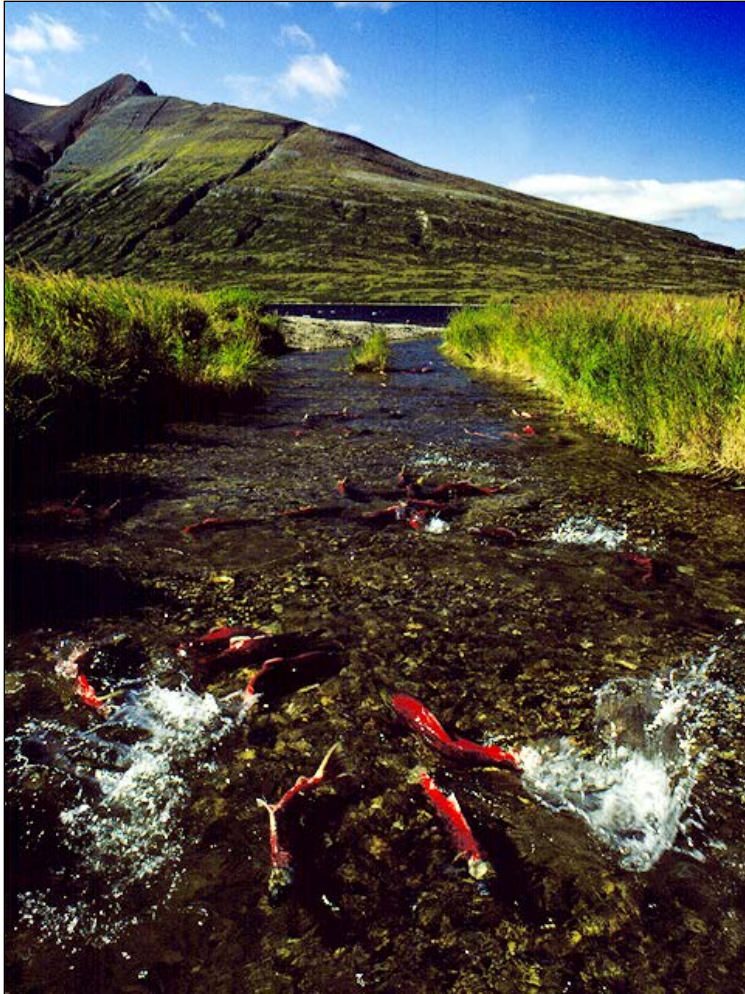


Alaska's Genetics Program

Genetics applications for fisheries management



Gene Conservation Laboratory
Division of Commercial Fisheries
Alaska Department of Fish and Game



Why does ADF&G have a genetics lab?

Alaska Department of Fish and Game uses genetic information to achieve its mission 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.



Why does ADF&G have a genetics lab?

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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.

The Gene Conservation Laboratory provides 4 main services:

1. Understand the resource
2. Develop capabilities for management
3. Assess genetic risk
4. Inform/Assess management actions



Questions that use genetic information

Did exposure to oil cause genetic injury?

EVOS oiling experiments

What species of salmon is this?

Atlantic salmon escapees

Is this crab a hybrid?

Snow/tanner crab hybrids

Which broodstock are these hatchery salmon from?

DIPAC broodstock

What is the genetic structure of these populations?

Coho salmon in Cook Inlet

Where are these fish going?

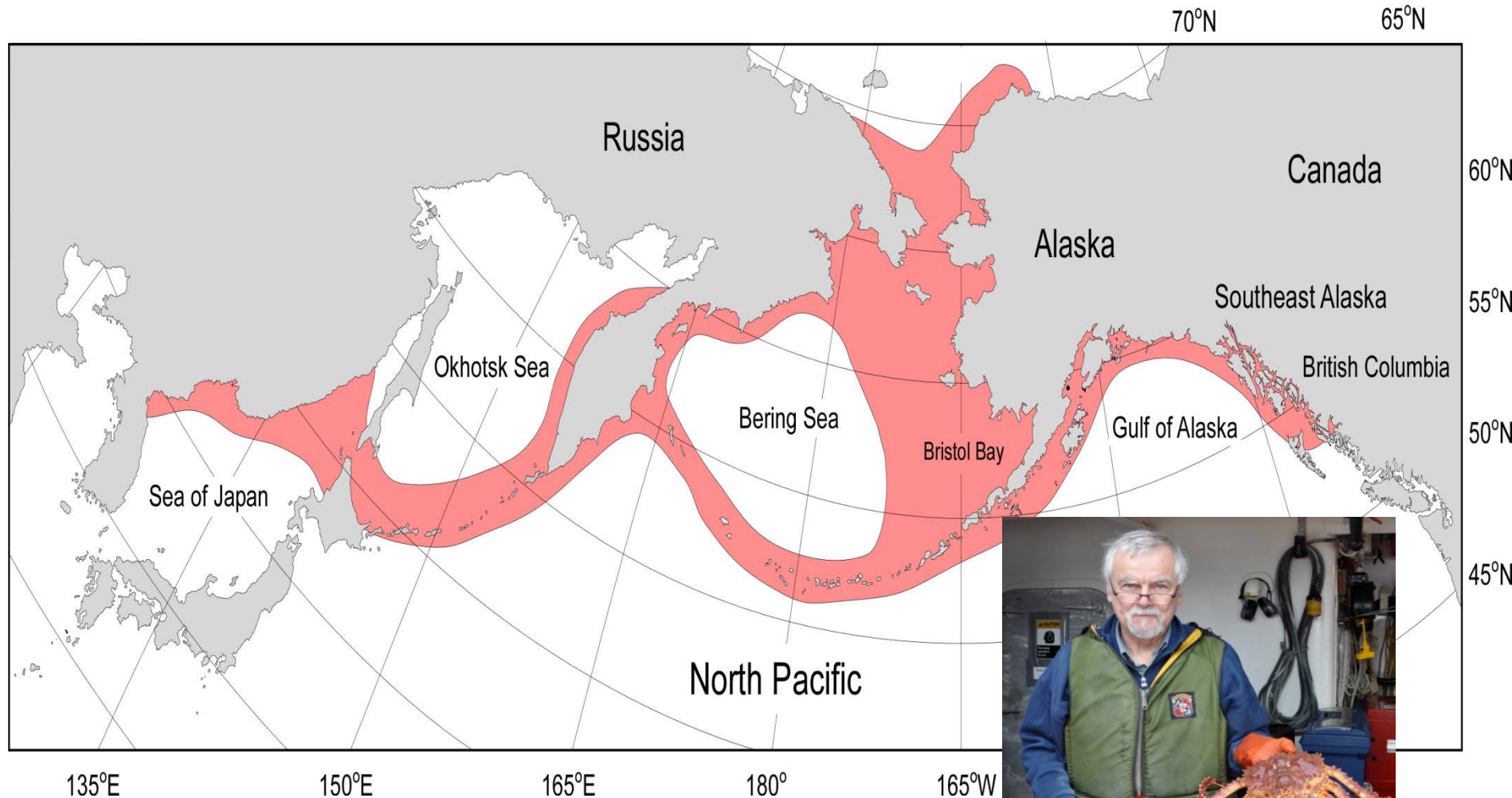
Chinook salmon in Yukon River

Who's fish are being harvested?

Chinook salmon in SE Alaska for Pacific Salmon Treaty

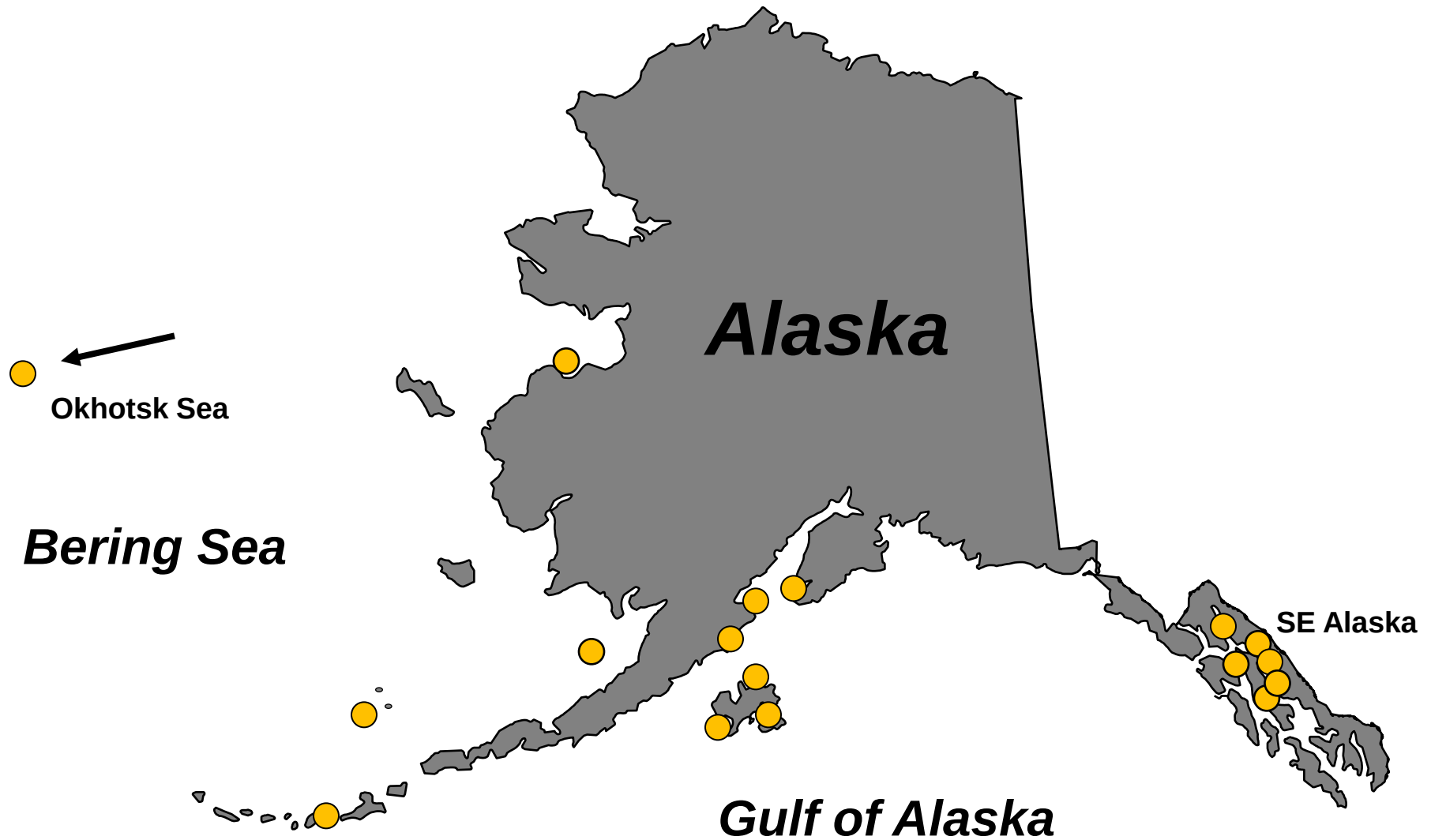
Applications: Understanding the Resource

Example: Red king crab population structure



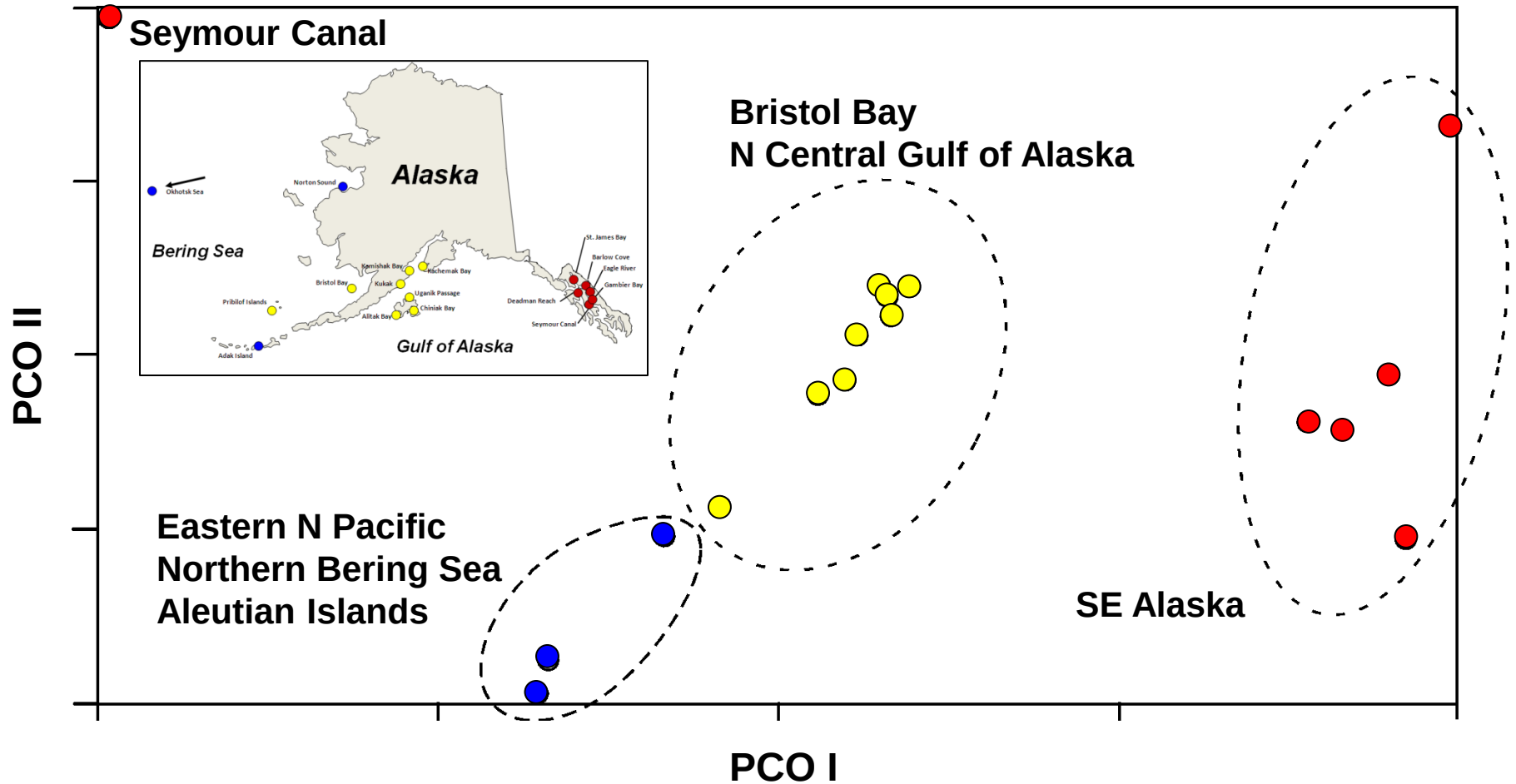
Applications: Understanding the Resource

Example: Red king crab population structure



Applications: Understanding the Resource

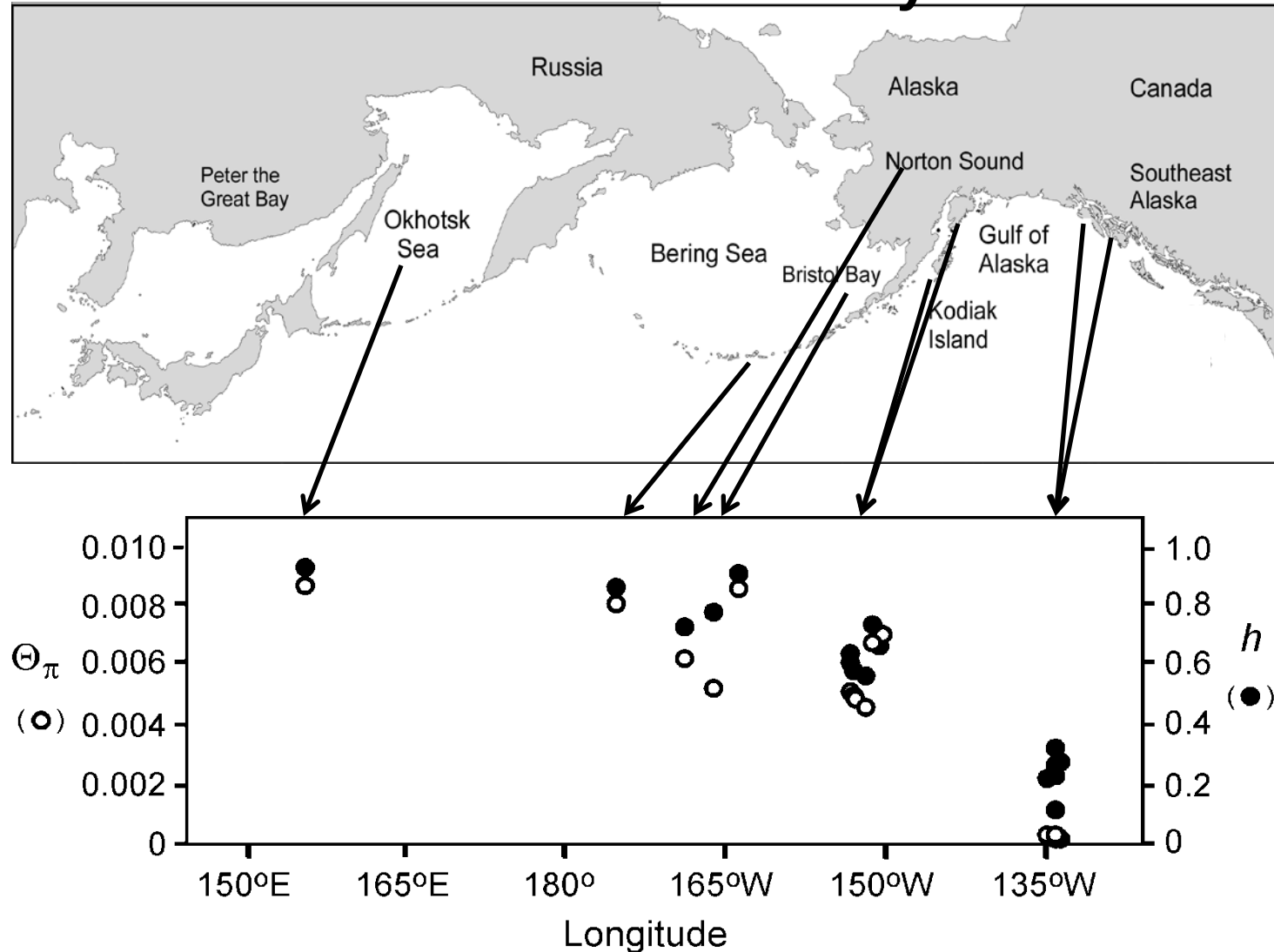
Example: Red king crab population structure



