Idaho Salmon and Steelhead

Overview of Management, Status and Factors Affecting Abundance

Jim Fredericks, Idaho Department of Fish and Game

Outline of Presentation

- Relationship of Idaho and anadromous fish
- Management and limiting factors
- Historical returns by species

Anadromous Species in Idaho

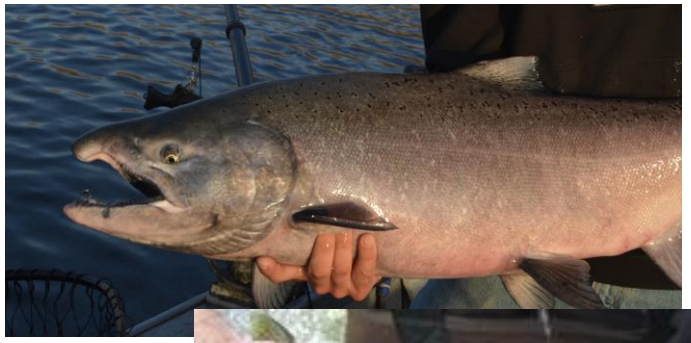
Chinook Salmon
- Spring
- Summer
- Fall

Steelhead
- Summer

Sockeye

Coho

Lamprey

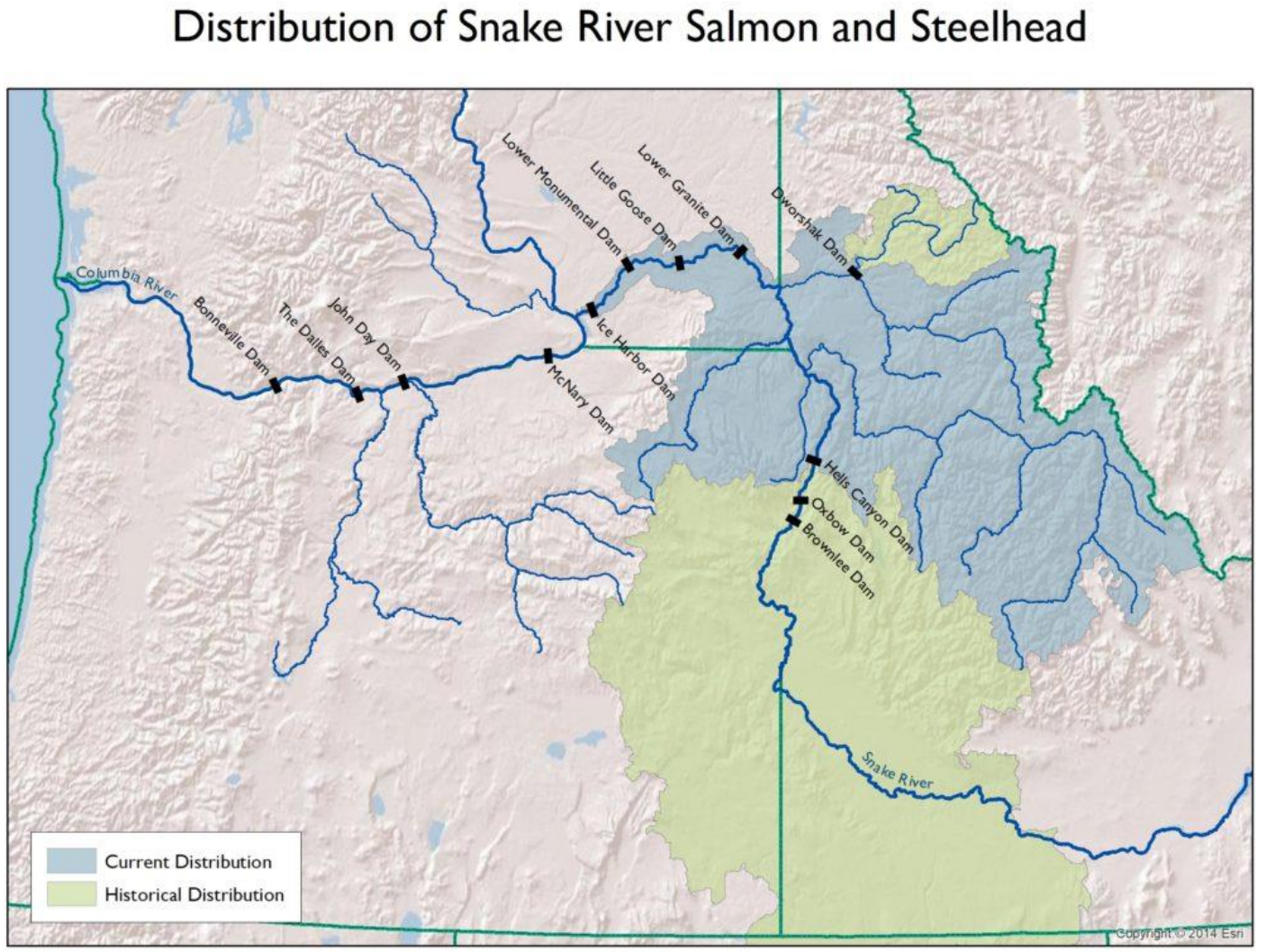


Importance of Idaho

Snake Basin Historically Produced:

≈55% of Summer Steelhead

≈ 40-45% of Spring/Summer Chinook



Importance to Idaho

Economic Importance

- Typically 20-25% of angling effort
- Over $100 million annual spending
- 1,000 – 2,000 thousand (rural) jobs
- Chinook fisheries can generate up to $90 million
  - 2001 Chinook fishery = estimated $10 million in Riggins alone
  - Estimated total spending in Riggins that year was $44 million)

Importance to Idaho

- Economic Importance
- Ecological Importance
  - Marine derived nutrients
  - Food source
  - Gravel cleaning

Importance to Idaho

- Economic Importance
- Biological Importance
- Cultural Importance

Limiting Factors -- 4 H's

A “P”

And an “O”

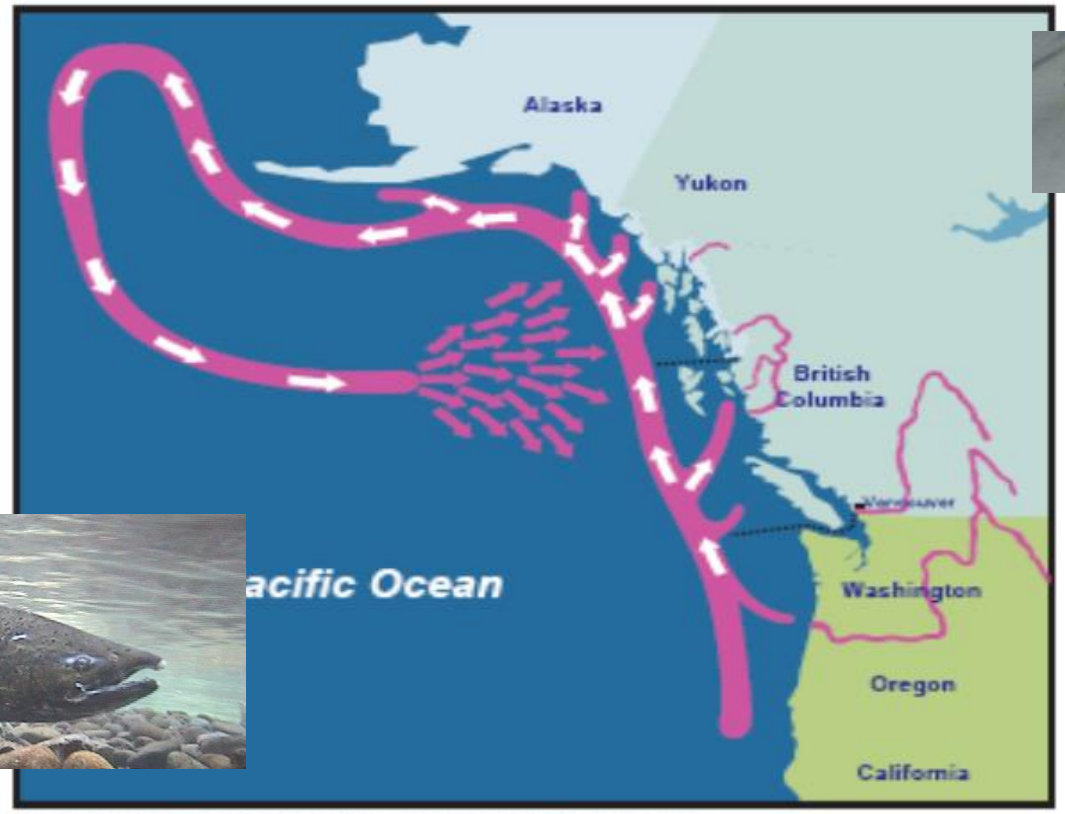
A World of Acronyms

Minimum Abundance Threshold (MAT)

- Based on viability and the relative amount of historical spawning and rearing habitat associated with each population
- Represents the number of spawners needed for a population to achieve the 5% risk level at a given productivity
- Required for de-listing, but not the sole criteria

Smolt to Adult Return Rates (SAR)

The survival from a beginning point as a smolt to an ending point as an adult.



General migratory pattern of pacific salmon.

Smolt to Adult Return Rates (SAR)

- For example

100,000 smolts Migrate past Lower Granite Dam in 2016

500- 1 Ocean Salmon Return to Bonneville Dam in 2017

2,000- 2 Ocean Salmon Return in 2018

800- 3 Ocean Salmon Return in 2019

$$SAR = \frac{(500+2,000+800)}{100,000} = 3.3\%$$

Point to Point

Hydrosystem

News

Hot water kills half of Columbia River sockeye salmon

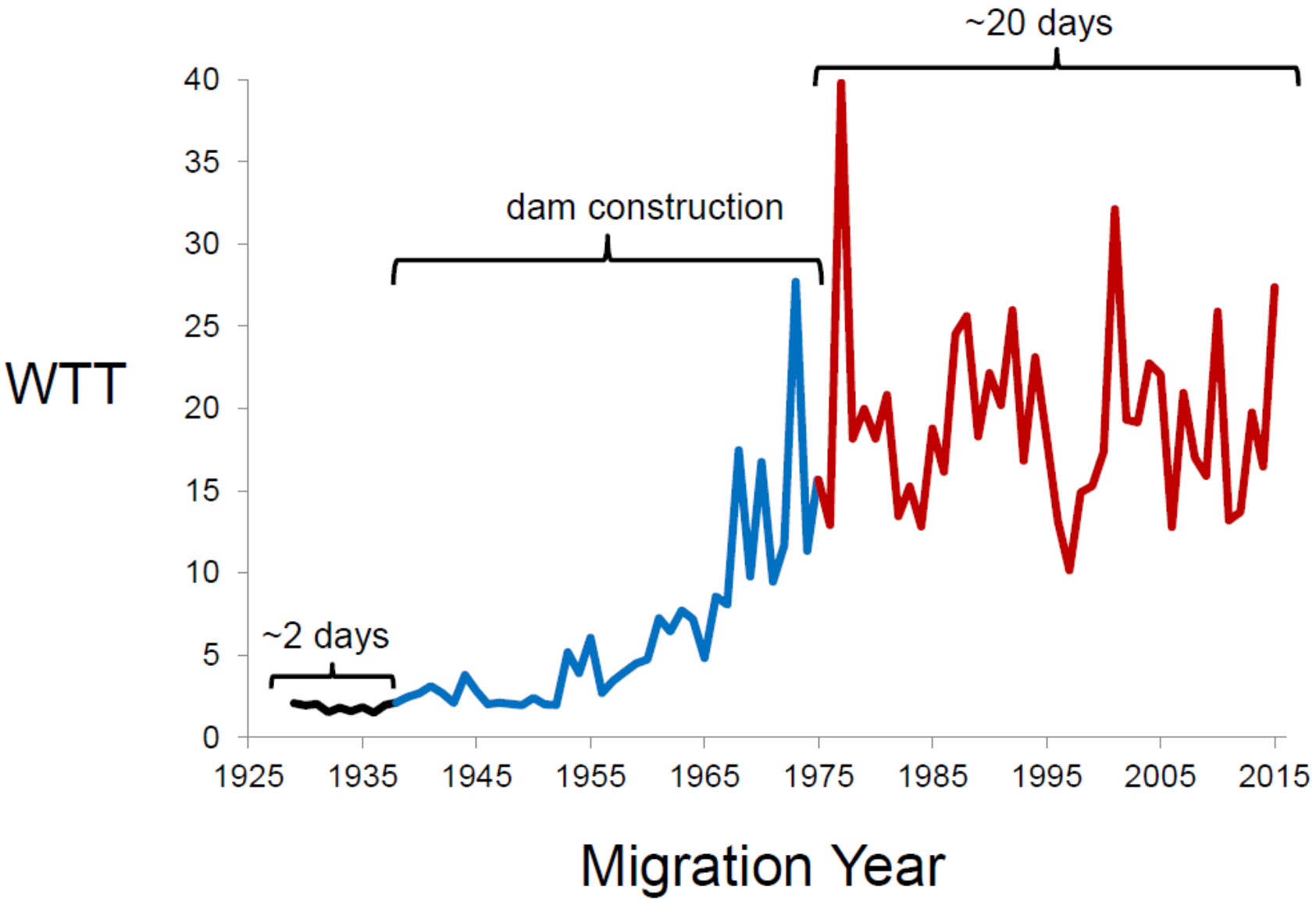
Drought and record heat are behind the high water temperatures

