FAO-BASED RESPONSIBLE FISHERY MANAGEMENT CERTIFICATION SURVEILLANCE REPORT

For The

US Alaska Salmon Commercial Fisheries

Applicant Group

Alaska Fisheries Development Foundation (AFDF)

Report Code: **AK/Sal/001.3/2014**
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Main Sections of the Surveillance Report

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I. Summary and Recommendations

The objective of surveillance audits is to monitor for any changes/updates in the management regime, regulations and their implementation since the previous surveillance assessment, and to determine whether these changes (if any) and current practices remain consistent with the overall confidence rating scorings of the fishery allocated during initial certification and verified during the 1st and 2nd surveillance activities.

The minor non conformance issued on the 1st surveillance assessment (on the Application of the Precautionary Approach, Fundamental Clause 7) was assessed for continued compliance using current evidence and the relative action plan received and published within the previous surveillance assessment reports.

Up-date on the Client holding the Certificate:
The Alaska Seafood Marketing Institute requested transferral of the certificate for Alaska Commercial Salmon fisheries to the Alaska Fisheries Development Foundation in December 2014 and transfer was completed in January 2015.

The original certification determination was published March 2011.

This report is the **3rd Surveillance Report (ref. AK/Sal/001.3/2014)** for the Alaska salmon commercial fisheries. The surveillance activity commenced in December 2014, although was extended to include a review of the evidence prior to returning a recommendation for continued certification.

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

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

Based on the outcome of this 3rd 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).

1. Introduction

Unit of Certification

The US Alaska commercial salmon [all pacific salmon species: Chinook *(Oncorhynchus tschawytscha);* sockeye *(Oncorhynchus nerka);* coho *(Oncorhynchus kisutch);* pink *(Oncorhynchus gorbuscha);* and chum *(Oncorhynchus keta)*] fisheries employing troll, purse seine, drift gillnet, set gillnet gear (and fish wheel in Upper Yukon River only) in the four administrative Regions of Alaska principally managed by the Alaska Department of Fish and Game (ADFG), underwent their 3rd surveillance assessment against the requirements of the FAO-Based RFM Conformance Criteria Version 1.2 Fundamental clauses.

This is a voluntary program for the Alaska salmon fisheries that has been supported by ASMI who wishes to provide an independent, third-party certification program that can be used to verify that these fisheries are responsibly managed according to the FAO-Based RFM Program. The assessment was conducted according to the Global Trust procedures for FAO-Based RFM Certification GTC Version 1.2 Sept 2011 in accordance with EN45011/ISO/IEC Guide 65 accredited certification procedures.

The assessment is based on 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).

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

These six major components are supported by 13 fundamental clauses (+ 1 in case of enhanced fisheries) against which a capture fishery certified under the FAO-Based RFM Program is assessed during the various assessment surveillance events. A summary of the site meetings is presented in Section 5. Assessors comprised of both externally contracted fishery experts and Global Trust internal staff.

2. Fishery Applicant Details

New Applicant for 3rd surveillance audit:

Applicant Contact Information			
Organization/ Company Name:	**Alaska Fisheries Development Foundation**	Date:	**January 2015**
Correspondence Address:	P.O. Box 2223, Wrangell, AK 99929-2223		
Street :			
City :	**Wrangell**		
State:	**Alaska**		
Country:	***USA*** *907-276-7315*		
Phone:		**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

Notices of sites visits were posted at the ASMI website in advance of those, and emailed to various stakeholders out via an e-blast.

Organization	Time, day and representative	Items discussed
Alaska Department of Fish and Game. **Juneau, Alaska, USA**	**6th of March 2014, 09.00 am.** Forrest Bowers, Ron Josephson, Andrew Munro.	• Changes or significant updates in law, regulations or commercial fisheries operations affecting salmon management in any of the four management regions of Alaska for 2013/14. • Coastal project proposals other than fishing (e.g. oil exploration) in 2013 in which ADFG was consulted to determine potential impacts to salmon stocks and their habitats by these activities. • Alaska Coastal Management Plan, efforts to reinstate it in 2013. • Changes in the survey effort (e.g. aerial surveys, weirs, towers) used to manage salmon species in Alaska in 2013 since 2012. Changes specific to Chinook salmon management. • Quantification of straying hatchery salmon in SEAK, PWS or the Kodiak regional areas in 2013. • Board of Fisheries Cycle – most Recent Escapement Goal Reviews. • Intention and practicality to utilize WASSIP genetic data for upcoming Escapement Goal reviews. • Southeast Alaska and Yukon/International PSC Agreements with Canada. Have the escapement goals been met in 2013 in respect with the harvest quota established by the U.S. and Canada through the PSC? • Chinook salmon returns in 2013. Differences from 2012 and management actions. • Pink salmon harvest in 2013, hatchery and wild. • Emergency Orders issued in 2013 to open and close salmon fisheries in Alaska. • Updates on the Chinook Salmon Research Plan/initiative. Funding planned for 2014. • Management of non-salmon bycatch in the salmon fisheries. • Interaction of salmon fisheries with seabirds and marine mammals. • Kodiak hatchery salmon. Incoming requirement for otolith marking in Kodiak hatcheries (considering the availability of dry otolith marking techniques). Hatchery salmon straying in Kodiak. • Bycatch of Chinook and chum salmon in the groundfish fisheries (i.e. pollock) of Alaska: interaction between ADFG and federal management to constrain Chinook and chum salmon bycatch. • Status of the stocks of concern to date. Differences from the 2012 stock of concern designations.

		• Gulkana sockeye. • Interactions of Wild and Hatchery Pink and Chum Salmon in Prince William Sound and Southeast Alaska - Annual Report 2013. • New studies (i.e. peer reviewed or agencies reports) relating to hatchery salmon straying and its genetic or ecological interactions with wild salmon stocks in Alaska. • ADFG comments on the Jasper et al. 2013 study. • Hatchery corporation permit alteration requests received by ADFG over the last 12 months and their treatment and decision (i.e. granted/declined and rationale for such decision). • Updated Regional Management and Enhancement Plan in 2013 for any of the key enhancement regions in Alaska.
Douglas Island Pink and Chum **Inc.** **Juneau, Alaska, USA**	**7th of March 2014, 09.00 am.** Eric Prestegard, Rick Focht	• Recent changes in guidelines, regulations or policies covering the management of hatcheries in SEAK or Alaska Statewide (e.g. affecting practices relating to disease control, genetics or other parameters). • Changes, increases or decreases in DIPAC's salmon production by species over the last 12 months. • Annual Development Plan for 2013. Significant changes from the previous year. • ADFG continuous interface and collaboration. • Regional Salmon Planning process to guide fisheries enhancement. Updates for 2013/14. • Request for permit alteration submitted/accepted by ADFG in 2013/14. • Pathology issues in DIPAC hatcheries for any salmon species in 2013/14. • Expected returns for summer 2014. • Release sites in SEAK: changes in number/location over 2013/14. • Chum, pink and Chinook salmon returns (e.g. above/below escapement goals) in the SEAK region over 2013. • Issues with interception of hatchery and wild salmon during harvest in THAs. Ability to manage and fully harvest the hatchery returns in 2013. • Changes in the use of salmon for hatchery broodstock production purposes over 2013. • Management of hatchery broodstock. • Changes in requirements for tagging/ otoliths marking of hatchery fish over 2013. • Involvement or information exchange process with Prince William Sound Science Center in relation to the large scale hatchery research program currently in progress. • Involvement with the ADFG 2013 Chinook Research plan. • Knowledge of recent studies on straying or wild/hatchery salmon interactions in SEAK.

Alaska Wildlife Troopers. **Juneau Division, Alaska, USA**	**7th of March 2014, 01.00 pm**. Lt. Streifel	• Salmon regulations. • Salmon enforcement. • Violations types and extent.
Prince William Sound Aquaculture Corporation. **Cordova, Alaska, USA**	**8th of March 2014**, **01.30 pm.** (Anchorage), Dave Reggiani.	• Changes in guidelines, regulations or policies covering the management of hatcheries in PWS or Alaska (e.g. affecting practices relating to disease control, genetics, production). • Changes in PWSAC salmon production by species in 2013/14. • Annual Development Plan 2014. Changes from the previous year. • ADFG interface and collaboration over the last 12 months. • Regional Salmon Planning process to guide fisheries enhancement. • Request for permit alteration submitted and/or accepted by ADFG in 2013/14. • Pathology issues in PWSAC hatcheries in 2013/14. • Pink salmon returns and harvest in 2013. • Prediction for 2014 pink salmon harvests in PWS. • Release sites in PWS: changes from 2012. • Issues with interception of hatchery and wild salmon during harvest in THAa in 2013. • Number of salmon used as brood for salmon production. Changes from 2012. Gulkana hatchery practices. • Requirements for tagging/marking of hatchery fish. % of hatchery fish marked in PWS. • Involvement or information exchange process with PWS Science Center in relation to the large scale hatchery research program. • Views on the Jasper et al. paper (2013) dealing with potential genetic introgression of hatchery chum salmon in PWS wild populations. • Knowledge of other studies relating to hatchery wild interactions in 2013.
Kodiak Regional Aquaculture Association (KRAA), **Kodiak, Alaska, USA**	**10th of March 2014, 10.00 am**. Tina Fairbanks.	• Updates for KRAA's salmon enhancement activities over the last 12 months. • Changes in guidelines, regulations or policies covering the management of hatcheries in Kodiak or Alaska (e.g. affecting practices relating to disease control, genetics, salmon production). • Increase or decrease in KRAA's salmon production by species over the last 12 months. • Annual Development Plan 2014. Significant changes from the previous year. • ADFG interface and collaboration. • Regional Salmon Planning process to guide fisheries enhancement.

		• Requests for permit alteration submitted and/or accepted by ADFG in 2013/14. • Pathology issues in any KRAA hatcheries in 2013/14. • Hatchery release sites in Kodiak. Changes in 2013/14. • General salmon returns (e.g. above or below escapement goals) and harvest in the Kodiak Management Area in 2013. • Terminal Harvest Areas (THAs), changes from previous year. Issues with interception of hatchery and wild salmon during harvest in THAa in 2013. • Practices used for hatchery salmon broodstock production. • Requirements for tagging/ otoliths marking of hatchery fish. % of hatchery fish marked by KRAA. • Involvement or information exchange process with Prince William Sound Science Center in relation to the large scale hatchery research program. • Involvement with the ADFG 2013 Chinook Research plan in response to the recent years "below escapement goal" Chinook runs. • Studies on potential straying of hatchery salmon. Ongoing projects related to lake enrichment, habitat improvement etc…
Alaska Wildlife Troopers. **Kodiak Division, Alaska, USA**	**11th of March 2014, 02.30 pm**. Lt. Ellis.	• Salmon regulations. • Salmon enforcement. • Violations types and extent.

Stakeholder information input

Stakeholder Submissions: The Alaska Seafood Marketing Institute website provides an opportunity for stakeholders to provide information that relevant for the assessment or surveillance audit of fisheries within the Alaska FAO Based Responsible Fisheries Management Certification Program. All scientific, objective information relative to the assessment provided to the assessment team is used within the assessment and referenced for transparency at the end of the report.

5. Assessment Outcome Summary

Fundamental Clauses: Summaries of evidence

Clause 1: Structured and legally mandated management system
Evidence adequacy rating: High

No major change has affected the fishery since the 2nd surveillance assessment in 2013. This clause is still considered of high conformance. Alaska's salmon fisheries are managed under a clear structure of laws, regulations, treaties, and other legal mandates and instruments, at the international, national, and local levels. This management process is well-established and transparent. ADFG's Commercial Fisheries Division is responsible for conservation of Alaska's salmon stocks and for management of the commercial fisheries. ADFG's main priority is achieving escapement, which ensures that enough salmon escape the fisheries, and spawn in their natal rivers to provide maximum sustainable yield. The Alaska Wildlife Troopers are charged with protecting the fishery through reducing illegal harvest, waste and illegal sale of commercially and sport harvested fish, and by protecting fish and wildlife habitat in state waters. In December 2012 the NPFMC modified the Federal Salmon Fishery Management Plan to specifically exclude three historical commercial salmon fishing areas outside of state waters in the EEZ and the sport salmon fishery from the West Area EEZ in favour of continuing management by the State of Alaska. The FMP 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 2012 and 2013.

Clause 2: Coastal area management frameworks
Evidence adequacy rating: High

No major change has affected the fishery since the 2nd surveillance assessment in 2013. This clause is still considered of high conformance. The institutional capacity of existing agencies (e.g. ADFG, ADEC, ADNR, USFWS, ANILCA , OPMP and BOEM), 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. NEPA and BOF 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. There are no significant updates since the 2nd surveillance assessment.

Clause 3: Management objectives and plan
Evidence adequacy rating: High

No major change has affected the fishery since the 2nd surveillance assessment in 2013. This clause is still considered of high conformance. The BOF main role is to conserve and develop the fishery resources of the state. The BOF is charged with making allocative decisions, and ADFG is responsible *for management based on those decisions. Management Plans are established by the BOF for each Region and incorporated into regulation in Title 5 Alaska Administrative Code. Those plans are implemented each season in each Region by the responsible ADFG biologist following the direction of the BOF. Management plans on recovery of depleted stocks are active policy of the state and are based on providing adequate 'escapement' or spawning stock in each generation. In December 2012 the NPFMC modified the Federal Salmon Fishery Management Plan to specifically exclude three historical commercial salmon fishing areas outside of state waters in the EEZ and the sport salmon fishery from the West Area EEZ in favour of continuing management by the State of Alaska. The FMP 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.*

Clause 4: Fishery data
Evidence adequacy rating: High

No major change has occurred since the 2nd surveillance assessment in 2013, albeit the new cycle of data and survey data has been gathered. Also, a few areas had their escapement goals reviewed. This clause is still considered of high conformance. Intensive monitoring of incoming run strength is required for successful abundance-based management of commercial salmon fisheries in Alaska. Fish weirs, counting towers, sonar, test fishing, fish wheels, and aerial surveys are the primary assessment tools. Fishery openings are targeted where production surplus to escapement goals is identified. Each assessment tool is designed to work best for the geographical and physical conditions encountered. The primary method of accounting for commercial fishery harvest is the ADFG's fish ticket system. By Alaska law (AS 16.05.690 Record of Purchase) each buyer of fish is required to keep a record of each purchase showing the name or number of the vessel from which the catch is taken, the date of landing, vessel license number, pounds purchased of each species, number of each species, and the ADFG statistical area in which the fish were taken, as well as other information ADFG may require for specific fisheries or areas.

Clause 5: Stock assessment
Evidence adequacy rating: High

No major change has occurred since the 2nd surveillance assessment in 2013. This clause is still considered of high conformance. Stock assessment activities undertaken in Alaska represent a wide breadth of approaches in the provision of science-based advice in support of salmon resource management. 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. Provision of advice for salmon fisheries management is not without its challenges. 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, and adding to this the management of fisheries with 296 individual escapement goals. One of the greatest research challenges in Pacific salmon management throughout the north Pacific has been the identification of individual stocks in mixed-stock fisheries. The WASSIP genetic study of chum and sockeye has perhaps been the most intensive research program in that regard undertaken to quantify the accuracy and precision of stock-specific catch and harvest rate estimates. The governance *structure for salmon management in the State and its policies that requires a 3-year cycle of stock assessment review reflects a high standard and commitment of ADFG staff and operational funding in support of sustainable resource management. Clause 5 is strongly supported by evidence of the policies and effective salmon stock assessment activities routinely undertaken in Alaska.*

Clause 6: Biological reference points and harvest control rule
Evidence adequacy rating: High

There has been no change in conformity since the previous surveillance assessment. Escapement goals effectively represent reference points of the various Alaska salmon systems. There are currently 296 active salmon stock escapement goals throughout the state (as of 2013). These escapement goals cover mainly index systems but also individual streams. A variety of methods are used to develop escapement goals in Alaska. During the 2013-2014 Board of Fisheries cycle, reviews of the escapement goals were done for Chignik, Kodiak, Lower Cook Inlet and Upper Cook Inlet management areas. Where escapements chronically (4-5 years) fail to meet expectations for harvestable yield or spawning escapements, the department may recommend, and the board may adopt a stock of concern designation for those underperforming salmon stocks. Stock improvement following this designation is supported by data. A review of all the latest escapements (296) throughout Alaska indicates that the general majority of escapement goals have recently been met, with clear exceptions for Chinook salmon statewide. In response to this Statewide decline in Chinook production, ADFG has been limiting and/or closing commercial fisheries to meet escapement goals and has initiated a $30 million research projects aimed at elucidating Chinook stock dynamics and to improve stock assessment and overall management for the species.

Clause 7: Precautionary approach
Evidence adequacy rating: Medium- Minor Non Conformance remains in place

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 productive, 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: Technical 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 inseason 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 inseason 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 competence
Evidence adequacy rating: High

No changes have occurred since the last surveillance assessment in 2013. 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

No significant changes have occurred since the previous surveillance assessment in 2013. The Division of Wildlife Troopers in the Department of Public Safety continues to be charged with protecting the state's natural resources through reducing illegal harvest, waste and illegal sale of commercially and sport harvested fish, and by safeguarding fish and wildlife habitat. The structure of ADFG, with management authority instilled at the area office level, allows it to monitor, control and enforce compliance with fishery regulations and emergency orders. Area Management Biologists are on the scene to actually watch the prosecution of the fishery in their area through aerial surveys and on-the-ground observations.

Clause 12: Framework for sanctions
Evidence adequacy rating: High

*No significant changes have occurred since the previous surveillance activities in 2013. 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 Alaska Department of Public Safety, Alaska State Troopers, Division of Wildlife Troopers (AWT) who is the State enforcement agency with 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 and the US Fish and Wildlife Service also work with AWT on the enforcement of fish and game* *regulations (both state and federal) on federal public land.*

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. The Alaska Department of Fish and Game actively supports and participates in research aimed to evaluate the effects of salmon fisheries 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.

To reduce genetic risks from hatchery strays, Alaska salmon hatchery brood stocks have been founded by local, wild fish, wherever possible. Moreover, random mating and relatively large numbers of adult spawners are also used in Alaskan salmon hatcheries to maximize effective population sizes, maintain genetic diversity and reduce risks associated with interbreeding between wild fish and stray hatchery salmon. Nevertheless, these measures do not entirely eliminate the *possibility of risk from Alaskan salmon hatcheries to wild populations. Information is needed with respect to the effects of introgression from stray hatchery salmon on the mean fitness and productivity of recipient wild salmon populations in Alaska. Efforts to meet this critical information need are currently being made through state and privately-funded genetic pedigree studies of wild and hatchery salmon. This ongoing pedigree and other important genetics-based research should continue to be supported, with results carefully monitored and applied to the management of Alaskan salmon fisheries enhancement.*

6. Conformity statement

Following this 3rd 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).

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

A. The Fisheries Management System

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

FAO CCRF 7.1.3/7.1.4/7.1.9/7.3.1/7.3.2/7.3.4/7.6.8/7.7.1/10.3.1
FAO Eco 28

Evidence adequacy rating:

☑ **High** **Medium** **Low**

Rating Determination

No major change has affected the fishery since the 2nd surveillance assessment in 2013. This clause is still considered of high conformance.
Alaska's salmon fisheries are managed under a clear structure of laws, regulations, treaties, and other legal mandates and instruments, at the international, national, and local levels. This management process is well-established and transparent. ADFG's Commercial Fisheries Division is responsible for conservation of Alaska's salmon stocks and for management of the commercial fisheries. ADFG's main priority is achieving escapement, which ensures that enough salmon escape the fisheries, and spawn in their natal rivers to provide maximum sustainable yield. The Alaska Wildlife Troopers are charged with protecting the fishery through reducing illegal harvest, waste and illegal sale of commercially and sport harvested fish, and by protecting fish and wildlife habitat in state waters. In December 2012 the NPFMC modified the Federal Salmon Fishery Management Plan to specifically exclude three historical commercial salmon fishing areas outside of state waters in the EEZ and the sport salmon fishery from the West Area EEZ in favour of continuing management by the State of Alaska. The FMP 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 2012 and 2013.

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.

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

Board of Fisheries allocation

Salmon are "allocated" to the different use groups by the Alaska Board of Fisheries (BOF). Every three years, the board considers proposals on allocation and management of salmon in each of the management Regions in an open and public process. The Board considers proposals submitted by the public and management staff, and sets policy after public testimony and scientific presentations. Decisions are guided on the Sustainable Salmon Fishery Policy. 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 (see table below for 2013 meetings) in communities around the state to consider proposed changes to fisheries regulations around the state.

2013	December 8 – 11	Anchorage	Lower Cook Inlet Finfish
2013	December 5 – 6	Anchorage	Chignik Finfish
2013	October 9 – 11	Girdwood	Work Session, Agenda Change Requests, Cycle Organization, and

			Stocks of Concern
2013	June 12	Juneau	Joint Protocol Committee
2013	March 19 – 24	Anchorage	Statewide Finfish and Supplemental Issues
2013	February 26 – March 4	Anchorage	Alaska Peninsula / Aleutian Islands Finfish
2013	February 14	Kenai	Upper Cook Inlet Task Force
2013	January 15 – 20	Anchorage	Arctic-Yukon-Kuskokwim Finfish
2013	January 14	Kenai	Upper Cook Inlet Task Force

http://www.adfg.alaska.gov/index.cfm?adfg=fisheriesboard.meetinginfo&date=10-09-2013&meeting=worksession

Research

ADFG Commercial Fisheries Division offices are situated throughout the range of commercial salmon fisheries.

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

Institutional framework for fisheries management includes supervisory, administrative, technical, economic, 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.

Constitution, statutes and regulations

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

Constitution, statutes (laws), and regulations (administrative code). Article VIII of Alaska's Constitution states: Section 4. Sustained Yield: Fish, forests, wildlife, grasslands, and all other replenishable resources belonging to the State shall be utilized, developed, and maintained on the sustained yield principle, subject to preferences among beneficial uses.

"Alaska's Constitution: A Citizen's Guide (Fourth Edition)" explains: "The principle of sustained yield management is a basic tenet of conservation: the annual harvest of a biological resource should not exceed the annual regeneration of that resource. Maximum sustained yield is the largest harvest that can be maintained year after year. State law defines maximum sustained yield as ''the achievement and maintenance in perpetuity of a high level annual or regular periodic output of the various renewable resources of the state land consistent with multiple use'' (AS 38.04.910). At the time of the constitutional convention, stocks of Alaska's salmon had been reduced to a sad remnant of their past bounty by neglect of the sustained yield maxim. The qualifying phrase 'subject to preferences among beneficial uses' signals recognition by the delegates that not all the demands made upon resources can be satisfied, and that prudent resource management based on modern conservation principles necessarily involves prioritizing competing uses."
http://w3.legis.state.ak.us/docs/pdf/citizens_guide.pdf

Statutes (also termed "laws") are enacted by the state Legislature. Title 16 of Alaska Statutes (AS16) "Fish And Game" sets forth the laws which govern the management of Alaska's salmon fisheries, as well as myriad other living resources. Like all other statutes, Title 16 is consistent with the Constitution. Regulations (also termed "administrative code") are developed and implemented by departments of the Executive branch of government, which is headed by the Governor. Title 5 of the Alaska Administrative Code (5AAC) "Fish And Game" is the body of state regulations by which Alaska's salmon fisheries are managed. All regulations must be consistent with the governing statutes; that is, 5AAC is consistent with AS16.
http://ltgov.alaska.gov/treadwell/services/alaska-constitution/article-viii-96A0natural-resources.html

Of particular relevance to this assessment are the following regulations relative to the commercial salmon fisheries (http://www.adfg.alaska.gov/index.cfm?adfg=fishregulations.commercial) -
- 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 December 2012 the NPFMC modified the Federal Salmon Fishery Management Plan (FMP) to specifically exclude three historical commercial salmon fishing areas outside of state waters in the EEZ and the sport salmon fishery from the West Area EEZ in favour of continuing management by the State of Alaska. The FMP 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.
http://alaskafisheries.noaa.gov/frules/77fr75570.pdf

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. AWT enforces other types of regulations passed by the Board of Game and the Board of Fisheries. This includes those designed to:

- Preventing unlawful & illegal fisheries harvests, and sales of sport fish & commercial wild stocks.
- Preventing waste and illegal harvest of hunted or trapped species.
- Protecting watersheds and other important habitat areas, including by reducing non-compliance with environmental permits.
- Protecting Alaska's native species from harmful invasive species, importation of exotic pets, and illegal export of animal parts from Alaska.
- Monitoring commercial big game services (pilots, transporters, etc.), and identifying illegal guiding and transporter activities.

http://www.adfg.alaska.gov/index.cfm?adfg=enforcement.main
http://www.dps.state.ak.us/AWT/mission.aspx

The U.S. Coast Guard (USCG) also enforces boating safety laws and fishing vessels are often under surveillance by AWT and the USCG during fishing operations. For fisheries under federal management, the NOAA Fisheries Office for Law Enforcement (OLE) enforces federal laws that protect and conserve Alaska's living marine resources and their habitat. The Alaska Limited Entry system only allows legally permitted vessels to operate in salmon fisheries. The "right to fish" is embodied in a permit card that is issued annually. Cooperation and coordination among ADFG, AWT, USCG, and OLE is frequent and routine.
http://www.uscg.mil/d17/

Overall, there have been no significant changes over 2013 in the management framework for the Alaska salmon fisheries.

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

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

Evidence adequacy rating:

☑ **High** **Medium** **Low**

Rating Determination

No major change has affected the fishery since the 2nd surveillance assessment in 2013. This clause is still considered of high conformance.

The institutional capacity of existing agencies (e.g. ADFG, ADEC, ADNR, USFWS, ANILCA , OPMP and BOEM), 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. NEPA and BOF 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. There are no significant updates since the 2nd surveillance assessment.

ADFG

ADFG protects estuarine and marine habitats primarily through cooperative efforts involving other state and federal agencies and local governments. ADFG has jurisdiction over the mouths of designated anadromous fish streams and legislatively designated state special areas (critical habitat areas, sanctuaries and refuges). ADFG's Habitat Division is delegated by the Commissioner to implement the state's Title 16 authority for Fish Habitat and Special Area permitting. Unlike many of Fish and Game's regulations, which are developed through the Board process and address harvest, Fish Habitat and Special Area laws address land use activities in fish-bearing streams and in the state's legislatively designated refuges, critical habitat areas, and sanctuaries through a project review and permitting process. Other statutory responsibilities of the Habitat Division include issuing permits for wildlife hazing in connection with petroleum and chemical spills (5 AAC 92.033), and reviews for fish habitat concerns under the Forest Resources and Practices Act (AS 41.17.010-AS41.17.950 and 11 AAC 95.185 – 11 AAC 95.900).

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

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

ADEC

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

ADNR

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

USFWS

The U.S. Fish and Wildlife Service (USFWS) is a federal bureau within the Department of the Interior. Its objectives include 1) assisting in the development and application of an environmental stewardship ethic, based on ecological principles, scientific knowledge of fish and wildlife, and a sense of moral responsibility; 2) guide the conservation, development, and management of the US's fresh water fish and some marine and terrestrial wildlife resources, 3) administer a national program to provide the public opportunities to understand, appreciate, and wisely use fish and wildlife resources. The USFWS functions include enforcement of federal wildlife laws, protection of endangered species, management of migratory birds, restoration of nationally significant fisheries, conservation and restoration of wildlife habitat such as wetlands, help of foreign governments with their international conservation efforts, and distribution of hundreds of millions of dollars, through the Wildlife Sport Fish and Restoration program, in excise taxes on fishing and hunting equipment to State fish and wildlife agencies (http://www.fws.gov/help/about_us.html).

ANILCA

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

OPMP

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

NEPA

For large scale federal process which may affect the environment, natural resources and their habitat, as well as the people depending on them, the federal National Environmental Policy Act (NEPA) process (essentially an environmental/biological socio-economic risk assessment of potential options) allows for comment and input from federal and state agencies as well as the public. The salmon fishery management organizations in Alaska (principally ADFG) may participate in coastal area management-related institutional frameworks through the federal National Environmental Policy Act (NEPA) processes, to proposals that may impact fisheries under their management. The state is a cooperating agency in the NEPA process for federal actions, giving the State of AK another seat at the table for federal actions. This includes decision-making processes and activities relevant to the fishery resource and its users in support of sustainable and integrated use of living marine resources and avoidance of conflict among users.

BOEM

The Bureau of Ocean Energy Management (BOEM) (previously Minerals Management Service) is responsible for managing environmentally and economically responsible development and provide safety and oversight of the offshore oil and gas leases. The activities of BOEM and the process for application and approval of oil exploration permits overlaps extensively with evaluation by ADNR, ADFG, and ADEC given the potential impacts of such activities on anadromous and other marine resources and their habitat. An example of this is provided by the *Cook Inlet Offshore Oil & Gas Exploration Permit Application & Approval Process* available at:
http://dog.dnr.alaska.gov/Permitting/Documents/Arcadis/Arcadis_Flowchart_CookInletOffshore_Draft.pdf
http://www.boem.gov/uploadedFiles/Proposed_OCS_Oil_Gas_Lease_Program_2012-2017.pdf

Stakeholder Engagement

With regards to conflict avoidance and resolution between different fisheries and/or users within fisheries, the Board of Fisheries (BOF) tends to avoid this by actively involving stakeholders in the process leading up to decision making. In addition, the Board of Fisheries (BOF) public meetings process provides a regularly scheduled public forum for all interested individuals, fishermen, fishing organizations, environmental organizations, Alaskan Native organizations and other governmental and non-governmental entities to participate in the development of policies and regulations for all salmon fisheries in the state. The BOF ensures that the process for the state's regulatory system relating to fish and wildlife resources operates publicly, efficiently and effectively. ADFG staff provides support for this public process, and ensures that the system is legal, timely, and accessible to the citizens of the state. The BOF is a seven member board appointed by the governor and confirmed by the legislature which sets fishing seasons, bag limits, methods and means for the state's commercial, subsistence, sport, guided sport, and personal use fisheries. It also sets policy and direction for management of the state's fishery resources and makes all decisions on allocation of those resources among users. The enabling statute for the BOF is AS 16.05.251. Regulations enacted by the BOF are found in the Alaska Administrative Code (AAC) Title 5, Chapters 1 – 77.

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

Conclusion

The assessment team agrees that the institutional capacity of existing agencies (e.g. ADFG, ADEC, ADNR, USFWS, ANILCA , OPMP and BOEM), 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. NEPA and BOF 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 the NEPA or other processes.

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

FAO CCRF 7.3.3/7.2.2

Evidence adequacy rating:

☑ **High** **Medium** **Low**

Rating Determination

No major change has affected the fishery since the 2nd surveillance assessment in 2013. This clause is still considered of high conformance.
The BOF main role is to conserve and develop the fishery resources of the state. The BOF is charged with making allocative decisions, and ADFG is responsible for management based on those decisions. Management Plans are established by the BOF for each Region and incorporated into regulation in Title 5 Alaska Administrative Code. Those plans are implemented each season in each Region by the responsible ADFG biologist following the direction of the BOF. Management plans on recovery of depleted stocks are active policy of the state and are based on providing adequate 'escapement' or spawning stock in each generation. In December 2012 the NPFMC modified the Federal Salmon Fishery Management Plan to specifically exclude three historical commercial salmon fishing areas outside of state waters in the EEZ and the sport salmon fishery from the West Area EEZ in favour of continuing management by the State of Alaska. The FMP 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.

Management of Alaska's salmon fisheries have been well documented throughout history. Section 8.4 of the State of Alaska constitution mandates "Fish, forests, wildlife, grasslands, and all other replenishable resources belonging to the State shall be utilized, developed, and maintained on the sustained yield principle, subject to preferences among beneficial uses."

Specific management plans and strategies exist that describe and document state management in a format easily understood by the various user groups and the public. At the backbone of management are Alaska State Statutes and the Alaska Administrative Codes derived under their guidance. Actual regulatory language is developed through the Alaska Board of Fisheries (BOF) process. Long-term objectives are defined in regulation under management of mixed stock salmon fisheries, management of sustainable salmon fisheries, and statewide salmon escapement goals:

- 5 AAC 39.220. 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 Alaska Administrative Code (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, vessel requirements (etc…) within its specific chapter. Regulations are available in paper and electronic formats.

03. Arctic-Kotzebue Area. (5 AAC 03.001 - 5 AAC 03.630)
04. Norton Sound-Port Clarence Area. (5 AAC 04.001 - 5 AAC 04.510)
05. Yukon Area. (5 AAC 05.001 - 5 AAC 05.510)
06. Bristol Bay Area. (5 AAC 06.001 - 5 AAC 06.990)
07. Kuskokwim Area. (5 AAC 07.001 - 5 AAC 07.792)
09. Alaska Peninsula Area. (5 AAC 09.001 - 5 AAC 09.792)
11. Atka-Amlia Islands Area. (5 AAC 11.001 - 5 AAC 11.392)
12. Aleutian Islands Area. (5 AAC 12.001 - 5 AAC 12.792)
15. Chignik Area. (5 AAC 15.001 - 5 AAC 15.792)
18. Kodiak Area. (5 AAC 18.001 - 5 AAC 18.792)
21. Cook Inlet Area. (5 AAC 21.001 - 5 AAC 21.992)
24. Prince William Sound Area. (5 AAC 24.001 - 5 AAC 24.990)
29. Salmon Troll Fishery. (5 AAC 29.001 - 5 AAC 29.200)
30. Yakutat Area. (5 AAC 30.001 - 5 AAC 30.460)
33. Southeastern Alaska Area. (5 AAC 33.001 - 5 AAC 33.792)
40. Private Nonprofit Salmon Hatcheries. (5 AAC 40.005 - 5 AAC 40.990)

These AAC possess details about the management plans for the major salmon stocks in the four management regions of Alaska.

http://www.touchngo.com/lglcntr/akstats/statutes.htm

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. During the 2013 calendar year ADFG issued about 800 emergency orders to open and close commercial salmon fisheries in the Southeast, Central, Westward and Artic-Yukon-Kuskokwim management regions.

- 2014-2017 Chignik and Kodiak Areas Commercial Salmon Fishing Regulations (*PDF 1,217 kB*) *(Includes changes made effective March 9, 2014 and May 1, 2014)*
- 2014-2017 Cook Inlet Area Commercial Salmon Fishing Regulations (*PDF 1,148 kB*) *(Includes changes made effective March 22, 2014 and May 18, 2014)*
- 2013-2016 Alaska Peninsula, Atka-Amlia Islands, and Aleutian Islands Areas Commercial Salmon Fishing Regulations (*PDF 1,177 kB*) *(Includes changes made effective June 1, 2013)*
- 2012–2015 Prince Wiliam Sound Commercial Salmon Fishing Regulations (*PDF 928 kB*)
- 2012 –2015 Southeast Alaska and Yakutat Commercial Salmon Fishing Regulations (*PDF 1,098 kB*)
- 2013-2016 Bristol Bay Commercial Salmon Fishing Regulations (*PDF 1,229 kB*) *(Includes changes made effective in April 2013)*
- 2013-2016 Arctic-Yukon-Kuskokwim Commercial-Subsistence-Personal Use Finfish and Shellfish Fishing Regulations (*PDF 1,092 kB*) *(Includes changes made effective April 13, 2013)*
- 2013-2014 Commercial Finfish and Shellfish Fishing General Regulation and Statute

Provisions (*PDF 856 kB*)
(Includes changes made effective June 1, 2013)

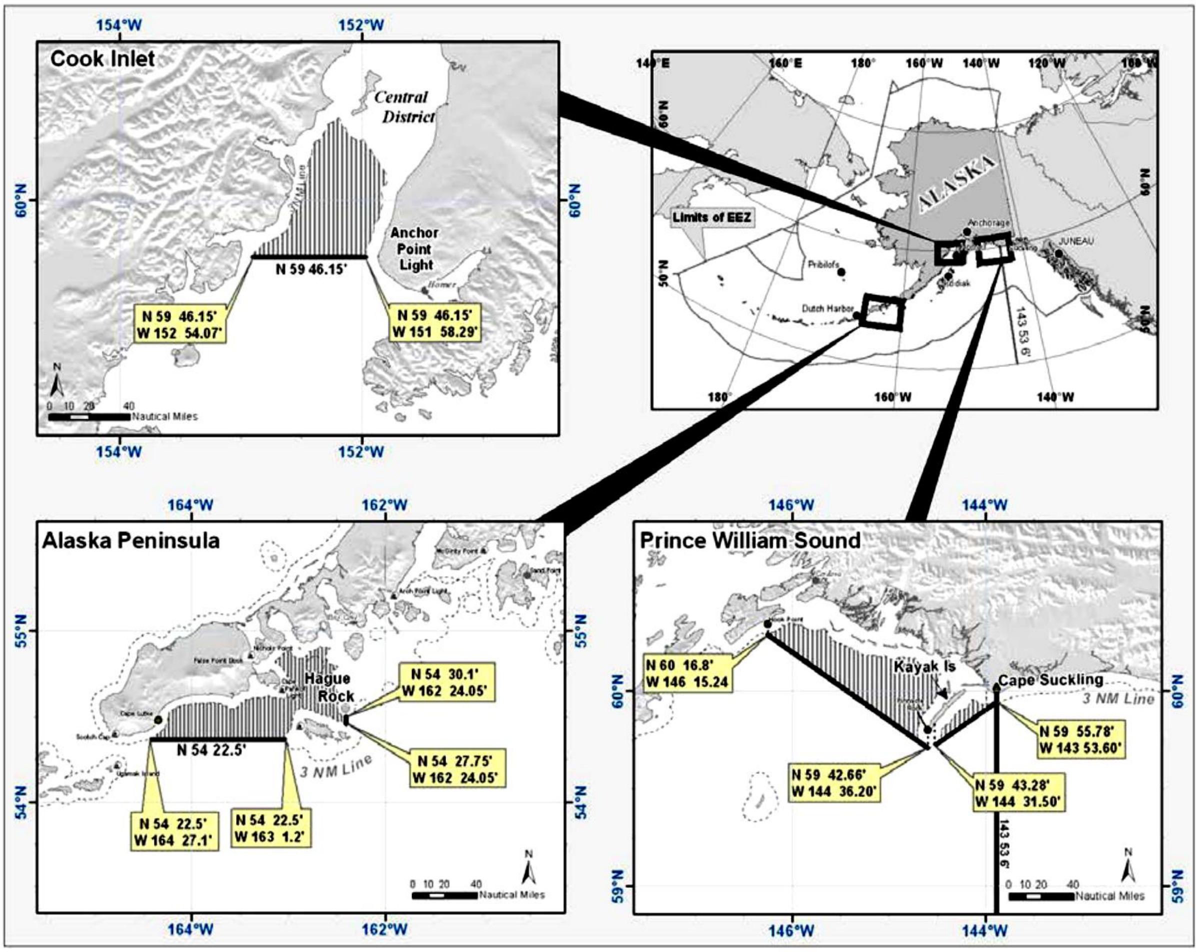
- 2014-2015 Subsistence and Personal Use Statewide Fisheries Regulations (*PDF 990 kB*) *(Includes changes made effective through June 27, 2014)*

http://www.adfg.alaska.gov/index.cfm?adfg=fishregulations.commercial

Changes in the Federal FMP for AK 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) 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 FMP is being comprehensively revised to comply with the recent MSA requirements, such as annual catch limits and accountability measures, and to more clearly reflect the Council's policy with regard to State of Alaska management authority for commercial and sport salmon fisheries in the EEZ. The *Final Environmental Assessment/Regulatory Impact Review for Amendment 12: Revisions to the Fishery Management Plan for the Salmon Fisheries in the EEZ Off the Coast of Alaska, June 2012*, provides decision-makers and the public with an evaluation of the environmental, social, and economic effects of alternative fishery management plans for the salmon fisheries in the EEZ and addresses the requirements of the National Environmental Policy Act and Executive Order 12866.

In December 2012 NMFS issued regulations to implement Amendment 12 to the Fishery Management Plan for Salmon Fisheries in the EEZ off the Coast of Alaska (FMP). Amendment 12 comprehensively revises and updates the FMP to reflect the Council salmon management policy and to comply with Federal law. In December 2011, the Council voted unanimously to recommend Amendment 12 to the FMP. Amendment 12 comprehensively revises the FMP to reflect the Council's salmon management policy, which is to facilitate State of Alaska (State) salmon management in accordance with the Magnuson-Stevens Act, Pacific Salmon Treaty, and applicable Federal law. To reflect the Council's policy and objectives, Amendment 12 redefines the FMP's management area to remove three small pockets of Federal waters adjacent to Cook Inlet, Prince William Sound, and the Alaska Peninsula from the West Area (see below).



The salmon fisheries in these areas are managed by the State. Amendment 12 also removes the sport fishery in the West Area from the FMP. The Council determined and NMFS agreed that State management of the stocks and fisheries occurring in the net fishing areas and the sport fishery in the West Area is consistent with the policies and standards of the Magnuson- Stevens Act, and that Federal management of the net fishing areas and the sport fishery in the West Area would serve no useful purpose or provide present or future benefits that justified the costs of Federal management. The Council and NMFS determined that removing the net fishing areas and the sport fishery from the West Area allows the State to manage Alaska salmon stocks and directed fishing for those stocks as seamlessly as practicable throughout their range.

The FMP continues to apply to the vast majority of the EEZ west of Cape Suckling and maintains the prohibition on commercial salmon fishing in the redefined West Area. In the East Area, Amendment 12 maintains the current scope of the FMP and reaffirms that management of the commercial and sport salmon fisheries in the East Area is delegated to the State. The FMP relies on a combination of State management and management under the Pacific Salmon Treaty to ensure that salmon stocks, including trans-boundary 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 structures in place, recognizing that the FMP is the nexus for the application of the Pacific Salmon Treaty and other applicable Federal law.

The primary new FMP provision is a mechanism to establish annual catch limits (ACLs) and accountability measures (AMs) for the salmon stocks caught in the East Area commercial troll fishery, the only commercial fishery authorized under the FMP. The mechanism to establish ACLs and AMs for the East Area commercial troll fishery builds on the FMP's existing framework for establishing status determination criteria. Amendment 12 does not establish a mechanism for specifying ACLs and AMs for Chinook salmon because the Magnuson-Stevens Act exempts stocks managed under an international fisheries agreement in which the United States participates from the ACL requirement (16 U.S.C. 1853). The Council recommended and NMFS approved an alternative approach because the State's escapement-based management system is a more effective management system for preventing overfishing of Alaska salmon than a system that places rigid numeric limits on the number of fish that may be caught.

Amendment 12 also revises the definition of optimum yield (OY). For Chinook salmon stocks in Tier 1, an all gear maximum sustainable yield (MSY) is prescribed in terms of catch by the Pacific Salmon Treaty and takes into account the biological productivity of Chinook salmon and ecological factors in setting this limit. Under Amendment 12, the portion of the all-gear catch limit allocated to troll gear represents the OY for that fishery and takes into account the economic and social factors considered by the State in making allocation decisions. For the redefined West Area under Amendment 12, commercial fishing is prohibited; therefore the directed harvest OY is zero. The redefined West Area has been closed to commercial net fishing since 1952 and commercial troll fishing since 1973, and there has not been any commercial yield from this area. Finally, Amendment 12 adds a fishery impact statement to the FMP, revises the current FMP process for Federal review of State management measures to more fully describe the process and bring it into compliance with Magnuson-Stevens Act requirements (16 U.S.C. 1856(a)(3)(B)), and removes existing FMP language governing the issuance of Federal salmon permits. The Council recommended removing FMP language related to Federal salmon permits because all current participants have State of Alaska limited entry permits and Federal permits are no longer necessary. According to language included in the original 1979 FMP, provisions for Federal salmon permits were established to complement the State limited entry permit, in order to limit capacity in the EEZ so that persons who did not receive a State limited entry permit would not simply shift their fishing efforts into Federal waters.

No further changes to these federal regulations occurred in 2013.

http://www.fakr.noaa.gov/analyses/salmon/earir_salmonfmpamds0612.pdf
http://alaskafisheries.noaa.gov/frules/77fr75570.pdf

US-Canada Salmon Fisheries Management Arrangements

In May, 2008 the Pacific Salmon Commission recommended a new bilateral agreement for the conservation and harvest sharing of Pacific salmon to the Governments of Canada and the United States. The product of nearly 18 months of negotiations, the agreement represents a major step forward in science-based conservation and sustainable harvest sharing of the salmon resource between Canada and the United States of America. Approved in December, 2008 by the respective governments, the new fishing regimes are in force from the beginning of 2009 through the end of 2018. The new fishing regimes (last updated on January 31st 2013) are contained in the following

Chapters of the Treaty:

Chapter 1: Transboundary Rivers
Chapter 2: Northern British Columbia and Southeastern Alaska
Chapter 3: Chinook Salmon
Chapter 4: Fraser River Sockeye and Pink Salmon
Chapter 5: Coho Salmon
Chapter 6: Southern British Columbia and Washington State Chum Salmon
Chapter 7: General Obligations
Chapter 8: Yukon River (added December 4, 2002)
http://www.psc.org/pubs/Treaty/Treaty.pdf

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.

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

http://www.adfg.alaska.gov/static/fishing/PDFs/hatcheries/mcgeebrochure.pdf

B. Science and Stock Assessment Activities

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

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

Evidence adequacy rating:

☑ **High** **Medium** **Low**

Rating Determination

No major change has occurred since the 2nd surveillance assessment in 2013, albeit the new cycle of data and survey data has been gathered. Also, a few areas had their escapement goals reviewed. This clause is still considered of high conformance.

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

Fishery independent data

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

The following summaries for the Chignik, Kodiak, Lower Cook Inlet and Upper Cook Inlet salmon escapement reviews in the 2013/14 Board of Fisheries meeting cycle are from ADFG manuscript report series available on the ADFG website:

http://www.adfg.alaska.gov/index.cfm?adfg=fisheriesboard.meetinginfo. The specific links for each management area are as follows:

Chignik Management Area

http://www.adfg.alaska.gov/static/regulations/regprocess/fisheriesboard/pdfs/2013-2014/chignik/rc3_tab1_chignik_2013.pdf

Kodiak Management Area
http://www.adfg.alaska.gov/static/regulations/regprocess/fisheriesboard/pdfs/2013-2014/kodiak/fms13-11.pdf

Lower Cook Inlet
http://www.adfg.alaska.gov/static/regulations/regprocess/fisheriesboard/pdfs/2013-2014/lci/rc3_tab1_lci_2013.pdf

Upper Cook Inlet
http://www.adfg.alaska.gov/static/regulations/regprocess/fisheriesboard/pdfs/2013-2014/uci/FMS13-13.pdf

Chignik Management Area (CMA)
The CMA comprises all coastal waters and inland drainages on the south side of the Alaska Peninsula, bounded by a line extending 135° southeast for three miles from a point near Kilokak Rocks (57°10.34' N lat, 156°20.22' W long) then due south, to a line extending 135° southeast for three miles from Kupreanof Point at 55°33.98' N lat, 159°35.88' W long.

The area is divided into 5 commercial fishing districts: Eastern, Central, Chignik Bay, Western, and Perryville districts. These districts are further divided into 14 sections and 26 statistical reporting areas (Anderson et al. 2013). The Chignik River is the major watershed in the CMA, and consists of 2 interconnecting lakes (Black and Chignik lakes) with a single outlet river (the Chignik River) that empties into the estuary of Chignik Lagoon. All 5 species of Pacific salmon Oncorhynchus spp. return to the Chignik River; sockeye salmon returns consist of an early run and a late run. Pink and chum salmon also return to other streams throughout the CMA.

One Chinook salmon stock in the CMA has an established BEG and is located in the Chignik River. Chinook salmon escapement is enumerated through the Chignik River weir. Harvest occurs during directed sport fisheries and incidentally in commercial fisheries targeting sockeye salmon.

Two sockeye salmon stocks in the CMA have established SEGs. Prior to the escapement goal review in 2004, these goals were BEGs with the same ranges. Both of these stocks are part of the Chignik River watershed. The majority of the early run (Black Lake stock) enters the watershed from June through July and spawns in Black Lake and its tributaries. The majority of the late run (Chignik Lake stock) enters the watershed in July and August, and typically spawns in Chignik Lake tributaries and Chignik Lake shoal areas. Although the peak periods of passage for each stock are usually a few weeks apart, there is a period of overlap when both stocks are entering the watershed. Sockeye salmon bound for Black and Chignik lakes are enumerated through the use of a weir outfitted with a video-camera system and are harvested primarily in the commercial and subsistence fisheries. In order to achieve escapement goals for these 2 runs (stocks) simultaneously, inseason estimates of the numbers of each stock in the daily escapement are required. These estimates have been determined using various methods over time. Prior to 1980, time-of-entry relationships based on tagging studies and age groups were employed to divide the catch and escapement between the 2 runs. From 1980 through 2003, with the exception of 1982, stock separation was accomplished using scale pattern analysis. Beginning in 2004, an estimate of the total escapement of the Black Lake early run was based on weir counts through July 4. After July 4, the fish that passed upstream through the weir were assumed to be Chignik Lake late-run fish. This method was determined not to be significantly different (P>0.05) than the scale pattern analysis method in estimating recruitment. Beginning in 2010, genetics were used to separate the early- and late-run stocks. In comparison to the current management early/late switch date of July 4, logistic run timing during the overlap period suggest that utilizing inseason genetic information would result in more biologically sound escapement-based management. Direct comparison of escapement estimates using genetic stock identification and the traditional July 4 cutoff showed differences of approximately 40,000 fish in 2010 and 32,000 in 2011 and in three out of four years has shown a run timing curve later than that predicted via the July 4 date.

Pink salmon escapements in the CMA are managed to achieve objectives based on aggregates of streams by district. Separate areawide BEGs were established for odd and even years during the 2004 review, and amended to SEGs during the 2007 review. The areawide goals represent 5 districts. These aggregate goals comprise the respective sums of aerial survey escapement estimates for 49 individual index streams.

Chum salmon escapements in the CMA are managed to achieve objectives based on aggregates of streams by district, similar to pink salmon (Table 1). This aggregate lower-bound SEG comprises the respective sums of aerial survey escapement estimates for 42 individual index streams.

Due to the late-season run timing of coho salmon returns to the CMA, there are no established coho salmon escapement goals. The vast majority of coho salmon escapement occurs after the Chignik River weir is pulled for the season and the inclement fall weather precludes reliable aerial surveys for estimating coho salmon escapement. Catches of coho salmon are generally incidental to the sockeye salmon fishery. If a directed coho salmon fishery occurs, catch per unit effort is used to manage the fishery.

Table 1. Methods used to enumerate and develop escapement goals for the Chignik Management Area salmon stocks.

System	Enumeration Method	Goal Development Method
CHINOOK SALMON		
Chignik River	Weir Count	SRA[a]
SOCKEYE SALMON		
Black Lake (early)	Weir Count	SRA/Yield Analysis
Black Lake (late)	Weir Count	SRA
PINK SALMON		
Entire CMA		
CHUM SALMON	Peak Aerial Survey	Yield Analysis
Entire CMA	Peak Aerial Survey	Risk Analysis

[a] SRA = Spawner-recruit analysis.

Kodiak Management Area (KMA)

The KMA comprises the waters of the western Gulf of Alaska surrounding the Kodiak Archipelago, and along that portion of the Alaska Peninsula that drains into the Shelikof Strait between Cape Douglas and Kilokak Rocks.

The KMA is devided into 7 commercial fishing districts: Afognak, Northwest Kodiak, Southwest Kodiak, Atitak, Eastside Kodiak, Northeast Kodiak, and Mainland districts. These are further subdivided into sections, each of which is comprised of smaller statistical areas, including terminal or special harvest areas. For commercial salmon fisheries, legal gear in districts or sections can consist of purse seines, hand purse seines, beach seines, or set gillnets. Subsistence and sports fisheries occur throughout the KMA.

Commercial fisheries in the KMA primarily target sockeye salmon from June through early July; some early chum salmon stock may influence management in localized areas. Pink salmon stocks are targeted from early July through mid-August, with some areas managed specifically for local sockeye or chum stocks. Late run sockeye, coho and late returning chum are targeted from mid-August through early Sepember; coho salmon are the target species in late September and October.

There is an extensive data base for KMA salmon stocks that include stock specific catch, escapement and return data. The 2013 ADFG review team based their review on the compilation of these data from previous reports. The relatively large number of BEG goals for KMA stocks (2 Chinook stocks each with BEG; 14 sockeye stocks and 8 BEGs; 4 coho and 1 BEG) attests to comprehensive nature of the stock assessment data for KMA salmon, particularly for Chinook and sockeye salmon.

Table 2. Methods used to enumerate and develop escapement goals for Kodiak Management Area salmon stocks.