Applications: Understanding the Resource

Example: Red king crab population structure

Pattern of diversity



Applications: Understanding the Resource

Example: Red king crab population structure

Implications

- **Gene flow and ice-age isolations**
- **Red king crab might be managed on a small geographic scale in some regions**
- **Guidance for possible stock enhancement**

Applications: Develop Capabilities

Example: Chinook salmon coastwide baseline

Alaska Department of Fish and Game



NOAA Fisheries

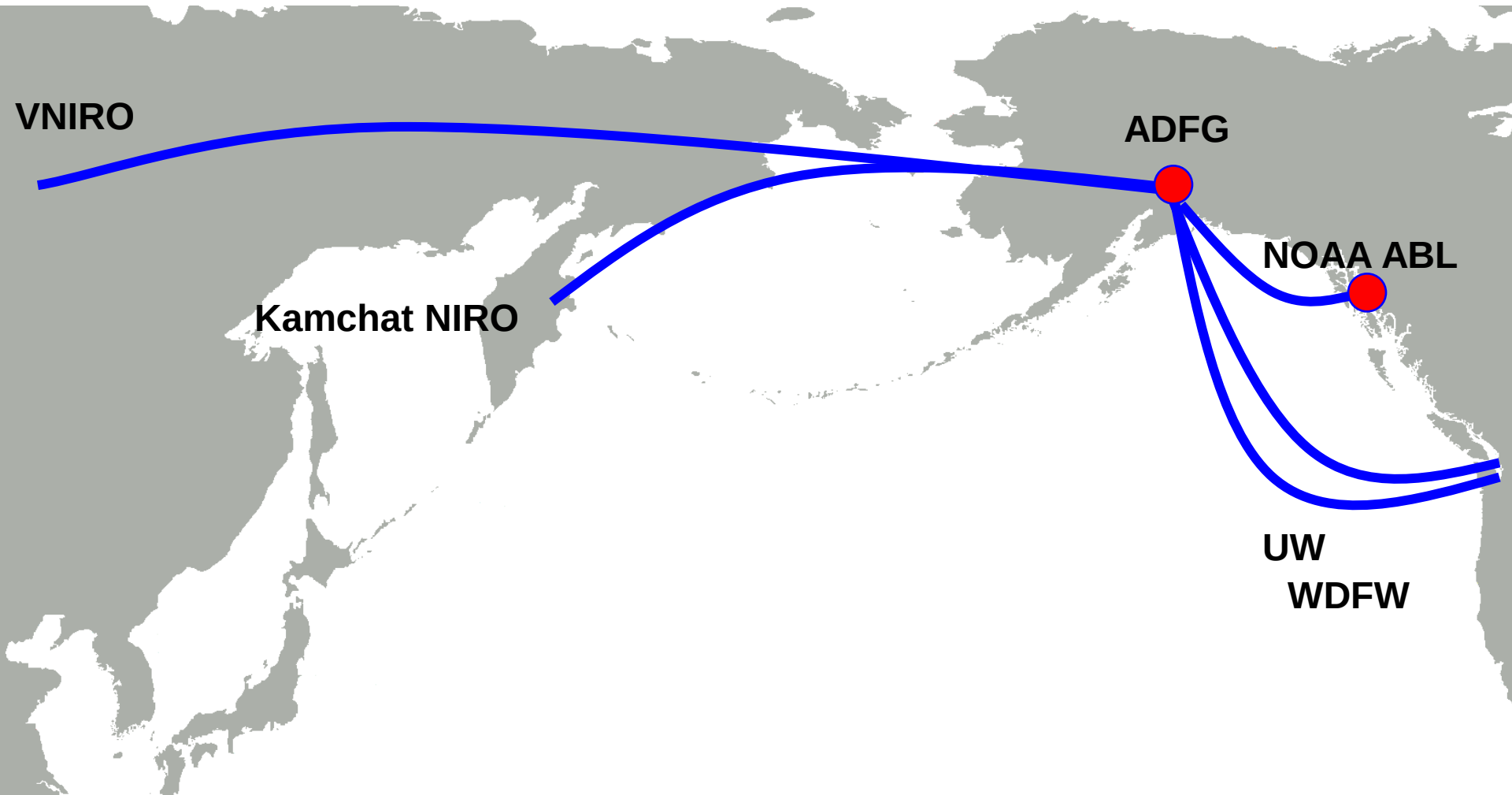


University of Washington



Applications: Develop Capabilities

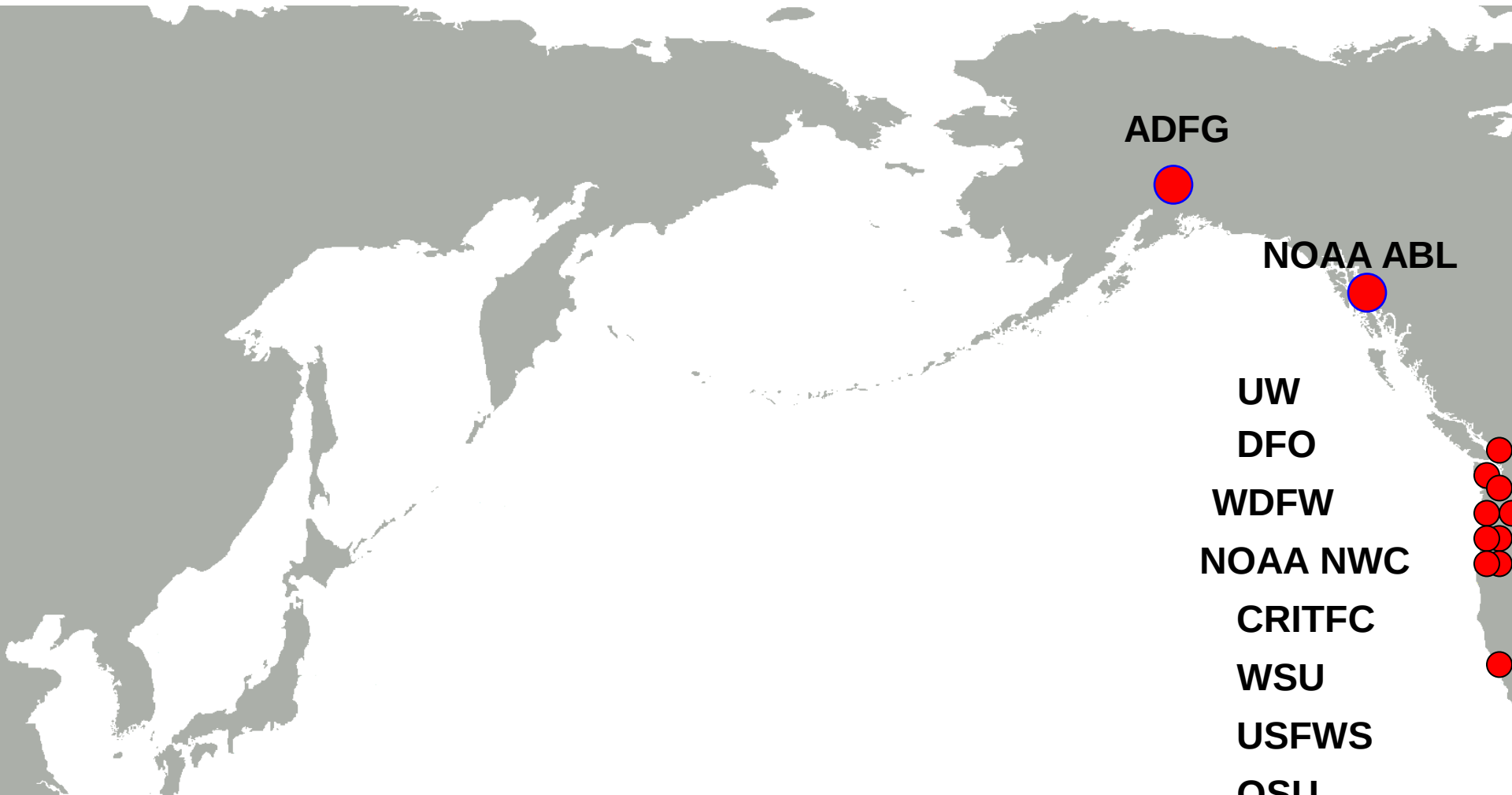
Example: Chinook salmon coastwide baseline