By: Shuly Wasserstrom

Posted: Jul 27, 2015 07:38 AM PDT

Updated: Jul 27, 2015 07:38 AM PDT

Long-term changes in Lewiston-BON WTT

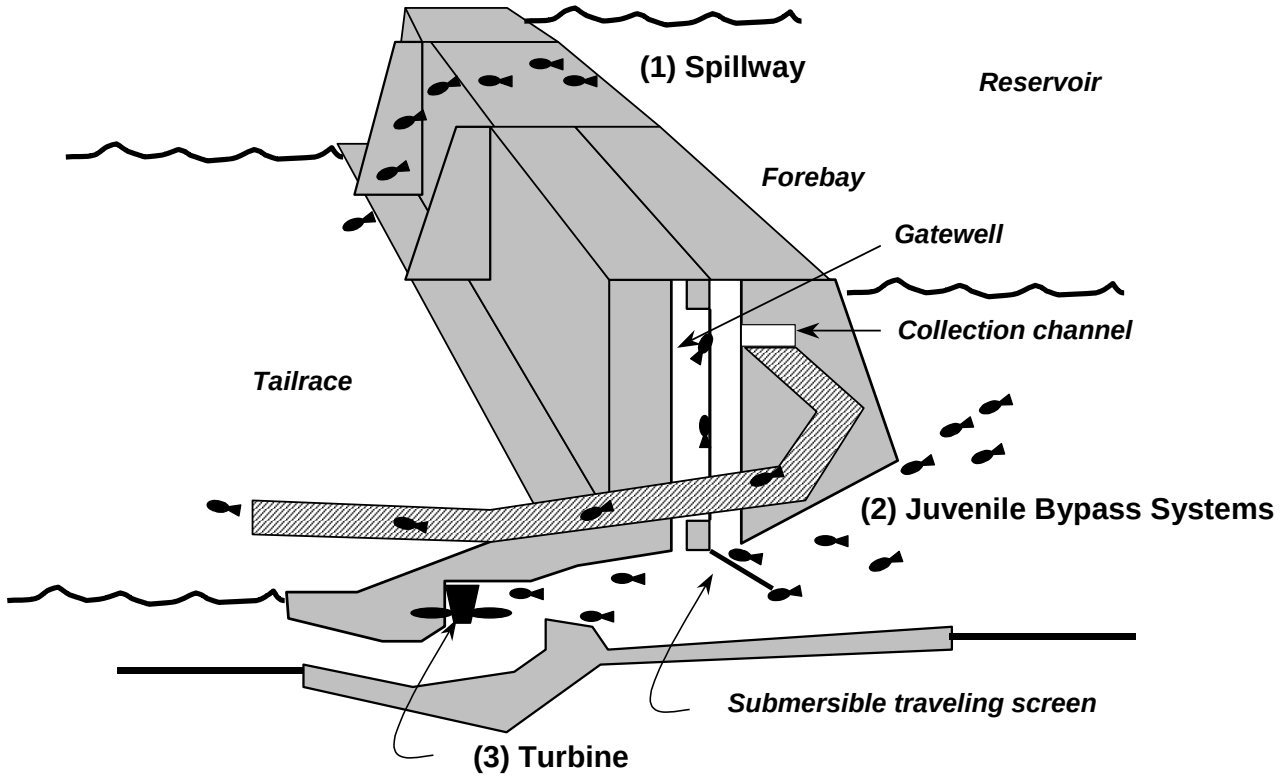


Passage Routes

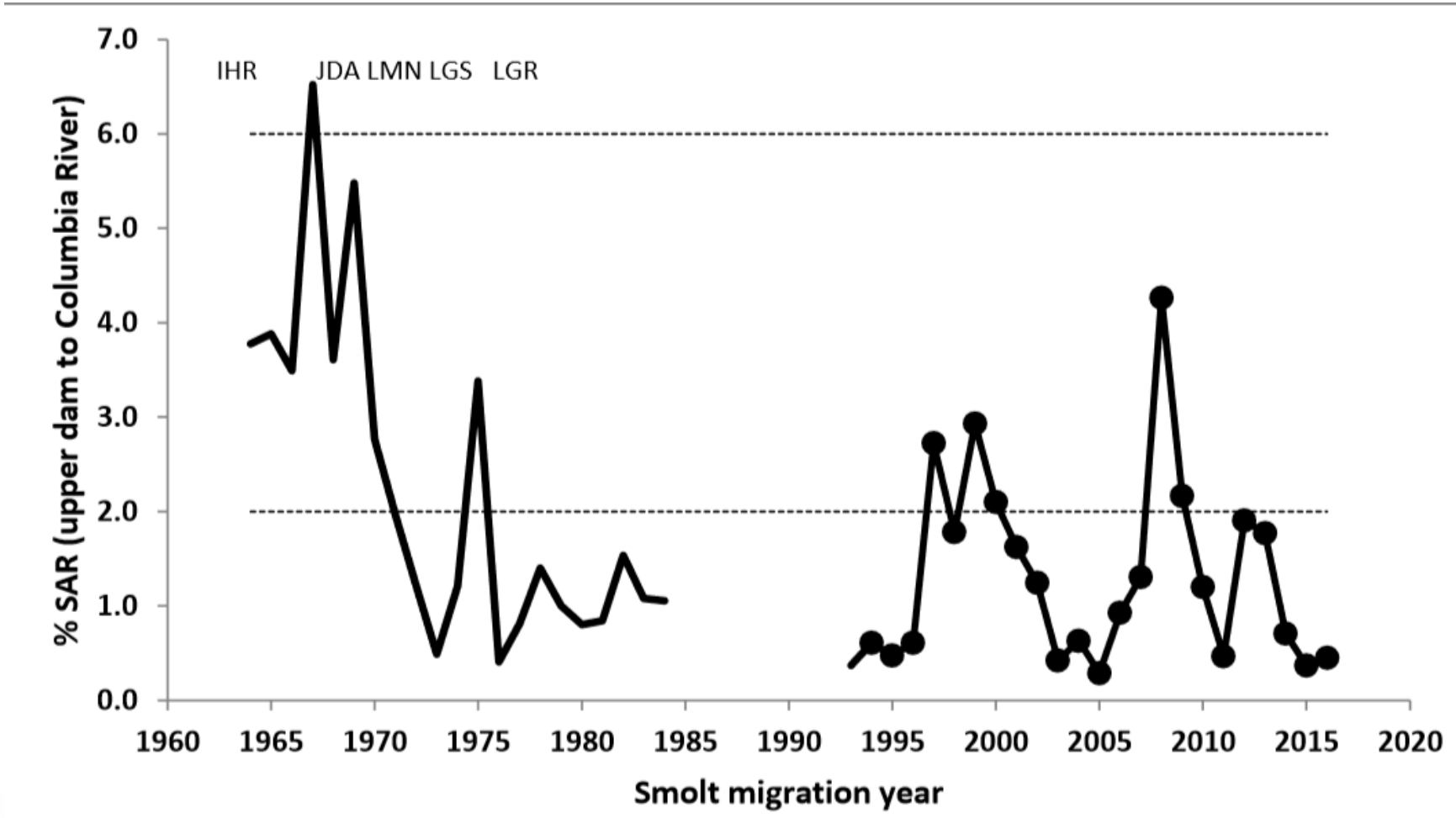
Non-powerhouse = Spill (traditional or surface spillway weirs)
Powerhouse = Turbine or juvenile collection/bypass

