Yakima Basin Science & Management Conference 2013

Purpose:
To provide a comprehensive overview and exchange of ideas about the most current biological science and resource management activities in the Yakima Basin

Wednesday, June 12, 2013
8:00AM to 5:00PM

Thursday, June 13, 2013
8:30 AM to 5:00PM

Central Washington University

400 E University Way
Ellensburg, WA 98926

Science Building
Room 147

This conference is free of charge and pre-registration is not necessary

- Information
- Communication
- Coordination

Bonneville Power Administration

Washington Department of Fish and Wildlife

Confederated Tribes and Bands of the Yakama Nation

Central Washington University — Your future is Central.

Reclamation

Yakima Basin Fish and Wildlife

For More information visit the Yakima-Klickitat Fisheries Project website, www.ykfp.org

Yakima Klickitat Fisheries Project YKFP/ORG

- Click on ‘Yakima River Basin’
- Technical Reports and Publications
- Yakima Basin Aquatic Science and Management Conference

- FAST@YAKAMA.Com

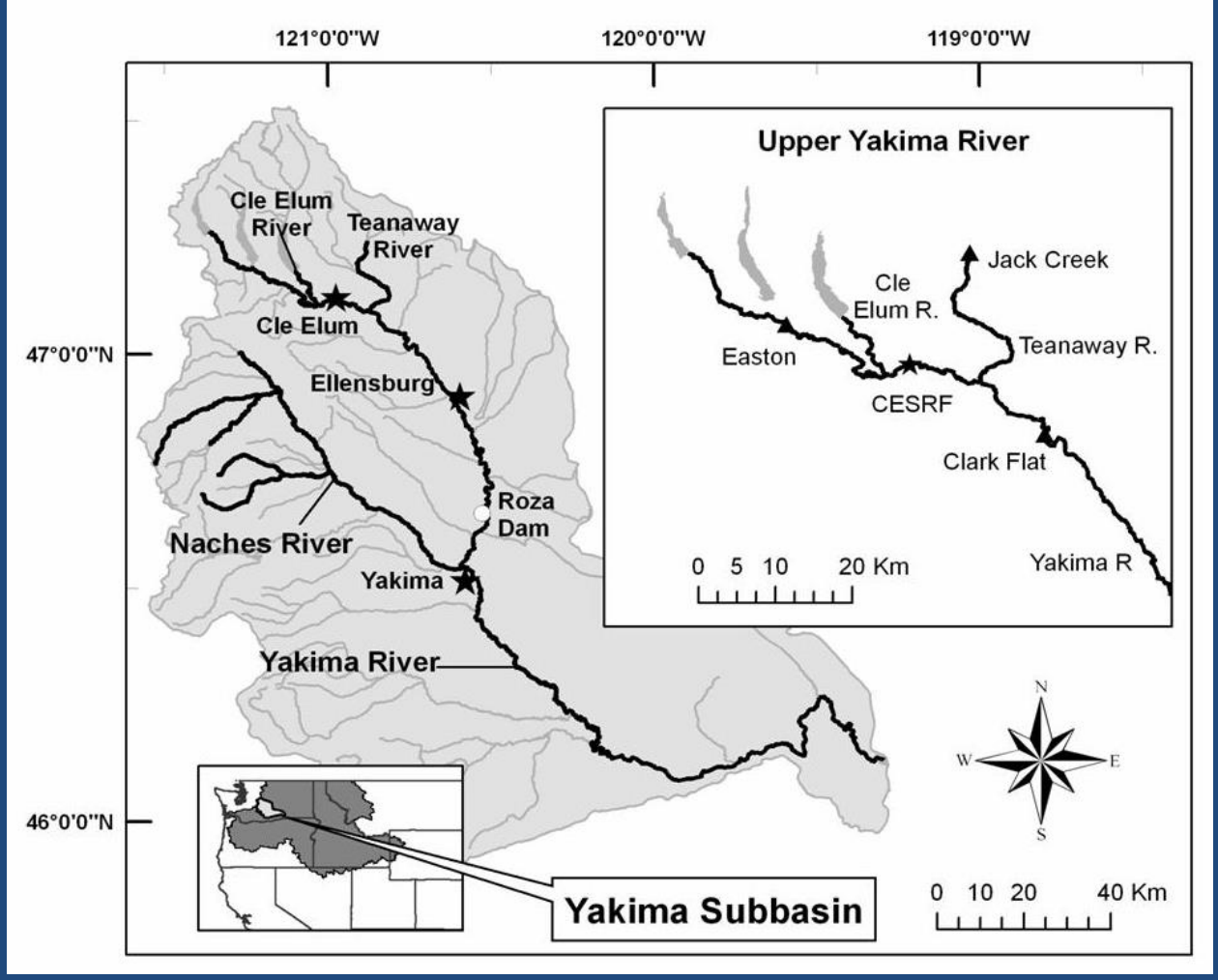
Salmon Extinction in the Yakima Basin

- "Not an Option!" or
- The Preferred Alternative?

Historic Salmon Runs Modified from Alex Conley

Species/Run	Estimates	Current Status	Low	Year	High	Year
Spring Chinook	200,000-500,000	Supplemented Population	666	1995	23,265	2001
Fall Chinook	38,000-100,000	Supplemented Population	523	1988	13,000	2002
Summer Chinook	??	Extirpated 1970'S Began Reintroduction 2008	0	till 12	1,511	2014
Coho	40,000 150,000	Extirpated 1980'S Reintroduced 1997	0	till 93	26,405	2014
Sockeye	100,000 200,000	Extirpated Early 1900's Reintroduction 2009	0	Till 2009	10,000 2,666	2014
Steelhead	30,000 100,000	Wild Population (ESA) Kelt Reconditioning	505	1996	6,793	2010
Total	408,000-1,050,000					
Bull Trout	??	Wild Population (ESA)			2500 to 3000 adults	
Lamprey	??	Wild Population			0 to 87 adults	

DEVELOPMENT AND OPERATION OF THE CLE ELUM SUPPLEMENTATION RESEARCH FACILITY TO ENHANCE SPRING CHINOOK SALMON *Oncorhynchus tshawytscha* IN THE YAKIMA RIVER, WASHINGTON



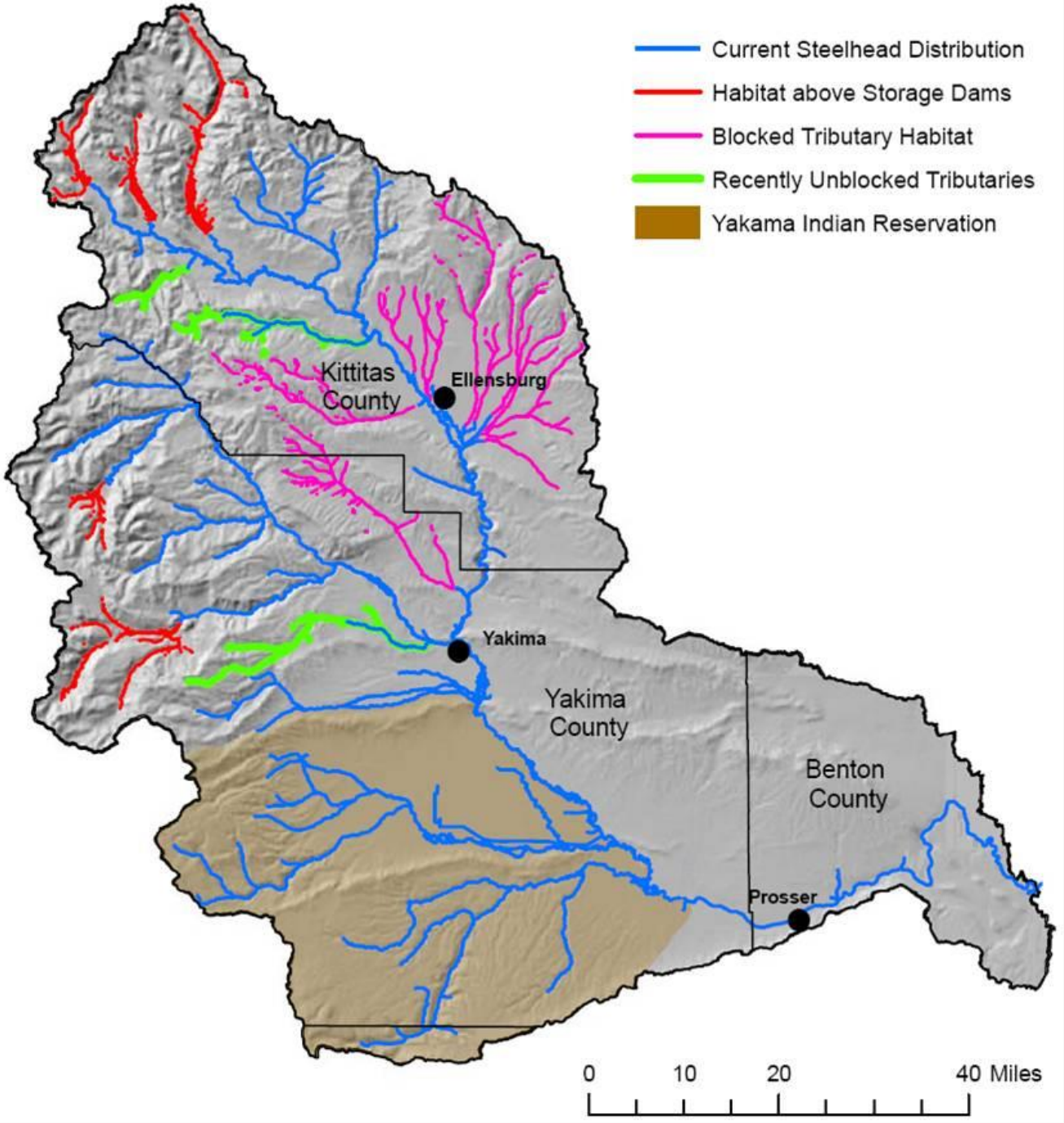
1st Brood

Integrated HxW spawning in the wild

Integrated F1 progeny return

Integrated F2 progeny return

1997 2001 2005 2009 2013


Current Steelhead Distribution
Habitat above Storage Dams
Blocked Tributary Habitat
Recently Unblocked Tributaries
Yakama Indian Reservation
Kittitas County
Ellensburg
Yakima
Yakima County
Benton County
Prosser
0
10
20
40 Miles

