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July 6, 2016

MEMORANDUM

TO: Fish and Wildlife Committee members

FROM: Kendall Farley

SUBJECT: Panel Presentation on Salmon Recovery in Washington

Presenters: Jim Unsworth, Director, Washington Department of Fish and Wildlife

Jennifer Quan, Government Affairs Director, WDFW

Kaleen Cottingham, Director, Washington Recreation and Conservation Office

David Troutt, Chair, Washington Salmon Recovery Funding Board

Phil Rigdon, Dept of Natural Resources, Deputy Director at Yakama Nation

BACKGROUND:

In 1991, the federal government declared the first salmon in the Pacific Northwest, Snake River sockeye, as endangered under the Endangered Species Act. In the next few years, 16 more species of salmon were listed as either threatened or endangered. By 1999, wild salmon had disappeared from about 40 percent of their historic breeding ranges in Oregon, Washington, Idaho, and California.

In Washington, the numbers had dwindled so much that salmon and bull trout were listed as threatened or endangered in nearly three-fourths of the state. These losses can be attributed to human influences such as habitat degradation of habitat, pollution,

dams, overfishing, fluctuating marine conditions, climate change and increased predation.

SUMMARY:

Washington has developed a unique structure for addressing salmon recovery across the state. The development of salmon recovery plans that address habitat, hatcheries, harvest, and hydropower (all-H approach) by individuals in communities who didn't wait for the federal government to direct efforts, but organized themselves across the state to address recovering ESA listed fish has proven a powerful and effective framework and implementation tool for recovery. This bottom-up approach and scale of efforts is unprecedented in the United States and has been dubbed “The Washington Way” by those involved in salmon recovery.

The network of individuals dedicated to restoring salmon starts with people in communities and includes watershed groups, regional organizations, state and federal agencies, city and county governments, tribes, conservation districts, nonprofit groups, as well as the legislature, Governor, and Congress.

The Washington Recreation and Conservation Office is a small state agency that manages the grant programs that help increase salmon populations and enhance habitat and supports regional organizations, lead entities, the Salmon Recovery Funding Board and the Governor’s Salmon Recovery Office. They work closely with other state agencies in coordinating recovery across the state.

Regional Organizations develop regional recovery plans, coordinate implementation and are made up of local, state, and federal agencies; tribes; citizens; and others interested in salmon recovery. They coordinate the work of recovery planning and implementation, and offer technical support to recovery projects. Seven regional organizations developed recovery plans that have been accepted by the federal government and are currently being implemented.

Lead Entities are watershed based organizations authorized by the Legislature in 1998 to develop habitat restoration and protection strategies, and look for projects to meet and implement those strategies. They are community-based groups and are essential in developing a strategic framework for how and where state and federal money should be spent to prioritize projects that maximize the public’s investment. Lead entities are the nexus for science based, citizen supported salmon habitat recovery efforts.

The Salmon Recovery Funding Board provides funding for elements necessary to achieve overall salmon recovery, including habitat projects and other activities that result in sustainable and measurable benefits for salmon and other fish species.

The Governor’s Salmon Recovery Office was established by the Legislature, through the Salmon Recovery Planning Act, and charged with coordinating a statewide salmon recovery strategy. The office helps develop and implement regional recovery plans,

secure funding for local, regional and state efforts, advise the Salmon Recovery Funding Board and prepare the biennial *State of the Salmon in Watersheds* report to the Legislature.

The Washington Department of Fish and Wildlife operates with a goal of more than ESA delisting where “Extinction is not an option” and goal is “healthy, harvestable” populations and “no net impact” by new and ongoing human activities. The agency developed the 21st Century Salmon and Steelhead Initiative to meet its responsibilities in recovering salmon and steelhead and provide sustainable fisheries. This integrated science-based management framework works to restore federally listed populations through six salmon recovery plans, creates and maintains sustainable fisheries, protects and restores habitat, supports hatchery operations to support wild fish recovery and furthers state-tribal co-management.

The agency contributes to the success of the science based all-H approach in that management decisions on hatchery, harvest, habitat and hydro activities are coordinated to restore salmon and steelhead populations and meet sustainable fishery goals. They also administer the regulatory Hydraulic Project Approval (HPA) application program that assures construction and projects meet state conservation standards to protect fish life.

Washington Department of Fish & Wildlife and Salmon Recovery

Washington Department of FISH and WILDLIFE

Jim Unsworth, Director
Jennifer Quan, Government Affairs Director
Northwest Power & Conservation Council
July 12, 2016

WDFW's statutory mandates

- Preserve, protect, perpetuate, and manage fish and wildlife populations
- Maintain fishing opportunity, promote orderly fisheries, and enhance and improve recreational and commercial fishing, consistent with conservation goals
- Maximize public recreational game fishing and hunting opportunities of all citizens
- Provide public opportunities to view wildlife and support wildlife viewing tourism

Migration Routes of Pacific Salmon

Legal framework

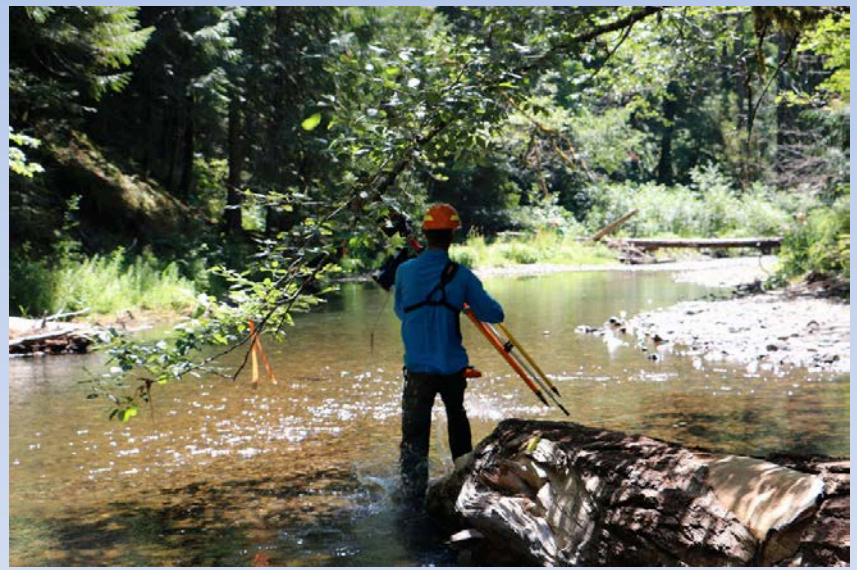
- Tribal co-management
  - U.S. v. WA
  - U.S. v. OR
- Federal law (e.g., ESA)
- International/national forums
  - Pacific Salmon Treaty
  - Pacific Fishery Management Council
  - Columbia River Compact
- State law
  - Title 77 Fish & Wildlife
  - Forest & Fish, Growth Management Act
  - Shoreline Management Act
  - Hydraulic Code

Extinction is not an option

- Washington's goal is not merely delisting of ESA-listed stocks, but "healthy, harvestable" populations
- We are pursuing full mitigation for fish populations impacted by dams and other facilities

Following the Science

- Hatchery Reform
- Harvest co-management
- Habitat restoration
- Reducing hydropower impacts
- Science – research, monitoring, and evaluation



Hatchery reform

- Hatchery Scientific Review Group principles
- Hatchery Genetic Management Plans
- Wild steelhead gene banks

Harvest management

- Set harvest levels and seasons
- Expand selective fisheries to target hatchery fish
- Develop, promote, and implement tools to reduce mortality to wild fish
- Strong record meeting ESA limits on wild stocks

Habitat protection and restoration

- Salmon recovery boards and plans
- Floodplain and meadow restoration
- Fish passage improvements
- Comprehensive stakeholder-driven strategies such as Yakima Basin Integrated Plan

Estuary restoration

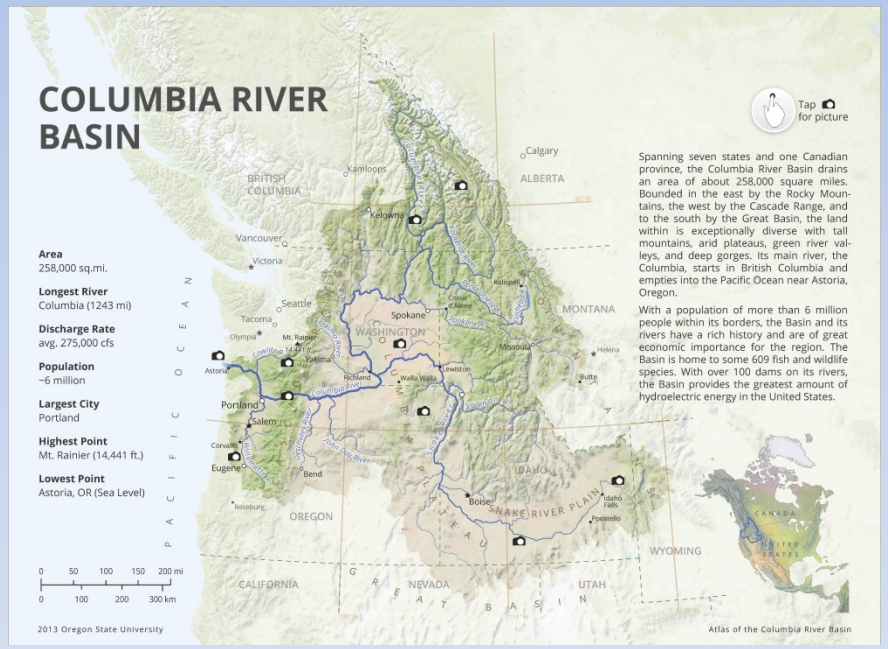
Wildlife areas

Asotin Creek Wildlife Area

Wenas Wildlife Area

Hydropower and water management

- Working to make the Columbia Basin resilient to climate change
- Columbia Treaty modernization can be a “win-win”
- Washington values partnerships to improve mainstem survival



Key Columbia River issues for Washington

- Mid-Columbia steelhead are trending positively – fixes in the Yakima and Walla Walla basins can help
- Upper Columbia spring chinook are still struggling

Near Abundance Recovery Goal	Below Abundance Recovery Goal			
• Hood Canal summer chum • Snake River fall Chinook In some areas of the state, fish are approaching recovery goals. However, in most areas of the state, fish are below their recovery goals.	**INCREASING** • Middle Columbia River steelhead • Lake Ozette sockeye • Snake River spring and summer Chinook • Upper Columbia River steelhead	**CONSISTENTLY LOW** • Lower Columbia River fall Chinook • Lower Columbia River spring Chinook • Lower Columbia River steelhead • Snake River steelhead	**DECREASING** • Lower Columbia River chum • Puget Sound Chinook • Upper Columbia River spring Chinook • Puget Sound steelhead	**INSUFFICIENT DATA** • Lower Columbia River coho

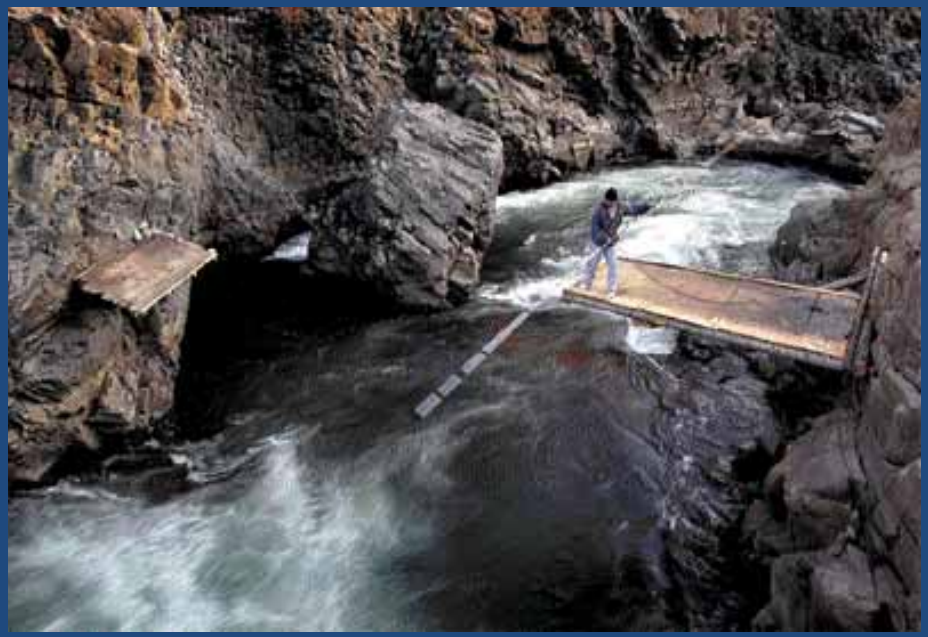
Partners

- Indispensable partners include:
  - Tribes
  - Other state agencies: Ecology, Conservation Commission, DNR, Agriculture, RCO
  - Watershed lead entities, salmon recovery boards, and Regional Fishery Enhancement Groups
  - Environmental NGOs
  - Local governments including irrigation districts
  - Federal fish and wildlife and land management agencies

