

**Yakima Basin Science &
Management Conference 2007
YKFP CWU BPA BOR**

**Overview of Research and
Management Activities in the
Yakima Basin**

HISTORY OF SALMON ACTS

- **1030 – EARLIEST KNOWN EDICT RESTRICTING SALMON FISHING IN SCOTLAND**
- **1215 – MAGNA CARTA - DISMANTLE THE KING'S FISHERIES TO PROTECT SALMON IN ENGLAND**
- **1424 - ACT BANNING WEIRS THAT BLOCKED FISH MIGRATION AND SET CLOSED SEASON DURING SPAWNING MIGRATION**
- **1828 – ABOVE ACT WAS REPEALED AND REPLACED WITH 'ACT FOR THE PRESERVATION OF SALMON FISHERIES IN SCOTLAND'**
- **RICHARD THE LIONHEARTED – KING'S GAP – Well Fed Three year old pig stand sideways in stream without touching**
- **1429 – ACT AUTHORIZING SCOTSMEN TO POACH SALMON IN ENGLAND**

ATLANTIC SALMON LEGISLATION & WAR

- AMERICAN REVOLUTION – BRITISH GAVE FISHING RIGHTS TO U.S. IN “ALL OF HIS BRITANNIC MAJESTY’S DOMINIONS”
- WAR OF 1812 – UNSUCCESSFULLY TRIED TO REVOKE US FISHING RIGHTS. 1829 OVER 90% OF BOATS IN BAY OF FUNDY U.S.



PACIFIC SALMON LEGISLATION & WAR

- 1936 – JAPAN OPERATES OCEAN FACTORY SHIP FISHERY OFF ALASKA. US SAYS ‘HANDS OFF OUR SALMON’
- 1941 – PEARL HARBOR BOMBED – SHIPS WERE NEEDED FOR THE WAR EFFORT AND SALMON STOCKS REBOUNDED

Photo # 80-G-182249 Japanese plane leaves Shokaku to attack Pearl Harbor, 7 Dec. 1941





OUR CARELESSNESS
Their Secret Weapon

PREVENT FOREST FIRES

U. S. DEPT. OF AGRICULTURE
FOREST SERVICE

STATE
FOREST SERVICE

HISTORY LESSONS LEARNED?

WHAT CAN WE LEARN FROM A THOUSAND YEARS OF SALMON HISTORY?

- REASONS FOR DECLINE STAY THE SAME
 1. OVERFISHING
 2. DAMS
 3. HABITAT
- EACH ENTITY BLAMES THE OTHERS

RESEARCH! REVIEW! REFORM!

.....REMEMBER?

- **ISRP, ISAB, HSRG, ICTRT, ETC.....**
- **PROBLEMS REMAIN THE SAME**
 - 1. HYDRO (DAMS OF ALL KINDS)**
 - 2. HARVEST**
 - 3. HABITAT**
 - 4. HATCHERIES**

SALMON RECOVERY RECOMMENDATION FOR MAINE RIVERS

(Maine Commissioners of Fisheries, 1869)

To restore the sea fish (salmon) to our waters these conditions are essential:

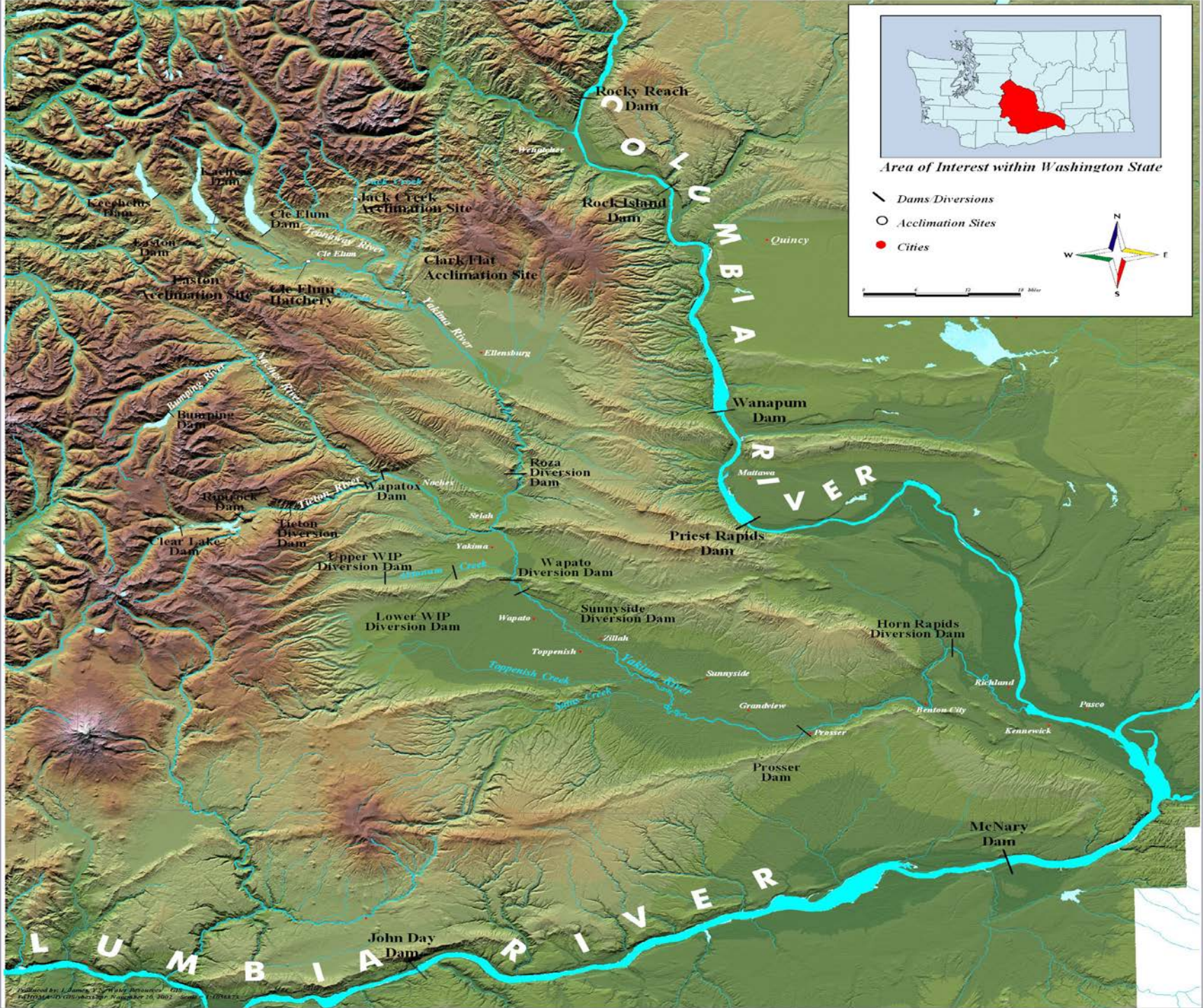
- **First, that fishways be built over all impassable dams**
- **Second, that excessive fishing be prevented**
- **Third, that the waters not be poisoned**
- **Fourth, that in some cases fish be bred in the waters to be restocked**

VIABLE SALMONID POPULATIONS (VSP) AVOIDING RISK OF EXTINCTION (INTERIOR COLUMBIA BASIN TECHNICAL RECOVERY TEAM '07)

- **ABUNDANCE**
- **PRODUCTIVITY**
- **SPATIAL STRUCTURE**
- **DIVERSITY**

Yakima Basin Fish & Wildlife Recovery Board

- **Alex Conley – Executive Director**
- **David Bowen – Kittitas County Commissioner**
- **Nancy Lillquist – City of Ellensburg Council Member**
- **Matt Bleich – City of West Richland Council Member**
- **Jeff Tayer – Washington Department of Fish & Wildlife**
- **Paul Ward – Yakama Nation Fisheries Program Manager**



Area of Interest within Washington State

- Dams Diversions
- Acclimation Sites
- Cities

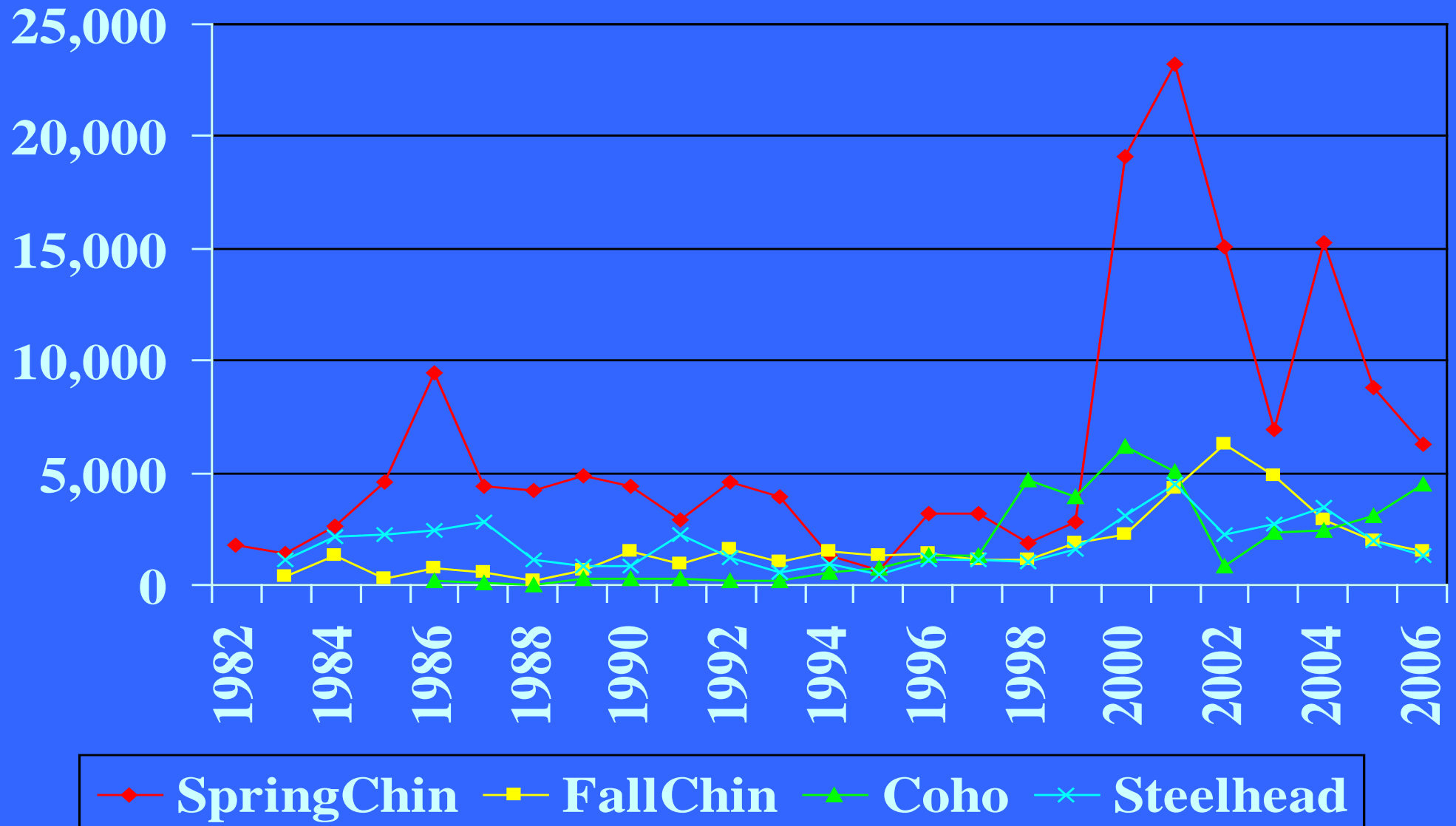
0 4 8 12 16 Miles

N
W E
S

Estimates of Historical Anadromous Fish Runs in the Yakima Subbasin as Compared to Recent Run Size (5-year Average, 2002-2006)

