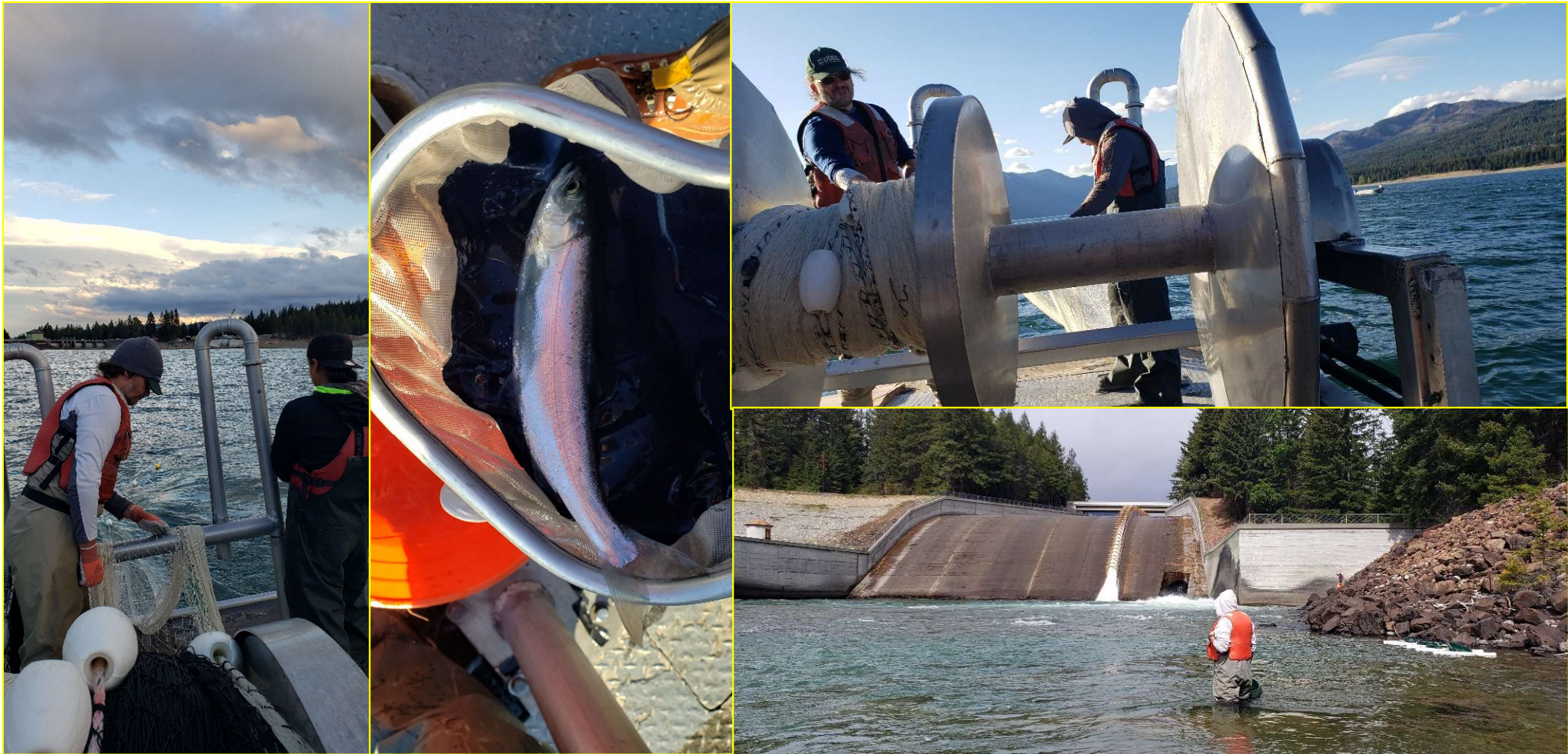


Sockeye Salmon Reintroduction in the Yakima Basin: Monitoring a Population Undergoing Naturalization