System	Enumeration Method	Goal Development Method
CHINOOK SALMON		
Karluk River	Weir Count	SRA[a]
Ayakulik River	Weir Count	SRA
SOCKEYE SALMON		
Afognak Lake	Weir Count	SRA
Ayakolik River (ealry)	Weir Count	Limnological models/escapement
Ayakolik River (late)	Weir Count	Limnological models/escapement
Buskin River	Weir Count	SRA

Frazer Lake	Weir Count	SRA/Limnological models
Karluk Lake (early)	Weir Count	SRA
Karluk Lake (late)	Weir Count	SRA
Little River	Peak Aerial Survey	Percentile
Manila Creek	Peak Aerial Survey	Percentile
Pasagshak River	Weir Count/Peak Aerial Survey	Percentile
Saltery Lake	Weir Count/Peak Aerial Survey	SRA/Limnological models
Uganik Lake	Peakj Aerial Survey	Percentile
Upper Station River (early)	Weir Count	SRA/Limnological models
Upper Station River (late)	Weir Count	SRA/Limnological models
COHO SALMON		
American River	Foot Survey	Theoretical SRA
Buskin River	Weir Count	SRA
Olds River	Foot Survey	Theoretical SRA
Pasagshak River	Weir Count	Theoretical SRA
PINK SALMON		
Kodiak Archipelago	Peak Aerial Survey	SRA
Kodiak Mainland	Peak Aerial Survey	SRA
CHUM SALMON		
Kodiak Archipelago	Peak Aerial Survey	Percentile
Kodiak Mainland	Peak Aerial Survey	Percentile

[a] SRA = Spawner-recruit analysis.

Lower Cook Inlet (LCI)

The LCI commercial salmon fishery management area is comprised of all waters west of the longitude of Cape Fairfield, north of the latitude of Cape Douglas, and south of the latitude of Anchor Point. The area is divided into 5 fishing districts. Barren Island District is the only non-fishing district, with the remaining 4 districts (Southern, Outer, Eastern and Kamishak Bay) separated into approximately 40 subdistricts and sections to facilitate commercial fisheries management of discrete stocks of salmon. Salmon streams in the management areas primarily produce pink and chum salmon, but also support smaller less numerous runs of sockeye, coho and Chinook salmon.

Escapements for most systems are monitored by foot survey, aerial survey or a combination of both. These surveys provide only an index of escapement due to the lack of supporting data such as accurate estimates of stream life and observer efficiency. Escapement indices for stocks of pink and chum salmon are calculated by applying the area-under-the-curve (AUC) method, which accounts for multiple sightings of the same fish during consecutive surveys by applying an average stream-life factor.

Consistent wier data exist only for Anchor and Ninilchik River Chinook salmon and Bear, Delight and English Bay Lake sockeye salmon. Weir data provide a count or estimate of the total number of fish in the escapement, expressed in units that are comparable to estimates of total fish harvested for the same stock. Weir data exist for some other species-year-system combinations, but those are not complete or consistent. Since the late 1990s, LCI ADFG staff have been developing and testing a digital time-lapse video recording system to remotely census fish returns in small clear streams. On selected streams, this technology may eventually allow replacement of aerial survey indices with escapement estimates more appropriate for developing census rather than index-based escapement goals. In 2010, LCI staff transitioned the Chenik Lake sockeye salmon SEG from an aerial survey to a remote-video based goal and in 2013 sufficient data were available to do the same for Mikfik Lake sockeye. Dual-frequency identification sonar (DIDSON) has been operating to count Chinook salmon escapement in the Anchor River since 2003. The total Chinook escapement has been enumerated with DIDSON in conjuction with a weir since 2004. A spawner-recruit model was used to establish a lower bound SEG for Anchor River Chinook in 2007 and again to create a SEG range in 2010.

The majority of commercial fisheries in LCI occur in terminal areas, some stock mixing does occur, especially in areas such as Port Dick and Resurrection bays. Lack of stock identification data prevents allocation of commercial harvest to specific stocks. Also, a lack of annual age composition data for many stocks prevents construction of accurate brood tables and adds to uncertainty in determining total returns for many stocks. The short-comings of the data in this regard precludes the use of stock-recruitment models to assess LCI escapement goals.

Table 3. Methods used to enumerate and development escapement goals for the Lower Cook Inlet salmon stocks.

System	Enumeration Method	Goal Development Method
CHINOOK SALMON		
Anchor River	Sonar, Weir Count	SRA[a]
Deep Creek	Single Aerial Survey[b]	Percentile
Ninilchik River	Weir Count	Percentile
CHUM SALMON		
Port Graham River	Multiple Foot Surveys	Percentile
Dogfish Lagoon	Multiple Foot Surveys	Percentile
Rocky River	Multiple Foot Surveys	Percentile
Port Dick Creek	Multiple Aerial[c] or Foot Surveys	Percentile
Island Creek	Multiple Aerial or Foot Surveys	Percentile
Big Kamishak River	Multiple Aerial Surveys	Percentile
Little Kamishak River	Multiple Aerial Surveys	Percentile

McNeil River	Multiple Aerial Surveys	Percentile
Bruin River	Multiple Aerial Surveys	Percentile
Ursus Cove	Multiple Aerial Surveys	Percentile
Cottonwood Creek	Multiple Aerial Surveys	Percentile
Iniskin Bay	Multiple Aerial Surveys	Percentile
COHO SALMON		
There are no coho salmon stocks with escapement goals in Lower Cook Inlet		
PINK SALMON		
Humpy Creek	Multiple Foot Surveys	Percentile
China Poot Creek	Multiple Foot Surveys	Percentile
Tutka Creek	Multiple Foot Surveys	Percentile
Barabara Creek	Multiple Foot Surveys	Percentile
Seldovia Creek	Multiple Foot Surveys	Percentile
Port Graham River	Multiple Foot Surveys	Percentile
Port Chatham	Multiple Foot Surveys	Percentile
Windy Creek Right	Multiple Foot Surveys	Percentile
Windy Creek Left	Multiple Foot Surveys	Percentile
Rocky River	Multiple Foot Surveys	Percentile
Port Dick Creek	Multiple Aerial or Foot Surveys	Percentile
Island Creek	Multiple Aerial or Foot Surveys	Percentile
S. Nuka Island Creek	Multiple Aerial or Foot Surveys	Percentile
Desire Lake Creek	Multiple Aerial Surveys	Percentile
Bruin River	Multiple Aerial Surveys	Percentile
Sunday Creek	Multiple Aerial Surveys	Percentile
Brown's Peak Creek	Multiple Aerial Surveys	Percentile
SOCKEYE SALMON		
English Bay	Peak Aerial Survey, Weir Count	Percentile
Delight Lake	Peak Aerial Survey, Weir Count	Percentile
Desire Lake	Peak Aerial Survey	Percentile
Bear Lake	Weir Count	Percentile
Aialik Lake	Peak Aerial Survey	Percentile
Mikfik Lake	Peak Aerial Survey, Video	Percentile
Chenik Lake	Peak Aerial Survey, Video	Percentile
Amakdedori Creek	Peak Aerial Survey	Percentile

[a] SRA = Spawner-recruit analysis.

[b] Single survey done around time of presumed peak of the run with no expansion of counts.

[c] Multiple aerial surveys are attempted throughout the run. Peak count is used to index the escapement.

Upper Cook Inlet (UCI)

The UCI commercial fisheries management unit consists of that portion of Cook Inlet north of Anchor Point and is divided into Central and Northern districts. The Central District is approximately 120 Km long, averages 50 Km wide, and is further divided into 6 subdistricts. The Northern District is 80 Km long, averaged 32 Km wide, and is divided into 2 subdistricts. Commercial fisheries primarily target sockeye salmon, with secondary catches of Chinook, coho, chum and pink salmon.

Estimates or indices of escapement for UCI have been collected with a variety of methods such as foot and aerial surveys, mark-recapture experiments, weir counts and hydroacoustics (sonar). Escapement for most Chinook stocks have been monitored by single aerial or foot surveys to provide an index of escapement. Hydroacoustics were used to assess early and late run Chinook inriver runs to the Kenai River. An associated gillnet program samples Chinook to estimate age, sex and size composition. Since 1995, a weir project counts and samples the Deshka River Chinook salmon escapement, although previously (1974-1994) it was indexed annually by single aerial surveys. To estimate total escapement for those years, the aerial surveys were expanded using their relationship to weir counts. A weir project also operates on Crooked Creek to count and sample Chinook.

Peak aerial surveys are used to index escapement of chum salmon in Clearwater Creek, the only chum stock in UCI that has an escapement goal monitored by ADF&G. Coho salmon escapements are monitored with foot surveys on Jim Creek and weirs on Fish Creek and Little Susitna River.

Sonar is used to estimate sockeye salmon abundance passing specific locations in the Kasilof, Kenai and Yentna rivers, where highly glacial turbidity precludes visual survey methods. In 2002, studies compared salmon abundance estimated using the historical Bendix sonar and the more state-of-the-art DIDSON. Similar comparison studies occurred on the Kenai River. Prior to the 2010/2011 review, the ADF&G used those comparisons to convert historical daily BENDIX sonar estimates t DIDSON units. Beginning 2010, the Yetna River sonar project ceased producing estimates for inseason management. The Yentna project continues operating to determine if it is feasible to reconstruct the historical records of escapement (measured with a Bendix sonar) while adjusting for species selectivity of fishwheels that were used to apportion the historical sonar counts.

For sockeye in Clearwater systems that are assessed, fish are counted with weirs or video cameras. Weirs are used to count and sample adult sockeye escapement to the Susitna River drainage, Russian River and Fish Creek. Historically at Packers Creek, escapement has been counted with both weirs and video cameras.

The Kasilof River sockeye escapement goal is based on run-reconstruction of the total return by brood year, and the total number of sockeye spawning (wild and hatchery) within the watershed. Kasilof escapement is estimated by subtracting (a) the number of sockeye harvested in recreational fisheries upstream of the sonar site, and (b) when applicable, the number of sockeye removed for hatchery brood stock from the sockeye sonar count.

The Kenai River late-run sockeye escapement goal is based on run-reconstruction of the total return by brood year, and the total spawning escapement. Escapement is estimated based on subtracting

(a) the number of sockeye harvested in recreational fisheries upstream of the sonar site, and (b) the number of hatchery-produced sockeye passing the Hidden Creek weir from the sockeye salmon.
The majority of UCI sockeye are caught in mixed-stock fisheries and an extensive effort by ADF&G has been applied to apportion catch to specific stocks in the fishery. Since 2006, the primary means for estimating stock-specific harvests has been based on state-of-the-art genetic techniques. Age composition of sockeye catch is estimated annually using a stratified systematic sampling design.

DIDSON-adjusted historical escapements estimates of Kasilof and Kenai sockeye were used to construct brood tables for these 2 stocks beginning with brood year 1969. The brood tables were then used develop multiple stock-recruitment models given various stock productivity assumptions to evaluation escapement goals for the Kasilof and Kenai sockeye stocks.

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

System	Enumeration Method	Goal Development Method
CHINOOK SALMON		
Alexander Creek	Single Aerial Survey	Percentile
Campbell Creek	Single Foot Survey	Risk Analysis
Chuitna River	Single Aerial Survey	Percentile
Chulitna River	Single Aerial Survey	Percentile
Clear (Chunilna) Creek	Single Aerial Survey	Percentile
Crooked Creek	Weir Count	Percentile
Deshka River	Weir Count	SRA[a]
Goose Creek	Single Aerial Survey	Percentile
Kenai River - Early Run	Sonar	SRA
Kenai River - Late Run	Sonar	SRA
Lake Creek	Single Aerial Survey	Percentile
Lewis River	Single Aerial Survey	Percentile
Little Susitna River	Single Aerial Survey	Percentile
Little Willow Creek	Single Aerial Survey	Percentile
Montana Creek	Single Aerial Survey	Percentile
Peters Creek	Single Aerial Survey	Percentile
Prairie Creek	Single Aerial Survey	Percentile
Sheep Creek	Single Aerial Survey	Percentile
Talachulitna River	Single Aerial Survey	Percentile
Theodore River	Single Aerial Survey	Percentile
Willow Creek	Single Aerial Survey	Percentile
CHUM SALMON		
Clearwater Creek	Peak Aerial Survey[c]	Percentile

COHO SALMON		
Fish Creek (Knik)	Weir Count	Percentile
Jim Creek	Single Foot Survey	Percentile
Little Susitna River	Weir Count	Percentile
Northern Southeast Outside	Peak Aerial Survey	Yield Analysis
Situk River	Weir Index	Percentile
PINK SALMON		
There are no pink salmon stocks with escapement goals in Upper Cook Inlet		
SOCKEYE SALMON		
Crescent River	Sonar	SRA
Fish Creek (Knik)	Weir Count	Percentile
Kasilof River	Sonar	SRA
Kenai River	Sonar	Brood Interaction Simulation Model
Packers Creek	Weir Count	Percentile
Russian River - Early Run	Weir Count	SRA
Russian River - Late Run	Weir Count	Percentile
Chelatna Lake	Weir Count	Percentile
Judd Lake	Weir Count	Percentile
Larson Lake	Weir Count	Percentile

[a] SRA = Spawner-recruit analysis.

For the entire list of enumeration methods used throughout Alaska reflecting the active escapement goals in place, refer to the previous (2nd) FAO RFM AK Salmon surveillance assessment or the latest ADFG Fishery Manuscript Series No. 14-01: Summary of Pacific Salmon Escapement Goals in Alaska with a Review of Escapements from 2005 to 2013 (Munro and Volk 2014) available at http://www.adfg.alaska.gov/FedAidpdfs/FMS14-01.pdf
These have largely remain unchanged since the previous surveillance.

Alaska Statewide

Fishery Dependant data, catch data

The Alaska all-species salmon harvest for 2013 totaled 282.9 million, which was about 104.1 million more than the preseason forecast of 178.8 million. This combined harvest was composed of 323.394 Chinook salmon, 29.5 million sockeye, 5.8 million coho, 226.3 million pink, and 21 million chum salmon.

Table 5. Preliminary 2013 Alaska Commercial salmon harvests, by fishing area and species, in thousand of fish.

	Species					
Fishing Area	Chinook	Sockeye	Coho	Pink	Chum	Total
Southeast Region Total	241[a]	975	3,864	94,787	12,578	112,444
Prince William Sound	11	2,339	609	92,463	4,070	99,492
Upper Cook Inlet	5	2,683	261	48	139	3,137
Lower Cook Inlet	0	170	6	2,099	54	2,329
Bristol Bay	19	15,376	135	1	872	16,402
Central Region Total	35	20,568	1,011	94,611	5,135	121,360
Kodiak Area	34	2,574	269	28,192	794	31,863
Chignik	3	2,398	32	872	155	3,460
South Peninsula and Aleutians	7	2,235	293	7,799	947	11,281
North Peninsula	1	721	27	5	131	886
Westward Region Total	44	7,928	622	36,868	2,026	47,489
Arctic-Yukon-Kuskokwim Region Total	3	52	277	8	1,285	1,624
Total Alaska	323	29,523	5,773	226,274	21,024	282,917

Note: Missing data indicates no harvest, and zeros indicate harvest activity but <500.

Note: Columns may not total exactly due to rounding.

[a] Total commercial harvest of Chinook salmon for the October 1, 2012–September 30, 2013, catch accounting period.

Table 6. Preliminary 2013 Alaska Commercial salmon harvests, by fishing area and species, in thousands of pounds.

	Species					
Fishing Area	Chinook	Sockeye	Coho	Pink	Chum	Total
Southeast Region Total	3,225[a]	5,870	23,467	305,236	98,078	435,875
Prince William Sound	185	14,193	4,831	256,364	30,205	305,777
Upper Cook Inlet	75	16,794	1,603	154	1,035	19,661
Lower Cook Inlet	4	922	32	6,463	405	7,826
Bristol Bay	346	92,259	810	2	5,578	98,994
Central Region Total	610	124,168	7,276	262,982	37,222	432,259
Kodiak Area	255	14,814	1,779	89,159	6,221	112,227
Chignik	37	17,056	226	2,610	1,194	21,124
South Peninsula and Aleutians	79	13,256	1,868	24,304	6,814	46,321
North Peninsula	7	4,057	230	15	985	5,294
Westward Region Total	378	49,183	4,103	116,088	15,213	184,965
AYK Region Total	44	330	2,057	24	8,711	11,166
Total Alaska	4,256	179,551	36,902	684,330	159,225	1,064,265

Note: Missing data indicates no harvest, and zeros indicate harvest activity but <500.

Note: Columns may not total exactly due to rounding.

[a] Total commercial harvest of Chinook salmon for the October 1, 2012–September 30, 2013, catch accounting period.

Salmon catches by region

Southeast Alaska and Yakutat Region

Table 7. Preliminary 2013 Southeast Region Commercial salmon harvests, by fishing area and species, in thousands of fish.

	Species					
Fishery	Chinook[a,b]	Sockeye	Coho	Pink	Chum	Total
Purse Seine						
Southern Purse Seine Traditional	5	167	326	49,297	1,144	50,938
Northern Purse Seine Traditional	2	101	206	38,676	1,645	40,629
Hatchery Terminal	18	14	14	791	3,014	3,851
Total Purse Seine	25	282	546	88,764	5,802	95,419
Drift Gillnet						
Tree Point	2	55	106	693	232	1,088
Prince of Wales	2	49	161	475	94	781
Stikine	11	21	44	116	103	294
Taku-Snettisham	1	138	51	123	726	1,040
Lynn Canal	1	114	68	67	1,248	1,497
Drift Gillnet Hatchery Terminal	17	80	13	190	1,020	1,319
Total Drift Gillnet	35	456	442	1,664	3,422	6,019
Set Gillnet (Yakutat)	1	168	158	67	1	397
Troll						
Hand Troll						
Traditional	7	0	169	18	14	208
Hatchery Terminal	0		2	1	3	6
Spring Areas	5	0	3	4	12	24
Total Hand Troll	12	0	174	23	29	238
Power Troll						
Traditional	104	4	2,178	576	633	3,495
Hatchery Terminal	1	0	16	12	75	104
Spring Areas	33	1	24	73	318	449
Total Power Troll	138	5	2,218	661	1,026	4,048
Total Troll	150	5	2,392	685	1,055	4,286
Annette Island Reservation						
Seine	0	4	8	2,138	38	2,187
Drift Gillnet	1	7	41	440	145	634
Troll	0	0	2	0	0	2
Hand Troll	0	0	0	0	0	0
Power Troll	0		2	0	0	2
Trap						
Total Annette Island Reservation	1	11	50	2,578	182	2,823
Hatchery Cost Recovery	30	50	272	968	2,100	3,420
Miscellaneous[c]	0	2	4	60	14	81
Southeast Region Total	241	975	3,864	94,787	12,578	112,444

Note: Missing data indicates no harvest, and zeros indicate harvest activity but <500.

Note: Columns may not total exactly due to rounding.

[a] Chinook salmon adults and jacks are totaled.

[b] Catch accounting period for the 2013 Chinook salmon season goes from October 1, 2012, to September 30, 2013.

[c] Includes salmon that were confiscated or caught in sport fish derbies or commercial test fisheries and sold.

Central Region

Table 8. Preliminary 2013 Central Region Commercial salmon harvests, by fishing area and species, in thousands of fish.

	Species					
Fishing Area	Chinook	Sockeye	Coho	Pink	Chum	Total
Purse Seine						
Eastern District	0	13	159	25,561	94	25,828
Northern Dist.	0	3	3	17,054	6	17,067
Coghill Dist.	0	2	8	6,691	70	6,771
Northwestern Dist.		0	0	110	0	111
Southwestern Dist.	0	47	48	33,510	275	33,881
Montague Dist.		0	2	414	0	416
Southeastern Dist.	0	8	1	2,571	41	2,622
Unakwik Dist.		3	0	0	0	3
Drift Gillnet						
Bering River District	0		47	0		50
Copper River Dist.	9	1,622	245	65	10	1,952
Coghill Dist.	0	94	63	2,450	2,100	4,708
Eshamy Dist.	0	336	2	62	184	585
Montague Dist.	0	2	0	28	484	514
Unakwik Dist.	0	1		0	0	1
Set Gillnet						
Eshamy Dist.	0	203	0	19	43	265
Hatchery[a]		0	29	3,962	761	4,717
Prince William Sound Total	11	2,339	609	92,463	4,070	99,492
Southern District	0	66	6	35	3	111
Kamishak District		33		0	2	36
Outer District	0	0	0	2,015	49	2,064
Eastern District						
Hatchery[b]		70		48	0	118
Lower Cook Inlet Total	0	170	6	2,099	54	2,329
Central District	4	2,660	219	46	137	3,066
Northern District	1	23	42	2	2	71
Upper Cook Inlet Total	5	2,683	261	48	139	3,137
Naknek-Kvichak District	0	4,790	[c]	0	267	5,058[d]
Nushagak District	15	3,173	[c]	0	523	3,712[d]
Egegik District	0	4,766	[c]		43	4,809[d]
Ugashik District	0	2,173			31	2,204
Togiak District	3	474	[c]	0	8	485[d]
Bristol Bay Total	19	15,376	135	1	872	16,402
Central Region Total	35	20,568	1,011	94,611	5,135	121,360

Note: Missing data indicates no harvest and zeros indicate harvest activity but <500.
Note: Columns may not total exactly due to rounding.
[a] Hatchery sales for operating expenses and broodstock harvests.
[b] LCI hatchery harvest includes cost recovery only, not broodstock or donated fish.
[c] Confidential information.
[d] Confidential information not included in District totals.

Arctic-Yukon-Kuskokwim Region

Table 9. Preliminary 2013 Arctic-Yukon-Kuskokwim Commercial salmon harvests, by fishing area and species, in thousands of fish.

	Species					
Fishing Area	Chinook	Sockeye	Coho	Pink	Chum	Total [a]
Kuskokwim River	0	1	114		52	167
Kuskokwim Bay	3	51	43		71	167
Kuskokwim Area Total	3	52	157		123	334
Lower Yukon River			59		592	651
Upper Yukon River			7		132	139
Yukon River Total			66		724	790
Norton Sound		0	54[a]	8[a]	119	181[a]
Kotzebue Sound					319	319
AYK Region Total	3	52	277	8	1,285	1,624

Note: Missing data indicates no harvest and zeros indicate harvest activity but <500.
Note: Columns and rows may not total exactly due to rounding error.
[a] Confidential information not included.

Westward Region

Table 10. Preliminary 2013 Westward Region Commercial salmon harvests, by fishing area and species, in thousands of fish.

	Species					
Fishing Area	Chinook	Sockeye	Coho	Pink	Chum	Total
Kodiak	34	2,574	269	28,192	794	31,863
Chignik	3	2,398	32	872	155	3,460
South Peninsula and Aleutians Islands	7	2,235	293	7,799	947	11,281[a]
North Peninsula	1	721	27	5	131	886[a]
Alaska Peninsula Total	7	2,956	321	7,805	1,078	12,166
Westward Region Total	44	7,928	622	36,868	2,026	47,489

Note: Columns and rows may not total exactly due to rounding error.
[a] Catches includes test fishery catch.

http://www.adfg.alaska.gov/FedAidPDFs/SP14-10.pdf

Anadromous Water Catalogue

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

The Catalog and Atlas are important because they specify which streams, rivers and lakes are important to anadromous fish species and therefore afforded protection under AS 16.05.871. The Catalog is a numerically-ordered list of the water bodies with documented use by anadromous fish for these purposes. The Atlas shows cartographically the location, name and number of these specified water bodies, the anadromous fish species using these water bodies, and the fish life history phases for which the water bodies are used (to the extent known). Water bodies that are not "specified" within the Catalog and Atlas are not afforded that protection. Protection of these specified water bodies is addressed by other sections of AS 16.05.871, which requires persons or governmental agencies to submit plans and specifications to ADFG and receive written approval in the form of a Fish Habitat Permit prior to beginning the proposed use, construction or activity that would take place in specified water bodies. More detailed information about AS 16.05.871, the types of activities requiring permits, and permit application procedures. To be protected under AS 16.05.871, water bodies must be documented as supporting some life function of an anadromous fish species (salmon, trout, char, whitefish, sturgeon, etc.) Anadromous fish must have been seen or collected and identified by a qualified observer. Most nominations come from Department of Fish and Game fisheries biologists. Others are received from private individuals, companies and biologists from other state and federal agencies.

Format

The Atlas and Catalog are divided into six volumes corresponding to Alaska's six fish and game resource management regions (Arctic, Interior, Western, Southwestern, Southcentral, Southeastern) established in 1982 by the Joint Boards of Fisheries and Game. The Catalog is a numerical listing of the water bodies documented as being used by anadromous fish. Also listed are the U.S. Geological Survey (USGS) quadrangle (quad) map, latitude, longitude, anadromous fish documented in the water body and a legal description for the mouth and upper known extent of anadromous fish use for each specified water body.

Limitations

Location information (latitude/longitudes, legal descriptions) and graphic representations used in the Atlas and Catalog are primarily derived from USGS quad maps, from field observations, and in some cases from aerial photos. ADFG use the most recent editions of these quad maps, when possible, to depict as accurately as possible the locations of water bodies found in the Atlas and Catalog. The intent is to avoid any confusion when referring to a specific water body. In some parts of Alaska, however, channel and coastline configurations have changed since the relevant USGS quad map was published, making it not entirely accurate for on-the-ground use. Locations listed in the catalog should be compared to the water body locations depicted on Atlas maps, not to field-surveyed or photo-extracted locations.

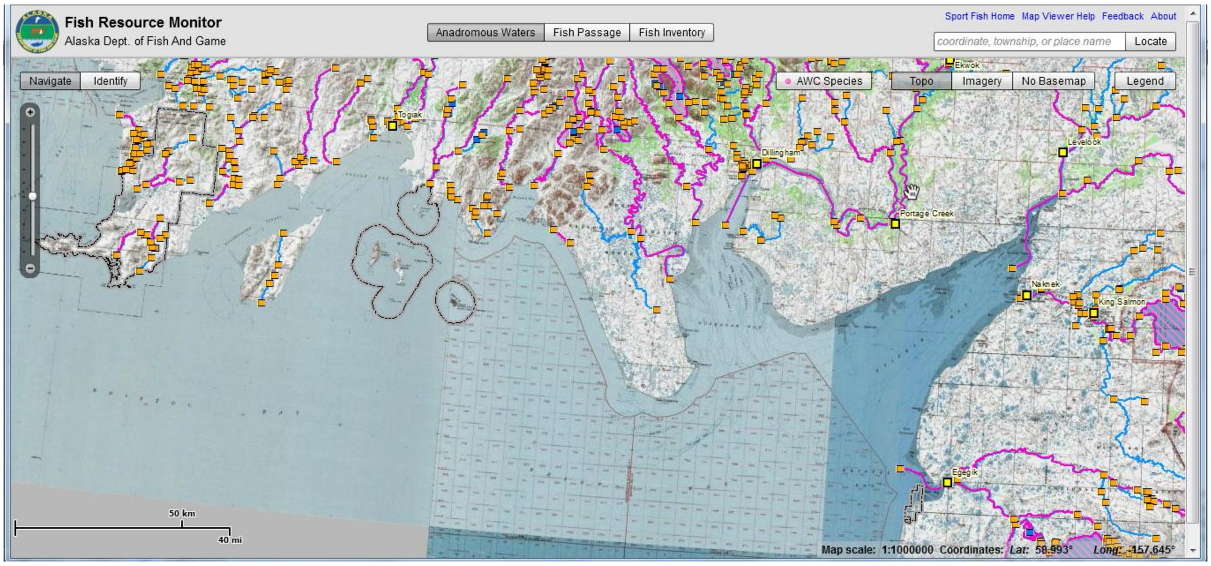
In some instances, polygons are used to specify areas containing a number of water bodies supporting anadromous fish that are impossible to depict legibly and accurately on 1:63,360-scale maps. Generally used by juvenile anadromous fish for rearing, water bodies in these polygons are highly productive and are considered important for anadromous fishes.

Fisheries surveys are important tools protecting anadromous fish habitat, and for managing sport, personal use, subsistence and commercial fisheries. Data are collected by various methods including aircraft, boat, and foot. Due to timing, water clarity, temperature, survey method or other factors, a survey for a particular species may fail to gather complete life-phase information, or observe juvenile fish, non-targeted anadromous fish species, or the actual upper limit of anadromous fish use. Therefore, the upper points of stream reaches listed in the Catalog and shown in the Atlas usually reflect the extent of fish surveys or known anadromous fish use in a particular water body rather than the actual limits of anadromous fish occurrence or of habitat use.

In addition, only a limited number of the water bodies in Alaska have actually been surveyed. Virtually all coastal water bodies in the state provide important habitat for anadromous fish, as do many unsurveyed tributaries to known anadromous fish-bearing water bodies. Anadromous fish often rear in small tributaries, flood channels, intermittent streams, and beaver ponds. Due to the remote location, small size, or ephemeral nature of these systems, most have not been surveyed and are not included in the Catalog or Atlas.

Snapshot of the Atlas, Northern Bristol Bay streams with recorded presence, rearing and spawning of sockeye salmon (violet).

http://extra.sf.adfg.state.ak.us/FishResourceMonitor/?mode=awc



Update Procedures

Procedures are in place, which provide for regular updating of the AWC. Water bodies, or particular stream reaches, can be added or deleted and the upper range of anadromous water bodies changed as more current surveys document the presence or absence of anadromous fish. Anyone can submit a proposal for additions or changes to the AWC. However, proposals from other than ADFG staff may be subject to field verification prior to approval by ADFG. The Catalog indicates that the extent of surveyed, and harvested salmon throughout the State is likely significant and that not all salmon are Alaska is subject to fishery harvest. The GIS Atlas can be found at the following link: http://extra.sf.adfg.state.ak.us/FishResourceMonitor/?mode=awc

Purpose and use of the Catalog can be found in the following link:
http://www.adfg.alaska.gov/static-sf/AWC/PDFs/awc_pn_intro.pdf

Summary

The approaches taken to monitor the abundance of salmon in spawning systems in Alaska meet the scientific standards required for fisheries management. ADFG has continued to expand the use of higher quality monitoring tools beyond the less reliable visual survey methods (foot and aerial

surveys). These include fish counting weirs, counting towers, sonar (e.g. DIDSON), test fishing and fish wheels. Although there are differences in the reliability of the escapement enumeration methods depending on the region and species, the assessment tools are generally well designed to account for varying geographical and physical conditions, the intensity of harvest impact and finite budgets, as well as dealing with the intrinsic difficulties in surveying such vast and remote geographical areas. In conclusion, Clause 4 is effectively supported in the approaches to salmon escapement monitoring, the collection of fishery dependent catch and effort information and the laws and policies governing those processes.

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

FAO CCRF 7.2.1/12.2/12.3/12.5/12.6/12.7/12.17
FAO Eco 29-29.3

Evidence adequacy rating:

☑ **High** **Medium** **Low**

Rating determination

No major change has occurred since the 2nd surveillance assessment in 2013. This clause is still considered of high conformance.

Stock assessment activities undertaken in Alaska represent a wide breadth of approaches in the provision of science-based advice in support of salmon resource management. 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. Provision of advice for salmon fisheries management is not without its challenges. 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, and adding to this the management of fisheries with 296 individual escapement goals. One of the greatest research challenges in Pacific salmon management throughout the north Pacific has been the identification of individual stocks in mixed-stock fisheries. The WASSIP genetic study of chum and sockeye has perhaps been the most intensive research program in that regard undertaken to quantify the accuracy and precision of stock-specific catch and harvest rate estimates. The governance structure for salmon management in the State and its policies that requires a 3-year cycle of stock assessment review reflects a high standard and commitment of ADFG staff and operational funding in support of sustainable resource management. Clause 5 is strongly supported by evidence of the policies and effective salmon stock assessment activities routinely undertaken in Alaska.

General framework of stock assessment activities for salmon in Alaska.

Currently, as or 2014, there are 296 active salmon stock escapement goals throughout the state of Alaska. The number of goals was 287 in 2012 and 300 in 2013. Escapement goals are derived using a variety of quantitative techniques. The development of science-based escapement goals is founded in the sustained yield principle highlighted in the Alaska Constitution (Article VIII, section 4) and in state statute (AS 16.05.020). Several policies in Alaska Administrative Code also provide guidance for establishing escapement goals including the policy for the management of sustainable salmon fisheries (SSFP: 5AAC 39.222), the policy for statewide salmon escapement goals (5 AAC 39.223) and the policy for the management of mixed stock fisheries (5 AAC 39.220). These policies provide detailed definitions of specific escapement goal types, outline the responsibilities of the ADFG and the BOF in establishing goals, and provide general direction for development and application of escapement goals.

The policies call for review of salmon escapement goals every 3 years in concert with the regulatory cycle for each management area, and provide process and criteria to be followed. The SSFP defines 3 types of escapement goals that can be established by the department. These are defined to be biological or sustainable escapement goals or sustainable escapement threshold as follows:

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

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 will be developed from the best available biological information. An 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.

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. The 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, evaluation
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.

Percentile Method: A method for establishing sustainable escapement goals (SEG) developed by Bue and Hasbrouck (Unpublished). Contrast of 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.

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

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

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

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

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

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

Spawning Habitat Model: Estimates of spawning capacity or number of spawners that produce 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).

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

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

Conditional Sustained Yield Analysis: Observed escapement indices and harvest are used to estimate if, on average, surplus production (yield) results from a particular goal range (Nelson et al. 2005). Estimated expected yields are conditioned on extreme values of measurement error in the escapement indices.

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

The particular method for establishing goals is depends on the specific life history of the species and stock, fishery structure and on the data quality available including the quality of escapement, harvest, age composition and habitat/ecological inputs. The fundamental approach for establishing biologically-based, management reference points of Pacific salmon (e.g. S_{MSY}, U_{MSY}) is based on the concept of stock and recruitment involving a stock-recruitment analysis (SRA) of escapement and brood-year returns-at-age data. Variants of the classical Ricker model now used routinely in data rich situations to capture parameter uncertainty include Bayesian state-space models with time-varying productivity. See Fleischman, S.J. and McKinley, T.R. 2013 for an example of this recently applied to Late-run Kenai River Chinook salmon reviewed by the BOF in 2013.

The quality of escapement and stock-specific harvest data is lacking in most salmon stocks throughout the Pacific Rim and this precludes the use of stock-specific SRA models in those cases. This is generally true for most exploited salmon stocks in Alaska with some notable exceptions (e.g. Bristol Bay sockeye). Opportunities may exist within the Bayesian SR framework to “borrow” key parameter estimates from nearby stocks assuming they are representative. This approach is identified as a Theoretical SRA by ADFG in the preceding list.

The list of escapement goal methods provided by ADFG includes a variety of juvenile and habitat models that, depending on the species/stock, allows the use of habitat (e.g. euphotic volume, spawning/rearing habitat) and life history (e.g. marine survival) models information to estimate key management parameters. These methods are also used in other jurisdictions in the Pacific Rim (Bodtker and Peterman 2007; Bradford et al. 1999; Bradford et al. 1997; Parken et al. 2004; Shortreed et al. 2000).

Ultimately, science advice for sustainable fisheries management depends, to a large extent, on the quality of escapement data. It is the single most important information source for developing management reference points and assessing management performance of exploited salmon stocks relative to the reference points. ADFG employs a wide variety of methods to estimate spawning escapement including weirs, towers, hydroacoustics, mark-recapture and visual aerial, foot and/or boat surveys. Typically, the most reliable escapement estimates are based on complete census counts (e.g. weirs, towers, hydroacoustics), followed by accurate and precise estimates using mark-recapture experiments or multiple visual survey methods. The least reliable escapement estimates are from visual escapement estimates or indices from single foot/aerial surveys

Coupled with estimates of harvest and return age data, where they exist, ADFG defines a range of data quality as follows:

Rating	Description	Type of goal supported
Excellent	Good accuracy and precision of escapement estimates by weir or hydroacoustics. Age estimates available in sufficiently long time series. and escapement and return estimates in sufficient time series to construct a brood table and estimate MSY	BEG
Good	Fair to good accuracy and precision of estimates of escapement from mark-recapture experiments or multiple foot/aerial surveys. Escapement and age estimates available, but may have gaps. Time series may or may not be sufficient to allow construction of brood table.	BEG or SEG
Fair	Fair to good accuracy, but precision estimates missing or inadequate. Escapement estimates or indices available. Age estimates missing or incomplete (e.g., not available from stock-specific harvest). Time series of escapement data may or may not be sufficient to allow estimate of Sustainable Escapement Goal.	SEG or none
Poor	Fair accuracy in escapement count or index data (e.g., single foot/aerial survey); no harvest or age data; time series of escapement data may result in high uncertainty in estimates of Sustainable Escapement Goal.	SEG or none

Of the nearly 300 statewide escapement monitoring programs conducted in 2013, 63% were based on visual survey methods using multiple or peak/single survey methods. Of those, 59% were reportedly done using the less reliable single/peak survey methods. Visual surveys are known to underestimate total escapement and the harvest rate when estimated directly as the catch divided by the sum of escapement plus catch. Given the vast, isolated landscape of the salmon spawning habitat, challenging environmental conditions and the large number of salmon populations, most escapement monitoring in Alaska is conducted using aerial surveys.

There are regional and species differences in the type of escapement surveys conducted. In the Central and Westward regions a higher proportion were done using visual survey methods (66% and 53% respectively). The Central Region had the highest number of surveyed systems (119) and the lowest percentage (29%) of surveys done using more reliable fixed-site (weirs, towers, sonar) or mark-recapture methods. Statewide, most pink salmon surveys (82%) were based on visual boat, foot or aerial methods. Visual survey methods comprised 57% of the surveys for Chinook, 48% for coho, 70% for chum and 28% for sockeye.

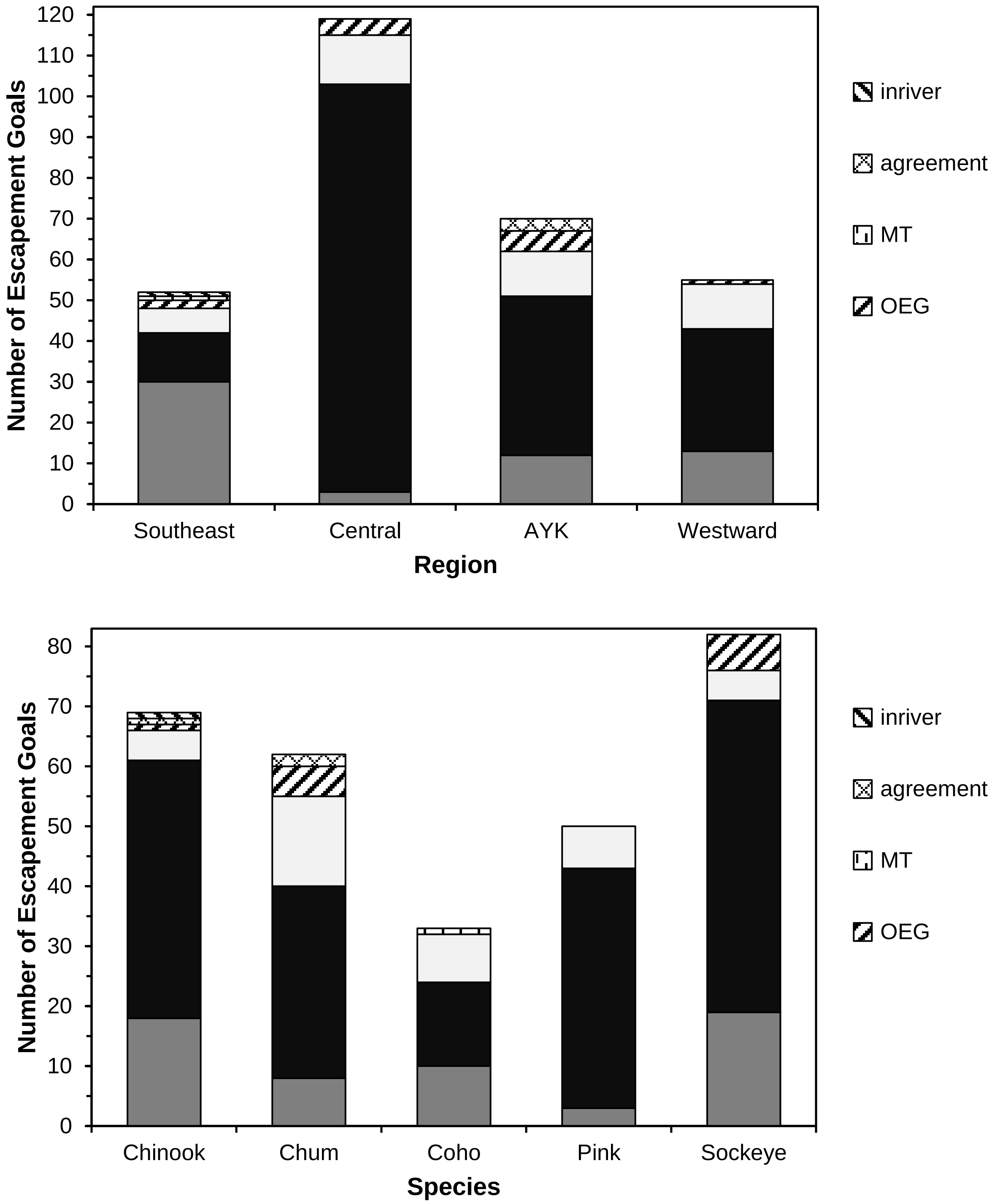


Figure 1. Statewide summary of the 296 escapement goals in effect during the 2013 spawning season for (upper) the four Division of Commercial Fisheries regions and (lower) by species. BEG is biological escapement goal, SEG is sustainable escapement goal, OEG is optimal escapement goal (set by the Alaska Board of Fisheries), MT is management target and agreement goals are established through international treaties. Source: Munro and Volk 2014 (http://www.adfg.alaska.gov/FedAidPDFs/FMS14-01.pdf).

The quality of stock assessment data directly impacts the accuracy and precision of the escapement goal. The percentile method, noted above, was developed mainly for stocks without reliable stock-specific catch data. Most salmon stocks are not associated with reliable stock-specific catch estimates and therefore the percentile method is the most common method for setting escapement goals. In 2013, 46% of the statewide escapement goals were derived as SEGs from the percentile method. Of the total number of percentile goals, 43% were derived from typically less reliable peak/single visual survey methods. The remaining statewide surveys (54%) were based on more accurate approaches using weir, tower, sonar, mark-recapture or multiple visual survey methodologies. Those survey methods are typically associated with higher quality methods for deriving escapement goals, including SRA.

The recently published ADFG summary of Alaskan salmon escapement goals (2005-2013) (http://www.adfg.alaska.gov/FedAidPDFs/FMS14-01.pdf) reports on goal changes made in the 2012/2013 Board of Fisheries (BOF) review cycle. The BOF reviewed escapement goals for Bristol Bay, Alaskan Peninsula/Aleutian Islands and Arctic-Yukon-Kuskokwim (AYK). Changes in the Bristol Bay management area included the elimination of three goals, revisions of three goals and the establishment of 2 goals. In the Alaskan Peninsula/Aleutian Island area, four lower-bound SEGs were eliminated. Changes in the AYK Region included the establishment of one goal, revisions of three goals and elimination of two goals. A drainagewide escapement goal for Kuskokwim River Chinook was established based on a recently completed run reconstruction. BOF out-of-cycle changes in 2013 included goal revisions of Chinook and sockeye goals for Klukshu River, a tributary to the Alsek River in SEAK, and establishing goals of both species in the Alsek River. Also in SEAK, an out-of-cycle escapement goal for Klawock coho was established. In the Central Region, escapement goals for early- and late-run Kenai River Chinook were revised as part of the transition to DIDSON escapement enumeration methods and future plans to relocate the assessment project in the Kenai system.

Aggregate escapement goals, accounting for small stock/population components

In Alaska there are hundreds of individual salmon spawning populations distributed over a vast landscape from Southeast Alaska to the Arctic. The challenge is to develop escapement monitoring programs within a finite budget that are representative of the productivity and abundance of exploited populations. In reality, the data collected range from presence/absence information to the full suite of stock assessment data including annual estimates of absolute abundance at various life stages (adult spawning abundance, size-age composition, stock-specific harvest, smolt production). Data from many stocks represent aggregates of "sub-stocks" that individually may have different productivity and abundance trends as a result of varying ecological and genetic properties. Some stocks are represented in the data by indicator or index spawning populations. The use of escapement indicator systems is a common approach used throughout the Pacific Rim for stock assessment of salmon. In this respect, the notion that escapement and coded-wire-tagged (CWT) indicator stocks are broadly representative of neighboring unindexed stocks is the fundamental premise of the Pacific Salmon Commission's (PSC) indicator stock program for abundance-based management of Chinook and coho stocks intercepted by Parties of the Canada-US Salmon Treaty (http://www.psc.org/publications_psctreaty.htm).

The assumption is that the particular indicator system represents the productivity and abundance typically of a larger or group on unindexed stocks. There are 13 stocks for which the escapement goals in the ADFG database are reportedly derived from the Theoretical SRA method. That approach, as defined above, "borrows" SR parameters from other systems where SR parameters are estimated directly from more data rich indicator stocks. The ADFG (2013) stock assessment and research plan for Alaska Chinook provides a comprehensive proposal for establishing rigorous stock assessment data for 12 Chinook indicator stocks throughout the State.

There are 11 Arctic-Yukon Koskokwim Region chum salmon spawning systems in the ADFG database (ADFG 2013) that report the escapement goal method as the proportion of an aggregate system. The escapement for the Chandalar and Sheenkek rivers are proportions of the aggregated tributaries of the Upper Yukon River tributaries for which the escapement goal range is based on an aggregate SRA. The goals for the Nome, Snake and Eldorado are proportions of the Norton Sound Sub-district 1 aggregate derived from a SRA for the stock aggregate. Similarly, the escapement goals for the Noatak, Upper Kobuk/Selby, Salmon, Tutuksuk and Squirrel rivers are based on the proportion of SRA goal for the Kotzebue Sound Aggregate. Currently, the catch of the individual stock components cannot be separated from the aggregates. As a result, the productivity and abundance of the individual component stocks cannot be estimated directly. In the future, genetic data such as from the Western Alaska Salmon Stock Identification Program summarized below could help distinguish the harvest of these individual stocks in mixed-stock fisheries. The outcome may improve precision in managing the component stocks based on their individual productivity and abundance levels.

WASSIP Program

ADFG announced the publication of results of the Western Alaska Salmon Stock Identification Program (WASSIP) in 2012. Results can be found in 9 reports on the ADFG website: http://www.adfg.alaska.gov/index.cfm?adfg=wassip.tds. This follows 8 years of a stakeholder-driven program with scientists to address long-standing questions about harvest patterns of commercial and subsistence fisheries in western Alaska. The process involved 11 signatories representing fishing, Alaska Native and government interests that served as an Advisory Panel along with a 4-member Technical Committee.

Most of the catch of sockeye and chum salmon comes from terminal fisheries near spawning locations but mixed-stock fisheries do occur in non-terminal (non-local) areas. Unless non-local fisheries are accounted for in the total harvest, estimates of stock-specific catch, harvest rates, run size and productivity will be biased. Uncertainty about the magnitude, frequency, location and timing of non-local harvest was the motivation for the WASSIP study. WASSIP was designed to use genetic data in mixed-stock analysis (MSA) to reduce the uncertainty. MSA has been used effectively for estimating stock composition in mixed-stock fisheries throughout the Pacific Rim.

Estimates of stock composition in mixed-stock fisheries are derived by comparing genotypes of salmon of unknown origin with a baseline measured from salmon stocks of known origin that potentially contribute to the harvest. The baseline data for sockeye comprises populations ranging along a coastline of about 6,000 km and genetic markers using single nucleotide polymorphisms (SNPs). The current WASSIP baseline for sockeye is comprised of 39,205 fish, 294 populations and 96 SNPs. This represents 10,000 additional fish and twice the number of markers compared to the previously published baseline (2010). The current WASSIP baseline for chum is comprised of 32,817 fish, 310 populations and 96 SNPs and represents an increase in the number of populations and markers reported in previous studies. More than 225,000 samples of sockeye and chum collected from Chignik to Kotzebue over a 3 year period (2006-2008) were analyzed to determine stock-specific composition, catch and harvest rates of sockeye and chum salmon. In all, the study represents a very comprehensive program of sampling and analytical effort that has effectively reduced uncertainty in stock composition, harvest and harvest rates of sockeye and chum salmon supporting the management regulatory process in western Alaska. From a stock assessment perspective, the results of the WASSIP are linked to escapement monitoring initiatives for purposes of estimating stock-specific harvest rates, run size and productivity. Outputs of those estimates are key to conducting state-of-the-art stock-recruitment analysis and reducing uncertainty in stock-specific impacts of fishing and other human impacts on sockeye and chum stocks. Ultimately, more reliable estimates of key management reference points derived from the WASSIP will improve precision in science-based advice for fisheries management of sockeye and chum in western Alaska.

Issues

The published WASSIP reports acknowledge and account, to the extent possible, for uncertainty not only in stock composition estimates, as is regularly done in MSA, but also uncertainty in commercial and subsistence harvest numbers, and in escapement estimates. Escapement monitoring based on aerial surveys are biased low and generally less reliable than estimates based on weirs, towers, DIDSON or mark-recapture techniques. For most stocks of sockeye and chum in the WASSIP study, estimates of escapement are based on aerial surveys. The WASSIP reports acknowledge that the point estimates of harvest rates are over-estimates in cases where aerial surveys are used given that estimates of harvest rates are calculated as the catch divided by the sum of catch plus escapement.

Forecasts for the 2014 All Salmon Alaska Season

ADFG prepares yearly forecast for salmon runs that affect major fisheries around the state.

Southeast	pink salmon
Prince William Sound	Wild chum, sockeye, and pink salmon
Copper River/ Copper River Delta	Chinook and sockeye salmon
Upper Cook Inlet	sockeye salmon
Lower Cook Inlet	pink salmon
Kodiak	
KMA	pink salmon
Spiridon Lake	sockeye salmon
Ayakulik River	sockeye salmon
Karluk Lake (Early and Late Runs)	sockeye salmon
Alitak District, Frazer and Upper Station	sockeye salmon
Chignik (Early and Late Runs)	sockeye salmon
Bristol Bay	sockeye salmon
Nushagak District	Chinook salmon
Alaska Peninsula	
South Alaska Peninsula	pink salmon
Bear River (late run)	sockeye salmon
Nelson River	sockeye salmon
Arctic-Yukon-Kuskokwim	
Yukon Area	fall chum salmon

Salmon runs to be forecasted are selected using several criteria, including economic importance, feasibility, compatibility with existing programs, and management needs (http://www.adfg.alaska.gov/FedAidPDFs/SP14-10.pdf). For the 2014 fishing year, forecast fisheries are as follows:

Table 11. Projections of 2014 Alaska commercial salmon harvests, by fishing area and species, in thousands of fish.

	Species					
Fishing Area	Chinook	Sockeye	Coho	Pink	Chum	Total
Southeast Alaska						
Natural Production		962	2,687	22,000	2,357	28,006
Hatchery Production[a]					9,430	9,430
Southeast Region Total	[b]	962[c]	2,687	22,000	11,787	37,435
Prince William Sound						
Natural Production	33	1,513[d]	232[e]	3,140	245	5,163
Hatchery Production[f]		2,031	335	30,174	2,664	35,205
Upper Cook Inlet	8[c]	4,300	165[c]	338[c]	170	4.981
Lower Cook Inlet						
Natural Production	0[c]	60[c]	2	182	62[c]	306
Hatchery Production		94[g]		402		496
Bristol Bay		17,920	85[c]	535[h]	921[c]	19,461
Central Region Total	41	25,918	820	34,771	4,062	65,611
Kodiak						
Natural Production	22[c]	1,817[i]	117[c]	12,000[j]	709[c]	14,666
Hatchery Production		495[k]	128	2,500[g]	126	3,250
Chignik[l]	5	1,097	82	762	287	2,234
South Peninsula & Aleutians	7[c]	1,834[c]	189[c]	2,294[m]	1,005[c]	5,329
North Alaska Peninsula	2[c]	1,415[n]	43[c]	22[h]	215[c]	1,696
Westward Region Total	37	6,658	560	17,578	2,342	27,175
Arctic-Yukon-Kuskokwim Region Total	2	83	295	375	1,673	2,427
Statewide Total	79	33,620	4,361	74,725	19,863	132,648

Note: Columns and rows may not total exactly due to rounding.

[a] Hatchery projections made by Southern Southeast Regional Aquaculture Association, Northern Southeast Regional Aquaculture Association, Douglas Island Pink and Chum , Armstrong-Keta, Inc., Kake Nonprofit Fisheries Corporation, and Metlakatla Indian Community less broodstock (500,000). Wild chum salmon catch estimated as 20% of total catch.

[b] Southeast Chinook treaty forecast not available. The allowable catch of Chinook salmon in Southeast Alaska is determined by the Pacific Salmon Commission and the Commission has not published the quota for 2014. Release of the 2014 Chinook salmon quota for Southeast Alaska is expected in early April.

[c] Average harvest for the 5-year, 2009–2013 period.

[d] Includes harvest estimates for Coghill and Eshamy lakes, Unakwik District and Copper River sockeye salmon.

[e] Five-year average harvest (2009–2013) in the Copper River and Bering River districts.

