ALASKA RESPONSIBLE FISHERY MANAGEMENT CERTIFICATION SURVEILLANCE REPORT

For The

US Alaska Salmon Commercial Fisheries

Applicant group

Alaska Fisheries Development Foundation

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Glossary

ABC	Allowable Biological Catch
ADFG	Alaska Department of Fish and Game
AFA	American Fisheries Act
AFDF	Alaska Fisheries Development Foundation
AFSC	Alaska Fisheries Science Center
ASMI	Alaska Seafood Marketing Institute
BOF	Board of Fisheries
BSAI	Bering Sea and Aleutian Islands
CCRF	Code of Conduct for Responsible Fisheries
CDQ	Community Development Quota
CFEC	Commercial Fisheries Entry Commission
CPUE	Catch per Unit Effort
EIS	Environmental Impact Statement
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
ESA	Endangered Species Act
FAO	Food and Agriculture Organization of the United Nations
FMP	Fishery Management Plan
GOA	Gulf of Alaska
GHL	Guideline Harvest Level
IFQ	Individual Fishing Quota
IRFA	Initial Regulatory Flexibility Analysis
IRIU	Improved Retention/Improved Utilization
LLP	License Limitation Program
MSFCMA	Magnuson-Stevens Fisheries Management and Conservation Act
mt	Metric tons
MSY	Maximum Sustainable Yield
NEPA	National Environmental Policy Act
nm	Nautical miles
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPFMC	North Pacific Fishery Management Council
OFL	Overfishing Level
OLE	Office for Law Enforcement
OY	Optimum Yield
PSC	Prohibited Species Catch
RACE	Resource Assessment and Conservation Engineering
REFM	Resource Ecology and Fisheries Management
RFM	Responsible Fisheries Management
SAFE	Stock Assessment and Fishery Evaluation (Report)
SSC	Scientific and Statistical Committee
SSL	Steller Sea Lion
TAC	Total Allowable Catch
USCG	U.S. Coast Guard

I. Summary and Recommendations

The main Key outcomes have been summarized in Section 5 "Assessment Outcome Summary".

II. Assessment Team Details

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1. Introduction

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 4th surveillance assessment against the requirements of the FAO-Based RFM Conformance Criteria Version 1.2 Fundamental clauses.

This 4th Surveillance Report documents the assessment result for the continued certification of commercially exploited Alaska Salmon fisheries to the Alaska RFM Certification Program. This is a voluntary program that has been supported by ASMI who wishes to provide an independent, third- party certification that can be used to verify that these fisheries are responsibly managed according to the Alaska RFM Program.

The assessment was conducted according to the Global Trust procedures for Alaska RFM Certification using the fundamental clauses of the FAO-Based RFM Conformance Criteria 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. It is based on six 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); including:

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) that guide the FAO-Based RFM Certification Program surveillance assessment.

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

1.1. Recommendation of the Assessment Team

Based on the outcome of this 4th Surveillance Assessment for the US Alaska Commercial Salmon Fisheries, Global Trust Certification confirms continued certification of these fisheries under this (Alaska) FAO Based Responsible Fisheries Management Certification Program:

U.S.A. Alaska commercial salmon, including 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 Fisheries Development Foundation**	Date:	**January 2016**
Correspondence Address:	P.O. Box 2223, Wrangell, AK 99929-2223		
Street :			
City :	**Wrangell**		
State:	**Alaska**		
Country:	***USA***		
Phone:	**907-276-7315**	**E-mail Address:**	jdecker@afdf.org
Key Management Contact Information			
Full Name:	*(Last)* **Decker**	*(First)* **Julie**	
Position:	***Director***		

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

City/Date /Time	Attendants	Location
Anchorage	**ADFG**	APICDA (Aleutian Pribilof Islands Community Development Association) Office.
1/25/16	*In Person* Eric Volk, Bert Lewis, Jack Erickson	
9:30 AM	*Phone* Scott Kelley	APICDA office
	AFDF	717 K Street
	In Person Dave Gaudet	Anchorage AK 99501
	SAIG	
	In Person Dr Ivan Mateo,Dr Brian Allee, Scott Marshall (Remote Audit)	
	Private Hatcheries Managers	
Anchorage	*In Person*, Gary Fandrei CIAA	APICDA office
1/25/16	*Phone* Dave Regiani(PWSAC*)* Tina Fairbanks (KAAA) Sam Rabung (ADF&G)	717 K Street
2:00 PM	**AFDF**	Anchorage AK 99501
	In Person	
	Dave Gaudet	
	SAIG	
	In Person Dr Ivan Mateo,Dr Brian Allee, Scott Marshall (Remote Audit)	
Juneau	**ADFG**	ADFG office
1/27/16	*In Person* Scott Kelley, Forrest Bowers, Lowell Fair, Ed Jones Sam Rambung	1255 W 8th St, Juneau, AK 99802
9:30 AM	**AFDF**	
	In Person Dave Gaudet	
	SAIG	
	In Person Dr Ivan Mateo,Dr Brian Allee, Scott Marshall (Remote Audit)	
Juneau	**DIPAC**	Douglas Island Pink and Chum, Inc (DIPAC)
1/28/16	*In Person* Eric Prestegaard (DIPAC), John Burke (SSRAA), Steve Reifensthul (NSRAA), Alex Weirthamer (DIPAC)	2697 Channel Dr, Juneau, AK 99801
9:30 AM	**AFDF**	
	In Person Dave Gaudet	
	SAIG	
	In Person Dr Ivan Mateo,Dr Brian Allee, Scott Marshall (Remote Audit)	
Juneau	**AFDF**	
1/28/16	*In Person* Dave Gaudet, Julie Decker	Client Meeting
5:30 PM	**SAIG**	
	In Person Dr Ivan Mateo,Dr Brian Allee, Scott Marshall (Remote Audit)	

5. Assessment Outcome Summary

Fundamental Clauses Summaries

Clause 1: Structured and legally mandated management system
Evidence adequacy rating: High
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 a 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. The NPFMC FMP prohibits commercial salmon fisheries in the modified West Area and continues 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. No significant changes at the management level occurred between 2013 and 2014.

Clause 2: Coastal area management frameworks
Evidence adequacy rating: High
The institutional capacity of existing agencies, 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. Moreover, the available public processes between fishermen and other users and between fishermen (i.e. Board of Fisheries process) tends to bring stakeholders together early during proposals about coastal developments and avoid conflict to various degrees. Courts of law are used when conflict cannot be resolved through other processes.

Clause 3: Management objectives and plan
Evidence adequacy rating: High
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 an active policy of the state and are based on providing adequate 'escapement' or spawning stock in each generation. The Fishery Management Plan for the Salmon Fisheries in the EEZ off the Coast of Alaska (FMP) manages the salmon fisheries in the United States Exclusive Economic Zone (EEZ; 3 nautical miles to 200 nautical miles offshore) off Alaska. The North Pacific Fishery Management Council (NPFMC) developed this FMP under the Magnuson-Stevens Fishery Conservation and Management Act (MSA). The Secretary of Commerce approved the FMP and it became effective in 1979. The FMP was comprehensively revised in 1990 and 2012.

Clause 4: Fishery data
Evidence adequacy rating: High
No major change has occurred since the 3rd surveillance assessment other than a new annual fishing cycle in which the annual run strength was assessed, and harvest statistics collected.
The core of Alaska's fishery abundance –based management system is; 1) the establishment of escapement goals and BOF Management Plans, 2) in-season assessment of run strength via fishery dependent data and independent assessment of numbers of fish escaping the fishery to spawn; and 3) delegated local authority to summarily open and close times and areas where fishing may occur.
Fishery harvest data are collected by tallying sales receipts. By Alaska law (AS 16.05.690) each buyer of

fish is required to keep a record of each purchase showing the name or number of the vessel landing the catch, the date of landing, vessel license number, pounds purchased of each species, number of each species, and the ADFG statistical area where the fish were harvested, as well as other information ADFG may require for specific fisheries or areas. On an in-season basis, Area Management Biologists may also obtain rapid assessments of harvest via telephone surveys of processors, or sub-sampling of individual fishers on the fishing grounds. In several fisheries, in-season estimates of stock composition or hatchery/wild composition are also made.

Clause 5: Stock assessment
Evidence adequacy rating: High
In addition to the ADF&Gs stock assessment activities that are fishery dependent, (e.g. estimating harvest numbers, stock and age composition of harvests, migration timing and pathways), the Department undertakes extensive and intensive assessment of the numbers, age composition, and distribution of the escapements. Assessing the escapement of salmon in Alaska requires many different approaches depending on local circumstances. The depth of the stock assessment toolkit in the state reflects a high scientific standard in support of optimal resource use and rivals that of any other agency in the Pacific Rim. However, the sheer magnitude and diversity of salmon spawning population spread over the vast landscape of a State that is over 500,000 square miles of land mass and nearly 7000 miles of coastline is challenging.

Clause 6: Biological reference points and harvest control rule
Evidence adequacy rating: High
Scientifically defensible escapement goals are the reference points used to manage Alaska salmon fisheries. The legal authority to set and manage harvest so as achieve these goals is founded in the Alaska Constitution's sustained yield principle Article VIII, section 4) and in state statute (AS 16.05.020).

Clause 7: Precautionary approach
Evidence adequacy rating: High
Alaska's policies for Sustainable Fisheries Management, embodied in the State Constitution and regulations, includes key elements of the precautionary approach for salmon fisheries and habitats. Faced with various uncertainties current evidence provided by ADF&G is consistent with a conservative approach to the management of salmon stocks, fisheries, artificial propagation, and essential salmon habitats. Holding 2013 increases in hatchery production to modest levels provides corrective evidence sufficient to maintain the previous minor non-conformance determination issued in 2012 under this clause.

This requires application of prudent foresight; avoidance of irreversible changes; and importantly, priority to conserving productive capacity of the resource. Two pressing salmon management issues in Alaska are: depressed runs, declining productivity, and biological changes in age and size of statewide Chinook salmon populations, especially the AYK region; and, in light of new findings documenting genetic introgression of hatchery fish into wild populations, concerned awareness over significant straying of hatchery pink salmon in Prince William Sound (PWS) and chum salmon in Southeast Alaska (SEAK). ADF&G management has limited commercial and sport fisheries and traditional subsistence harvest of Chinook salmon to meet escapement goals and international treaty obligations. ADF&G also has taken the lead in developing partnerships with other state and federal agencies, academia, and NGOs to implement the new comprehensive Chinook Salmon Stock Assessment and Research Plan involving 12 key stocks in all regions of the state. Initial funding for this plan, secured in 2013 was sufficient for 2014 field work with uncertainty about future funding. A complementary AYK Chinook Salmon Research Action Plan developed through the AYK Sustainable Salmon Initiative is directed at these critical management issues in Western Alaska. Focused on hatchery-wild interactions of pink and chum salmon in PWS and SEAK, a new long term Alaska Hatchery Research Program coordinated and funded by state, industry, Regional Aquaculture Associations and academia completed its second field season in 2013. Following specific schedules of tasks and reports

from a research plan developed by a science panel, intensive field work and sampling in both regions is directed by Prince William Sound Science Center. This research, designed to provide definitive information on impacts of different levels of straying on the genetic structure and fitness of wild stocks, gives credence to appropriate levels of risk assessment involving this complex issue. Funding supporting new research plans for both Chinook salmon and hatchery-wild stock interactions with pink and chum salmon is essential for providing critical information needed for maintaining precautionary approach principles in Alaska salmon management.

Clause 8: Management measures
Evidence adequacy rating: High
No significant changes in management measures have occurred from the previous surveillance report in 2013. Escapement goals are essentially the harvest control rule used for management of Alaska salmon. Currently, there are 296 active salmon stock escapement goals throughout the state of Alaska. However, not all Alaska salmon fisheries and salmon stocks are managed with formal escapement goals, but instead, through in-season management and emergency orders. In season management involves opening and closing geographical areas and prosecuting (commercial, sport, subsistence) components of the fishery using emergency orders, based on run size projections, historical and contemporary escapement estimates, intensive harvest monitoring, fishing-effort monitoring, and escapement monitoring, environmental conditions, stock sampling data and any other available information. During the 2013 calendar year ADFG issued about 800 emergency orders to open and close commercial salmon fisheries in the Alaska. Fisheries regulations are published for the various areas in Alaska. These documents contain selected Alaska statutes enabling legal management of resources, statewide general provisions, management plans, gear allowances, closed and open areas, and all the other area specific provisions. These regulations may be changed in-season by emergency regulations or emergency orders at any time to allow sufficient escapements. 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. 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). 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.

Clause 9: Management measures to produce maximum sustainable levels
Evidence adequacy rating: High
No significant changes have occurred since the last surveillance assessment in 2013. 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 sufficient salmon to escape and spawn in their relative natal rivers, and enable them to produce, over the long term, maximum sustainable levels. 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.

Clause 10: Appropriate standards of fisher’s competence
Evidence adequacy rating: High
Fishing operations are carried out by fishers with appropriate standards of competence in accordance with international standards and guidelines and regulations. Training programs for fishermen are widely available throughout Alaska.

Clause 11: Effective legal and administrative framework

Evidence adequacy rating: High
The Alaska Department of Public Safety, Alaska State Troopers Division of Wildlife Troopers (AWT) 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.

Clause 12: Framework for sanctions
Evidence adequacy rating: High
Alaska salmon management is supported by a framework for sanctions for violations and illegal activities of adequate severity to support compliance and discourage violations. Salmon management is entrusted to ADFG, pursuant to Alaska Statutes Title 16 (AS16) and Alaska Administrative Code Title 5 (5AAC). These laws and regulations are enforced by the AWT which is the State enforcement agency within 0-3 nautical miles jurisdiction. AWT coordinates with, and is supported when required, by law enforcement personnel from USCG and NMFS Office of Law Enforcement (OLE). The US Forest Service USFS) and the US Fish and Wildlife Service (USFWS) also work with AWT on the enforcement of fish and game regulations (both state and federal) on federal public land.

Clause 13: Impacts of the fishery on the ecosystem
Evidence adequacy rating: High
No significant changes have occurred since the previous surveillance assessment in 2013. Alaska's Sustainable Salmon Policy includes provisions addressing the potential effects of ecological changes/perturbations on sustainable 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 does not appear to be a significant issue in most Alaska salmon fisheries. Most non-targeted fish harvested in salmon fisheries are other species of salmon and these are reported on fish tickets. Salmon bycatch in the groundfish fisheries in the Bering Sea Aleutian Islands and the Gulf of Alaska are formally 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 gear as used in other fisheries). Takes of endangered species, e.g. Chinook from the Columbia River system, are regulated (e.g. Pacific Salmon Treaty regulations). Potential negative effects of the Alaska salmon fisheries is represented by the dynamics surrounding the ecological and genetic interactions between wild and hatchery salmon and between salmon and other species.

Clause 14: Fisheries Enhancement Activities
Evidence adequacy rating: High
Hatchery production of salmon in Alaska is transparently regulated by a state administrated permitting process that annually evaluates on the economic gains and ecological risks associated with changes to fisheries enhancement activities and rules on their implementation. ADF&G actively supports and participates in research aimed to evaluate the effects of salmon fisheries enhancement on the genetic structure and diversity of natural salmon populations. Research activities include, but are not limited to, genetic stock identification of catch in mixed stock fisheries, surveys to estimate hatchery salmon stray rates, and genetic analyses to estimate extant genetic structure and introgression rates from hatchery salmon into wild populations. Research findings have revealed wide ranges of stray rates by hatchery sockeye, pink and chum salmon in Alaska's Prince William Sound. Highest proportions of hatchery pink salmon were observed in streams in relatively close proximity to a hatchery, though similar patterns were not evident for other species. Interestingly, genetic introgression rates from hatchery chum salmon appeared to be most strongly (and positively) correlated with spawn-timing overlap, and not proximity to

hatchery facilities.

6. Conformity Statement

Following this 4th surveillance assessment Global Trust confirms 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).

A. The Fisheries Management System

Fundamental 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.

No. Supporting clauses	**17**
Supporting clauses applicable	**9**
Supporting clauses not applicable	**8**
Overall level of conformity	**HIGH**
Non Conformances	**0**

Summarized evidence:

The structure and function of the management system governing the Salmon fisheries in Alaska.

1.1 There shall be an effective legal and administrative framework established at local and national level appropriate for the fishery resource and conservation and management.

State Management

The Alaska Department of Fish and Game (ADFG) 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. Alaska's commercial salmon fisheries are administered through the use of four 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[1].

Constitution, statutes and regulations

Almost all of Alaska's salmon fisheries take place in the internal waters (0-3 nm, and other enclosed

[1] ADF&G Commercial Salmon Fisheries http://www.adfg.alaska.gov/index.cfm?adfg=CommercialByFisherySalmon.main

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[2].

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[3]. Of particular relevance to this assessment are the following regulations relative to the commercial salmon fisheries: [4] Commercial and Subsistence Fishing and Private Nonprofit Salmon Hatcheries (5 AAC 1 - 5 AAC 41) - Fish and Game Advisory Committees (5 AAC 96 - 5 AAC 98).

Federal FMP and salmon management

In 2012 NMFS adopts a final rule to implement Amendment 97 to the FMP for Groundfish of the GOA. This amendment limits Chinook salmon prohibited species catch in Western and Central GOA non-pollock trawl catcher/processor and catcher vessel fisheries. Effective January 1, 2015. Amendment 97 is intended to promote the goals and objectives of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), the FMP, and other applicable laws[5].

1.2 Management measures shall take into account the whole stock unit over its entire area of stock distribution

ADFG Commercial Fisheries Division offices are situated throughout the range of commercial salmon fisheries[6]. Institutional framework for fisheries management includes supervisory, administrative, technical, biometric, research, and management staff. The staff is 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, preseason forecasts and other published work), 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 are 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.

1.7. Review and Revision of conservation and management measures

1.8. Transparent management arrangements and decision making

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

[2] Alaska's Constitution A Citizens Guide http://w3.legis.state.ak.us/docs/pdf/citizens_guide.pdf

[3] Office of the Lieutenant Governor http://ltgov.alaska.gov/treadwell/services/alaska-constitution/article-viii-96A0natural-resources.html

[4] Commercial Fisheries Regulations http://www.adfg.alaska.gov/index.cfm?adfg=fishregulations.commercial

[5] Federal Register/Vol. 79, No. 231/Tuesday, December 2, 2014/Rules and Regulations https://alaskafisheries.noaa.gov/sites/default/files/79fr71350.pdf

[6] ADF&G Contacts by location http://www.adfg.alaska.gov/index.cfm?adfg=contacts.main

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 by the Sustainable Salmon Fishery Policy. 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, and meets about six times per year[7] in communities around the state to consider proposed changes to fisheries regulations around the state.

1.9. Compliance with international conservation and management measures

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. Biologists and other ADFG staff sometimes participate in enforcement activities and assist AWT[8,9].

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[10].

[7] Alaska Board of Fisheries Meeting Information http://www.adfg.alaska.gov/index.cfm?adfg=fisheriesboard.meetinginfo
[8] ADF&G Enforcement of Alaska's Fish & Wildlife Laws http://www.adfg.alaska.gov/index.cfm?adfg=enforcement.main
[9] Dept. of Public Safety Alaska Wildlife Troopers Mission statement http://www.dps.state.ak.us/AWT/mission.aspx
[10] United States Coast Guard http://www.uscg.mil/d17/

Fundamental 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.

