Introduction and Concepts

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Alaska Department of Fish and Game
Alaska Board of Fisheries Hatchery Committee
March 7, 2020

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Constitutional Provision for Sustained Yield

Article VIII, Sec(4). Fish, forests, wildlife, grasslands, and all other replenishable resources belonging to the State shall be utilized, developed, and maintained on the sustained yield principle, subject to preferences among beneficial uses.

Alaska Department of Fish and Game Mission Statement

To protect, maintain, and improve the fish, game, and aquatic plant resources of the state, and manage their use and development in the best interest of the economy and the well-being of the people of the state, consistent with the sustained yield principle.

> It must be recognized that the welfare of people and not fish is the [reason] for a management program, and that if maximum sustained yield has any validity, it is as a means to important human ends rather than as an end in itself.

RA Cooley

Politics and Conservation: The decline of Alaska salmon

Policy for the Management of Sustainable Salmon Fisheries 5 AAC 39.222(c)(5)

(5) 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; a precautionary approach requires

(i) consideration of the needs of future generations and avoidance of potentially irreversible changes;

(ii) prior identification of undesirable outcomes and of measures that will avoid undesirable outcomes or correct them promptly;

(iii) 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;

(iv) 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;

(v) 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;

(B) a precautionary approach should be applied to the regulation of activities that affect essential salmon habitat.

Definition Precautionary Approach SSFP 5 AAC 39.222(c)(5)(A)

(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

Prudent foresight accounts for:

1. Uncertainty in
    a) Fisheries management
    b) Habitat management
2. Risks
    a) Biological
    b) Social
    c) Cultural
    d) Economic
3. Need to act with incomplete knowledge

Straying and Homing in Salmon Life History

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Pacific Salmon: A Balance of Homing and Straying

Salmon return home to spawn … except when they don't.

Benefits of two strategies

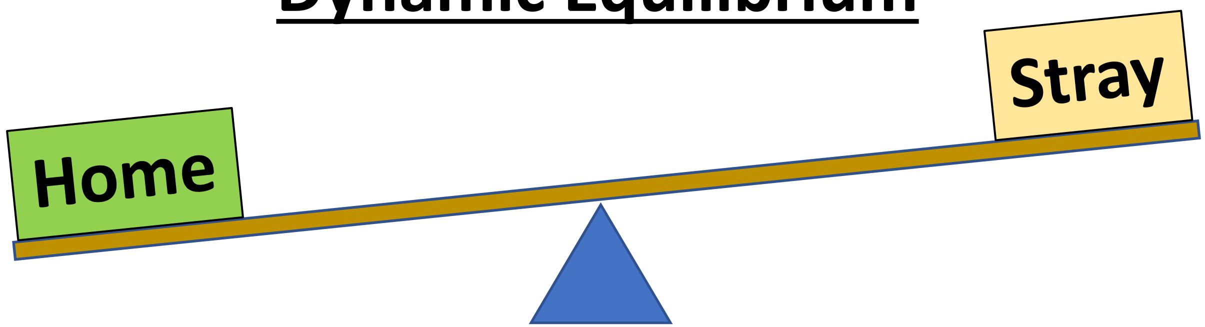
Homing

- Local adaptation
- Increase diversity among populations
- Increased survival

Straying

- Colonize new habitats
- Increase diversity within populations
- Buffer changes in habitat quality

Dynamic Equilibrium



Hutchings, J.A., Hendry, A.P. and Stearns, S.C. 2004. *Evolution illuminated: salmon and their relatives*

Quinn, T.P. 1984. *Homing and straying in Pacific salmon*

Pacific Salmon: A Balance of Homing and Straying

Examples of differences among species

Sockeye salmon:
- Long freshwater residency
- Higher variability in habitat
- Higher annual stability in habitat
- Variable-year life cycle

Higher benefit from homing

Pink salmon:
- Short freshwater residency
- Lower variability in habitat
- Lower annual stability in habitat
- Two-year life cycle