Parting thoughts

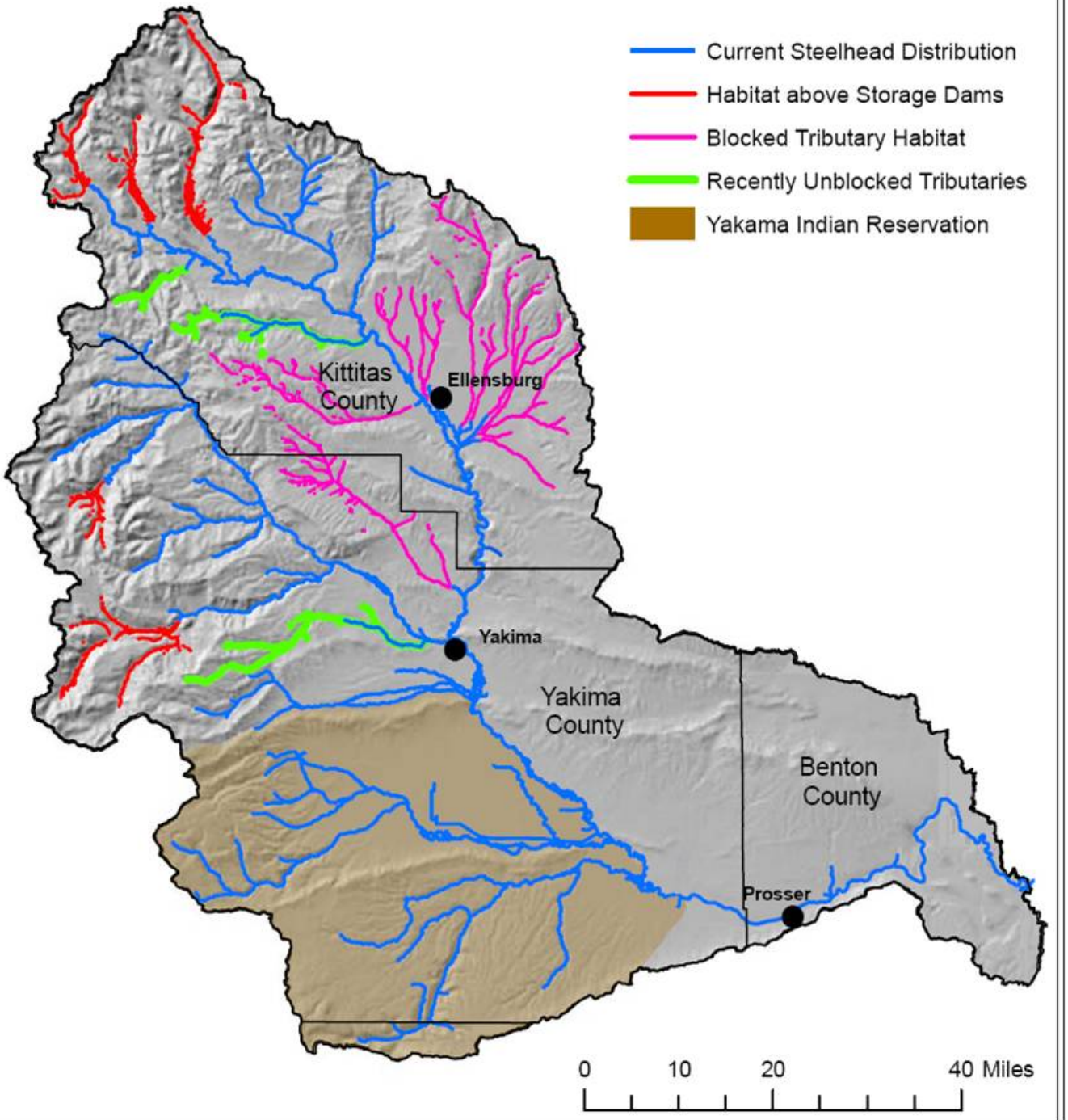
Salmon Recovery in the Yakima Basin:
Putting Fish Back in the Rivers and Protecting the Places they live

David Fast, PhD
Senior Research Scientist
Yakama Nation



Map by GIS
Yakama Nation

Celilo Falls tribal fishing site
Flooded in 1957 with construction of the Dalles Dam


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

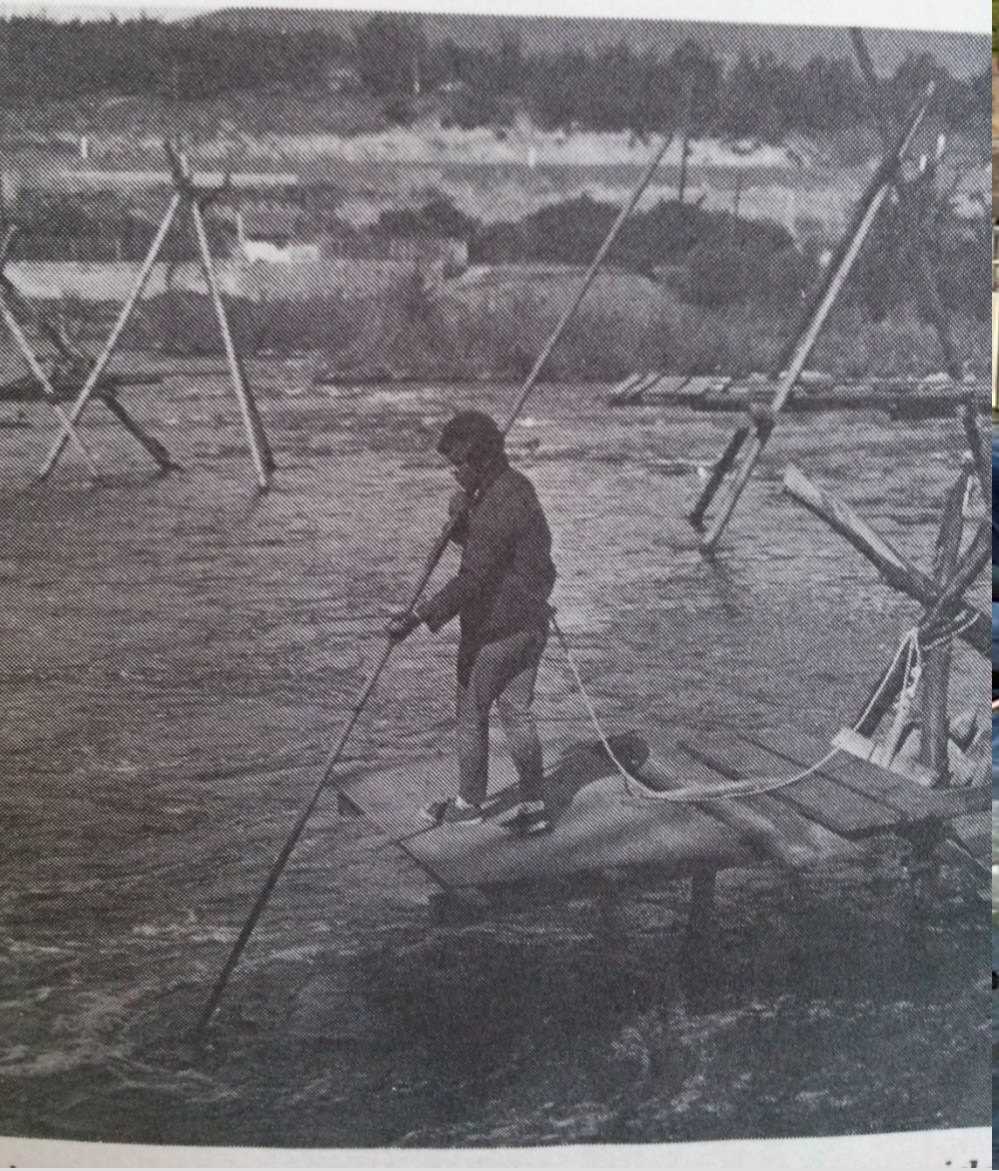
Salmon Extinction in the Yakima Basin

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

Historic Salmon Runs

Species/Run	Estimates	Current Status	Low	Year	2014
Spring Chinook	200,000-500,000	Supplemented Population	666	1995	10,205
Fall Chinook	38,000-100,000	Supplemented Population	523	1988	7,792
Summer Chinook	??	Extirpated 1970'S Began Reintroduction 2008	-	till 12	1,513
Coho	40,000 150,000	Extirpated 1980'S Reintroduced 1997	-	till 93	24,420
Sockeye	100,000 200,000	Extirpated Early 1900's Reintroduction 2009	-	Till 2009	2,676
Steelhead	30,000 100,000	Wild Population (ESA) Kelt Reconditioning	505	1996	4,141
Total	408,000-1,050,000				50,747
Bull Trout	??	Wild Population (ESA)			2500 to 3000 adults
Lamprey	??	Wild Population			0 to 87 adults

The vision of the Yakama Nation is to bring back *all* stocks historically present in the Yakima Basin.



Salmon Recovery Toolkit

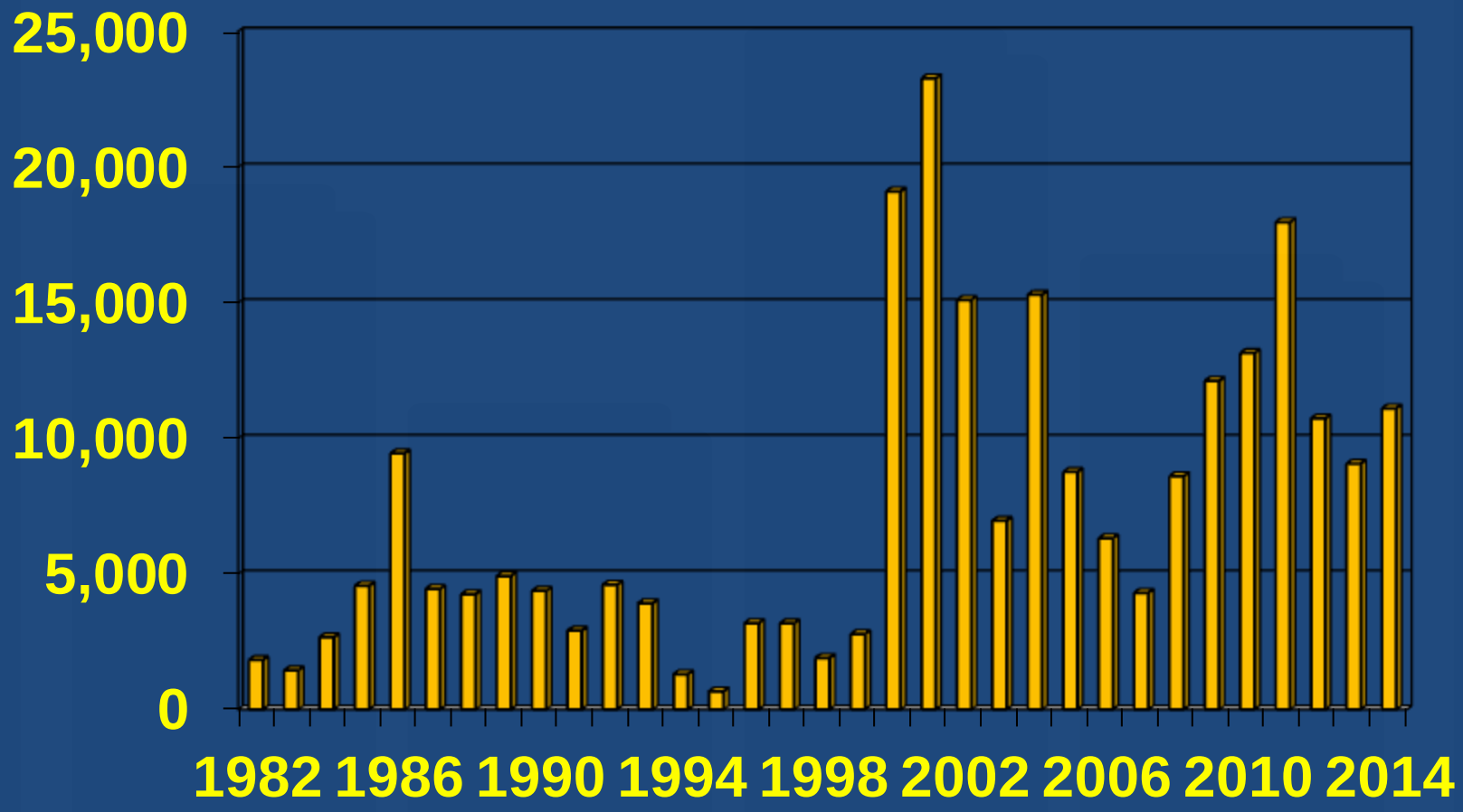
- Habitat Protection and Restoration
- Nutrient Enhancement
- Flow Restoration
- Passage at Reservoir and Irrigation Diversion Dams
- Reintroduction of Extinct Stocks
- Outplanting Natural Origin Adults
- Hatchery Supplementation and Harvest Augmentation

