FAO-BASED RESPONSIBLE FISHERY MANAGEMENT CERTIFICATION SURVEILLANCE REPORT

For The

US Alaska Salmon Commercial Fisheries

Applicant Group

Alaska Seafood Marketing Institute (ASMI)

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Main Headings of the Surveillance Report

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I. Summary and Recommendations

The Alaska Seafood Marketing Institute, requested assessment of the Alaska salmon commercial fisheries to the FAO Based Responsible Fisheries Management (RFM) Certification Program.
The application was made in April 2010. Assessment commenced in April 2010 with assessment validation before proceeding to full assessment and final certification determination in March 2011.

This report is the **1st Surveillance Report (ref AK/Sal/001.1/2012)** for the Alaska salmon commercial fisheries following Certification award against the FAO-Based RFM Program, awarded on March 11th 2011. The objective of the surveillance report is to monitor for any changes/updates in the management regime, regulations and their implementation since the previous assessment (in this case full assessment) and to determine whether these changes (if any) and current practices remain consistent with the overall confidence rating scorings of the fishery allocated during initial certification.
In addition to this, any areas reported as "items for surveillance" or action plans in the previous assessment are reassessed and a new conclusion on consistency of these items with the Conformance Criteria is given accordingly.

The US Alaska commercial salmon [all pacific salmon species: Chinook *(Oncorhynchus tschawytscha);* sockeye *(Oncorhynchus nerka);* coho *(Oncorhynchus kisutch);* pink *(Oncorhynchus gorbuscha);* and chum) *(Oncorhynchus keta)*] fisheries, employ troll, purse seine, drift gillnet, set gillnet (and fish wheel in Upper Yukon River only) gear, in the four administrative Regions of Alaska, and are principally managed by the Alaska Department of Fish and Game (ADFG). The certification covers the entire Alaska Exclusive Economic Zone (EEZ) although the vast majority of the harvest is taken in the internal waters (0-3 nautical miles, and other enclosed waters) of the state of Alaska.

The surveillance assessment was conducted according to the Global Trust procedures for FAO – Based Responsible Fisheries Management Certification using the FAO – Based RFM Conformance Criteria V1.2 fundamental clauses as the assessment framework.

The assessment was conducted by a team of Global Trust appointed Assessors comprising of two externally contracted fishery experts and Global Trust internal staff. Details of the assessment team are provided in Appendix 1.

The main Key outcomes have been summarised in Section 5 "Assessment Outcome Summary"
Following close out of the minor non conformance found during this 1st surveillance assessment, the Certification Committee confirms continued Certification under the FAO-Based Responsible Fisheries Management Certification Program to the U.S.A. Alaska commercial salmon fisheries.

II. Assessment Team Details

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1. Introduction

Unit of Certification

The US Alaska commercial salmon [all pacific salmon species: Chinook *(Oncorhynchus tschawytscha);* sockeye *(Oncorhynchus nerka);* coho *(Oncorhynchus kisutch);* pink *(Oncorhynchus gorbuscha);* and chum *(Oncorhynchus keta)*] fisheries, employing troll, purse seine, drift gillnet, set gillnet gear(and fish wheel in Upper Yukon River only), in the four administrative Regions of Alaska principally managed by the Alaska Department of Fish and Game (ADFG), underwent their 1st surveillance assessment against the requirements of the FAO-Based RFM Conformance Criteria Version 1.2 Fundamental clauses.

This 1st Surveillance Report documents the assessment result for the continued certification of commercially exploited Alaska salmon fisheries to the FAO-Based RFM Certification Program. This is a voluntary program for the Alaska salmon fisheries that has been supported by ASMI who wishes to provide an independent, third-party certification program that can be used to verify that these fisheries are responsibly managed according to the FAO-Based RFM Program.

The assessment was conducted according to the Global Trust procedures for FAO-Based RFM Certification GTC Version 1.2 Sept 2011 in accordance with EN45011/ISO/IEC Guide 65 accredited certification procedures. The assessment is based on the fundamental clauses specified in the FAO-Based RFM Conformance Criteria.

The assessment is based on 6 major components of responsible management derived from the FAO Code of conduct for Responsible Fisheries (1995) and Guidelines for the Eco-labeling of products from marine capture fisheries (2009).

A The Fisheries Management System
B Science and Stock Assessment Activities
C The Precautionary Approach
D Management Measures
E Implementation, Monitoring and Control
F Serious Impacts of the Fishery on the Ecosystem

These six major components are supported by 13 fundamental clauses (+ 1 in case of enhanced fisheries) against which a capture fishery certified under the FAO-Based RFM Program is assessed during the various assessment surveillance events.

A summary of the site meetings is presented in Section 5. Assessors comprised of both externally contracted fishery experts and Global Trust internal staff (Appendix 1).

This report documents the 1st Surveillance Assessment of the Alaska salmon commercial fisheries, originally certified the 11th of March 2011, and the recommendation of the Assessment Team for continued FAO-Based RFM Certification.

1.1. Recommendation of the Assessment Team

Following close out of the minor non conformance found during this 1st surveillance assessment, the Assessment Team recommends that continued Certification under the FAO-Based Responsible Fisheries Management Certification Program is granted to the U.S.A. Alaska commercial salmon [all pacific salmon species: Chinook *(Oncorhynchus tschawytscha);* sockeye *(Oncorhynchus nerka);* coho *(Oncorhynchus kisutch);* pink *(Oncorhynchus gorbuscha);* and chum *(Oncorhynchus keta)*] fisheries, employing troll, purse seine, drift gillnet, set gillnet gear(and fish wheel in Upper Yukon River only), in the four administrative Regions of Alaska principally managed by the Alaska Department of Fish and Game (ADFG).

2. Fishery Applicant Details

Applicant Contact Information			
Organization/ Company Name:	**Alaska Seafood Marketing Institute**	Date:	**April 2010**
Correspondence Address:	**International Marketing Office and Administration Suite 200**		
Street :	**311 N. Franklin Street**		
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State:	**Alaska AK 99801-1147**		
Country:	***USA***		
Phone:	**(907) 465-5560**	**E-mail Address:**	***info@alaskaseafood.org***
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Nominated Deputy:	***As Above***		
Deputy Phone:	**As Above**	**Deputy E-mail Address:**	**rrice@alaskaseafood.org**

3. Unit of Certification

Unit of Certification				
US ALASKA SALMON FISHERIES				
	Fish Species (Common & Scientific Name)	**Geographical Location of Fishery**	**Gear Type**	**Principal Management Authority**
1.	**King/Chinook *(Oncorhynchus tschawytscha)* Sockeye/Red *(Oncorhynchus nerka)* Coho/Silver *(Oncorhynchus kisutch)* Pink/Humpback *(Oncorhynchus gorbuscha)* Keta/Chum *(Oncorhynchus keta)***	**ADFG Admin Region 1: Southeast & Yakutat**	**Troll, Purse Seine, Drift Gillnet, Set Gillnet**	**Alaska Department of Fish and Game (ADFG)**
2.	**King/Chinook *(Oncorhynchus tschawytscha)* Sockeye/Red *(Oncorhynchus nerka)* Coho/Silver *(Oncorhynchus kisutch)* Pink/Humpback *(Oncorhynchus gorbuscha)* Keta/Chum *(Oncorhynchus keta)***	**ADFG Admin Region 2: Central**	**Purse Seine, Drift Gillnet, Set Gillnet**	**Alaska Department of Fish and Game (ADFG)**
3.	**King/Chinook *(Oncorhynchus tschawytscha)* Sockeye/Red *(Oncorhynchus nerka)* Coho/Silver *(Oncorhynchus kisutch)* Pink/Humpback *(Oncorhynchus gorbuscha)* Keta/Chum *(Oncorhynchus keta)***	**ADFG Admin Region 3: Arctic-Yukon-Kuskokwim**	**Drift Gillnet, Set Gillnet Fish wheel.**	**Alaska Department of Fish and Game (ADFG)**
4.	**King/Chinook *(Oncorhynchus tschawytscha)* Sockeye/Red *(Oncorhynchus nerka)* Coho/Silver *(Oncorhynchus kisutch)* Pink/Humpback *(Oncorhynchus gorbuscha)* Keta/Chum *(Oncorhynchus keta)***	**ADFG Admin Region 4:Kodiak, Chignik, Alaska Peninsula, Aleutian Islands**	**Purse Seine, Drift Gillnet, Set Gillnet**	**Alaska Department of Fish and Game (ADFG)**

4. Surveillance Meetings

Organization	Time, day and representative	Items discussed
Alaska Seafood Marketing Institute. Seattle, Washington, USA	1.30 pm, 19th March, Randy Rice	Salmon surveillance site visits schedule and key items for discussion
Alaska Wildlife Troopers. Juneau, Alaska, USA	9.00 am, 20th March, Lt. Steven Hall	Salmon regulations. Salmon enforcement. Violations types and extent.
Douglas Island Pink and Chum, Inc. Juneau, Alaska, USA	1.00 pm, 20th March, Eric Prestegard (Executive director), Rick Focht (Operations Director).	Annual Management Plans (AMPs) development and interface with ADFG personnel for review and approval. Alaska Statute relative to AMPs requirement. Hatcheries funding for new ADFG research study on hatcheries interactions with wild/hatchery salmon. Previous studies on salmon straying in SEAK and PWS. Hatcheries permitting process. Fish transport regulations. PNPs Board of Directors members inclusion from ADFG, processing, producers etc... Hatcheries Permit alterations. Remote release sites of hatcheries. Comprehensive regional planning. Statewide genetics policy to protect wild stocks. Fish health and disease statutes (no disease has ever been introduced or amplified). Siting of hatcheries, terminal harvest areas (temporal and spatial segregation from wild stocks to minimize mixed fisheries, then harvest all the returning salmon to minimize potential breeding. DIPAC confirmed that hatchery production is not approved if there is not high confidence that the resulting salmon will be fully harvested). Hatchery brood stock diversity practices (random selection of fish, 1 to 1 mating ratio, effective population sizes very large in accordance with Genetic Policy, broodstock is local fish). Productivity of brood stock. Collection of broodstock for the hatcheries is stratified over spawn/run timing to maximize the heterogeneity of the gene pool. Founder populations of broodstocks. Otolith marking. Broodstock management practices. Disease avoidance practices and interface with ADFG pathology lab. Genetic policy. Absence of evidence for competitive interaction of wild/hatchery salmon.
US NOAA Fisheries Ted Stevens Marine Research Institute, Juneau, Alaska, USA	3.00 pm, 20th March, Phil Mundy (Institute Director), Jeff Guyon, William	History of Auke Bay Lab (ABL) and relevance to salmon research throughout Alaska. Collaboration with ADFG. Salmon FMP. Endangered Species Act (ESA) issues in Pacific Northwest. Development of Alaska Fisheries Hatchery Program. ADFG FRED division. Regional

	Heard (Program Directors)	Planning Teams (scientists from ADFG, ABL, PNP, FRED Division). Careful process for policy setting. Specific genetic policy 1985. Siting of Hatcheries. Planning and development input from NOAA Auke Bay Laboratory. Contribution to genetic policy from ABL. Auke Creek Research Station. Straying research. Wild and hatcheries interactions research work. Uniqueness of Auke creek weir for counting juvenile and adult salmon. WASSIP program genetic fingerprinting across Western Alaska. Otolith marking technology and widespread use. Forecasting pink salmon in PWS and SE Alaska techniques. Biophysical variables for forecasting runs. Ocean Research Activities (BSIERP, GOAIERP, SECM) on ecology, links with bioenvironmental parameters and species interaction. Straying pink, chum and Chinook studies. NPAFC workshop on salmon and report on oceanographic conditions and linkages.
Prince William Sound Aquaculture Corporation. Cordova, Alaska, USA	2.00 pm, 21st March, Dave Reggiani (General Manager), George Covel (Chairman)	Regional Planning Team. Levels of Approval. ADFG interface. Hatcheries siting. Strontium Chloride marking. Broodstock randomized sampling on size, colour, and different runs. Different year class thermal marking. Genetic policy. PWSAC program review. Original broodstock collection, guidelines and practices. Egg production. Stable fecundity over 17 generation of hatchery broodstock. Large broodstock sample sizes, more than required by genetic policy. 1 to 1 male to female mating for pinks and chums, 3 to 2 for coho. Pink salmon eggs taken from 100,000 males and 100,000 females. 400 animals minimal requirement from Genetic policy. Aim for total harvest of terminal fisheries. Straying dynamics. ADFG research to fill gap in knowledge. ADFG pathology lab. Instantaneous killing of diseased batches requirement. Gulkana facility. Otolith and strontium marking. 10% budget spent on R&D. Original broodstock origin and number. Eggs survival. Wild stocks abundance and assessment. Issue of overcounting. ADFG aerial surveys tracks timing and trend of season run.
Alaska Department of Fish and Game. Juneau, Alaska, USA	5th April, 10.00 am conference call, Sue Aspelund, Jeff Regnart	Alaska Hatcheries multigenerational Research Program. Further approaches before availability of data. Use of data as available. ADFG interface with hatcheries. Baseline study of the genetic makeup of the different populations of pinks in PWS. ADFG confidence in current assessment practices. The potential issue of over-counting returning wild salmon. Genetic Policy and Regional Plans, review plans. ADFG studies on enhanced salmon straying.

Stakeholder information input

Stakeholder Submissions: The Alaska Seafood Marketing Institute website provides an opportunity for stakeholders to provide information that relevant for the assessment or surveillance audit of fisheries within the Alaska FAO Based Responsible Fisheries Management Certification Program. Although, no stakeholder input was provided by this route, Global Trust did receive direct correspondence from the Wild Salmon Center and Sustainable Fisheries Partnership with respect to the Alaska salmon assessment (and other matters). The submission information specific to Alaska salmon is provided in Appendix 2. This submission provided additional reference material used as part of the surveillance audit evidence.

5. Assessment Outcome Summary

Fundamental clauses summaries (refer to FAO Based Conformance Criteria v1.2)

1. *Alaska's salmon fisheries are managed under a clear structure of laws, regulations, treaties, and other legal mandates and instruments, at the international, national, and local levels. This management process is well-established and transparent. ADFG's Commercial Fisheries Division is responsible for conservation of Alaska's salmon stocks and for management of the commercial fisheries. ADFG's main priority is achieving escapement, which ensures that enough salmon escape the fisheries, and spawn in their natal rivers to provide maximum sustainable yield. The Alaska Wildlife Troopers are charged with protecting the fishery through reducing illegal harvest, waste and illegal sale of commercially and sport harvested fish, and by protecting fish and wildlife habitat in state waters.*

2. *The assessment team considers that the collectivity of: the NEPA process, existing agencies and processes (e.g. ADFG, ADEC, DNM, USFWS, ANILCA and OPMP), and the existing intimate and routine cooperation between federal and state agencies managing Alaska's coastal resources is capable of planning and managing coastal developments in a transparent, organized and sustainable way. In the absence of the ACMP, the assessment team has not been presented with information of a deterioration of the ability of the management agencies in their participation in coastal frameworks, decision making and activities related to the fishery and its users. In addition, the recent developments from the public and upcoming ballot to reinstitute the Alaska Coastal Management Plan offer some insight in the possible return of the ACMP in August 2012. This development will be closely followed as part of next surveillance assessment and a new determination will be made accordingly during the next surveillance assessment.*

3. *The BOF main role is to conserve and develop the fishery resources of the state. The BOF is charged with making allocative decisions, and ADFG is responsible for management based on those decisions. Management Plans are established by the BOF for each Region and incorporated into regulation in Title 5 Alaska Administrative Code. Those plans are implemented each season in each Region by the responsible ADFG biologist following the direction of the BOF. Management plans on recovery of depleted stocks are active policy of the state and are based on providing adequate 'escapement' or spawning stock in each generation. In a 2011 action, the NPFMC (responsible under US national law for sustainable*

management of fisheries in US EEZ waters off Alaska) modified the Federal Salmon Fishery Management Plan to specifically exclude three historical commercial salmon fishing areas outside of state waters in the EEZ and the sport salmon fishery from the West Area EEZ in favour of continuing management by the State of Alaska. The FMP would prohibit commercial salmon fisheries in the modified West Area and would continue to delegate management authority to the State of Alaska for the directed commercial salmon troll fishery and the sport salmon fishery in the East Area of the EEZ.

4. *Intensive monitoring of incoming run strength is required for successful abundance-based management of commercial salmon fisheries in Alaska. Fish weirs, counting towers, sonar, test fishing, fish wheels, and aerial surveys are the primary assessment tools. Fishery openings are targeted where production surplus to escapement goals is identified. Each assessment tool is designed to work best for the geographical and physical conditions encountered. The primary method of accounting for commercial fishery harvest is the ADFG's fish ticket system. By Alaska law (AS 16.05.690 Record of Purchase) each buyer of fish is required to keep a record of each purchase showing the name or number of the vessel from which the catch is taken, the date of landing, vessel license number, pounds purchased of each species, number of each species, and the ADFG statistical area in which the fish were taken, as well as other information ADFG may require for specific fisheries or areas. The new multi-generation ADFG led hatchery salmon research program aims at providing a better account of strays proportion in wild salmon streams to improve escapement enumeration practices.*

5. *Stock assessment practices throughout Alaska vary. One of the department's core services is to maintain stock assessment and applied research programs. The department maintains ongoing programs for the enumeration, assessment, and understanding of salmon. The Division of Commercial Fisheries operates 23 area offices, which are organized into the Arctic-Yukon-Kuskokwim, Westward, Central, and Southeast Regions. Each year, ADFG staff in the various regions define the data needs for management of each salmon fishery, develop statistically valid study designs, and collect, analyze, and report the data necessary for effective fisheries management following procedures detailed in its study plans. The State has also cooperative technical, stock assessment, and management interactions with other States and management organizations that deal with trans-boundary salmon stocks that are harvested in Alaska. Annual salmon production, particularly of pink, chum and sockeye in PWS and chum and sockeye in SEAK is the result of both natural spawning and hatchery production. The new multi-generation hatchery salmon research program aims at providing a better account of strays proportion in wild salmon streams to improve stock assessment practices.*

6. *Escapement goals effectively represent reference points of the various Alaska salmon systems. Currently, there are 289 active salmon stock escapement goals throughout the state. A variety of methods are used to develop escapement goals in Alaska. Of these, the percentile approach has been used for the recent BOF cycle review of escapement goals in the PWS and SEAK management areas causing a general reduction of escapement goals*

for pink salmon in PWS and chum salmon in SEAK. Such decrease are due to change of management targets to Sustainable Escapement Goals (SEG) ranges for PWS pink salmon because each district is actually managed by district, not by overall return to the sound; and due to addition of data series for SEAK chum salmon. Where escapements chronically (4-5 years) fail to meet expectations for harvestable yield or spawning escapements, the department may recommend, and the board may adopt a stock of concern designation for those underperforming salmon stocks. During the 2010/2011 board meeting cycle, seven new stocks of concern were declared including: Karluk River Chinook salmon in Westward Region, and in Central Region, Chuitna, Theodore and Lewis rivers Chinook salmon, and Alexander, Willow and Goose creeks Chinook salmon. All of these stocks were designated as stocks of management concern, except for Willow and Goose creeks Chinook salmon that were designated as stocks of yield concern.

7. *Salmon enhancement programs in Alaska were designed to help rehabilitate depressed fisheries and to protect wild salmon stocks through detailed planning and permitting processes that included focused policies on genetics, pathology, and management. Hatcheries were located away from significant wild stocks, local sources were used to develop hatchery broodstocks, and juveniles are marked so management can target fisheries on hatchery fish. New evidence collected during 2011 and 2012 points to the fact that hatchery salmon stray rates in wild salmon streams in PWS and SEAK are in excess of 10%. Potential genetic depression could occur from gene introgression of hatchery to wild salmon. The State of Alaska has organised for a multigenerational study starting in 2013 in PWS and SEAK that aims at understanding (1) the genetic stock structure of pink and chum salmon in PWS and SEAK, (2) the extent and annual variability in straying of hatchery pink salmon in PWS and chum salmon in PWS and SEAK, and (3) the impact on fitness productivity of wild pink and chum salmon stocks due to straying of hatchery pink and chum salmon. This project will deliver answers about the scope of straying on phase 1 and some preliminary results could be available around 2014-2015. However, answers regarding genetics impact on fitness of wild strains may not be available until 2023. Relating to the requirements of the Precautionary Approach and especially supporting clause 7.1 ("The absence of adequate scientific information shall not be used as a reason for postponing or failing to take conservation and management measures") it is unclear how ADFG plans to deal with development plans and release activities (e.g. potential requests from hatchery corporations for increased pink and chum salmon productions) in the two regions in light of the fact that negative genetic interactions between hatchery and wild salmon could already be occurring, and that research results of the genetic interactions between hatchery and wild salmon following the multigenerational study in PWS and SEAK may take considerable time to accrue. Since the assessment team is aware of a range of management tools that are in place for the limitation of straying rates of hatchery fish, a minor non-conformance is applied specific to clause 7.1.1 specific to PWS and SEAK. A corrective action plan from the client shall detail 1) how ADFG intends to address this issue and 2) a set of specific timelines to allow for assessment during the next surveillance activities in 2013, 2014 and 2015 and the second full assessment audit in 2016, as relevant and if needed. This is been delivered and later accepted by the assessment team.*

8. *Escapement goals are essentially the harvest control rule used for management of Alaska salmon. Currently, there are 289 active salmon stock escapement goals throughout the state of Alaska. Every three years (based on the BOF schedule) each Region updates its*

escapement information and submits a salmon stock status report to the BOF. This report (mandated in the Policy for the Management of Sustainable Salmon Fisheries, 5AAC 39.222) reviews the status of all stocks within a management area, recommends new and modified escapement goals based on the new data that have been collected and analyzed in the past three years, defines stocks of concern, and develops management or action plans to deal with fishery management issues. Emergency Orders (EO) are used to close or limit access to fisheries based on information on run strength and escapement goals, EOs are widely used to open and close fisheries as needed by local area biologists. Time and area restrictions limit when and where specific fisheries occur and restrictions are also imposed by regulation on all types of fishing gear (e.g., mesh size restrictions and length of nets for gillnets, number of fishing lines, rods, and gurdies for troll gear, and mesh size, net length and depth for purse seine gear). Specific requirement for gear (i.e. gillnet length, depth, and mesh sizes) are defined for each area and in specific management plans and regulations. Following the internal review of operations for PWSAC, since 2008, the majority of action plan compliance issues have been resolved. Data exchange between the department and PWSAC has improved since data needs and reporting requirements have been clearly articulated in PWSAC's annual management plans.

9. *There are defined management measures designed to maintain stocks at levels capable of producing maximum sustainable levels. Escapement goals (BEGs, SEGs, OEGs and SETs) aim at allowing enough salmon to escape and spawn in their relative natal rivers, to produce maximum sustainable yields. The commercial Alaska salmon fisheries are limited entry fisheries. The CFEC manages the entry program by issuing permits and vessel licenses. Stocks below escapement goals are classified as: yield, management, or chronic inability concern. For stocks of concern, action plans dealing with their recovery are prepared and applied.*

10. *Fishing operations are carried out by fishers with appropriate standards of competence in accordance with international standards and guidelines and regulations.*

11. *An effective legal and administrative framework shall be established and compliance ensured through effective mechanisms for monitoring, surveillance, control and enforcement for all fishing activities within the jurisdiction. The Division of Wildlife Troopers in the Department of Public Safety continues to be charged with protecting the state's natural resources through reducing illegal harvest, waste and illegal sale of commercially and sport harvested fish, and by safeguarding fish and wildlife habitat. The structure of ADFG, with management authority instilled at the area office level, allows it to monitor, control and enforce compliance with fishery regulations and emergency orders. Area Management Biologists are on the scene to actually watch the prosecution of the fishery in their area through aerial surveys and on-the-ground observations.*

12. *Alaska's salmon fisheries are managed by ADFG, pursuant to Alaska Statutes Title 16 (AS16) and Alaska Administrative Code Title 5 (AAC5). These laws and regulations are enforced by the Alaska Department of Public Safety, Alaska State Troopers, and Division of Wildlife Troopers (AWT). AWT coordinates with, and is supported by, law enforcement personnel from USCG and NMFS Office of Law Enforcement (OLE). The US Forest Service and the US Fish*

and Wildlife Service also work with AWT on the enforcement of fish and game regulations (both state and federal) on federal public land.

13. *Alaska's Sustainable Salmon Policy includes provisions addressing the potential effects of ecological changes/perturbations on sustainably allowable harvest in that salmon fisheries shall be managed to allow escapements within ranges necessary to conserve and sustain potential salmon production and maintain normal ecosystem functioning. Bycatch of non-targeted species is not a major issue in most Alaska salmon fisheries. Most non-targeted fish harvested in salmon fisheries are other species of salmon and are reported on fish tickets. Salmon bycatch in trawl fisheries for walleye pollock in the Bering Sea and the Gulf of Alaska is managed by the NPFMC with regulations implemented by the NMFS. Gear used for commercial catches of Alaska salmon are not considered deleterious to physical habitats as they do not interact directly with it (unlike bottom trawl, dredges and pot as used in other fisheries). Takes of endangered species, e.g. Chinook from the Columbia River system, are minimized (e.g. by establishment of annual quotas in all SEAK commercial and sport fisheries that harvest Chinook salmon under the Pacific Salmon Treaty. Auke Bay lab and Little Port Walter lab support long term research in salmon biology and constitute important contributions to fisheries science resulting from decades of research conducted at these facilities. One potential negative ecological effect of the salmon fishery is represented by the dynamics surrounding the ecological and genetic interactions between wild and hatchery salmon. In that respect, a whole range of peer reviewed publications has been recently released that further elucidate the subject. The general results of these papers indicate potential negative effects of hatchery salmon on wild salmon stocks. ADFG has organized for the start of a large scale multi-generation research program to elucidate and address the issue of interactions of wild and hatchery pink and chum salmon in Prince William Sound and Southeast Alaska, in May 2012.*

14. *Salmon enhancement programs in Alaska were designed to help rehabilitate depressed fisheries and to protect wild salmon stocks through detailed planning and permitting processes that included focused policies on genetics, pathology, and management. Hatcheries were located away from significant wild stocks, local sources were used to develop hatchery broodstocks, and juveniles are marked so management can target fisheries on hatchery fish. From the beginning of Alaska's salmon fishery enhancement program it was recognized that salmon stray and that hatchery stocks would stray; consequently, policies and regulations were adopted to mitigate concerns associated with straying. Hatchery programs in Alaska pioneered use of otolith thermal marks for mass-marking hatchery production to facilitate evaluation and management. These marking programs have also made possible accurate detection of hatchery-bred salmon on the spawning grounds of wild salmon. Recent studies have demonstrated large proportions of hatchery-bred salmon in some wild spawning populations in parts of Alaska.*
    These observations have led to the development of a large scale multigenerational research study starting in 2013 that aims at answering several important questions:

    (1) Are hatchery-bred salmon interbreeding with wild salmon to the extent that fitness and productivity of these stocks are being diminished? If so, does any loss of fitness and

productivity continue through subsequent generations? Can such a loss of productivity be compensated by addition of hatchery strays to the spawning stock?

(2) *Is the annual assessment of wild stocks (which is, in part, based on visual observation) so biased by the presence of hatchery salmon that excessive harvest of wild fish is being allowed or that escapement goals are difficult to set and difficult to assess? Or, if the additional enhanced fish have an overall positive effect on the escapement, should they be simply counted as part of that escapement?*

(3) Do density interactions diminish productivity of wild salmon?

6. Conformity statement

Following the close out of the minor non conformance raised during this 1st surveillance assessment, the Assessment Team recommends that continued Certification under the FAO-Based Responsible Fisheries Management Certification Program is granted to the U.S.A. Alaska commercial salmon [all pacific salmon species: Chinook *(Oncorhynchus tschawytscha);* sockeye *(Oncorhynchus nerka);* coho *(Oncorhynchus kisutch);* pink *(Oncorhynchus gorbuscha);* and chum *(Oncorhynchus keta)*] fisheries, employing troll, purse seine, drift gillnet, set gillnet gear(and fish wheel in Upper Yukon River only), in the four administrative Regions of Alaska principally managed by the Alaska Department of Fish and Game (ADFG).

7. FAO-Based Conformance Criteria Fundamental Clauses for Surveillance Reporting

A. The Fisheries Management System

1. There shall be a structured and legally mandated management system based upon and respecting International, National and local fishery laws, for the responsible utilization of the stock under consideration and conservation of the marine environment.

FAO CCRF 7.1.3/7.1.4/7.1.9/7.3.1/7.3.2/7.3.4/7.6.8/7.7.1/10.3.1

FAO Eco 28

Evidence adequacy rating:

☑ High **☐ Medium** **☐ Low**

Rating Determination

Alaska's salmon fisheries are managed under a clear structure of laws, regulations, treaties, and other legal mandates and instruments, at the international, national, and local levels. This management process is well-established and transparent. ADFG's Commercial Fisheries Division is responsible for conservation of Alaska's salmon stocks and for management of the commercial fisheries. ADFG's main priority is achieving escapement, which ensures that enough salmon escape the fisheries, and spawn in their natal rivers to provide maximum sustainable yield. The Alaska Wildlife Troopers are charged with protecting the fishery through reducing illegal harvest, waste and illegal sale of commercially and sport harvested fish, and by protecting fish and wildlife habitat in state waters.

State Management

The Alaska's Department of Fish and Game took over salmon management from the federal government following statehood in 1960. ADFG Commercial Fisheries Division is responsible for conservation of Alaska's salmon stocks and for management of the commercial fisheries. As part of our fisheries management process, Alaska's commercial salmon fisheries are administered through the use of salmon management areas throughout the state.

- **Southeast Region.**
- **Central Region** (Copper River, Prince William Sound, Upper Cook Inlet, Lower Cook Inlet, Bristol Bay).
- **Arctic-Yukon-Kuskokwim** (Kuskokwim, Norton Sound & Kotzebue, Yukon).
- **Westward Region** (Kodiak Island, Alaska Peninsula, Chignik, Bering Sea/Aleutian Islands).

Along with ADFG offices in several town and villages across Alaska, each ADFG Regional Office supervises and makes decision for its own Region. Local area management biologists have inseason management authority (i.e. issuing emergency orders) to address the rapidly changing inseason fishery management needs of salmon fisheries in Alaska.

Sustained Yield

The state constitution requires salmon be managed on a sustained yield principle, and adequate

spawning escapement to assure sustained salmon populations is the highest management priority. After escapement goals are met, subsistence use takes priority over other salmon harvesters. Commercial, sport and personal use fisheries share equally in priority after escapement and subsistence use goals are met.

Board of Fisheries allocation

Salmon are "allocated" to the different use groups by the Alaska Board of Fisheries (BOF). Every three years, the board considers proposals on allocation and management of salmon in each of the management Regions in an open and public process. The Board considers proposals submitted by the public and management staff, and sets policy after public testimony and scientific presentations. Decisions are guided on the Sustainable Salmon Fishery Policy for the State of Alaska. The regional staff of ADFG manages salmon in each of the regions fisheries based on the rules and regulations adopted by the Board of Fisheries. Alaska's Sustainable Salmon Policy directs ADFG to follow a systematic process for evaluating the health of salmon stocks throughout the State by requiring ADFG 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 process to identify stocks of concern (yield, management and conservation concern), and requires ADFG and the BOF to develop action plans to rebuild these stocks through the use of fisheries restrictions, improved research, and restoring and protecting habitat. The management arrangements and decision-making processes for Alaska salmon fisheries are organized in a very transparent manner, and are readily accessible to any person. The BOF actively and routinely encourages stakeholder involvement in the process. The BOF meets four to six times per year in communities around the state to consider proposed changes to fisheries regulations around the state.

Research

ADFG Commercial Fisheries Division offices are situated in 23 locations throughout the range of commercial salmon fisheries. Institutional framework for fisheries management includes supervisory, administrative, technical, economic, biometric, research, and management staff. The staff are located within each management division as well as within the commissioner's office. Each year, they define the data needs for management of each salmon fishery (reported in annual management reports, BOF reports, stock status reports, and preseason forecasts), develop statistically valid study designs (or operational plans) to obtain the necessary information, and collect, analyze, and report the data necessary for effective fisheries management following procedures detailed in its study plans. Each step of this process is guided by state policies, standards, and/or nationally recognized scientific standards. The state has a well-organized and adequately funded program. The escapement goals with which salmon as managed under, take into account all sources of mortality because escapement is the "net result" of all factors which have influenced salmon during its juvenile stages in freshwater, its oceanic migration, and the fisheries to which it is subjected.

Constitution, statutes and regulations

Almost all of Alaska's salmon fisheries take place in the internal waters (0-3 nm, and other enclosed waters) of the State of Alaska. Alaska manages those fisheries under the authority of its Constitution, statutes (laws), and regulations (administrative code).

Article VIII of Alaska's Constitution states: Section 4. Sustained Yield: 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.
"Alaska's Constitution: A Citizen's Guide (Fourth Edition)" explains: "The principle of sustained yield management is a basic tenet of conservation: the annual harvest of a biological resource should not exceed the annual regeneration of that resource. Maximum sustained yield is the largest harvest that can be maintained year after year. State law defines maximum sustained yield as 'the achievement and maintenance in perpetuity of a high level annual or regular periodic output of the various renewable resources of the state land consistent with multiple use'(AS 38.04.910). At the time of the constitutional convention, stocks of Alaska's salmon had been reduced to a sad remnant of their past bounty by neglect of the sustained yield maxim. The qualifying phrase 'subject to preferences among beneficial uses' signals recognition by the delegates that not all the demands made upon resources can be satisfied, and that prudent resource management based on modern conservation principles necessarily involves prioritizing competing uses."