Lower benefit from homing

Beach

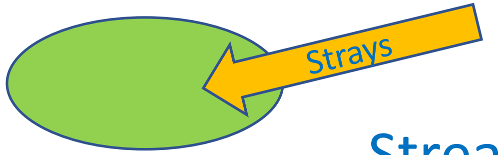
River

Stream

Observable in population structure of species

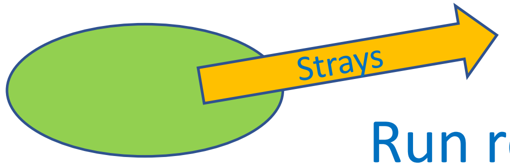
Stray Rate Definitions Depend on Perspective

- Recipient stray rate = Stray-in rate
  - Proportion of fish in a spawning location that did **not come from that location**



Stream stray studies

- Donor stray rate = Stray-out rate
  - Proportion of fish from a spawning location that did **not return to that location**



Run reconstruction

Pacific Salmon: A Balance of Homing and Straying

Why is this important for today's discussion?

1. Hatchery and wild-origin salmon interact from the time they enter the ocean.
2. This study focuses on the effect of interactions between hatchery and wild salmon spawning in freshwater.
3. Genetic interaction is one potential outcome.
4. Genetic interaction can be a source of long-term effects on productivity.

While straying is a natural part of salmon behavior, it is also the means by which hatchery salmon potentially affect long-term productivity of wild populations.


Questions?

Alaska Hatchery Research Project

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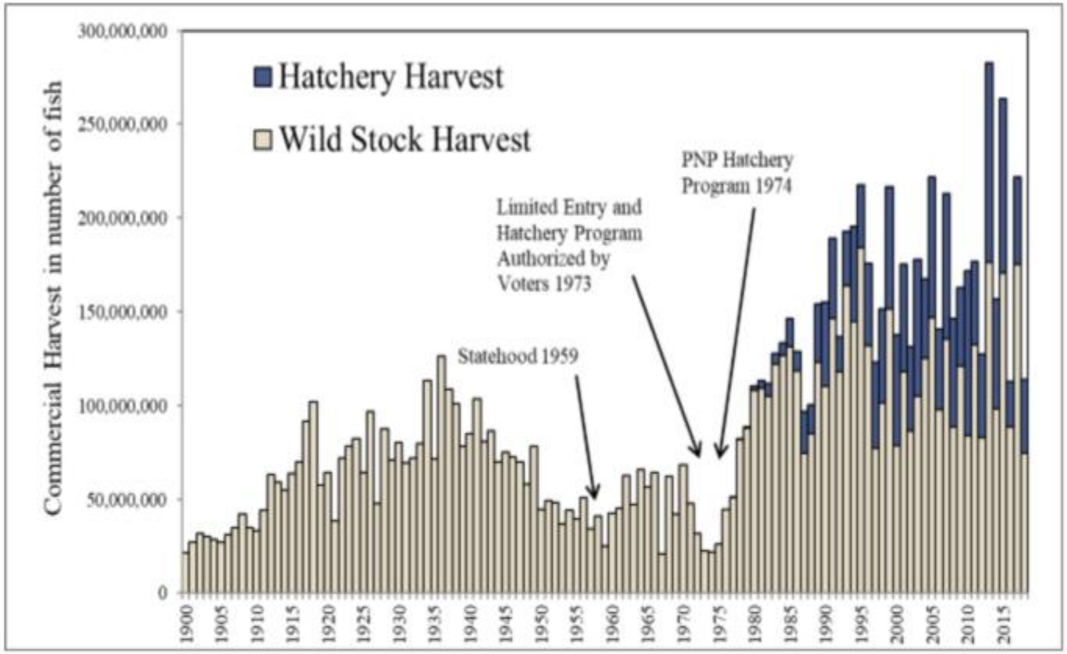
Background

- Hatcheries began making substantial contributions to harvest in 1980's
- Statewide harvests (wild and hatchery) have averaged 172 M annually for 2009-2018
- Hatcheries produced an annual average of 61 M, 33% of the harvest, 2009-2018



Alaska commercial harvest of wild and hatchery salmon, 1900-2018.
Stopha (2019)