No. Supporting clauses	**16**
Supporting clauses applicable	**15**
Supporting clauses not applicable	**1**
Overall level of conformity	**HIGH**
Non Conformances	**0**

Summarized evidence

2.1. Appropriate policy, legal and institutional framework adopted to achieve sustainable and integrated use of living marine resources.

The ADF&G, NMFS and the NPFMC participate in coastal area management-related institutional frameworks through the federal National Environmental Policy Act (NEPA) processes, a socio-economic and biological/environmental impact assessment of various proposed scenarios, before the path of action is decided. This occurs whenever resources under their management may be affected by other developments and each time they create, renew or amend regulations. The NEPA processes provide public information and opportunity for public involvement that are robust and inclusive at both the state and federal levels. Fisheries are relevant to the NEPA process in two ways. First, each significant NPFMC fisheries package must go through the NEPA review process. Second, any project that could impact fisheries (i.e., oil and gas, mining, coastal construction projects, etc.,) that is either on federal lands, in federal waters, receives federal funds or requires a federal permit, must go through the NEPA process. In this manner, both fisheries and non-fisheries projects that have a potential to impact fisheries have a built in process by which concerns of the NPFMC, NMFS, state agencies, industry, other stakeholders or the public can be accounted for.

The NEPA process consists of an evaluation of the environmental effects of a federal undertaking including its alternatives. There are three levels of analysis: categorical exclusion determination; preparation of an environmental assessment/finding of no significant impact (EA/FONSI); and preparation of an environmental impact statement (EIS).

2.2/2.3/2.4. Representatives of the fisheries sector and fishing communities shall be consulted in the decision making processes involved in other activities related to coastal area management planning and development. Conflict avoidance and dissemination of management measures

The Board of Fisheries (BOF) seeks to avoid conflict by actively involving stakeholders in the process leading up to decision making. In addition, the 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 84 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[11]

2.5. The economic, social and cultural value of coastal resources shall be assessed in order to assist decision-making on their allocation and use.

In 2014 the National Oceanic and Atmospheric Administration's (NOAA) National Ocean Service (NOS) and National Marine Fisheries Service's Alaska Fisheries Science Center (AFSC) proposed to collect data on non-economic values related to subsistence salmon fishing and use in Alaska. Data are needed to support Natural Resource Damage Assessment (NRDA) and resource restoration analysis and activities.[12]

2.6/2.7. Research and monitoring of the coastal environment

The coastal zone is monitored as part of the coastal management process using physical, chemical, biological, economic and social parameters. Involvement include federal and state agencies and programs including the U.S. Forest Service, U.S. Fish and Wildlife Service, NMFS Pacific Marine Environmental Lab (PMEL), the Alaska Department of Environmental Conservation (DEC) Division of Water, ADFG Habitat Division, the AFSC's "Ecosystem Monitoring and Assessment Program", The NMFS' Habitat Conservation Division (HCD) and their Essential Fish Habitats (EFH) monitoring and protection program, the U.S. Coast Guard, the NMFS Alaska Regional Office's Restricted Access Management Program (RAM), the Alaska National Interest Lands Conservation Act (ANILCA) federal agencies cooperation directive, and the Department of Natural Resources (DNR) Office of Project Management and Permitting (OPMP) coordinating the review of large scale projects in the state of Alaska.

[11] ADF&G Alaska's Fisheries and Game Board Process http://www.adfg.alaska.gov/index.cfm?adfg=process.main
[12] Federal Register/Vol. 79, No. 204/Wednesday, October 22, 2014/Notices
https://alaskafisheries.noaa.gov/sites/default/files/79fr63085_0.pdf

Fundamental 3

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

No. Supporting clauses	**6**
Supporting clauses applicable	**6**
Supporting clauses not applicable	**0**
Overall level of conformity	**HIGH**
Non Conformances	**0**

Summarized evidence:

3.1. Long – term management objectives shall be translated into a plan or other management document and be subscribed to by all interested parties.

3.2. Management measures should limit excess fishing capacity, promote responsible fisheries, take into account artisanal fisheries, protect biodiversity and allow depleted stocks to recover.

At the backbone of management are Alaska State Statutes and the Alaska Administrative Codes (AAC) 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. Policy for the management of mixed stock salmon fisheries
- 5 AAC 39.222. Policy for the management of sustainable salmon fisheries
- 5 AAC 39.223. Policy for statewide salmon escapement goals.

The AAC addresses each fishery uniquely, in Chapters 3-40 of Title 5. Each salmon fishery is legally defined and addressed by specific geographical area, season, legal gears, and vessel requirements etc. within its specific chapter. Regulations are available in paper and electronic formats. These AAC describe details about the management plans for the major salmon stocks in the four management regions of Alaska[13].

The implementation of the management objectives is then realized through management rules and actions formulated in the commercial fisheries regulations for the four regions. As for management of the salmon stocks in Alaska, the regulations outlined in these documents may be changed by emergency regulations or emergency orders (e.g. close and open fisheries) at any time given the highly flexible and responsive nature of escapement goal based management in Alaska[14].

Federal FMP for Alaska Salmon

Although the overwhelming majority of Alaska salmon is harvested within State waters (up to 3 nm) some harvest occurs within federal waters (3-200 nm). The salmon troll fishery in Southeast Alaska is such an example. The *Fishery Management Plan for the Salmon Fisheries in the EEZ off the Coast of Alaska* (FMP)[15]

[13] Alaska Statutes http://www.touchngo.com/lglcntr/akstats/statutes.htm

[14] ADF&G Commercial Salmon Fisheries Regulations http://www.adfg.alaska.gov/index.cfm?adfg=fishregulations.commercial

[15] Fishery Management plan for the Salmon fisheries in the EEZ off Alaska NPFMC, NMFS, ADF&G June 2012 http://www.npfmc.org/wp-content/PDFdocuments/fmp/Salmon/SalmonFMP114.pdf

manages the salmon fisheries in the United States Exclusive Economic Zone (EEZ; 3 nautical miles to 200 nautical miles offshore) off Alaska. The North Pacific Fishery Management Council developed this FMP under the Magnuson-Stevens Fishery Conservation and Management Act (MSA). The Secretary of Commerce approved the FMP and it became effective in 1979. The FMP was comprehensively revised in 1990 and 2012.

The FMP relies on a combination of State management and management under the Pacific Salmon Treaty (PST) to ensure that salmon stocks including transboundary stocks are managed as a unit throughout their ranges and that interrelated stocks are managed in close coordination. Maintaining the FMP in the East Area leaves existing management structure in place, recognizing that the FMP is the nexus for the application of the PST and other applicable Federal laws. The Council has identified the following six management objectives to carry out the management policy for this FMP:

1. Prevent overfishing and achieve optimum yield
2. Manage salmon as a unit throughout their range
3. Minimize bycatch and bycatch mortality
4. Maximize economic and social benefits to the nation over time
5. Protect wild stocks and fully utilize hatchery production
6. Promote safety

US-Canada Salmon Fisheries Management Arrangements

In May, 2008 the Pacific Salmon Commission, the implementing body of the PST, recommended a new bilateral agreement for the conservation and harvest sharing of Pacific salmon to the Governments of Canada and the United States. The product of nearly 18 months of negotiations, the agreement represents a major step forward in science-based conservation and sustainable harvest sharing of the salmon resource between Canada and the United States of America. Approved in December, 2008 by the respective governments, the new fishing regimes are in force from the beginning of 2009 through the end of 2018 and were last updated in July 2014[16].

Hatchery Program Policies

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.

- 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

[16] Treaty between the Government Of Canada and the Government of the United States of America concerning Pacific salmon: http://www.psc.org/pubs/Treaty/Treaty.pdf

- 1994 Sockeye salmon culture policy
- 1994 Fish resource permit policy
- 2000 Sustainable salmon management policy[17]

[17] Salmon Hatcheries in Alaska Plans, Permits, and Policies that Provide Protection for Wild Stocks Steven G. McGee ADF&G http://www.adfg.alaska.gov/static/fishing/PDFs/hatcheries/mcgeebrochure.pdf

B. Science and Stock Assessment Activities

Fundamental 4

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

No. Supporting clauses	**14**
Supporting clauses applicable	**9**
Supporting clauses not applicable	**5**
Overall level of conformity	**HIGH**
Non Conformances	**0**

Summarized evidence:

4.1. Reliable and accurate data required for assessing the status of fisheries and ecosystems - including data on retained catch of fish, bycatch, discards and waste shall be collected.

Pattern of Harvest

The 2014 harvest of 98.4 million pink salmon was similar to recent even-year harvests. Odd year harvests in recent years have been substantially higher because of much larger runs of pink salmon.

The statewide harvest of wild salmon since 1900 shows three periods. After an initial period when the fisheries were initiated (1915 -1949) the average harvest was 79.1 million. The period 1950 – 1979 was characterized by severe reductions in harvest (average 46.9 million). The decline in harvest precipitated the development of hatchery program in Alaska. The first commercial harvest of hatchery-origin fish began in 1977. Average harvests since 1980 of wild fish have been the highest (117.6 million) in Alaska's 115 year history. The pattern of record catches occurring over multiple generations is evidence that the state's abundance-based management system has produced sustainable harvests at a high level of productivity.

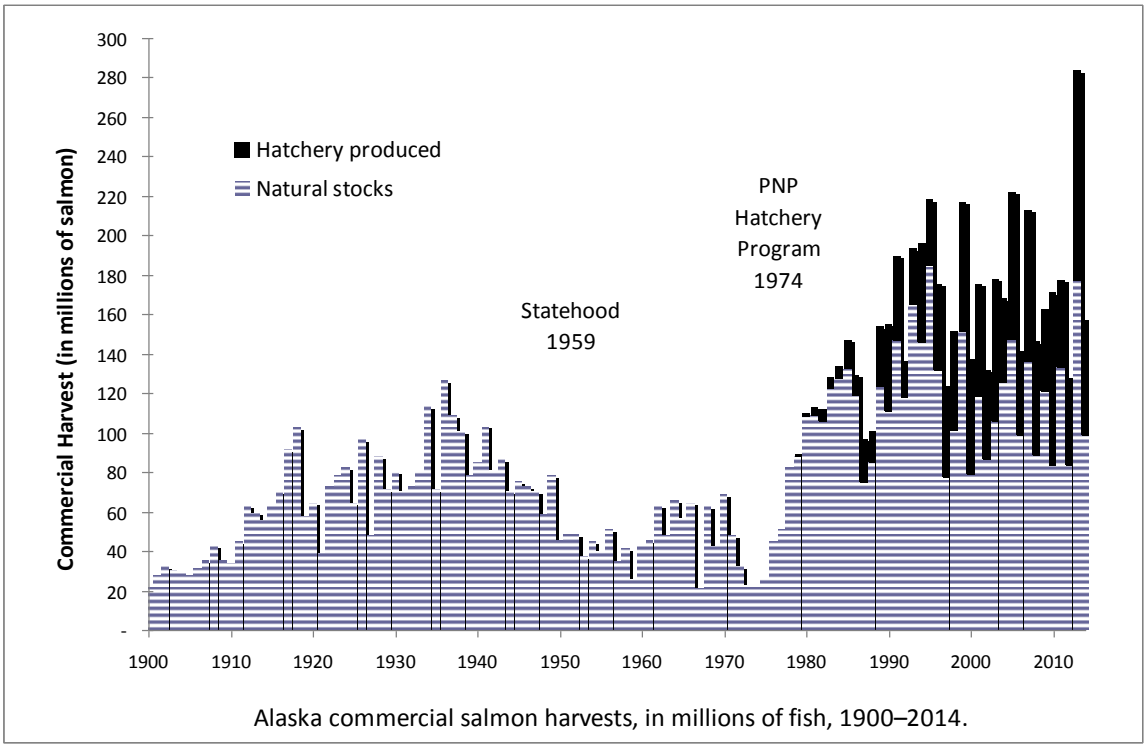

Figure 1. Alaska Commercial Salmon Harvests, in millions of fish, 1900-2014
Chinook salmon catches, especially the Arctic- Yukon-Kuskokwim area have been lower in recent years than historically, and this has led the State to adopt an intensive research program. [18]

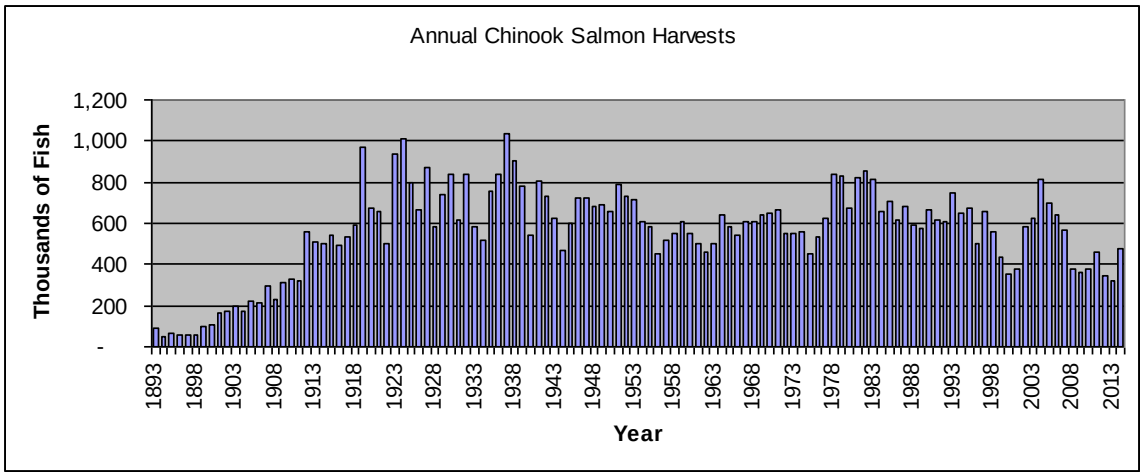

Figure 2. Annual Chinook Salmon Harvests
Catches of sockeye salmon have been, and remain at the highest levels observed as have catches of coho.

[18] ADF&G Chinook Salmon Research Initiative http://www.adfg.alaska.gov/index.cfm?adfg=chinookinitiative.main

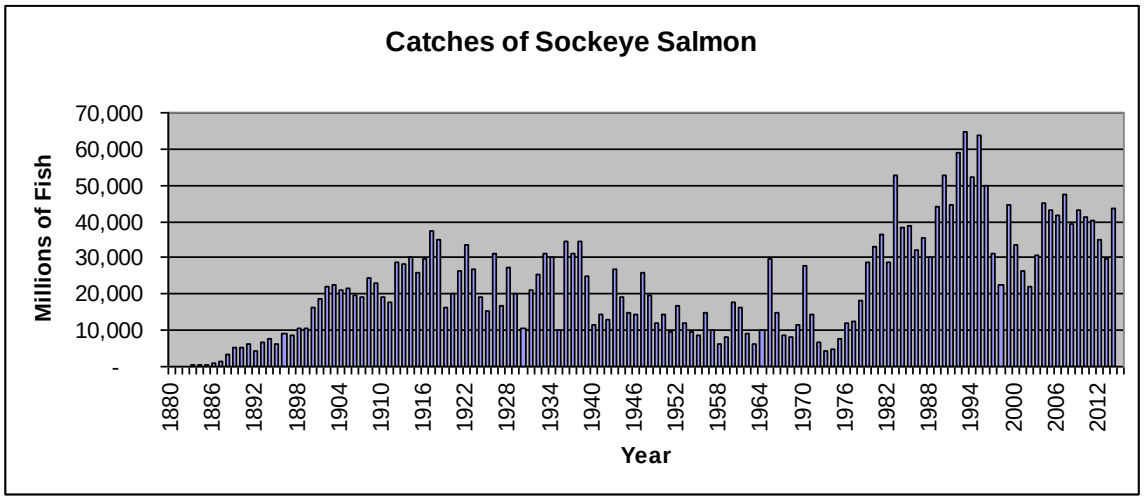

Figure 3. Catches of Sockeye Salmon

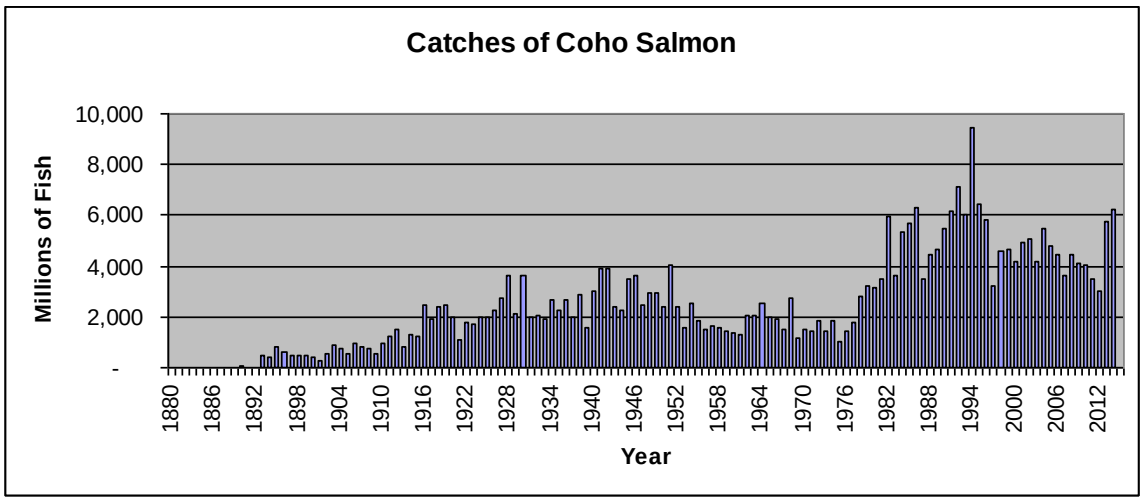

Figure 4. Catches of Coho Salmon

Catches of pink and chum salmon have been at or near record levels, however a significant portion of pink salmon in Prince William Sound and of chums in Southeast are of hatchery origin.

