

Klickitat River Spring Chinook Master Plan Pathway to Hatchery Reform

Columbia Gorge Fisheries & Watershed Science Conference

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Presentation Outline:

Background

Spring Chinook Conservation Program

Related Subbasin Habitat Actions



Klickitat River Spring Chinook Master Plan Overview

Native Stocks:

I. Spring Chinook



II. Steelhead



Introduced Stocks:

I. Fall Chinook



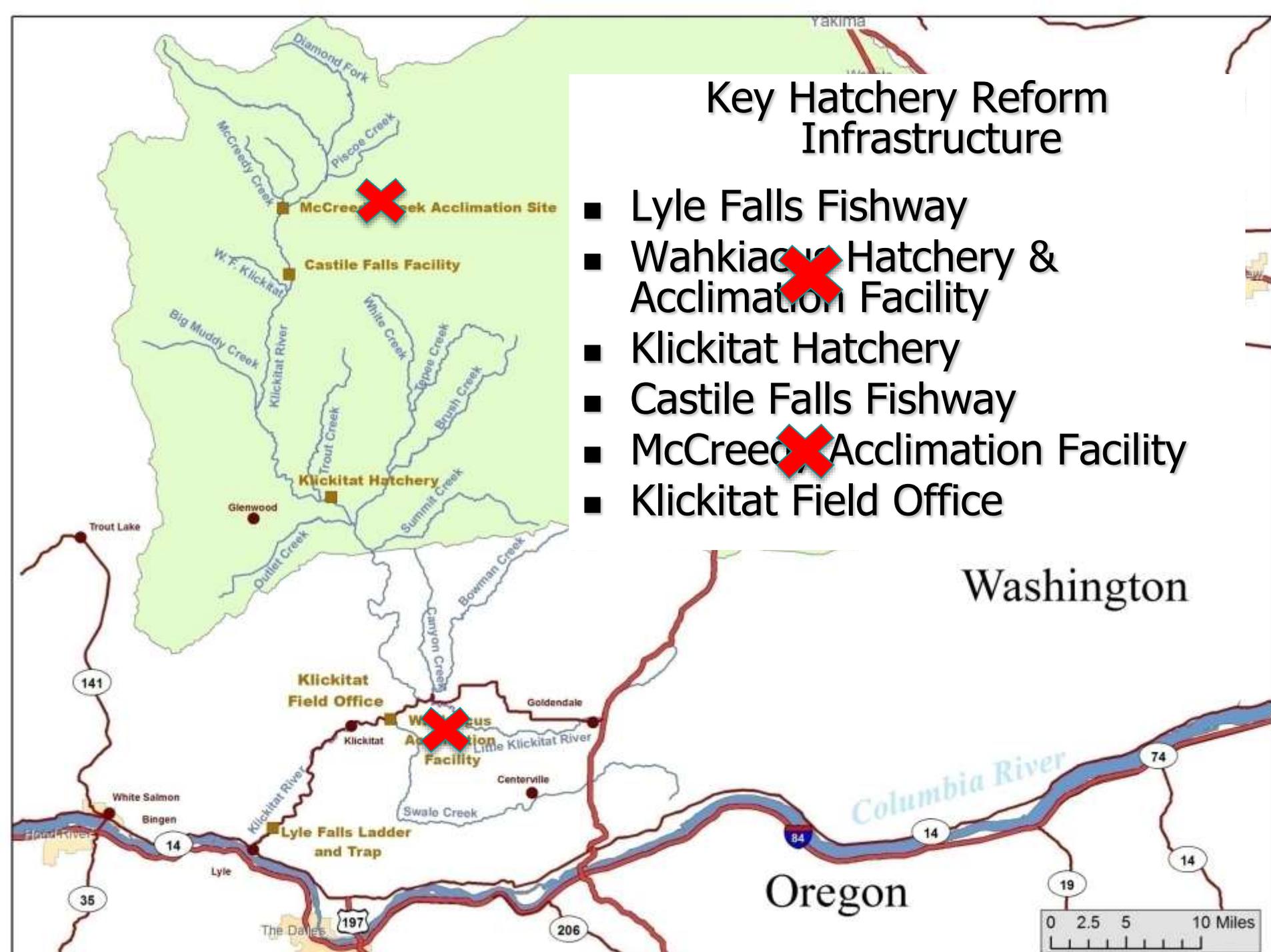
II. Coho



- All stocks have existing artificial (hatchery) production
- Programs designed for harvest augmentation

Key Hatchery Reform Infrastructure

- Lyle Falls Fishway
- Wahkiacum Hatchery & Acclimation Facility
- Klickitat Hatchery
- Castile Falls Fishway
- McCree Creek Acclimation Facility
- Klickitat Field Office



Klickitat Subbasin Monitoring & Evaluation Project



Lyle Falls Monitoring & Collection Facility



Castile Falls Monitoring Facility

Goals:

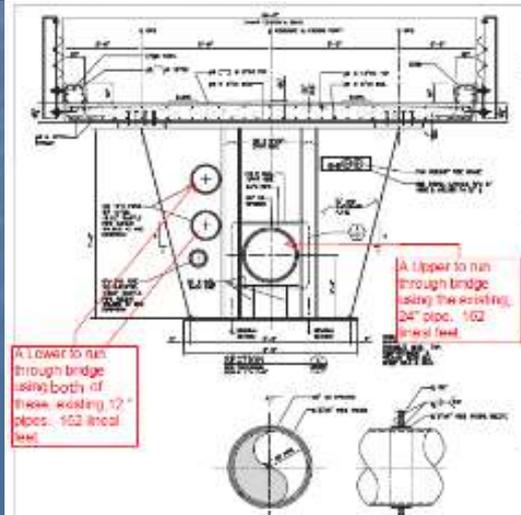
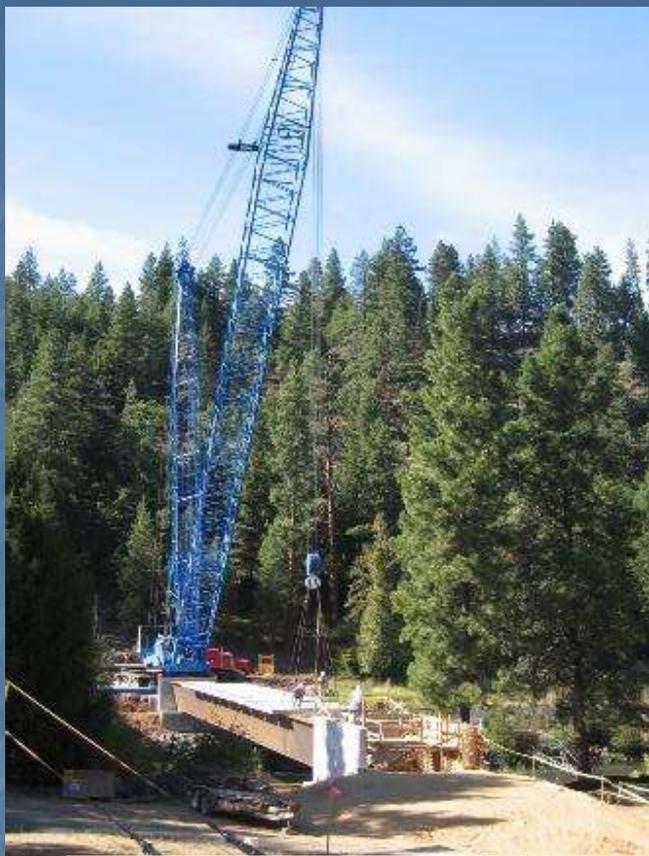
Monitor status and trends in abundance, distribution, productivity, life history and diversity, and habitat of anadromous salmonids.

Monitor and evaluate effectiveness of hatchery and habitat actions

Began in 1995



Accord Bridge Project, 2010.



NOAA Actions (Hatchery Reform & PCSRF Funding):

Infrastructure improvements:

- 3-Phase power
- Chilled incubation water to improve smolt survival
- Juvenile transfer lines
- Fish Transport



Spring Chinook Focused Key Capital Actions:

1. Reroute main spring-water pipeline through bridge
2. Construct new circular tanks (river acclimation) for spring Chinook
3. Rebuild adult holding & spawning building
Dual purposes (juveniles/adults in large concrete raceways)
4. Reconfigure Pollution Abatement

1



2



3



4



Klickitat River Spring Chinook Overview

Chris Frederiksen & Joe Zendt



Spring Chinook Management Objectives:



Overarching Conservation Goal:

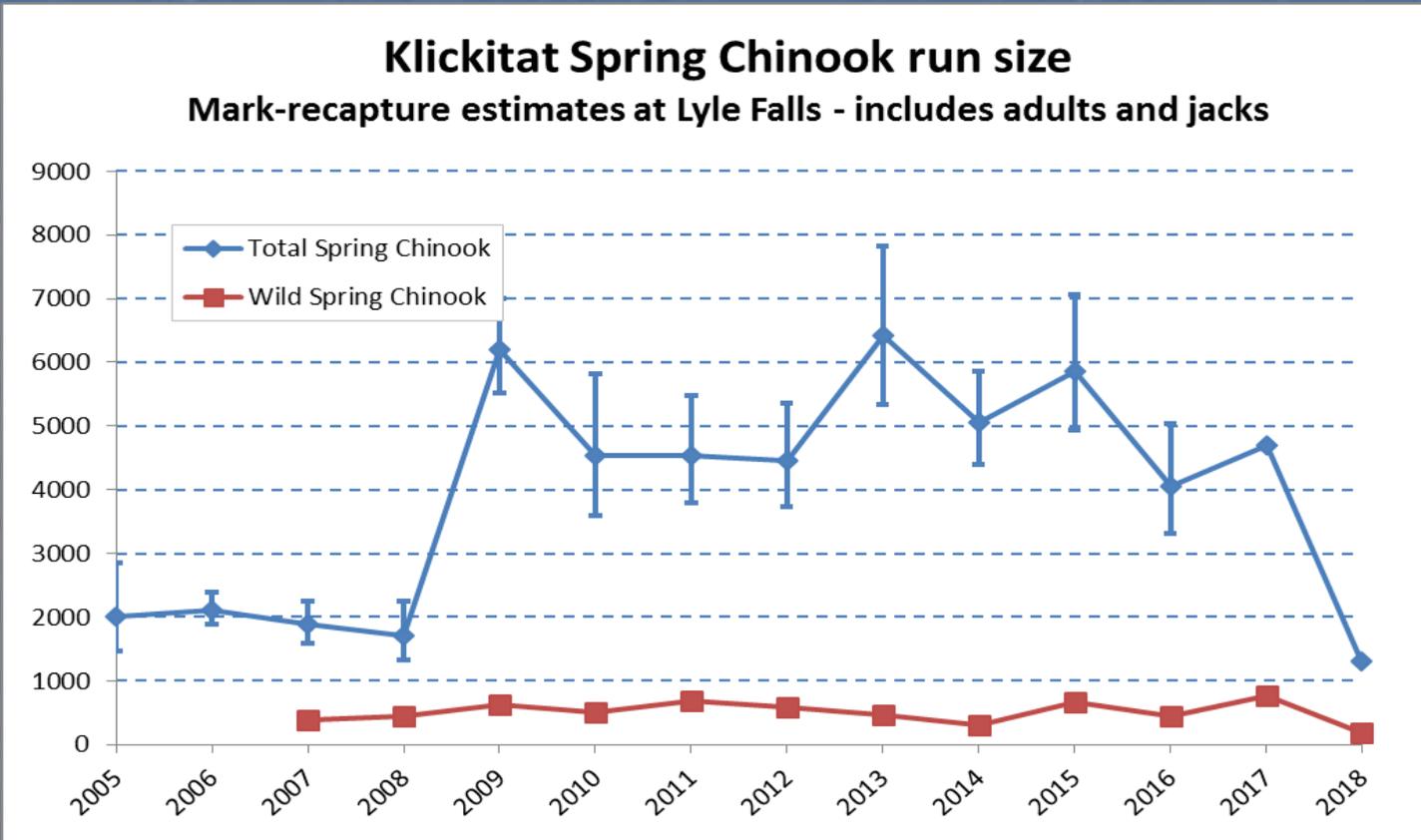
- *Increase natural population's viability*



Strategies:

- Implement hatchery reform measures
- Recolonize upper watershed
- Address environmental limiting factors with ongoing habitat restoration

