

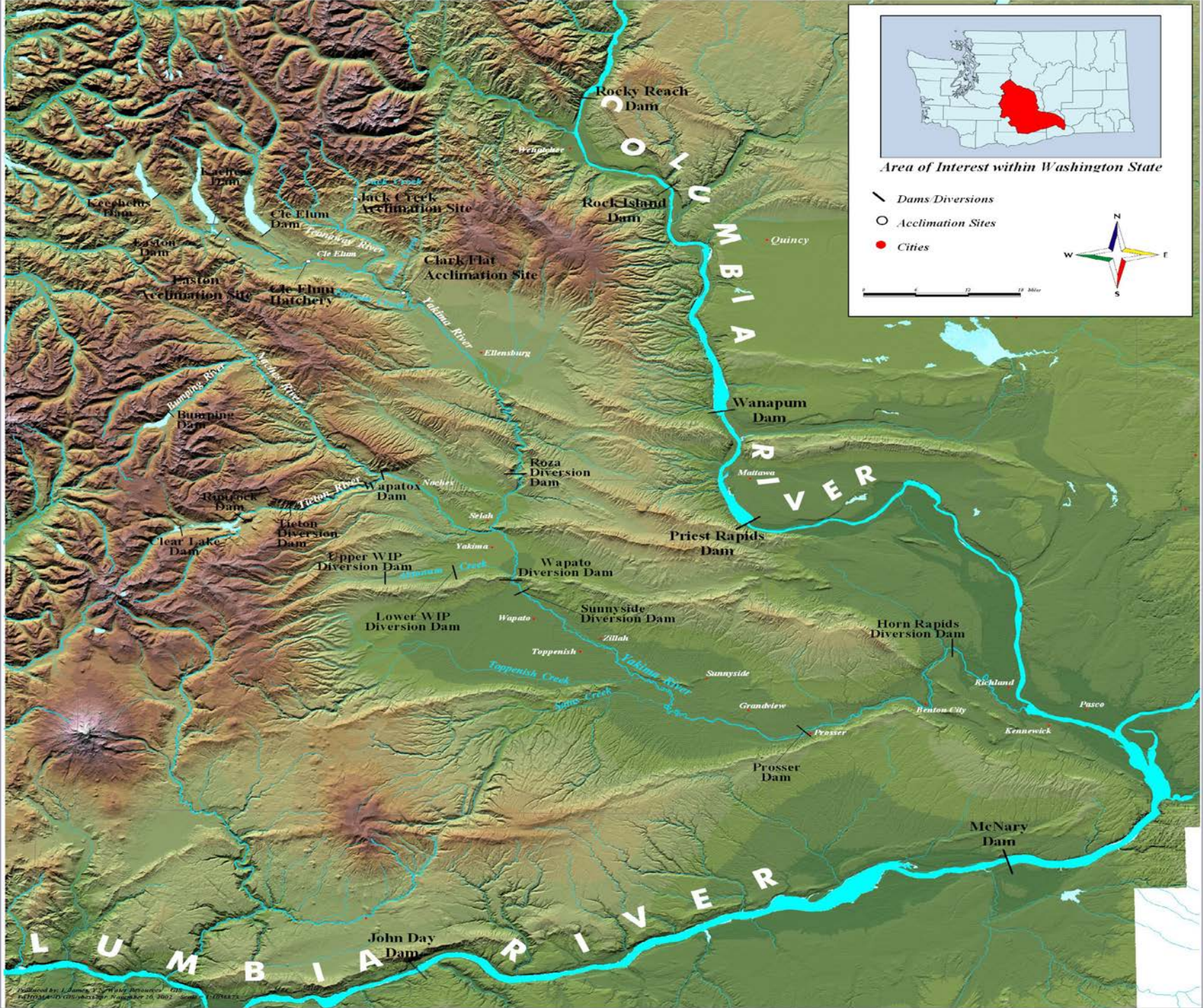
Yakima Basin Science & Management Conference 2006

YKFP CWU BOR

OVERVIEW OF FISHERIES RESEARCH IN THE YAKIMA BASIN

Presented by David Fast

Wednesday June 14, 2006



Area of Interest within Washington State

\ Dams Diversions
 ○ Acclimation Sites
 ● Cities

0 5 10 20 Miles

Published by: L. James, J. M. Kelly, Resources - GIS
 14700 147th Ave SW, Everett, WA 98202

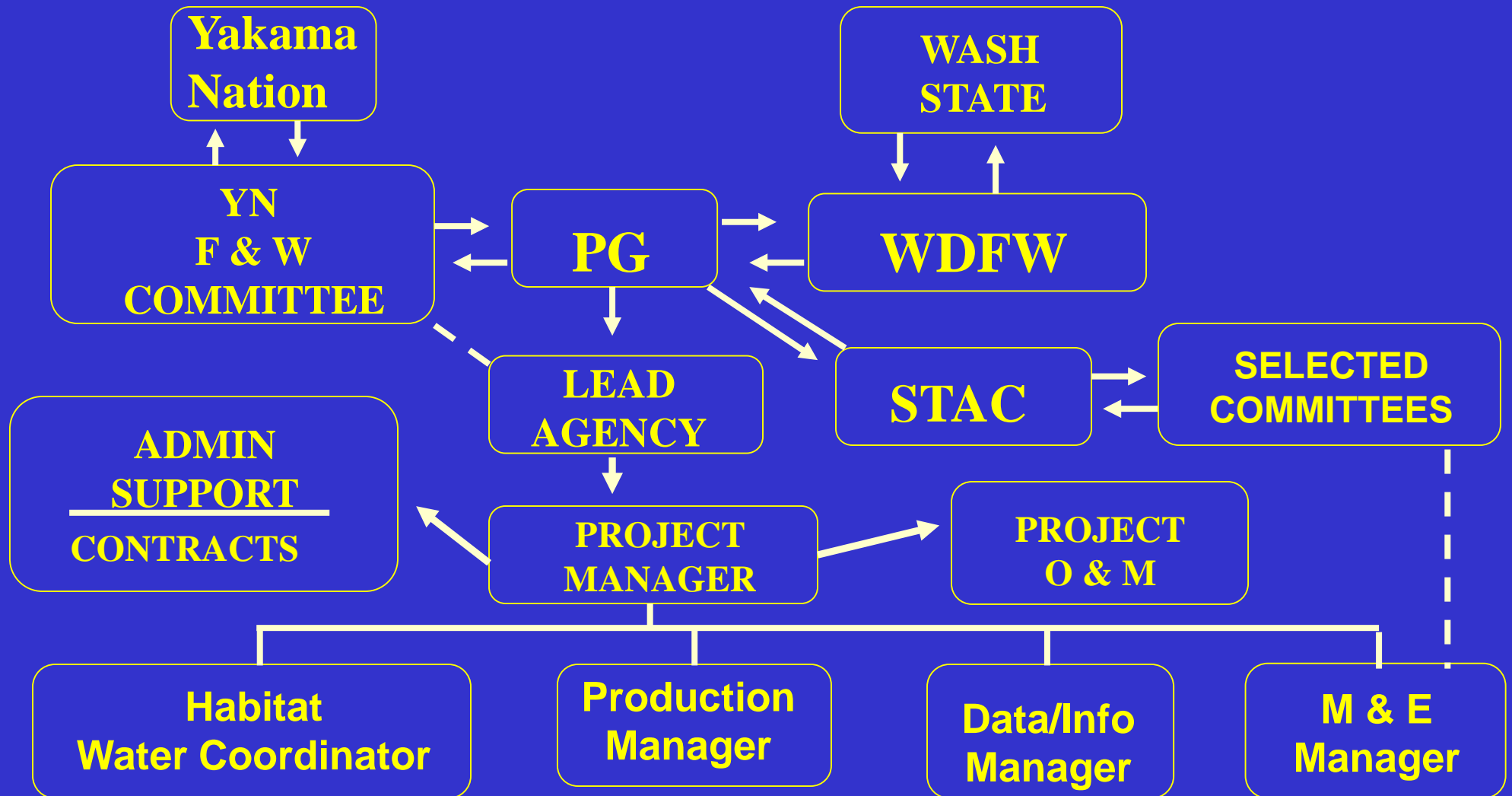
Estimates of Historical Anadromous Fish Runs in the Yakima Subbasin as Compared to Recent Run Size (5-year Average, 2001-2005)

Species/Race	Pre-1900 Run	Recent Average
Fall Chinook	132,000	4,050
Spring Chinook	200,000	13,870
Summer Chinook	68,000	0
Coho	110,000	2,730
Summer Steelhead	80,500	2,890
Sockeye	200,000	0

YAKIMA/KLICKITAT FISHERIES PROJECT (YKFP)

- **MODELING (EDT) NOT TWD, and AHA**
- **SALMON SUPPLEMENTATION AND REINTRODUCTION PROGRAMS**
- **HABITAT ACQUISITION AND ENHANCEMENT PROGRAMS**

Yakima/Klickitat Fisheries Project Management Structure



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 YKFP

- **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!**

IMPROVE NATURAL PRODUCTION

1. Increase Survival

- * Egg to Smolt – Supplementation Culture
- * Outmigrating Smolt Survival
 - Precocial Males
 - Fish Predators
 - Bird Predators
- * Returning Adult Survival
 - Ocean Survival & Productivity
 - Columbia Migration
 - Harvest

**SUPPLEMENTATION GOAL:
MAINTAIN THE LONG-TERM GENETIC
FITNESS OF THE SUPPLEMENTED AND
NATIVE POPULATIONS**

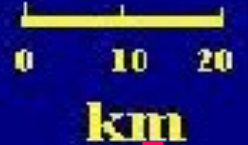
- 1. Monitor Genetic Traits of Fish**
- 2. Conduct Research to Evaluate Domestication Effects of Hatchery**