Statutes (also termed "laws") are enacted by the state Legislature. Title 16 of Alaska Statutes (AS16) "Fish And Game" sets forth the laws which govern the management of Alaska's salmon fisheries, as well as myriad other living resources. Like all other statutes, Title 16 is consistent with the Constitution. Regulations (also termed "administrative code") are developed and implemented by departments of the Executive branch of government, which is headed by the Governor. Title 5 of the Alaska Administrative Code (5AAC) "Fish And Game" is the body of state regulations by which Alaska's salmon fisheries are managed. All regulations must be consistent with the governing statutes; that is, 5AAC is consistent with AS16. Of particular relevance to this assessment are –
1. Commercial and Subsistence Fishing and Private Nonprofit Salmon Hatcheries (5 AAC 1 - 5 AAC 41)
6. Fish and Game Advisory Committees. (5 AAC 96 - 5 AAC 98).

Enforcement
The Division of Wildlife Troopers in the Department of Public Safety (known as Alaska Wildlife Troopers, or AWT) is charged with protecting the state's natural resources through reducing illegal harvest, waste and illegal sale of commercially and sport harvested fish, and by safeguarding fish and wildlife habitat. The U.S. Coast Guard (USCG) also enforces boating safety laws and fishing vessels are often under surveillance by AWT and the USCG during fishing operations. For fisheries under federal management, the NOAA Fisheries Office for Law Enforcement (OLE) enforces federal laws that protect and conserve Alaska's living marine resources and their habitat. The Alaska Limited Entry system only allows legally permitted vessels to operate in salmon fisheries. The "right to fish" is embodied in a permit card that is issued annually. Cooperation and coordination among ADFG, AWT, USCG, and OLE is frequent and routine.

http://www.adfg.alaska.gov/static/home/library/PDFs/afrb/clarv12n1.pdf
http://www.adfg.alaska.gov/index.cfm?adfg=commercialbyfisherysalmon.salmonareas

2. Management organizations shall participate in coastal area management institutional frameworks, decision-making processes and activities related to the fishery and its users, in support of sustainable and integrated resource use, and conflict avoidance.

FAO CCRF 10.1.1/10.1.2/10.1.4/10.2.1/10.2.2/10.2.4

Evidence adequacy rating:

☑ **High** ☐ **Medium** ☐ **Low**

Rating Determination:

The assessment team considers that the collectivity of: the NEPA process, existing agencies and processes (e.g. ADFG, ADEC, DNM, USFWS, ANILCA and OPMP), and the existing intimate and routine cooperation between federal and state agencies managing Alaska's coastal resources is capable of planning and managing coastal developments in a transparent, organized and sustainable way. In the absence of the ACMP, the assessment team has not been presented with information of a deterioration of the ability of the management agencies in their participation in coastal frameworks, decision making and activities related to the fishery and its users. In addition, the recent developments from the public and upcoming ballot to reinstitute the Alaska Coastal Management Plan offer some insight in the possible return of the ACMP in August 2012. This development will be closely followed as part of next surveillance assessment and a new determination will be made accordingly during the next surveillance assessment.

ACMP and NEPA

The salmon fishery management organizations in Alaska (principally ADFG) participate in coastal area management-related institutional frameworks through the federal National Environmental Policy Act (NEPA) processes. The state is a cooperating agency in the NEPA process for federal actions, so that gives the State of AK another seat at the table for federal actions. This includes decision-making processes and activities relevant to the fishery resource and its users in support of sustainable and integrated use of living marine resources and avoidance of conflict among users.

ACMP ceased in July 2011

Up to July 2011, Alaska also participated in the Alaska Coastal Management Plan (ACMP), a program which included a state coastal plan, coastal district (local government) plans, standards for evaluating and managing uses and activities in the coastal zone, and a process to coordinate state resource agency permitting and approval of uses and activities in the coastal zone. The program was initially established to influence federal off-shore activities; however, over time it became an important planning and coordination tool for coastal zone related topics and interests, including protection of fish habitats. The ACMP was implemented through federal and state agencies and through local governments. State agencies involved included three divisions of ADFG, four divisions of the Department of Environmental Conservation, and nine divisions of the Department of Natural Resources. Federal agencies included the U.S. Forest Service, U.S. Fish and Wildlife Service, NMFS, U.S. Army Corps of Engineers, and the Environmental Protection Agency.
http://coastalmanagement.noaa.gov/programs/czm.html
http://alaskacoast.state.ak.us/Clawhome/handbook/pdf/OCRM_Approval.pdf

All construction activities in the coastal zone (e.g., work on docks, breakwaters, harbors and other infrastructure) were subject to the ACMP review process as well as in many cases the NEPA process. These processes deliberately take into account all resources and users of those resources. Conflict resolution mechanisms include both administrative (through governmental agencies) and legal

(through courts of law) procedures.

The ACMP up for ballot election in August 2012

In March 9 2012, Anchorage, AK – Lieutenant Governor Mead Treadwell certified the citizen initiative to establish an Alaska Coastal Management Program. The Division of Elections completed its review of signatures and determined they meet constitutional and statutory requirements for initiative petitions. Treadwell notified petition sponsors, the Senate President, and the Speaker of the House. The Division notified the lieutenant governor that the petition contains signatures of 29,991 qualified voters, exceeding the minimum requirement of 25,875 signatures. Alaska's prior coastal management program expired on July 1, 2011, after the legislature adjourned the second of two special sessions without passing legislation required to extend the program. The program coordinated state and federal permitting for development projects in coastal districts.

Under AS 15.45.190, upon a determination of proper filing, the initiative may appear on the next statewide general, special, or primary election that is held 120 days after a legislative session has convened and adjourned and a period of 120 days has expired since the adjournment of the legislative session.

Sponsors filed the petition with the Division of Elections on January 17, 2012. Determination of proper filing was made in March 2012 and the governor announced that the initiative is to become law subject to election ballot on August 28, 2012, barring unforeseen special election. If a majority of the votes cast on the initiative proposition favor its adoption, the proposed law will be enacted and become effective after 90 days.

http://ltgov.alaska.gov/treadwell/press-room/full-press-release.html?pr=112
http://www.elections.alaska.gov/petitions/11ACMP/Notice-of-Proper-Filing.pdf

DEC, ADFG, DNR and the USFWS

The Department of Environmental Conservation (DEC) implements statutes and regulations affecting air, land and water quality. DEC is the lead state agency for implementing the federal Clean Water Act and its authorities provide considerable opportunity to maintain high quality fish and wildlife habitat through pollution prevention (http://dec.alaska.gov/).

ADFG, on the hand, protects estuarine and marine habitats primarily through cooperative efforts involving other state and federal agencies and local governments. ADFG has jurisdiction over the mouths of designated anadromous fish streams and legislatively designated state special areas (critical habitat areas, sanctuaries and refuges). Some marine species also receive special consideration through the state Endangered Species program.

The Department of Natural Resources (DNR) manages all state-owned land, water and natural resources except for fish and game. This includes most of the state's tidelands out to the three mile limit and approximately 34,000 miles of coastline. DNR authorizes the use of log-transfer sites, access across state land and water, set-net sites for commercial gill net fishing, mariculture sites for shellfish farming, lodge sites and access for the tourism industry, and water rights and water use authorizations. DNR also uses the state Endangered Species Act to preserve natural habitat of species or subspecies of fish and wildlife that are threatened with extinction (http://dnr.alaska.gov/).

The U.S. Fish and Wildlife Service (USFWS) is a bureau within the Department of the Interior. Its objectives include 1) Assisting in the development and application of an environmental stewardship ethic, based on ecological principles, scientific knowledge of fish and wildlife, and a sense of moral responsibility; 2) Guide the conservation, development, and management of the US's fish and wildlife resources. 3) Administer a national program to provide the public opportunities to understand, appreciate, and wisely use fish and wildlife resources. The USFWS functions include enforcement of federal wildlife laws, protection of endangered species, management of migratory

birds, restoration of nationally significant fisheries, conservation and restoration of wildlife habitat such as wetlands, help of foreign governments with their international conservation efforts, and distribution of hundreds of millions of dollars, through the Wildlife Sport Fish and Restoration program, in excise taxes on fishing and hunting equipment to State fish and wildlife agencies http://www.fws.gov/help/about_us.html).

ANILCA

The Alaska National Interest Lands Conservation Act (ANILCA) directs federal agencies to consult and coordinate with the state of Alaska. State agencies responsible for natural resources, tourism, and transportation work as a team to provide input throughout federal planning processes (http://dnr.alaska.gov/commis/opmp/anilca/anilca.htm).

OPMP

The Department of Natural Resources (DNR) Office of Project Management and Permitting (OPMP) coordinates the review of larger scale projects in the state. Because of the complexity and potential impact of these projects on multiple divisions or agencies, these projects typically benefit from a single primary point of contact. A project coordinator is assigned to each project in order to facilitate interagency coordination and a cooperative working relationship with the project proponent. The office deals with a diverse mix of projects including transportation, oil and gas, mining, federal grants, ANILCA coordination, and land use planning. Every project is different and involves a different mix of agencies, permitting requirements, statutory responsibilities, and resource management responsibilities (http://dnr.alaska.gov/commis/opmp/).

NEPA

Virtually every development affecting the natural environment, by regulation, has to go through the environmental impact assessment process required by the US National Environmental Policy Act which identifies its potential environmental, social and economic impacts and/or benefits. The NEPA processes provide public information and opportunity for public and agencies involvement that are robust and inclusive at both the state and federal levels.

The assessment team considers that the collectivity of: the NEPA process, existing agencies and processes (e.g. ADFG, ADEC, DNM, USFWS, ANILCA and OPMP), and the existing intimate and routine cooperation between federal and state agencies managing Alaska's coastal resources is capable of planning and managing coastal developments in a transparent, organized and sustainable way. In addition, the recent developments from the public and upcoming ballot to reinstitute the Alaska Coastal Management Plan offer some insight in the possible return of the ACMP in August 2012. This development will be closely followed as part of next surveillance assessment and a determination will be made accordingly.

ADFG fisheries management staff at the regional and areas levels meet routinely with federal fisheries staff at both formal and informal meetings to discuss salmon fishery-related activities including research projects, in-season management issues and coastal developments. Area Biologists and other ADFG employees also routinely meet with fishery groups, environmental groups, developers, and other agencies with management authority (e.g., USFS, NMFS, and USFWS) to ensure that the needs of Alaska's salmon fisheries are considered when making decisions about development or policies.

In addition, the Board of Fisheries (BOF) public meetings process provides a regularly scheduled public forum for all interested individuals, fishermen, fishing organizations, environmental organizations, Alaskan Native organizations and other governmental and non-governmental entities to participate in the development of policies and regulations for all salmon fisheries in the state. The

BOF ensures that the process for the state's regulatory system relating to fish and wildlife resources operates publicly, efficiently and effectively. ADFG staff provides support for this public process, and ensures that the system is legal, timely, and accessible to the citizens of the state. The BOF is a seven member board appointed by the governor and confirmed by the legislature which sets fishing seasons, bag limits, methods and means for the state's commercial, subsistence, sport, guided sport, and personal use fisheries. It also sets policy and direction for management of the state's fishery resources and makes all decisions on allocation of those resources among users. The enabling statute for the BOF is AS 16.05.251. Regulations enacted by the BOF are found in the Alaska Administrative Code (AAC) Title 5, Chapters 1 – 77.

The Joint Boards of Fisheries and Game periodically meet for mutual issues such as non-subsistence use areas and the advisory committee system. Statutes describing the Joint Boards and the subsistence law include AS 16.05.258 and AS 16.05.315. Regulations enacted by the Joint Boards are found in the Alaska Administrative Code (AAC) Title 5, Chapters 96 and 99. Advisory Committees (AC) are local "grass roots" citizen groups intended to provide a local voice for the collection and expression of public opinions and recommendations on matters relating to the management of fish and wildlife resources in Alaska. ADFG staff regularly attend the AC meetings in their respective geographic areas to provide information to the public and hear local opinions on fisheries related activities. Currently, there are 82 advisory committees in the state. Of these, approximately 80% to 85% are "active", meaning they regularly meet, write proposals, comment and attend BOF meetings. The enabling statute for the AC system is AS 16.05.260. Regulations governing the ACs are found in the Alaska Administrative Code (AAC) Title 5, Chapters 96 – 97 http://www.boards.adfg.state.ak.us/bbs/what/prps.php.

3. Management objectives shall be implemented through management rules and actions formulated in a plan or other framework.

FAO CCRF 7.3.3/7.2.2

Evidence adequacy rating:

☑ **High** ☐ **Medium** ☐ **Low**

Rating Determination

The BOF main role is to conserve and develop the fishery resources of the state. The BOF is charged with making allocative decisions, and ADFG is responsible for management based on those decisions. Management Plans are established by the BOF for each Region and incorporated into regulation in Title 5 Alaska Administrative Code. Those plans are implemented each season in each Region by the responsible ADFG biologist following the direction of the BOF. Management plans on recovery of depleted stocks are active policy of the state and are based on providing adequate 'escapement' or spawning stock in each generation. In a 2011 action, the NPFMC (responsible under US national law for sustainable management of fisheries in US EEZ waters off Alaska) modified the Federal Salmon Fishery Management Plan to specifically exclude three historical commercial salmon fishing areas outside of state waters in the EEZ and the sport salmon fishery from the West Area EEZ in favour of continuing management by the State of Alaska. The FMP would prohibit commercial salmon fisheries in the modified West Area and would continue to delegate management authority to the State of Alaska for the directed commercial salmon troll fishery and the sport salmon fishery in the East Area of the EEZ.

Management of Alaska's salmon fisheries have been well documented throughout history. With Statehood in 1959, and the formation of the Alaska Department of Fish and Game in 1960, sound management of this renewable resource has occurred. Section 8.4 of the State of Alaska constitution mandates "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."

Specific management plans and strategies exist that describe and document state management in a format easily understood by the various user groups and the public. At the backbone of management are Alaska State Statutes and the Alaska Administrative Codes derived under their guidance. Actual regulatory language is developed through the Alaska Board of Fisheries (BOF) process. Long-term objectives are defined in regulation under management of mixed stock salmon fisheries, management of sustainable salmon fisheries, and statewide salmon escapement goals (5 AAC 39.220, 5 AAC 39.222 and 5 AAC 39.223 respectively). The Alaska code addresses each fishery uniquely, in Chapters 3-29 of Title 5. Each salmon fishery is legally defined and addressed by specific geographical area, season, legal gears, vessel requirements etc within its specific chapter. Regulations are available in paper and electronic formats.

http://www.legis.state.ak.us/basis/folioproxy.asp?url=http://wwwjnu01.legis.state.ak.us/cgi-bin/folioisa.dll/acontxt/query=sustained+yield/doc/{@1}?firsthit
http://www.adfg.alaska.gov/index.cfm?adfg=fisheriesboard.main
http://www.adfg.alaska.gov/index.cfm?adfg=fishregulations.commercial

MSA and Salmon FMP

The Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA or MSA) is the primary domestic legislation governing the management of American fisheries. Under the MSA, the fisheries of the American EEZ off Alaska are managed by the North Pacific Fishery Management Council (NPFMC). The salmon fisheries in the exclusive economic zone (EEZ) off Alaska are managed under the Fishery Management Plan for the Salmon Fisheries in the EEZ off the Coast of Alaska (salmon FMP), produced by the North Pacific Fishery Management Council (NPFMC). The salmon FMP allows a commercial troll fishery in the EEZ off Southeast Alaska, and closes the remaining EEZ off Central and Western Alaska to commercial salmon fishing. Through the salmon FMP, the NPFMC and NMFS intend to conserve and manage the salmon resources in the North Pacific Ocean. All other salmon fishing occurs either in state waters or in one of three historical State-managed net fishing areas that extend into the EEZ. The salmon FMP does not cover the fisheries in these three State managed fishing areas; Cook Inlet, Prince Williams Sound, and Alaska Peninsula. The salmon FMP defers management of the commercial troll fishery in Southeast Alaska to the State of Alaska and, under the Pacific Salmon Treaty, the U.S.-Canada Pacific Salmon Commission.

Hatchery Program Policy Development

Beginning with the inception of Alaska's hatchery program, policies, statutes, and regulations were instituted to control hatchery development and, at the same time, protect wild stocks. Rigorous genetic and fish health policies were developed to guide the program.

Law, Policy and Regulation Chronology

- 1974 Private Non-Profit Hatchery Act
- 1974 Hatchery permitting policy
- 1975 Genetic policy
- 1976 Regional salmon planning statute
- 1978 Alaska Board of Fisheries hatchery management policy
- 1981 Fish transport and fish disease regulations
- 1985 PNP hatchery permitting regulations
- 1985 Revised genetic policy
- 1988 Fish pathology policy
- 1992 Wild stock priority statute
- 1992 Statewide salmon escapement goal policy
- 1993 Policy for the management of mixed stock salmon fisheries
- 1994 Sockeye salmon culture policy
- 1994 Fish resource permit policy
- 2000 Sustainable salmon management policy

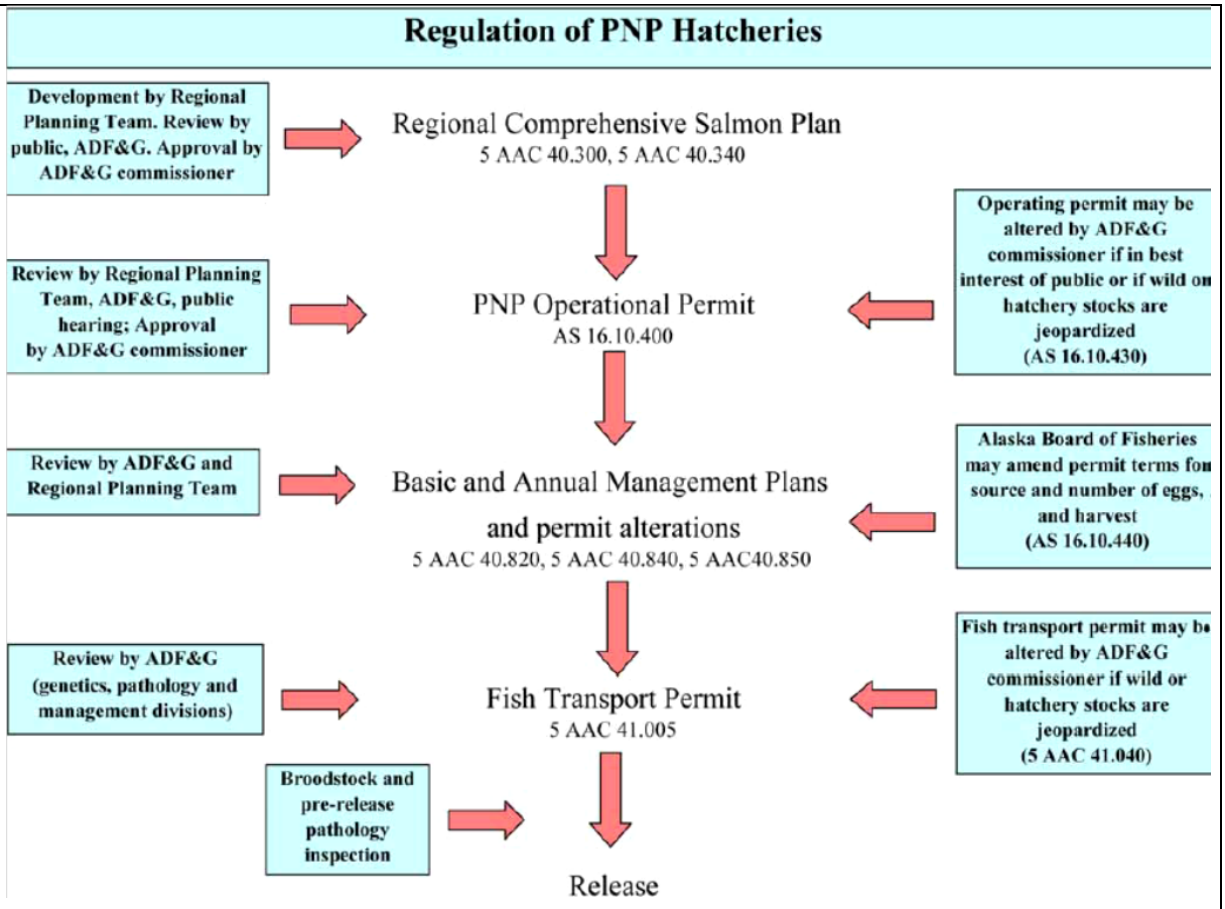

Figure 1. Regulation of PNP Hatcheries in Alaska.
http://www.adfg.alaska.gov/static/fishing/PDFs/hatcheries/mcgeebrochure.pdf

2011 updates to the salmon FMP

Although the North Pacific Fishery Management Council's *Fishery Management Plan for the Salmon Fisheries in the EEZ off the Coast of Alaska* (Salmon FMP) has been amended nine times in the last two decades, no comprehensive consideration of management strategy or scope of coverage has occurred since 1990. State fisheries regulations and Federal and international laws affecting Alaska salmon have changed since 1990 and the reauthorized Magnuson-Stevens Fishery and Conservation Management Act (MSA) expanded the requirements for FMPs. The Council recognizes that the Salmon FMP is vague with respect to management authority for the three directed commercial salmon fisheries that occur in the EEZ west of Cape Suckling. The Salmon FMP must be updated in order to comply with the current MSA requirements, and it should be amended to more clearly reflect the Council's desires with regard to the State of Alaska continued management authority over commercial fisheries in the West Area EEZ, the Southeast Alaska (SEAK) commercial troll fishery, and the sport fishery.

Motion:
The Council's salmon management policy is to facilitate State of Alaska salmon management in accordance with the Magnuson-Stevens Act, the Pacific Salmon Treaty, and all other applicable federal law. Under this policy, the Council has identified six management objectives to guide salmon

management under the FMP. These six objectives, as currently laid out in the analysis and working draft FMP, accurately reflect Council intent towards achieving this policy. To reflect this policy and objectives, the Council adopts Alternative 3 to modify the Federal Salmon FMP to specifically exclude the three historical net commercial salmon fishing areas and the sport salmon fishery from the West Area EEZ. The FMP would prohibit commercial salmon fisheries in the modified West Area and would continue to delegate management authority to the State of Alaska for the directed commercial salmon troll fishery and the sport salmon fishery in the East Area EEZ.
http://www.fakr.noaa.gov/npfmc/PDFdocuments/fmp/Salmon/SalmonFMPmotion1211.pdf

The NMFS Northwest Region has jurisdiction over the salmon species listed as endangered or threatened under the Endangered Species Act.
http://www.fakr.noaa.gov/sustainablefisheries/salmon/default.htm

There are no salmon fisheries in Alaska that are listed as either “endangered” or threatened” by the Federal Government under the Endangered Species Act. While the Alaska troll fishery has been estimated to take a small number of Chinook salmon listed under the Act originating from the Columbia River in Washington, this is well regulated under the Pacific Salmon Agreement between the Governments of the United States and Canada. In Alaska, by State statute, subsistence and personal use fisheries receive the highest priority use during allocative decisions before the BOF.

For stocks of Alaska salmon under concern, proactive, conservative management actions are illustrated by a review of Emergency Orders (Sec. 16.05.060) issued by department biologists closing fisheries, areas within fisheries, or gear limitations aimed at reducing catches of species of concern. The original assessment report listed several examples, such as recent actions taken on the Yukon River to address declining numbers of Chinook salmon returning to the system. The BOF also routinely addresses stocks of concern.

http://www.legis.state.ak.us/basis/folioproxy.asp?url=http://wwwjnu01.legis.state.ak.us/cgi-bin/folioisa.dll/aac/query=[JUMP:'t!2E+5!2C+p!2E+1']/doc/{@1}?firsthit
http://www.legis.state.ak.us/basis/folioproxy.asp?url=http://wwwjnu01.legis.state.ak.us/cgi-bin/folioisa.dll/aac/query=[JUMP:'t!2E+5!2C+p!2E+1']/doc/{@1}?firsthit
http://www.adfg.alaska.gov/index.cfm?adfg=cfnews.main
http://www.fakr.noaa.gov/npfmc/bycatch-controls/SalmonBycatch.html

B. Science and Stock Assessment Activities

4. There shall be effective fishery data (dependent and independent) collection and analysis systems for stock management purposes.

FAO CCRF 7.1.9/7.4.4/7.4.5/7.4.6/8.4.3/12.4
ECO 29.1-29.3

Evidence adequacy rating:

☑ **High** ☐ **Medium** ☐ **Low**

Rating Determination

Intensive monitoring of incoming run strength is required for successful abundance-based management of commercial salmon fisheries in Alaska. Fish weirs, counting towers, sonar, test fishing, fish wheels, and aerial surveys are the primary assessment tools. Fishery openings are targeted where production surplus to escapement goals is identified. Each assessment tool is designed to work best for the geographical and physical conditions encountered. The primary method of accounting for commercial fishery harvest is the ADFG's fish ticket system. By Alaska law (AS 16.05.690 Record of Purchase) each buyer of fish is required to keep a record of each purchase showing the name or number of the vessel from which the catch is taken, the date of landing, vessel license number, pounds purchased of each species, number of each species, and the ADFG statistical area in which the fish were taken, as well as other information ADFG may require for specific fisheries or areas. The new multi-generation ADFG led hatchery salmon research program aims at providing a better account of strays proportion in wild salmon streams to improve escapement enumeration practices.

Fishery independent data

Intensive monitoring of incoming run strength is required for successful abundance-based management of commercial salmon fisheries in Alaska. In addition to catch and effort information gathered inseason by the fish ticket system, fish counting weirs, counting towers, sonar, test fishing, fish wheels, foot surveys and aerial surveys are the primary assessment tools. Fishery openings are targeted where production surplus to escapement goals is identified. Each assessment tool is designed to work best for the geographical and physical conditions encountered.

Arctic-Yukon-Kuskokwim (AYK) Region

The Arctic-Yukon-Kuskokwim (AYK) Region encompasses the coastal waters of Alaska and includes the rivers and streams that drain into the Bering, Chukchi, and Beaufort Seas. It stretches from its boundary at Cape Newenham with the Bristol Bay area to the border with Canada on the Arctic Ocean.

The Yukon River, with the fifth largest drainage in North America, lies within this management region, as do many other major rivers; the Kuskokwim being second in size next to the Yukon. With the exception of Fairbanks, Bethel, and Nome, this is a region of villages. Salmon and herring are the most important fisheries resources in this region.

Large numbers of salmon are taken for subsistence and subsistence harvests can equal or surpass the numbers of fish harvested in commercial fisheries, especially Chinook salmon (http://www.adfg.alaska.gov/index.cfm?adfg=fishingcommercialbyarea.interior).

The enumeration method in the following tables shows the type of system used to collect data for the various salmon fisheries over the four management Regions throughout the State of Alaska (See http://www.adfg.alaska.gov/FedAidpdfs/FMS11-06.pdf for full details).

Also note that If no escapement goal is available in a given region for a given salmon species it is because there is no fishery for it (e.g. Yukon and Kuskokwim pink salmon).

Table 1. Methods used to enumerate and develop escapement goals for Arctic-Yukon-Kuskokwim region Chinook, chum, coho, pink, and sockeye salmon stocks.

System	Enumeration Method	Goal Development Method
CHINOOK SALMON		
Kuskokwim Area		
North (Main) Fork Goodnews R.	Single Aerial Survey [a]	Percentile
Middle Fork Goodnews River	Weir Count	SRA [b]
Kanektok River	Single Aerial Survey	Percentile
Kogrukluk River	Weir Count	Percentile
Kwethluk River	Weir Count	Percentile
Tuluksak River	Weir Count	Percentile
George River	Weir Count	Percentile
Kisaralik River	Single Aerial Survey	Percentile
Aniak River	Single Aerial Survey	Percentile
Salmon River (Aniak R)	Single Aerial Survey	Percentile
Holitna River	Single Aerial Survey	Percentile
Cheeneetnuk River (Stony R)	Single Aerial Survey	Percentile
Gagaryah River (Stony R)	Single Aerial Survey	Percentile
Salmon River (Pitka Fork)	Single Aerial Survey	Percentile
Yukon River		
East Fork Andreafsky River	Weir Count	Percentile
West Fork Andreafsky River	Peak Aerial Survey [c]	Percentile
Anvik River	Peak Aerial Survey	Percentile
Nulato River (forks combined)	Peak Aerial Survey	Percentile
Chena River	Tower, Mark-Recapture	SRA
Salcha River	Tower, Mark-Recapture	SRA
Canada Mainstem	Sonar	Agreement (U.S./Canada Joint Technical Committee)

Norton Sound		
Fish River/Boston Creek	Peak Aerial Survey	Percentile
Kwiniuk River	Tower Count	SRA
North River (Unalakleet R)	Tower Count	Percentile
Shaktoolik River	Peak Aerial Survey	Theoretical SRA
Unalakleet/Old Woman River	Peak Aerial Survey	Theoretical SRA
CHUM SALMON		
Kuskokwim Area		
Middle Fork Goodnews River	Weir Count	Percentile
Kanektok River	Single Aerial Survey	Percentile
Kogrukluk River	Weir Count	Percentile
Aniak River	Sonar	Percentile
Yukon River Summer Chum		
East Fork Andreafsky River	Weir Count	SRA
Anvik River	Sonar	SRA
Mainstem Yukon River	NA	NA
Yukon River Fall Chum		
Yukon River Drainage	Calculated - Multiple Surveys	SRA
Tanana River	Mark-Recapture	SRA

System	Enumeration Method	Goal Development Method
Delta River	Multiple Foot Surveys	Proportion of Tanana River Goal
Upper Yukon River Tributaries	Sonar and Weir Count	SRA
Chandalar River	Sonar	Proportion of Upper Yukon River Tributaries Goal
Sheenjek River	Sonar	Proportion of Upper Yukon River Tributaries Goal
Fishing Branch River (Canada)	Weir Count	Agreement (U.S./Canada Joint Technical Committee) IMEG Percentile
Yukon R. Mainstem (Canada)	Mark-Recapture	Agreement (U.S./Canada Joint Technical Committee) IMEG SRA
Norton Sound		
Subdistrict 1 Aggregate	Calculated - Multiple Surveys	SRA
Nome River	Weir Count	Proportion of Aggregate Goal
Snake River	Tower/Weir Count	Proportion of Aggregate Goal
Eldorado River	Peak Aerial Survey (Expanded)	Proportion of Aggregate Goal
Niukluk River	Tower Count	Risk Analysis
Kwiniuk River	Tower Count	SRA
Tubutuluk River	Peak Aerial Survey (Expanded)	SRA
Unalakleet/Old Woman River	Peak Aerial Survey	Empirical Observation
Kotzebue Sound		
Kotzebue Sound Aggregate	Peak Aerial Survey (Expanded)	SRA
Noatak and Eli Rivers	Peak Aerial Survey	Proportion of Aggregate Goal
Upper Kobuk w/ Selby River	Peak Aerial Survey	Proportion of Aggregate Goal
Salmon River	Peak Aerial Survey	Proportion of Aggregate Goal
Tutuksuk River	Peak Aerial Survey	Proportion of Aggregate Goal
Squirrel River	Peak Aerial Survey	Proportion of Aggregate Goal

COHO SALMON		
Kuskokwim Area		
Middle Fork Goodnews River	Weir Count	Percentile
Kogrukluk River	Weir Count	Percentile
Kwethluk River	Weir Count	Empirical Observation
Yukon River		
Delta Clearwater River	Boat Survey	Percentile
Norton Sound		
Kwiniuk River	Peak Aerial Survey	Theoretical SRA
Niukluk River	Tower Count	Percentile
North River (Unalakleet R.)	Peak Aerial Survey	Theoretical SRA
PINK SALMON		
Kuskokwim Area		
There are no escapement goals for pink salmon in the Kuskokwim Management Area		
Yukon River		
There are no escapement goals for pink salmon in the Yukon River drainage		
Norton Sound		
Nome River (odd year)	Weir Count	Empirical Observation
Nome River (even year)	Weir Count	Empirical Observation

System	Enumeration Method	Goal Development Method
Kwiniuk River	Tower Count	Empirical Observation
Niukluk River	Tower Count	Empirical Observation
North River	Tower Count	Empirical Observation
SOCKEYE SALMON		
Kuskokwim Area		
North (Main) Fork Goodnews River	Single Aerial Survey	Percentile
Middle Fork Goodnews River	Weir Count	SRA
Kanektok River	Single Aerial Survey	Percentile
Kogrukluk River	Weir Count	Percentile
Yukon River		
There are no escapement goals for Sockeye in the Yukon River drainage		
Norton Sound		
Salmon Lake/Grand Central River	Peak Aerial Survey	Empirical Observation
Glacial Lake	Peak Aerial Survey	Empirical Observation

Note: NA = data not available.
[a] Typically single survey done around time of presumed peak of the run with no expansion of counts.
[b] SRA = Spawner-recruit analysis.
[c] One or more aerial surveys are attempted during the peak of the run. Peak count is used to index the escapement.

http://www.adfg.alaska.gov/FedAidpdfs/FMS11-06.pdf

Westward

The Westward Region includes the Kodiak archipelago, the north and south sides of the Alaska Peninsula (including Chignik, the Shumagin Islands, and Port Moller), and the Aleutian Islands. Dutch Harbor, the number one fishing port in the nation, in pounds landed, is situated in the Aleutian Islands.

This region encompasses all Pacific Ocean waters extending south from the Kodiak Archipelago and west of the longitude of the eastern side of Cook Inlet, as well as Bering Sea waters east of the maritime boundary between Russia and the United States. The islands of St. Matthew and the Pribilofs, as well as the Chukchi-Beaufort seas, also fall within the Westward Region.