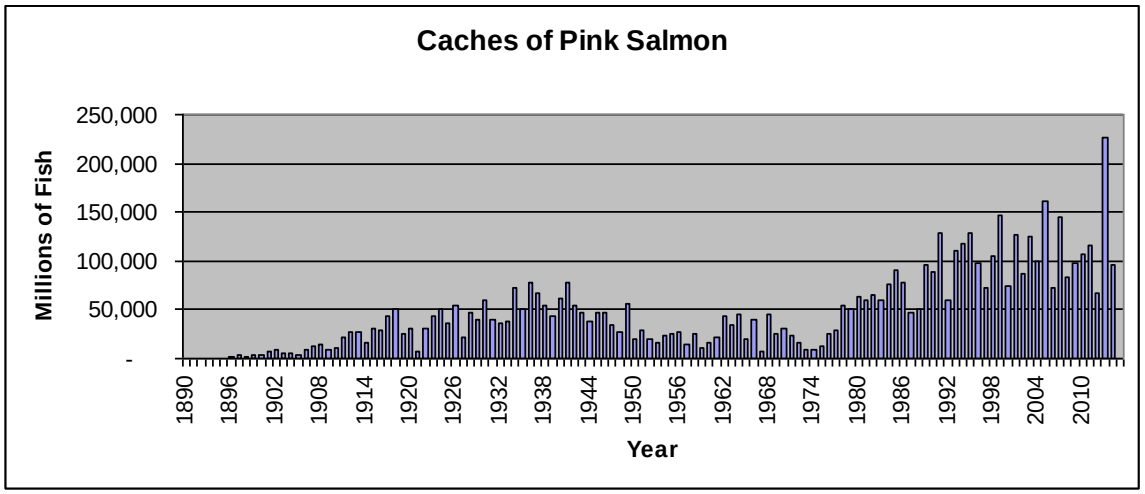

Figure 5. Annual Catch of Pink Salmon

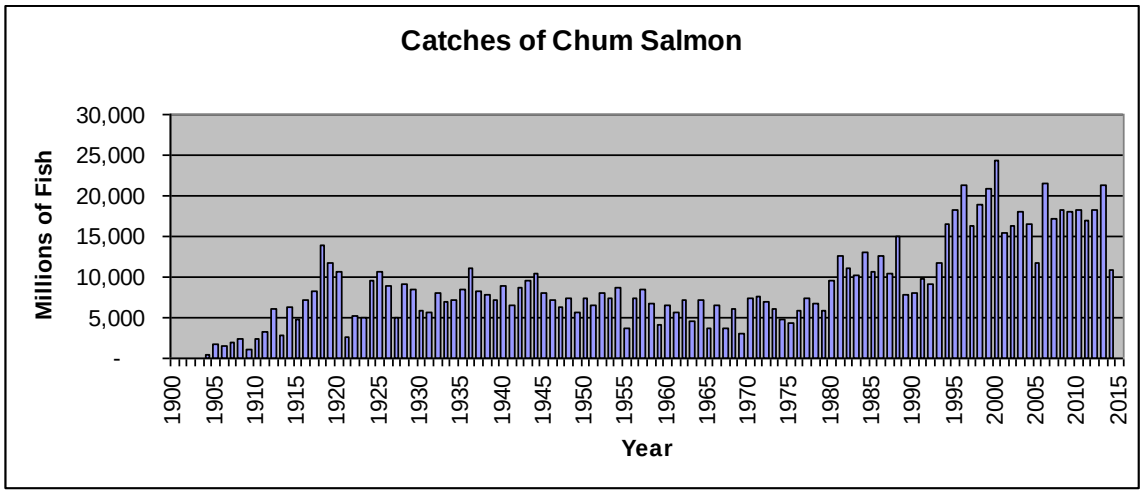

Figure 6 Annual Catch of Chum Salmon

In addition to catch, a substantial amount of varying types of data is collected from harvested fish to assess run strength. The types of data collected and analyzed vary widely depending upon local management needs. It is beyond the scope of a surveillance audit to provide detailed compilation of these programs but a few examples are provided to illustrate the scope of programs.

Age –Sex and Size Data

Because all Pacific Salmon, other than pink salmon, mature at various ages it is necessary to sample harvested fish to obtain estimates of age and size of fish returning by sex (AWL data). These data, when coupled with similar estimates for the number of fish escaping provide the data required to estimate productivity, sustained yield and are used to set biological based and sustainable (BEG and SEG) escapement goals. There is extensive effort statewide to collect AWL data from the state's commercial fisheries.

Stock Composition

Many, if not most of Alaska's commercial harvest, occurs in areas where harvests are composed of more than one stock of fish. Understanding the stock composition of these harvests has been a long standing and ongoing effort of the Department. The need for stock composition data and the approaches vary widely. Selected highlights of the Departments program are provided below.

Coded Micro-wire Tagging and Recovery: Coded micro-wire tags (CWT) are used almost exclusively for Chinook and coho salmon. Notable programs that use CWT include the following:

1. In response to declines in Chinook salmon and recognition that little was known about the life history and productivity outside of select streams in the Southeast Region, the state has undertaken a large research program to obtain these data for 12 "indicator stocks" throughout the state. Coded micro-wire tags will help determine in what fisheries these stocks are harvested, what the harvest rates are in the various fisheries and the annual survival rates.[19]

[19] ADF&G Chinook Salmon Research Initiative http://www.adfg.alaska.gov/index.cfm?adfg=chinookinitiative.main

2. In Southeast Alaska, a series of coho salmon indicator stocks have been tagged for many years. Recovery of these tags has provided data on where these stocks are harvested, what the harvest rates are in the fisheries, and the annual survival rates.[20]

3. The Chinook Technical Committee of the Pacific Salmon Commission uses coded micro-wire tag and recovery data as the basis for determining the status of coast-wide Chinook salmon stocks. This analysis is used to set abundance-based harvest quotas for Southeast Alaska's all-gear harvest if and for ocean fisheries in British Columbia. Recovery of CWT tagged Alaska-origin hatchery Chinook is used to determine what portion of the Southeast catch can be excluded from the quota.[21]

4. To meet internal needs and international commitments share data the Department maintains a lab to read and process coded micro-wire tags[22] .

Otolith Marking and Recovery: Otolith marking is used primarily to determine whether harvested pink, chum and sockeye are of hatchery or wild origin and to determine if fish on the spawning grounds are of hatchery or wild origin. In Prince William Sound and Southeast, the Private Non-profit Hatchery operators play a significant role in both marking the fish and in sampling the fishery and reading the otoliths. The Department maintains an Otolith Lab, where otoliths sampled from selected commercial fisheries, test fisheries, and escapements are read. The Lab also compile an annual "Voucher Report" that documents otolith marks that are induced each year and an on-line database to provide managers information on the number and types of marks recovered each year.[23]

1. In Prince William Sound, the Regional Aquaculture Association otolith marks all of its pink and chum salmon, samples the fishery to determine hatchery wild contributions and reads the otoliths. This provides crucial information to the Department in real time to manage the fishery[24].

2. In Southeast Alaska all hatchery reared chum salmon and sockeye salmon from the Snettisham Hatchery are otolith marked by the hatchery operators. The commercial fisheries are sampled and the information on the contribution of hatchery fish provided to managers[25]. The sockeye data are vital to the management of the Taku gill net fishery under the U.S. Canada Pacific Salmon Treaty[26].

Genetic Stock Identification: The Genetics Conservation Laboratory has made estimates of harvest and harvest rates in several fisheries around the state, some examples include:

1. Since 2006, the Lab has estimated the stock composition of sockeye harvested in the Bristol Bay sockeye fishery and in the Port Moller Test Fishery which is used to update preseason forecasts of Bristol Bay sockeye abundance. [27]

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[20]Regional Operational Plan SF.1J.2015.17 Production and Harvest of Chilkat River Chinook and Coho Salmon, 2015–2016 by Brian W. Elliott, and Sarah J. H. Power http://www.adfg.alaska.gov/FedAidPDFs/ROP.SF.1J.2015.17.pdf .
[21] PACIFIC SALMON COMMISSION JOINT CHINOOK TECHNICAL COMMITTEE ANNUAL REPORT OF CATCH AND ESCAPEMENT FOR 2014 REPORT TCCHINOOK (15)-2 http://www.psc.org/pubs/TCCHINOOK15-2.pdf
[22] ADF&G Tag Lab http://mtalab.adfg.alaska.gov/CWT/Default.aspx
[23] ADF&G Mark Recovery Laboratory http://mtalab.adfg.alaska.gov/OTO/reports.aspx
[24] ADF&G 2014 Prince William Sound Area Finfish Management Report http://www.adfg.alaska.gov/FedAidPDFs/FMR15-34.pdf
[25] ADF&G Annual Management Report of the 2014 Southeast Alaska Commercial Purse Seine and Drift Gillnet Fisheries http://www.adfg.alaska.gov/FedAidPDFs/FMR15-08.pdf
[26] PACIFIC SALMON COMMISSION JOINT TRANSBOUNDARY TECHNICAL COMMITTEE FINAL ESTIMATES OF TRANSBOUNDARY RIVER SALMON PRODUCTION, HARVEST AND ESCAPEMENT AND A REVIEW OF JOINT ENHANCEMENT ACTIVITIES IN 2013 REPORT TCTR (15)-5 http://www.psc.org/pubs/TCTR15-5.pdf
[27] ADF&G Gene Conservation Laboratory
http://www.adfg.alaska.gov/index.cfm?adfg=fishinggeneconservationlab.bbaysockeye_application

2. In the Southeast Region, the Lab conducted a sockeye stock identification in Northern Districts purse seine fisheries. Stock composition data from the Chatham Strait, Icy Strait, and Lynn Canal commercial fisheries was estimated from the genetic baseline and in conjunction with existing escapement monitoring projects, helped provide essential information for a more complete run reconstruction of the harvest.[28]

Scale Pattern Analysis:
Scale pattern analysis is currently used to determine the contribution of Pillar Creek Hatchery sockeye to Kodiak purse seine catches.

4.2. An observer scheme designed to collect accurate data for research and support compliance with applicable fishery management measures shall be established.

4.3. Sufficient knowledge of social, economic and institutional factors relevant to the fishery in question shall be developed through data gathering, analysis and research.

4.4. States shall stimulate the research required to support national policies related to fish as food.

4.5. States shall ensure that the economic, social, marketing and institutional aspects of fisheries are adequately researched and that comparable data are generated for ongoing monitoring, analysis and policy formulation.

4.6. States shall investigate and document traditional fisheries knowledge and technologies, in particular those applied to small scale fisheries, in order to assess their application to sustainable fisheries conservation, management and development.

Historical Studies:
There has been an 80 year effort to research Alaska salmon. Under Federal management, the Bureau of Commercial Fisheries initiated numerous studies. In the late 1940's the University of Washington's Fishery Research Institute began large scale studies on the high seas, in Bristol Bay, Chignik, Kodiak and Southeastern Alaska with funding from the Alaska processing industry[29]. At statehood in 1959 the Department initiated studies and in the 1970's the University of Alaska joined the research effort[30]. Since then, new players like the Prince William Sound Science Center[31] have joined the effort and NOAA Fisheries[32] has continues a long history of salmon research in the marine environment. Many of the studies by these agencies documented stock composition, migration timing in mixed stock fisheries, productivity and other life history attributes through a variety of methods including mark-recovery, scale patterns analysis and genetic methods.[33] Several of these studies still form a basis for management of many mixed stock fisheries even though they are not repeated annually.

[28] ADF&G Chatham Strait, Icy Strait, and Lynn Canal Fisheries Sockeye Salmon Genetic Stock Identification (GSI) Project http://www.adfg.alaska.gov/index.cfm?adfg=fishinggeneconservationlab.chatham_icy_lynncanal_project .
[29] Alaska Salmon Program University of Washington http://depts.washington.edu/aksalmon/
[30] University of Alaska Fairbanks School of Fisheries and Ocean Science http://www.uaf.edu/sfos/research/fisheries/
[31] Prince William Sound Science Center http://pwssc.org/research/fish/
[32] NOAA Fisheries Alaska Fisheries science center Auke Bay Labs http://www.afsc.noaa.gov/ABL/default.php
[33] Sockeye Salmon *(Oncorhynchus nerka*) population Biology and Future Management, Canadian Special Publication of Fisheries and Aquatic Sciences 96 http://www.dfo-mpo.gc.ca/Library/103523.pdf

Fundamental 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.

No. Supporting clauses	**11**
Supporting clauses applicable	**10**
Supporting clauses not applicable	**1**
Overall level of conformity	**HIGH**
Non Conformances	**0**

Summarized Evidence

5.1. States shall ensure that appropriate research is conducted into all aspects of fisheries including biology, ecology, technology, environmental science, economics, social science, aquaculture and nutritional science.

5.2. The state of the stocks under management jurisdiction, including the impacts of ecosystem changes resulting from fishing pressure, pollution or habitat alteration shall be monitored.

5.3/5.4/5.5. Management organizations shall cooperate with relevant international organizations to encourage research in order to ensure optimum utilization of fishery resources.

5.6 /5.7. Studies shall be promoted which provide an understanding of the costs, benefits and effects of alternative management options designed to rationalize fishing, in particular, options relating to excess fishing capacity and excessive levels of fishing effort.

There are 6 main types of methods used to assess the numbers escaping the fishery to spawn; aerial surveys, foot surveys, weir counts, counts from towers, sonar counts, and mark-recapture estimates. Age composition of the escapements is typically determined either by reading scales or reading otoliths collected from carcasses on the spawning grounds.

Pink salmon inhabit most of the rivers and streams from Southeast Alaska northward into the Bering Sea. The large number of streams and remoteness makes intensive efforts to enumerate each stock impossible. Aerial surveys from slow, low-flying aircraft dominate the stock assessment for pink salmon[34,35,36]. These aerial surveys include not only the final numbers actually in the streams to spawn, but are used to assess aggregations in/near terminal intertidal waters. On an in-season basis, the numbers aggregating in these intertidal areas provide important data to help determine appropriate fishing times in nearby areas. A significant research effort has been undertaken over the years to evaluate the accuracy and precision of aerial survey estimates[37]. To determine the steam life of pinks and to determine the relationship between numbers counted from the air, and the estimated numbers present in a section of stream using mark-recapture studies. Because all pink salmon are two years old there is no need to take

[34] 2014 Prince William Sound Area Finfish Management Report http://www.adfg.alaska.gov/FedAidPDFs/FMR15-34.pdf
[35] Annual Management Report of the 2014 Southeast Alaska Commercial Purse Seine and Drift Gillnet Fisheries http://www.adfg.alaska.gov/FedAidPDFs/FMR15-08.pdf
[36] ADF&G Kodiak Management Area Commercial Salmon Fishery Annual Management Report, 2013 http://www.adfg.alaska.gov/FedAidPDFs/FMR13-44.pdf
[37] Variability in Aerial Counts of Spawning Salmon Donald E. Bevan *Journal of the Fisheries Research Board of Canada*, 1961, 18(3): 337-348, 10.1139/f61-030 http://www.nrcresearchpress.com/doi/abs/10.1139/f61-030#.VsT8r_krLIU

samples e.g. scales) to determine age.

Chinook salmon are mostly found in the large rivers of Alaska from the Stikine in Southeast Alaska north to the Yukon River. Where intensive fisheries occur, such as the Yukon, Kuskokwim, Nushagak, Kenai, and Copper rivers, intensive effort to count escapements have been underway for decades. Sonar has proven to be especially effective in large occluded rivers such as the Yukon River, Copper River, and Kenai. Mark-recapture studies like that conducted in the Taku have proven effective. Weirs are commonly used where access and river size permits. Sometimes the entire system can be weired such as at Chignik, while at other times, only tributaries like the Deshka, a tributary of the Susitna River, can be enumerated this way. Aerial and foot surveys (either single or multiple) round out the methods used to assess Chinook. Because Chinook mature at several ages, obtaining scales or otoliths from carcass is necessary in order to estimate spawner - recruit relationships and this data commonly collected.

Sockeye salmon are found almost exclusively in river systems with lakes in their headwaters. Bristol Bay is the heart of the sockeye production in Alaska. Counting towers are used in the major rivers (e.g. Wood, Kvichak, Naknek, Ugashik, Egegik) to estimate the number escaping. Foot and aerial surveys document the distribution of escapement within these complex systems[38] . In the Westward Region, weirs are used at Chignik and in the Kodiak area at Karluk, Buskin, Upper Station, Frazer, Afognak, Ayakilik, Pasagshik. In Cook Inlet, sonar is used in the large sockeye production rivers of Kenai and Kasilof and several tributary weirs are also used. Sonar is also used in the main stem Copper River. In the Copper River Delta, 12 systems are aerial surveyed in multiple locations several times a year. In Southeast Alaska weirs are used to get complete counts in the Situk, Chilkat, Chilkoot, Hugh Smith, Redoubt, Speel and in selected tributaries of the Transboundary Alsek, Taku and Stikine rivers. In the Taku River, a mark-recapture program provides estimates of total escapement.[39] Age composition from scales and/or otoliths collected from carcasses provides age-sex and size data for most systems with counts.

Coho Salmon are most abundant in the systems that empty into the Gulf of Alaska. While coho catches are usually small in the AYK Region compared to the rest of the state, there are still 3 weirs (Goodness, Kogrukluk, Kwethluk) to assess coho, and one counting tower on the Niukluk. Aerial and boat surveys are used to estimate escapement on three systems in the AYK Region. There are no escapement goals in Bristol Bay for coho. In the Alaska Peninsula, aerial surveys are used exclusively. There are no escapement goals for coho in the Chignik Area. In the Kodiak area, there is one weir on the Buskin and foot surveys are conducted on three other systems. In the Central Region, there are two weirs in Upper Cook Inlet on Fish Creek and on the Little Susitna River and a foot survey is conducted on Jim Creek. In Prince William Sound aerial surveys are used on the Copper River Delta and the Bering River. There are no escapement surveys in either Bristol Bay or Lower Cook Inlet. In Southeast Alaska there is an extensive coho salmon escapement assessment program. There are four weirs (Hugh Smith, Klawock, Auke and Ford Arm). Mark-recapture estimates are made on the Taku, Berners and Chilkat Rivers. Foot surveys are conducted on Montana Cr, Peterson Cr, Lost River and in the Sitka Management Area. Aerial surveys are conducted on two systems and a boat survey on one system.

Chum Salmon: Chum salmon are one of the two species vital to the commercial and subsistence fisheries in the AYK Region, and substantial effort is placed into accurately estimating chum salmon escapements. Sonar is used on 4 system, weirs on 5 systems, towers on 2 systems and a mark-recapture program is conducted for the Tanana and for the escapement in the Yukon above the Alaska-Canada border. Aerial surveys are used for the smaller 7 systems or areas. In Bristol Bay sonar is used on the Nushagak which is the only major chum river. In the remaining areas of the Central Region aerial or foot surveys are used. In

[38] ADF&G 2014 Bristol Bay Area Annual Management Report http://www.adfg.alaska.gov/FedAidPDFs/FMR15-24.pdf
[39] ADF&G Annual Management Report of the 2014 Southeast Alaska Commercial Purse Seine and Drift Gillnet Fisheries http://www.adfg.alaska.gov/FedAidPDFs/FMR15-08.pdf

the Westward Region there are 8 index areas and peak aerial surveys are used. In Southeast Alaska there are 3 summer chum index area and 4 fall chum index areas. Aerial surveys are used in all these areas. A mark-recapture estimate is made for chums on the Chilkat.

C. The Precautionary Approach

Fundamental 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.

No. Supporting clauses (& sub-clauses)	**5**
Supporting clauses applicable	**5**
Supporting clauses not applicable	**0**
Overall level of conformity	**HIGH**
Non Conformances	**0**

Summarized Evidence

6.1 States shall determine for the stock both safe targets for management (Target Reference Points) and limits for exploitation (Limit Reference Points), and, at the same time, the action to be taken if they are exceeded.

Scientifically defensible escapement goals are the reference points used to manage Alaska salmon fisheries. The legal authority to set and manage harvest so as achieve these goals is founded in the Alaska Constitution's sustained yield principle Article VIII, section 4) and in state statute (AS 16.05.020). Alaska's administrative rules provide additional, and more specific guidance to the Department of Fish and Game, these rules include; 1) guidance for establishing escapement goals, including the policy for the management of sustainable salmon fisheries (5 AAC 39.222), 2) the policy for statewide salmon escapement goals (5 AAC 39.223), 3) and 3) the policy for the management of mixed stock fisheries (5 AAC 39.220). Every three years, on a rotating basis between Regions, the Department conducts a scientific review of these goals, and presents its recommendations to the public and Board of Fisheries. Following this public process, the recommend goals are presented to the Directors of the Division of Commercial Fisheries and Division of Sport Fish for their review and approval. Because of the diversity of stock assessment approaches used and the unique circumstances each fishery and species, several different kinds of defensible escapement goals are defined.