DOMESTICATION RESEARCH

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

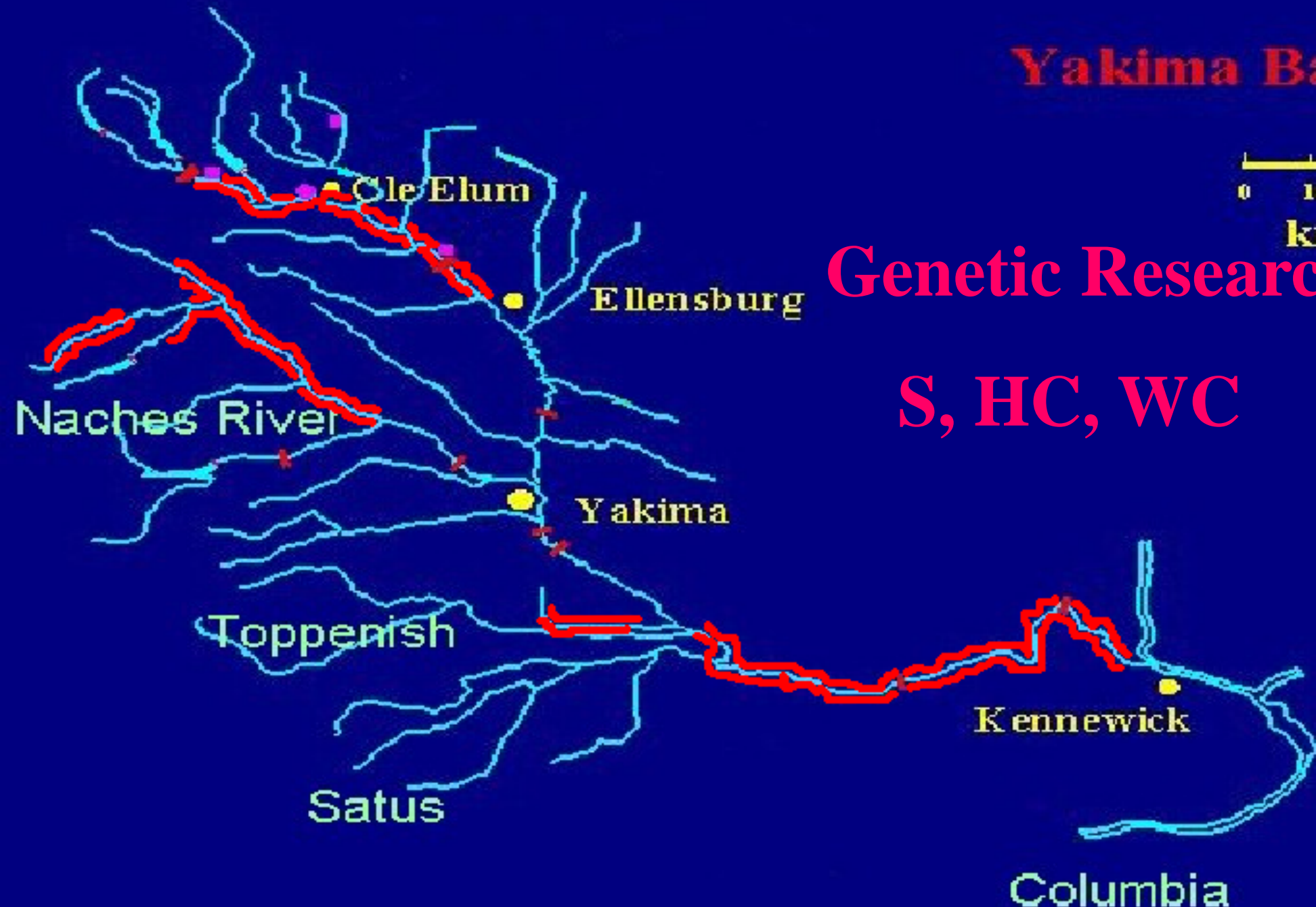
Potential to evaluate the level of domestication that is occurring in the YKFP Supplementation Line (S) and compare to the Hatchery Control Line (HC) of traditional hatcheries as well as an unsupplemented population (W).

Yakima Basin

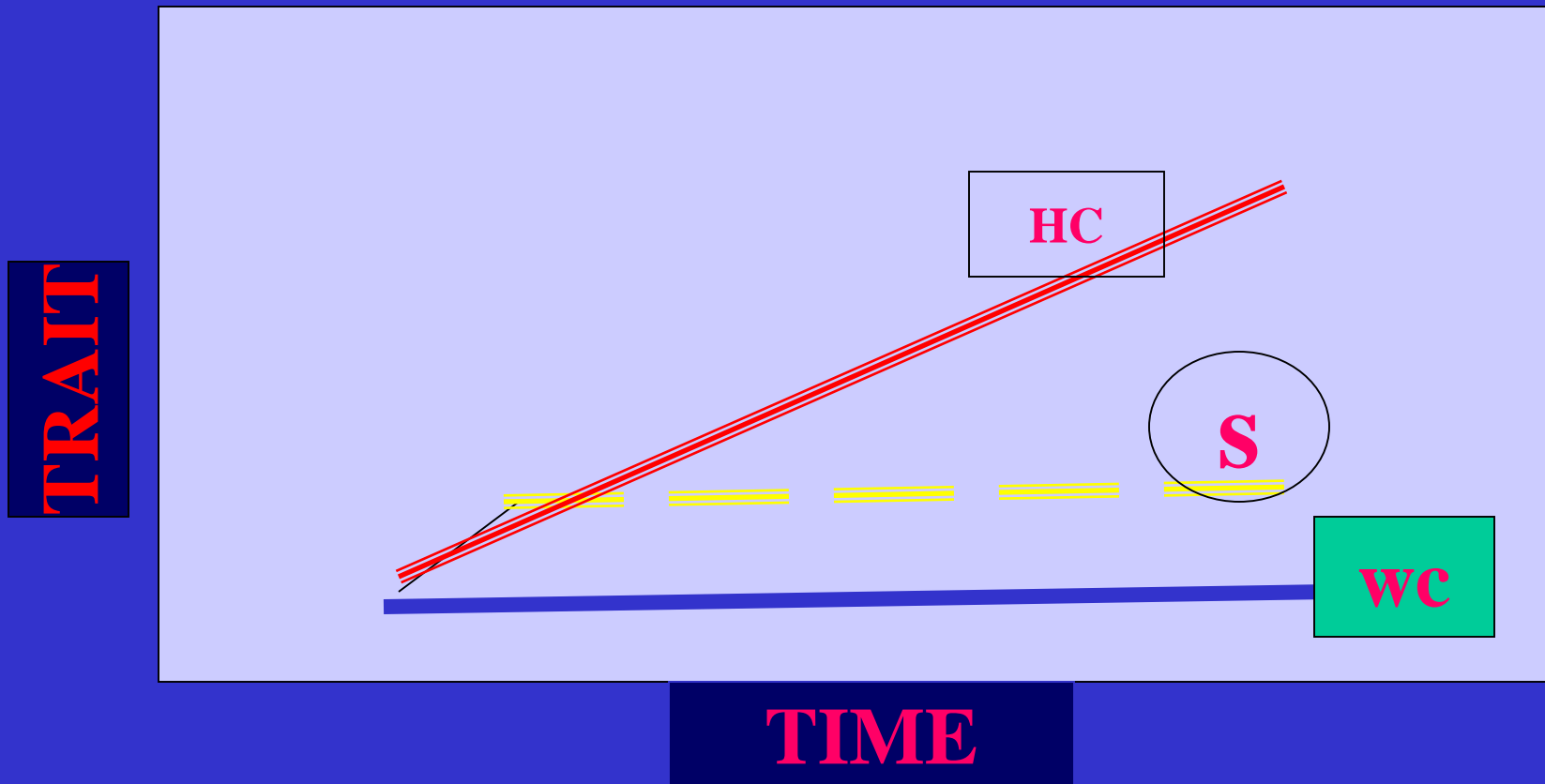


Genetic Research

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**

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**

HOMING FIDELITY -Upper Yakima Acclimation Sites







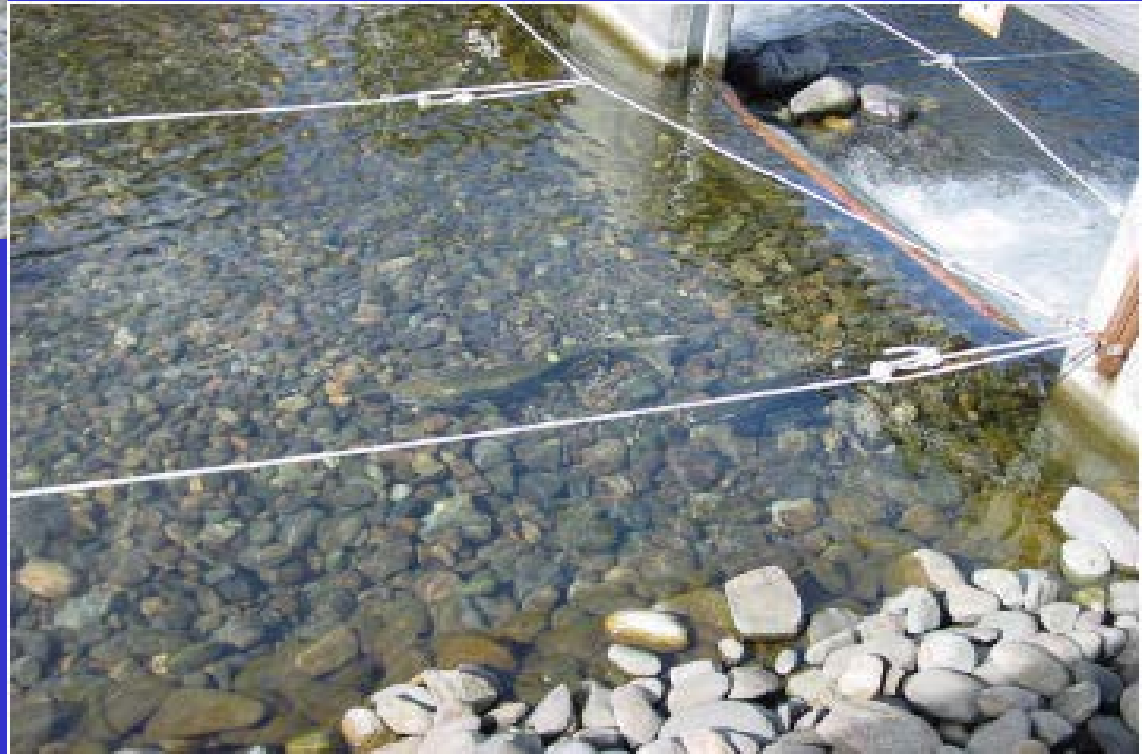
Reproductive Success

Comparative behavioral/reproductive fitness research



Spawning Channel

Measuring
Reproductive
Success



Microsatellite
Pedigree
Analysis





Thursday June 15 – Fish Science

- **Spring Chinook (Cont) – Precocious Males**
- **Ecological Interactions**
- **Fish and Bird Predation**
- **Coho Salmon**
- **Fall Chinook**
- **Steelhead**
- **Bull Trout**
- **Sockeye**

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 and trees are in the background. The text is overlaid on the image.