North Pacific Anadromous Fish Commission Partners

Applications: Develop Capabilities

Example: Chinook salmon coastwide baseline



ADFG

NOAA ABL

UW

DFO

WDFW

NOAA NWC

CRITFC

WSU

USFWS

OSU

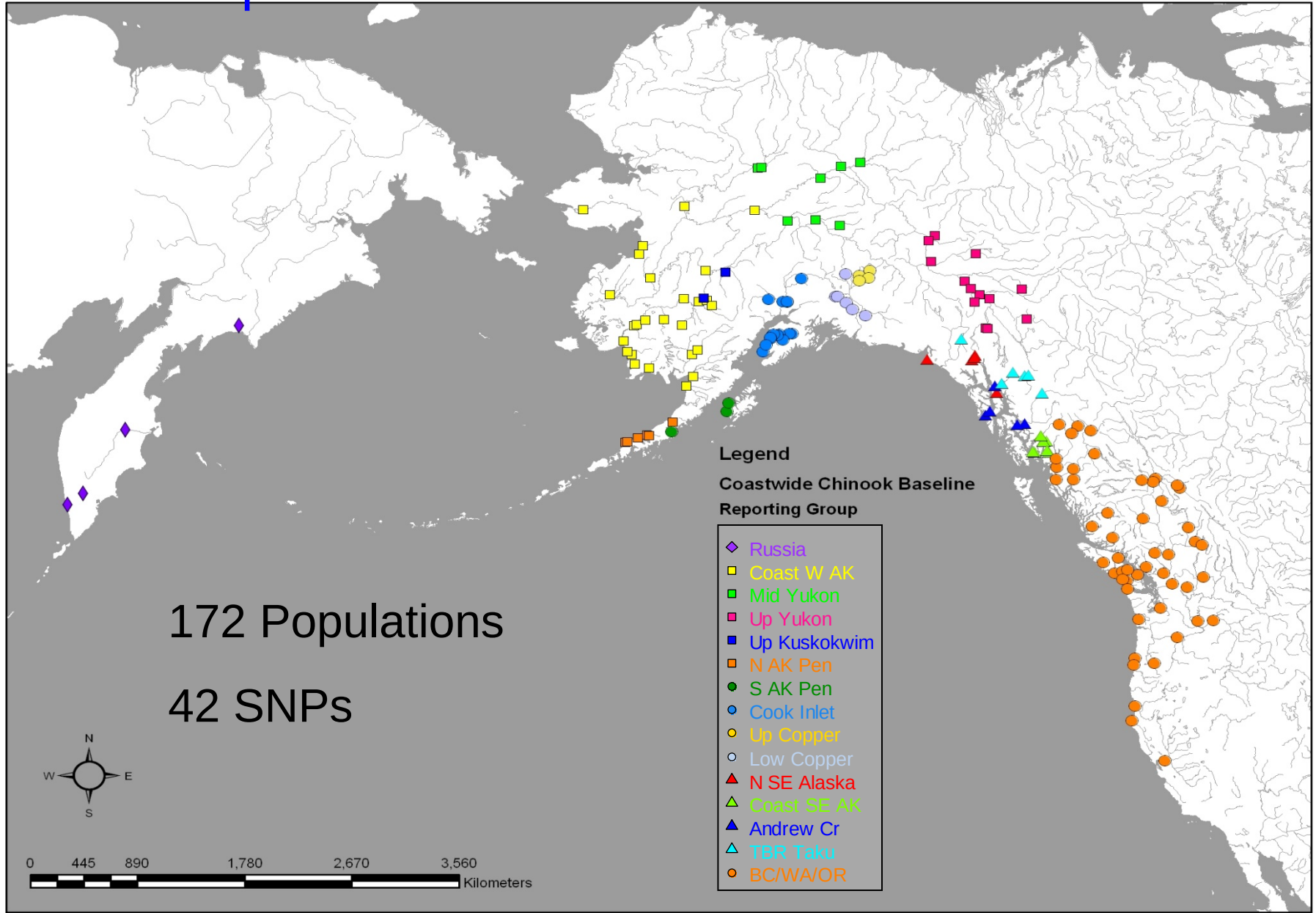
IDFG

NOAA SWC

Pacific Salmon Commission Partners

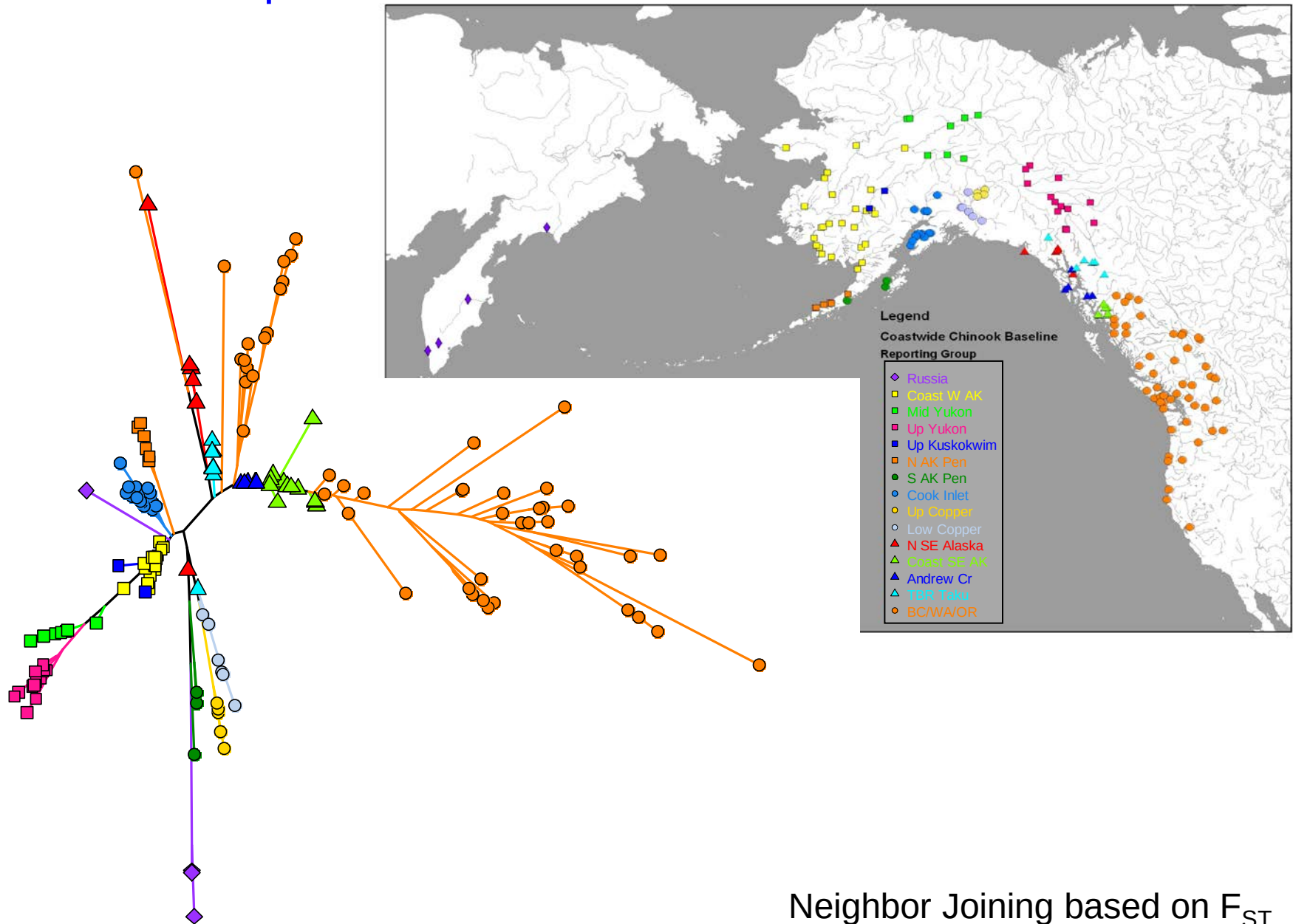
Applications: Develop Capabilities

Example: Chinook salmon coastwide baseline



Applications: Develop Capabilities

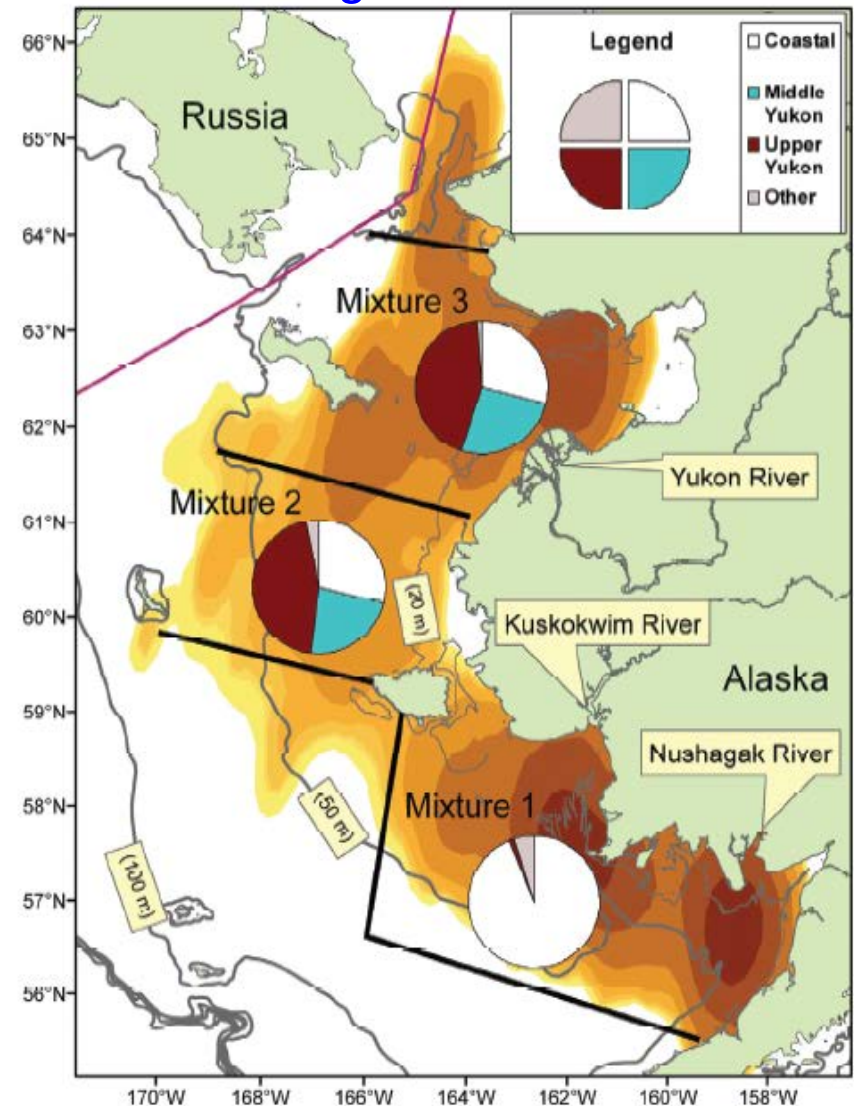
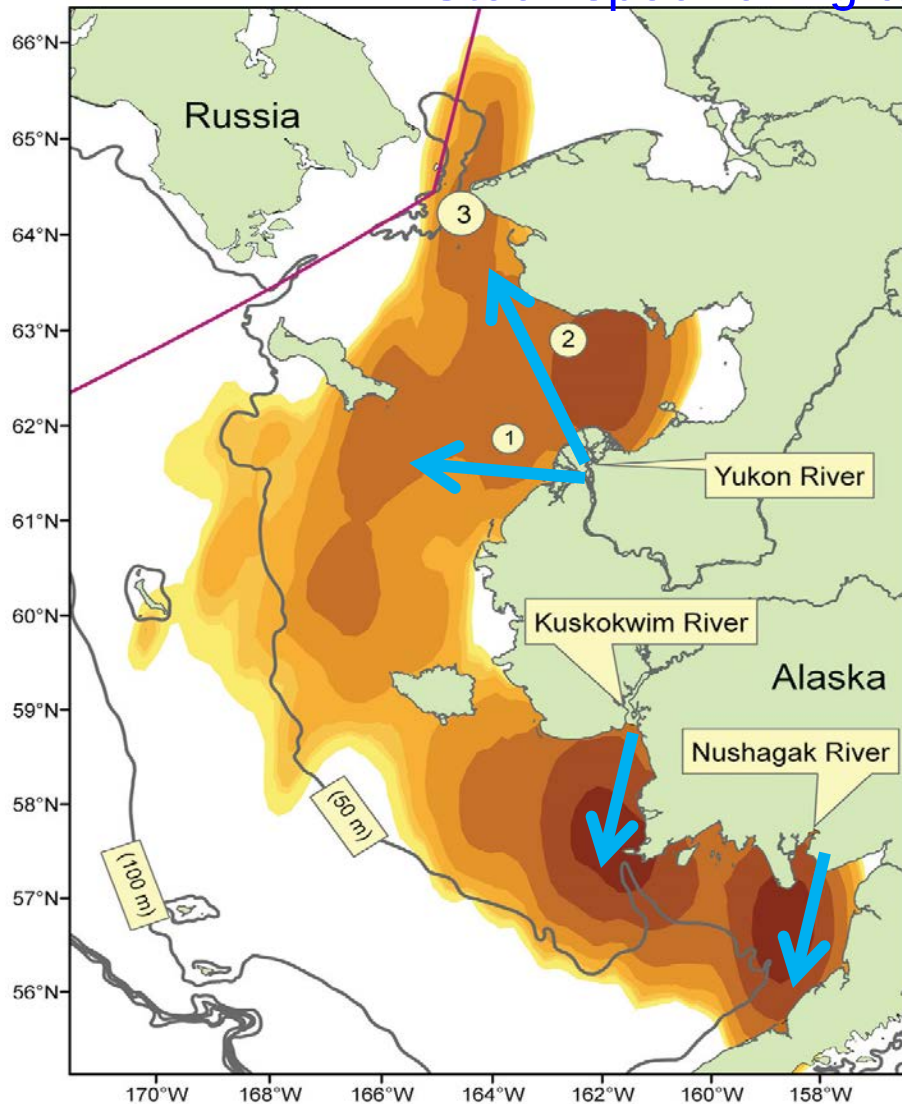
Example: Chinook salmon coastwide baseline



Applications: Develop Capabilities

Example: Chinook salmon coastwide baseline

Stock-specific migration in the Bering Sea



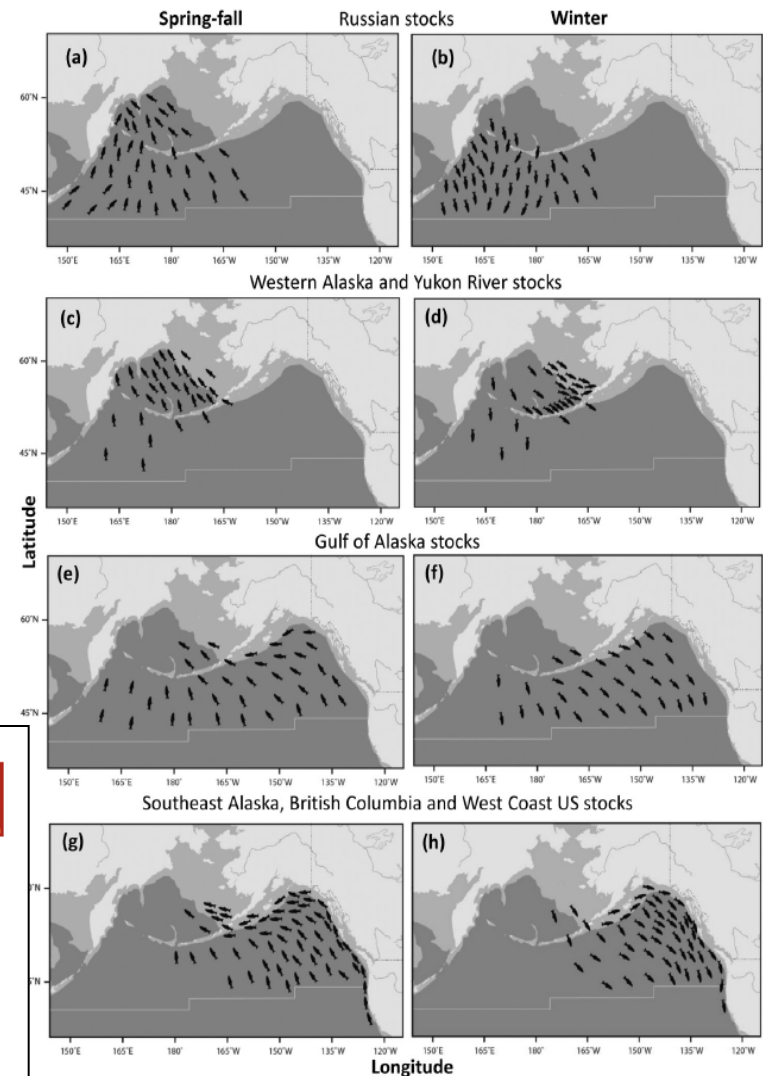
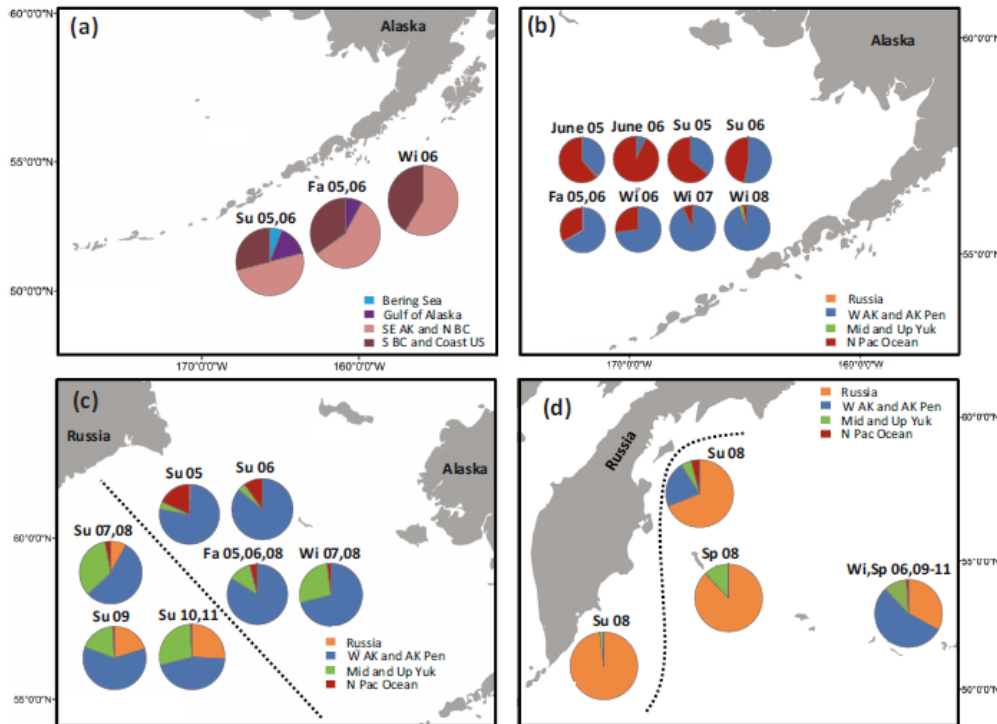
Murphy et al. 2009

Stock-Structured Distribution of Western Alaska and Yukon Juvenile Chinook Salmon from United States BASIS surveys, 2002-2007

Applications: Develop Capabilities

Example: Chinook salmon coastwide baseline

Stock-specific migration in the Bering Sea



128



ARTICLE

Single-nucleotide polymorphisms reveal distribution and migration of Chinook salmon (*Oncorhynchus tshawytscha*) in the Bering Sea and North Pacific Ocean

Wesley A. Larson, Fred M. Utter, Katherine W. Myers, William D. Templin, James E. Seeb, Charles M. Guthrie III, Alexander V. Bugaev, and Lisa W. Seeb