[f] Hatchery projections made by Prince William Sound Aquaculture Corporation and Valdez Fisheries Development Association. Gulkana Hatchery projection made by ADF&G.

[g] Includes common property plus cost recovery harvests.

[h] Average previous five even-year harvests, 2004–2012 period.

[i] Total Kodiak harvest of 1.818 million natural run sockeye salmon includes projected harvests from formally forecasted systems, projected Chignik harvest at Cape Igvak, and projected harvest from additional minor systems totaling 750,000 fish.

[j] See formal pink salmon forecast.

[k] Hatchery projections made by Kodiak Regional Aquaculture Association. Sockeye salmon hatchery projections include Kodiak Regional Aquaculture Association projections (105,000); enhanced Spiridon sockeye salmon run harvest forecast (391,000) was developed by ADF&G staff.

[l] Chignik Chinook, coho, pink, and chum salmon harvests based on 5-year (2009–2013) average harvests; Chignik sockeye salmon based on a formal forecast with projected harvest at Igvak and Southeastern District Mainland excluded.

[m] Based on South Peninsula formal forecast and the Aleutian Islands average previous four even-year harvests, 2006–2012 period.

[n] Five-year average (2009–2013); sockeye salmon includes formal forecasts for Bear late run (219,000), Nelson stocks (365,000).

A variety of information is used to forecast salmon runs. In most cases the principal indicator of future abundance is the escapement magnitude of parental stocks. Other information that might have been considered includes spawning stock of distribution, outmigrating smolt numbers, returns to date from sibling age classes of the projected return, and environmental conditions. A range of run possibilities are predicted for each forecasted fishery. In general, based on past experience, the actual run can be expected to fall within the range (between the lower and upper limits) less than half the time.

Catch projections based on quantitative forecasts of salmon runs generally reflect potential harvests, and are made for most of the major sockeye salmon fisheries and pink salmon fisheries in Southeast Alaska, Kodiak, PWS, and Alaska Peninsula. Forecast for large hatchery runs including pink, sockeye, and chum salmon runs to the SEAK, Kodiak and the PWS areas are provided by private non profit operators. For other fisheries, the catch projections are made based on recent catch levels and are reflective of recent levels of fishing effort, thus recent catch levels are reflective of both market conditions and recent levels of salmon runs. Harvest projections for these fisheries may not be indicative of potential harvest levels.

Salmon Species Projections

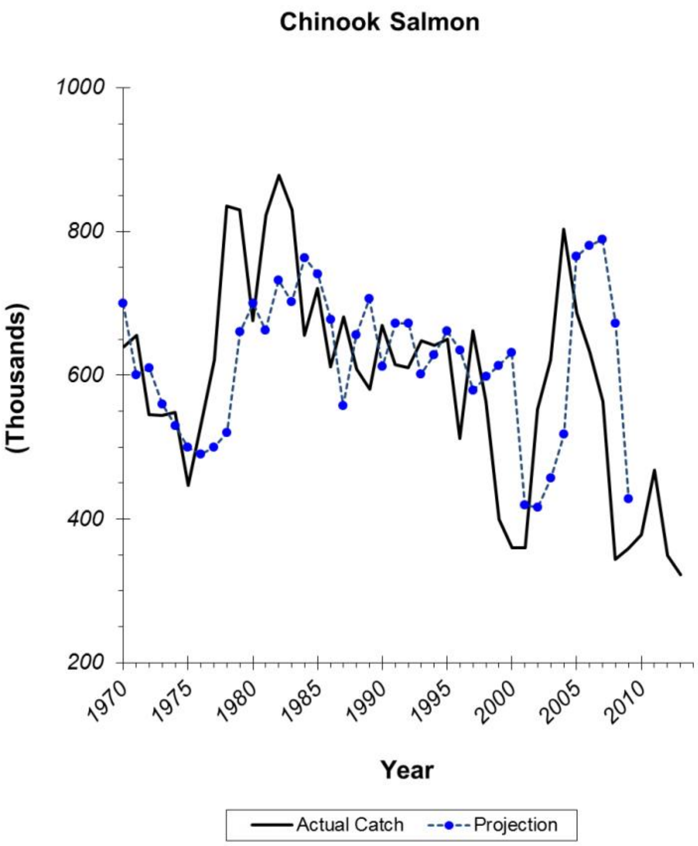


Figure 2. Relationship between actual catch (thousands) and projected catch (thousands), for Alaska Chinook salmon fisheries from 1970 to 2013, 2011-2014 projection not available.

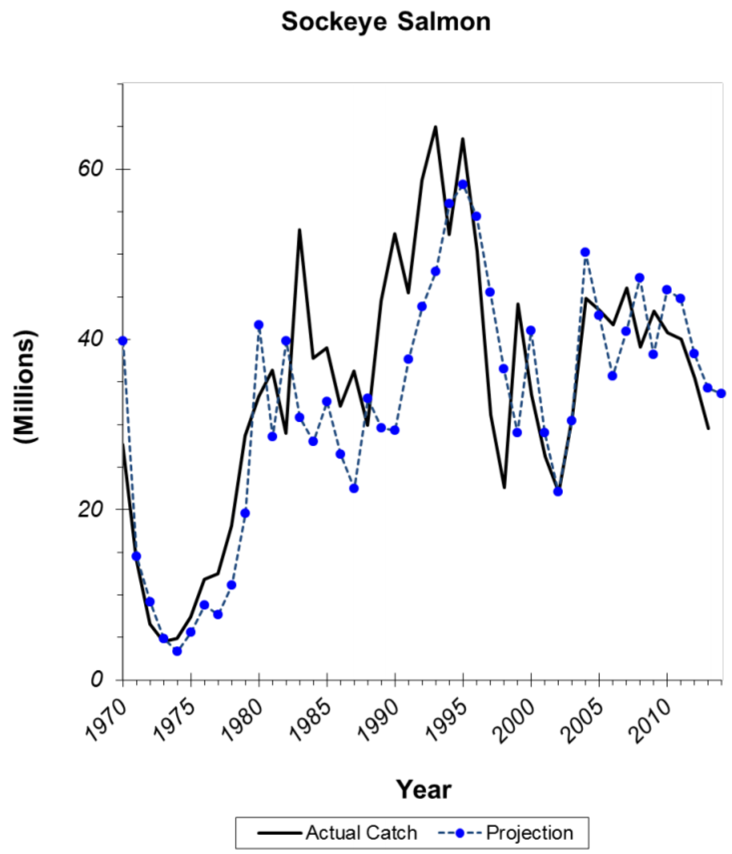


Figure 3. Relationship between actual catch (millions) and projected catch (millions), for Alaska sockeye salmon fisheries from 1970 to 2013, 2011-2014 projection not available.

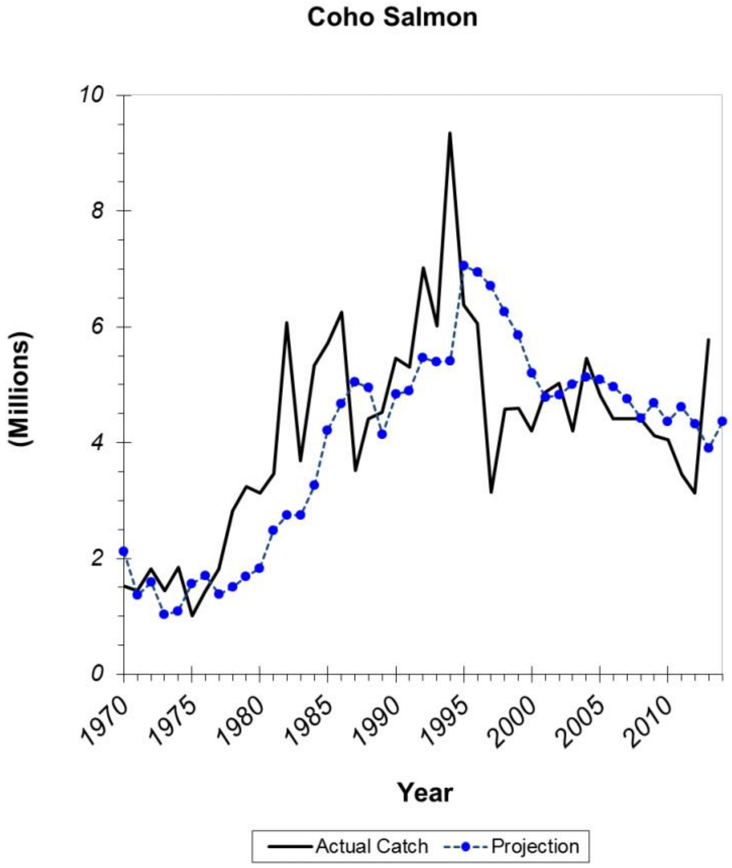


Figure 4. Relationship between actual catch (millions) and projected catch (millions), for Alaska sockeye coho fisheries from 1970 to 2013, with the 2014 projections.

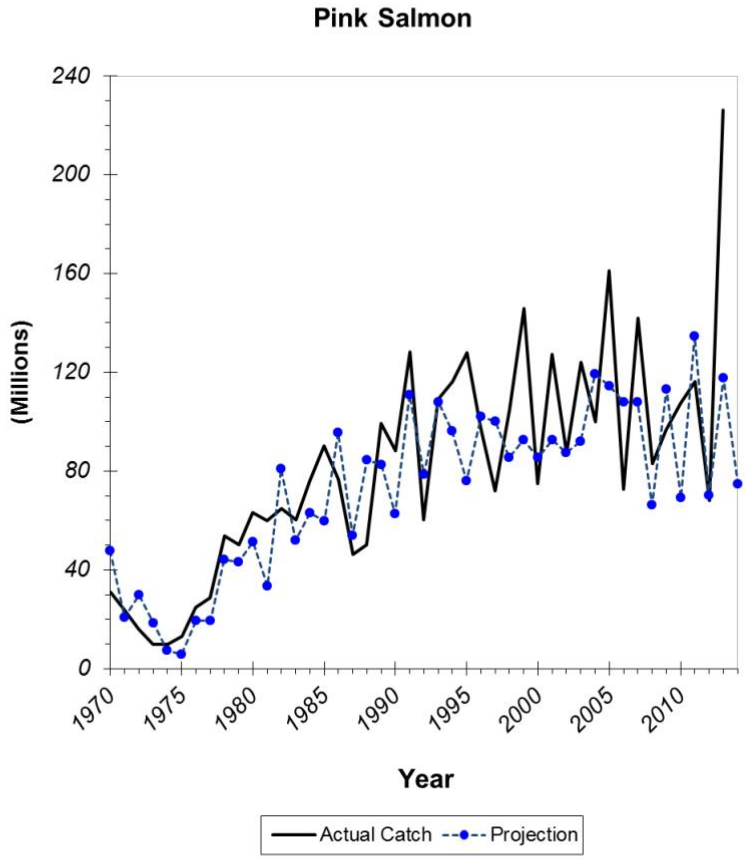


Figure 5. Relationship between actual catch (millions) and projected catch (millions), for Alaskan pink salmon fisheries from 1970 to 2013, with the 2014 projection.

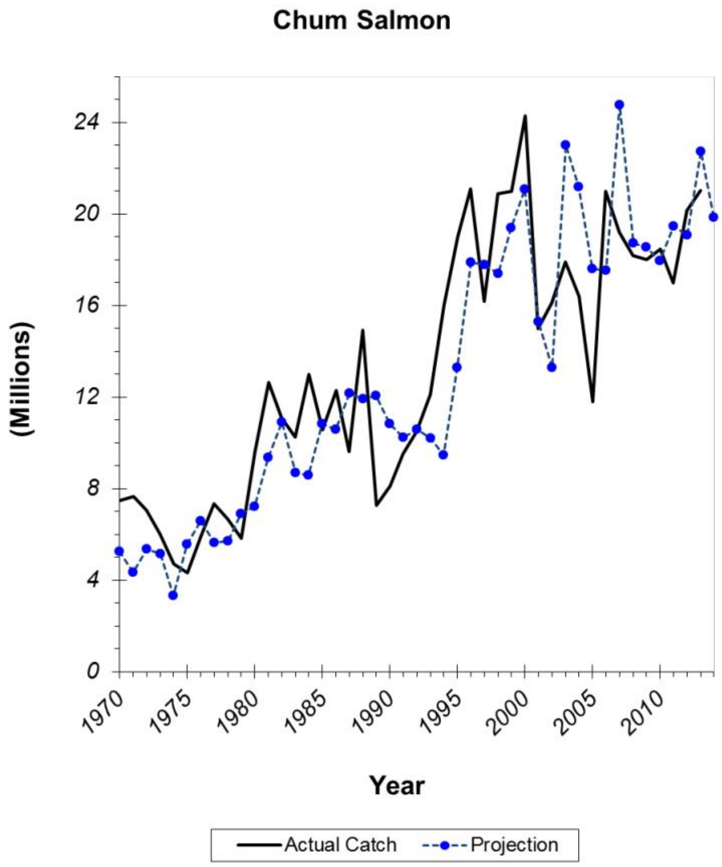


Figure 6. Relationship between actual catch (millions) and projected catch (millions), for Alaskan chum salmon fisheries from 1970 to 2013, with the 2014 projection.

Summary

Stock assessment activities undertaken in Alaska represent a wide breadth of approaches in the provision of science-based advice in support of salmon resource management. 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. Provision of advice for salmon fisheries management is not without its challenges. 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 enough, let alone the challenge of managing fisheries with close to 300 individual escapement goals. One of the greatest research challenges in Pacific salmon management throughout the north Pacific has been the identification of individual stocks in mixed-stock fisheries. The WASSIP genetic study of chum and sockeye has perhaps been the most intensive research program in that regard undertaken to quantify the accuracy and precision of stock-specific catch and harvest rate estimates. The governance structure for salmon management in the State and its policies that requires a 3-year cycle of stock assessment review reflects a high standard and commitment of ADFG staff and operational funding in support of sustainable resource management. In conclusion, Clause 5 is strongly supported by evidence of the policies and effective salmon stock assessment activities routinely undertaken in Alaska.

C. The Precautionary Approach

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

Evidence adequacy rating:

☑ **High** **Medium** **Low**

Rating Determination

Escapement goals effectively represent reference points of the various Alaska salmon systems. There are currently 296 active salmon stock escapement goals throughout the state (as of 2013). These escapement goals cover mainly index systems but also individual streams. A variety of methods are used to develop escapement goals in Alaska. During the 2013-2014 Board of Fisheries cycle, reviews of the escapement goals were done for Chignik, Kodiak, Lower Cook Inlet and Upper Cook Inlet management areas. Where escapements chronically (4-5 years) fail to meet expectations for harvestable yield or spawning escapements, the department may recommend, and the board may adopt a stock of concern designation for those underperforming salmon stocks. Stock improvement following this designation is supported by data. A review of all the latest escapements (296) throughout Alaska indicates that the general majority of escapement goals have recently been met, with clear exceptions for Chinook salmon statewide. In response to this Statewide decline in Chinook production, ADFG has been limiting and/or closing commercial fisheries to meet escapement goals and has initiated a $30 million research projects aimed at elucidating Chinook stock dynamics and to improve stock assessment and overall management for the species.

Escapement goals supporting policy

Escapement goals effectively represent reference points of the various Alaska salmon systems. Currently, (reviewing the 2013 season) there are 296 active salmon stock escapement goals throughout the state. A variety of methods are used to develop escapement goals in Alaska. Where escapements chronically (4-5 years) fail to meet expectations for harvestable yield or spawning escapements, the department may recommend, and the board may adopt a stock of concern designation for those underperforming salmon stocks. Escapement goals are based on a number of scientific evaluation methods, founded in the sustained yield principle highlighted in the State Constitution (Article VIII, section 4) and in state statute (AS 16.05.020). Several policies in Alaska Administrative Code also provide guidance for establishing escapement goals including the policy for the management of sustainable salmon fisheries (5AAC 39.222), the policy for statewide salmon escapement goals (5 AAC 39.223) and the policy for the management of mixed stock fisheries (5 AAC 39.220). These policies provide detailed definitions of specific escapement goal types, outline the responsibilities of the ADFG the BOF in establishing goals, and provide general direction for development and application of escapement goals in Alaska.

Escapement goal review

Escapement goals for the various regions are reviewed every 3 years by the Board of Fisheries. The Department has prepared and presented several stock status and escapement goal reviews for the 2013-2014 cycle:

1) Chignik Management Area
http://www.adfg.alaska.gov/static/regulations/regprocess/fisheriesboard/pdfs/2013-2014/chignik/rc3_tab1_chignik_2013.pdf ,
2) Kodiak Management Area
http://www.adfg.alaska.gov/static/regulations/regprocess/fisheriesboard/pdfs/2013-2014/kodiak/fms13-11.pdf
3) Lower Cook Inlet
http://www.adfg.alaska.gov/static/regulations/regprocess/fisheriesboard/pdfs/2013-2014/lci/rc3_tab1_lci_2013.pdf
4) Upper Cook Inlet
http://www.adfg.alaska.gov/static/regulations/regprocess/fisheriesboard/pdfs/2013-2014/uci/FMS13-13.pdf

Chignik Management Area
During the ADFG 2013 review process, escapement goals were evaluated for one Chinook and 2 sockeye salmon stocks. In addition, 2 pink and one chum salmon stock-aggregate goals were evaluated. The CMA salmon escapement goals had previously been reviewed in 2010. In 2013, the team reviewed recent data for the 6 goals in existence to determine whether substantial new information existed. Only the Chignik River early- and late-run sockeye salmon escapement goals were analyzed further. The team recommended changing the Chignik River early- run sockeye salmon sustainable (SEG) of 350,000 to 400,000 to a biological escapement goal (BEG) of 350,000 to 450,000. The team recommended no change to the late-run sockeye salmon SEG. No goals were eliminated and none were added for systems currently without escapement goals.

Kodiak Management Area
During the 2012/2013 review cycle, escapement goals were evaluated for 2 Chinook, 14 sockeye and 4 coho salmon stocks. In addition, 3 pink and 2 chum stock-aggregate goals were reviewed. The review was conducted similarly to the 2010 review, primarily examining recent (2010-2012) data and updating previous analyses.

Kodiak Chinook salmon
An initial Ayakulik River Chinook salmon SEG of 4,500 to 10,000 fish was established based on average historical escapements providing harvestable surpluses. This was revised in the 2001-2002 review cycle as a BEG of 4,800 to 9,600 fish based on stock-recruit analysis. The BEG was reevaluated in 2005 using an updated Ricker analysis, but was left unchanged. The BEG was reevaluated in 2007 and again in 2010. The current BEG of 4,000 to 7,000 fish was set in 2010. In 1996, a Karluk River Chinook salmon SEG of 4,500 to 8,000 fish was established based on average historical escapements providing harvestable surpluses. The escapement goal was revised as a BEG of 3,600 to 7,300 fish based on a

stock-recruitment analysis in the 2001-2002 review cycle. An analysis in 2010 resulting in a BEG of 3,000 to 6,000 fish.

Kodiak sockeye salmon

For KMA sockeye, the 2013 review team revised the stock assessment data set by adding the 2010-2012 escapement data to the existing stock-recruit information. Six of the 14 stocks with escapement goals were re-evaluated. The escapement goal for Afognak Lake sockeye was set at 20,000 to 40,000 in 1988. The 2004 review resulted in changing the SEG to a BEG of 20,000 to 50,000 fish for the 2005 season. The 2007 and 2010 reviews resulted in no changes to Afognak Lake sockeye. The 2013 review team agreed that the impact of the addition years of escapement data for Afognak sockeye, did not warrant further analysis.

The 2004 review of the escapement goal for Ayakilik River sockeye led to changing the previous SEG of 200,000 to 300,000 fish, established in 1983, to a range of 200,000 to 500,000 fish. In 2010, the team recommended reinstating separate early- and late-run goals for Ayakilik sockeye based on run-timing curves and new genetic data. An early-run SEG of 140,000 to 280,000 fish through July 15 and a late-run SEG of 60,000 to 120,000 fish thereafter was established based on zoooplankton biomass models and historical escapement goals. The 2013 ADFG review team assessed the most recent escapement data and concluded that no further analysis was required.

A Buskin Lake sockeye SEG of 8,000 to 13,000 was developed in 1996 based on historical weir counts. In 2010, An updated analysis resulted in a reduced SEG of 5,000 to 8,000. With only 3 additional years of data since the 2010 review the 2013 team agreed no further analysis was necessary.

A Fraser Lake sockeye goal was initially set at 175,000 fish from the 1950s through the 1970s. In 1981 the escapement goal was changed to the range of 350,000 to 400,000 fish based on rearing capacity and and spawning habitat estimates. The goal was lowered to 200,000 to 275,000 in 1986 and in 1988 a BEG of 140,000 to 200,000 fish was established. In 2005, the BEG was to reduced to a range of 70,000 to 150,000 fish based on spawner-recruit analysis. The 2013 review concluded that the addition of additional data was unlikely to result in a change from the BEG range set in 2005.

A Karluk Lake sockeye escapement goals were established from 1988 to 1991 for an early-timed run of 250,000 to 350,000 fish and a late-timed run of 310,000 to 550,000 fish. In 1992, spawner-recruit analysis was used to develop BEGs of 150,000 to 250,000 for the early run and 400,000 to 550,000 for the late run. The 2004 review resulted in a change to 100,000 to 210,000 for the early run and 170,000 to 380,000 for the late run. Following the 2007 review, the early-run goal was changed to a BEG of 110,000 to 250,000 sockeye with the inclusion of recent strong brood-year returns. The late-run Karluk sockeye BEG remained unchanged. In the subsequent 2010 and 2013 reviews, no changes to the BEGs established in 2007 were recommended.

The first published escapement goal for Little River Lake was developed in 1988 and set at 15,000 to 25,000 sockeye. The 2004 review team recommended eliminating the Little River sockeye SEG due to incomplete escapement data and the inability to actively manage escapement to the system. This recommendation was adopted in 2005. An escapement goal was re-established in 2008 given the high exploitation rates exerted in the commercial fishery impacting Little River Lake sockeye. After conducting a risk analysis using aerial survey and weir data, the team recommended a lower-bound SEG of 3,000 sockeye at that time. In the 2013 review, following escapements in 2010-2012 above the lower-bound SEG ranging from 3,200 to 6,300 sockeye, the team recommended further review of the goal. The 2013 team concluded that given the low priority for collecting assessment data from the Little River Lake system, the lower SEG of 3,000 should be eliminated.

A goal of 5,000 to 10,000 sockeye for Malina Creek sockeye was developed in 1988 based on historical aerial survey indexed escapements and, to as lesser extent, cursory habitat estimates. The SEG was revised in 1992 to 10,000 to 20,000 fish based on further limnological studies and rehabilitation investigations. A review in 2004 recommended reducing the SEG to 1,000 to 10,000 fish based on the percentile approach and a zooplankton model. The review teams in 2010 and 2013 agreed that no further analysis was necessary.

The Pasagshak River sockeye escapement goal was set at 1,000 to 5,000 fish in 1988 based on historical aerial survey indexed escapements and, to as lesser extent, cursory habitat estimates. In 2004, the SEG was revised to 3,000 to 12,000 fish based on the percentile approach and a zooplankton model. Subsequent reviews in 2010 and 2013 concluded that no further analysis to the Pasagshak SEG was warranted.

The escapement goal for Saltrey Lake sockeye was developed and published in 1988 and set at 20,000 to 40,000 fish. In 2001, the SEG was changed to a SEG of 15,000 to 30,000 fish, based on spawner-recruit data, euphotic zone depth and volume, smolt biomass as a function of zooplankton biomass, smolt biomass as a function of lake rearing availability, and spawning habitat availability analysis. In 2007, the consensus of the review team was to change the BEG to a SEG of 20,000 to 50,000 fish, based on a percentile analysis of aerial survey data. In 2008, the goal was reanalysed using weir counts at Sultery Lake. The team recommended reverting to the prior BEG of 15,000 to 30,000 used to manage the stock since 2001. The goal was reanalysed again in 2010 resulting in a change to a BEG of 15,000 to 35,000 sockeye. That recommendation was adopted in 2011. The 2013 review team agreed that no further analysis was necessary beyond that undertaken in 2010.

The first published escapement goal for Uganik Lake sockeye was developed in 1988 and set at 40,000 to 60,000 sockeye. Based on a review in 2004, the escapement goal was eliminated due to incomplete escapement data and the inability to actively manage escapements to the Uganik Lake system. A lower-bound escapement goal of 24,000 sockeye was implemented in 2008 based on aerial survey and wier count estimates using the percentile approach. No further adjustment to the goal were recommended in 2010 and 2013.

From 1978 to 1982, the Upper Station sockeye stock, also referred to as South Olga lakes, was managed for an escapement goal range of 100,000 to 180,000 fish. In 1983 ADFG increased the escapement goal range to 150,000 to 250,000 fish. In 1988, the goal was split into separate SEGs of 50,000 to 75,000 fish for the early run and 150,000 to 200,000 fish for the late run. During the 2004 review, the team recommended changing the Upper Station early-run SEG to 30,000 to 65,000 fish based on the percentile approach and changing the late-run SEG to a BEG of 120,000 to 265,000 based on spawner-recruit analysis. In 2010, the Upper Station early-run goal was changed to a BEG of 43,000 to 93,000. There was no change recommended for the late-run BEG. In 2013, the team recommended no changes from 2010 although a stock-recruit analysis revealed non-stationary productivity processes in the data series used in the stock-recruit analysis.

Kodiak coho salmon

Coho salmon escapement goals have been established for 4 KMA rivers (American, Buskin, Olds and Pasagshak rivers). Escapement goals were first established in 1999. A SEG for the American River was set at 200 to 400 fish, then changed to 400 to 900 fish in 2005. The Olds River SEG was set at 450 to 675 fish then changed to 1,000 to 2,200 fish in 2005. The Pasagshak goal was changed from the existing goals of 1,500 to 3,000 fish to 1,200 to 3,300 fish in 2005. The first Buskin River coho SEG was 6,000 to 9,000. In 2005, the SEG was changed to a BEG of 3,200 to 7,200 fish. The BEG was based on a spawner-recruit analysis. In 2011, the upper bounds of the escapement goals for the American, Olds and Pasagshak were removed due to lack of active in-season management for the upper ends of the goals. The 2013 review team has recommended no further analysis of the existing goals. Bayesian stock-recruit analysis of Buskin River data incorporating escapement data through 2012 resulted in a recommendation to adopt a Buskin River SEG of 4,700 to 9,600 coho.

Kodiak pink salmon

There are 2 escapement goals for KMA pink salmon corresponding to aggregates of escapements to multiple streams from aerial surveys. The Mainland District aggregate is derived solely from aerial surveys. The Kodiak Archipelago aggregate is derived from aerial surveys supplemented by weir counts. The first KMA district wide escapement goas were published in 1978. In 2005, the Mainland District SEG was retained as its own discrete goal, while 6 other districts were combined to form the Kodiak Archipelago goal. Also, separate goals for even and odd years were illuminated and replaced by an overall goal. The newly-created Kodiak Archipelago SEG was set at 2,000,000 to 5,000,000 fish. The Mainland District goal was revised to 250,000 to 750,000 fish. During the 2010 review, the team recommended changing the Kodiak Archipelago SEG to an odd-year SEG of 2,000,000 to 5,000,000 fish and even-year SEG of 3,000,000 to 7,000,000 pink salmon. The team also recommended changing the Kodiak Mainland SEG to 250,000 to 1,000,000 fish. The goals were implemented in 2011. No further changes were recommended in the 2013 review.

Kodiak chum salmon

There are 2 aggregate escapement goals for KMA chum salmon. Both are SEGs based on estimates from aerial surveys. Escapement goals were first established in 1988. In 2004, the goals were revised and implemented in 2005 as lower-bounded SEGs of 153,000 fish for the Mainland District. The Mainland District lower-bound goal was further revised in 2007 and reduced to 104,000 fish. In the same year, the Kodiak Archipelago aggregate goal was set at 151,000 fish. The 2010 and 2013 reviews recommended no further changes.

In summary, the 2013 review team reviewed data for all 25 salmon stocks. The team recommended changing 1 goal and eliminating 1 goal. The new recommendations resulted in a total of 24 KMA escapement goals as follows: 2 BEG goals for Chinook salmon; 13 goals for sockeye salmon (8 BEGs, 3 SEGs, and 2 lower-bound SEGs); 4 goals for coho salmon (1 BEG and 3 lower-bound SEGS); 3 aggregate SEGs for pink salmon; and 2 aggregate SEGs for chum salmon.

Lower Cook Inlet Management Area

During the review process in 2013 for LCI Area salmon, escapement goals were evaluated for 3 Chinook, 12 chum, 17 pink and 8 sockeye salmon stocks. The majority of escapement goals are based on foot or aerial surveys. Chinook escapements have been monitored since 1962. Escapement goals for Chinook (Deep Creek, Ninilchik, Anchor River) and were first adopted in 1993. Chinook escapement goals at that time were point estimates of the average of the escapement indices. In 1999, point goals were changed to ranges by multiplying the respective point goal by 0.8 and 1.6, similar to the method used to estimate the escapement range that produced 90% or more of the maximum sustainable yield. Chum escapement surveys began in the early 1970s and escapement goals were first established in 1979. Many of the original chum goals were based on a subjective assessment of habitat quality and the level of commercial harvests resulting from various levels of escapement. Pink salmon escapement surveys began in the 1960s. Escapement goals for some pink salmon systems were first established in 1970, while goals for many other systems were established in either 1976 or 1982. Origins of these early pink escapement goals are not well documented. Those in the Outer and Eastern districts were based on qualitative estimates of available spawning areas, assuming an optimal density of 1.5-2.0 spawners per square meter. Monitoring of LCI sockeye escapement began in 1960 largely based on aerial surveys to produce indices of sockeye escapements. For Bear Lake sockeye, a complete count or estimate of escapements has been monitored through a weir since 1960. Escapement goals for LCI sockeye were first established in 1982 and additional systems were added through the 1980s.

In 2001, with the definition of escapement goals adopted into policy by the BOF and the uncertainties in estimating escapements and stock-specific commercial harvest rates, ADF&G changed all LCI goals to SEGs. SEG percentiles were calculated for nearly all stocks using foot and aerial survey escapement indices from 1976 through 2001 (through 2000 for Chinook). Survey data prior to 1976 were excluded due to inconsistencies in data collection methods.

Survey data since 1976 were not used for 3 stocks: Ninilchik River Chinook, Tutka Lagoon Creek pink salmon and Bear Lake sockeye salmon. The Ninilchik Chinook salmon SEG was based on a weir count of naturally-produced Chinook after accounting for marked hatchery-stocked Chinook. The Ninilchik weir count is still considered an index because it does not account for the total escapement. For Tutka Lagoon Creek pink salmon, survey data from 1959 to 1975 were set to exclude years with hatchery supplementation, which began in 1976 and continued until 2005. The Tutka Bay Lagoon Hatchery began rearing and releasing pink salmon again in 2011/2012. For Bear Lake sockeye, weir data from 1985 to 2001 were used because prior to 1985 the lake was managed to limit sockeye production in favour of coho salmon.

The 2013 review team reviewed 40 LCI escapement goals and recommended that most remain the same. The exceptions are recommendations to recalibrate the Mikfik sockeye stock and create a new goal for Dogfish Lagoon Creek pink salmon.

Upper Cook Inet Management Area

The 2013 review committee recommended that the majority of salmon escapement goals in UCI remain unchanged. The committee recommended a range change to 1 coho salmon SEG and to eliminate 1 sockeye salmon goal. Only stocks having goals that were modified, added, or deleted since the previous review are discussed the 2013 UCI report detailing the review of UCI escapement goals.

Due to a change in assessment methodology, Kenai River early- and late-run Chinook salmon goals were assessed in out-of-cycle reviews in early 2013. The early-run SEG of 4,000–9,000 was changed to a SEG of 3,800–8,500. For the late run, it changed from a SEG of 17,800–35,700 to an SEG of 15,000–30,000. Due to a lack of new information, these 2 goals were not re-assessed during the 2013 review period.

The 2013 review committee considered the development of an escapement goal for Deshka River coho salmon but, concluded that a Susitna drainage-wide goal would best suit management needs. The committee recommended that an escapement goal not be developed for Deshka River coho salmon due to issues related to inaccurate run timing and abundance estimates during periods of high stream flow and because highly variable inter-annual run timing based largely on stream flow limits the ability of the weir to provide reliable inseason information to manage the sport fishery. Currently, 16 years of annual weir counts are available; however, high water events compromised the weir for 5 of those years. Ongoing coho salmon studies in the Susitna drainage help to better evaluate whether Deshka River coho run strength is representative of run strength in the entire Susitna drainage and whether a drainagewide escapement goal can be developed. Currently, there are 3 years (2010–2012) of drainagewide estimates for Susitna River coho salmon.

The escapement goal review committee recommended changing the Jim Creek coho salmon SEG of 450–700. This change is the result of incorporating escapement information acquired after the original goal was established in 2001. A single annual foot survey on McRobert's Creek is used to assess this stock. From 2001 to 2009, coho salmon counts exceeded the upper bound of the SEG in 8 of 9 years. Concurrently, sport fish harvests were higher than average, resulting in large returns from large parent escapements, and providing additional sustained yield information from which to better evaluate the current goal. Using the percentile approach (25th to 75th percentiles) with data since 1985, the committee recommend a revised SEG of 450–1,400 Jim Creek coho.

Management of UCI commercial fisheries is driven primarily towards achieving the Kasilof and Kenai River sockeye salmon escapement goals. The up-dated stock-recruitment series for these stocks were reanalyzed using similar methods as in the previous review. The reanalysis had little impact on estimates of escapement that produce maximum yields of Kasilof River sockeye salmon, so the committee recommended no change to the current BEG of 160,000–340,000.
The committee recommended that the Kenai River late-run sockeye salmon SEG be kept at 700,000–1,200,000 spawners. This range approximately represents the escapement that, on average, will produce 90–100% of MSY. The 90–100% range for an SEG was selected because it results in a broader interval with the highest predicted yield near its center.

The committee recommended eliminating the Crescent River sockeye salmon BEG of 30,000– 70,000. Escapements in 12 of 14 years since 1999 exceeded the upper bound of the escapement goal range. For this reason, the committee recommended that the goal should be eliminated.

Six other salmon stocks in UCI were considered by the committee to address 2014 UCI BOF proposals. The public requested the BOF consider adopting escapement goals for those stocks during the January 2014 UCI BOF meeting. The committee did not recommend escapement goals for any of the six stocks due largely to data quality issues.

Escapements goals versus actual escapements performance

Statewide, for those spawning systems with escapement goals (2005-2013) and all stocks/species combined, there was an increase in the proportion of stocks that have not met their lower escapement goal starting in 2008. The average percentage increased from 12% in 2004-2007 to 26% thereafter, the bulk being Chinook salmon. The proportion of stocks maintained within their escapement goal range has been slightly increasing over the 2005-2013 period. The proportion of stocks that exceeded the upper goal over the same period declined during 2005-2012 but increased from 13% in 2012 to 23% in 2013. For all stocks/species combined, the increase in the proportion of stocks that have not met their goal occurred in 3 of the 4 regions (Central, AYK, Westward) starting in about 2008. The proportion below the goal for all species and regions combined was 29% in 2012 and 24% in 2013.

Refer to Escapement Goal Performance Summary Tables at the end of this Section.

All rivers/tributaries within the larger Yukon River drainage are covered by the SOC designation - not just the systems that are monitored and have escapement goals. The reason behind this is that these stocks are defined by the fishery (e.g. Yukon River Chinook) and managed as aggregate stocks. Therefore, SOC designation for individual systems within these types of larger designations are somewhat immaterial because action plans that are developed to deal with the aggregate will likely include any actions that would pertain to individual systems within. However, conceivably, there could be a SOC designation for a specific river or tributary within a larger SOC designation if it was determined to be warranted and specific actions, not already addressed in the action or management plan of the larger SOC designation, could be taken. Similar to the Yukon River Chinook SOC, the Norton Sound SOC designation for Subdistricts 5 and 6 Chinook applies to all systems within the subdistricts.

Data from the Munro and Volk 2014 Report '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. Note some of the data in the report are considered preliminary and subject to change.

Analysis of the stocks that failed to meet their goals for a 4-5 years period.

Due to the scale and extent of salmon resources in Alaska and the difficulty in managing such a resource, escapement goal performance over one year alone may not necessarily be reflective of the true management quality and performance. Therefore, the analysis here analyzed the results of all the active escapement goals in Alaska over ten years to discern the ability of management to allow sufficient salmon escapement throughout the State. More specifically, when a stock does not meet escapement for a period of 4 or 5 years (described as "chronic inability"), the stock is recommended by ADFG to the BOF and placed under the Stock of Concern designation. This designation allows a stock further and more specific management measures to allow its rebuilding to sustainable levels. If a stock chronically fails to meet escapement goals it is reported by ADFG to the Board of Fisheries (BOF) as a stock of concern and the fishery management plan is amended to protect the productivity of the stock. In addition, a specific action plan associated with the management plan is prepared for any new or expanding salmon fishery, or stock of concern. The action plans are to contain goals, measurable and implementable objectives, and provisions for fishery management actions needed to achieve rebuilding goals and objectives, performance measures appropriate for monitoring and gauging the effectiveness of the action plan and a research plan that is periodically reevaluated, as necessary, to provide information to address concerns.

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."

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)).

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)).

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.” (5 AAC 39.222(f)(6)).

In March 2011, the BOF took action to identify six stocks of Chinook salmon and continue one stock of sockeye from Upper Cook Inlet as stocks of concern. The Chuitna River, Theodore River, Lewis River, Goose and Alexander Creek Chinook stocks were designated as a management concern and the Willow Creek stock was designated as a yield concern. The escapement goal among these six stocks was only met twice during 2009-2013. The Susitna (Yentna) River sockeye stock was designated as a yield concern in 2007 (BOF Finding 2011-266-FB). Since its designation, the Yentna sonar-based SEG was eliminated and replaced with three Susitna wier-based SEGs (Chelatna, Judd and Larson lakes). The new escapement goals became effective for the 2009 return year. The Chelatna escapement met the goal or exceeded the upper goal in four of the past five years, Judd Lake met the goal in two of the past five years and Larson Lake met the goal in four of the past five years.

The stock of concern status of Yukon River Chinook, has continued. The performance of Yukon River Chinook stocks relative to the escapement goals in the past 5 years (2009–2013) has been mixed, depending on the stock. However, commercial and subsistence harvests have decreased substantially from the historical 10-year period (1989–1998) to the recent 5-year (2008–2012) average. There has been no directed commercial fishery for Chinook salmon since 2007. While run sizes showed a modest increase during the years 2003–2006, lower returns have occurred since that time despite continued conservative management strategies, and ADFG recommended continued classification of Yukon River king salmon as a stock of yield concern (Schmidt and Newland, 2012). At its January 2013 regulatory meeting, the BOF continued the classification of Yukon River Chinook salmon as a stock of yield concern. Previous classifications of Yukon River summer and fall chum stocks as stocks of concern were discontinued in 2004 and 2007.

For Bristol Bay, the Kvichak River sockeye stock was identified by ADFG to be a stock of concern, although it achieved the minimum escapement goal for the last three years (Sand, 2012). In 2009, the Kvichak River was reclassified to a “stock of yield concern” and with continued improvements in production over the past 5 years, ADFG recommended that this sockeye stock be removed as a stock of concern in 2012 (Morstad and Brazil, 2012). In Norton Sound, ADFG recommended the BOF continue the “stock of yield concern” classification for Norton Sound Subdistrict 1 and Subdistricts 2 and 3 chum salmon.

The BOF classified the Norton Sound Subdistrict 5 (Shaktoolik) and Subdistrict 6 (Unalakleet) Chinook salmon as a “stock of yield concern” at its January 2004 meeting, also approving an action plan developed by ADFG. The BOF continued the Subdistrict 5 and Subdistrict 6 Chinook salmon classification as a stock of yield concern in 2007, and adopted a Chinook salmon management plan (5 AAC 04.395) in order to increase escapements and restore the stock to historical levels of abundance. In 2010, the BOF continued the stock of concern designation and modified the management plan for commercial chum and pink salmon fisheries in times of low Chinook salmon abundance. Chinook escapement goals were achieved in 2007, 2009, and 2010, but only as a result of the subsistence fishing schedule stipulated in the management plan, gillnet mesh size restrictions, and early closures to subsistence and sport fisheries. Escapement goals were not achieved in 2008 and 2012 despite similar conservation measures (Kent and Bergstrom, 2012). ADFG recommended continuing the stock of yield concern classification for these stocks. Similarly to the case of protecting Yukon River Chinook during fisheries directed at summer chum salmon, the challenge with Norton Sound Chinook management is to develop strategies to allow subsistence and commercial fisheries directed at chum and pink salmon while minimizing adverse impacts on Chinook escapement (Kent and Bergstrom, 2012).

Sockeye salmon escapements to McDonald Lake have been below the recommended escapement goal in four of the last five years, and are not anticipated to meet the escapement goal in upcoming years (Bergmann, et al, 2009). As a result, McDonald Lake sockeye salmon were identified as a candidate stock of concern in a memo to the BOF in 2008. An action plan for McDonald Lake has been approved by the BOF and is intended to rebuild the McDonald Lake sockeye salmon run back to levels that can maintain the current escapement goal range. In 2009, the McDonald Lake sockeye stock was identified as a stock of management concern. McDonald Lake escapement was short of its goal in 2008 and 2009, but met its goal in 2010. Sockeye escapements to McDonald Lake have improved substantially over subsequent years, and the department recommended that the stock of concern designation be removed. The Hugh Smith Lake sockeye salmon run was removed from stock of concern status in 2006 as a result of improved escapements. Total adult escapements have improved steadily from a low of 1,138 in 1998 and surpassed the lower bound of the escapement goal in seven of eight years, 2003–2010 (Brunette and Piston, 2012). No additional stocks of sockeye salmon were identified in Southeast Alaska that currently meet the criteria for stocks of concern defined in the sustainable salmon fisheries policy (Heinl, Bachman and Jensen, 2011).

Swnason Lagoon sockeye was identified in early 2013 as a stock of concern after the 2012-2013 BOF regulatory cycle review of all Chinook, sockeye, pink, coho and chum salmon stocks with escapement goals in the Alaska Peninsula/Aleutian Islands. In the past there has been little effort and minimal harvest in the Swanson Lagoon Section, and effort outside of this section is localized such that harvest of Swanson Lagoon sockeye salmon is believed unlikely. As a result of this fishing behaviour, no management actions were taken prior to 2012 in the Swanson Lagoon to address low escapement of Sockeye salmon. During 2012, the section was closed starting July 10th for the entire fishing season to protect this stock (http://www.adfg.alaska.gov/static/regulations/regprocess/fisheriesboard/pdfs//2012-2013/area-m/rcs/rc007_adfg_swanson_lagoon.pdf). Actions to constrain commercial fisheries will continue as necessary to allow sufficient escapements, most likely via issuance of Emergency Orders.
The biological escapement goal range (BEG) for Karluk River king salmon is 3,000 to 6,000 fish. In January 2011, the Board of Fisheries designated Karluk River king salmon a stock of concern. Escapements have improved slightly, meeting the goal in 2011 and 2012, due to management actions to reduce king salmon harvest in sport, commercial and subsistence fisheries. However, recent poor productivity warrants sport fishing nonretention of all king salmon, regardless of size. Emergency Order No. 2-KS-4-02-13 prohibits the retention of king salmon in the Karluk River drainage. King salmon may not be possessed or retained; king salmon caught may not be removed from the water and must be released immediately. In addition, to reduce mortality, the use of bait is prohibited in the Karluk River drainage, excluding Karluk Lake. This emergency order was effective from 12:01 a.m., Saturday, June 1 through 11:59 p.m. Thursday, July 25, 2013. Harvest opportunity may be allowed by subsequent emergency order if inseason assessment of the Karluk River king salmon run indicates the BEG will be attained (http://www.adfg.alaska.gov/static-sf/EONR/PDFs/2013/R2/EO_2-KS-4-02-13_Karluk_Nonretention.pdf).

Other stocks considered for Stock of Concern Designation

A number of factors are considered when ADFG assesses under-performing stocks relative to escapement goals. These include the biology and life history of the species, management approaches and assessment tools available, and changing environmental conditions that may affect the stock assessment capability. Four stocks that under-performed relative to their escapement goals in 4 of the past 5 years (2009-2013) are McNeil chum, Little Susitna coho, Aialik sockeye, Kwiniuk Chinook. Nontheless, ADFG did not recommend a stock of concern designation to the BOF in the 2013 cycle review process for the following reasons:

McNeil River chum salmon
ADFG did not recommend this stock be designated a "stock of concern" at the 2013 BOF regulatory cycle in part because the escapement goal was achieved in 2011. ADF&G raised the escapement goal in 2008 with the intention of providing additional escapement upstream of the world-famous McNeil

River Falls, which are frequented by large numbers of brown bears during the salmon run. ADFG's objective when developing this goal was to increase the stream-wide productivity of McNeil River by more consistently seeding abundant upriver spawning areas. Currently, heavy predation by bears at McNeil Falls restricts chum salmon production to a relatively small amount of spawning habitat available below the falls (Peirce et al 2013). Increasing the number of upstream spawners is an attempt to eventually boost stream-wide production to the point where a harvestable surplus is available, despite continuing high predation by bears at the falls. The McNeil sub-District is closed by regulation to commercial fishing unless opened by emergency order. No commercial fishing for salmon has been allowed in this sub-district since 2006 in order to maximize spawning escapement.

References:

Peirce, J.M., E.O. Otis, M.S. Wipfli, and E.H. Follmann. 2011. Radiotelemetry to estimate stream life of adult chum salmon in the McNeil River, Alaska. North American Journal of Fisheries Management. 31(2): 315–322.

Peirce, J.M., E.O. Otis, M.S. Wipfli, and E.H. Follmann. 2013. Interactions between brown bears and chum salmon at McNeil River, Alaska. Ursus. 24(1):42-53.

<u>Little Susitna River coho salmon</u>

ADFG did not recommend Little Susitna coho salmon be designated a stock of concern at the 2013 BOF review because weir counts indicated the goal was made in 2013. Secondly, ADFG improved its ability to manage this fishery inseason by moving the fish counting weir downstream in 2012. ADFG's management decisions are now closer to the fishery and management actions are now more timely. As of August 28th, 2014 a total of 22,743 coho salmon have passed the weir which indicates the upper bound of the escapement goal (11,100–17,700) will very likely be exceeded in 2014. Finally, in the past, Little Susitna coho salmon have demonstrated the ability to produce large returns from small escapements.

<u>Aialik Lake sockeye salmon</u>

ADFG elected not to recommend Aialik sockeye as a stock of concern in 2013 despite not having met the goal in 2011–2013. Typically ADFG does not recommend a stock be designated a stock of concern unless it fails to meet is goal for a period as long as the life cycle of the fish (in this case 5 years). The escapement goal was met at Aialik Lake in 2010 and was only 220 fish and 170 fish less than the goal in 2011 and 2013, respectively. Furthermore, ADFG area staff have noted a change in the assessment capabilities for this stock over the last decade. The escapement goal for Aialik Lake sockeye salmon was developed when the lake was clear and fish could readily be observed during aerial surveys. The turbidity of this lake has now increased to the point that only fish near the surface can be observed from the air, and current index counts are likely not comparable to those on which the escapement goal is based. Staff will be reviewing the current escapement goal and assessment methods prior to the next regulatory BOF. The Aialik sub-District is closed by regulation to commercial fishing unless open by emergency order. No commercial fishing for salmon has been allowed in this sub-district since 2006.

Kwiniuk River Chinook

Kwiniuk River Chinook are not currently listed as a stock of concern because the goal has been met at least once in any five year period. If the goal is met once in the last five years, they do not consider it to have meet the definition of a chronic and continuing inability to meet escapement thresholds (see below for further discussion on this). Therefore, Kwiniuk River Chinook are not listed as a stock of concern because despite declining escapements since the mid-2000s, there has not been an instance of missing the goal for 5 consecutive years. ADFG regional and area staff have noted that Kwiniuk River Chinook are recent colonizers to the area and started appearing in southern Norton Sound after WWII. Fishermen in the area near the Kwiniuk River reported sporadic occurrences of Chinook in the 1960s and increasing numbers in the 1970s. At the Kwiniuk River tower, the counts of Chinook were also increasing in the 1980s and 1990s before declining in the mid-2000s. There has been no commercial fishing for Chinook in Norton Sound since the 1990s and is currently limited to subsistence fishing.

The table below shows the current stocks (as of April 2014) designated as management and yield concern.

Stocks of _Management Concern_		**Species**	**Area**	**Year Initiated**	**Year Removed**
Norton Sound SD 1		chum	Norton Sound	2001	2007
Toklat River		fall chum	Yukon	2001	2004
Fishing Branch		fall chum	Yukon	2001	2004
Yukon River		summer chum	Yukon	2001	2007
Anchor River		Chinook	Cook Inlet	2001	2004
Hugh Smith Lake		sockeye	Southeast	2003	2006
Kvichak River		sockeye	Bristol Bay	2004	2007
MacDonald Lake		sockeye	Southeast	2009	2012
Karluk River		Chinook	Kodiak	2011	ongoing
Alexander River		Chinook	Cook Inlet	2011	ongoing
Theodore River		Chinook	Cook Inlet	2011	ongoing
Lewis River		Chinook	Cook Inlet	2011	ongoing
Chuitna River		Chinook	Cook Inlet	2011	ongoing
Swanson Lagoon		Sockeye	Alaska Peninsula	2013	ongoing
Sheep Creek		Chinook	Cook Inlet	2013	Ongoing
Goose Creek		Chinook	Cook Inlet	2013	ongoing
Stocks of _Yield Concern_		**Species**	**Area**	**Year Initiated**	**Year Removed**
Kuskokwim River		Chum	Kuskokwim	2001	2007
Kuskokwim River		Chinook	Kuskokwim	2001	2007
Kvichak River		sockeye	Bristol Bay	2001 & 2007	2004 & 2012
Yukon River		fall chum	Yukon	2001	2007
Fish Creek		sockeye	Cook Inlet	2002	2005
Norton Sound SD 2/3		Chum	Norton Sound	2001	ongoing
Yukon River		Chinook	Yukon	2001	ongoing
Norton Sound SD 5/6		Chinook	Norton Sound	2004	ongoing
Norton Sound SD 1		Chum	Norton Sound	2007	ongoing
Susitna River		sockeye	Cook Inlet	2008	ongoing
Willow Creek		Chinook	Cook Inlet	2011	ongoing

Note: SD = Subdistrict

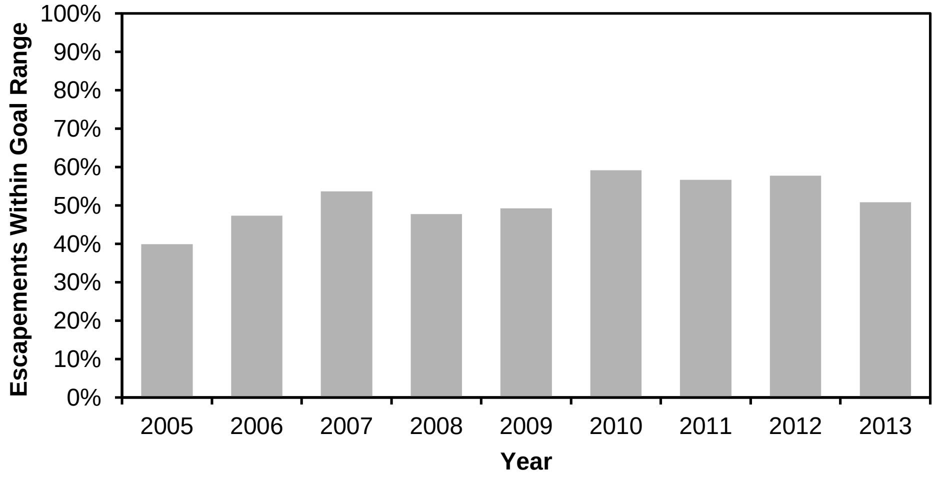
http://www.adfg.alaska.gov/static/regulations/regprocess/fisheriesboard/pdfs//2012-

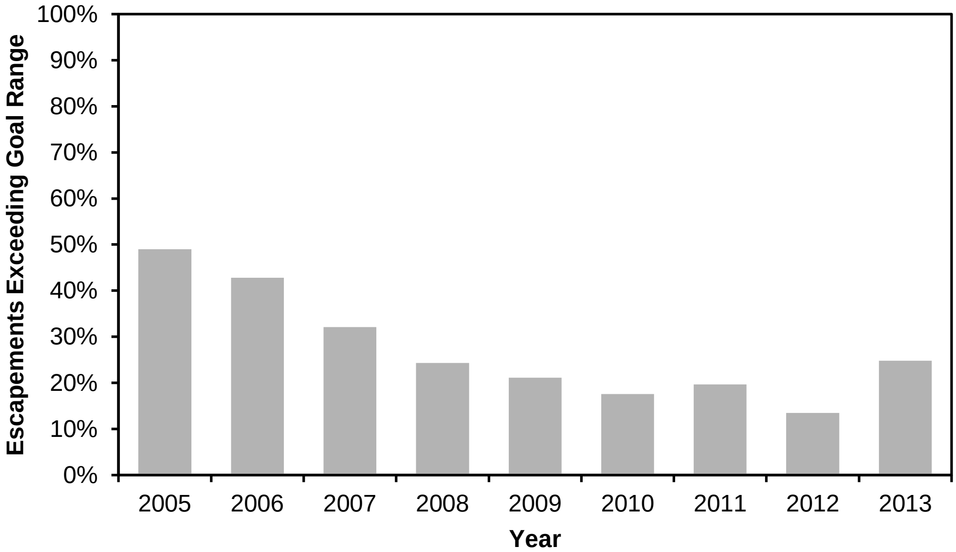
2013/statewide/rcs/rc008_adfg_stocksofconcernhistory.pdf
http://www.adfg.alaska.gov/index.cfm?adfg=specialstatus.akfishstocks

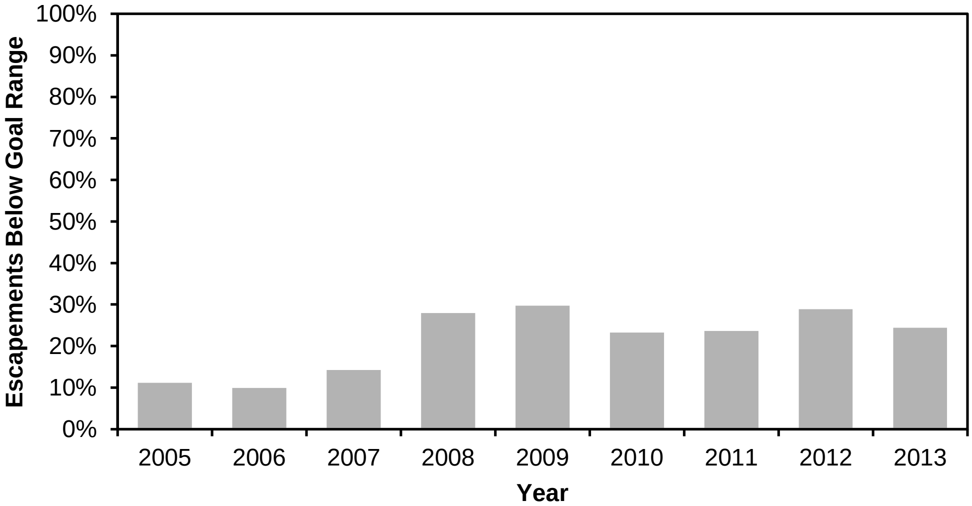
It is clear from the tables above that stocks of concern designation and later extra management afforded to them, is able to return stocks to acceptable level of productivity (i.e. removed from stock of concern designation), and in some way allowing the rebuilding of these runs. In December 2013, the designation of the Goose Creek Chinook stock of concern was changed from a stock of Yield Concern to a stock of management Concern. The Sheep Creek Chinook stock was added to the list of stocks of management Concern. The SEG for Sheep Creek Chinook has not been achieved since 2005 and the SEG for Goose Creek has not been achieved since 2006.
(http://www.adfg.alaska.gov/static/regulations/regprocess/fisheriesboard/pdfs/2013-2014/worksession/rc8_worksession_2013.pdf)
Note that 10 of 14 current stocks of concern are Chinook salmon stocks.