YKFP Coho Program

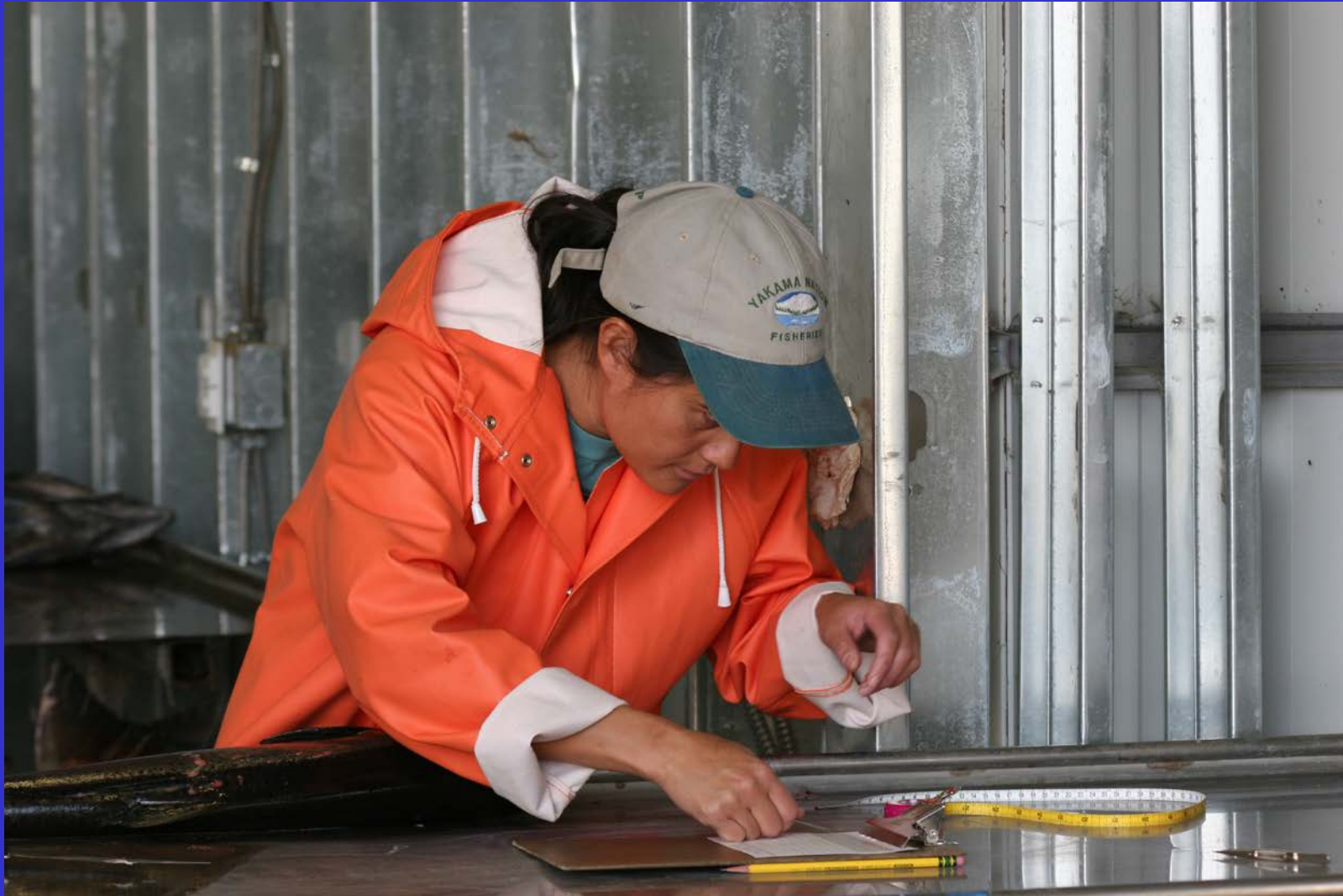
- **Program Goal** - Re-establish self-sustaining naturally spawning population of coho salmon in Yakima River

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 PROGRAMS:

- 1. Steelhead Kelt Reconditioning**
- 2. Bull Trout Evaluations**
- 3. Habitat Protection and Enhancement**
- 4. Dam Passage**

Kelt Pictures Before and After





HABITAT ENHANCEMENT IMPROVING CULVERT PASSAGE



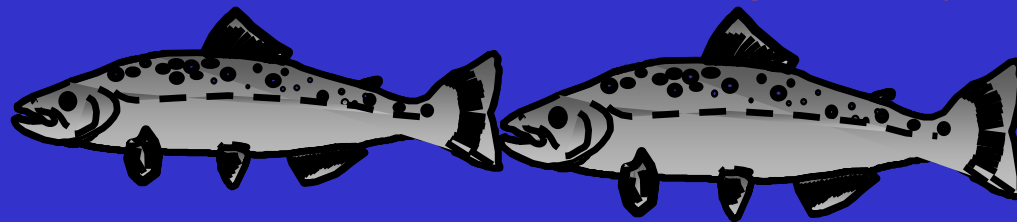
Cle Elum Dam Passage Study Outfall of Flume into River



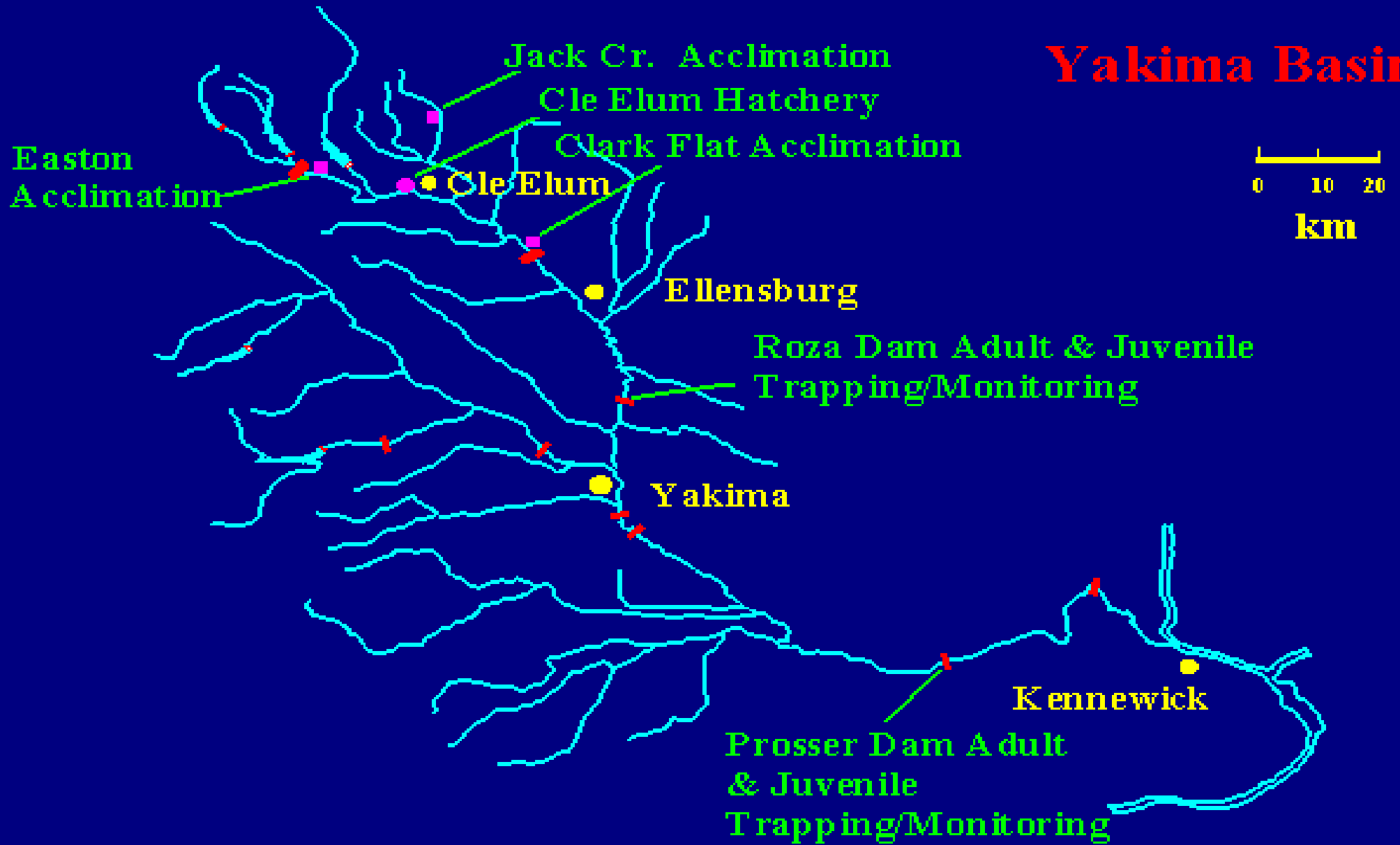
Cle Elum Supplementation & Research Facility

OCT/SNT Rearing and
Smolt Survival Status

David Fast, Charles Strom, Mark Johnston, David Lind,
Curtis Knudsen, Steve Shroder, Doug Neeley & Bill Bosch



Yakima Basin





MISSION OF FACILITY

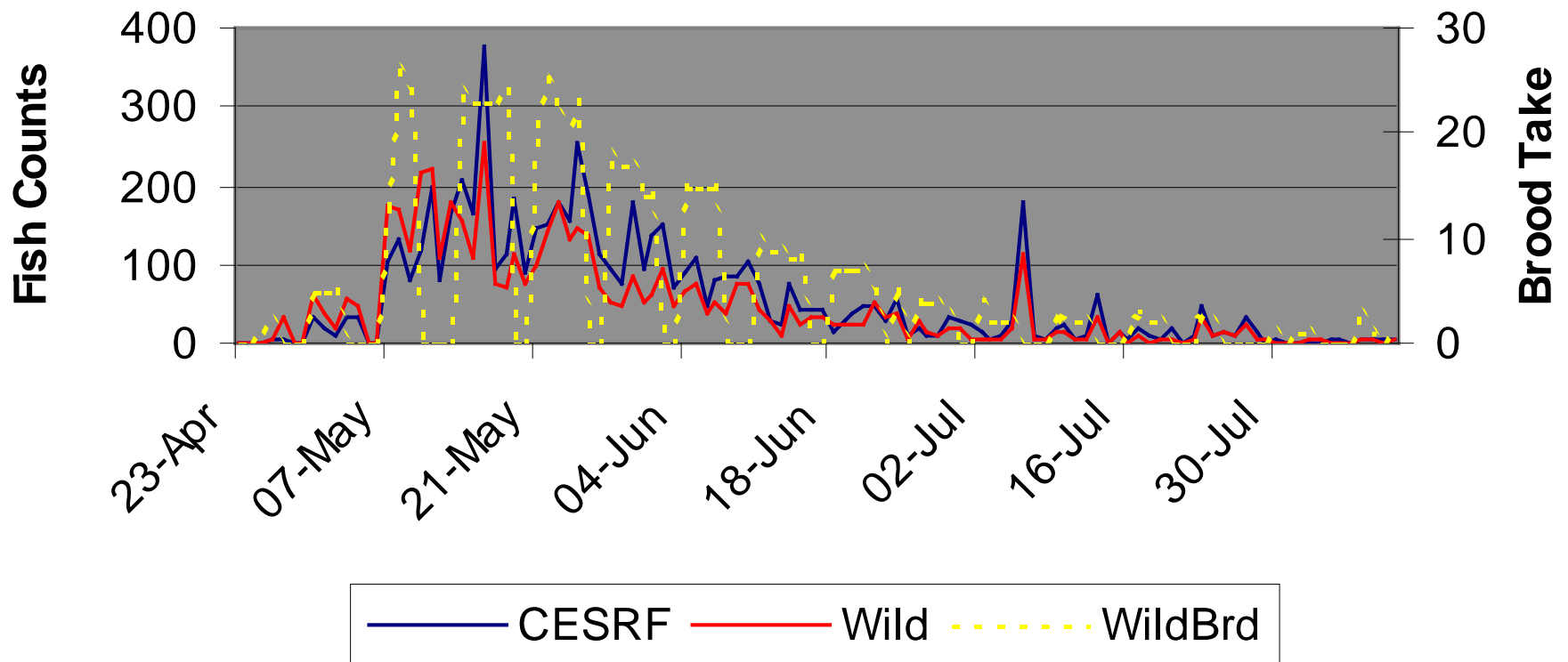
- **Collect Broodstock**
- **Enumerate Spawning Escapement**
- **Monitor Characteristics of Escapement (age, length, weight, DNA,)**
- **Enumerate Hatchery Returns (by Treatment, Acclimation Site and Brood Year)**