Restoration Toolkit

- Habitat Protection and Restoration
- Passage and Flow Restoration
- Outplanting Natural- and Hatchery-Origin Adults
- Nutrient Enhancement
- Hatcheries

HABITAT ENHANCEMENT
IMPROVING CULVERT PASSAGE

Upper Yakima River Basin

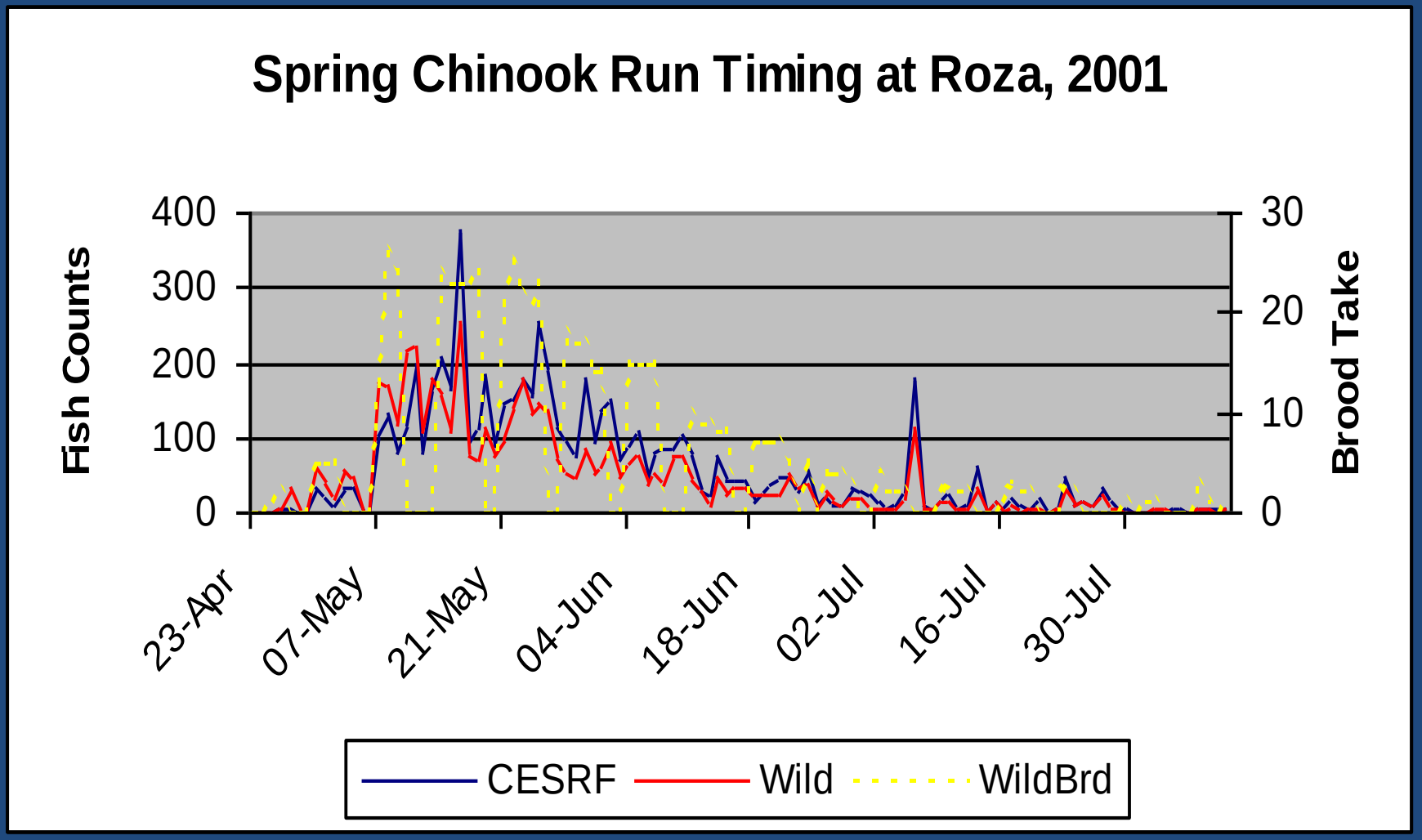
Roza Dam Fish Monitoring Facilities

MISSION OF FACILITY

- Collect Broodstock
- Enumerate Spawning Escapement
- Monitor Characteristics of Escapement (age, length, weight, DNA,)
- Enumerate Hatchery Returns (by Treatment, Acclimation Site and Brood Year)

BROODSTOCK COLLECTION GENETIC GUIDELINES

- 100% NATURAL BROOD STOCK
- COLLECTION THROUGHOUT ADULT RUN TIMING
- RANDOM COLLECTION OF ADULTS
- TAKE NO MORE THAN 50% OF ADULTS INTO HATCHERY (HALF THE ADULTS SPAWN IN THE WILD)
- Integrated Hatchery Concept - PNI


Spring Chinook Run Timing at Roza, 2001
Fish Counts
400
300
200
100
0
30
20
10
0
Brood Take
23-Apr
07-May
21-May
04-Jun
18-Jun
02-Jul
16-Jul
30-Jul
CESRF
Wild
WildBrd

Upper Yakima River Basin

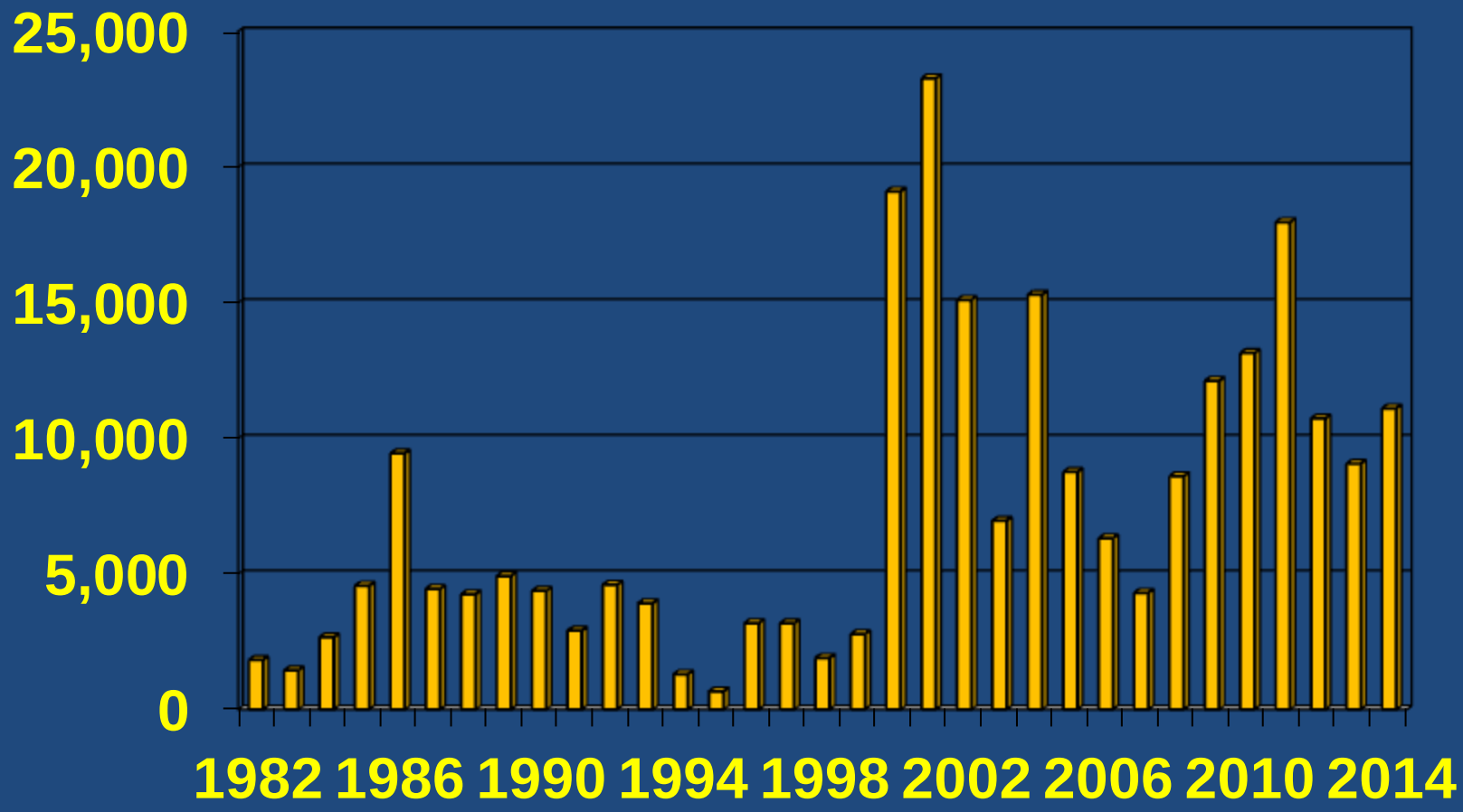
Cle Elum Spring Chinook
Supplementation and Research Facility