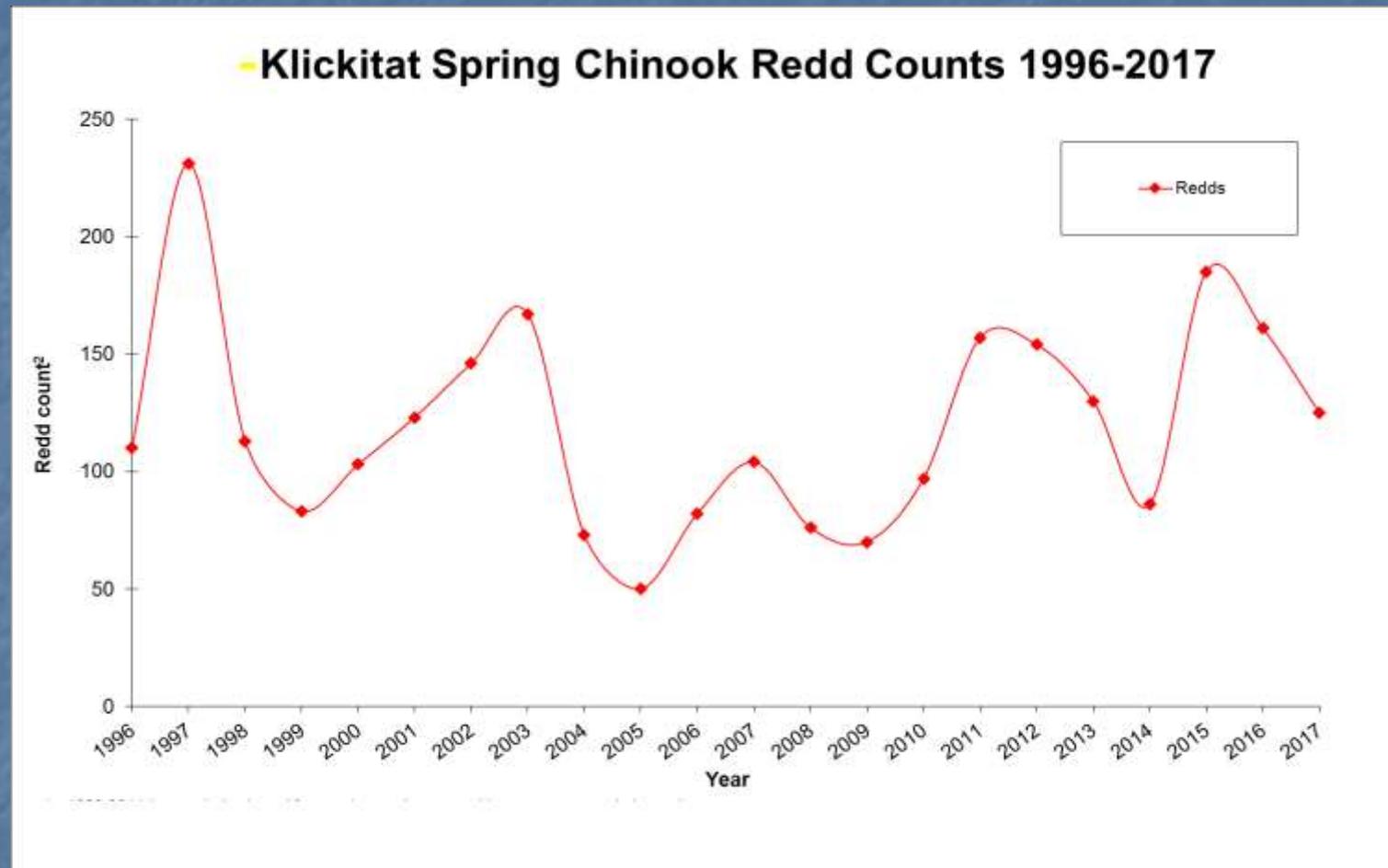
Spring Chinook: Stock Status Review



2007-2014 Adult abundance estimates:

- Hatchery Origin: ~1,137 – 5,959
- Natural Origin: ~179 - 685

Spring Chinook: Stock Status Review



1996-2017 Redd Counts: 39 - 231

Hatchery Reform: Why?

- Recent study: Introgression likely came from summer Chinook stocked in late 1970s
- 70+ Years of Propagation:
 - 0-5% NOR Broodstock!
- Introgression with Upper Columbia Summer Chinook (Ocean type)

1876

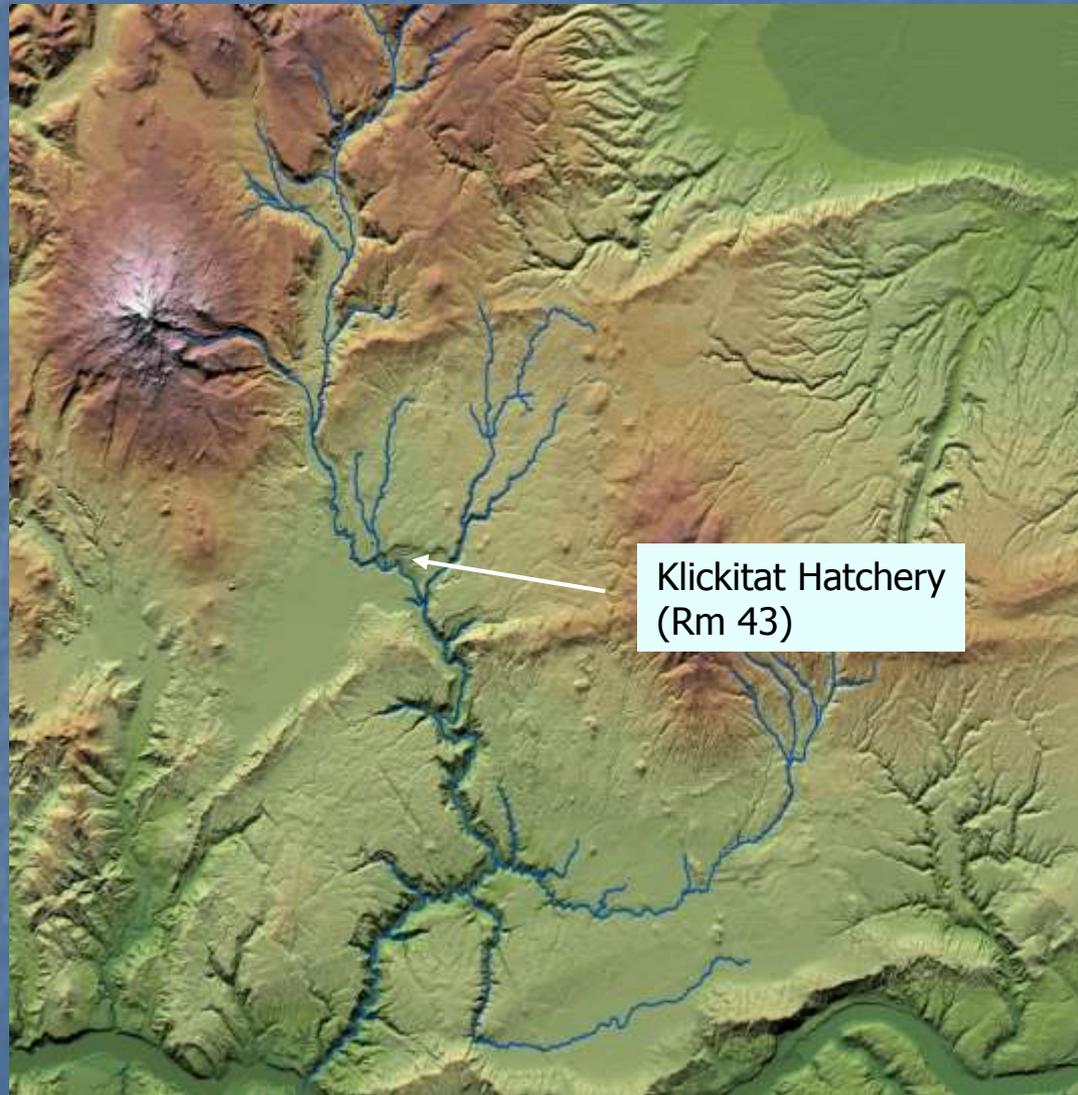
Introgressive hybridization among major Columbia River Chinook salmon (*Oncorhynchus tshawytscha*) lineages within the Klickitat River due to hatchery practices