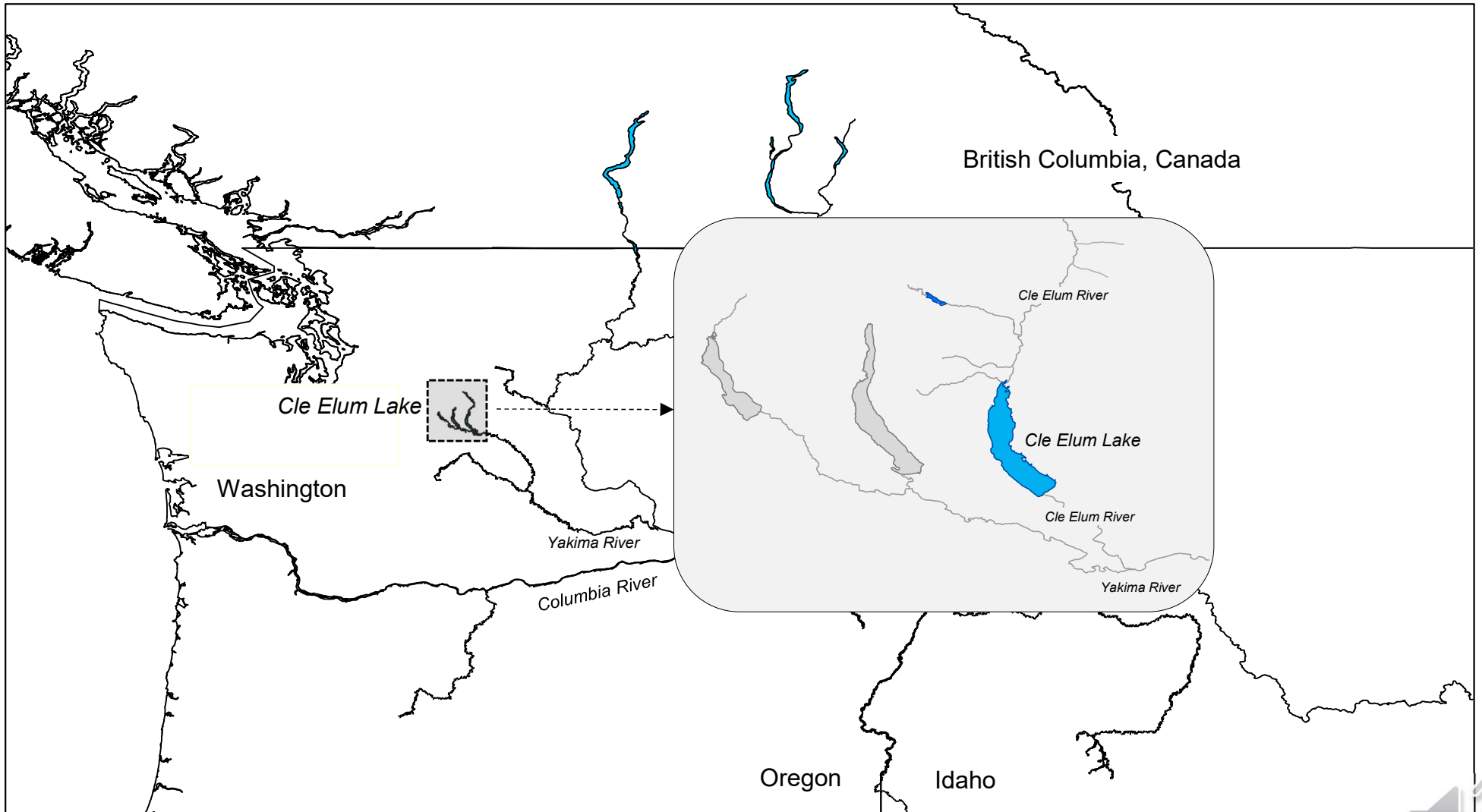


— BUREAU OF —
RECLAMATION



The site of reintroduction

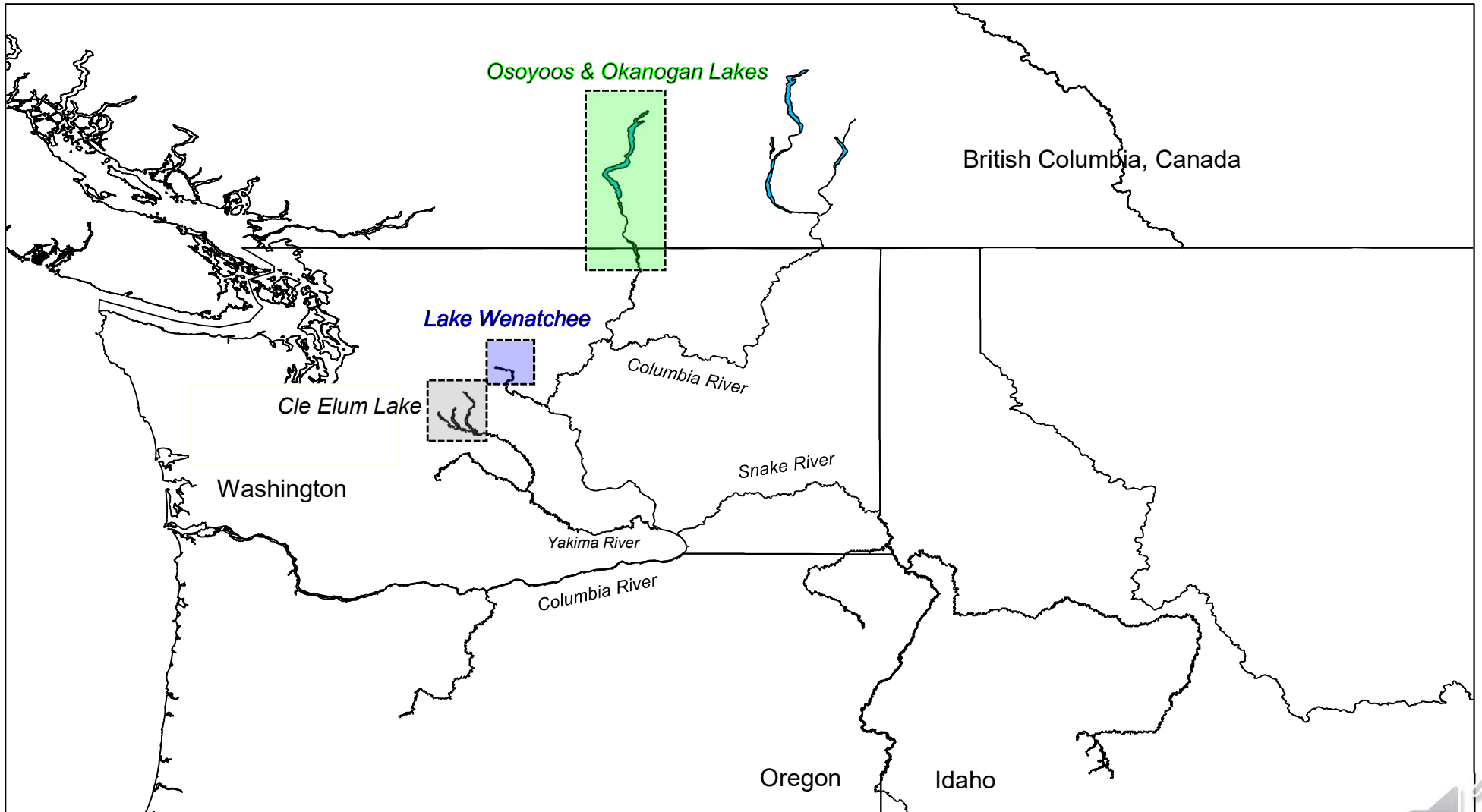
- Historical escapement of sockeye among Yakima Basin nursery lake ~200K
- Cle Elum Lake was believed to be the largest producer