Cle Elum Spring Chinook
Supplementation and Research Facility

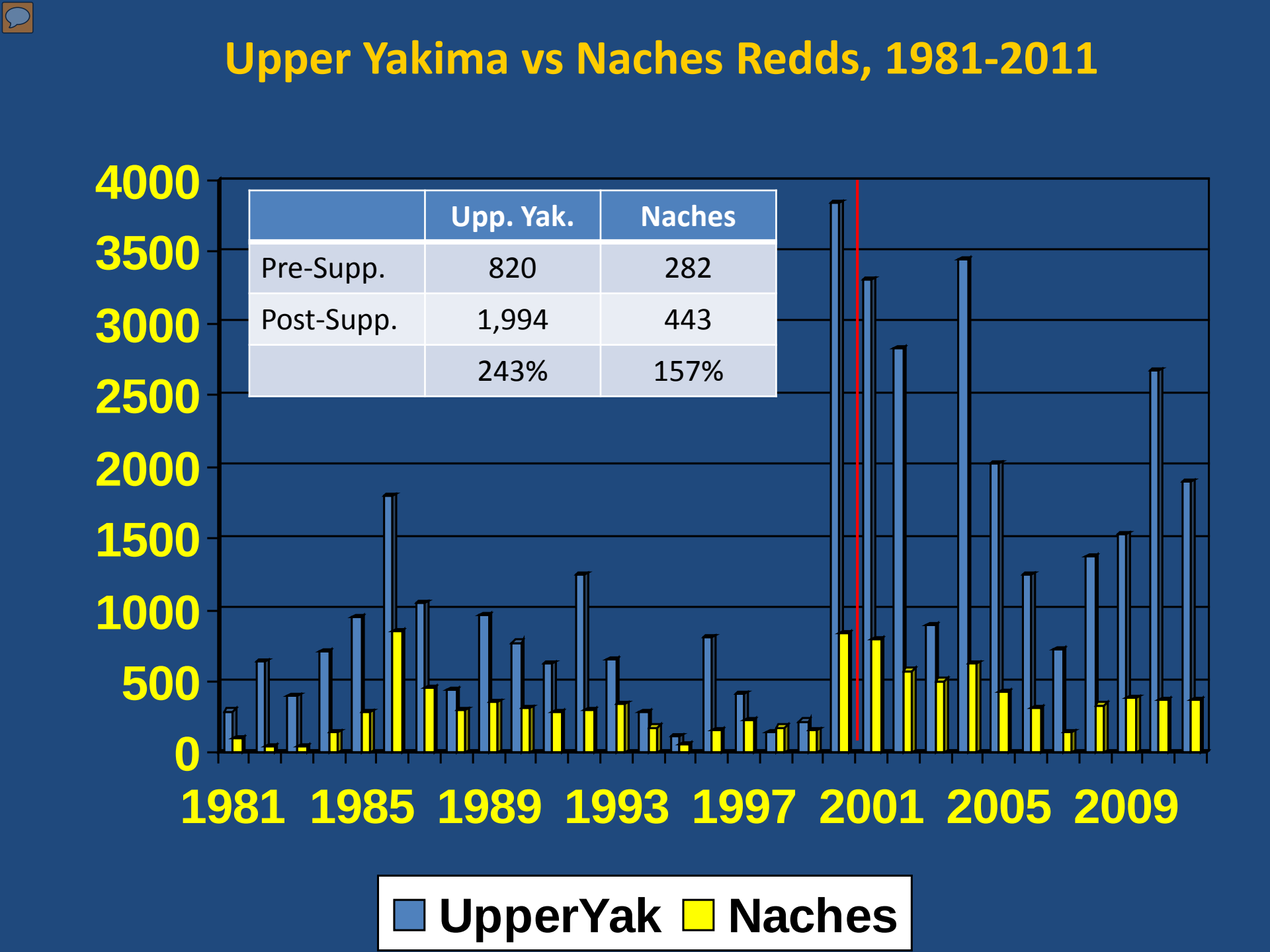
Goals

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

Yakima Basin Spring Chinook
Total Returns, 1982 – 2014



Upper Yakima vs Naches Redds, 1981-2011



	Upp. Yak.	Naches
Pre-Supp.	820	282
Post-Supp.	1,994	443
	243%	157%


Reproductive Success
Comparative behavioral/reproductive fitness research

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)

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."

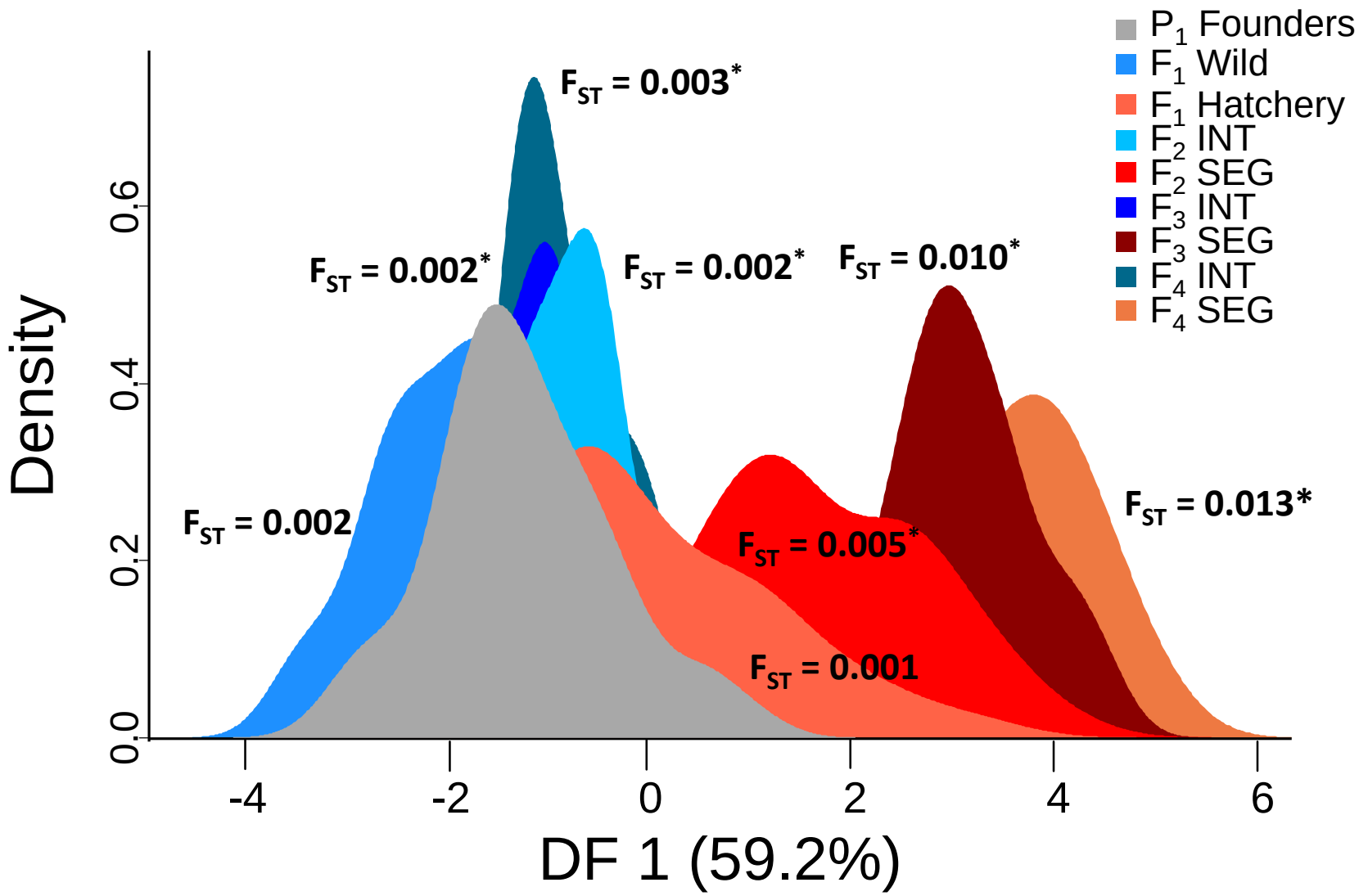
Breeding Success of Wild and First-Generation Hatchery Female Spring Chinook Salmon Spawning in an Artificial Stream

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."

Temporal Change in Genetic Variation



Waters et al. 2015. Effectiveness of managed gene flow in reducing genetic divergence associated with captive breeding. Evolutionary Applications. Discriminant analysis of principal components (DAPC).

Summary of CESRF Integrated Program

- Spawner Abundance, Spatial Distribution, and Harvest Increased (first sport harvest in over 50 years)
- Natural –origin returns were maintained
- Managed gene flow reduced genetic divergence
- Ecological interactions were maintained within guidelines
- Habitat and water management factors limit natural productivity
- Results are consistent with Venditti et al. Idaho Supplementation Studies Final Report

Yakima River Summer Run Steelhead

Populations

upper Yakima R.
Gmean: 151

Naches R.
Gmean: 840

Toppenish Cr.
Gmean: 599

Satus Cr.
Gmean: 660

Yakima River steelhead status

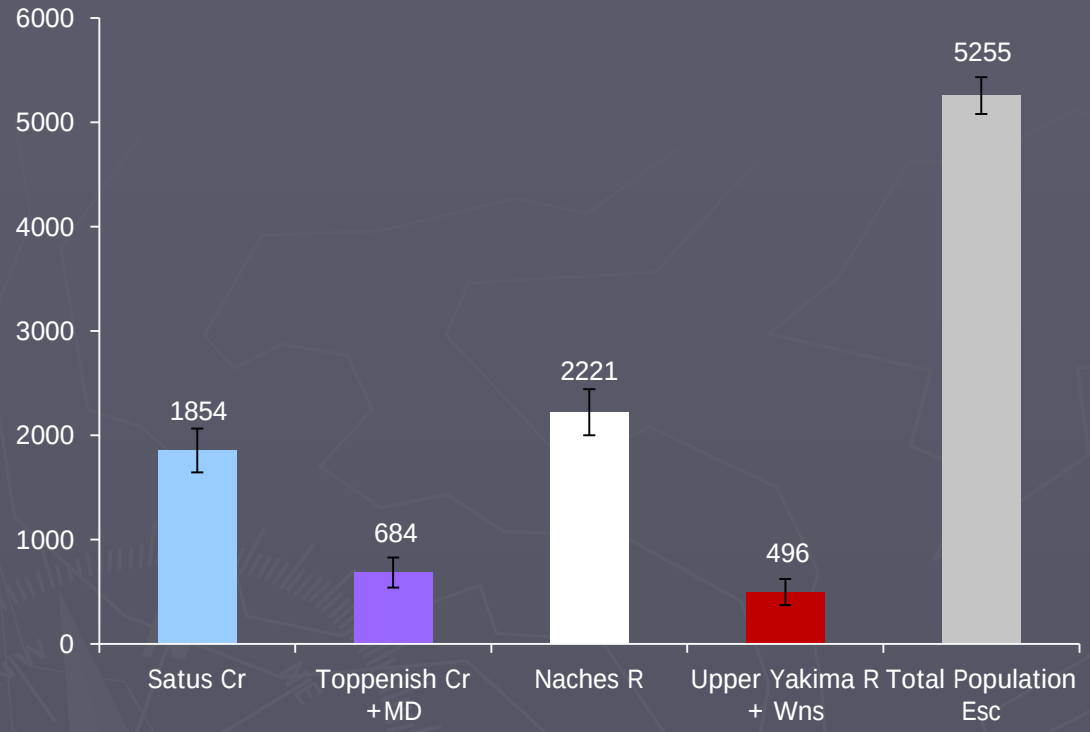
- 1999 Mid Columbia DPS listed as threatened

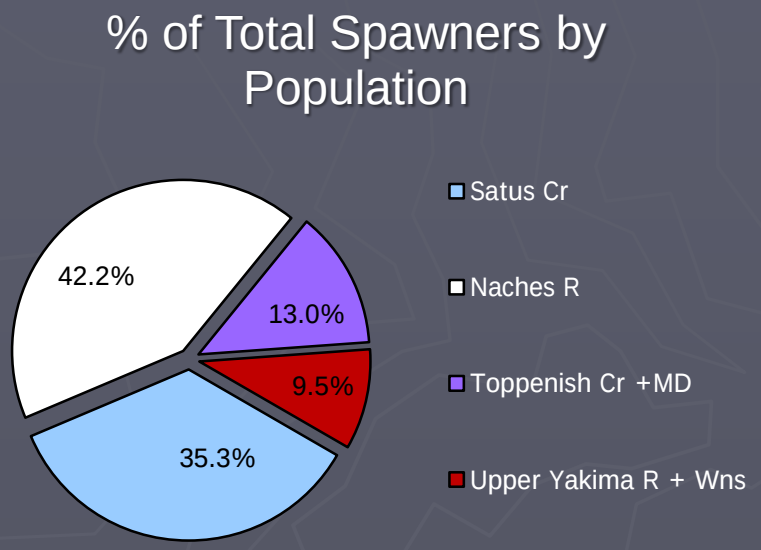
Yakima River adult steelhead counts

Enumeration 2002-2014
- Avg 3,965 (1,537-6796)

Prosser

Yakima River Steelhead Population Estimates:





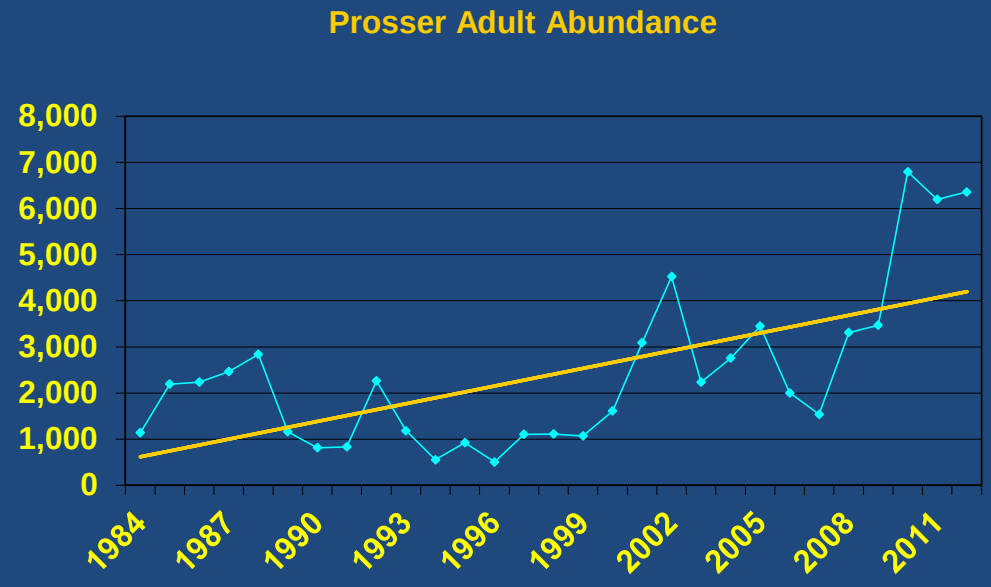
Population	Abundance	CI (α = .10)
Satus Cr	1854	+/- 211
Toppenish Cr +MD	684	+/- 144
Naches R	2221	+/- 221
Upper Yakima R + Wns	496	+/- 125
Total Population Esc	5255	+/- 176