Species/Race	Pre-1900 Run	Recent Average
Fall Chinook	132,000	3,500
Spring Chinook	200,000	10,500
Summer Chinook	68,000	0
Coho	110,000	2,600
Summer Steelhead	80,500	2,400
Sockeye	200,000	0

Yakima River Salmon by Species, 1982 - Present



YAKIMA/KLICKITAT FISHERIES PROJECT (YKFP)

- **MODELING EDT and AHA**
- **SALMON SUPPLEMENTATION AND REINTRODUCTION PROGRAMS**
- **HABITAT ACQUISITION AND ENHANCEMENT PROGRAMS**

Yakima/Klickitat Fisheries Project

Federal Agencies Cooperating

BPA

- Funding
- NEPA
- Review

NPPC

- Review
- Priority
- 5 Yr. Plan

USFWS

- ESA
- Fish Health

USFS

- Habitat

BOR

- Passage
- Water
- Facilities O & M
- Phase II Screens

NOAAFish

- ESA
- Physiology
- Homing

SPECIES TARGETED IN YKEP

- **ALL STOCKS IN BASIN - TIERED**
- **SPRING CHINOOK INITIAL STOCK 1997**
- **COHO FEASIBILITY PART OF PROGRAM**
- **FALL CHINOOK 1998**
- **STEELHEAD – MODELING, PLANNING,
(and KELT RECONDITIONING)**
- **OTHER STOCKS OF ABOVE SPECIES
REVIEWED FOR POTENTIAL**

YKFP SUPPLEMENTATION AND RESEARCH PROGRAM

Purpose

To test the hypothesis that new supplementation techniques can be used in the Yakima River Basin to increase natural production and to improve harvest opportunities, while maintaining the long-term genetic fitness of the wild and native salmonid populations and keeping adverse ecological interactions within acceptable limits

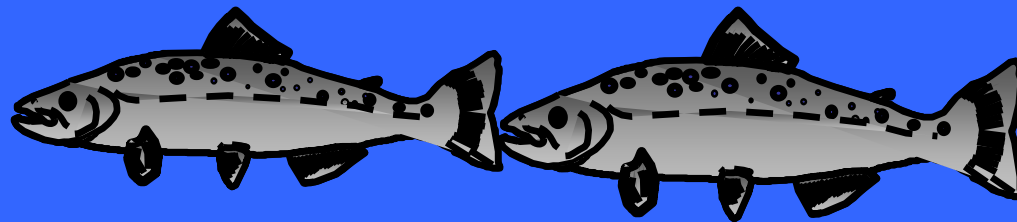
SUPPLEMENTATION GOAL: IMPROVE NATURAL PRODUCTION

- 1. Increase Survival**
- 2. Maintain Demographic Traits of Wild Fish**
- 3. Maintain Homing and Spawning Site Selection**
- 4. Reproduce Successfully!**

Cle Elum Supplementation & Research Facility

OCT/SNT Rearing

Smolt and Adult Survival Results



Yakima Basin





Adult and Juvenile Fish Passage

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

- **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**

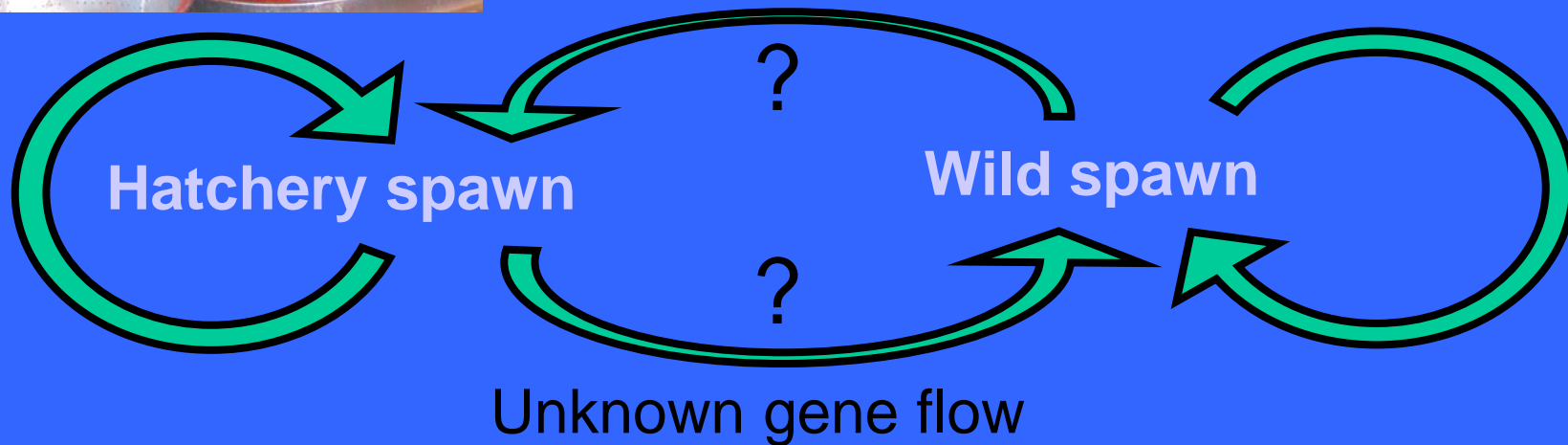
Hatchery Reform: *Genetic Integration vs. Segregation* of Hatchery Broodstocks



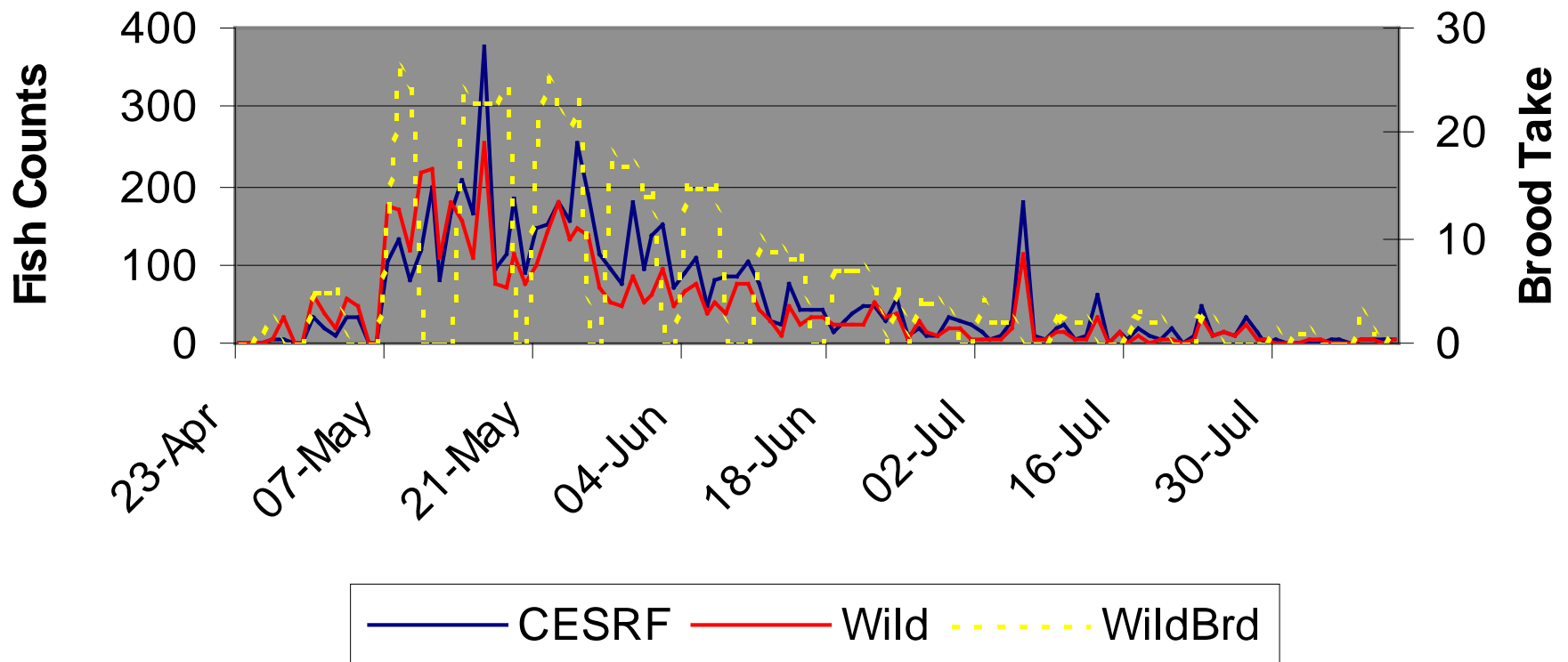
Donald E. Campton
U.S. Fish and Wildlife Service
Abernathy Fish Technology Center
Longview, WA



Historical Hatchery Problem: Unknown gene flow between two environments



Spring Chinook Run Timing at Roza, 2001



Yakima Basin





P# No. EL

Female #1

Female #2

Male #1

Male #2



Research Monitoring Activities

Designed to test the performance of the two treatments of artificially reared fish (OCT vs. SNT), and to compare their performance with naturally reared fish.

REARING CRITERIA for BY's 1997-2001

- **OPTIMUM CONVENTIONAL TREATMENT-OCT
PRODUCTION VESSEL – 100'X10'X3.5'
LOW DENSITY – 0.75 LB/FT³
45,000 FISH PER VESSEL
TEMPERATURE – <55F**
- **SEMI-NATURAL TREATMENT -SNT –
IDENTICAL TO OCT - PLUS
OVERHEAD COVER,
SUBSTRATE,
INSTREAM COVER,
UNDERWATER FEEDERS**