Donor stock sources for reintroduction

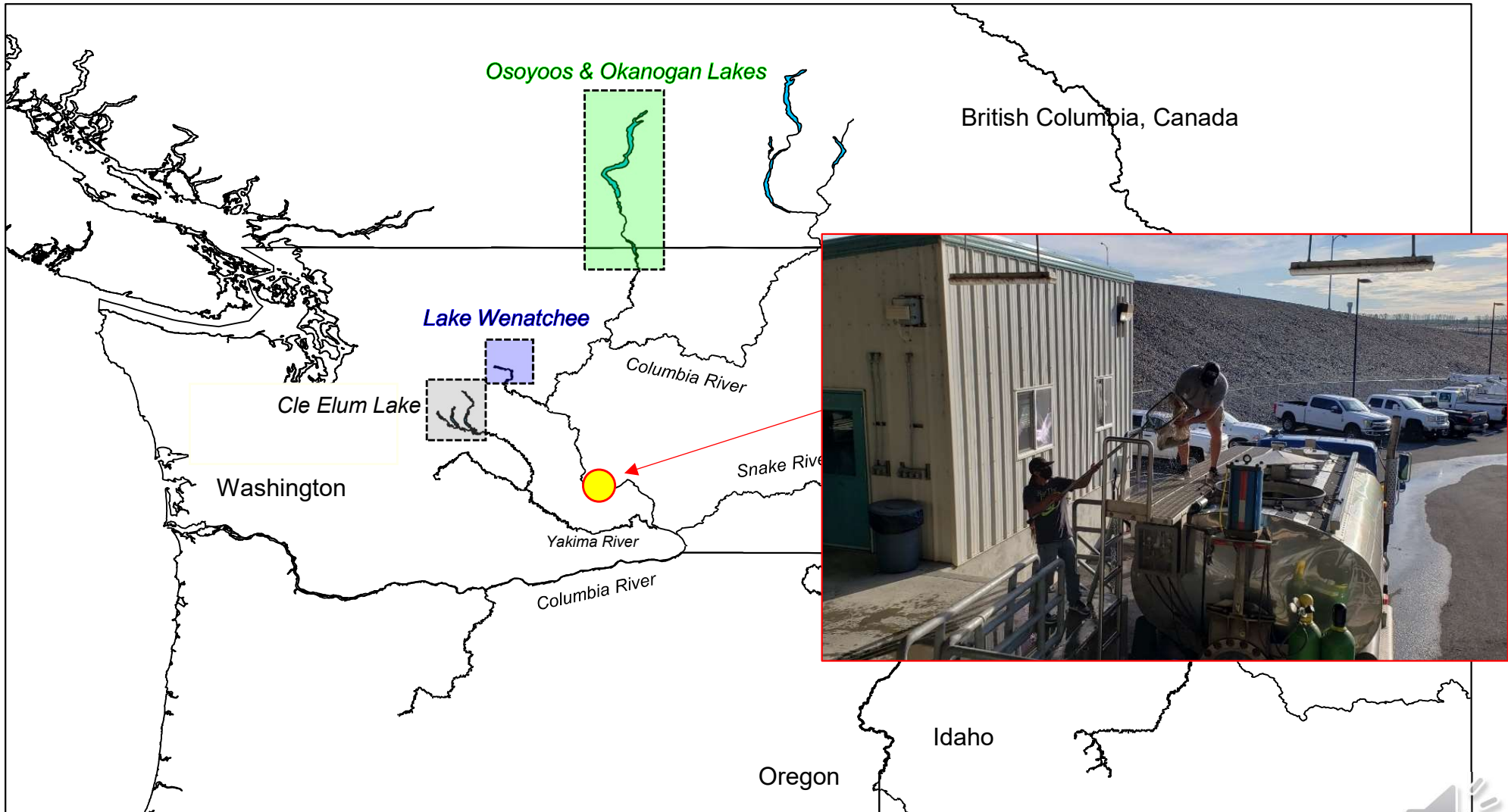
the only two extant populations in the Columbia River