Goals

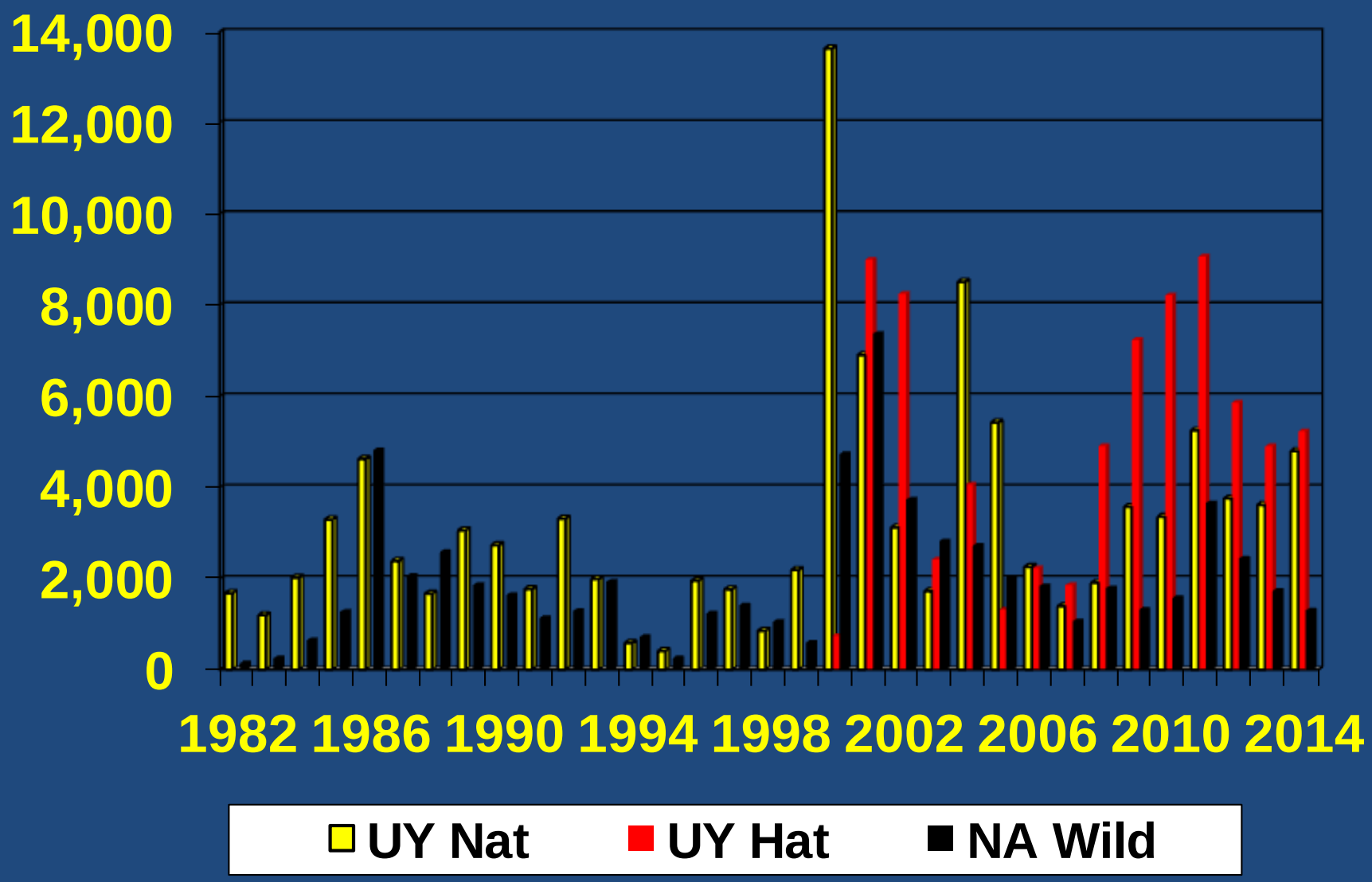
- maintain or increase:
  - Harvest
  - natural production
  - ecosystem function
- research to:
  - address critical uncertainties
  - improve hatchery practices

Upper Yakima River Basin

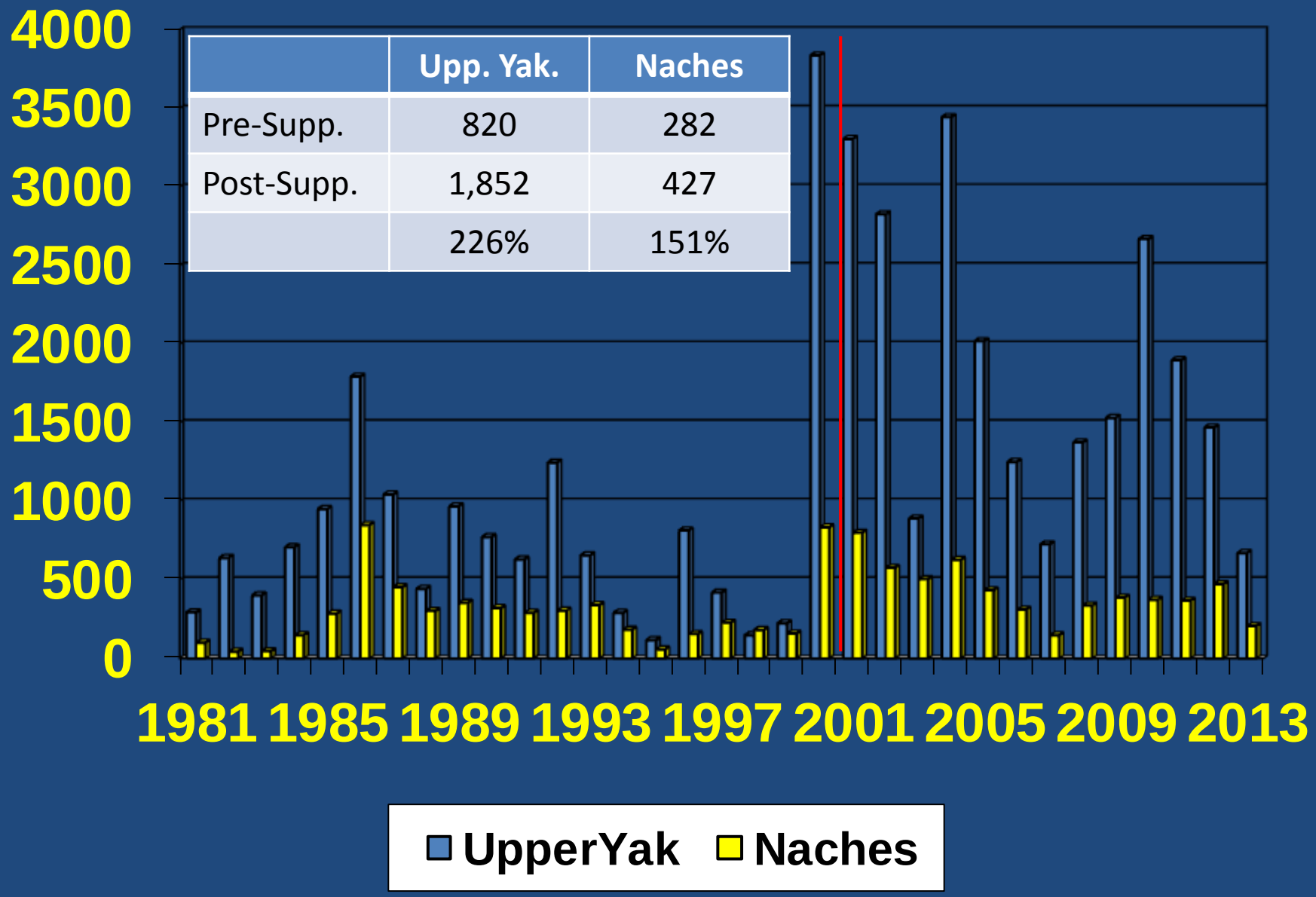
Yakima Basin Spring Chinook
Total Returns, 1982 – 2011