There are currently 296 active salmon stock escapement goals in the state. In the Southeast region there are 50 stocks with escapement goals, 41 (82%) of the stocks were at or above goal in 2014, which is above the long term (2006 -2014) average achievement rate. In the Central Region, there are 104 established goals, and 77 (74%) stocks were at or above the goal in 2014, which is below the long term 2006 -2014) average achievement rate. In the Artic-Yukon-Kuskowim Region there are 50 established goals and 41 (82%) were at or above their goal in 2014, which is above the long term (2006 – 2014) average achievement rate. In the westward Region, there are 50 established escapement goals and 36 (72%) were at or above their goal in 2014, which is below the long term average achievement rate.

The Department has as very strong method for taking remedial action when reference points (escapement goals) are approached. Regional and Area Management Biologists have been delegated the authority to

rapidly and summarily open or close fisheries and to limit the areas that may be fished by issuing Emergency Orders in response to in-season assessments of run strength in relation to escapement goals. The fisheries are typically closed by regulation until opened by the Department.

Types of Escapement Goals

1. **A Biological Escapement Goal (BEG)** is defined as an escapement range that provides the greatest potential for maximum sustained yield. A BEG is the primary management objective for the escapement unless an optimal escapement or in-river run goal has been adopted. The BEG is developed from the best available biological information. A BEG is determined by the Department and is expressed as a range based on factors such as salmon stock productivity and data uncertainty. The Department seeks to maintain evenly distributed salmon escapements within the bounds of a BEG.
2. **Sustainable Escapement Goal (SEG)** is defined as a level of escapement, indicated by an index or a range of escapement estimates that is known to have provided for sustained yield over a 5 to 10 year period. A SEG is 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 or in-river run goal has been adopted by the Board, and is developed from the best available biological information. An SEG is determined by the Department and is stated as a range that takes into account data uncertainty. The department seeks to maintain escapements within the bounds of the SEG.
3. **Sustained Escapement Threshold (SET**) is defined as a threshold level of escapement, below which the ability of the salmon stock to sustain itself is jeopardized. In practice, an SET can be estimated based on lower ranges of historical escapement levels, for which the salmon stock has consistently demonstrated the ability to sustain itself. A SET is lower than the lower bound of the BEG and lower than the lower bound of the SEG. An SET is established by the department, in consultation with the board, as needed, for salmon stocks of management or conservation concern.

Methods for Escapement Goal Development

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

1. **Percentile Method:** A method for establishing sustainable escapement goals (SEG) developed by Bue and Hasbrouck[40]. Contrast the observed annual escapements (largest escapement divided by smallest escapement) and exploitation rate of the stock are used to select percentiles of observed escapements for estimating lower and upper bounds of the escapement goal.
2. **Spawner-Recruit Analysis (SRA):** Analysis of the relationship between escapement (number of spawners) and subsequent production of adults in the next generation. The Ricker production model (Ricker 1954) is almost exclusively used for salmon populations in Alaska.
3. **Risk Analysis:** Risks Analysis uses evaluation 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 non-targeted stocks of salmon.
4. **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).
5. **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 (e.g., Clark 2005).
6. **Empirical Observation:** Goal development methods classified as “Empirical Observation” generally are

[40] An Evaluation of the Percentile Approach for Establishing Sustainable Escapement Goals in lieu of Stock Productivity Information http://www.adfg.alaska.gov/FedAidpdfs/FMS14-06.pdf

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, ADFG 2004).

7. **Zooplankton Model**: This model estimates the number of sockeye salmon 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.
8. **Spawning Habitat Model:** Estimates of spawning capacity or number of spawners that produce maximum sustained yield 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 *O. kisutch* (Bradford et al. 1999; Bradford et al. 1997) and Chinook salmon *O. tshawytscha* (Parken et al. 2004).
9. **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.
10. **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).
11. **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.
12. **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.

Rating of Types of Escapement Goals

1. **Highest Rating:** When methods such as weirs and sonar are used to estimate escapement and age composition of the escapements are available over several generations A BEG is typically developed using spawner recruit analysis and results in an estimate of Maximum Sustained Yield.
2. **Good Rating:** When fair to good accuracy and precision of estimates of escapement from mark-recapture experiments or multiple foot/aerial surveys and escapement and age estimates available, but may have gaps a BEG or SEG will be developed by conducting a spawner-recruit analysis.
3. **Fair:** When fair to good accuracy, of escapements are available but when estimates are missing or inadequate and age estimates missing or incomplete (e.g., not available from stock-specific harvest) a time series of escapement data may or may not be sufficient to allow estimate of Sustainable Escapement Goal.
4. **Poor:** When fair accuracy in escapement count or index data (e.g., single foot/aerial survey) is available and no harvest or age data is available, a time series of escapement data it may be possible to develop a SEG but it will have a high degree of uncertainty.

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 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 three levels of concern (Yield, Management, and Conservation) with yield being the lowest level of concern and conservation the highest level of concern. Chronic inability is defined as "the

continuing or anticipated inability to meet expected yields over a 4 to 5 year period." No new stocks of concern were identified in 2014.

1. **Yield 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)).
2. **Management Concern:** 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)).
3. **Conservation Concern :** A stock of conservation concern is defined as "a concern arising from a chronic inability, despite the use of specific management measures, to maintain escapements for a stock above a sustained escapement threshold (SET); a conservation concern is more severe than a management concern." (5AAC 39.222(f)(6)).

Changes in Escapement Goals for 2014

During the 2013/2014 BOF meeting cycle, the following changes were made to Board of Fisheries established escapement goals in the Cook Inlet, Chignik and Kodiak areas:

1. In Upper Cook Inlet, the upper end of the Jim Creek coho salmon goal was modified. The escapement goal for Crescent River sockeye salmon goal was eliminated because escapement is no longer assessed.
2. In Lower Cook Inlet, the Mikfik Lake sockeye salmon escapement goal was updated to reflect a change in escapement assessment methodology, and a new goal was established for Dogfish Lagoon Creek's pink salmon.
3. In the Chignik Management Area, the upper end of Chignik River early-run sockeye salmon was changed
4. In the Kodiak Management Area, the Buskin River coho salmon goal was updated and the Little River sockeye salmon goal was eliminated because of the inability to assess escapement regularly.

Escapements in 2014

Salmon escapement data for 2014 was evaluated by comparing actual escapements for systems that had been surveyed in 2014 against the lower bound on the published escapement goal.[41] Only the lower bound of the goal range was used because many stocks do not have an upper bound. As such, the analysis measures achievement of only minimal goals, and not goals meant to achieve MSY. There is a difference between the number of escapement goals statewide, the number of systems with goals, and the number of systems surveyed in a year. The primary reason there are more goals than systems is that typically there is a difference in escapement goals for even and odd year pink salmon runs in a system. The reason not all systems with a goal are surveyed in a year is usually because of logistical constraints, for example bad weather, mechanical breakdowns or other factors encountered in the field may preclude the ability to survey a system.

Chinook salmon: In 2014, escapement estimates were obtained for 61 stocks statewide and 39 met or exceeded the lower bound of their goal. The total estimated Chinook escapement statewide was 426,332, which is significantly greater than the sum of the lower bound of the statewide goal of 303,195 for the surveyed systems. Overall, there continued to be some weakness in the large systems particularly in the Central Region.

[41] ADF&G Summary of Pacific Salmon Escapement Goals in Alaska with a Review of Escapements from 2005 to 2013 http://www.adfg.alaska.gov/FedAidpdfs/FMS14-01.pdf

In the Arctic-Yukon-Kuskokwim (AYK) region, 15 of 20 systems met or exceeded the lower bund of their goal. The estimated escapement of Chinook in the AYK was 223,667, significantly more than the lower bound of the AYK goal of 135,020 for the surveyed systems. Two very important goals were met in 2014. For the first time since 2008, the upper end of the Kuskokwim goal (120,000) was exceeded and the upper end of the Treaty established goal of 55,000 for the main stem of the Yukon River was met for the first time since 2009.

In the Central Region, only 14 of 25 surveyed systems met or exceeded the lower bound of their escapement goal. The total estimated escapement of Chinook in the Central Region was 134,390 which is higher than the sum of lower bound of 25 systems for which estimates are available (114,530). An escapement estimate was not yet available for the Copper River, which is one of the largest systems in the region. In the larger systems of the region that were surveyed in 2014 (Nushagak, Kenai, Deshka, and Anchor), the 2014 escapements continued to be significantly below the upper bound of the SEGs.

In the Westward Region, only two of four surveyed systems met or exceeded the lower bound of their escapement goal. The estimated escapement of 8,667 is lower than the sum of the lower bound of the escapement goals for the four surveyed systems ((10,700). The Chignik River escapement was above the upper bound of its goal, and the Nelson River escapement was near the upper end of its goal. The Karluk and Ayakulik River rivers were well below their goals.

In the Southeast Region eight of 12 met or exceed the lower bound of their escapement goals. A total 59,598 Chinook were estimated to have escaped in the 12 systems which is more than the sum of the lower bound of the 12 systems escapement goal of 42,945. The two largest systems in the region are the Taku and Stikine with a combined escapement of 49,004. Both of these systems escapements were in the upper end of their goal ranges.

Sockeye salmon: Statewide, escapements of sockeye were assessed in 74 systems, and 63 were above the lower bound of their goal. The sum of the lower bound of the escapement range in the surveyed systems is 8.75 million sockeye and the estimated escapement in these systems was 17.83 million.

The AYK region has five surveyed sockeye systems and all exceeded the lower bound of their escapement goal range. The estimated escapement of 0.19 million is almost 5 times larger than the sum of the lower bound of the escapement goal range for the region's 5 systems. The largest escapement of 136,400 was in the Kanektok River was substantially above the upper bound of its escapement goal range of 34,000.

In the Central Region, 24 of 29 surveyed systems were above the lower bound of their escapement goal range. The estimated escapement of 13.84 million sockeye is over twice the sum of the lower bound of the surveyed 29 systems escapement goal range. Sockeye escapements throughout Bristol Bay were very strong. The Wood River escapement of 2.76 million is substantially over the upper bound of its goal of 1.5 million. In Upper Cook Inlet, escapements to the major systems were strong. The only weakness was evident in the smaller systems of Judd Lake and Fish Creek. Eight smaller systems are surveyed in Lower Cook Inlet and escapements were strong to all but 2 surveyed systems. In Prince William Sound, the Coghill Lake escapement was above goal and the other two surveyed systems were within their goal range.

Sockeye escapements in the Westward Region were excellent with an estimated escapement of 3.25 million which is over a million fish above the lower bound of the region's combined goal. Only five minor systems out of 28 did not exceed the lower bound of their goal.

In the Southeast Region, 11 of 12 sockeye systems exceeded the lower bound of their escapement goal. Region wide, an estimated 0.54 million sockeye escaped. This is substantially more than the sum of the

combined lower bound of the 28 systems escapement goal range of 0.34 million. Only one system (McDonald Lake) was below its goal while 5 systems were above the high end of their respective goals.

Coho salmon: Statewide 29 coho salmon systems have goals that were surveyed in 2014 and all but 2 had escapements above the lower bound of their goal range. The estimated escapement in the surveyed systems was 1.101 million fish, and this is about three times larger than the sum of the lower bound of the 29 systems escapement goal range of 319 thousand. In the AYK Region coho runs to the Kuskokwim River were strong, while the one surveyed tributary in the Yukon was below goal. In the Westward Region coho escapements to all six of the surveyed systems was strong. In the Central Region, coho runs were strong to the large systems. The escapement to the Nushagak of 478 thousand was substantially over the upper bound (120 thousand) of its goal. Coho runs to the Southeast Region were also exceptionally strong, especially to the Chilkat and Taku rivers which are major producers in the region.

Chum salmon: Statewide, 36 of 53 surveyed chum salmon systems had escapements larger than the lower bound of their escapement goal range. The sum of the lower bound of the 53 systems escapement goal range is 2.77 million, and the estimated escapement statewide was 4.85 million. AYK has the largest production of wild chum salmon. Fifteen of 18 AYK surveyed systems had escapements larger than the lower bound of their range. Overall AYK escapement of 2.87 million was over twice the sum of the lower bound of the regions18 surveyed system. The total chum escapement into the Yukon River and into the Canadian portion of the river was above the upper bound of the goal range. Runs into the Kuskokwim were modest. Very strong runs were seen in Kotzebue Sound, the run into the Noatak and Eli Rivers of 453 thousand was over four times the upper end of the escapement goal range. Escapements into the four Norton Sound systems were all above the upper end of their escapement goal range. Chum salmon escapements to Bristol Bay and Prince William Sound were strong. Escapements into Cook Inlet were mixed, with 7 systems below the lower bound of their goal and 6 above the lower bound of the range. Chum escapements to Chignik and parts of the Alaska Peninsula were above the lower end of the goal range, while those to Kodiak and most of the Peninsula were below the lower bound of goal range. In the Southeast region summer chum to the inside waters were below the lower end of the escapement goal range while those in the northern outside water were above the lower end of the goal range. Runs of fall Chum were all with the goal range.

Pink salmon: Statewide, 27 of 38 surveyed systems met or exceeded the lower bound of their escapement goal range. The sum of the lower bound of the escapement goal range for the surveyed systems is 12.4 million and the estimated escapement in these 38 systems was 22.46 million. In the AYK Region there were 3 surveyed systems in Norton Sound and escapements in all three were substantially larger than the lower bound of their goals. In Bristol Bay, the only surveyed system had an escapement over 13 times the lower bound of its goal. In the Lower Cook Inlet Area, 16 of 18 surveyed systems had escapements above the lower bound of their escapement goal range. In Prince William Sound, escapement goals are set for each of the eight management Districts and 5 of 8 had escapements above the lower bound of their escapement goal range. The total estimated escapement of 812 thousand was only slightly higher than the sum of the lower bound of the areas escapement goal of 793 thousand. For the entire PWS region in 2014, the fraction of hatchery Pink Salmon in all spawning streams was calculated to be 0.15 ± 0.071. This hatchery fraction estimate was greater than it was in 2013 (0.04 ± 0.029) although the difference was not statistically tested.[42] In the Westward Region, 2 of 4 index areas had escapements larger than the lower bound their escapement goal range. The sum of the observed escapements was 4.57 million which is lower than the sum of the lower bound of the Region's escapement goal range of 5.31 million. In the Southeast Region 2 of 4 index areas had escapements larger than the lower bound of their escapement goal range. However, the estimated escapement to the

[42] ADF&G Interactions of Wild and Hatchery Pink Salmon and Chum Salmon in Prince William Sound and Southeast Alaska Progress Report for 2014 http://www.adfg.alaska.gov/static/fishing/PDFs/hatcheries/research/pwssc_2014.pdf

Region was 13.8 million and this over twice the sum of the lower bound of the Region's escapement goal range.

Fundamental 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.

No. Supporting clauses (& sub-clauses)	**6**
Supporting clauses applicable	**6**
Supporting clauses not applicable	**0**
Overall level of conformity	**HIGH**
Non Conformances	**0**

Summarized Evidence

7.1. The precautionary approach shall be applied widely to conservation, management and exploitation of living aquatic resources in order to protect them and preserve the aquatic environment.

Alaska's policies for Sustainable Fisheries Management, embodied in the State Constitution and regulations includes, key elements of the precautionary approach for salmon fisheries and habitats. Faced with various uncertainties current evidence provided by ADF&G is consistent with a conservative approach to the management of salmon stocks, fisheries, artificial propagation, and essential salmon habitats.

The 3rd Surveillance Report outlined 2 examples of fishery concern which are:

1. Depressed runs, declining productive, and biological changes in age and size of statewide Chinook salmon populations, especially the AYK region;
2. And, in light of recent research the concern over hatchery origin pink salmon in Prince William Sound (PWS) and hatchery origin chum salmon in Southeast Alaska (SEAK).

Regarding the Chinook salmon issue, ADF&G management has limited commercial and sport fisheries and traditional subsistence harvest of Chinook salmon to meet escapement goals and international treaty obligations. ADF&G also has taken the lead in developing partnerships with other state and agencies, academia, and NGOs to implement the new comprehensive Chinook Salmon Stock Assessment and Research Plan involving 12 key stocks in all regions of the state. Initial funding for this plan was estimated to be $30 million, however, this has been revised to $15 million over five years. A complementary AYK Chinook Salmon Research Action Plan developed through the AYK Sustainable Salmon Initiative is directed at these critical management issues in Western Alaska.

Chinook salmon are critically important to subsistence, commercial, and sport users and to communities and economies across Alaska. Recent downturns in productivity and abundance of Chinook salmon across the state and the resulting hardships have highlighted the significant need for the ADFG to better understand and characterize the changing productivity and abundance trends for Chinook salmon and to identify actions that could be taken to lessen the hardships experienced by Alaskans that use and depend on this resource. Overall, there is clear evidence of recent and persistent statewide declines in Chinook salmon productivity, run abundance, and inshore harvest from available stock assessment data as well as from local and traditional knowledge sources. This decline in productivity appears to have begun with the 2001 brood year and has persisted through at least the 2007 brood year, resulting in below average run

abundance and harvest during 2007 through present. There is some evidence that a statewide downturn in run abundance occurred during the early to late 1970s, but this is based on incomplete information. Trends in stock specific productivity during brood years 1975 through 2000 and in run abundance during 1977 through 2006 did not appear consistent statewide, although some regional trends were apparent throughout the time series.

Fishery management has been responsive to lower run abundances by constraining significantly commercial fishing in an attempt to achieve escapement goals. Conservative management in the face of uncertainty will sustain Chinook salmon stocks by reducing the risk of overfishing and inadequate escapements, but will also increase the risk of foregone harvest opportunities that can threaten the viability of social and economic system in Alaska that are highly dependent on Chinook salmon as cultural value, subsistence and income.

To address the decline, the Department tasked a team of agency scientists and researchers with developing a comprehensive Chinook salmon research plan to address knowledge gaps and research needs. The team conducted a comprehensive review of Chinook salmon programs and developed a report entitled "Alaska Chinook Salmon Knowledge Gaps and Needs" (Gap Analysis) to identify existing knowledge gaps, identify activities that could be undertaken to narrow those gaps, and identify the range of potential costs associated. The Department hosted the Chinook Salmon Symposium in October 2012, and invited state, federal, and academic scientists and the public, to discuss and further identify knowledge gaps and compile a list of research priorities to address specific questions informing observations of Chinook salmon abundance and productivity in Alaska. This process resulted in the Chinook salmon research plan[43].