Emergency Orders

Sustained yield management of commercial salmon fisheries requires precise timing of fishery openings and closures and adjustments in gear, often with short notice, to allow or constrain the harvest of fish, ultimately assuring adequate escapement of spawning fish. Emergency Orders (EO) are widely used to open and close fisheries as needed by local area biologists. For this surveillance activity the assessment team has analyzed more than 800 emergency orders released in 2013. During the 2013 calendar year ADFG issued about 800 emergency orders to open and close commercial salmon fisheries throughout Alaska. These emergency orders can be found trough the *Regulation Announcements, News Releases, and Updates for Commercial, Subsistence and Personal Use Fishing* page at the ADFG website at http://www.adfg.alaska.gov/index.cfm?adfg=cfnews.main. Emergency orders are a testament to the flexibility of inseason management as carried out by the Department to manage salmon using run size and timing information among other parameters. This allows for the achievement of escapement goals-based management objectives.



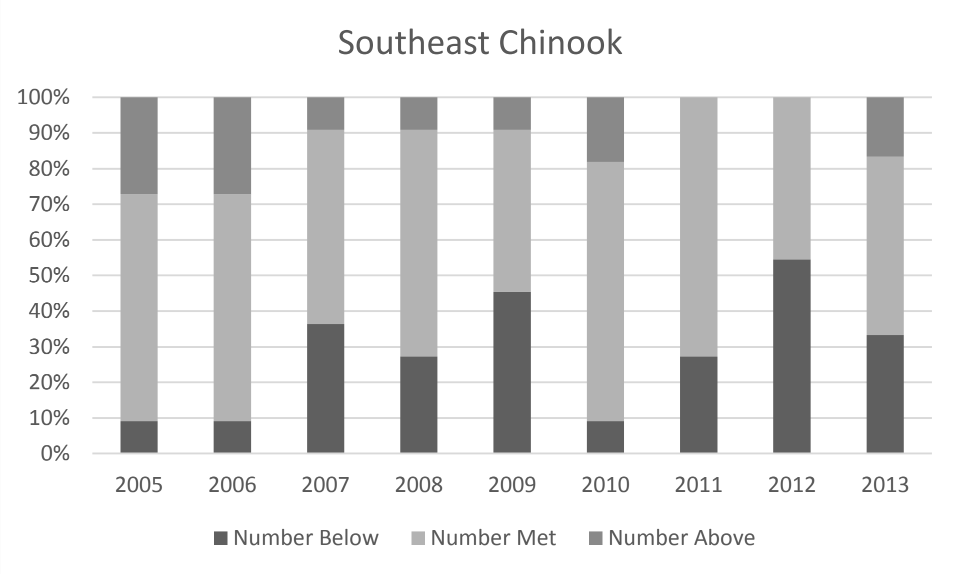


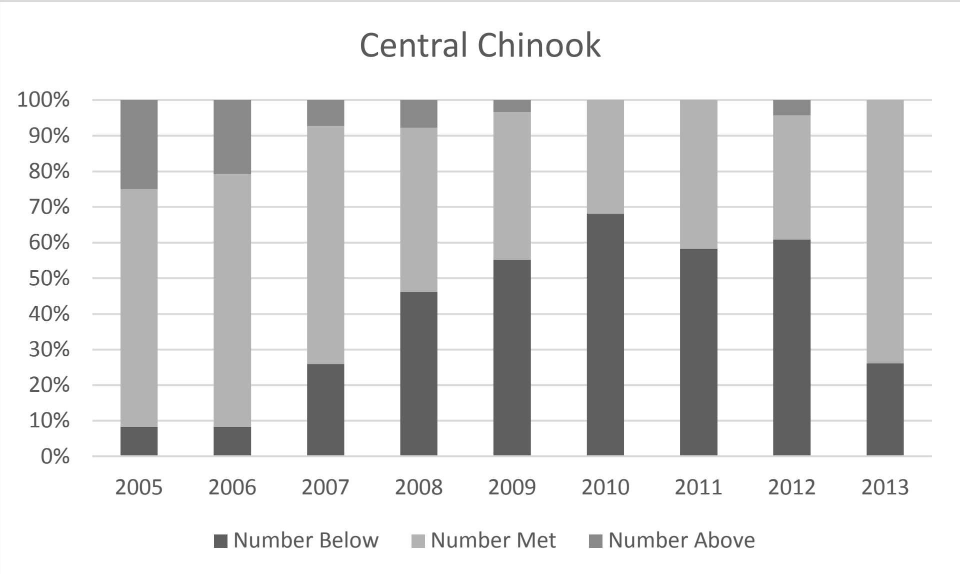


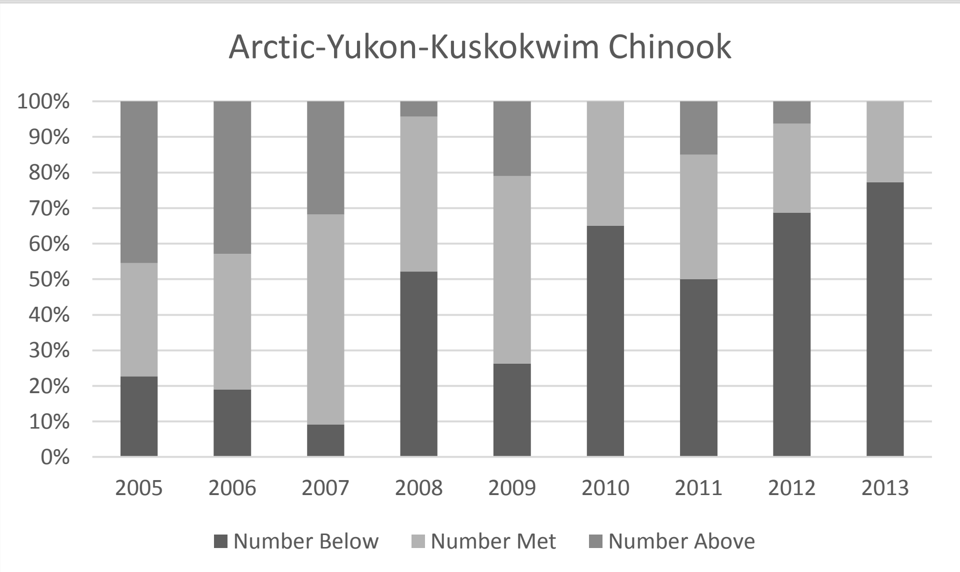
Statewide summary of the percentage of escapements that met (upper) the escapement goal (i.e. within goal range or above lower bound of a lower-bound SEG), exceeded (middle) the upper bound of goal range or were below the lower bound of the goal (lower) for the years 2005 to 2013.

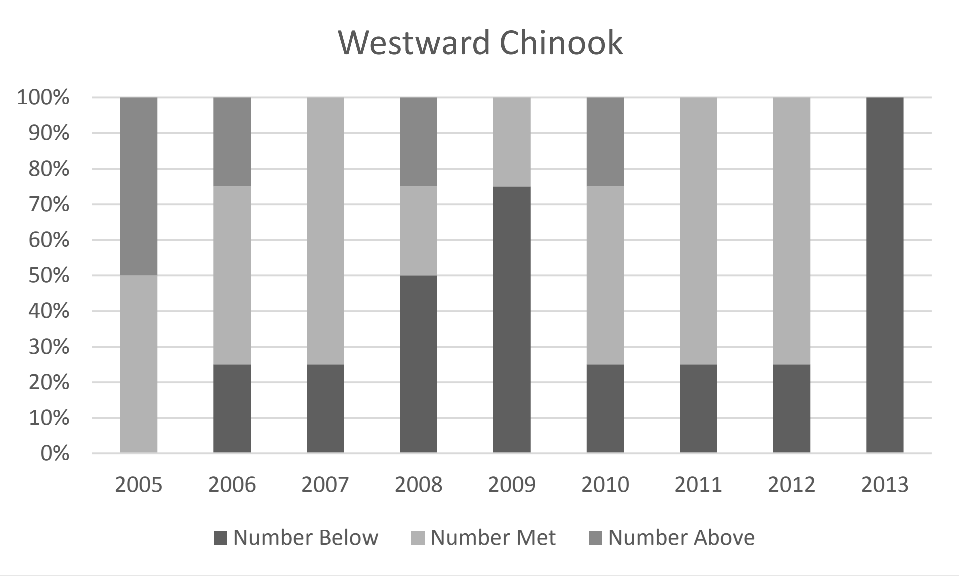
An increasing trend in the proportion of stocks that have not met the lower escapement goal is most evident in Chinook salmon. Increases in the proportion of Chinook stocks that have not met the lower goal has occurred in all regions. The trend is evident in all areas where Chinook salmon stocks historically were abundant (Southeast, Central, Arctic-Yukon-Koskokwim). Chum and Pink salmon in the Central Region have also shown an increasing trend in the proportion that have not met the lower escapement goal. Of the 12 Chinook stocks in the Southeast Region that have escapement goals, 4 (33%) were below the goal in 2013 compared to 6 in 2012 and 3 in 2011. Of the 22-29 Chinook stocks in the Central Region with goals, the proportion below the lower goal has been relatively high during 2007-2012 at an average of 52% but declined to levels observed in 2007 (26%) in 2013. Of the 16-23 Chinook stocks in the Arctic-Yukon-Koskokwim Region 57% have been below the lower goal on average since 2007 with a record high of 77% in 2013 compared to 69% in 2012.

There are only 4 Chinook spawning systems in the Westward Region that have escapement goals and all 4 were below the lower goal in 2013.


Southeast Chinook
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2005
2006
2007
2008
2009
2010
2011
2012
2013
Number Below
Number Met
Number Above


Central Chinook
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2005
2006
2007
2008
2009
2010
2011
2012
2013
Number Below
Number Met
Number Above


Arctic-Yukon-Kuskokwim Chinook
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2005
2006
2007
2008
2009
2010
2011
2012
2013
Number Below
Number Met
Number Above



Summary of the four ADFG Management Region Chinook salmon escapements compared against escapement goals for the years 2005 to 2013

Declines in the productivity and total returns of Chinook salmon have been observed since 2001 for many stocks harvested in Alaska (ADFG 2013).
http://www.adfg.alaska.gov/static/home/news/hottopics/pdfs/chinook_research_plan.pdf.
Stock recruitment analysis (SRA) for 12 Chinook stocks harvested in Alaska reveal consistent negative residuals in model Ricker fits beginning with brood year 2001. The decline is widespread throughout Alaska as well as stocks that are harvested in Alaska and that spawn in transboundary systems within Canada. For half of the stocks, recent productivity residuals are the lowest observed since data collection began in the 1970s. The decline in productivity beginning in 2001 would have begun to affect returning abundances in 2005 as age-4 Chinook. The decline would have fully affected returns by 2007 when all ages would have been affected by productivity declines. As Chinook abundance declined, fisheries management actions reduced the amount of catch taken in an attempt to meet escapement goals, however, as noted above, the decline in productivity and run abundance resulted in escapement levels below the lower range of the goals in many cases. The causes of the decline in productivity are not known and for most Chinook stocks there are insufficient data to separate freshwater and marine effects on productivity.

Alaska Chinook Stock Assessment and Research Plan (ADFG 2013)

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. Results from the Gap Analysis, discussion at the Chinook Salmon Symposium, and comments received on the Gap Analysis were combined to develop the Chinook salmon research plan.

Documents are available online at:
http://www.adfg.alaska.gov/index.cfm?adfg=chinook_efforts_symposium.information

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.

http://www.adfg.alaska.gov/static/home/news/hottopics/pdfs/chinook_research_plan.pdf

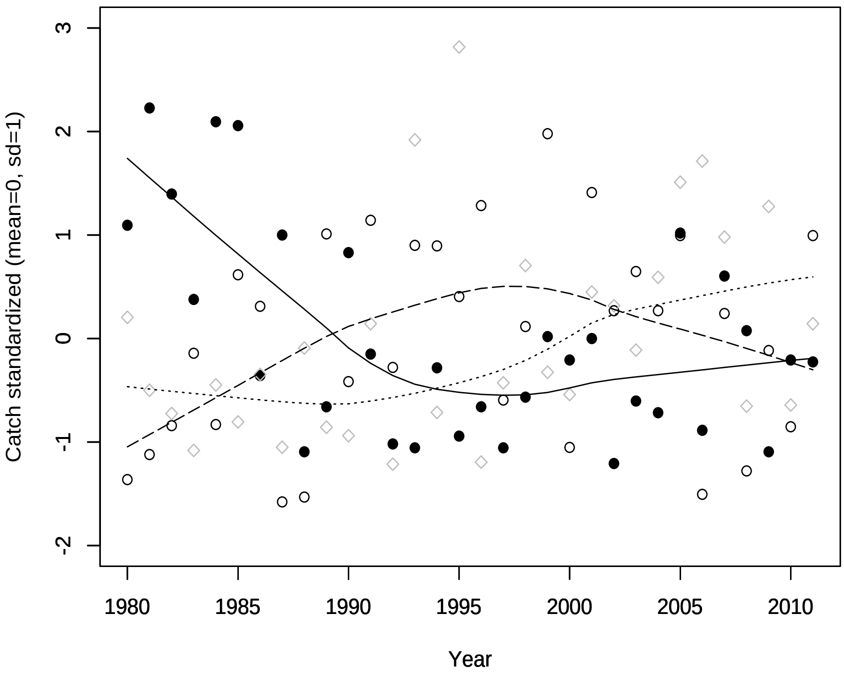
The Chinook Stock Assessment and Research Plan (ADFG 2013) acknowledge that better information is needed from all life stages to improve forecasts of productivity and abundance. Additionally, that information would help improve escapement goal development and responsiveness of fisheries management to 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 (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.*
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 biggest component to be funded is $3 million for stock-specific escapement or in-river run assessments. Smolt enumeration assessments is about $2.5 million, harvest assessments at $1.8 million, and marine surveys and modelling at $1.6 million. Other components are $500,000 for long term knowledge assessments, $700,000 for process studies, and $500,000 for programmatic support.
This project is closely aligned with the Department's top two core services of stock assessment and harvest assessment. For 2013, the Governor of Alaska requested to the legislature $10 million; the legislature funded $7.5 million. As for the original research plan, $10 million was also requested in 2014 and $7.5 million has been funded for a total of $15 million in 2013 and 2014 combined. Another $10 million will be requested in 2015 toward a five-year $30 million research effort. The $7.5 million funded in 2013 and 2014 is in addition to the $14.6 million ADFG typically spends each year on Chinook-related research and management. In 2013, a bill was introduced in 2013 into the legislature that could fund future Chinook studies. HB 49 would create an endowment that includes a fund, grant account and oversight body, all designed to benefit Chinook salmon in perpetuity. That's currently in the House fisheries committee. A similar bill was introduced in 2012. Progress and development resulting from this effort will be followed as the various surveillance assessments progress in time. 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 appropriate for the issue at hand and in line with improving the state of affairs of Chinook salmon stocks in Alaska.

Prince William Sound Area Management

Hilborn and Eggers (2000) reported almost fifteen years ago that there was a large amount of missing wild-stock production in Prince William Sound. When the commercial pink salmon harvest of Southeast Alaska, the Kodiak area, and the wild-stock harvest of Prince William Sound are normalized (to account for differences in scale and variation) and plotted, it can be seen that the harvest from wild-stock pink salmon in Prince William Sound declined considerably (almost two standard deviations) in the 1980s and early 1990s (Figure below), consistent with the time of development of the Prince William Sound hatcheries. During this time, pink salmon stocks in the other two regions increased or were stable. Scientists now know that this was a time of very favorable marine conditions for salmon stocks in the northern Gulf of Alaska (Beamish and Bouillon 1993, Hare et al. 1999,). However, the decline in wild-stock pink salmon catch in Prince William Sound does not necessarily imply a decrease in productivity. This decline could have been the result of active management measures to pass more fish through fisheries to the spawning grounds as a conservation measure. However, when Prince William Sound wild-stock pink salmon catch is standardized and plotted for all Prince William Sound districts, the harvest declined in the 1980s and into the 1990s (Figure xxx).



The standardized commercial catch of pink salmon from Southeast Alaska (open circles), Kodiak area (grey diamonds), and wild-stock pink salmon catch from Prince William Sound (filled circles) together with lowess smoothed trend curves (solid for Prince William Sound, long dash for Southeast Alaska, and short dash for Kodiak area).

Note that of the three stocks, only Prince William Sound showed a strong decrease during the 1980s up to beginning of the 1990s, a period of increased ocean productivity. In the same period, Southeast has shown a strong increase, and Kodiak has shown a very light decrease. Source: Sheridan et al. (2013) and similar documents from the Alaska Department of Fish and Game.

In 2002, district and brood-year specific escapement goals for pink salmon in the PWS area were downgraded to *sustainable escapement goals*, and a single Sound-wide escapement goal was established of lower levels than what had been previously used (Bue et al. 2002). These changes made management performance somehow harder to track through time. District-specific escapement goals were re-established during the regional escapement goal review in November 2011 at yet lower levels. For the purposes of making a time series of comparisons, the assessment team took what Fair et al. (2011, Table 11) called "management targets" to be the management objectives during the period without district specific escapement goals to be able to track management performance at maintaining escapements through time. The management of Prince William Sound pink salmon stocks had appeared in past years in conflict with a key principle: the apparent lowering of escapement goals in response to the failure to maintain yield and escapement.

Percent decline in Escapement Goals from 2002 to 2011 evaluation:

PWS District	Odd years	Even years	PWS District	Odd years	Even years
Eastern District	27%	47%	**Eshamy District**	30%	63%
Northern District	30%	34%	**Southwestern District**	40%	51%
Coghill District	66%	58%	**Montague District**	14%	29%
Northwestern District	40%	48%	**Southeastern District**	19%	37%
Median reduction in escapement goal from 2002 to 2011 = 44%					

If the history of the escapement performance with respect to the district-specific targets is taken into consideration, there has been a pattern of missed management targets in the even years. The Alaska Policy for Sustainable Fisheries defines a stock of management concern to have "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] management objectives for the fishery (5 AAC 39.222(f)(21))." Of the eight districts in Prince William Sound, in recent years more than half of the districts had targets for pink salmon missed 50% or more of the time in the even years (Table 11. However, the Alaskan policy (SSFP) defines chronic inability as "the continuing or anticipated inability to meet expected yields over a 4 to 5 year period". This "chronic inability" classification applies only to stocks which are formal Escapement Goals as opposed to "Management Targets" (i.e. non formal designations of targets to guide managers in meeting adequate salmon escapements). since 2011, the "4 or 5 years - chronic inability" mark has not been reached for any of the Prince William Sound pink salmon districts (even and odd year stocks). In fact, over this past period the vast majority of pink salmon escapement goals have been met or exceeded in PWS. Specifically, in the last evaluation period (2012, 2013, and 2014) 5 out of 24 escapement goals were missed (just over 20%).

Table 11. Escapement measures[1] and management targets for Prince William Sound pink salmon districts (stocks) from 1995 to 2013by year and brood line (odd or even). Escapement measures in bold italics are for years when the escapement measure was below the lower bound of the management target range (from Fair et al. 2011) with earlier escapement goals from Fried (1994) and newer performance measures from Munro and Volk (2014) and ADFG catch data.

	Odd years				Even years				Odd years				Even years	
Year	*Escapement measure*	*Lower target bound*		*Year*	*Escapement measure*	*Lower target bound*		*Year*	*Escapement measure*	*Lower target bound*		*Year*	*Escapement measure*	*Lower target bound*
Eastern District								**Eshamy District**						
1995	***396,696***	422,000		1994	613,866	474,000		1995	10,182	5,700		1994	11,799	8,200
1997	***345,725***	422,000		1996	584,236	474,000		1997	***914***	5,700		1996	***3,000***	8,200
1999	622,502	422,000		1998	***377,700***	474,000		1999	6,900	5,700		1998	***4,644***	8,200
2001	436,585	422,000		2000	554,984	474,000		2001	***2,963***	5,700		2000	***4,286***	8,200
2003	975,327	355,000		2002	***226,068***	425,000		2003	5,206	5,000		2002	***1,397***	5,000
2005	1,025,756	355,000		2004	724,663	425,000		2005	32,396	5,000		2004	***2,300***	5,000
2007	374,723	355,000		2006	***248,592***	425,000		2007	9,461	5,000		2006	11,247	5,000
2009	454,960	355,000		2008	***193,844***	425,000		2009	9,790	5,000		2008	***579***	5,000
2011	982,837	310,000		2010	490,952	425,000		2011	4,368	4,000		2010	9,585	5,000
2013	1,266,783	310,000		2012	301,709	250,000		2013	12,145	4,000		2012	***1,052***	3,000
Northern District								**Southwestern District**						
1995	***84,447***	128,000		1994	***178,151***	213,000		1995	***82,490***	116,000		1994	143,479	144,000
1997	***65,260***	128,000		1996	218,022	213,000		1997	***112,010***	116,000		1996	***63,337***	144,000
1999	214,732	128,000		1998	213,288	213,000		1999	163,347	116,000		1998	280,335	144,000
2001	163,573	128,000		2000	***168,247***	213,000		2001	176,503	116,000		2000	***131,648***	144,000
2003	262,503	110,000		2002	***138,204***	175,000		2003	130,356	100,000		2002	***35,554***	130,000
2005	579,079	110,000		2004	***163,858***	175,000		2005	272,572	100,000		2004	***108,192***	130,000
2007	156,063	110,000		2006	211,603	175,000		2007	116,130	100,000		2006	***118,205***	130,000
2009	119,747	110,000		2008	***141,396***	175,000		2009	239,357	100,000		2008	***70,291***	130,000
2011	162,994	90,000		2010	287,570	175,000		2011	232,302	70,000		2010	***126,489***	130,000
2013	329,434	90,000		2012	***106,568***	140,000		2013	348,012	70,000		2012	90,156	70,000
Coghill District								**Montague District**						

[1] ADF&G monitors escapement in "index units," which are units that are not directly comparable to published estimates of catch. These index escapement estimates do not represent the full magnitude of the actual escapement. In principle, these index units are intended to be a series that will increase and decrease proportionally to the increase or decrease in the total actual escapement, subject to some level of measurement error.

1995	***46,029***	178,000		1994	***65,648***	143,000		1995	183,448	162,000		1994	***58,820***	70,000
1997	***52,961***	178,000		1996	***104,781***	143,000		1997	206,943	162,000		1996	92,966	70,000
1999	***168,816***	178,000		1998	***85,968***	143,000		1999	381,054	162,000		1998	161,275	70,000
2001	***148,665***	178,000		2000	223,646	143,000		2001	314,323	162,000		2000	227,881	70,000
2003	375,147	125,000		2002	***54,882***	115,000		2003	320,494	155,000		2002	***71,461***	75,000
2005	528,264	125,000		2004	***79,010***	115,000		2005	566,002	155,000		2004	183,891	75,000
2007	197,405	125,000		2006	145,511	115,000		2007	***142,769***	155,000		2006	149,798	75,000
2009	125,907	125,000		2008	145,177	115,000		2009	263,770	155,000		2008	***56,999***	75,000
2011	257,020	60,000		2010	335,108	115,000		2011	598,918	140,000		2010	144,821	75,000
2013	640,414	60,000		2012	172,611	60,000		2013	411,373	140,000		2012	77,756	50,000
Northwestern District								**Southeastern District**						
1995	***50,582***	83,000		1994	141,290	135,000		1995	336,310	333,000		1994	***196,228***	239,000
1997	***53,740***	83,000		1996	***86,709***	135,000		1997	585,135	333,000		1996	330,285	239,000
1999	***52,340***	83,000		1998	***97,485***	135,000		1999	853,180	333,000		1998	***199,410***	239,000
2001	102,294	83,000		2000	***66,078***	135,000		2001	655,480	333,000		2000	282,258	239,000
2003	103,931	65,000		2002	***50,981***	110,000		2003	691,769	335,000		2002	364,630	215,000
2005	401,640	65,000		2004	***51,306***	110,000		2005	1,330,407	335,000		2004	687,903	215,000
2007	68,667	65,000		2006	127,836	110,000		2007	443,914	335,000		2006	***178,009***	215,000
2009	127,261	65,000		2008	141,787	110,000		2009	488,831	335,000		2008	***112,347***	215,000
2011	147,128	50,000		2010	211,709	110,000		2011	1,537,438	270,000		2010	404,862	215,000
2013	203,444	50,000		2012	117,795	70,000		2013	1,472,633	270,000		2012	258,047	150,000

Refer to end of section for tables.

International fisheries

Yukon salmon harvest 2013 and 2014 outlook

The Joint Technical Committee (JTC) of the United States and Canada serves as a scientific advisory body to the Yukon River Panel. The JTC discusses harvest and escapement goals, management trends, postseason reviews and preseason outlooks, and results of cooperative research projects. The 2014 JTC report (http://www.adfg.alaska.gov/FedAidPDFs/RIR.3A.2014.01.pdf) summarizes the status of Chinook, coho and summer and fall chum salmon stocks in 2013, presents an outlook for the 2014 season, and provides data on salmon harvests in commercial, subsistence, aboriginal, personal use domestic and sports fisheries. Recommended Yukon River escapement goals for Chinook, chum and coho salmon for 2012 remained unchanged from 2011. In response to a poor Chinook salmon run strength, the need to fulfill the Canadian border passage obligation, meet Alaska escapement needs, and provide for subsistence uses, no commercial harvest targeting Chinook salmon was allowed in 2012 in the Yukon River mainstem or in the Tanana River.

The preliminary 2013 Chinook escapement in Canada was about 28,700 fish, falling below the goal range of 42,500-55,000 fish. A preliminary reconstruction suggests that the total Canadian-origin Chinook salmon run size was approximately 38,000 fish. Preliminary estimates indicate that about 7,200 Canadian origin Chinook salmon were harvested in Alaskan subsistence fisheries. The 2013 harvest level represents a 47% reduction over the 2012 harvest of Chinook salmon. The Alaska subsistence harvest was the lowest on record and represents an 84% reduction from the average harvest levels recorded for 2001-2007, when some commercial harvest of Chinook salmon was still occurring and fewer subsistence fishing restrictions were in place. Preliminary harvest estimates were about 1,900 Chinook for Yukon Territory aboriginal fisheries. This harvest in Canada is the lowest on record and represents a 56% reduction from 2012 harvest levels. For fall chum salmon, the preliminary 2013 drainage-wide total run size estimate was 866,000 fish. The escapement goal range for chum in Canada was 70,000-104,000 fish and the preliminary 2013 fall chum salmon estimate for fall chum escapement in the Yukon River mainstem in Canada was about 200,000 fish or nearly twice as high as the upper end of the goal range. The total commercial harvest of fall chum salmon in Alaska was 238,000 fish, the fifth largest harvest since 1990. The Alaska preliminary subsistence harvest of fall chum salmon was 113,000 fish. The Canadian commercial harvest was 3,369 fall chum salmon and the aboriginal harvest was about 2,800 fish.

Northern Transboundary Stocks

Most of the Chinook salmon harvested in the Southeast Alaska summer troll fishery are of wild stock origin. Fish of hatchery origin harvested in this fishery originate primarily from hatcheries in British Columbia, Canada, Washington, and Oregon with a relatively small number from Alaskan hatcheries. The Southeast Alaska Chinook salmon harvest is managed on an annual, all-gear harvest quota established by the United States and Canada through the PSC. The quota is now abundance-based, with increases when abundance is high, and reductions when it is low. In addition to the harvest ceiling of treaty fish, the treaty includes provisions administered by the PSC to provide for an additional harvest of Chinook salmon produced in Alaskan hatcheries (add-on). The all-gear add-on is equal to the total number of Alaskan hatchery Chinook caught, minus the pre-treaty production of Chinook salmon and a risk adjustment factor of around 4,700 fish. The hatchery add-on is calculated inseason through port sampling programs. Chinook salmon are sampled for the presence of adipose fins. The heads from fish that have missing adipose fins are then sent to the Juneau Mark, Tag and Age lab where coded-wire tags are removed from the heads and decoded. The number of Alaskan hatchery fish is then calculated by expanding the number of Alaskan hatchery-produced Chinook salmon in the sampled catch by the total catch.

The harvest of treaty Chinook salmon is limited to a specific number of fish, which varies annually according to an abundance index. The accounting of treaty Chinook harvested by trollers begins with the winter fishery and ends with the summer fishery. The winter troll fishery is managed to not exceed the guideline harvest level (GHL) of 45,000 Chinook salmon plus a number of non-Alaska hatchery-produced Chinook salmon. Fish tickets provide inseason information on harvest and effort throughout the fishery. In years when the winter fishery closed prior to April 30 because the GHL was reached

(2003–2006, 2011 and 2012), daily counts from regional processors were important in tracking harvest during the final weeks of the fishery. During these years several spring fishery areas opened prior to May 1. Spring fisheries are conducted along migration routes or close to the following hatcheries and release sites: Little Port Walter Hatchery; Port Armstrong Hatchery; Macaulay Hatchery (Douglas Island Pink and Chum, Inc.); Whitman Lake Hatchery; Crystal Lake Hatchery; Neets Bay and Anita Bay release sites (Southern Southeast Regional Aquaculture Association); and Medvejie Hatchery and Hidden Falls Hatchery (Northern Southeast Aquaculture Association). Spring troll and terminal troll fisheries target Alaska hatchery Chinook salmon, although non-Alaska hatchery Chinook are also harvested. Non-Alaska hatchery fish are counted towards the season treaty quota of Chinook salmon under the Pacific Salmon Treaty, while most of the Alaska hatchery fish are not.

ADFG management objectives for this fishery include: achieve the allowable Chinook salmon harvest; maximize the harvest of Alaska hatchery-produced Chinook salmon; manage the fishery according to the BOF Summer Salmon Troll Fishery Management Plan (5AAC 29.100); continue the coastwide natural Chinook salmon stock-rebuilding program; achieve harvest allocations among user groups as mandated by the BOF; and minimize the incidental mortality of Chinook salmon to the extent practicable. Historically, the majority of the annual troll Chinook salmon harvest is taken during the general summer opening, when salmon may be taken throughout most of the Southeast Alaska/Yakutat area, including the outside waters of the EEZ. One of the major functions of the department's troll management plan is to determine when the general summer season for Chinook salmon must be closed in order to stay within the allowable harvest. Timely tabulation of the troll catch is difficult due to the large number of fish tickets and the difficulty of receiving them from remote areas in a timely manner. A Fisheries Performance Data (FPD) program, consisting of confidential interviews with commercial trollers as they deliver catches, is used to estimate daily catch rates. The department manages the summer troll season to harvest 70% of the summer Chinook salmon troll quota in an initial opening beginning July 1. The remainder of the Chinook salmon quota for troll gear is harvested following any closure for coho salmon conservation and/or allocation in August.

The 2013 Southeast/Yukutat Alaska Chinook fisheries managed within the auspices of the Canada/US Pacific Salmon Commission and documented by ADFG (http://www.adfg.alaska.gov/FedAidpdfs/FMR14-10.pdf) was managed to achieve an all-gear harvest of 176,000 treaty Chinook salmon. The actual all-gear treaty harvest was 183,886 fish, which was 4% over the quota. The troll treaty harvest was 134,960 fish, which was 4% over the troll treaty allocation of 129,862. The purse seine harvest of 6,706 treaty Chinook was 13% l under the allocation of 7,568 fish. The drift gillnet allocation was 5,104 Chinook, of which 6,020 were harvested. The Yukutat set gillnetters harvested 900 of their 1,000 fish quota. The Treaty sport harvest of 35,299 was above the allocation of 32,466 fish. For 2014, the Chinook treaty harvest quota is 439,400 fish, of which 325,411 are allocated to troll, 81,353 to sport, 18,894 to purse seine, 12,743 to drift gillnet and 1,000 to set gillnet.

For 2014, the Chinook Technical Committee of the PSC has determined that the Chinook salmon abundance index for Southeast Alaska is 2.57. The abundance index equates to the all-gear quota of 439,400 treaty Chinook salmon. This is 263,400 more Chinook than the 2013 all- gear quota. According to the BOF allocation plan, the troll fishery allocation of the all-gear quota (129,862 treaty Chinook salmon), is 67,410 fewer than the 2013 troll treaty allocation. The quota is based on the Southeast Alaska (SEAK) abundance index from 30 stock groups that originate from the Oregon coast to Alaska. Of those, seven stocks make up the majority of the SEAK abundance index. The all-gear quota for 2014 of 439,400 Chinook is allocated among commercial and sport fisheries according to management plans established by the BOF in regulations 5AAC 29.060(b) and 47.055. Most Chinook salmon produced by Alaska hatcheries are not included in the abundance index and may be harvested above and beyond the treaty limit. The commercial troll fishery is allocated 80% and the recreational fishery 20% of the PST quota (after subtracting 4.3% from the total for the purse seine fishery, 2.9% for the drift gillnet fishery, and 1,000 fish for the set gillnet fishery). The pre-treaty Chinook salmon harvest and risk adjustment factor (4,700 combined) are proportionally shared between the gear groups. The summer troll treaty quota is calculated by adding the winter treaty harvest, the projected spring treaty harvest, the pre-treaty Alaska hatchery harvest of 3,700 fish, and a statistical risk factor surrounding the Alaska hatchery contribution estimate of 1,000 fish. The resultant sum is then subtracted from the troll allocation, yielding a summer troll treaty quota. In addition, under the BOF plan, 70% of the summer quota is to be harvested during the first summer opening beginning July 1.

In 2013 the all-gear treaty Chinook salmon quota for Southeast Alaska was 176,000 fish based on the coastwide Chinook salmon abundance model updated by the Chinook Technical Committee under terms of the Pacific Salmon Treaty. In addition to the coastwide treaty quota, preseason forecasts and inseason monitoring may provide small allowable catches for directed fisheries for returns to the Stikine River and to the Taku River. The 2013 forecasts for these transboundary rivers were too low for an Allowable Catch. There were also no directed fisheries on the transboundary Taku or Stikine rivers in 2011 due to low forecasts and returns.

Native Chinook salmon stocks occur throughout Southeast Alaska and Yakutat, primarily in the large mainland rivers and their tributaries. In total, 34 rivers in the region are known to produce runs of Chinook salmon. The most important are the Alsek, Taku, Stikine, Chilkat, and the Behm Canal rivers (i.e., Unuk, Chickamin, Blossom, and Keta rivers). The three major river systems (Alsek, Taku, and Stikine rivers), as well as several mid-sized systems (Unuk, Chickamin and Chilkat rivers) are transboundary rivers, originating in Canada and flowing through Alaska to the Pacific Ocean. The Pacific Salmon Commission, under the terms of the PST, addresses shared ownership and coordinated management of the Alsek, Taku, and Stikine rivers. In the Yakutat area, Chinook salmon are harvested incidentally in the set gillnet fishery for sockeye salmon. Chinook are harvested in the Situk-Ahrnklin Inlet, Alsek River, Yakutat Bay and Awe River areas. In 2011, the preseason projection for the Situk River was for a below average return and conservation measures mandated by 5AAC 30.365 were implemented. Commercial, sport and subsistence fisheries for Chinook were closed in Situk-Ahrnklin Inlet area. The preseason projection for Chinook returning to the Alsek River in 2011 was above average and the harvest of 550 fish was only 3% below the recent average of 570.

Since a Chinook salmon rebuilding program began in 1981, ADFG has annually estimated Chinook salmon escapements on 11 indicator systems. These escapements were initially measured against interim goals established prior to 1985, which in general were set as the largest escapements seen prior to 1981. As a part of the rebuilding program, ADFG conducted CWT studies and improved escapement estimation methods. The department also sampled age and sex data in the escapement in order to collect data that would, when included with escapement data, allow the use of spawner-recruit analytical methods to set Biological Escapement Goals (BEG) to achieve maximum sustained yield. Establishment of BEG goals indicated that the Alsek, Situk, Unuk, and Keta rivers were within the ranges of desired escapement prior to the rebuilding program and only the Blossom River was below desired escapements. Prior to 2012, the four indicator systems in Behm Canal, the Unuk, Chickamin, Blossom, and Keta Rivers, had consistently been above or within escapement goal ranges dating back to 1985. Escapements to both the Blossom and Keta continued this trend, and with new BEGs established, both systems were either within or exceeded the BEG in 2012 and 2013. Unlike the Blossom and Keta, the escapements to the Unuk and Chickamin have been below the lower BEG in 2012 and 2013 and were the lowest on record in 2012, dating back to 1975. Escapement values for indicator stocks in the Wrangell vicinity, the Stikine River and Andrew Creek, have been above or within their escapement goal ranges for 26 of the last 27 years and 24 of the last 27 years, respectively. Both of these stocks were within the goal range in 2013. While the escapement to the Stikine was within the desired goal range, With the exception of 2007, Taku River Chinook escapements have been above or within the desired ranges since 1991. The 2013 Taku Chinook escapement was slightly below the lower BEG. Escapement to the Chilkat River was below the lower BEG in 2013. Prior to 2005, the Alsek River, one of two indicator systems near Yakutat, was consistently above or within the BEG range. Since then, the Alsek escapement values have been below the lower end goal in four of the last nine years and was within the BEG range in 2013. Although the 2012 escapement to the Situk River, the second indicator system near Yakutat, was an improvement over the record lows of 2010 and 2011, it still fell below the lower limit of the BEG range. In 2013, the Situk escapement was within the BEG range.

Escapement to Southeast Chinook Systems											
Year	**System**										
	Alsek	*Taku*	*Stikine*	*Situk*	*Chilkat*	*Andrew*	*Unuk*	*Chickamin*	*Blossom*	*Keta*	*King Salmon*
2008	1,337	24,121	18,843	453	2,833	981	3,104	5,277	774	1,093	120
2009	6,095	22,806	11,086	902	4,429	628	3,157	2,902	370	614	109
2010	9,428	29,307	15,177	167	1,852	1,205	4,290	4,859	542	1,430	158
2011	6,668	19,682	14,569	240	2,803	936	3,272	4,052	569	671	192
2012	2,660	19,538	25,939	322	1,627	589	956	444	793	725	236
2013	5,044	18,008	16,735	912	1,730	920	1,135	468	255	493	94
Lower Goal	3,500	19,000	14,000	450	1,850	650	1,800	450	150	175	120

Summary

Escapement goals effectively represent reference points of the various Alaska salmon systems. There are currently 296 active salmon stock escapement goals throughout the state (as of 2013). These escapement goals cover mainly index systems but also individual streams. A variety of methods are used to develop escapement goals in Alaska. During the 2013-2014 Board of Fisheries cycle, reviews of the escapement goals were done for Chignik, Kodiak, Lower Cook Inlet and Upper Cook Inlet management areas. Where escapements chronically (4-5 years) fail to meet expectations for harvestable yield or spawning escapements, the department may recommend, and the board may adopt a stock of concern designation for those underperforming salmon stocks. Stock improvement following this designation is supported by data. A review of all the latest escapements (296) throughout Alaska indicates that the general majority of escapement goals have recently been met, with clear exceptions for Chinook salmon statewide. In response to this Statewide decline in Chinook production, ADFG has been limiting and/or closing commercial fisheries to meet escapement goals and has initiated a $30 million research projects aimed at elucidating Chinook stock dynamics and to improve stock assessment and overall management for the species. Issues relating to PWS pink salmon escapement goals and actual escapements have been raised.

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Analysis from 1994 (when the first formal escapement goals were introduced) up to 2014. (Note that 1994 is year zero).								
Year	**Eastern**	**Northern/Unakwik**	**Coghill**	**Northwestern**	**Eshamy**	**Southwestern**	**Montague**	**Southeastern**
Annual increase or decline in escapements:	-7,145	-2,625	6,189	5,408	353	-369	-2,759	5,327
Annual decline or increase of escapements since 1994 as percent of year zero	-1%	-1%	9%	12%	14%	0%	-1%	1%
Conclusion	When both broodlines are combined together, some stocks have declined slightly, while three stocks had large increases in overall escapement trends. Importantly, the Northwestern stock had previously seen large decreases in escapement, and combined broodline escapements have increased for this stock. None of the measured decreases would be classified as biologically meaningful.							

Analysis going back to 1980 (just prior to hatchery production increases) up to 2014. (Note that 1980 is year zero).								
Year	Eastern	Northern/Unakwik	Coghill	Northwestern	Eshamy	Southwestern	Montague	Southeastern
Annual increase or decline:	1,457	1,019	2,604	1,550	-337	-648	545	3,682
Annual decline or increase in escapements since 1980 as percent of year zero	0%	1%	3%	2%	-2%	0%	0%	1%
Conclusion	The escapements have risen substantially in recent years so that declines in all but the smallest stock have been reversed or the declines are of negligible size. Of course, because the odd and even broodlines have become more dissimilar this is not a perfect analysis. Even so, there has been an obvious rise in the odd-year escapements, and perhaps the even-year trends too.							

Escapement Goal Performance Summary Tables

			2013 Goal Range			Year									
Region	Species	System	Lower	Upper	Type	2005	2006	2007	2008	2009	2010	2011	2012	2013	Stock of Concern?
SEAK	Chinook[a]	Blossom River	150	300	BEG	Over	Over	Under	Met	Under	Over	Under	Met	Met	No
SEAK	Chinook	Keta River	175	400	BEG	Over	Over	Met	Met	Met	Over	Met	Met	Over	No
SEAK	Chinook	Unuk River	1,800	3,800	BEG	Over	Over	Over	Met	Over[b]	Over[b]	Over[b]	Under[c]	Under[c]	No
SEAK	Chinook	Chickamin River	450	900	BEG	Over	Over	Met	Over	Met	Over	Met	Under	Met	No
SEAK	Chinook	Andrew Creek	650	1,500	BEG	Over	Over	Over	Met	Under	Met	Met	Under	Met	No
SEAK	Chinook	Stikine River	14,000	28,000	BEG	Over	Met	Met	Met	Under[b]	Met[b]	Met[b]	Met[b]	Met[b]	No
SEAK	Chinook	King Salmon River	120	240	BEG	Met	Met	Met	Under	Under	Met	Met	Met	Under	No
SEAK	Chinook	Taku River	19,000	36,000	BEG	Over	Over	Under	Over[b]	Met[b]	Met[b]	Met[b]	Met[b]	Under[b]	No
SEAK	Chinook	Chilkat River[d]	1,750	3,500	BEG	Met	Met	Under	Met	Over	Met	Met[b]	Under[b]	Under[b]	No
SEAK	Chinook	Klukshu (Alsek) River	800	1,200	BEG	Met	Under	Under	Under	Over	Over	Over	Under[b]	Over[b]	No
SEAK	Chinook	Alsek River[e]	3,500	5,300	BEG	Met	Under	Under	Under	Over	Over	Over	Under[b]	Met[b]	No
SEAK	Chinook	Situk River	450	1,050	BEG	Met	Met	Met	Under	Met	Under[f]	Under	Under	Met	No
SEAK	Chum	Southern Southeast Summer	54,000		lower-bound SEG	Met	Met	Met	Under	Under	Under	Met	Met	Met	No
SEAK	Chum	Northern Southeast Inside Summer	119,000		lower-bound SEG	Met	Met	Met	Under	Under	Under	Met	Met	Met	No
SEAK	Chum	Northern Southeast Outside Summer	19,000		lower-bound SEG	Met	Met	Met	Met	Under	Met	Met	Met	Under	No
SEAK	Chum	Cholmondeley Sound Fall	30,000	48,000	SEG	Under	Over	Under	Over	Met	Over	Over	Over	Under	No
SEAK	Chum	Port Camden Fall	2,000	7,000	SEG	Met	Met	Under	Under	Under	Met	Under	Met	Under	No
SEAK	Chum	Security Bay Fall	5,000	15,000	SEG	Under	Over	Met	Met	Met	Met	Met	Met	Under	No
SEAK	Chum	Excursion River Fall	4,000	18,000	SEG	Under	Under	Met	Met	Under	Met	Under	Under	Met	No
SEAK	Chum	Chilkat River Fall	75,000	170,000	SEG	Over	Over	Over	Over	Over	Met	Over	Over	Met	No
SEAK	Coho	Hugh Smith Lake	500	1,600	BEG	Over	Met	Met	Over	Over	Over	Over	Over	Over	No
SEAK	Coho	Klawock River	4,000	9,000	SEG	Over	Met	Over	Met	Met	Over	Met	Met	Met	No
SEAK	Coho	Taku River[g]	70,000		MT	Met	Met	Met	Met[b]	Met[b]	Met[b]	Met[b]	Met[b]	Under[b]	No
SEAK	Coho	Auke Creek	200	500	BEG	Met	Over	Met	Over	Met	Met	Over	Over	Over	No
SEAK	Coho	Montana Creek	400	1,200	SEG	Under	Met	Under	Met	Met	Met	Met	Under	Under	No
SEAK	Coho	Peterson Creek	100	250	SEG	Met	Over	Met	Over	Met	Over	Met	Met	Met	No
SEAK	Coho	Ketchikan Survey Index	4,250	8,500	BEG	Over	Met	Met	Over	Met	Met	Met	Over	Over	No
SEAK	Coho	Sitka Survey Index	400	800	BEG	Over	Over	Over	Over	Over	Over	Over	Over	Over	No
SEAK	Coho	Ford Arm Lake	1,300	2,900	BEG	Over	Over	Met	Over	Met	Met	Met	Met	Met	No
SEAK	Coho	Berners River	4,000	9,200	BEG	Met	Met	Under	Met	Met	Met	Met	Met	Met	No
SEAK	Coho	Chilkat River	30,000	70,000	BEG	Met	Over	Under	Met	Met	Over	Met	Met	Met	No
SEAK	Coho	Lost River	2,200		lower-bound	Under	Met	Met	NA	Met	Met	Under	Met	Met	No

					SEG										
SEAK	Coho	Situk River	3,300	9,800	BEG	Under	Met	Met	NA	Met	Over	Met	Under	Over	No
SEAK	Coho	Tsiu/Tsivat Rivers	10,000	29,000	BEG	Met	Met	Met	Met	Met	Met	Met	Met	Over	No
SEAK	Pink	Southern Southeast	3,000,000	8,000,000	BEG	Over	Met	Over	Met	Met	Met	Met	Met	Over	No
SEAK	Pink	Northern Southeast Inside	2,500,000	6,000,000	BEG	Over	Met	Met	Under	Met	Met	Over	Under	Met	No
SEAK	Pink	Northern Southeast Outside	750,000	2,500,000	BEG	Over	Met	Met	Met	Met	Met	Over	Met	Over	No
SEAK	Pink	Situk River (even-year)[h]	eliminated												No
SEAK	Pink	Situk River (odd-year)	eliminated												No
SEAK	Pink	Situk River	33,000		lower-bound SEG								Under	Met	No
SEAK	Sockeye	Hugh Smith Lake	8,000	18,000	OEG[i]	Over	Over	Over	Under	Met	Met	Over	Met	Under	No
SEAK	Sockeye	McDonald Lake	55,000	120,000	SEG	Met	Under	Under	Under	Under	Met	Met	Met	Under	No
SEAK	Sockeye	Mainstem Stikine River	20,000	40,000	SEG	Met	Met	Met	Under[b]	Met[b]	Met[b]	Met[b]	Met[b]	Met[b]	No
SEAK	Sockeye	Tahltan Lake[j]	18,000	30,000	BEG	Over	Over	Met	Under	Over	Met	Over	Under	Under	No
SEAK	Sockeye	Speel Lake	4,000	13,000	BEG	Met	Met	Under	Under	Under	Met	Met	Met	Met	No
SEAK	Sockeye	Taku River	71,000	80,000	SEG	Over	Over	Over	Under	Met	Over[b]	Over[b]	Over[b]	Met[b]	No
SEAK	Sockeye	Redoubt Lake	7,000	25,000	OEG	Over	Over	Over	Met	Met	Met	Met	Over	Over	No
SEAK	Sockeye	Chilkat Lake	70,000	150,000	BEG	Met	Met	Under	Met	Over	Under	Under	Met	Met	No
SEAK	Sockeye	Chilkoot Lake	38,000	86,000	SEG	Met	Over	Met	Under	Under	Met	Met	Over	Met	No
SEAK	Sockeye	East Alsek-Doame River	13,000	26,000	BEG	Over	Over	Over	Under	Under	Met	Over	Met	Over	No
SEAK	Sockeye	Klukshu River	7,500	11,000	BEG	Under	Over	Met	Under	Under	Over	Over	Over	Under	No
SEAK	Sockeye	Alsek River[k]	24,000	33,500	BEG										No
SEAK	Sockeye	Lost River	1,000		lower-bound SEG	Over	Over	Under	Under	Over	Over	Over	Under	Under	No
SEAK	Sockeye	Situk River	30,000	70,000	BEG	Met	Over	Met	Under	Over	Met[f]	Over	Met	Over	No
Central	Chinook	Nushagak River	55,000	120,000	SEG	Over	Met	Under	Met	Met	Met	Met	Over	Met	No
Central	Chinook	Togiak River	eliminated			NS	NS	NS	NS	NS	NS	NS	NS		No
Central	Chinook	Naknek River	5,000		lower-bound SEG	NS	NS	Met	Met	Under[a]	NS	NS	NS	NS	No
Central	Chinook	Alagnak River	2,700		lower-bound SEG	Met	Met	Met	Under	Under	NS	NS	NS	NS	No
Central	Chinook	Egegik River[b]	eliminated								NS	NS	NS		No
Central	Chinook	Alexander Creek	2,100	6,000	SEG	Met	Under	Under	Under	Under	Under	Under	Under	Under	Management
Central	Chinook	Campbell Creek	380		lower-bound SEG	Met	Met	Met	Met	Met	Under	Under	NS	NS	No
Central	Chinook	Chuitna River	1,200	2,900	SEG	Met	Met	Under	Under	Under	Under	Under	Under	Met	Management
Central	Chinook	Chulitna River	1,800	5,100	SEG	Met	Met	Over	Met	Met	Under	Met	Under	Under	No
Central	Chinook	Clear (Chunilna) Creek	950	3,400	SEG	Met	Met	Met	Met	Met	Under	Under	Met	Met	No
Central	Chinook	Crooked Creek	650	1,700	SEG	Over	Met	Met	Met	Under	Met	Met	Under	Met	No