★ stocks will be designated by color throughout



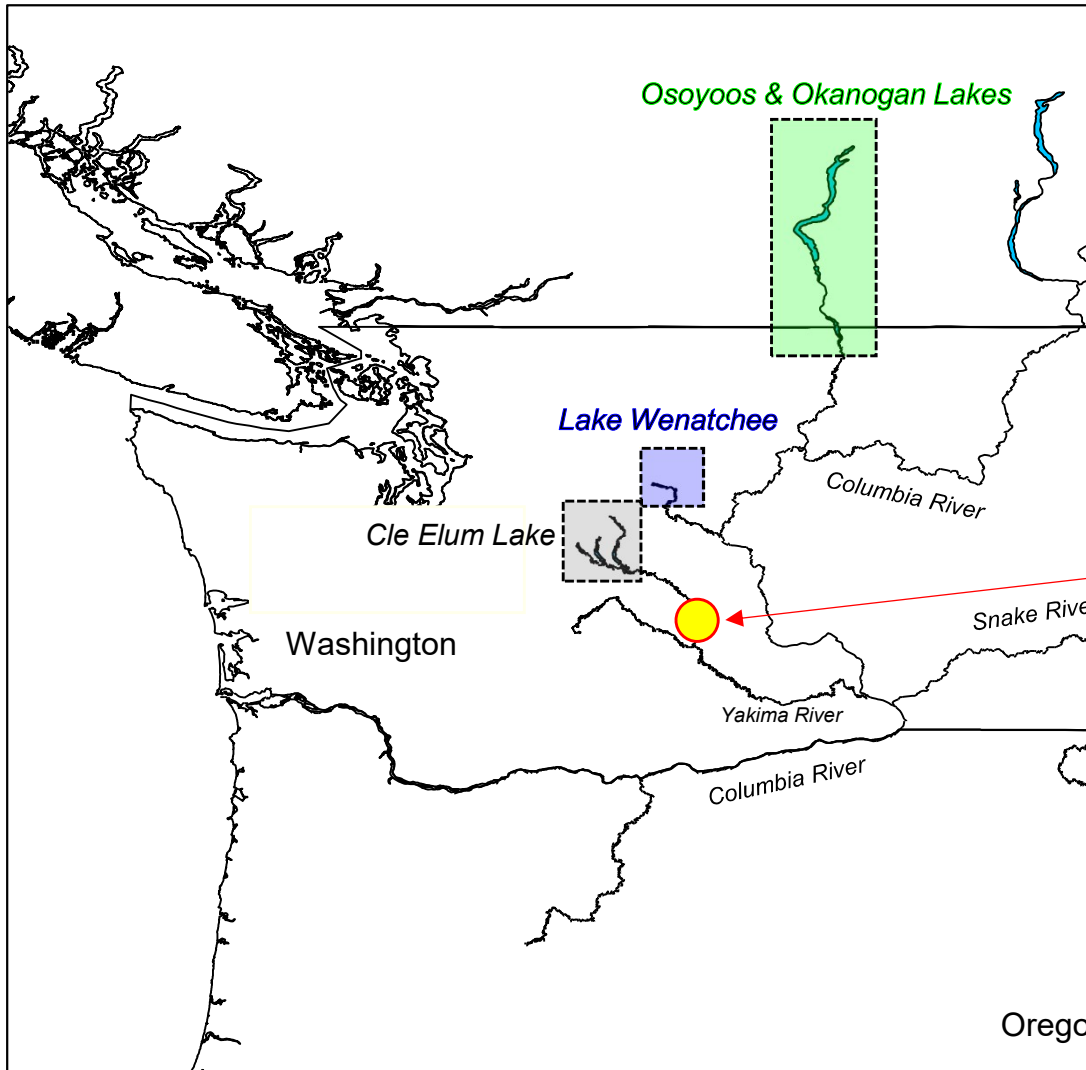
Adult Sockeye Passage & Collection

- Priest Rapids Dam – donor stock collection & translocation