Important salmon and herring fisheries occur throughout the coastal waters of the region (http://www.adfg.alaska.gov/index.cfm?adfg=fishingcommercialbyarea.southwest).

Table 2. Methods used to enumerate and develop escapement goals for Westward Region (Alaska Peninsula/Aleutian Islands, Kodiak, and Chignik areas) Chinook, chum, coho, pink and sockeye salmon stocks.

System	Enumeration Method	Goal Development Method
CHINOOK SALMON		
AK Peninsula		
Nelson River	Weir, Peak Aerial Survey[a]	Spawning Habitat Model, SRA[b]
Chignik		
Chignik River	Weir Count	SRA
Kodiak		
Karluk River	Weir Count	SRA
Ayakulik River	Weir Count	SRA
CHUM SALMON		
AK Peninsula		
Northern District	Peak Aerial Survey	SRA
Northwestern District	Peak Aerial Survey	SRA
Southeastern District	Peak Aerial Survey	Percentile
South Central District	Peak Aerial Survey	Percentile
Southwestern District	Peak Aerial Survey	Percentile
Unimak District	Peak Aerial Survey	Risk Analysis
Chignik		
Entire Chignik Area	Peak Aerial Survey	Risk Analysis
Kodiak		
Mainland District	Peak Aerial Survey	Percentile, Risk Analysis
Kodiak Archipelago Aggregate	Peak Aerial Survey	Percentile
COHO SALMON		
AK Peninsula		
Nelson River	Peak Aerial Survey	Risk Analysis
Thin Point Lake	Peak Aerial Survey	Empirical Observation
Ilnik River	Peak Aerial Survey	Risk Analysis
Chignik		
There are no coho salmon stocks with escapement goals in Chignik Area		
Kodiak		
Pasagshak River	Foot Survey	Theoretical SRA
Buskin River	Weir Count	SRA
Olds River	Foot Survey	Theoretical SRA
American River	Foot Survey	Theoretical SRA
PINK SALMON		
AK Peninsula		
Bechevin Bay Section (odd year)	Peak Aerial Survey	Risk Analysis
Bechevin Bay Section (even year)	Peak Aerial Survey	Risk Analysis
South Peninsula Total (odd year)	Peak Aerial Survey	SRA
South Peninsula Total (even year)	Peak Aerial Survey	SRA
Chignik		
Entire Chignik Area (odd year)	Peak Aerial Survey	Yield Analysis
Entire Chignik Area (even year)	Peak Aerial Survey	Yield Analysis

System	Enumeration Method	Goal Development Method
Kodiak		
Mainland District	Peak Aerial Survey	Conditional Sustained Yield Analysis
Kodiak Archipelago	Peak Aerial Survey	Conditional Sustained Yield Analysis
SOCKEYE SALMON		
AK Peninsula		
Cinder River	Peak Aerial Survey	Percentile
Ilnik River	Weir Count	Percentile, Euphotic Volume Model, Zooplankton Model
Meshik River	Peak Aerial Survey	Percentile
Sandy River	Weir Count	Percentile
Bear River Early Run	Weir Count	Spawning Habitat Model, Percentile, Euphotic Volume Model, Zooplankton Model, Lake Surface Area
Bear River Late Run	Weir Count	Spawning Habitat Model, Percentile, Euphotic Volume Model, Zooplankton Model, Lake Surface Area
Nelson River	Weir Count	SRA
Christianson Lagoon	Peak Aerial Survey	Spawning Habitat Model
Swanson Lagoon	Peak Aerial Survey	Percentile
North Creek	Peak Aerial Survey	Percentile
Orzinski Lake	Weir Count	Percentile
Mortensen Lagoon	Peak Aerial Survey	Spawning Habitat Model, Percentile, Euphotic Volume Model, Zooplankton Model, Lake Surface Area
Thin Point Lake	Peak Aerial Survey	Spawning Habitat Model, Percentile, Euphotic Volume Model, Zooplankton Model, Lake Surface Area
McLees Lake	Weir Count	Percentile
Chignik		
Chignik River Early Run	Weir Count	Yield Analysis, Euphotic Volume Model, Zooplankton Model
Chignik River Late Run	Weir Count	SRA, Euphotic Volume Model, Zooplankton Model
Kodiak		
Malina Creek	Peak Aerial Survey	Percentile, Zooplankton Model
Afognak (Litnik) River	Weir Count	SRA
Little River	Peak Aerial Survey	Risk Analysis
Uganik Lake	Peak Aerial Survey	Percentile
Karluk River Early Run	Weir Count	SRA
Karluk River Late Run	Weir Count	SRA
Ayakulik River	Weir Count	SRA, Yield Analysis
Upper Station River Early Run	Weir Count	Percentile
Upper Station River Late Run	Weir Count	SRA
Frazer Lake	Weir Count	SRA
Saltery Lake	Weir Count	SRA
Pasagshak River	Peak Aerial Survey	Percentile, Risk Analysis
Buskin Lake	Weir Count	Empirical Observation

[a] One or more aerial surveys are attempted during the peak of the run. Peak count is used to index the escapement.
[b] SRA = Spawner-recruit analysis.

http://www.adfg.alaska.gov/FedAidpdfs/FMS11-06.pdf

Central Region

Southcentral Alaska commercial fisheries are composed of four distinct management areas that include Bristol Bay, Prince William Sound and Copper River, Upper Cook Inlet, and Lower Cook Inlet. Although all 5 species of salmon are harvested in each area, sockeye and pink salmon are the most abundant and most valuable. This area encompasses some of the largest and most valuable salmon

fisheries in the world. From Bristol Bay, home of the largest sockeye salmon fishery in the world, to the Copper River where sockeye and Chinook salmon fetch some of the highest prices per pound paid to commercial fishermen. Cook Inlet commercial fisheries occur near the largest population center in Alaska, providing salmon to numerous niche and local markets, as well as fresh salmon to markets in other states. Prince William Sound adds productive pink, chum, and sockeye salmon fisheries to the region.
(http://www.adfg.alaska.gov/index.cfm?adfg=fishingcommercialbyarea.southcentral).

Table 3. Methods used to enumerate and development escapement goals for Central Region (Bristol Bay, Cook Inlet, and Prince William sound/Copper River) Chinook, chum, coho, pink, and sockeye salmon stocks.

System	Enumeration Method	Goal Development Method
CHINOOK SALMON		
Bristol Bay		
Nushagak River	Sonar	SRA [a], Yield Analysis
Togiak River	Single Aerial Survey [b]	Risk Analysis
Naknek River	Single Aerial Survey	Risk Analysis
Alagnak River	Single Aerial Survey	Risk Analysis
Egegik River	Single Aerial Survey	Risk Analysis
Upper Cook Inlet		
Alexander Creek	Single Aerial Survey	Percentile
Campbell Creek	Single Foot Survey	Percentile
Chuitna River	Single Aerial Survey	Percentile
Chulitna River	Single Aerial Survey	Percentile
Clear (Chunilna) Creek	Single Aerial Survey	Percentile
Crooked Creek	Weir Count	Percentile
Deshka River	Weir Count	SRA
Goose Creek	Single Aerial Survey	Percentile
Kenai River - Early Run	Sonar	SRA
Kenai River - Late Run	Sonar	SRA
Lake Creek	Single Aerial Survey	Percentile
Lewis River	Single Aerial Survey	Percentile
Little Susitna River	Single Aerial Survey	Percentile
Little Willow Creek	Single Aerial Survey	Percentile
Montana Creek	Single Aerial Survey	Percentile
Peters Creek	Single Aerial Survey	Percentile
Prairie Creek	Single Aerial Survey	Percentile
Sheep Creek	Single Aerial Survey	Percentile
Talachulitna River	Single Aerial Survey	Percentile
Theodore River	Single Aerial Survey	Percentile
Willow Creek	Single Aerial Survey	Percentile

Lower Cook Inlet		
Anchor River	Sonar, Weir Count	SRA
Deep Creek	Single Aerial Survey	Percentile
Ninilchik River	Weir Count	Percentile
Prince William Sound		
Copper River	Mark-Recapture	Empirical Observation
CHUM SALMON		
Bristol Bay		
Nushagak River	Sonar	Risk Analysis
Upper Cook Inlet		
Clearwater Creek	Peak Aerial Survey [c]	Percentile
Lower Cook Inlet		
Port Graham River	Multiple Foot Surveys [d]	Percentile
Dogfish Lagoon	Multiple Foot Surveys	Percentile

System	Enumeration Method	Goal Development Method
Rocky River	Multiple Foot Surveys	Percentile
Port Dick Creek	Multiple Aerial or Foot Surveys	Percentile
Island Creek	Multiple Aerial or Foot Surveys	Percentile
Big Kamishak River	Multiple Aerial Surveys	Percentile
Little Kamishak River	Multiple Aerial Surveys	Percentile
McNeil River	Multiple Aerial Surveys	Percentile
Bruin River	Multiple Aerial Surveys	Percentile
Ursus Cove	Multiple Aerial Surveys	Percentile
Cottonwood Creek	Multiple Aerial Surveys	Percentile
Iniskin Bay	Multiple Aerial Surveys	Percentile
Prince William Sound		
Eastern District	Multiple Aerial Surveys	Risk Analysis
Northern District	Multiple Aerial Surveys	Risk Analysis
Coghill District	Multiple Aerial Surveys	Risk Analysis
Northwestern District	Multiple Aerial Surveys	Risk Analysis
Southeastern District	Multiple Aerial Surveys	Risk Analysis
COHO SALMON		
Bristol Bay		
There are no coho salmon stocks with escapement goals in Bristol Bay		
Upper Cook Inlet		
Jim Creek	Single Foot Survey	Percentile
Little Susitna River	Weir Count	Percentile
Lower Cook Inlet		
There are no coho salmon stocks with escapement goals in Lower Cook Inlet		
Prince William Sound		
Copper River Delta	Peak Aerial Survey	Percentile
Bering River	Peak Aerial Survey	Percentile

PINK SALMON

Bristol Bay

There are no pink salmon stocks with escapement goals in Bristol Bay

Upper Cook Inlet

There are no pink salmon stocks with escapement goals in Upper Cook Inlet

Lower Cook Inlet

Humpy Creek	Multiple Foot Surveys	Percentile
China Poot Creek	Multiple Foot Surveys	Percentile
Tutka Creek	Multiple Foot Surveys	Percentile
Barabara Creek	Multiple Foot Surveys	Percentile
Seldovia Creek	Multiple Foot Surveys	Percentile
Port Graham River	Multiple Foot Surveys	Percentile
Port Chatham	Multiple Foot Surveys	Percentile
Windy Creek Right	Multiple Foot Surveys	Percentile
Windy Creek Left	Multiple Foot Surveys	Percentile
Rocky River	Multiple Foot Surveys	Percentile
Port Dick Creek	Multiple Aerial or Foot Surveys	Percentile

System	Enumeration Method	Goal Development Method
Island Creek	Multiple Aerial or Foot Surveys	Percentile
S. Nuka Island Creek	Multiple Aerial or Foot Surveys	Percentile
Desire Lake Creek	Multiple Aerial Surveys	Percentile
Bear and Salmon Creeks	Multiple Foot Surveys	Percentile
Thumb Cove	Multiple Foot Surveys	Percentile
Humpy Cove	Multiple Foot Surveys	Percentile
Tonsina Creek	Multiple Foot Surveys	Percentile
Bruin River	Multiple Aerial Surveys	Percentile
Sunday Creek	Multiple Aerial Surveys	Percentile
Brown's Peak Creek	Multiple Aerial Surveys	Percentile
Prince William Sound		
All Districts Combined (even year)	Multiple Aerial Surveys	Yield Analysis
All Districts Combined (odd year)	Multiple Aerial Surveys	Yield Analysis

SOCKEYE SALMON

Bristol Bay

Kvichak River	Tower Count	SRA, Yield Analysis
Alagnak River	Tower Count	Risk Analysis
Naknek River	Tower Count	SRA, Yield Analysis
Egegik River	Tower Count	SRA, Yield Analysis
Ugashik River	Tower Count	SRA, Yield Analysis
Wood River	Tower Count	SRA, Yield Analysis
Igushik River	Tower Count	SRA, Yield Analysis
Nushagak River	Sonar	SRA, Yield Analysis
Togiak River	Tower Count	SRA, Yield Analysis

Upper Cook Inlet		
Crescent River	Sonar	SRA
Fish Creek (Knik)	Weir Count	Percentile
Kasilof River	Sonar	SRA
Kenai River	Sonar	Brood Interaction Simulation Model
Packers Creek	Weir Count	Percentile
Russian River - Early Run	Weir Count	Percentile
Russian River - Late Run	Weir Count	Percentile
Yentna River	Sonar	Percentile
Chelatna Lake	Weir Count	Percentile
Judd Lake	Weir Count	Percentile
Larson Lake	Weir Count	Percentile
Lower Cook Inlet		
English Bay	Peak Aerial Survey, Weir Count	Percentile
Delight Lake	Peak Aerial Survey, Weir Count	Percentile
Desire Lake	Peak Aerial Survey, Weir Count	Percentile
Bear Lake	Weir Count	Percentile
Aialik Lake	Peak Aerial Survey	Percentile
Mikfik Lake	Peak Aerial Survey	Percentile
Chenik Lake	Peak Aerial Survey, Weir Count	Percentile
Amakdedori Creek	Peak Aerial Survey	Percentile

System	Enumeration Method	Goal Development Method
Prince William Sound		
Upper Copper River	Sonar	SRA
Copper River Delta	Peak Aerial Survey	SRA
Bering River	Peak Aerial Survey	Percentile
Coghill Lake	Weir Count	Percentile
Eshamy Lake	Weir Count	SRA

[a] SRA = Spawner-recruit analysis.
[b] Single survey done around time of presumed peak of the run with no expansion of counts.
[c] Multiple aerial surveys are attempted throughout the run. Peak count is used to index the escapement.
[d] Multiple surveys throughout run (at least 1 per week). Area under the curve method (AUC) used to estimate annual escapement.

http://www.adfg.alaska.gov/FedAidpdfs/FMS11-06.pdf

The Southeast Region

The Southeast Alaska/Yakutat Region (Region I) consists of Alaska waters between Cape Suckling on the north and Dixon Entrance on the south. Salmon are commercially harvested in Southeast Alaska with purse seines and drift gillnets; in Yakutat with set gillnets; and in both areas with hand and power troll gear.

There are more than 1,200 streams and rivers in Southeast Alaska for which ADFG has a record of at least one annual adult chum salmon spawning count since 1960, and counts of 1,000 or more chum salmon were obtained at approximately 450 of those streams prior to 1985 (ADF&G Integrated Fisheries Database). Long time series of escapement information are not available, however, for the vast majority of those streams.
Of the chum salmon populations that have been consistently monitored, most have been monitored through aerial surveys, though several have been monitored annually by foot surveys. Inriver fish wheel counts have been used to monitor salmon escapements to the Taku and Chilkat rivers, two large glacial, mainland river systems
(http://www.adfg.alaska.gov/index.cfm?adfg=commercialbyareasoutheast.salmon_managementplans).

Table 4. Methods used to enumerate and develop escapement goals for Southeast Region Chinook, chum, coho, pink, and sockeye salmon stocks.

System	Enumeration Method	Goal Development Method
CHINOOK SALMON		
Blossom River	Peak Aerial Survey [a]	SRA [b]
Keta River	Peak Aerial Survey	SRA
Unuk River	Mark-Recapture	SRA
Chickamin River	Peak Aerial Survey	SRA
Andrew Creek	Peak Aerial Survey (Expanded)	SRA
Stikine River	Mark-Recapture	SRA
King Salmon River	Peak Aerial Survey (Expanded)	SRA
Taku River	Mark-Recapture	SRA
Chilkat River	Mark-Recapture	Theoretical SRA
Klukshu (Alsek) River	Weir Count	SRA
Situk River	Weir Count	SRA
CHUM SALMON		
Southern Southeast Summer	Peak Aerial Survey	Percentile
Northern Southeast Inside Summer	Peak Aerial Survey	Percentile
Northern Southeast Outside Summer	Peak Aerial Survey	Percentile
Cholmondeley Sound Fall	Peak Aerial Survey	Percentile
Port Camden Fall	Peak Aerial Survey	Risk Analysis
Security Bay Fall	Peak Aerial Survey	Percentile
Excursion River Fall	Peak Aerial Survey	Percentile
Chilkat River Fall	Mark-Recapture, Fish Wheel	SRA
COHO SALMON		
Hugh Smith Lake	Weir Count	SRA
Taku River	Mark-Recapture	Agreement, SRA
Auke Creek	Weir Count	SRA
Montana Creek	Foot Survey	Theoretical SRA
Peterson Creek	Foot Survey	Theoretical SRA
Ketchikan Survey Index	Peak Aerial Survey	Theoretical SRA
Sitka Survey Index	Foot Survey	Theoretical SRA
Ford Arm Lake	Weir Count	SRA
Berners River	Mark-Recapture	SRA
Chilkat River	Mark-Recapture, Foot Survey	SRA
Lost River	Foot Survey	SRA
Situk River	Peak Aerial Survey	SRA
Tsiu/Tsivat Rivers	Peak Aerial Survey	SRA
PINK SALMON		
Southern Southeast	Peak Aerial Survey	Yield Analysis
Northern Southeast Inside	Peak Aerial Survey	Yield Analysis
Northern Southeast Outside	Peak Aerial Survey	Yield Analysis
Situk River (even-year)	Weir Count	SRA
Situk River (odd-year)	Weir Count	SRA

SOCKEYE SALMON		
Hugh Smith Lake	Weir Count	Risk Analysis, Theoretical SRA
McDonald Lake	Expanded Foot Survey	SRA
Mainstem Stikine River	Mark-Recapture	Professional Judgement (Transboundary Technical Committee, Pacific Salmon Commission)
Tahltan Lake	Weir Count	SRA
Speel Lake	Weir Count	SRA
Taku River	Mark-Recapture	Professional Judgement (Transboundary Technical Committee, Pacific Salmon Commission)
Redoubt Lake	Weir Count	SRA
Chilkat Lake	Sonar, Mark-Recapture	SRA
Chilkoot Lake	Weir Count	SRA
East Alsek-Doame River	Peak Aerial Survey	SRA
Klukshu River	Weir Count	SRA
Lost River	Foot/Boat Survey	Percentile
Situk River	Weir Count	SRA

[a] One or more aerial surveys are attempted during the peak of the run. Peak count is used to index the escapement.
[b] SRA = Spawner-recruit analysis.

http://www.adfg.alaska.gov/FedAidpdfs/FMS11-06.pdf

Catch data

The primary method of accounting for commercial fishery harvest is the ADFG's fish ticket system. By Alaska law (AS 16.05.690 Record of purchase) each buyer of fish is required to keep a record of each purchase showing the name or number of the vessel from which the catch is taken, the date of landing, vessel license number, pounds purchased of each species, number of each species, and the ADFG statistical area in which the fish were taken, as well as other information ADFG may require for specific fisheries or areas. The primary responsibility for filling out and submitting a fish ticket lies with the fish buyer, and they may not knowingly submit a false or inaccurate fish ticket. The seller of the fish (fisherman) is also legally responsible to ensure that the information they provide on a fish ticket is accurate.

ADFG distributes fish ticket books upon request to all permitted or licensed buyers/processors/sellers of fish in Alaska. Fish tickets are filled out by the processor each time they receive a delivery from a commercial fisherman and a copy is provided to ADFG within 7 days of the sale. Currently, ten different types of fish ticket forms are used by ADFG based on fishery or species harvested (http://www.cf.adfg.state.ak.us/geninfo/permits/cfscodes_fishtickets.php). In some cases, the delay in receiving fish ticket information is too long for effective management. In these cases ADFG may require timelier reporting (e.g. salmon processors in Yukon River fishing districts must verbally report their salmon purchases within 18 hours of the closure of a commercial fishing period).

The Alaska all-species salmon harvest for 2011 totaled 177.1 million, which was about 26.4 million less than the preseason forecast of 203.5 million. This combined harvest was composed of 468,000 Chinook, 40 million sockeye, 3.5 million coho, 116.1 million pink, and 17 million chum salmon. Table 5shows 2011 harvest numbers by salmon species and fishing area, in units of fish harvested, and table 6 provides this information in units of pounds harvested.

Table 5. Preliminary 2011 Alaska commercial salmon harvest, by fishing area and species, in thousands of fish.

	Species					
Fishing Area	Chinook	Sockeye	Coho	Pink	Chum	Total
Southeast Region Total	346[a]	1,243	2,269	59,071	10,702	73,630
Prince William Sound	20	3,541	371	33,356	1,910	39,199
Upper Cook Inlet	11	5,277	95	34	129	5,547
Lower Cook Inlet	0	393	0	362	32	788
Bristol Bay	38	21,880	14	0	739	22,671
Central Region Total	70	31,092	480	33,753	2,810	68,205
Kodiak	19	2,269	190	16,649	825	19,952
Chignik	7	2,497	77	905	270	3,755
South Alaska Peninsula and Aleutians	7	1,921	153	5,369	979	8,700
North Alaska Peninsula	2	926	19	109	294	1,350
Westward Region Total	35	7,613	440	23,302	2,368	33,757
AYK Region Total	18	77	255	7	1,125	1,482
Total Alaska	468	40,024	3,444	116,133	17,004	177,074

Note: Missing data indicates no harvest, and zeros indicate harvest activity but <1,000.
Note: Columns may not total exactly due to rounding.
[a] Total commercial harvest of Chinook salmon for the October 1, 2010–September 30, 2011 catch accounting period.

Table 6. Preliminary 2011 Alaska commercial salmon harvests, by fishing area and species, in thousands of pounds.

	Species					
Fishing Area	Chinook	Sockeye	Coho	Pink	Chum	Total
Southeast Region Total	4,616[a]	7,529	13,772	219,210	81,792	326,919
Prince William Sound	388	21,637	2,619	99,799	14,152	138,596
Upper Cook Inlet	227	34,239	542	110	860	35,978
Lower Cook Inlet	2	1,993	1	1,042	214	3,251
Bristol Bay	492	135,655	93	3	5173	141,416
Central Region Total	1,109	193,524	3,255	100,954	20,399	319,241
Kodiak Area	175	13,444	1,271	53,441	5,566	73,897
Chignik	75	17,891	520	2,883	1,858	23,226
South AK Peninsula and Aleutians	91	11,541	931	18,554	6,509	37,626
North Alaska Peninsula	37	5,259	138	375	2,056	7,864
Westward Region Total	377	48,136	2,859	75,253	15,988	142,613
AYK Region Total	222	502	1,800	20	7,933	10,477
Total Alaska	6,324	249,691	21,686	395,437	126,112	799,250

Note: Missing data indicates no harvest, and zeros indicate harvest activity but <1,000.
Note: Columns may not total exactly due to rounding.
[a] Total commercial harvest of Chinook salmon for the October 1, 2010–September 30, 2011 catch accounting period.

http://www.adfg.alaska.gov/FedAidPDFs/SP12-01.pdf

Issues about data collection.

Monitoring of wild salmon escapements can be complicated by hatchery-origin fish straying into spawning streams. This can be a problem in areas with large hatchery programs for pink and chum salmon such as Prince William Sound (PWS) and Southeast Alaska (SEAK). However, hatcheries operations are planned in a way that aims to segregate spatially and temporally returning hatcheries salmon so to minimize their interaction with returning wild salmon. This means that hatchery strays do not effect stream surveys/stock assessment monitoring during the main part of the fishery and interactions with wild salmon are diminished (ADFG. August 2011. Evaluation of Prince William Sound Aquaculture Corporation's 2011 Pink Salmon Permit Alteration Requests) Escapements of these species are monitored primarily through aerial surveys (Fair et al. 2011, Piston and Heinl

2011). Recent studies by ADFG have found hatchery origin fish in nearly all spawning streams surveyed in these areas, with high proportions within 40 km of hatchery release sites (Brenner et al. 2012) and proportions greater than 10% in streams more than 50km from the nearest release site (Piston and Heinl 2011). High rates of hatchery straying exacerbate problems with aerial escapement monitoring programs.

ADFG does not currently have a practical means to estimate the number of hatchery-origin fish in their escapement counts. There is a growing recognition that wild salmon escapement goals based on these escapement counts may not reflect the productivity of the wild stocks, and may need to be revised or qualified at some time in the future (Piston and Heinl 2011).

Partly to resolve this problem and following a large collaborative and funding effort by the hatchery corporations, the processing industry and ADFG, the ADFG Division of Commercial Fisheries, has released a Request for Proposals (RFP) to initiate large-scale research related to hatchery wild salmon stock interactions. This proposed research is the culmination of several years of effort to identify key questions related to hatchery production and wild stocks that were of most relevance to Alaska salmon management. The hatchery operators and the department both have capital improvement projects included in the legislature's budget; a group of salmon processors have indicated that they will also cover a portion of the research costs.

Assessment of straying rates

Annual production of pink and chum salmon in PWS and of chum salmon in SEAK is the result of both natural spawning and hatchery production. This production is realized as catch and escapement with hatchery-produced salmon in natural escapement labeled as "strays". Currently, catches of naturally-spawned salmon and of hatchery produced salmon are estimated with catch sampling programs.

Hatchery salmon in samples can be recognized because 100% of hatchery pink and chum salmon production in these regions has been batch-marked (thermal marks on otoliths). However, escapement in both regions is reported as an index, not as estimated total numbers of spawning fish. A suite of new projects is proposed to annually estimate the following for pink and chum salmon in these two regions:

- number of wild salmon spawning in the wild;
- number of hatchery salmon spawning in the wild (hatchery strays);
- production of hatchery salmon (including hatchery strays); and
- production of wild salmon (excluding hatchery strays).

These new projects involve sampling in both the ocean and streams to estimate two statistics:
the fraction of the total run and the fraction of spawning abundance composed of hatchery salmon. These two fractions can be expressed as functions of catches (which are known), broodstocks at the hatchery (which are known), and escapements to natural spawning systems (which are not). These two functions represent two equations with two unknowns (run size of wild salmon and the number of hatchery strays in the region). Solving these two equations produces estimates of these numbers, and subsequently, estimates of the four bulleted numbers above.

New projects consist of field sampling in PWS and SEAK and ocean sampling in PWS. Field sampling is to estimate the fraction of spawning abundance composed of hatchery salmon. Ocean sampling is to estimate the fraction of the run composed of hatchery salmon. Ocean sampling is needed in PWS because management and fishermen tend to concentrate fishing effort on hatchery salmon,

sometimes restricting openings to hatchery terminal harvest areas. Therefore, PWS commercial catches will not be representative of the proportions of wild and hatchery salmon in the total return. No ocean sampling is needed for chum salmon in SEAK as they are caught throughout SEAK incidentally to directed fisheries on wild pink salmon, making catches in commercial fisheries (excluding terminal harvest fisheries) generally representative of the chum salmon run.

The amount of hatchery straying is not constant, but will vary annually due to factors such as run size, precipitation, water temperatures, and stream flows. To determine average straying rates and their variability will require multiple years of sampling and estimation of hatchery and wild returns, escapements, and hatchery strays. A minimum of five years is envisioned for estimating the scope of straying, after which time the costs and benefits of continuing to collect information on pink and chum salmon runs at this level of resolution can be evaluated.

http://notes4.state.ak.us/pn/pubnotic.nsf/cc52605f7c156e7a8925672a0060a91b/d52efa396245b1db892579f70075d4dd/$FILE/RFP%20-%20Hatchery%20fish%20interaction.pdf

5. There shall be regular stock assessment activities appropriate for the fishery, its range, the species biology and the ecosystem, undertaken in accordance with acknowledged scientific standards to support its optimum utilization.

FAO CCRF 7.2.1/12.2/12.3/12.5/12.6/12.7/12.17

FAO Eco 29-29.3

Evidence adequacy rating:

☑ High **☐ Medium** **☐ Low**

Rating determination

Stock assessment practices throughout Alaska vary. One of the department's core services is to maintain stock assessment and applied research programs. The department maintains ongoing programs for the enumeration, assessment, and understanding of salmon. The Division of Commercial Fisheries operates 23 area offices, which are organized into the Arctic-Yukon-Kuskokwim, Westward, Central, and Southeast Regions. Each year, ADFG staff in the various regions define the data needs for management of each salmon fishery, develop statistically valid study designs, and collect, analyze, and report the data necessary for effective fisheries management following procedures detailed in its study plans. The State has also cooperative technical, stock assessment, and management interactions with other States and management organizations that deal with trans-boundary salmon stocks that are harvested in Alaska. Annual salmon production, particularly of pink, chum and sockeye in PWS and chum and sockeye in SEAK is the result of both natural spawning and hatchery production. The new multi-generation hatchery salmon research program aims at providing a better account of strays proportion in wild salmon streams to improve stock assessment practices.

Since statehood, Alaska has dedicated a significant effort in developing an extensive institutional framework necessary to studying and managing this resource to meet the constitutional mandate for sustained yield. Alaska's fisheries are managed at a local area level. Local area management puts the fishery manager, and supporting research staff, in close proximity to the resources being managed and to the people harvesting and processing those resources. It is an information rich environment that provides for rapid decisions based on changing conditions on the fishing grounds and at stock assessment projects.

The Division of Commercial Fisheries operates 23 area offices, which are organized into the Arctic-Yukon-Kuskokwim, Westward, Central, and Southeast Regions. Each year, ADFG staff in the various regions define the data needs for management of each salmon fishery, develop statistically valid study designs, and collect, analyze, and report the data necessary for effective fisheries management following procedures detailed in its study plans. Each step of this process is guided by state policies, standards, and/or nationally recognized scientific standards.

Alaska manages thousands of salmon runs and has developed a sophisticated system of fishery and habitat monitoring projects to ensure that stocks are managed for sustained yield. The State has also cooperative technical, stock assessment, and management interactions with other States and management organizations that deal with trans-boundary salmon stocks that are harvested in Alaska. Alaska has a strong research analysis and reporting program that respects the confidentiality of the data it obtains, and closely monitors its salmon management programs and implements needed research projects when the need arises and when funding permits.

Stock assessment practices throughout Alaska vary. One of the department's core services is to maintain stock assessment and applied research programs. The department maintains ongoing programs for the enumeration, assessment, and understanding of salmon, herring, groundfish, and shellfish stocks. Budget to enable stock assessment activities for 2012 is detailed at http://omb.alaska.gov/ombfiles/13_budget/Fish/Proposed/12priorities_by_comp_fish.pdf.

With regard to salmon, escapement goals are established, and all fish surplus to escapement are available for harvest. Intensive monitoring of incoming run strength is required for successful abundance-based management of commercial salmon fisheries in Alaska. Evidence under fundamental clause 4 details the assessment tools used for each of the identified salmon systems.
Fishery openings are targeted where production surplus to escapement goals is identified.

Columbia River Chinook

The southeast troll fishery is estimated to take a small number of Chinook salmon belonging to threatened or endangered stocks from the Columbia River. Those takes are regulated under treaty with Canada by the 1999 Pacific Salmon Agreement (see http://www.psc.org/). Under the treaty an annual quota of Chinook salmon is set for the Alaska fishery, a quota designed to conserve all wild stocks of Chinook salmon. The management of the troll fishery (through inseason opening and closure of the fishery) is governed by that annual quota.
The harvest of different stocks each year is estimated from the recovery rates of coded wire tags implanted in representative index stocks in the region of the threatened or endangered stocks described (http://www.psc.org/info_codedwiretagreview.htm, http://tagotoweb.adfg.state.ak.us/).

ADFG Announces 2012 Southeast Alaska Chinook Salmon Harvest Quota

Under provisions of the Pacific Salmon Treaty, the ADFG announced that the Chinook salmon all-gear harvest quota for Southeast Alaska in 2012 is 266,800 fish. This compares with allowable Chinook all-gear harvest levels of 294,800 in 2011 and 221,800 in 2010.
The annual all-gear quota for Southeast Alaska is determined by the Chinook Technical Committee of the Pacific Salmon Commission. The quota is based on the forecast of aggregate abundance of Pacific Coast Chinook salmon stocks subject to management under the treaty. Most Chinook salmon produced in Alaska hatcheries may be harvested in addition to the annual treaty limit.
The annual Chinook harvest in Southeast is allocated to sport, commercial troll, and commercial net fisheries under management plans specified by the Alaska Board of Fisheries.
(http://www.adfg.alaska.gov/index.cfm?adfg=pressreleases.pr03292012)

Conservation of the biodiversity of aquatic habitats and ecosystems

Conservation of the biodiversity of aquatic habitats and ecosystems is the responsibility of Habitat Division within ADFG (AS 16.05.871/841) (http://www.habitat.adfg.alaska.gov/overview.php).
Activities by individuals, private companies, or agencies within streams used by anadromous fish require permission of the ADFG. The Division oversees activities in refuges, critical habitat, and sanctuaries. It coordinates with other agencies in reviewing plans for forestry, mining, oil and gas development and coastal management. Sport Fish Division maintains and updates the anadromous stream catalog which lists all waters used by salmon for spawning, rearing, and travel. Anadromous streams receive increased protection from development.

Anadromous Water Catalogue

ADFG conducts research on watersheds, active mining sites, fire-impacted woodlands, anadromous fish streams, and coastal and marine environments throughout Alaska in an effort to document and mitigate human-related impacts, changes in habitat, and species abundance. Salmon are also considered to be the foundation of a healthy ecosystem in Alaska. In this context, salmon can be considered a keystone species both ecologically as well as socially and economically. The Anadromous Waters Catalog (AWC) is the catalyst and media used to accomplish statutory protection afforded through multiple Alaska Statutes, including the Anadromous Fish Act, which is the State of Alaska's primary regulatory tool for protecting and conserving water bodies inhabited by Pacific salmon and other anadromous fish.