- Hatchery production now dominates the harvest of pink and chum salmon in PWS and chum salmon in SEAK

Background

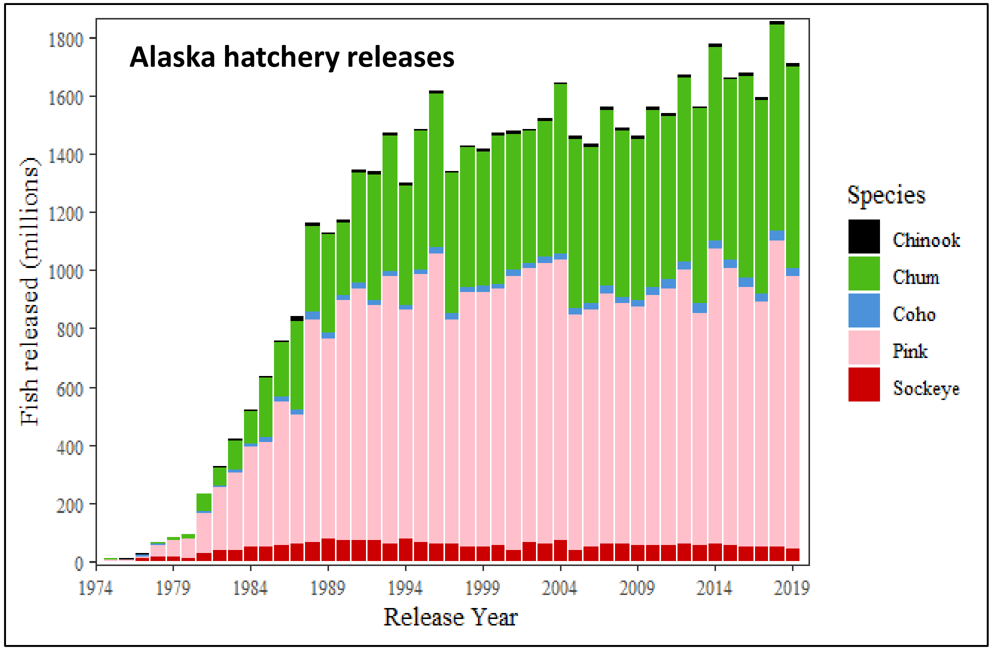
Large-scale salmon releases raise concerns for wild stock impacts

Do hatchery fish detrimentally affect productivity and sustainability of wild stocks?

Alaska policy mandates sustainable productivity of wild stocks

Not a new concern:

Alaska first state to have a Genetics Policy in 1985



Background

Plan:

PNPs proposed that ADF&G organize science panel to design/implement a research project to inform resource management decisions

Funding partnership:

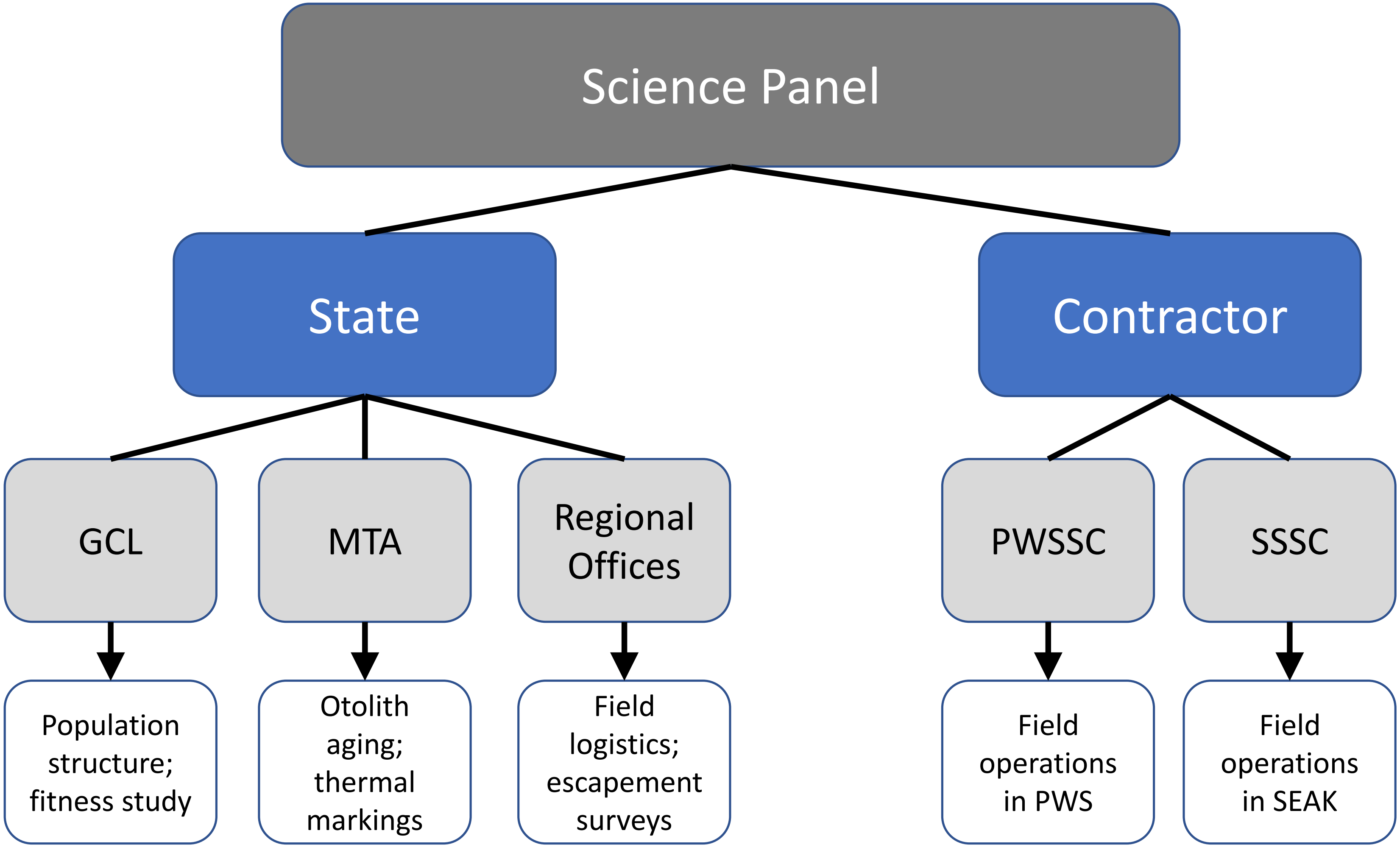
State, Operators & Industry

Purpose:

Examine potential effect of hatchery straying on fitness of wild stocks

- Pink and chum salmon PWS
- Chum salmon SEAK

Structure of AHRP



Structure of AHRP

Science Panel

<u>Current Members</u>

Dr. Milo Adkison – UAF
Dr. David Bernard – ADF&G Retired
Dr. John Burke – ADF&G Retired; SSRAA
Dr. John H. Clark – ADF&G
Chris Habicht – ADF&G
Dr. Jeff Hard – NOAA Fisheries
Ron Josephson – ADF&G Retired
Dr. William Smoker – UAF Emeritus; PWSAC
William Templin – ADF&G
Alex Wertheimer – NOAA Fisheries; DIPAC
Dr. Peter Westley – UAF

<u>Former Members</u>

Jeff Regnart – ADF&G
Steve Reifenstuhl – NSRAA
Thomas Sheridan – ADF&G; Silver Bay Seafoods
Eric Volk – ADF&G

More detailed information available at
http://www.adfg.alaska.gov/static/fishing/PDFs/hatcheries/research/2018.12.19_hwi_sp_roster.pdf

AHRP Research Questions

1) What is the genetic stock structure of pink and chum in PWS and SEAK?

2) What is the extent and annual variability of straying?

3) What is the impact on fitness (*productivity*) of natural pink and chum stocks?

AHRP Research Questions

1) What is the genetic stock structure of pink and chum in PWS and SEAK?