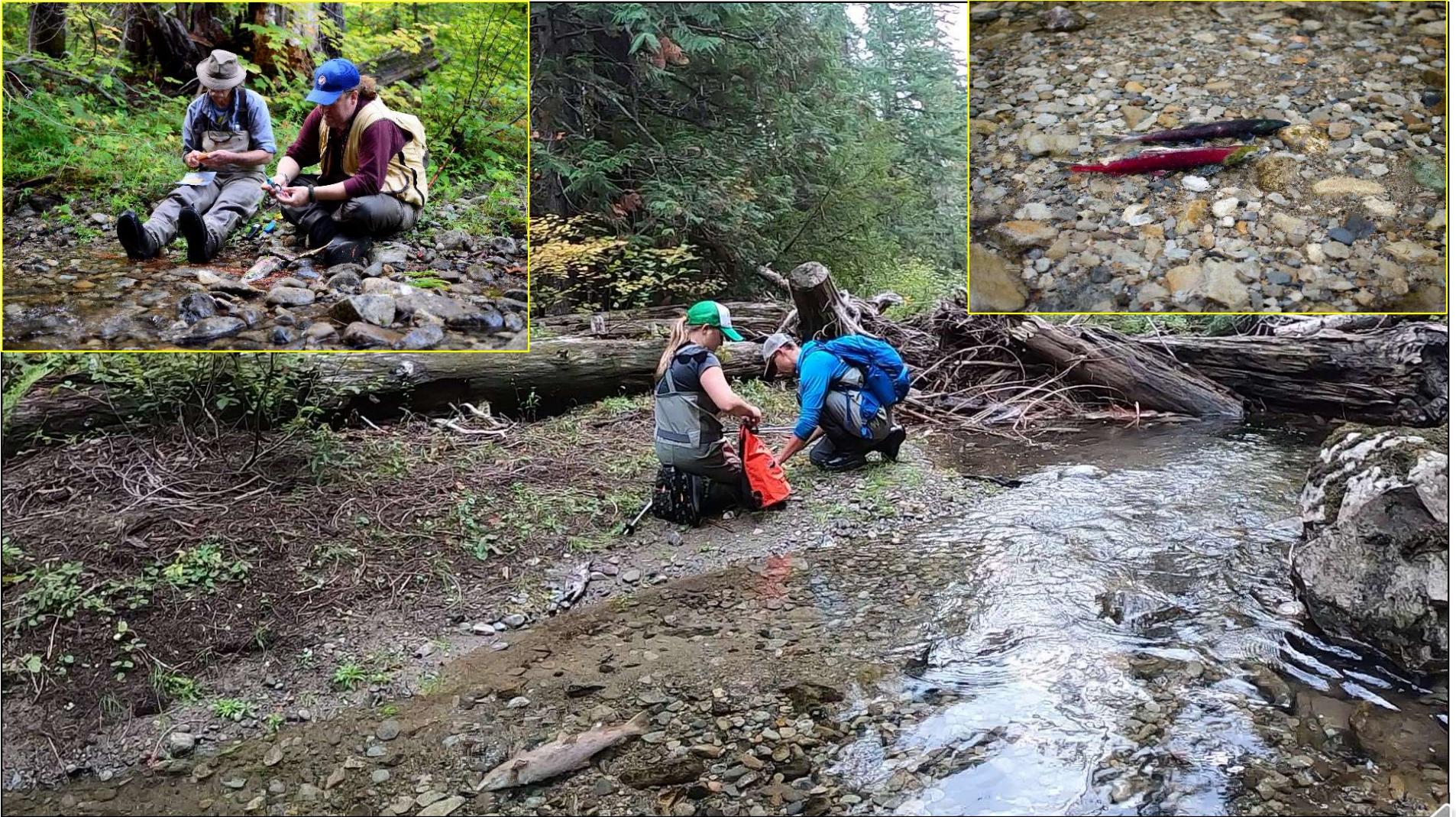
Adult Sockeye Passage & Collection

- Roza Dam adult trap – wild fish sampled & trucked



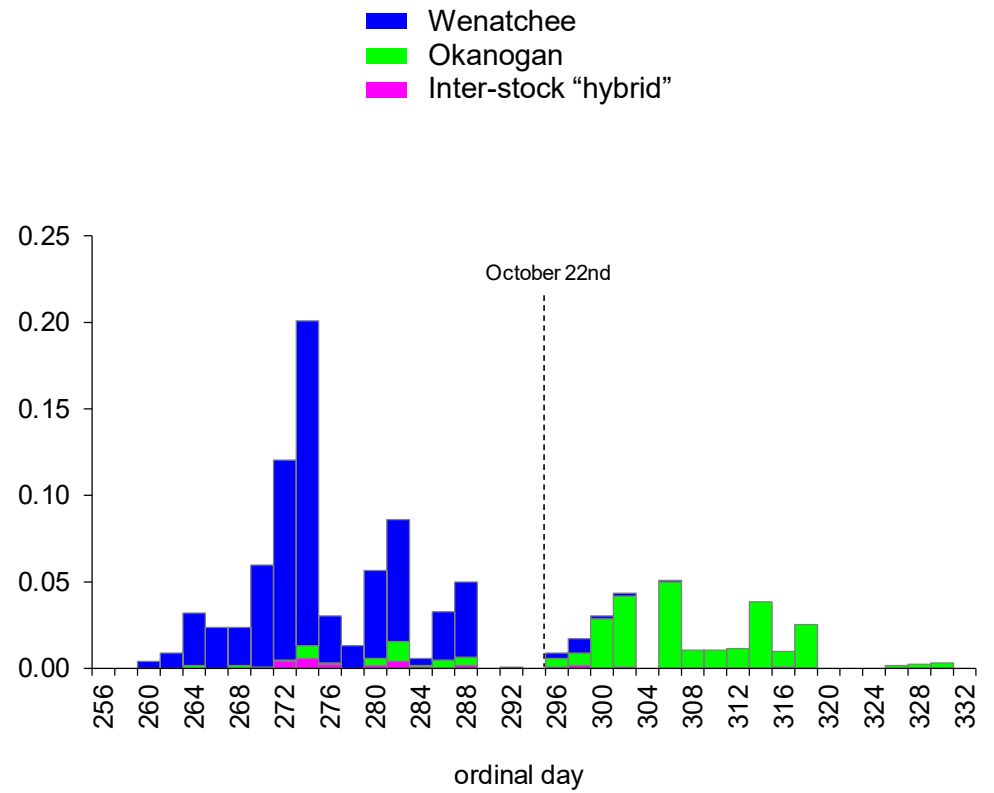
Spawning Ground Surveys:

spatial distribution differs

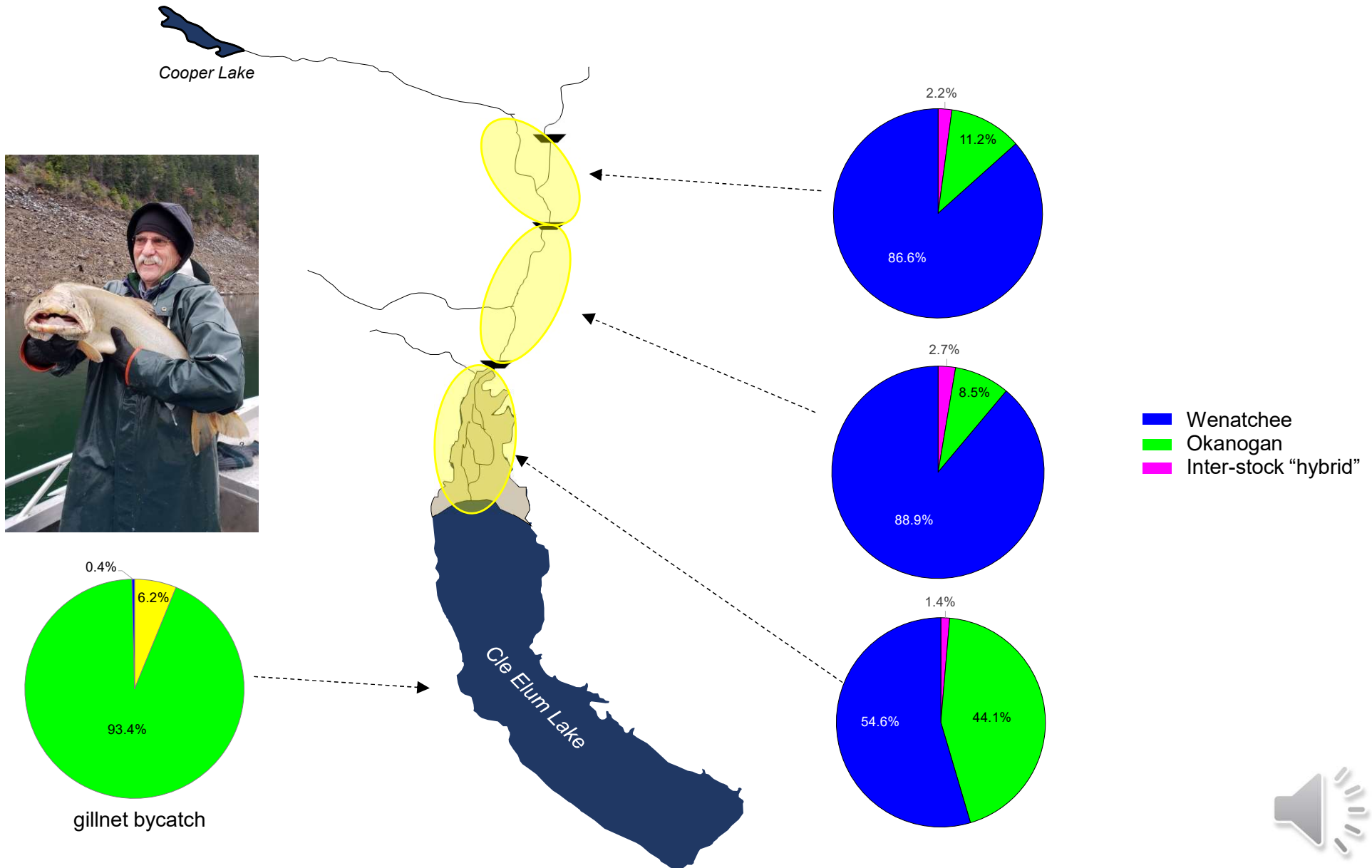


Spawning Ground Surveys: temporal assortative mating

☆ spawn times – trait retained from natal populations



Spawning Ground Surveys: spatial distribution differs



Smolt Monitoring: Background & Objectives

- **Feasibility Studies (NOAA, WDOE, YN)**

- ultra-oligotrophic: low nutrient levels

- low primary productivity

- low zooplankton densities; small standing crop of macroinvertebrates

- estimated smolt production potential = 600k to >3 million

- smolts able to find outlet successfully (bypass flume)