Due to regulatory and statutory changes, which took effect July 1, 2008, the ADFG is now solely responsible for maintaining anadromous waters data as well as revision to and publication of the Catalog of Waters Important for the Spawning, Rearing or Migration of Anadromous Fishes and its associated Atlas (the Catalog and Atlas, respectively). The ADFG is now also responsible for regulatory adoption of the Atlas and Catalog.

The *Catalog of Waters Important for the Spawning, Rearing or Migration of Anadromous Fishes* and its associated Atlas (the Catalog and Atlas, respectively) currently contain over 17,000 streams, rivers or lakes around the state which have been specified as being important for the spawning, rearing or migration of anadromous fish. Based upon thorough surveys of a few drainages it is believed that this number represents less than 50% of the streams, rivers and lakes actually used by anadromous species. It is estimated that at least an additional 20,000 or more anadromous water bodies have not been identified or specified under AS 16.05.871(a).

The Catalog and Atlas are important because they specify which streams, rivers and lakes are important to anadromous fish species and therefore afforded protection under AS 16.05.871. Water bodies that are not "specified" within the Catalog and Atlas are not afforded that protection. To be protected under AS 16.05.871, water bodies must be documented as supporting some life function of an anadromous fish species (salmon, trout, char, whitefish, sturgeon, etc.) Anadromous fish must have been seen or collected and identified by a qualified observer. Most nominations come from Department of Fish and Game fisheries biologists. Others are received from private individuals, companies and biologists from other state and federal agencies.

http://www.adfg.alaska.gov/index.cfm?adfg=habitatresearch.main

Issues

Within the stock assessment dimension of salmon management in Alaska there are issues relating to straying of hatchery salmon, this is been further highlighted by the recent Brenner et al. (2012) publication indicating significant straying of pink, chum and sockeye hatchery salmon in PWS; and by Piston and Heinl (2011) indicating chum salmon straying in SEAK. This issue has implications concerning potential escapement overestimation.

Large scale ADFG hatchery research proposal

The ADFG Division of Commercial Fisheries, has released in April 2012 a Request for Proposals (RFP) to initiate large-scale research related to hatchery wild salmon stock interactions. This proposed research is the culmination of several years of effort to identify key questions related to hatchery production and wild stocks that were of most relevance to Alaska salmon management. The

hatchery operators and the department both have capital improvement projects included in the legislature's budget; a group of salmon processors have indicated that they will also cover a portion of the research costs.

Scope of straying

Annual production of pink and chum salmon in PWS and in SEAK is the result of both natural spawning and hatchery production. This production is realized as catch and escapement with hatchery-produced salmon in natural escapement labelled as "strays". Currently, catches of wild salmon and of hatchery salmon are estimated with catch sampling programs.

A suite of new projects is proposed to annually estimate the following for pink and chum salmon in these two regions:

- number of wild salmon spawning in the wild;
- number of hatchery salmon spawning in the wild (hatchery strays);
- production of hatchery salmon (including hatchery strays); and
- production of wild salmon (excluding hatchery strays).

These new projects involve sampling in both the ocean and streams to estimate two statistics:

1) the fraction of the total run and 2) the fraction of spawning abundance composed of hatchery salmon.

These two fractions can be expressed as functions of catches (which are known), broodstocks at the hatchery (which are known), and escapements to natural spawning systems (which are not). These two functions represent two equations with two unknowns (run size of wild salmon and the number of hatchery strays in the region). Solving these two equations produces estimates of these numbers, and subsequently, estimates of the four points bulleted above.

A minimum of five years is envisioned for estimating the scope of straying, after which time the costs and benefits of continuing to collect information on pink and chum salmon runs at this level of resolution can be evaluated.

Some of the proposed work will be of value immediately, such as the estimates of run size for wild and hatchery-produced pink salmon in PWS, and may well improve management and result in changes in how fish are harvested. Improved information on population structure should also accrue early in the process. Other information, such as quantitative estimates of average hatchery straying rates and their interannual variation, and the comparisons of fitness between hatchery strays and natural-origin parents, will take longer.

Please follow this link for full details of the research program http://notes4.state.ak.us/pn/pubnotic.nsf/cc52605f7c156e7a8925672a0060a91b/d52efa396245b1db892579f70075d4dd/$FILE/RFP%20-%20Hatchery%20fish%20interaction.pdf

C. The Precautionary Approach

6.	**The current state of the stock shall be defined in relation to reference points or relevant proxies or verifiable substitutes allowing for effective management objectives and targets. Remedial actions shall be available and taken where reference point or other suitable proxies are approached or exceeded.** ***FAO CCRF 7.5.2/7.5.3*** ***Eco 29.2/29.2bis/30-30.2***
Evidence adequacy rating:	**☑ High** **☐ Medium** **☐ Low**

Rating Determination

Escapement goals effectively represent reference points of the various Alaska salmon systems. Currently, there are 289 active salmon stock escapement goals throughout the state. A variety of methods are used to develop escapement goals in Alaska. Of these, the percentile approach has been used for the recent BOF cycle review of escapement goals in the PWS and SEAK management areas causing a general reduction of escapement goals for pink salmon in PWS and chum salmon in SEAK. Such decrease are due to change of management targets to Sustainable Escapement Goals (SEG) ranges for PWS pink salmon because each district is actually managed by district, not by overall return to the sound; and due to addition of data series for SEAK chum salmon. Where escapements chronically (4-5 years) fail to meet expectations for harvestable yield or spawning escapements, the department may recommend, and the board may adopt a stock of concern designation for those underperforming salmon stocks. During the 2010/2011 board meeting cycle, seven new stocks of concern were declared including: Karluk River Chinook salmon in Westward Region, and in Central Region, Chuitna, Theodore and Lewis rivers Chinook salmon, and Alexander, Willow and Goose creeks Chinook salmon. All of these stocks were designated as stocks of management concern, except for Willow and Goose creeks Chinook salmon that were designated as stocks of yield concern.

Escapement goals are based on a number of scientific evaluation methods, founded in the sustained yield principle highlighted in the State Constitution (Article VIII, section 4) and in state statute (AS 16.05.020). Several policies in Alaska Administrative Code also provide guidance for establishing escapement goals including the *policy for the management of sustainable salmon fisheries* (5AAC 39.222), the *policy for statewide salmon escapement goals (5* AAC 39.223) and the *policy for the management of mixed stock fisheries (5* AAC 39.220). These policies provide detailed definitions of specific escapement goal types, outline the responsibilities of the ADFG the BOF in establishing goals, and provide general direction for development and application of escapement goals in Alaska. Currently, there are 289 active salmon stock escapement goals throughout the state of Alaska (Figure 2). The various stocks and geographical areas of interest have been shown in the tables under fundamental clause 4.

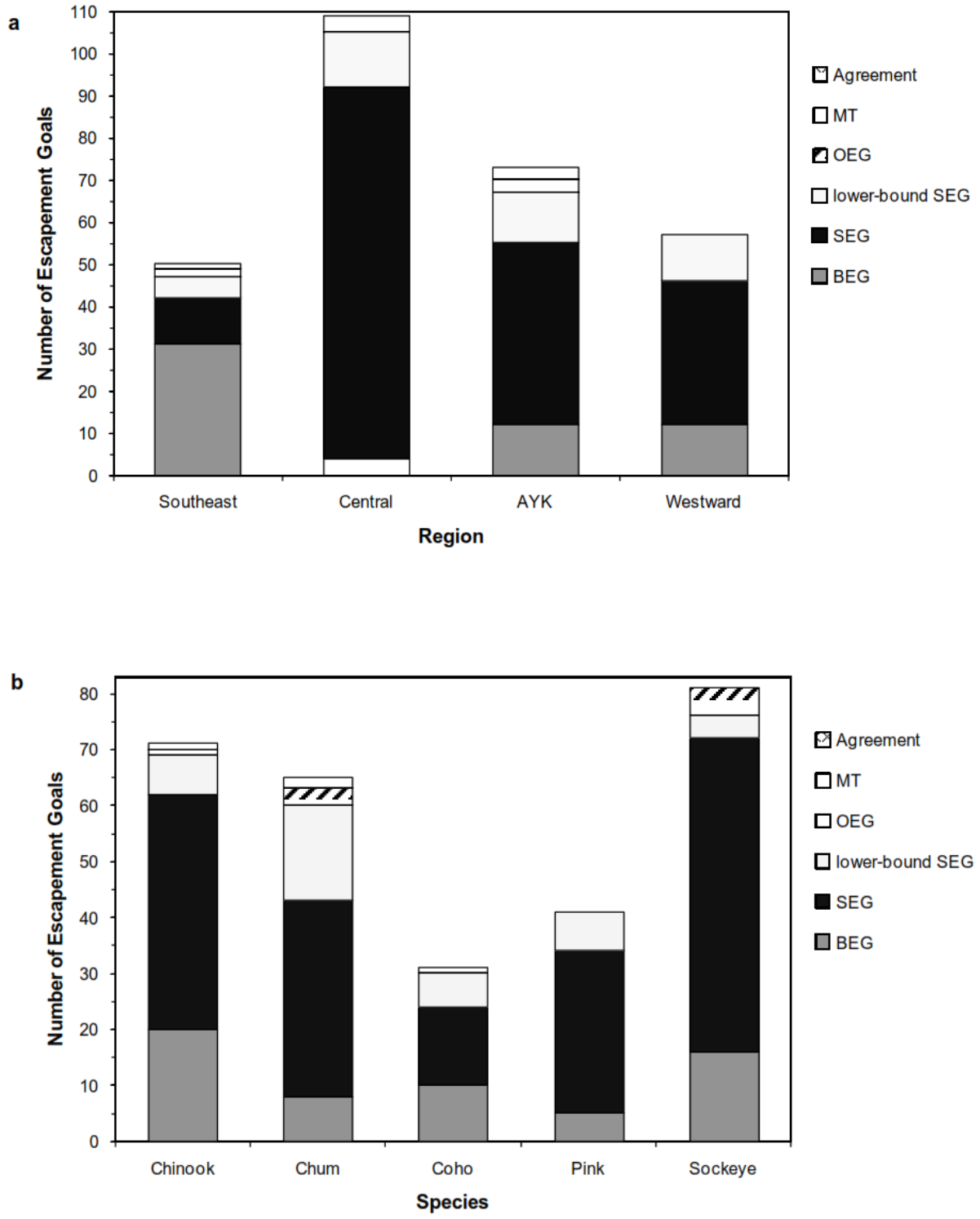

Figure 2. Statewide summary of the 289 escapement goals in effect during the 2010 spawning season for (a) the four Division of Commercial Fisheries regions and (b) by species. BEG is biological escapement goal, SEG is sustainable escapement goal, OEG is optimal escapement goal (set by the Alaska Board of Fisheries), MT is management target and agreement goals are established through international treaties
http://www.adfg.alaska.gov/FedAidpdfs/FMS11-06.pdf

Types of escapement goals

There are two primary types of escapement goals. A Biological Escapement Goal (BEG) is the escapement that provides the greatest potential for maximum sustained yield. BEGs are usually established using stock-recruit information which generally requires multiple years of run reconstructions to establish. BEGs are expressed as a range based on factors such the productivity of the stock and data uncertainty. A Sustainable Escapement Goal (SEG) is the level of past escapement (as demonstrated by escapement counts or indices) that has resulted in sustainable yield over a 5-10 year period. SEG's are used when data are insufficient to establish a BEG, usually due to lack of stock specific harvest data. SEGs are also set as a range and take into account uncertainty of the data. Once established, ADFG attempts to manage fisheries to maintain an even distribution of escapement within the boundaries of a BEG or SEG.

Two other, less common escapement goals are also defined in the Sustainable Salmon Policy. A Sustainable Escapement Threshold (SET) is a threshold level of escapement, below which the ability of the stock to sustain itself is jeopardized. The SET is below the lower bound of a BEG or SEG and is established when needed for salmon stocks of management or conservation concern. An Optimum Escapement Goal (OEG) is a specific management objective for salmon escapement that considers biological and allocative factors and may differ from BEG or SEG. An OEG may be expressed as a range but the minimum bound of an OEG will always be above the SET.

It is the responsibility of the department to document, establish and review escapement goals, prepare scientific analyses in support of goals, notify the public when goals are established or modified, and notify the board of allocative implications associated with escapement goals. The foundation for this effort is regional or area escapement goal review teams assembled every three years to review goals, recommend changes, establish new goals or eliminate goals. The teams encompass broad expertise in biological characteristics of salmon stocks and technical approaches for establishing goals. Scientific staff from headquarters may assist regional teams and address issues of general importance for escapement goal development and application in Alaska. A detailed regional report of escapement goal recommendations is presented to the board and the public at tri-annual board meetings for that region or area. Following the board meeting, recommended goals are presented to the directors of the divisions of Commercial Fisheries and Sport Fish for approval http://www.adfg.alaska.gov/FedAidpdfs/FMS11-06.pdf

Development of escapement goals

A variety of methods are used to develop escapement goals in Alaska and brief descriptions of each are summarized below. The most commonly used methods are listed first, followed by the less common methods.

Percentile Method: A method for establishing sustainable escapement goals (SEG) developed by Bue and Hasbrouck (Unpublished)[1]. Contrast of the observed annual escapements (largest escapement divided by smallest escapement) and exploitation rate of the stock are used to select percentiles of

[1] Bue, B. G., and J. J. Hasbrouck. *Unpublished.* 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.

observed escapements for estimating lower and upper-bounds of the escapement goal. In this way the historical performance of the stock is used as an empirical estimate of the range of stock sizes associated with maximum sustainable yield.

Spawner-Recruit Analysis (SRA): Analysis of the relationship between escapement (number of spawners) and subsequent production of recruits (i.e. adults) in the next generation. There are several SRA models, but the Ricker production model (Ricker 1954) is almost exclusively used for salmon populations in Alaska because of the historical success of this model in explaining salmon population dynamics.

Risk Analysis: Risks of management error, unneeded management action or mistaken inaction, in future years are estimated based on a precautionary reference point established using past observations of escapement (Bernard et al. 2009). This method is primarily used to guide establishment of a lower-bound SEG for nontargeted stocks of salmon.

Yield Analysis: Graphical or tabular examination of yields produced from observed escapement indices from which the escapement range with the greatest yields is identified (Hilborn and Walters 1992).

Theoretical Spawner-Recruit Analysis (Theoretical SRA): Used in situations where there are few or no stock specific harvest estimates and/or age data. Information from nearby stocks, or generalizations about the species, are used in a spawner-recruit production model to estimate the number of spawners needed to achieve maximum sustained yield (MSY) (e.g., Clark 2005).

Empirical Observation: Goal development methods classified as "Empirical Observation" generally are *ad hoc* methods for stocks with limited or sparse data. Goals are based on observed escapements over time and may be calculated as the average escapement or the value of a low escapement for which there is evidence that the stock is able to recover (e.g., Norton Sound pink salmon escapement goals, ADF&G 2004).

Zooplankton Model: This model estimates the number of sockeye salmon *Oncorhynchus nerka* smolts of a threshold or optimal size that a lake can support based upon measures of zooplankton biomass and surface area of the lake (Koenings and Kyle 1997). Adult production is then estimated from predicted smolt production by applying marine survival rates for a range of smolt sizes.

Spawning Habitat Model: Estimates of spawning capacity or number of spawners that produce MSY are based on relationship with watershed area, available spawning habitat in a drainage, or stream length. Spawning habitat models have been developed for sockeye salmon (Burgner et al. 1969), coho salmon *0. kisutch* (Bradford et al. 1999; Bradford et al. 1997) and Chinook salmon *0. tshawytscha* (Parken et al. 2004).

Euphotic Volume (EV) Model: Measurement of the volume of a lake where enough light penetrates to support primary production (i.e. euphotic volume) is used to estimate sockeye salmon smolt biomass (Koenings and Burkett 1987) from which adult escapement is then estimated using marine survival rates.

Lake Surface Area: Similar to spawning habitat models, the relationship between the lake surface area and escapement are used to estimate adult sockeye salmon production (Honnold et al. 1996; Nelson et al. 2006).

Conditional Sustained Yield Analysis: Observed escapement indices and harvest are used to estimate

if, on average, surplus production (yield) results from a particular goal range (Nelson et al. 2005). Estimated expected yields are conditioned on extreme values of measurement error in the escapement indices.

Brood Interaction Simulation Model: This model simulates production using a spawner–recruit relationship that modifies the simulated production for the year of return using an age-structured sub-model, and estimates resulting catches and escapements under user-specified harvest strategies (Carlson et al. 1999). This is a hybrid of a theoretical SRA and yield analysis that has only been used to develop the escapement goal for Kenai River sockeye salmon (http://www.adfg.alaska.gov/FedAidpdfs/FMS11-06.pdf).

Alaska salmon is managed largely under the principle of escapement goals which includes a lower bound, technically equivalent to a limit reference point. These lower bounds are indicative of when fishing should stop although this is not always the case (i.e. due to the dynamic nature of managing runs and allowing escapements through inseason management).

Emergency Orders (EO) (AS 16.05.060) are used to close or limit access to fisheries based on information on run strength and escapement goals, EOs are widely used to open and close fisheries as needed by local area biologists. Inseason management allows for closure of fishery using EOs if and when escapement goals are not met. The allowable harvest in each year is set with respect to escapement goals.

Escapement goals for the various regions are reviewed every 3 years by the Board of Fisheries. Concurrent with increased scientific knowledge on the stocks of interest, escapement goals may be lowered or increased. During the past year the Board of Fisheries has maintained its multi-year cycle of public meetings devoted to different fisheries in different regions of Alaska. The Department has prepared and presented several stock status and escapement goal reviews since March 2011:

Escapement goal review of Copper and Bering rivers, and Prince William Sound Pacific salmon stocks, 2011 at the December 2011 meeting on Prince William Sound and Upper Copper River/Upper Susitna River Finfish, and

Pink Salmon Stock Status and Escapement Goals in Southeast Alaska, Chinook Salmon Status and Escapement Goals for Stocks in Southeast Alaska, Sockeye Salmon Stock Status and Escapement Goals in Southeast Alaska, Chum Salmon Stock Status and Escapement Goals in Southeast Alaska, Coho Salmon Stock Status and Escapement Goals in Southeast Alaska at the March 2012 meeting on Southeast and Yakutat Finfish.

ADFG Prince William Sound management area 2011 revision of escapement goals

The existing even and odd year pink salmon escapement goals cover all districts in PWSMA and are 1,250,000 to 2,750,000. ADFG established these soundwide goals in 2002. Concurrently, they established “management target” for each district. In the 2011 review, ADFG recommends converting the existing management targets to SEG ranges because each district is actively managed by district, not by overall returns to the sound.

An ADFG examination of the even-year management targets reveals that the historical median escapement is *below* the lower end of the proposed SEG for 7 of 8 districts, and barely above the

lower goal for the other 1. This strongly suggests that the management targets were set too high. The problem is likely related to the existing soundwide goal that was divided into district management targets based on their historical escapement proportions. An alternative explanation is that the goals are properly set, meaning that escapements have often been too low (below the goal) and harvest rates too high for much of the past 50 years. However, given the long time series of escapement data and their general stationary or increasing characteristics through time, it seems most plausible that the existing management targets are too high relative to the existing sustainable fishery.
The situation of median escapements being less than the lower-bound goal is less severe for the odd-year brood line; nonetheless, 1 district has the historical median below the lower end of the management target, while 7 others are only slightly above it.

An evaluation of the soundwide brood data for even and odd years with updated information did not warrant lowering the goal below 1,250,000. Hence, the committee believes the only viable option for setting district SEGs is to apply the percentile approach to each district. The premise for choosing the percentile approach over previously-used techniques (Ricker model, Markov yield table) that utilized the 1960–1994 pre-emergence fry data or brood table yield data is that errors associated with these other approaches are causing the soundwide goal to be overestimated. Possible explanations for this include (a) high variability in productivity, largely driven by environmental forces that cause pink salmon stock-recruitment relationships to be less informative than other salmon species – as evidence of this poor relationship, Ricker stock-recruitment models using escapement and returns are not significant; and (b) poor relationships ($P>0.10$) between total return and fry data, and (c) poor fits between observed and predicted fry density ($P>0.35$). While the brood tables are not informative about SMSY, they do indicate that the goal for even years should probably be lower than odd years, given the slightly higher productivity of the even-year brood line. Indeed, the soundwide sum of the recommended district SEGs for even years (793,000 to 1,701,000) is less than the sum of the recommended district SEGs for odd years (1,210,000 to 2,080,000).

On the 2011 review of escapement goals for the Copper river, Bering River and Prince William Sound management area, the use of the percentile approach caused a decrease in the lower bounds (compared to the current management targets) for each odd and even year district goal. The same occurs for the upper bounds of each district, with the exception of Eshamy District, which increases from 10,000 to 11,000. To maintain future pink salmon sustainability in PWS, ADFG recommended that each district be managed for its current long term median value of escapement (which is higher than the current lower bounds escapement goal for Odd Brood line; but lower than the current lower bounds escapement goal for the Even Brood line).

ADFG Southeast Alaska chum salmon escapement goal 2011 review

The current summer-run chum salmon escapement goals for the Southern Southeast and Northern Southeast Inside subregions are *lower bound sustainable* escapement goals based on the 25th percentile of peak survey estimates to aggregates of index streams from the early 1980 to 2007. Eggers and Heinl (2008) used survey data starting in the early 1980s to provide the most complete data set possible with which to establish escapement goals. For approximately half the index streams

in these subregions, however, survey information exists going back to 1960.

Eescapement goals for these two subregions were revaluated using all available historic data in order to provide the broadest time series possible on which to base the goals, including two periods of high productivity in the 1960s and 1980s–1990s, and a period of low productivity in the 1970s. The goal for the Northern Southeast Outside Subregion was not re-examined as very little survey information exists for index streams in that subregion prior to 1980. Escapement goals were reevaluated using the simple percentile approach recommended by Bue and Hasbrouck (*unpublished*), whereby the contrast of the escapement data (i.e., the ratio of the highest observed escapement to the lowest observed escapement) and the exploitation rate of the stock were used to select percentiles of observed annual escapements to be used for estimating a *sustainable* escapement goal. Contrast in the escapement data is simply the maximum escapement value divided by the minimum escapement value. Low contrast (<4) implies that stock productivity is known for only a limited range of escapements. According to this approach, percentiles of the total range of observed annual escapements that are used to estimate a sustainable escapement goal for a stock with low contrast should be relatively wide in an attempt to improve future knowledge of stock productivity. As contrast increased, Bue and Hasbrouck recommended that percentiles used to estimate the goal be narrowed. For exploited stocks with high contrast, the lower bound of the escapement goal range was set at the 25th percentile as a precautionary measure for stock protection.

Since the current escapement goals were based on data through 2007, the analysis was carefully based on the years 1960–2007,not including the three most recent years of lower index values, 2008–2010, as index counts for these years were below the current escapement goals for both subregions. Indices from 2008 to 2010 can be incorporated into future escapement goal analysis if it is clear that those low counts represent normal stock fluctuations, such as those that occurred during the 1960s and 1970s.

Southern Southeast Summer Run Chum Salmon

The current Southern Southeast Subregion escapement goal is set at the 25th percentile of the sum of annual peak escapement survey counts to 13 index streams over the years 1980–2007.

Eight streams in the index with survey counts for greater than 50% of the years 1960–1979 were identified. This set of eight index streams also accounted for a large portion (median = 74%) of the annual subregion escapement index from 1980 to 2007. Escapement indices were calculated for the years 1960–1979 by expanding this set of eight index streams in three steps as follows.

First, these eight streams were grouped together and imputed missing values for the years 1960–1979 (16% of the data points). Second, the annual surveys to this set of eight index streams, 1960–1979 was summed. Finally, the total Southern Southeast Subregion escapement indices for 1960–1979 was estimated, by dividing the annual sum-of-surveys to this set of eight index streams by the median proportion of 74%. These calculations provided annual escapement indices for the years 1960–2007. Given the high contrast (>8) in the entire 1960–2007 escapement series, and at least moderate exploitation rate, the 25th percentile of the escapement index was used to calculate a *lower bound sustainable* escapement goal of 54,000 chum salmon counted on peak surveys to the 13 index streams in this subregion (compared to the current goal of 68,000 based only on 1980–2007 data).

Norhtern Southeast Inside summer Run Chum Salmon

The current Northern Southeaset Inside Subregion escapement goal is set at the 25th percentile of the annual sum of peak escapement survey data to 63 index streams over the years 1982-2007. We identified 31 streams in the index with survey counts for greater than 50% of the years 1960-1981. This set of 31 index streams also accounted for a large portion (median = 68%) of the annual subregion escapement index from 1982 to 2007. The escapement indices for the years 1960-1981 were calculated by expanding this set of 31 index streams in three steps as follows. First, the 31 streams were grouped together and imputed missing values for the years 1960-1981 (27% of the data points). Second, the annual surveys to this set of 31 index streams, 1960-1981. Finally, the total Northern Southeast Inside Subregion escapament indices for 1960-1981 were estimated, by dividing the annual sum of surveys to this set of 31 index streams by the median proportion of 68%. These calculations provided annual escapement indices for the years 1960-2007. Given the high contrast (>8) in the entire 1960-2007 escapement series, and at least moderate exploitation rate, we used the 25th percentile of the escapement index to calculate a lower bound sustainable escapement goal of 119,000 chum salmon counted on peak surveys to the 63 index streams in this subregion (compared to the current goal of 149,000 based only on 1982-2007 data).
http://www.adfg.alaska.gov/FedAidpdfs/SP11-21.pdf

Escapements results against escapement goals from 2002 to 2010

Between 2002 and 2006, it was typical to observe greater than 80% success in achieving minimum escapement goals for all species in all regions except AYK. In recent years, the proportion of escapements falling below the lower bound of goals has increased in Southeast, Central and Westward regions. Statewide, the percentage of escapement goals within the goal range (or above the lower bound if a lower-bound SEG) has been between 35% and 58% since 2002. In recent years there has been a decrease in the percentage of goals exceeded, and an increase in the percentage of goals not achieved, when compared to previous years. Because meeting escapement goals is fundamental to department efforts to manage for sustainable salmon stock productivity, ADFG states it is important to document outcomes for meeting these goals. Where escapements chronically (4-5 years) fail to meet expectations for harvestable yield or spawning escapements, the department may recommend, and the board may adopt a stock of concern designation for those underperforming salmon stocks. The policy for the management of sustainable salmon fisheries (5 AAC 39.222) provides specific definitions for stocks of concern. Yield concerns arise from a chronic inability to maintain expected yields or harvestable surpluses above escapement needs. Management concerns are precipitated by a chronic failure to maintain escapements within the bounds, or above the lower bound of the established goal. A conservation concern may arise from a failure to maintain escapements above a sustained escapement threshold. Stocks of concerns are treated more carefully and an action plan is developed (i.e. the action plan may contain the following elements: habitat restoration/ protection measures, stock rebuilding goals/ objectives, management actions, performance measures, research plan, communication with other agencies).

Methods to develop stock-specific sustained escapement thresholds, as defined in the sustainable salmon fisheries policy, are not well developed for Pacific salmon, and no sustained escapement thresholds or stocks of conservation concern exist in Alaska. In 2010 there were five stocks of yield concern and one stock of management concern in the state. During the 2010/2011 board meeting cycle, seven new stocks of concern were declared including: Karluk River Chinook salmon in

Westward Region, and in Central Region, Chuitna, Theodore and Lewis rivers Chinook salmon, and Alexander, Willow and Goose creeks Chinook salmon. All of these stocks were designated as stocks of management concern, except for Willow and Goose creeks Chinook salmon that were designated as stocks of yield concern. Details about stocks of concern and the latest escapement goals are described under Fundamental Clause 14. The vast majority of these stocks have achieved escapement goals for the last year of available data.

Table 7. Statewide Summary of salmon stocks of concern in Alaska.

Region	System	Species	Level of Concern
Southeast	McDonald Lake	Sockeye	Management
Central	Kvichak River	Sockeye	Yield
	Susitna (Yentna) River	Sockeye	Yield
	Chuitna River [a]	Chinook	Management
	Theodore River [a]	Chinook	Management
	Lewis River [a]	Chinook	Management
	Alexander Creek [a]	Chinook	Management
	Willow Creek [a]	Chinook	Yield
	Goose Creek [a]	Chinook	Yield
Westward	Karluk River [a]	Chinook	Management
Arctic-Yukon-Kuskokwim	Yukon River	Chinook	Yield
	Norton Sound Sub-district 5 and 6	Chinook	Yield
	Norton Sound Sub-district 1, 2, and 3	Chum	Yield

[a] Designated as stock of concern during the 2010/2011 Board of Fisheries meeting cycle.

http://www.adfg.alaska.gov/FedAidpdfs/FMS11-06.pdf

Escapements versus escapement goals

Southeast AK

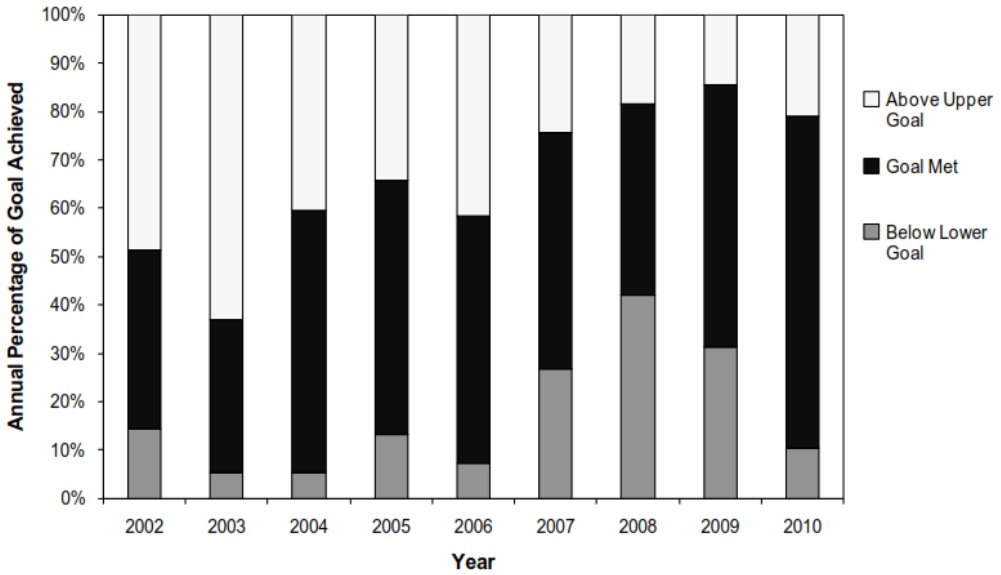

Figure 3. Southeast Region salmon escapement compared against escapement goals for the years 2002 to 2010.

Table 8. Summary of Southeast Region salmon escapements compared against escapement goals for the years 2002-2010.

Southeast Region	2002	2003	2004	2005	2006	2007	2008	2009	2010
Stocks with Escapement Data	35	38	37	38	41	41	38	48	48
Below Lower Goal									
Number	5	2	2	5	3	11	16	15	5
Percent	14%	5%	5%	13%	7%	27%	42%	31%	10%
Goal Met									
Number	13	12	20	20	21	20	15	26	33
Percent	37%	32%	54%	53%	51%	49%	39%	54%	69%
Above Upper Goal									
Number	17	24	15	13	17	10	7	7	10
Percent	49%	63%	41%	34%	41%	24%	18%	15%	21%

Central Region

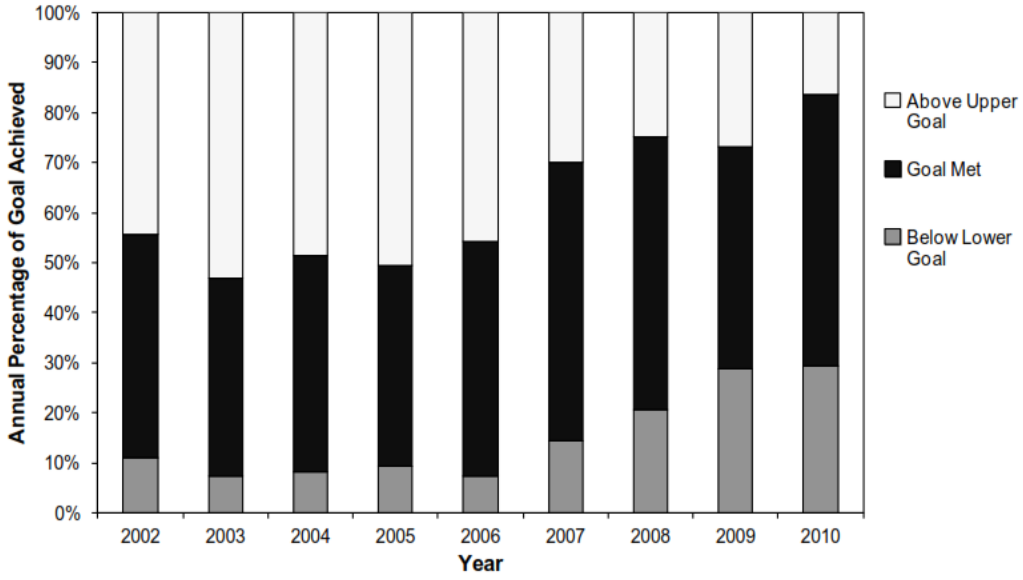

Figure 4. Central Region (Bristol Bay, Cook Inlet, Prince William sound/Copper river) salmon escapements compared against escapement goals for the years 2002 to 2010.

Table 9. Summary of Central Region (Bristol Bay, Cook Inlet, Prince William Sound/Copper River) salmon escapements compared against escapement goals for the years 2002 to 2010.