Direct survival:
spill ≥ bypass > turbine

Direct & indirect survival (delayed mortality):
spill > bypass
spill > turbine

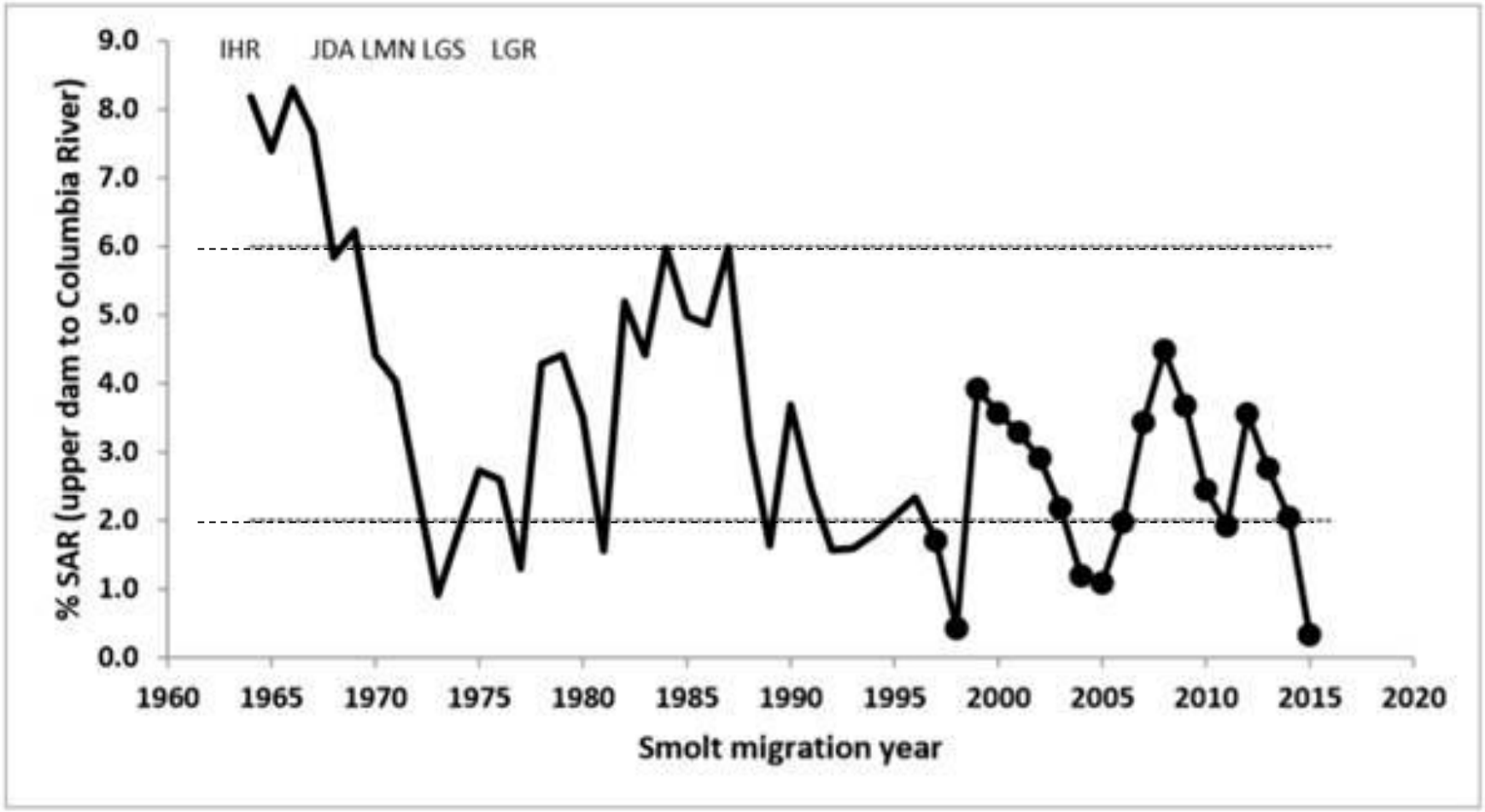


Wild Snake River Chinook SAR*



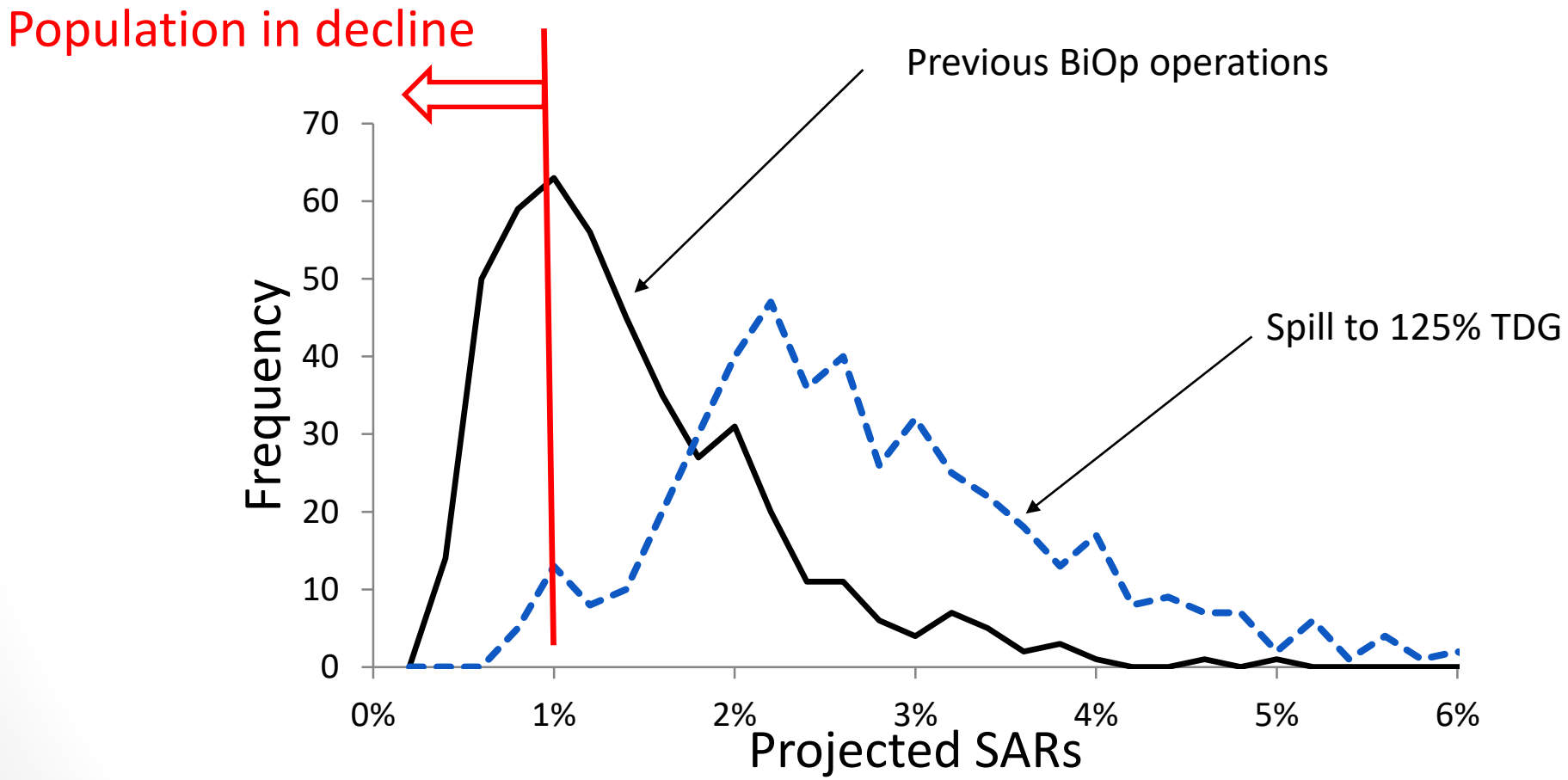
*2018 CSS Annual Report; to Upper Most SR dam

Wild Snake River Steelhead SAR



Simulation models

…integrate across river and ocean conditions…



Anadromous Hatchery Programs

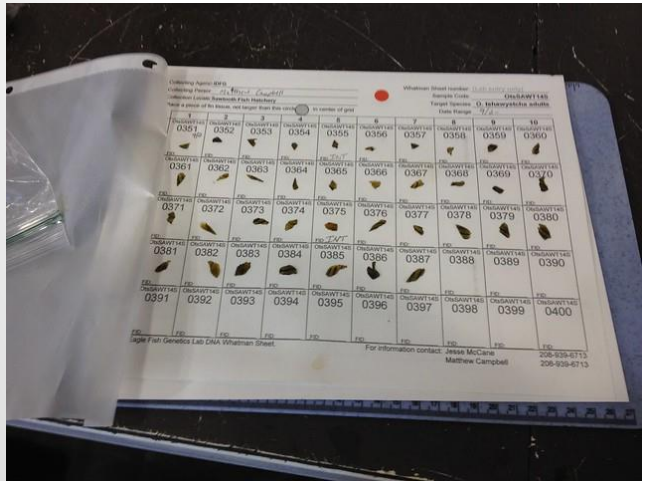
- 13 anadromous hatcheries in Idaho
  - Chinook-8, Steelhead-5, Sockeye-2, Coho-1
  - Multiple satellite facilities
  - Currently operated by IDFG and NPT
- Funding is provided by BPA (3), USFWS (6), Idaho Power (4)
- Primary Purpose – Harvest mitigation, but a conservation and restoration role for Sockeye and Chinook
- Mitigation is for downriver fisheries as well
  - *Typically for every Idaho hatchery Chinook harvested in Idaho, 2-3 are harvested downstream*

Idaho Hatchery Smolt Releases:

- 13M Sp/Su Chinook
- 1 M Sockeye
- 8M Steelhead
- 5M Fall Chinook
- 1M Coho Salmon
- Established in US v. OR production agreement

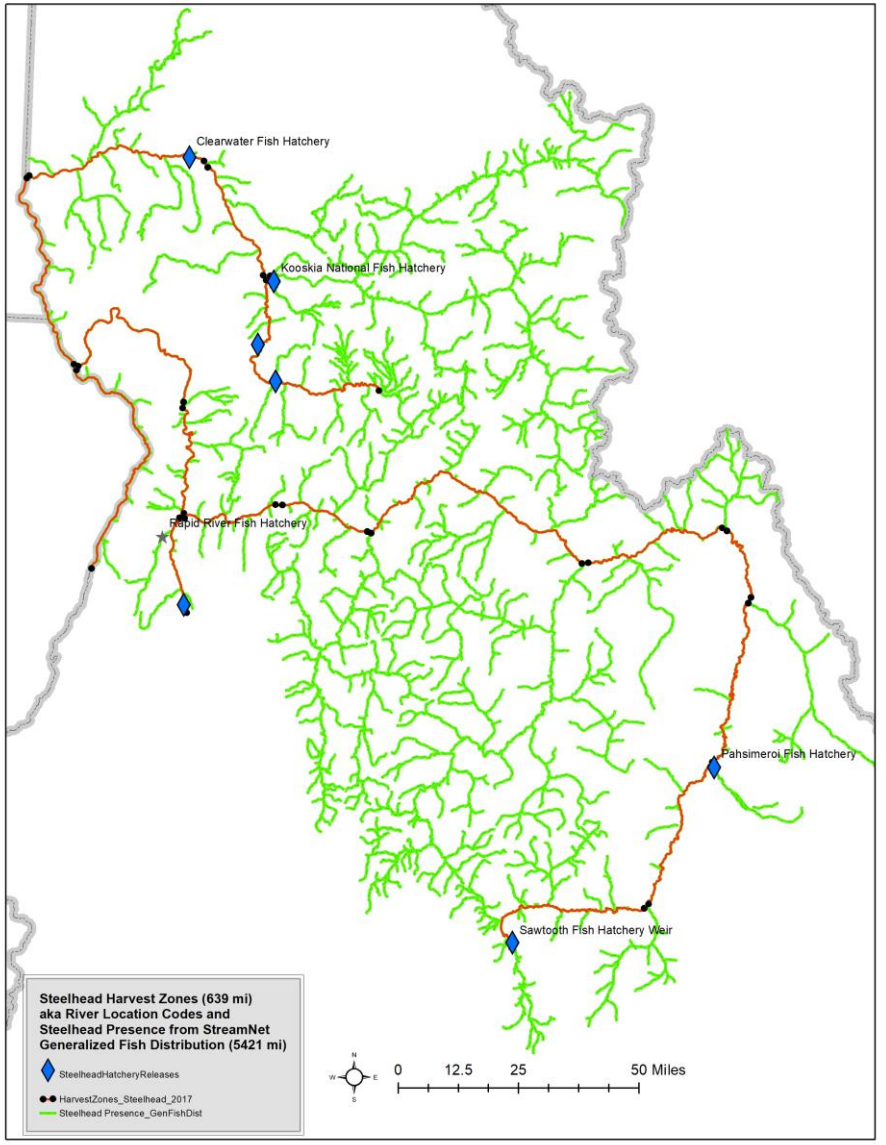
Tagging

All 28 Million PBT Tagged!



Segregated Management

- Hatcheries today are not the hatcheries of 40 years ago
- All facilities have approved Hatchery Genetic Management Plan to comply with ESA



Harvest

Mathers Museum of World Cultures

Regulation

Magnuson-Stevens

- Passed in 1976
- Primary law governing marine fisheries management in U.S. federal waters
- Extended regulated harvest from 3 to 200 miles off shore

U.S. v. Oregon Management Agreement

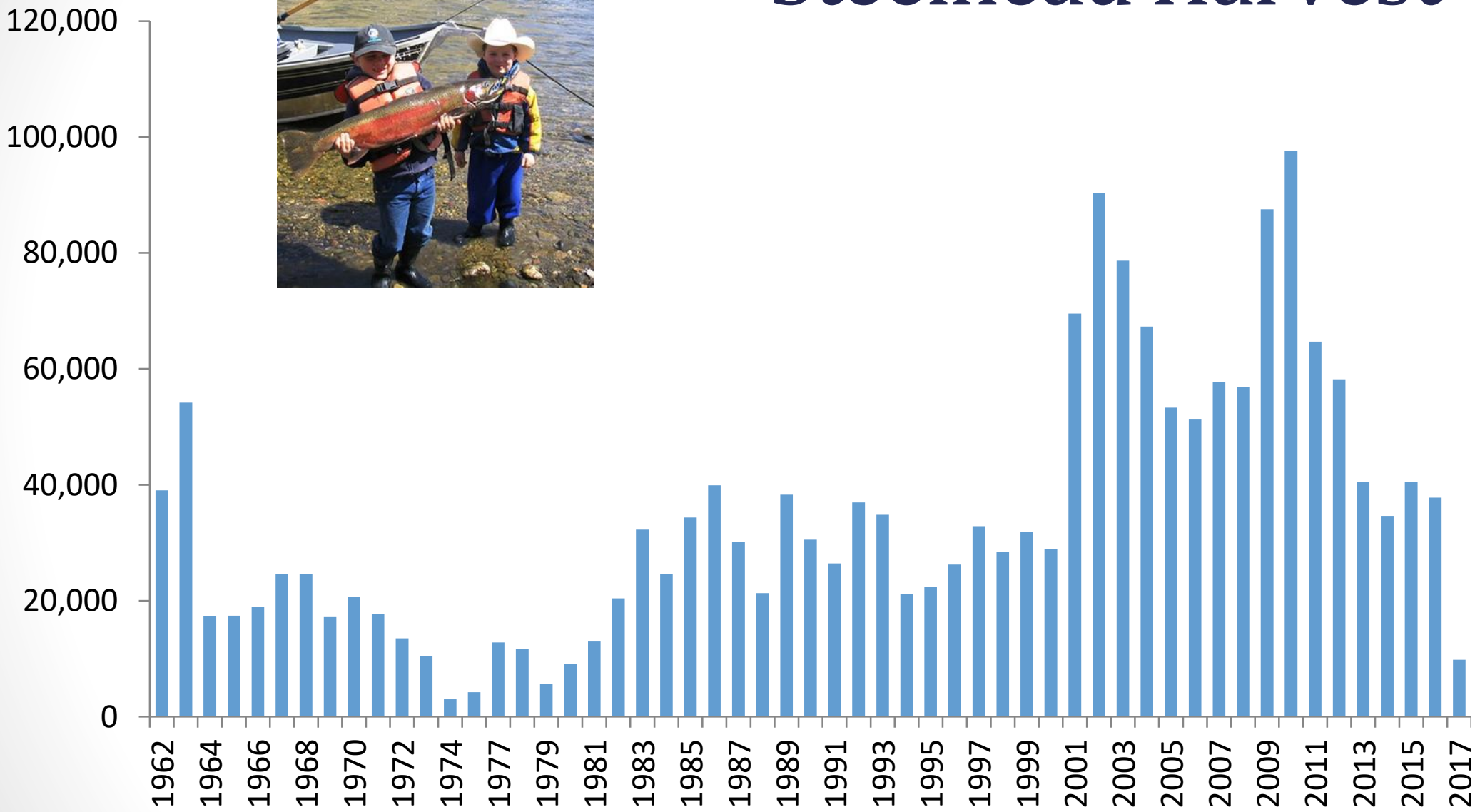
- Court upheld the Columbia River treaty tribes reserved fishing rights under the 1855 Treaties.
- Provided 50/50 harvest sharing of salmon between the treaty tribes and non-Indians
- State and Tribal entities work cooperatively towards rebuilding salmon runs, and developing fishery management strategies
- Allocates harvest in system below LGD