Upper Yakima River Basin





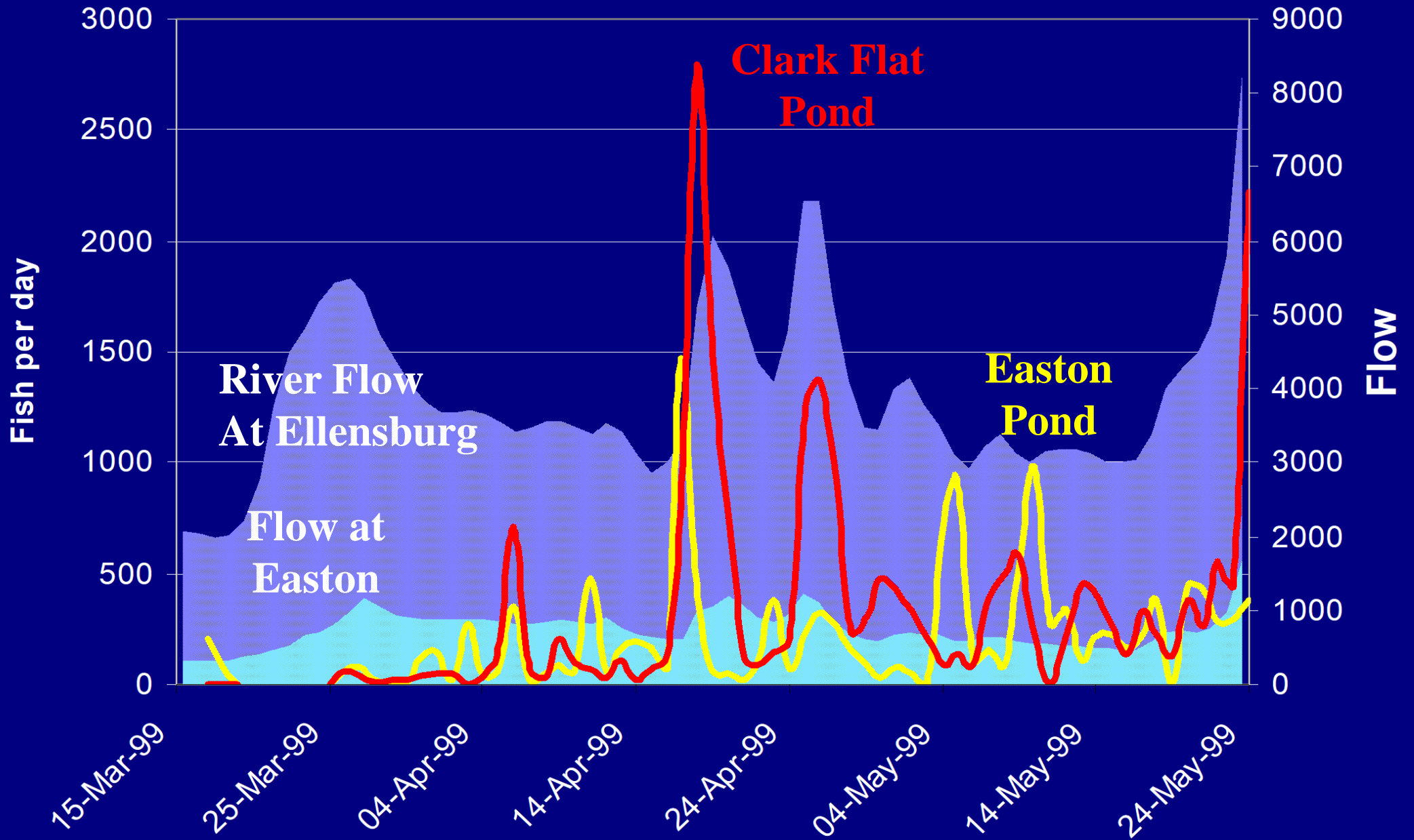




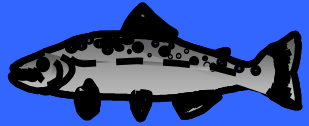
PIT-Tag data transfer

- Fish volitionally leave acclimation raceways, starting March 15 (screens pulled, all ponds).
- PIT-Tag data retrieved from migration channel detection system.
- Data downloaded to PTAGIS system, distributed to YKFP data managers.
- Fish movement posted on website YKFP.org.

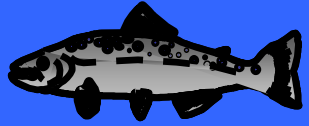
Volitional Releases and River Flows 1999



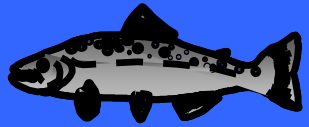
Hatchery Fish Performance will be Measured in Four Areas



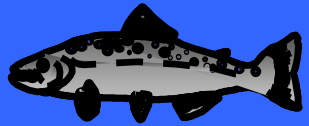
Post-release Survival (smolt release to adult)



Reproductive Success (smolts/spawner)

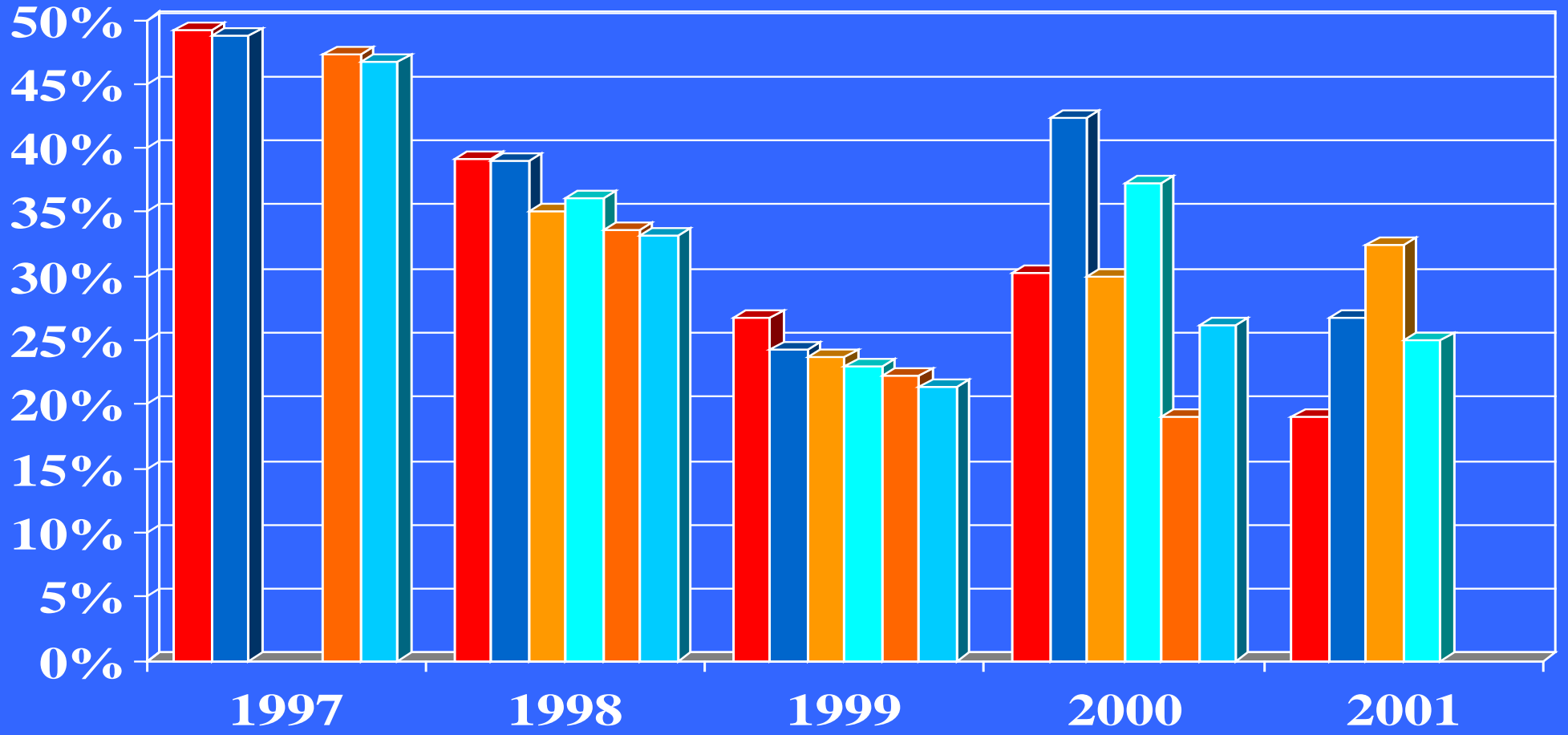


Long Term Fitness (genetic diversity and long term stock productivity)



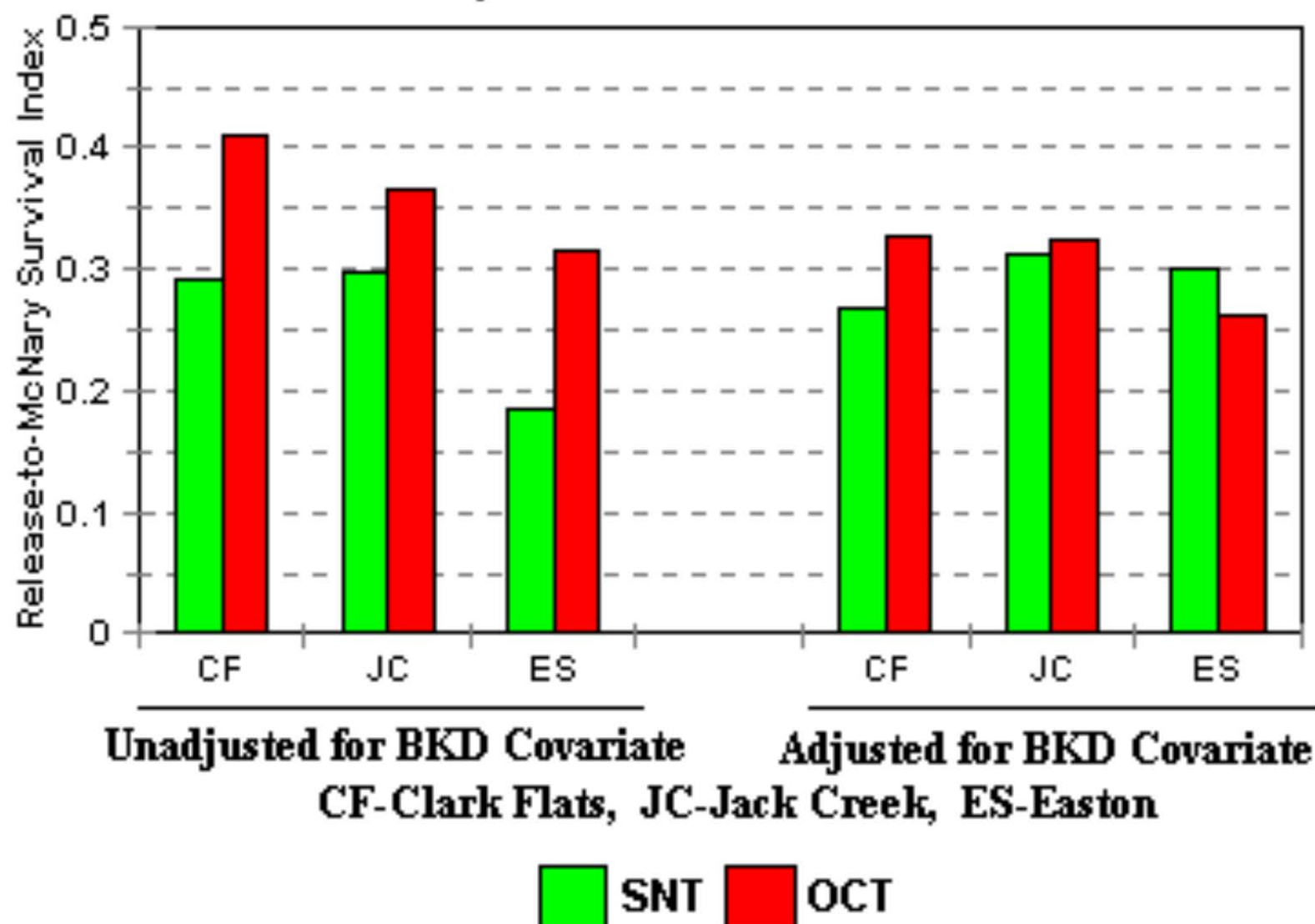
Ecological Interactions (population abundance, and distribution, growth rates, predation and competition)

Outmigrant SNT and OCT Treatment Release-to-McNary-Dam Survival Indices within Sites for Brood-Years 1997 through 2001 (1999 through 2003 Outmigrants)