Why is this important?

- Provides perspective on degree of diversity
  - Within area
  - Across the species range

- Insight into temporal changes associated with hatchery production

- Capacity to track future changes

AHRP Research Questions

2) What is the extent and annual variability of straying?
Part 1 – Patterns and Proportions of Strays

<u>Why is this important</u>?

- Prerequisite for genetic risk is interaction while spawning

- Patterns in magnitude and occurrence of straying in space and time inform evaluation of risk

AHRP Research Questions

2) What is the extent and annual variability of straying?
Part 2 – Run reconstruction 2013-2015

<u>Why is this important?</u>

- Ocean sampling allows estimates of:
  - total hatchery and wild runs
  - wild escapement
  - number of hatchery strays
  - harvest rates of hatchery and wild
- Compute the hatchery donor stray rate
- Reconstruct the run of wild and hatchery fish

AHRP Research Questions

3) What is the impact on fitness (productivity) of wild pink and chum stocks?

Why is this important?

Wild stock priority

- Genetic Policy: *"First priority will be given to the protection of wild stocks from possible **harmful** interactions with introduced stocks"*
- SSFP: *"…wild salmon stocks and fisheries on those stocks should be protected from **adverse** impacts from artificial propagation and enhancement efforts"*

Harmful/adverse genetic interactions:

- Loss of diversity among populations
- Introduction of poorly adapted traits


Questions?
J. Hyde

Project Financial Proforma

Proforma as of February 27, 2020

REVENUE	ACTUAL **FY13**	ACTUAL **FY14**	ACTUAL **FY15**	ACTUAL **FY16**	ACTUAL **FY17**	ACTUAL **FY18**	ACTUAL **FY19**	Actual to Date **FY20**	Remaining PROJECTED **FY20**	PROJECTED **FY21**	PROJECTED **FY22**	PROJECTED **FY23**	PROJECTED **FY24**	PROJECTED **TOTAL**
State of AK (GF)	$ 1,000,000													$ 1,000,000
State of AK (CFEC)	$ 2,500,000													$ 2,500,000
SK & NPRB Grants to ADFG GCL					$ 122,579	$ 157,585	$ 210,467							$ 490,631
NF Grants to NSRAA					$ 31,262	$ 168,738	$ -	$ 75,000	$ -	$ 150,000				$ 425,000
2016 Pink Salmon Disaster								$ 156,115	$ 2,032,692					$ 2,188,807
Processors = SPA	$ 500,000	$ 500,000	$ 500,000	$ 494,190	$ 500,000	$ -	$ 500,000	$ -	$ 500,000	$ 500,000	$ 500,000	$ 500,000	$ 500,000	$ 5,494,190
DIPAC			$ 2,000,000											$ 2,000,000
PNP Operators					$ 300,000	$ 350,000	$ 353,500	$ -	$ 350,000	$ 350,000	$ 350,000	$ 350,000	$ 350,000	$ 2,753,500
TOTAL REVENUE	**$ 4,000,000**	**$ 500,000**	**$ 2,500,000**	**$ 494,190**	**$ 953,841**	**$ 676,323**	**$ 1,063,967**	**$ 231,115**	**$ 2,882,692**	$ 1,000,000	$ 850,000	$ 850,000	$ 850,000	$ 16,852,128
Running Total Revenue	$ 4,000,000	$ 4,500,000	$ 7,000,000	$ 7,494,190	$ 8,448,031	$ 9,124,354	$ 10,188,321	$ 10,419,436	$ 13,302,128	$ 14,302,128	$ 15,152,128	$ 16,002,128	$ 16,852,128	$ 16,852,128