This project will fund activities identified as needed by the Chinook salmon research plan. The plan is structured on a stock-specific, life-history basis for 12 indicator stocks from Southeast Alaska to the Arctic-Yukon-Kuskokwim, representing diverse life history and migratory characteristics across a broad geographic range. Stock assessments to be funded include, for these stocks, a complete assessment of adult escapement and stock-specific harvests in all relevant fisheries, assessment of juvenile Chinook salmon smolt, local and traditional knowledge (LTK) studies, nearshore marine surveys, and life history process studies. The central objective of the plan implementation is to create a consistent stock assessment framework across a diversity of indicator systems in Alaska that will provide improved information for sustained yield management of Chinook salmon for a range of run sizes and productivity regimes. Linkage of improved monitoring data with process based research will provide insight into ecological and environmental mechanisms causing recent abundance declines and give managers better predictive tools.[44]

Chinook Salmon Research Initiative

The Chinook Stock Assessment and Research Plan (ADFG 2013) acknowledged that better information is needed from all life stages to improve forecasts of productivity and abundance. Additionally, that information would help improve escapement goal development and responsiveness of fisheries management to in-season changes in abundance and run timing to better balance the trade-offs between fishing mortality and future sustainability of Chinook stocks harvested in Alaska. The indicator stocks include the Unuk, Stikine, Taku and Chilkat rivers (Southeast Region); the Copper, Susitna and Kenai rivers (Central Region); the Karluk River on Kodiak Island, and the Chignik River on the Alaska Peninsula

[43] ADF&G Chinook Salmon Research Plan and 2012 Symposium www.adfg.alaska.gov/index.cfm?adfg=chinook_efforts_symposium.information

[44] Chinook Salmon Stock Assessment and Research Plan , 2013 by ADF&G Chinook Salmon Research Team http://www.adfg.alaska.gov/static/home/news/hottopics/pdfs/chinook_research_plan.pdf

(westward Region); and, the Nushagak, Kuskokwim and Yukon rivers (Arctic-Yukon-Kuskokwim Region). The Research Plan recommends that stock assessment programs be implemented for each of 12 Chinook indicator stocks with the following features:

1. Estimate annual escapement and age-size composition.
2. Estimate annual total harvest.
3. Estimate total production of adult equivalents.
4. Estimate the number of smolts and smolts-per-spawner from 1 above.
5. Estimate marine survival using CWT tagging.
6. Estimate annual abundance in nearshore marine environments for forecasting.
7. Update and refine production models to estimate optimal escapement levels.
8. Provide forecasts of returns for improved management capability.
9. Provide adequate local traditional knowledge concerning patterns and trends.

The Research Plan identifies several knowledge gaps, including elements of the Chinook life cycle and productivity changes, and notes that long-term study is needed to make any of the research effective. The Chinook Salmon Research Initiative has an implementation budgetary plan of $15, million which is partitioned into adult, juvenile, marine, subsistence, genetic monitoring, and University of Alaska Fairbanks contracted research involving detailed scale pattern analysis.
Based on the fact that ADFG is constraining significantly commercial harvests of Chinook salmon throughout Alaska in response to the current period of low production, and considering the ADFG led Chinook salmon stock assessment and research plan effort and funding allocated so far; the assessment team considers that this management response is an appropriate precautionary approach for the Chinook salmon stocks in Alaska.

The Alaska Hatchery Program
The second example of precautionary management by ADFG relates to the Private Non-Profit (PNP) hatchery program which produces the majority of commercially caught salmon and it is made up of regional aquaculture associations in PWS (PWSAC), SE Alaska (NSRAA an SSRAA), Kodiak (KRAA) and Cook Inlet (CIAA), as well as community development hatchery programs in Valdez (VFDA) and Juneau (DIPAC) and smaller hatchery programs In SE Alaska (PAH, BIH, PSNH and KRH). The PNP hatchery program is unique to Alaska. It is characterized by large releases of pink salmon and chum salmon in especially in PWS and in SEAK and smaller releases of sockeye, coho and chinook.

Hatchery Regulatory Environment
In terms of the regulatory environment, the PNP program is administered and regulated by ADFG with many regulatory safeguards and protocols which are a significant effort towards implementing a precautionary management system for hatcheries in Alaska.
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

In particular, there is clear policy that ensures that hatcheries are placed in areas that are least likely to risk 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 eggs for hatchery rearing and release. [45]

There are very well prescribed Statutes and laws for planning of hatchery development. In particular, there is clear policy that ensures that hatcheries are placed in areas that are least likely to cause the risk of mixing with existing wild stocks. 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, shape, color, etc.). An extremely wide, pre-determined number of returning fish are used for stripping of eggs for hatchery rearing and release. This is especially true for Pink and Chum salmon hatcheries in PWS and SEAK. Large population sizes allow for a large gene pool and decreases, over time, the likelihood of genetic loss due to inbreeding.[46]

Key Aspects of Salmon Enhancement Management in Alaska

1. Highest priority: protect and maintain wild salmon stocks, legal mandates that require wild stocks to be given priority in fishery management;
2. Vigorous habitat protection, no dams on rivers
3. Escapement-based management, no fishery targets
4. Mixed stock fisheries avoided wherever possible
5. Hatcheries supplement not replace wild stocks, mitigation of pressure on wild stocks.
6. Annual Management Plans of all hatcheries are annually reviewed by ADFG.
7. Comprehensive regional planning.
8. Utilize conservative fish culture practices.
9. A rigorous hatchery permitting process that includes genetics, pathology and fishery management reviews.
10. Statewide genetics policy to guide hatchery program and practices to allow protection of wild stocks by avoiding foreseeable negative effects.
11. Fish health and disease statutes (no disease has ever been introduced or amplified in the wild).
12. Careful siting of hatcheries, terminal harvest areas (temporal and spatial segregation from wild stocks to minimize mixed fisheries, allows harvest all the returning salmon to minimize potential interbreeding with wild salmon by straying hatchery fish. Hatchery production is not approved if

[45] ADF&G Genetic Policy, 1985 http://www.adfg.alaska.gov/fedaidpdfs/fred.geneticspolicy.1985.pdf
[46] Ibid

there is not high confidence that the resulting salmon will be fully harvested.

13. Hatchery brood stock diversity practices (fish selected at random and not on external trait basis such as size, color or shape, 1 to 1 mating ratio, effective population sizes extremely large – especially true for pink and chum salmon in SEAK and PWS).
14. Use of local brood sources is priority.
15. Collection of broodstock for the hatcheries is stratified over spawn/run timing to maximize the heterogeneity of the gene pool.
16. Mass otolith thermal marking for real-time in-season fisheries management. All hatcheries with significant production in Southeast, Central and Westward Region (apart from Kitoi Bay and Pillar Creek hatcheries, in Kodiak) thermally mark virtually all of their releases for identification of hatchery salmon during harvest.
17. 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[47,48].

The hatchery program in Alaska has evolved over time since the mid 1970's from a small program by both the ADFG Fisheries Rehabilitation Enhancement Development Division (F.R.E.D.) and the PNP sector to its current status as the largest program in North America if not the world. The history and magnitude of the program is described in the ADFG hatchery Annual Report for 2014 and can be seen graphically in this report and is displayed below.

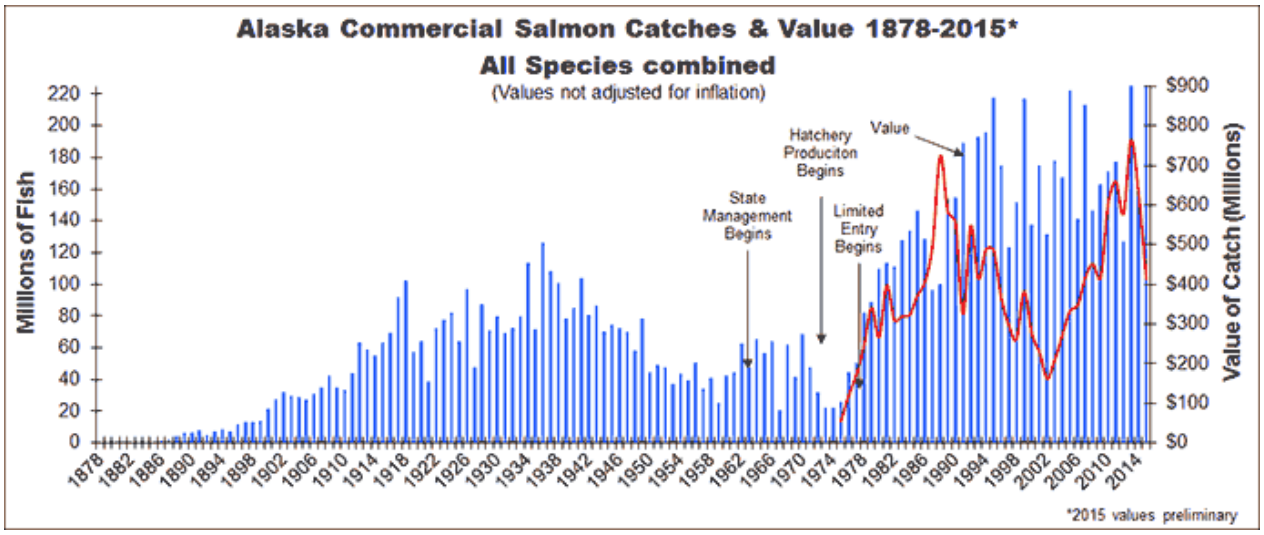

Figure 7. Alaska Commercial Salmon Catches and Value (All Species Combined) (1878-2015)

- The Alaska salmon fisheries enhancement program adult return was estimated at 62 million fish in 2014.
- Hatchery-produced coho salmon returned in record numbers in 2014. The majority of the return, an estimated 1.6 million coho salmon (Onchorhynchus kisutch), returned to Southeast Alaska, contributing 27% of the regions coho salmon commercial harvest.
- An estimated 231,000 hatchery-produced coho salmon were commercially harvested in the Kodiak region in 2014, a record harvest for the region.
- The preliminary total statewide commercial salmon harvest was 157 million fish, with an estimated

[47] Overview of salmon stock enhancement in southeast Alaska and compatibility with maintenance of hatchery and wild stocks William R. Heard Environmental Biology of Fishes May 2012, Volume 94, Issue 1, pp 273-283 http://www.springerlink.com/content/25k01460326l7g38/

[48] Salmon Hatcheries in Alaska Steven McGee http://www.adfg.alaska.gov/static/fishing/PDFs/hatcheries/mcgeebrochure.pdf

exvessel value of $578 million. Hatchery contribution of salmon to the commercial harvest was estimated at 58 million salmon.

- The contribution to the commercial CPH in 2014 is estimated to be 51 million hatchery produced salmon. They were harvested in the seine, gillnet, and troll fisheries with a preliminary exvessel value of $113 million.
- Statewide, the fisheries enhancement program contributed 34% of the salmon in the commercial CPH: 56% of the chum (O.keta), 47% of the pink (O.gorbuska), 23% of the coho, 12% of the Chinook (O. tshawytscha), and 5% of the sockeye salmon (O. nerka).
- Statewide, approximately 20% of the total exvessel value of the commercial CPH of salmon is attributed to the fisheries enhancement program. By species, this accounts for 54% of the chum, 46% of the pink, 22% of the coho, 12% of the Chinook, and 7% of sockeye salmon exvessel value.
- An estimated 303,297 hatchery-produced salmon were harvested among personal use, sport, and subsistence fisheries. Sport anglers harvested an estimated 390,654 hatchery-produced fish represented by 8 species: Chinook, coho, pink, chum, and sockeye salmon; rainbow trout (O. mykiss); Arctic char; and Arctic grayling.
- Hatchery-produced sockeye salmon are the greater part of the noncommercial Fishery (sport, personal use, and subsistence), with an estimated 149,494 harvested statewide in 2014. Fisheries enhancement projects also provided a significant contribution of coho salmon to the noncommercial CPF, with an estimated 118,564 fish harvested in 2014. Hatchery-produced Chinook, pink, and chum salmon were also harvested in noncommercial CPF.
- In 2015, an estimated 62.8 million hatchery-produced fish are projected to return to Alaska.
- Southeast Alaska: Returning hatchery-produced salmon accounted for 12% of the salmon in the commercial CPH: 85% of the chum, 27% of the coho, 13% of the Chinook, 7% of the sockeye, and 1% of the pink salmon can be attributed to fisheries enhancement projects. The harvest of hatchery-produced salmon contributed an estimated $38 million, or 26%, of the exvessel value of salmon in the commercial CPH. In Southeast Alaska, the majority of the noncommercial CPF contribution was coho salmon, with an estimated 65,455 fish harvested.
- Prince William Sound: An estimated 45 million salmon returned from hatchery releases, accounting for an estimated 87% of the total number of salmon in the commercial CPH: 68% of the chum, 93% of the pink, 45% of the sockeye, and 29% of the coho salmon in the commercial CPH were hatchery-produced fish. In addition, hatchery-produced salmon contributed an estimated $64 million, or 62%, of the exvessel value of salmon in the commercial CPH. Sockeye salmon were the bulk of the noncommercial CPF harvest, with an estimated 118,220 fish harvested in the Prince William Sound area.[49]

Alaska Salmon Management and Research

In-Season Management

One of the challenges of a successful hatchery program in Alaska and along the Pacific Coast is the ability to discriminate wild and hatchery salmon in the commercial and sport fishery so as to avoid overharvesting wild stocks while providing the economic benefits of the salmon harvest of wild and hatchery origin salmon to the common property fishery and coastal communities. A major technological advance that provides a measure of management control over harvest and escapement and enables the precautionary approach by ADFG to be realized is the technique of salmon otolith (ear bone) thermal marking of hatchery pink and chum salmon during the incubation phase within a hatchery. In order to determine which fish as adults are hatchery and wild salmon it is necessary to excise and decode the salmon otoliths in the laboratory. The PNP operators conduct this operation with chum salmon in SEAK themselves ADFG conducts the decoding for PWS pink and chum salmon.

The ADFG uses this technology in PWS as an in-season management tool to determine the proportion of hatchery pink salmon from wild salmon in a directed fishery on pink salmon in the purse seine and drift gill net fishery in PWS. This effort is designed to achieve the economic benefits of harvesting surplus hatchery pink salmon, the goal of the enhancement program, while avoiding the over exploitation of wild pink salmon as they return to the spawning grounds. This is not the only example of in-season management using technology in the commercial fishery by ADFG as it is being implemented in SE Alaska for the hatchery add-on for the chinook salmon troll fishery using CWT technology and the WASSIP program for in -season management for wild sockeye using genetic discrimination to separate stocks and predict their abundance in Bristol Bay.
In theory and in practice the application of the thermal otolith technology allows the fisheries managers in PWS with regard to pink salmon to harvest hatchery salmon in-season at levels to avoid large numbers of hatchery fish accumulating in the escapement which effectively reduces the risk of hatchery and wild stock interaction on the spawning grounds. This differential harvest of hatchery fish is a function of the degree of spatial isolation of hatchery fish in which the exploitation rate can be high or the proportion of wild stocks in a mixed stock fishery in which case it depends on the proportion of hatchery to wild stocks and the potential abundance of wild fish being harvested. So this strategy is managed on a complex of spatial and temporal realities within the season.

Research on Hatchery and Wild Pink and Chum Salmon interactions on the Spawning Grounds
By way of introduction, the Prince William Sound Science Center (PWSSC) and its sub-contracting partner Sitka Sound Science Center (SSSC) are engaged in scientific data collection and analysis services requested under the State of Alaska contract IHP-13-013 entitled "Interactions of Wild and Hatchery Pink and Chum Salmon in Prince William Sound and Southeast Alaska". This is the third annual report, focusing on the results of 2014 data collection and analysis.

The plans and intentions of this contracted research are guided by two documents: 1) the ADF&G RFP 2013-1100-1020, dated May 7, 2012 entitled "Interactions of Wild and Hatchery Pink and Chum Salmon in Prince William Sound and Southeast Alaska and 2) the PWSSC proposal for the project, dated June 29, 2012. The overarching purposes of this research, as stated in the RFP, are to:

- Estimate the proportion of the annual runs of Pink and Chum Salmon in Prince William Sound (PWS) comprised of first-generation offspring of hatchery salmon.
- Determine the extent and annual variability in straying of hatchery Pink Salmon in PWS and Chum Salmon in PWS and Southeast Alaska (SEAK), and
- Assess the impact on fitness (productivity) of wild Pink and Chum Salmon stocks due to straying of hatchery Pinks and Chum Salmon.

The 2014 field research was organized into three major activities:
- Ocean sampling near PWS to estimate hatchery fractions of runs
- Adult sampling in streams to estimate the hatchery fractions of spawning salmon and to collect DNA samples; and
- Sampling of alevins from the gravel in two experimental streams for collecting DNA tissues for the fitness studies.

Adult sampling was further subdivided into PWS and SEAK activities. The first (2014) spring sampling of alevins in streams for fitness studies followed the first summer sampling of their parents (2013). The methods in the 2014 Annual Report reflect guidance in the RFP, some refinements made following the 2012 preliminary field season and 2013 full season (Knudsen et al. 2013, Knudsen et al. 2015)., and changes made as a result of consultation with the Science Panel in November 2012 and December 2013.
This report includes summaries of sample collection during 2014 for estimating hatchery fractions and for the DNA-based fitness studies. DNA samples from the latter were delivered to the ADF&G Gene

Conservation Lab and the subsequent analysis will be reported later. This report includes analysis of hatchery proportions of Pink Salmon and Chum Salmon from the ocean sampling and analysis of hatchery fractions by stream, district or sub region; and region. It also includes estimates of the total run sizes of wild and hatchery-origin Pink Salmon and Chum Salmon for both PWS and SEAK. Last, sampling activities alevins from the gravel in Fish and Stockdale creeks in spring of 2014, for part of the fitness study, is reported here.

As an overall summary the 2014 Annual Report is the third in a series of annual reports on data collection and analysis for studies of hatchery-wild interactions of Pink Salmon in Prince William Sound (PWS), Chum Salmon in PWS, and summer run Chum Salmon in Southeast Alaska (SEAK). This work was performed by the Prince William Sound Science Center under contract to Alaska Department of Fish & Game. The SEAK portion was further subcontracted to Sitka Sound Science Center. Hatchery Pink Salmon and Chum in Alaska have thermally marked otoliths which were used to determine hatchery or wild origin through samples collected at sea and in streams. As in 2013, ocean sampling was conducted at nine stations near the entrances to PWS in 2014. Otoliths from 1,515 Pink Salmon and 947 Chum Salmon were analyzed for thermal marks indicating hatchery or wild origin. The overall 2014 proportion of hatchery fish across all ocean stations was 86% for Pink Salmon and 51 % for Chum Salmon. The proportions of hatchery fish in the ocean sampling varied by station and time. Stream studies were conducted in 2014 for two major purposes: an analysis of straying of hatchery-origin spawners into natural populations in all study streams; and an investigation of the relative survival of hatchery-origin and wild-origin offspring following natural spawning in 10 of the study streams. In 2014 field sampling on the spawning grounds, 33,574 individual fish of both species were sampled during repeated visits to 64 streams for both studies combined." Otoliths were collected from all specimens for identification of possible hatchery origin. Fractions of hatchery Pink Salmon were estimated for 27 PWS spawning populations and hatchery fractions of Chum Salmon were estimated for 17 PWS and 32 SEAK streams. Fractions in each case were estimated by stream, then by district (PWS) or Sub-region (SEAK), and then by region. Estimated region-wide hatchery fractions in spawning streams were 0.15 for PWS Pink Salmon, 0.03 for PWS Chum Salmon, and 0.05 for SEAK Chum Salmon. PWS Pink Salmon hatchery fractions ranged 0.0 to 0.91 across all study streams. Pink Salmon hatchery fractions tended to be greater in districts with hatcheries, such as the Eshamy District (0.87) and the Southwestern District (0.29). PWS Chum Salmon stream hatchery fractions were all less than 0.12, except Cabin Creek where the hatchery fraction was 0.80. Hatchery fractions in 32 SEAK Chum Salmon streams were similarly mostly low (0.0 to 0.15), except in Fish (0.72) and Sawmill creeks (0.19). Using information from both ocean sampling and field sampling programs, as well as data from the commercial fisheries, an estimated 49.7 million Pink Salmon entered PWS in 2014 of which an estimated 7 million were wild fish and 42.8 million were hatchery fish. An estimated 2.4 million Chum Salmon entered PWS in 2014 of which 1.2 million were wild fish and 1.2 million were hatchery fish.