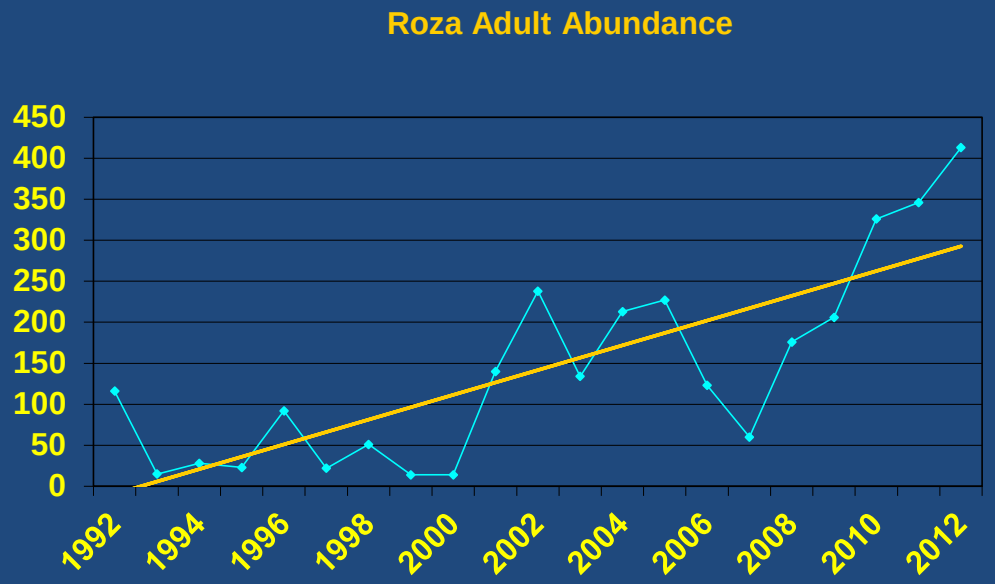
Yakima River Steelhead Kelt Reconditioning

- Capture steelhead returning to ocean after completing first spawning cycle
- Most (>90%) are females
- Held and fed for 6-8 months
- Released in mid-late October (beginning of upstream migration peak)
- Select own mates, where to spawn, when to spawn


Existing Conditions
C4
C1

Steelhead Population Response: Abundance Trends

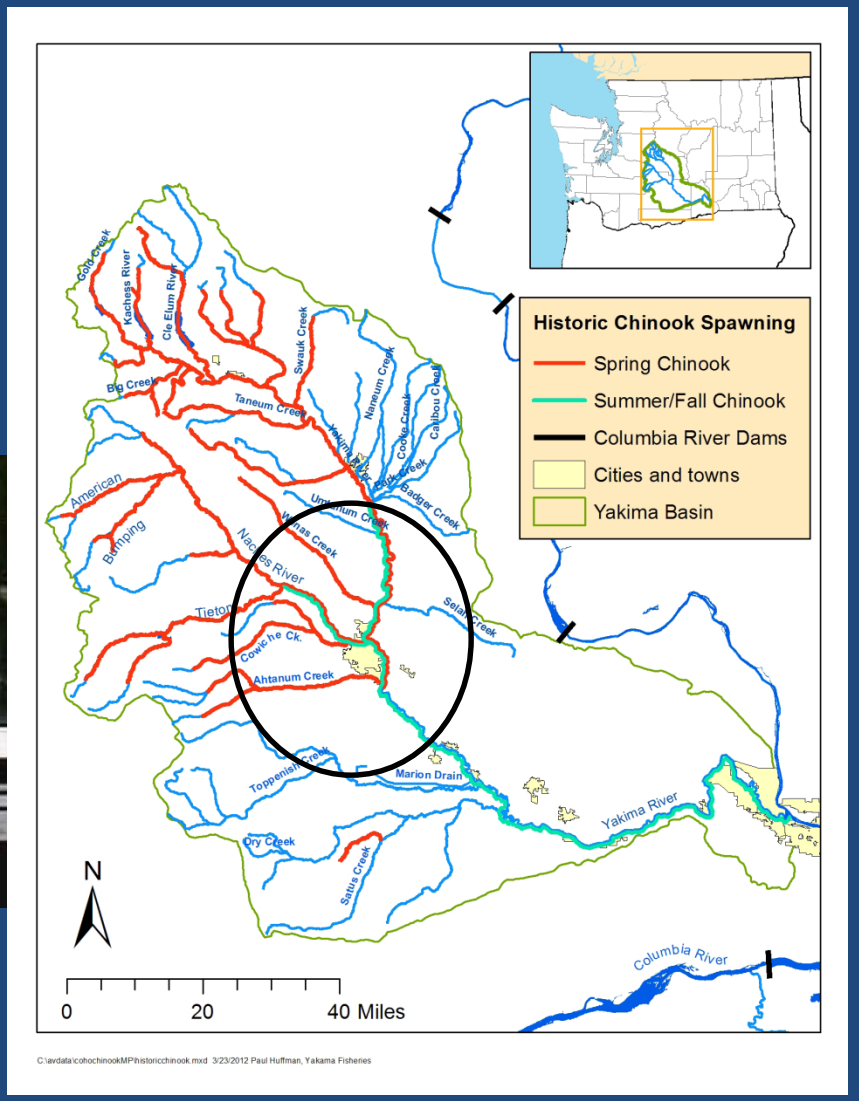




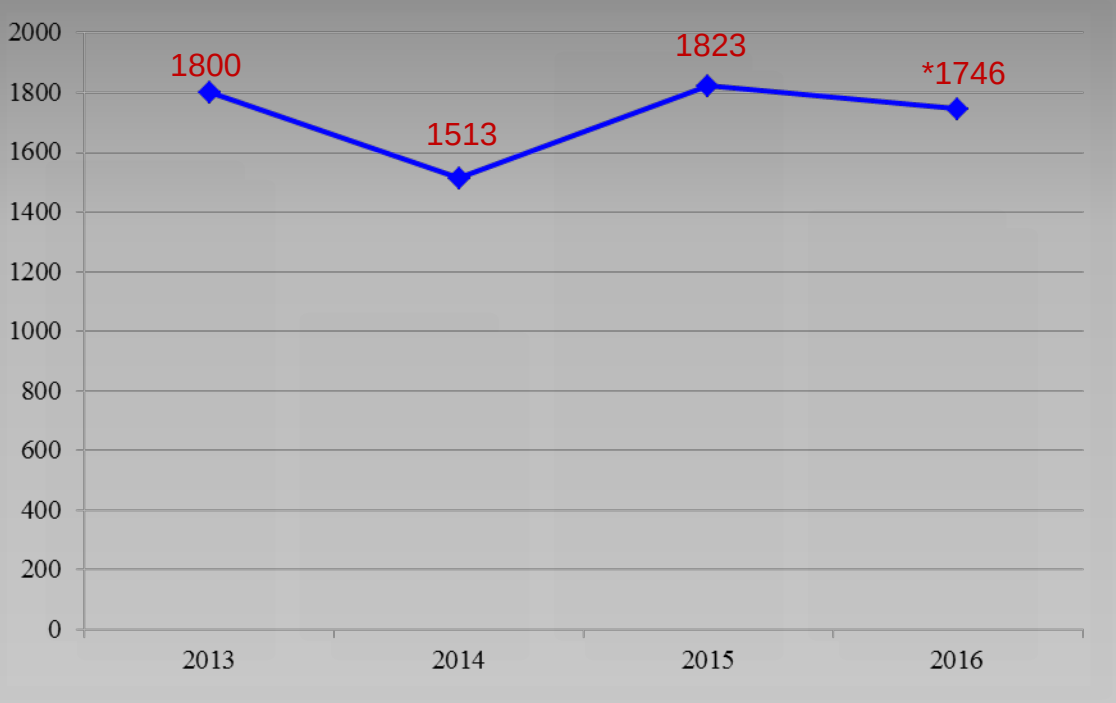
Yakima River Summer Run Chinook Reintroduction – Restoring Diversity

- Extirpated stock
- Started with Wells transfers
- Releasing both yearling and subyearling fish
- Intend to move to local stock once returns and infrastructure in place
- Adults returning now from three different age classes

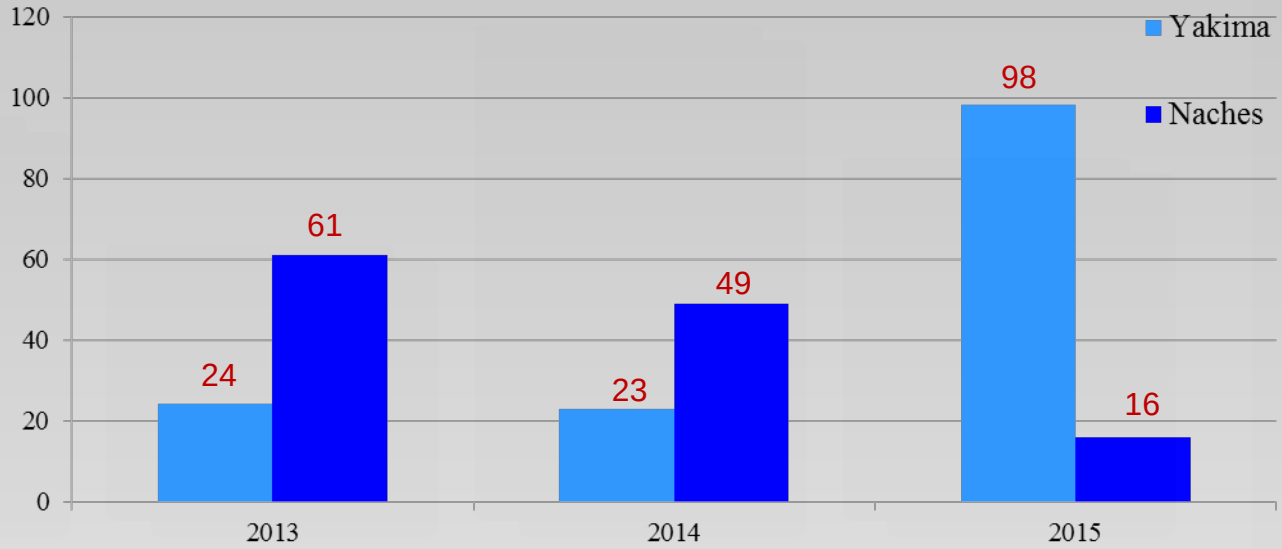
3-Ocean Adult Summer at Prosser, 7/1/2012

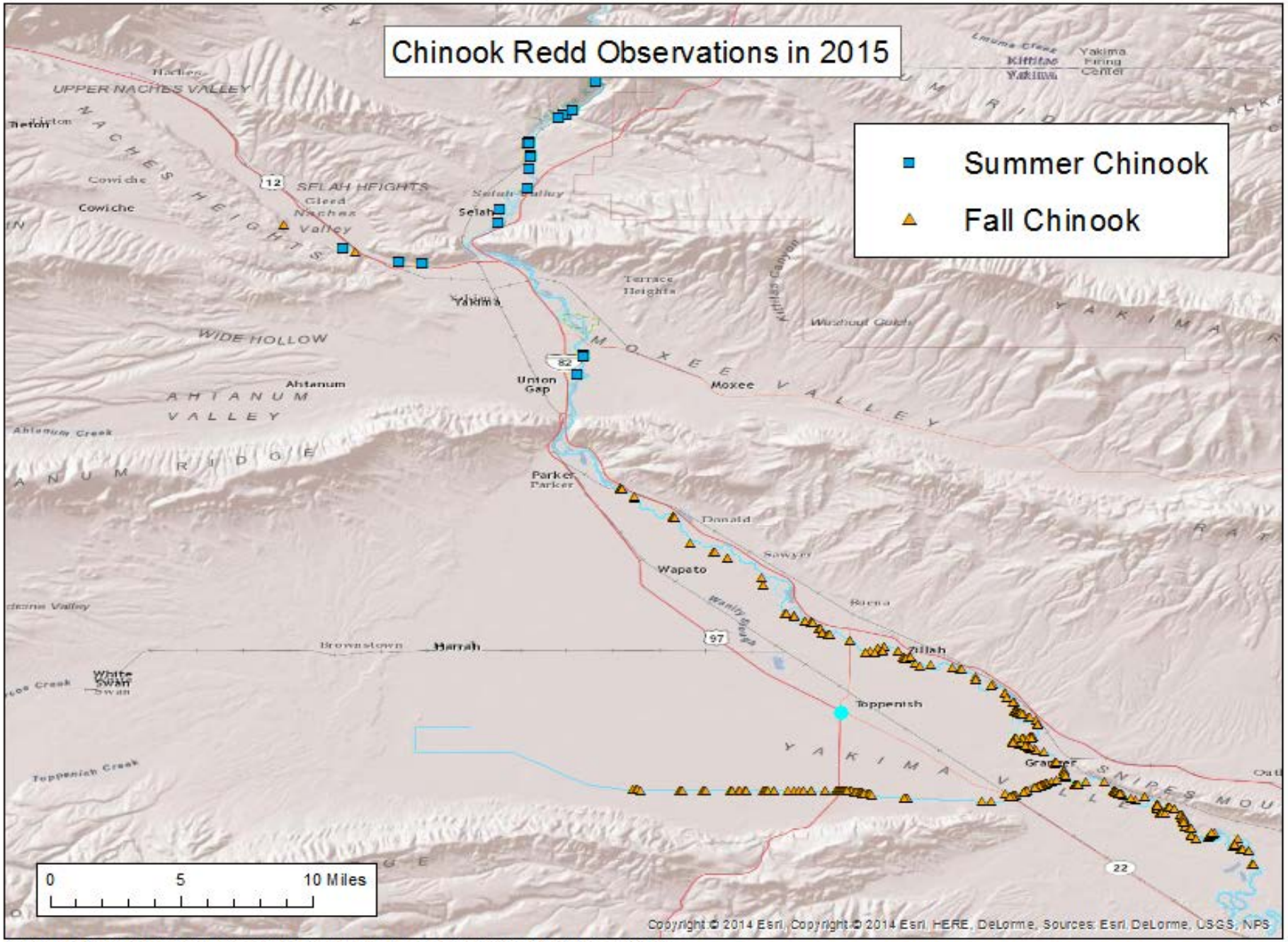


Adult Returns over Prosser 2013-*16



Redd Counts 2013-15





C:\avdata\FallChinookRedds\2015\fallsummerchinook2015.mxd Paul Huffman, Yakama Fisheries, 6/15/2015