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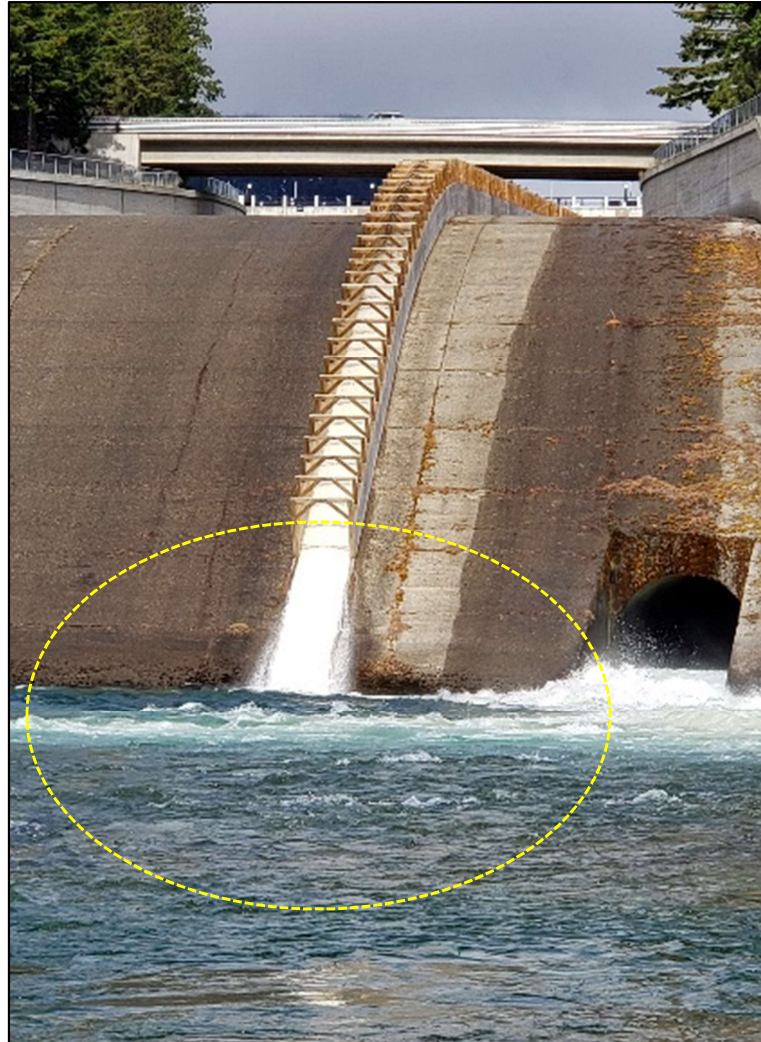
- **Population Trends - “success” by stock-of-origin**

 - relative abundances, response to environment



Smolt Monitoring: Emigration

- Via wooden bypass flume on spillway
- Reservoir must first reach full pool for operation
- **This route is BRUTAL!**
- remedy is an innovative passage system (see presentation by R. Visser)



severe trauma among sampled fish

- torn operculum
- missing eyes
- descaling
- disorientation
- **mortality may be as high as 50%**



Night Video in the tail race when spill began (2022)



Smolt Monitoring: Emigration

Cle Elum Dam

- Chandler juvenile facility ~215 rkm downstream
- Monitor emigration timing
- Monitor transit time