Ocean Salmon Sampling

A total of 12,607 salmon were caught in the ocean test fishery in 2014. Fishing all nine stations occurred over a two (sometimes three) day period throughout the season, so for analysis and graphic purposes each fishing period is defined as a "Trip" with Trip 1 beginning May 15, 2014 and ending with Trip 29 on August 30, 2014. Pink Salmon were the most numerous salmon caught (9,400), followed by Sockeye Salmon (1,644), Chum Salmon (1,198), and then Coho Salmon (355). Ten Chinook Salmon were caught and nine released alive. Further results are focused only on Chum Salmon and Pink Salmon. Similarly to 2013, Chum Salmon entered early in the 2014 season and in lower numbers than Pink Salmon. Chum Salmon was the first species caught at the beginning of the season and they were caught fairly consistently for the entirety of the season, but started to decline by June 24 (TRIP 20). Pink Salmon started showing up in the catch on June 2 (TRIP 17). Pink Salmon trended upward until the first peak on July 5 (957, TRIP 21). Another peak occurred on August 5 (841, TRIP 23) and then trended downward until fishing ceased. The overall proportion of hatchery-origin Pink Salmon entering PWS was apparently greater in 2014 (0.86) than in 2013 (0.68). The overall proportion of hatchery-origin Chum Salmon entering PWS was apparently

less in 2014 (0.51) than in 2013 (0.72). These hatchery proportion estimates are affected by the relative run sizes of both hatchery and wild fish. For example, the 2013 wild Pink Salmon run was the largest on record until then (Botz et al. 2014), which helps to explain the lower relative proportion of hatchery fish entering the Sound in 2013.

Pink Salmon hatchery proportions indicate more hatchery fish are entering PWS at the Montague Strait stations than at the Hinchinbrook Entrance stations and the hatchery-specific origin is variable by station. The Solomon Gulch Hatchery was the single largest contributor to Pink Salmon hatchery fish across most stations. There was an apparent overall greater hatchery proportion for Pink Salmon across all stations in 2014 than in 2013 (Knudsen et al. 2015).

Chum Salmon hatchery proportions were variable by ocean sampling stations for 2014 and, for most stations, exhibited lower hatchery proportions than 2013 (Figure 8 and Knudsen et al. 2015). Most of the hatchery Chum Salmon originated from Wally Noerenberg Hatchery.

Hatchery and Wild Proportions in the Spawning Streams

The overall hatchery fractions in the study streams were 0.15 for PWS Pink Salmon, 0.03 for PWS Chum Salmon, and 0.05 for SEAK for Chum Salmon in 2014. In comparison, the 2014 estimates were higher than in 2013 for PWS Pink Salmon (0.04), but similar between years for both PWS Chum Salmon (0.03 in 2013) and SEAK Chum Salmon (0.07 in 2013). The apparently higher PWS Pink Salmon hatchery fractions in 2014 are probably attributable to the reduced even-year wild Pink Salmon run relative to the record run size of 2013 which increased the relative proportion of hatchery fish. Hatchery fractions varied by species, region, and management unit but were generally low for a majority of the streams. A few individual streams exhibited high hatchery fractions, some exhibited medium fractions, but many streams had low or no hatchery strays. As in 2013, the hatchery fractions for 2014 generally reflect the same patterns of higher hatchery fractions in streams closer to hatcheries than in more distant streams, as reported in Brenner et al (2012) for PWS Pink Salmon and Chum Salmon and Piston and Heinl (2012). and for Chum Salmon in SEAK. The intention when hatchery release sites were established was to locate them away from important wild stocks. This was to protect wild populations from over-harvest, but it also serves to limit high hatchery stray fractions to a few local streams thereby minimizing potential negative effects on the overall PWS or SEAK spawning populations. Results from the ongoing hatchery-wild fitness studies should advance understanding of the effects of relative high proportions of hatchery-origin spawners in some local populations. These studies were repeated in 2015 for a third year of the hatchery fraction analysis.

Hatchery and Wild proportions in the Harvest

The HWI Study's 2014 estimate for PWS Pink Salmon spawning abundance (about 5.9 million, from $\hat{S}_W$ + $\hat{S}_H$) is approximately 2.6 times larger than ADF&G's estimate of 2.3 million fish (T. Sheridan, pers. comm.). ADF&G's estimate was based on an aerial survey index expanded through area-under-the-curve methodology, which takes several assumptions into consideration, including stream life, observer efficiency, and a proportion of PWS streams flown as estimated in Bue et al. (1998). Possible reasons for this difference can include inaccurate assumptions being used for ADF&G's expansion, and imprecise aerial survey indices due to reduced survey effort (T. Sheridan, pers. comm.). Budget limitations and poor weather have negatively impacted the PWS pink and chum salmon aerial survey program in recent years, leading to fewer surveys being flown, and increasing duration between surveys (T. Sheridan, pers. comm.). As reported in Wiese et al. (2015), PWS aerial survey observational conditions in 2014 were among the worst on record for the PWS aerial survey program; poor weather conditions resulted in fewer streams flown during August 2014 than any month of August since 1981. Bue et al. (1998) documented that the accuracy and precision of area-under-the-curve estimates decreased as the interval between surveys increased. Further, PWS area-under-the-curve methodology resulted in the majority of Montague District escapement to be excluded from postseason analyses, as only 17 of 33 streams in the district were flown often enough (≥ 3 surveys) in 2014 to use with area-under-the-curve methodology (Wiese et al. 2015).

ADF&G believes that 2014 PWS aerial survey pink and chum salmon escapement indices are likely an underestimate of escapement, and represent a minimum count (T. Sheridan, pers. comm.).

Another statistic of interest is the estimated Sound-wide harvest rate of wild fish ($\hat{C}_W/\hat{R}_W$) which is 26.3% for PWS Pink Salmon and 21.3% for PWS Chum Salmon in 2014. These results compare to 2013 observations, when the estimated Sound-wide harvest rate of wild fish ($\hat{C}_W/\hat{R}_W$) was 52.6% for PWS Pink Salmon and 21.6% for PWS Chum Salmon. Low Chum Salmon values for both years likely speak to the fact that most PWS fisheries do not target, and are not managed for, wild Chum Salmon (Fair et al. 2008). Lower wild Pink Salmon harvest rates in 2014 are likely due in part to a relatively conservative management approach in the face of below average escapements, combined with uncertainty resulting from an inability to fly surveys (T. Sheridan, pers. comm.). Late season management in 2014 included a 10-day Sound-wide closure during the traditional peak of the Pink Salmon purse seine fishery to ensure that escapement goals were made, and subsequent fishing opportunity was limited with regards to time and area (Wiese et al. 2015). These summaries results were excerpted from the 2014 PWSSC Annual Report which is located on the ADFG website.

Minor Non Conformance Determination

In 2012, during the FAO RFM AK Salmon 1st Surveillance Activities, one minor non-conformance was assigned under Clause 7, the precautionary approach. At the time of assessment it was unclear how ADFG planned to deal with development plans and release activities (e.g. potential requests from hatchery corporations for increased pink and chum salmon productions in PWS and SEAK) in light of the fact that potential 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 hatchery wild salmon multigenerational study in PWS and SEAK may take considerable time to accrue.

A corrective action plan from the client required the following clarifications and evidence:

1. How ADFG intended to address the issue of hatchery permit alteration (PAR) requests for pink and chum in PWS and Chum in SE Alaska; and
2. Interim progress towards completion of the large scale hatchery salmon research study.

With regards to PAR's it should be noted that all hatchery production increases are proposed to the ADFG and they are scrutinized by a regulatory review, approved or rejected before they are introduced to the Regional Planning Team (RPT). The planning team will either approve or modify or not approve. ADFG has full control over the process. The regulatory process is described on the ADFG website.

The 2014 PAR's that were approved as amended by the RPT for pink salmon in PWS were 20 million green eggs in 2016 which is a stock of early pink salmon characterized by a low straying rates as identified by ADFG. ADFG has stated that this is a step wise effort with new increases in production to evaluate the fishery effects before increasing further. NO other PAR's were approved for PWS in 2014.

In SE Alaska for chum salmon there were three PAR's approved. Port Saint Nicholas Hatchery in SSE Alaska was approved for 8 million chum salmon green eggs for release at Port Asuncion. In NSE Alaska for chum salmon Hidden Falls Hatchery was approved for 10 million green eggs on behalf of Gunnuk Creek Hatchery and Sawmill Creek Hatchery was approved for 30 million fall chum as green eggs. These approved PAR's went through the full regulatory process as described in ADFG regulations on the website and previously discussed.

The second provision is met by the PWSSC 2014 Annual Report on the ADFG website and as described earlier in this document.

Recommendation

1. Funding supporting new research plans for both Chinook salmon and hatchery-wild stock interactions with pink and chum salmon is essential for providing critical information needed for maintaining precautionary approach principles in Alaska salmon management.

2. ADFG should continue its leadership role in in-season salmon management of pink salmon in PWS. It is requested that ADFG provide a description of the procedure and the methodology used to make decisions about the rate of exploitation for hatchery and wild pink salmon. ADFG should determine whether they need more management capacity to be applied and if increase in expertise or manpower would improve the decision making process within season. If it is determined that this effort would require an incremental increase in management costs that this should be requested with documentation. Potential funding opportunities could come from a consortium of University, Agency, Regional Hatchery Associations, NGO's and legislative initiatives. A small steering group could be appointed by the Commissioner of Fish and Game to provide recommendation to the ADFG. It would be helpful if a description of the in-season management approach used by ADFG area managers in PWS utilizing thermal otolith marking could be posted on the ADFG website.

3. The minor non-conformance that was rendered in the 1st Surveillance Report should be continued but should be re-evaluated in light of PWSSC research findings, continuing precautionary management in PWS for pink and chum salmon and for chum salmon in SE Alaska during the re-assessment audit in 2016.

7.2. <u>For new and exploratory fisheries, procedures shall be in place for promptly applying precautionary management measures, including catch or effort limits.</u>

Not applicable – Alaska Salmon is not a new or exploratory fishery

D. Management Measures

Fundamental 8

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

No. Supporting clauses	**10**
Supporting clauses applicable	**10**
Supporting clauses not applicable	**0**
Overall level of conformity	**HIGH**
Non Conformances	**0**

Summarized evidence:

Management measures:

8.1. Conservation and management measures shall be designed to ensure the long-term sustainability of fishery resources at levels which promote the objective of optimum utilization, and be based on verifiable and objective scientific and/or traditional sources.

No significant changes in management measures have occurred from the previous surveillance report in 2013. Escapement goals are essentially the harvest control rule used for management of Alaska salmon. Currently, there are 296 active salmon stock escapement goals throughout the state of Alaska. However, not all Alaska salmon fisheries and salmon stocks are managed with formal escapement goals, but instead, through in-season management and emergency orders. Inseason management involves opening and closing geographical areas and prosecuting (commercial, sport, subsistence) components of the fishery using emergency orders, based on run size projections, historical and contemporary escapement estimates, intensive harvest monitoring, fishing-effort monitoring, and escapement monitoring, environmental conditions, stock sampling data and any other available information. During the 2013 calendar year ADFG issued about 800 emergency orders to open and close commercial salmon fisheries in the Alaska. Fisheries regulations are published for the various areas in Alaska. These documents contain selected Alaska statutes enabling legal management of resources, statewide general provisions, management plans, gear allowances, closed and open areas, and all the other area specific provisions. These regulations may be changed in-season by emergency regulations or emergency orders at any time to allow sufficient escapements. 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. 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). 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.

Fundamental 9

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

No. Supporting clauses	**11**
Supporting clauses applicable	**8**
Supporting clauses not applicable	**3**
Overall level of conformity	**HIGH**
Non Conformances	**0**

Summarized evidence:

9.1. Measures shall be introduced to identify and protect depleted resources and those resources threatened with depletion, and to facilitate the sustained recovery of such stocks.

9.2. When deciding on use, conservation and management of the resource, due recognition shall be given, where relevant, in accordance with national laws and regulations, to the traditional practices, needs and interests of indigenous people and local fishing communities which are highly dependent on these resources for their livelihood.

9.3/9.4. States and relevant groups from the fishing industry shall encourage the development and implementation of technologies and operational methods that reduce discards of the target and non-target species catch.

9.5 /9.6/9.7/9.8. There shall be a requirement that fishing gear, methods and practices where practicable, are sufficiently selective as to minimize waste, discards, and catch of non-target species - both fish and non-fish species and impacts on associated or dependent species.

No significant changes have occurred since the last surveillance assessment in 2013. 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 sufficient salmon to escape and spawn in their relative natal rivers, and enable them to produce, over the long term, maximum sustainable levels. 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[50].

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[51].

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). Details about these are provided in more detail in clause 4-5-6. Escapement goals are the key management references for production of maximum sustainable levels 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 in-river 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

[50] Commercial Fisheries Entry Commission http://www.cfec.state.ak.us/
[51] What is the CFEC? http://www.cfec.state.ak.us/Publications/what_is_cfec.pdf

of the SEG, BEG or OEG, plus specific allocations to inriver fisheries; (5 AAC 39.222(f)).
Stocks below escapement goals are classified as:

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

Fundamental 10

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

No. Supporting clauses	**3**
Supporting clauses applicable	**3**
Supporting clauses not applicable	**0**
Overall level of conformity	**HIGH**
Non Conformances	**0**

Summarized evidence:

10.1/10.2/10.3. Education and training programmes.

The North Pacific Fishing Vessel Owners association (NPFVO)[52] provides a large and diverse training program that many of the professional crew members must pass. Training ranges from firefighting on a vessel, damage control, man-overboard, MARPOL, etc., and The Sitka-based Alaska Marine Safety Education Association alone has trained more than 10,000 fishermen in marine safety and survival through a Coast Guard-required class on emergency drills. 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[53].

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. Also, the University of Alaska Sea Grant Marine Advisory Program (MAP)[54] provides education and training in several sectors, including fisheries management, in the forms of seminars and workshops. MAP also conducts sessions of their Alaska Young Fishermen's Summit. Each Summit is an intense course in all aspects of Alaska fisheries, from fisheries management & regulation (e.g. MSA), to seafood marketing. The 2013 summit was hosted in Anchorage, Alaska, from December 10th to the 12th. The next Summit is due to be held on the 27-29th January 2016. The conference aimed at providing crucial training and networking opportunities for fishermen entering the business or wishing to take a leadership role in their industry[55].

In addition to this, MAP provides training and technical assistance to fishermen and seafood processors in Western Alaska. A number of training courses and workshops were developed in cooperation with local communities and CDQ groups. Additional education is provided by the Fishery Industrial Technology Center, in Kodiak, Alaska[56].

[52] The North Pacific Fishing Vessel Owners association http://www.npfvoa.org/
[53] Alaska's Institute of Technology http://www.avtec.edu/amtc-cost.aspx
[54] University of Alaska Sea Grant Marine Advisory Program (MAP) http://seagrant.uaf.edu/map/fisheries/
[55] Alaska Young Fishermen's Summit: https://seagrant.uaf.edu/map/workshops/2013/ayfs/, https://seagrant.uaf.edu/map/workshops/2016/ayfs/
[56] Fishery Industrial Technology Center http://www.uaf.edu/sfos/about-us/locations/kodiak/about-ksmsc/

E. Implementation, Monitoring and Control

Fundamental 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.

No. Supporting clauses	**6**
Supporting clauses applicable	**3**
Supporting clauses not applicable	**3**
Overall level of conformity	**HIGH**
Non Conformances	**0**

Summarized evidence:

11.1. Enforcement agencies and framework

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. 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.[57] Wildlife Troopers cover all areas of the state with detachments and/or posts in the communities. 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.[58]

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

[57] Department of Public Safety Alaska Wildlife Troopers http://www.dps.state.ak.us/AWT/mission.aspx
[58] AWT detachment information http://www.dps.state.ak.us/AWT/detachments.aspx

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. [59]

11.2/11.4. Fishing permit requirements:

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.

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

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.

11.3. Boardings and Violations

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.

Alaska Wildlife Troopers supplied the assessment team with information regarding the number of boardings, number of violations detected, types of violations in the past 12 months, and overall level of compliance:

- 1243 commercial salmon fishing vessel boardings – this number would generally only include vessels boarded where no offenses were charged as a result of the boarding.
- 165 incidents which document offenses charged for commercial salmon fishing regulations which are specific to the 15 salmon fishing management areas. Those areas include: Artic-Kotzebue, Northon Sound-Port Clarence, Yukon, Bristol Bay, Kuskokwim, Alaska Peninsula, Atka-Amlia Islands, Aleutian Islands, Chignik, Kodiak, Cook Inlet, Prince William Sound, Yakutat, and Southeastern Alaska Areas. The majority of offenses are related to commercial fishing in closed waters and commercial fishing during a closed period. It also includes offenses related to illegal gear.
- 83 incidents documented offenses related to statewide statutes and regulations related to commercial salmon fishing. The majority of these offenses are related to licensing requirements, as well as gear marking requirements.

Commercial fishing patrol during the period June 1, 2015 through August 1, 2015. In most areas of Alaska, during this date range, commercial fishing enforcement activity is primarily focused on salmon fisheries. This data revealed 6,216 contacts with commercial fisheries participants, 393 warning given to these contacts, and 384 citations issues. Calculating a violation rate from these statistics indicates violations discovered during commercial fishing contacts occur at a 12.5% rate.

[59] AWT safeguard http://www.dps.state.ak.us/AWT/safeguard.aspx

Fundamental 12

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

No. Supporting clauses	**4**
Supporting clauses applicable	**2**
Supporting clauses not applicable	**2**
Overall level of conformity	**HIGH**
Non Conformances	**0**

Summarized evidence:

12.1/12.2. Enforcement policies and regulations, state and federal.

Alaska's salmon fisheries are managed by ADFG, pursuant to Alaska Statutes Title 16 (AS16) and Alaska Administrative Code Title 5 (5AAC). 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 when required, 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. The framework for sanction and violations specific to the salmon fisheries is shown below.

Alaska Statutes, Title 16, Chapter 16.43. Article 08. POINT SYSTEM FOR COMMERCIAL FISHING VIOLATIONS IN SALMON FISHERIES. [60]

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.

Regulations and violations relating to 5 AAC 95.011 [61]

5 AAC 95.011*: The Catalogue of Waters Important for Spawning, Rearing or Migration of Anadromous Fishes,* and its companion Atlas are the means by which ADFG specifies water bodies considered important for use by anadromous fish in accordance with AS 16.05.871. The Atlas and Catalog are adopted by reference under 5 AAC 95.011 (a) of the Alaska Administrative Code. Permit application procedures,

[60] Alaska Statutes Title 16 (laws) http://codes.lp.findlaw.com/akstatutes/16/16.43./08

[61] Alaska Administrative Code Title 5 (regulations) The Catalogue of Waters Important for Spawning, Rearing or Migration of Anadromous Fishes http://www.adfg.alaska.gov/static-sf/AWC/PDFs/awc_pn_intro.pdf

definitions, and other information contained in the introductions of the Atlas and Catalog are also adopted by reference under 5 AAC 95.011 (b).