Yakima Basin Spring Chinook
Total Returns by Subbasin, 1982 – 2014



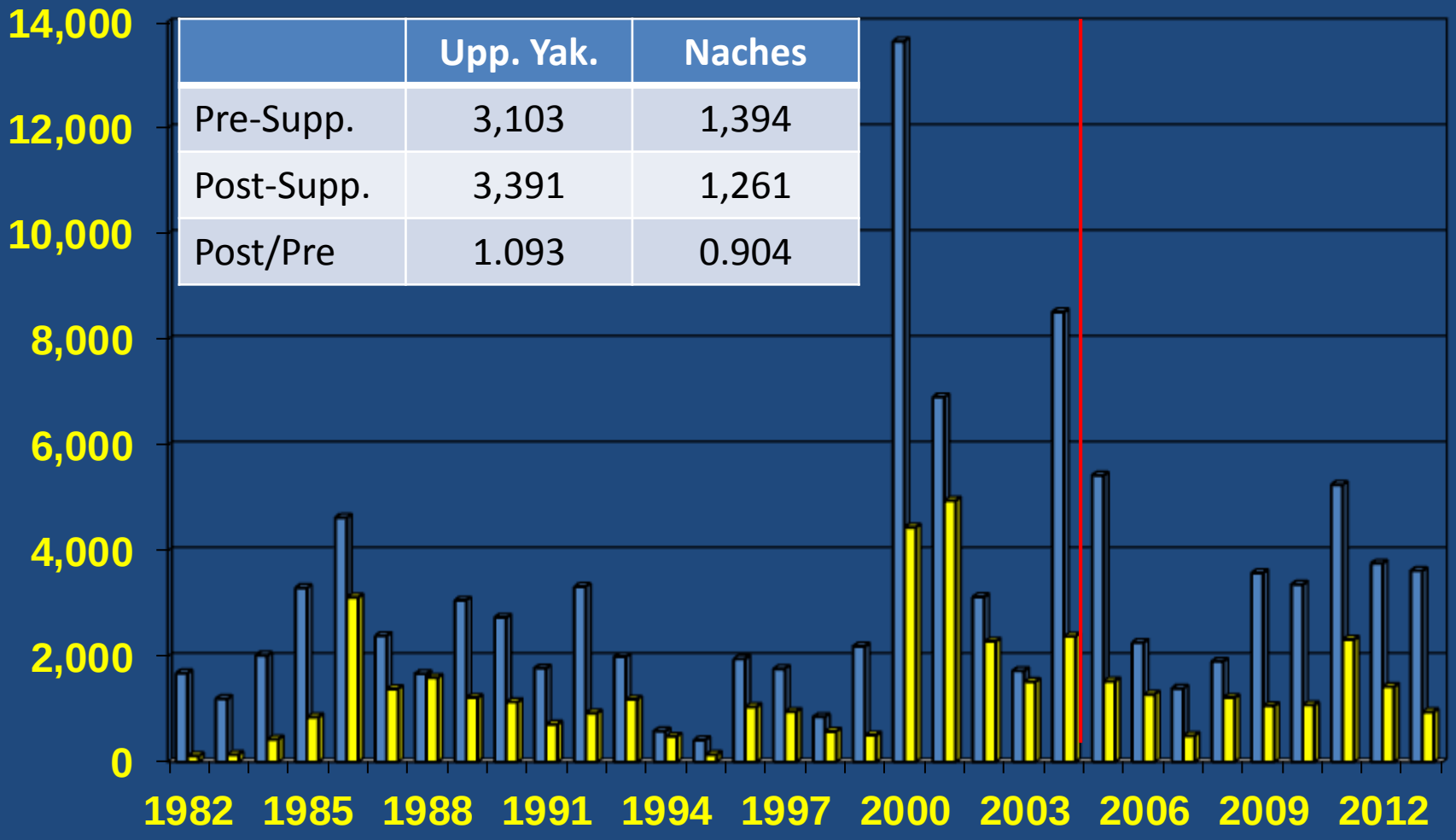
Upper Yakima vs Naches Redds, 1981-2013

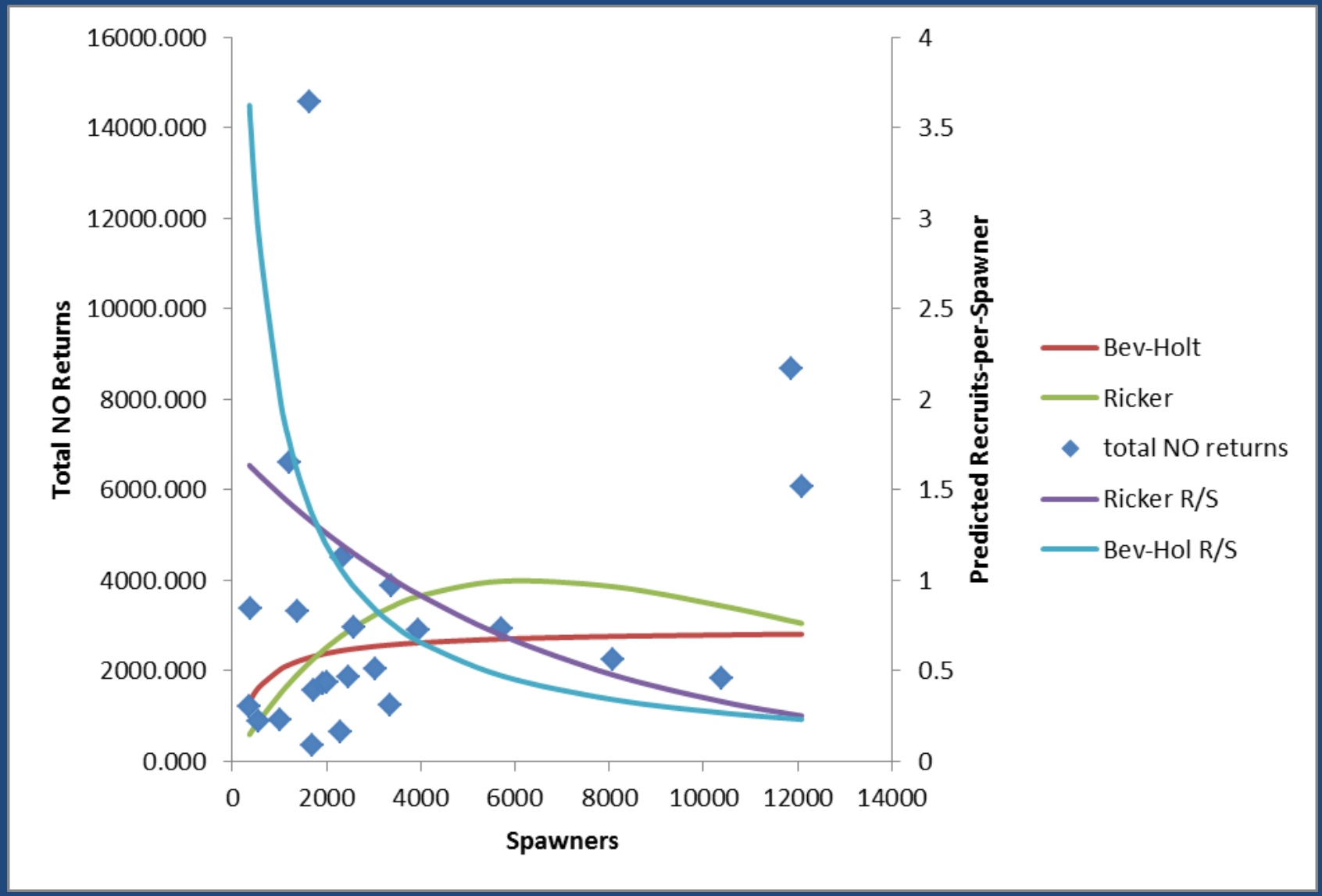


	Upp. Yak.	Naches
Pre-Supp.	820	282
Post-Supp.	1,852	427
	226%	151%

Upper Yakima vs Naches Natural-Origin Returns, 1982-2013

	Upp. Yak.	Naches
Pre-Supp.	3,103	1,394
Post-Supp.	3,391	1,261
Post/Pre	1.093	0.904

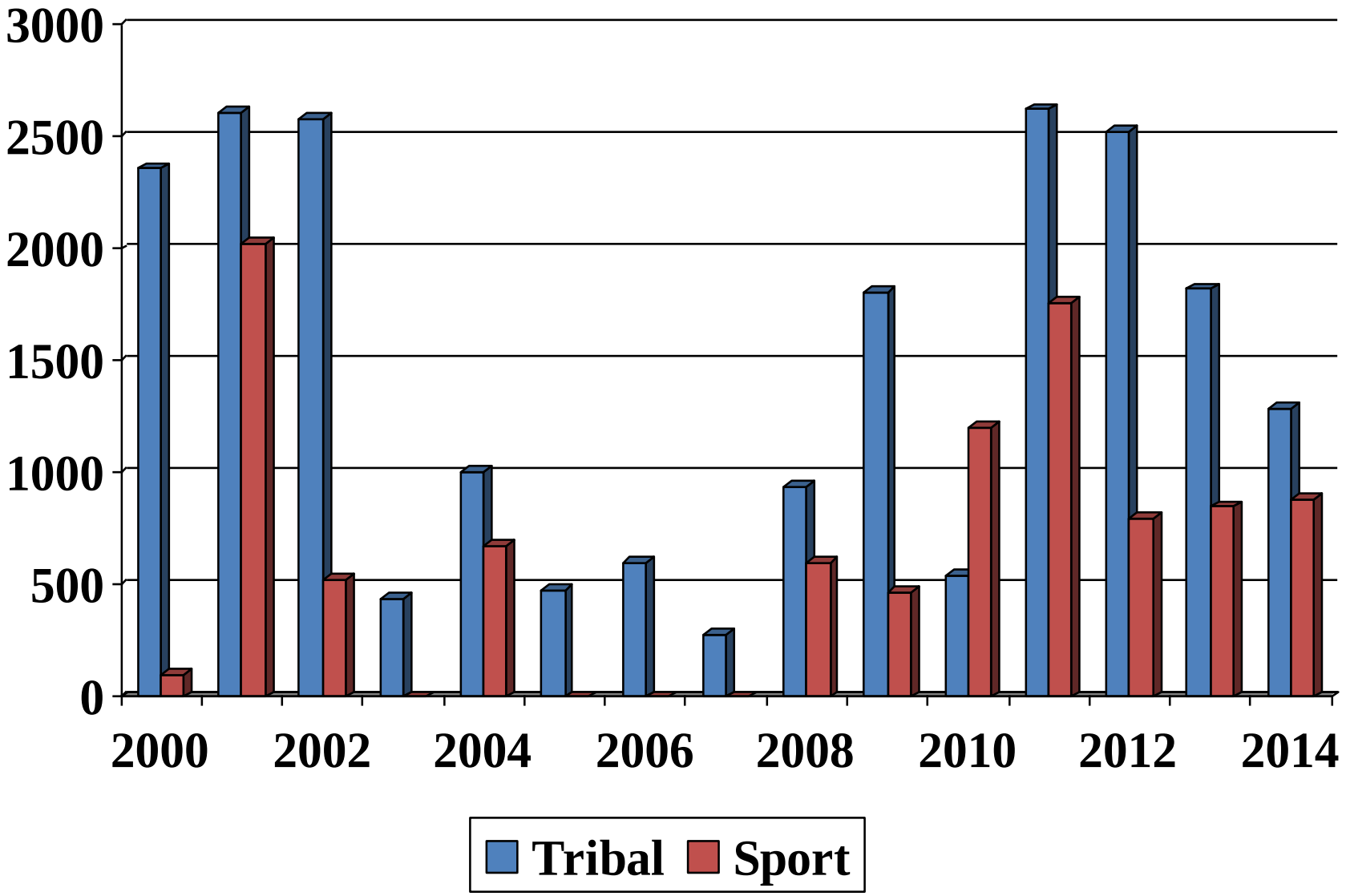



16000.000
14000.000
12000.000
10000.000
8000.000
6000.000
4000.000
2000.000
0.000
Total NO Returns
4
3.5
3
2.5
2
1.5
1
0.5
0
Predicted Recruits-per-Spawner
0
2000
4000
6000
8000
10000
12000
14000
Spawners
Bev-Holt
Ricker
total NO returns
Ricker R/S
Bev-Hol R/S

YKFP
Spring Chinook Supplementation Project

Enhanced the tribal subsistence
And ceremonial fisheries
&
Initiated the first sport fisheries
In over 50 years

Yakima Spring Chinook Harvest



IMPROVE NATURAL PRODUCTION

Maintain Homing & Site Selection

* Homing to Acclimation Sites
* Redd Characterization and Selection

Reproductive Success

* Laboratory
* Spawning Channel
* Hatchery & Wild Redd Characteristics


HOMING
FIDELITY
NRS


Reproductive Success
Comparative behavioral/reproductive fitness research

Breeding Success of Naturally Spawning Wild- And Hatchery-Origin Spring Chinook Salmon