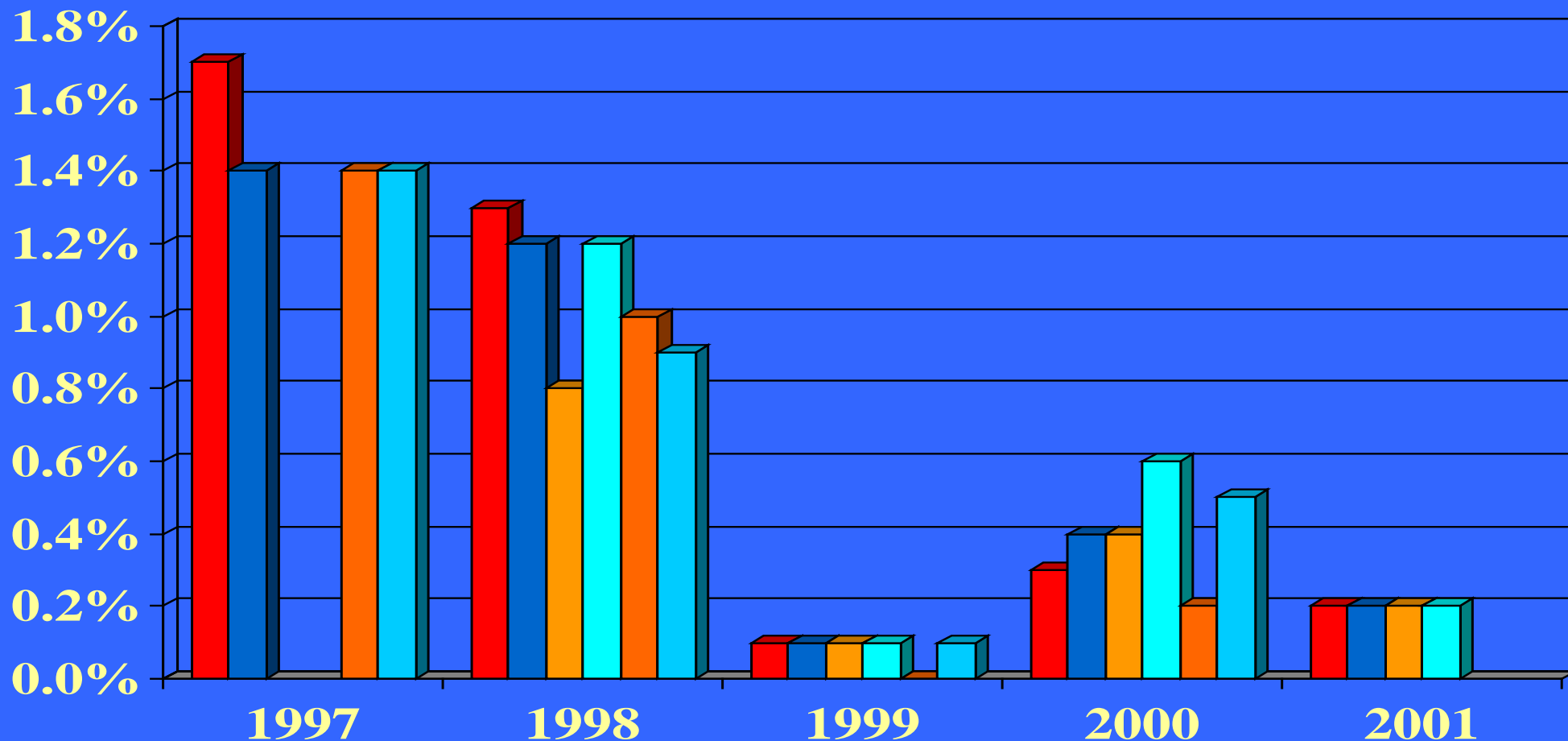
■ CF SNT
 ■ CF OCT
 ■ JC SNT
 ■ JC OCT
 ■ Ea SNT
 ■ Ea OCT

2000 Brood Survival Indices Unadjusted and Adjusted for BKD Covariate



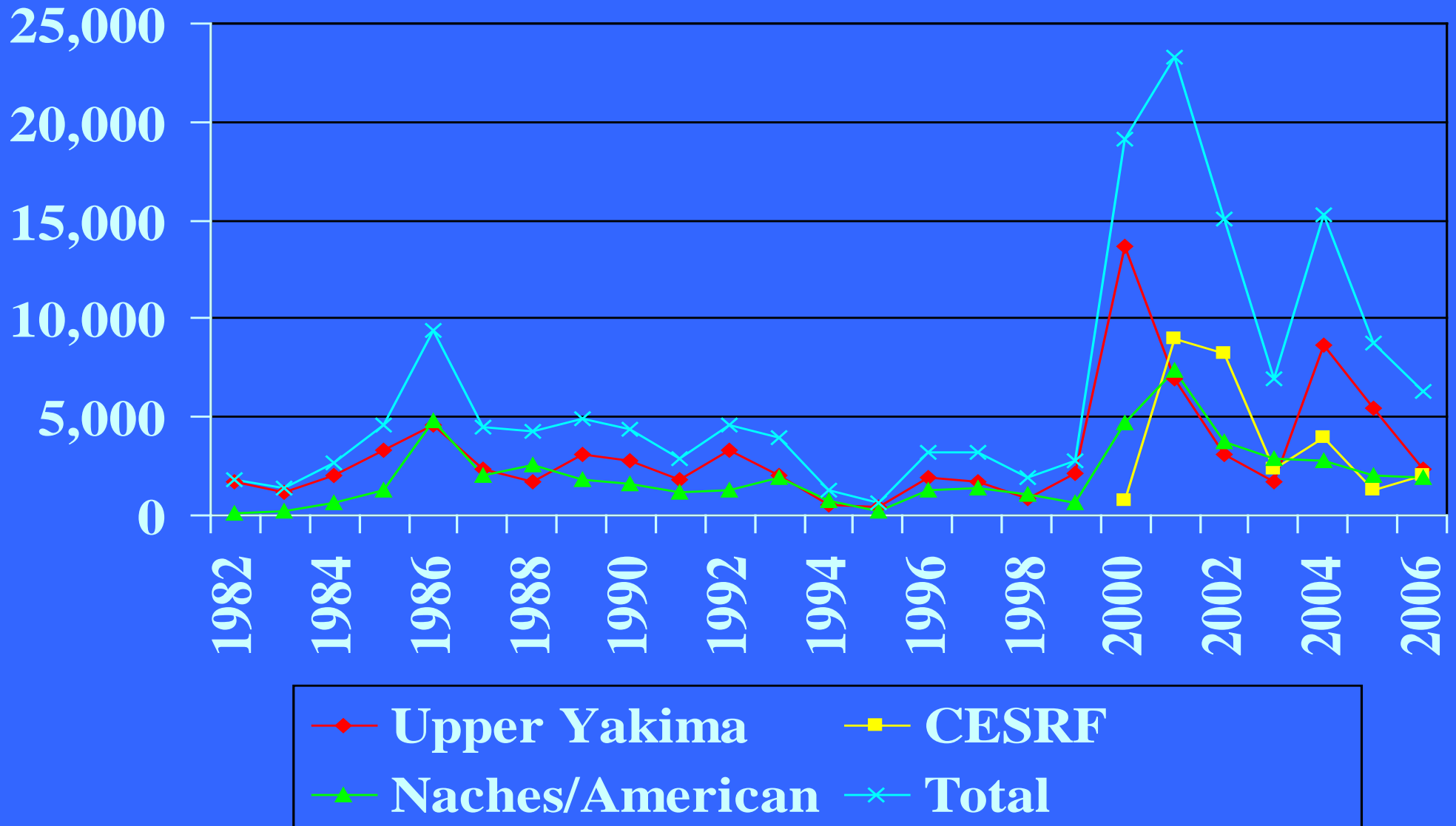


Adult SNT and OCT Treatment Survival Indices within Sites for Brood-Years 1997 through 2001 (2000 through 2005 Adult Returns)