Penalties

AS 12.55.035 specifies the fines for various offenses. Possible fines for a Class A misdemeanor resulting from a conviction for violating AS 16.05.871 – .896 include:

- If a defendant is not an organization: A fine of up to $10,000.
- If the defendant is an organization: Maximum fines of up to $500,000; or three times the pecuniary gain realized by the defendant; or three times the pecuniary damage or loss caused by the defendant to another, or to the property of another, as a result of the offense.

In addition to these fines, convicted defendants are liable for the cost of restoring the stream to its original condition (AS 16.05.881), may receive up to one year in prison, and may be subject to civil fines or penalties. Please refer to the complete current text of AS 16.05.871 - .901, AS 12.55.035 and 12.55.135 and 5 AAC 95.011 for detailed information.

F. Serious Impacts of the Fishery on the Ecosystem

Fundamental 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 on the fishery on the ecosystem shall be appropriately assessed and effectively addressed.

No. Supporting clauses	**13**
Supporting clauses applicable	**13**
Supporting clauses not applicable	**0**
Overall level of conformity	**HIGH**
Non Conformances	**0**

Summarized evidence:

13.1. Research and Institutional capacity for environmental impact assessment

Alaskan salmon fisheries are co-managed by state (ADF&G) and federal (NMFS) agencies, both of which make substantial investments toward assessing the environmental impacts of these fisheries. At the state level, ADF&G is guided by Alaska's Sustainable Salmon Fisheries Policy (5 AAC 39.222)[62], which was designed to ensure the conservation of salmon and their habitats, and which clearly mandates a precautionary approach for Alaskan salmon fisheries and artificial propagation. The Policy also identifies the need to protect wild salmon stocks and their habitats, and recommends habitat, population and hatchery risk assessments. To meet assessment and research needs, ADF&G owns and operates three major laboratories: the Gene Conservation Laboratory, the Mark, Tag, and Age Laboratory (MTA Lab), and a Pathology Laboratory[63]. Each of these state-operated facilities supports fisheries research and provides information services to assist with the management and conservation of salmon and other species that could be affected by Alaskan fisheries. The Alaska state government invests directly to the Chinook Salmon Research Initiative, which aims to identify and describe those factors that drive Chinook salmon abundance[64]. Other research projects supported or performed by ADF&G include a long-term, genetics-based study of chum and pink salmon to determine stock structure, stray rates and hatchery impacts on wild salmon fitness (see Brenner et al. 2012; Jaspar et al. 2013); straying patterns of hatchery sockeye salmon (Habitch et al. 2013); the Western Alaska Salmon Stock Identification Program (WASSIP)[65] and the Cook Inlet Coho Salmon Genetic Baseline Project[66].

Through their Alaska Regional Office and the Alaska Fisheries Science Center (AFSC), NMFS supports and conducts a wide range of research and environmental assessments related to Alaskan salmon and

[62] Policy for the management of sustainable salmon fisheries
http://www.housemajority.org/coms/jcis/pdfs/Sustainable_Salmon_Fisheries_Policy.pdf
[63] ADF&G Fish and Shellfish — Management & Research Facilities
http://www.adfg.alaska.gov/index.cfm?adfg=fishresearch.facilities
[64] ADF&G Chinook Salmon Research Initiative http://www.adfg.alaska.gov/index.cfm?adfg=chinookinitiative.main
[65] ADF&G The Western Alaska Salmon Stock Identification Program (WASSIP)
http://www.adfg.alaska.gov/index.cfm?adfg=wassip.main
[66] ADF&G Gene Conservation Laboratory Cook Inlet Coho Salmon Genetic Baseline Project
http://www.adfg.alaska.gov/index.cfm?adfg=fishinggeneconservationlab.cookinlet_coho_baseline

associated fisheries. The Auke Bay Laboratories of AFSC[67] maintains four major research programs: Marine Ecology and Stock Assessment, Recruitment Energetics and Coastal Assessment, Ecosystem Monitoring and Assessment and a Genetics program. Each of these programs contributes to Alaskan salmon research and habitat assessments.

13.2/13.3. Fishery Interaction with the ecosystem

Ecosystem effects on the Alaskan salmon stock

Alaska's Policy for Management of Sustainable Salmon Fisheries (5 AAC 39.222) includes provisions that address the potential effects of ecological changes on sustainable harvest in the respect that salmon fisheries must be managed to provide escapements within ranges necessary to conserve and sustain salmon production and to maintain normal ecosystem functioning. Potential ecological effects on salmon stocks are considered during the establishment of escapement goals for each stock. Salmon stocks presenting less than desired abundance levels are classified at each regulatory cycle as (in order of increasing concern): yield concern, management concern and conservation concern. ADF&G fisheries managers consider these classifications and stock status changes when establishing harvest and conservation plans.

The Policy for Management of Sustainable Salmon Fisheries establishes the principle that wild salmon stocks and the salmon's habitats should be maintained at levels of resource productivity that assure sustained yields; and that salmon spawning, rearing and migratory habitats should be protected such that:

- Salmon habitats not be perturbed beyond natural boundaries of variation
- Scientific assessments of possible adverse ecological effects of proposed habitat alterations and the impacts of the alterations on salmon populations should be conducted before approval of a proposal
- Adverse environmental impacts on wild salmon stocks and the salmon's habitats should be assessed

Alaskan salmon fishery effects on the ecosystem

Effects from fisheries on habitat

Because salmon fishing gears do not contact substrate in the way that bottom trawls or long-lines do, effects from salmon fishing gear on habitats are typically negligible. Alaska's Policy for Management of Sustainable Salmon Fisheries mandates 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 follows:

- 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;
- Salmon escapement goals, whether sustainable escapement goals, biological escapement goals, optima escapement goals or inriver run goals, should be established in a a manner consistent with sustained yield; unless otherwise directed, the department will manage Alaska's salmon fisheries, to the extent possible, for maximum sustained yield;
- Salmon escapement goal ranges should allow for uncertainty associated with measurement techniques, observed variability in the salmon stock measure, changes in climatic and oceanographic conditions, and varying abundance within related population of the salmon stock measured;
- 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;
- Impacts of fishing, including incidental mortality and other human-induced mortality, should be assessed and considered in harvest management decisions;

[67] Auke Bay Laboratories of NMFS Alaska Fisheries Science Center. http://www.afsc.noaa.gov/ABL/default.php

- Salmon escapement and harvest management decisions should be made in a a manner that protects non-target salmon stocks or species; the role of salmon in ecosystem functioning should eb evaluated and considered in harvest management decisions and setting of salmon escapement goals;
- Salmon abundance trends should be monitored and considered in harvest management decisions."

Bycatch

Salmon fishing gears (purse seines, gillnets, and troll gear) cause minimal impact to non-target species and bycatch is generally not considered to be a major issue in most Alaskan salmon fisheries. Regulations define when and where fisheries occur and which types of fishing gear (e.g. mesh sizes, net lengths, number of fishing lines, rods, and gurdies, etc.) can be used. Alaska maintains specific regulations for bycatch of non-target species. For example, for the troll fishery in the state waters of the Eastern Gulf of Alaska, all groundfish incidentally taken by hand and power troll gear may be legally retained, but in accordance with state-defined restrictions (5 AAC 28.171) and annual fishery management plans.

For federally managed groundfish species, trollers are limited to strict federal retainable percentages that vary by area and fishery. For example, in the Alaska East Area, all groundfish incidentally taken by hand and power troll gear being operated to take salmon (and consistent with applicable laws and regulations) can be legally retained, but with the following restrictions:

- The bycatch allowance for DSR is limited to 10 percent of the round weight of all salmon on board the vessel. All DSR in excess of 10 percent must be weighed and reported as bycatch overage on an ADFG fish ticket. DSR bycatch overages must be reported on fish tickets but may be kept for a person's own use.
- Lingcod may be taken as bycatch in the commercial salmon troll fishery only from May 16 through November 30.
- Lingcod must measure at least 27 inches from the tip of the snout to the tip of the tail, or 20.5 inches from the front of the dorsal fin to the tip of the tail.

Seabirds

Onboard observers employed through the marine mammal protection program also collect valuable data on interactions between Alaskan fisheries and seabirds, which are protected under the Migratory Bird Act (MBA) and, in some cases, the U. S. Endangered Species Act (ESA). In brief, harmful interactions with birds are relatively rare for Alaskan salmon fisheries, as compared to trawl, gillnet and long-line fisheries for other species, which can have significant impacts on seabird populations (Moore et al. 2009).

Marine mammals

Marine mammals in Alaska are protected by the Marine Mammal Protection Act (MMPA). The MMPA prohibits, with certain exceptions, the "take" of marine mammals in U.S. waters and by U.S. citizens on the high seas, and the importation of marine mammals and marine mammal products into the U.S.[68] General interaction with marine mammals in the Alaska salmon fisheries is limited and not considered to be of significant negative impact.

The NOAA List of Fisheries (LOF) classifies U.S. commercial fisheries into one of three Categories according to the level of incidental mortality or serious injury of marine mammals:

- **I, frequent** incidental mortality or serious injury of marine mammals,
- **II, occasional** incidental mortality or serious injury of marine mammals,
- **III, remote likelihood of/no known** incidental mortality or serious injury of marine mammals.

The Marine Mammal Protection Act (MMPA) mandates that each fishery be classified by the level of serious injury and mortality of marine mammals that occurs incidental to each fishery is reported in the

[68] NOAA Marine Mammal Protection Act. http://www.nmfs.noaa.gov/pr/laws/mmpa/

annual Marine Mammal Stock Assessment Reports for each stock. Those participating in a Category I or II fishery are required to accommodate an onboard observer upon request (50 CFR 229.7) and must comply with applicable take reduction plans. NMFS may develop and implement take reduction plans for any Category I or II fishery that interacts with a strategic stock. No category I salmon fisheries are present in Alaska.

Marine mammal interaction classifications for select Alaskan salmon fisheries are as:

- AK Bristol Bay Salmon Drift Gillnet Fishery, category II.
- AK Bristol Bay Salmon Set Gillnet Fishery, category II.
- AK Kodiak Salmon Set Gillnet Fishery, category II.
- AK Kodiak Salmon Purse Seine Fishery, category II.
- AK Cook Inlet Salmon Set Gillnet Fishery, category II.
- AK Cook Inlet Salmon Drift Gillnet Fishery, category II.
- AK Cook Inlet Salmon Purse Seine Fishery, category II.
- AK Peninsula/Aleutian Islands Salmon Drift Gillnet Fishery, category II.
- AK Peninsula/Aleutian Islands Salmon Set Gillnet Fishery, category II.
- AK Prince William Sound Salmon Drift Gillnet Fishery, category II.
- AK Southeast Salmon Drift Gillnet Fishery, category II.
- AK Yakutat Salmon Set Gillnet Fishery, category II.

Other category III (remote likelihood of/no known incidental mortality or serious injury of marine mammals) fisheries in Alaska exist, but are not been listed here.

13.4. Pollution – MARPOL

MARPOL 73/78 (the "International Convention for the Prevention of Pollution from Ships") is one of the most important treaties regulating pollution from ships. Six Annexes of the Convention cover the various sources of pollution from ships and provide an overarching framework for international objectives. In the U.S., the Convention is implemented through the Act to Prevent Pollution from Ships (APPS). Under the provisions of the Convention, the United States can take direct enforcement action under U.S. laws against foreign-flagged ships when pollution discharge incidents occur within U.S. jurisdiction. When incidents occur outside U.S. jurisdiction or jurisdiction cannot be determined, the United States refers cases to flag states, in accordance with MARPOL. These procedures require substantial coordination between the Coast Guard, the State Department, and other flag states, and the response rate from flag states has been poor. Different regulations apply to vessels, depending on the individual state[69,70].

13.5. Management responses to serious impacts on the ecosystem

Regulations/measures to minimize impacts

Alaska enforces its fisheries laws through a points system, whereby and in accordance with Alaska state statute 16.43.850, commercial salmon fishers shall be demerit points for the following points for the following violations that relate to serious impacts to the ecosystem:

- fishing in closed waters ..... 6 points;
- fishing during closed season or period ..... 6 points;

[69] Act to Prevent Pollution from Ships, 33 U.S.C. §§ 1901–1915. **https://www.law.cornell.edu/uscode/text/33/1901**

[70] U.S. Government Accountability Office, Washington, D.C. (2000). "Progress Made to Reduce Marine Pollution by Cruise Ships, but Important Issues Remain." Report to Congressional Requesters. Report No. RCED-00-48. **http://www.gao.gov/assets/230/228813.pdf**

- fishing with more than the legal amount of gear ..... 4 points;
- fishing with gear not allowed in fishery ..... 6 points;
- improper operation of fishing gear ..... 4 points;
- wanton waste of fishery resources ..... 4 points.

The Commercial Fisheries Entry Commission shall suspend a permit holder's commercial salmon fishing privileges 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.

Individuals or organizations that illegally degrade the spawning, rearing and migratory habitats of anadromous fishes, including salmon, shall be guilty of a class A misdemeanor, in accordance with Sections 871-901 of Alaska state statute 16.05. Penalties for class A misdemeanors are as:

- If a defendant is not an organization: A fine of up to $10,000.
- If the defendant is an organization: Maximum fines of up to $500,000; or three times the pecuniary gain realized by the defendant; or three times the pecuniary damage or loss caused by the defendant to another, or to the property of another, as a result of the offense.

In addition to these fines, convicted defendants are liable for the cost of restoring the stream to its original condition (AS 16.05.881), may receive up to one year in prison, and may be subject to civil fines or penalties.

Essential Fish Habitat

Alaska has more than 50% of the U.S. coastline and leads the United States in fish habitat area and value of fish harvested, yet large gaps exist in knowledge of Essential Fish Habitat (EFH) in Alaska. Major research is needed to identify habitats that contribute to the survival, growth, and productivity of managed fish species, and to determine how to best manage and protect these habitats. EFH research support is based on priorities from the EFH Research Implementation Plan for Alaska. Around $450,000 is spent on EFH research projects each year. Project results are described in annual reports and peer-reviewed literature. Study results contribute to existing Essential Fish Habitat data sets[71]. All federal agencies must consult with NMFS regarding any action they authorize, fund, or undertake that may adversely affect EFH, and NMFS must provide conservation recommendations to federal and state agencies regarding any action that would adversely affect EFH. All significant permits and actions are subject to the Environmental Impact Statement (EIS) process, which not only requires thorough review by scientists and agencies, but also mandates thorough and comprehensive public information and transparency.

In 2005 the North Pacific Fishery Management Council (NPFMC) identified the entire U.S. Exclusive Economic Zone (EEZ; 200-nautical miles from shore) as essential fish habitat (EFH) for each of the five species of Pacific salmon found in Alaska. In order to better define EFH within the U.S. EEZ for Pacific salmon found in Alaska, Echave et al. (2012) analyzed the influence of sea surface salinity (SSS), sea surface temperature (SST), and bottom depth on salmon distribution. By calculating and mapping the coincidence of the 95% range of each environmental variable (SSS, SST, depth) for each of the five species at each maturity stage, updated EFH descriptions were used by these authors to reduce the area of designated EFH for Pacific salmon by 71.3%, on average. In brief, juvenile salmon EFH generally consists of the water over the continental shelf within the Bering Sea extending north to the Chukchi Sea, and over the

[71] NMFS Essential Fish Habitat. http://www.afsc.noaa.gov/HEPR/efh.htm

continental shelf throughout the Gulf of Alaska and within the inside waters of the Alexander Archipelago. Immature and mature Pacific salmon EFH includes nearshore and oceanic waters, often extending well beyond the shelf break, with fewer areas within the inside waters of the Alexander Archipelago and Prince William Sound. According to Echave et al. (2012), this was the first time that salmon data sets from multiple surveys, agencies, and years were accumulated and formatted for Pacific salmon distribution and habitat analysis.

13.6. Research on environment and social impacts of fishing gear

As previously described, bycatch of non-target species by Alaskan salmon fisheries usually occurs at negligible levels, quota and use is regulated by state and federal agencies and is generally not considered to present significant ecological risk. However, fishing gears designed to harvest other species do occasionally capture and kill significant numbers of Alaskan salmon. In response, a growing body of research has explored means to reduce bycatch take of Alaskan salmon, such as improved salmon excluders on bottom trawl nets[72], with noteworthy success.

Environmental impacts from salmon fishing gear are considered to be minimal, as they do not typically contact substrate and are retrieved after short duration, with little potential for "ghost fishing" by lost gear.

[72] Gear modifications in Alaska. http://access.afsc.noaa.gov/pubs/posters/pdfs/pGauvin01_gear-modifications.pdf

Fundamental 14

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

No. Supporting clauses	**4**
Supporting clauses applicable	**4**
Supporting clauses not applicable	**0**
Overall level of conformity	**HIGH**
Non Conformances	**0**

Summarized evidence:

14.1. States shall promote responsible development and management of aquaculture, including an advanced evaluation of the effects of aquaculture development on genetic diversity and ecosystem integrity, based on the best available scientific information.

Aquacultural enhancement of Alaska's salmon fisheries, which began in the 1960s, is now based on the operation of private non-profit, state-regulated hatcheries that, in 2014, released 1.8 billion juvenile salmon into open public waters for commercial, recreational and tribal harvest[73]. Alaskan salmon hatcheries are typically sited away from major natural populations, yet use locally-sourced fish to found and, in some cases, supplement hatchery broodstocks[74]. These two measures (hatchery siting and broodstock sourcing) are intended to reduce the frequency and genetic consequences of hatchery-wild interactions that may occur when hatchery salmon stray onto natural spawning grounds. Alaskan hatcheries also use random mating protocols and relatively large numbers of adult spawners to maximize effective population sizes, maintain allelic diversity and further reduce genetic risks from hatchery strays on wild salmon.

The efficacy of these management approaches toward minimizing adverse hatchery effects on natural salmon populations are evaluated by Alaska Department of Fish and Game (ADF&G)[75] and partnering non-profit organizations, such as the Prince William Sound Science Center (PWSSC) and Sitka Sound Science Center (SSSC). For example, in 2012, ADF&G organized a science panel comprised of federal and state fisheries managers, aquaculture representatives and university professors to identify critical research needed to evaluate potential impacts from pink and chum hatchery operations on wild populations. The panel proposed a series of studies, which were subsequently funded and are now providing information on the extant structure of pink and chum salmon population, as well as stray and genetic introgression rates from neighboring hatchery populations[76,77]. Most recent results from these and related studies suggest that 1)within SEAK and streams feeding into Prince William Sound, hatchery fish represent highly variable proportions of pink, chum and sockeye spawning populations, but streams within a 20 km radius of hatcheries contain the highest proportions of hatchery spawners[78, 79]; 2)that Prince William Sound chum

[73] Alaska salmon fisheries enhancement program; 2014 annual report: http://www.adfg.alaska.gov/FedAidPDFs/FMR15-15.pdf
[74] Heard (2012) *Environmental Biology of Fish* 94:273-283
[75] ADF&G Hatcheries Research: http://www.adfg.alaska.gov/index.cfm?adfg=fishingHatcheriesResearch.main
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[78] Brenner et al. (2012) *Environmental Biology of Fishes* 94:179-195
[79] Knudsen et al. (2015) Interactions of wild and hatchery pink salmon and chum salmon in Prince William Sound and Southeast Alaska: Progress Report for 2014 by PWSSC and SSSC to ADF&G: www.adfg.alaska.gov/static-f/fishing/PDFs/hatcheries/research/pwssc_2014.pdf

populations are spatially (and not interannually) structured and that 3)genetic introgression from hatchery populations appears to be better explained by overlap between hatchery and wild spawn timing than physical proximity[80]. With regard to ongoing genetic pedigree studies that evaluate potential fitness effects from stray hatchery salmon, ADF&G has stated that "as these studies provide results, we will evaluate and decide if any modifications to the [hatchery] program may be warranted"[81].