2012 Yakima Basin Coho Reintroduction

Yakima River Coho History

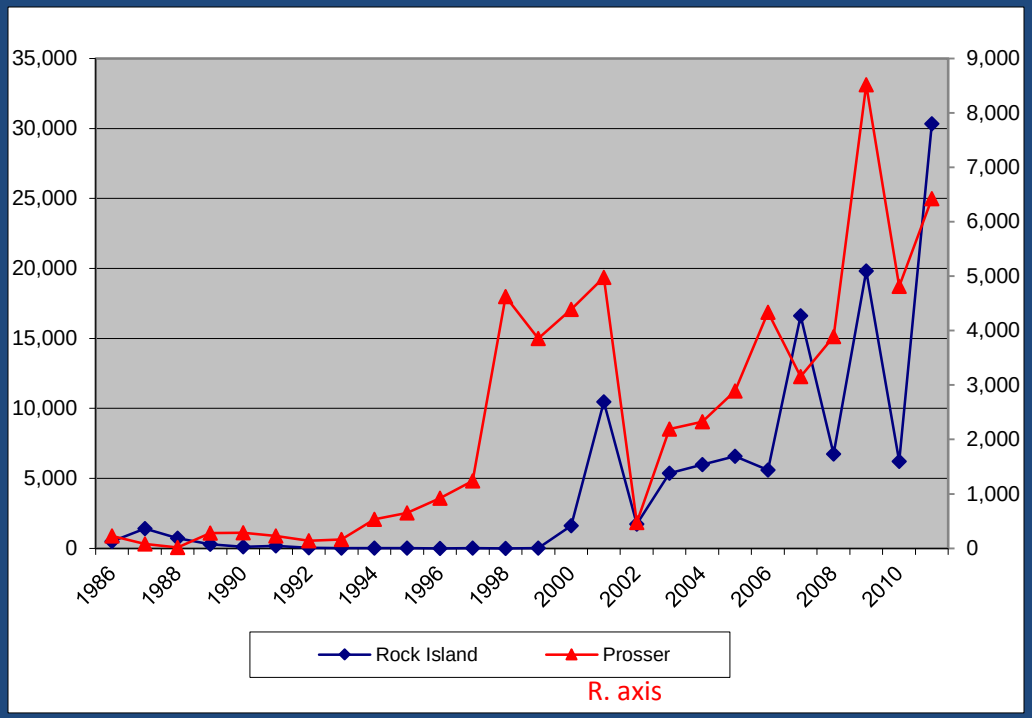
Program Goal - Re-establish self-sustaining naturally spawning population of coho salmon in Yakima River

- Historical Abundance
  - 44,000 to 150,000 (est. Mullan 1983 and other references)
- Extinct in the early 1980's
- Yakama Nation began reintroduction of coho salmon in 1985
- 1985 to 1997 Coho release for harvest purposes
- 1997 to present, monitoring strategies for full reintroduction

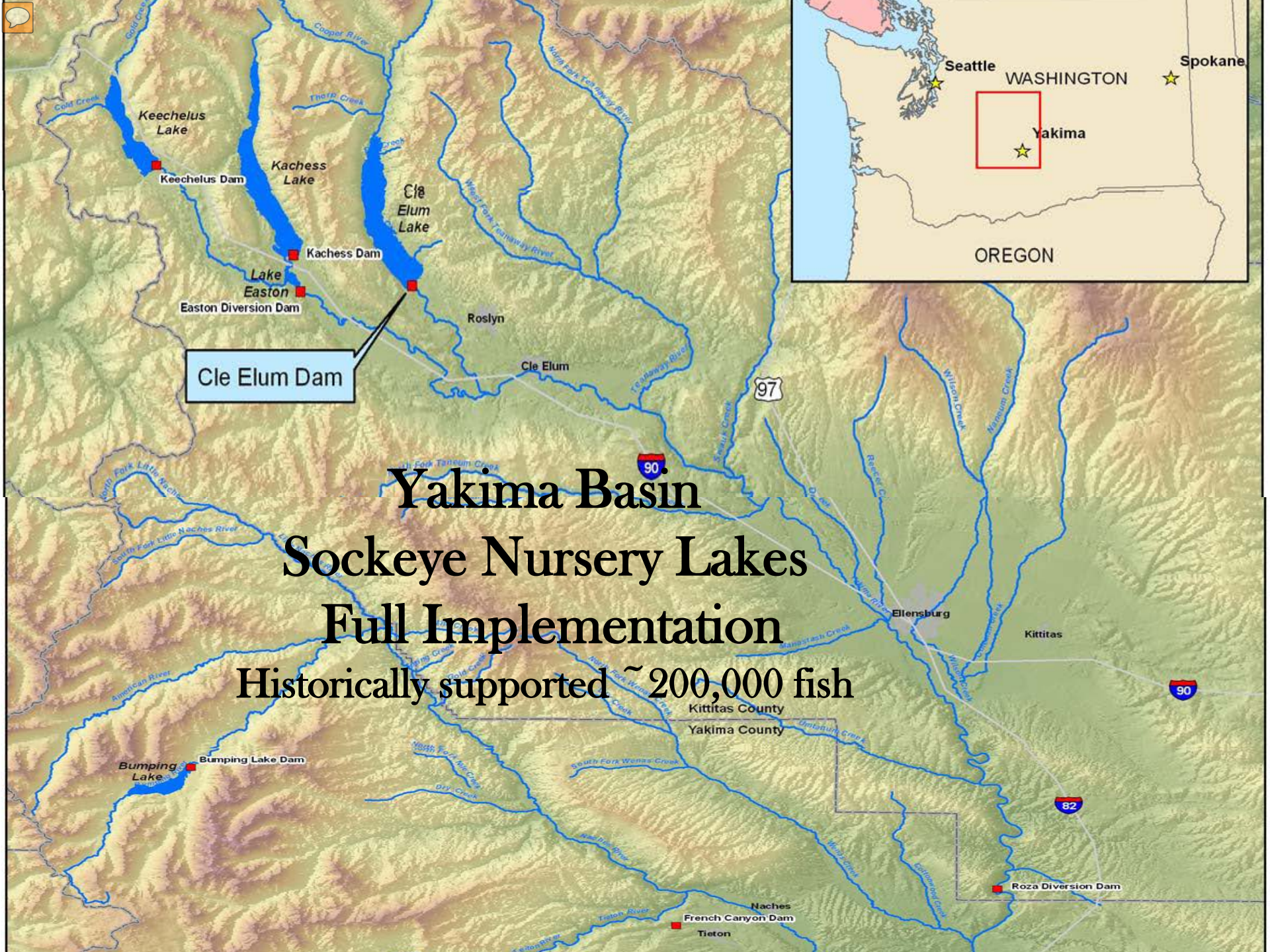
Yakama Coho Reintroduction Programs

- Virtually extinct in the mid-1980s
- Started with out-of-basin transfers
- Demonstrated ability to reestablish a naturalized population after as few as 3 to 5 generations of outplanting in the wild
- Moving to local brood stocks
- Using combination of fry, smolt, and adult release strategies
- Adult returns are combination of natural- and hatchery-origin fish

Adult Coho counts at Rock Island and Prosser Dams, 1986- Present



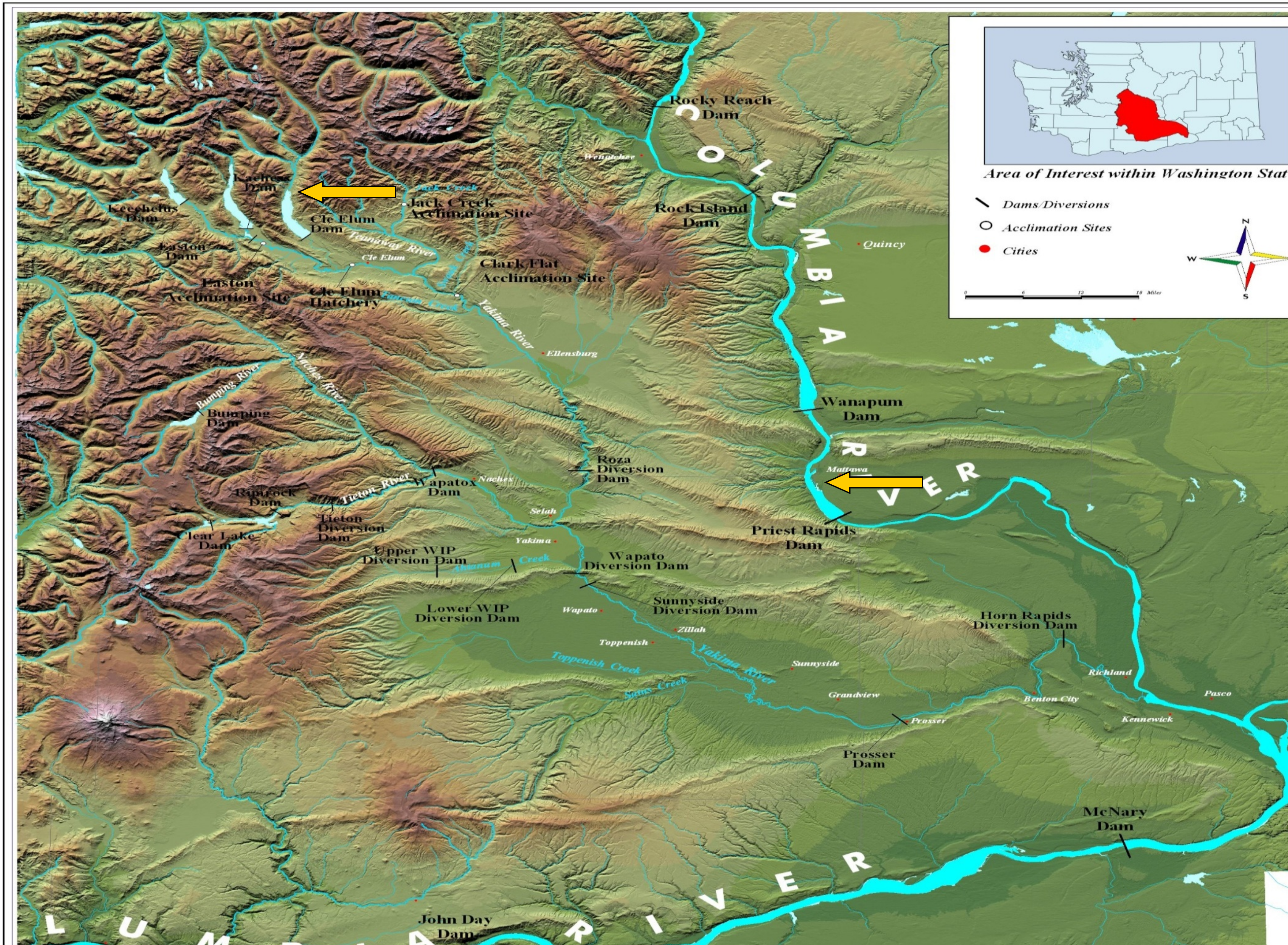
Lake Cle Elum Fish Passage Project
Sockeye Reintroduction