S.L. Schroder

C.M. Knudsen

T.N. Pearsons

T.W. Kassler

D.E. Fast

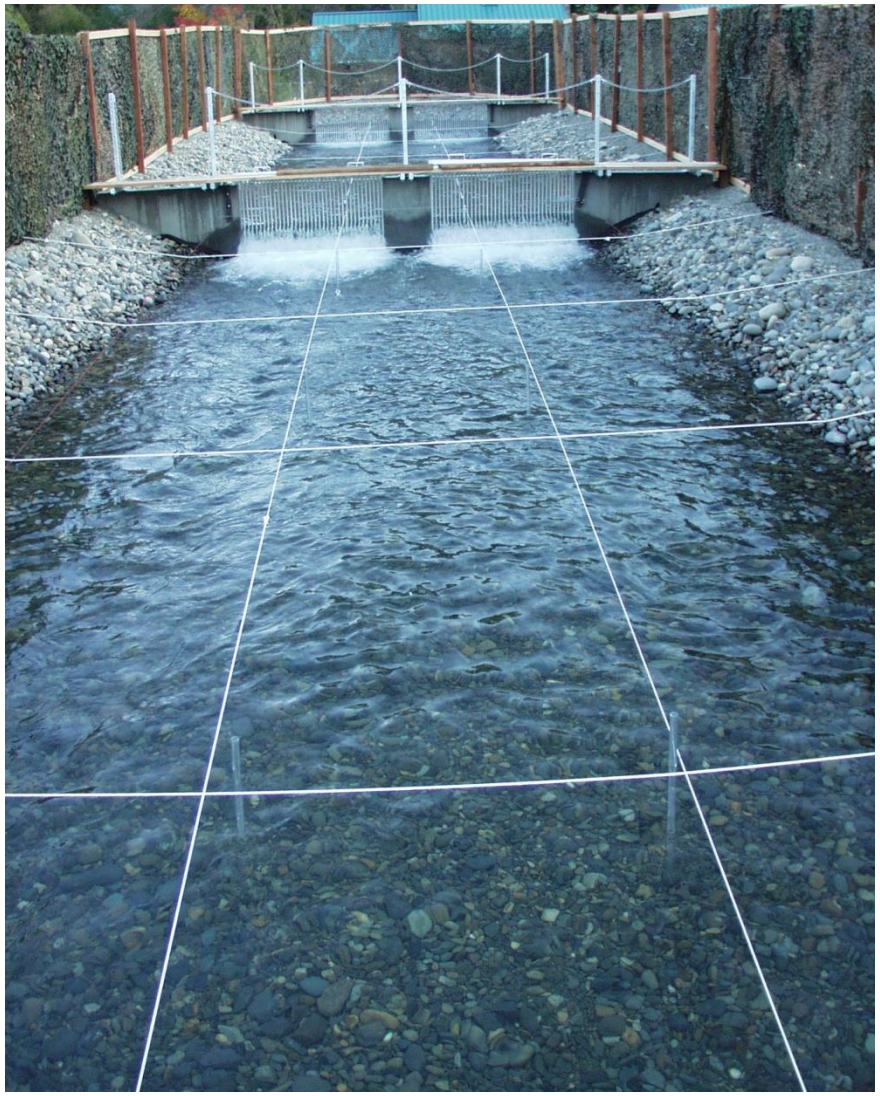
E.P. Beall

S.F. Young

Why An Artificial Stream?

Confounding Factors Can Be Controlled

- **Physical Environment (Gravel, Water Velocity & Depth)**
- **Fish (No., Type, Maturation, Condition, Entrance Timing)**
- **DNA (All Adults & Subsample Of Fry)**
- **Behavior (Correlate Individual Behavior with Fish Origin & Breeding Success)**



Female Breeding Success

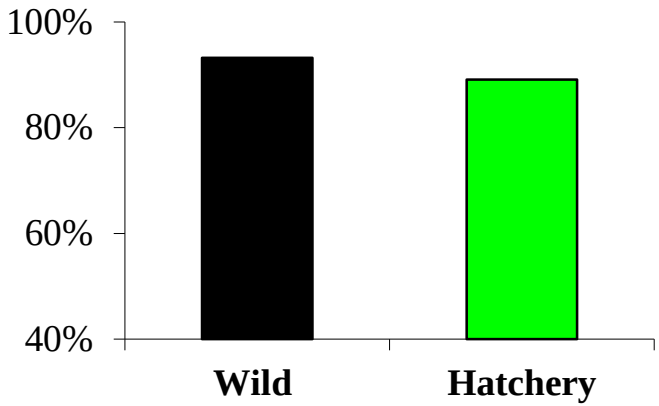
Performance Based:

•Capacity to Deposit Eggs

•Survival of Deposited Eggs
To The Fry Stage

• Converting Absolute Fecundity
To Fry

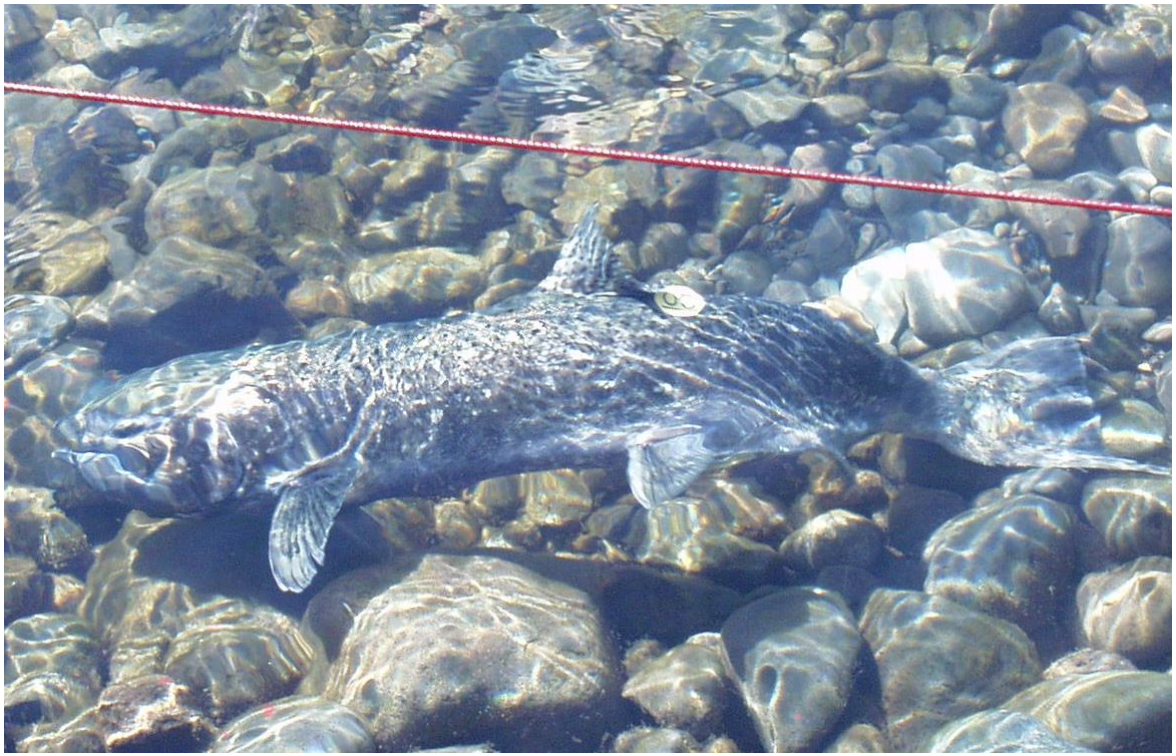
Egg Deposition



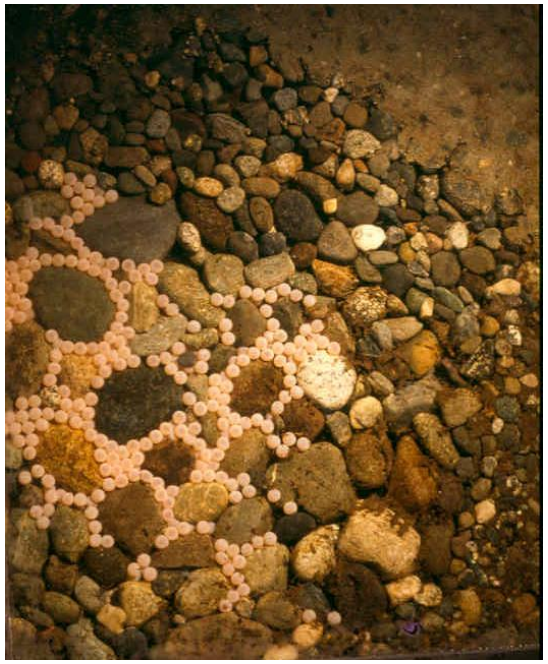
Wild = 93.2%
Hatchery = 89.1%
P = 0.15 paired-*t* test