Central Region	2002	2003	2004	2005	2006	2007	2008	2009	2010
Stocks with Escapement Data	99	96	99	97	96	97	97	101	92
Below Lower Goal									
Number	11	7	8	9	7	14	20	29	27
Percent	11%	7%	8%	9%	7%	14%	21%	29%	29%
Goal Met									
Number	44	38	43	39	45	54	53	45	50
Percent	44%	40%	43%	40%	47%	56%	55%	45%	54%
Above Upper Goal									
Number	44	51	48	49	44	29	24	27	15
Percent	44%	53%	48%	51%	46%	30%	25%	27%	16%

Arctic-Yukon-Kuskokwim Region

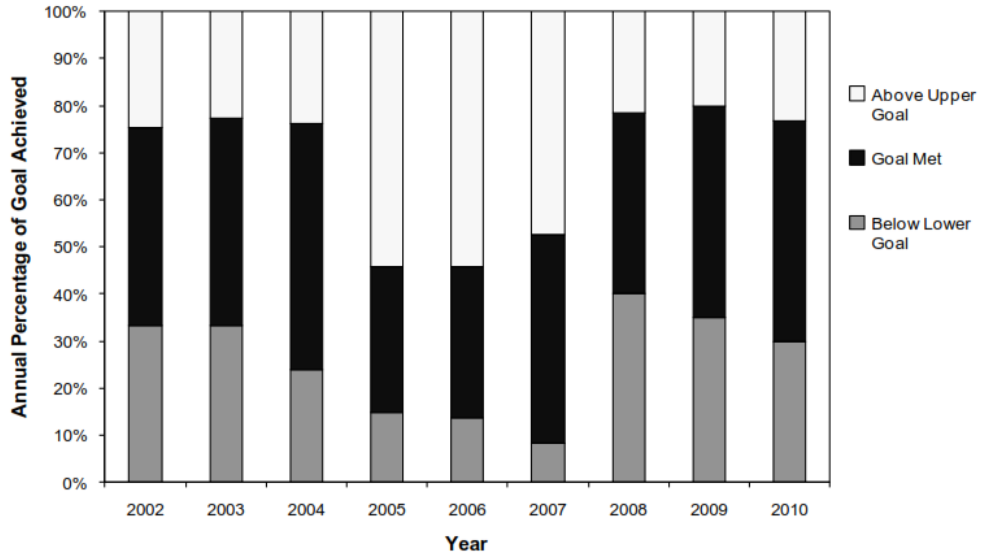

Figure 5. Arctic-Yukon-Kuskokwim region salmon escapement compared against escapement goals for the years 2002 to 2010.

Table 10. Summary of Arctic-Yukon-Kuskokwim Region salmon escapement compared against escapement goals for the years 2002 to 2010.

AYK Region	2002	2003	2004	2005	2006	2007	2008	2009	2010
Stocks with Escapement Data	57	57	63	61	59	61	60	60	60
Below Lower Goal									
Number	19	19	15	9	8	5	24	21	18
Percent	33%	33%	24%	15%	14%	8%	40%	35%	30%
Goal Met									
Number	24	25	33	19	19	27	23	27	28
Percent	42%	44%	52%	31%	32%	44%	38%	45%	47%
Above Upper Goal									
Number	14	13	15	33	32	29	13	12	14
Percent	25%	23%	24%	54%	54%	48%	22%	20%	23%

Westward Region

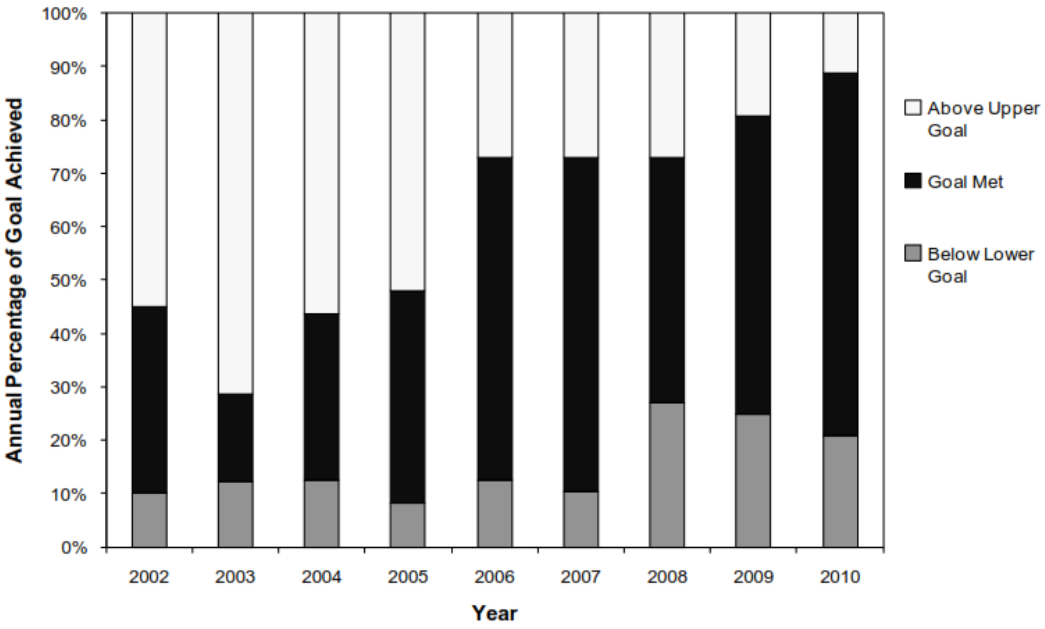

Figure 6. Westward region (Alaska Peninsula/Aleutian Islands, Kodiak, and Chignik areas) salmon escapements compared against escapement goals for the years 2002 to 2010.

Table 10. Summary of Westward Region (Alaska Peninsula/aleutian Islands, Kodiak, and Chignik areas) salmonn escapements compared against escapement goals for the years 2002 to 2010.

Westward Region	2002	2003	2004	2005	2006	2007	2008	2009	2010
Stocks with Escapement Data	49	49	48	48	48	48	52	52	53
Below Lower Goal									
Number	5	6	6	4	6	5	14	13	11
Percent	10%	12%	13%	8%	13%	10%	27%	25%	21%
Goal Met									
Number	17	8	15	19	29	30	24	29	36
Percent	35%	16%	31%	40%	60%	63%	46%	56%	68%
Above Upper Goal									
Number	27	35	27	25	13	13	14	10	6
Percent	55%	71%	56%	52%	27%	27%	27%	19%	11%

http://www.adfg.alaska.gov/FedAidpdfs/FMS11-06.pdf

International Fisheries

Yukon salmon harvest 2011 and 2012 outlook

The Joint Technical Committee (JTC) of the United States and Canada serves as a scientific advisory body to the Yukon River Panel. The JTC discusses harvest and escapement goals, management trends, postseason reviews and preseason outlooks, and results of cooperative research projects. Recommended Yukon River escapement goals for Chinook, chum and coho salmon for 2012 remained unchanged from 2011.

Due to uncertianty concerning Chinook salmon run strenght and the need to fulfill the canadian border passage obligation, meet Alaska escapement needs, and provide fro subsistence uses, management of the chinook salmon commercial fishery continued to follow the conservative preseason management strategy. No Commercial periods targeting Chinook salmon were allowed in 2011 in the Yukon river mainstem or in the Tanana River.

Preliminary Chinook salmon escapement in Canada was 46,307 fish, which was within the 42,500–55,000 escapement goal range and provided for the Canadian harvest share. By preliminary estimate, about 40,211 Chinook salmon were harvested for subsistence in Alaska, and in Yukon Territory, 4,550 Chinook salmon were harvested in aboriginal fisheries. For fall chum salmon, the preliminary 2011 Yukon River drainagewide total run size estimate was 1,000,000 fish, based on the postseason expanded escapement and estimated harvest. The border passage estimate was 212,000 fall chum salmon, and after subtracting harvests in Canada, the spawning escapement was approximately 205,930 fish, exceeding the upper end of the IMEG range of 70,000 to 104,000 fall chum salmon. The total commercial harvest of fall chum salmon in Alaska was 238,979 fish; the largest harvest since 1995, and by preliminary estimate, the Alaskan subsistence harvest of fall chum salmon was 79,887 fish. The Canadian commercial harvest was 5,312 fall chum salmon.

http://www.adfg.alaska.gov/index.cfm?adfg=commercialbyareayukon.salmon#/management
http://www.adfg.alaska.gov/FedAidpdfs/RIR.3A.2012.01

7.	**Management actions and measures for the conservation of stock and the aquatic environment shall be based on the Precautionary Approach. Where information is deficient a suitable method using risk assessment shall be adopted to take into account uncertainty.**
	FAO CCRF 7.5.1/7.5.4/7.5.5
	FAO ECO 29.6/32

Evidence adequacy rating:

☐ **High** ☑ **Medium** ☐ **Low**

Rating Determination:

Salmon enhancement programs in Alaska were designed to help rehabilitate depressed fisheries and to protect wild salmon stocks through detailed planning and permitting processes that included focused policies on genetics, pathology, and management. Hatcheries were located away from significant wild stocks, local sources were used to develop hatchery broodstocks, and juveniles are marked so management can target fisheries on hatchery fish. New evidence collected during 2011 and 2012 points to the fact that hatchery salmon stray rates in wild salmon streams in PWS and SEAK are in excess of 10%. Potential genetic depression could occur from gene introgression of hatchery to wild salmon. The State of Alaska has organised for a multigenerational study starting in 2013 in PWS and SEAK that aims at understanding (1) the genetic stock structure of pink and chum salmon in PWS and SEAK, (2) the extent and annual variability in straying of hatchery pink salmon in PWS and chum salmon in PWS and SEAK, and (3) the impact on fitness productivity of wild pink and chum salmon stocks due to straying of hatchery pink and chum salmon. This project will deliver answers about the scope of straying on phase 1 and some preliminary results could be available around 2014-2015. However, answers regarding genetics impact on fitness of wild strains may not be available until 2023. Relating to the requirements of the Precautionary Approach and especially supporting clause 7.1 ("The absence of adequate scientific information shall not be used as a reason for postponing or failing to take conservation and management measures") it is unclear how ADFG plans to deal with development plans and release activities (e.g. potential requests from hatchery corporations for increased pink and chum salmon productions) in the two regions in light of the fact that negative genetic interactions between hatchery and wild salmon could already be occurring, and that research results of the genetic interactions between hatchery and wild salmon following the multigenerational study in PWS and SEAK may take considerable time to accrue. Since the assessment team is aware of a range of management tools that are in place for the limitation of straying rates of hatchery fish, a minor non-conformance is applied specific to clause 7.1.1 specific to PWS and SEAK. A corrective action plan from the client shall detail 1) how ADFG intends to address this issue and 2) a set of specific timelines to allow for assessment during the next surveillance activities in 2013, 2014 and

2015 and the second full assessment audit in 2016, as relevant and if needed. The corrective action plan is been received and accepted by the assessment team.

Summary points

- The precautionary approach is applied in the Sustainable Salmon Policy, the Policy for Management of Sustainable Salmon Fisheries, the Policy for Management of Mixed Stock Salmon Fisheries, and the Management Plan for High Impact Emerging Fisheries. In addition, policies enabling hatchery operations have been designed with the precautionary approach in mind to avoid impacts and disturbance to wild salmon stocks.
- In the April 13th 2011 internal memo from Chief ADFG scientists (Commercial and Sport Divisions) to Division of Commercial Fisheries and Sport Fish Directors regarding PWSAC Permit Alteration Request (PAR) for increased pink salmon production there are recommendations not to allow increase. This recommendation is made on the basis that the level of uncertainty and risks associated with hatchery and wild interactions (relating to straying and escapement targets, genetic impacts of straying and competition in the marine environment) cannot be reduced with increased salmon production.
- In August 2011, ADFG carried out a risk assessment evaluation to decide whether allowing further pink salmon production at PWSAC's Cannery Creek Hatchery (CCH) would exacerbate managers ability to estimate pink salmon wild stock strength. On the basis that CCH strays are not likely to have an effect on inseason management in any district and are not likely to affect manager's ability to estimate wild-stock strength during the period prior to August 26, when most directed fishing on pink salmon (95%) occurs, CCH was deemed least risk with respect to increased salmon production.
- The Brenner at al. (2012) paper on straying of hatchery salmon in Prince William Sound, Alaska, highlights that hatchery pink salmon returning to PSWAC's CCH, WNH and AFK facilities arrive relatively late in the spawning season, and most strays from these facilities were found within streams after Julian day 230 in mid August. Streams generally contained fewer than 10% strays prior to this date but after this date strays constituted as much as 93% of the fish sampled [from Solomon Gulch Hatchery (SGH)] decreasing management risks in respect to affecting assessment of wild stock run strength during the season. The study also highlights that the proportion of stray hatchery fish ranged from 0% to 98% for pink salmon, 0–63% for chum salmon, and 0–33% for sockeye salmon. Hatchery fish strayed most frequently into streams within 40 km of a hatchery. Overall, a model of these data indicated that more than 10% of pink salmon found in PWS wild-salmon streams was of hatchery origin. Similarly, the estimated proportion of hatchery-origin chum salmon spawning in streams in northern inside SEAK was 13.5% in 2010 (Piston and Heinl 2011).
- The ADFG Division of Commercial Fisheries, has released a Request for Proposals (RFP) to initiate large-scale research related to hatchery wild salmon stock interactions. This proposed research is the culmination of several years of effort to identify key questions related to hatchery production and wild stocks that were of most relevance to Alaska salmon management. The hatchery operators and the department both have capital improvement projects included in the legislature's budget; a group of salmon processors have indicated that they will also cover a portion of the research costs.

- Reference points indicating the percentage of straying allowed in PWS is available and has been surpassed. A second area, Southeast Alaska, needs to develop such reference points for straying and the actions to be taken when they are exceeded. It is unclear whether the new ADFG led large scale hatchery research program also aims to address this issue.

The Precautionary Approach in Policy

A principle tenant of the Sustainable Salmon Policy is "in the face of uncertainty, salmon stocks, fisheries, artificial propagation, and essential habitats shall be managed conservatively" (5AAC 39.222(c)(5)). This regulation further defines the "precautionary approach" to involve consideration of: the uncertainties in salmon fisheries and habitat management; biological, social, cultural, and economic risks; consideration of the needs of future generations; and placement of the burden of proof on those activities that pose a risk to salmon habitat or production.

State Regulation, the Policy for the Management of Sustainable Salmon Fisheries (5 AAC 39.222 (a) (1); (a) (5)(A,B),) also codifies the precautionary approach in State regulation of salmon fisheries and habitats. This policy states that in the face of uncertainty, salmon stocks, fisheries, artificial propagation, and essential habitats shall be managed conservatively as follows:

(A) a precautionary approach, involving the application of prudent foresight that takes into account the uncertainties in salmon fisheries and habitat management, the biological, social, cultural, and economic risks, and the need to take action with incomplete knowledge, should be applied to the regulation and control of harvest and other human-induced sources of salmon mortality;
(B) a precautionary approach requires consideration of the needs of future generations and avoidance of potentially irreversible changes; prior identification of undesirable outcomes and of measures that will avoid undesirable outcomes or correct them promptly; initiation of any necessary corrective measure without delay and prompt achievement of the measure's purpose, on a time scale not exceeding five years, which is approximately the generation time of most salmon species; that where the impact of resource use is uncertain, but likely presents a measurable risk to sustained yield, priority should be given to conserving the productive capacity of the resource;
(C) appropriate placement of the burden of proof, of adherence to the requirements of this subparagraph, on those plans or ongoing activities that pose a risk or hazard to salmon habitat or production; a precautionary approach should be applied to the regulation of activities that affect essential salmon habitat.

The precautionary approach is also applied into the Management Plan for High Impact Emerging Fisheries (5AAC 39.210) and the Policy for Management of Mixed Stock Salmon Fisheries (5AAC 39.220).
http://www.legis.state.ak.us/basis/folioproxy.asp?url=http://wwwjnu01.legis.state.ak.us/cgi-bin/folioisa.dll/aac/query=[JUMP:'5+aac+39!2E222']/doc/{@1}?firsthit

There are very well prescribed Statutes and laws for planning of hatchery developments (see

evidence under fundamental clause 3 for evidence). In particular, there is clear policy that ensures that hatcheries are placed in areas that causes least likely risk of mixing with existing wild stocks. Evaluation is based on documented environmental assessment. All hatchery release strategies are reviewed by ADFG and are ultimately under the authority of ADFG. Both economic and ecological evaluation of the release plan forms part of the decision making process. Introduction of genetic material is prohibited and hatchery stock is selected from the terminal area stock and hence, all genetic material originated from that location. Selection techniques are designed to avoid artificial reduction in genetic material – i.e. fish are selected at random and not on external trait basis (size etc). An extremely wide, pre-determined number of returning fish are used for stripping of ova for hatchery rearing and release (Reference to Genetic Policy, 1985).

Salmon Management in Alaska

- Highest priority: protect and maintain wild stocks
- Vigorous habitat protection, no dams on rivers
- Escapement-based management, no fishery targets
- Mixed stock fisheries avoided wherever possible
- Hatcheries supplement not replace wild stocks, mitigation of pressure on wild stocks.
- Annual Management Plans of all hatcheries are annually reviewed by ADFG.

Minimizing Hatchery-Wild Stock Interactions

- Comprehensive regional planning.
- Utilise conservative fish culture practices.
- A rigorous hatchery permitting process that includes genetics, pathology and fishery management reviews.
- Statewide genetics policy to protect wild stocks.
- Fish health and disease statutes (no disease has ever been introduced or amplified in the wild).
- Careful siting of hatcheries, terminal harvest areas (temporal and spatial segregation from wild stocks to minimize mixed fisheries, then harvest all the returning salmon to minimize potential breeding. Hatchery production is not approved if there is not high confidence that the resulting salmon will be fully harvested).
- Hatchery brood stock diversity practices (fish selected at random and not on external trait basis such as size, 1 to 1 mating ratio, effective population sizes very large).
- Use of local brood sources.
- Collection of broodstock for the hatcheries is stratified over spawn/run timing to maximize the heterogeneity of the gene pool.
- Mass otolith marking for real-time in-season fisheries management.

http://www.springerlink.com/content/25k01460326l7g38/
http://www.adfg.alaska.gov/static/fishing/PDFs/hatcheries/mcgeebrochure.pdf

Each hatchery is required to complete an annual report containing information on hatchery returns, numbers of eggs taken, and numbers of fry or smolt released, by species and stock.

The Precautionary Approach in Practice

In a practical sense, the implementation of the precautionary approach is applied in several situations and can be evaluated accordingly.

1- **April 13th 2011 internal memo from Chief ADFG scientists (Commercial and Sport Divisions) to Division of Commercial Fisheries and Sport Fish Directors.** [document forwarded by ADFG]

In this memo, internal ADFG scientists argue against approval of 2011 PWSAC requests to increase hatchery production of pink salmon at three of its hatcheries: CCH (Cannery Creek), WNH (Wally Noerenberg) and AFK (Armin F. Koernig) hatcheries. The commissioner eventually permitted increased capacity at one, Cannery Creek Hatchery, to an additional 34 million pink salmon eggs.

While the proportion of hatchery fish estimated in district streams is highly variable, based on most recent data from 2008-2010, there is clearly a bias induced in estimates of wild stock escapement. It is not yet possible to determine the magnitude of this effect for escapement targets in specific districts or for even and odd year races across the sound as a whole. However, recent data shows that proportions of hatchery fish on spawning grounds in some districts may exceed 20% or more and most districts showed some evidence of stray hatchery fish. In light of documented hatchery stray proportions in district escapements, even where management targets have been achieved, it is not clear that wild stock management targets for escapement are actually being met. In the case of even –year runs, poor performance at meeting wild stock management targets is likely worse than it appears and some odd year district targets which were barely achieved may not have been if hatchery strays are taken into account. There is no simple resolution of this issue because adjusting escapement goals to account for both hatchery and wild fish requires some knowledge of relative spawning numbers for sustained yield. Obviously, inseason management cannot account for hatchery strays in escapements because they are not distinguishable from wild fish in aerial surveys. As a result, management actions are based on uncertain knowledge of wild stock escapements. This impairs the department's ability to meet statutory and regulatory requirements to manage for the sustained yield of wild salmon as the highest priority. The level of uncertainty and risk associated with this cannot be reduced with increased pink salmon production.

Genetics

While a large body of research on enhanced salmon has indicated that introgression of hatchery salmon into wild populations may have depressive effects on wild stock fitness (Naish et al. 2007; Mobrand et al. 2005) it is important to note that the most of these studies use steelhead, king or coho salmon as research species. It is widely recognized that life histories of pink and chum salmon are very different from these species, and that the shorter time pink and chum salmon typically spend in hatcheries reduces concerns about domestication. It is also widely believed that pink salmon have inherently greater stray rates than other Pacific salmon species, especially in PWS, where intertidal spawning is uncommon. Unfortunately, little is known about genetic stock structure in PWS pink salmon, although Seeb et al (1999) have documented ecologically important genetic structure among even-year pink salmon. Genetic impacts of pink salmon enhancement programs on wild stock fitness in PWS are unknown, but high proportions of hatchery strays in pink salmon spawning populations increases the probability of genetic introgression. The potential adverse

impacts of this as documented in recent literature for other species should not be ignored.

Competition in the marine environment

There is growing concern that large releases of juvenile hatchery fish may result in adverse competitive interactions with wild stocks as juveniles. Density dependent reductions in growth and increased mortality have been observed for wild pink salmon in PWS at current levels of hatchery production (Armstrong et al 2008; Cross et al. 2009; Moss et al. 2009; Moss 2006, Moss et al. 2005; Werthheimer et al. 2004). Other analysis highlight interspecific interactions, where it has been suggested that abundant pink salmon may reduce growth and increase mortality of sockeye and king salmon in the marine environment through competition for similar food (Azumaya and Ishida 2000; Ruggerone et al. 2005; Ruggerone and Neilson 2004), but then, in years like the present one, both adult pink salmon in PWS and adult sockeye salmon in PWS are extraordinarily abundant and extraordinarily large. While there is no much to understand about the ultimate influence of hatchery fish competition on wild stock productivity, and these studies are only suggestive, it is reasonable to assume that there are some limits to carrying capacity in the nearshore for juvenile pink salmon abundance in the North Pacific, only part of which is hatchery fish from North America and Asia. Carrying capacity of the North Pacific Ocean for Pacific Salmon can vary from year to year due to biological and environmental factors (Helle et al. 2007).

Cannery Creek Hatchery

The Cannery Creek Hatchery Sub-district and terminal area fisheries largely avoid migration corridors; however, local pink salmon stocks in the Northern District are directly affected by the terminal fisheries. Close proximity of wild stock systems to intensive CCH fisheries makes harvest of wild fish difficult to control with time and area restrictions. This may be especially problematic in years with weak wild stock runs. Overall harvest of wild stocks maybe small, but smaller stocks may represent a significant fraction of the district escapement target. For example, Jonah and Siwash creek stocks are relatively small in comparison to the hatchery run, but comprise approximately 30% of the Northern District pink salmon escapement target. In 2008 and 2009, wild salmon were harvested in larger numbers than intended despite restricted fisheries in the eastern half of the CCH Subdistrict. In those years, wild stock represented less than 3% of total CCH Subdistrict harvests, yet wild stock management targets were below the target range in 2008 and just above the lower bound in 2009. The Northern and Unakwik districts have not met their pink salmon management targets in five of ten even years and three of ten odd years. This highlights the difficulty of allowing smaller numbers of wild stock to escape fisheries while also targeting large hatchery returns.

Increased CCH pink salmon production will likely increase the risk of not meeting local management targets for escapement. Additional time and area restrictions will probably be necessary to allow escapement windows for wild stocks and area restrictions similar to those employed during the 2009 fishing season could become routine. Time and area restrictions may cause fish to build up more frequently in hatchery terminal areas, which may cause a decline in fish quality and increase the possibility of straying.

Straying

Hatchery pink salmon released from CCH have been detected in wild pink salmon streams throughout PWS, occurring in every district and in 68% of sampled streams. In the past three years, total annual escapement into wild stock streams attributed to CCH-released pink salmon in some streams has been as high as 32% in the Northern District, 12% in the Eastern district, and 11% in the Southwestern District. Stream monitoring in 2010 documented that 41% of dead spawned fish in Jonah Creek in the Northern District were stray hatchery fish from CCH. Jonah Creek is one of the primary pink salmon streams in the Northern District. Stray rates in other streams in the area are not as high. It is reasonable to assume that pink salmon production increases at CCH would also increase the occurrence of stray hatchery fish in wild stock streams. This would exacerbate difficulties accounting for wild stock escapement and increase risk of genetic effects caused by straying.

2- White Paper, Evaluation of Prince William Sound Aquaculture Corporation's 2011 Pink Salmon Permit Alteration Requests. [document forwarded by ADFG]

Since 1998 in the Northern District, where CCH is located, the district target has almost always been met, or when below the target, has been relatively close. From 1987 through 1997, the target was missed in all but three years, and often well below. In comparison to other districts, Northern District escapements appear to be acceptable and generally good in the last 12 years. Of the hatchery districts, the Northern District appears to be generally doing acceptably.

In the Coghill District, where WNH is located, the target has been met or exceeded in 10 years of the last 12 years, but well short in two years at 69% in 2004 and 48% in 2002. In the Northwestern District, also near WNH, escapement has been within target for the last five years, preceded by a high number of below-target escapements.

In the Southwestern District, where AFK is located, the target has been missed, both above and below, almost regularly since 2002, with several years (2002 and 2008) well below.

The management targets are a means by which we can assess the quality of the Soundwide escapement, and failing to meet a target is presumably not as significant as missing the Soundwide goal. Nonetheless, it appears that in the presence of large harvests of hatchery pink salmon from the three PWSAC pink salmon hatcheries, managers have done an acceptable job of achieving the district targets in most areas. The best performance appears to be in the Northern District (CCH), and lesser so, near WNH and AFK.

Hatchery production, in general, would seem to make managing the pink salmon return in PWS more difficult. The presence of a large "stock" of fish which can sustain a higher harvest rate than wild fish can make assessment of wild-stock run strength difficult; however, it also can mitigate the impacts of commercial openings. Harvesters tend to fish where they can catch the most fish with the least effort and aggregations of hatchery fish tend to draw effort away from fishing on wild stocks. In years of weak wild-stock strength, managers can adjust areas open to fishing to move effort off wild stocks and onto hatchery stocks. Even so, some harvest of wild stocks is inevitable when targeting hatchery stocks in terminal areas.

It is probably not possible to measure the effect of hatchery production on managers' ability to achieve escapement goals. With almost 25 years of hatchery pink salmon production at a relatively constant level, there is no "control" with which to compare the current situation. In terms of meeting escapement goals and district targets, it does appear that there is improvement in some districts, even as harvests of hatchery fish have increased.

Summation
Management is able to ensure adequate escapements with current levels of hatchery production. While the requested increases would likely have some effect on escapement-goal management, measurement of those effects would require tools not currently available to the department. Of the three PWSAC PAR requests, the CCH appears to be most manageable.

Pink Salmon Management and Straying
Assessment of escapement goals is based on the assumption that counted fish are wild fish; however, the department has recognized for some time that portions of these fish were likely hatchery fish. Recently, the department systematically sampled escapements of a selected suite of streams for the presence of hatchery fish. The straying studies were designed to only sample dead fish. The purpose of this approach is to ensure that fish counted as strays really were committed to the streams and not simply probing with the intention of returning to their release sites.
The department regularly surveys 215 streams by air. The objective is to survey each of these streams at least once a week over the expected timing of the escapement. There has been at least some sampling for stray pink salmon in 46 of the 215 index streams. Of these 46 streams, AFK fish were detected at least once in 34, CCH fish at least once in 32, and WNH fish at least once in 39. No PWSAC pink salmon were detected in six of the streams. While the 46 streams were not necessarily representative of the whole Sound (none were in the Southeastern District), the data does suggest that pink salmon do stray to wild systems on a regular basis.

The first question is whether the presence of stray pink salmon has an impact on inseason management decisions. It's unclear why hatchery fish have a later timing, but it may be that's normal timing for hatchery fish, or more likely, a behavioral trait related to being strays. Proportions of strays from various hatcheries were measured against unmarked fish in the samples, rather than the total number (which might include strays from other hatcheries). Since the sampled fish are dead, they represent fish that were in the stream a week or more earlier than the sample date. Fried et. al. (1998) estimated individual stream life values from 6.8 to 21.5 days, with a mean value of 12.6 days.
On average, 95% of the pink salmon harvest takes place prior to August 26 in PWS. Accordingly, hatchery fish in streams would have to be at a significant level prior to that date to have an impact on management decisions. Even accounting for stream life, it appears that in most districts, only low portions of strays would be present prior to the end of August, suggesting that strays are not affecting management districts. In the case of the Eshamy District, strays from the WNH and AFK pink salmon are present at levels greater than 30% on almost all sample dates and would give a false impression of run strength. A few strays in this district can account for a large proportion due to low numbers of any pink salmon in this district, where the midpoint of the management target is 7,500 for even years and 10,000 for odd years. In the Southwestern District, strays from AFK show up at

high levels starting with samples on September 9, but only above 10% in one of eight sample days prior to September 9, when they were observed in 32% of the samples collected on August 25.
The sampled streams in the Southwestern District that have the largest proportions of AFK fish showing in August are Falls, Horseshoe, and Sleepy Bay creeks, all within nine miles of the hatchery. Slightly more distant systems of Snug Harbor and Johnson creeks had AFK fish at 11% and 9%, respectively, in late August samples. In aggregate, sampling in Southwestern District has not taken place with enough frequency to provide assurance that pink salmon strays from AFK hatchery may not be biasing managers' estimates of wild-stock escapement during the period when fishing is taking place, i.e., prior to August 26.
CCH pink salmon are occasionally observed at levels greater than 10% of the sample in some districts, but those occurrences are later in the run timing and not likely to affect management decisions during the fishery. However, the proportions of strays in the Southwest and Eshamy districts should be a consideration to managers.

Summation
Strays are not likely to affect manager's ability to estimate wild-stock strength during the period prior to August 26 when most directed fishing on pink salmon occurs, except in the Eshamy District where strays from WNH and AFK are likely to bias estimates of wild-run escapement, and possibly, toward the end of directed fishing in the Southwestern District. CCH strays are not likely to have an effect on inseason management in any district, and except in Eshamy district, WNH fish are not likely to affect estimates either. Allowing an increase in production at CCH would not be likely to affect assessment of wild-stock run strength during the season; increases at WNH and AFK would exacerbate assessment in Eshamy district and possibly, in Southwestern district.

3- Brenner, R.E., S.D. Moffitt, and W.S. Grant. 2012. Straying of hatchery salmon in Prince William Sound, Alaska. Environ Biol Fish. DOI 10.1007/s10641-012-9975-7.

Hatchery pink salmon returning to CCH, WNH and AFK facilities arrive relatively late in the spawning season, and most strays from these facilities were found within streams after Julian day 230 in mid August. Streams generally contained fewer than 10% strays prior to this date but after this date strays constituted as much as 93% of the fish sampled [from Solomon Gulch Hatchery (SGH)]. Hatchery pink salmon return to SGH comparatively early in the summer spawning season and strays from this facility were most prevalent in streams prior to Julian day 245. From this study it appears that most of the hatchery salmon returns late in the season (when the vast majority of wild pink salmon has been harvested) decreasing management risks in respect to affecting assessment of wild stock run strength during the season.

The study also highlights that the proportion of stray hatchery fish ranged from 0% to 98% for pink salmon, 0–63% for chum salmon, and 0–33% for sockeye salmon. Hatchery fish strayed most frequently into streams within 40 km of a hatchery. Overall, a model of these data indicated that more than 10% of pink salmon found in PWS wild-salmon streams was of hatchery origin. Similarly, the estimated proportion of hatchery-origin chum salmon spawning in streams in northern inside SEAK was 13.5% in 2010 (Piston and Heinl 2011)

4- Alaska Hatchery Research Plan

The ADFG Division of Commercial Fisheries, has released a Request for Proposals (RFP) to initiate large-scale research related to hatchery wild salmon stock interactions. This proposed research is the culmination of several years of effort to identify key questions related to hatchery production and wild stocks that were of most relevance to Alaska salmon management. The hatchery operators and the department both have capital improvement projects included in the legislature's budget; a group of salmon processors have indicated that they will also cover a portion of the research costs.

Scope of straying

Annual production of pink and chum salmon in PWS and of chum salmon in SEAK is the result of both natural spawning and hatchery production. This production is realized as catch and escapement with hatchery-produced salmon in natural escapement labeled as "strays". Currently, catches of naturally-spawned salmon (hereafter called wild salmon) and of hatchery produced salmon (hereafter called hatchery salmon) are estimated with catch sampling programs.

A suite of new projects is proposed to annually estimate the following for pink and chum salmon in these two regions:

- number of wild salmon spawning in the wild;
- number of hatchery salmon spawning in the wild (hatchery strays);
- production of hatchery salmon (including hatchery strays); and
- production of wild salmon (excluding hatchery strays).