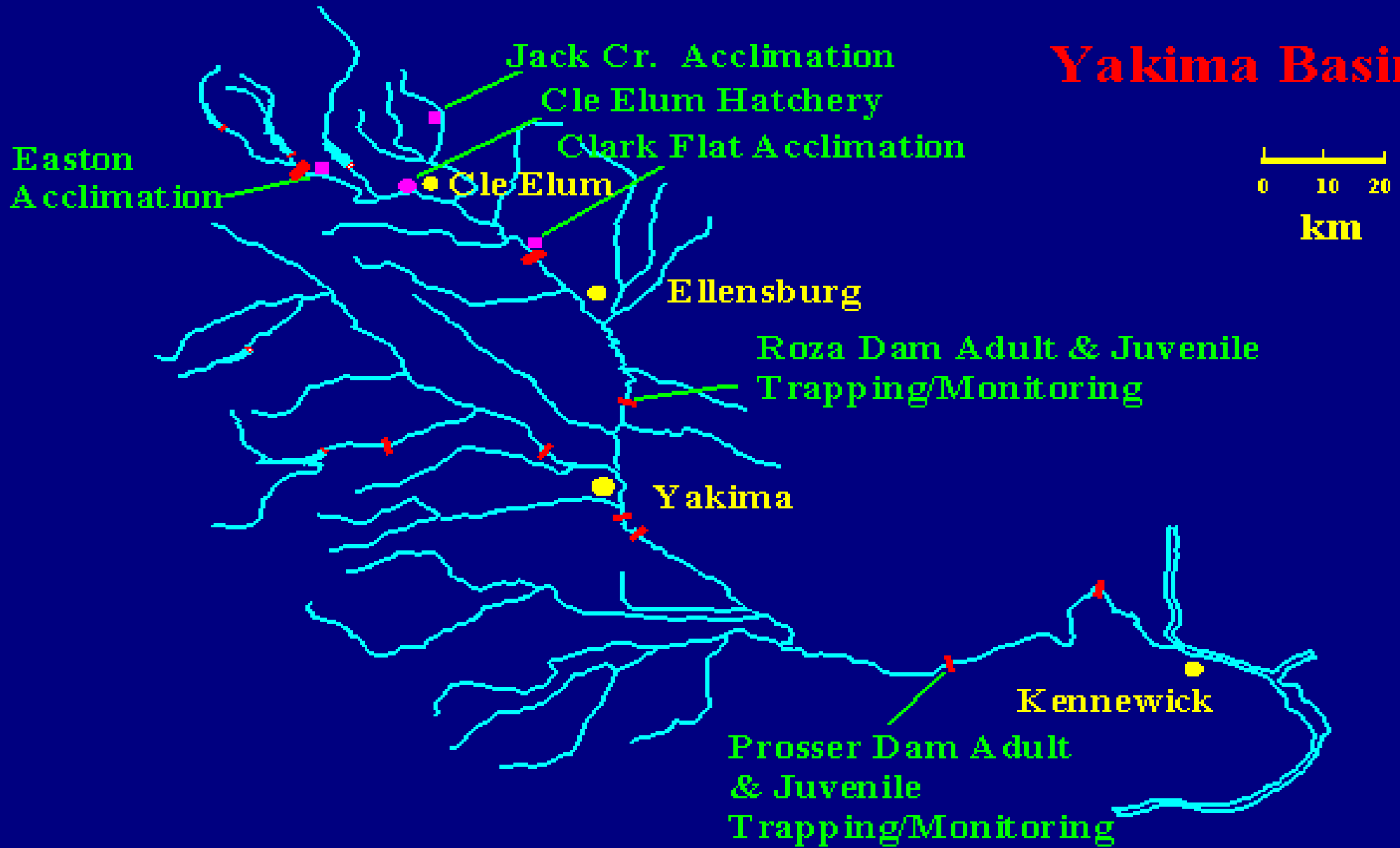
BROODSTOCK COLLECTION GENETIC GUIDELINES

- **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)**

Spring Chinook Run Timing at Roza, 2001



Yakima Basin





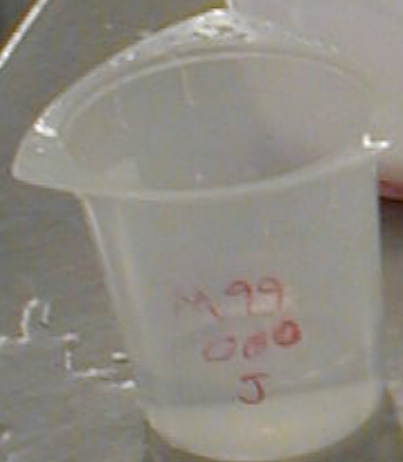
P# No. EL

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**



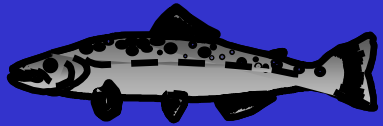




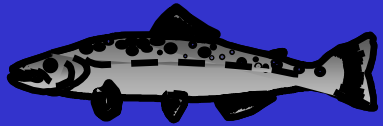


Cle Elum

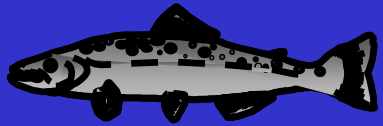
PIT Tagging Operation



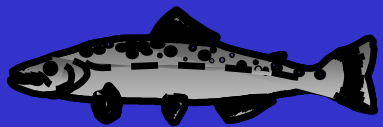
134 KHz (ISO) Tags



**Tagged ~ 5.6% Fish per Raceway
(~ 2,225 per Raceway)**



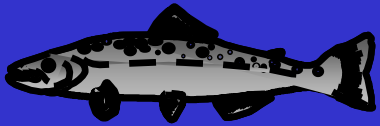
40,000 Fish PIT tagged



**Selected 40,000 Total Marked to
Rigorously Estimate Smolt-to-Adult
Survival Rates.**

Cle Elum

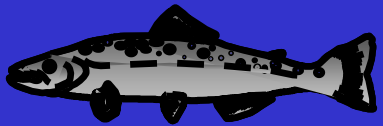
PIT Tagging Operation



Tagged ~ 5.6% Fish per Raceway
(~ 2,225 per Raceway)

40,000 Fish PIT tagged

CWT and Elastomer Marking Operation



Raceway Specific Binary Codes
100% Fish Marked

All Adipose fin clipped

PIT tagged fish snout tag

All 18 raceways body CWT & Elastomer





Upper Yakima River Basin



↑
North



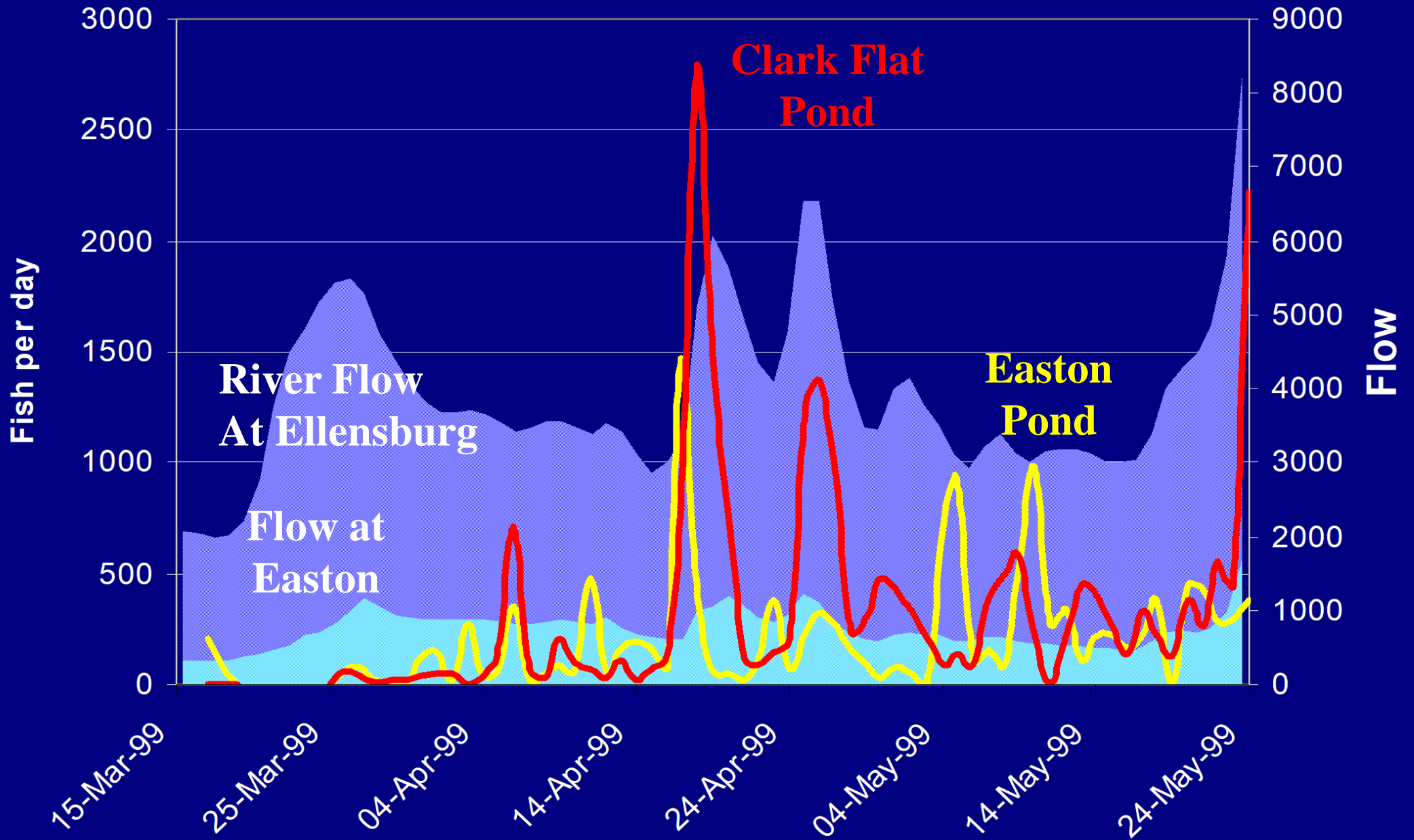




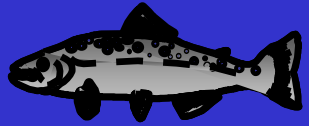
PIT-Tag data transfer

- 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.