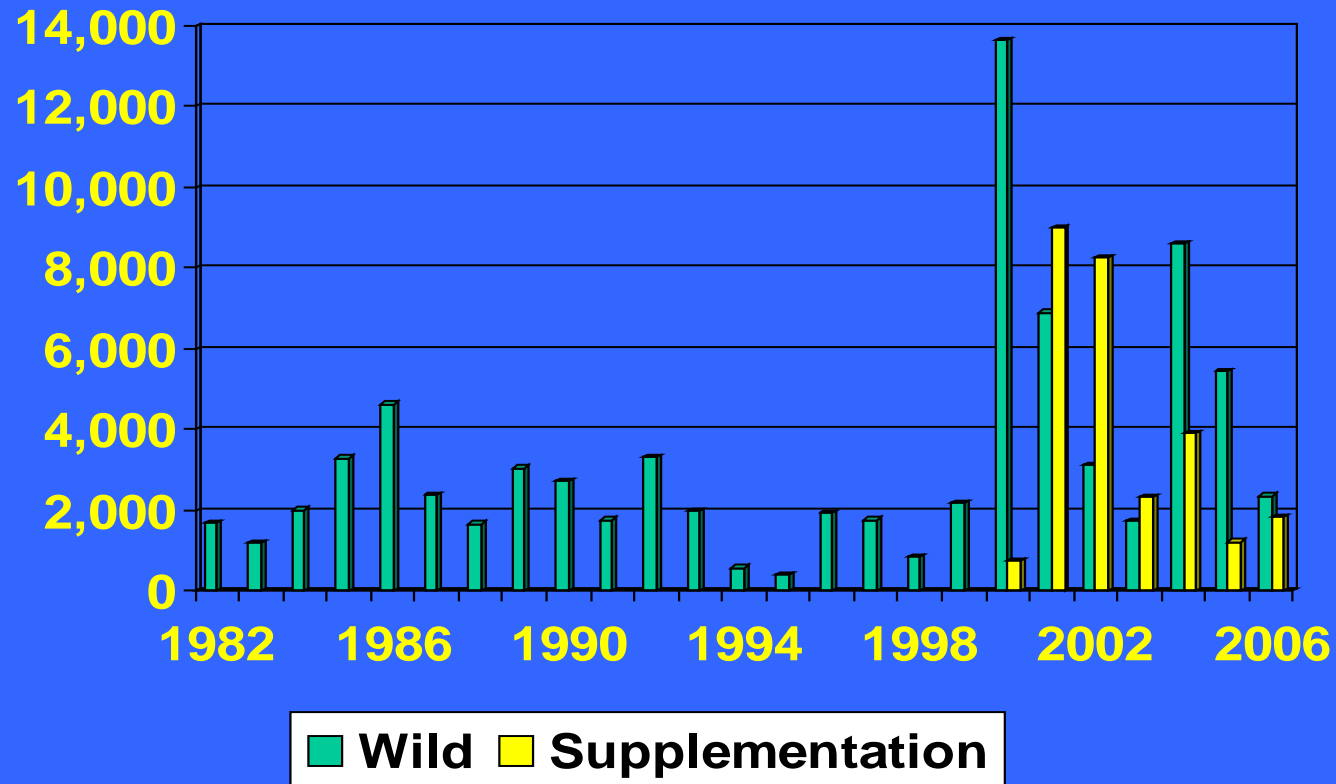


■ CF SNT
 ■ CF OCT
 ■ JC SNT
 ■ JC OCT
 ■ Ea SNT
 ■ Ea OCT

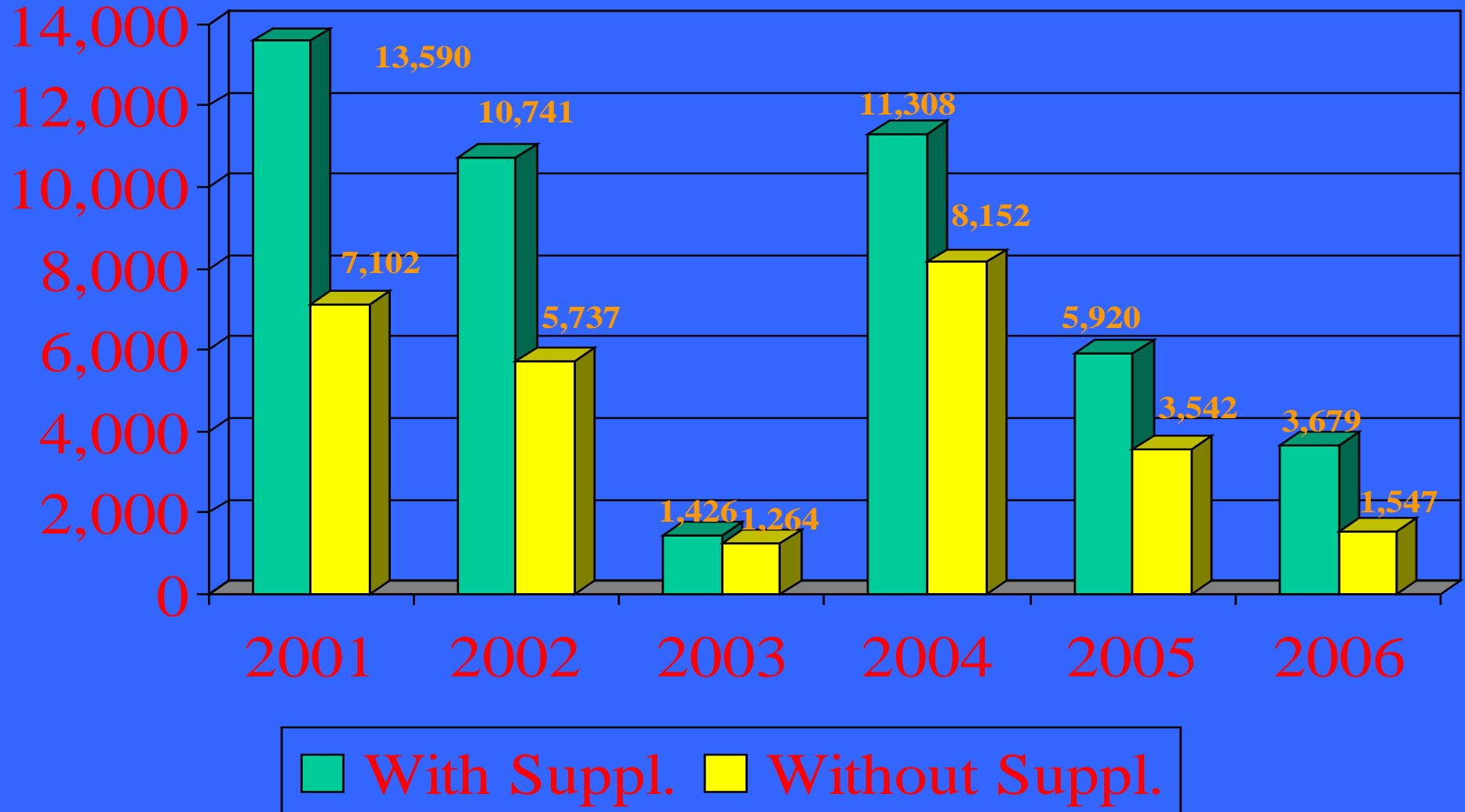
Yakima River Spring Chinook by Stock, 1982 - Present



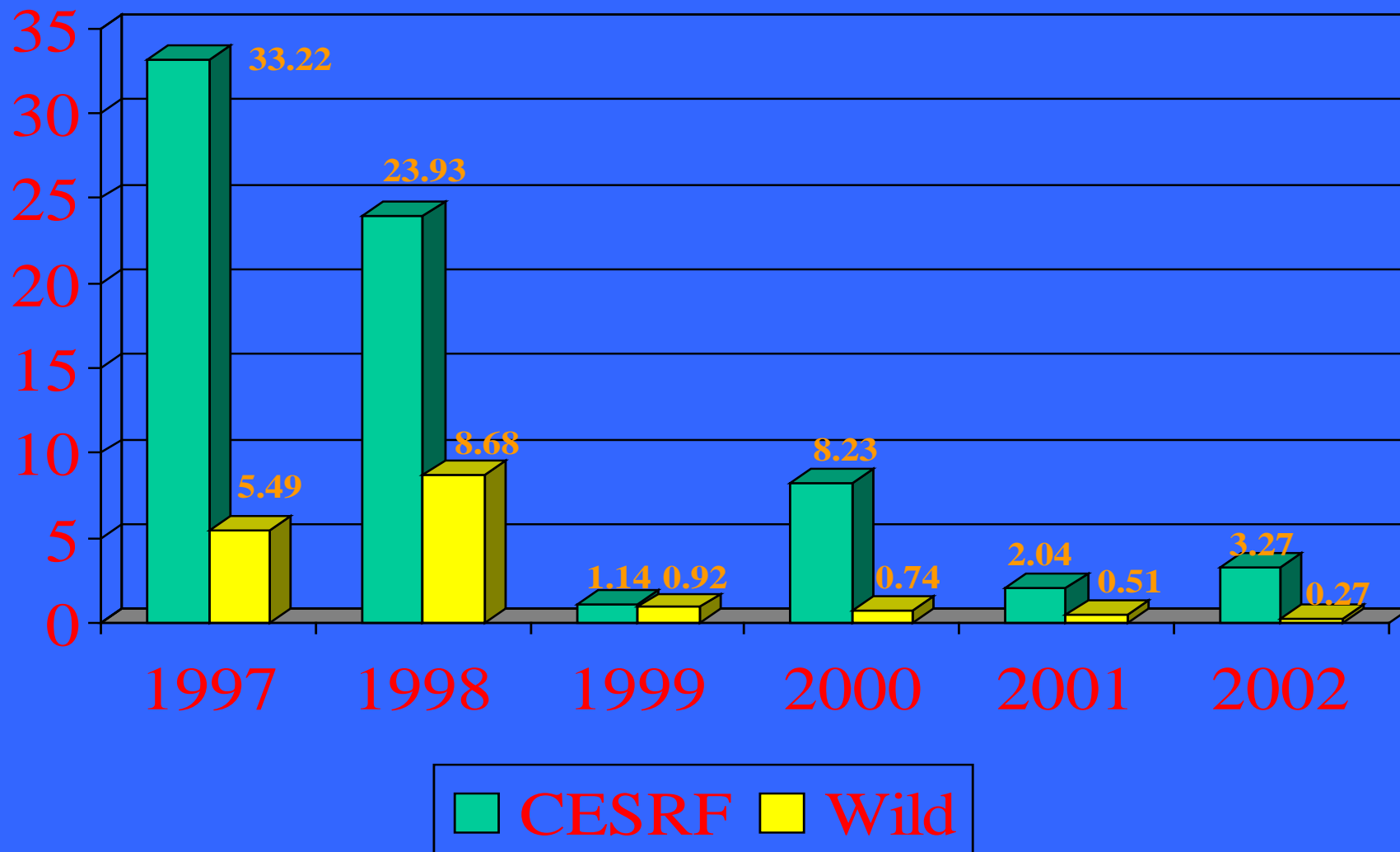
Upper Yakima Spring Chinook Returns, 1982 – 2006



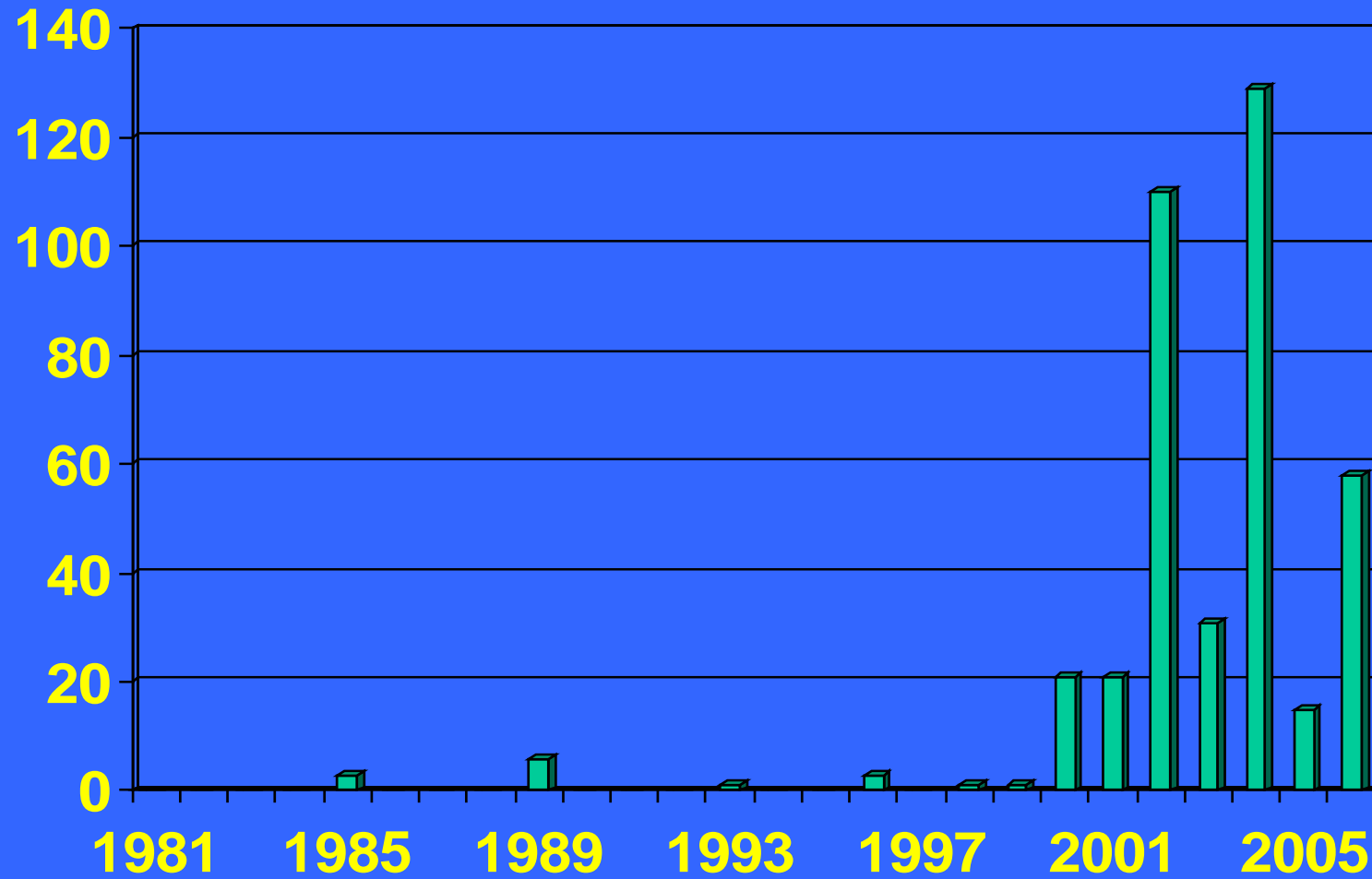
Upper Yakima Spring Chinook Age 4 Returns with and without Supplementation