Craig D'Angelo

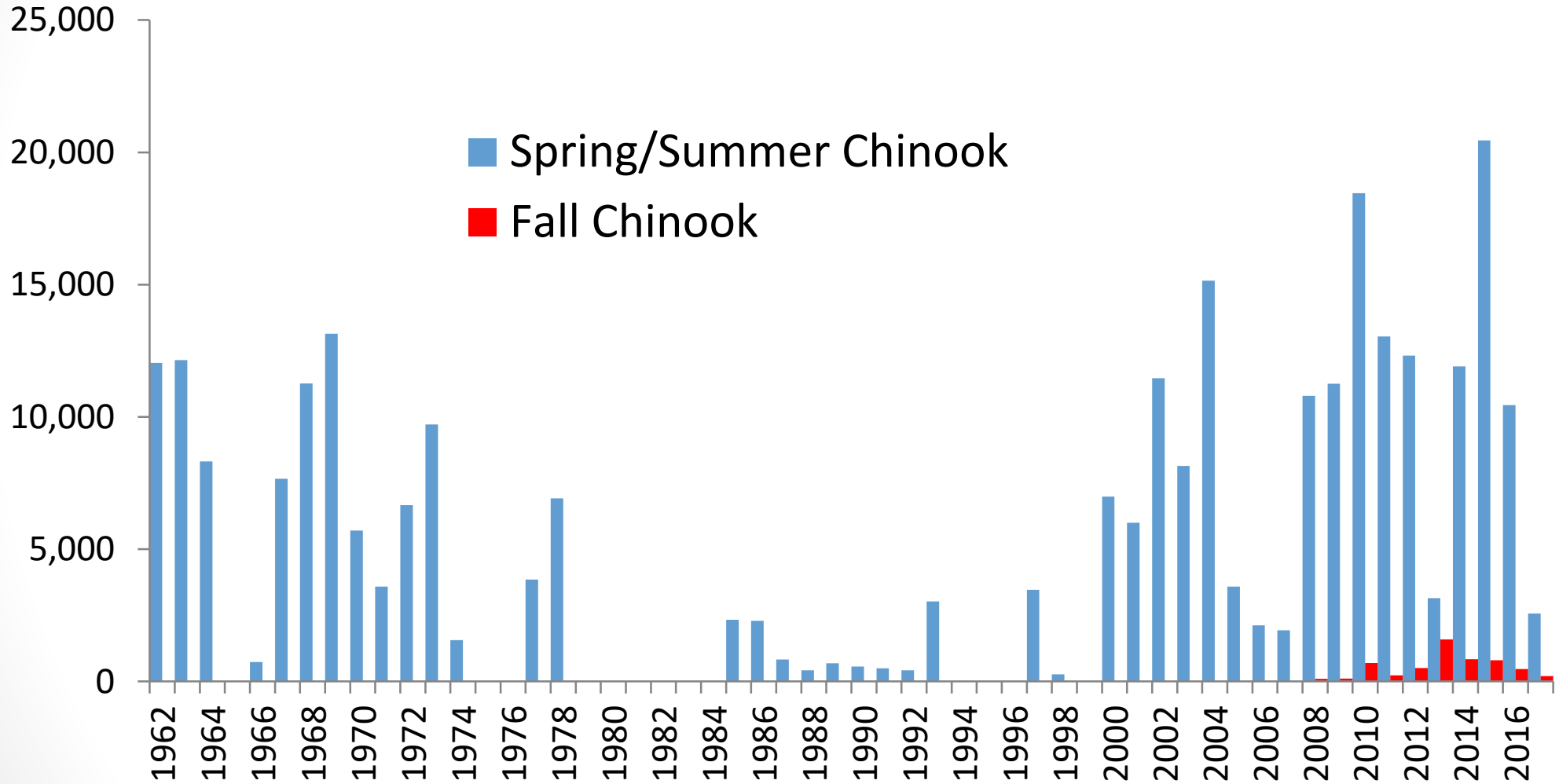
Idaho Management

- Meet brood stock (10,000 Sp/Su Chinook)
- Minimize encounters of wild stocks
- Fisheries and “impact rates” approved and permitted by NOAA Fisheries.
  - about 3.5% for steelhead
  - about 2% for Sp/Su Chinook.
- No non-tribal harvest of wild Chinook or Steelhead

Steelhead Harvest



Chinook Harvest



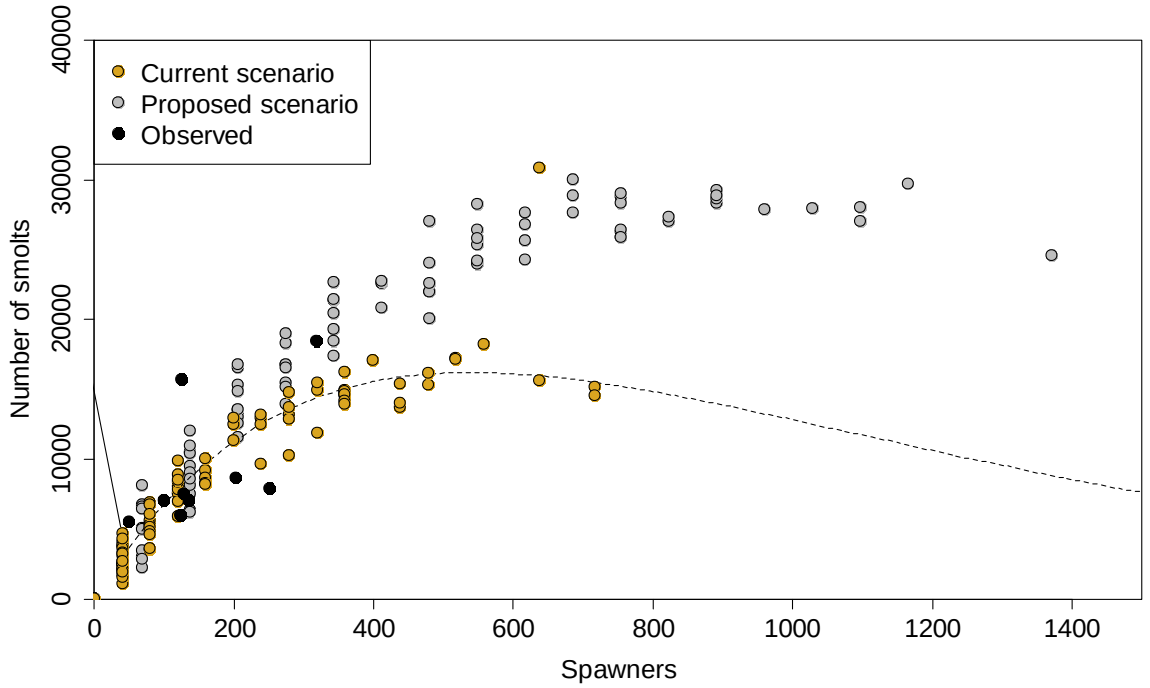
Habitat

- **Efforts include stream restoration projects to improve production and life-cycle survival (higher growth rates)**
  - BPA Accord Funding (≈4.5M)
  - PCSRF – Up to 5.25M annually
  - Mitchell Act Funding (Screening) ≈ $1M

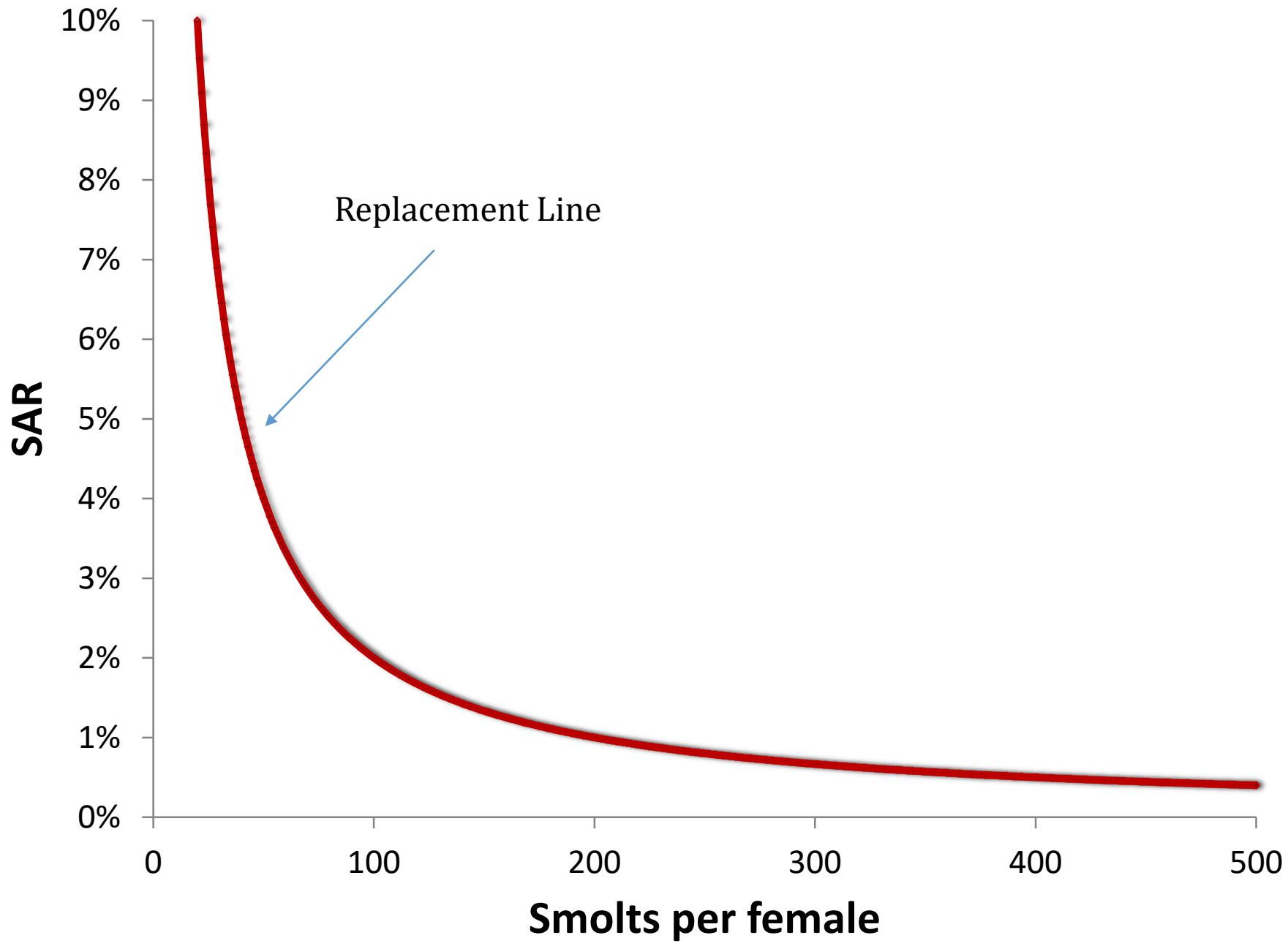


Potlatch River Restoration

What is the potential increase in juvenile production (i.e. # of smolts) following implementation of these 3 projects?