Yakima Basin
Sockeye Nursery Lakes
Full Implementation

Historically supported ~200,000 fish

Collecting Adult Sockeye At Priest Rapids

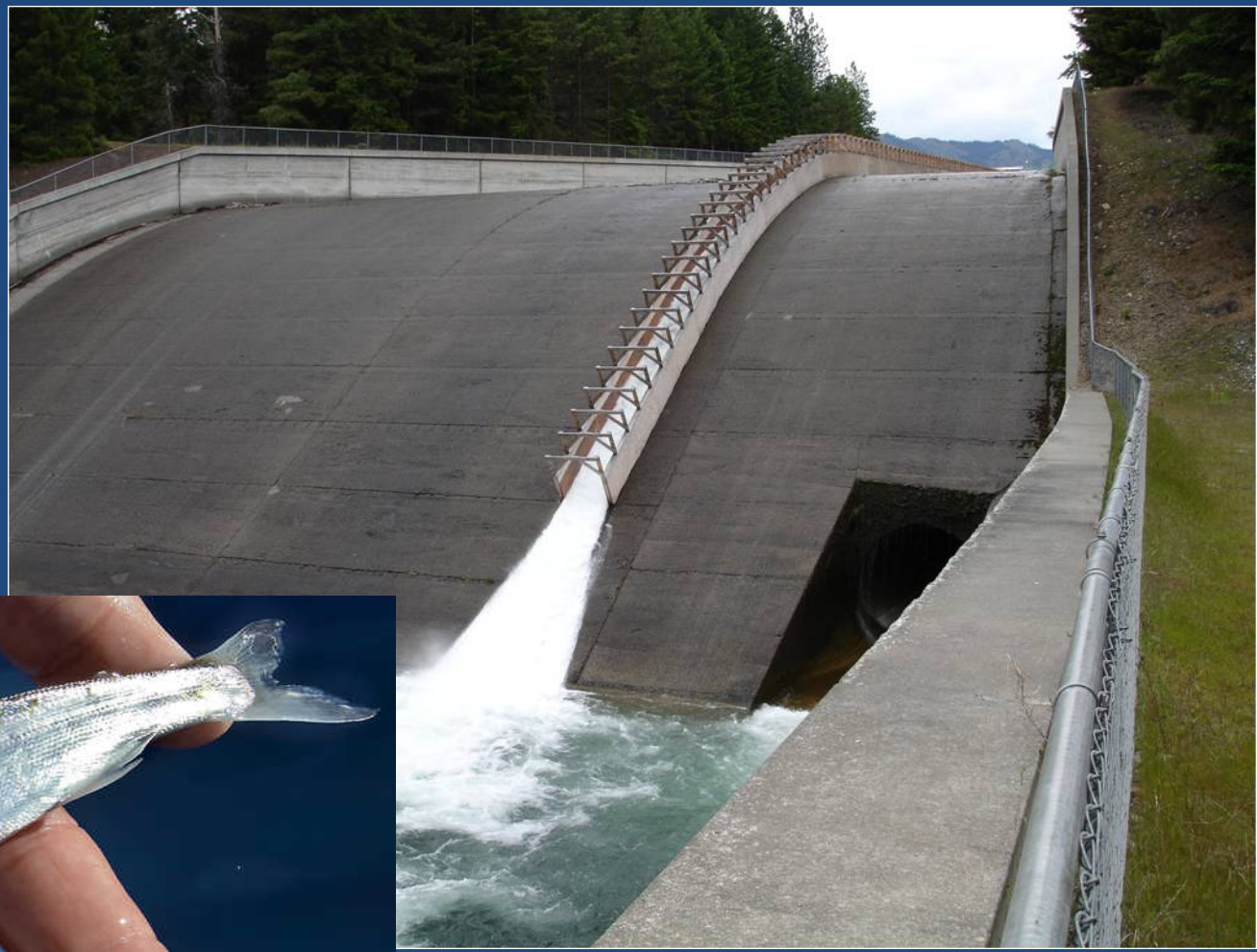


Area of Interest within Washington Stat
Dams/Diversions
Acclimation Sites
Cities
N
W
S
0
6
12
18 Miles
Rocky Reach Dam
COLUMBIA RIVER
Wenatchee
Kachess Dam
Jack Creek
Jack Creek Acclimation Site
Keechelus Dam
Cle Elum Dam
Teanaway River
Cle Elum
Easton Dam
Rock Island Dam
Quincy
Clark Flat Acclimation Site
Easton Acclimation Site
Cle Elum Hatchery
Yakima River
Ellensburg
Naches River
Bumping River
Bumping Dam
Wanapum Dam
Mattawa
Roza Diversion Dam
Tieton River
Wapatox Dam
Naches
Rimrock Dam
Selah
Tieton Diversion Dam
Clear Lake Dam
Yakima
Priest Rapids Dam
Upper WIP Diversion Dam
Ahtanum Creek
Wapato Diversion Dam
Lower WIP Diversion Dam
Wapato
Sunnyside Diversion Dam
Zillah
Toppenish
Horn Rapids Diversion Dam
Sunnyside
Toppenish Creek
Richland
Grandview
Benton City
Pasco
Prosser
Kennewick
Prosser Dam
McNary Dam
John Day Dam


Venus Lake
Hyas Lake
Lake Rowena
Circle Lake
Shovel Lake
Deep Lake
Spade Lake
Tucquala Lake
Waptus Lake
Trail Creek
Cle Elum River
Fortune Creek
Pete Lake
Camp Creek
Waptus River
Spectacle Lake
Cooper Lake
Cooper River
Thorp Creek
Howson Creek
Cle Elum Lake
Domerie Creek
0 1 2 3 4 5 6 7 8 9 10
Miles

L. Cle Elum Sockeye Reintroduction

Naturally Produced Smolts are monitored at Roza and Prosser Dam Juvenile Evaluation Facilities



Wild smolt at Roza, 5/10/2011

Lake Cle Elum Sockeye Reintroduction

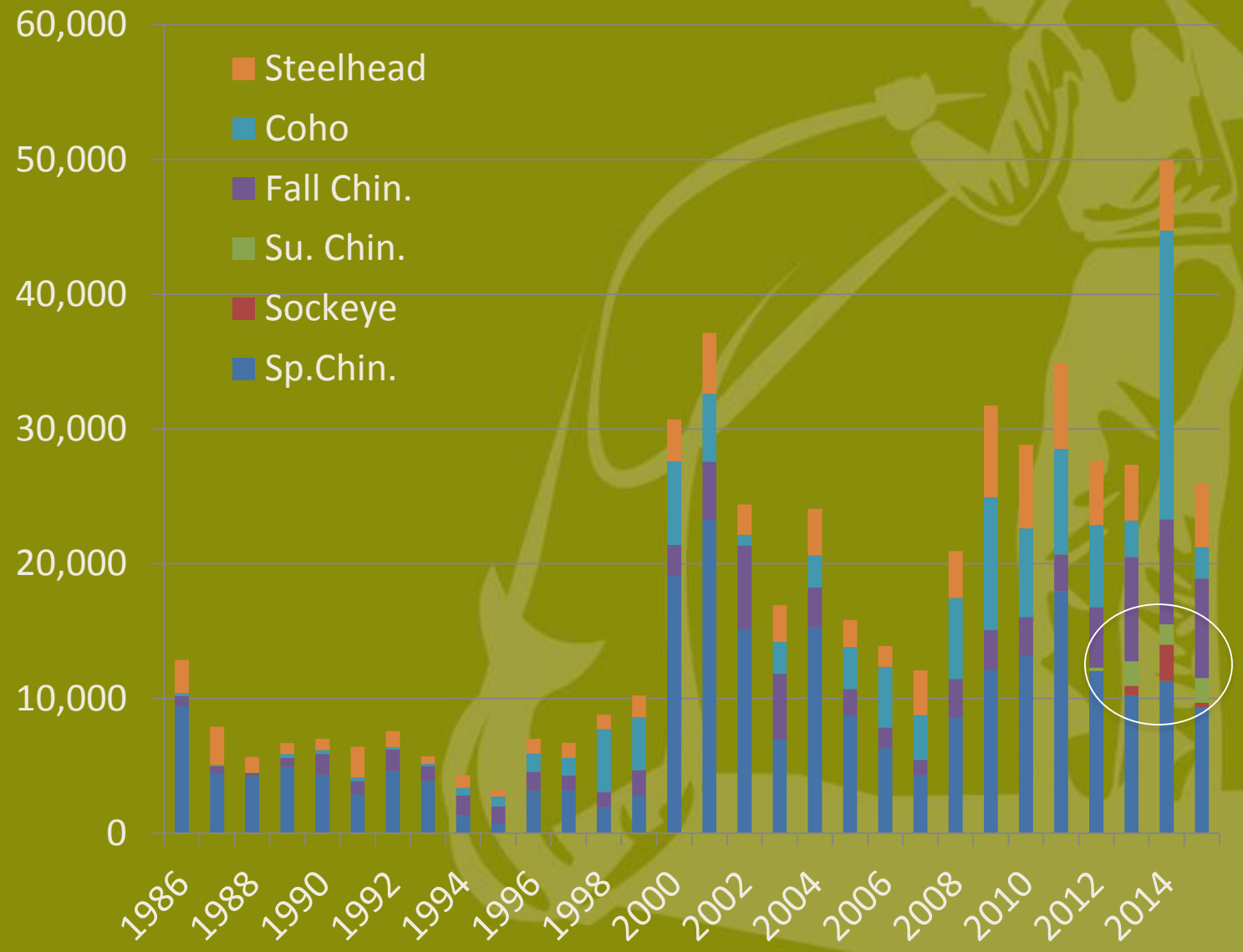
Year	Adults Transported	Percent Survival to adult
2009	1,000	
2010	2,500	
2011	4,500	
2012	10,000	
2013	3,996	
	+703	70%
2014	10,000	
	+2676	107%
2015	10,000	
	+341	8%

Some of the first sockeye to spawn in the upper Cle Elum R. watershed in over 100 years

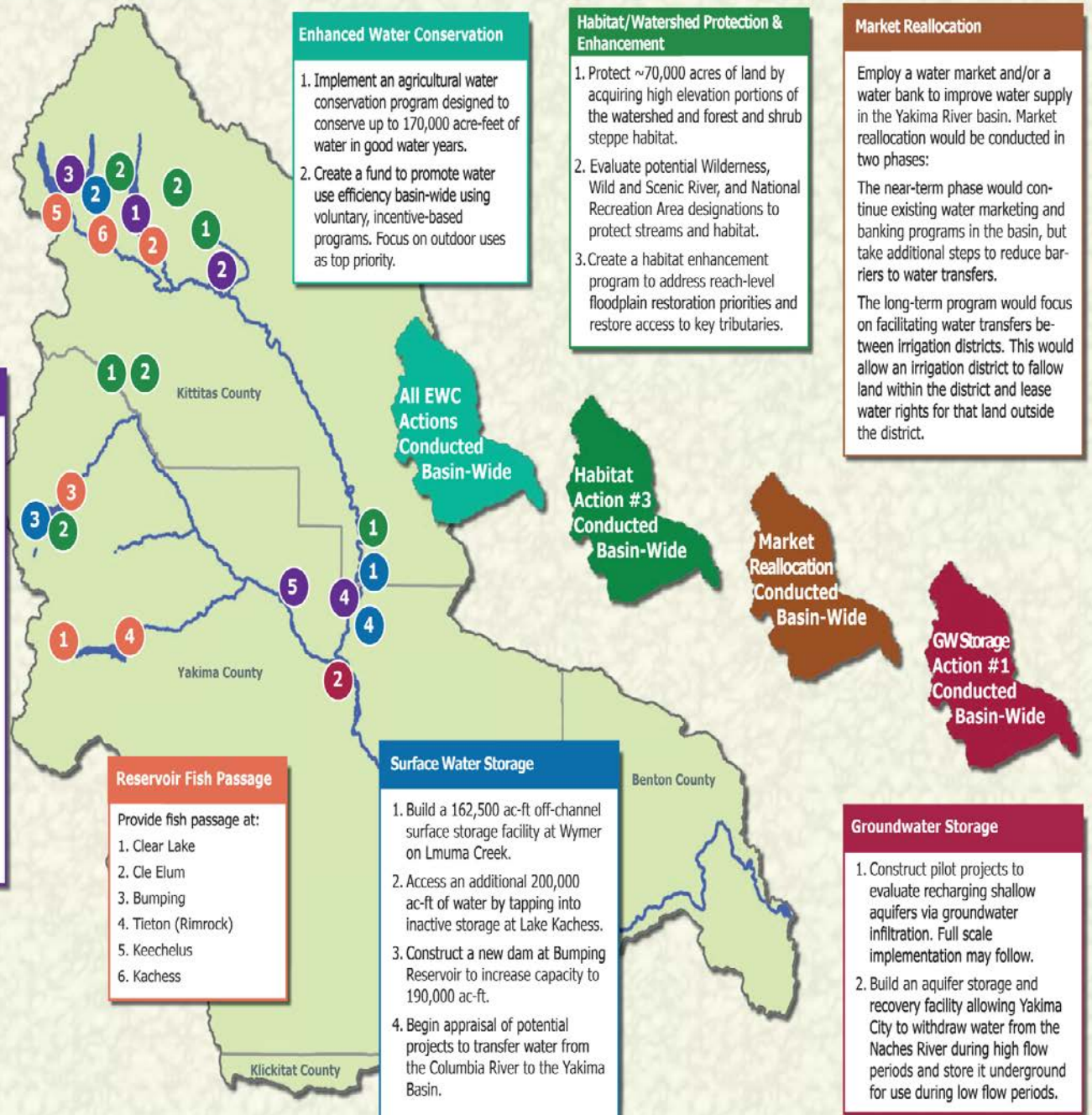
Releasing Sockeye Adults at Cle Elum


4X4

Salmon and Steelhead Returns to Yakima Basin



Yakima River Basin Integrated Water Resource Management Plan



Structural & Operational Changes

1. Raise the Cle Elum Pool by three feet to add 14,600 ac-ft in storage capacity.
2. Modify Kittitas Reclamation District canals to provide efficiency savings.
3. Construct a pipeline from Lake Keechelus to Lake Kachess to reduce flows and improve habitat conditions during high flow releases below Keechelus and to provide more water storage in Lake Kachess for downstream needs.
4. Decrease power generation at Roza Dam and Chandler power plant to support outmigration of juvenile fish.
5. Make efficiency improvements to the Wapatox Canal.

Enhanced Water Conservation

1. Implement an agricultural water conservation program designed to conserve up to 170,000 acre-feet of water in good water years.
2. Create a fund to promote water use efficiency basin-wide using voluntary, incentive-based programs. Focus on outdoor uses as top priority.

Habitat/Watershed Protection & Enhancement

1. Protect ~70,000 acres of land by acquiring high elevation portions of the watershed and forest and shrub steppe habitat.
2. Evaluate potential Wilderness, Wild and Scenic River, and National Recreation Area designations to protect streams and habitat.
3. Create a habitat enhancement program to address reach-level floodplain restoration priorities and restore access to key tributaries.

Market Reallocation

Employ a water market and/or a water bank to improve water supply in the Yakima River basin. Market reallocation would be conducted in two phases:

The near-term phase would continue existing water marketing and banking programs in the basin, but take additional steps to reduce barriers to water transfers.

The long-term program would focus on facilitating water transfers between irrigation districts. This would allow an irrigation district to fallow land within the district and lease water rights for that land outside the district.