Central	Chinook	Deshka River	13,000	28,000	SEG	Over	Over	Met	Under	Under	Met	Met	Met	Met	No
Central	Chinook	Goose Creek	250	650	SEG	Met	Met	Under	Under	Under	Under	Under	Under	Under	Management
Central	Chinook	Kenai River - Early Run	5,300	9,000	OEG	Over	Over	Over	Met	Met	Met	Met	Under	Under	No
Central	Chinook	Kenai River - Late Run	15,000	30,000	SEG	Over	Over	Over	Over	Met	Met	Met	Met	Met	No
Central	Chinook	Lake Creek	2,500	7,100	SEG	Met	Met	Met	Under	Under	Under	Met	Under	Met	No
Central	Chinook	Lewis River	250	800	SEG	Met	Met	Under[c]	Under	Under	Under	Under	Under	Under	Management
Central	Chinook	Little Susitna River	900	1,800	SEG	Over	Over	Met	Met	Met	Under	Under	Met	Met	No
Central	Chinook	Little Willow Creek	450	1,800	SEG	Met	Met	Met	NC	Met	Met	Met	Met	Met	No
Central	Chinook	Montana Creek	1,100	3,100	SEG	Met	Met	Met	Met	Met	Under	Under	Under	Met	No
Central	Chinook	Peters Creek	1,000	2,600	SEG	Met	Met	Met	NC	Met	NC	Met	Under	Met	No
Central	Chinook	Prairie Creek	3,100	9,200	SEG	Met	Met	Met	Under	Met	Under	Under	Under	Met	No
Central	Chinook	Sheep Creek	600	1,200	SEG	Met	Under	Under	NC	Under	NC	Under	Under	NC	Management
Central	Chinook	Talachulitna River	2,200	5,000	SEG	Met	Over	Met	Met	Met	Under	Under	Under	Met	No
Central	Chinook	Theodore River	500	1,700	SEG	Under	Met	Under	Under	Under	Under	Under	Under	Under	Management
Central	Chinook	Willow Creek	1,600	2,800	SEG	Met	Met	Under	Under	Under	Under	Under	Under	Met	No
Central	Chinook	Anchor River	3,800	10,000	SEG	Over	Met	Met	Met	Under	Met	Under	Met	Met[d]	No
Central	Chinook	Deep Creek	350	800	SEG	Over	Met	Met	Under	Met	Met	Met	Met	Met	No
Central	Chinook	Ninilchik River	550	1,300	SEG	Met	Met	Under	Met	Under	Met	Met	Met	Met[d]	No
Central	Chinook	Copper River	24,000		lower-bound SEG	Under	Met	Met	Met	Met	Under	Met	Met	NA[e]	No
Central	Chum	Nushagak River	200,000		lower-bound SEG	Over	Over	Under	Over	Over	Over	Over	Over	Over	No
Central	Chum	Clearwater Creek	3,800	8,400	SEG	Under	Under	Met	Over	Met	Over	Over	Met	Over	No
Central	Chum	Port Graham River	1,450	4,800	SEG	Under	Met	Met	Met	Under	Under	Met	Under	Met	No
Central	Chum	Dogfish Lagoon	3,350	9,150	SEG	Under	Met	Met	Met	Met	Over	Over	Met	Over	No
Central	Chum	Rocky River	1,200	5,400	SEG	Over	Over	Met	Met	Met	Met	Met	Met	Over	No
Central	Chum	Port Dick Creek	1,900	4,450	SEG	Over	Met	Met	Over	Over	Met	Over	Over	Met	No
Central	Chum	Island Creek	6,400	15,600	SEG	Over	Under	Under	Met	Met	Under	Met	Met	Met	No
Central	Chum	Big Kamishak River	9,350	24,000	SEG	Over	Over	Met	Under	Met	Over	Under	Met	Under	No
Central	Chum	Little Kamishak River	6,550	23,800	SEG	Met	Over	Met	Met	Under	Met	Met	Over	Met	No
Central	Chum	McNeil River	24,000	48,000	SEG	Under	Under	Under	Under	Under	Under	Met	Under	Under	No
Central	Chum	Bruin River	6,000	10,250	SEG	Over	Met	Under	Over	Met	Met	Under	Over	Met	No
Central	Chum	Ursus Cove	6,050	9,850	SEG	Over	Over	Over	Met	Over	Over	Over	Under	Over	No
Central	Chum	Cottonwood Creek	5,750	12,000	SEG	Over	Over	Over	Met	Over	Over	Under	Under	Under	No
Central	Chum	Iniskin Bay	7,850	13,700	SEG	Over	Over	Under	Over	Over	Over	Over	Under	Under	No

Central	Chum	Eastern District	50,000		lower-bound SEG	Met	Met	Met	Met	Met	Met	Met	Met	Met	No
Central	Chum	Northern District	20,000		lower-bound SEG	Met	Met	Met	Met	Met	Met	Met	Under	Met	No
Central	Chum	Coghill District	8,000		lower-bound SEG	Met	Met	Met	Met	Met	Met	Met	Met	Met	No
Central	Chum	Northwestern District	5,000		lower-bound SEG	Met	Met	Met	Met	Met	Met	Met	Met	Under	No
Central	Chum	Southeastern District	8,000		lower-bound SEG	Met	Met	Met	Met	Met	Met	Met	Met	Met	No
Central	Coho	Nushagak River	60,000	120,000	SEG								Over	Over	No
Central	Coho	Fish Creek (Knik)	1,200	4,400	SEG	Met[g]	Over[g]	Over[g]	Over[g]	Over	Over	Met[g]	Met	Over	No
Central	Coho	Jim Creek	450	700	SEG	Over	Over	Over	Over	Over	Under	Under	Under	Over	No
Central	Coho	Little Susitna River	10,100	17,700	SEG	Met[h]	Under[h]	Met	Over	Under	Under	Under[h]	Under	Met	No
Central	Coho	Copper River Delta	32,000	67,000	SEG	Over	Over	Met	Over	Met	Met	Met	Met	Met	No
Central	Coho	Bering River	13,000	33,000	SEG	Over	Over	Over	Met	Met	Met	Met	Met	Met	No
Central	Pink	Nushagak River	165,000		lower-bound SEG								Met	NA	No
Central	Pink	Humpy Creek	21,650	85,550	SEG	Over	Met	Met	Over	Under	Met	Under	Met	Under	No
Central	Pink	China Poot Creek	2,900	8,200	SEG	Over	Met	Met	Met	Under	Under	Met	Over	Met	No
Central	Pink	Tutka Creek	6,500	17,000	SEG	Over	Over	Under	Met	Under	Under	Over	Met	Met	No
Central	Pink	Barabara Creek	1,900	8,950	SEG	Over	Met	Over	Over	Met	Over	Met	Under	Over	No
Central	Pink	Seldovia Creek	19,050	38,950	SEG	Over	Over	Over	Over	Under	Met	Over	Over	Met	No
Central	Pink	Port Graham River	7,700	19,850	SEG	Over	Over	Over	Over	Met	Met	Over	Over	Met	No
Central	Pink	Port Chatham	7,800	21,000	SEG	Over	Over	Met	Met	Over	Under	Met	Under	Over	No
Central	Pink	Windy Creek Right	3,350	10,950	SEG	Over	Over	Over	Over	Over	Met	Under	Met	Over	No
Central	Pink	Windy Creek Left	3,650	29,950	SEG	Over	Over	Over	Over	Over	Met	Met	Met	Over	No
Central	Pink	Rocky River	9,350	54,250	SEG	Over	Over	Over	Over	Over	Met	Met	Met	Over	No
Central	Pink	Port Dick Creek	18,550	58,300	SEG	Over	Met	Met	Met	Met	Met	Under	Under	Met	No
Central	Pink	Island Creek	7,200	28,300	SEG	Met	Over	Over	Over	Over	Over	Met	Met	Met	No
Central	Pink	S. Nuka Island Creek	2,700	14,250	SEG	Met	Met	Met	Met	Over	Over	Over	Under	Met	No
Central	Pink	Desire Lake Creek	1,900	20,200	SEG	Over	Over	Met	Met	Over	Met	Under	Met	Over	No
Central	Pink	Bear & Salmon Creeks	eliminated					NS	NS	NS	NS				No
Central	Pink	Thumb Cove	eliminated					NS	NS	NS	NS				No
Central	Pink	Humpy Cove	eliminated					NS	NS	NS	NS				No
Central	Pink	Tonsina Creek	eliminated					NS	NS	NS	NS				No
Central	Pink	Bruin River	18,650	155,750	SEG	Met	Over	Over	Met	Over	Met	Under	Met	Under	No
Central	Pink	Sunday Creek	4,850	28,850	SEG	Over	Over	Over	Met	Over	Met	Under	Under	Met	No
Central	Pink	Brown's Peak Creek	2,450	18,800	SEG	Over	Over	Over	Met	Over	Met	Under	Met	Met	No

Central	Pink	PWS All Districts Combined (even year)[i]	eliminated				Under		Under		Under			No
Central	Pink	PWS All Districts Combined (odd year)	eliminated			Under		Under		Under		Under		No
Central	Pink	PWS Eastern District (even year)	250,000	580,000	SEG								Met		No
Central	Pink	PWS Eastern District (odd year)	310,000	640,000	SEG									Over	No
Central	Pink	PWS Northern District (even year)	140,000	210,000	SEG								Under		No
Central	Pink	PWS Northern District (odd year)	90,000	180,000	SEG									Over	No
Central	Pink	PWS Coghill District (even year)	60,000	150,000	SEG								Over		No
Central	Pink	PWS Coghill District (odd year)	60,000	250,000	SEG									Over	No
Central	Pink	PWS Northwestern District (even year)	70,000	140,000	SEG								Met		No
Central	Pink	PWS Northwestern District (odd year)	50,000	110,000	SEG									Over	No
Central	Pink	PWS Eshamy District (even year)	3,000	11,000	SEG								Under		No
Central	Pink	PWS Eshamy District (odd year)	4,000	11,000	SEG									Over	No
Central	Pink	PWS Southwestern District (even year)	70,000	160,000	SEG								Met		No
Central	Pink	PWS Southwestern District (odd year)	70,000	190,000	SEG									Over	No
Central	Pink	PWS Montague District (even year)	50,000	140,000	SEG								Met		No
Central	Pink	PWS Montague District (odd year)	140,000	280,000	SEG									Over	No
Central	Pink	PWS Southeastern District (even year)	150,000	310,000	SEG								Met		No
Central	Pink	PWS Southeastern District (odd year)	270,000	620,000	SEG									Over	No
Central	Sockeye	Kvichak River[j]	2,000,000	10,000,000	SEG	Met	Met	Met	Met	Met	Met	Met	Met	Met	No
Central	Sockeye	Alagnak River	320,000		lower-bound SEG	Over	Over	Over	Over	Over	Over	Over	Over	Over	No
Central	Sockeye	Naknek River	800,000	1,400,000	SEG[k]	Over	Over	Over	Over	Met	Over	Met	Met	Met	No
Central	Sockeye	Egegik River	800,000	1,400,000	SEG	Over	Over	Over	Met	Met	Met	Met	Met	Met	No
Central	Sockeye	Ugashik River	500,000	1,200,000	SEG	Met	Met	Over	Met	Over	Met	Met	Met	Met	No
Central	Sockeye	Wood River	700,000	1,500,000	SEG	Met	Over	Over	Over	Met	Over	Met	Met	Met	No
Central	Sockeye	Igushik River	150,000	300,000	SEG	Over	Over	Over	Over	Over	Over	Over	Met	Over	No
Central	Sockeye	Nushagak River	260,000	760,000	OEG	Over	Met	Met	Met	Met	Met	Met	Met	Over	No
Central	Sockeye	Kulukak Bay	eliminated			NS	NS	NS	NS	NS	NS	NS	NS		No
Central	Sockeye	Togiak River	120,000	270,000	SEG	Met	Over	Met	Met	Over	Met	Met	Met	Met	No

Central	Sockeye	Crescent River	30,000	70,000	BEG	Over	Over	Over	Met	Over	Over	Over	Met	Over	No
Central	Sockeye	Fish Creek (Knik)	20,000	70,000	SEG	Under	Met	Met	Under	Over	Over	Met	Under	Under	No
Central	Sockeye	Kasilof River	160,000	390,000	OEG	Met	Met	Met	Met	Met	Met	Met	Met	Over	No
Central	Sockeye	Kenai River[l]	700,000	1,400,000	OEG	Met	Met	Under	Under	Under	Met	Met	Met	Met	No
Central	Sockeye	Packers Creek	15,000	30,000	SEG	Met	NS	Over	Met	Met	NS	NA	NA	NA	No
Central	Sockeye	Russian River - Early Run	22,000	42,000	BEG	Over	Over	Met	Met	Over	Met	Met	Met	Met	No
Central	Sockeye	Russian River - Late Run	30,000	110,000	SEG	Met	Met	Met	Met	Met	Met	Met	Met	Met	No
Central	Sockeye	Yentna River[m]	eliminated			Under	Under	Under	Under						No
Central	Sockeye	Chelatna Lake	20,000	65,000	SEG		Under	Met	Over	Under	Met	Over	Met	Over	No
Central	Sockeye	Judd Lake	25,000	55,000	SEG		Met	Over	Met	Met	Under	Met	Under	Under	No
Central	Sockeye	Larson Lake	15,000	50,000	SEG	Under	Over	Met	Met	Met	Met	Under	Met	Met	No
Central	Sockeye	English Bay	6,000	13,500	SEG	Met	Over	Over	Met	Over	Met	Met	Under	Met[f]	No
Central	Sockeye	Delight Lake	7,550	17,650	SEG	Met	Met	Over	Over	Met	Over	Over	Met	Under	No
Central	Sockeye	Desire Lake	8,800	15,200	SEG	Under	Over	Met	Met	Over	Under	Met	Met	Under	No
Central	Sockeye	Bear Lake	700	8,300	SEG	Over	Over	Over	Over	Over	Over	Over	Met	Over	No
Central	Sockeye	Aialik Lake	3,700	8,000	SEG	Met	Met	Met	Met	Under	Met	Under	Under	Under	No
Central	Sockeye	Mikfik Lake	6,300	12,150	SEG	Under	Over	Met	Under	Over	Met	Under	Under	Under	No
Central	Sockeye	Chenik Lake	3,500	14,000	SEG	Met	Met	Over	Met	Over	Over	Met	Over	Met	No
Central	Sockeye	Amakdedori Creek	1,250	2,600	SEG	Met	Under	Over	Over	Met	Under	Over	Under	Met	No
Central	Sockeye	Upper Copper River	360,000	750,000	SEG	Met	Met	Met	Met	Met	Met	Met	Over	NA[n]	No
Central	Sockeye	Copper River Delta	55,000	130,000	SEG	Met	Met	Met	Met	Met	Met	Met	Met	Met	No
Central	Sockeye	Bering River	15,000	33,000	SEG	Met	Under	Met	Met	Met	Under	Met	Met	Met	No
Central	Sockeye	Coghill Lake	20,000	60,000	SEG	Met	Met	Over	Met	Under	Over	Over	Over	Under	No
Central	Sockeye	Eshamy Lake	13,000	28,000	BEG	Met	Over	Met	Met	Met	Met	Met	NA[o]	NA[o]	No
AYK	Chinook	North (Main) Fork Goodnews River	640	3,300	SEG	NS	Over	NS	Met	NS	NS	Met	Under	NS	No
AYK	Chinook	Middle Fork Goodnews River	1,500	2,900	BEG	Over	Over	Over	Met	Met	Met	Met	Under	Under	No
AYK	Chinook	Kanektok River	3,500	8,000	SEG	Over	Over	NS	Met	NS	Under	NS	NA	Under	No
AYK	Chinook	Kuskokwim River (entire area)	65,000	120,000	SEG	Over	Over	Over	Over	Met	Under	Met	Met	Under	No
AYK	Chinook	Kogrukluk River	4,800	8,800	SEG	Over	Over	Over	Over	Over	Met	Met	NA	Under	No
AYK	Chinook	Kwethluk River	4,100	7,500	SEG	NA	Over	Over	Met	Met	Under	Under	NA	NA	No
AYK	Chinook	Tuluksak River	eliminated												No
AYK	Chinook	George River	1,800	3,300	SEG	Over	Over	Over	Met	Over	Under	Under	Met	Under	No
AYK	Chinook	Kisaralik River	400	1,200	SEG	Over	Over	Met	Met	NS	Under	NS	Met	Met	No
AYK	Chinook	Aniak River	1,200	2,300	SEG	NS	Over	Over	Over	NS	NS	NS	NS	Under	No
AYK	Chinook	Salmon River (Aniak R)	330	1,200	SEG	Over	Over	Over	Met	NS	NS	Under	Under	Under	No
AYK	Chinook	Holitna River	970	2,100	SEG	Met	Met	NS	NS	NS	Under	Over	Over	Under	No

AYK	Chinook	Cheeneetnuk River (Stony R)	340	1,300	SEG	Met	Met	NS	Under	Under	NS	Under	Under	Under	No
AYK	Chinook	Gagaryah River (Stony R)	300	830	SEG	Met	Met	Over	Under	Met	Under	Under	Under	Under	No
AYK	Chinook	Salmon River (Pitka Fork)	470	1,600	SEG	Over	Met	Met	Met	Met	Under	Met	Met	Met	No
AYK	Chinook	East Fork Andreafsky River (Yukon R)	2,100	4,900	SEG	Met	Over	Met	Met	Met	Met	Over	Met	Under	Yield
AYK	Chinook	West Fork Andreafsky River (Yukon R)	640	1,600	SEG	Met	Met	Met	NS	Over	Met	Met	NS	Met	Yield
AYK	Chinook	Anvik River (Yukon R)	1,100	1,700	SEG	Over	Over	Met	Under	Under	Under	Under	Under	Under	Yield
AYK	Chinook	Nulato River (forks combined) (Yukon R)	940	1,900	SEG	Under	Met	Over	Under	Over	Under	Met	Met	Met	Yield
AYK	Chinook	Gisasa River (Yukon R)	eliminated												Yield
AYK	Chinook	Chena River (Yukon R)	2,800	5,700	BEG	Over	Met	Met	Met	Met	Under	Over	Under[a]	Under	Yield
AYK	Chinook	Salcha River (Yukon R)	3,300	6,500	BEG	Met	Over	Met	Met	Over	Met	Over[b]	Over	Met	Yield
AYK	Chinook	Canada Mainstem (Yukon R)	42,500	55,000	agreement[c]	Over	Over	Under	Under	Over	Under	Met	Under	Under[d]	Yield
AYK	Chinook	Fish River/Boston Creek	100		lower-bound SEG	Under	NS	NS	NS	NS	NS	NS	NS	Under	No
AYK	Chinook	Kwiniuk River (Norton Sound SD 2)	300	550	SEG	Met	Under	Under	Under	Met	Under	Under	Under	Under	No
AYK	Chinook	North River (Unalakleet R) (Norton Sound SD 6)	1,200	2,600	SEG	Under	Under	Met	Under	Met	Met	Under	Under	Under	Yield
AYK	Chinook	Shaktoolik River (Norton Sound SD 5)[e,f]	eliminated						NS	NS	NS	106	NS		Yield
AYK	Chinook	Unalakleet/Old Woman River (Norton Sound SD 6)	550	1,100	SEG	Under[e]	NS	Met	NS	Over	NS	Under	NA	NS	Yield
AYK	Chum	Middle Fork Goodnews River	12,000		lower-bound SEG	Over	Over	Over	Over	Over	Over	Over	Under	Over	No
AYK	Chum	Kanektok River	eliminated			NS	NS	NS	NS	NS	NS	NS	NA		No
AYK	Chum	Kogrukluk River	15,000	49,000	SEG	Over	Over	Over	Met	Over	Over	Over	NA	Over	No
AYK	Chum	Aniak River	220,000	480,000	SEG	Over	Over	Over	Met	Met	Met	Met	NA	NA	No
AYK	Chum	East Fork Andreafsky River	40,000		lower-bound SEG	Under	Met	Met	Met	Under	Met	Met	Met	Met	No
AYK	Chum	Anvik River	350,000	700,000	BEG	Met	Met	Met	Met	Under	Met	Met	Met	Met	No
AYK	Chum	Yukon River Drainage	300,000	600,000	SEG	Over	Over	Over	Over	Met	Met	Over	Met	Over	No
AYK	Chum	Tanana River[g]	61,000	136,000	BEG	Over	Over	Over	Over	Over	Over	Over	Met	Over	No
AYK	Chum	Delta River	6,000	13,000	BEG	Over	Over	Over	Over	Over	Over	Over	Met	Over	No
AYK	Chum	Toklat River	eliminated			NA	NA	NA	NA	NA					No
AYK	Chum	Upper Yukon River Tributaries	152,000	312,000	BEG	Over	Over	Over	Met	Over	Met	Over	Over	Over	No
AYK	Chum	Chandalar River	74,000	152,000	BEG	Over	Over	Over	Over	Over	Over	Over	Over	Over	No
AYK	Chum	Sheenjek River	50,000	104,000	BEG	Over	Over	Met	Under	Met	Under	Met	Over	Over[h]	No
AYK	Chum	Fishing Branch River (Canada)	22,000	49,000	agreement	Over	Met	Met	Under	Met	Under	Under	Under	Met	No
AYK	Chum	Yukon R. Mainstem (Canada)	70,000	104,000	agreement	Over	Over	Over	Over	Met	Over	Over	Over	Over	No

AYK	Chum	Norton Subdistrict 1 Aggregate	23,000	35,000	BEG	Over	Over	Over	Met	Under	Over	Over	Over	Over	Yield
AYK	Chum	Sinuk River	eliminated												No
AYK	Chum	Nome River	2,900	4,300	OEG	Over	Over	Over	Under	Under	Over	Met	Under	Over	No
AYK	Chum	Bonanza River	eliminated												No
AYK	Chum	Snake River	1,600	2,500	OEG	Over	Over	Over	Under	Under	Over	Over	Under	Over	No
AYK	Chum	Solomon River	eliminated						NS						No
AYK	Chum	Flambeau River	eliminated												No
AYK	Chum	Eldorado River	6,000	9,200	OEG	Over	Over	Over	Met	Under	Over	Over	Over	Over	No
AYK	Chum	Niukluk River (Norton SD 2)	23,000		lower-bound SEG	Met	Met	Met	Under	Under	Met	Met	Under	Met	Yield
AYK	Chum	Kwiniuk River (Norton SD 2)	11,500	23,000	OEG	Met	Over	Over	Under	Under	Over	Over	Under	Under	Yield
AYK	Chum	Tubutulik River (Norton SD 3)	9,200	18,400	OEG	Under	NS	Under	NS	Under	Met	Met	NS	NS	Yield
AYK	Chum	Unalakleet/Old Woman River	2,400	4,800	SEG	Under	NS	Under	NS	NS	NS	NS	NS	Met	No
AYK	Chum	Kotzebue Sound Aggregate	196,000	421,000	BEG										No
AYK	Chum	Noatak and Eli Rivers	42,000	91,000	SEG	NS	Under	NS	Over	Met	NS	NS	NS	NS	No
AYK	Chum	Upper Kobuk w/ Selby River	9,700	21,000	SEG	NS	Over	NS	Over	Over	NS	NS	NS	NS	No
AYK	Chum	Salmon River	3,300	7,200	SEG	NS	NS	NS	NS	NS	NS	NS	NS	NS	No
AYK	Chum	Tutuksuk River	1,400	3,000	SEG	Met	NS	NS	NS	NS	NS	NS	NS	NS	No
AYK	Chum	Squirrel River	4,900	10,500	SEG	NS	NS	NS	NS	NS	NS	NS	NS	NS	No
AYK	Coho	Middle Fork Goodnews River	12,000		lower-bound SEG	Met	Met	Met	Met	Met	Met	Met	Met	NA	No
AYK	Coho	Kogrukluk River	13,000	28,000	SEG	Met	Met	Met	Over	Met	Met	Met	Met	Met	No
AYK	Coho	Kwethluk River	19,000		lower-bound SEG	NS	Met	Met	Met	Met	NA	NA	Met	NA	No
AYK	Coho	Delta Clearwater River	5,200	17,000	SEG	Over	Met	Met	Met	Met	Met[k]	Met	Met	Met	No
AYK	Coho	Kwiniuk River	650	1,300	SEG	NS	NS	Over	Over	Over	Over	Over	NS	NS	No
AYK	Coho	Niukluk River[l]	2,400	7,200	SEG	Met	Over	Met	Over	Met	Over	Met	Under	NS	No
AYK	Coho	North River (Unalakleet R.)	550	1,100	SEG	Over	NS	Over	Over	Over	NS	Met	NS	Met	No
AYK	Pink	Nome River (odd year)	3,200		lower-bound SEG	Met		Met		Met		Met		Met	No
AYK	Pink	Nome River (even year)	13,000		lower-bound SEG		Met		Met		Met		Met		No
AYK	Pink	Kwiniuk River	8,400		lower-bound SEG	Over	Over	Over	Over	Over	Over	Over	Over	Over	No
AYK	Pink	Niukluk River	10,500		lower-bound SEG	Over	Over	Over	Over	Over	Over	Over	Over	NA	No
AYK	Pink	North River	25,000		lower-bound SEG	Met	Met	Met	Met	Met	Met	Met	Met	Met	No
AYK	Sockeye	North (Main) Fork Goodnews River	5,500	19,500	SEG	NS	Over	NS	Over	NS	NS	Met	Met	NS	No

AYK	Sockeye	Middle Fork Goodnews River	18,000	40,000	BEG	Over	Over	Over	Over	Met	Met	Under	Met	Met	No
AYK	Sockeye	Kanektok River	14,000	34,000	SEG	Over	Over	NS	Over	NS	Met	NS	NA	Over	No
AYK	Sockeye	Kogrukluk River	4,440	17,000	SEG	Over	Over	Met	Over	Over	Met	Met	NA	Met	No
AYK	Sockeye	Salmon Lake/Grand Central River	4,000	8,000	SEG	Over	Over	Over	Over	Under	Under	Met	Met	Met	No
AYK	Sockeye	Glacial Lake	800	1,600	SEG	Over	Over	Met	Under	Under	Under	NS	NS	Met	No
West	Chinook	Nelson River	2,400	4,400	BEG	Over	Met	Met	Over	Under	Met	Under	Under	Under[a]	No
West	Chinook	Chignik River	1,300	2,700	BEG	Over	Over	Met	Met	Met	Over	Met	Met	Under	No
West	Chinook	Karluk River	3,000	6,000	BEG	Met	Met	Under	Under	Under	Under	Met	Met[b]	Under[b]	Management
West	Chinook	Ayakulik River	4,000	7,000	BEG	Over	Under	Met	Under	Under	Met	Met	Met	Under	No
West	Chum	AK Penisula Northern District	119,600	239,200	SEG	Under	Over	Over	Met	Met	Met	Under	Met	Met	No
West	Chum	AK Peninsula Northwestern District	100,000	215,000	SEG	Met	Met	Over	Over	Under	Met	Met	Met	Under	No
West	Chum	AK Peninsula Southeastern District[c]	106,400	212,800	SEG	Over	Over	Met	Over	Met	Under	Met	Under	Met	No
West	Chum	AK Peninsula South Central District	89,800	179,600	SEG	Over	Met	Met	Met	Under	Under	Met	Under	Met	No
West	Chum	AK Peninsula Southwestern District	133,400	266,800	SEG	Over	Met	Over	Met	Over	Met	Met	Under	Met	No
West	Chum	Unimak District	eliminated												No
West	Chum	Entire Chignik Area	57,400		lower-bound SEG	Met	Met	Met	Met	Met	Met	Met	Met	Met	No
West	Chum	Kodiak Mainland District	104,000		lower-bound SEG	Under	Met	Under	Under	Under	Met	Met	Met	Met	No
West	Chum	Kodiak Archipelago Aggregate	151,000		lower-bound SEG	Under[d]	Met[d]	Met[d]	Under	Under	Met	Met	Met	Met	No
West	Coho	Nelson River	18,000		lower-bound SEG	Met	Met	Met	Met	Met	Under	Met	Met	Met	No
West	Coho	Thin Point Lake[e]	eliminated												No
West	Coho	Ilnik River	9,000		lower-bound SEG	NA	Met	Met	Met	NA	Met	Met	Met	Met	No
West	Coho	Pasagshak River	1,200		lower-bound SEG	Met	Met	Met	Met	Met	Met	Under	Met	Met	No
West	Coho	Buskin River	3,200	7,200	BEG	Over	Over	Over	Over	Over	Met	Met	Met	Met[f]	No
West	Coho	Olds River	1,000		lower-bound SEG	Met	Under	Met	Under	Under	NA	Met	Under	Met	No
West	Coho	American River	400		lower-bound SEG	Under	Met	Under	Met	Met	NA	Met	Met	Met	No
West	Pink	Bechevin Bay Section (odd year)	eliminated												No
West	Pink	Bechevin Bay Section (even year)	eliminated												No
West	Pink	South Peninsula Total (odd year)	1,637,800	3,275,700	SEG	Over		Met		Met		Met		Met	No

West	Pink	South Peninsula Total (even year)	1,864,600	3,729,300	SEG		Met		Met		Under		Under		No
West	Pink	Entire Chignik Area (odd year)	500,000	800,000	SEG	Over		Over		Over		Over		Over	No
West	Pink	Entire Chignik Area (even year)	200,000	600,000	SEG		Met		Over		Met		Met		No
West	Pink	Kodiak Mainland District	250,000	1,000,000	SEG	Met	Met	Met	Under	Met	Met	Met	Met	Met	No
West	Pink	Kodiak Archipelago (odd year)	2,000,000	5,000,000	SEG	Met		Met		Met		Met		Met	No
West	Pink	Kodiak Archipelago (even year)	3,000,000	7,000,000	SEG		Met		Under		Met		Met		No
West	Sockeye	Cinder River	12,000	48,000	SEG	Over	Over	Over	Over	Over	Over	Over	Over	Over	No
West	Sockeye	Ilnik River	40,000	60,000	SEG	Over	Over	Over	Met	Over	Met	Met	Over	Met	No
West	Sockeye	Meshik River	25,000	100,000	SEG	Over	Over	Met	Met	Met	Met	Met	Met	Met	No
West	Sockeye	Sandy River	34,000	74,000	SEG	Over	Met	Met	Under	Met	Met	Met	Under	Met	No
West	Sockeye	Bear River Early Run	176,000	293,000	SEG	Over	Met	Met	Under	Met	Met	Met	Under	Met	No
West	Sockeye	Bear River Late Run	117,000	195,000	SEG	Over	Met	Over	Over	Met	Met	Met	Under	Over	No
West	Sockeye	Nelson River	97,000	219,000	BEG	Over	Met	Met	Met	Met	Met	Under	Met	Over	No
West	Sockeye	Christianson Lagoon	25,000	50,000	SEG	Over	Met	Met	Over	Met	Met	Met	Met	Under	No
West	Sockeye	Swanson Lagoon	6,000	16,000	SEG	Under	Under	Met	Under	Under	Under	Under	Under	Under	Management
West	Sockeye	North Creek	4,400	8,800	SEG	Over	Met	Over	Over	Met	Over	Over	Over	Met	No
West	Sockeye	Orzinski Lake	15,000	20,000	SEG	Over	Met	Under	Over	Over	Met	Met	Met	Met	No
West	Sockeye	Mortensen Lagoon	3,200	6,400	SEG	Over	Over	Met	Met	Over	Over	Under	Met	Met	No
West	Sockeye	Thin Point Lake	14,000	28,000	SEG	Met	Under	Met	Met	Over	Under	Met	Met	Under	No
West	Sockeye	McLees Lake[g]	10,000	60,000	SEG	Met	Met	Met	Under	Met	Met	Met	Met	Met	No
West	Sockeye	Chignik River Early Run	350,000	400,000	SEG	Met	Met	Met	Met	Met	Over	Over	Met	Met	No
West	Sockeye	Chignik River Late Run[h]	200,000	400,000	SEG	Met	Met	Met	Met	Met	Met	Met	Met	Met	No
West	Sockeye	Malina Creek	1,000	10,000	SEG	Over	Met	Met	Met	Met	Met	Met	Met	Met	No
West	Sockeye	Afognak (Litnik) River	20,000	50,000	BEG	Met	Met	Met	Met	Met	Over	Met	Met	Met	No
West	Sockeye	Little River	3,000		lower-bound SEG	Under	Met	Met	Under	Under	Met	Met	Met	Met	No
West	Sockeye	Uganik Lake	24,000		lower-bound SEG	Under	Met	Met	Met	Met	Met	Met	Met	Met	No
West	Sockeye	Karluk River Early Run	110,000	250,000	BEG	Over	Met	Over	Under	Under	Under	Under	Met	Met	No
West	Sockeye	Karluk River Late Run	170,000	380,000	BEG	Over	Met	Met	Under	Met	Met	Met	Met	Met	No
West	Sockeye	Ayakulik River	eliminated												No
West	Sockeye	Ayakulik River Early Run	140,000	280,000	SEG	Under	Under	Met	Under	Met	Met	Met	Met	Met	No
West	Sockeye	Ayakulik River Late Run	60,000	120,000	SEG	Met	Under	Met	Met	Met	Met	Met	Met	Met	No
West	Sockeye	Upper Station River Early Run	25,000		OEG	Over	Under	Over	Over	Over	Over	Under	Under	Under	No
West	Sockeye	Upper Station River Late Run	120,000	265,000	BEG	Met	Met	Met	Met	Met	Met	Under	Met	Met	No

West	Sockeye	Frazer Lake	75,000	170,000	BEG	Met	Met	Met	Met	Met	Met	Met	Met	Met	No
West	Sockeye	Saltery Lake[j]	15,000	35,000	BEG	Met	Met	Met	Over	Over	Met	Met	Met	Over	No
West	Sockeye	Pasagshak River	3,000		lower-bound SEG	Met	Met	Met	Met	Under	Met[k]	Met[k]	Met[k]	Met[k]	No
West	Sockeye	Buskin Lake	5,000	8,000	BEG	Over	Over	Over	Met	Met	Over	Over	Over	Over	No

Footnotes by Region:

Southeast:

Note: NA = data not available. Blank cells indicate that there was no official escapement goal for the stock in that particular year.

[a] Escapement goal reevaluated, goal range changed.

[b] Prior to 2009, goal was based on index count of escapements.

[c] Escapement goal reevaluated, lower-bound changed.

d Management target revised.

[e] Escapement goal reevaluated, upper bound eliminated, lower bound remained the same.

[f] Expansion factor was removed from escapement estimates and escapement goal was reevaluated.

[g] Situk River weir was pulled well before peak of pink salmon run, therefore a valid assessment of whether the goal was met is not possible.

[h] Escapement goal reevaluated, odd and even-year goals replaced by single goal, goal range changed to lower-bound.

[i] Prior to 2005, escapement goal was based on weir counts. After 2005, escapements and escapement goal were based on mark-recapture estimates (see DerHovanisian and Geiger 2005).

[j] Escapement goal reevaluated, upper-bound changed.

[k] Alsek River sockeye salmon run is not regularly assessed, so escapement numbers are not available. Alsek River sockeye salmon are managed to meet Klukshu River escapement goal.

Central:

Note: NA = data not available; NC = no count; NS = no survey. There are no escapement goals for coho salmon in Bristol Bay or Lower Cook Inlet and there are no pink salmon escapement goals in Bristol Bay or Upper Cook Inlet.

[a] Escapement goal reevaluated, point goal changed to a range.

[b] Escapement goal reevaluated, historic escapements converted from Bendix counts to DIDSON equivalents. Escapements in Table 2 (of ADFG document) are based on DIDSON counts.

[c] Escapement goal reevaluated, point goal changed to a lower-bound goal.

[d] Previous escapement goal reinstated.

[e] Escapement goal reevaluated, goal range changed.

[f] Target strength based escapement estimate deemed unreliable or not available.

[g] Escapements and escapement goal reevaluated, goal range changed. Escapement estimates in Table 2 (of ADFG document) are based on new methodology.

[h] Escapement goal reevaluated, lower-bound goal changed to a range.

[i] Escapement goal reevaluated, current goal based on escapement count over longer period during spawning season, escapement numbers in Table 2 (of ADFG document) are based on longer counting time.

[j] Escapement goal reevaluated, escapement goal in place prior to 2002 was reinstated. Escapement goal in place from 2002 to 2007 was based on escapement estimates using a different aerial survey index expansion method (see Otis and Szarzi 2007).

[k] Escapement goal reevaluated, upper bound eliminated, lower bound remained the same.

[l] Escapement goal reevaluated, goal range changed to a lower bound goal.
[m] Escapement goal reevaluated, goal type changed but goal range remained the same.

Arctic-Yukon-Kuskokwim:

Note: NA = data not available; NS =no survey; ND = not determined yet. There are no escapement goals for pink salmon in Kuskokwim Area and Yukon River and there are no escapement goals for sockeye salmon in Yukon River.

a Escapement goal reevaluated, lower-bound goal changed to a range.

b Escapement goal reevaluated, goal value changed.

c Previous escapement goal was based on aerial surveys, replaced with escapement goal based on weir counts. Escapements in Table 3 (of ADFG document) are weir counts.

d Escapement goal revised by The United States and Canada Yukon River Panel.

e Escapement goal reevaluated, goal range changed to a lower-bound goal.

f Escapement goal reevaluated, goal type changed but goal value remained the same.
g Previous escapement goal was based on Bendix and Biosonics sonar counts, replaced with escapement goal based on DIDSON sonar counts. Escapements in Table 3 (of ADFG document) are in DIDSON units (see Molyneaux & Brannian 2006).

h Prior to 2007 escapement goal was based on escapements enumerated by aerial surveys of Niukluk and Ophir rivers. Escapements in Table 3 (of ADFG document) are weir counts.
i Escapement goal reevaluated, point goal changed to a lower-bound goal.

Westward:

Note: There are no coho salmon escapement goals in Chignik Area.

[a] Escapement goal reevaluated, goal range changed.

[b] Escapement goal reevaluated, goal type changed but goal range remained the same.

[c] Escapement goal reevaluated, upper bound eliminated, lower bound remained the same.

[d] Aggregate goal established to replace individual district level goals.

[e] Escapement goal reevaluated, goal range changed to a lower bound goal.

[f] Escapement goal reevaluated, lower bound goal changed.

[g] Goal reestablished. New analysis.

[h] Separate odd and even year goals were discontinued and a single goal established.

[i] Escapement goal reevaluated, upper bound of goal changed.

[j] Single escapement goal was separated into odd- and even-year escapement goals.

[k] Previous escapement goal reestablished.

[l] Single escapement goal was changed to separate early- and late-run escapement goals.
[m] Escapement goal reevaluated, goal type and range changed.

*****Extra notes about the Yukon and Kuskokwim stock of concern (SOC) designations**

7. Management actions and measures for the conservation of stock and the aquatic environment shall be based on the Precautionary Approach. Where information is deficient a suitable method using risk assessment shall be adopted to take into account uncertainty.

FAO CCRF 7.5.1/7.5.4/7.5.5
FAO ECO 29.6/32

Evidence adequacy rating:

High ☑ **Medium** **Low**

Rating Determination:

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 productive, 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.

The Precautionary Approach in Policy

Salmon Management

For the State of Alaska, adopted and ratified by the people almost 60 years ago, in 1956, the Constitution Article 8.4 in the state's Constitution states "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".

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

(A) a precautionary approach, involving the application of prudent foresight that takes into account the uncertainties in salmon fisheries and habitat management, the biological, social, cultural, and economic risks, and the need to take action with incomplete knowledge, should be applied to the regulation and control of harvest and other human-induced sources of salmon mortality;

(B) a precautionary approach requires consideration of the needs of future generations and avoidance of potentially irreversible changes; prior identification of undesirable outcomes and of measures that will avoid undesirable outcomes or correct them promptly; initiation of any necessary corrective measure without delay and prompt achievement of the measure's purpose, on a time scale not exceeding five years, which is approximately the generation time of most salmon species; that where the impact of resource use is uncertain, but likely presents a measurable risk to sustained yield, priority should be given to conserving the productive capacity of the resource;

(C) appropriate placement of the burden of proof, of adherence to the requirements of this subparagraph, on those plans or ongoing activities that pose a risk or hazard to salmon habitat or production; a precautionary approach should be applied to the regulation of activities that affect essential salmon habitat.

Habitat/Ecosystem protection

Further, Alaska's Sustainable Salmon Policy (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 incorporated in the establishment of escapement goals for each stock.

In terms of the ecological provisions set forth in the Alaska's Sustainable Salmon Policy, a list is provided:

- Maintenance of wild salmon stocks and salmon habitats at levels of resource productivity that assure sustained yields through protection of spawning, rearing, and migratory habitats;
- Maintenance of salmon habitats beyond natural perturbation and boundaries of variation.

- Preparation of scientific assessments of possible adverse ecological effects of proposed habitat alterations and the impacts of those alterations on salmon populations before approval of a proposal.
- Assessment of adverse environmental impacts on wild salmon stocks and the salmon's habitats.
- Protection of all essential salmon habitats in marine, estuarine, and freshwater ecosystems and access of salmon to these habitats. Essential habitats include spawning and incubation areas, freshwater rearing areas, estuarine and nearshore rearing areas, offshore rearing areas, and migratory pathways.
- Protection of salmon habitat in fresh water on a watershed basis, including appropriate management of riparian zones, water quality, and water quantity.
- Protection of salmon stocks within spawning, incubating, rearing, and migratory habitats.
- Assessment of degraded salmon productivity resulting from habitat loss, considered, and controlled by affected user groups, regulatory agencies, and boards when making conservation and allocation decisions.
- Assessment of effects and interactions of introduced or enhanced salmon stocks on wild salmon stocks and wild salmon stocks and fisheries on those stocks and protection from adverse impacts from artificial propagation and enhancement efforts.
- Restoration of degraded salmon spawning, incubating, rearing, and migratory habitats to natural levels of productivity.
- Establishment of ongoing monitoring activities to determine the current status of habitat and the effectiveness of restoration activities.
- Allowance of recovery for depleted salmon or, where appropriate, active restoration and and maintenance of diversity to the maximum extent possible, at the genetic, population, species, and ecosystem levels.
- Management of salmon fisheries to allow escapements within ranges necessary to conserve and sustain potential salmon production and maintain normal ecosystem functioning.
- Management of salmon escapement 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.
- Evaluation of the role of salmon in ecosystem functioning and consideration in harvest management decisions and setting of salmon escapement goals (see State of Alaska Regulation 5 AAC 39.222).

Mixed Stock Fisheries

5 AAC 39.220. Policy for the management of mixed stock salmon fisheries. In applying this statewide mixed stock salmon policy for all users, conservation of wild salmon stocks consistent with sustained yield is accorded the highest priority. Allocation of salmon resources under this policy is consistent with the subsistence preference in AS 16.05.258 , and the allocation criteria set out in 5 AAC 39.205, 5 AAC 75.017, and 5 AAC 77.007.

Also, in the absence of a regulatory management plan that otherwise allocates or restricts harvest, and when it is necessary to restrict fisheries on stocks where there are known conservation problems, the burden of conservation is shared among all fisheries in close proportion to their respective harvest on the stock of concern. The board recognized that precise sharing of conservation among fisheries is dependent on the amount of stock-specific information available.

The board's preference in assigning conservation burdens in mixed stock fisheries is through the application of specific fishery management plans set out in the regulations. A management plan incorporates conservation burden and allocation of harvest opportunity.

Most wild Alaska salmon stocks are fully allocated to fisheries capable of harvesting available surpluses. Consequently, the board restrict new or expanding mixed stock fisheries unless otherwise provided for by management plans or by application of the board's allocation criteria. Natural fluctuations in the abundance of stocks harvested in a fishery will not be the single factor that identifies a fishery as expanding or new.

Various concepts in line with the precautionary approach are also applied into the Management Plan for High Impact Emerging Fisheries (5AAC 39.210).

http://www.legis.state.ak.us/basis/folioproxy.asp?url=http://wwwjnu01.legis.state.ak.us/cgi-bin/folioisa.dll/aac/query=[JUMP:'5+aac+39!2E222']/doc/{@1}?firsthit

Managing Salmon in Alaska

Escapement goals are based on a number of scientific evaluation methods, founded in the sustained yield principle highlighted in the State Constitution (Article VIII, section 4) and in state statute (AS 16.05.020). Several policies in Alaska Administrative Code also provide guidance for establishing escapement goals including the policy for the management of sustainable salmon fisheries (5AAC 39.222), the policy for statewide salmon escapement goals (5 AAC 39.223) and the policy for the management of mixed stock fisheries (5 AAC 39.220). These policies provide detailed definitions of specific escapement goal types, outline the responsibilities of the ADFG and the BOF in establishing goals, and provide general direction for development and application of escapement goals in Alaska. Where escapements chronically (4-5 years) fail to meet expectations for harvestable yield or spawning escapements, the department may recommend, and the board may adopt a stock of concern designation for those underperforming salmon stocks.

Chinook salmon stock assessment and research plan (ADFG 2013)

The central objective of the Chinook salmon stock assessment and research plan implementation is to create a consistent stock assessment framework across a 12 diverse 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.

http://www.adfg.alaska.gov/static/home/news/hottopics/pdfs/chinook_research_plan.pdf

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 was appropriated for the year 2013 and 2014; the assessment team considers that this management response is appropriate for the issue at hand , in line with improving the state of Chinook salmon stocks In the A-Y-K, Westward, Central and Southeast Management Regions, and in accordance with a precautionary approach to management.

Decreasing uncertainty in Western Alaska Fisheries management

Western Alaska Salmon Stock Identification Program (WASSIP)

ADFG announced the publication of results of the Western Alaska Salmon Stock Identification Program (WASSIP) in 2012. Results can be found in 9 reports on the ADFG website: http://www.adfg.alaska.gov/index.cfm?adfg=wassip.tds. This follows 8 years of a stakeholder-driven program with scientists to address long-standing questions about harvest patterns of commercial and subsistence fisheries in western Alaska. The process involved 11 signatories representing fishing, Alaska Native and government interests that served as an Advisory Panel along with a 4-member Technical Committee.

Most of the catch of sockeye and chum salmon comes from terminal fisheries near spawning locations but mixed-stock fisheries do occur in non-terminal (non-local) areas. Uncertainty about the magnitude, frequency, location and timing of non-local harvest was the motivation for the WASSIP study. WASSIP was designed to use genetic data in mixed-stock analysis (MSA) to reduce the uncertainty. MSA has been used effectively for estimating stock composition in mixed-stock fisheries throughout the Pacific Rim.

The baseline data for sockeye comprises populations ranging along a coastline of about 6,000 km and genetic markers using single nucleotide polymorphisms (SNPs). The current WASSIP baseline for sockeye is comprised of 39,205 fish, 294 populations and 96 SNPs. This represents 10,000 additional fish and twice the number of markers compared to the previously published baseline (2010). The current WASSIP baseline for chum is comprised of 32,817 fish, 310 populations and 96 SNPs and represents an increase in the number of populations and markers reported in previous studies.

More than 225,000 samples of sockeye and chum collected from Chignik to Kotzebue over a 3 year period (2006-2008) were analyzed to determine stock-specific composition, catch and harvest rates of sockeye and chum salmon. In all, the study represents a very comprehensive program of sampling and analytical effort that has effectively reduced uncertainty is stock composition, harvest and harvest rates of sockeye and chum salmon supporting the management regulatory process in western Alaska.

Precautionary Approach in Hatcheries Practices

There are very well prescribed Statutes and laws for planning of hatchery developments (see evidence under fundamental clause 3 for evidence). In particular, there is clear policy that ensures that hatcheries are placed in areas that causes least likely risk of mixing with existing wild stocks. 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, colour etc). An extremely wide, pre-determined number of returning fish are used for stripping of ova 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 (Reference to Genetic Policy, 1985, and communications in the March site visits with the managers of DIPAC and PWSAC).

Key Aspects of Salmon Enhancement Management in Alaska

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

Minimizing Hatchery-Wild Stock Interactions

- Comprehensive regional planning.
- Utilise conservative fish culture practices.
- A rigorous hatchery permitting process that includes genetics, pathology and fishery management reviews.
- Statewide genetics policy to guide hatchery program and practices to allow protection of wild stocks by avoiding foreseeable negative effects.
- Fish health and disease statutes (no disease has ever been introduced or amplified in the wild).
- Careful siting of hatcheries, terminal harvest areas (temporal and spatial segregation from wild stocks to minimize mixed fisheries, then harvest all the returning salmon to minimize potential breeding. Hatchery production is not approved if there is not high confidence that the resulting salmon will be fully harvested –decreasing the potential of hatchery strays).
- Hatchery brood stock diversity practices (fish selected at random and not on external trait basis such as size, colour or shape, 1 to 1 mating ratio, effective population sizes extremely large – especially true for pink and chum salmon in SEAK and PWS).
- Use of local brood sources is priority.
- Collection of broodstock for the hatcheries is stratified over spawn/run timing to maximize the heterogeneity of the gene pool.
- Mass otolith marking for real-time in-season fisheries management. All hatcheries with significant production in Southeast, Central and Westward Region (apart from Kitoy Bay and Pillar Creek hatcheries, in Kodiak) thermally mark virtually all of their releases for identification of hatchery salmon during harvest.

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

Fundamental Clause 7. Minor Non Conformance Assigned during the 1st Surveillance Activities in 2012

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 negative genetic interactions between hatchery and wild salmon could already be occurring, and that research results of the genetic interactions between hatchery and wild salmon following the 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 this issue and
2) a set of specific timelines to allow for assessment during the next surveillance activities in 2013, 2014 and 2015 and the second full assessment audit in 2016, as relevant and if needed.
The action plan is available in the surveillance report 1 and provided a response to these requests.

Changes in Hatchery Production

The table below summarizes the increases in hatchery capacities that were approved in 2012. The allowed increases was essentially one in 2012 (Hidden falls coho, 0.8 million eggs). The approval for 7 million green eggs increase in Medvejie Creek was requested, reviewed and recommended in 2011, but otherwise just a housekeeping PAR to correct stated capacity was approved. Burnett Inlet too dealt with capacity of 2.0 million eggs of coho salmon from one hatchery to another one. No other increases in salmon production were allowed in other sites in Southeast or in Prince William Sound.

2012 Hatchery Approvals

Region	Hatchery	Species	Change in hatchery permitted capacity via approved PAR	Total hatchery permitted capacity after approved PAR (by species)	Region-wide permitted capacity after approved PAR (by species)
Southeast	Hidden Falls	Coho salmon	0.8 million green eggs	7.7 million green eggs	39.72 million green eggs
Southeast	Medvejie Creek[1]	Chum salmon	7 million green eggs	77 million green eggs	584.80 million green eggs
Southeast	Burnett Inlet[2]	Coho salmon	2.0 million green eggs	4.5 million green eggs	41.72 million green eggs

[1] Housekeeping PAR, to correct stated permitted capacity to the level previously requested, reviewed, and recommended in 2011.

[2] This approved PAR moved production from Whitman Lake Hatchery to Burnett Inlet Hatchery; no increase in production overall.

2013 PAR Changes

In terms of high release species in the PWS and SEAK region (pink and chum salmon respectively), between 2012 and 2013 there has been a total permitted capacity increase of 8 million chum eggs in the SEAK Region. This is equivalent to a 1.3% increase in chum salmon production in the Region (from 584.8 to 592.8 million eggs).

2013 Hatchery Approvals SEAK

Region	Hatchery	Species	Change in hatchery permitted capacity via approved PAR	Total hatchery permitted capacity after approved PAR in 2013 (by species)
Southern Southeast	Burnett Inlet	Chum salmon	6 million eggs	31 million eggs
Northern Southeast	Sheldon Jackson	Chum salmon	2 million eggs	12 million eggs
Northern Southeast	Medvejie	Coho salmon	2.9 million eggs	3.3 million eggs

No increase in pink salmon, chum salmon or any other species production has been permitted in the Prince William Sound Area from 2012 to 2013.

http://www.adfg.alaska.gov/FedAidPDFs/FMR13-05.pdf
http://www.adfg.alaska.gov/FedAidpdfs/FMR14-12.pdf

Considerations made prior to approval decisions of Permit Alteration Requests

Generally speaking, Permit Alteration Requests (PARs) are brought in front of the Regional Planning Team Meetings for discussion between ADFG staff, industry and other stakeholders, before formal decisions are taken.

Salmon enhancement in Alaska and its potential effects on wild stocks

Alaska's modern salmon fishery enhancement program is stakeholder driven, with provisions for planning and oversight by representatives of regional user groups. Since ADFG is expanding studies of wild and hatchery interactions to better understand those relationships as they occur in Alaska.