Jon E. Hess, Andrew P. Matala, Joseph S. Zendt, Chris R. Frederiksen, Bill Sharp, and Shawn R. Narum

Abstract: Major lineages of anadromous salmonids show resilience to natural introgressive hybridization; however, Klickitat River spring-run Chinook salmon (KRSC, *Oncorhynchus tshawytscha*) have an enigmatic origin because of their intermediate genetic and geographic relationship among Columbia River Chinook salmon lineages. We used computer simulations to evaluate four anthropogenic and natural processes as likely causes of the apparent introgressed genetic composition of KRSC: recent admixture (~5 generations), historical admixture (>200 generations), isolation-by-distance gene flow, and natural selection. We also genotyped 2413 fish (32 collections) across 96 single nucleotide polymorphism loci to clarify the relationship of KRSC among the three major Columbia River lineages (Lower Columbia and interior ocean- and stream-type) and to quantify introgression among collections. Between 1980 and 2000, we observed a decline of pure interior stream-type individuals in the KRSC collections. This temporal shift in genetic composition was coincident with relevant changes in hatchery practices. Based on results from the simulations and time-series samples, a recent and anthropogenically caused admixture was most likely responsible for introgression of KRSC. Potential long-term negative effects of introgression may require some form of mitigation.

Hess et al. 2011. Canadian Journal of Fisheries and Aquatic Sciences 68: 1876-1891.