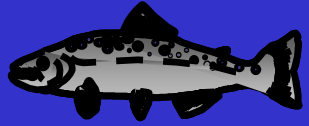
Volitional Releases and River Flows 1999



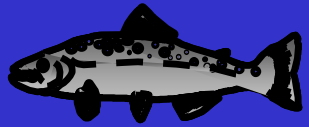
Hatchery Fish Performance will be Measured in Four Areas



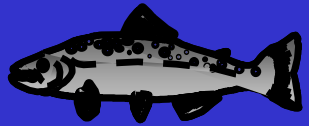
Post-release Survival (smolt release to adult)



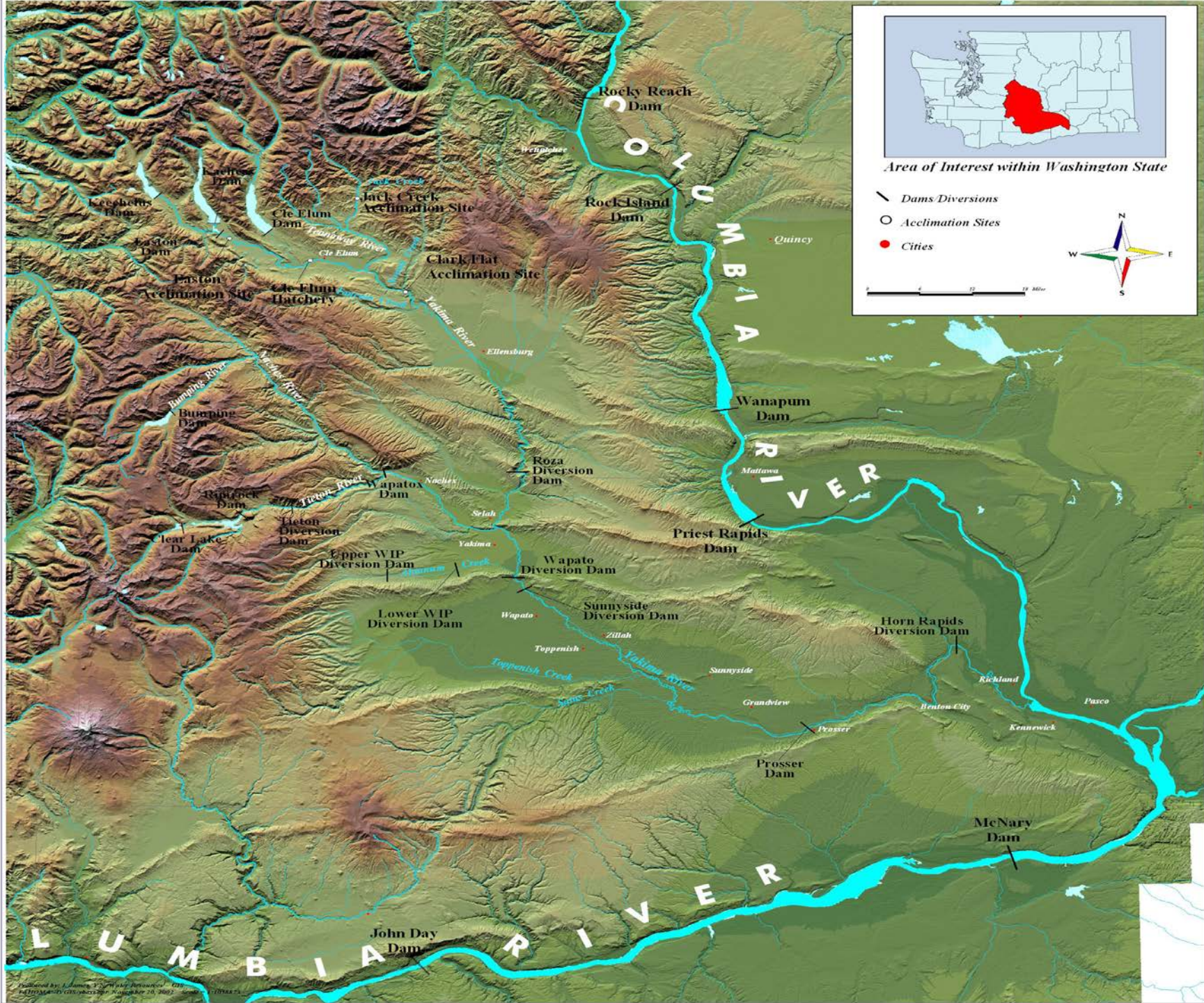
Reproductive Success (smolts/spawner)



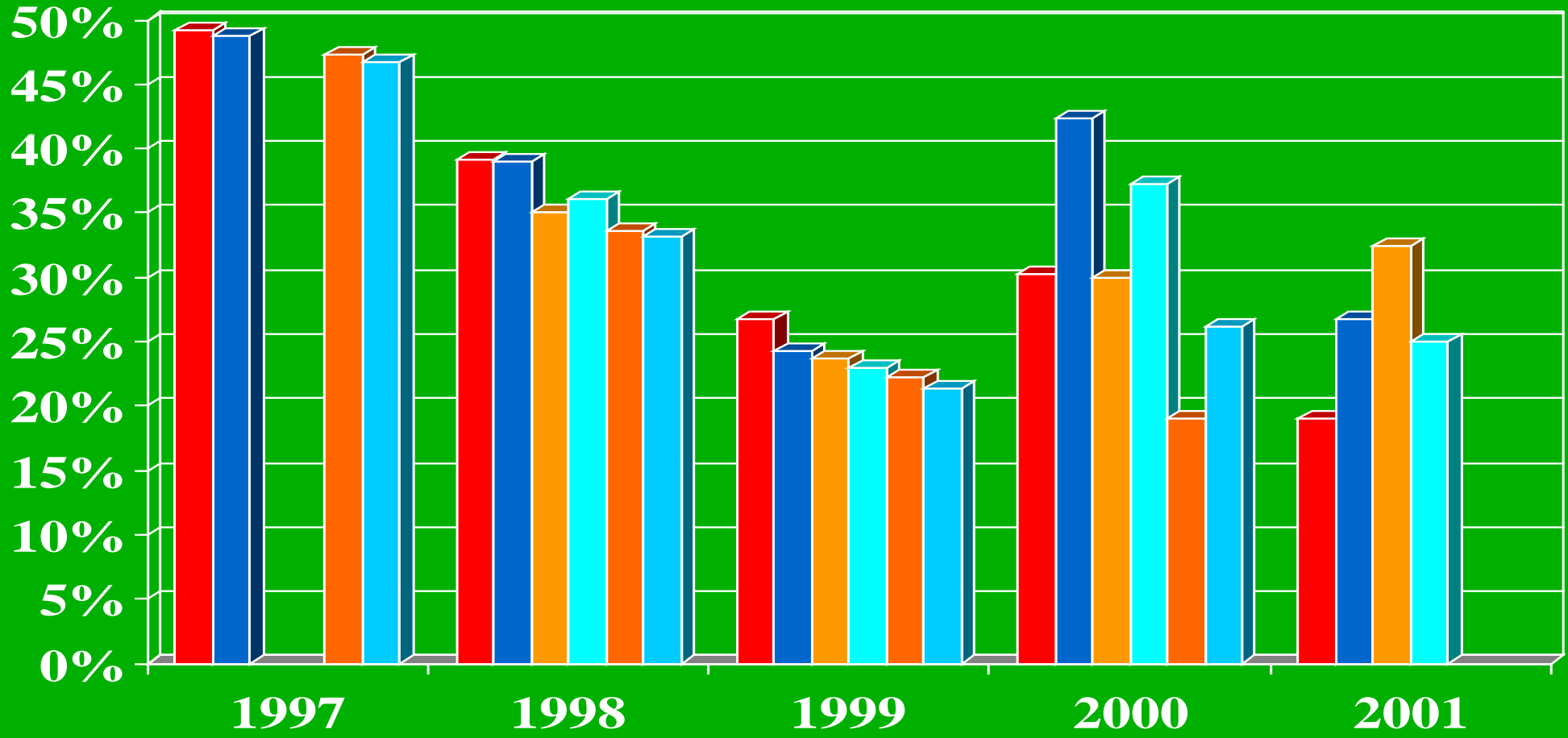
Long Term Fitness (genetic diversity and long term stock productivity)



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

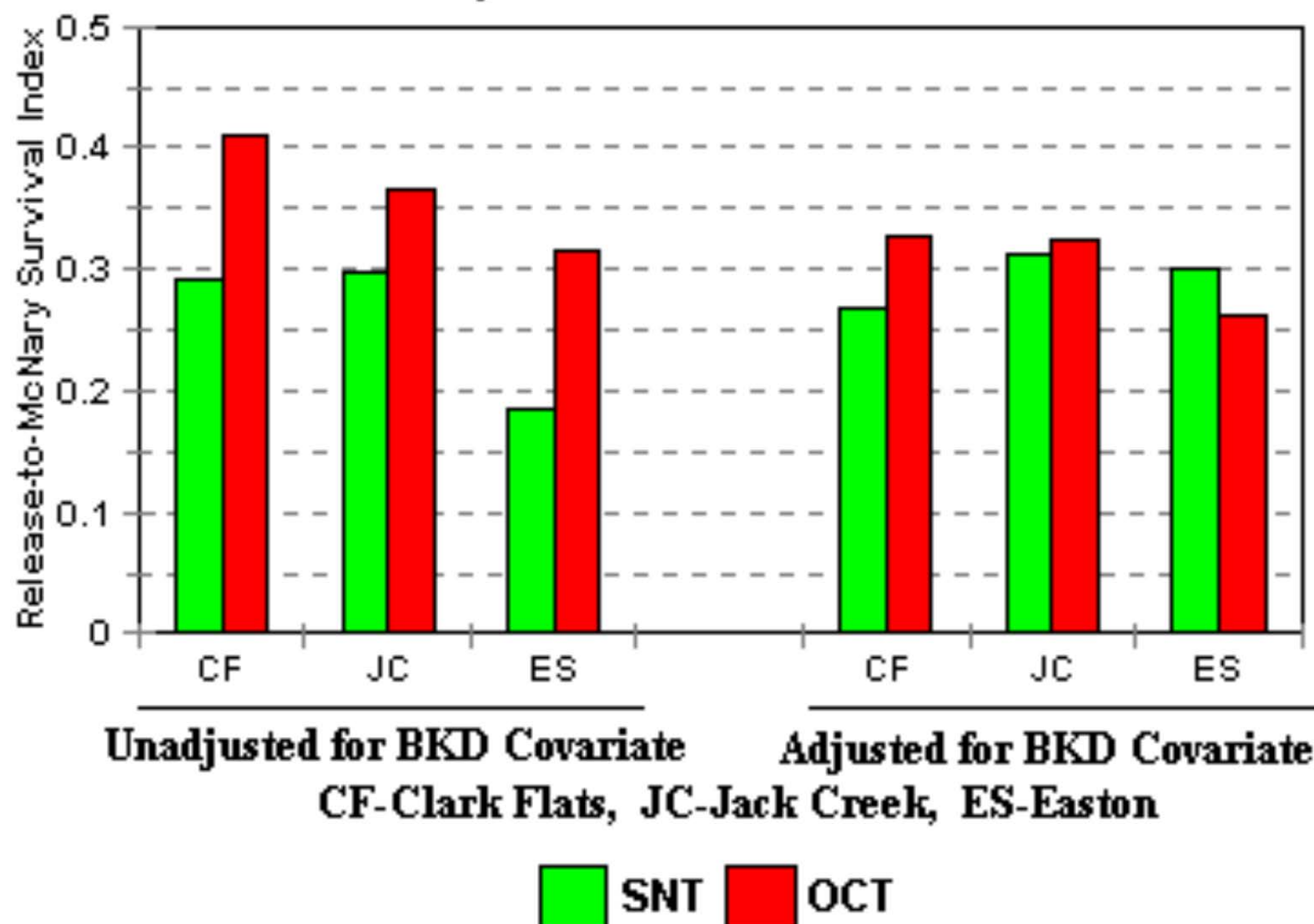


Outmigrant SNT and OCT Treatment Release-to-McNary-Dam Survival Indices within Sites for Brood-Years 1997 through 2001 (1999 through 2003 Outmigrants)