- From the beginnings of Alaska's salmon fishery enhancement program it was recognized that salmon stray and that hatchery stocks would stray; consequently, policies and regulations were adopted to mitigate concerns associated with straying.
- For the protection of wild salmon stocks, hatchery programs are required to use local stocks as the brood source and locate hatcheries away from important wild stocks. Requiring the use of only local salmon stocks means that straying hatchery fish are less likely to reduce fitness of local populations.
- In the 1980's hatchery programs in Alaska pioneered use of otolith thermal marks for mass-

marking hatchery production. Now almost 100% of all hatchery salmon in most of the state are marked. Marking programs have made possible accurate detection of hatchery-bred salmon on the spawning grounds of wild salmon.
- Straying on a sub-regional level appears to be on the order of 5 to 10% for pink and chum salmon; and less for other species. However, in a few select streams it can be over 50%.

These observations have raised several important questions:

1. Are hatchery-bred salmon interbreeding with wild salmon to the extent that fitness and productivity of these stocks are being diminished?
2. Is the annual assessment of wild stocks (which is, in large part, based on visual observation) so biased by the presence of hatchery salmon that excessive harvest of wild fish is being allowed or that escapement goals are difficult to set and difficult to assess?
3. Do density interactions diminish productivity of wild salmon?

Prince William Sound Science Center (PWSSC), in conjunction with Sitka Sound Science Center (SSSC), submitted the successful proposal and the contract was approved to conduct a portion of this project. The study was designed, and continues to be guided, by a Science Panel organized by ADFG consisting of state, federal, NGO, and academic experts on salmon biology and management, genetics, hatchery issues, and experimental statistics. In the winter of 2013, PWSSC will present the first annual report for review by the science panel and department. The science panel will continue to advise the department on how to proceed.

Written reports

Proposed reports will consist of complete description of preceding field data methods and the data collected. Reports will include any analyses that can be made with the data available up to that time. Reports will be progressive, i.e., will include all data and analyses from the beginning of the project up to the date of the report. Annual progress will be submitted in December of each year, except that the final report will be submitted in January of 2016, so that it can be reviewed by ADFG staff and then revised based on their comments prior to the March, 2016 contract end date.

Workshops

The Project Manager and one or more Project leaders will host a workshop in late November or early December of 2013 to provide ADFG staff with an in-person overview of the progress made and challenges encountered, so that mid-course adjustments can made if necessary.

Schedule

As proposed by the Prince William Sound Science Center (PWSSC), a summary of the expected timing of major activities is:

Year	Season	Activity
2012	Summer	• Preliminary trials of the ocean sampling • Initial reconnaissance on the 10 intensive streams to begin mapping • Collect otoliths from potential intensive streams where the stray rates are uncertain
2013	Spring	• Preliminary evaluation of the redd pumping techniques on one or more SEAK streams
	Summer	• Prince William Sound (PWS) Ocean sampling • PWS and Southeast Alaska (SEAK) streams sampling - extensive and intensive
	Winter	• **Annual progress report and workshop**
2014	Spring	• Intensive alevin sampling in PWS and SEAK
	Summer	• PWS Ocean sampling • PWS and SEAK streams sampling - extensive and intensive
	Winter	• **Annual progress report**
2015	Spring	• Intensive alevin sampling in PWS and SEAK
	Summer	• PWS and SEAK streams sampling - extensive and intensive
		• **Annual progress report**
2016	Spring	• Intensive alevin sampling in PWS and SEAK
	Winter	• **Annual progress report and workshop**

Although the entire project is anticipated in the RFP to extend through 2018 for the straying aspects, and through 2023, for the fitness studies, the scope of the Phase One proposal is limited to the period July 1, 2012 through March 21, 2016. The current research programme, headed by the PWSSC includes data collection for three complete annual cycles of adults in streams and their resultant offspring alevins. It also includes one preparatory season followed by two full seasons of adult sampling in the ocean (because budget limitations, the third full season of ocean sampling is suggested to be funded at a later date). The work described will provide a substantial beginning to the longer term project.

A first summary report of these research activities was posted in April 2013 on the ADFG website: Interaction of Wild and Hatchery Pink and Chum Salmon in Prince William Sound and Southeast Alaska, Annual Report 2012

The second draft report for the research activities carried out in 2013 was not available at the time of completing this 3rd surveillance audit report.

D. Management Measures

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

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

Evidence adequacy rating:

☑**High** **Medium** **Low**

Rating Determination

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 inseason 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 inseason 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.

Commercial Fisheries Regulations

Commercial and Subsistence Fishing and Private NonProfit Salmon Hatcheries

Fisheries regulations are published for the various areas in Alaska. These documents contain selected Alaska statutes enabling legal management of resources, statewide general provisions and the area specific provisions including area description, geographical extent and position of fishing district and subdistricts, seaward boundaries of fishing districts, fishing seasons, weekly fishing periods, gear allowances in the various districts, gillnet, seine, troll, fish-wheel specifications and operations, minimum distance between units of gear, vessel and gear identification, waters closed to commercial fisheries, salmon fishermen, processor and buyer permit, reporting and landing requirements, fish size limits, river/fishery/region specific fishery management plans, salmon hatcheries management plans, salmon enhancement allocation plans etc...

The regulations as outlined in the documents below may be changed by emergency regulations or emergency orders at any time. Supplementary changes to these regulations are available at offices of the Department of Fish and Game.

- 2014-2017 Chignik and Kodiak Areas Commercial Salmon Fishing Regulations (*PDF 1,217 kB*)
  (Includes changes made effective March 9, 2014 and May 1, 2014)
- 2014-2017 Cook Inlet Area Commercial Salmon Fishing Regulations (*PDF 1,148 kB*)
  (Includes changes made effective March 22, 2014 and May 18, 2014)
- 2013-2016 Alaska Peninsula, Atka-Amlia Islands, and Aleutian Islands Areas Commercial Salmon Fishing Regulations (*PDF 1,177 kB*)
  (Includes changes made effective June 1, 2013)
- 2012–2015 Prince Wiliam Sound Commercial Salmon Fishing Regulations (*PDF 928 kB*)
- 2012 –2015 Southeast Alaska and Yakutat Commercial Salmon Fishing Regulations (*PDF 1,098 kB*)
- 2013-2016 Bristol Bay Commercial Salmon Fishing Regulations (*PDF 1,229 kB*)
  (Includes changes made effective in April 2013)
- 2013-2016 Arctic-Yukon-Kuskokwim Commercial-Subsistence-Personal Use Finfish and Shellfish Fishing Regulations (*PDF 1,092 kB*) *(Includes changes made effective April 13, 2013)*
- 2013-2014 Commercial Finfish and Shellfish Fishing General Regulation and Statute Provisions (*PDF 856 kB*)
  (Includes changes made effective June 1, 2013)
- 2014-2015 Subsistence and Personal Use Statewide Fisheries Regulations (*PDF 990 kB*)
  (Includes changes made effective through June 27, 2014)

http://www.adfg.alaska.gov/index.cfm?adfg=fishregulations.commercial

Escapement goals and salmon management

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.

- Biological Escapement Goals (BEGs) are usually established using stock-recruit information which generally requires multiple years of run reconstructions to establish. BEGs are expressed as a range based on factors such the productivity of the stock and data uncertainty.

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

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

Emergency Orders and Inseason Management

Emergency Orders (EOs) have the force and effect of law after announcement by the ADFG commissioner or an authorized designee. Sustained yield management of commercial salmon fisheries requires precise timing of fishery openings and closures and adjustments in gear, often with short notice, to allow or constrain the harvest of fish, ultimately assuring adequate escapement of spawning fish. EOs are widely used to open and close fisheries as needed by local area biologists, based on information on run strength and escapement goals. In 2013, 798 Emergency Orders have been released to open and close commercial salmon fisheries in the Southeast, Central, Westward and Artic-Yukon-Kuskokwim management regions.

These EOs can be found in the *Regulation Announcements, News Releases, and Updates for Commercial, Subsistence and Personal Use Fishing* page at the ADFG website at http://www.adfg.alaska.gov/index.cfm?adfg=cfnews.main

EOs are a testament to the flexibility of inseason management as carried out by the Department to manage salmon using run size and timing information among other parameters. This allows for the achievement of escapement goals-based management objectives.

Time and area restrictions limit when and where specific fisheries occur and restrictions are also imposed by regulation on all types of fishing gear (e.g., mesh size restrictions and length of nets for gillnets, number of fishing lines, rods, and gurdies for troll gear, and mesh size, net length and depth for purse seine gear). Specific requirement for gear (i.e. gillnet length, depth, and mesh sizes) are defined for each area and in specific management plans and regulations.

Enforcement agencies spend much of their resources checking that fishing vessels at the onset of a given fishery start and finish at the established time, that the gear used is that allowed by regulation, and that reporting requirements are fulfilled, among other things. All gear types in Alaska are strictly regulated, in many cases different salmon fisheries have different gear requirements and restrictions to increase selectivity and decrease incidental non target catches (i.e. other salmon species). Types of legal gear are listed in 5AAC 39.105.

Management of Alaskan salmon stock without formal escapement goals

Not all Alaska salmon fisheries and salmon stocks are managed with formal escapement goals. These include stocks with low fishery impact, poor stock assessment data quality or cases where escapement goals do not affect management actions of the stock. In some cases stocks are managed wholly or partially without escapement goals. Here below some examples are provided (not a comprehensive list) for the 4 management regions of Alaska. It should not be assumed that any fishery not described below is managed by escapement goal.

Summary of Examples

Yukon & Northern

Yukon Summer Chum Salmon (No escapement goal)

There are no formal escapement goals for the majority of chum salmon stocks in the Yukon (http://www.sf.adfg.state.ak.us/FedAidpdfs/FMS09-07.pdf, page 12). The summer chum management plan (http://touchngo.com/lglcntr/akstats/aac/title05/chapter005/section362.htm) sets out management actions based on projected run sizes across the entire Yukon region. Components of the fishery (subsistence, commercial, sport, personal use) are opened/closed as follows:

- Projected run of 600,000 fish or less = all fisheries closed, except subsistence under some circumstances.
- 600,000 – 700,000 fish = all fisheries except subsistence closed, subsistence managed to achieve an escapement of 600,000.
- 700,000 – 1,000,000 fish = Subsistence fishery open and other fisheries possibly opened in

geographical areas where individual escapement goals are met.
- 1,000,000+ fish = fishery opened and managed for a guideline harvest level of 400,000 - 1,200,000 fish, distributed in a prescribed manner between the various districts.

Projected run size is primarily estimated using past run size data, recognising the age classes which will dominate the run and therefore the years which are most relevant. For example, the strength of the summer chum salmon run in 2012 was projected to be dependent on production from the 2008 (age-4 fish) and 2007 (age-5 fish) escapements, as these age classes dominate the run. Both 2007 and 2008 produced runs of approximately 1.9 million fish. Combining this information with estimates of 'predicted return per spawner', ADFG predicted the summer chum run would provide a harvestable surplus of 500,000 – 1,000,000 fish.

This estimate is further updated in response to in-season indicators such as Pilot Station sonar project passage estimate, test fishing indices, age and sex composition, subsistence and commercial harvest reports, and information from escapement monitoring projects. Emergency orders and other in-season management measures are then implemented by local fishery managers to ensure the stock is not over-exploited (http://www.adfg.alaska.gov/FedAidpdfs/FMR12-23.pdf, p. 36).

Kuskokwim

Kuskokwim all species

In 2010 the Kuskokwim management area contained 25 escapement goals, of which 14 were for Chinook, 4 for chum, 4 for sockeye and 3 for coho (http://www.sf.adfg.state.ak.us/FedAidpdfs/FMS09-07.pdf, p.7).

In addition to the escapement goals (where present), the Kuskokwim salmon fisheries are managed according to the Kuskokwim River Salmon Rebuilding Management Plan (http://www.touchngo.com/lglcntr/akstats/aac/title05/chapter007/section365.htm), which was introduced in 2001.

The commercial fisheries are opened when "*inseason indicators of run strength indicate a run strength that is large enough to provide for a harvestable surplus and a reasonable opportunity for subsistence uses*". To determine what constitutes a 'reasonable opportunity', the BOF has calculated the 'amount necessary for subsistence' (ANS) for each species in the Kuskokwim area, most recently updated in 2004. The values for Kuskokwim River itself are 64,500 to 83,000 Chinook salmon, 39,500 to 75,500 chum salmon, 27,500 to 39,500 sockeye salmon, and 24,500 to 35,000 coho salmon. The ANS range for the remainder of the Kuskokwim Area is from 7,500 to 13,500 salmon (http://www.adfg.alaska.gov/FedAidpdfs/FMR11-67.pdf, p.7).

Other significant components of the management plan include:
- The commercial King (Chinook) fishery is closed; the GHL for incidental Chinook catch in other fisheries is 0 – 50,000 fish.
- The GHL for sockeye is 0 – 50,000 fish.

Management of those stocks without escapement goals is therefore primarily by in-season management measures instigated by managers based on all available data, including projected run size, aerial surveys, escapements in those streams which are monitored, catch and other information.

Central

Four annual management reports are published for the Central management area:

- Bristol Bay
- Upper Cook Inlet
- Lower Cook Inlet
- Prince William Sound

Escapement goals are reviewed in each of these sub-areas separately.

Bristol Bay

Bristol Bay salmon fisheries are divided into ten river systems as listed in the table below. In 2012 an escapement goal review was carried out (http://www.adfg.alaska.gov/FedAidPDFs/FMS12-04.pdf), the results of which are also provided in the table. Between 2006 and 2012, coho and pink salmon were managed entirely without escapement goals; since the review in 2012, escapement goals have been re-introduced in the Nushagak river system but continue to not be used elsewhere. Summary of stocks for which escapement goals are established as of the 2012 escapement review. 'X' indicates an escapement goal is established. (http://www.adfg.alaska.gov/FedAidPDFs/FMS12-04.pdf) NOTE: the absence of an 'X' does not indicate a fishery without an escapement goal; there are not substantial fisheries for all species in all districts.

River	Chinook	Chum	Coho	Pink	Sockeye
Alagnak	X				X
Egegik	Eliminated 2012				X
Igushik					X
Kulukak					Eliminated 2012
Kvichak					X
Naknek	X				X
Nushagak	X	X	Created 2012	Created 2012	X
Togiak	Eliminated 2012				X
Ugashik					X
Wood					X

Bristol Bay Coho & Pink salmon (No escapement goals 2006 – 2012, outside this period escapement goals only set in Nushagak district).

A historical Coho SEG for Nushagak was dropped in 2006 by the escapement review and a new SEG set in 2012. Between these years the stock was managed without an official escapement goal. The smaller coho fisheries in the other Bristol Bay districts have always been managed without an escapement goal (http://www.adfg.alaska.gov/FedAidPDFs/FMS12-04.pdf, p. 10 & 11).

The same is true of Pink salmon, which was without escapement goal between 2006-2012 in Nushagak and permanently in the other districts. The 20-year average harvest of these species (in 2011) was 84,000 and 253,000 (even years only) respectively. The management of these stocks therefore represents a straightforward example of salmon management without escapement goals. Note that there are not necessarily substantial fisheries for these two species in all of the river systems listed above. The majority of pink salmon landings are in the Nushagak, Togiak and Naknek-Kvichak regions, with very few landings in odd years.

Coho salmon landings are more evenly spread across the districts, although the most significant landings are made in Nushagak, especially in recent years (http://www.adfg.alaska.gov/FedAidpdfs/FMR12-21, p76 & 77).

Nushagak District – There was very little directed effort towards Coho in 2011, with total landings of 4,613, and as an odd-numbered year there was almost no Pink salmon fishery. The 2010 Annual Management Report (http://www.adfg.alaska.gov/FedAidpdfs/FMR11-23.pdf) provides a better example of the management process in years where there is a substantial fishery.

The 2010 management report references the Nushagak Coho Salmon Management Plan (http://www.adfg.alaska.gov/static-sf/management_areas/PDFs/bbcohopl.pdf) which sets escapement goals and other harvest control rules for the stock.

The management plan directs ADFG to managed the fishery to achieve an escapement of 100,000 Coho, measured by sonar, by August 25th (http://www.adfg.alaska.gov/FedAidpdfs/FMR11-23.pdf, p. 16). The historical SEG was 50,000 – 100,000 (http://www.adfg.alaska.gov/FedAidPDFs/FMS12-04.pdf, p. 10).
At the time of the 2010 report the sonar station referenced in the management plan was no longer being used to monitor Coho escapement, and there was no forecast of expected run size. Based on the information provided in the 2010 Annual Management Report (AMR), there does not appear to have been any management plan or escapement target for Pink salmon in Nushagak 2006-2012.

The relevant section of the AMR describes the management of the two species as follows:
"*In the fall of 2009, processors expressed interest in buying pink salmon in the Nushagak District during the 2010 season. With no escapement enumeration and uncertain participation, ADFG staff set a preliminary schedule based on stakeholder input. The preseason schedule called for commercial fishing 6 days per week for 15 hours each day. On alternate days, fishing gear would be restricted to pink salmon mesh (4.75 inches or smaller) for the conservation of coho salmon. The alternate gear openings would provide an opportunity to determine if the smaller mesh resulted in lower coho salmon catches. Fishing time would be adjusted inseason based on effort and harvest.*
The department's goal was to achieve escapement for coho and pink salmon while providing a harvest opportunity for fish surplus to escapement needs. Fishing was closed in the Nushagak District on July 24 and July 25 and the transition to pink and coho salmon management occurred on

July 26. There was some concern about poor sport fishing for coho salmon in the Wood River but other reports indicated sport fishing for coho salmon was good despite high water on the Nushagak River. However, because of community concerns regarding coho salmon escapement, fishing time on unrestricted mesh days was reduced beginning July 29. With no measure of escapement available and high water preventing any meaningful aerial surveys, fishing time was reduced as the number of deliveries increased. On August 5, all future openings were restricted to 4.75 inch mesh or smaller and periods were limited to 10 hours per day. The final period occurred on August 10 for 8 hours.
The total pink salmon harvest was 1.3 million fish, 26 times more than the average harvest since 1990 and more than the total pink salmon harvest in the Nushagak District in the last 20 years combined. The 69,186 coho salmon harvested in 2010 was double the latest 10-year average harvest of 39,000." (http://www.adfg.alaska.gov/FedAidpdfs/FMR11-23.pdf, p.16 & 17).

These fisheries were managed by in-season management measures described later in this document. Formal escapement goals for pink and coho were then assigned in 2012.

Naknek/Kvichak District – Sockeye fishery extensively managed and forecasted. There is no forecasting for Coho or Pink salmon; however the 2011 removals were very small – 633 coho salmon and no reported pink salmon (this was an odd-numbered year; Pink landings in 2010 were 8,237). Based on the AMR there does not appear to be any monitoring of pink or coho escapement or in-season management, probably due to the small numbers.

Togiak District – The 2010 AMR again provides a better explanation of the management process due to it being an even-numbered year; however even this provides limited detail. In 2010, "*Coho salmon began to appear in catches in the last week of July and focus shifted* [from sockeye management] *to coho salmon management. Participation and harvest was at historical averages for August. A small group of permit holders continued to fish with above average coho salmon fishing into the beginning of September. Buying ceased for the season on September 3 with a cumulative coho salmon harvest of 23,730 fish.*" (http://www.adfg.alaska.gov/FedAidpdfs/FMR11-23.pdf, p. 19).

Although the 2011 AMR reports total landings of pink salmon in 2010 to be 39,734 fish (http://www.adfg.alaska.gov/FedAidpdfs/FMR12-21, p. 76), the 2010 AMR does not mention Pink salmon landings in the Togiak district, nor explain the management process. Based on the AMRs, there does not appear to be an enumeration of pink or coho salmon escapement in Togiak district.

Upper Cook Inlet (UCI)

UCI sockeye

Management of UCI commercial sockeye fisheries is driven primarily towards achieving the Kasilof and Kenai River sockeye salmon escapement goals. There are relatively lengthy series of escapement and return data for those systems and the escapement goals are derived from stock-recruit modelling approaches. With only 5 years of escapement data derived from wier counts, the 2013 review committee concluded that escapement data for Little Susitna River sockeye is currently not sufficient to develop an escapement goal for that system.

UCI Coho

The 2013 review committee (www.adfg.alaska.gov/static/regulations/.../pdfs/2013.../FMS13-13.pdf) assessed available escapement data from the Deshka River weir and concluded that a Susitna drainage-wide goal would best suit management needs. The committee recommended that an escapement goal not be developed for Deshka River coho salmon because run timing and abundance is difficult to assess accurately during periods of high stream flow and because highly variable inter-annual run timing based largely on stream flow limits the ability of the weir to provide reliable inseason information to manage the sport fishery. The AMR indicates that ongoing studies in the Susitna drainage should help evaluate whether Deshka River coho run strength is representative of run strength in the entire Susitna drainage and whether a drainagewide escapement goal can be developed. Currently, there are only 3 years (2010–2012) of drainagewide estimates for Susitna River coho salmon.

The 2013 review committee recommended no goal be developed for Big River Lake and Kustatan coho stocks because ADFG does not have an escapement monitoring program for coho salmon on these systems or any other comparable system from which to establish escapement goals.

UCI Pink

There are no UCI pink salmon systems with an escapement goal and no species-specific enumeration projects in place. The only data available to managers of pink salmon in the UCI are from commercial fisheries harvests, recreational fishing surveys, and some information collected at projects that are designed to enumerate other species. Commercial harvest data are the main source of population estimates, which ADFG recognises is not a particularly effective indicator. A marine tagging project designed to estimate the total population size, escapement, and exploitation rates for coho, pink, and chum salmon returning to UCI was conducted in 2002, and estimated the exploitation rate on pink salmon by the UCI commercial fishery to range between 1% and 12%, with a point estimate of 2%, and so ADFG consider that the stock is in no danger of overfishing. (http://www.adfg.alaska.gov/FedAidpdfs/FMR12-25).

UCI Chum

Except for Clearwater Creek, there are no escapement goals for UCI chum salmon management. The only information available for most UCI chum stocks is commercial fishery catch data. Stock- specific catch data is not available. . The single escapement goal for Clearwater Creek represents only a small proportion of the fishery (although this escapement goal has been met or exceeded every year since it was established in 2002). Sporadic additional data are available from aerial surveys and projects designed to monitor other species, and are used to make general conclusions about run sizes and thus population health. Management of chum escapements to streams throughout UCI have occurred as a result of management actions or regulatory changes aimed principally at other species.

These actions have included:

- Significant reductions in the offshore drift gillnet and Northern District set gillnet fisheries to conserve Yentna River sockeye salmon
- Adoption of the Northern District Salmon Management Plan (5 AAC 21.358, http://www.touchngo.com/lglcntr/akstats/aac/title05/chapter021/section358.htm), which states that its primary purpose is to minimize the harvest of coho salmon bound for the Northern District
- The lack of a directed chum salmon fishery in Chinitna Bay
- Harvest avoidance by the drift fishery as a result of lower prices being paid for chum salmon than for sockeye salmon.

Based on the 2002 tagging study mentioned in the pink salmon section above, the commercial fishing exploitation rate on chum salmon was estimated at approximately 6%, and so ADFG consider that the chum stock is in no immediate danger of overfishing (http://www.adfg.alaska.gov/FedAidpdfs/FMR12-25, p. 36).

UCI Chinook

The 2013 committee recommended that no goal be developed for Kashwitna River Chinook salmon. The Kashwitna River Chinook escapement has been assessed annually by a single fixed wing survey since 1979. The Kashwitna River is a semi-glacial river.The system is difficult to assess due to turbid water conditions and only the north fork of the Kashwitna River is surveyed. Escapement surveys may not reflect the true spawning escapement. Ongoing Susitna-wide Chinook salmon abundance and distribution studies that started in 2012 may help determine if the north fork Kashwitna River is a reliable index stream.

Lower Cook Inlet (LCI)

Salmon management in the LCI Management Area, to the extent possible, has focused on terminal fishing areas associated with individual streams. Escapement goals have been derived for all 47 stocks (3 Chinook, 12 chum, 24 pink, 8 sockeye) that have historically received fishing pressure. In 2004, the escapement goals for Little and Big Kamishak River pink salmon were eliminated because no fishery targets these stocks and escapement monitoring was inconsistent. The goals for 4 pink salmon stocks in Resurrection Bay were eliminated because they are reportedly "*modest*" producers that rarely received commercial fishing effort and were inconsistently monitored. There are no escapement goals for LCI coho.

Southeast

An annual management report is published summarising the entire Southeast management area, with three additional, detailed reports divided by gear type and geographical location as follows:

- Yakutat set gillnet
- Southeast & Yakutat troll
- Southeast purse seine & drift gillnet

Southeast & Yakutat troll

Southeast Chinook troll (partially managed by escapement goal)

NOTE: There are 11 established Chinook escapement goals in the Southeast region (according to the Alaska Pacific Salmon Escapement Goals Summary published in 2012). These are referred to in the AMR as 'indicator systems' and appear to represent stocks within the broader quota-based management regime described below. In-season management measures are implemented similar to those in the escapement-based management in other regions, but the AMR does not include any substantial description of these (http://www.adfg.alaska.gov/FedAidpdfs/FMR12-02, p. 15).

The Southeast & Yakutat troll primarily targets Chinook and Coho salmon, although other species are caught incidentally. Chinook troll fisheries in the Southeast region are managed according to the Pacific Salmon Treaty (http://www.psc.org/pubs/Treaty/Treaty.pdf), an agreement between the USA and Canada for co-managing international salmon stocks. It is important to note that throughout the management process, Chinook are divided into two groups: treaty and non-treaty. Non-treaty individuals are primarily Alaska hatchery fish, and do not count towards the treaty quotas described below.

Chapter 3, Section 6 of the treaty states that between 2008 and 2013, selected Chinook fisheries (including the Southeast troll fishery) will be managed by Aggregate Abundance-Based Management regimes (AABM). Chapter 3, Section 6(a) defines AABM as:

"*an abundance-based regime that constrains catch or total mortality to a numerical limit computed from either a preseason forecast or an in-season estimate of abundance, from which a harvest rate index can be calculated, expressed as a proportion of the 1979 to 1982 base period.*" (Pacific Salmon Treaty, Chapter 3, Section 6(a)).

In relation to the determining of appropriate catch levels, Chapter 3, Section 9(e) of the treaty states:
"*the annual catch (or total mortality) limit applicable to each AABM fishery shall be based upon the best available pre-season predictions of abundance as determined by the CTC* [Chinook Technical Committee, maintained by the USA and Canadian governments and reporting to the Pacific Salmon Commission]." (Pacific Salmon Treaty, Chapter 3, Section 9(e)).

There are two seasons in the Chinook fishery; the winter season lasts from October to April inclusive, or until 45,000 fish are caught. The summer season runs from May to September inclusive, but may start early if the 45,000 fish quota is reached. The main difference between the seasons is that there are substantial regional closures during the winter season. 45,000 fish represents the Guideline Harvest Level (GHL) for the winter fishery, and fish tickets are monitored on a daily basis to ensure the fishery is closed upon reaching the quota.

The quota for the summer season is calculated based on pre-season estimates of abundance. An all-gear Allowable Catch (AC) is determined by the Joint Chinook Technical Committee (CTC) from the pre-season abundance indicators each spring, and is divided between the troll, net and sport fisheries according to a plan formulated by the ADFG (CTC Chinook catch and escapement report, 2011, p.3: http://www.psc.org/pubs/TCCHINOOK12-3.pdf).

The methodology used to estimate abundance indices is subject to annual assessment and adjustment by the CTC. This process is summarised in an annual "Exploitation Rate Analysis and Model Calibration" report (2012 report here: http://www.psc.org/pubs/TCCHINOOK12-4.pdf).
The relationship between abundance index and maximum all-gear catch is set out in Chapter 3, Table 1 of the treaty (p.63). Abundance indices themselves are determined using cohort analysis of release and recovery data, catch and escapement data, and other fishery dependent and independent data sources (2012 Exploitation Rate Analysis and Model Calibration, p.1: : http://www.psc.org/pubs/TCCHINOOK12-4.pdf).

The spring fishery (the first part of the summer season) primarily targets hatchery Chinook, although treaty fish are also captured. The spring fishery is divided into five fishing areas near hatcheries and release sites, each of which is managed separately. Although there is no absolute quota for the spring fisheries, each area is permitted to land a limited number of treaty individuals before the area is closed. The precise number is based on the ratio of treaty to non-treaty fish harvested (http://www.adfg.alaska.gov/FedAidpdfs/FMR12-02, p. 4).

Spring troll areas are opened from May 1st and are either open continually or on weekly schedules. The broader summer Chinook troll fishery targets the remainder of the treaty troll quota during one or more openings. The fishery is closed when estimates of total landings reach the allowed quota (http://www.adfg.alaska.gov/FedAidpdfs/FMR12-02, p.5).

The table below shows the deviations between total Chinook catch and treaty quota from 1999 – 2011. Note that these values cover the entire Southeast Alaska Chinook fishery and are not limited to the troll component.

Year	Treaty Harvest	Hatchery Add–on	Terminal Exclusion	Total Harvest	Treaty Quota	Over/Under Quota
1985	268,293	6,246	0	274,539	263,000	5,293
1986	271,262	11,091	0	282,353	263,000	8,262
1987	265,323	17,095	0	282,418	263,000	2,323
1988	256,787	22,525	0	279,312	263,000	-6,213
1989	269,522	21,510	0	291,032	263,000	6,522
1990	320,996	45,873	0	366,869	302,000	18,996
1991	297,986	61,476	0	359,462	273,000	24,986
1992	221,980	36,811	0	258,791	243,000	-21,020
1993	271,193	32,910	0	304,103	263,000	8,193
1994	235,165	29,185	0	264,350	240,000	-4,835
1995	176,939	58,800	0	235,739	175,000	1,939
1996	154,997	72,599	8,663	236,259	140,000–155,000	0
1997	286,696	46,463	9,843	343,002	277,000–302,000	0
1998	243,152	25,021	2,420	270,593	260,000	-16,848
1999	198,842	47,725	4,453	251,020	184,200	14,642
2000	186,493	74,316	2,481	263,290	178,500	7,993
2001	186,919	77,287	1,528	265,734	250,300	-63,381
2002	357,133	68,164	1,237	426,534	371,900	-14,767
2003	380,152	57,228	2,056	439,436	439,613	-59,461
2004	417,019	75,955	6,295	499,268	418,342	-1,323
2005	390,470	65,294	40,875	496,639	387,403	3,067
2006	362,402	49,111	26,979	438,493	354,530	7,872
2007	328,504	69,647	8,730	406,881	259,184	69,320
2008	173,040	68,163	6,147	247,350	152,850	20,190
2009	230,401	65,189	3,869	299,459	218,789	11,612
2010	231,591	55,816	121	287,528	221,823	9,768
2011	**289,980**	**67,225**	**1,147**	**358,352**	**294,800**	**-4,820**
					2001–2010 Sum:	-17,102

Summary data for Chinook in Southeast Alaska. 'Treaty Harvest' is the number of fish to which the treaty applied which were actually harvested; 'Treaty Quota' is the maximum number of fish to which the treaty applies which should have been harvested, based on the methodology described in the text. From the AMR, http://www.adfg.alaska.gov/FedAidpdfs/FMR12-02, p.20).

Southeast Coho troll (partially escapement-based management)

Coho fisheries in the Southeast management area are managed to adhere to the Southeastern Alaska/Yakutat Area coho salmon fishery management plan (5 AAC 29.110, http://www.touchngo.com/lglcntr/akstats/aac/title05/chapter029/section110.htm). One of the main components of the plan is a troll closure for up to seven days in late July if the total projected commercial harvest of wild coho salmon is less than 1.1 million fish. A second closure, for up to ten days, can be issued if "the number of coho salmon reaching inside waters might be inadequate to provide for spawning requirements under normal or restricted inside fisheries for coho salmon and other species". The primary indicators for determining whether the number of salmon might be inadequate are commercial catch and CPUE data, which are compared to historical values. In addition, in-season management is supported by a range of data including wild stock and hatchery stock CWT programs, dockside sampling programs to sample the harvest for CWTs, escapement monitoring, and the troll FPD collection program, all of which have been running since the 1980's. Finally, a model was developed in the late 1980's to accurately project the likely total landings based on late-June harvest data.

Westward

In addition to a region-wide summary report, five detailed annual management reports are published for the Westward management area:

- North Alaska Peninsula
- South Alaska Peninsula
- Kodiak
- Aleutian & Atka-Amlia Islands
- Chignik

North Alaska Peninsula

North Alaska Peninsula Chinook, outside the Nelson River

Total landings in 2012 across the entire North Alaska Peninsula area were 1,053 fish, significantly below the 10-year average of 5,057 per year (http://www.adfg.alaska.gov/static/regulations/regprocess/fisheriesboard/pdfs/2012-2013/area-m/frm12-52.pdf, p.3). Although Nelson River is the only Chinook stock with an escapement goal, escapement in other rivers is monitored and estimated, including King Salmon, Bear, and Sandy rivers (Bear River Section, weir counts); Ilnik river (weir count); Meshik River and tributaries (Inner Port Heiden Section, aerial survey); and Cinder River Section. There are only occasionally directed fisheries for Chinook, and in most years any catch is incidental in the sockeye fisheries.

South Alaska Peninsula

South Alaska peninsula Chinook

There are no South Alaska peninsula Chinook escapement goals because there are no directed Chinook fisheries (http://www.adfg.alaska.gov/static/regulations/regprocess/fisheriesboard/pdfs/2012-2013/area-m/fms13-01.pdf). There are no known Chinook spawning streams in the region, and all Chinook catch is incidental (http://www.adfg.alaska.gov/FedAidPDFs/FMR12-42.pdf, p.11).

Kodiak

Kodiak coho (some escapement goals)

A 2005 review of escapement goals in the Kodiak Management Area (KMA) recommended the elimination of a number of coho escapement goals due to the high level of uncertainty in the development of the goals, and the difficulty in monitoring the river systems. Of 16 SEGs in place before the review, it was recommended that 12 be eliminated, including: Saltery, Roslyn, Big Bay, Bear Creek, Portage, Pauls, Afognak, Karluk, Ayakulik, Akalura, Upper Station and Dog Salmon (http://www.sf.adfg.state.ak.us/FedAidPDFs/fms05-05.pdf, p.81).

The 2010 AMR confirms that the four remaining SEGs were the only ones still in place more recently (http://www.adfg.alaska.gov/FedAidpdfs/FMR10-47.pdf, p.20). The only established coho salmon escapement goals occur in Northeast and Eastside Kodiak districts for the following systems; American (400 fish), Olds (1000 fish), Buskin (3200 to 7200 fish) and the Pasagshak rivers (1200 fish). All systems but Olds were met. It is expected that coho salmon enter systems in the fall after weirs have been removed and aerial and foot surveys have concluded. The estimated coho salmon escapement in 2012 of 118,814 fish was above the previous 10 years average of 92,420 fish.

Kodiak sockeye

The 2004 ADFG escapement goal review recommended eliminating the Little River Lake escapement goal due to incomplete escapement data and the inability to actively manage escapements to the system. The SEG was dropped in 2005. The subsequent 2007 review recommended reinstating an escapement goal because the stock is located in an important commercial fishery section and potentially subject to high exploitation. A lower-bound SEG of 3,000 was implemented in 2008. In 2010 the SEG was further reviewed. At that time, the review team concluded that aerial surveys for the system were a low priority because no management actions are based on the SEG. The 2013 review team recommended eliminating the 2013 Little River Lake escapement goal.
(http://www.adfg.alaska.gov/static/fishing/PDFs/commercial/kodiak/2012_kodiak_salmon_summary.pdf)

Chignik Management Area (CMA)

Chignik sockeye

The only sockeye salmon stock with established escapement goals are for returns to the Chignik River. Sockeye returning to several smaller stream systems in the CMA do not have escapement goals due to their small size and limited sampling effort.

Chignik coho

Coho salmon escapement goals have not been established for the CMA. The majority of coho escapement in the CMA occurs after the Chignik River wier is pulled for the season and the inclement fall weather precludes reliable aerial surveys for estimating coho escapement. Catches of coho returning to the CMA are mainly caught incidental to the cockeye salmon fishery. If a directed coho salmon fishery occurs, catch per unit effort is used to manage the fishery. Coho salmon escapement estimates throughout the CMA appear to be consistent with past years and sustainable at this level.
(http://www.adfg.alaska.gov/static/regulations/regprocess/fisheriesboard/pdfs/2013-2014/chignik/rc3_tab1_chignik_2013.pdf)

Aleutian & Atka-Amlia islands

Aleutian Islands Chum & Coho

The Aleutian Islands salmon fishery primarily targets pink salmon. In 2011, 235 chum and 2 coho salmon were landed. This broadly reflects the low level of fishery removals over the last 20+ years. The geography and location of the Aleutian islands makes escapement enumeration very difficult, and the majority of runs, particularly of the less commercially exploited species, are generally not monitored, although foot and aerial surveys have been conducted on occasion (http://www.adfg.alaska.gov/FedAidpdfs/FMR12-19, p. 3 & 4). The escapement goal review process includes monitoring of stocks without escapement goals to ensure goals are generated as appropriate, as has occurred in other regions.

In-Season Management

Whether managed by escapement goal or not, salmon fisheries in Alaska are subject to in-season management measures designed to achieve the goals of the various applicable over-arching management documents, including:

- the Policy for the Management of Mixed Stock Salmon Fisheries (Mixed Stock Policy: 5 AAC 39.220, http://www.touchngo.com/lglcntr/akstats/aac/title05/chapter039/section220.htm);
- Policy for the Management of Sustainable Salmon Fisheries(Sustainable Salmon Policy: 5 AAC 39.222, http://www.housemajority.org/coms/jcis/pdfs/Sustainable_Salmon_Fisheries_Policy.pdf);
- and Policy for Statewide Salmon Escapement Goals (Escapement Goal Policy: 5 AAC 39.223 http://www.touchngo.com/lglcntr/akstats/aac/title05/chapter039/section223.htm).

At the most basic level, in-season management involves local fishery managers utilising the most up-to-date fishery data, combined with their own expert knowledge and experience, to make immediate and ongoing management decisions and ensure the sustainability of the various stocks. Generally managers are assigned escapement goals for a sub region or index stock, with less formal harvest guidelines for each of the stocks. Harvests are monitored through a "fish ticket" system. A formal fish ticket is required by law at the time of each ex-vessel sale. The fish tickets are entered into a computer-based fish system so that cumulative catch can be estimated up to the minute. Through this system, the cumulative catch can be forecasted to the end of the season, as a function of increased or decreased fishing effort. Fishing effort can also be computed through the fish tickets system. Additionally, fishing effort -- and the spatial distribution of fishing effort -- is monitored by occasional aerial overflights of the fishery by fishery managers. In practice, this involves opening and closing geographical areas and prosecuting (i.e. 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.

Index streams tend to be large streams with good visual access. On aerial overflights, managers record their impression of the number of pink salmon staging near spawning areas and the number of pink salmon present in the spawning areas. These impressions are combined into an index of escapement, and ADFG maintains a computer system so that managers can view values of these indices, by date, for each fishery historic record. This system allows managers to forecast year-end values of the indices as a function of fishing effort. Managers can control fishing effort by "emergency orders." The season begins with a series of scheduled fishing periods and closed periods defined for specific fishing areas or districts. If managers want to increase fishing effort they can extend the time of a fishing period or add additional fishing periods. Similarly, on short notice, managers can eliminate fishing periods. In some cases they can add to or restrict the size of fishing areas to fine tune the effort exerted on different stocks and substocks. Managers have a very wide latitude to control fishing effort during the season, and they are evaluated based on their ability to permit orderly fisheries and to have the escapement indices fall within pre-season escapement goal ranges, which are specified in regulations. Notably, preseason forecasts have very little to do with the management of these fisheries, and the preseason forecasts only affect the fishing intensity very early in the season, before many fish are present. This style of management is almost entirely based on measured and observed harvest and a measured and observed proxy for escapement.

In addition to the generalised policies listed above, the majority of salmon fisheries are subject to local management plans or policies which further inform and guide the ability of managers to achieve their objectives for the fisheries. The following are stock-specific examples of in-season management to illustrate how the process functions in practice.

North Alaska Peninsula

A summary of in-season management is provided in the North Alaska Peninsula AMR (http://www.adfg.alaska.gov/static/regulations/regprocess/fisheriesboard/pdfs/2012-2013/area-m/frm12-52.pdf, p. 2):

"*While the earliest opening dates are established by regulation and modified by emergency orders, actual fishing time in North Alaska Peninsula fisheries is based on inseason evaluation of local stock abundance and escapement objectives. Sockeye salmon are the primary species targeted for harvest, and Nelson and Bear rivers are the largest sockeye salmon producing systems. Between June 1 and September 15, within the Nelson Lagoon to Port Heiden region, management emphasis is on five sockeye salmon systems: Nelson, Bear, Sandy, Ilnik, and Meshik rivers (Murphy and Wilburn 2012). Alaska Department of Fish and Game (ADFG) operates weir camps on the Nelson, Bear, Sandy, and Ilnik rivers that provide daily escapement counts used to manage commercial fisheries. Aerial surveys from a fixed wing aircraft are used to enumerate salmon in other systems that do not have weirs.*"
http://www.adfg.alaska.gov/static/regulations/regprocess/fisheriesboard/pdfs/2012-2013/area-m/frm12-52.pdf, p.80)

Key References

(AYK)

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Norton sound, Port Clarence and Kotzebue AMR, 2011:

http://www.adfg.alaska.gov/FedAidpdfs/FMR11-23.pdf
Yukon and Northern AMR, 2010 (published May 2012):
http://www.adfg.alaska.gov/FedAidpdfs/FMR12-23.pdf
2010 AYK escapement goal recommendations: http://www.sf.adfg.state.ak.us/FedAidpdfs/FMS09-07.pdf
Yukon river summer chum management plan:
http://touchngo.com/lglcntr/akstats/aac/title05/chapter005/section362.htm
2012 Yukon salmon fishery outlook and management strategies:
http://www.adfg.alaska.gov/FedAidpdfs/RIR.3A.2012.04.pdf
2012 Norton Sound salmon fishery outlook and management strategies:
http://www.adfg.alaska.gov/FedAidpdfs/RIR.3A.2012.03.pdf
Kuskokwim River Salmon Rebuilding Management Plan:
http://www.touchngo.com/lglcntr/akstats/aac/title05/chapter007/section365.htm
(Central)
Bristol Bay AMR, 2011: http://www.adfg.alaska.gov/FedAidpdfs/FMR12-21
Upper Cook Inlet AMR, 2011: http://www.adfg.alaska.gov/FedAidpdfs/FMR12-25
Lower Cook Inlet AMR, 2011: http://www.adfg.alaska.gov/FedAidpdfs/FMR12-30.pdf
Prince William Sound AMR, 2011 (includes Copper River):
http://www.adfg.alaska.gov/FedAidpdfs/SP11-12.pdf
2012 Bristol Bay management outlook:
http://www.adfg.alaska.gov/static/fishing/PDFs/commercial/2012_bristolbay_salmon_outlook.pdf
Review of Bristol Bay escapement goals, 2012: http://www.adfg.alaska.gov/FedAidPDFs/FMS12-04.pdf
Nushagak River coho salmon management plan: http://www.adfg.alaska.gov/static-sf/management_areas/PDFs/bbcohopl.pdf
Upper Cook Inlet escapement goal review, 2011: http://www.susitna-watanahydro.org/wp-content/uploads/2012/05/Fair_2010_UCI_Salmon_Escpmt_Goals.pdf

(Southeast)
Southeast & Yakutat Overview AMR, 2012: http://www.adfg.alaska.gov/FedAidPDFs/FMR13-03.pdf
Yakutat set gillnet AMR, 2011: http://www.adfg.alaska.gov/FedAidpdfs/FMR12-01.pdf
Southeast & Yakutat troll AMR, 2011: http://www.adfg.alaska.gov/FedAidpdfs/FMR12-02
Southeast Purse Seine & Drift Gillnet AMR, 2011: http://www.adfg.alaska.gov/FedAidpdfs/FMR12-03
Pacific Salmon Treaty: http://www.psc.org/pubs/Treaty/Treaty.pdf
Joint Chinook Technical Committee (CTC) publications:
http://www.psc.org/publications_tech_techcommitteereport.htm#TCCHINOOK
CTC Chinook catch and escapement report, 2011: http://www.psc.org/pubs/TCCHINOOK12-3.pdf
CTC Exploitation Rate Analysis and Model Calibration report, 2012:
http://www.psc.org/pubs/TCCHINOOK12-4.pdf

(Westward)
North Alaska Peninsula AMR, 2012:
http://www.adfg.alaska.gov/static/regulations/regprocess/fisheriesboard/pdfs/2012-2013/area-m/frm12-52.pdf
South Alaska Peninsula AMR, 2012: http://www.adfg.alaska.gov/FedAidPDFs/FMR12-42.pdf

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Aleutian & Atka-Amlia Islands AMR, 2011: http://www.adfg.alaska.gov/FedAidpdfs/FMR12-19
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Review of Chignik escapement goals, 2005: http://www.sf.adfg.state.ak.us/FedAidPDFs/fms05-06.pdf
Review of Kodiak escapement goals, 2005: http://www.sf.adfg.state.ak.us/FedAidPDFs/fms05-05.pdf
Escapement goal review, Peninsula & AI, 2012 (not used in 2012 AMR): http://www.adfg.alaska.gov/static/regulations/regprocess/fisheriesboard/pdfs/2012-2013/area-m/fms13-01.pdf
Escapement goal review, Peninsula & AI, 2010: http://www.adfg.alaska.gov/FedAidpdfs/FMS09-09.pdf

Regulation of salmon fishing opportunities in Alaska

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. The 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.

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 the permit card that is issued annually.
http://www.cfec.state.ak.us/
http://www.cfec.state.ak.us/Publications/what_is_cfec.pdf

Summary

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 inseason 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 inseason 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

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

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

Evidence adequacy rating:

☑ **High** ☐ **Medium** ☐ **Low**

Rating Determination:

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 http://www.cfec.state.ak.us/.

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

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

Since statehood, ADFG has compiled databases on salmon runs for each of the 5 species and within the Regions and Districts of Alaska. Alaska has a large and ongoing fishery monitoring and stock assessment program to obtain the extensive scientific information necessary to establish new escapement goals, modify existing escapement goals, and provide other scientific information that allows fisheries to be managed to achieve escapement goals or other benchmarks (such as harvest quotas or allocations). 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 inriver run goal has been adopted by the board, and will be developed from the best biological information; the SEG will be determined by the department and will be stated as a range that takes into account data uncertainty; the department will seek to maintain escapements within the bounds of the SEG (5 AAC 39.222(f)).

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

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

Stocks below escapement goals are classified as:

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

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

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

The overall salmon harvest levels in Alaska have remained fairly constant since the 90s. This can be seen in the figure here below.

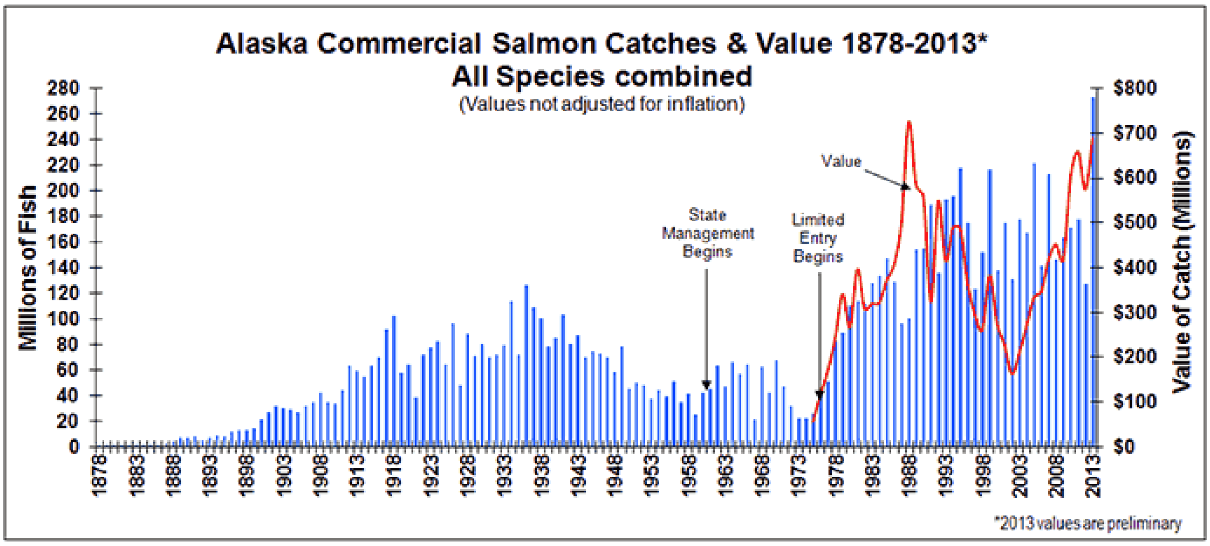

Figure 9. Alaska salmon harvest volume million of fish and value of catch from 1989 to 2013 (http://www.adfg.alaska.gov/index.cfm?adfg=commercialbyfisherysalmon.salmoncatch).

http://www.adfg.alaska.gov/FedAidpdfs/FMS11-06.pdf
http://www.touchngo.com/lglcntr/akstats/aac/title05/chapter039.htm
http://www.adfg.alaska.gov/static/fishing/PDFs/commercial/gk_trends_4-12-12.pdf

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

FAO CCRF 8.1.7/8.1.10/8.2.4/8.4.5

Evidence adequacy rating:

☑ **High** **Medium** **Low**

Rating Determination:

No changes have occurred since the last surveillance assessment in 2013. 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.

The State of Alaska, Department of Labor & Workforce Development (ADLWD) includes AVTEC (formerly called Alaska Vocational Training & Education Center, now called Alaska's Institute of Technology). One of AVTEC's main divisions is the Alaska Maritime Training Center.
The goal of the Alaska Maritime Training Center is to promote safe marine operations by effectively preparing captains and crew members for employment in the Alaskan maritime industry.

The Alaska Maritime Training Center is a United States Coast Guard (USCG) approved training facility located in Seward, Alaska, and offers USCG/STCW-compliant maritime training (STCW is the international Standards of Training, Certification, & Watchkeeping). In addition to the standard courses offered, customized training is available to meet the specific needs of maritime companies. Courses are delivered through the use of their world class ship simulator, state of the art computer based navigational laboratory, and modern classrooms equipped with the latest instructional delivery technologies.

The Center's mission is to provide Alaskans with the skills and technical knowledge to enable them to be productive in Alaska's continually evolving maritime industry.
Supplemental to their on-campus classroom training, the Alaska Maritime Training Center has a partnership with the Maritime Learning System to provide mariners with online training for entry-level USCG Licenses, endorsements, and renewals.

The University of Alaska Sea Grant Marine Advisory Program (MAP) provides education and training in several sectors, including fisheries management, in the forms of seminars and workshops. In addition, MAP conducts sessions of their Alaska Young Fishermen's Summit (AYFS). Each Summit is an intense, 2/3-day course in all aspects of Alaska fisheries, from fisheries management & regulation, to seafood markets & marketing. The target audience for these Summits is young Alaskans from coastal communities. The 2013 AYFS was held on December 10th-12th in Anchorage. The three-day conference aimed at providing crucial training and networking opportunities for fishermen entering the business or wishing to take a leadership role in their industry.

The Alaska Fisheries Business Assistance Project, Fishbiz**,** is a seafood business training and educational program for Alaska's seafood industry participants and dependent coastal communities.

Fishbiz services focus on education, research and extension, and offers educational workshops, seminars, manuals and industry updates.

The University of Alaska Sea Grant Marine Advisory Program collected input in an online survey for 10 weeks in early 2011 of commercial fishing captains and crew, retired fishermen, people interested in becoming a fisherman, and those supporting the commercial fishing industry with their goods and services, including scientists and educators. The purpose of this survey was to understand if a formal University-sponsored training program in commercial fisheries would be of value and, if so, what subjects would be most important to offer. MAP reached survey respondents through various media outlets and direct email lists. 185 people throughout Alaska, from various fisheries, participated in the survey. Seventy-nine percent of respondents had attended workshops and/or training related to fishing and 88% responded that this had helped their fishing careers. Fifty-two percent also believed the University of Alaska should offer a formal training program in commercial fisheries; while 34% said “don’t know” and 14% said “no.”

The respondents also indicated that important classes would include: *Marine safety, Marine navigation and seamanship, and Seafood handling and quality, Vessel maintenance and repair, Understanding regulatory processes & fisheries management and Maritime law.*

Moreover, 77% of total respondents “strongly or somewhat agree” that a *formal training program would make an inexperienced individual a better fisherman*. Thirty-nine percent of respondents elaborated on this point and emphasized that all training is helpful, not necessarily a formal training program, and specified the need for hands-on learning and fishing experience.