Spring Chinook

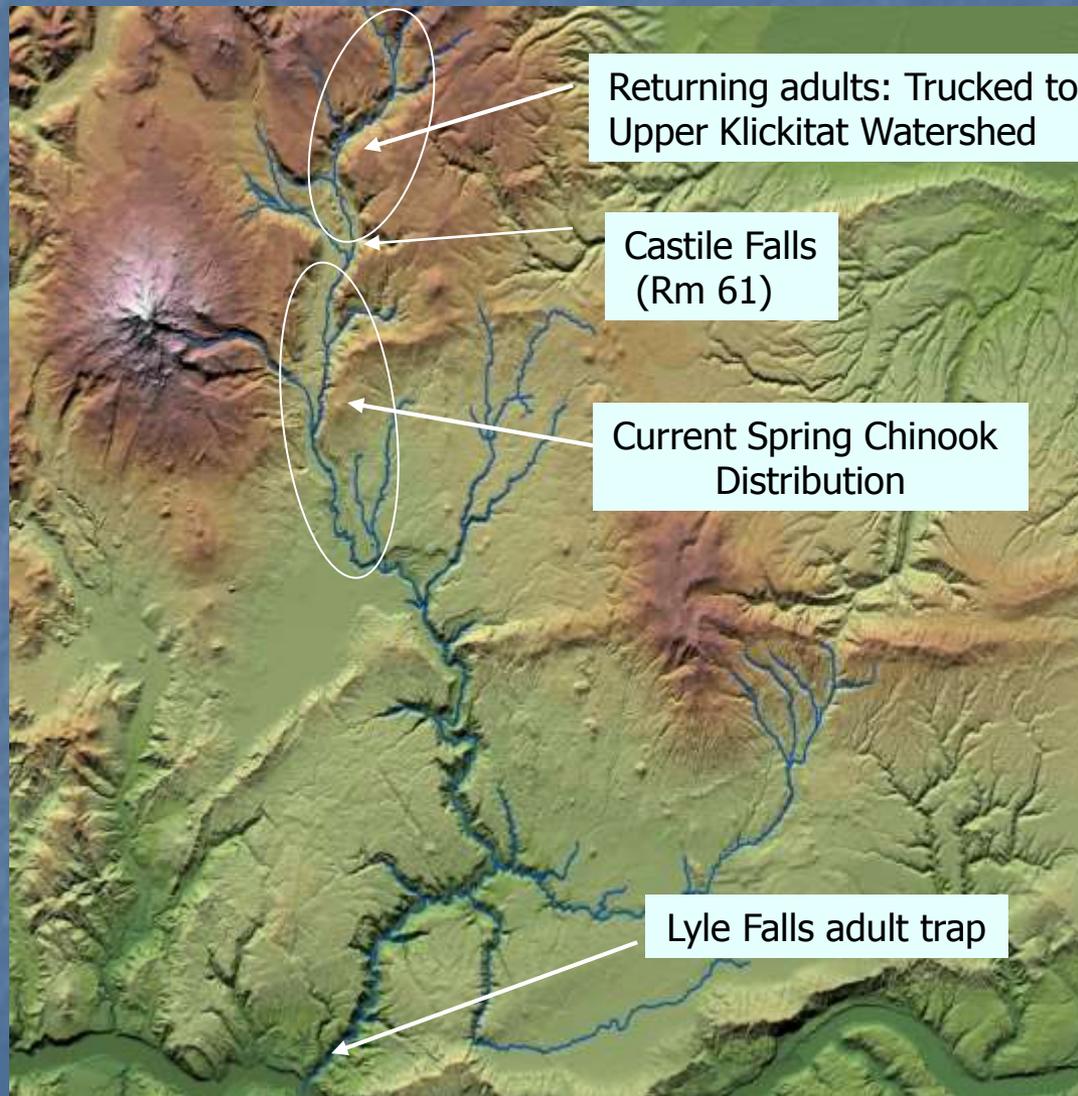


Current program

I. Segregated Practices

- ❑ ~550 adults
- ❑ 95-100% hatchery broodstock
- ❑ ~600k on-station release
- ❑ PHOS ~ 10-20%
- ❑ PNI = 0.25

Spring Chinook



Future program

I. Conservation & Harvest

- ❑ Integrated program
 - ❑ Incorporate greater proportion natural origin fish
- ❑ Broodstock collection
 - ❑ Lyle Falls Trap
- ❑ ~550 Adults
 - ❑ 800k on-station release

Conservation benefits

- ❑ Increase spawning & rearing distribution
 - ❑ Increase abundance
- ❑ Increase PNI

Spring Chinook Hatchery Transition Plan:



4 Phase approach:

- 1. Phase I- Implement collection of NOR adults for new hatchery stock (N₁ line).**
 - Collect ~68 Natural origin Adults (NORs) for broodstock
 - 100k smolt release
 - Reduce release number for current hatchery line (H1 line)
 - ~Five years

- 2. Phase II- Propagate new hatchery line (H₂ line)**
 - Returning adults from N₁ line
 - Terminate propagation of old hatchery line
 - ~ Five years

Spring Chinook Hatchery Transition Plan:



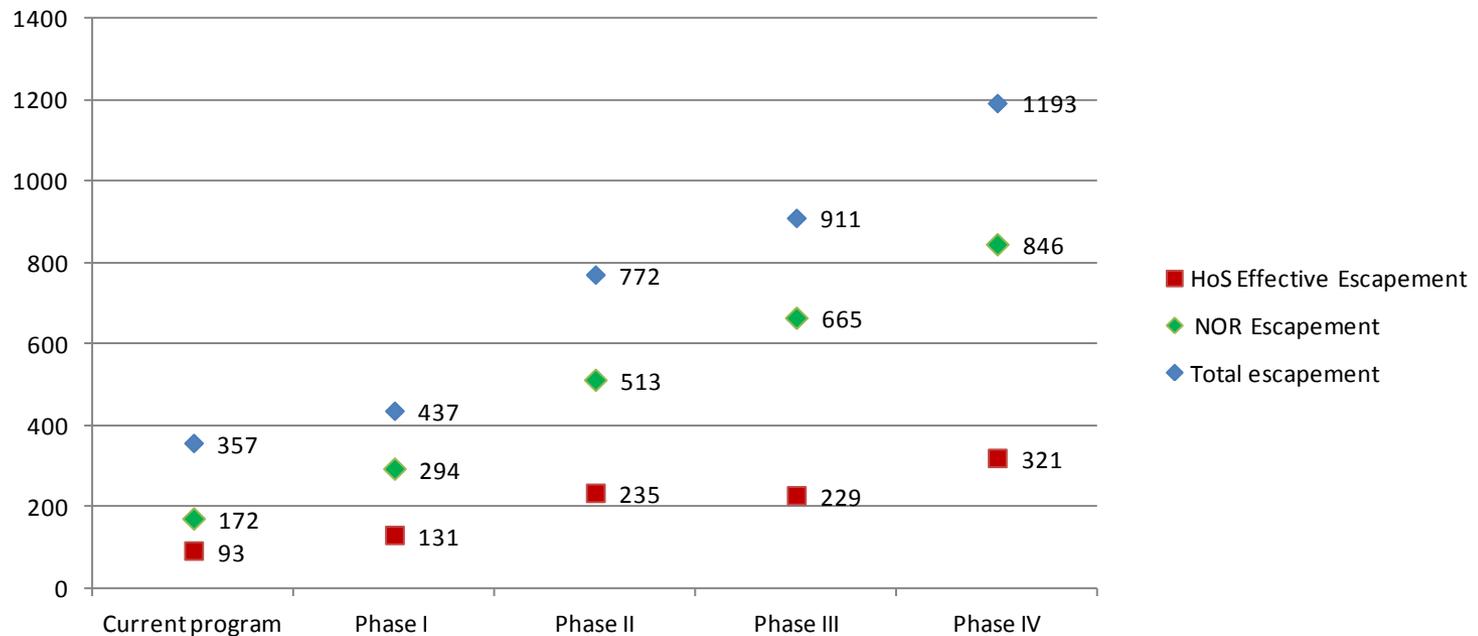
4 Phase approach:

- 3. Phase III- Complete hatchery stock conversion**
 - Old hatchery line completely phased out (H₁ line)
 - Increase brood collection for N₁ line and new hatchery line (H₁ line)
 - ~Five years

- 4. Phase IV- Final increase in production for both N₁ line and H₂ line)**
 - Brood take and release of N₁ line will be dependent on strength of Natural Spring Chinook run
 - H₂ line brood take dependent on N₁ line
 - ~ Five years

Klickitat Spring Chinook theoretical performance

Klickitat Spring Chinook: Integrated Hatchery Program Performance



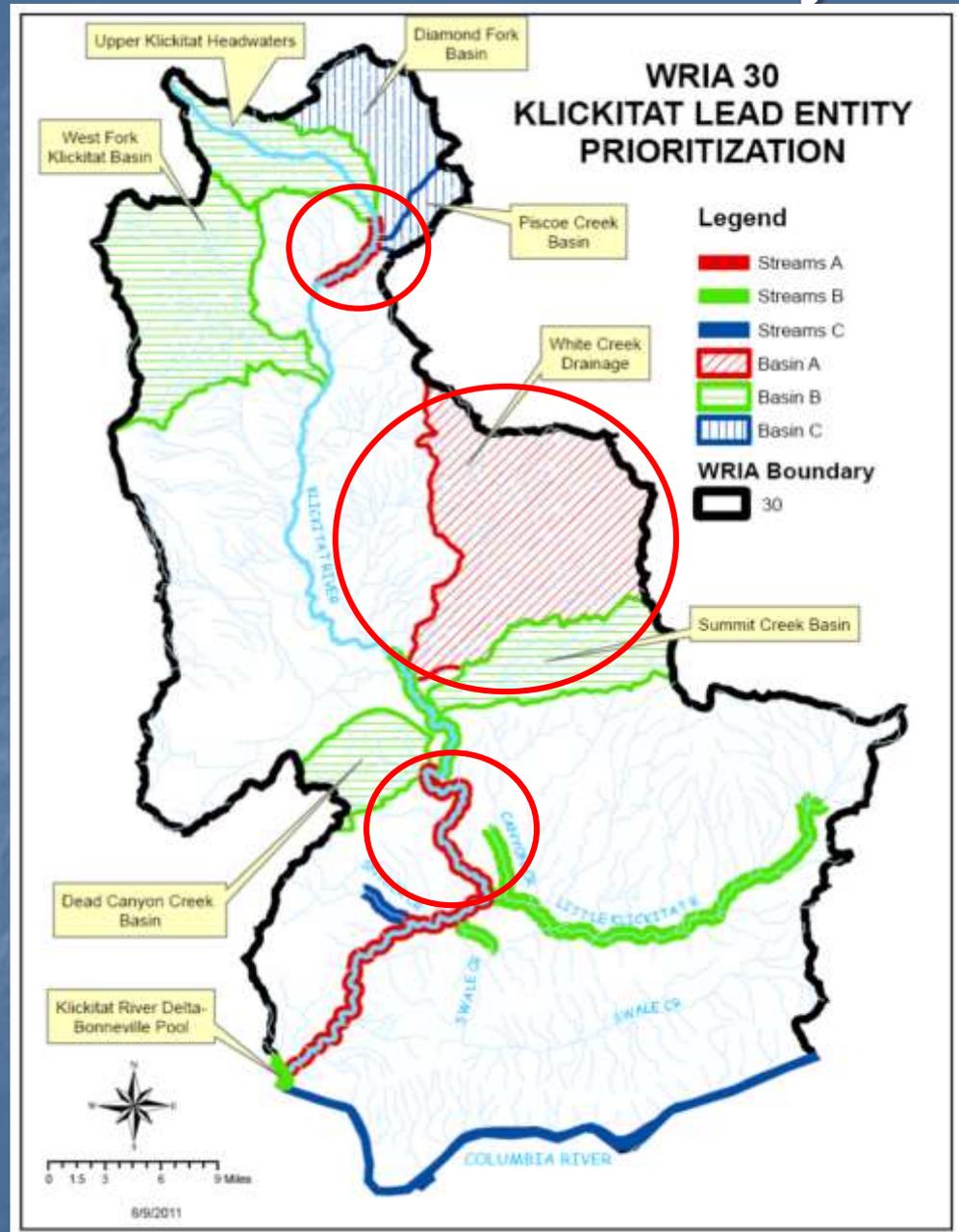
Klickitat Watershed Enhancement Project

Overall goal: restore watershed health to aid recovery of native salmonid stocks in the Klickitat Subbasin.