Upper Yakima Spring Chinook Return-per-Spawner rates Brood Years 1997-2002



Teaway R. Spring Chinook Redd Counts, 1981 - 2006



YKFP

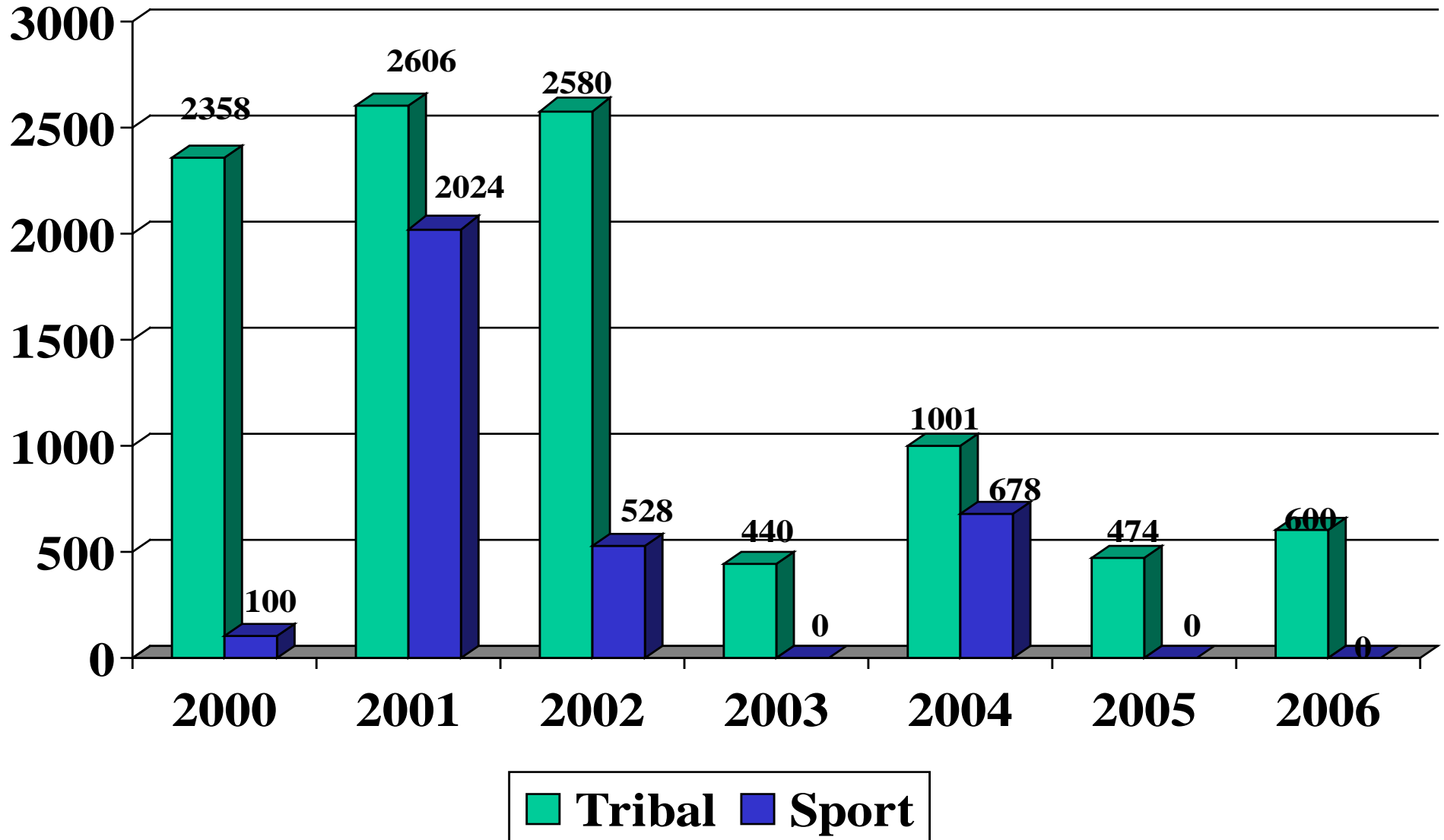
Spring Chinook Supplementation Project

**Enhanced the tribal subsistence
And ceremonial fisheries**

&

**Initiated the first sport fisheries
In over 50 years**

Yakima Spring Chinook Harvest



Current Hi-Low Study – Survival vs. Precocialism

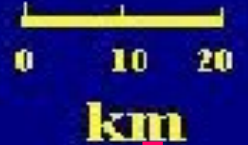
- Program appeared to increase precocial fish on the spawning grounds.
- Hypothesized that growth regime allows earlier sexual maturity.
- Designed study to evaluate effects of high vs lower growth rate on survival and precocialism.

DOMESTICATION RESEARCH

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

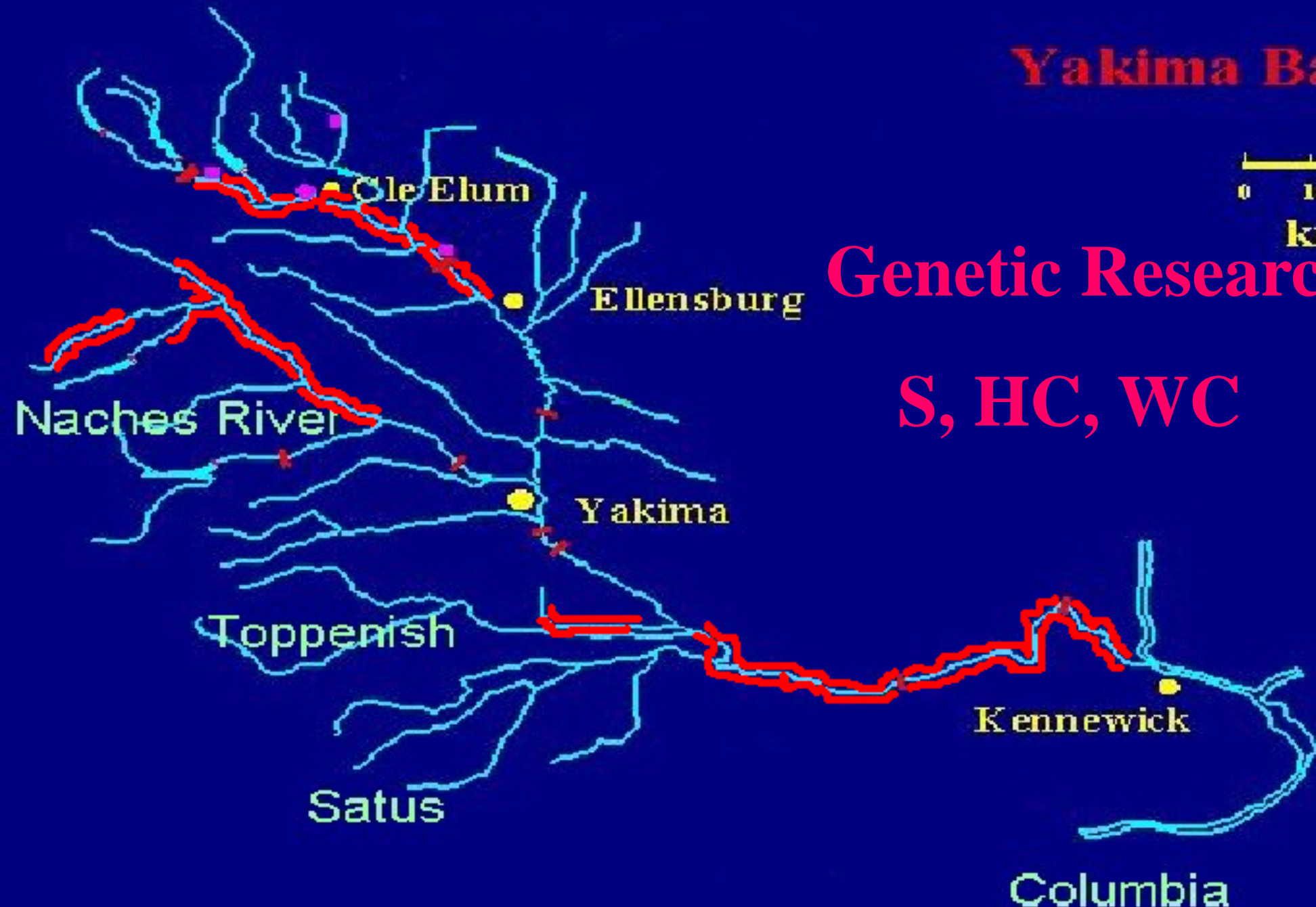
Potential to evaluate the level of domestication that is occurring in the YKFP Supplementation Line (S) and compare to the Hatchery Control Line (HC) of traditional hatcheries as well as an unsupplemented population (W).