Genetic and ecological studies of Alaskan Chinook salmon are also in progress. Amid evidence of declining Chinook salmon stocks, ADF&G hosted a research symposium in 2012 to "identify key knowledge gaps and assemble a list of research priorities" to better understand the factors affecting Chinook salmon abundance in Alaska.[82] The plan that emerged from this symposium[83] included a recommendation for improved genetic baseline data to assist with stock-specific analyses and management, and in 2013 the state of Alaska subsequently invested $7.5M toward Chinook salmon research[10] and, ultimately, $30M over a 5-year period, in addition to funding baseline monitoring. This "Chinook Salmon Research Initiative" has supported collection and analysis of robust Chinook salmon abundance data for the Chignik, Chilkat, Copper, Karluk, Kenai, Kuskokwim, Nushagak, Stikine, Susitna, Taku, Unuk and Yukon rivers.

14.2. Aquaculture development is ecologically sustainable and to allow the rational use of resources shared by aquaculture and other activities.

Full-lifecycle cultivation of salmon for commercial purposes is prohibited in Alaska by state statute[84]. Instead salmon fisheries in Alaska are enhanced through non-profit hatchery operations that release juvenile fish into open waters, whereby returning adult salmon may be harvested in recreational, commercial or tribal fisheries. Salmon produced by Alaskan hatcheries are descended from native local stocks and spend much of their lives in natural environments together with wild salmon. Alaska's approach to salmon aquaculture likely reduces some ecological risks to native fish populations, such high parasite loads often associated captive reared salmon, while possibly exacerbating others, such as competition for food in ocean environments[85,86]. Mass marking of Alaskan hatchery salmon via otolith thermal bands facilitates research on possible effects from inter- and intraspecific competition from hatchery salmon. Such research has been recommended[14, 87] and performed[88]. ADF&G's position is that their hatchery "program guards against potential negative effects on natural production, as evidenced by over 40 years of hatchery production alongside stable or increasing natural production".[9]

14.3. 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 (such as those caused by inputs from enhancement activities and related economic and social consequences.

Otolith thermal marking is used extensively by Alaskan salmon hatcheries to allow for the identification of hatchery salmon in fisheries and on natural spawning grounds, thereby enabling managers to estimate the

[80] Jaspar et al. (2013) *PLOS One* 8(12): http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0081916
[81] Alaska Hatchery Research: http://www.adfg.alaska.gov/index.cfm?adfg=fishingHatcheriesResearch.main
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[84] Alaska Statute § 16.40.210: http://codes.lp.findlaw.com/akstatutes/16/16.40./03./16.40.210.
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[87] Ruggerone et al. (2010) Marine and Coastal Fisheries: Dynamics, Management, and Ecosystem Science 2: 306-328: http://www.tandfonline.com/doi/pdf/10.1577/C09-054.1
[88] Sturdevant et al. (2012) *Environmental Biology of Fishes* 94:101-116

proportion of hatchery fish harvested in mixed-stock fisheries[89], evaluate the influence of hatchery fish on wild salmon populations[6, 90], and make informed management decisions. ADF&G's Mark Recovery Laboratory analyzes thousands of otoliths annually from test fisheries, commercial fisheries and escapement surveys, as well as voucher specimens from participating hatcheries. Data from these analyses are publically accessible through their website[91], which allows queries filtered by year, species and fishery district. Otolith thermal mark data are used by ADF&G managers to provide in-season salmon escapement estimates and adjust fisheries regulations as appropriate[92].

ADF&G also supports development and application of genetic tools which are used to assess impacts of fisheries and hatchery production on diverse stocks of Chinook, sockeye, chum and pink salmon[5,10]. Studies of stock structure, genetic introgression and potential impacts of hatchery salmon on wild salmon fitness all serve to inform fisheries managers charged with upholding Alaska's statutes §16.10.400 and §16.10.420 which promote segregation and prohibit jeopardy from hatcheries on natural salmon stocks.

[89] Hagen et al. (1995) Alaska Fishery Research Bulletin 2(2):143-155
[90] Habicht et al. (2013) North American Journal of Fisheries Management 33(4):777-782
[91] ADF&G Mark Recovery Laboratory: http://mtalab.adfg.alaska.gov/OTO/default.aspx
[92] ADF&G News Release for August 13, 2014: http://www.adfg.alaska.gov/static/applications/dcfnewsrelease/477280272.pdf

8. Performance specific to agreed corrective action plans

The minor non conformance assigned in 2012 under clause 7, on the Precautionary Approach, remains open until the next full re-assessment date (2016).

- Holding 2014 increases in hatchery production to modest levels provides corrective evidence sufficient to maintain the previous minor non-conformance determination issued in 2013 under this clause.
- The second provision is met by the PWSSC 2014 Annual Report on the ADFG website and as described earlier in this document.

These same items will be re-analyzed in the next full re-assessment activities due to commence in April 2016.

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

The minor non conformance referring to clause 7.1.1 remains open although sufficient evidence of progress has been provided toward both a precautionary approach to hatchery releases and progress with the large scale hatchery research program. No new non conformances were opened during this surveillance audit.

10. Future Surveillance Actions

Open minor non conformance	Year and assessment	Corrective action	Status
Clause 7, relating to the precautionary approach	Surveillance 1, 2012	**1) The interim progress towards the completion of the large scale hatchery salmon research study and; 2) Hatchery corporations permit alteration requests (if any) and their treatment by ADFG.**	Non Conformance Assigned. Corrective Action received, reviewed and accepted.
Clause 7, relating to the precautionary approach	Surveillance 2, 2013	**1) The interim progress towards the completion of the large scale hatchery salmon research study and; 2) Hatchery corporations permit alteration requests (if any) and their treatment by ADFG.**	All required evidence received. Progressing successfully as for agreed timeline.
Clause 7, relating to the precautionary approach	Surveillance 3, 2014	**1) The interim progress towards the completion of the large scale hatchery salmon research study and; 2) Hatchery corporations permit alteration requests (if any) and their treatment by ADFG**	Sufficient evidence received from 2013 PAR's and progress with research.

Clause 7, relating to the precautionary approach	Surveillance 4, 2015	**1) The interim progress towards the completion of the large scale hatchery salmon research study and; 2) Hatchery corporations permit alteration requests (if any) and their treatment by ADFG**	Sufficient evidence received from 2014 PAR's and progress with research.

11. Client signed acceptance of the action plan

Section not required at this audit.

12. Recommendation and Determination

On concluding this report and 4th surveillance audit activity, Global Trust confirms that continued Certification under the Alaska 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).

13. References

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ADF&G Contacts by location	http://www.adfg.alaska.gov/index.cfm?adfg=contacts.main
ADF&G Current Research	http://www.adfg.alaska.gov/index.cfm?adfg=fishingHatcheriesResearch.current_res
ADF&G Commercial Salmon Fisheries	http://www.adfg.alaska.gov/index.cfm?adfg=CommercialByFisherySalmon.main
ADF&G Enforcement of Alaska's Fish & Wildlife Laws	http://www.adfg.alaska.gov/index.cfm?adfg=enforcement.main
ADF&G Commercial Salmon Fisheries Regulations	http://www.adfg.alaska.gov/index.cfm?adfg=fishregulations.commercial
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ADF&G Chinook Salmon Research Initiative	http://www.adfg.alaska.gov/index.cfm?adfg=chinookinitiative.main
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Appendix 1

Assessment Team Details

Dr. Ivan Mateo, Lead Assessor

Dr. Ivan Mateo has over 20 years' experience working with natural resources population dynamic modeling. His specialization is in fish and crustacean population dynamics, stock assessment, evaluation of management strategies for exploited populations, bioenergetics, ecosystem-based assessment, and ecological statistical analysis. Dr. Mateo received a Ph.D. in Environmental Sciences with Fisheries specialization from the University of Rhode Island. He has studied population dynamics of economically important species as well as candidate species for endangered species listing from many different regions of the world such as the Caribbean, the Northeast US Coast, Gulf of California and Alaska. He has done research with NMFS Northeast Fisheries Science Center Ecosystem Based Fishery Management on bioenergetic modeling for Atlantic cod He also has been working as environmental consultant in the Caribbean doing field work and looking at the effects of industrialization on essential fish habitats and for the Environmental Defence Fund developing population dynamics models for data poor stocks in the Gulf of California. Recently Dr. Mateo worked as National Research Council postdoc research associate at the NOAA National Marine Fisheries Services Ted Stevens Marine Research Institute on population dynamic modeling of Alaska sablefish.

Brian Allee, Ph.D. (Assessor)

Dr. Brian Allee attended the University of California Berkeley majoring in zoology. He received his Ph.D. from the University of Washington in fisheries. Dr. Allee has worked extensively with salmonid fish specializing in salmon research, restoration and enhancement of salmon and steelhead in freshwater, estuarine, and marine ecosystems in Alaska, Washington and Oregon.

After working in Washington and Oregon as a fisheries biologist, he first came to Alaska in 1982 and worked for Prince William Sound Aquaculture Association as operations manager and later as president. He subsequently served as Director of the Fisheries Rehabilitation and Enhancement, Development Division (FRED) of the Alaska Department of Fish and Game. His responsibilities included the statewide public hatchery program, the private non-profit permitting and planning program, and oversaw the genetic, pathology, limnology, and coded wire tagging laboratories, fisheries engineering and regional and area FRED staff. While serving as Director he was appointed by the Governor to the Alaska Science and Engineering Commission and the Alaska Science and Technology Foundation.

Dr. Allee returned to Alaska in 2003 to be the Alaska Sea Grant Director at the University of Alaska Fairbanks where he was active in funding fisheries research, education and extension for coastal Alaska. He more recently worked for the National Marine Fisheries Service in Portland on Mitchel Act hatchery funding in the Columbia River and participated on hatchery reform efforts.

In addition, he was past President of the Fish Culture Section of the American Fisheries Society and a member of the Scientific and Statistical Committee of the Pacific Fisheries Management Council. During Dr. Allee's 44 year career as a fisheries scientist and administrator he had broad management experience at the policy and technical level, supervising large and small organizations in public (state, federal and

tribal), private and private non-profit sectors.

Scott Marshall (Assessor)
B.S. Fisheries Science Oregon State University, M.S. Fisheries Science University of Washington
1974 - 1980 Fisheries Scientist and Project Leader at the Fisheries Research Institute, University of Washington. My primary emphasis was on researching sockeye salmon productivity in the Chignik Lakes, Alaska , on determining the origins of Chinook salmon harvested by foreign vessels operating in the the North Pacific Ocean, and on the population dynamics of sockeye salmon in the Lake Washington watershed of Washington.

1980 - 2001. Alaska Dept. Fish and Game: I served in three primary capacities, Research Project Leader, Principal Fishery Scientist for Pacific Salmon Commission Affairs and Regional Supervisor. As a Project Leader I lead research teams in the study of population structure and dynamics of the state's Pacific Salmon and Pacific herring stocks. As a Principal Scientist I served as a Co-Chairman or as Alaska's senior representative on several international technical teams established by the the Pacific Salmon Treaty (e.g Chinook Salmon, Transboundary Rivers, Canadian/Alaska Boundary Area Fisheries, Interceptions Accounting Committee, Data Sharing Committee, Editorial board). I served on Scientific and Statistical Committee of the North Pacific Management Council. As the Division of Commercial Fisheries Regional Supervisor for Southeast Alaska, I represented the Department at Alaska Board of Fisheries meetings, reviewed and/or critiqued numerous regulatory proposals for the fisheries of Southeast Alaska. I oversaw the daily research and management of the Southeast Region's commercial, personal use and subsistence fisheries. I served as Co-Chairman of the Transboundary Rivers Panel of the Pacific Salmon Commission. Undertook numerous administrative responsibilities, such as budgeting, hiring HR etc.

2000- 2005. Idaho Department of Fish and Game I served as the Fisheries Bureau's Staff Biologist for Endangered Species Act Affairs. This included developing Biological Assessments, Applications for ESA Section 7 & 10 permits, and writing reports for incidental take of endangered Pacific salmon that occurred during the conduct of research activities, recreational fisheries and hatchery operations. I lso served as the Department's representative on the Habitat Committee of the Pacific Fishery Management Council.

2005 - 2013 U.S Fish and Wildlife . I was a Fisheries Administrator in charge of the Lower Snake River Compensation Plan (a hatchery mitigation program to compensate for construction and operation of four hydroelectric dams on the Lower Snake River in Washington Oregon and Idaho). I developed, presented and negotiated budgets for the program to the Bonneville Power Administration (roughly $30 million annually). I reviewed and negotiated annual budgets, contracts, annual spending and scientific reports developed by our fish and wildlife agency cooperators who implemented the program (3 state, 3 tribal agencies and several U.S Fish and Wildlife Service field offices). I developed a series of three Programmatic Reviews (one for each of the primary species raised in our hatcheries) as required by the Northwest Power Planning Council's implementation legislation.

Marc Johnson (Assessor)
Key features of Marc's career in salmon fisheries as follows:
Oregon Department of Fish and Wildlife Corvallis Research Laboratory 28655 Highway 34 Corvallis, Oregon 97333
Oregon State University Department of Fisheries and Wildlife 104 Nash Hall Corvallis, Oregon 97391
EDUCATION PhD in Fisheries Science Oregon State University Corvallis, Oregon Completed June of 2009
MSc in Ecology University of Brasília Brasília, Federal District (Brazil) Completed June of 1999
BSc in Zoology Oregon State University Corvallis, Oregon Completed June of 1996

Experience In Fisheries Research

Oregon Department of Fish and Wildlife (Period: 2/2010 – present)
Location: Corvallis, Oregon
Position: Technical Analyst
Research Objective: Develop research and provide technical advice for studies of spring Chinook salmon (Oncorhynchus tshawytscha) and winter steelhead (O. mykiss) in support of the 2008 (NMFS) Willamette Valley Project Biological Opinion
Cooperative Institute for Marine Resources Studies (Period: 7/2009 – 8/2009)
Location: Newport, Oregon / Seattle, Washington
Position: Academic Wage Researcher
Research Objective: Design and use novel qPCR assays to investigate the influence of acclimation site exposure on olfactory receptor gene expression in juvenile spring Chinook salmon.

Oregon State University (Period: 9/2003 – 6/2009)
Location: Newport, Oregon
Position: Doctoral Student and Graduate Research Assistant
Research Objective: Use existing and develop new genetic markers to investigate the genetic structure of Oregon coastal coho salmon (O. kisutch); infer demographic and evolutionary processes.

PEER-REVIEWED PUBLICATIONS
Sard, N. M., K. G. O'Malley, D. P. Jacobson, M. J. Hogansen, M. A. Johnson and M. A. Banks (2015) Factors influencing spawner success in a spring Chinook salmon (Oncorhynchus tshawytscha) reintroduction program. Canadian Journal of Fisheries and Aquatic Sciences
Van Doornik, D. M., M. A. Hess, M. A. Johnson, D. J. Teel, T.A. Friesen and J. M. Myers (2015) Genetic population structure of Willamette River steelhead and the influence of introduced stocks. Transactions of the American Fisheries Society144(1): 150-162
Johnson M. A. and T.A. Friesen. (2014) Genetic diversity and population structure of Chinook salmon from the upper Willamette River, Oregon. North American Journal of Fisheries Management 34:853862
Johnson M. A. and T.A. Friesen. (2013) Age at maturity, fork length and sex ratio of upper Willamette River hatchery spring Chinook salmon. North American Journal of Fisheries Management 33:318-328
Johnson M. A. and M. A. Banks (2011). Sequence conservation among orthologous vomeronasal type 1 receptor-like (ora) genes does not support the differential tuning hypothesis in Salmonidae. Gene 485(1):16-21.
Johnson, M. A. and M A. Banks, (2009) Interlocus variance of Fst provides evidence for selection over an olfactory receptor gene in coho salmon (Oncorhychus kisutch) populations. Marine Genomics 2:127-131
Johnson M. A. and M. A. Banks (2008) Genetic structure, migration and patterns of allelic richness among coho salmon (Oncorhynchus kisutch) populations of the Oregon Coast. Canadian Journal of Fisheries and Aquatic Science 75(7): 1274-1285
Johnson M. A., J. S. Marinho-Filho and W. M. Tomas (2004) Species-habitat association of the spiny rat, Proechimys roberti (Rodentia: Echimyidae), in the National Park of Brasília, DF, Brazil. Studies on Neotropical Fauna and Environment 39(2):103-108

Johnson M. A., P. Saraiva and D. Coelho (1999) The role of gallery forests in the distribution of Cerrado mammals. Revista Brasileira de Biologia 59(3):421-427
Johnson M. A., W. M. Tomas and N. M. R. Guedes (1997) Density of young manduvi (Sterculia apetala), the hyacinth macaw's nesting tree, under three different management conditions in the Pantanal wetland, Brazil. Ararajuba (Brazilian Ornithological Society Journal) 5(2):185-188

RECENT PRESENTATIONS

Johnson, M. A., T. A. Friesen, D. J. Teel, D. M. Van Doornik. The genetic structure of steelhead and spring Chinook salmon in the upper Willamette River, Oregon. Oral presentation at the USACE Willamette Fisheries Science Review, Corvallis, OR, Feb. 5-7, 2013.

Jacobson, D. P., N. Sard, M. J. Hogansen, K. Schroeder, M. A. Johnson, K. G. O'Malley, and M. A. Banks. Total lifetime fitness and cohort replacement rate for Chinook salmon outplanted above Cougar Dam, South Fork McKenzie River, Oregon. Oral presentation at the USACE Willamette Fisheries Science Review, Corvallis, OR, Feb. 5-7, 2013.

Deirdre Hoare (Assessor)

Deirdre Hoare has a BSc in Marine Science and a MSc in Marine Zoology from the National University of Ireland, Galway and a post graduate diploma in Statistics from Trinity College Dublin. Deirdre has worked directly in fisheries stock assessment as an observer on international projects in NAFO and Ireland. For 5 years she worked as a Fisheries Assessment Analyst and as a Scientific and Technical Officer for the Marine Institute in Ireland. This work involved fisheries research and stock assessment for ICES working groups. The work also involved coordination and management of a Fisher Self sampling program in the Irish Sea, with particular emphasis on spatial and temporal discard measurement tools. Currently Deirdre is working as an independent Fisheries Consultant. Her work currently involves evaluation and verification of fisheries management and sustainability against international standards. She also performs fish stock assessments, evaluate data the date and outlines the limitations.