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

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

E. Implementation, Monitoring and Control

11. An effective legal and administrative framework shall be established and compliance ensured through effective mechanisms for monitoring, surveillance, control and enforcement for all fishing activities within the jurisdiction. ***FAO CCRF 7.1.7/7.7.3/7.6.2/8.1.1/8.1.4/8.2.1*** ***FAO Eco 29.5***
Evidence adequacy rating: ☑ **High** **Medium** **Low**

Rating Determination

No significant changes have occurred since the previous surveillance assessment in 2013. The Division of Wildlife Troopers in the Department of Public Safety continues to be charged with protecting the state's natural resources through reducing illegal harvest, waste and illegal sale of commercially and sport harvested fish, and by safeguarding fish and wildlife habitat. The structure of ADFG, with management authority instilled at the area office level, allows it to monitor, control and enforce compliance with fishery regulations and emergency orders. Area Management Biologists are on the scene to actually watch the prosecution of the fishery in their area through aerial surveys and on-the-ground observations.

The salmon management program conducted by ADFG is a responsive and adaptive program that monitors salmon abundance during the fishing season and makes continual adjustments in fishing time and area based on observed escapements, commercial fishery performance (e.g., catch per unit of effort), test fishing, biological data on age, sex and size, historical run timing curves and other data. In 2013, commercial fishery managers issued almost 800 emergency orders to adjust fishing time and area based on inseason fishery performance and used their best professional judgment in order to achieve escapement goals, while still providing an orderly harvest of high quality salmon.

The structure of ADFG, with management authority instilled at the area office level, allows it to monitor, control and enforce compliance with fishery regulations and emergency orders. Area Management Biologists are on the scene to actually watch the prosecution of the fishery in their area through aerial surveys and on-the-ground observations. Area and regional staff biologists are deputized law enforcement officers trained to assist Alaska Wildlife Troopers (AWT) with law enforcement activities. ADFG has instituted an on-going training and refresher class to keep deputized staff up-to-date on enforcement techniques.

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

AWT's mission also includes enforcement of boating safety. Wildlife Troopers cover all areas of the state with detachments and/or posts in the communities of Southeast (Klawock, Haines, Hoonah, Juneau, Sitka, Petersburg, Ketchikan, and Wrangell), Southcentral (Anchorage, Palmer, Big Lake, Soldotna, Anchor Point, Seward, Girdwood, Cordova, Valdez, Glennallen and Talkeetna), Western

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

AWT uses significant resources in its missions –

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

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

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

Patrol Missions
* In-river gill net salmon fisheries using smaller vessels, aircraft and land based viewing operations using photo equipment
* Near coastal gill net and seine salmon and herring fisheries using all sizes of vessels, aircraft and land based viewing operations using photo equipment
* Near coastal shrimp and crab (Dungeness, king and tanner) pot fisheries using aircraft, medium

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

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

In 2013, the SEAK AWT Region boarded salmon vessels in commercial fisheries almost 500 times.

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

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

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

FAO CCRF 7.7.2/8.2.7

Evidence adequacy rating:

☑ **High** **Medium** **Low**

Rating determination

No significant changes have occurred since the previous surveillance activities in 2013. 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 Alaska Department of Public Safety, Alaska State Troopers, Division of Wildlife Troopers (AWT) who is the State enforcement agency with 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 and the US Fish and Wildlife Service also work with AWT on the enforcement of fish and game regulations (both state and federal) on federal public land.*

Alaska's salmon fisheries are managed by ADFG, pursuant to Alaska Statutes Title 16 (AS16) and Alaska Administrative Code Title 5 (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.

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

Section 16.43.850. Point System.

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

(b) The commission shall assess demerit points against a permit holder for a conviction of a violation of commercial fishing laws in a salmon fishery under AS 16.05.722, 16.05.723, 16.05.831; AS 16.10.055, 16.10.070 - 16.10.090, 16.10.100, 16.10.110, 16.10.120, 16.10.200 - 16.10.220, and 16.10.760 - 16.10.790 for the following violations in accordance with this schedule:
(1) fishing in closed waters .... 6 points;
(2) fishing during closed season or period .... 6 points;
(3) fishing with more than the legal amount of gear ...... 4 points;
(4) fishing with gear not allowed in fishery .... 6 points;
(5) fishing before expiration of transfer period .... 6 points;
(6) interfering with commercial fishing gear .... 4 points;
(7) fishing with more than the legal amount of gear on vessel .... 4 points;
(8) improper operation of fishing gear .... 4 points;
(9) permit holder not present when required .... 4 points;
(10) fishing with underlength or overlength vessel .... 6 points;
(11) wanton waste of fishery resources .... 4 points.

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

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

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

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

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

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

AS 16.05.165. Form and issuance of citations
AS 16.05.170 Power to execute warrant

AS 16.05.180 Power to search without warrant
AS 16.05.190 Seizure and disposition of equipment
AS 16.05.195 Forfeiture of equipment
AS 16.05.332 Wildlife Violator Compact
AS.16.05.410 Revocation of license
AS 16.05.710 Suspension of Commercial License and Entry Permit
AS 16.05.722 Strict liability commercial fishing penalties
AS 16.05.723 Misdemeanor commercial fishing penalties
AS 16.05.896 Penalty for causing material damage
AS 16.05.901 Penalty for violations of AS 16.05.871 – AS 16.05.896.
AS 16.05.030 Penalty for violation of 16.10.010-16.10.050
AS 16.10.090 Penalty for violation of AS 16.10.090
AS 16.10.220 Penalty for violation of AS 16.10-200-16.1-.210
AS 16.10.790 Fines
AS 16.40.290 Penalty
AS 16.34.850-895 Point system for commercial fishing violations in salmon fisheries
AS 16.43.960 Commission revocation or suspension of permits
AS 16.43.970 Penalties

Regulations and violations relating to 5 AAC 95.011

5 AAC 95.011*: The Catalog 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, 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.

Key references

Alaska Statutes Title 16 (laws)

Alaska Administrative Code Title 5 (regulations)

http://www.cf.adfg.state.ak.us/
http://www.dps.state.ak.us/awt/
http://www.nmfs.noaa.gov/ole/
http://www.uscg.mil/d17/
http://codes.lp.findlaw.com/akstatutes/16/16.43./08
http://www.adfg.alaska.gov/static-sf/AWC/PDFs/awc_pn_intro.pdf

F. Serious Impacts of the Fishery on the Ecosystem

13.	**Considerations of fishery interactions and effects on the ecosystem shall be based on best available science, local knowledge where it can be objectively verified and using a risk based management approach for determining most probable adverse impacts. Adverse impacts of the fishery on the ecosystem shall be appropriately assessed and effectively addressed.** ***FAO CCRF 7.2.3/8.4.7/8.4.8/12.11*** ***Eco 29.3/31***

Evidence adequacy rating:

☑ **High** **Medium** **Low**

Rating Determination:

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 largely represented by the dynamics surrounding the ecological and genetic interactions between wild and hatchery salmon and between salmon and other species.

Habitat/Ecosystem protection policy

Alaska's Sustainable Salmon Policy (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 incorporated in the establishment of escapement goals for each stock.

In terms of the provisions set forth in the Alaska's Sustainable Salmon Policy, a list is provided:

- Maintenance of wild salmon stocks and salmon habitats at levels of resource productivity that assure sustained yields through protection of spawning, rearing, and migratory habitats;
- Maintenance of salmon habitats beyond natural perturbation and boundaries of variation.
- Preparation of scientific assessments of possible adverse ecological effects of proposed habitat alterations and the impacts of those alterations on salmon populations before approval of a proposal.
- Assessment of adverse environmental impacts on wild salmon stocks and the salmon's

habitats.

- Protection of all essential salmon habitats in marine, estuarine, and freshwater ecosystems and access of salmon to these habitats. Essential habitats include spawning and incubation areas, freshwater rearing areas, estuarine and nearshore rearing areas, offshore rearing areas, and migratory pathways.
- Protection of salmon habitat in fresh water on a watershed basis, including appropriate management of riparian zones, water quality, and water quantity.
- Protection of salmon stocks within spawning, incubating, rearing, and migratory habitats.
- Assessment of degraded salmon productivity resulting from habitat loss, considered, and controlled by affected user groups, regulatory agencies, and boards when making conservation and allocation decisions.
- Assessment of effects and interactions of introduced or enhanced salmon stocks on wild salmon stocks and wild salmon stocks and fisheries on those stocks and protection from adverse impacts from artificial propagation and enhancement efforts.
- Restoration of degraded salmon spawning, incubating, rearing, and migratory habitats to natural levels of productivity.
- Establishment of ongoing monitoring activities to determine the current status of habitat and the effectiveness of restoration activities.
- Allowance of recovery for depleted salmon or, where appropriate, active restoration and and maintenance of diversity to the maximum extent possible, at the genetic, population, species, and ecosystem levels.
- Management of salmon fisheries to allow escapements within ranges necessary to conserve and sustain potential salmon production and maintain normal ecosystem functioning.
- Management of salmon escapement 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.
- Evaluation of the role of salmon in ecosystem functioning and consideration in harvest management decisions and setting of salmon escapement goals (see State of Alaska Regulation 5 AAC 39.222).

This regulation requires ADFG to provide the BOF with reports on the status of salmon stocks, and, in turn, requires the BOF to develop or amend salmon fishery management plans to address any concerns that have been raised. ADFG and the BOF are also required to develop action plans for new or expanding fisheries or for stocks of concern that contain measurable and implementable objectives and performance measures for monitoring the effectiveness of the plans. This process takes place in routine fashion at regularly scheduled BOF meetings. The allowable harvest in each year is set based on fish in excess of the escapement goal.

If a stock chronically fails to meet escapement goals it is reported by ADFG to the Board of Fisheries (BOF) as a stock of concern and the fishery management plan is amended to protect the productivity of the stock. In addition, a specific action plan associated with the management plan is prepared for any new or expanding salmon fishery, or stock of concern. The action plans are to contain goals, measurable and implementable objectives, and provisions for fishery management actions needed to achieve rebuilding goals and objectives, performance measures appropriate for monitoring and gauging the effectiveness of the action plan and a research plan that is periodically reevaluated, as necessary, to provide information to address concerns.

Fishing gear habitat interaction and issues

Introduction of new gear types or fishing methods into Alaska salmon fisheries is rare or simply does not occur. State statutes and regulations define acceptable gear and its specifications. These include gillnet, purse seine, troll (and fishwheel in the AYK Region). Any change in gear specifications requires regulatory action by the BOF. Under these restrictions, while fishing gear, methods and means, through time, may have become marginally more technologically and operationally efficient, harvest rates are controlled by biological limitations, and because fishing gear does not generally contact the bottom, salmon fishing operations are not considered to result in habitat disturbance on fisheries ecosystems.

Habitat in Alaska

The Alaska Department of Fish and Game preserves the health and viability of Alaska's fish and wildlife populations by protecting the lands and waters these species depend upon for their survival and reproductive success. The Department conducts research on watersheds, active mining sites, fire-impacted woodlands, anadromous fish streams, and coastal and marine environments throughout Alaska in an effort to document and mitigate human-related impacts, changes in habitat, and species abundance. Salmon habitat in Alaska, contrary to other States including California, Oregon and Washington, is believed to be in pristine conditions, largely due to the aggressive policies for habitat protection and the importance of the salmon resources in this State.

The Catalog of Waters Important for the Spawning, Rearing or Migration of Anadromous Fishes and its associated Atlas (the Catalog and Atlas, respectively) currently contain over 18,000 streams, rivers or lakes around the state which have been specified as being important for the spawning, rearing or migration of anadromous fish. Based upon thorough surveys of a few drainages it is believed that this number represents less than 50% of the streams, rivers and lakes actually used by anadromous species. It is estimated that at least an additional 20,000 or more anadromous water bodies have not been identified or specified under AS 16.05.871(a).
https://www.adfg.alaska.gov/sf/SARR/AWC/

The Catalog and Atlas are important because they specify which streams, rivers and lakes are important to anadromous fish species and therefore afforded protection under the Anadromous Fish Act AS 16.05.871. The Anadromous Fish Act requires that an individual or governmental agency provide prior notification and obtain approval from the Alaska Department of Fish and Game, Division of Habitat (Habitat) "to construct a hydraulic project or use, divert, obstruct, pollute, or change the natural flow or bed" of a specified anadromous waterbody or "to use wheeled, tracked, or excavating equipment or log-dragging equipment in the bed" of a specified anadromous waterbody. All activities within or across a specified anadromous waterbody and all instream activities affecting a specified anadromous waterbody require approval. A person who violates AS 16.05.871 - 16.05.896 is guilty of a class A misdemeanor.

Water bodies that are not "specified" within the Catalog and Atlas are not afforded that protection. Protection of these specified water bodies is addressed by other sections of AS 16.05.871, which requires persons or governmental agencies to submit plans and specifications to ADFG and receive written approval in the form of a Fish Habitat Permit prior to beginning the proposed use, construction or activity that would take place in specified water bodies. More detailed information about AS 16.05.871, the types of activities requiring permits, and permit application procedures are available here http://www.adfg.alaska.gov/index.cfm?adfg=fishpassage.regulations.

To be protected under AS 16.05.871, water bodies must be documented as supporting some life function of an anadromous fish species (salmon, trout, char, whitefish, sturgeon, etc.) Anadromous fish must have been seen or collected and identified by a qualified observer. Most nominations come from Department of Fish and Game fisheries biologists. Others are received from private individuals, companies and biologists from other state and federal agencies (http://www.adfg.alaska.gov/sf/SARR/AWC/).

Bycatch issues

Salmon bycatch in other fisheries

The United States is a member of the North Pacific Anadromous Fish Commission (NPAFC), established in 1993, which has eliminated directed fishing on anadromous fishes and limits bycatch of anadromous fishes in the North Pacific (http://www.npafc.org/new/index.html).
In addition, the North Pacific Fisheries Management Council (NPFMC) has adopted measures to control bycatch of salmon in groundfish trawl fisheries in the Bering Sea Aleutian Islands and the Gulf of Alaska. Salmon are listed as prohibited species in groundfish management plans, meaning they cannot be retained and sold. Prohibited species caps on the groundfish fisheries off Alaska are designed to close a given fishery when the PSC cap is reached. Monitoring of PSC is paramount in the extensive groundfish observer programme and a priority of enforcement agencies such as the USCG. (http://alaskafisheries.noaa.gov/npfmc/).

Salmon that originated in Alaska, primarily Chinook and chum salmon, are caught incidentally in groundfish fisheries off Alaska. Salmon bycatch in trawl fisheries for pollock in the Bering Sea and Gulf of Alaska are monitored by National Marine Fisheries service (NMFS) with an onboard observer program. NMFS found that most (about 85%) of the Chinook salmon bycatch from the Bering Sea and Aleutians (BSAI) ground fish fisheries occurred in the Bering Sea Pollock fishery.

Catch limits and incentives to reduce bycatch were implemented in 2011 under Amendment 91 to the Fishery Management Plan for Groundfish in the BSAI. NMFS states “Amendment 91 is an innovative approach to managing Chinook salmon bycatch in the BSAI pollock fishery that combines a limit on the amount of Chinook salmon that may be caught incidentally with incentive plan agreements and performance standards. The program was designed to minimize bycatch to the extent practicable in all years, and prevent bycatch from reaching the limit in most years, while providing the pollock fleet with the flexibility to harvest the total allowable catch”.

In 2012, NMFS implemented Amendment 93 in the GOA to further limit the amount of Chinook salmon caught in the pollock fishery. Amendment 93 established separate catch limits for Chinook salmon in the Central and Western GOA that, if the applicable catch limit is reached, would cause NMFS to close the directed pollock fishery in the Central or Western areas of the GOA. This action would also require retention of salmon by all vessels in the Central and Western GOA pollock fisheries until the catch is delivered to a processing facility where an observer would be given an opportunity to count the number of salmon and to collect scientific data or biological samples from them (https://alaskafisheries.noaa.gov/sustainablefisheries/bycatch/default.htm).

NMFS is also considering measures to minimize chum salmon bycatch in the Bering Sea pollock fishery because of potential negative impacts on salmon stocks in general, and on western Alaska salmon stocks in particular. A significant portion of the chum salmon (20-34%) and Chinook salmon (56%) bycatch from trawl fisheries are fish that originate from western Alaska. NMFS hosted a workshop in Seattle on May 16, 2013, to obtain input from owners and operators of AFA catcher vessels and shoreside processors who participate in the Bering Sea pollock fishery. This workshop was designed to discuss accurate accounting of Chinook salmon bycatch https://alaskafisheries.noaa.gov/sustainablefisheries/bycatch/default.htm.

In state-managed fisheries, ADFG has implemented significant restrictions on chum and Chinook salmon fisheries in areas of western Alaska in response to declining returns, and reducing the trawl bycatch is part of the ongoing effort to help restore these stocks. In areas managed by ADFG, groundfish harvesters are required to keep on board, or at a shoreside processing plant, all salmon harvested as bycatch in trawl fisheries in order for them to be sampled by ADFG personnel (5AAC 39.166).

Bycatch in the directed salmon fisheries

Bycatch of non-targeted species is not a major issue in most Alaska salmon fisheries and generally considered negligible. Operation of all salmon fishing gear (purse seines, gillnets, and troll gear) is required to minimize incidental harvest of non-target species, mostly other salmon. Time and area restrictions limit when and where specific fisheries occur and restrictions are also imposed by regulation on all types of fishing gear (e.g., mesh size restrictions and length of nets for gillnets, number of fishing lines, rods, and gurdies for troll gear, and mesh size, net length and depth for purse seine gear).

Specific regulations also exist pertaining to 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 taken and possessed, but with numerous restrictions (5 AAC 28.171). Commercial salmon trollers may take unlimited numbers of incidentally taken groundfish in Southeast Alaska except for limitations on demersal shelf rockfish, spiny dogfish, lingcod and halibut as percentages of the salmon harvested. Aside from the troll fishery in SEAK non salmon bycatch maybe retained as personal use. Personal use fish cannot be sold, eliminating the incentive for significant amounts of such catches.

The SEAK troll fishery incidentally harvests State managed groundfish species; including lingcod, black rockfish, dark rockfish, blue rockfish, and demersal shelf rockfish (DSR). The seven species of rockfish in the DSR assemblage are yelloweye, quillback, canary, rosethorn, copper, china, and tiger rockfish. Bycatch allowances for federal waters are the same as in state waters only for the state managed groundfish species.

For federally managed groundfish species, trollers are restricted to a federal retainable percentage found at http://www.fakr.noaa.gov/rr/tables/tabl10.pdf. In the East Area, all groundfish incidentally taken by hand and power troll gear being operated to take salmon (consistent with applicable laws and regulations) can be legally taken and possessed 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.

Lingcod harvest allocations for the troll fishery are set by the Lingcod Management Area and area closures will occur as allocations are taken. Inseason closures are announced by news release and marine radio broadcast.

Halibut incidentally taken during an open commercial halibut season by power and hand troll gear being operated for salmon consistent with applicable state laws and regulations are legally taken and possessed. Commercial halibut may be legally retained only by IFQ permit holders during the open season for halibut. Trollers making an IFQ halibut landing of 500 pounds or less of IFQ weight are exempted from the three hour Prior Notice of Landing if landed concurrently with a legal landing of salmon. Halibut taken incidentally during the troll fishery is reported on an ADFG fish ticket using the CFEC salmon permit.

Trollers are allowed to longline for groundfish and troll for salmon on the same trip as long as fish are not onboard the vessel in an area closed to commercial fishing or closed to retention of that species and the fisher has both a commercial salmon permit and the appropriate commercial longline permit. A vessel may not participate in a directed fishery for groundfish with dinglebar troll or mechanical jig gear if they have commercial salmon on board. A vessel fishing for groundfish with dinglebar troll gear must display the letter "D" and a vessel fishing for groundfish with mechanical jigging machines must display the letter "M" at all times when fishing with or transporting fish taken with dinglebar troll gear or mechanical jigging machines.

A person may not operate a vessel that is displaying one of these letters when the vessel is being used to fish for salmon. The State reports the amount and type of groundfish harvested incidentally in the SEAK troll fishery in the SE region groundfish report prepared for the Board on a 3-year cycle. In general, all harvest information on bycatch in the commercial troll fishery comes from catch reported on fish tickets. Lingcod and black rockfish, both state managed species, make up the primary bycatch in the commercial troll fishery. Reported harvest of groundfish bycatch from EEZ waters, is small when compared to bycatch totals from all of Southeast Alaska (see table below reporting all groundfish species (round pounds) reported on salmon troll fish tickets for EEZ waters only, 2005-2010.).

SPECIES	2005	2006	2007	2008	2009	2010
Black rockfish	2,049	2,690	1,144	2,217	550	167
Bocaccio rockfish			26			48
Canary rockfish	8		13	11		
Dusky rockfish	5	581	59			
General shark	29					
Lingcod greenling	2,701	8,322	10,569	6,241	8,047	7,308
Quillback rockfish		6	3	89	7	42
Redstripe rockfish			11			
rockfish, dusky				10	696	684
Rougheye rockfish			6			
Salmon shark				111		
Silvergray rockfish	108	63	36	50	84	20
Widow rockfish				39		
Yelloweye rockfish	54	208	413	64	282	191
Yellowtail rockfish	40	22	65	38	5	
Total	**4,994**	**11,892**	**12,345**	**8,869**	**9,670**	**8,460**

Bycatch in the East Area occurs during the months of July, August, and September when the summer troll season is open. Unreported harvest and discard-at-sea mortality is not estimated, but is thought to be low.
http://alaskafisheries.noaa.gov/Sustainablefisheries/salmon/default.htm
http://www.npfmc.org/wp-content/PDFdocuments/fmp/Salmon/SalmonFMPfinal1212.pdf

Commercial fishers are allowed to longline for groundfish and troll for salmon on the same trip as long as commercial fishing for any of the species found on the vessel is not prohibited and the fisher has all appropriate fishing permits (Skannes and Hagerman, 2013). Most non-targeted fish harvested in salmon fisheries are other species of salmon that are required to be reported on fish tickets. Alaska fishing regulations, fishery management plans, and inseason management actions are designed to minimize the harvest of non target species, where they occur. The upper Cook Inlet gillnet fishery, for example, targets sockeye, pink, and chum salmon, but coho salmon are also caught in this fishery. In this respect, the Cook Inlet Northern District Salmon Management Plan (5AAC 21.358) provides a series of regulatory measures to minimize harvest of coho salmon bound for the northern district of upper Cook Inlet.
(http://www.adfg.alaska.gov/static/regulations/fishregulations/pdfs/commercial/CI-2011-14.pdf).

Endangered, threatened, protected species

No species or stocks of salmon in Alaska are classified as endangered or threatened under US federal law, or State law (AS 16.20.190). Instead, fish stocks in Alaska are may be categorized as stocks of concern. A review of this was provided in detail under Clause 6 of this report. However, the southeast troll fishery is estimated to take a small number of Chinook salmon belonging to threatened or endangered stocks from the Columbia and other salmon from other river systems (US and Canada). The harvest of those fish is regulated under treaty with Canada by the 2009 Pacific Salmon Agreement (see http://www.psc.org/about_treaty.htm).

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 (http://www.nmfs.noaa.gov/pr/laws/mmpa/). 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 annual Marine Mammal Stock Assessment Reports for each stock.

Fishers participating in a Category I or II fishery are required to accommodate an observer onboard their vessel(s) upon request (50 CFR 229.7). Fishers participating in a Category I or II fishery are required to comply with any 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.

Data are available on marine mammal interactions for several salmon fisheries throughout Alaska:

AK Bristol Bay Salmon Drift Gillnet Fishery, category II. Current list of marine mammal species/stocks injured/killed: Beluga whale, Bristol Bay; Gray whale, Eastern North Pacific; Harbor seal, Bering Sea; Northern fur seal, North Pacific; Pacific white-sided dolphin, Central North Pacific; Spotted seal, AK; Steller sea lion, Western U.S.

Basis for original classification on the LOF: This fishery was categorized as a Category II based on logbook data. Observer coverage was inadequate to determine mortality and serious injury levels of marine mammal stocks across all fisheries, but available data suggested that, if observer data were available, serious injury and mortality levels may have been greater than the Potential Biological Removal (PBR) levels for each stock with which this fishery interacts. Also, known mortality and serious injury was greater than 1% of PBR for harbor seal (Bering Sea stock) and beluga whale (Bristol Bay stock).

AK Bristol Bay Salmon Set Gillnet Fishery, category II. Current list of marine mammal species/stocks injured/killed: Beluga whale, Bristol Bay; Gray whale, Eastern North Pacific; Harbor seal, Bering Sea; Northern fur seal, North Pacific; Spotted seal, AK.

Basis for original classification on the LOF: This fishery was categorized as a Category II based on analogy to other set gillnet fisheries. Observer coverage was inadequate to determine if serious injury and mortality levels in this fishery were greater than 1% of a marine mammal stock's Potential Biological Removal (PBR) level, but it was assumed to be similar to marine mammal serious injury and mortality levels incidental to other AK set gillnet fisheries. Also, logbook data showed that the total mortality and serious injury of beluga whales (Bristol Bay stock) was 0.5 animals/year, or 2% of PBR.

AK Kodiak Salmon Set Gillnet Fishery, Category II. Current list of marine mammal species/stocks injured/killed (a (1) indicates those stocks driving the fishery's classification): Harbor porpoise, GOA (1); Harbor seal, GOA; Sea otter, Southwest AK; Steller sea lion, Western U.S.
Basis for original classification on the LOF: This fishery was categorized as a Category II based on logbook data. The total mortality and serious injury of harbor porpoise (GOA stock) was 4 animals/year, or 1.6% of PBR.

AK Kodiak Salmon Purse Seine Fishery, Category II. Current list of marine mammal species/stocks injured/killed (a (1) indicates those stocks driving the fishery's classification): Humpback whale, Central North Pacific (1).
Basis for original classification on the LOF: This fishery was categorized as a Category II based on a single, documented mortality of a humpback whale (Central North Pacific), in 2005. This single event translated to an annual average mortality of 0.2 animals/year, or 1.55% of PBR (PBR=12.9).

AK Cook Inlet Salmon Set Gillnet Fishery, Category II. Current list of marine mammal species/stocks injured/killed (a (1) indicates those stocks driving the fishery's classification): Beluga whale, Cook Inlet; Dall's porpoise, AK; Harbor porpoise, Gulf of Alaska (GOA); Harbor seal, GOA; Humpback Whale (Central North Pacific)(1) ; Steller sea lion, Western U.S
Basis for current classification on the LOF: The total annual mortality and serious injury of humpback whales (Central North Pacific stock) in this fishery is greater than 1% and less than 50% of the stock's Potential Biological Removal (PBR) level.

AK Cook Inlet Salmon Drift Gillnet Fishery, Category II. Current list of marine mammal species/stocks injured/killed (a (1) indicates those stocks driving the fishery's classification): Beluga whale, Cook Inlet; Dall's porpoise, AK; Harbor porpoise, GOA (1) ; Harbor seal, GOA; Steller sea lion, Western U.S.
Basis for current classification on the LOF: The total annual mortality and serious injury of harbor porpoise (Gulf of Alaska [GOA] stock) in this fishery is greater than 1% and less than 50% of the stock's Potential Biological Removal (PBR) level.

AK Cook Inlet Salmon Purse Seine Fishery, category II. Current list of marine mammal species/stocks injured/killed (a (1) indicates those stocks driving the fishery's classification): Humpback whale, Central North Pacific (1).
Basis for original classification on the LOF: This fishery was categorized as a Category II based on a single, documented mortality of a humpback whale (Central North Pacific stock), in 2005. This single event translated to an annual average mortality of 0.2 animals/year, or 1.55% of PBR (PBR=12.9).

AK Peninsula/Aleutian Islands Salmon Drift Gillnet Fishery Category II. Current list of marine mammal species/stocks injured/killed: Dall's porpoise, AK; Harbor seal, GOA; Harbor porpoise, Gulf of Alaska (GOA); Northern fur seal, North Pacific.
Basis for original classification on the LOF: This fishery was categorized as a Category II by analogy with other category II AK drift gillnet fisheries, and because of inadequate observer data since 1991. The low levels of observer coverage across all fisheries were inadequate to determine mortality and serious injury levels of marine mammals across all fisheries, but available data suggested that mortality and serious injury may have exceeded 10% of the Potential Biological Removal (PBR) level for some stocks. Known Dall's porpoise mortality and serious injury was 28 animals/year, or 1.8% of PBR (PBR=1,556). Also, level of harbor porpoise take documented in logbooks was more than 10% across all fisheries, and because logbook reports represent an underestimate of total take, the total impact to harbor porpoises may be more than 1% in this fishery.

AK Peninsula/Aleutian Islands Salmon Set Gillnet Fishery, category II. Current list of marine mammal species/stocks injured/killed: Harbor porpoise, Bering Sea; Steller sea lion, Western U.S.
Basis for current classification on the LOF: Based on analogy to other Category II AK set gillnet fisheries.

AK Prince William Sound Salmon Drift Gillnet Fishery, category II. Current list of marine mammal species/stocks injured/killed (a (1) indicates those stocks driving the fishery's classification): Dall's porpoise, AK; Harbor porpoise, GOA (1) ; Harbor seal, GOA; Northern fur seal, North Pacific; Pacific white-sided dolphin, Central North Pacific; Sea otter, AK; Steller sea lion, Western U.S.
Basis for current classification on the LOF: The total annual mortality and serious injury of harbor porpoise (Gulf of Alaska [GOA] stock) and Steller sea lion (Western U.S. stock) in this fishery is greater than 1% and less than 50% of the stocks' Potential Biological Removal (PBR) level.

AK Southeast Salmon Drift Gillnet Fishery, category II. Current list of marine mammal species/stocks injured/killed (a (1) indicates those stocks driving the fishery's classification): Dall's porpoise, AK; Harbor porpoise, Southeast AK; Harbor seal, Southeast, AK; Humpback whale, Central North Pacific (1) ; Pacific white-sided dolphin, central North Pacific; Steller sea lion, Eastern U.S.
Basis for original classification on the LOF: This fishery was categorized as a Category II because observer and stranding data indicated that mortality and serious injury of harbor porpoise (Southeast AK) was 3 animals/year, or 1.3% of PBR (PBR=231); and serious injury and mortality of humpback whale (Central North Pacific) was 0.13 animals/year, or 4.6% PBR (PBR=2.8). Also, Category III reports from fishermen indicated that mortalities of both species occurred prior to 1994.

AK Yakutat Salmon Set Gillnet Fishery, category II. Current list of marine mammal species/stocks injured/killed: Gray Whale, Eastern North Pacific; Harbor seal, Southeast AK; Humpback whale, Central North Pacific (Southeast AK).
Basis for original classification on the LOF: This fishery was categorized as a Category II based on analogy with other gillnet fisheries because observer coverage was inadequate. Logbook data showed the total known mortality and serious injury for harbor seals across all fisheries did not exceed 10% of the Potential Biological Removal (PBR) level, but low levels of observer coverage were inadequate and data suggests take levels may be exceed 10%. The known mortality and serious injury of harbor seals (Southeast AK) in this fishery was 30 animals/year, or 1.5% of PBR (PBR=2,000).

Other category III (remote likelihood of/no known incidental mortality or serious injury of marine mammals) fisheries in Alaska exist, but have not been listed here.
http://www.nmfs.noaa.gov/pr/interactions/lof/final2014.htm

Marine Birds

Observers employed in the marine mammal program also collect valuable data on marine bird interactions. Birds are protected under the Migratory Bird Act (MBA) and the Endangered Species Act (ESA) covers those animals that may be threatened or Endangered to extinction. The most noted examples in Alaska include the Steller sea lion and the short tailed albatross. CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora, also known as the Washington Convention) also offers further protection to such animals.

Records of birds interaction assessment exist are available for Kodiak and Southeast Alaska salmon fisheries. A small number of birds including a Kittlitz's murrelet, four marbled murrelets, a murrelet of unknown species, an Arctic loon, two red-throated loons, a common murre, and two Long-tailed duck ducks were recorded in the Yakutat set net fishery. For all birds and murrelets the usual approximate 95% confidence limits from ratio estimation were used, giving limits for SI/M takes of 125 to 485 for all birds in 2007, 26 to 328 for murrelets in 2007, 39 to 234 for all birds in 2008, and 5 to 137 for murrelets in 2008.
http://alaskafisheries.noaa.gov/protectedresources/observers/bycatch/yakutat07-08.pdf

In the Kodiak set net salmon fishery birds interactions with salmon fisheries have also been recorded. For example, in 2005, these included pelagic cormorants, 178.0 (62.5); harlequin ducks, 19.7(19.0); pigeon guillemots, 117.6 (46.4); marbled murrelets, 142.6 (67.4); Kittlitz's murrelets, 18.1 (16.8), common murres, 483.5 (156.2); thick-billed murres, 19.7 (19.3); tufted puffins, 95.9(41.4); white-winged scoters, 21.5(21.1); and other species of birds, 1096.6 (195.4). All of the birds observed to be taken were released dead.
http://alaskafisheries.noaa.gov/protectedresources/observers/bycatch/kodiakreport02_05.pdf

Habitat issues

Impacts to fish habitat from fishing activities in Alaska are considered minimal to none. Fishing gear types (e.g. purse seine, gill net, troll, fish wheel) and the manner in which they operate have been developed over time to selectively target specific species of salmon. The gear is generally environmentally safe (not lost, not unattended, and not in contact with the bottom, etc…).

Federal research and programs in support of Alaska salmon management

The North Pacific Fish Anadromous Commission (NPAFC), made up of representatives from Canada, Japan, Korea, Russia, and the United States (including Alaska), serves as a forum for promoting the conservation of anadromous fishes and ecologically-related species, including marine mammals, sea birds, and non-anadromous fish, in the high seas area of the North Pacific Ocean that are beyond national boundaries. The NPAFC coordinates high seas fishery enforcement activities by member countries because directed fishing for salmonids is prohibited in the area and agreements have been made to minimize the incidental take of salmonids in other area fisheries. The NPAFC's scientific research focuses on trends in marine production of salmon stocks, their population structure and diversity in marine ecosystems of the North Pacific, and climate change impacts. http://www.npafc.org/new/science_plan.html.

ADFG participates with federal, state and international agencies and institutions in numerous research and monitoring programs that assess physical, chemical, biological, economic and social parameters of the coastal area. One of the functions of the NPAFC is to coordinate the collection, exchange, and analysis of scientific data regarding anadromous fishes and other ecologically-related species. The NPAFC's scientific research focuses on trends in marine production of salmon stocks, their population structure and diversity in marine ecosystems of the North Pacific, and impacts from climate change. Genetic and otolith marking techniques developed by the member states of NPAFC are used to identify the origins of stocks of salmon that intermix in the Pacific Ocean.

ADFG and various federal agencies participate with numerous organizations that seek information about the ecosystem and the status and management of salmon fisheries. Examples include: the North Pacific Research Board (NPRB) (http://www.nprb.org/) which distributes monies from the earnings of the Environmental Improvement and Restoration Fund (ERIF), created by congress and derived from the Dinkum Sands case; the Bering Sea Integrated Ecosystem Research Program (http://www.nprb.org/bering-sea-project/detailed-results-findings/) which is a partnership between the North Pacific Research Board and the National Science Foundation that funds research and ecosystem modeling to understand the impacts of climate change and sea ice cover on the eastern Bering Sea ecosystem; the Gulf of Alaska Integrated Ecosystem Research Project (http://www.nprb.org/gulf-of-alaska-project/detailed-results-findings/) is a program of the NPRB that seeks to understand how environmental and anthropogenic processes, including climate change, affect trophic levels and dynamic linkages among trophic levels, with emphasis on fish and fisheries, marine mammals, and seabirds within the Gulf of Alaska; The Wild Salmon Center (http://www.wildsalmoncenter.org/) works to protect the best remaining wild salmon ecosystems across the Pacific Rim; The Pacific States Marine Fisheries Commission (http://www.psmfc.org/) coordinates research activities, monitors fishing activities, and collects and maintains databases on salmon, steelhead and other marine fish occurring off the coast of California, Oregon, Washington, Idaho, and Alaska; The Pacific Coastal Salmon Recovery Fund (http://www.westcoast.fisheries.noaa.gov/protected_species/salmon_steelhead/recovery_planning_and_implementation/index.html) was established by Congress in FY 2000 to provide project funding to states and tribes of the Pacific Coast Region to protect, restore, and conserve Pacific salmon and steelhead populations and their habitats; and The Saltonstall-Kennedy grant program for fisheries research and development (http://www.nmfs.noaa.gov/mb/financial_services/skhome.htm) which is a competitive grant program administered by NMFS to provide grants or cooperative agreements for fisheries research and development.

The Alaska Fisheries Science Centre (NOAA) conducts research on marine ecology of juvenile salmon, on stock assessment and enhancement of salmonids and on other fishes in Southeast Alaska and other parts of North Pacific Ocean marine ecosystems. Some of this work is based at the Ted Stevens

Marine Research Institute in Juneau, AK. Studies focus on stewardship and management of salmon as indicator species in ecosystem fluctuations in support of NOAA Fisheries goals and international obligations including the Pacific Salmon Treaty (PST), North Pacific Anadromous Fish Commission (NPAFC), and Global Ocean Ecosystems Dynamics (GLOBEC).

Alaska has more than 50% of the U.S. coastline and leads the Nation 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 most to the survival, growth, and productivity of managed fish and shellfish species; and to determine how to best manage and protect these habitats from human disturbance and environmental change. Project selection for EFH research is based on research priorities from the EFH Research Implementation Plan for Alaska. Around $450,000 is spent on about ten EFH research projects each year. Project results are described in annual reports and the peer-reviewed literature. Study results contribute to existing Essential Fish Habitat data sets (http://www.afsc.noaa.gov/HEPR/efh.htm). 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. 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 the distribution of Pacific salmon. 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. 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 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 have been accumulated and formatted for Pacific salmon distribution and habitat analysis. This study summarizes catches of more than 420,000 Pacific salmon sampled during 5,280 surface trawl and purse seine events in the Alaska EEZ from 1964 to 2009. Distribution was plotted for each salmon species and life history within the Alaska EEZ.

Ecological interactions relevant to the salmon resources in Alaska

Abundances of hatchery salmon and management implications in terms of density-dependent processes and conservation of wild salmon populations

Abundance estimates of wild and hatchery Pacific salmon *Oncorhynchus* spp. are important for evaluation of stock status and density-dependent interactions at sea. Ruggerone et al. 2010 assembled available salmon catch and spawning abundance data for both Asia and North America and reconstructed total abundances of pink salmon *O. gorbuscha*, chum salmon *O. keta*, and sockeye salmon *O. nerka* during 1952–2005. Abundance trends were evaluated with respect to species, regional stock groups, and climatic regimes. Wild adult pink salmon were the most numerous salmon species (average = 268 x 10^6 fish/year, or 70% of the total abundance of the three species), followed by sockeye salmon (63 x 10^6 fish/year, or 17%) and chum salmon (48 x 10^6 fish/year, or 13%). After the 1976–1977 ocean regime shift, abundances of wild pink salmon and sockeye salmon increased by more than 65% on average, whereas abundance of wild chum salmon was lower in recent decades. Although wild salmon abundances in most regions of North America increased in the late 1970s, abundances in Asia typically did not increase until the 1990s. Annual releases of juvenile salmon from hatcheries increased rapidly during the 1970s and 1980s and reached approximately 4.5 x 10^9 juveniles/year during the 1990s and early 2000s. During 1990–2005, annual production of hatchery-origin adult salmon averaged 78 x 10^6 chum salmon, 54 x 10^6 pink salmon, and 3.2 x 10^6 sockeye salmon, or approximately 62, 13, and 4%, respectively, of the combined total wild and hatchery salmon abundance. The combined abundance of adult wild and hatchery salmon during 1990–2005 averaged 634 x 10^6 salmon/year (498 x 10^6 wild salmon/year), or approximately twice as many as during 1952–1975. The large and increasing abundances of hatchery salmon have important management implications in terms of density-dependent processes and conservation of wild salmon populations (Ruggerone et al. 2010).

Pink salmon – herring interactions in Prince William Sound

In 2008, Deriso et al. reported a framework for evaluating the cause of fishery declines by integrating covariates into a fisheries stock assessment model. This allowed for the evaluation of fisheries' effects vs. natural and other human impacts.

They showed that multiple factors influence populations and that analysis of factors in isolation can be misleading. The framework was illustrated by applying it to Pacific herring of Prince William Sound, Alaska (USA). The Pacific herring stock that spawns in PWS is a stock that has collapsed, but there are several competing or alternative hypotheses to account for the initial collapse and subsequent lack of recovery.

Factors failing the initial screening tests for statistical significance included indicators of the 1989 Exxon Valdez oil spill, coho salmon predation, sea lion predation, Pacific Decadal Oscillation, Northern Oscillation Index, and effects of containment in the herring egg-on-kelp pound fishery. The overall results indicated that the most statistically significant factors related to the lack of recovery of the herring stock involve competition or predation by juvenile hatchery pink salmon on herring juveniles. Secondary factors identified in the analysis were poor nutrition in the winter, ocean (Gulf of Alaska) temperature in the winter, the viral hemorrhagic septicemia virus, and the pathogenIchthyophonus hoferi. The implication of this result to fisheries management in Prince William Sound was that it may well be difficult to simultaneously increase the production of pink salmon and maintain a viable Pacific herring fishery. Also, the authors held that the impact could be extended to other commercially important fisheries, and a whole ecosystem approach may be needed to evaluate the costs and benefits of salmon hatcheries.

Abundance of Pink salmon in the North Pacific Ocean and Bering Sea and relative effects on seabird populations

Springer and van Vliet (2014) reported that climate change in the last century was associated with spectacular growth of many wild Pacific salmon stocks in the North Pacific Ocean and Bering Sea, apparently through bottom-up forcing linking meteorology to ocean physics, water temperature, and plankton production. One species in particular, pink salmon, became so numerous by the 1990s that they began to dominate other species of salmon for prey resources and to exert top-down control in the open ocean ecosystem. Information from long-term monitoring of seabirds in the Aleutian Islands and Bering Sea reveals that the sphere of influence of pink salmon is much larger than previously known. Seabirds, pink salmon, other species of salmon, and by extension other higher-order predators, are tightly linked ecologically. The author's data further emphasize that the unique 2-y cycle in abundance of pink salmon drives interannual shifts between two alternate states of a complex marine ecosystem.

Interannual switching between alternate ecosystem states of the subarctic North Pacific Ocean and Bering Sea (SNPO/BS) driven by pink salmon must be accounted for when attempting to explain patterns of change in populations of species at lower and higher trophic levels and when building ocean ecosystem models. Key forcing from the salmon is additive to, perhaps dominant to in some cases, whatever other drivers are important in the environment.

Pink salmon spend less than 2 y at sea and most stocks alternate between high and low levels of abundance every other year. In years of high abundance, they now constitute a pelagic consumer front as they return to their spawning rivers, exert top-down control over the open ocean ecosystem by outcompeting other species for shared prey resources, and drive major ecological shifts between years of high and low abundance.

The abundance of pink salmon, owing to their life history strategy, is an uncommon case of too many fish in the sea, and the ecosystem-scale effect they have needs to become part of international resource common-pool policy discussions that include seabirds, and by extension additional competing species. The large and growing number of hatchery-reared salmon raises additional concern about the carrying capacity of the SNPO/BS, although such concern is not universally embraced (Springer and van Vliet, 2014).

Wild-hatchery salmon interactions

Recent studies have determined that large numbers of hatchery-origin salmon are present on the spawning grounds of wild salmon in some areas of Alaska, particularly PWS and Southeast (Brenner, et al., 2012, Piston and Heinl, 2012a, Piston and Heinl, 2012b). These studies were enabled by the incorporation of otolith thermal marks into mass-marking programs at most hatcheries that make possible the detection of hatchery-origin salmon in streams. With the possible exception of Kitoi Bay and Pillar Creek hatchery in the Kodiak region and the Tutka Lagoon Hatchery in Cook Inlet, juvenile pink and chum salmon produced from all major hatcheries in Alaska are being thermally marked to allow differentiation from wild fish wherever they are found. Having said that, Kodiak hatcheries are in the process of moving to full otolith marking for all their stocks. Full otolith marking for any new increment of production or new release site (for any stock) is now compulsory (pers. communication ADFG, March 2014). Issues surrounding hatcheries in PWS and Southeast will eventually be raised in the other areas of Alaska that have large-scale hatchery production.

Currently, the majority of studies that suggest a reduction in fitness of wild salmonids due to interbreeding of hatchery and wild fish have been with species that require a year or more of rearing in freshwater, including steelhead, coho and Chinook (Chilcote et al., 2011; Naish et al., 2007). Tallman and Healy (1994) found geneflow in wild chum salmon to be much lower than expected based on observed straying and suggested that the stray fish were less successful at reproducing. Berejikian et al., (2009) did not find a significant difference in reproductive success between wild and hatchery-origin chum salmon. However, their study had low statistical power to detect such differences. A study by Dann, et al. (2010) on outbreeding depression in Alaskan coho salmon found no loss of fitness after two generations; however, as with Berejikian, et al. (2009) the statistical power of this study was low.

Grant (2012) provided an extensive literature review of interactions between wild and hatchery-produced salmonids and suggested the health of wild salmon in Alaska should be a concern in light of the magnitude of hatchery production there. His review focused on fitness of populations of wild fish that have been impacted by fish of hatchery-origin. The main concern with wild-hatchery interactions is the effect that strays from hatcheries have on wild fish, primarily from interbreeding. Grant (2012) maintains that wild salmon populations are adapted to environmental conditions in streams, rearing areas, and the ocean while hatchery-produced fish are intentionally or unintentionally selected against traits that enhance fitness in natural environments. Hatchery selection may favor traits that enhance survival in a hatchery but are maladaptive in the wild and, in the hatchery environment; natural selective pressure may be relaxed so that non-adaptive traits increase in frequency. Grant (2012) states that a growing body of evidence, both empirical and theoretical, indicates that hatchery practices almost always result in genetic changes, life-history shifts and behavioral changes that affect survival and that persistent straying of hatchery fish into wild populations will eventually lead to complete replacement of wild individuals with hatchery-origin descendants. His conclusion is that the results of the numerous studies he has reviewed show that inevitable changes to hatchery populations will result in alteration of the fitness of wild populations from intermixing and interbreeding on the spawning grounds. However, he does say this conclusion would be strengthened by controlled, generational experiments with Alaskan salmon populations.

Recent studies (2012/2013) in Prince William Sound and Southeast Alaska

SEAK straying (Piston and Heinl 2012)

From 2008 to 2010 Piston and Heinl (2012a) collected otoliths from chum salmon (*Oncorhynchus cheta*) at wild stock index streams throughout Southeast Alaska to document the presence and distribution of stray hatchery fish. Summer chum salmon index streams in Southeast Alaska are grouped into aggregates of streams in three broad Subregions – Southern Southeast (SSE), Northern Southeast Inside (NSEI), and Northern Southeast Outside (NSEO).

Samples of greater than 50 fish were collected from 5 of 13 index streams in the SSE Subregion, 5 of 5 index streams in the NSEO Subregion, and 23 of 63 index streams in the NSEI Subregion. The proportion of hatchery fish was greater than 5% in 21 of 33 index streams: 2 of 5 in the SSE Subregion, 1 of 5 in NSEO Subregion, and 18 of 23 in the NSEI Subregion. The highest proportion of hatchery strays were found in streams located within 50 km of hatchery releases sites.

The authors observed significant year to year variations in the proportion of hatchery fish in four of nine streams that were sampled in multiple years. In the NSEI Subregion, they detected proportions of stray hatchery fish in excess of 5% at the majority of index streams. The overall estimated proportion of hatchery fish in the NSEI Subregion escapement index in 2010 was 13.5% (80% CI=12.5%-14.4%). In all three years the estimated overall proportion of hatchery strays in the NSEO Subregion was less than 2%.

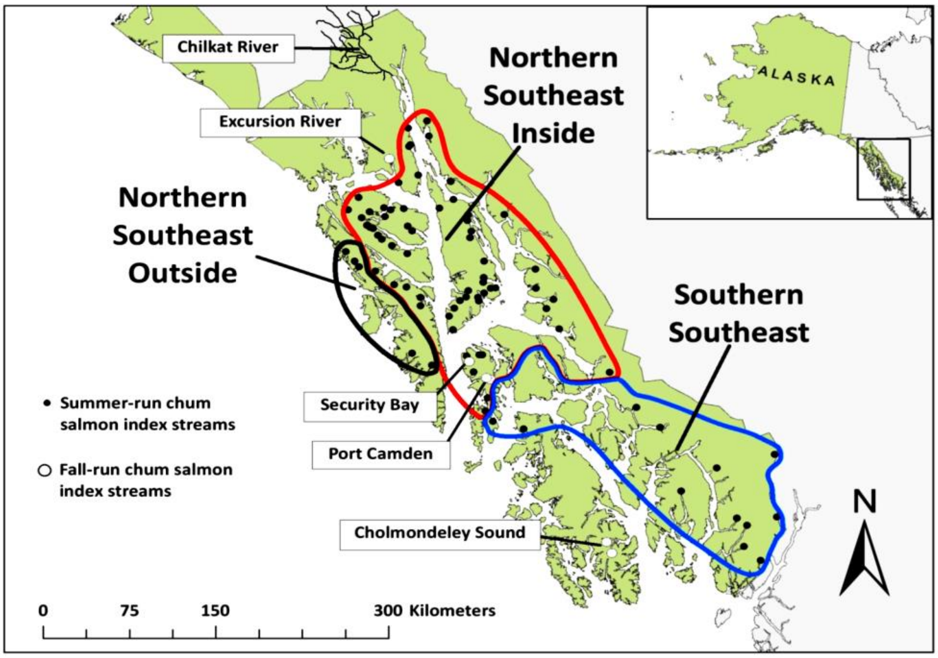

Figure 11. ADFG summer and fall-run chum salmon index streams in Southeast Alaska.

In 2011 Piston and Heinl (2012b) collected otoliths from chum salmon at wild stock index streams in the NSEI Region of Southeast Alaska to document the presence and distribution of stray hatchery fish in the escapement index for the Subregion. Sixteen of the 63 index streams were randomly selected for sampling and collections of otoliths at each stream, designed to be representative of the entire escapement. Samples of greater than 50 fish were obtained from 14 of 16 streams and hatchery fish were detected in 12 of those streams. The overall estimated proportion of hatchery fish in the NSEI escapement index in 2011 was 9.8% (95% CI=8.9%-10.7%), which was lower than the 2010 estimate of 13.5%, and the difference was statistically significant. The authors observed considerable year to year variation in five of the streams sampled in prior years. The proportion of hatchery strays in all samples collected from 2008 and 2011 decreased as distance from release sites increased and the proportions were generally highest at streams located within 50 km of the nearest hatchery release site. The authors calculated that modification of summer chum salmon escapement indices to account for the proportion of hatchery strays observed would result in little or no change to current escapement goals due to the method used to establish goals.

PWS straying (Brenner et al. 2012)

Surveys of pink (*Oncorhynchus gorbuscha*), chum (*O. keta*) and sockeye (*O. nerka*) salmon in wild salmon spawning locations in Prince William Sound (PWS), Alaska since 1997 show a wide range of hatchery straying. The analysis of thermally marked otoliths collected from carcasses indicate that 0–98% of pink salmon, 0–63% of chum salmon and 0–93% of sockeye salmon in spawning areas are hatchery fish, producing an unknown number of hatchery-wild hybrids.

Streams within 20 km of hatcheries generally contained the highest proportions of hatchery-origin pink salmon. Their estimates suggest from 0-98% of the pink salmon in some streams were from hatcheries. Before late August, as much as 0-63% of the chum salmon sampled in some streams were from hatcheries; however, after late August no stream had more than 20%. For sockeye salmon, the Eshamy River had the highest numbers of hatchery-origin fish sampled (22%). For streams without documented populations of sockeye, 29 of 44 carcasses sampled (66%) were of hatchery origin. Conversely, the remaining 44% may have been strays from wild stocks.

Most spawning locations sampled (77%) had hatchery pink salmon from three or more hatcheries, and 51% had annual escapements consisting of more than 10% hatchery pink salmon during at least one of the years surveyed. An exponential decay model of the percentage of hatchery pink salmon strays with distance from hatcheries indicated that streams throughout PWS contain more than 10% hatchery pink salmon. Pink salmon in PWS are intertidal spawners and that intertidal populations show less genetic difference from one another than do spawners from upstream locations indicating greater straying and more gene flow among populations of this species.

The prevalence of hatchery pink salmon strays in streams increased throughout the spawning season, while the prevalence of hatchery chum salmon decreased. The level of hatchery salmon strays in many areas of PWS are beyond all proposed thresholds (2–10%), which confounds wild salmon escapement goals and may harm the productivity, genetic diversity and fitness of wild salmon in this region.