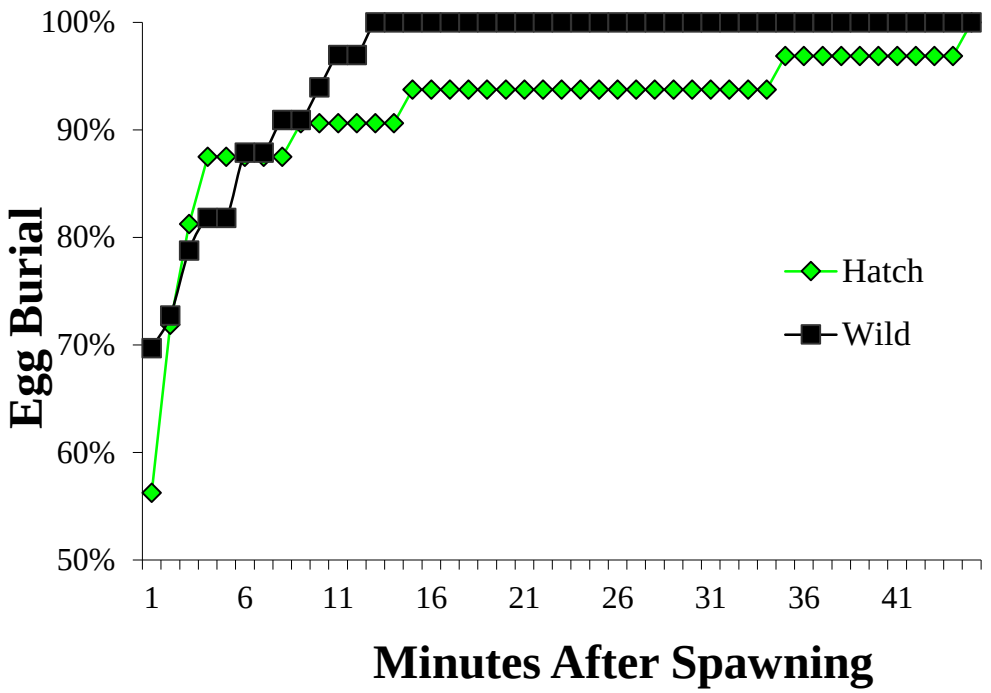
Nest Construction Activities Compared

- **Digging Frequency**
- **Body Flexures Per Dig**
- **Egg Burial**



Egg Burial Times For Hatch & Wild Females





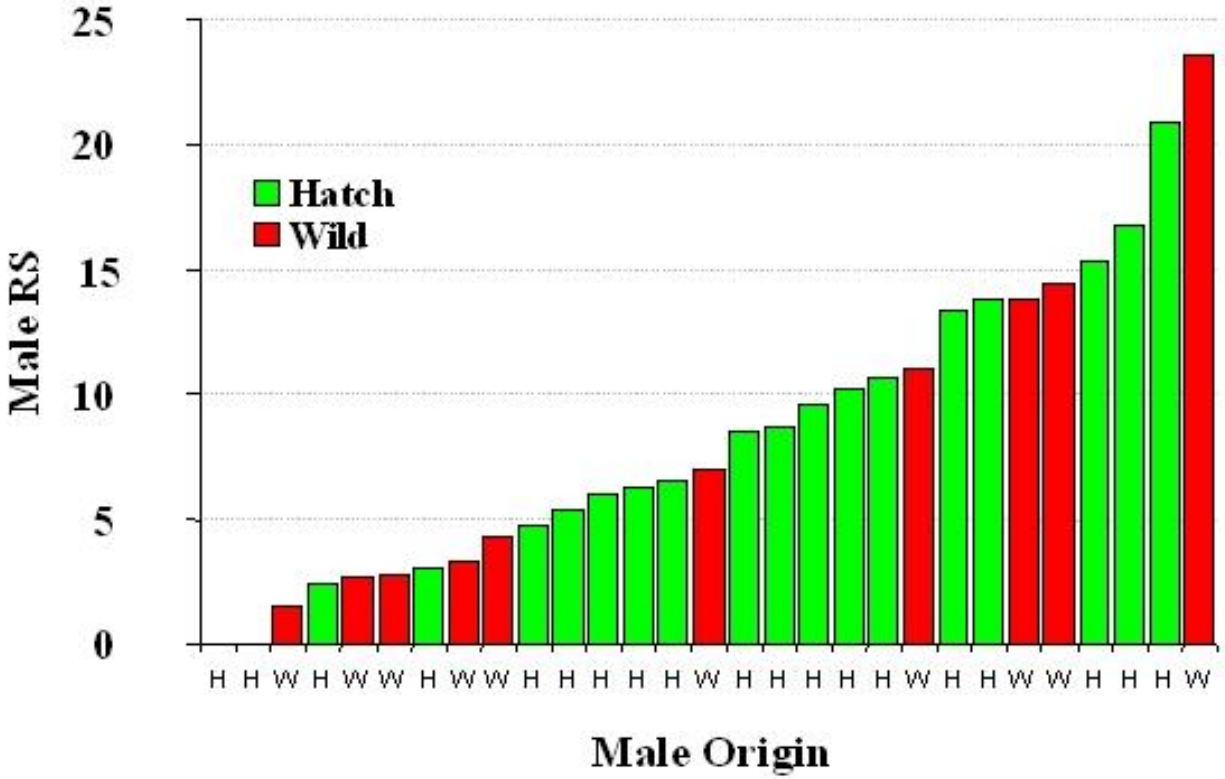
Breeding Success of Wild and First-Generation Hatchery Female Spring Chinook Salmon Spawning in an Artificial Stream

S.L. Schroder, C.M. Knudsen, T.N. Pearsons, T.W. Kassler, S.F. Young, C.A. Busack, and D.E. Fast

Transactions of the American Fisheries Society, 137:1475-1489

"No differences were detected in the egg deposition rates of wild and hatchery females. Pedigree assignments based on microsatellite DNA, however, showed that the eggs deposited by wild females survived to the fry stage at a 5.6% higher rate than those spawned by hatchery females."

Reproductive Success Of Wild & Hatchery Males

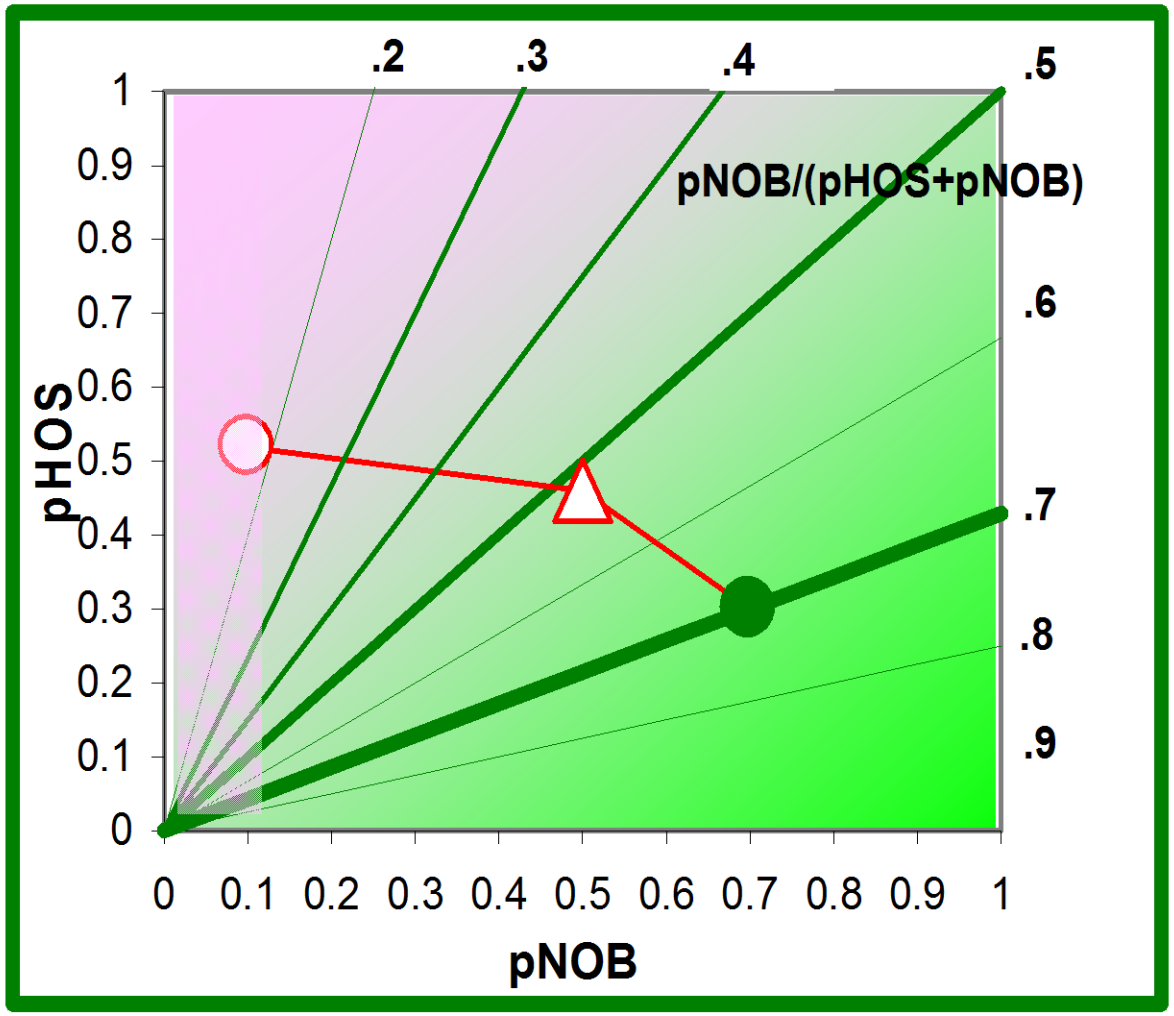


Behavior and Breeding Success of Wild and First-Generation Hatchery Male Spring Chinook Salmon Spawning in an Artificial Stream