Applications: Assess Genetic Risk

Example: Chum salmon hatchery/wild interaction

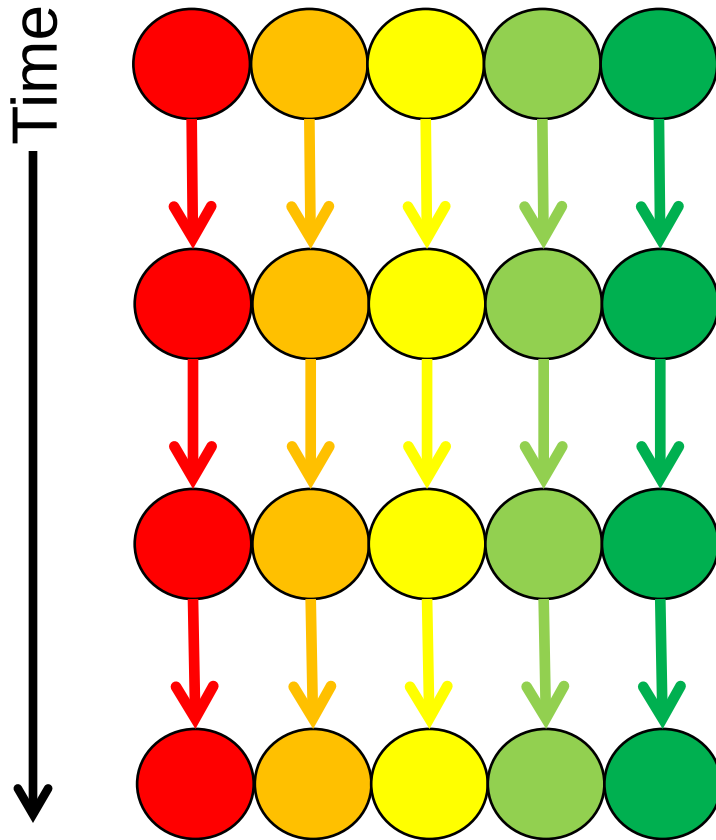


Applications: Assess Genetic Risk

Example: Chum salmon hatchery/wild interaction

Idealized natural system

No straying

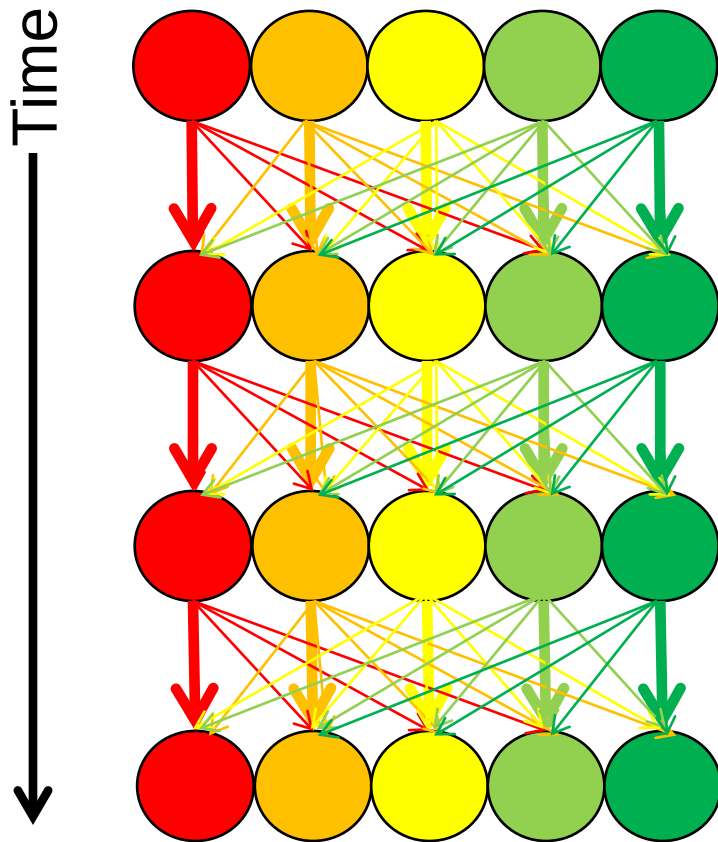


Applications: Assess Genetic Risk

Example: Chum salmon hatchery/wild interaction

Reality natural system

Straying/drift equilibrium

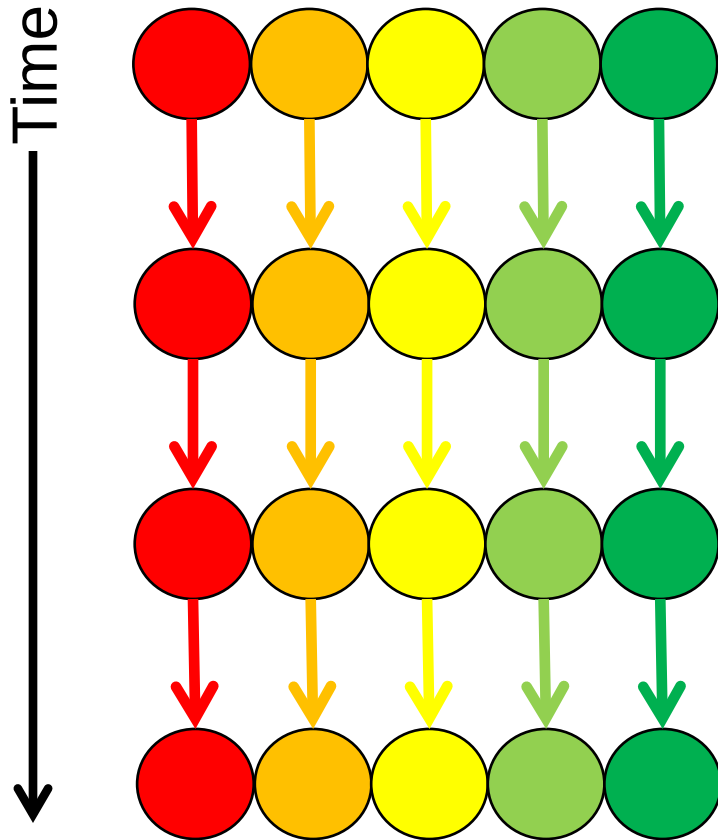


Applications: Assess Genetic Risk

Example: Chum salmon hatchery/wild interaction

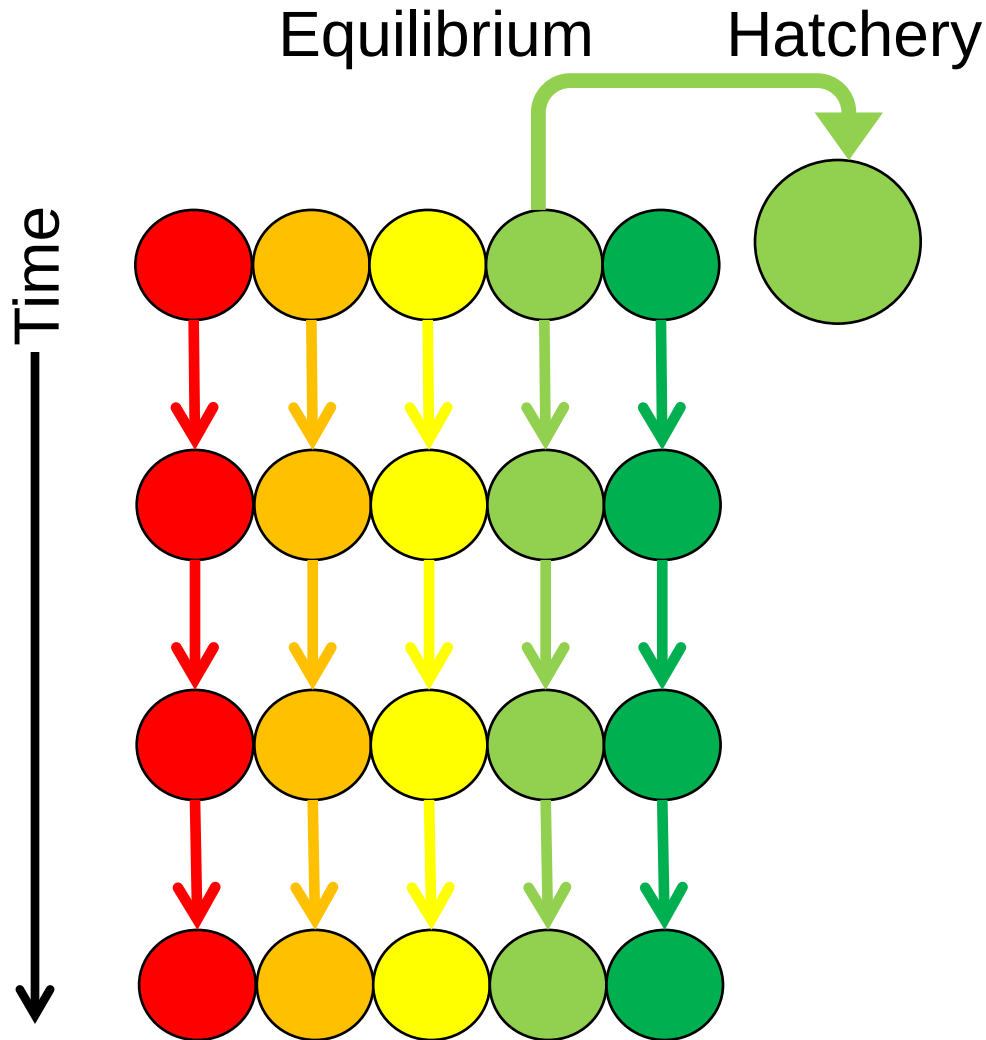
Reality natural system

Equilibrium



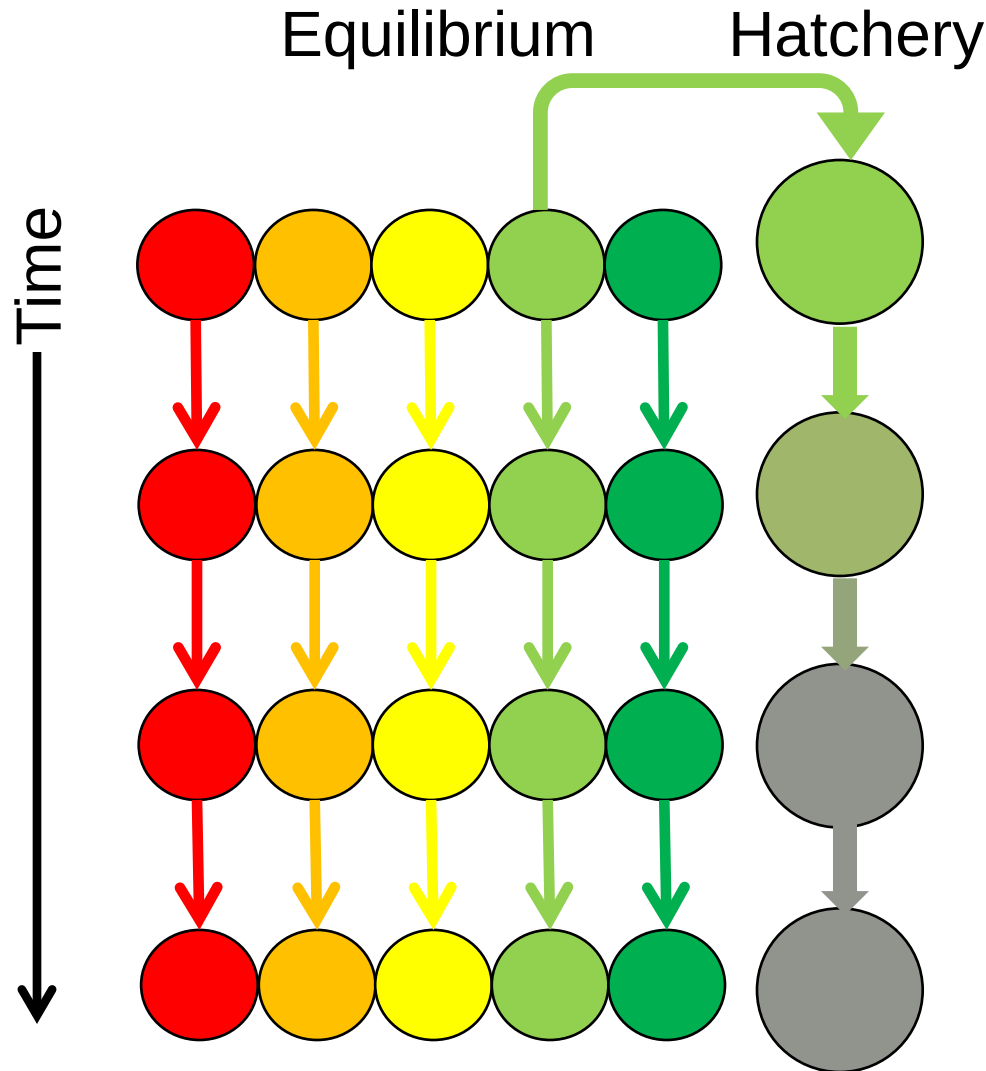
Applications: Assess Genetic Risk

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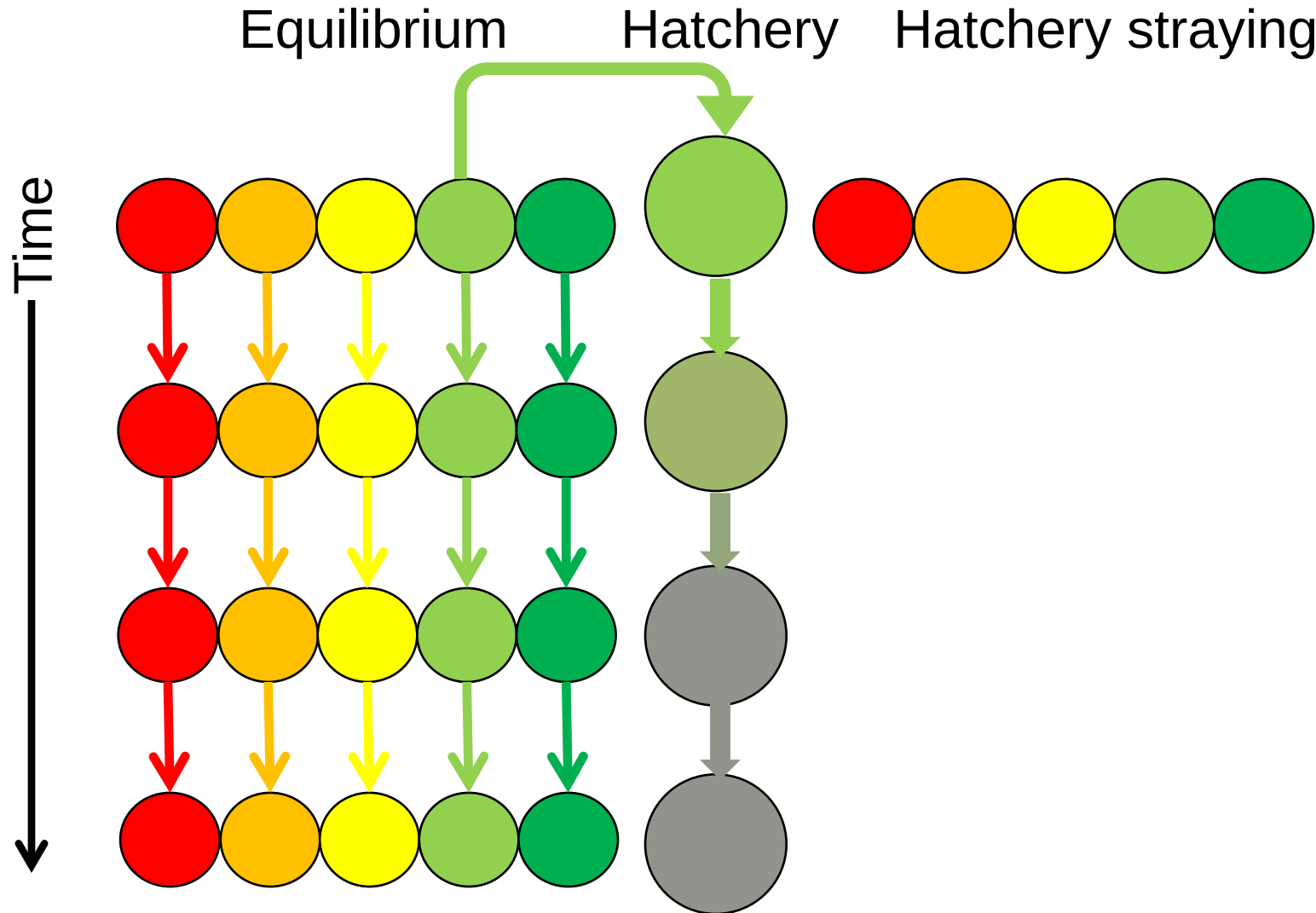
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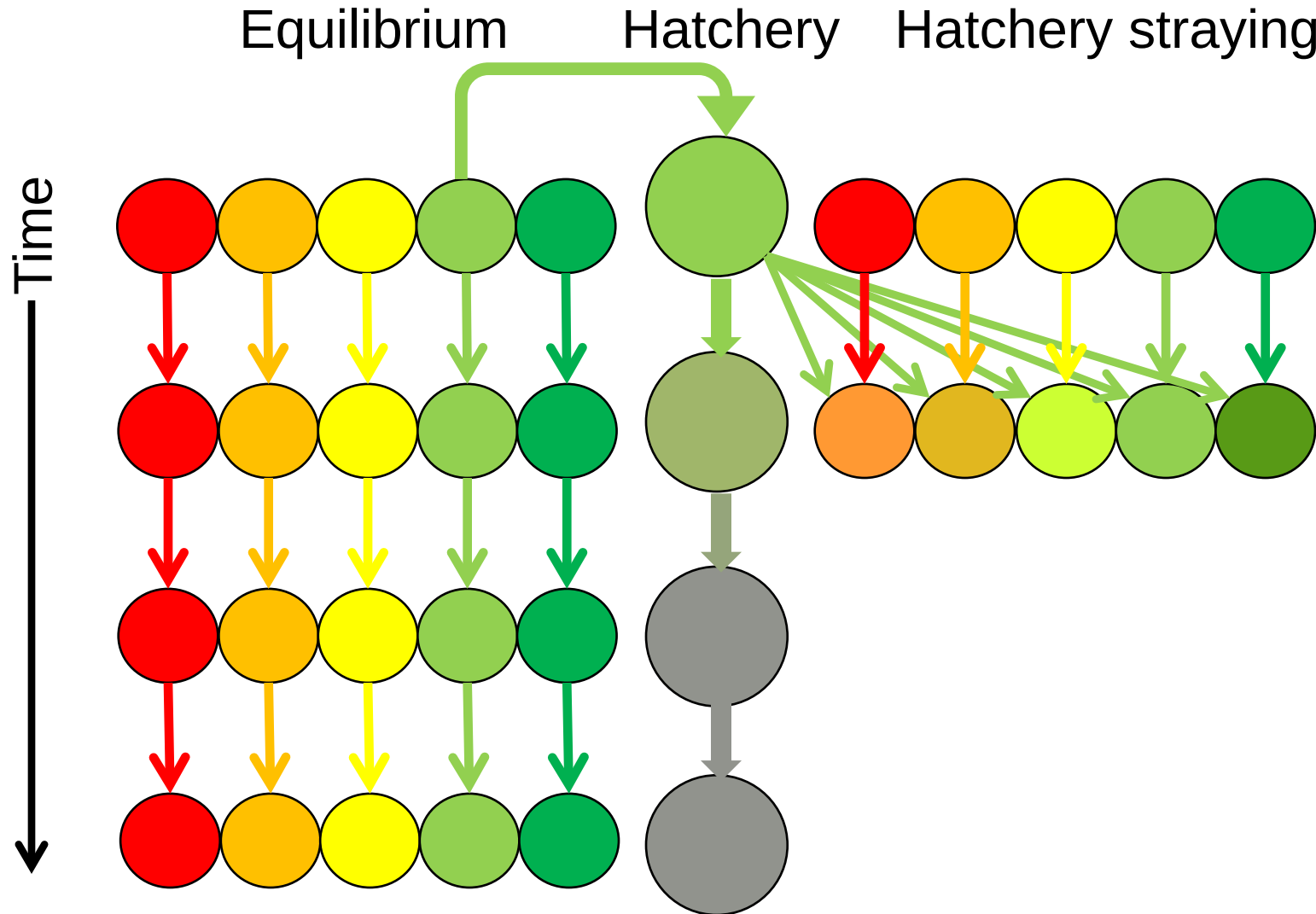
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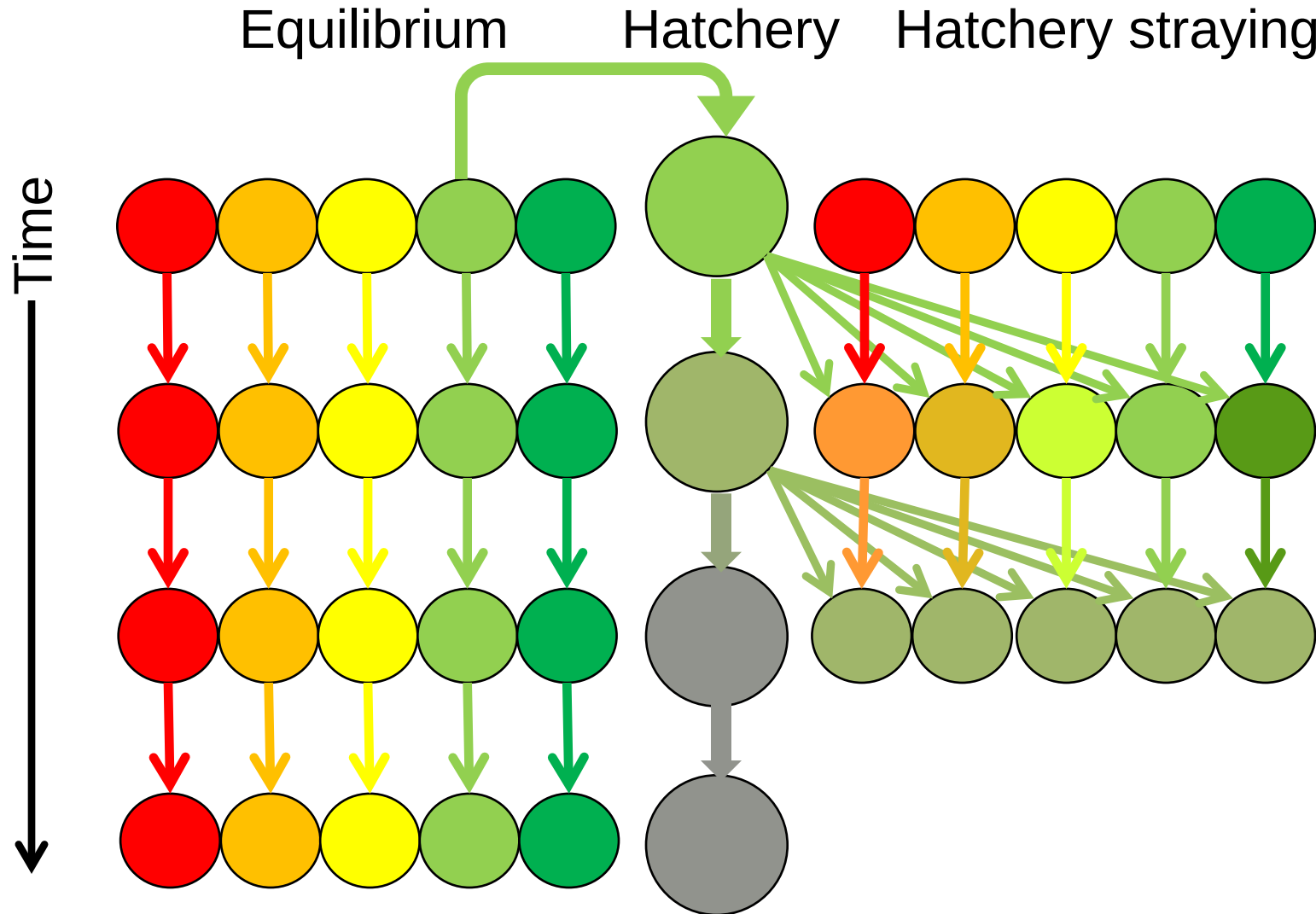
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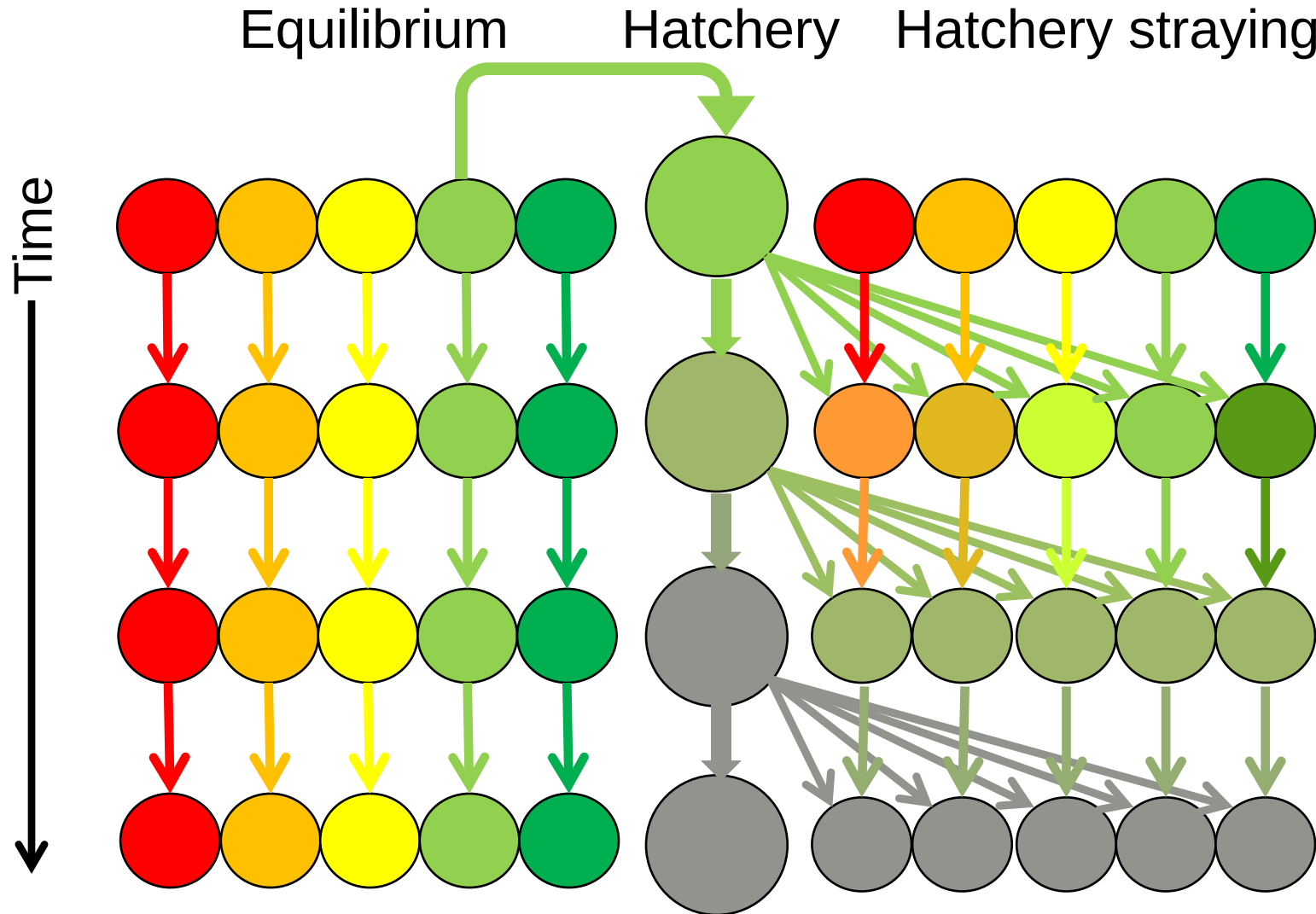
Applications: Assess Genetic Risk