Reservoir Fish Passage

Provide fish passage at:

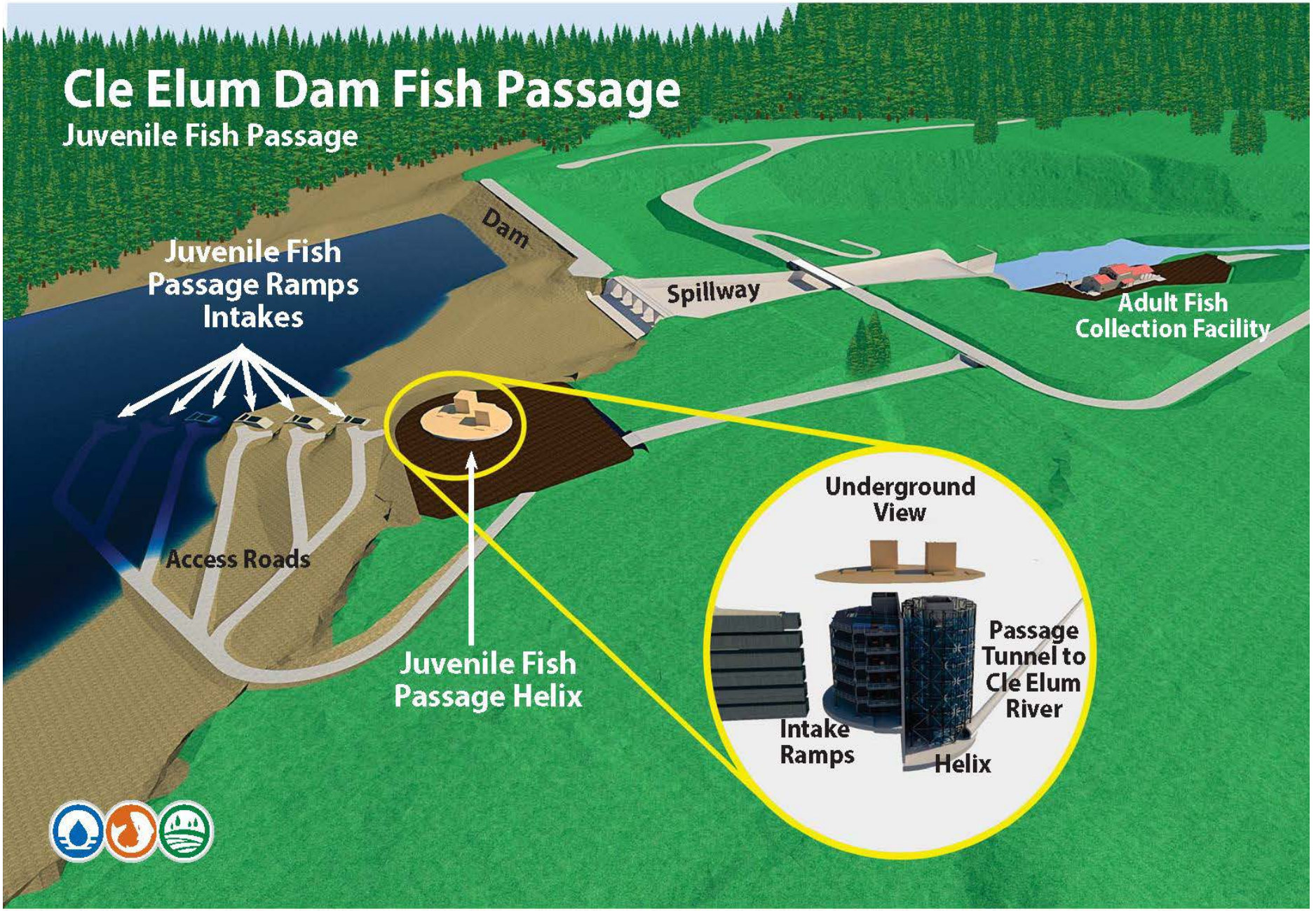
1. Clear Lake
2. Cle Elum
3. Bumping
4. Tieton (Rimrock)
5. Keechelus
6. Kachess

Surface Water Storage

1. Build a 162,500 ac-ft off-channel surface storage facility at Wymer on Lmuma Creek.
2. Access an additional 200,000 ac-ft of water by tapping into inactive storage at Lake Kachess.
3. Construct a new dam at Bumping Reservoir to increase capacity to 190,000 ac-ft.
4. Begin appraisal of potential projects to transfer water from the Columbia River to the Yakima Basin.

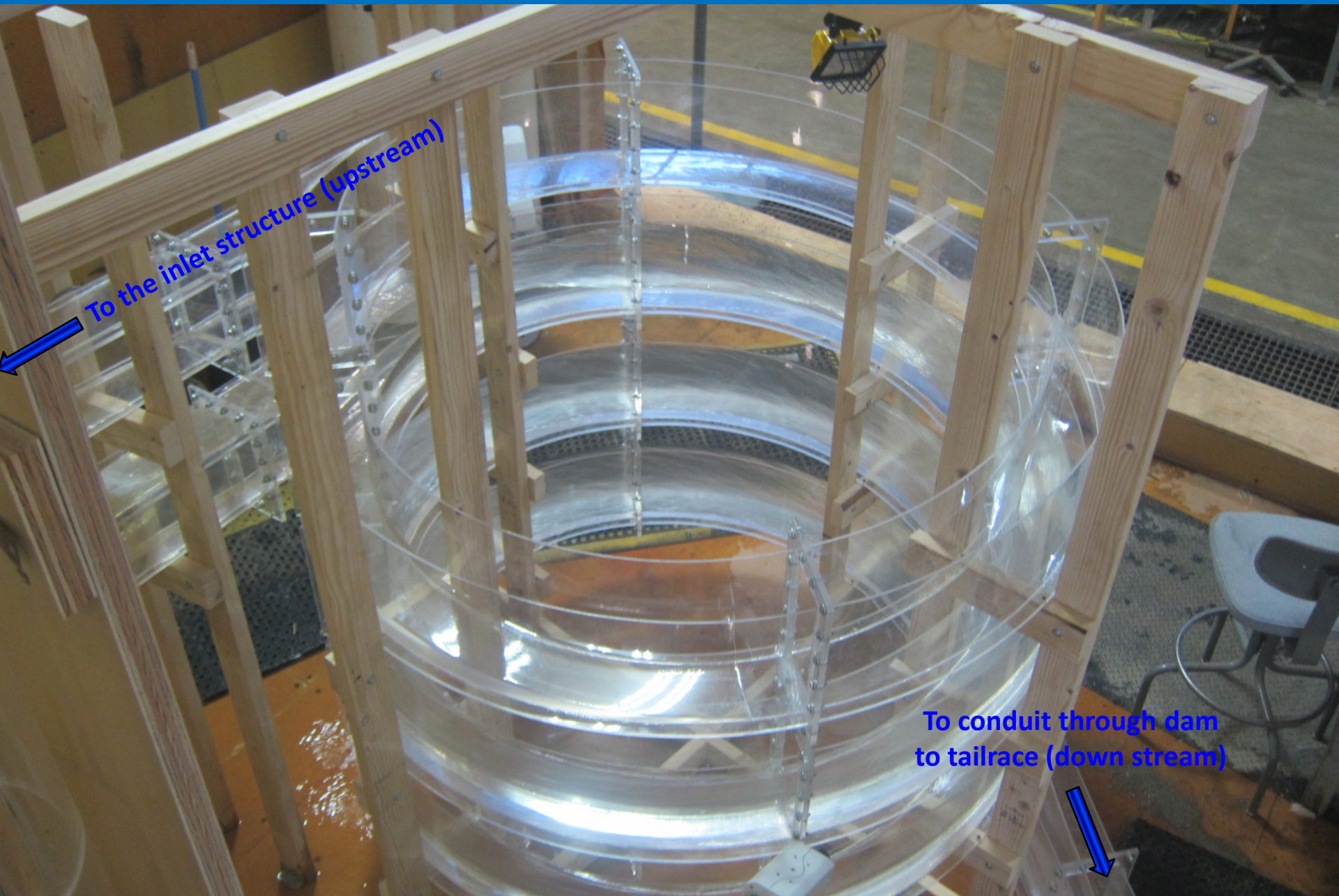
Groundwater Storage

1. Construct pilot projects to evaluate recharging shallow aquifers via groundwater infiltration. Full scale implementation may follow.
2. Build an aquifer storage and recovery facility allowing Yakima City to withdraw water from the Naches River during high flow periods and store it underground for use during low flow periods.


Cle Elum Dam Fish Passage
Juvenile Fish Passage
Dam
Spillway
Juvenile Fish Passage Ramps Intakes
Adult Fish Collection Facility
Access Roads
Juvenile Fish Passage Helix
Underground View
Passage Tunnel to Cle Elum River
Intake Ramps
Helix

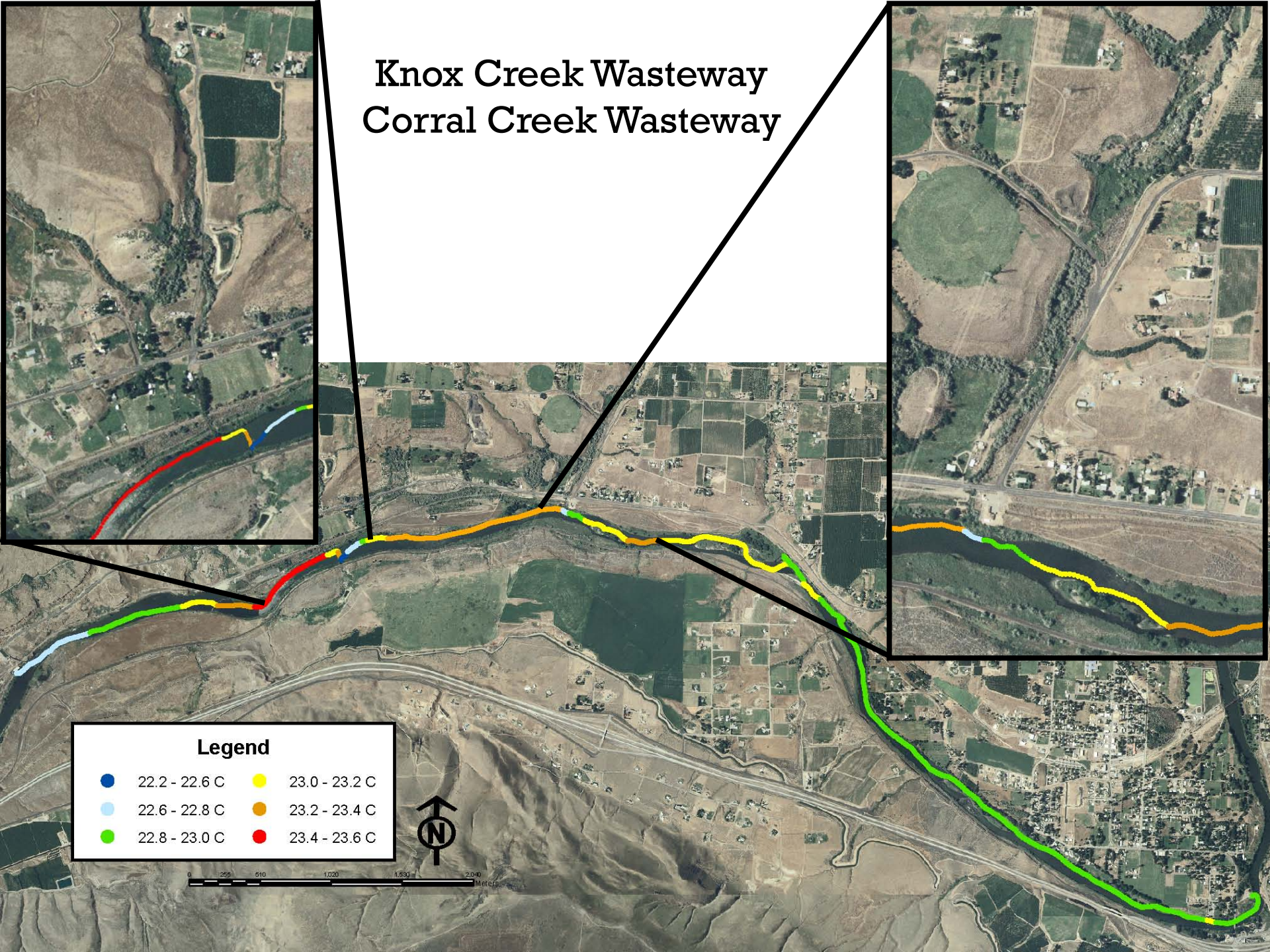
Helix Tower

Function- moves fish from the inlet structure into conduit bypass through the dam



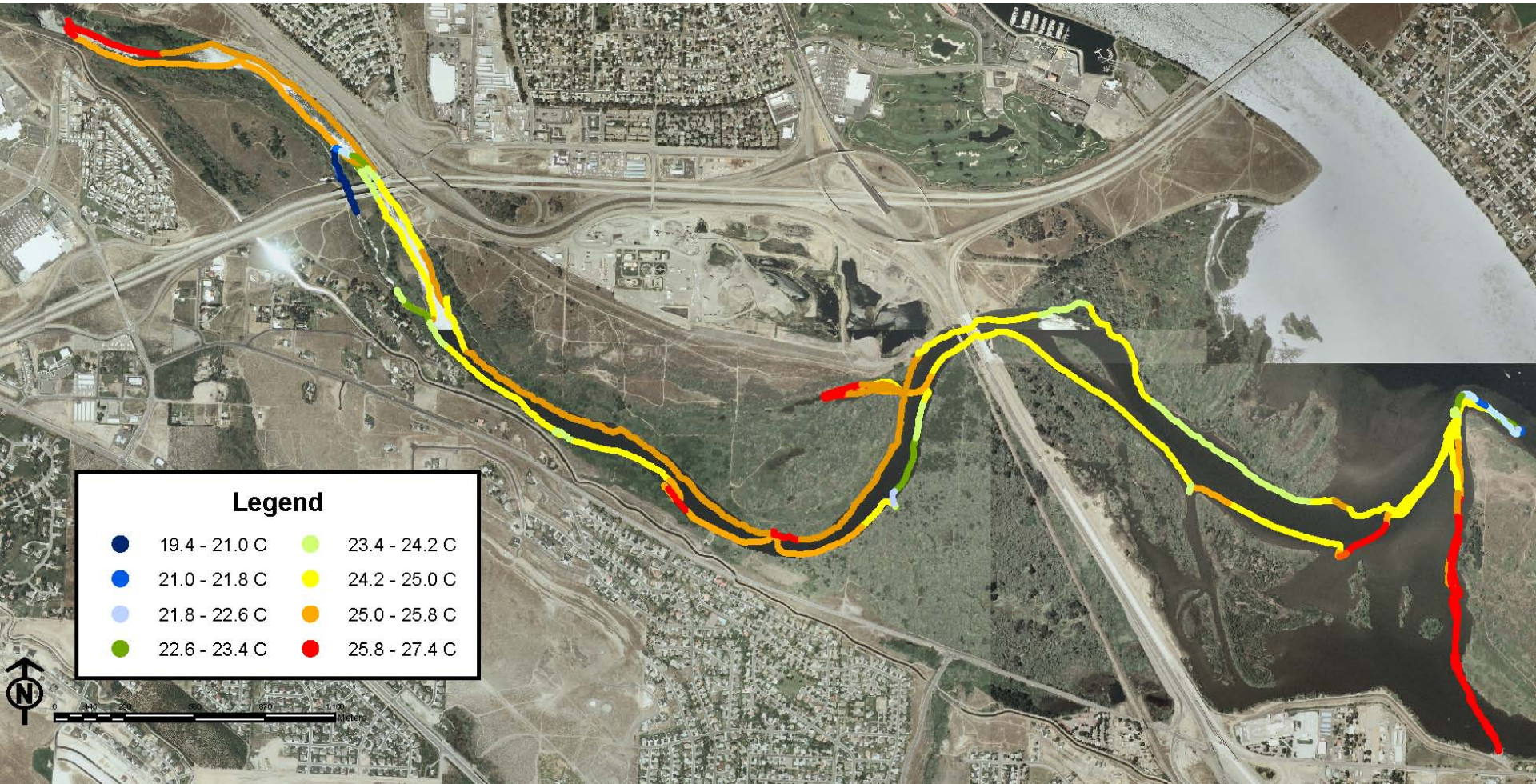
Roza Dam Fish Monitoring Facilities

WHOOSHH Fish Transport – Salmon Canon


Knox Creek Wasteway
Corral Creek Wasteway
Legend
22.2 - 22.6 C
22.6 - 22.8 C
22.8 - 23.0 C
23.0 - 23.2 C
23.2 - 23.4 C
23.4 - 23.6 C
N
0
255
510
1,020
1,530
2,040
Meters