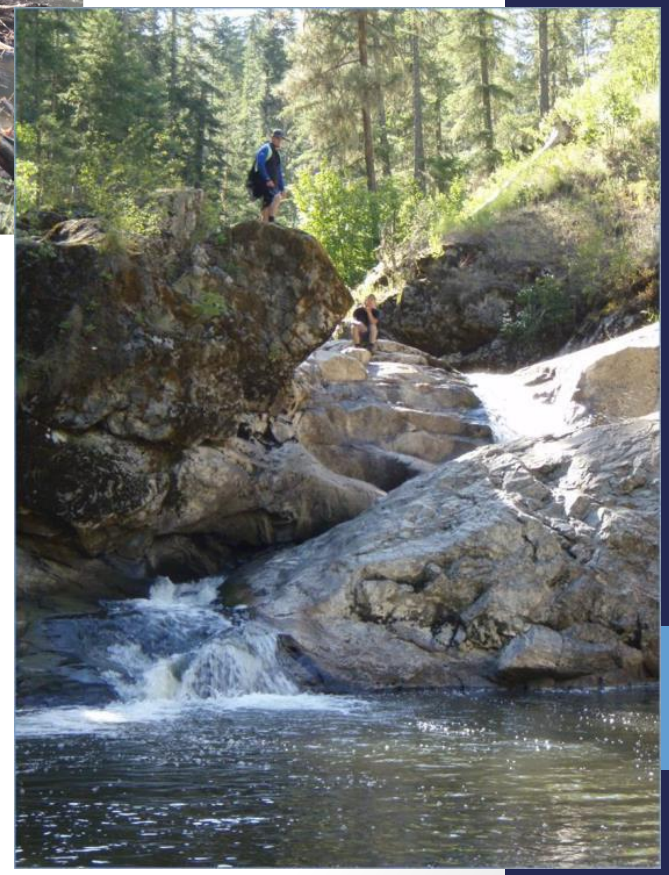
Modeled Production- 19,075 Smolts (85% increase)


10%
9%
8%
7%
6%
5%
4%
3%
2%
1%
0%
SAR
Replacement Line
0
100
200
300
400
500
Smolts per female

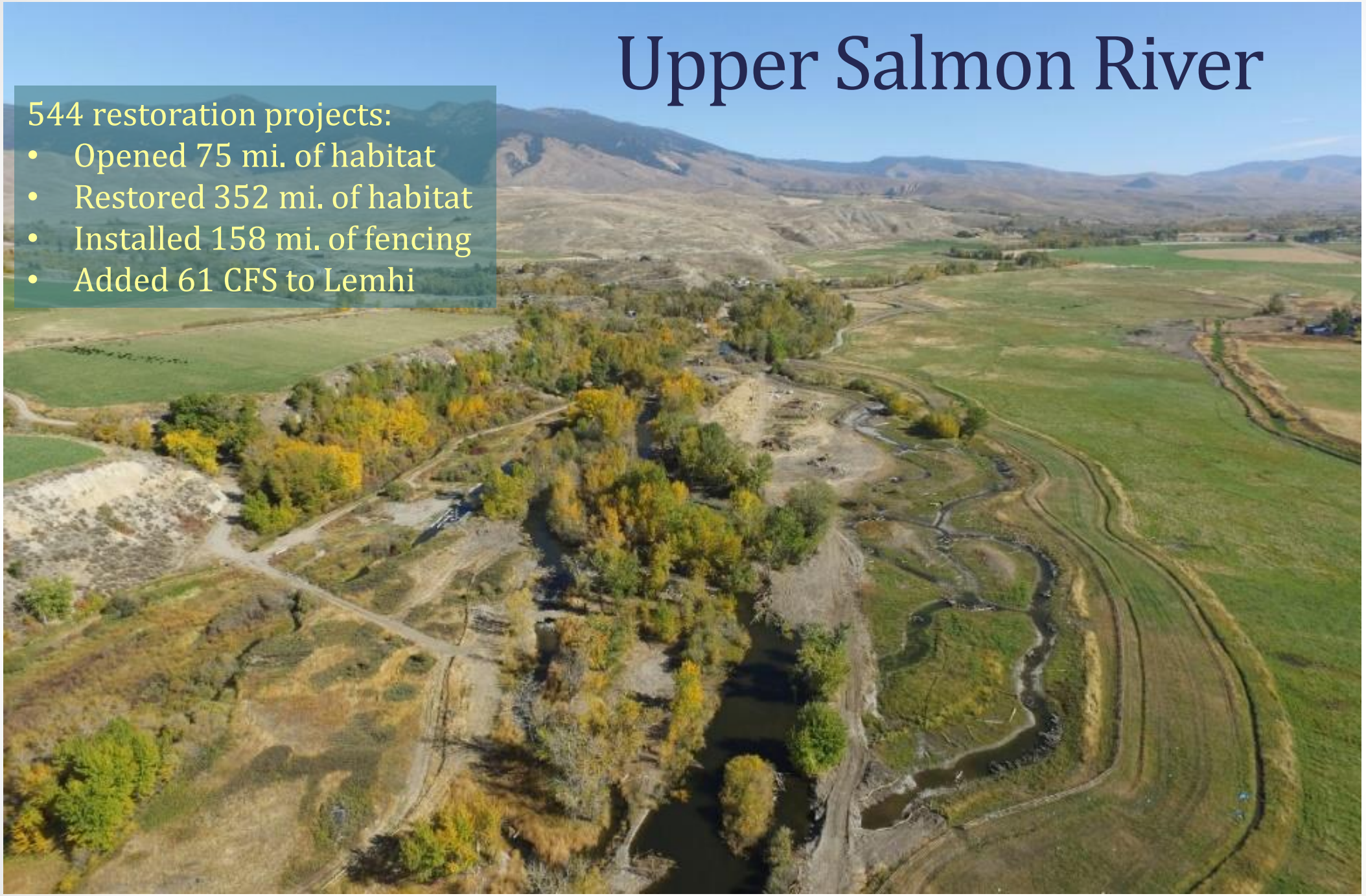
Potlatch River Restoration

- Completed and planned projects will result in:
  - Access to over 20 miles of good habitat
  - Restoration of 21 miles of habitat

- An estimated increase in production of over 46,000 Steelhead Smolts (85% increase)



Upper Salmon River



544 restoration projects:

- Opened 75 mi. of habitat
- Restored 352 mi. of habitat
- Installed 158 mi. of fencing
- Added 61 CFS to Lemhi

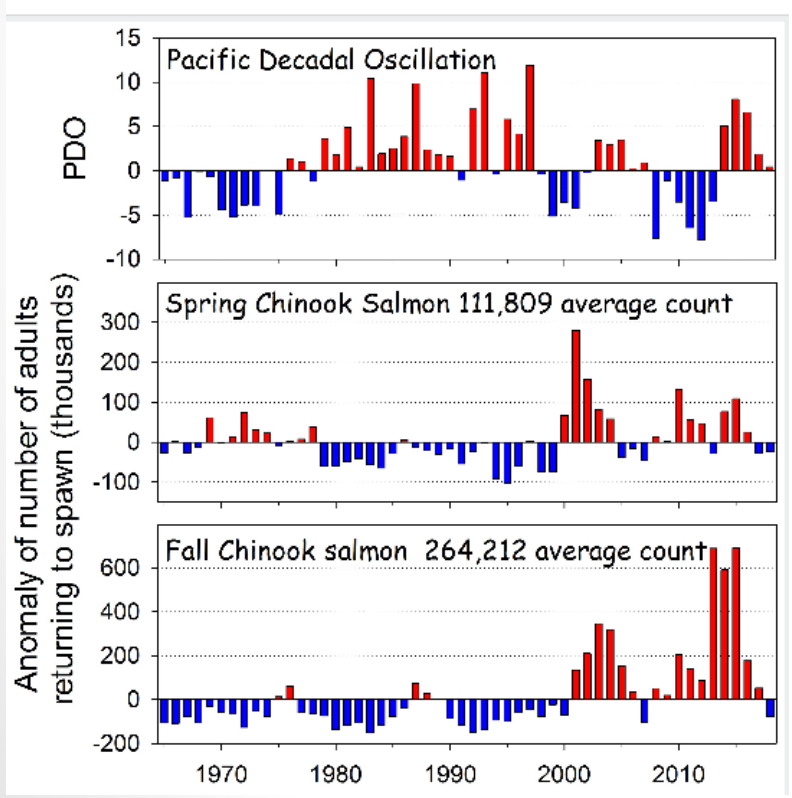
Fish Screen Program (Upper Salmon Basin)

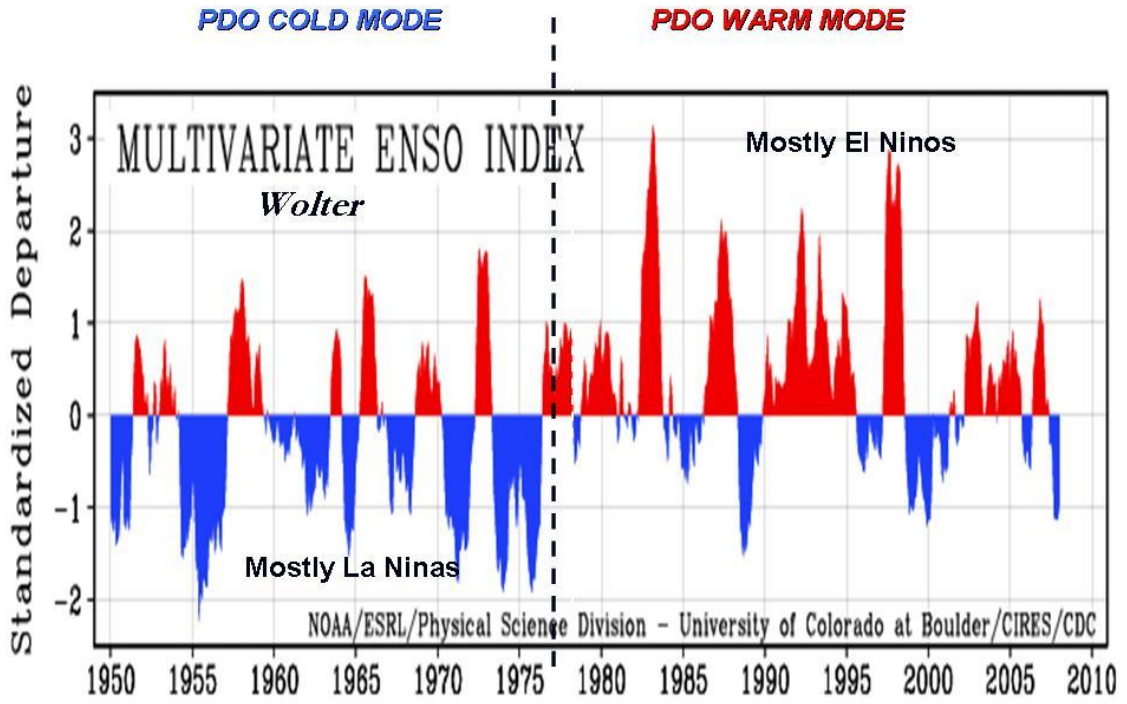
- Affects ~4 million acres, 270 screens, and 2,500 water rights
- Protects ESA-listed salmon, steelhead, and bull trout from entrainment
- Modelling suggests entrainment has been cut from >70% to <2%
- Helps to maintain an agricultural based economy