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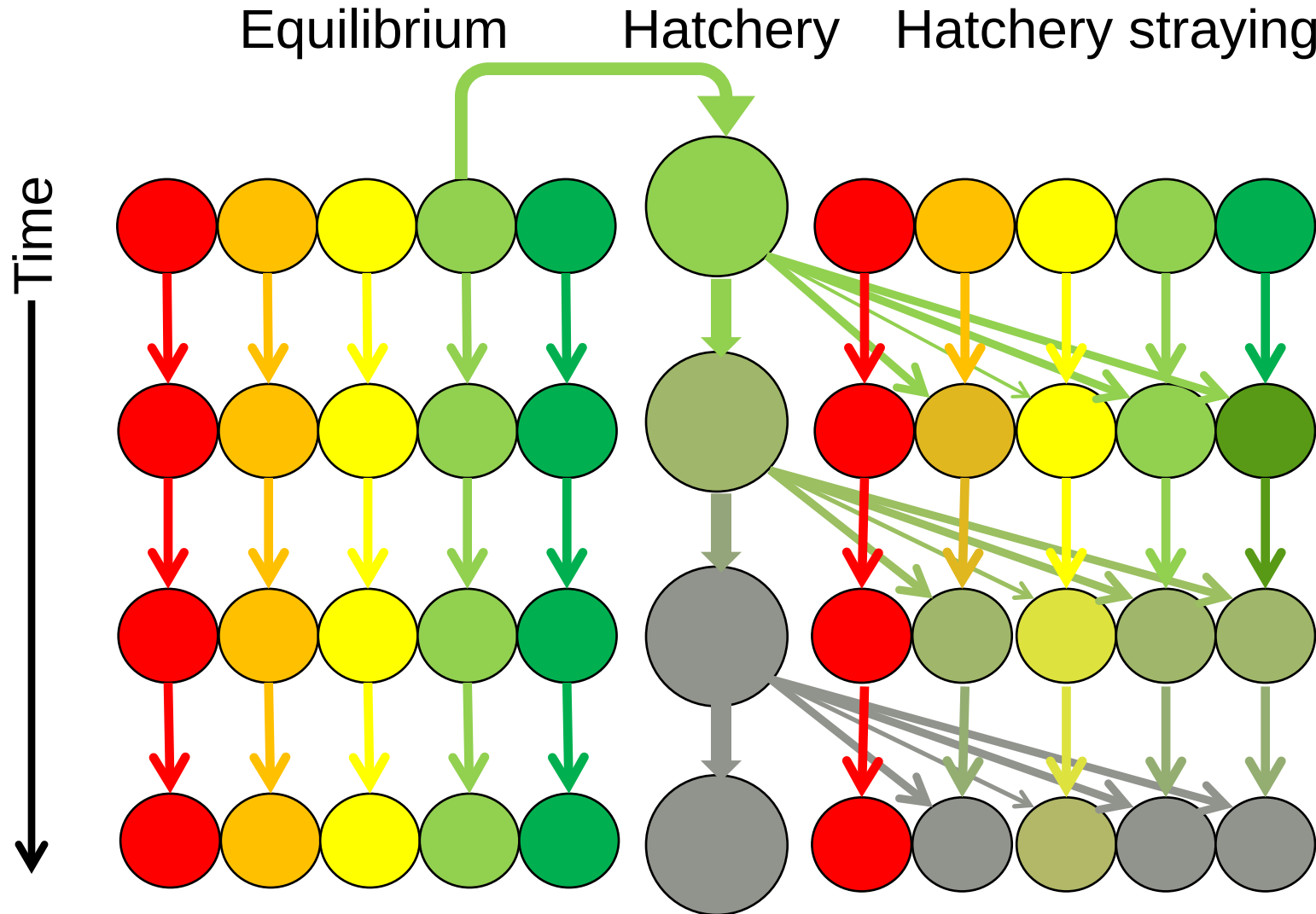
Applications: Assess Genetic Risk

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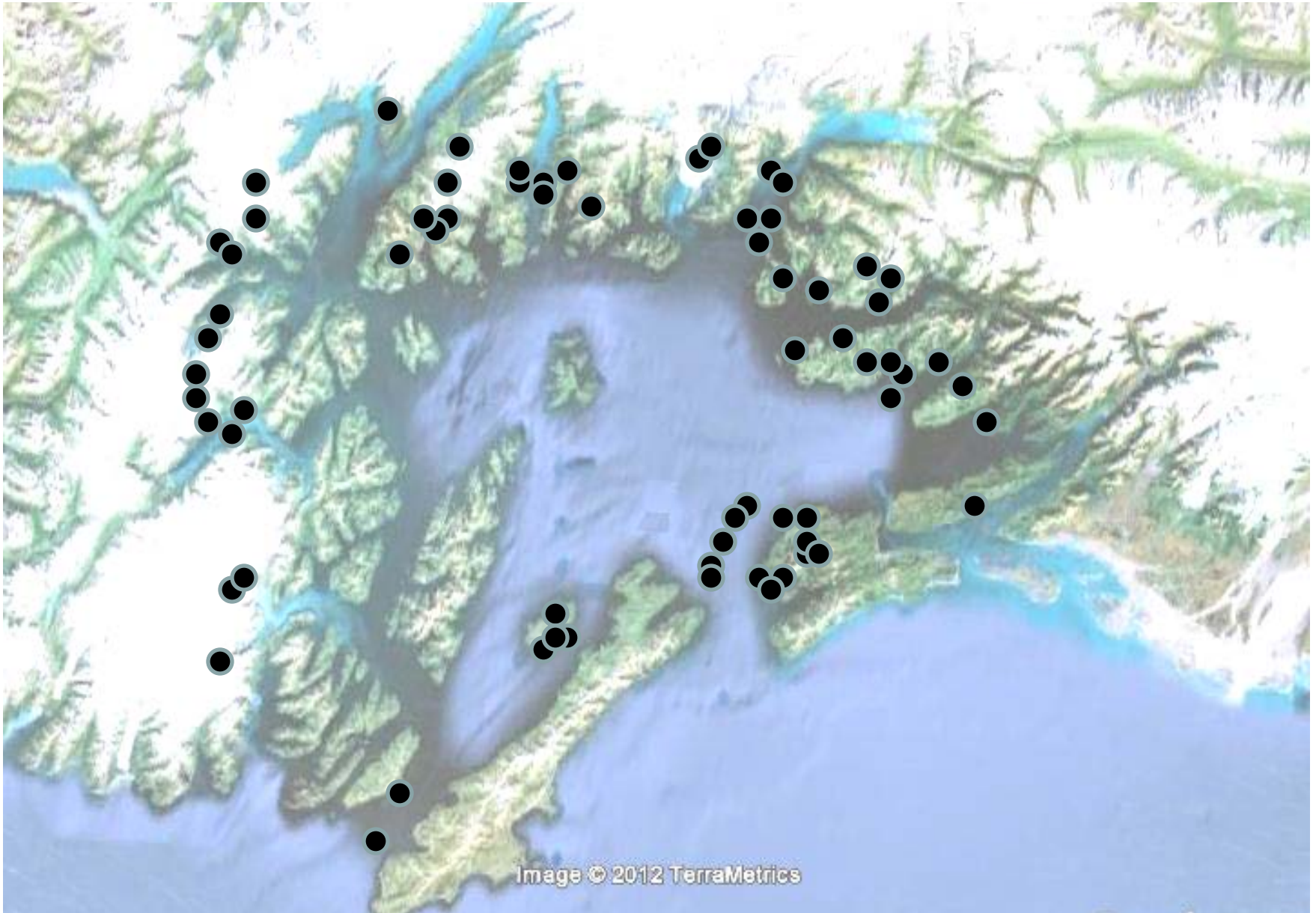
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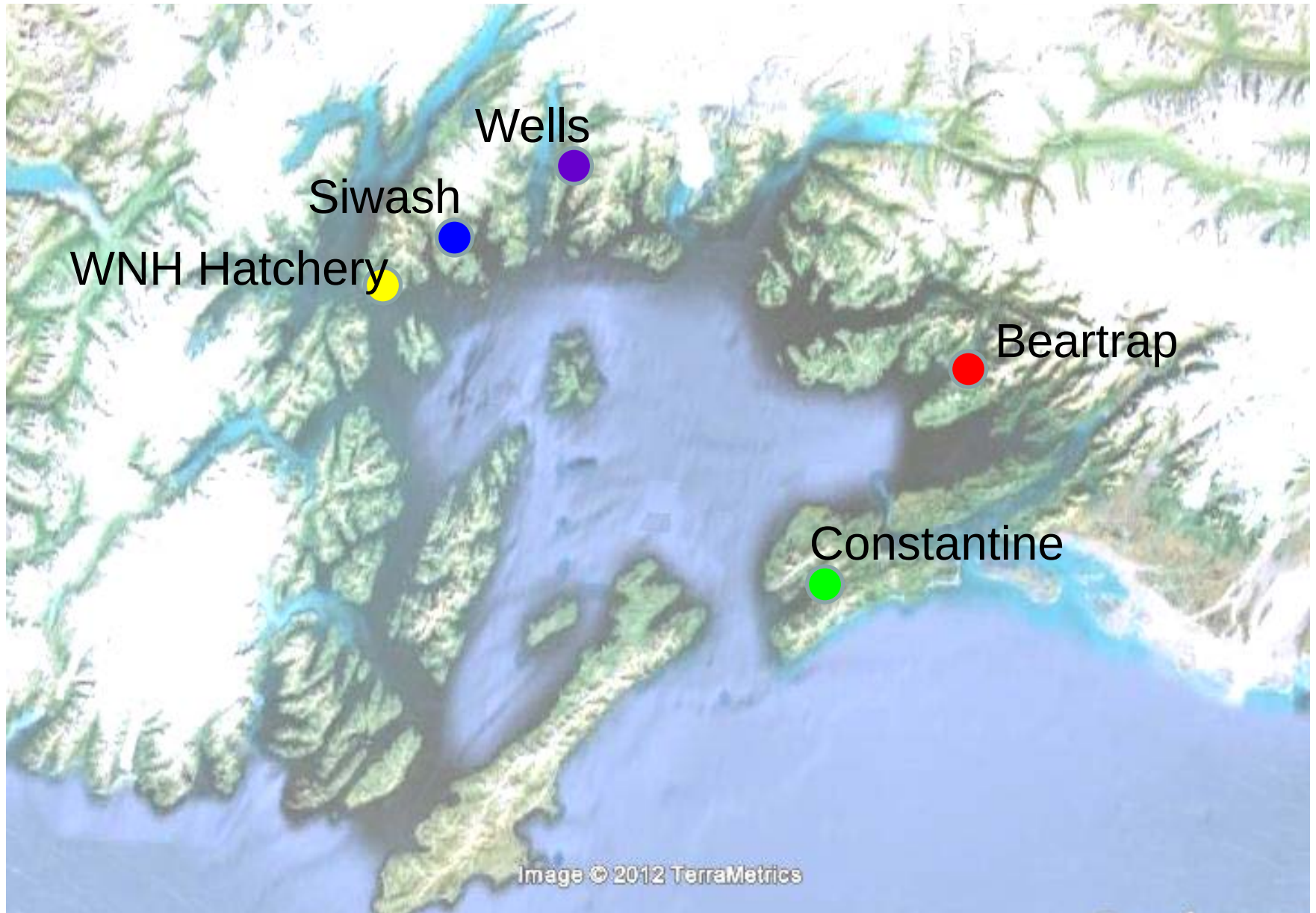
Applications: Assess Genetic Risk

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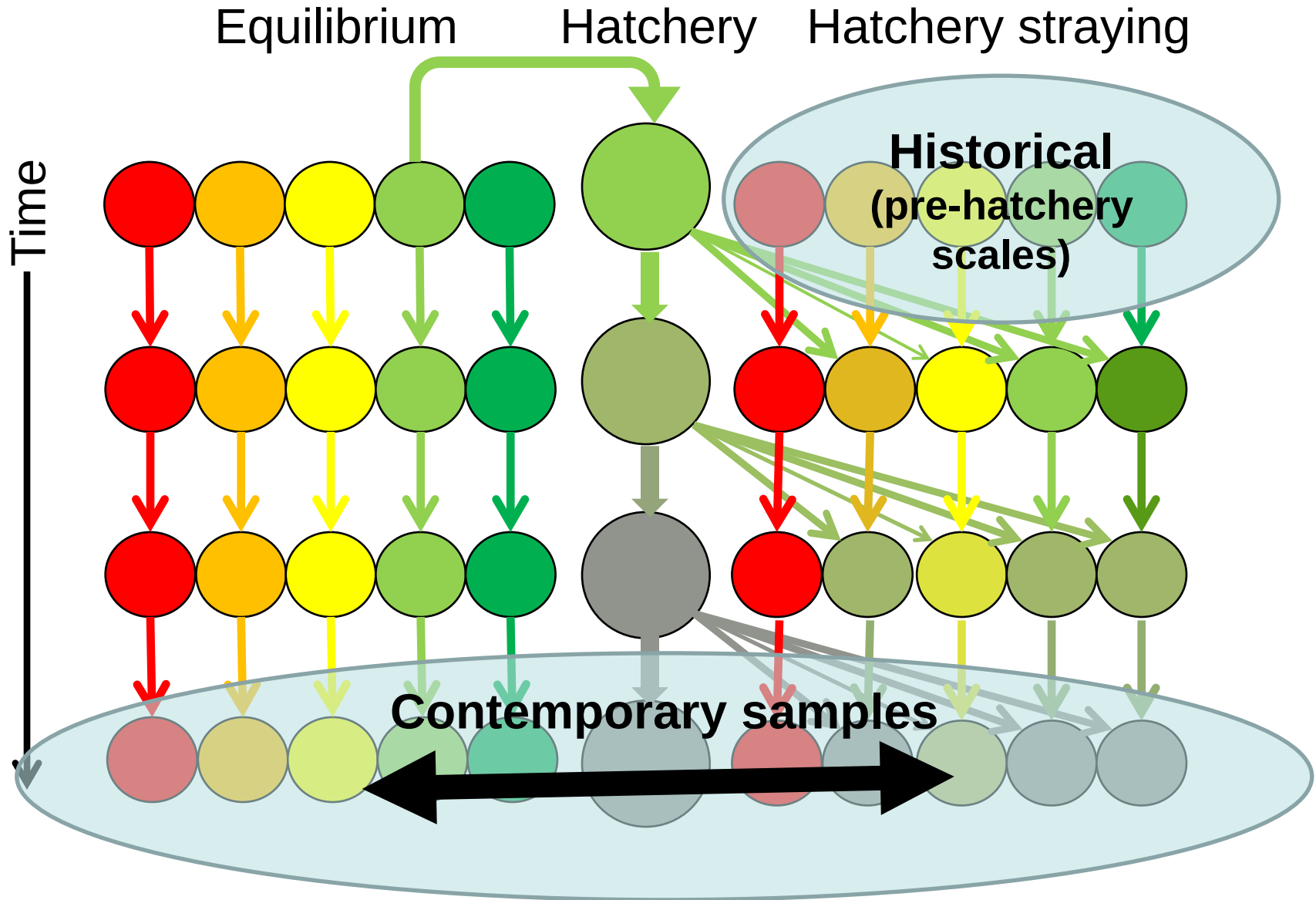
Applications: Assess Genetic Risk