Grant 2012, adaptive consequences of hatchery-wild salmon interactions

About 31% of salmon harvested in Alaska comes from the hatchery production of hundreds of millions of pink and chum salmon and smaller numbers of sockeye, Chinook, and coho salmon. The numbers of hatchery-reared juveniles released in some areas are greater than the numbers of juveniles from wild populations. However, very little is known about the effects of hatchery fish on wild populations in Alaska.
Numerous studies show a complex relationship between the genetic architecture of a population and its environment. Adaptive responses to nature and anthropogenic selection can be influenced by variation at a single gene, or more often, by the additive effects of several genes. Studies of salmonids in other areas show that hatchery practices can lead to the loss of genetic diversity, to shifts in adult run timing and earlier maturity, to increases in parasite load, to increases in straying, to altered levels of boldness and dominance, to shifts in juvenile out-migration timing, and to changes in growth.

Controlled experiments across generations show, and theory predicts, that the loss of adaptive fitness in hatchery salmon, relative to fitness in wild salmon, can occur on a remarkably short time scale. All of these changes can influence survival and impose selective regimes that influence genetically based adaptive traits. The preservation of adaptive potential in wild populations is an important buffer against diseases and climate variability and, hence, should be considered in planning hatchery production levels and release locations. The protection of wild populations is the foundation for achieving sustained harvests of salmon in Alaska.

Protecting wild populations of Pacific salmon in Alaska from the detrimental effects of wild-hatchery interactions is important for several reasons. The preservation of genetic variability among wild populations, and not just within populations, is important to the survival of regional populations and future broodstock availability. Second, genetic variability underpins physiological and behavioral responses to environmental variables that challenge fry in freshwater habitats and juveniles and adults in the marine realm. Selection from these challenges changes constantly because of human activities and swings in climate. Climate influences patterns of precipitation, which affect salmon fry production in freshwater and ocean nutrient cycles, which influence growth and survival in marine waters. Third, adaptive variation among populations may be essential for the regional persistence of populations. The abundances of local populations may change considerably, even though regional abundances remain constant.

The concern over hatchery-wild interactions is centered on the effects that hatchery-reared strays have on wild populations. These concerns are focused on ecological mechanisms that ultimately reduce the abundances of wild populations when fish compete for mates or for nesting sites. Most interactions between wild and hatchery-reared fish have the potential to influence the demography or genetics of wild populations. First, competition from hatchery fish can lead to the loss of genetic diversity in a wild population by reducing its effective population size. Second, mating between hatchery and wild fish can also lead to the loss of adaptive fitness in wild populations, especially when hatchery fish come from cultured populations that have diverged substantially from wild populations. First-generation hybrids between hatchery and wild fish may represent a loss of productivity in the short term, and genetic introgression can produce a shift in adaptive potential that reduces the long term viability of a wild population.

The table below, extracted from Grant (2012) shows some examples of adaptations and effects of hatchery practices and hatchery strays on Pacific salmon and other salmonids.

Table 12. Examples of adaptations and effects of hatchery practices and hatchery strays on Pacific salmon and other salmonids. The literature on this topic is abundant, and the information on these topics reported in the table is not comprehensive. Note that species: 1 = pink salmon, 2 = chum salmon, 3 = coho salmon, 4 = Chinook salmon, 5 = sockeye salmon, 6 = masu salmon, 7 = rainbow/steelhead trout, 8 = cutthroat trout, 9 = Atlantic salmon, 10 = brown trout, 11 = lake trout, 12 = brook trout. Table extracted from: W. S. Grant. 2012. Understanding the adaptive consequences of hatchery-wild interactions in Alaska salmon Environ Biol Fish, 94:325–342.

Trait	Results	Species[a]	Reference
Environmental adaptations in salmonids			
Population structure	Neutral genetic markers generally show significant divergence between populations, which reflects homing, local adaptation, and ancestral divergence	All	e.g. Seeb et al. (1999); Waples et al. (2001); and many others
Local adaptation	Hybrids between distant populations had reduced survival over controlled matings within populations. Demonstrates outbreeding depression from disruption of epistatic gene interactions	3	Gilk et al. (2004)
	Adaptive differences in morphology, growth, and timing of migration in juveniles response to water flow and temperature	9	Riddell and Leggett (1981)
Behavior	Inherited differences in agonistic behavior between wild juveniles from different streams	3	Rosenau and McPhail (1987)
	Innate ability to migrate appropriately upstream or downstream to feeding areas after emergence from gravel	5,7,8	Raleigh (1971)
Temperature adaptation	Abnormal embryo development in thermally stressed eggs	3	Campbell et al. (1998)
	Genotype-temperature interactions influences juvenile traits in pink and chum salmon	1,2	Beacham (1988)
Run timing	Complex interaction between arrival in spawning area and size; early arrival allowed choice of nest	1	Dickerson et al. (2002, 2005)
	Seasonal temperature cycles influence migration into freshwater	1,5	Hodgson and Quinn (2002); McGregor et al. (1998); Smoker et al. (1998)
Hatchery practices			
Loss of genetic diversity	Sperm competition from mixing of milt leads to smaller effective broodstock size for a given number of fish	All	Withler (1988); Hoysak et al. (2004); Campton (2004); Wedekind et al. (2007)
	Small effective broodstock size	8,9	Allendorf and Phelps (1980); Ryman and Ståhl (1980); Verspoor (1988); Norris et al. (1999)
	Inbred fish showed less resistance to pathogens than individuals	4	Arkush et al. (2002)
Broodstock selection	Reduced differentiation among hatcheries, relative to wild populations	10	Garcia-Marin et al. (1991)
Artificial mating	Artificial random mating prevents mate choice and to loss of fitness	All	Berejikian et al. (2000); Hankin et al. (2009)
	Random hatchery matings select for earlier maturity in Chinook salmon	4	Hankin et al. (2009)
	Artificially bred Atlantic salmon had four times higher parasite loads than fish from naturally matings	9	Consuegra and Garcia de Leaniz (2008)
Timing of egg take	Selection of eggs from one part of run can shift run timing of adults	3,4	Quinn et al. (2002); Ford et al. (2006)
Timing of fry release	Smots released in winter tended to stray the most	9	Hansen and Jonsson (1991)
Behavior	Small 2.2% advantage of wild fry over first-generation hatchery fry in avoidance of predation	4	Fritts et al. (2007)
Hatchery-reared fish released into the wild			
Growth rate	Lower growth rates in hatchery-reared fish released into the wild	7,9,12	Reisenbichler and McIntyre (1977); Lachance and Magnan (1990); Finstad and Heggberget (1993); Hesthagen et al. (1999)
	Hatchery supplementation led to smaller naturally spawning males	4	Unwin and Glova (1997)
Behavior	Hatchery juveniles failed to establish feeding territories, fed less and used less efficient feeding strategies than wild fish	10	Bachman (1984)

	Hatchery juveniles were more aggressive, spent less time foraging and more time in fast flowing water than wild fish	8	Mesa (1991)
	Captive or hatchery-bred salmon were more aggressive than wild-bred fish	3,9	Swain and Riddell (1990); Blanchet et al. (2008)
	Hatchery domestication promotes boldness in brown trout	10	Sunderström et al. (2004)
Survival	Lower survival in hatchery-reared fish released into the wild	7	Reisenbichler and McIntyre (1977); Reisenbichler and Rubin (1999)
	Decline in fitness relative to wild fish the longer a broodstock is cultivated in a hatchery	7	Araki et al. (2007b)
	Offspring of hatchery spawners produced only 10-20% surviving offspring of wild spawners	7	Chilcote et al. (1986); Campton et al. (1991)
Age at maturity	Hatchery-reared fish mature more rapidly in the wild	7	Leider et al. (1986)
	Hatchery supplementation led to earlier male maturity (jacks)	4	Unwin and Glova (1997)
Homing	Homing to hatchery of origin, rather than to location of release site	7	Hayes et al. (2004)
	Hatchery fish strayed more than wild fish	4,9	Jonsson et al. (1991); McIsaac and Quinn (1988); Quinn et al. (1991)
	No difference in stray rate between hatchery and wild salmon	3	Labelle (1992)
Reproductive success	Hatchery fish reproducing in the wild had lower lifetime reproductive success than wild fish	3	Thériault et al. (2011)
Run timing	Shift of run timing in hatchery and straying led to shift to earlier run timing in natural population	3	Ford et al. (2006)
	Wild fish returned to freshwater earlier than hatchery fish	9	Jonsson et al. (1991)
Wild population abundance	Hatchery supplementation led to depressed recruitment of replacement of large proportion of wild populations with fish of hatchery origin	4,9	Unwin and Glova (1997); McGinnity et al. (2009)
Hatchery-reared and wild fish studied in common hatchery environment			
Growth rate	Hatchery fish grow more rapidly than wild fish reared in a hatchery	12	Vincent (1960); Dwyer and Piper (1984); Fleming et al. (2002)
Egg size	Wild fish had larger eggs	11	McDermid et al. (2010)
Egg development	Egg survival better in wild fish	11	McDermid et al. (2010)
Fry growth and development early growth rate	Fewer deformities in wild fish	11	McDermid et al. (2010)
	Wild fish grew more rapidly	11	McDermid et al. (2010)
Behavior	Hatchery and hatchery × wild hybrids showed higher levels of agonistic behavior than wild fish	4	Wessel et al. (2006)
	Hatchery juveniles dominant over wild juveniles	9	Metcalfe et al. (2003)
Life-time survival	Reduced survival of hatchery offspring relative to offspring from wild parents	4	Kostow (2004)

[a] Species: 1 = pink salmon, 2 = chum salmon, 3 = coho salmon, 4 = Chinook salmon, 5 = sockeye salmon, 6 = masu salmon, 7 = rainbow/steelhead trout, 8 = cutthroat trout, 9 = Atlantic salmon, 10 = brown trout, 11 = lake trout, 12 = brook trout

Overall, the evidence highlights that, for the studies referenced in the table above, hatchery culture reduces the fitness of hatchery-reared fish, relative to wild fish, and second that straying of hatchery fish into wild populations can lower the fitnesses of these populations. Without question, adaptations to seasonal and annual environmental cycles allow Pacific salmon to successfully complete their life history cycles in freshwater, estuarine, and marine habitats. Several experimental studies show that numerous ecological and life-history variables, such as runtiming, nest building, mating behavior, egg size, fry emergence, and juvenile behavior, are closely tied to environmental variables by selection, which shape adaptive responses that affect survival and, hence, fitness of wild fish. These finely tuned adaptations can be disrupted by hybridization with genetically altered hatchery fish.

Evidence for understanding the effects of hatchery strays on wild populations in Alaska comes from studies of Pacific salmon and other salmonids in a variety of regional settings and from theoretical considerations. It may be argued that these results are not entirely applicable to Pacific salmon populations in Alaska, because of environmental differences between regions, because of life-history differences between species, and because many models for investigating the effects of straying were constructed to address conservation concerns of threatened populations and not the management of large populations. However, the results of the numerous studies reported in the table above show that artificial culture inevitably changes the genetic architectures of hatchery-reared fish. When these fish stray into streams and rivers, they can alter the fitnesses of wild populations through ecological interactions and hybridization.

Jasper et al. 2013, evidence of genetic introgression in PWS Chum salmon

The extent to which stray, hatchery-reared salmon affect wild populations is much debated. Although experiments show that artificial breeding and culture influence the genetics of hatchery salmon, little is known about the interaction between hatchery and wild salmon in a natural setting. In this study, the authors estimated historical and contemporary genetic population structures of chum salmon (*Oncorhynchus keta*) in Prince William Sound (PWS), Alaska, with 135 single nucleotide polymorphism (SNP) markers. Historical population structure was inferred from the analysis of DNA from fish scales, which had been archived since the late 1960's for several populations in PWS. Parallel analyses with microsatellites and a test based on Hardy-Weinberg proportions showed that about 50% of the fish-scale DNA was cross-contaminated with DNA from other fish. These samples were removed from the analysis. The authors used a novel application of the classical source-sink model to compare SNP allele frequencies in these archived fish-scales (1964–1982) with frequencies in contemporary samples (2008–2010) and found a temporal shift toward hatchery allele frequencies in some wild populations. The results of the study yielded insights into the extent that hatchery strays have influenced wild populations of chum salmon in PWS after more than 30 years of large-scale hatchery production. These results show that some populations are more susceptible to genetic introgression by hatchery strays than other populations. Both proximity to a hatchery and the intensity of straying were less important, under some circumstances, than similarity in spawning time. Mismatches in other life-history traits may also be important in retarding genetic introgression into wild populations. Nevertheless, the results showed a general convergence of allele frequencies in wild populations toward hatchery allele frequencies. While this convergence demonstrates introgression at neutral genes, the fundamental concern is over the effect of introgression on adaptive variation. Introgression from hatchery strays applies equal pressure on neutral and adaptive genes in wild populations, but it is uncertain to what extent genes underlying adaptation are resilient to introgression. The source-sink model is a powerful means of detecting low levels of introgression over several generations.

http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0081916

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

The scale of the hatchery program in Alaska (particularly for pink salmon in PWS and for chum salmon in Southeast Alaska and PWS) has raised concerns that hatchery-produced fish may be detrimentally impacting the productivity and sustainability of wild stocks of salmon. Risks posed to natural stocks from hatchery production, including genetic impacts from interbreeding, disease transmission, ecological impacts from competition and overharvest mortality, have been recognized and reported for many years (see Brenner et al., 2012; Grant, 2012; Araki and Schmid, 2010 for reviews).

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

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

Evidence adequacy rating:

☑ **High** **Medium** **Low**

Rating determination

This clause is deemed to be of high conformance.

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. The Alaska Department of Fish and Game actively supports and participates in research aimed to evaluate the effects of salmon fisheries 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.

To reduce genetic risks from hatchery strays, Alaska salmon hatchery brood stocks have been founded by local, wild fish, wherever possible. Moreover, random mating and relatively large numbers of adult spawners are also used in Alaskan salmon hatcheries to maximize effective population sizes, maintain genetic diversity and reduce risks associated with interbreeding between wild fish and stray hatchery salmon. Nevertheless, these measures do not entirely eliminate the possibility of risk from Alaskan salmon hatcheries to wild populations. Information is needed with respect to the effects of introgression from stray hatchery salmon on the mean fitness and productivity of recipient wild salmon populations in Alaska. Efforts to meet this critical information need are currently being made through state and privately-funded genetic pedigree studies of wild and hatchery salmon. This ongoing pedigree and other important genetics-based research should continue to be supported, with results carefully monitored and applied to the management of Alaskan salmon fisheries enhancement.

N.B. This report reviews 2013 hatchery releases. Hatchery releseases in 2014 will be reviewed at the 4th surveillance audit.

Salmon Enhancement in Alaska

The hatchery program in Alaska was initiated in the early 1970's to contribute to the rehabilitation of the state's depleted and depressed salmon fisheries. It was intended that wild stocks of salmon would be protected from adverse impacts through the development of permitting processes that included genetics, pathology and fisheries management reviews, policies that required hatcheries to be located away from significant wild stocks, use of local brood stock sources, a wild stock priority in fisheries management, and options to require marking of hatchery salmon and special studies on hatchery/wild stock interactions (McGee, 2004).

A key concept behind development of policies for salmon hatcheries in Alaska was the comprehensive regional planning process. This involved formation of regional planning teams consisting of scientists and fishery managers from ADFG and other state agencies, along with scientists from universities, federal agencies, commercial and recreational fishery groups, regional aquaculture associations, and local community representatives. Planning teams developed comprehensive regional plans that determined the location of hatcheries with consideration given to terminal harvest areas that would allow targeting of hatchery fish while minimizing impact on wild stocks. Other aspects of comprehensive planning included the permitted capacity of each species to be raised in individual hatcheries, the use of broodstocks of local origin, and distance of hatcheries to wild stocks. Because the Alaska program was developed to enhance the salmon fishery and not mitigate for lost habitat, or help rebuild wild runs with infusions of hatchery fish, the siting of hatcheries became of paramount importance.

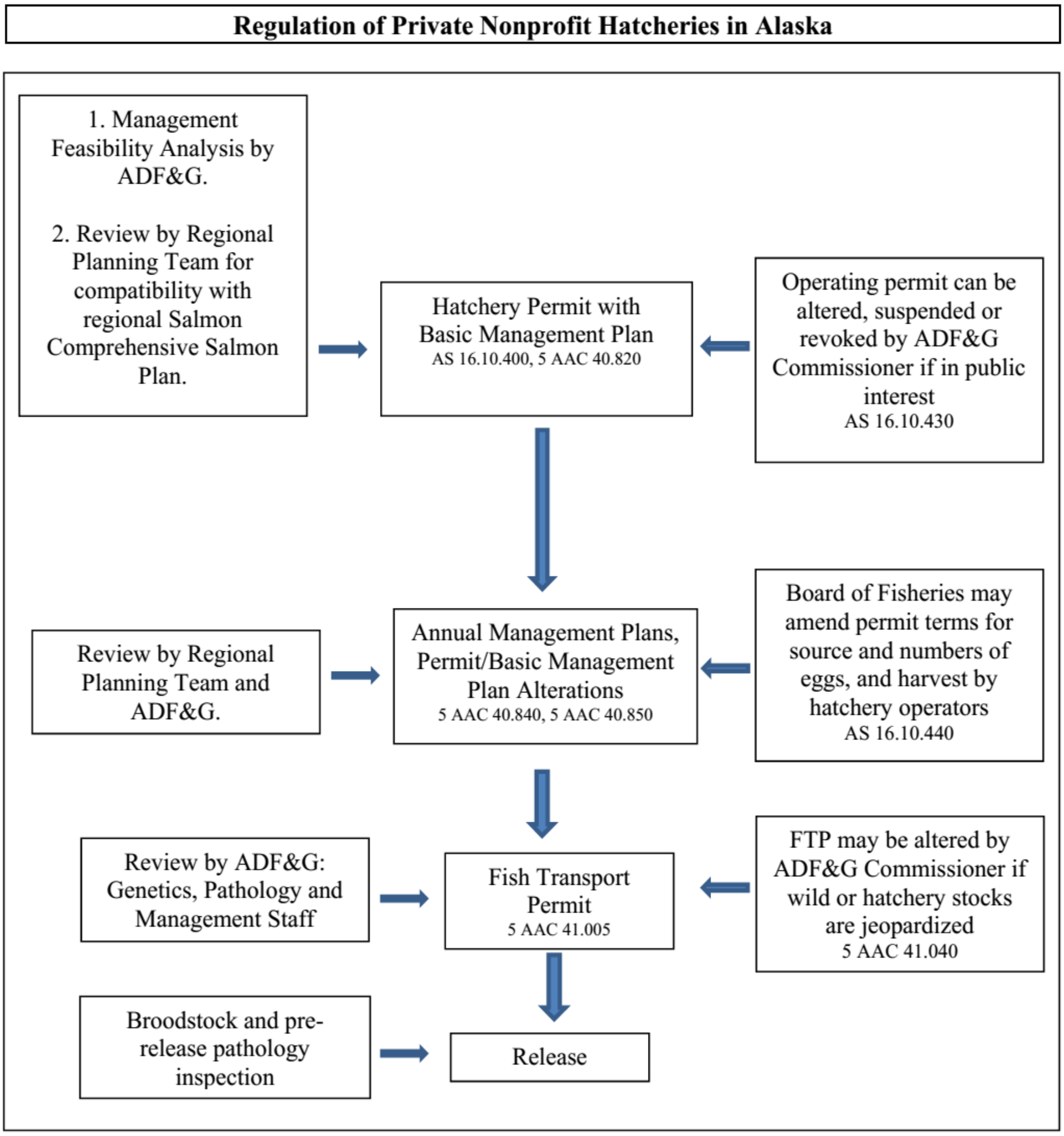

Figure 10. Diagram of Alaska hatchery permitting process.
http://www.adfg.alaska.gov/FedAidPDFs/RIR.5J.2013.10.pdf

In order to minimize potential negative impacts of hatchery salmon, no hatcheries are located on streams or rivers with major runs of wild salmon; conversely, most hatcheries are located on non-anadromous water sources at or near tidewater and some distance from important wild stocks. Other key planning and policy issues included development of conservative fish culture practices, statewide genetics and fish health policies, and use of innovative technologies. Conservative fish culture practices included use of hatchery broodstock originating from local regional wild stocks and restricting the use of a particular broodstock to a limited number of hatcheries. These practices and other policies are encoded in the statewide genetics and fish health policies (Heard 2011).

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.). A large and pre-determined number of returning fish are used for hatchery spawning (Reference to Genetic Policy, 1985).

Key Aspects of Salmon Enhancement Management in Alaska

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

Each hatchery is required to complete an annual report containing information on hatchery returns, numbers of eggs taken, and numbers of fry or smolts released, by species and stock, in accordance with their approved permits (Heard 2012).

Hatchery management plans ensure hatchery operations are consistent with departmental policies, regulations, and fishery management plans. Prior to approval, all fish and egg transport permits are reviewed to make sure they are consistent with approved plans and policies. Hatcheries are also subject to biennial pathology inspections to maintain fish health at acceptable levels. Large scale studies are currently underway to identify confidently the straying rates of pink and chum salmon in PWS and SEAK and the potential level of introgression and fitness of hatchery-wild salmon F1 generation.

In contrast to the mitigation hatcheries of the Pacific Northwest, which were built to replace wild production that was diminished or even extirpated by widespread habitat degradation and damming of many major salmon-producing rivers, the Alaskan hatchery program was developed to supplement and enhance fisheries that historically depended on wild production (McGee, 2004). The policies and procedures established by ADFG at the onset of the Alaskan hatchery program were intended to avoid some of the detrimental impacts observed with Pacific Northwest hatchery programs. These policies have been generally successful for over three decades by preventing introductions of exotic stocks of fish and fish pathogens and allowing increased harvest of salmon while attempting to minimize risk to wild stocks.

Generally speaking, all hatchery broodstock comes from returning hatchery salmon. One exception occurs at the Gulkana facility for sockeye salmon enhancement in PWS. Gulkana sockeye broodstock is strongly integrated because PWSAC has observed the proportion of otolith marks (in this case chemical marks, not thermal marks) in the sockeye broodstock to be pretty low, i.e. near half. There is also evidence that relatively few fish stray away from the Gulkana project to wild-spawning populations. In the Gulkana sockeye broodstock there is evidence of a large portion of wild-spawned fish each year and there is scant evidence of hatchery-spawned fish among wild spawners.

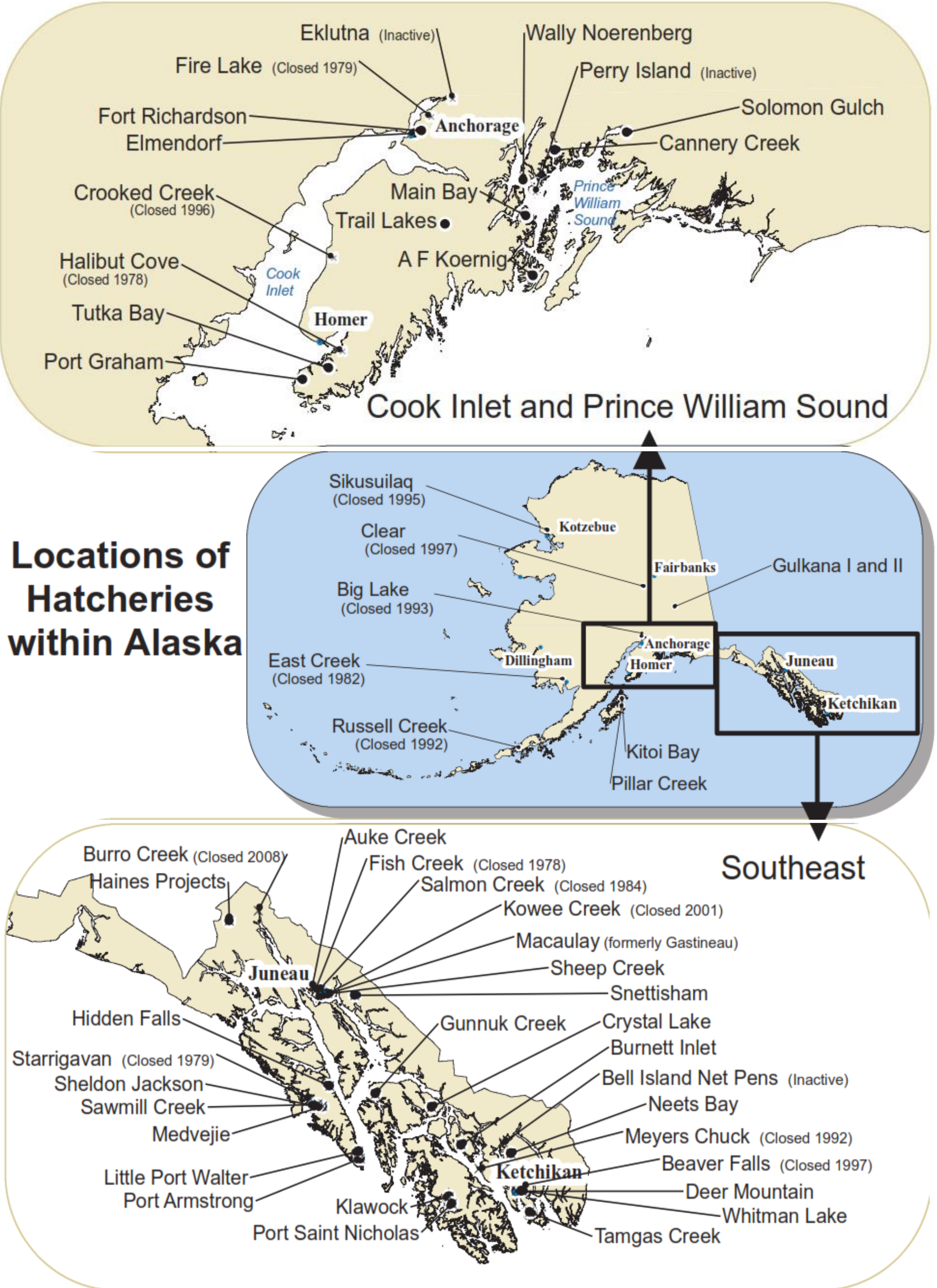

Figure 11. Locations of Alaskan salmon hatcheries in Prince William Sound and Southeastern Alaska. Adapted from Heard (2012).

In their recent study, Bidlack and McCall (2009) collected 426 readable otoliths from six sites in sub-drainages of the upper Copper River to document any occurrence of strontium-marked sockeye salmon from the Gulkana Hatchery that had strayed into and died in wild salmon spawning streams. A microscopic analysis of recovered otoliths from spawned-out carcasses revealed no evidence of hatchery-marked fish in surveyed wild salmon streams and lakes (Bidlack and McCall 2009 http://www.crks.org/wp/wp-content/uploads/Upriver-Sockeye-Straying-Report-10-13-09.pdf).

In Southeast Alaska, the majority of Chinook, coho, sockeye and pink salmon harvested in common property fisheries are from wild stocks (Vercessi, 2013). However, a high proportion of the chum salmon harvested in this region are of hatchery origin (e.g. 83.5% in 2012). Much of the commercial harvest of chum salmon is taken in terminal/special harvest areas where the catch of wild stocks is minimized. However, the available data on wild and hatchery stock composition of fisheries that harvest both hatchery and wild stocks simultaneously may be insufficient to determine that over-harvest of wild stocks does not occur.

Recent studies have determined that large numbers of hatchery-origin salmon are present on the spawning grounds of wild salmon in some areas of Alaska, particularly PWS and Southeast (Brenner et al. 2012, Piston and Heinl 2012a,b). These studies were enabled by the incorporation of otolith thermal marks into mass-marking programs at most hatcheries, which subsequently facilitate detection of hatchery-origin salmon in streams. With the exception of hatcheries in the Kodiak region, juvenile salmon produced from all major hatcheries in Alaska are marked to allow differentiation from wild fish wherever they are found. Issues surrounding hatcheries in PWS and Southeast will eventually be raised in other areas of Alaska that have large-scale hatchery production, including Kodiak and Cook Inlet.

Kodiak hatcheries (Pillar Creek, Kitoi Bay) are not currently required by ADFG to mass mark the fish they produce. Instead, ADFG staff perform scale pattern analyses to verify the origin of salmon. The relatively discrete scale of the hatchery operations in Kodiak and the absence of evidence for straying salmon have not prompted ADFG to require mass marking of hatchery salmon produced in the Kodiak Region.

Hatchery Production in 2013

The contribution of hatchery produced salmon to Alaska fisheries in 2013 was as follow.

Southeast: Returning hatchery-produced salmon accounted for 10% of the salmon in the commercial CPF; 81% of the chum, 26% of the coho, 32% of the Chinook, 14% of the sockeye, and 2% of the pink salmon can be attributed to fisheries enhancement projects. The harvest of hatchery produced salmon contributed an estimated $52 million, or 21% of the ex-vessel value of salmon in the commercial CPF. In Southeast, the majority of the non-commercial common property fisheries (CPF) contribution was coho salmon, with an estimated 36,000 fish harvested.

Prince William Sound: An estimated 75 million salmon returned from hatchery releases, accounting for an estimated 79% of the total number of salmon in the commercial CPH; 88% of the chum, 80% of the pink, 45% of the sockeye, and 39% of the coho salmon in the commercial CPH were hatchery-produced fish. In addition, hatchery produced salmon contributed an estimated $113 million, or 68%, of the ex-vessel value of salmon in the commercial CPH. Sockeye salmon were the bulk of the non-commercial CPF harvest, with an estimated 131,000 fish harvested in the PWS area.

Cook Inlet: The fisheries enhancement program accounted less than 1% of the sockeye salmon and 1% of the pink salmon in the commercial CPH and contributed an estimated $471,000 or 1%, of the ex-vessel value of salmon in the commercial CPH. Cook Inlet area non-commercial CPF harvest of 47,000 fish was dominated by sockeye salmon, with estimates of over 31,000 hatchery produced fish harvested.

Kodiak: Hatcheries in the salmon fisheries enhancement program accounted for 35% of the total number of salmon in the commercial CPH; 12% of the chum, 20% of the coho, 15% of the sockeye, and 38% for the pink salmon in the commercial CPH were hatchery produced fish. Additionally, the fisheries enhancement program contributed an estimated $16 million, or 26% of the ex-vessel value of salmon in the commercial CPH. Of the 14,000 hatchery produced salmon harvested in the non commercial CPF, an estimated 5,700 were coho salmon.

(Vercessi 2014, available at http://www.adfg.alaska.gov/FedAidpdfs/FMR14-12.pdf).

Recent publications on the hatchery-wild salmon interaction

The majority of studies, to date, that suggest a reduction in fitness of wild salmonids due to interbreeding of hatchery and wild fish have been with species that require a year or more of rearing in freshwater, including steelhead, coho and Chinook (Araki et al. 2007; Chilcote et al., 2011; Ford et al. 2012; Naish et al., 2007; Thériault et al. 2011).

Recent studies (2012/2013) in Prince William Sound and Southeast Alaska

SEAK straying (Piston and Heinl 2012a,b)

From 2008 to 2010 Piston and Heinl (2012a) collected otoliths from chum salmon (*Oncorhynchus keta*) at wild stock index streams throughout Southeast Alaska to document the presence and distribution of stray hatchery fish. Summer chum salmon index streams in Southeast Alaska are grouped into aggregates of streams in three broad Subregions – Southern Southeast (SSE), Northern Southeast Inside (NSEI), and Northern Southeast Outside (NSEO).

Samples of greater than 50 fish were collected from 5 of 13 index streams in the SSE Subregion, 5 of 5 index streams in the NSEO Subregion, and 23 of 63 index streams in the NSEI Subregion. The proportion of hatchery fish was greater than 5% in 21 of 33 index streams: 2 of 5 in the SSE Subregion, 1 of 5 in NSEO Subregion, and 18 of 23 in the NSEI Subregion. The highest proportions of hatchery strays were found in streams located within 50 km of hatchery releases sites.

The authors observed significant year-to-year variations in the proportion of hatchery fish in four of nine streams that were sampled in multiple years. In the NSEI Subregion, they detected proportions of stray hatchery fish in excess of 5% at the majority of index streams. The overall estimated proportion of hatchery fish in the NSEI Subregion escapement index in 2010 was 13.5% (80% CI=12.5%-14.4%). In all three years the estimated overall proportion of hatchery strays in the NSEO Subregion was less than 2%.

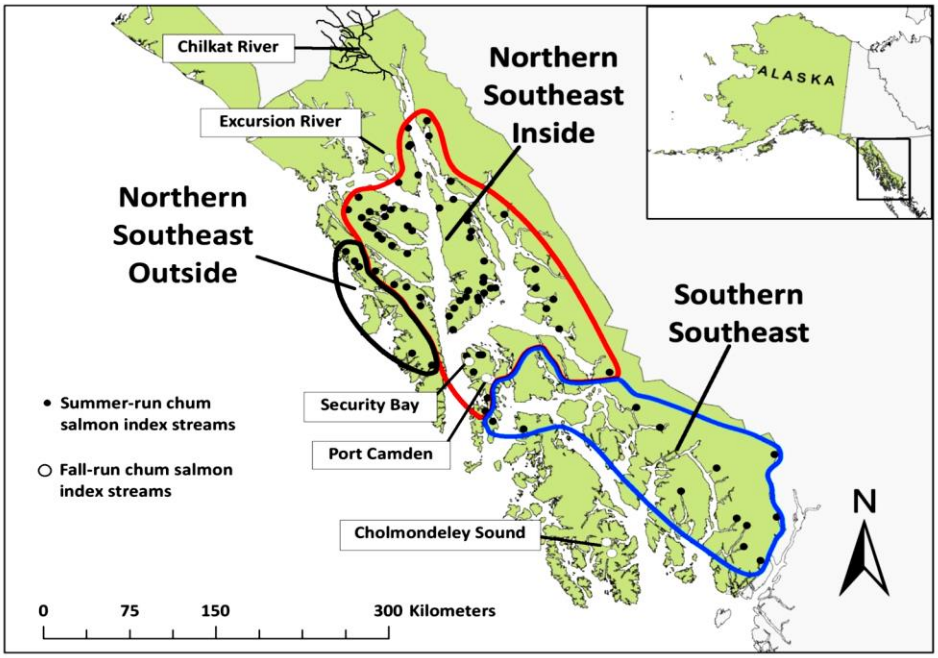

Figure 12. ADFG summer- and fall-run chum salmon index streams in Southeast Alaska.

In 2011 Piston and Heinl (2012b) collected otoliths from chum salmon at wild stock index streams in the NSEI Region of Southeast Alaska to document the presence and distribution of stray hatchery fish in the escapement index for the Subregion. Sixteen of the 63 index streams were randomly selected for sampling and collections of otoliths at each stream, designed to be representative of the entire escapement. Samples of >50 fish were obtained from 14 of 16 streams and hatchery fish were detected in 12 of those streams. The overall estimated proportion of hatchery fish in the NSEI escapement index in 2011 was 9.8% (95% CI=8.9%-10.7%), which was lower than the 2010 estimate of 13.5%, and the difference was statistically significant. The authors observed considerable year to year variation in five of the streams sampled in prior years. The proportion of hatchery strays in all samples collected from 2008 and 2011 decreased as distance from release sites increased and the proportions were generally highest at streams located within 50 km of the nearest hatchery release site. The authors calculated that modification of summer chum salmon escapement indices to account for the proportion of hatchery strays observed would result in little or no change to current escapement goals due to the method used to establish goals.

PWS straying (Brenner et al. 2012)

During their investigation of stray rates by hatchery salmon in Prince William Sound, Brenner et al. (2012) reported that, "pink (*Oncorhynchus gorbuscha*), chum (*O. keta*) and sockeye (*O. nerka*) salmon in wild salmon spawning locations in Prince William Sound (PWS), Alaska since 1997 show a wide range of hatchery straying. The analysis of thermally marked otoliths collected from carcasses indicate that 0–98% of pink salmon, 0–63% of chum salmon and 0–93% of sockeye salmon in spawning areas are hatchery fish, producing an unknown number of hatchery-wild hybrids."

More specifically, they found that streams “within 20 km of hatcheries generally contained the highest proportions of hatchery-origin pink salmon”. Their estimates suggest from 0-98% of the pink salmon in some streams were from hatcheries. Before late August, as much as 0-63% of the chum salmon sampled in some streams were from hatcheries; however, after late August no stream had more than 20%. For sockeye salmon, the Eshamy River had the highest numbers of hatchery-origin fish sampled (22%) and for “streams without documented populations of sockeye, 29 of 44 carcasses sampled (66%) were of hatchery origin”. Conversely, the remaining 44% may have been strays from wild stocks.

Most spawning locations sampled (77%) had hatchery pink salmon from three or more hatcheries, and 51% had annual escapements consisting of more than 10% hatchery pink salmon during at least one of the years surveyed. An exponential decay model of the percentage of hatchery pink salmon strays with distance from hatcheries indicated that streams throughout PWS contain more than 10% hatchery pink salmon. Pink salmon in PWS are intertidal spawners and that intertidal populations show less genetic difference from one another than do spawners from upstream locations indicating greater straying and more gene flow among populations of this species.

Brenner also noted that the “prevalence of hatchery pink salmon strays in streams increased throughout the spawning season, while the prevalence of hatchery chum salmon decreased. The level of hatchery salmon strays in many areas of PWS are beyond all proposed thresholds (2–10%), which confounds wild salmon escapement goals and may harm the productivity, genetic diversity and fitness of wild salmon in this region”.

Grant 2012, adaptive consequences of hatchery-wild salmon interactions

In his review of potential impacts from Alaskan salmon hatcheries on wild populations, Grant (2012) noted that “About 31% of salmon harvested in Alaska comes from the hatchery production of hundreds of millions of pink and chum salmon and smaller numbers of sockeye, Chinook, and coho salmon. The numbers of hatchery-reared juveniles released in some areas are greater than the numbers of juveniles from wild populations. However, virtually nothing is known about the effects of hatchery fish on wild populations in Alaska.”

He added that, “Numerous studies show a complex relationship between the genetic architecture of a population and its environment. Adaptive responses to nature and anthropogenic selection can be influenced by variation at a single gene, or more often, by the additive effects of several genes. Studies of salmonids in other areas show that hatchery practices can lead to the loss of genetic diversity, to shifts in adult run timing and earlier maturity, to increases in parasite load, to increases in straying, to altered levels of boldness and dominance, to shifts in juvenile out-migration timing, and to changes in growth. Controlled experiments across generations show, and theory predicts, that the loss of adaptive fitness in hatchery salmon, relative to fitness in wild salmon, can occur on a remarkably short time scale. All of these changes can influence survival and impose selective regimes that influence genetically based adaptive traits. The preservation of adaptive potential in wild populations is an important buffer against diseases and climate variability and, hence, should be considered in planning hatchery production levels and release locations. The protection of wild populations is the foundation for achieving sustained harvests of salmon in Alaska.”

Table 12, extracted from Grant (2012), presents some examples of adaptations and effects of hatchery practices and hatchery strays on Pacific salmon and other salmonids.

Table 12. Examples of adaptations and effects of hatchery practices and hatchery strays on Pacific salmon and other salmonids. The literature on this topic is abundant, and the information on these topics reported in the table is not comprehensive. Note that species: 1 = pink salmon, 2 = chum salmon, 3 = coho salmon, 4 = Chinook salmon, 5 = sockeye salmon, 6 = masu salmon, 7 = rainbow/steelhead trout, 8 = cutthroat trout, 9 = Atlantic salmon, 10 = brown trout, 11 = lake trout, 12 = brook trout. Table extracted from Grant (2012).

Trait	Results	Species[a]	Reference
Environmental adaptations in salmonids			
Population structure	Neutral genetic markers generally show significant divergence between populations, which reflects homing, local adaptation, and ancestral divergence	All	e.g. Seeb et al. (1999); Waples et al. (2001); and many others
Local adaptation	Hybrids between distant populations had reduced survival over controlled matings within populations. Demonstrates outbreeding depression from disruption of epistatic gene interactions	3	Gilk et al. (2004)
	Adaptive differences in morphology, growth, and timing of migration in juveniles response to water flow and temperature	9	Riddell and Leggett (1981)
Behavior	Inherited differences in agonistic behavior between wild juveniles from different streams	3	Rosenau and McPhail (1987)
	Innate ability to migrate appropriately upstream or downstream to feeding areas after emergence from gravel	5,7,8	Raleigh (1971)
Temperature adaptation	Abnormal embryo development in thermally stressed eggs	3	Campbell et al. (1998)
	Genotype-temperature interactions influences juvenile traits in pink and chum salmon	1,2	Beacham (1988)

Run timing	Complex interaction between arrival in spawning area and size; early arrival allowed choice of nest	1	Dickerson et al. (2002, 2005)
	Seasonal temperature cycles influence migration into freshwater	1,5	Hodgson and Quinn (2002); McGregor et al. (1998); Smoker et al. (1998)
Hatchery practices			
Loss of genetic diversity	Sperm competition from mixing of milt leads to smaller effective broodstock size for a given number of fish	All	Withler (1988); Hoysak et al. (2004); Campton (2004); Wedekind et al. (2007)
	Small effective broodstock size	8,9	Allendorf and Phelps (1980); Ryman and Ståhl (1980); Verspoor (1988); Norris et al. (1999)
	Inbred fish showed less resistance to pathogens than individuals	4	Arkush et al. (2002)
Broodstock selection	Reduced differentiation among hatcheries, relative to wild populations	10	Garcia-Marin et al. (1991)
Artificial mating	Artificial random mating prevents mate choice and to loss of fitness	All	Berejikian et al. (2000); Hankin et al. (2009)
	Random hatchery matings select for earlier maturity in Chinook salmon	4	Hankin et al. (2009)
	Artificially bred Atlantic salmon had four times higher parasite loads than fish from naturally matings	9	Consuegra and Garcia de Leaniz (2008)
Timing of egg take	Selection of eggs from one part of run can shift run timing of adults	3,4	Quinn et al. (2002); Ford et al. (2006)
Timing of fry release	Smots released in winter tended to stray the most	9	Hansen and Jonsson (1991)
Behavior	Small 2.2% advantage of wild fry over first-generation hatchery fry in avoidance of predation	4	Fritts et al. (2007)
Hatchery-reared fish released into the wild			
Growth rate	Lower growth rates in hatchery-reared fish released into the wild	7,9,12	Reisenbichler and McIntyre (1977); Lachance and Magnan (1990); Finstad and Heggberget (1993); Hesthagen et al. (1999)
	Hatchery supplementation led to smaller naturally spawning males	4	Unwin and Glova (1997)
Behavior	Hatchery juveniles failed to establish feeding territories, fed less and used less efficient feeding strategies than wild fish	10	Bachman (1984)
	Hatchery juveniles were more aggressive, spent less time foraging and more time in fast flowing water than wild fish	8	Mesa (1991)
	Captive or hatchery-bred salmon were more aggressive than wild-bred fish	3,9	Swain and Riddell (1990); Blanchet et al. (2008)
	Hatchery domestication promotes boldness in brown trout	10	Sunderström et al. (2004)
Survival	Lower survival in hatchery-reared fish released into the wild	7	Reisenbichler and McIntyre (1977); Reisenbichler and Rubin (1999)
	Decline in fitness relative to wild fish the longer a broodstock is cultivated in a hatchery	7	Araki et al. (2007b)
	Offspring of hatchery spawners produced only 10-20% surviving offspring of wild spawners	7	Chilcote et al. (1986); Campton et al. (1991)
Age at maturity	Hatchery-reared fish mature more rapidly in the wild	7	Leider et al. (1986)
	Hatchery supplementation led to earlier male maturity (jacks)	4	Unwin and Glova (1997)

Homing	Homing to hatchery of origin, rather than to location of release site	7	Hayes et al. (2004)
	Hatchery fish strayed more than wild fish	4,9	Jonsson et al. (1991); McIsaac and Quinn (1988); Quinn et al. (1991)
	No difference in stray rate between hatchery and wild salmon	3	Labelle (1992)
Reproductive success	Hatchery fish reproducing in the wild had lower lifetime reproductive success than wild fish	3	Thériault et al. (2011)
Run timing	Shift of run timing in hatchery and straying led to shift to earlier run timing in natural population	3	Ford et al. (2006)
	Wild fish returned to freshwater earlier than hatchery fish	9	Jonsson et al. (1991)
Wild population abundance	Hatchery supplementation led to depressed recruitment of replacement of large proportion of wild populations with fish of hatchery origin	4,9	Unwin and Glova (1997); McGinnity et al. (2009)
Hatchery-reared and wild fish studied in common hatchery environment			
Growth rate	Hatchery fish grow more rapidly than wild fish reared in a hatchery	12	Vincent (1960); Dwyer and Piper (1984); Fleming et al. (2002)
Egg size	Wild fish had larger eggs	11	McDermid et al. (2010)
Egg development	Egg survival better in wild fish	11	McDermid et al. (2010)
Fry growth and development early growth rate	Fewer deformities in wild fish	11	McDermid et al. (2010)
	Wild fish grew more rapidly	11	McDermid et al. (2010)

Genetic Introgression from hatchery chum salmon in PWS

Using a suite of 135 single nucleotide polymorphisms (SNPs), Jaspar et al. (2013) compared the allele frequencies present in hatchery and wild chum salmon populations sampled in different years and at various locations of Prince William Sound, Alaska. They then used the allele frequency data from histrorical and contemporary samples and two analytical methods to infer the level of genetic introgression from hatchery chum salmon on wild populations. They found that samples could best be clustered into four groups, defined by sampling location. That is, samples collected from the same site at different times were more alike than samples collected from different sites at the same time (Figure 13).

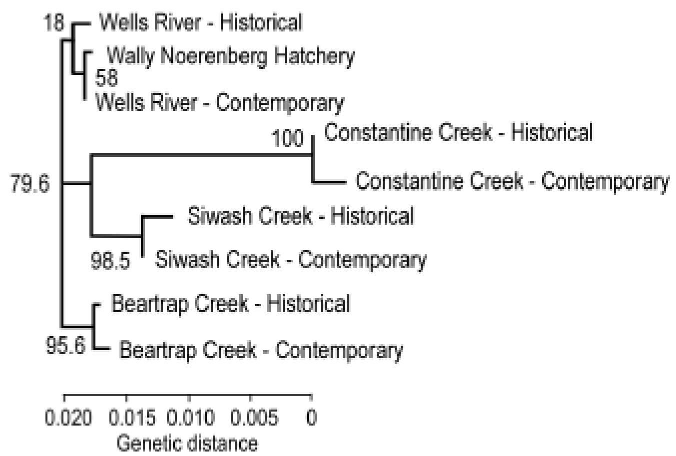

Figure 13. Neighbor-joining tree of F_{ST} between chum salmon samples from Prince William Sound, Alaska. Numbers in the tree represent bootstrap support for a node. From Jasper et al. 2013.

Results by Jasper et al. (2013) from STRUCTURE analyses (Pritchard et al. 2000) further suggested high genetic similarity between contemporary and historical samples within sites. The authors observed some possible evidence of among site admixture in both historical and contemporary samples, but noted that it was uncertain "whether these extrinsic components are due to gene flow and hybridization, or to the similarity of some SNP genotypes among populations.

Using a modified source-sink modelling approach, Jasper et al. (2013) found that "Three sample pairs fof Siwash Creek, Wells River, and Beartrap Creek showed a shift in allele frequencies, with the strongest shift appearing in Wells River. Less introgression was detected in Constatine Creek. Bayesian estimates of the per-generation introgression rate from the source-sink equation indicated that [migration]was significantly larger than zero in each of the four populations."

The authors concluded that the results of their study "yield insights into the extent that hatchery strays have influenced wild populations of chum salmon in PWS after more than 30 years of large-scale hatchery production. These results show that some populations are more susceptible to genetic introgression by hatchery strays than other populations. Both proximity to a hatchery and the intensity of straying were less important, under some circumstances, than similarity in spawning time. Mismatches in other life-history traits may also be important in retarding genetic introgression into wild populations."

Box 1. Identified sections from the 5 AAC 39.222 Policy for the management of sustainable salmon fisheries, establishing the highest priority for management of wild stocks and which are relevant to any consideration of the interaction of hatchery and wild salmon

*Section (b) The goal of the policy under this section **is to ensure conservation of salmon** and salmon's required marine and aquatic habitats, protection of customary and traditional subsistence uses and the sustained economic health of Alaska's fishing communities.*

Management of salmon fisheries by the state should be based on the following principles and criteria:

PART 1 wild salmon stocks and the salmon's habitats should be maintained at levels of resource productivity that assure sustained yields as follows:

Section (B) salmon stocks should be protected within spawning, incubating, rearing and migratory habits;

Section (D) effects and interactions of introduced or enhanced salmon stocks on wild salmon stocks should be assessed; wild salmon stocks and fisheries on those stocks should be protected from adverse impacts from artificial propagation and enhancement efforts;

Section (G) depleted salmon stocks should be allowed to recover or, where appropriate, should be actively restored; diversity should be maintained to the maximum extent possible, at the genetic, population, species and ecosystem levels;

PART 2 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:

Section (D) salmon escapement should be managed in a manner to maintain genetic and phenotypic characteristics of the stock by assuring appropriate geographic and temporal distribution of spawners as well as consideration of size, sex ratio, and other population decisions.

PART 3 effective management systems should be established and applied to regulate human activities that affect salmon as follows:

Section (A) Salmon management objectives should be appropriate to the scale and intensity of various uses and the biological capacities of target salmon stocks;

PART 5 in the face of uncertainty, salmon stocks, fisheries, artificial propagation, and essential habitats shall be managed conservatively as follows:

Section (A) A precautionary approach, involving the application of prudent foresight that takes into account the uncertainties in salmon fisheries and habitat management, the biological, social, cultural and economic risks and the need to take action with incomplete knowledge, should be applied to the regulation and control of harvest and other human induced sources of salmon mortality; a precautionary approach requires add provisions (i) to (v)….

2012 PAR CHANGES

Region	Hatchery	Species	Change in hatchery permitted capacity via approved PAR	Total hatchery permitted capacity after approved PAR (by species)	Region-wide permitted capacity after approved PAR (by species)
Southeast	Hidden Falls	Coho salmon	0.8 million green eggs	7.7 million green eggs	39.72 million green eggs
Southeast	Medvejie Creek[1]	Chum salmon	7 million green eggs	77 million green eggs	584.80 million green eggs
Southeast	Burnett Inlet[2]	Coho salmon	2.0 million green eggs	4.5 million green eggs	41.72 million green eggs

[1] Housekeeping PAR, to correct stated permitted capacity to the level previously requested, reviewed, and recommended in 2011.

[2] This approved PAR moved production from Whitman Lake Hatchery to Burnett Inlet Hatchery; no increase in production overall.

2013 PAR Changes

Region	Hatchery	Species	Change in hatchery permitted capacity via approved PAR	Total hatchery permitted capacity after approved PAR in 2013 (by species)
Southern Southeast	Burnett Inlet	Chum salmon	6 million eggs	31 million eggs
Northern Southeast	Sheldon Jackson	Chum salmon	2 million eggs	12 million eggs
Northern Southeast	Medvejie	Coho salmon	2.9 million eggs	3.3 million eggs

http://www.adfg.alaska.gov/FedAidPDFs/FMR13-05.pdf
http://www.adfg.alaska.gov/FedAidpdfs/FMR14-12.pdf
http://www.adfg.alaska.gov/index.cfm?adfg=fishingHatcheriesResearch.findings_updates.

Schedule of Research Actvities:

As proposed by the Prince William Sound Science Center (PWSSC), a summary of the expected timing of major activities is:

Year	Season	Activity
2012	Summer	• Preliminary trials of the ocean sampling • Initial reconnaissance on the 10 intensive streams to begin mapping • Collect otoliths from potential intensive streams where the stray rates are uncertain
2013	Spring	• Preliminary evaluation of the redd pumping techniques on one or more SEAK streams
	Summer	• Prince William Sound (PWS) Ocean sampling • PWS and Southeast Alaska (SEAK) streams sampling - extensive and intensive
	Winter	• **Annual progress report and workshop**
2014	Spring	• Intensive alevin sampling in PWS and SEAK
	Summer	• PWS Ocean sampling

		• PWS and SEAK streams sampling - extensive and intensive
	Winter	• **Annual progress report**
2015	Spring	• Intensive alevin sampling in PWS and SEAK
	Summer	• PWS and SEAK streams sampling - extensive and intensive
2016	Spring	• Intensive alevin sampling in PWS and SEAK
	Winter	• **Annual progress report and workshop**

A first summary report of these research activities was posted in April 2012 on the ADFG website: Interaction of Wild and Hatchery Pink and Chum Salmon in Prince William Sound and Southeast Alaska, Annual Report 2012.

At the time of completion of this report activity, the 2013 summary report was not available.

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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 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*.**
- ***The summary report on the 2013 hatchery release research program was not available at the time of reporting but a comprehensive summary of 2013 is provided alongside the 2014 report (Dec 2014) and provided sufficient evidence of progress made.***

http://www.adfg.alaska.gov/static/fishing/PDFs/hatcheries/research/ak_hatchery_research_project_2014.pdf

These same items will be re-analyzed in the next (4th) surveillance activities due to commence in December 2015.

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. 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	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**	All required evidence received. Progressing

approach		**any) and their treatment by ADFG.**	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.

11. Client signed acceptance of the action plan

Section not required at this audit.

12. Determination

On concluding this report and 3rd 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).

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