Ocean Conditions

- Variations in Ocean Conditions – Impact survival and recruitment

upwelling → nutrients → plankton → forage fish → salmon

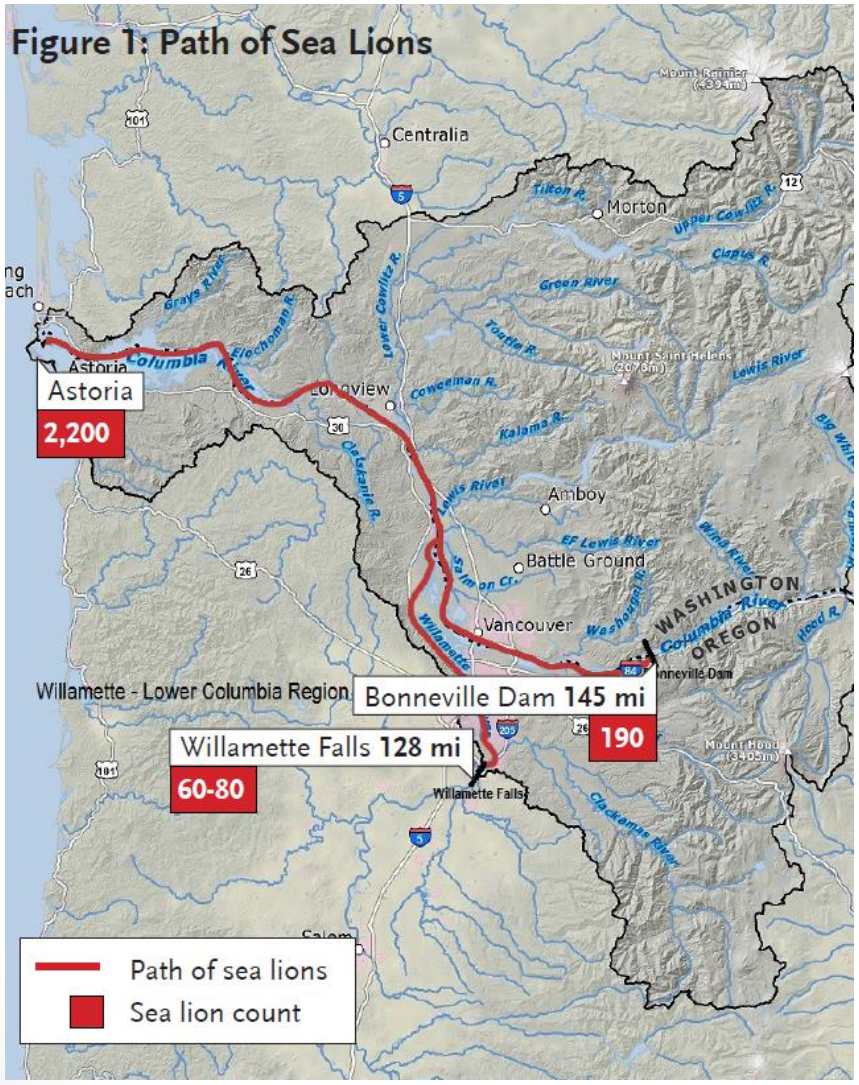




NOAA Stoplight Chart

Ecosystem Indicators	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
PDO (Sum Dec-March)	18	6	3	13	7	20	12	16	14	9	5	1	15	4	2	8	10	21	19	17	11
PDO (Sum May-Sept)	10	4	6	5	11	17	16	18	12	14	2	9	7	3	1	8	19	21	20	15	13
ONI (Average Jan-June)	20	1	1	7	14	16	15	17	9	12	3	11	18	4	6	8	10	19	21	13	5
46050 SST (°C; May-Sept)	16	9	3	4	1	8	21	15	5	17	2	10	7	11	12	13	14	20	18	6	19
Upper 20 m T (°C; Nov-Mar)	20	11	8	10	6	15	16	12	13	5	1	9	17	4	3	7	2	21	19	18	14
Upper 20 m T (°C; May-Sept)	17	12	14	4	1	3	21	19	7	8	2	5	13	10	6	18	20	9	15	11	16
Deep temperature (°C; May-Sept)	21	6	8	4	1	10	12	16	11	5	2	7	14	9	3	15	20	18	13	17	19
Deep salinity (May-Sept)	19	3	9	4	5	16	17	10	6	1	2	14	18	13	12	11	20	15	8	7	6
Copepod richness anom. (no. species; May-Sept)	19	2	1	7	6	14	13	18	15	10	8	9	17	4	5	3	11	20	21	16	12
N. copepod biomass anom. (mg C m^{-3}; May-Sept)	19	14	10	11	3	16	13	20	15	12	6	9	8	1	2	4	5	17	21	18	7
S. copepod biomass anom. (mg C m^{-3}; May-Sept)	21	2	5	4	3	14	15	20	13	10	1	7	16	9	8	6	11	18	19	17	12
Biological transition (day of year)	18	8	5	7	9	14	13	19	12	2	1	3	16	6	10	4	11	21	21	17	15
Ichthyoplankton biomass (mg C 1,000 m^{-3}; Jan-Mar)	21	12	3	8	10	19	18	15	17	16	2	13	5	14	11	9	20	6	7	1	4
Ichthyoplankton community index (PCO axis 1 scores; Jan-Mar)	10	13	2	7	5	11	20	18	3	12	1	14	15	8	4	6	9	19	21	17	16
Chinook salmon juvenile catches (no. km^{-2}; June)	19	4	5	16	8	12	17	20	11	9	1	6	7	15	3	2	10	13	18	21	14
Coho salmon juvenile catches (no. km^{-2}; June)	19	8	13	6	7	3	16	20	17	5	4	10	11	15	18	1	12	9	14	21	2
Mean of ranks	17.9	7.2	6.0	7.3	6.1	13.0	15.9	17.1	11.3	9.2	2.7	8.6	12.8	8.1	6.6	7.7	12.8	16.7	17.2	14.5	11.6
Rank of the mean rank	21	5	2	6	3	15	17	19	11	10	1	9	13	8	4	7	13	18	20	16	12
Ecosystem Indicators not included in the mean of ranks or statistical analyses																					
Physical Spring Trans. UI based (day of year)	3	7	20	17	4	13	15	21	13	1	6	2	8	11	18	9	19	10	5	16	11
Physical Spring Trans. Hydrographic (day of year)	20	3	13	8	5	12	14	21	6	9	1	9	18	3	11	2	16	7	17	19	14
Upwelling Anomaly (April-May)	10	3	17	6	9	14	13	21	10	4	7	8	15	17	15	12	19	1	2	20	5
Length of Upwelling Season UI based (days)	6	2	19	12	1	14	10	21	5	3	9	3	16	18	16	15	20	11	8	13	7
SST NH-5 (°C; May-Sept)	9	6	5	4	1	3	21	16	10	18	2	19	11	7	14	13	15	12	17	8	20
Copepod Community Index (MDS axis 1 scores)	20	3	4	8	1	13	15	18	16	10	2	6	12	9	7	5	11	19	21	17	14
Coho Juv Catches (no. fish km^{-2}; Sept)	11	2	1	4	3	6	12	14	8	9	7	15	13	5	10	NA	NA	NA	NA	NA	NA

Sea Lion Predation



California Sea Lions have increased on west coast from 30K in 1980 to over 300K and are near carrying capacity

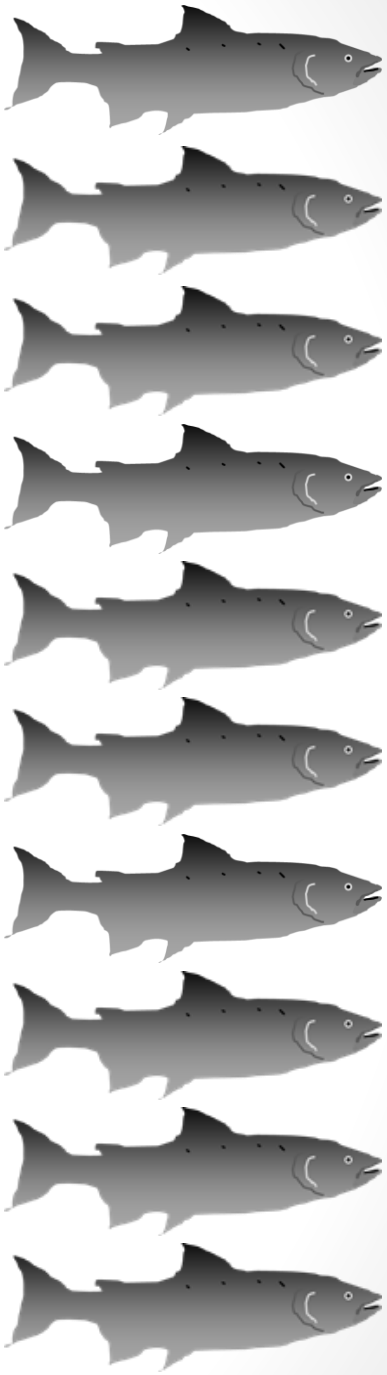
In the 1980's, Sea Lions started appearing in the Columbia River

By 2018, 190 animals at Bonneville Dam and 60-80 animals at Willamette Falls

Have consumed up to 10,000 fish in the spring (mostly spring chinook) at BON

Consider:

- BON estimates vs. total estimates
- Run specific impacts



California vs. Steller

California sea lion male (dark brown) with adult male Steller sea lions. Photo: Pat Gearin, NMML