Link Project Actions to Priority Areas

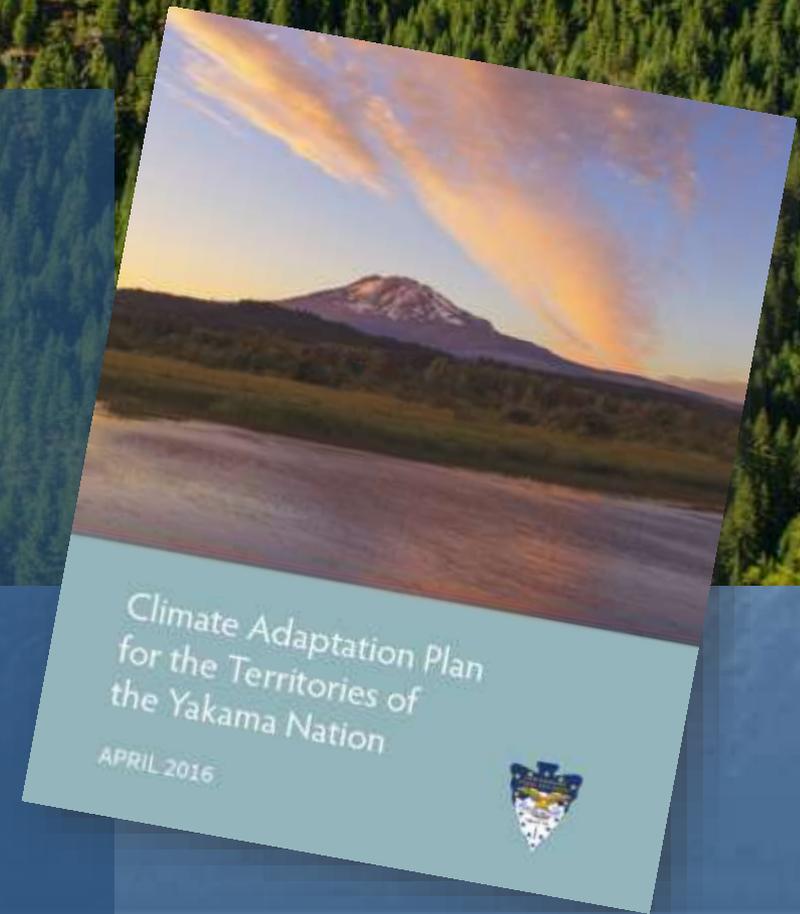
Three-pronged approach:

- Assess watershed and habitat conditions to prioritize actions
- Protect, restore, and enhance priority watersheds and reaches
- Monitor to assess watershed conditions and effectiveness



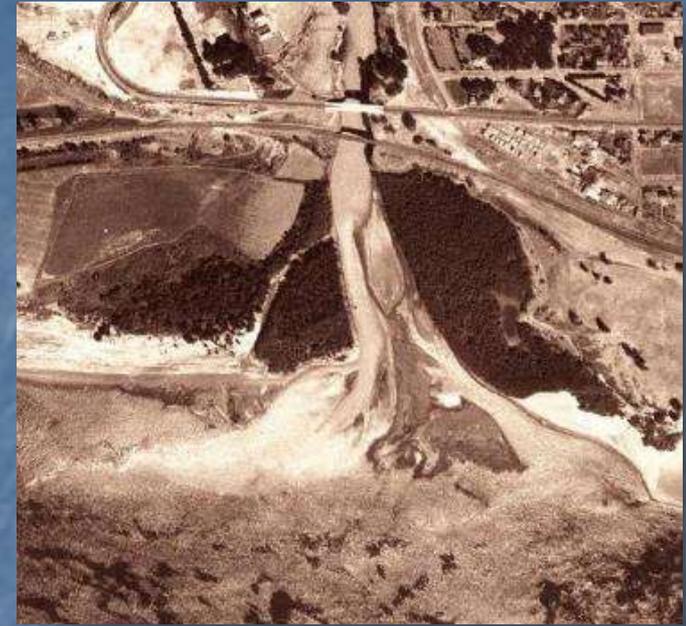
KWEP Project Types

- Conservation Acquisitions
- Geomorphic & Habitat Assessments
- Passage – longitudinal connectivity (fish, sediment, and wood)
- Forest Roads – drainage improvements, reduce road/river
- Meadows Restoration/Floodplain Reconnection
- Side Channel Reconnection
- Wood Replenishment
- Revegetation
- Livestock Fencing



Klickitat Delta/Sediment Fan

- Evaluate opportunities to provide “ecological lift” at tributary deltas.
- Strengthen cold water benefit from tributaries.
- Reduce impacts due to stranding during power ramping events and predation hotspots (avian and piscivorous).
- Evaluate use of dredged material to elevate adjacent shallow bar habitat above ordinary high pool to recreate riparian forest galleries similar to historic conditions.



Klickitat Delta pre-Bonneville Dam



Klickitat Delta/Sediment Fan, 2018



White Salmon River

Special Thanks to:



Questions