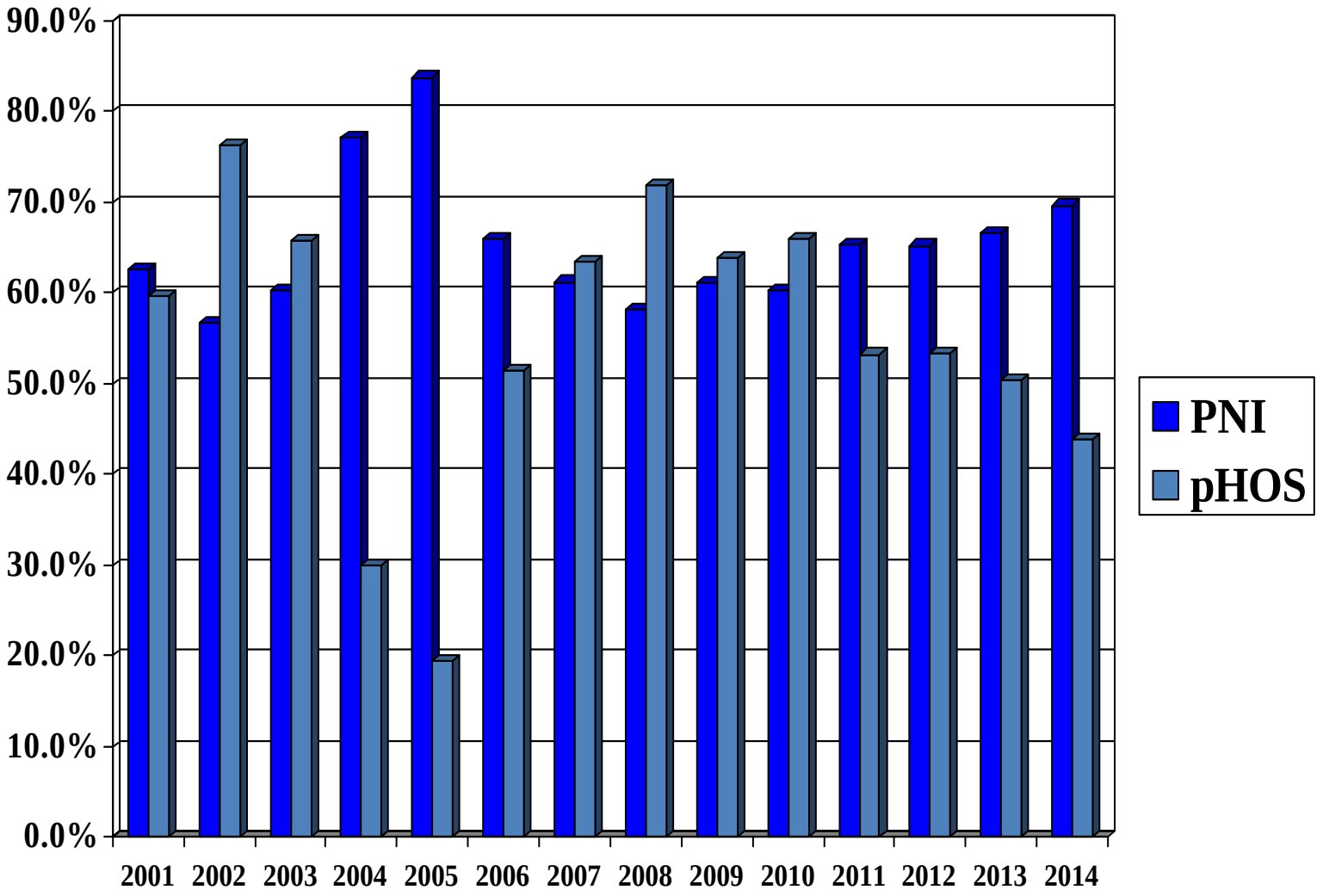
S.L. Schroder, C.M. Knudsen, T.N. Pearsons, T.W. Kassler, S.F. Young, E.P. Beall and D.E. Fast

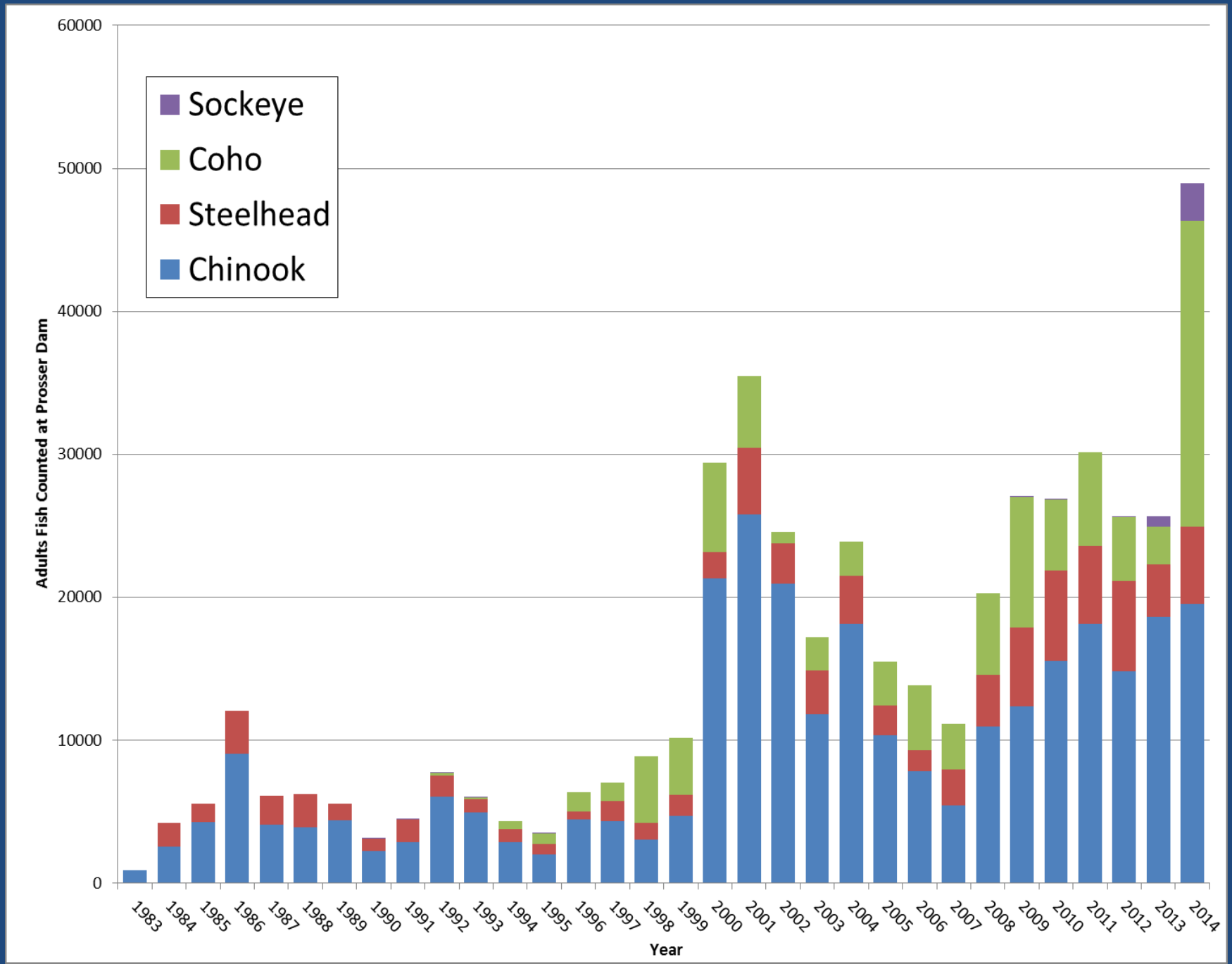
Transactions of the American Fisheries Society, 139:989-1003

"Pedigree analyses based on DNA showed that hatchery and wild males had comparable breeding success values."


.2
.3
.4
.5
.6
.7
.8
.9
pNOB/(pHOS+pNOB)
pHOS
pNOB
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1

Annual PNI and pHOS




Sockeye
Coho
Steelhead
Chinook
60000
50000
40000
30000
20000
10000
0
Adults Fish Counted at Prosser Dam
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
Year

www.ykfp.org

Evaluating the effectiveness of managed gene flow to reduce adaptation to captivity in supportive breeding programs

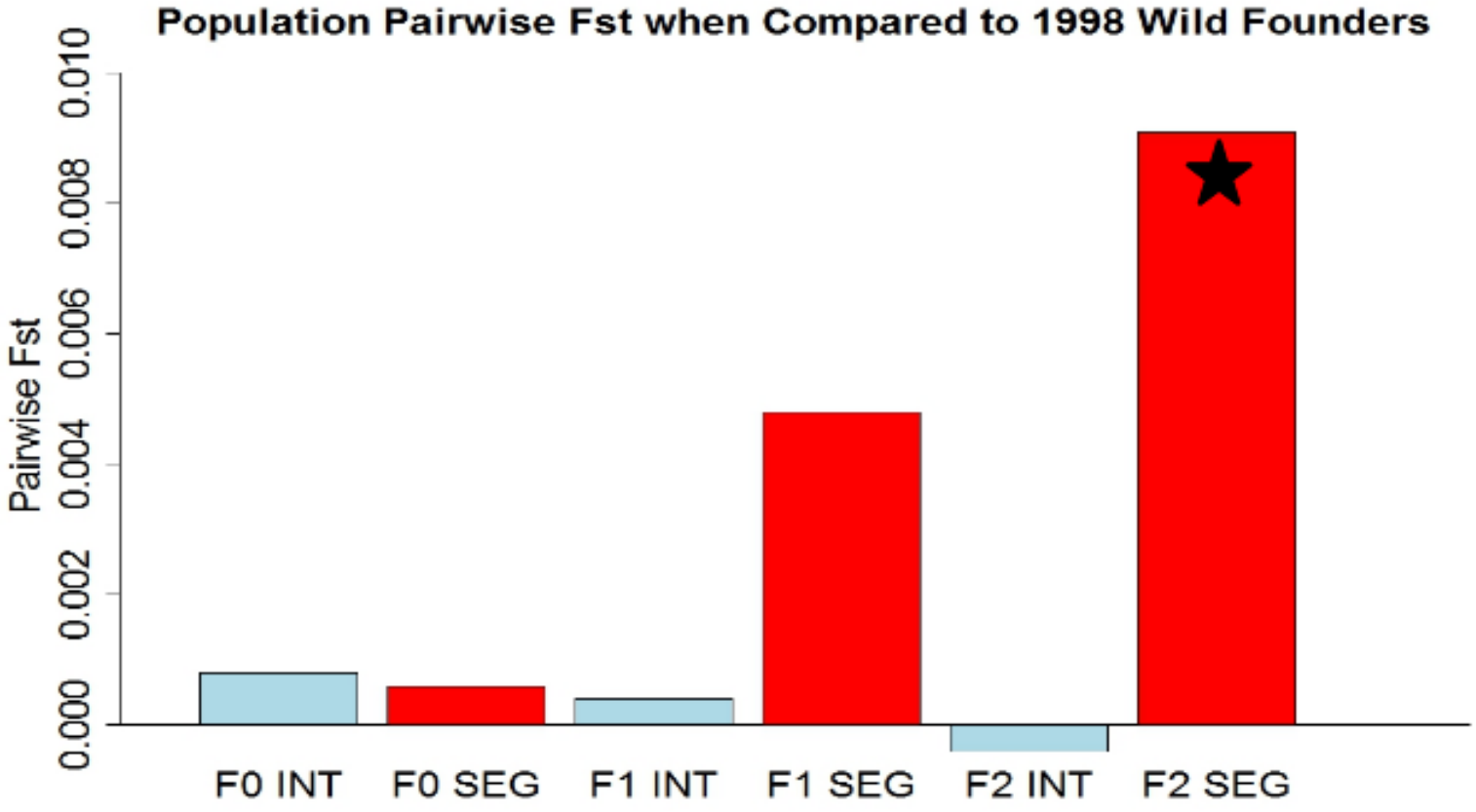
Charlie Waters[1], Marine Brieuc[1], Curtis Knudsen[2], Dave Fast[3], Jeff Hard[4], Ken Warheit[5], and Kerry Naish[1]