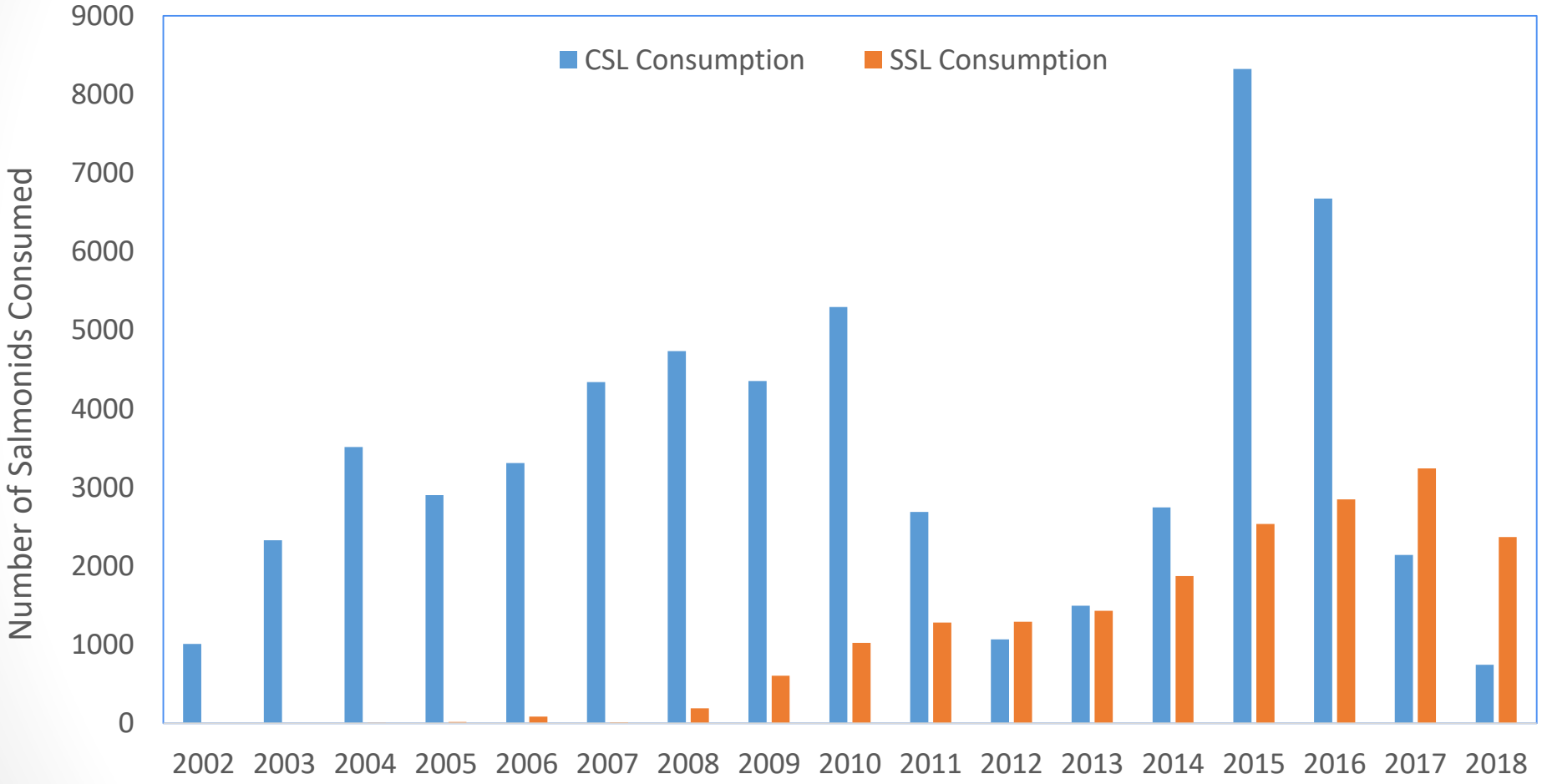
Steller Male

- Weight - up to 2200 lbs
- Length – up to 10.5 ft
- Present at BON – 10 months

California Male

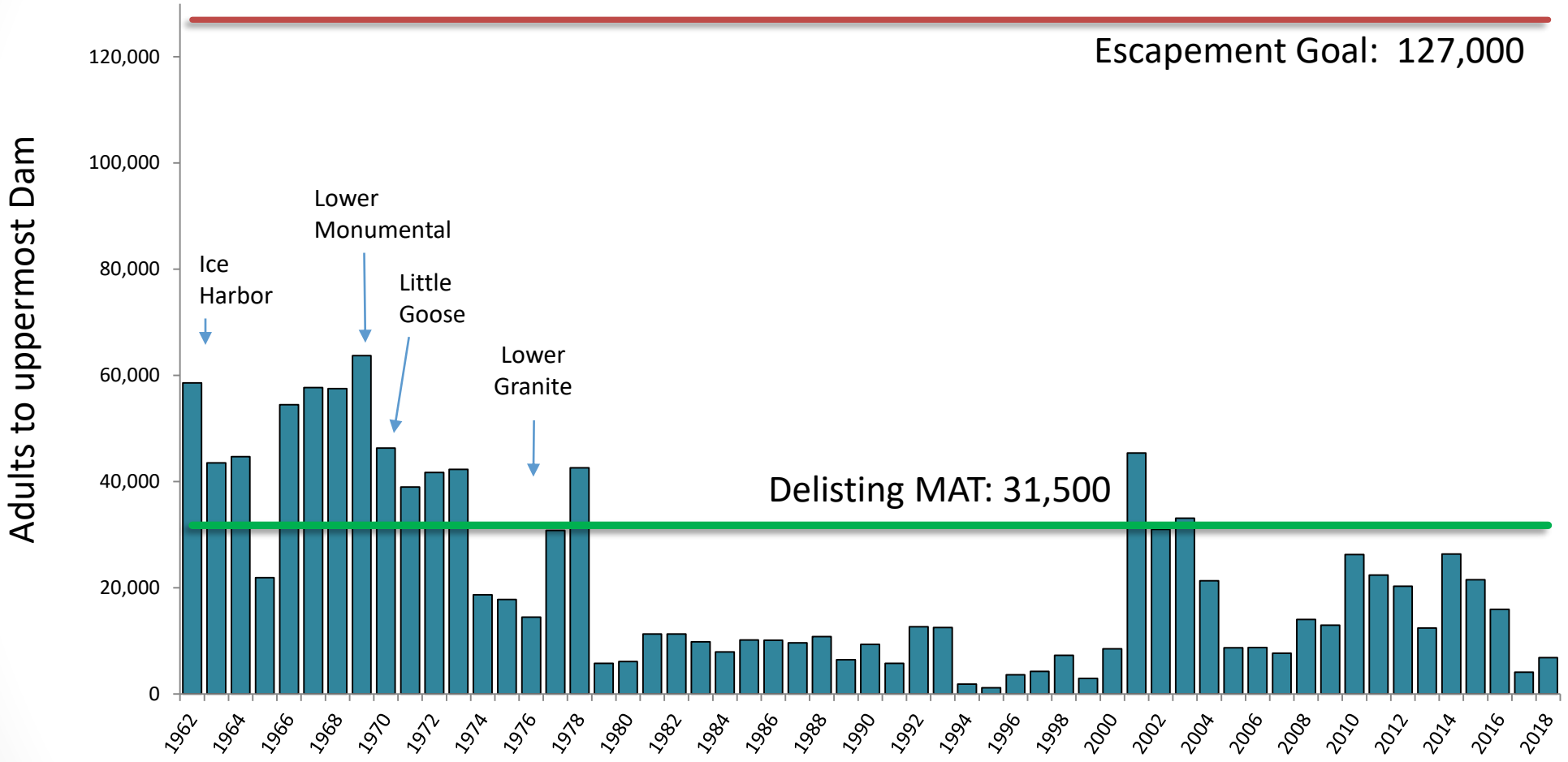
- Weight - up to 1200 lbs
- Length – up to 8.5 ft
- Present at BON – 7 months

Bonneville Dam Sea Lion Predation

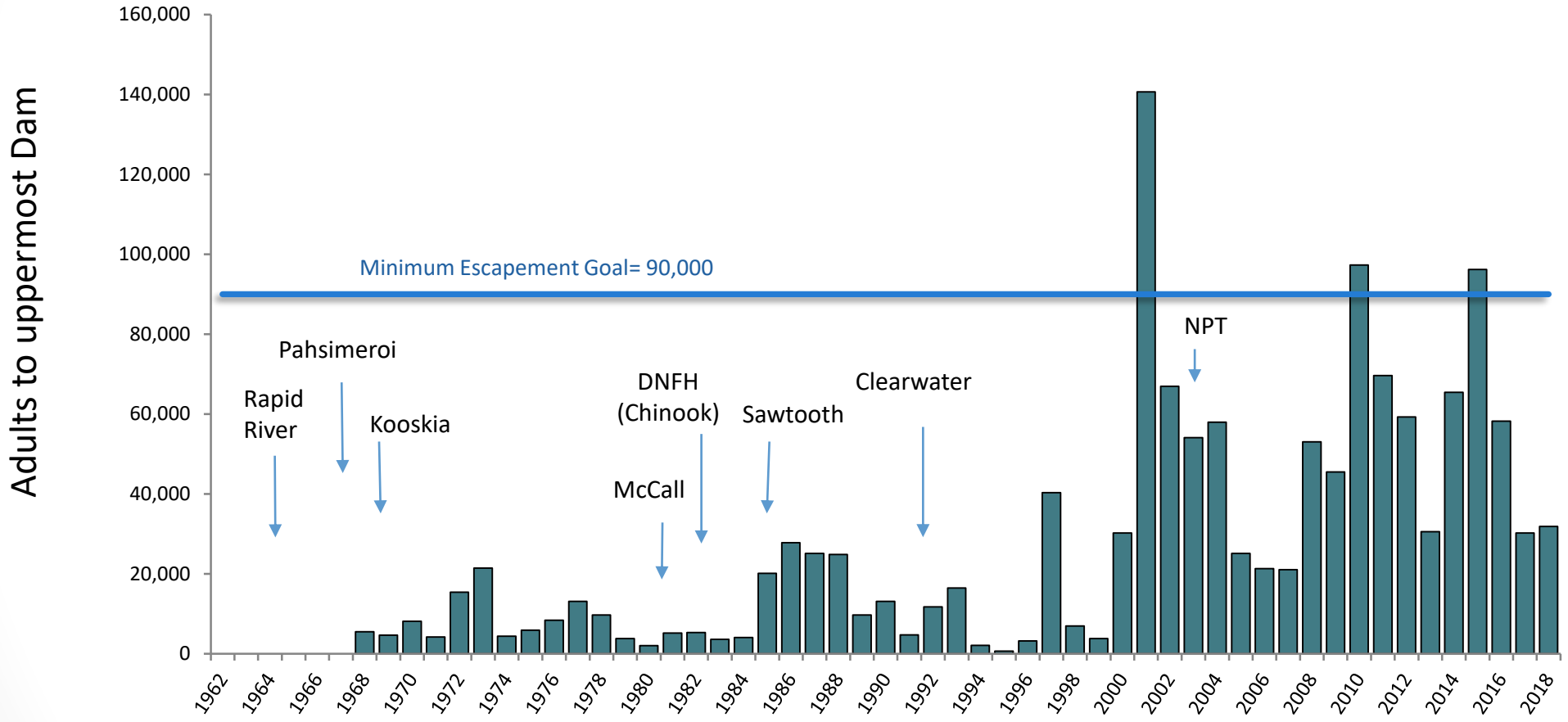


Adjusted estimates of salmonid consumption by California and Steller sea lions at Bonneville Dam

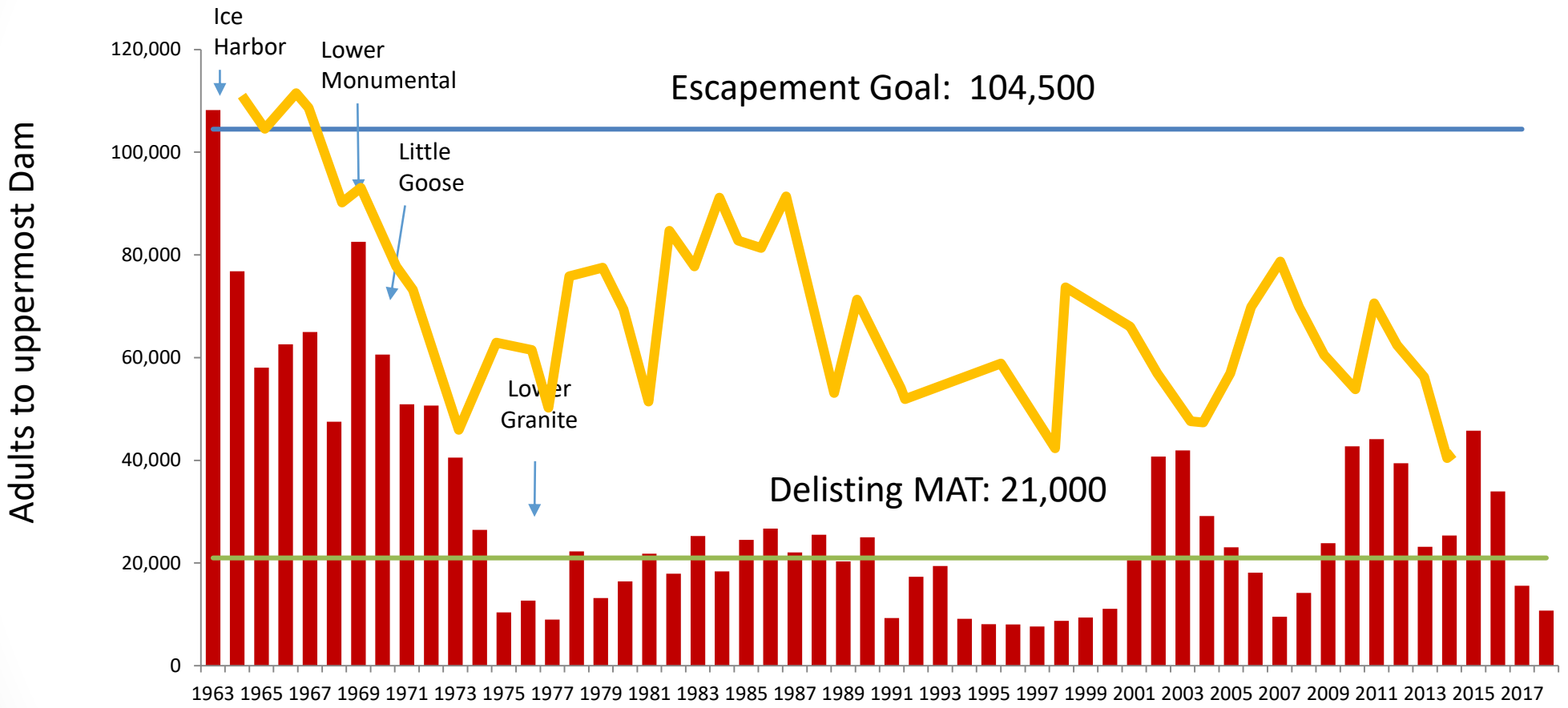
Wild/Natural Spring/Summer Chinook Salmon