The amount of hatchery straying is not constant, but will vary annually due to factors such as run size, precipitation, water temperatures, and stream flows. To determine average straying rates and their variability will require multiple years of sampling and estimation of hatchery and wild returns, escapements, and hatchery strays. A minimum of five years is envisioned for estimating the scope of straying, after which time the costs and benefits of continuing to collect information on pink and chum salmon runs at this level of resolution can be evaluated. Results of this study will have positive outcomes in determining clearly the scope of straying and the ecological and genetic implications on wild salmon in terms of management.

http://notes4.state.ak.us/pn/pubnotic.nsf/cc52605f7c156e7a8925672a0060a91b/d52efa396245b1db892579f70075d4dd/$FILE/RFP%20-%20Hatchery%20fish%20interaction.pdf

In light of current studies highlighting straying of hatchery salmon in PWS and SEAK there are some concerns over acceptable limits for hatchery straying. Although the Prince William Sound Copper River Regional Planning Team recommended that "the proportion of hatchery salmon straying into wild-stock streams must remain below 2% of the wild-stock escapement over the long term" (PWS-CR RPT 1994), recent modeling suggests that streams throughout PWS contain more than 10% hatchery pink salmon (Brenner et al. 2012). The comprehensive salmon enhancement plan for SEAK (JSERPT 2004) does not specifically state a maximum allowable proportion of hatchery salmon into wild salmon stream. This plan indicates that evaluation plans will be developed for enhancement projects that "include the predetermined acceptable percentage of strays in a specific wild stock and what action will be taken if strays in excess of that percentage are observed".

It is not fully clear whether the ADFG led hatchery salmon research program will address specifically these points, but will definitely point out if and what type of ecological and genetic interactions, positive or negative, exists between hatchery and wild salmon.

D. Management Measures

8. Management shall adopt and implement effective measures including; harvest control rules and technical measures applicable to sustainable utilization of the fishery and based upon verifiable evidence and advice from available scientific and objective, traditional sources.

FAO CCRF 7.1.1/7.1.2/7.1.6/7.4.1/7.6.1/7.6.9/12.3
FAO Eco 29.2/29.4/30

Evidence adequacy rating:

☑High **☐ Medium** **☐ Low**

Rating Determination:

Escapement goals are essentially the harvest control rule used for management of Alaska salmon. Currently, there are 289 active salmon stock escapement goals throughout the state of Alaska. Every three years (based on the BOF schedule) each Region updates its escapement information and submits a salmon stock status report to the BOF. This report (mandated in the Policy for the Management of Sustainable Salmon Fisheries, 5AAC 39.222) reviews the status of all stocks within a management area, recommends new and modified escapement goals based on the new data that have been collected and analyzed in the past three years, defines stocks of concern, and develops management or action plans to deal with fishery management issues. Escapement goals are managed on an operational basis, through in-season Emergency Orders (EO), which are used to close or limit access to fisheries based on information on run strength and escapement goals, EOs are widely used to open and close fisheries as needed by local area biologists. Technical measures also include time and area restrictions limit when and where specific fisheries occur and restrictions are also imposed by regulation on all types of fishing gear (e.g., mesh size restrictions and length of nets for gillnets, number of fishing lines, rods, and gurdies for troll gear, and mesh size, net length and depth for purse seine gear). Specific requirement for gear (i.e. gillnet length, depth, and mesh sizes) are defined for each area and in specific management plans and regulations. A range of scientific and fishery based objective information is used to set escapement goals. These are summarized in the supporting paragraphs of fundamental clause 4,5 and 6.

Fishery based data from hatchery operations was noted by the team as an area requiring review in the case of the hatchery operation in Prince William Sound. This came to light through the surveillance audit and was based on an internal review of operations for Prince William Sound Aquaculture Corportation PWSAC, carried out by ADFG in 2008. Since this time, the majority of the subsequent action plan compliance issues have been resolved. ADFG have reported that data exchange between the department and PWSAC, an area of previous concern highlighted through ADFG process had improved and data needs and reporting requirements are now clearly articulated in PWSAC's annual management plans. The assessment team has reviewed these documents and consulted with both parties in detail in order to ascertain that the previous concerns on data transfer are resolved sufficiently in order for a high level of confidence to be achieved for Fundamental 8. A summary of the evidence reviewed is provided in the subsequent paragraphs below.

Escapement Goals:

Escapement goals are essentially the harvest control rule used for management of Alaska salmon. Currently, there are 289 active salmon stock escapement goals throughout the state of Alaska (http://www.adfg.alaska.gov/FedAidpdfs/FMS11-06.pdf).

- BEGs are usually established using stock-recruit information which generally requires multiple years of run reconstructions to establish. BEGs are expressed as a range based on factors such the productivity of the stock and data uncertainty.
- A Sustainable Escapement Goal (SEG) is the level of past escapement (as demonstrated by escapement counts or indices) that has resulted in sustainable yield over a 5-10 year period. SEGs are used when data are insufficient to establish a BEG, usually due to lack of stock specific harvest data. SEGs are also set as a range and take into account uncertainty of the data. Once established, ADFG attempts to manage fisheries to maintain an even distribution of escapement within the boundaries of a BEG or SEG.
- Two other, less common escapement goals are also defined in the Sustainable Salmon Policy. A Sustainable Escapement Threshold (SET) is a threshold level of escapement, below which the ability of the stock to sustain itself is jeopardized. The SET is below the lower bound of a BEG or SEG and is established when needed for salmon stocks of management or conservation concern. An Optimum Escapement Goal (OEG) is a specific management objective for salmon escapement that considers biological and allocative factors and may differ from BEG or SEG. An OEG may be expressed as a range but the minimum bound of an OEG will always be above the SET.

Every three years (based on the BOF schedule) each Region updates its escapement information and submits a salmon stock status report to the BOF. This report (mandated in the Policy for the Management of Sustainable Salmon Fisheries, 5AAC 39.222) reviews the status of all stocks within a management area, recommends new and modified escapement goals based on the new data that have been collected and analyzed in the past three years, defines stocks of concern, and develops management or action plans to deal with fishery management issues. State Regulation, the Policy for the Management of Sustainable Salmon Fisheries (5 AAC 39.22), directs management measures to ensure sustainability of yield. The Policy is implemented through the various fishery management plans for different fisheries in different regions and areas of the state. The BOF's process provides a transparent, accessible route for all fishery participants and stakeholders to submit proposals and

ultimately cause legitimate amendment to fishery regulations for the sustainable use of the resource through verifiable, objective based review of information, including from traditional sources.

Fishery monitoring and stock assessment programs collect escapement data, age, sex, size, tag recoveries, and run timing information from both the spawning portion of the stock and the fish harvested in commercial, sport, subsistence, and personal use fisheries, stock separation information, harvest estimates and catch sampling, and environmental information. Coded wire tag and otolith marks are collected on hatchery fish to support identification and abundance of hatchery fish in catches of natural fisheries and potential strays into native stock systems.
http://www.adfg.alaska.gov/FedAidpdfs/FMS11-06.pdf

Emergency Orders (EO) are used to close or limit access to fisheries based on information on run strength and escapement goals, EOs are widely used to open and close fisheries as needed by local area biologists. Time and area restrictions limit when and where specific fisheries occur and restrictions are also imposed by regulation on all types of fishing gear (e.g., mesh size restrictions and length of nets for gillnets, number of fishing lines, rods, and gurdies for troll gear, and mesh size, net length and depth for purse seine gear). All gear types in Alaska are strictly regulated. Types of legal gear are listed in 5AAC 39.105. Specific requirement for gear (i.e. gillnet length, depth, and mesh sizes) are defined for each area and in specific management plans and regulations.

Management measures for private non-profit salmon hatcheries

Management measures specific to salmon hatcheries include Title 05, Fish and Game; Chapter 40: Private Non Profit Salmon Hatcheries; and Chapter 41: Transportation, Possession and Release of Live Fish; Aquatic Farming.
http://www.touchngo.com/lglcntr/akstats/aac/title05/chapter040.htm
http://www.touchngo.com/lglcntr/akstats/aac/title05/chapter041.htm

2008 PWSAC Operations Internal Review and 2012 Performance

ADFG recognised, in terms of performance review, several action items from the 2008 internal review of Prince William Sound Aquaculture Corporation (PWSAC) activities:
Evidence was brought forward to the assessment team's attention during 2012, of a 2008 ADFG review of Prince William Sound Aquaculture Corporation (PWSAC) hatchery activities. The goal of the internal review was to document problems and recommend corrective measures to help PWSAC improve operations and meet permit obligations. The review described numerous permit compliance issues, general problems, and performance violations involving some conditions under which their permits are granted.

In 2008, in accordance with the Internal Review Action Plan (action plan) following the internal review of PWSAC, the department formed a review committee to closely monitor PWSAC hatchery operation activities, permit obligations, and performance, and report to the commissioner on PWSAC's performance relative to the action plan. The committee meets each year and has produced four memos to the commissioner since 2008 that summarized each annual review. In the

spring of 2012, the committee elected not to convene because there were no significant issues warranting review.

Since 2008, ADFG has reported that the majority of action plan compliance issues have been resolved and this has been confirmed through meetings with both ADFG staff and PWSAC during this surveillance assessment. The reviews confirm that data exchange between the department and PWSAC has improved and the data needs and reporting requirements have been clearly articulated in PWSAC's annual management plans. ADFG reports that PWSAC's recent performance and relationship with the department has improved. PWSAC's recent performance has been good, and the relationship between the department and PWSAC has improved.

On a wider but related note, evaluation of salmon straying and hatchery/wild fish interactions remains one of the primary unresolved issues statewide. To address this issue, the department, hatchery operators, and processing industry cooperatively designated a Hatchery Science Panel that is implementing a multi-year large-scale hatchery/wild salmon interactions study. This study is intended to address many of the related issues at a statewide level. Results of this study are expected to address some of the concerns previously identified in the action plan.

Overall, the department's intention is to foster a cooperative working relationship and elicit voluntary compliance with permits and management plans. The department has noted that it is confident that its relationship with PWSAC continues to evolve in a positive direction and that PWSAC's compliance with requirements will continue. The Review Committee recommended that continued annual review of PWSAC hatchery operations and compliance with permits and regulations by this committee should continue for issues that might arise outside of the normal give-and-take of hatchery management.

Bycatch

Bycatch of non-targeted species is not a major issue in most Alaska salmon fisheries. Most non-targeted fish harvested in salmon fisheries are other species of salmon and are reported on fish tickets. Alaska fishing regulations, management plans, and inseason management actions are often specifically designed to minimize the harvest of non-targeted salmon species. For example, the upper Cook Inlet gillnet fishery targets sockeye, pink, and chum salmon, but coho salmon are also caught, sold, and reported on fish tickets. The Cook Inlet Northern District Salmon Management Plan (5AAC 21.358) provides a series of regulatory measures to minimize harvest of coho salmon bound for the northern district of upper Cook Inlet. Alaska salmon, primarily juvenile Chinook and chum salmon, are caught in Alaska groundfish fisheries. In Alaskan waters, groundfish operators are required to keep on board, or at the shoreside processing plant, all salmon harvested as bycatch in trawl fisheries so that they may be sampled by agency personnel (5AAC 39.166).

The BSAI pollock fishery catches the vast majority of Chinook and chum salmon bycatch in Alaska. Salmon bycatch in trawl fisheries for walleye pollock in the Bering Sea and Gulf of Alaska are monitored by NMFS with an onboard observer program.

In the Bering Sea, the North Pacific Fishery Management Council (NPFMC) met with industry and

Western Alaskan in-river fishermen concerned with the perceived impacts from salmon bycatch in the pollock fisheries. The Council took action in 2009 to recommend a new approach to managing Chinook salmon bycatch in the Bering Sea pollock fishery under Amendment 91. This new approach combines a limit on the amount of Chinook salmon that may be caught incidentally with incentive plan agreements and performance standards to reduce bycatch. This program was designed to minimize bycatch to the extent practicable in all years, prevent bycatch from reaching the limit in most years, while providing the pollock fleet with the flexibility to harvest the total allowable catch. This program was implemented by NMFS for the 2011 fishery.

In the GOA, Pacific salmon are taken as bycatch in the GOA groundfish fisheries, in which they are considered prohibited. Although five species of salmon are caught in the fisheries, the Council has been concerned about Chinook salmon, as the species with the highest bycatch in recent years. Chinook salmon bycatch primarily occurs in trawl fisheries, in the central and western regulatory areas. Between 2003 and 2010, the pollock target fishery accounted for an average of three-quarters of intercepted Chinook salmon, while other, primarily nonpelagic, trawl fisheries for flatfish, rockfish, and Pacific cod accounted for the remainder. In 2011, the Council approved Chinook salmon prohibited species catch (PSC) limits for the GOA pollock fisheries in the central and western regulatory areas. Once these annual limits are reached, the pollock fishery in the respective regulatory area will be closed. The Council is also considering other, comprehensive management measures to address Chinook salmon bycatch in the GOA trawl fisheries

http://www.fakr.noaa.gov/npfmc/bycatch-controls/BSChinookBycatch.html
http://www.fakr.noaa.gov/npfmc/bycatch-controls/GOA-salmon-bycatch.html

9. There shall be defined management measures designed to maintain stocks at levels capable of producing maximum sustainable levels.

FAO CCRF 7.1.8/7.6.3/7.6.6/8.4.5/8.4.6/8.5.1/8.5.3/8.5.4/8.11.1/12.10
FAO Eco 29.2bis

Evidence adequacy rating:

☑ **High** ☐ **Medium** ☐ **Low**

Rating Determination:

There are defined management measures designed to maintain stocks at levels capable of producing maximum sustainable levels. Escapement goals (BEGs, SEGs, OEGs and SETs) aim at allowing enough salmon to escape and spawn in their relative natal rivers, to produce maximum sustainable yields. The commercial Alaska salmon fisheries are limited entry fisheries. The CFEC manages the entry program by issuing permits and vessel licenses. Stocks that are deemed below the escapement goals are classified as:
yield, management, or chronic inability concern. For stocks of concern, action plans dealing with their recovery are prepared and applied.

In the early 1970s, the Alaska government realized that the state's salmon resources could not produce livelihoods for an increasing and unlimited number of fishermen and still be managed for maximum sustained yield. Legislation was passed in 1973 to establish a "limited entry" system to allow the state to limit the number of participants in a specific fishery. State statute AS 16.43.140 states, "after January 1, 1974, a person may not operate gear in the commercial taking of fishery resources without a valid entry permit or a valid interim-use permit issued by the commission." The Alaska Commercial Fisheries Entry Commission (CFEC) issues permits and vessel licenses to qualified individuals in both limited and unlimited fisheries, and provides due process hearings and appeals for those individuals denied permits http://www.cfec.state.ak.us/.

CFEC issues three basic types of permits: limited entry permits, interim-use permits, and vessel permits. Limited entry permits are the permanent permits issued for limited fisheries. Limited entry permits must be renewed annually and most can be transferred to another person after initial issuance (e.g., sold, or inherited). Interim-use permits are issued annually for all commercial fisheries not under entry limitation, and to applicants waiting to find out if they qualify for permanent permits. Vessel permits (in contrast to vessel licenses) are issued annually for vessels qualified to participate in the Bering Sea hair crab or weathervane scallop fisheries http://www.cfec.state.ak.us/Publications/what_is_cfec.pdf.

A limited entry or interim-use permit entitles the holder to operate gear in a specific commercial fishery in accordance with BOF regulations. The term "fishery" refers to a specific combination of fishery resource(s), gear type(s), and area(s). For example, Southeast salmon trolling, Cook Inlet salmon drift gillnetting and Chignik salmon seining are distinct fisheries, requiring separate permits. Permits for some species other than salmon are issued on a statewide basis; however, most are valid only for specific areas of the state (e.g., Southeast, Cook Inlet or Bristol Bay). This "right to fish" is embodied in a permit card that is issued annually.

Since statehood, ADFG has compiled databases on salmon runs for each of the 5 species and within the Regions and Districts of Alaska. Alaska has a large and ongoing fishery monitoring and stock assessment program to obtain the extensive scientific information necessary to establish new escapement goals, modify existing escapement goals, and provide other scientific information that allows fisheries to be managed to achieve escapement goals or other benchmarks (such as harvest quotas or allocations).

Escapement goals are the key management references for production of maximum sustainable yields as data and knowledge allows.

***Biological Escapement Goal (BEG)*:** The escapement that provides the greatest potential for maximum sustained yield; BEG will be the primary management objective for the escapement unless an optimal escapement goal or in-river run goal has been adopted; BEG will be developed from the best biological information, and should be scientifically defensible on the basis of available biological information; BEG will be determined by the department and will be expressed as a range based on factors such as salmon stock productivity and data uncertainty; the department will seek to maintain evenly distributed salmon escapements within the bounds of the BEG (5 AAC 39.222(f)).

***Sustainable Escapement Goal (SEG)*:** A level of escapement, indicated by an index or an escapement estimate, that is known to provide for sustained yield over a 5 to 10 year period, used in situations where a BEG cannot be estimated due to the absence of a stock specific catch estimate; the SEG is the primary management objective for the escapement, unless an optimal escapement goal or inriver run goal has been adopted by the board, and will be developed from the best biological information; the SEG will be determined by the department and will be stated as a range that takes into account data uncertainty; the department will seek to maintain escapements within the bounds of the SEG (5 AAC 39.222(f)).

Optimal Escapement Goal (OEG): A specific management objective for salmon escapement that considers biological and allocative factors and may differ from the SEG or BEG; an OEG will be sustainable and may be expressed as a range with the lower bound above the level of Sustainable Escapement Threshold (SET), and will be adopted as a regulation by the board; the department will seek to maintain evenly distributed escapements within the bounds of the OEG (5 AAC 39.222(f)).

Inriver Goal: A specific management objective for salmon stocks that are subject to harvest upstream of where escapement is estimated; the inriver run goal will be set in regulation by the board and is comprised of the SEG, BEG or OEG, plus specific allocations to inriver fisheries; (5 AAC 39.222(f)).

Stocks below escapement goals are classified as:

- **Yield Concern**: results from a chronic inability to maintain yields or harvestable surplus above escapement needs.
- **Management Concern**: results from a chronic inability to maintain escapements within the bounds of a BEG, SEG, or OEG.
- **Conservation Concern**: results from a chronic inability to maintain escapements above a sustainable escapement threshold (SET).

- **Chronic inability** - continuing or anticipated inability to meet escapement threshold (goals) over 4-5 year period (generation time of most spp.) despite use of specific management measures.

For stocks of concern, action plans dealing with their recovery are prepared and applied. The Policy for the Management of Sustainable Salmon Fisheries (5 AAC 39.222) directs ADFG to report to the BOF on the status of salmon stocks and to Identify specific stocks that represent a concern based on yield, management, or conservation. Generally, review teams comprised of staff from the Commercial and Sport Fish Divisions examine escapement goals by region and report potential problems with stocks to the BOF at regularly scheduled meetings.

http://www.adfg.alaska.gov/FedAidpdfs/FMS11-06.pdf
http://www.touchngo.com/lglcntr/akstats/aac/title05/chapter039.htm

10. Fishing operations shall be carried out by fishers with appropriate standards of competence in accordance with international standards and guidelines and regulations.

FAO CCRF 8.1.7/8.1.10/8.2.4/8.4.5

Evidence adequacy rating:

☑ High **☐ Medium** **☐ Low**

Rating Determination:

Fishing operations are carried out by fishers with appropriate standards of competence in accordance with international standards and guidelines and regulations.

The State of Alaska, Department of Labor & Workforce Development (ADLWD) includes AVTEC (formerly called Alaska Vocational Training & Education Center, now called Alaska's Institute of Technology). One of AVTEC's main divisions is the Alaska Maritime Training Center.
The goal of the Alaska Maritime Training Center is to promote safe marine operations by effectively preparing captains and crew members for employment in the Alaskan maritime industry.
The Alaska Maritime Training Center is a United States Coast Guard (USCG) approved training facility located in Seward, Alaska, and offers USCG/STCW-compliant maritime training (STCW is the international Standards of Training, Certification, & Watchkeeping). In addition to the standard courses offered, customized training is available to meet the specific needs of maritime companies. Courses are delivered through the use of their world class ship simulator, state of the art computer based navigational laboratory, and modern classrooms equipped with the latest instructional delivery technologies.
The Center's mission is to provide Alaskans with the skills and technical knowledge to enable them to be productive in Alaska's continually evolving maritime industry.
Supplemental to their on-campus classroom training, the Alaska Maritime Training Center has a partnership with the Maritime Learning System to provide mariners with online training for entry-level USCG Licenses, endorsements, and renewals.

The University of Alaska Sea Grant Marine Advisory Program (MAP) provides education and training in several sectors, including fisheries management, in the forms of seminars and workshops. In addition, MAP conducts sessions of their Alaska Young Fishermen's Summit (AYFS). Each Summit is an intense, 3-day course in all aspects of Alaska fisheries, from fisheries management & regulation, to seafood markets & marketing. The target audience for these Summits is young Alaskans from coastal communities. The 2012 AYFS was held Feb. 13 and 14 in Juneau, AK. The two-day conference aimed at providing crucial training and networking opportunities for fishermen entering the business or wishing to take a leadership role in their industry. The event took advantage of the Juneau location by introducing participants to the legislative process, and introducing the fish caucus of the legislature to the issues and concerns of Alaska's emerging fishermen.

By law (Alaska Statues, or AS), all Alaska salmon fishing vessels are required to be licensed by the State of Alaska, and to display their permanent vessel license plate.
The fishing gear itself must be marked in accordance with state regulations (Alaska Administrative Code, or AAC), which are specific to each fishing region. Also, there are region-specific regulations which require how salmon fishing vessels must display their names and permit numbers.

All Alaska salmon fishing, except for a very small troll fishery in Southeast Alaska, is conducted in state waters ("internal waters").

Sources of evidence –
AS 16.05.510. Unlicensed vessel unlawful
AS 16.05.520. Number plate
5 AAC 06.334. Identification of gear
AAC 06.343. Vessel identification

http://www.avtec.edu/AMTC.htm
http://www.stcw.org/
http://seagrant.uaf.edu/map/
http://seagrant.uaf.edu/map/fishbiz/index.php
http://www.sfos.uaf.edu/fitc/academicprograms/

E. Implementation, Monitoring and Control

11. An effective legal and administrative framework shall be established and compliance ensured through effective mechanisms for monitoring, surveillance, control and enforcement for all fishing activities within the jurisdiction.

FAO CCRF 7.1.7/7.7.3/7.6.2/8.1.1/8.1.4/8.2.1
FAO Eco 29.5

Evidence adequacy rating:

☑ High **☐ Medium** **☐ Low**

Rating Determination

An effective legal and administrative framework shall be established and compliance ensured through effective mechanisms for monitoring, surveillance, control and enforcement for all fishing activities within the jurisdiction. The Division of Wildlife Troopers in the Department of Public Safety continues to be charged with protecting the state's natural resources through reducing illegal harvest, waste and illegal sale of commercially and sport harvested fish, and by safeguarding fish and wildlife habitat. The structure of ADFG, with management authority instilled at the area office level, allows it to monitor, control and enforce compliance with fishery regulations and emergency orders. Area Management Biologists are on the scene to actually watch the prosecution of the fishery in their area through aerial surveys and on-the-ground observations.

The salmon management program conducted by ADFG is a responsive and adaptive program that monitors salmon abundance during the fishing season and makes continual adjustments in fishing time and area based on observed escapements, commercial fishery performance (e.g., catch per unit of effort), test fishing, biological data on age, sex and size, historical run timing curves and other data. Each year, commercial fishery managers issue over 700 emergency orders to adjust fishing time and area based on inseason fishery performance and their best professional judgment in order to achieve escapement goals, while still providing an orderly harvest of high quality salmon. The structure of ADFG, with management authority instilled at the area office level, allows it to monitor, control and enforce compliance with fishery regulations and emergency orders. Area Management Biologists are on the scene to actually watch the prosecution of the fishery in their area through aerial surveys and on-the-ground observations. Area and regional staff biologists are deputized law enforcement officers trained to assist Alaska Wildlife Troopers (AWT) with law enforcement activities. ADFG has instituted an on-going training and refresher class to keep deputized staff up-to-date on enforcement techniques.

The Division of Wildlife Troopers in the Department of Public Safety is charged with protecting the state's natural resources through reducing illegal harvest, waste and illegal sale of commercially and sport harvested fish, and by safeguarding fish and wildlife habitat http://www.dps.state.ak.us/AWT/mission.aspx.

The troopers mission also includes enforcement of boating safety. Wildlife Troopers cover all areas of the state with detachments and/or posts in the communities of Southeast (Klawock, Haines, Hoonah, Juneau, Sitka, Petersburg, Ketchikan, and Wrangell), Southcentral (Anchorage, Palmer, Big

Lake, Soldotna, Anchor Point, Seward, Girdwood, Cordova, Valdez, Glennallen and Talkeetna), Western (Kodiak, King Salmon, Dillingham, Dutch Harbor, Iliamna, and Cold Bay), and Northern Alaska (Fairbanks, Coldfoot, Cantwell, Bethel, Aniak, McGrath, Nome, Delta, Tok, Galena, and St. Mary's). The troopers in these locations have numerous patrol vessels, small watercraft, fixed–wing aircraft, helicopters, trucks, snow-machines, and all-terrain-vehicles for use in meeting their law enforcement responsibilities (http://www.dps.state.ak.us/AWT/detachments.aspx).

AWT uses significant resources in its missions –

Personnel Resources

* 97 commissioned AWT Troopers
* 89 certified commissioned boat operators
* Commissioned boat operators pass certification exams
* 21 Public Safety Technician II - Conduct dockside boardings of federal fisheries vessels under agreement with National Marine Fisheries
* 16 Public Safety Technician I – seasonal technicians that assist troopers with vessel operations and maintenance
* 14 Boat Operators – civilian employees permanently assigned to operations of larger vessels between 42 ft and 156 ft
* Civilian captains and mates are all Coast Guard licensed

Vessel Resources

* 45 vessels in total that are used for commercial fisheries enforcement
* Vessels range is size from 18 ft day skiffs to a 156 ft high seas enforcement vessel
* 156 ft vessel stationed in Dutch Harbor, 121 ft vessel and 65 ft vessel stationed in Kodiak, 69 ft vessel stationed in Ketchikan and 42 ft vessel stationed in Cordova
* Various 26 ft – 33 ft medium vessels stationed throughout Southeast Alaska, Prince William Sound, Kenai Peninsula, Kodiak Island and the Alaska Peninsula that are used for multi-day commercial fisheries patrols
* Larger vessels (42 ft -156 ft) fully equipped with pot pulling capabilities

Aircraft Resources

* 22 Piper PA-18 Super Cubs, 10 on floats
* 6 Cessna 185, 3 on floats
* 1 Cessna 206
* 2 Cessna 208 Caravans
* 1 Beechcraft King Air equipped with infra-red photo equipment
* 3 Robinson R-44 helicopters, 2 on floats
* 1 turbine helicopter equipped with infra-red photo equipment

Patrol Missions

* In-river gill net salmon fisheries using smaller vessels, aircraft and land based viewing operations using photo equipment
* Near coastal gill net and seine salmon and herring fisheries using all sizes of vessels, aircraft and land based viewing operations using photo equipment

* Near coastal shrimp and crab (Dungeness, king and tanner) pot fisheries using aircraft, medium and large vessels.
* Off shore crab (king and tanner) fisheries using large vessels and infra-red equipped twin engine aircraft
* Off shore ground fish (halibut, pacific cod etc.) longline and pot fisheries using larger vessels and infra-red equipped twin engine aircraft
* Off shore trawl fisheries using large vessels and infra-red equipped twin engine aircraft
* Southeast Alaska salmon troll fisheries using all sizes of vessels and aircraft
* Herring pound fisheries using mostly medium sized vessels
* Rock fish jigging fisheries using any vessel class
* Dive fisheries (sea cucumber, sea urchin) fisheries

Patrol Information

* well over 1,100 days at sea scheduled per year for medium and larger vessels (does not include use of day skiffs)
* Larger vessels travel throughout the state on extended patrols up to a month long
* Medium sized vessels patrol up to a week at a time
* Calendar year 2005 had nearly 400 commercial fishing violations charged resulting in over $750,000 in fines in addition to nets, pots and other equipment being forfeited
* Vessels used in committing the most egregious offenses are sometimes seized and forfeited to the state

* Patrols are often conducted in conjunction with NMFS and USCG

Similarly to ADFG Area Biologists, the presence of Wildlife Troopers in all major and many minor communities in the state provides them almost immediate opportunity to monitor fishing activities across the state. ADFG and AWT inspect the catch and landing records of both harvesters and processers, and monitor the fishing permits required of harvesters and their crew members.

The U.S. Coast Guard (USCG) also enforces boating safety laws and fishing vessels are often under surveillance by AWT and the USCG during fishing operations. The US Forest Service and USFWS enforcement also work with AWT on the enforcement of fish and game regulations (both state and federal) on federal public land. USCG and AWT enforcement efforts are generally focused on violations that would do harm to the resource or those that create an unfair economic advantage to the violator. Trends in the incidence of these types of violations are monitored closely. The objective of regulatory enforcement is to ensure compliance. The cooperation of the public and fishing industry is further cultivated through programs such as AWT's Fish and Wildlife Safeguard program, which encourages the reporting of fish and wildlife violations and increases the outreach of enforcement agencies http://www.dps.state.ak.us/AWT/safeguard.aspx.

12. There shall be a framework for sanctions for violations and illegal activities of adequate severity to support compliance and discourage violations.

FAO CCRF 7.7.2/8.2.7

Evidence adequacy rating:

☑ High **☐ Medium** **☐ Low**

Rating determination

Alaska's salmon fisheries are managed by ADFG, pursuant to Alaska Statutes Title 16 (AS16) and Alaska Administrative Code Title 5 (AAC5). These laws and regulations are enforced by the Alaska Department of Public Safety, Alaska State Troopers, Division of Wildlife Troopers (AWT). AWT coordinates with, and is supported by, law enforcement personnel from USCG and NMFS Office of Law Enforcement (OLE). The US Forest Service and the US Fish and Wildlife Service also work with AWT on the enforcement of fish and game regulations (both state and federal) on federal public land.

Alaska's salmon fisheries are managed by ADFG, pursuant to Alaska Statutes Title 16 (AS16) and Alaska Administrative Code Title 5 (AAC5). These laws and regulations are enforced by the Alaska Department of Public Safety, Alaska State Troopers, Division of Wildlife Troopers (AWT). AWT coordinates with, and is supported by, law enforcement personnel from USCG and NMFS Office of Law Enforcement (OLE). US Forest Service and USFWS enforcement also work with AWT on the enforcement of fish and game regulations (both state and federal) on federal public land.

Alaska Statutes, Title 16, Chapter 16.43. Article 08. POINT SYSTEM FOR COMMERCIAL FISHING VIOLATIONS IN SALMON FISHERIES.

- Section 16.43.850. Point system.
- Section 16.43.855. Assessment of points.
- Section 16.43.860. Suspension.
- Section 16.43.870. Notice and appeal.
- Section 16.43.880. Required notice to commission.
- Section 16.43.895. Definitions for AS 16.43.850 - 16.43.895.
- Section 16.43.901. Vessel permits. [Repealed, Sec. 5 ch. 126 SLA 1996].

Section 16.43.850. Point System.

For the purpose of identifying frequent violators of commercial fishing laws in salmon fisheries, the commission shall adopt regulations establishing a uniform system for the suspension of commercial salmon fishing privileges by assigning demerit points for convictions for violations of commercial fishing laws in salmon fisheries that are reported to the commission under AS 16.43.880. The commission shall assess demerit points against a permit holder for each violation of commercial fishing laws in a salmon fishery in accordance with (b) and (c) of this section. The commission shall assess points against a permit holder for the salmon fishery in which the violation of commercial fishing laws occurred.

(b) The commission shall assess demerit points against a permit holder for a conviction of a violation of commercial fishing laws in a salmon fishery under AS 16.05.722, 16.05.723, 16.05.831; AS 16.10.055, 16.10.070 - 16.10.090, 16.10.100, 16.10.110, 16.10.120, 16.10.200 - 16.10.220, and 16.10.760 - 16.10.790 for the following violations in accordance with this schedule:

(1) fishing in closed waters ..... 6 points;

(2) fishing during closed season or period ..... 6 points;
(3) fishing with more than the legal amount of gear ..... 4 points;
(4) fishing with gear not allowed in fishery ..... 6 points;
(5) fishing before expiration of transfer period ..... 6 points;
(6) interfering with commercial fishing gear ..... 4 points;
(7) fishing with more than the legal amount of gear on vessel ..... 4 points;
(8) improper operation of fishing gear ..... 4 points;
(9) permit holder not present when required ..... 4 points;
(10) fishing with underlength or overlength vessel ..... 6 points;
(11) wanton waste of fishery resources ..... 4 points.

(c) Notwithstanding (b) of this section, if a permit holder's first conviction of a violation of commercial fishing laws in a salmon fishery in a 36-month period is a conviction under AS 16.05.722, the number of demerit points assessed against the permit holder for the violation must be one-half of the points assessed for the violation under (b) of this section.

(d) The commission shall suspend a permit holder's commercial salmon fishing privileges for a salmon fishery for a period of

(1) one year if the permit holder accumulates 12 or more points during any consecutive 36-month period as a result of convictions for violations of commercial fishing laws in the salmon fishery;

(2) two years if the permit holder accumulates 16 or more points during any consecutive 36-month period as a result of convictions for violations of commercial fishing laws in the salmon fishery;

(3) three years if the permit holder accumulates 18 or more points during any consecutive 36-month period as a result of convictions for violations of commercial fishing laws in the salmon fishery.

Here below are presented some of the statutes that enable the government to fine, imprison, and confiscate equipment for violations and restrict an individual's right to fish if convicted of a violation.