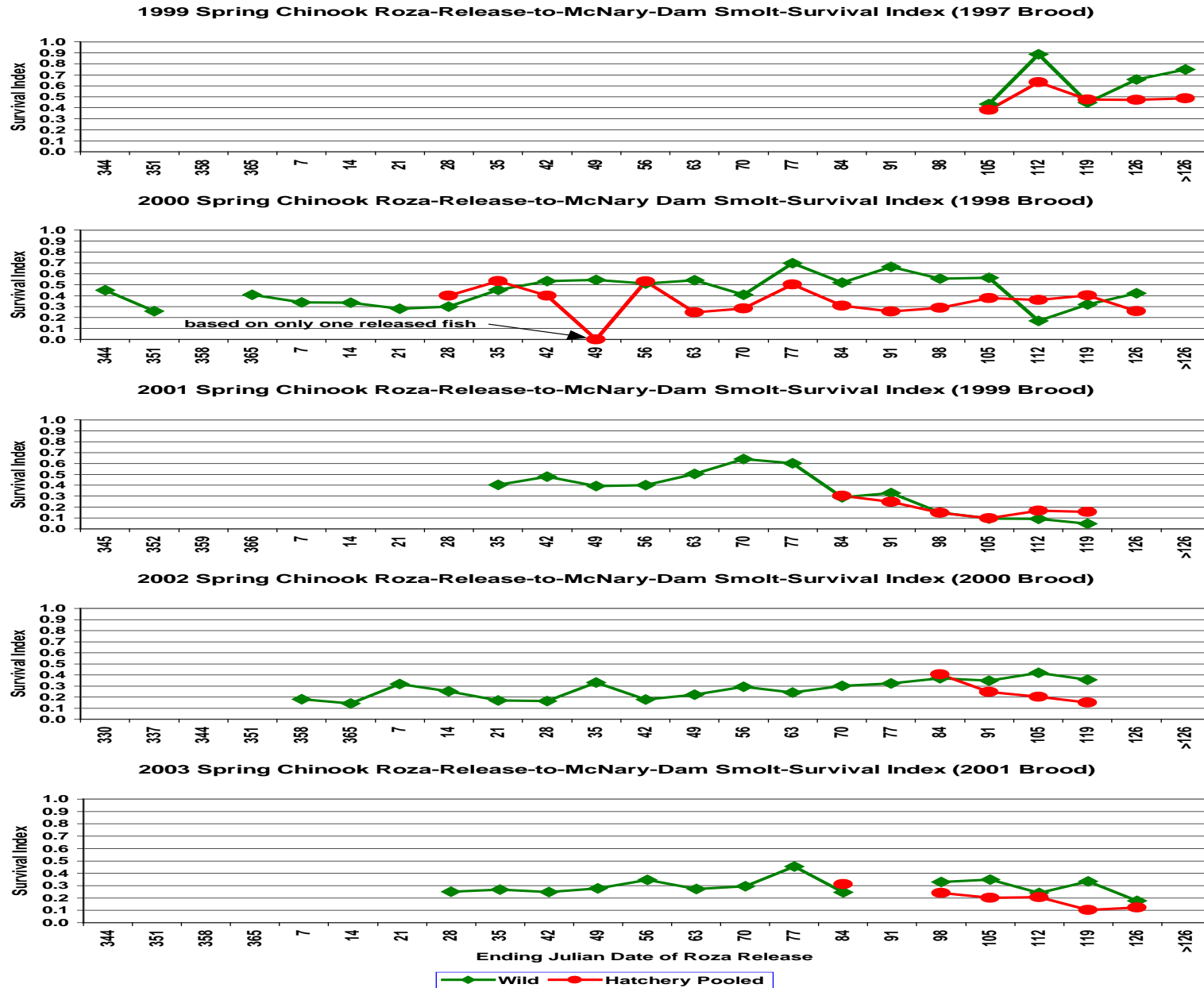
■ CF SNT
 ■ CF OCT
 ■ JC SNT
 ■ JC OCT
 ■ Ea SNT
 ■ Ea OCT

2000 Brood Survival Indices Unadjusted and Adjusted for BKD Covariate





Wild and Hatchery Smolt Survival Indices From Roza Dam to McNary



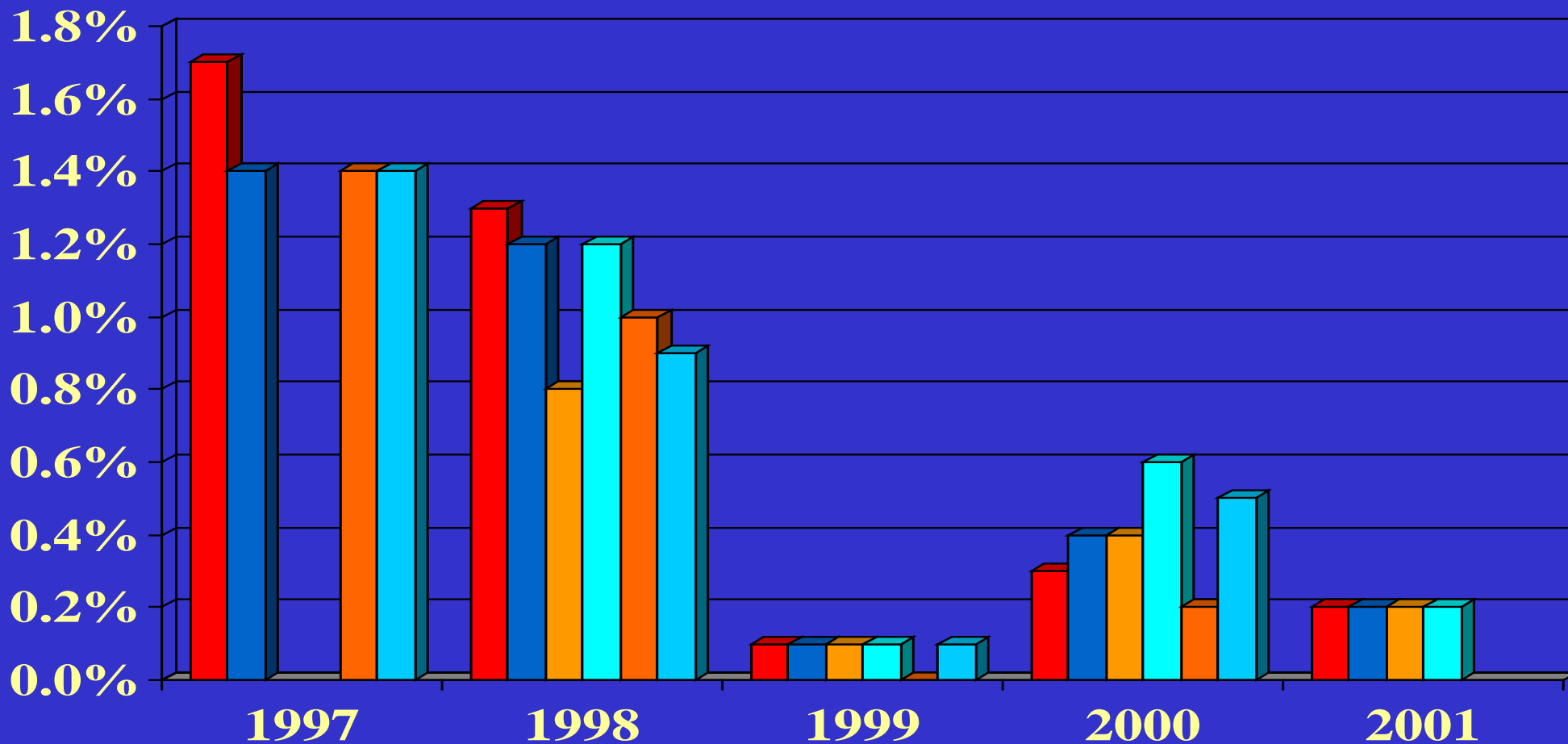
ADULT RETURNS

PIT Tag Interrogation

Roza Dam

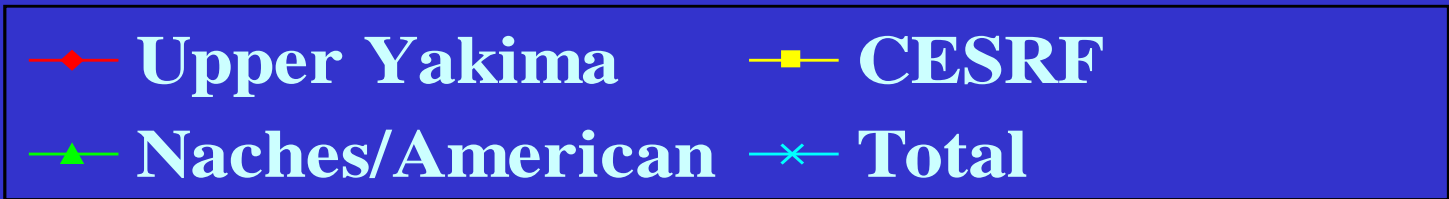
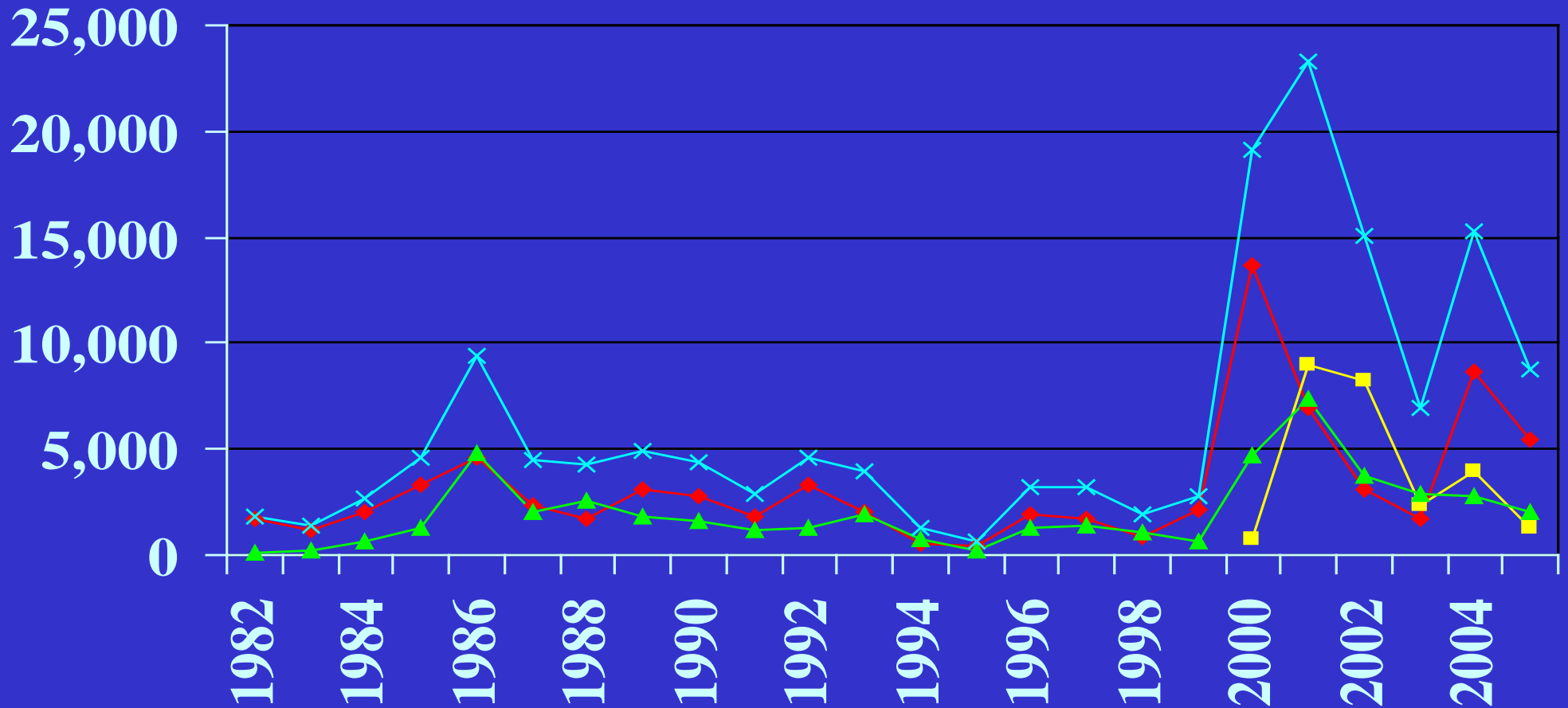