[1]School of Aquatic and Fishery Sciences, University of Washington
[2]Oncorh Consulting
[3]Yakama Nation
[4]NOAA Northwest Fisheries Science Center
[5]Washington Department of Fish and Wildlife

Genetic Differentiation

Fst is a common measure of genetic differentiation

- Higher Fst means more differentiation
- Fst of 0.05-0.1 common among salmon populations



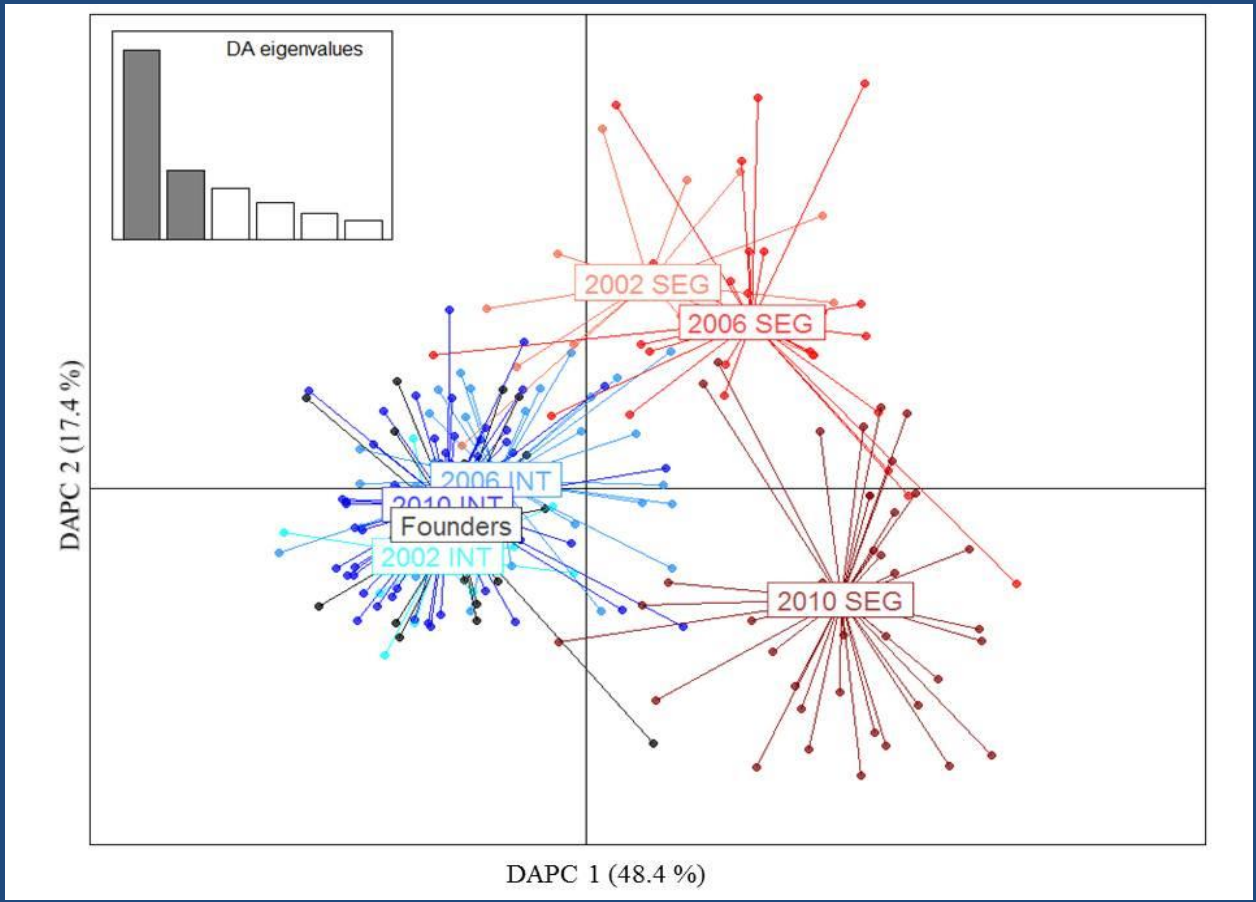


Fig 1. Discriminant analysis of principal components (axes 1-2 displayed; 70 PC's retained) describing genotypes of 213 Chinook salmon at 2,803 mapped loci. Individuals include the wild founders and three generations of integrated (INT) and segregated (SEG) hatchery lines. Points represent individuals, with lines connecting each individual to their respective population mean. The scree plot shows the eigenvalues of the plotted axes in grey.

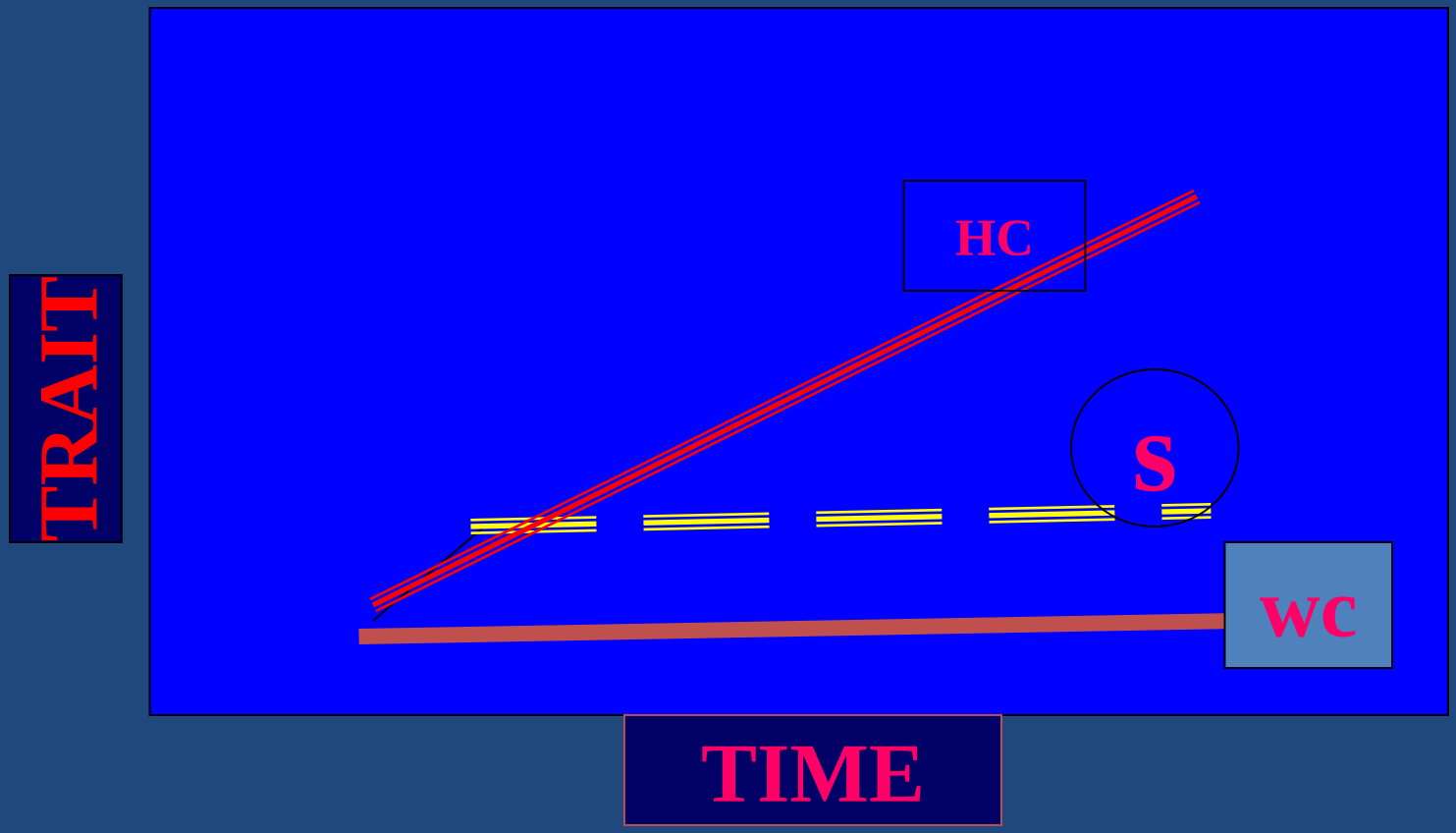
Charlie Waters[1], Marine Brieuc[1], Jeff Hard[2], Dave Fast[3], Ken Warheit[4], and Kerry Naish[1]
[1]School of Aquatic and Fishery Sciences, University of Washington ; [2]NOAA Northwest Fisheries Science Center;
[3]Yakama Nation; [4]Washington Department of Fish and Wildlife

DOMESTICATION RESEARCH

- Supplementation Line – S
- Wild Control Line – WC
- Hatchery Control Line – HC

  Potential to evaluate the level of domestication that is occurring in the YKFP Supplementation Line (S) and compare to the Hatchery Control Line (HC) of traditional hatcheries as well as an unsupplemented population (W).

DOMESTICATION – HYPOTHETICAL OUTCOMES



JUVENILE TRAITS

- Emergence Timing
- Kd at Emergence
- Egg-fry Survival
- Developmental Abnormalities
- Fry-Smolt Survival
- Juvenile morphology
- Smolt survival
- Natural Smolt Survival
- Smolt-Adult Survival HC Line
- Outmigration Timing
- Food Conversion
- Length-Weight
- Agonistic/Competitive Behavior
- Predator Avoidance
- Precocialism

ADULT TRAITS MONITORED

- Adult Recruits
- Age Composition
- Sex-at-Age
- Sex Ratio/Age
- Run Timing
- Spawn Timing
- Fecundity
- Egg Size
- Reproductive Effort
- Fertility
- Morphology
- Spawning Behavior
- Spawning Success