AS 16.05.165. Form and issuance of citations
AS 16.05.170 Power to execute warrant
AS 16.05.180 Power to search without warrant
AS 16.05.190 Seizure and disposition of equipment
AS 16.05.195 Forfeiture of equipment
AS 16.05.332 Wildlife Violator Compact
AS.16.05.410 Revocation of license
AS 16.05.710 Suspension of Commercial License and Entry Permit
AS 16.05.722 Strict liability commercial fishing penalties
AS 16.05.723 Misdemeanor commercial fishing penalties
AS 16.05.896 Penalty for causing material damage

AS 16.05.901 Penalty for violations of AS 16.05.871 – AS 16.05.896.
AS 16.05.030 Penalty for violation of 16.10.010-16.10.050
AS 16.10.090 Penalty for violation of AS 16.10.090
AS 16.10.220 Penalty for violation of AS 16.10-200-16.1-.210
AS 16.10.790 Fines
AS 16.40.290 Penalty
AS 16.34.850-895 Point system for commercial fishing violations in salmon fisheries
AS 16.43.960 Commission revocation or suspension of permits
AS 16.43.970 Penalties

sources of evidence –

Alaska Statutes Title 16 (laws)

Alaska Administrative Code Title 5 (regulations)

http://www.cf.adfg.state.ak.us/
http://www.dps.state.ak.us/awt/
http://www.nmfs.noaa.gov/ole/
http://www.uscg.mil/d17/
http://codes.lp.findlaw.com/akstatutes/16/16.43./08.

F. Serious Impacts of the Fishery on the Ecosystem

13. Considerations of fishery interactions and effects on the ecosystem shall be based on best available science, local knowledge where it can be objectively verified and using a risk based management approach for determining most probable adverse impacts. Adverse impacts of the fishery on the ecosystem shall be appropriately assessed and effectively addressed.

FAO CCRF 7.2.3/8.4.7/8.4.8/12.11

Eco 29.3/31

Evidence adequacy rating:

☑High **☐ Medium** **☐ Low**

Rating Determination:

Alaska's Sustainable Salmon Policy includes provisions addressing the potential effects of ecological changes/perturbations on sustainably allowable harvest in that salmon fisheries shall be managed to allow escapements within ranges necessary to conserve and sustain potential salmon production and maintain normal ecosystem functioning. Bycatch of non-targeted species is not a major issue in most Alaska salmon fisheries. Most non-targeted fish harvested in salmon fisheries are other species of salmon and are reported on fish tickets. Salmon bycatch in trawl fisheries for walleye pollock in the Bering Sea and the Gulf of Alaska is managed by the NPFMC with regulations implemented by the NMFS. Gear used for commercial catches of Alaska salmon are not considered deleterious to physical habitats as they do not interact directly with it (unlike bottom trawl, dredges and pot as used in other fisheries). Takes of endangered species, e.g. Chinook from the Columbia River system, are minimized (e.g. by establishment of annual quotas in all SEAK commercial and sport fisheries that harvest Chinook salmon under the Pacific Salmon Treaty. Auke Bay lab and Little Port Walter lab support long term research in salmon biology and constitute important contributions to fisheries science resulting from decades of research conducted at these facilities. One potential negative ecological effect of the salmon fishery is represented by the dynamics surrounding the ecological and genetic interactions between wild and hatchery salmon. In that respect, a whole range of peer reviewed publications has been recently released that further elucidate the subject. The general results of these papers indicate potential negative effects of hatchery salmon on wild salmon stocks. ADFG has organized for the start of a large scale multi-generation research program to elucidate and address the issue of interactions of wild and hatchery pink and chum salmon in Prince William Sound and Southeast Alaska, in May 2012.

Alaska's Sustainable Salmon Policy includes provisions addressing the potential effects of ecological changes/perturbations on sustainably allowable harvest in that salmon fisheries shall be managed to allow escapements within ranges necessary to conserve and sustain potential salmon production and maintain normal ecosystem functioning as follow:

(A) salmon spawning escapements should be assessed both temporally and geographically; escapement monitoring programs should be appropriate to the scale, intensity, and importance of each salmon stock's use;

(B) salmon escapement goals, whether sustainable escapement goals, biological escapement goals, optimal escapement goals, or inriver run goals, should be established in a manner consistent with sustained yield; unless otherwise directed, ADFG will manage Alaska's salmon

fisheries, to the extent possible, for maximum sustained yield;
(C) salmon escapement goal ranges should allow for uncertainty associated with measurement techniques, observed variability in the salmon stock measured, changes in climatic and oceanographic conditions, and varying abundance within related populations of the salmon stock measured;
(D) salmon escapement should be managed in a manner to maintain genetic and phenotypic characteristics of the stock by assuring appropriate geographic and temporal distribution of spawners as well as consideration of size range, sex ratio, and other population attributes;
(E) impacts of fishing, including incidental mortality and other human-induced mortality, should be assessed and considered in harvest management decisions;
(F) salmon escapement and harvest management decisions should be made in a manner that protects non-target salmon stocks or species;
(G) the role of salmon in ecosystem functioning should be evaluated and considered in harvest management decisions and setting of salmon escapement goals;
(H) salmon abundance trends should be monitored and considered in harvest management decisions (5 AAC 39.222, State of Alaska Regulation).

Bycatch

Bycatch of non-targeted species is not a major issue in most Alaska salmon fisheries. Most non-targeted fish harvested in salmon fisheries are other species of salmon and are reported on fish tickets. Alaska fishing regulations, management plans, and inseason management actions are often specifically designed to minimize the harvest of non-targeted salmon species. For example, the upper Cook Inlet gillnet fishery targets sockeye, pink, and chum salmon, but coho salmon are also caught, sold, and reported on fish tickets. The Cook Inlet Northern District Salmon Management Plan (5AAC 21.358) provides a series of regulatory measures to minimize harvest of coho salmon bound for the northern district of upper Cook Inlet.

Alaska salmon, primarily juvenile Chinook and chum salmon, are caught in Alaska groundfish fisheries. In Alaskan waters, groundfish operators are required to keep on board, or at the shoreside processing plant, all salmon harvested as bycatch in trawl fisheries so that they may be sampled by agency personnel (5AAC 39.166).

The BSAI pollock fishery catches the vast majority of Chinook and chum salmon bycatch in Alaska.
Salmon bycatch in trawl fisheries for walleye pollock in the Bering Sea and Gulf of Alaska are monitored by NMFS with an onboard observer program.

In the Bering Sea, the North Pacific Fishery Management Council (NPFMC) met with industry and Western Alaskan in-river fishermen concerned with the perceived impacts from salmon bycatch in the pollock fisheries. The Council took action in 2009 to recommend a new approach to managing Chinook salmon bycatch in the Bering Sea pollock fishery under Amendment 91. This new approach combines a limit on the amount of Chinook salmon that may be caught incidentally with incentive plan agreements and performance standards to reduce bycatch. This program was designed to minimize bycatch to the extent practicable in all years, prevent bycatch from reaching the limit in most years, while providing the pollock fleet with the flexibility to harvest the total allowable catch. This program was implemented by NMFS for the 2011 fishery.

In the GOA, Pacific salmon are taken as bycatch in the GOA groundfish fisheries, in which they are considered prohibited. Although five species of salmon are caught in the fisheries, the Council has been concerned about Chinook salmon, as the species with the highest bycatch in recent years. Chinook salmon bycatch primarily occurs in trawl fisheries, in the central and western regulatory areas. Between 2003 and 2010, the pollock target fishery accounted for an average of three-quarters of intercepted Chinook salmon, while other, primarily nonpelagic, trawl fisheries for flatfish, rockfish, and Pacific cod accounted for the remainder.
In 2011, the Council approved Chinook salmon prohibited species catch (PSC) limits for the GOA pollock fisheries in the central and western regulatory areas. Once these annual limits are reached, the pollock fishery in the respective regulatory area will be closed. The Council is also considering other, comprehensive management measures to address Chinook salmon bycatch in the GOA trawl fisheries
http://www.fakr.noaa.gov/npfmc/bycatch-controls/BSChinookBycatch.html
http://www.fakr.noaa.gov/npfmc/bycatch-controls/GOA-salmon-bycatch.html

Gear Effects
Gear used for commercial catches of Alaska salmon are not considered deleterious to physical habitats as they do not interact directly with it (unlike bottom trawl, dredges and pot as used in other fisheries). Lost gear in Alaska salmon fisheries is a virtually non-existent problem as purse seiners, trollers and gillnetters (set/driftnets) operate with near surface or floating gear securely connected to the boat or shore.

Stocks of Concern
Potential ecological effects on salmon stocks are incorporated in the establishment of escapement goals for each stock. The allowable harvest in each year is set with respect to the goal. If a stock chronically fails to realize escapement goals it is reported by ADFG to the BOF as a stock of concern (either 'conservation', 'management' or 'yield stock of concern') and the management plan is amended to protect the productivity of the stock; an action plan is associated with the management plan for any new or expanding salmon fisheries, or stocks of concern.

The Policy for the Management of Sustainable Salmon Fisheries (SSFP; 5 AAC 39.222, effective 2000, amended 2001) directs the Alaska Department of Fish and Game (ADF&G) to provide the Alaska Board of Fisheries with reports on the status of salmon stocks and identify any salmon stock that present a concern. The SSFP defines there levels of concern (Yield, Management, and Conservation) with yield being the lowest level of concern and conservation the highest level of concern.

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, above a stock's escapement needs; a yield concern is less severe than a management concern" (5 AAC 39.222(f)(42)).

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 management concern is not as severe as a conservation concern." (5 AAC 39.222(f)(21)).

http://www.adfg.alaska.gov/index.cfm?adfg=specialstatus.akfishstocks

Table 11. Statewide summary of salmon stocks of concern in Alaska.

Region	System	Species	Level of Concern
Southeast	McDonald Lake	Sockeye	Management
Central	Kvichak River	Sockeye	Yield
	Susitna (Yentna) River	Sockeye	Yield
	Chuitna River [a]	Chinook	Management
	Theodore River [a]	Chinook	Management
	Lewis River [a]	Chinook	Management
	Alexander Creek [a]	Chinook	Management
	Willow Creek [a]	Chinook	Yield
	Goose Creek [a]	Chinook	Yield
Westward	Karluk River [a]	Chinook	Management
Arctic-Yukon-Kuskokwim	Yukon River	Chinook	Yield
	Norton Sound Sub-district 5 and 6	Chinook	Yield
	Norton Sound Sub-district 1, 2, and 3	Chum	Yield

[a] Designated as stock of concern during the 2010/2011 Board of Fisheries meeting cycle.

http://www.adfg.alaska.gov/FedAidpdfs/FMS11-06.pdf

Latest escapement information about ADFG designated stocks of concern

McDonald Lake sockeye salmon. Because sockeye salmon escapements did not meet the new *sustainable* escapement goal in four of five years from 2004 to 2008, the stock was formally designated as a *stock of management* concern by the Board of Fisheries in 2009. Escapement were just below the current escapement goal range in 2009, and within the goal range in 2010. http://www.adfg.alaska.gov/FedAidpdfs/SP11-20.pdf

Kvichak river sockeye salmon. The 2010 escapement was within SEG range.
http://www.adfg.alaska.gov/static/fishing/PDFs/commercial/2010_bristolbay_salmon_summary.pdf

Susitna (Yentna) river sockeye salmon. Sockeye salmon escapement goals have historically been monitored in 6 systems in Upper cook Inlet. In 2009, the Yentna River sonar goal was replaced with sustainable escapement goals (SEGs) monitored by weirs on 3 lake systems within the Susitna River, those being Judd and Chelatna Lakes in the Yentra River drainage and Larson Lake in the mainstem Susitna River drainage.

Table 12. Upper Cook Inlet sockeye salmon goals and escapement, 2011.

System	2011 Inriver Estimate	Lower Goal	Upper Goal
Crescent River	81,952	30,000	70,000
Fish Creek	66,678	20,000	70,000
Kasilof River	245,721	160,000	340,000[a]
Kenai River	1,599,217	1,100,000	1,350,000
Packers Creek	To be determined	15,000	25,000
Larson Lake	12,393	15,000	50,000
Chelatna Lake	70,353[b]	20,000	65,000
Judd Lake	39,997	25,000	55,000

[a] The Kasilof River BEG is 160,000 to 340,000; an OEG was established in 2011 of 160,000 to 390,000 to aid in achieving the lower end of the Kenai River goal.

[b] The weir was flooded for 8 days, therefore counts represent minimum escapement.

http://www.adfg.alaska.gov/static/fishing/PDFs/commercial/2011_uci_salmon_summary.pdf

The Alaska Board of Fisheries found the following Chinook salmon stocks in the Central Region to be stocks of management concern: Chuitna, Theodore, Lewis, Alexander, and Beluga rivers as well as Willow and Goose creeks. As a result of the findings, specific management actions were implemented to reduce sport and commercial harvest of these stocks. Sport fishing in the Theodore, Lewis, and Chuitna rivers was closed by regulation prior to the 2011 season. Because of the sport fishing closures, the area from the wood chip dock to the Susitna River was closed for the directed Chinook salmon commercial fishery per the *Northern District King Salmon Management Plan.* The remainder of the Northern district was opened for four 12 hour periods between May 30 and June 20. http://www.adfg.alaska.gov/FedAidpdfs/FMR12-25

Karluk river Chinook: The Ayakulik and Karluk river systems support the largest Chinook salmon populations in the KMA. No commercial openings were allowed in the Inner Karluk and Outer Karluk sections in June or July. Non-retention of sport Chinook salmon was implemented during the fishing periods allowed prior to noon on July 13 in that portion of the Central Section south of the latitude of Cape Kuliuk and in the Inner Ayakulik and Outer Ayakulik sections. After July 13, it became apparent that both Karluk and Ayakulik rivers would have adequate Chinook salmon escapement. The 2011 Chinook salmon escapement through the Karluk weir (3,420 fish) was within the range of the established escapement goal range of 3,000 – 6,000 fish. Escapement through the Ayakulik was also within escapement goal range.
http://www.adfg.alaska.gov/static/fishing/PDFs/commercial/2011_kodiak_salmon_summary.pdf

Yukon Chinook salmon. The Joint Technical Committee (JTC) of the United States and Canada serves as a scientific advisory body to the Yukon River Panel. The JTC discusses harvest and escapement goals, management trends, postseason reviews and preseason outlooks, and results of cooperative research projects. Recommended Yukon River escapement goals for Chinook, chum and coho salmon for 2012 remained unchanged from 2011.
Due to uncertianty concerning Chinook salmon run strenght and the need to fulfill the canadian border passage obligation, meet Alaska escapement needs, and provide fro subsistence uses, management of the chinook salmon commercial fishery continued to follow the conservative preseason management strategy. No Commercial periods targeting Chinook salmon were allowed in 2011 in the Yukon river mainstem or in the Tanana River.

Preliminary Chinook salmon escapement in Canada was 46,307 fish, which was within the 42,500–55,000 escapement goal range and provided for the Canadian harvest share. By preliminary estimate, about 40,211 Chinook salmon were harvested for subsistence in Alaska, and in Yukon Territory, 4,550 Chinook salmon were harvested in aboriginal fisheries. For fall chum salmon, the preliminary 2011 Yukon River drainagewide total run size estimate was 1,000,000 fish, based on the postseason expanded escapement and estimated harvest. The border passage estimate was 212,000 fall chum salmon, and after subtracting harvests in Canada, the spawning escapement was approximately 205,930 fish, exceeding the upper end of the IMEG range of 70,000 to 104,000 fall chum salmon. The total commercial harvest of fall chum salmon in Alaska was 238,979 fish; the largest harvest since 1995, and by preliminary estimate, the Alaskan subsistence harvest of fall chum salmon was 79,887 fish. The Canadian commercial harvest was 5,312 fall chum salmon.
http://www.adfg.alaska.gov/index.cfm?adfg=commercialbyareayukon.salmon#/management
http://www.adfg.alaska.gov/FedAidpdfs/RIR.3A.2012.01

Norton Sound Chinook, sub-District 5 and 6. Chinook salmon runs to most areas of Norton sound in 2011 were not sufficient to provide for customary levels of subsistence use and precluded commercial fishing directed on Chinook salmon for the sixth consecutive season in Subdistrict 5 and 6. Early closures to Chinook salmon sport and subsistence fisheries were implemented for the sixth consecutive season in an attempt to meet escapement needs. Chinook salmon escapement goals were not achieved on the Kwiniuk River (Elim Subdistrict) or North River (Unalakleet Subdistrict). However, the 2011 North river tower estimate is thought to be incomplete due to high water levels that contributed to poor counting conditions for much of the Chinook salmon run; the late July aerial survey count of 433 Chinook salmon represented more than half the reported tower count at the time; the tower-based goal was easily achieved in all years which had acceptable aerial surveys with over 400 Chinook salmon.

Table 13. Chinook salmon counting tower (TCE) and weir (WCE) estimates, and unexpanded aerial surveys (UAS) from Norton Sound drainages compared to escapement goals.

http://www.adfg.alaska.gov/static/fishing/PDFs/commercial/2011_norton_salmon_summary.pdf

River System	2011 Escapement		TCE, UAS, WCE	Escapement Goal Range
Boston Creek/Fish River	No Survey		UAS	UAS SEG Threshold (≥100)
Kwiniuk River	57		TCE	TCE SEG Range (300-550)
Shaktoolik River	106		UAS	UAS SEG Range (400-800)
North River	864		TCE	TCE SEG Range (1,200-2,600)
Unalakleet River/Old Woman River	303	*	UAS	UAS SEG Range (550-1,100)

Note: asterisk indicates survey was late or flown under adverse survey conditions.

Norton Sound Subdistrict 1-2-3 chum salmon. As forecasted, the strong 2006 brood year led to another above average run of chum salmon to northern Norton Sound Subdistricts 1-3.

Table 14. Chum salmon counting tower (TCE) and weir count (WCE) estimates and unexpanded aerial surveys (UAS) from Norton Sound drainages compared to escapement goals, Norton Sound.

Table 3.–Chum salmon counting tower (TCE) and weir count (WCE) estimates and unexpanded aerial surveys (UAS) from Norton Sound drainages compared to escapement goals, Norton Sound.

River System	2011 Escapement	TCE, UAS, WCE	Escapement Goal Range
Nome River	3,582	WCE	SEG Range (2,900-4,300)
Eldorado River	16,227	WCE	SEG Range (6,000-9,200)
Snake River	4,343	WCE	SEG Range (1,600-2,500)
Nome Subdistrict	66,122		BEG Range (23,000-35,000)
Niukluk River	23,607	TCE	SEG Threshold (23,000)
Kwiniuk River	31,604	TCE	OEG Range (11,500-23,000)
Tubutulik River	14,127	EAS	OEG Range (9,200-18,400)
Unalakleet River/Old Woman River	7,021	UAS	SEG Range (2,400-8,400)

Note: Nome Subdistrict biological escapement goal (BEG) range is an aggregate goal comprised of Eldorado, Nome, and Snake River weir count estimates and expanded aerial survey estimates from the Solomon, Bonanza, Flambeau, and Sinuk Rivers.

http://www.adfg.alaska.gov/static/fishing/PDFs/commercial/2011_norton_salmon_summary.pdf

Pacific Salmon Treaty

In March, 1985 the United States and Canada agreed to cooperate in the management, research and enhancement of Pacific salmon stocks of mutual concern by ratifying the Pacific Salmon Treaty.

The arrangements and institutions established in 1985 proved effective in the early years of the Treaty but became outmoded after 1992 when the original fishing arrangements expired.

In May, 2008 the Pacific Salmon Commission recommended a new bilateral agreement for the conservation and harvest sharing of Pacific salmon to the Governments of Canada and the United States. The new fishing regimes are in force from the beginning of 2009 through the end of 2018 and are contained in Chapters 1, 2, 3, 5, and 6 of Annex IV of the Treaty. The agreement replaces previous versions of these Chapters (http://www.psc.org/publications_psctreaty.htm)

Columbia River Chinook

The southeast troll fishery is estimated to take a small number of Chinook salmon belonging to threatened or endangered stocks from the Columbia River. Those takes are regulated under treaty with Canada by the 1999 Pacific Salmon Agreement (see http://www.psc.org/). Under the treaty an annual quota of Chinook salmon is set for the Alaska fishery, a quota designed to conserve all wild stocks of Chinook salmon. The management of the troll fishery (through inseason opening and closure of the fishery) is governed by that annual quota.

The harvest of different stocks each year is estimated from the recovery rates of coded wire tags implanted in representative index stocks in the region of the threatened or endangered stocks described (http://www.psc.org/info_codedwiretagreview.htm, http://tagotoweb.adfg.state.ak.us/).

2012 Southeast Alaska Chinook Salmon Harvest Quota relevant to Pacific Salmon Treaty

Under provisions of the Pacific Salmon Treaty, the ADFG announced that the Chinook salmon all-gear harvest quota for Southeast Alaska in 2012 is 266,800 fish. This compares with allowable Chinook all-gear harvest levels of 294,800 in 2011 and 221,800 in 2010.

The annual all-gear quota for Southeast Alaska is determined by the Chinook Technical Committee of the Pacific Salmon Commission. The quota is based on the forecast of aggregate abundance of Pacific Coast Chinook salmon stocks subject to management under the treaty. Most Chinook salmon produced in Alaska hatcheries may be harvested in addition to the annual treaty limit. The annual Chinook harvest in Southeast is allocated to sport, commercial troll, and commercial net fisheries under management plans specified by the Alaska Board of Fisheries.
(http://www.adfg.alaska.gov/index.cfm?adfg=pressreleases.pr03292012)

Alaska Fisheries Science Center Ecological Research

The NMFS's Alaska Fisheries Science Center Ecosystem Monitoring and Assessment Program's overall goal is to improve and reduce uncertainty in stock assessment models of commercially important fish species through the collection of observations of fish and oceanography. Observations for fish include abundance, size, distribution, diet and energetic status. Oceanographic observations include conductivity-temperature at depth, nutrient levels, and estimates of the composition and biomass of phytoplankton and zooplankton (includes jellyfish) species. These fish and oceanographic observations are used to connect climate change and variability in large marine ecosystems to early marine survival of commercially important fish species in the Gulf of Alaska, Bering Sea, and Arctic. The program conducts studies in a variety of fishery habitats throughout Alaska, all focused on providing fish and oceanographic ecosystem indicators to address the Program's overall goal. For example, these studies highlight the connection between chum salmon populations and bycatch in the Bering Sea groundfish fisheries. There is extensive cooperation and collaboration within the program and among AFSC programs, other Federal science centers, Alaska State agencies, Universities of Alaska and Washington, non-profit agencies (i.e., the Bering Sea Fisherman's Association, the Alaska Sustainable Salmon Fund, and the Arctic Yukon Kuskokwim Sustainable Salmon Fund), and international commissions (North Pacific Anadromous Fish Commission, Pacific Salmon Commission, Yukon River Panel, and PICES).

Their activities include:
Southeastern Bering Sea ecosystem assessment
Northeastern Bering Sea ecosystem assessment
Gulf of Alaska ecosystem assessment
Southeast Alaska coastal monitoring (SECM)
Chukchi Sea ecosystem assessment
Anadromous Fish

The Ecosystem Monitoring and Assessment Anadromous Fish Program
Pacific salmon are an important component of the Gulf of Alaska, Bering Sea, and Arctic ecosystems, and are an important commercial, sport and subsistence resource. This is a "crosscutting" activity that utilizes salmon and other data from ongoing fisheries and oceanographic, surface trawl and mid-water acoustic surveys described in Activity Plans from the Southeast Alaska Coastal Monitoring (SECM), Southeastern Bering Sea Assessment, and Gulf of Alaska Assessment to monitor changes in large marine ecosystems of the North Pacific Ocean and to inform Alaska State and Federal Managers on changes in marine salmon growth, health, and abundance in relation to adult salmon

returns.

A highlight of the Ecosystem Monitoring and Assessment Program is the extensive coverage of the Large Marine Ecosystems (LMEs) by NMFS surveys, including the southeast Alaska inside waters (SECM), the eastern Bering Sea and the coastal waters of the GOA. Fish and oceanographic data collected by AFSC scientists within these LMEs have been applied to link climate variability to walleye pollock recruitment, western Alaska salmon early marine ecology, and to forecasting pink salmon returns in Southeast Alaska.

NOAA fish laboratories

NOAA at its Fisheries laboratory at Auke Bay, Alaska, in addition to cooperating in NPAFC's high seas research program, conducts a program of Marine Ecology of Juvenile Salmon (See: http://www.afsc.noaa.gov/ABL/MSI/msi_me.php) in which they cooperate with the University of Alaska and with ADFG. This research is based on long term sampling and process-oriented study of both hatchery and wild juvenile salmon in the coastal ocean where survival of salmon cohorts is determined. These time-series and process-oriented studies have revealed no compelling evidence of ecological interaction of Hatchery and Wild salmon in the coastal marine habitat. (Results and publications reviewed in 'Insights From a 12-Year Biophysical Time Series of Juvenile Pacific Salmon in Southeast Alaska Coastal Monitoring Progect (SECM)" a Research Feature article in the July-Aug-Sept 2009 Quarterly Report of the Alaska Fishery Science Center. (http://www.afsc.noaa.gov/Quarterly/jas2009/JAS09feature.pdf).

Auke Creek

The Genetics Program at Auke Bay Laboratories conducts stock enhancement research on Pacific salmonids. This is an important group of keystone fishes that are widely distributed, generally abundant, commercially valuable, and historically and symbolically important in the cultures of peoples around the North Pacific Rim. Chinook salmon studies include comparing stock differences and effects of 7 generations of hatchery culture with the original parental wild populations. Steelhead studies, focused on potential ESA recovery principles, examines relationships between the extant anadromous run in Sashin Creek and an 80-year old isolated freshwater population in Sashin Lake derived from the same stock. Other enhancement related research includes interactions between wild and hatchery juvenile salmon in various marine habitats. These studies are possible because a large percentage of hatchery salmon in southeast marine waters are marked either with otolith tags or coded wire tags that identifies which hatchery they came from. http://www.afsc.noaa.gov/ABL/Genetics/gsi_StockEnhancement.php

Auke Creek originates as the outflow stream from Auke Lake, and flows a short distance into Auke Bay adjacent to Auke Bay Marine Station. Auke Creek Station, including a two-way fish counting weir and an experimental hatchery, is located at the mouth of the stream at the head of tidewater. This stream supports anadromous runs of pink, chum, sockeye, and coho salmon, Dolly Varden, cutthroat and steelhead trout where studies have been underway for the past 40 years.

The long-term time series of data at Auke Creek play a critical role in understanding how climate

change impacts salmonid behaviour and population dynamics. The two-way weir allows complete enumeration of all downstream migrant juvenile salmonids and upstream migrant adults, allowing calculations of both freshwater and marine survival of anadromous stocks using this system. These types of population dynamics data are not commonly available around the Pacific Rim and are important resources for study of long-term ecological changes including impacts, if any, on fishery resources from climate changes.

NMFS scientists coordinate activities at Auke Creek Station involving other agencies. An annual interagency meeting on research projects and activities sets research priorities and NMFS provides an updated report of historical and current fish counts of juvenile and adult salmonid migrations. These reports, covering nearly 40 years of data, include information on daily migrations of each species using this system along with environmental data on water temperatures, freeze up, and ice out on Auke Lake.

Little Port Walter

Little Port Walter (LPW) Marine Station is a research unit of Auke Bay Laboratories located 110 miles south of Juneau near the southern tip of Baranof Island. LPW is the oldest year-round biological research station in Alaska and has been host to a wide variety of fisheries research projects since 1934. The station is in a small estuarine bay adjacent to Chatham Strait near the open Gulf of Alaska and is ideally suited for a broad range of studies on Alaska's fisheries. Sashin Creek with natural runs of salmonids flows into the head of the bay where daily counts of salmon entering and leaving the stream are made. Research facilities include an experimental hatchery with freshwater, saltwater raceways and marine net pens. Two laboratories include a behavior laboratory capable of detailed observation on species in fresh water, salt water, or simulated intertidal environments.

Research projects are jointly managed between the Genetics program and the FEDZ-CWT program. Recent studies include hatchery and wild stock interactions in chinook salmon, effects of crude oil on survival and homing behaviour of pink salmon, ESA recovery studies of steelhead, growth rates in marine corals, habitat behaviour and growth of juvenile rockfish and oceanographic research. Studies at LPW include cooperative programs with other NOAA laboratories, several universities, ADFG, and Regional Aquaculture Associations (http://www.afsc.noaa.gov/ABL/MSI/msi_acs.htm).
http://www.afsc.noaa.gov/ABL/Genetics/gsi_StockEnhancement.php

Wild- hatchery salmon interactions 2011/2012 studies

One potential ecological effect of the salmon fishery is represented by the dynamics surrounding the ecological and genetic interactions between wild and hatchery salmon. In that respect, a whole range of peer reviewed publications has been recently released that further elucidate the subject and indicates the need for focused research to elucidate hatchery and wild ecological interactions (e.g. competition, predation, density dependence) during juvenile and adult life stages in fresh, estuarine and marine ecosystems, as well as the need to understand the dynamics of genetic introgression between hatchery and wild salmon.
The papers can be found in the Journal of Environmental Biology of Fishes Volume 94, Number 1 / May 2012 (http://www.stateofthesalmon.org/hatcheries/abstracts.html).

ADFG is soliciting proposals from entities interested in conducting a research program to address interactions of Wild and Hatchery Pink and Chum Salmon in Prince William Sound and Southeast Alaska, in May 2012.

Request for Research Proposals

The Alaska Department of Fish and Game (ADFG), Division of Commercial Fisheries, has released a Request for Proposals (RFP) to initiate large-scale research related to hatchery wild salmon stock interactions. This proposed research is the culmination of several years of effort to identify key questions related to hatchery production and wild stocks that were of most relevance to Alaska salmon management. Funding for this research from a combination of sources. The hatchery operators and the department both have capital improvement projects included in the legislature's budget; a group of salmon processors have indicated that they will also cover a portion of the research costs. Full details of this research program are provided under fundamental clause 14.

http://notes4.state.ak.us/pn/pubnotic.nsf/cc52605f7c156e7a8925672a0060a91b/d52efa396245b1db892579f70075d4dd/$FILE/RFP%20-%20Hatchery%20fish%20interaction.pdf

14. Where fisheries enhancement is utilized, environmental assessment and monitoring shall consider genetic diversity and ecosystem integrity.

FAO CCRF 9.1.2/9.1.3/9.1.4/9.1.5/9.3.1/9.3.5

Evidence adequacy rating:

☑ High **☐ Medium** **☐ Low**

Rating Determination

Salmon enhancement programs in Alaska were designed to help rehabilitate depressed fisheries and to protect wild salmon stocks through detailed planning and permitting processes that included focused policies on genetics, pathology, and management. Hatcheries were located away from significant wild stocks, local sources were used to develop hatchery broodstocks, and juveniles are marked so management can target fisheries on hatchery fish. From the beginning of Alaska's salmon fishery enhancement program it was recognized that salmon stray and that hatchery stocks would stray; consequently, policies and regulations were adopted to mitigate concerns associated with straying. Hatchery programs in Alaska pioneered use of otolith thermal marks for mass-marking hatchery production to facilitate evaluation and management. These marking programs have also made possible accurate detection of hatchery-bred salmon on the spawning grounds of wild salmon. Recent studies have demonstrated large proportions of hatchery-bred salmon in some wild spawning populations in Alaska. These observations have led to the development of a large scale multigenerational research study starting in 2013 that aims at answering several important questions:

(1) Are hatchery-bred salmon interbreeding with wild salmon to the extent that fitness and productivity of these stocks are being diminished? If so, does any loss of fitness and productivity continue through subsequent generations? Can such a loss of productivity be compensated by addition of hatchery strays to the spawning stock?

(2) Is the annual assessment of wild stocks (which is, in part, based on visual observation) so biased by the presence of hatchery salmon that excessive harvest of wild fish is being allowed or that escapement goals are difficult to set and difficult to assess? Or, if the additional enhanced fish have an overall positive effect on the escapement, should they be simply counted as part of that escapement?

(3) Do density interactions diminish productivity of wild salmon?

The ADFG Division of Commercial Fisheries, has released a Request for Proposals (RFP) to initiate large-scale research related to hatchery wild salmon stock interactions. This project is a multigenerational study that should be ended by 2023. However, annual reports will be made available to ADFG, and full results of the scope of straying in PWSAC and SEAK should be available 5 years after the start of the project.

Salmon Enhancement in Alaska

Salmon enhancement programs in Alaska were designed to help rehabilitate depressed fisheries and to protect wild salmon stocks through detailed planning and permitting processes that included focused policies on genetics, pathology, and management. Hatcheries were located away from significant wild stocks, local sources were used to develop hatchery broodstocks, and juveniles are marked so management can target fisheries on hatchery fish. For example most Alaska hatcheries

are at or near tidewater on non-anadromous water sources, not on rivers with major runs of wild salmon. There are very well prescribed Statutes and laws for planning of hatchery developments (see evidence under fundamental clause 3 for evidence). In particular, there is clear policy to site hatcheries in areas that causes least likely risk of mixing with existing wild stocks.

Evaluation is based on documented environmental assessment. All hatchery release strategies are reviewed by ADFG and are ultimately under the authority of ADFG. Both economic and ecological evaluation of the release plan forms part of the decision making process. Introduction of genetic material is prohibited and hatchery stock is selected from the terminal area stock and hence, all genetic material originated from that location. Selection techniques are designed to avoid artificial reduction in genetic material – i.e. fish are selected at random and not on external trait basis (size etc). An extremely wide, pre-determined number of returning fish are used for stripping of ova for hatchery rearing and release (Reference to Genetic Policy, 1985).

Key Aspects of Salmon Management in Alaska

- Highest priority: protect and maintain wild stocks
- Vigorous habitat protection, no dams on rivers
- Escapement-based management, no fishery targets
- Mixed stock fisheries avoided wherever possible
- Hatcheries supplement not replace wild stocks, mitigation of pressure on wild stocks.
- Annual Management Plans of all hatcheries are annually reviewed by ADFG.