Example: Chum salmon hatchery/wild interaction



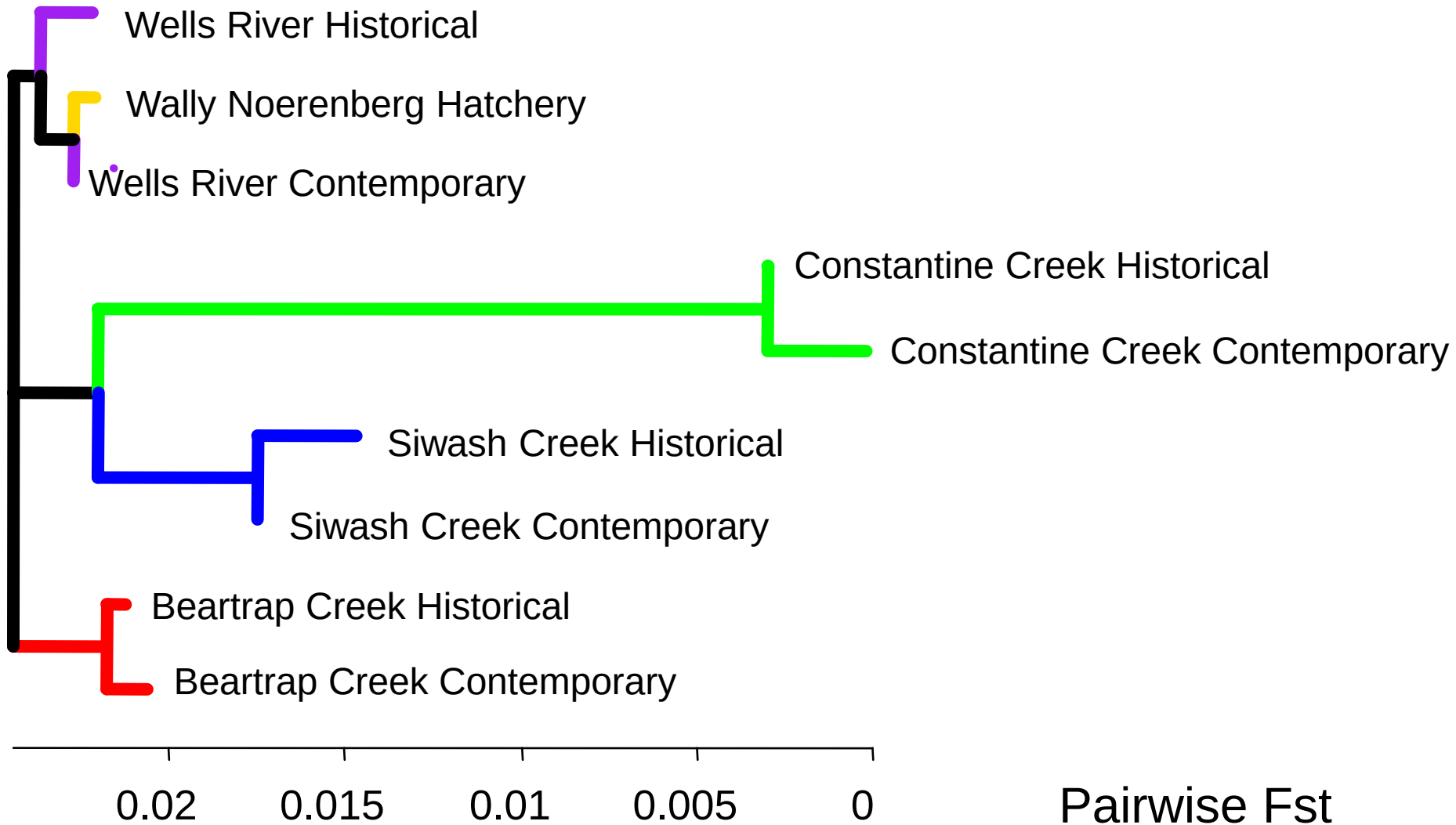
Applications: Assess Genetic Risk

Example: Chum salmon hatchery/wild interaction



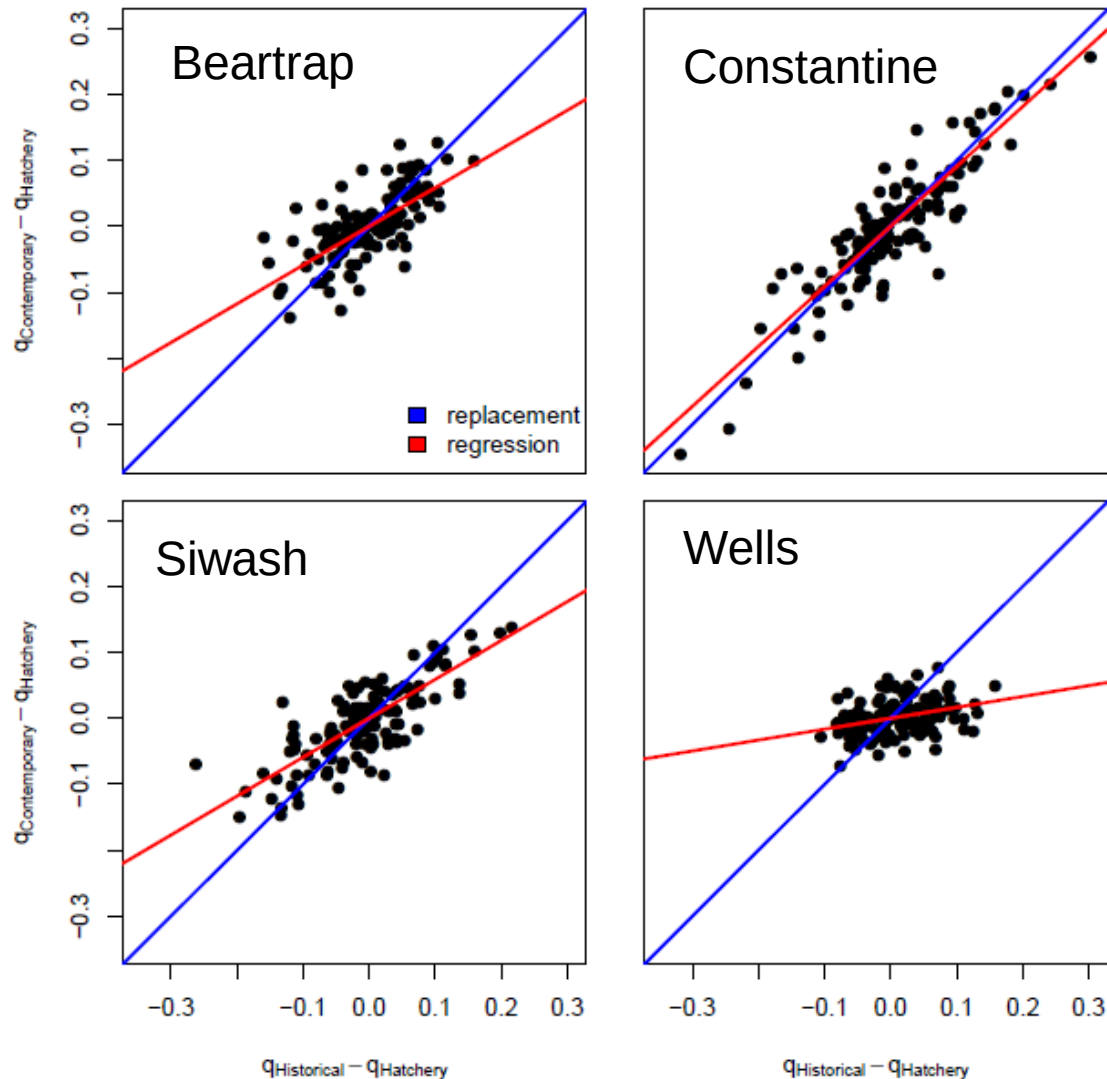
Applications: Assess Genetic Risk

Example: Chum salmon hatchery/wild interaction



Applications: Assess Genetic Risk

Example: Chum salmon hatchery/wild interaction



Applications: Assess Genetic Risk

Example: Chum salmon hatchery/wild interaction

Implications

- **Population structure not visibly eroded**
- **Introgression rates are highly variable among locations**
- **Both distance from the hatchery and life history can affect introgression rates**

Applications: Inform/Assess Management

Example: Western Alaska Salmon Stock Identification Program

NEWS

Bristol BayTimes & Dutch Harbor Fisherman



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"Spawned Weekly in Southwest Alaska"

October 16, 1992

Area M fishing gutted

■ **FALSE PASS:** Board acts to help poor Western Alaska chum runs

By WESLEY LOY
Anchorage Daily News

The Alaska Board of Fisheries revolutionized the controversial commercial salmon fishery near False Pass, severely reducing the fleet's fishing time to let more chum salmon swim farther north to fish-deficient Western Alaska rivers.

The action comes after three weeks of haggling at the board's marathon meeting at the Anchorage Marriott Downtown.

Gov. Tony Knowles had asked the board to stop the interception of chum salmon at False Pass to help prop up poor chum runs on Western Alaska rivers, where even subsistence needs have not been met.

The governor declared salmon disasters in three out of the past four years, triggering millions in relief funding for villagers along the



Oh, My Burning Eyes — Three local VPSO's wash the Cap-Stun from their eyes after undergoing training in the use of the self-defense spray.

Genetics may solve False Pass feud

by Jim Paulin
BayTimes Staff

Inside the hearts, liver tissue and eyeball fluid of chum salmon may lie part of the solution to the False Pass fishery dispute.

Using genetic testing, the high science of looking at the basic biological makeup of individual plants and animals, the state Department of Fish and Game hopes to find out which salmon are coming from which Alaska streams.

The sampling this summer by Ward Jones of Dillingham and his son Wesley was part of a \$270,000 state-funded project conducted by the Alaska Department of Fish and Game.

Yukon-Kuskokwim Delta-based residents claim fishermen at False Pass, located in the Aleutians East Borough, intercept too many chum en route to their region.

This summer, chum were sampled in streams on the north and south sides of the Alaska Peninsula and on Kodiak Island, said Lisa Seib, a Fish and Game geneticist in Anchorage. Only the most easily accessible streams were sampled, she said.

Technicians in Bristol Bay sampled chum in the Nushagak, Afognak and Stuyahok rivers this summer, Seib said. The study aims to collect basic data on the much debated subject of the origin of chum at False Pass, at the tip of the Alaska Peninsula.

Findings from the study could help manage the controversial False Pass fishery but not before some

be applied at False Pass as early as June 1993 but only on an experimental basis, she said.

Denby Lloyd, the Aleutians East Borough's chief resources analyst, cautiously welcomed the genetics study. Much of the borough's funding comes from a fish sales tax, which rose to 2 percent from 1.5 percent in July, so there is big interest in the work.

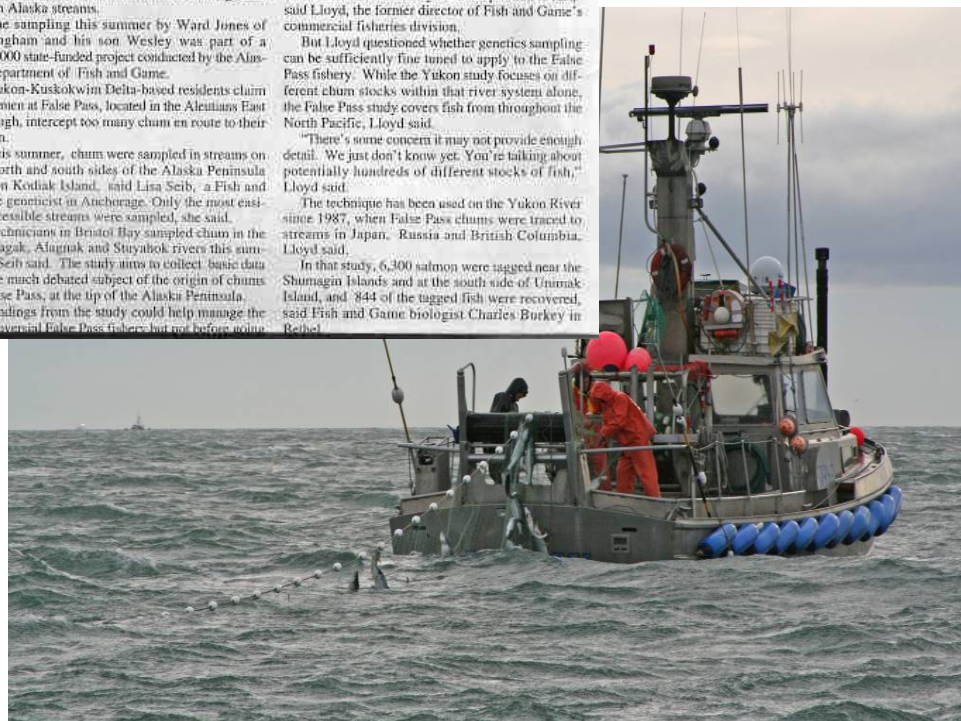
"It's not certain it can be done, but it does look promising. We welcome a good study of the origin of these fish so we can lay the data question to rest," said Lloyd, the former director of Fish and Game's commercial fisheries division.

But Lloyd questioned whether genetics sampling can be sufficiently fine tuned to apply to the False Pass fishery. While the Yukon study focuses on different chum stocks within that river system alone, the False Pass study covers fish from throughout the North Pacific, Lloyd said.

"There's some concern it may not provide enough detail. We just don't know yet. You're talking about potentially hundreds of different stocks of fish," Lloyd said.

The technique has been used on the Yukon River since 1987, when False Pass chums were traced to streams in Japan, Russia and British Columbia, Lloyd said.

In that study, 6,300 salmon were tagged near the Shumagin Islands and at the south side of Unimak Island, and 844 of the tagged fish were recovered, said Fish and Game biologist Charles Burkey in Bethel.



Applications: Inform/Assess Management

Example: Western Alaska Salmon Stock Identification Program

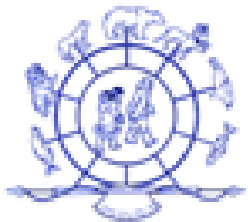
There was political support to fund large-scale, collaborative genetic stock identification study

IF

Stakeholders agree on necessary information, study design and results



WASSIP MOU Signatories

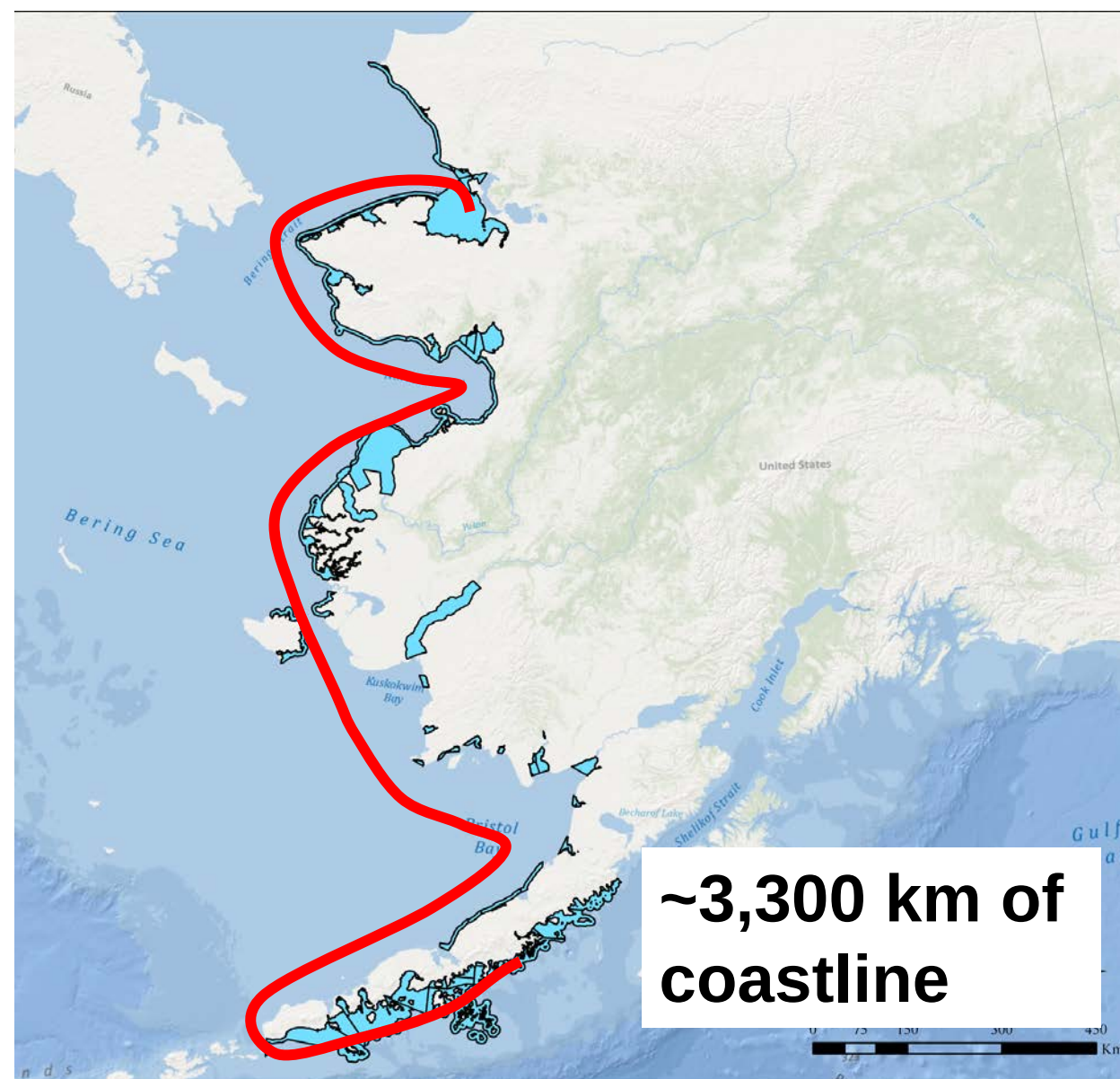


- Alaska Department of Fish and Game
- Aleut Corporation
- Aleutians East Borough
- Association of Village Council Presidents
- Bering Sea Fisherman's Association
- Bristol Bay Native Association
- Concerned Area M Fisherman
- Kawerak Incorporated
- Lake and Peninsula Borough
- Tanana Chiefs Conference
- Yukon River Drainage Fisheries A