EXPENSE	ACTUAL **FY13**	ACTUAL **FY14**	ACTUAL **FY15**	ACTUAL **FY16**	ACTUAL **FY17**	ACTUAL **FY18**	ACTUAL **FY19**	Actual to Date **FY20**	Remaining PROJECTED **FY20**	PROJECTED **FY21**	PROJECTED **FY22**	PROJECTED **FY23**	PROJECTED **FY24**	PROJECTED **TOTAL**
SP-579 PWSSC/SSSC (11309064)	$ 389,824	$ 1,228,072	$ 1,550,171	$ 1,503,849	$ 441,134	$ 906,039	$ 606,699	$ 603,048	$ 134,693	$ 525,000	$ 315,000	$ 315,000	$ 315,000	$ 8,833,528
SP-578 GCL (11369019)	$ -	$ 111,914	$ 308,824	$ 201,649	$ 248,263	$ 178,592	$ 459,480	$ 227,720	$ 572,280	$ 1,050,000	$ 855,000	$ 855,000	$ 855,000	$ 5,923,721
SP-583 MTA Lab (11309071)	$ -	$ 96,079	$ 87,033	$ 77,694	$ -	$ 37,418	$ 54,019	$ 29,414	$ 28,586	$ 58,000	$ 58,000	$ 58,000	$ 58,000	$ 642,243
SP-576 CDV OTO Lab (11329043)	$ -	$ 111,661	$ 102,845	$ 97,069	$ 45,206	$ 89,829	$ 79,067	$ 42,920	$ 34,080	$ 95,000	$ 95,000	$ 95,000	$ -	$ 887,677
SP-577 Project Mgmt. (11301515)	$ -	$ -	$ 9,260	$ 23,539	$ 6,560	$ 239	$ 7,486	$ 3,735	$ 8,265	$ 12,000	$ 12,000	$ 12,000	$ 12,000	$ 107,085
Total Annual Expense	**$ 389,824**	**$ 1,547,727**	**$ 2,058,133**	**$ 1,903,799**	**$ 741,163**	**$ 1,212,117**	**$ 1,206,751**	$ 906,837	$ 777,904	$ 1,740,000	$ 1,335,000	$ 1,335,000	$ 1,240,000	$ 16,394,255
Running Total Expense	$ 389,824	$ 1,937,551	$ 3,995,683	$ 5,899,482	$ 6,640,646	$ 7,852,763	$ 9,059,514	$ 9,966,351	$ 10,744,255	$ 12,484,255	$ 13,819,255	$ 15,154,255	$ 16,394,255	$ 16,394,255
FY Cash flow	**$3,610,176**	**($1,047,727)**	**$441,867**	**($1,409,609)**	**$212,678**	**($535,794)**	**($142,784)**	**($675,722)**	**$2,104,788**	($740,000)	($485,000)	($485,000)	($390,000)	$457,873
Running Total Fund Balance	**$3,610,176**	**$2,562,449**	**$3,004,317**	**$1,594,708**	**$1,807,385**	**$1,271,591**	**$1,128,807**	**$453,085**	**$2,557,873**	**$1,817,873**	**$1,332,873**	**$847,873**	**$457,873**	**$457,873**

Revenue Received to Date

• State of Alaska	$3,500,000
• Seafood Producers Association	$2,994,190
• DIPAC	$2,000,000
• PNP Corporations	$1,003,500
• Pink Salmon Disaster	$2,188,807
• Grants	$ 921,746
TOTAL	**$12,452,128**

- Additional in-kind contributions from ADF&G (Lab & project management and support) and DIPAC (scale reading)

Expenditures to Date

• Contractors		$7,228,835
• Gene Conservation Lab		$1,736,441
• Mark, Tag & Age Lab		$ 381,657
• Cordova Oto Lab		$ 568,598
• Project Management		$ 50,820
	TOTAL	**$9,966,351**

Projected Expenditures Remaining

• Contractors	$1,604,693
• Gene Conservation Lab	$4,187,280
• Mark, Tag & Age Lab	$ 260,586
• Cordova Oto Lab	$ 319,080
• Project Management	$ 56,265
TOTAL	**$6,427,904**

Financial Summary

• Revenue to Date	$12,452,128
• Expenditures to Date	$ (9,966,351)
Funds Remaining (in hand)	$ 2,641,892
• Projected Expenditures remaining	$ (6,427,904)
Projected Additional Funding Needed to Complete Project as Currently Designed	**$ 3,942,127**