Minimizing Hatchery-Wild Stock Interactions

- Comprehensive regional planning.
- Utilise conservative fish culture practices.
- A rigorous hatchery permitting process that includes genetics, pathology and fishery management reviews.
- Statewide genetics policy to protect wild stocks.
- Fish health and disease statutes (no disease has ever been introduced or amplified in the wild).
- Careful siting of hatcheries, terminal harvest areas (temporal and spatial segregation from wild stocks to minimize mixed fisheries, then harvest all the returning salmon to minimize potential breeding. Hatchery production is not approved if there is not high confidence that the resulting salmon will be fully harvested).
- Hatchery brood stock diversity practices (fish selected at random and not on external trait basis such as size, 1 to 1 mating ratio, effective population sizes very large).
- Use of local brood sources.
- Collection of broodstock for the hatcheries is stratified over spawn/run timing to maximize the heterogeneity of the gene pool.
- Mass otolith marking for real-time in-season fisheries management.

Each hatchery is required to complete an annual report containing information on hatchery returns, numbers of eggs taken, and numbers of fry or smolt released, by species and stock.
http://www.springerlink.com/content/25k01460326l7g38/

Research Program to Address Interactions of Wild and Hatchery Pink and Chum Salmon in Prince William Sound and Southeast Alaska, May 2012

Request for Research Proposals

The Alaska Department of Fish and Game (ADF&G), Division of Commercial Fisheries, has released a Request for Proposals (RFP) to initiate large-scale research related to hatchery wild salmon stock interactions. This proposed research is the culmination of several years of effort to identify key questions related to hatchery production and wild stocks that were of most relevance to Alaska salmon management. Funding for this research from a combination of sources. The hatchery operators and the department both have capital improvement projects included in the legislature's budget; a group of salmon processors have indicated that they will also cover a portion of the research costs.

Background

When the State of Alaska embarked on its salmon enhancement program, the purposes were to enhance fisheries to provide more harvest of salmon to mitigate the low abundance of wild stocks at the time, and to smooth out large variations in annual harvests of salmon. Protection and natural productivity of wild stocks was, and always has been, a priority.

From the beginnings of Alaska's salmon fishery enhancement program it was recognized that salmon stray and that hatchery stocks would stray; consequently, policies and regulations were adopted to mitigate concerns associated with straying. As the Alaskan enhancement program grew, the general impression was that straying, while recognized as happening, was not seen as a significant concern to most persons involved with salmon in Alaska. This viewpoint changed over time, for some, and the issue of strays has become a controversial and sometimes contentious topic.

Hatchery programs in Alaska pioneered use of otolith thermal marks for mass-marking hatchery production to facilitate evaluation and management. These marking programs have also made possible accurate detection of hatchery-bred salmon on the spawning grounds of wild salmon.

Recent studies have demonstrated large proportions of hatchery-bred salmon in some wild spawning populations in Alaska. These observations have raised several important questions:

(1) Are hatchery-bred salmon interbreeding with wild salmon to the extent that fitness and productivity of these stocks are being diminished? If so, does any loss of fitness and productivity continue through subsequent generations? Can such a loss of productivity be compensated by addition of hatchery strays to the spawning stock?

(2) Is the annual assessment of wild stocks (which is, in part, based on visual observation) so biased by the presence of hatchery salmon that excessive harvest of wild fish is being allowed or that escapement goals are difficult to set and difficult to assess? Or, if the additional enhanced fish have an overall positive effect on the escapement, should they be simply counted as part of that escapement?

(3) Do density interactions diminish productivity of wild salmon?

In general, the proportion of strays detected in wild spawning populations has been higher in streams closer to hatchery release sites (ADF&G unpublished data). However, sampling designs used to date have not been adequate to estimate the actual extent of straying at the level of the harvest

management system, e.g., the district level for Prince William Sound (PWS) pink salmon or the subregional level for Southeast Alaska (SEAK) chum salmon. Because of evidence of straying and uncertainty about its extent and effect, ADF&G generally acts cautiously and has denied some requests from hatchery corporations for increased production. Because of the value of hatchery production to industry's harvest and its place in the international market, and the mandate that hatchery production be compatible with sustainable productivity of wild stocks, ADFG and the private nonprofit (PNP) hatchery corporations have recognized the need for a research program addressing concerns about escapement assessment, and genetic and ecological interactions between hatchery and wild stocks. In July, 2011, ADF&G convened a science panel composed of current and retired scientists from ADF&G, University of Alaska, PNP aquaculture corporations, and National Marine Fisheries Service. Panel members have broad experience in salmon enhancement, management, and wild and hatchery interactions.

Actions Proposed

The panel addressed three priority 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 PWS and chum salmon in PWS and 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 panel discussed a variety of potential research programs that could be developed to address these questions. The panel agreed, by consensus, on recommended research approaches which will be described briefly, but these approaches are only recommendations and groups bidding through the RFP process are free to propose other approaches.

Genetic Structure of Pink and Chum Salmon

The ADF&G Gene Conservation Laboratory will take the lead on proposed genetic analyses, beginning with an evaluation of the genetic population structure of pink and chum salmon in PWS and SEAK. The laboratory has a relatively comprehensive collection of historical tissue samples from both species within the study areas. However, additional sample collection is necessary to complete the representation of populations and to obtain contemporary samples. Studies in several Pacific salmon species have demonstrated the utility of Single Nucleotide Polymorphisms (SNPs) as genetic markers for the study of population structure. SNPs have been developed for all five North American species of salmon and additional discovery effort is ongoing for each species. However, SNP discovery for pink salmon is just beginning and development of useful markers will either soon be done by another agency, or will be done as part of this project. Newly developed SNPs for pink salmon and currently available ones for chum salmon can be used to better define stock structure in areas of large-scale hatchery production. In addition to their large numbers, SNPs have the advantage of being digital (letters A, C, G, T, indicating the four bases that determine DNA sequence variation) and therefore, less error-prone and more transferable between laboratories than fragment-size based genetic markers, e.g., microsatellites. SNPs have also been shown to be useful for mixed-stock analysis and studies of parentage, which will make the data developed in this process useful for a wide range of additional studies.

Scope of straying

Annual production of pink and chum salmon in PWS and of chum salmon in SEAK is the result of both natural spawning and hatchery production. This production is realized as catch and escapement with hatchery-produced salmon in natural escapement labeled as "strays".
Currently, catches of naturally-spawned salmon (hereafter called wild salmon) and of hatchery produced salmon (hereafter called hatchery salmon) are estimated with catch sampling programs.
Hatchery salmon in samples can be recognized because 100% of hatchery pink and chum salmon production in these regions has been batch-marked (thermal marks on otoliths). However, escapement in both regions is reported as an index, not as estimated total numbers of spawning fish.
A suite of new projects is proposed to annually estimate the following for pink and chum salmon in these two regions:

- number of wild salmon spawning in the wild;
- number of hatchery salmon spawning in the wild (hatchery strays);
- production of hatchery salmon (including hatchery strays); and
- production of wild salmon (excluding hatchery strays).

These new projects involve sampling in both the ocean and streams to estimate two statistics:

1) the fraction of the total run and 2) the fraction of spawning abundance composed of hatchery salmon. These two fractions can be expressed as functions of catches (which are known), broodstocks at the hatchery (which are known), and escapements to natural spawning systems (which are not). These two functions represent two equations with two unknowns (run size of wild salmon and the number of hatchery strays in the region). Solving these two equations produces estimates of these numbers, and subsequently, estimates of the four bulleted numbers above.

New projects consist of field sampling in PWS and SEAK and ocean sampling in PWS. Field sampling is to estimate the fraction of spawning abundance composed of hatchery salmon. Ocean sampling is to estimate the fraction of the run composed of hatchery salmon. Ocean sampling is needed in PWS because management and fishermen tend to concentrate fishing effort on hatchery salmon, sometimes restricting openings to hatchery terminal harvest areas. Therefore, PWS commercial catches will not be representative of the proportions of wild and hatchery salmon in the total return. No ocean sampling is needed for chum salmon in SEAK as they are caught throughout SEAK incidentally to directed fisheries on wild pink salmon, making catches in commercial fisheries (excluding terminal harvest fisheries) generally representative of the chum salmon run.

The amount of hatchery straying is not constant, but will vary annually due to factors such as run size, precipitation, water temperatures, and stream flows. To determine average straying rates and their variability will require multiple years of sampling and estimation of hatchery and wild returns, escapements, and hatchery strays. A minimum of five years is envisioned for estimating the scope of straying, after which time the costs and benefits of continuing to collect information on pink and chum salmon runs at this level of resolution can be evaluated.

The effect of straying on population fitness

Research is needed to evaluate potential changes in spawning populations of Alaskan pink and chum salmon due to straying of hatchery produced fish. There is concern that hatchery-origin fish mixed in and spawning with naturally-produced fish may reduce the fitness of wild populations. Fitness is a statistic that describes the ability to both survive and reproduce, and is equivalent to the average contribution to the next generation that is made by an average individual of the specified type—hatchery-origin pink or chum salmon versus natural-origin pink or chum salmon, in this case. For salmon, fitness is typically measured as the number of adult offspring produced per spawner of each sex. Thus, fitness is closely related to the sustainable yield or productivity of the population. If hatchery-origin fish are less fit on the spawning grounds and interbreed with natural-origin fish, the concern is that natural-spawning populations will lose productivity as a consequence of the presence of strays among the breeding population. To evaluate whether or not fitness of natural-origin (wild) versus stray hatchery-origin salmon differ when spawning in the wild, survival of both types of fish and their relative spawning success needs to be documented. For pink salmon in PWS and chum salmon in SEAK, hatchery origin fish spawning in the wild can be identified because their otoliths have thermal marks. Potential applications of genetic analyses have improved to the point where individual fish can be traced to their respective parents, so long as their parents have been genetically sampled. The science involved is identical to paternity evaluations conducted in humans, and will take advantage of the polymorphic DNA markers (SNPs or microsatellites) that can be used to identify individual fish and their relatives. Thus, the combination of thermal marks on all hatchery-origin pink and chum salmon, coupled with application of current genetic techniques, provides a means to set up a robust experiment to evaluate fitness of natural-origin versus hatchery-origin stray salmon spawning in the wild in streams of PWS and SEAK.

The scope of research will identify:

(1) six streams in PWS with pink salmon spawning populations of about 3,000 fish each, three streams which have a low portion of strays (less than 20%), and three streams which have a high proportion of strays (around 50%); and
(2) four streams in SEAK with chum salmon spawning populations of about 3,000 fish each, two streams which have a low portion of strays, and two streams which have a high proportion of strays.

In each of these 10 streams, about 500 adult post-spawning salmon will be collected, their otoliths sampled to determine their origin (hatchery or wild), and genetic samples taken. The next spring, about 2,500 fry taken from about 250 redds from each stream will be collected and genetically analyzed to determine if:

(1) their mother was one of the 500 sampled earlier;
(2) their father was one of the 500 sampled earlier; or
(3) neither of their parents was sampled earlier.

In this way, reproductive success to the fry stage can be estimated for hatchery-origin versus natural-origin fish in each stream, as well as provide data for comparisons between low and high stray rates for each of the two species with replication. Sampling of adults will again occur when offspring of the originally-sampled 500 salmon return to spawn, and likewise, it will be determined if these fish are offspring of males or females originally sampled and of known origin, (either hatchery strays or

natural-spawning fish) or were offspring of fish not sampled earlier. These data will be used to estimate survival rates and reproductive success to the adult stage for hatchery-origin versus natural-origin fish in each stream, as well as provide data for comparisons between low and high stray rates for each of the two species with replication. Fish spawning in these streams will be similarly sampled for two complete generations; for pink salmon, sampling in each stream will occur in each of six years over two brood years for each brood line, and for chum salmon, sampling in each stream will occur in each of 11 years over two brood years. **Pink salmon sampling will occur annually from 2013–2018 and chum salmon sampling will occur annually from 2013–2023.** Data and statistics obtained from this robust experiment will provide the information needed to evaluate fitness of natural-origin versus hatchery-origin stray salmon spawning in the wild in streams of PWS and SEAK.

Final Results

The science panel that has worked on these proposed projects has a variety of viewpoints on the effects of the current enhancement program on Alaska's wild stocks. The long-term research project proposed here has the potential to answer some of the questions most relevant to the Alaska salmon enhancement program. Furthermore, as good stewards of wild salmon stocks and the natural resources of the state, the panel also believes strongly this work should be undertaken. It recognizes that the results will likely have some ambiguity and may even be interpreted differently by some groups. Nonetheless, this information will likely guide future decisions and will greatly advance the understanding of the ecological and evolutionary dynamics of wild and hatchery interactions.
Some of the proposed work will be of value immediately, such as the estimates of run size for wild and hatchery-produced pink salmon in PWS, and may well improve management and result in changes in how fish are harvested. Improved information on population structure should also accrue early in the process. Other information, such as quantitative estimates of average hatchery straying rates and their interannual variation, and the comparisons of fitness between hatchery strays and natural-origin parents, will take much longer. As ADFG notes, the contractor will be required to provide the following deliverables:

(a) *Annual Progress Reports detailing activities undertaken that year and summaries of data collection.*
After completion of two full seasons of data collection (2013 and 2014) and receipt of the annual progress reports, the Department will review the activity/progress to determine the benefit and viability of continuation of the project.

(b) Analysis of data collected on an annual basis , integrating field sampling data with otolith analyses provided by the ADFG MTA laboratory , including:

1) Estimate of proportion of hatchery pink salmon in escapements of PWS index streams by district and the whole sound.
2) Estimate of proportion of hatchery chum salmon in escapements of PWS and Southeast Alaska index streams by district and the sound in PWS and by the three broad index areas on Southeast Alaska.
3) Annual estimates of the numbers of hatchery and wild pink and chum salmon in the harvest and escapement in PWS and Southeast Alaska.

(c) *Final Report detailing results of five years of research.*

http://notes4.state.ak.us/pn/pubnotic.nsf/cc52605f7c156e7a8925672a0060a91b/d52efa396245b1db892579f70075d4dd/$FILE/RFP%20-%20Hatchery%20fish%20interaction.pdf

8. Performance specific to agreed corrective action plans

Not Applicable. This is the 1st FAO RFM Alaska salmon surveillance assessment. No non conformances were issued during the initial full assessment.

9. Unclosed, new non conformances and new corrective action plans

During this 1st FAO RFM Alaska salmon surveillance report, 1 minor non conformance has been issued under fundamental clause 7.

Details of MINOR Non-Conformances

1.	Clause		Response time
	7.1.1	*'The absence of adequate scientific information shall not be used as a reason for postponing or failing to take conservation and management measures'.*	
	NC	*Salmon enhancement programs in Alaska were designed to help rehabilitate depressed fisheries and to protect wild salmon stocks through detailed planning and permitting processes that included focused policies on genetics, pathology, and management. Hatcheries were located away from significant wild stocks, local sources were used to develop hatchery broodstocks, and juveniles are marked so management can target fisheries on hatchery fish. New evidence collected during 2011 and 2012 points to the fact that hatchery salmon stray rates in wild salmon streams in PWS and SEAK are in excess of 10%. Potential genetic depression could occur from gene introgression of hatchery to wild salmon. The State of Alaska has organised for a multigenerational study starting in 2013 in PWS and SEAK that aims at understanding (1) the genetic stock structure of pink and chum salmon in PWS and SEAK, (2) the extent and annual variability in straying of hatchery pink salmon in PWS and chum salmon in PWS and SEAK, and (3) the impact on fitness productivity of wild pink and chum salmon stocks due to straying of hatchery pink and chum salmon. This project will deliver answers about the scope of straying on phase 1 and some preliminary results could be available around 2014-2015. However, answers regarding genetics impact on fitness of wild strains may not be available until 2023. Relating to the requirements of the Precautionary Approach and especially supporting clause 7.1 ("The absence of adequate scientific information shall not be used as a reason for postponing or failing to take conservation and management measures") it is unclear how ADFG plans to deal with development plans and release activities (e.g. potential requests from hatchery corporations for increased pink and chum salmon productions) in the two regions in light of the fact that negative genetic interactions between hatchery and wild salmon could already be occurring, and that research results of the genetic interactions between hatchery and wild salmon following the multigenerational study in PWS and SEAK may take considerable time to accrue. Since the assessment team is aware of a range of management tools that are in place for the limitation of straying rates of*	28 days

		hatchery fish, a minor non-conformance is applied specific to clause 7.1.1 specific to PWS and SEAK. A corrective action plan from the client shall detail 1) how ADFG intends to address this issue and 2) a set of specific timelines to allow for assessment during the next surveillance activities in 2013, 2014 and 2015 and the second full assessment audit in 2016, as relevant and if needed.	

Evidence Substantiating the Corrective Action Plan

THE STATE of ALASKA
GOVERNOR SEAN PARNELL

Department of Fish and Game

DIVISION OF COMMERCIAL FISHERIES
Headquarters Office

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P.O. Box 115526
Juneau, Alaska 99811-5526
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September 6, 2012

Dave Garforth, Assessment Leader
Global Trust Certification Ltd
3rd Floor, Block 3
Quayside Business Park
Mill Street
Dundalk, Co. Louth, Ireland

Dear Mr. Garforth:

I would like to provide an update on the status of proposed research on hatchery and wild stock salmon interactions. We are pleased to announce that the department has entered into a five-year contract with Prince William Sound (PWS) Science Center to initiate a study that will better inform it regarding the number of hatchery fish that may be straying into wild stock systems, as well as the comparative fitness of fish of natural versus hatchery origin salmon.

The research is designed to collect data that will be used to: (1) estimate the extent and annual variability in straying of hatchery pink salmon in PWS, and chum salmon in PWS and Southeast Alaska (SE AK); and (2) determine the impact, if any, on fitness (productivity) of wild pink and chum salmon stocks due to straying of hatchery pinks and chum salmon.

An effective evaluation of the extent of straying of pink and chum salmon requires accurate and precise estimates of both the numbers of strays and the number of wild fish in the streams into which the hatchery fish are straying. Currently, pink and chum salmon escapements are estimated by index counts in selected streams. Mass-marking of hatchery fish with otolith thermal marks will provide the opportunity to estimate the actual number of wild-origin and hatchery-origin spawners in populations of pink and chum salmon in PWS, and chum salmon in SE AK, aggregated by management units within each region. This information would provide a comprehensive perspective on the extent of straying at the management unit level, something existing studies have not done. The research will also provide more accurate measures on the annual production of natural and hatchery fish production, by accounting for the actual numbers of fish, by origin, on the spawning grounds.

The second main component of the study will compare the relative fitness of hatchery-origin and natural-origin fish when spawning in wild stock systems. There is concern that stray hatchery-origin fish mixed in and spawning with naturally-produced fish will lower the fitness of wild populations. Fitness is a statistic that describes the ability to both survive and reproduce, and is equivalent to the average contribution to the population of the next generation that is made by an average individual of the specified type; hatchery-origin pink or chum salmon versus natural-origin pink or chum salmon, in this case. If hatchery-origin fish are less fit and interbreed with natural-origin fish, the concern is that the natural spawning populations will lose productivity as a consequence of the relative contribution of strays to the breeding population.

To evaluate whether or not fitness of natural-origin versus stray hatchery-origin salmon differ when spawning in the wild, the survival of both types of fish and their relative spawning success will be documented. For pink salmon in PWS and chum salmon in SE AK, hatchery-origin fish spawning in the wild can be identified because their otoliths have thermal marks. Fishery genetics techniques can trace individual fish to their respective parents, so long as their parents have been genetically sampled. Thus, the combination of thermal marks on all hatchery-origin pink and chum salmon, coupled with application of available genetic techniques, provides a means to set up a robust experiment to evaluate fitness of natural-origin versus hatchery-origin stray salmon spawning in the wild in streams of PWS and SE AK.

We expect the results of this work will be valuable to our managers, as well as others interested in Alaska salmon production. Furthermore, these studies may ultimately help shape future changes in hatchery production as we move forward to meet growing demands for seafood products.

A number of hatchery operators have expressed interest in reactivation of current permitted production, new increments of production, and even new hatchery permits. Any request for hatchery production will be addressed on its own merits in terms of protection of wild stocks and expectations of management feasibility. We hope that the industry recognizes that the current research is based on increasing our understanding of some important interactions and is not intended to limit production, nor "green light" new production. While we are confident of the long-term health of Alaska's salmon, we also find it important to know as much as is practical about these important fish.

Thank you.

Sincerely,

Jeff Regnart
Director

10. Future Surveillance Actions

The assessment team will review at each surveillance assessment:

1) the interim progress towards the completion of the 5 year hatchery salmon research study and;

2) hatchery corporation permit alteration requests (if any) and their treatment by ADFG.

11. Client signed acceptance of the action plan

Following the evidence provided by ADFG, ASMI will provide the following to GT, in relation to the corrective action plan to resolve the non conformance found in the 1st FAO RFM AK salmon surveillance assessment (2012).

1) **Interim progress information or report (as available) towards the completion of the 5 year hatchery salmon research study (i.e. progress report during the next surveillance activities in 2013, 2014 and 2015 and the second full assessment audit in 2016).**

2) **Hatchery corporation permit alteration requests (if any) received by ADFG and their treatment and decision (i.e. granted/declined and rationale for such decision).**

September 8, 2012

Julie McDonald
Global Trust Certification Ltd
Quayside Business Park
Mill Street, Dundalk, Co Louth
Ireland

RE: non-conformance Salmon RFM certification annual audit

Dear Julie,

Further to the minor Non-conformance identified during the first annual surveillance of Alaska salmon fisheries, under 7.1 of the FAO Based Conformance Criteria. ASMI have held meetings with ADFG, responsible for the statewide management of Alaska's salmon fisheries. I enclose the following evidence provided by ADFG which addresses the current research plan and management of salmon enhancement programs in PWS and SE Alaska.

As client, facilitating the certification on behalf of Alaska's salmon fisheries I acknowledge the requirement of providing annual up-dates of available progress reports and documents that confirm the consistency of implementation of these corrective actions during annual surveillance audits and on eventual re-certification evaluation.

Please can you acknowledge acceptance of the evidence provided by ADFG, on our behalf in closing out this non-conformance.

Best regards,

12. Recommendation and Determination

Following close out of the minor non conformance found during this 1st surveillance assessment, the Assessment Team and the Certification Committee recommend that continued Certification under the FAO-Based Responsible Fisheries Management Certification Program is granted to the U.S.A. Alaska commercial salmon [all pacific salmon species: Chinook *(Oncorhynchus tschawytscha);* sockeye *(Oncorhynchus nerka);* coho *(Oncorhynchus kisutch);* pink *(Oncorhynchus gorbuscha);* and chum *(Oncorhynchus keta)*] fisheries, employing troll, purse seine, drift gillnet, set gillnet gear(and fish wheel in Upper Yukon River only), in the four administrative Regions of Alaska principally managed by the Alaska Department of Fish and Game (ADFG).

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Appendix 1 (Assessment Team Details)

Based on the technical expertise required to carry out the above fishery assessment, Global Trust Certification Ltd. is pleased to confirm the surveillance assessment team members for this fishery as follows.

Herman Savikko

Herman Savikko has a degree in Biological Sciences and began his career in fisheries in 1975, working seasonally for the Alaska Department of Fish and Game in remote locations, including four Bristol Bay river systems and the Karluk River on Kodiak Island and several sockeye/Chinook salmon enumeration and escapement projects. Later, at the National Marine Fisheries Service at their Auke Bay Biological Laboratory, Mr. Savikko researched the early marine survival of pink and chum salmon throughout Northern Southeast Alaska and then gained hatchery experience at a private, non-profit hatchery on Gastineau Channel. Throughout a 30 year career at Alaska Department of Fish and Game, Mr. Savikko worked in the Divisions of Sport Fish, Fisheries Rehabilitation, Enhancement and Development, and Commercial Fisheries. His responsibilities covered freshwater and marine species management, research, and policy development. Mr. Savikko compiled and reported statewide salmon harvest data by management area, as well as maintaining the Commercial Operators Annual Report. As a member of the Commissioner's team, he helped develop, draft and implement salmon bycatch limits for the Bering Sea pollock fleet, as well as develop the foundation for bycatch measures in the Gulf of Alaska trawl fisheries.

Dr. William Smoker

Bill Smoker is an Alaskan salmon biologist. His research is on local adaptation of salmon and on genetic and environmental interactions of hatchery and wild salmon; he's author or co author of more than 50 peer-reviewed scientific papers on salmon biology. He retired in 2009 from University of Alaska Fairbanks where he was Director of Fisheries and now holds the rank of Emeritus Professor. He's a reviewer for the NW Power and Conservation Council in Portland and formerly a founding member of the Hatchery Scientific Review Group in Washington. He earned his BA (Biology) at Carleton College, and his MS (Oceanography) and PhD (Fisheries) at Oregon State University.

Vito Ciccia Romito

Vito holds a BSc in Ecology and an MSc in Tropical Coastal Management (Newcastle University, United Kingdom). His BSc studies related to the issues of bycatch, discards, benthic impact of commercial fishing gear and the available management and technical solutions, after which he spent a year in Tanzania as a Marine Research officer at Mafia Island Marine Park (MIMP) carrying out biodiversity assessments and populations census for potential inclusion of two additional islands within the MIMP. Subsequently, for his MSc, he focused on fisheries assessment techniques, ecological dynamics of overexploited tropical marine ecosystems, and evaluation of low trophic aquaculture in support to artisanal reef fisheries. Since 2010, he has been fully involved through Global Trust with the FAO-based RFM Assessment and Certification Programme covering the Alaska salmon, halibut, sablefish, pollock and king & tanner crab fisheries; and the Icelandic cod, haddock, saithe and redfish fisheries.

Dave Garforth

Dave Garforth, BSC, HDip. (Applied Science), MSc, has been involved in fisheries and aquatic resources for over 20 years. Currently, managing Global Trust FAO based Fishery Certification Program, with experience in the application of ISO/IEC Guide 65 based seafood certification systems and a professional background in numerous fishery assessments. Previous professional background includes; Development Officer in the Irish Sea Fisheries Board, supply chain and trade experience at Pan European Fish Auctions, the control and enforcement of fisheries regulations as a UK Fishery Officer. Dave is also a lead, third party IRCA approved auditor.

Appendix 2 (Information Submitted by Stakeholders)

The technical information here provided have been submitted by various stakeholders and considered by the assessment team as part of the evidence for this report.

Stakeholder name: Wild Salmon Centre
http://www.wildsalmoncenter.org/programs/sos.php

Relating to Fundamental Clause 6.
Monitoring of wild salmon escapements can be complicated by hatchery-origin fish straying into spawning streams. This is an acute problem in areas with large hatchery programs for pink and chum salmon such as Prince William Sound (PWS) and Southeast Alaska (SEAK). In a recent publication, Grant (2011) cited the range of straying observed in these areas:
"In Alaska, straying is especially problematic in two regions, because hatcheries release hundreds of millions of juveniles. In Prince William Sound, stream surveys of spawning salmon found marked hatchery fish in some spawning areas in large numbers (Brenner et al. 2011). The proportion of stray hatchery fish ranged from 0% to 98% for pink salmon, 0–63% for chum salmon, and 0–33% for sockeye salmon. Hatchery fish strayed most frequently into streams within 40 km of a hatchery. Overall, a model of these data indicated that more than 10% of pink salmon found in wild-salmon streams was of hatchery origin."
Escapements of these species are monitored primarily through aerial surveys (Fair et al. 2011, Piston and Heinl 2011). Recent studies by ADFG have found hatchery origin fish in nearly all spawning streams surveyed in these areas, with high proportions within 40 km of hatchery release sites (Brenner et al. 2012) and proportions greater than 10% in streams more than 50km from the nearest release site (Piston and Heinl 2011). High rates of hatchery straying exacerbate problems with aerial escapement monitoring programs. ADFG does not currently have a practical means to estimate the number of hatchery-origin fish in their escapement counts. There is a growing recognition that wild salmon escapement goals based on these escapement counts may not reflect the productivity of the wild stocks, and may need to be revised or qualified at some time in the future (Piston and Heinl 2011).

Alaska has not developed any formal management reference point related to acceptable limits for hatchery straying. Although the Prince William Sound Copper River Regional Planning Team recommended that "the proportion of hatchery salmon straying into wild-stock streams must remain below 2% of the wild-stock escapement over the long term" (PWS-CR RPT 1994), recent modeling suggests that streams throughout PWS contain more than 10% hatchery pink salmon (Brenner et al. 2012). The comprehensive salmon enhancement plan for SEAK (JSERPT 2004) does not specifically state a maximum allowable proportion of hatchery salmon into wild salmon stream. This plan indicates that evaluation plans will be developed for enhancement projects that "include the predetermined acceptable percentage of strays in a specific wild stock and what action will be taken if strays in excess of that percentage are observed". It is unclear whether any evaluation plans have been written since the plan was adopted.

Relating to Fundamental Clause 7

Recommended upper thresholds for proportion of hatchery-origin spawners in wild salmon populations has ranged from 2% (PWS-CR RPT 2004), to 5% (Mobrand et al. 2005), to 10% (Ford 2002). In contrast, modeling suggests that the proportion of hatchery-origin pink salmon spawning exceeds 10% throughout PWS (Brenner et al. 2012). Similarly, the estimated proportion of hatchery-origin chum salmon spawning in streams in northern inside SEAK was 13.5% in 2010 (Piston and Heinl 2011). Despite studies showing high proportions of hatchery origin fish in wild salmon streams in PWS and SEAK, the ADFG commissioner approved increased permitted capacities for chum salmon in PWS (17 million) and SEAK (39 million) in 2010, and pink salmon in PWS (35 million) in 2011. The two PWS increases were approved despite split votes by the RPT (all ADFG representatives opposed). While there have been some instances of ADFG disapproving production increases, approving increases in hatchery production in areas when studies have shown that hatchery straying is likely significant at existing hatchery release levels does not support the idea that the department is using a precautionary approach with respect to its oversight of artificial production programs.

Lack of scientific evidence on the negative impact of hatchery production is frequently used to justify current and expansion of hatchery programs. For example in a memo to the ADFG Commissioner dated August 23, 2011, the Commercial Fisheries and Sport Fish Directors recommended approval of increasing pink salmon capacity at the Cannery Creek hatchery in PWS stating “While there are unknowns about biological effects of strays, we do not find them strong enough, nor is there the research on pink salmon that would support denial based on that concern.”

Relating to Fundamental Clause 14.

Effective procedures specific to aquaculture of fisheries enhancement shall be established to undertake appropriate environmental assessment and monitoring with the aim of minimizing adverse ecological changes and related economic and social consequences. This clause has the most information on the policies, and responsibilities associated with Alaska hatchery program. There is some discussion of the ecological interactions between hatchery and wild salmon but many studies were not cited and the interactions were largely discounted. Naish et al. (2008) provide a thorough review of ecological interactions between hatchery and wild salmonids. In addition, new information is now available. Grant (2012) provided an overview of potential negative interactions of enhancement activities in Alaska inferred from studies in other areas. Preliminary results of study on the effects of gene introgression from hatchery chum salmon in PWS were presented at a recent workshop (Habicht et al. 2012). Presenters found that historical chum salmon population structure in PWS is still present in contemporary populations; however these populations are slowly becoming more similar to the hatchery population. Populations geographically closest to hatcheries have become more similar to the hatchery population than populations more distant from the hatcheries, a pattern that is consistent with hatchery straying observations. They concluded by recommending that straying be reduced through improved culture practices and number of hatchery releases. A number of presentations given at a NPAFC workshop in Nanaimo, B.C. last fall explored evidence of density dependent interactions in the North Pacific. These presentations can be viewed at http://www.npafc.org/new/events/workshops/workshop2011/workshop_presentations.html.

Recent Developments that Could Affect the Assessment

The Alaska Coastal Management Program (ACMP) ended on July 1, 2011 because the Alaska Governor and Legislature failed to agree on conditions for extending the program. The ACMP was cited, in part, to justify ratings for nine supporting clauses (under 3 fundamental clauses). The surveillance team needs to re-examine the ratings for these clauses to see if they are still justified.

Stakeholder name: Sustainable Fisheries Partnership
http://www.sustainablefish.org/

1. ADF&G 2009 internal review of Prince William Sound Aquaculture Corporation (PWSAC): this report describes several problems with PWSAC management and operations, including several criminal and permit violations and information regarding straying and hatchery marking. This report was pulled from ADF&G's website in 2010 (the linkhttp://www.sf.adfg.state.ak.us/FedAidPDFs/SP09-10.pdf no longer functions), and no information regarding implementation of recommendations included in the report has been made public.

2. Brenner et al. article on hatchery straying: This 2012 publication includes results of new studies on hatchery salmon straying in Prince William Sound. These results indicate that there are much larger amounts of straying in some regions of the Sound than that indicated by prior studies - in areas of high straying, proportions of hatchery fish at spawning grounds far exceed thresholds suggested by ADF&G and other researchers in past management plans and research publications.

3. Internal memo from chief ADF&G scientists (Commercial and Sport Divisions) to Jeff Regnart, Division of Commercial Fisheries Director: In this memo, internal ADF&G scientists argue against approval of 2011 PWSAC requests to increase hatchery production of pink salmon at three of its hatcheries. The memo was overlooked and permitted capacity at Cannery Creek Hatchery was increased by 34 million pink salmon eggs. Notably, the Brenner et al. publication indicates that there is significant straying of hatchery fish from this facility.

4. 2011 Review of Prince William Sound escapement goals: ADF&G reviews escapement goals on a region-by-region basis every three years, and presents its recommendations to the Board of Fisheries for approval. Several outstanding MSC conditions involve incorporation of straying study results into escapement goals in Prince William Sound. This would likely involve raising certain escapement goals in order to allow more wild spawners access to spawning grounds in light of high straying in particular regions. Instead, ADF&G applied a "percentile approach" to all escapement goals in the region, resulting in a decrease of the lower bounds of all district Sustainable Escapement Goals for pink salmon.