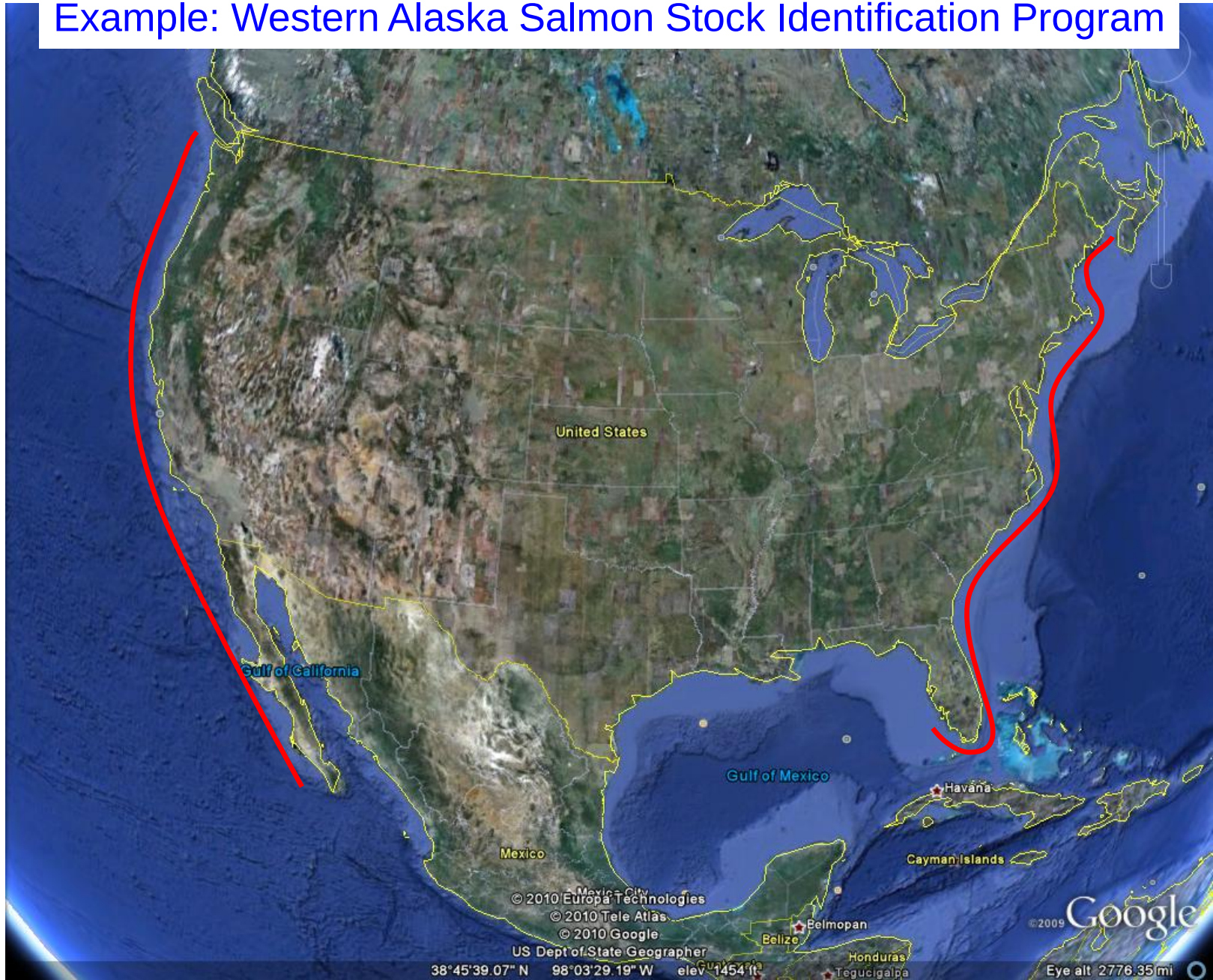
Applications: Inform/Assess Management

Example: Western Alaska Salmon Stock Identification Program



Applications: Inform/Assess Management

Example: Western Alaska Salmon Stock Identification Program



Applications: Inform/Assess Management

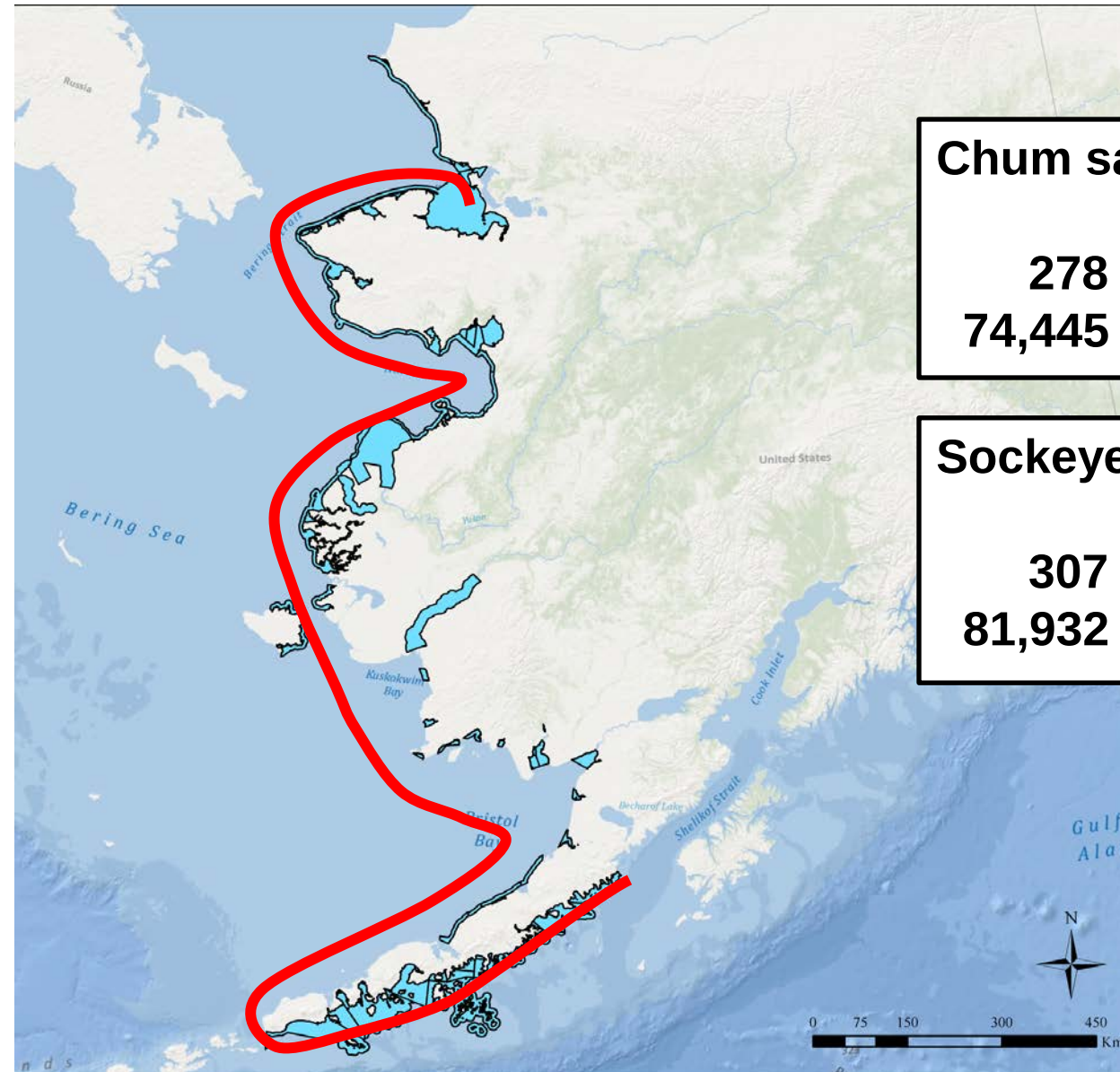
Example: Western Alaska Salmon Stock Identification Program

Chum salmon:

278 fishery strata
74,445 individuals genotyped

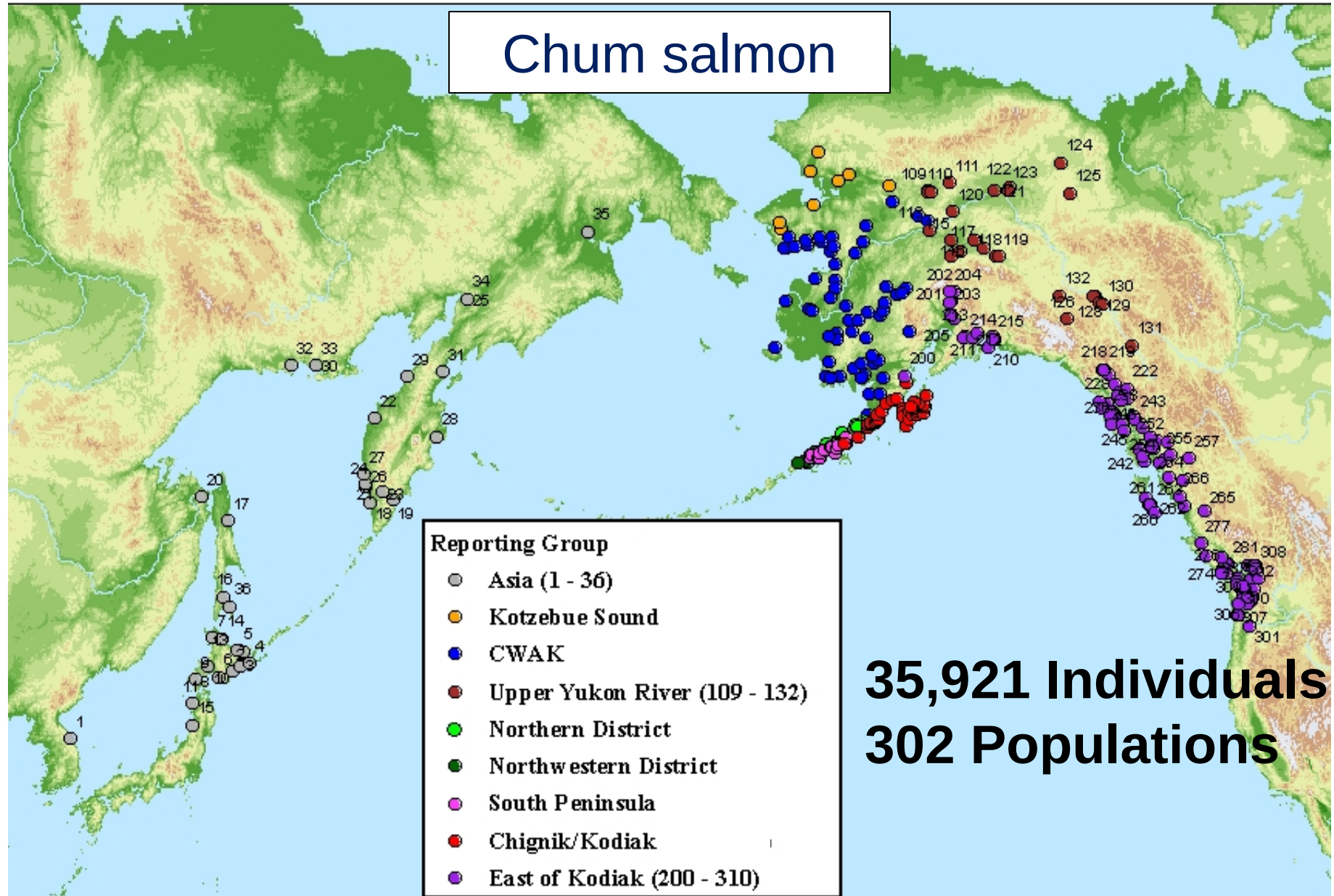
Sockeye salmon:

307 fishery strata sampled
81,932 individuals genotyped



Applications: Inform/Assess Management

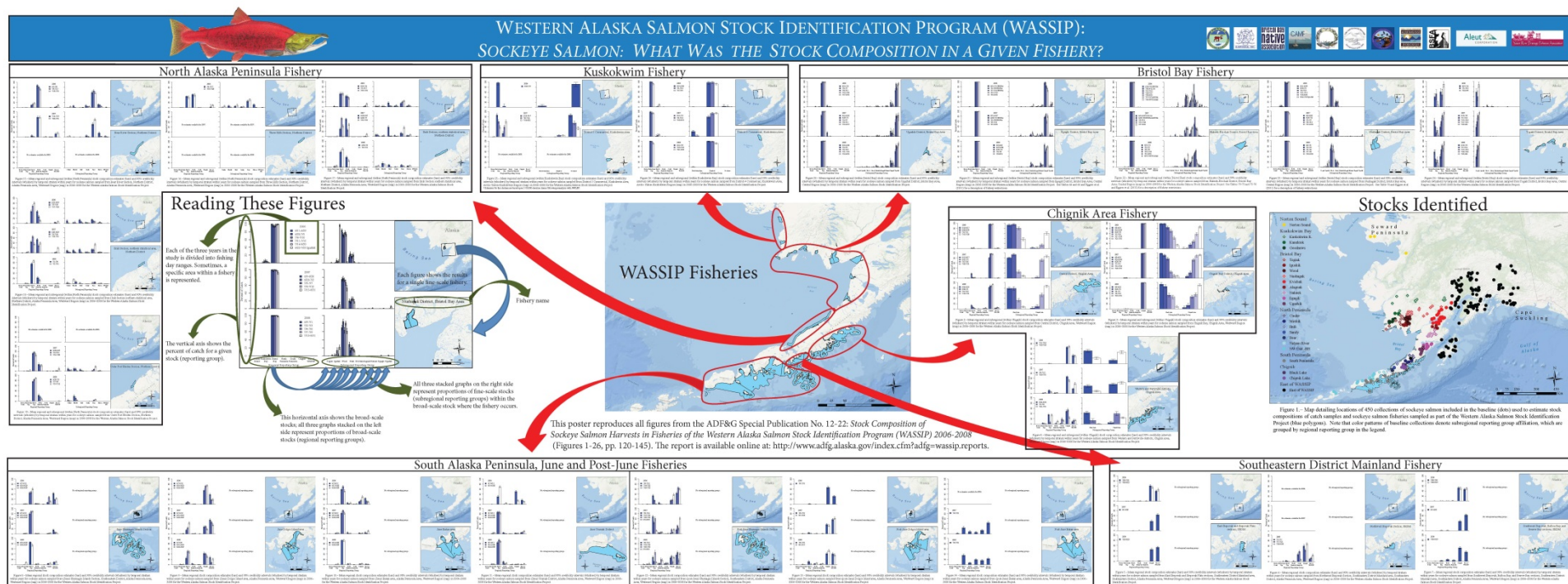
Example: Western Alaska Salmon Stock Identification Program



Applications: Inform/Assess Management

Example: Western Alaska Salmon Stock Identification Program

What stocks are caught in my fishery?



Example: Western Alaska Salmon Stock Identification Program

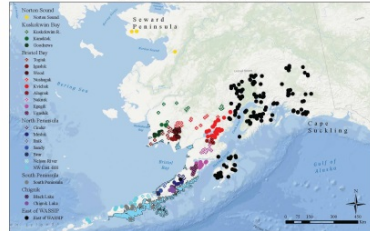
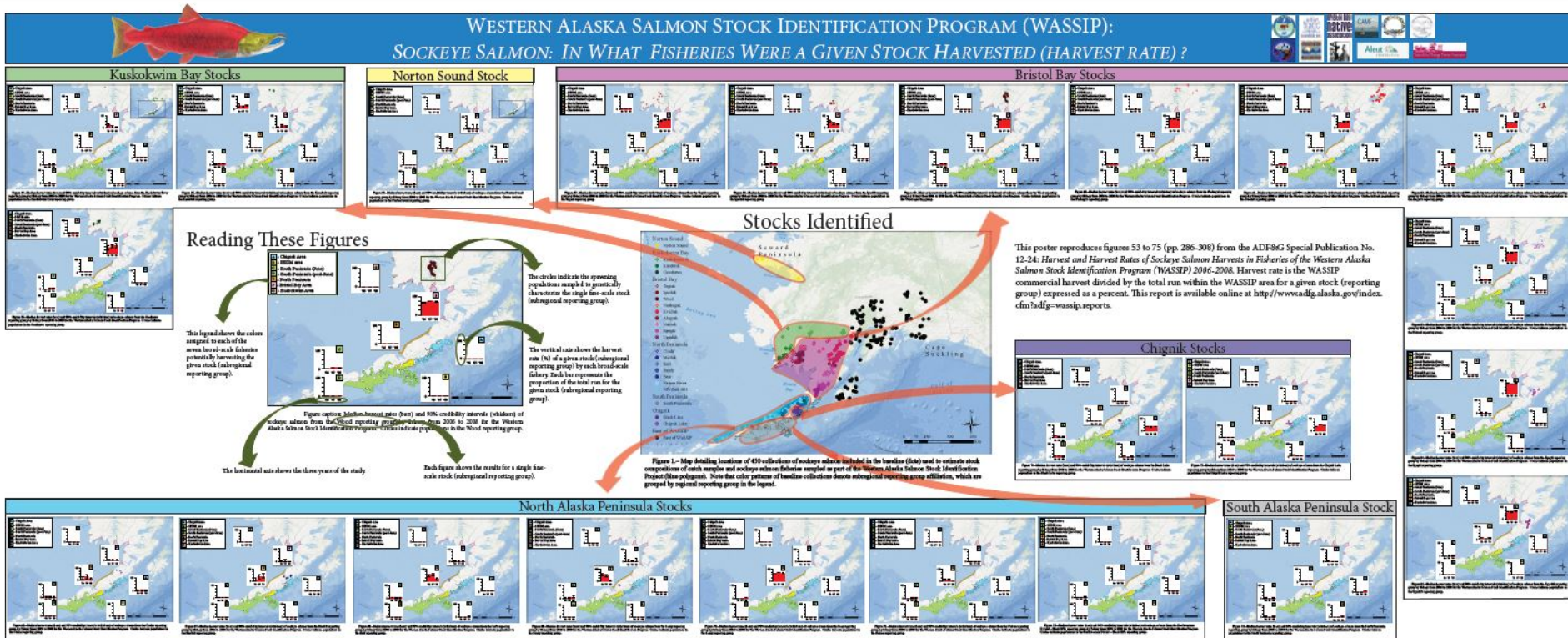


Figure 1. Map detailing locations of 450 collections of sockeye salmon included in the baseline (dots) used to estimate stock, compositions of catch samples and sockeye salmon fisheries sampled as part of the Western Alaska Salmon Stock Identification Project (blue polygons). Note that color patterns of baseline collections denote subregional reporting group affiliation, which are grouped by regional reporting group in the legend.

Applications: Inform/Assess Management

Example: Western Alaska Salmon Stock Identification Program

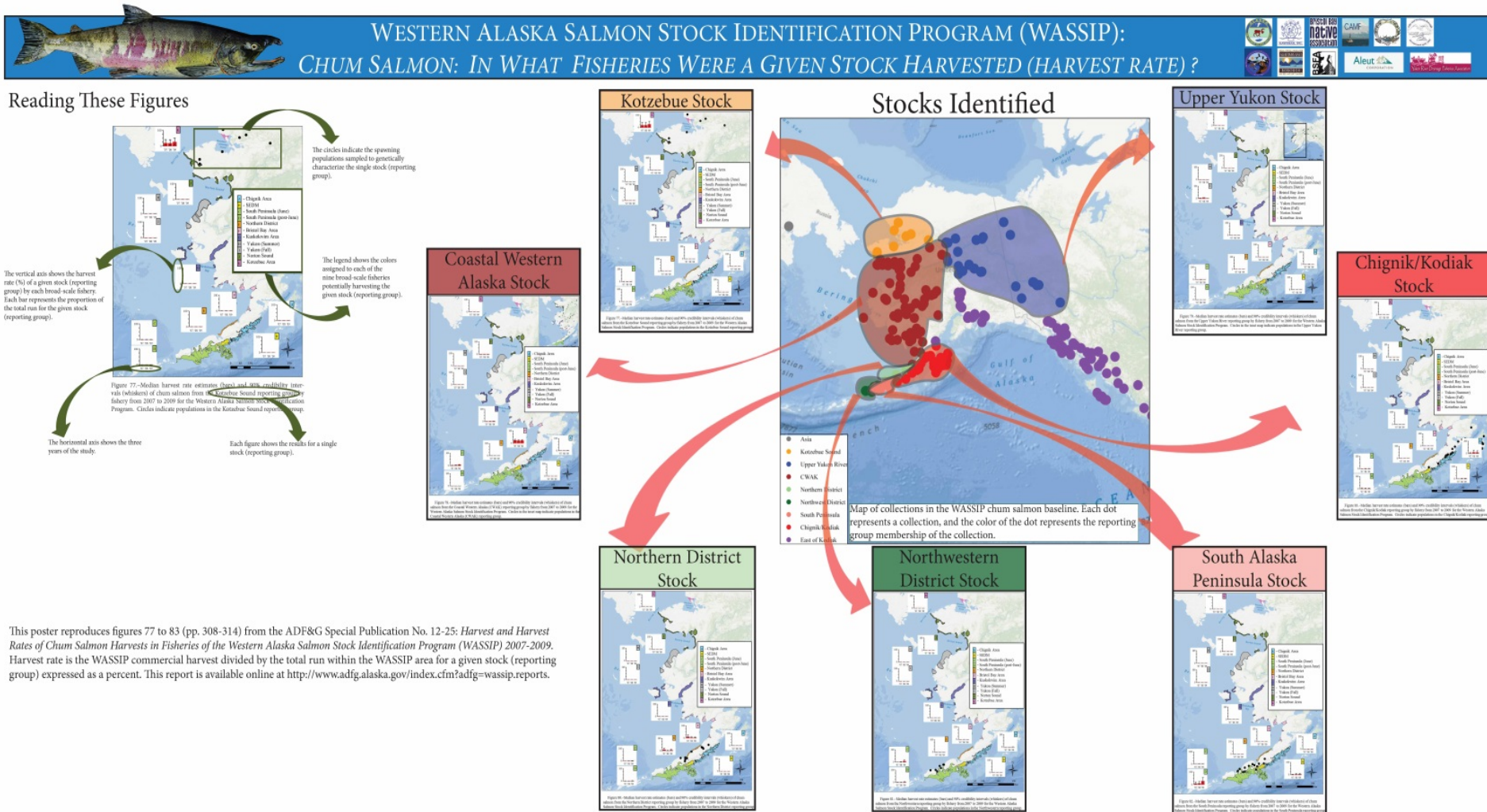
What fishery catches my stock?