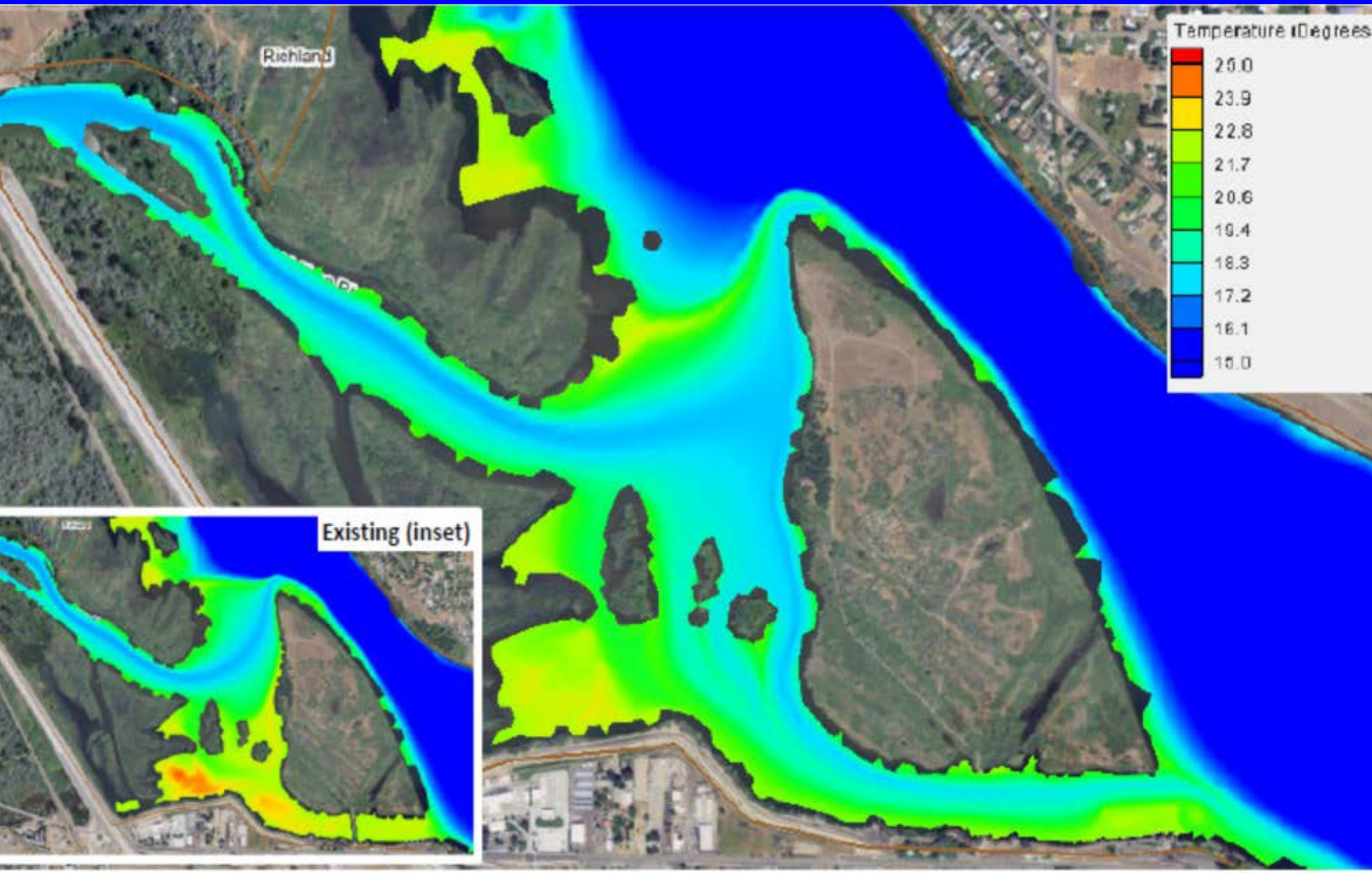
Duportail Boat Launch to Bateman Island

08/14/08



Bateman Island Causeway

Bateman Island Causeway Flow Blockage



Supplementing Tributary Flow in Kittitas Valley Streams

Yakama Nation Lamprey Restoration

- Goal: restore throughout ceded lands
- Regional collaboration
- Habitat surveys – identify limiting factors, key habitats for spawning and rearing
- Document presence and abundance
- Research and develop lamprey culture techniques

Lamprey spawning at Prosser Hatchery, 4/25/2012

Threatened Bull Trout

Courtesy Eric Anderson

HABITAT ENHANCEMENT
IMPROVING CULVERT PASSAGE

QUESTIONS?

Access Reports and Documents

- Yakima/Klickitat Fisheries Project (YKFP) at: YKFP.org
- Yakima Dams Fish Passage Study web page located at: **http://www.usbr.gov/pn/programs/ucao_misc/fishpassage/index.html**

- My email: FAST@YAKAMA.COM

That's All

Salmon Recovery in Washington

THE WASHINGTON WAY

David Troutt, Chair
Salmon Recovery Funding Board

Kaleen Cottingham, Director
Recreation and Conservation Office

Healthy Salmon, Healthy Washington

How We Got Here

- Endangered Species Act Listing
  - 17 species of salmon, steelhead, and bull trout listed in Washington State
  - Affects ¾ of Washington State

Washington is Invested in Salmon Recovery

How Washington's Organized for Success

- Salmon Recovery Act (1998)
  - Created "The Washington Way" – a bottom-up approach to recovery
  - Manages the "Habitat" of the 4 Hs
- State Strategy – Extinction is Not an Option
- Governor's Salmon Recovery Office
  - Coordinates state strategy to recover salmon
- Salmon Recovery Funding Board

The Washington Way

- Bottom-up approach
  - 8 geographical recovery regions
  - 7 regional recovery organizations wrote recovery plans

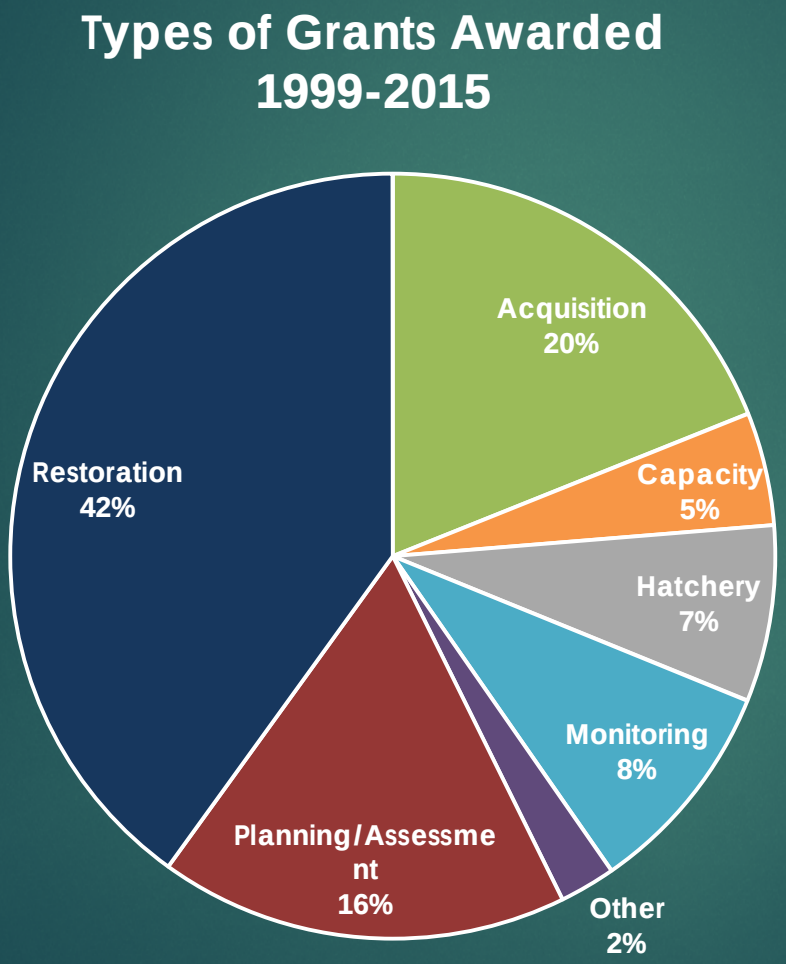
The Washington Way

- Bottom-up approach
  - 25 lead entities recruit projects
  - 100s of project sponsors implement projects on-the-ground
  - Salmon Recovery Funding Board distributes state and federal money

Salmon Recovery Funding Board

- Recover salmon and their habitat
  1. Priorities
  2. Funding
  3. Capacity
  4. Monitoring
  5. Adaptive Management

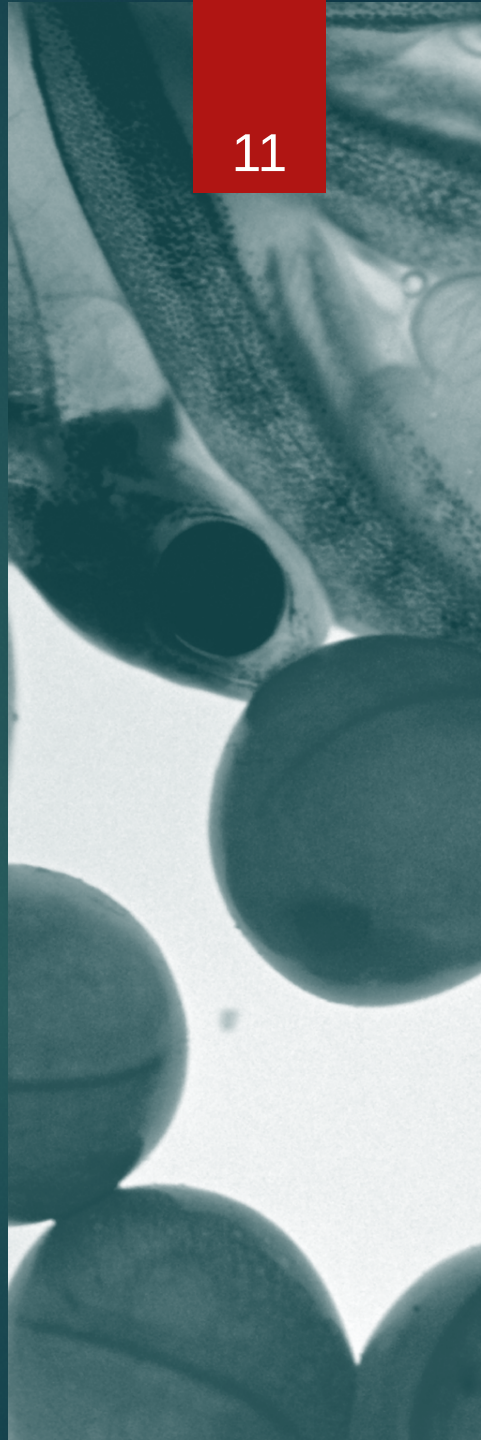
Funding Projects



Monitoring

Are Salmon Recovering?

Adult Fish Abundance				
Near Recovery Goal	Below Recovery Goal			
	Increasing	**Consistently Low**	**Decreasing**	**Insufficient Data**
Hood Canal Summer Chum Snake River Fall Chinook	Middle Columbia River Steelhead Lake Ozette Sockeye Snake River Spring Chinook Snake River Summer Chinook Upper Columbia River Steelhead	Lower Columbia River Fall Chinook Lower Columbia River Spring Chinook Lower Columbia River Steelhead Snake River Steelhead	Lower Columbia River Chum Puget Sound Chinook Upper Columbia River Spring Chinook Puget Sound Steelhead	Lower Columbia River Coho
★	↑	–	↓	O



Big Challenges Ahead?

We Still Have Hope

Questions?

- Recreation and Conservation Office
  Kaleen Cottingham
  (360) 902-3003
  Kaleen.Cottingham@rco.wa.gov

- Salmon Recovery Conference
  - April 26-27, 2017
    Wenatchee Conference Center