Adult SNT and OCT Treatment Survival Indices within Sites for Brood-Years 1997 through 2001 (2000 through 2005 Adult Returns)

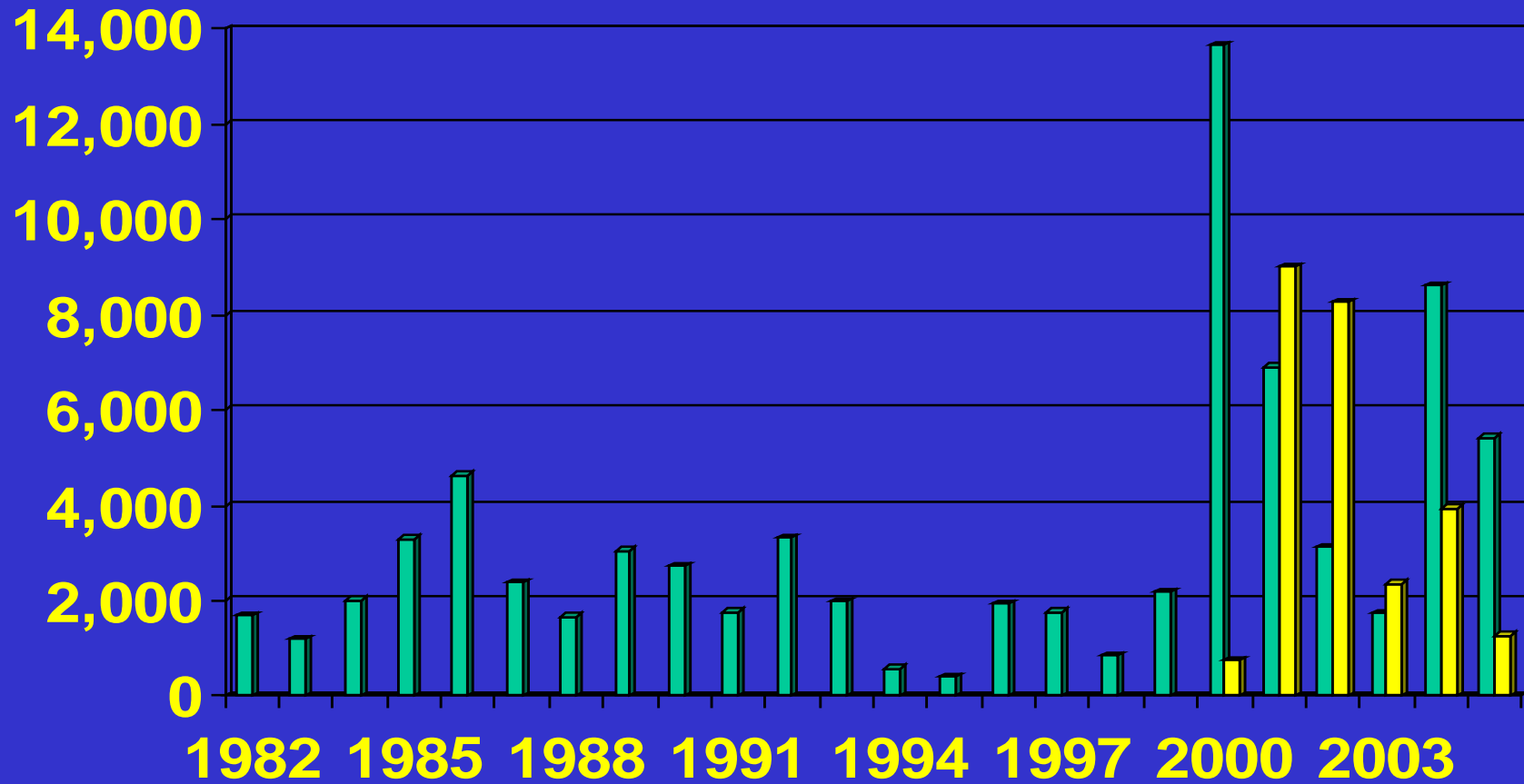


■ CF SNT
 ■ CF OCT
 ■ JC SNT
 ■ JC OCT
 ■ Ea SNT
 ■ Ea OCT

Yakima River Spring Chinook by Stock, 1982 - Present

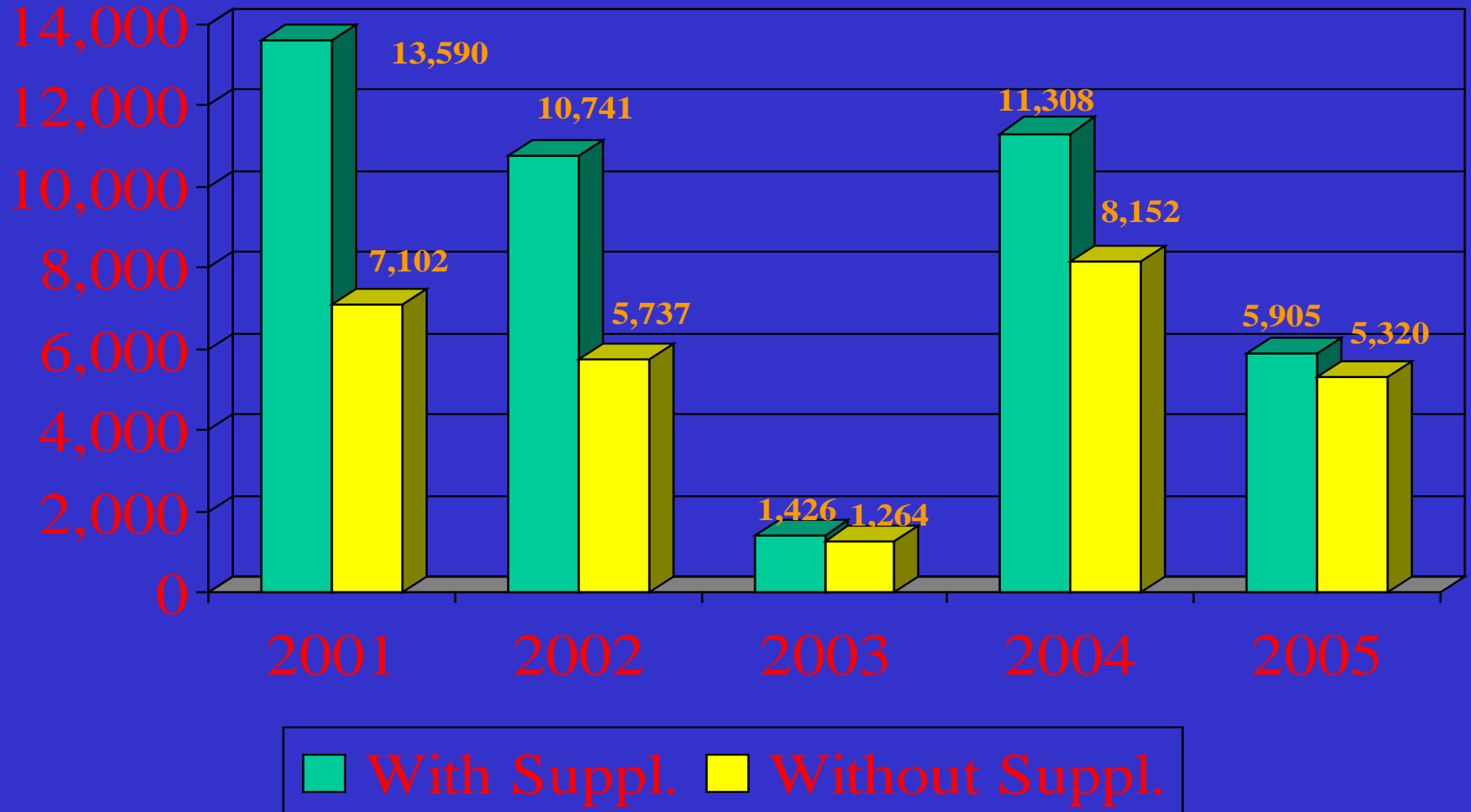


Upper Yakima Spring Chinook Returns, 1982 – 2005

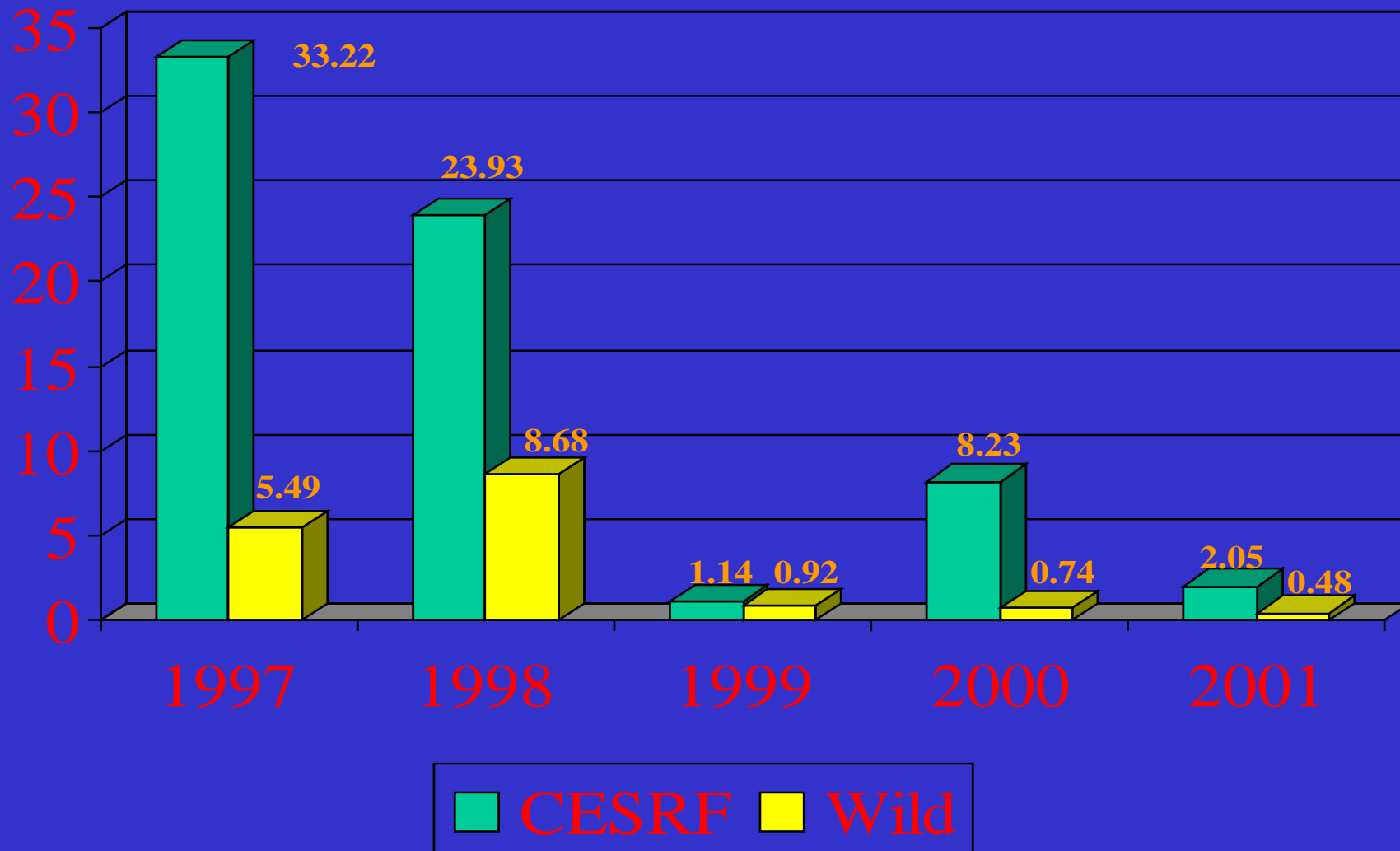


Wild **Supplementation**

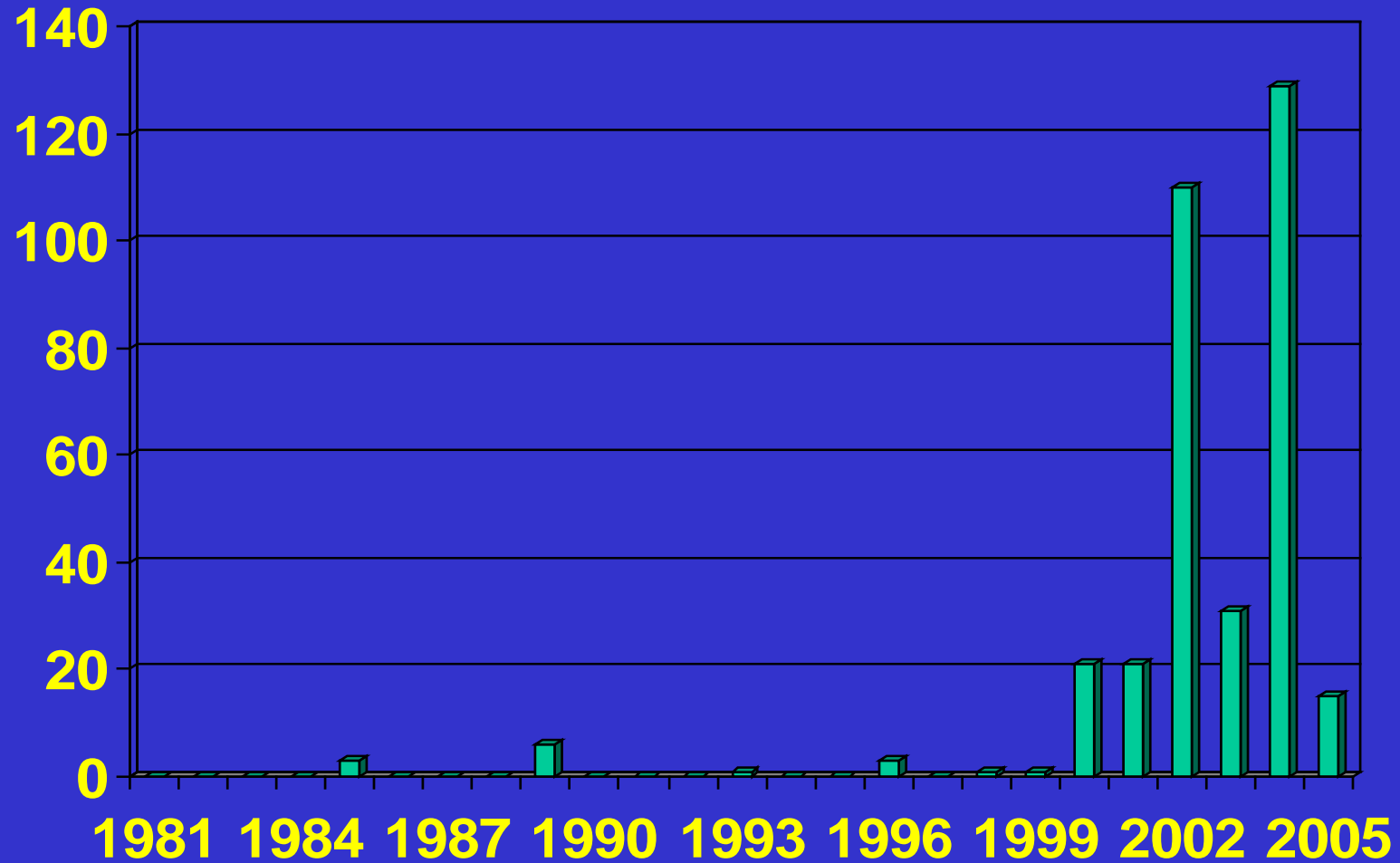
Upper Yakima Spring Chinook Age 4 Returns with and without Supplementation