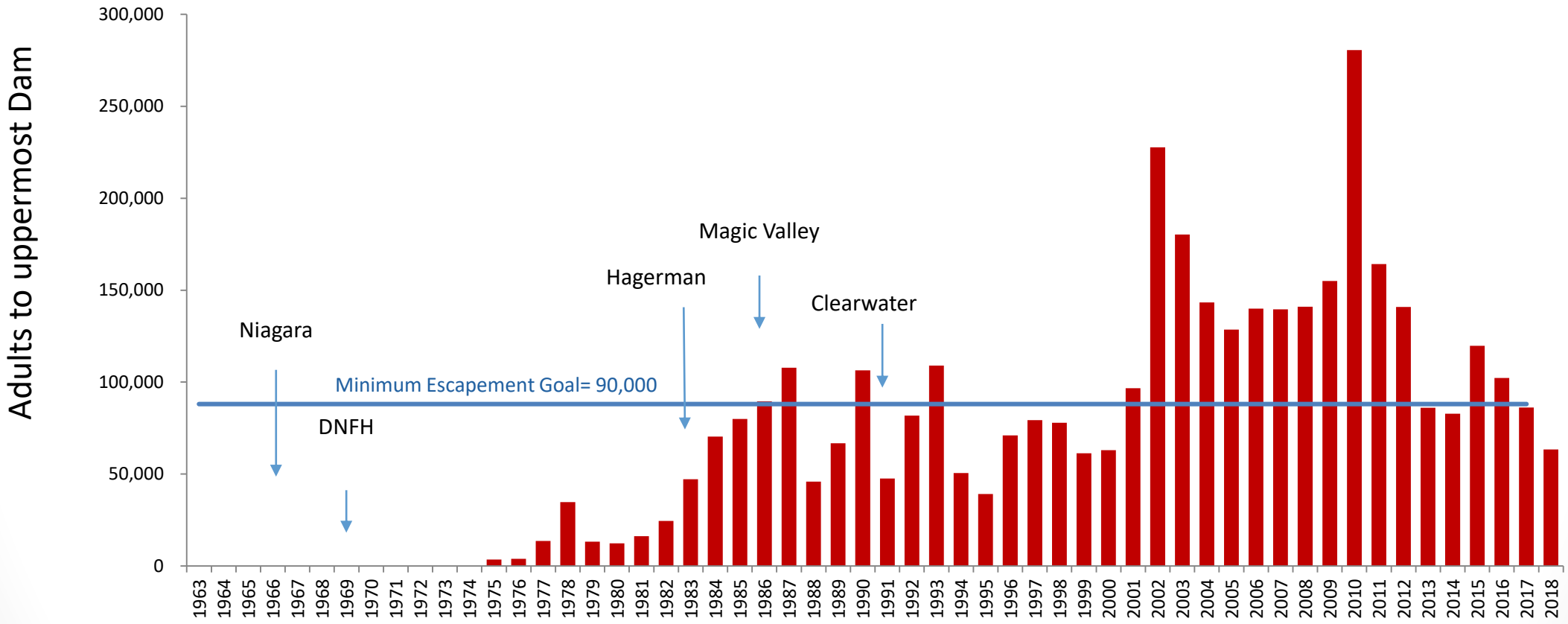
Hatchery Spring/Summer Chinook Salmon



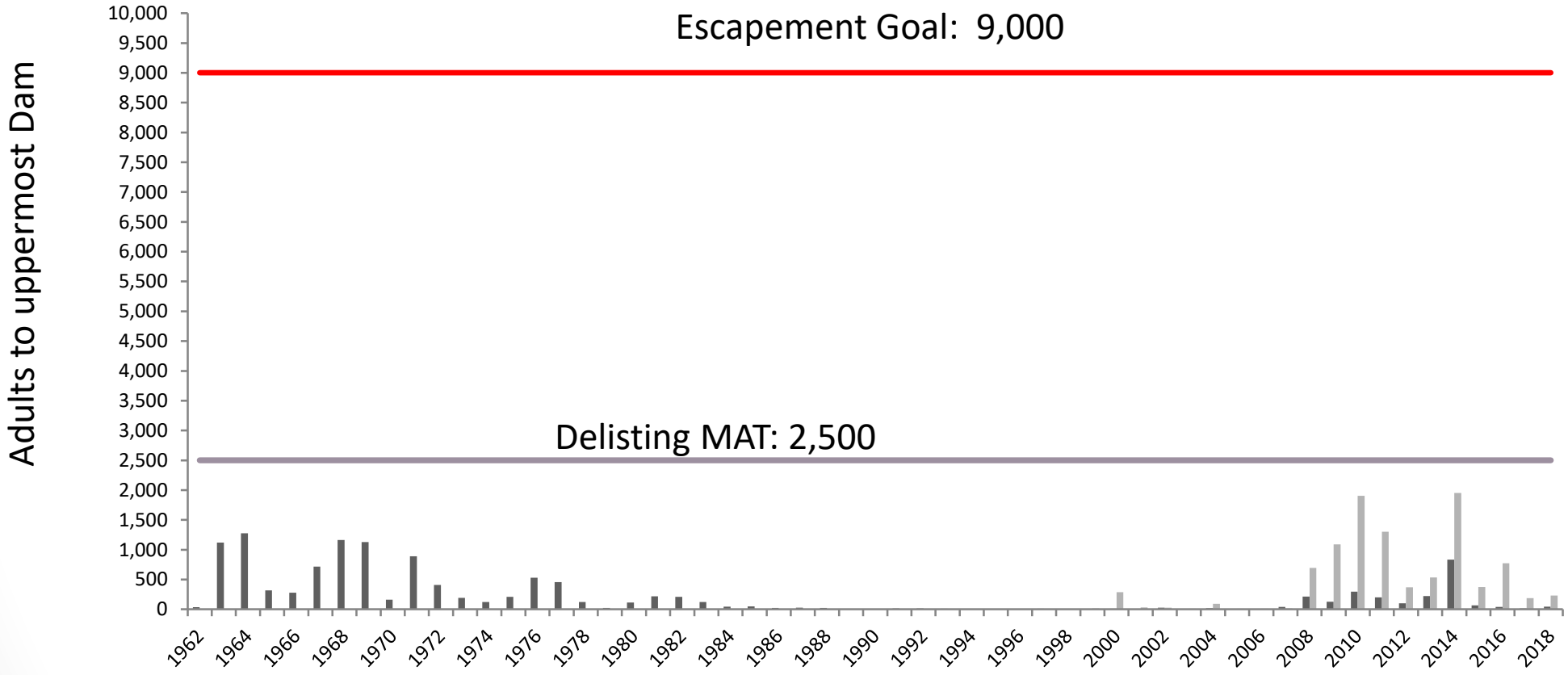
Wild/Natural Steelhead



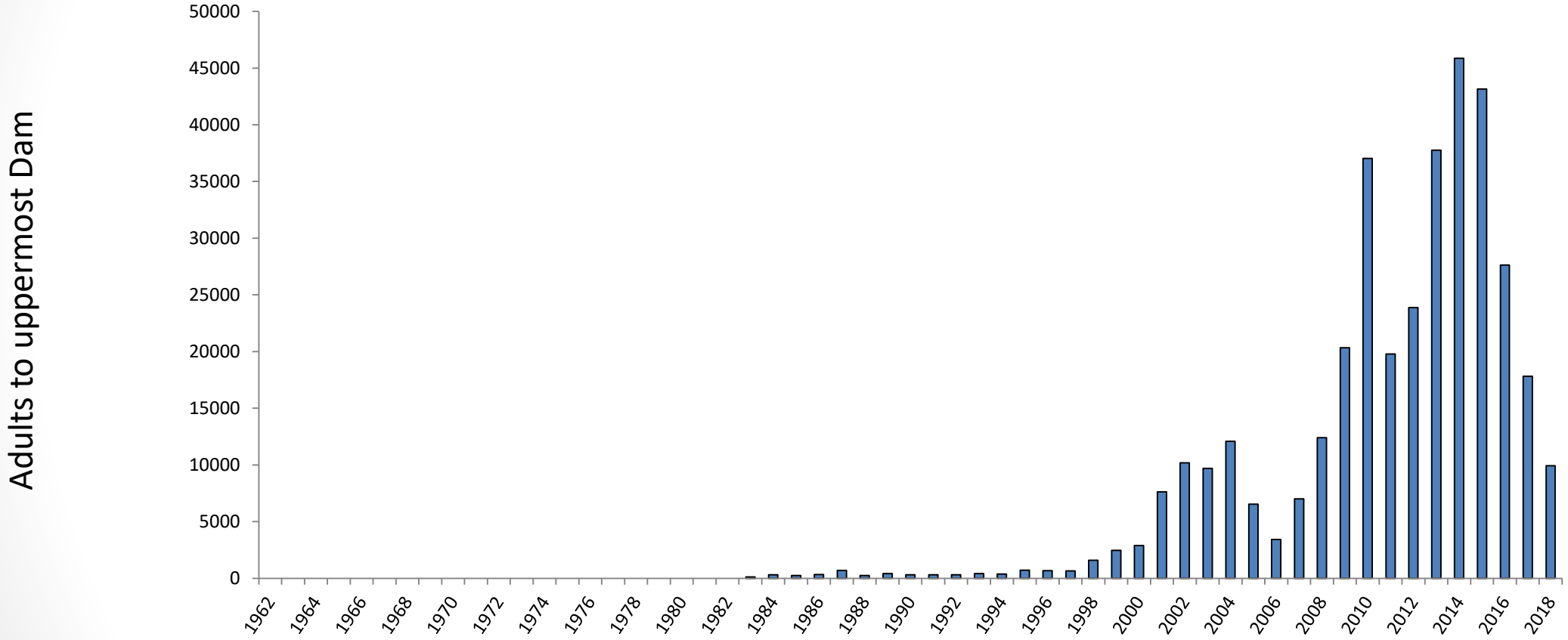
Hatchery Steelhead



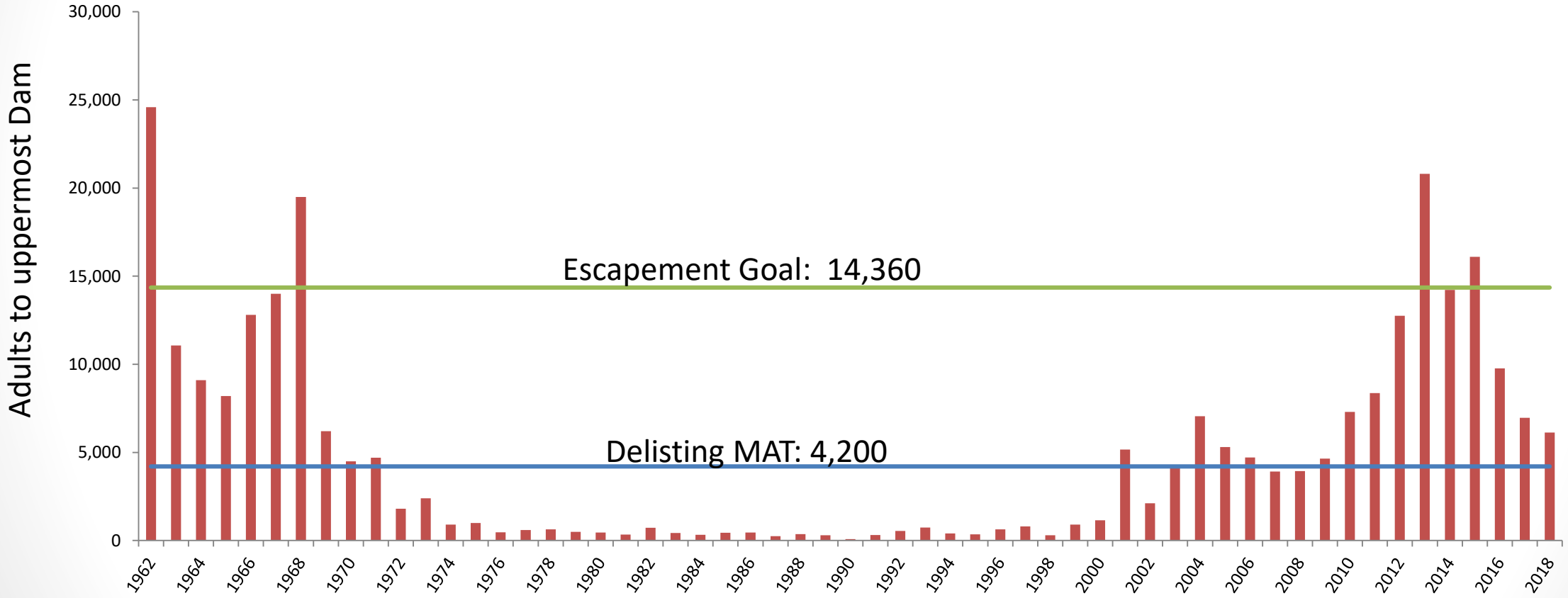
Wild/Hatchery Sockeye



Hatchery Fall Chinook



Wild/Natural Fall Chinook




Courtesy of: Johnson, BLM