Applications: Inform/Assess Management

Example: Western Alaska Salmon Stock Identification Program

Chum salmon: What fishery catches my stock?



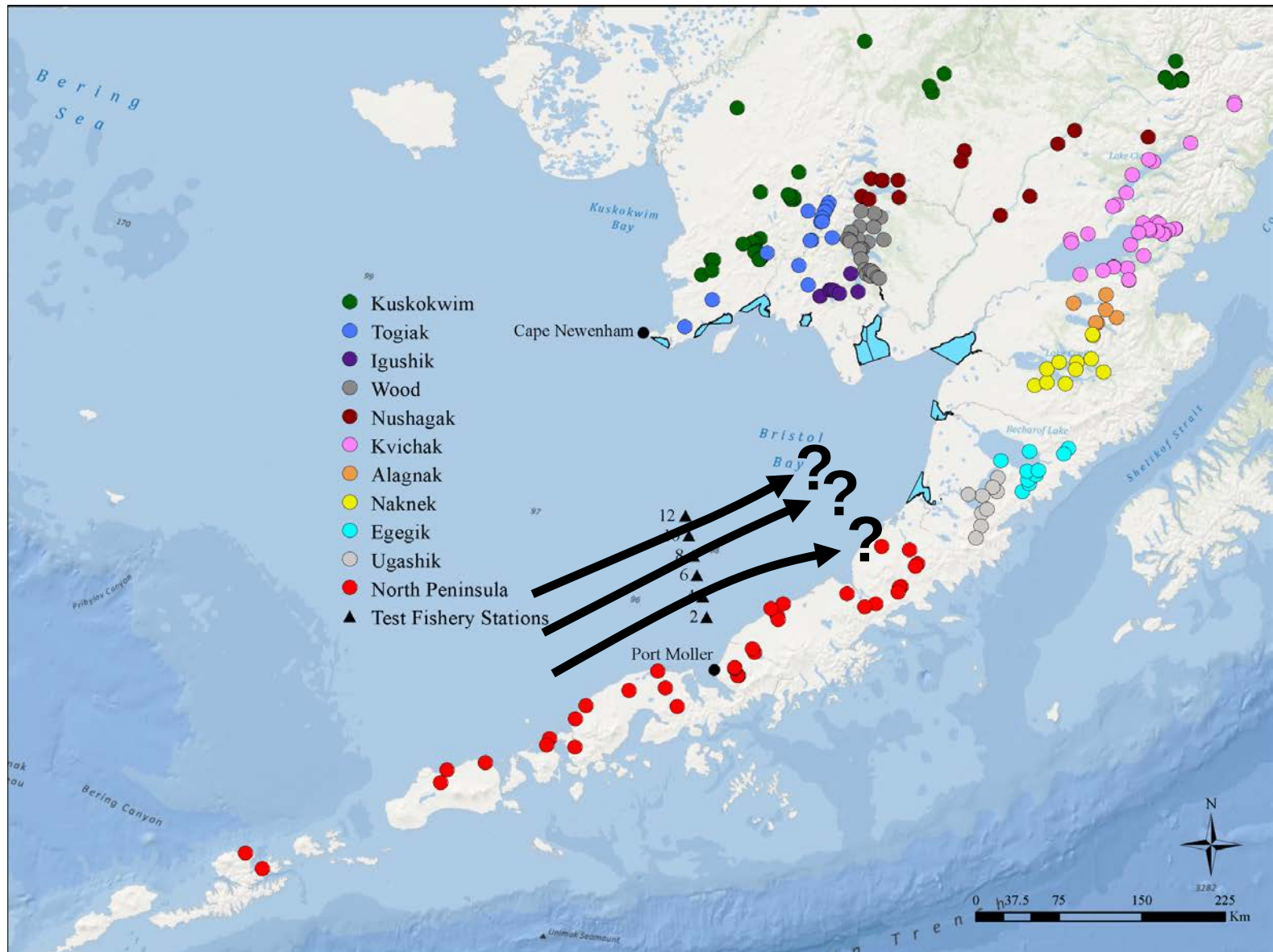
Applications: Inform/Assess Management

Example: Port Moller Test Fishery - Inseason



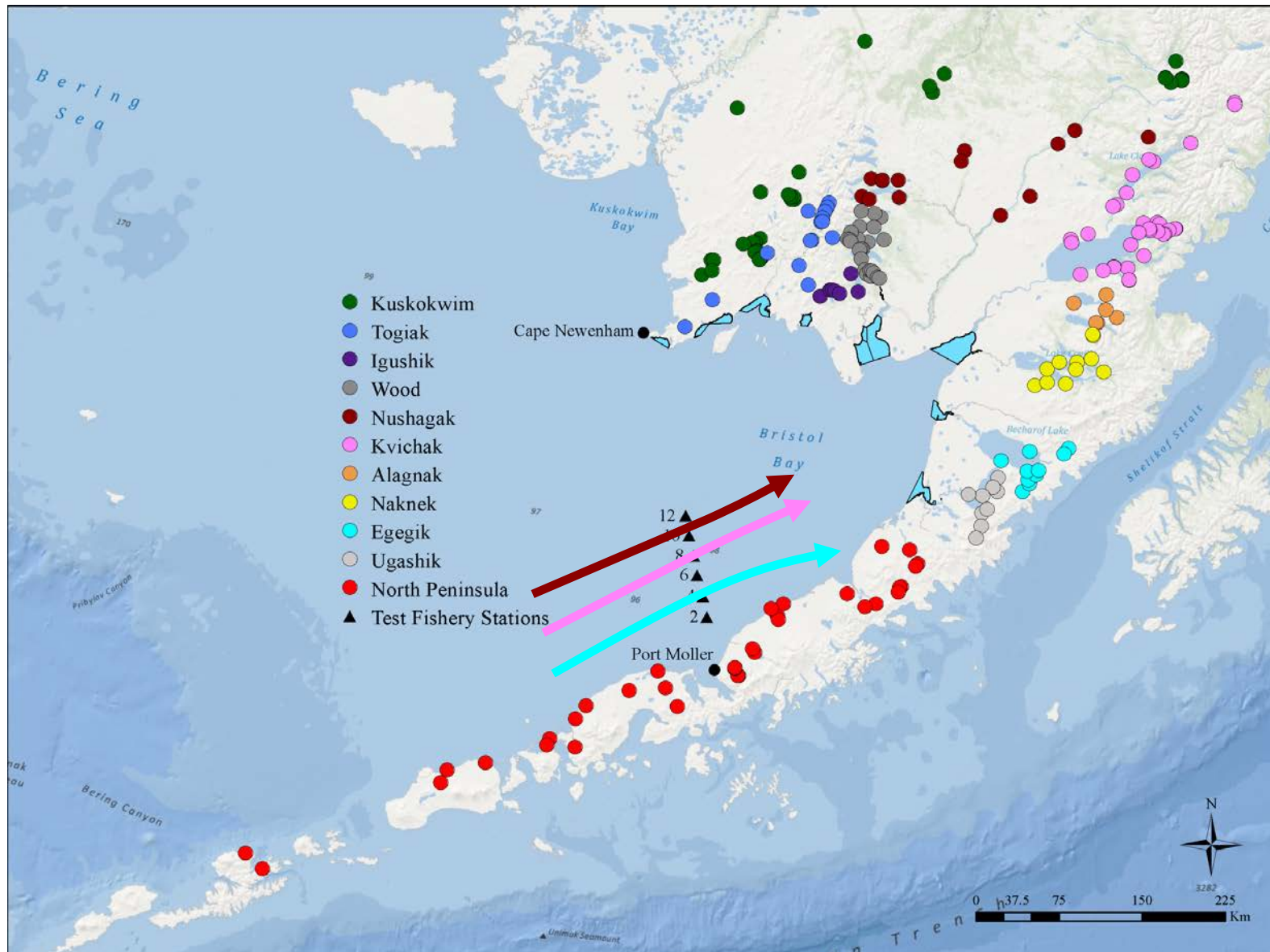
Applications: Inform/Assess Management

Example: Port Moller Test Fishery - Inseason



Applications: Inform/Assess Management

Example: Port Moller Test Fishery - Inseason



Applications: Inform/Assess Management

Example: Port Moller Test Fishery - Inseason

Bristol Bay Sockeye Salmon Fishery

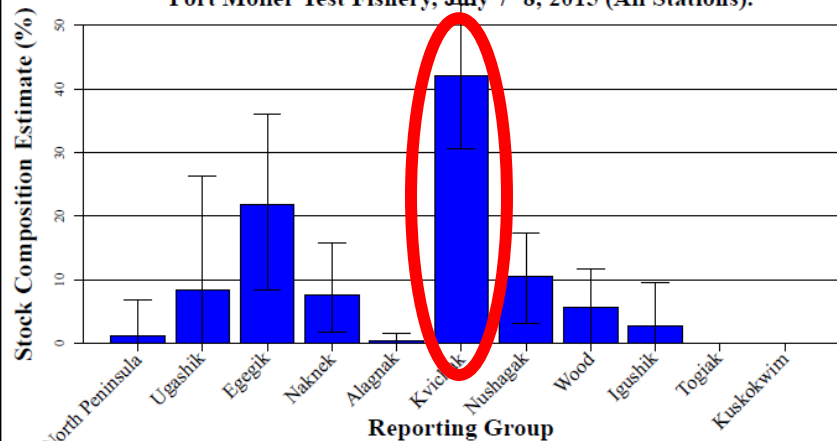
Port Moller Sockeye Salmon Stock Composition Summary

July 7-8, 2015 – All Stations

Genetic stock composition estimates for sockeye salmon from the Port Moller Test Fishery for July 7-8, 2015. A total of 722 fish were sampled and 190 were analyzed (186 had adequate data to include in the analysis).

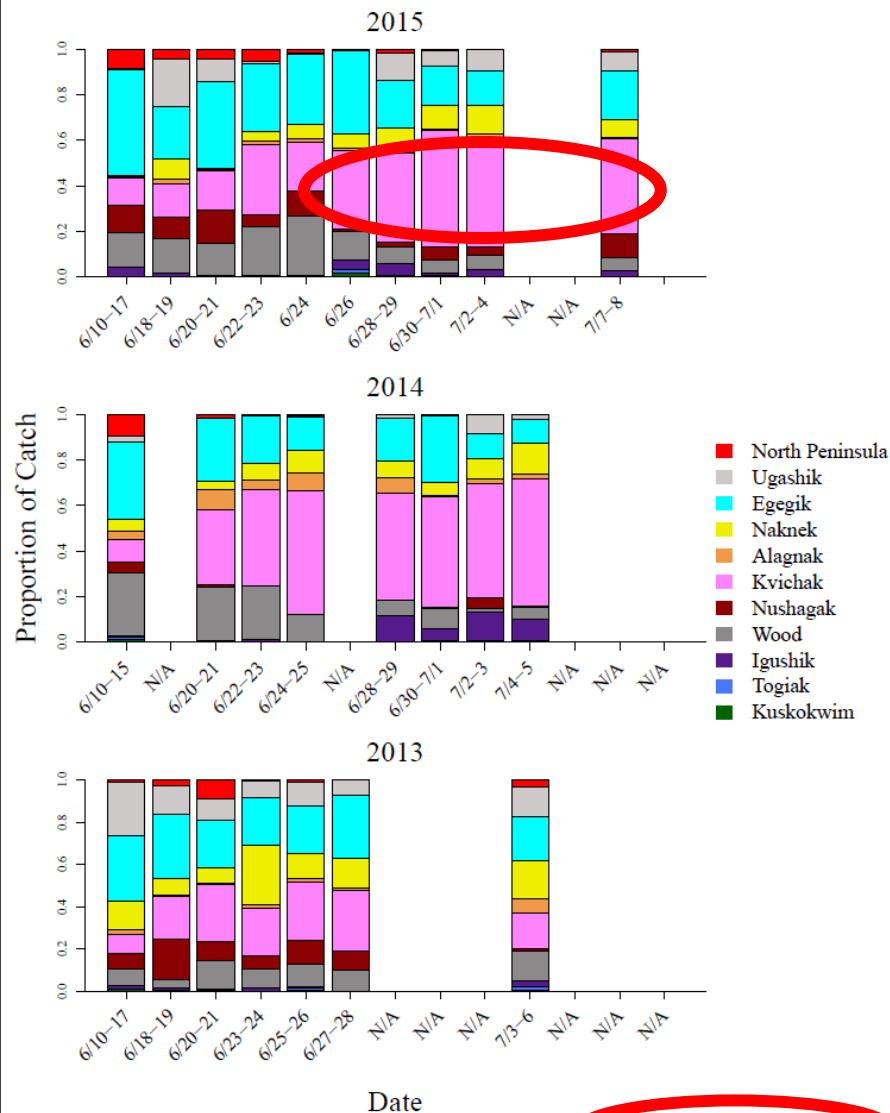
Reporting Group	Stock Composition Estimate	90% Confidence Intervals	
		Lower	Upper
North Peninsula	1.2%	0.0%	6.9%
Ugashik	8.3%	0.0%	26.4%
Egegik	21.7%	8.3%	36.1%
Naknek	7.6%	1.8%	15.7%
Alagnak	0.3%	0.0%	1.6%
Kvichak	42.1%	30.5%	53.4%
Nushagak	10.6%	3.0%	17.3%
Wood	5.5%	0.0%	11.7%
Igushik	2.6%	0.0%	9.5%
Togiak	0.0%	0.0%	0.0%
Kuskokwim	0.0%	0.0%	0.0%

Genetic Stock Composition Estimates for Sockeye Salmon Captured in the Port Moller Test Fishery, July 7-8, 2015 (All Stations).



The genetic analysis was completed by the Alaska Department of Fish and Game, Division of Commercial Fisheries, Gene Conservation Laboratory.

Historical Comparison of Stock Composition Estimates



Applications: Inform/Assess Management

Example: Port Moller Test Fishery - Inseason



SUNDAY, JULY 12, 2015

Bristol Bay's late rally

Gillnetters scored big on Friday and Saturday with catches of more than 2 million fish each day, and the grand total now stands at nearly 19 million fish.

The season, however, is still likely to end in disappointment as the preseason harvest forecast of 37.6 million fish seems out of reach.

That's especially true for the boats, and head of the fleet.

As for prices? Well, that's a different story.

Have you?

Posted by Deckboss at 3:00 PM

5 comments:

Labels: Bristol Bay, rally

THURSDAY, JULY 9, 2015

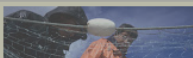
Who killed the sea lions?

A commercial fishing group, Cordova District Fishermen United, is offering \$5,000 for information leading to the conviction of whomever is responsible for a Steller sea lion slaughter near Cordova.

SUNDAY, JULY 5, 2015

Bristol Bay bust?

Gillnetters in Bristol Bay have taken just over 8 million sockeye salmon through the Fourth of July.



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Bristol Bay's Confused Sockeye Buyers Hold Out on Offers After Rare Mid-July Run (Fish Radio)

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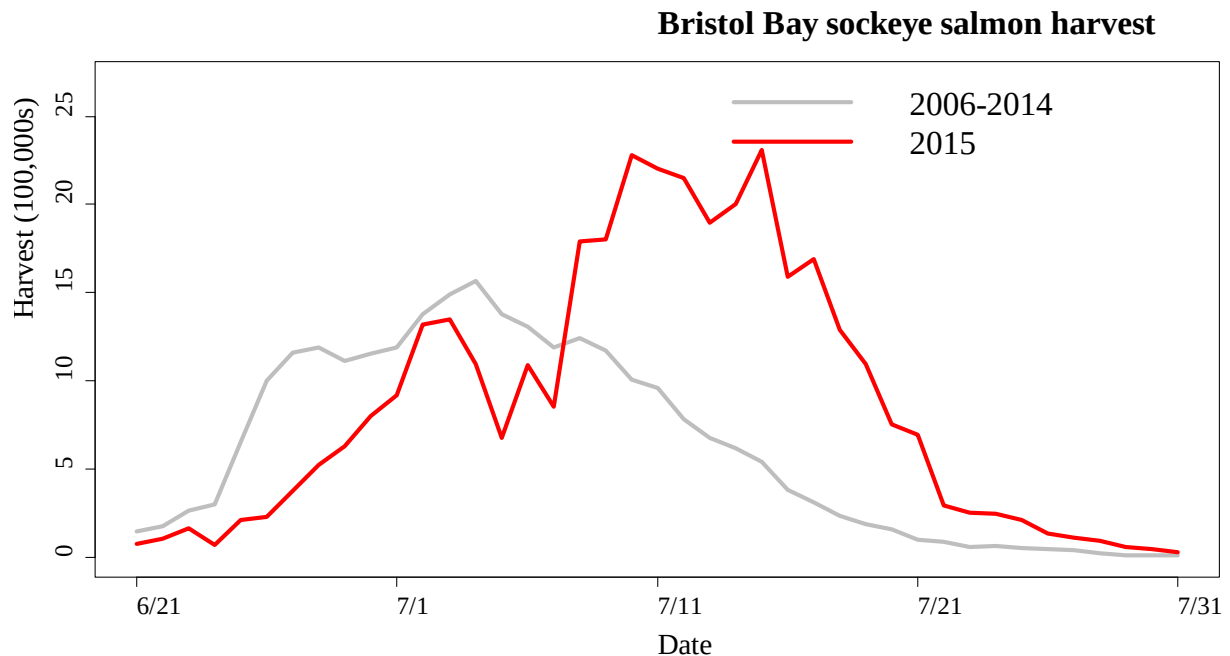
Video sponsored by Alaska Seafood Marketing Institute

News Summary July 14, 2015

Today's Main Story: Bristol Bay's Confused Sockeye Buyers Hold Out on Offers After Rare Mid-July Run

News Summary July 14, 2015

Today's Main Story: Bristol Bay's Confused Sockeye Buyers Hold Out on Offers After Rare Mid-July Run



Applications: Inform/Assess Management

Example: Port Moller Test Fishery - Inseason

Utility

- **Provides real-time information when other sources unavailable**
- **Relative abundances among largest sockeye salmon runs in Alaska**
- **Benefits resource management and industry**
- **Global model of fisheries management tool**

Questions?