Upper Yakima Spring Chinook Return-per-Spawner rates Brood Years 1997-2001



Teaway R. Spring Chinook Redd Counts, 1981 - 2005



YKFP

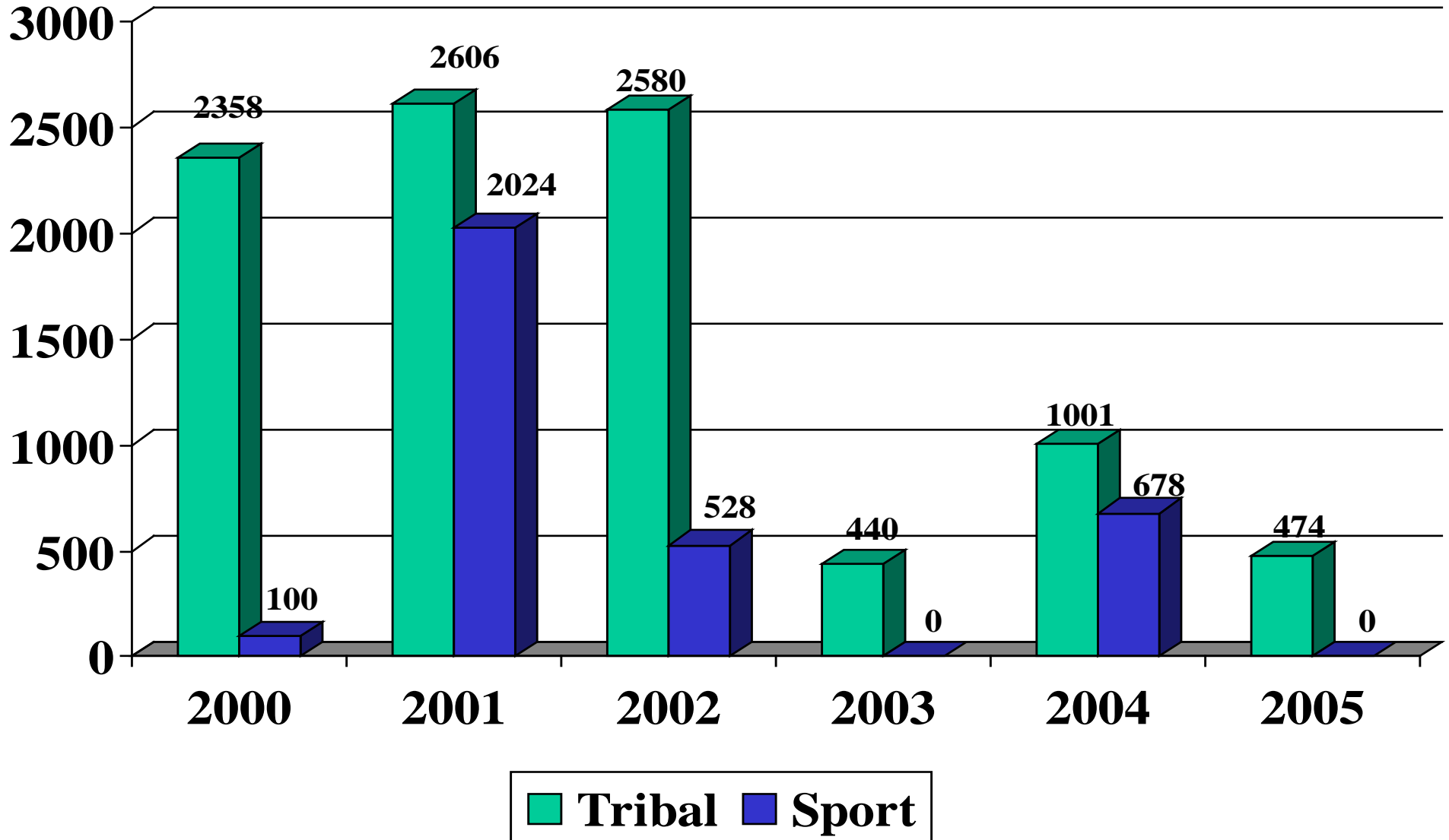
Spring Chinook Supplementation Project

**Enhanced the tribal subsistence
And ceremonial fisheries**

&

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

Yakima Spring Chinook Harvest





YAKAMA NATION
FISHERIES

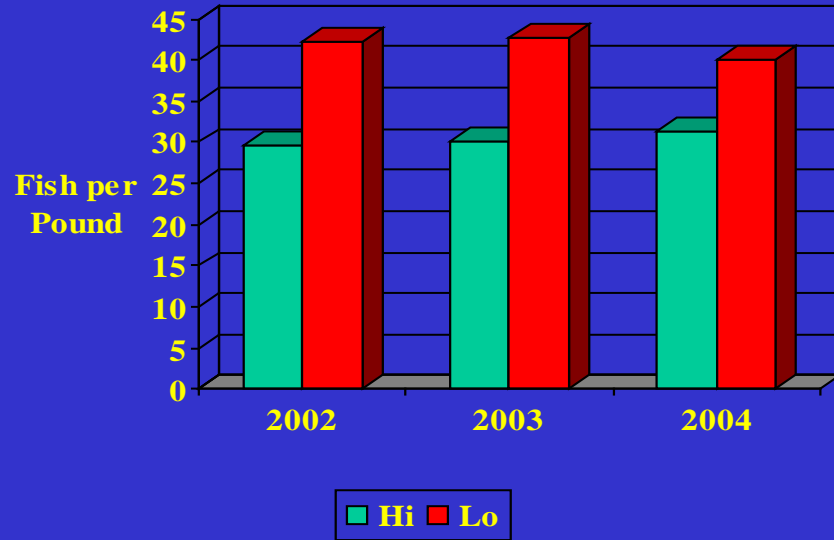


Current Hi-Low Study – Survival vs. Precocialism

- 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.

HI / LO Growth Treatment

Size at Release



Survival to McNary