Yakima Basin

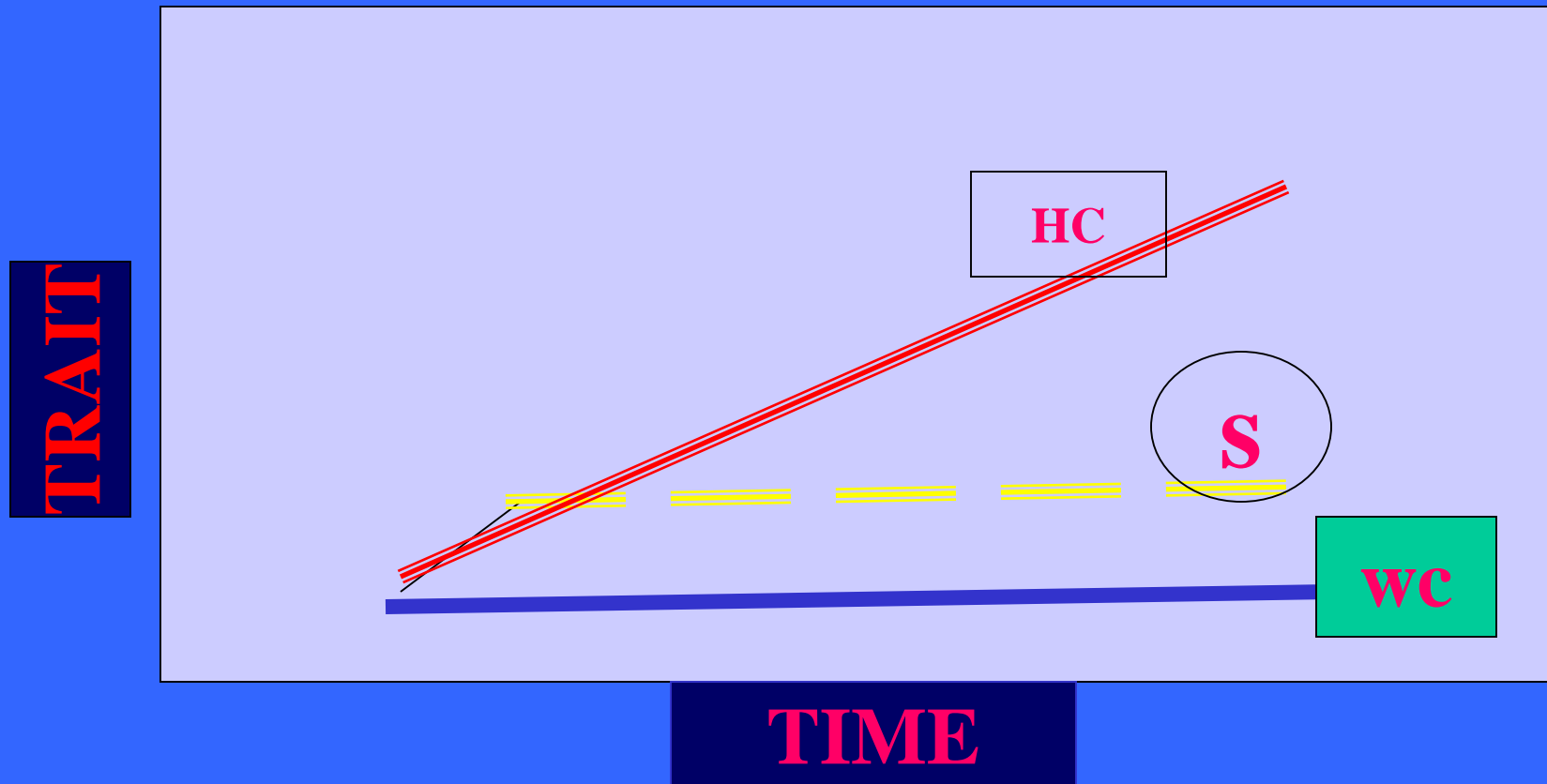


Genetic Research

S, HC, WC



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**



Juvenile Fish Separator DNA Stock Analysis



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**



IMPROVE NATURAL PRODUCTION

3. Maintain Homing and Site Selection

- * Homing to Acclimation Sites**
- * Redd Characterization and Selection**

4. Reproductive Success

- * Laboratory**
- * Spawning Channel**
- * Hatchery & Wild Precocials**

HOMING FIDELITY -Upper Yakima Acclimation Sites







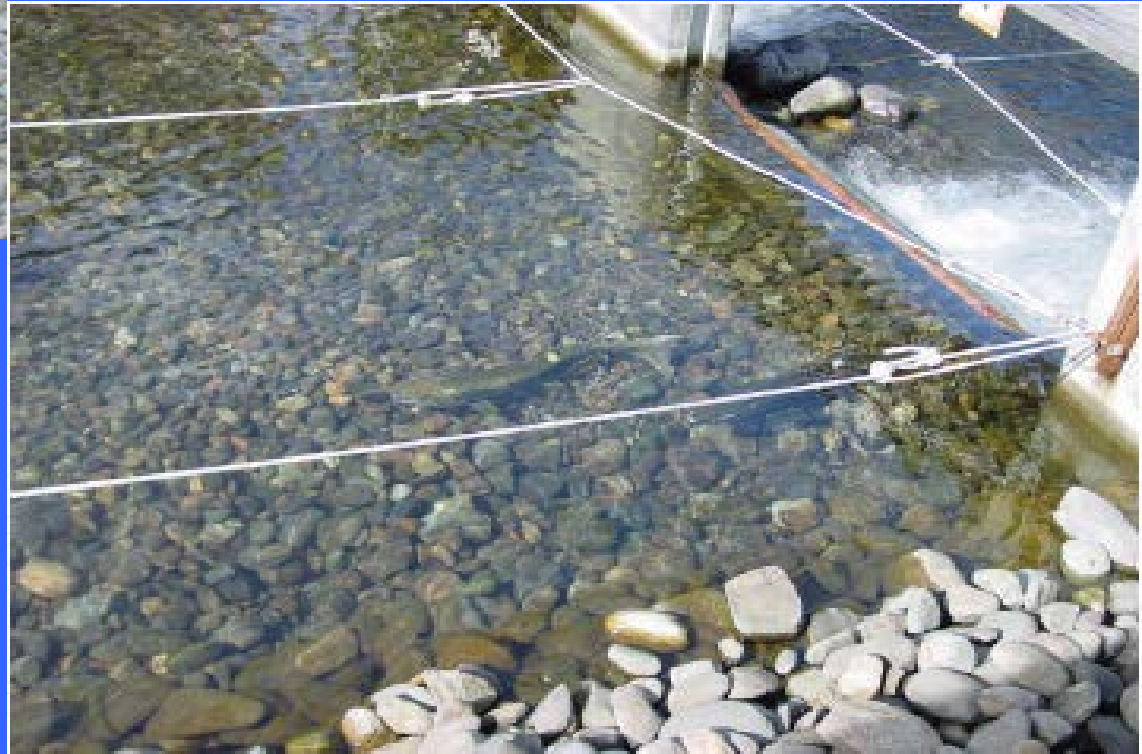
Reproductive Success

Comparative behavioral/reproductive fitness research



Spawning Channel

Measuring
Reproductive
Success



Microsatellite
Pedigree
Analysis





Thursday June 14 – Fish Science

- **Spring Chinook (Cont)**
- **Ecological Interactions**
- **Fish and Bird Predation**
- **Flip Flop – What it is, and What it's Done**
- **Coho Salmon Reintroduction**
- **Fall Chinook Supplementation**
- **Steelhead Stock I.D., Spawner Surveys, Kelts**
- **Bull Trout Abundance and Distribution**
- **Sockeye Reintroduction**
- **Water Storage Updates**

Northern Pike Minnow Predation and Movement

Presented by
Michael Berger, Joe Jay Pinkham
Linda Lamebull

Yakama Nation



Monitoring and Evaluation of Avian Predation on Juvenile Salmonids on the Yakima River, Washington



Ann E. Stephenson
Yakima Klickitat Fisheries Project
Yakama Nation Fisheries

A photograph of a river with a house and trees in the background. The river is in the foreground, and the house is in the background. The text is overlaid on the image.

YKFP Coho Program

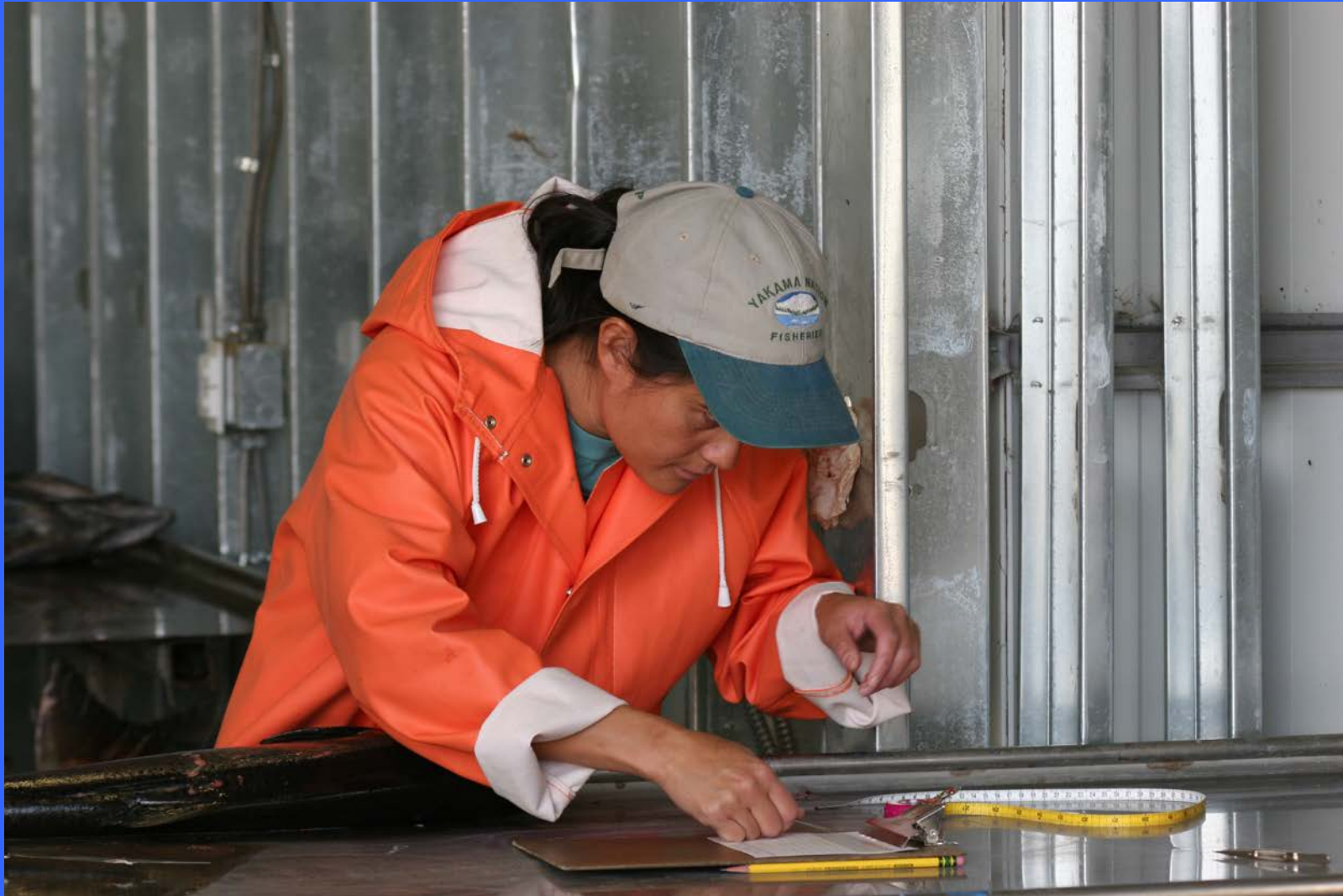
- **Program Goal** - Re-establish self-sustaining naturally spawning population of coho salmon in Yakima River

Phase I: 1999-2003 Completed (Yes, it is possible to re-establish an extinct stock of Coho Salmon)

- **Feasibility**

Phase II: 2006-2010 (Can escapement goals be obtained using an established, fully developed Yakima Basin Coho Stock and, can re-establishment occur in tributaries)

Fall Chinook Supplementation



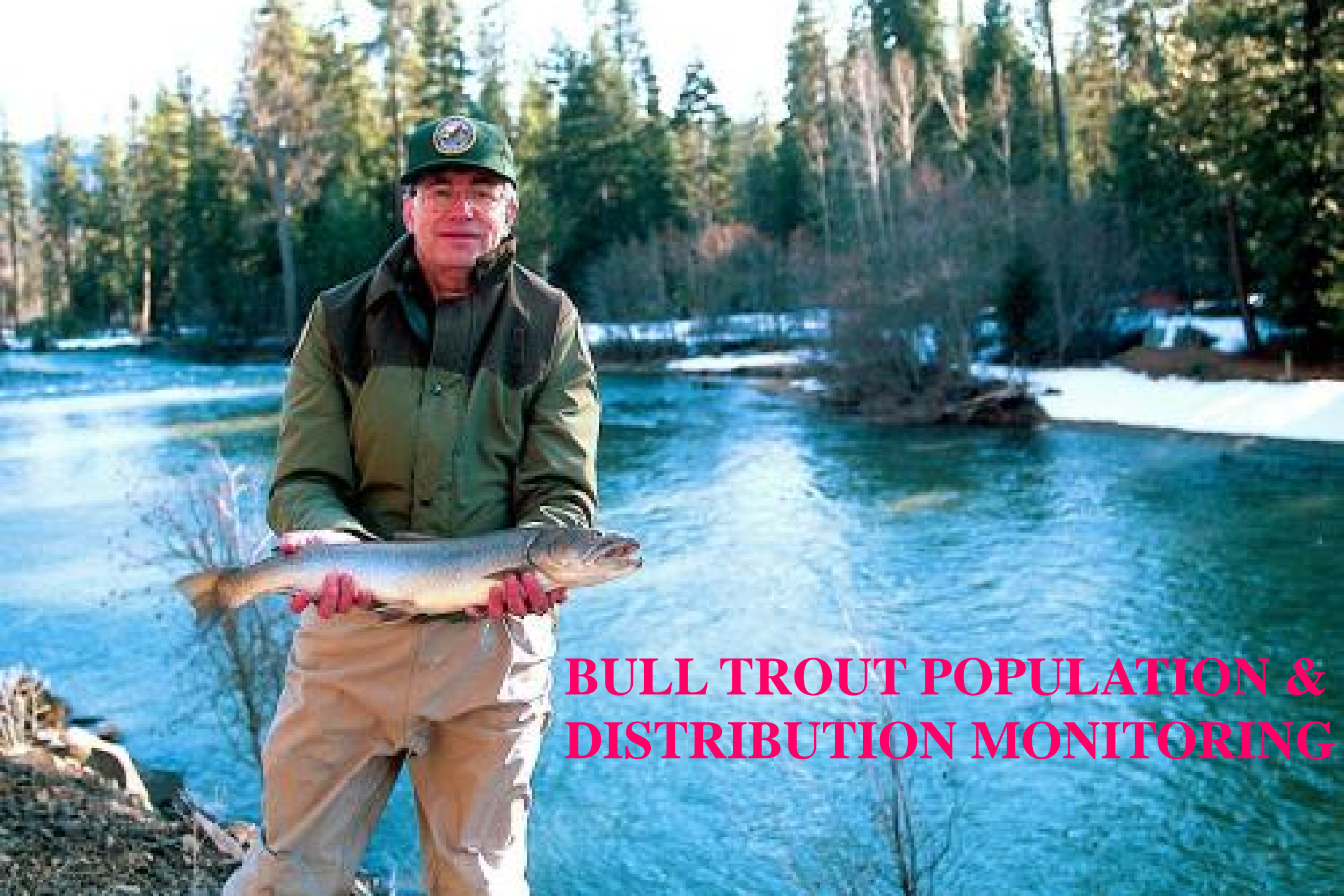
OTHER RESEARCH and HABITAT PROGRAMS:

- 1. Steelhead Kelt Reconditioning**
- 2. Bull Trout Evaluations**
- 3. Habitat Protection and Enhancement**
 - Riparian Restoration**
 - Land Use Planning**
 - Watershed Restoration**
 - Water Trusts & Enhancement**
- 4. Dam Passage**

Reconditioned Kelt - Before and After

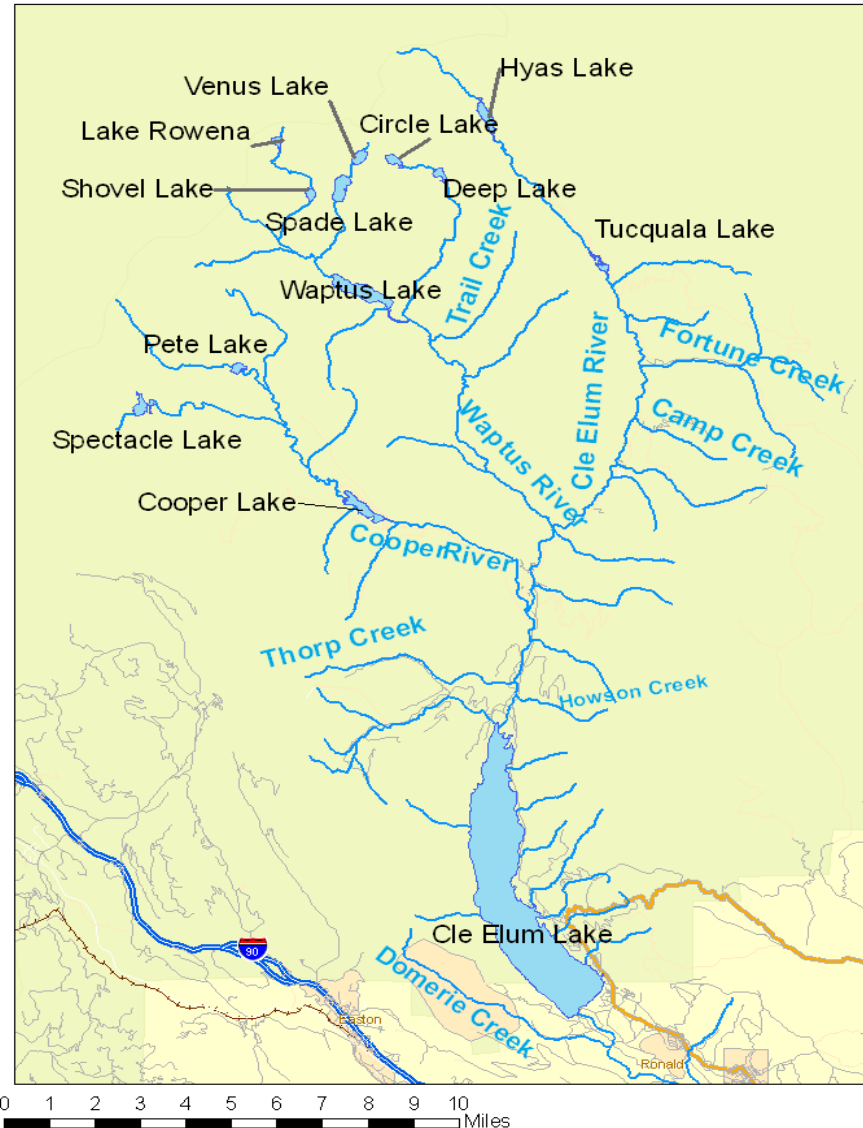






**BULL TROUT POPULATION &
DISTRIBUTION MONITORING**

Lake Cle Elum and Watershed



Cle Elum Dam Passage Study Outfall of Flume into River



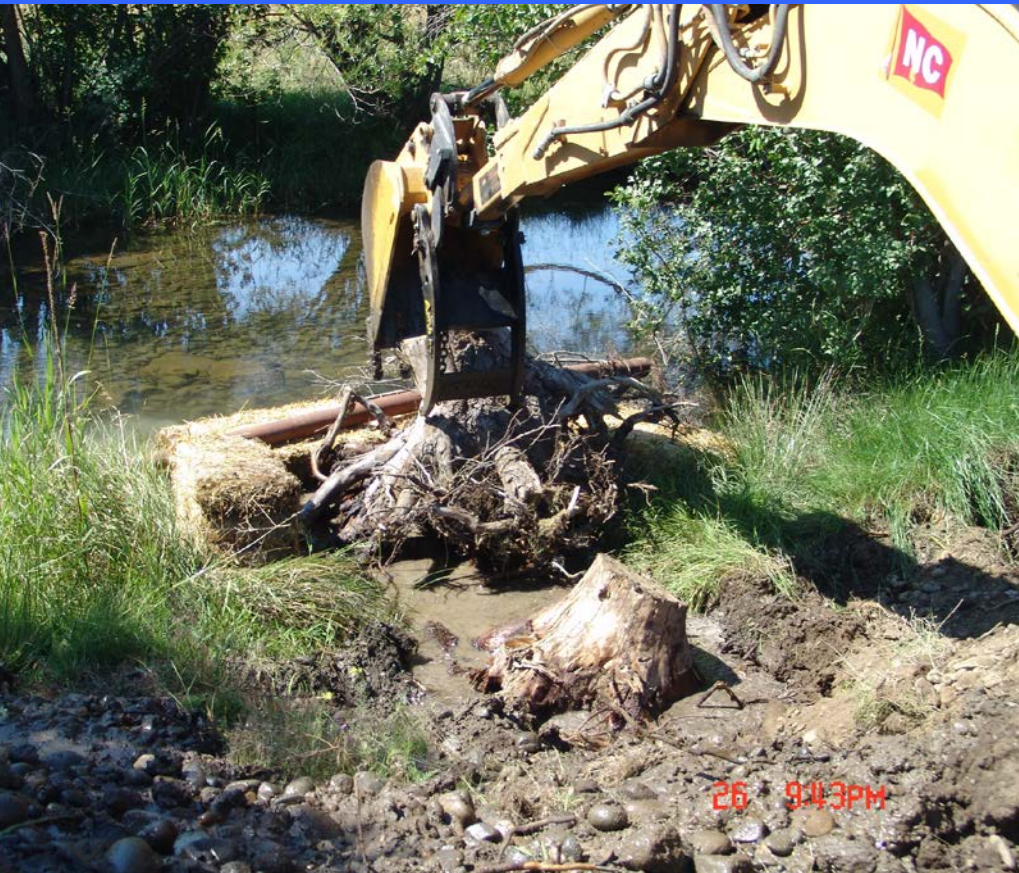
HABITAT ENHANCEMENT IMPROVING CULVERT PASSAGE





Side Channel Restoration

BREACHING DIKES AND LARGE WOOD



Riparian Restoration and Education



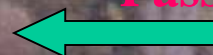


Screen

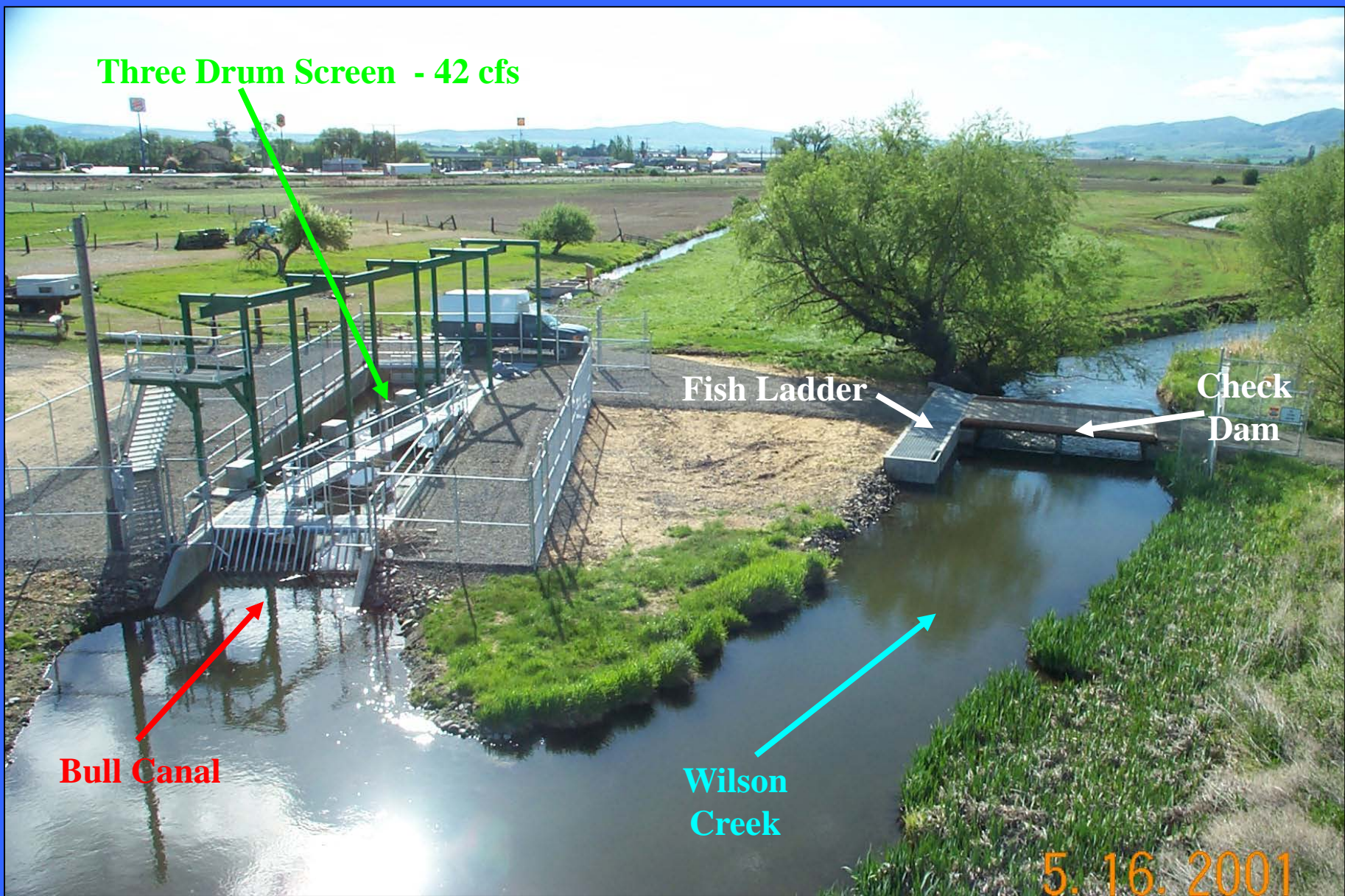


**Bull Ditch and Wilson Creek
Co-mingled Water**

**Diversion Dam
Passage Barrier**



10 25 '99



Three Drum Screen - 42 cfs

Fish Ladder

Check Dam

Bull Canal

Wilson Creek

5.16.2001

**Bull Canal screen at Wilson Creek looking southeast.
This facility was completed during the winter of 2000 – 2001**

Salmon Carcasses & Water Quality



NEW WILDLIFE SECTION

- COUGARS
- SPOTTED OWLS
- ELK