Geoffrey A. McMichael

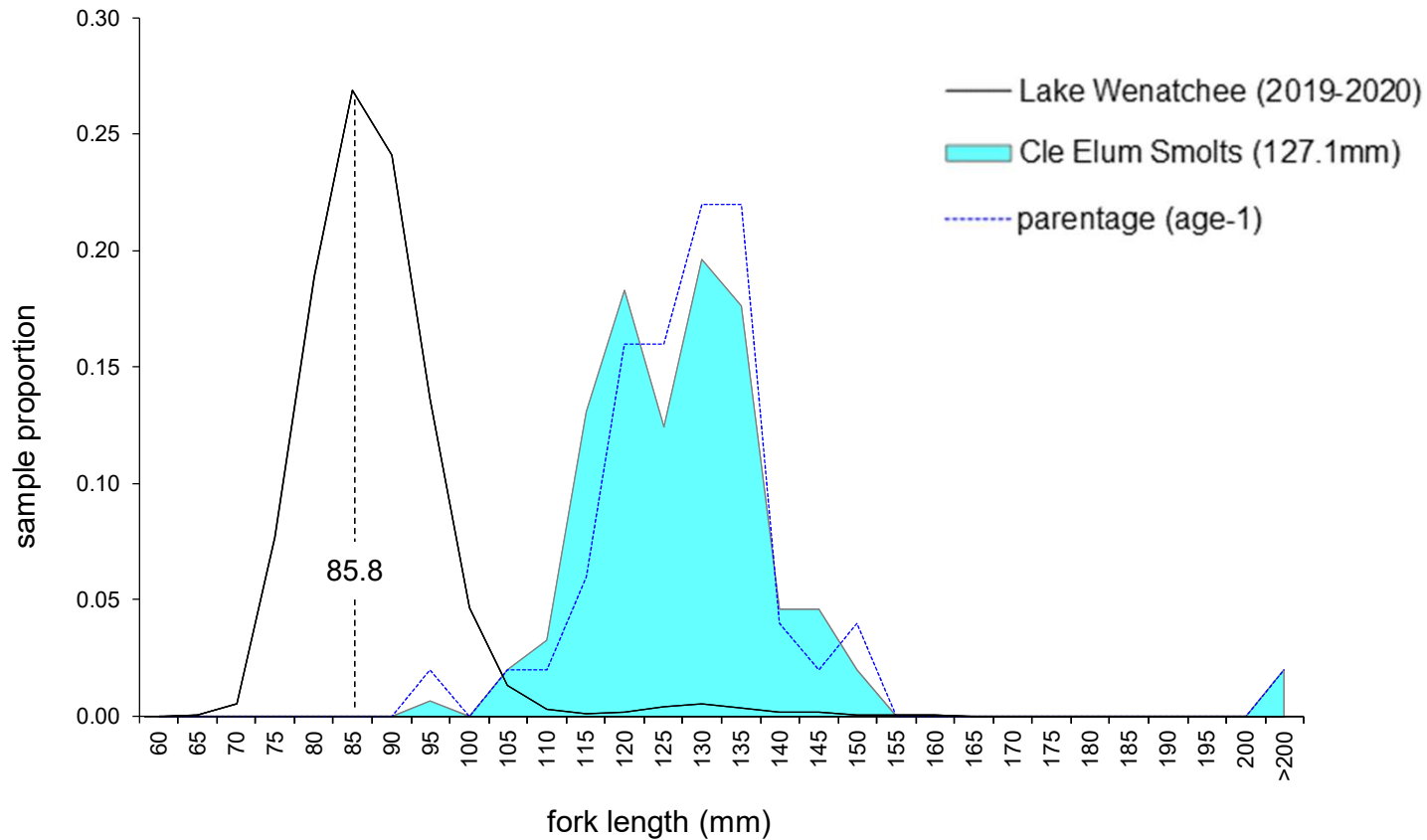
Yakima River

Columbia River



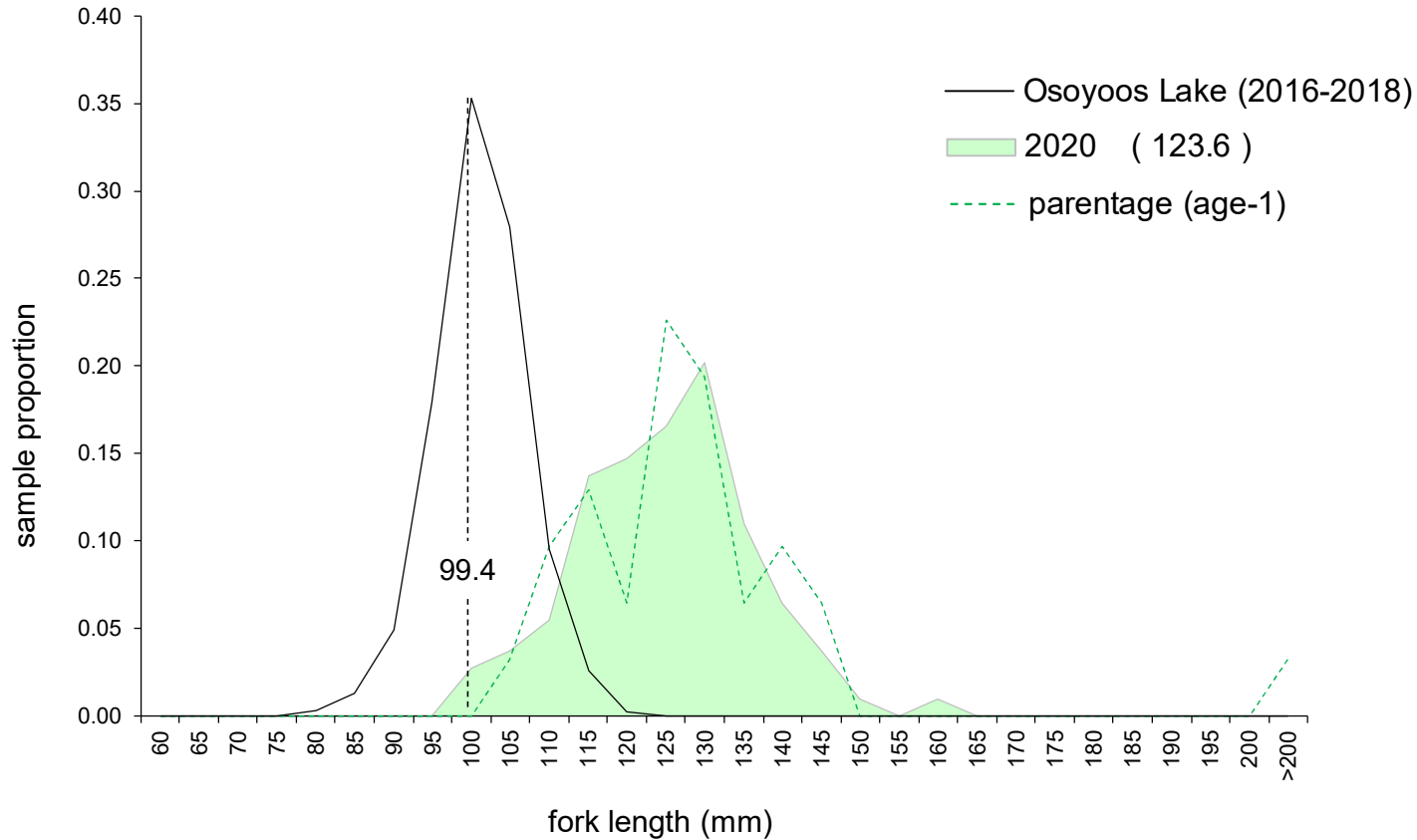
Smolt Monitoring: smolt growth & size

Wenatchee lineage: Cle Elum rearing produces larger fish than donor population



Smolt Monitoring: smolt growth & size

Osoyoos lineage: Cle Elum rearing produces larger fish than donor population

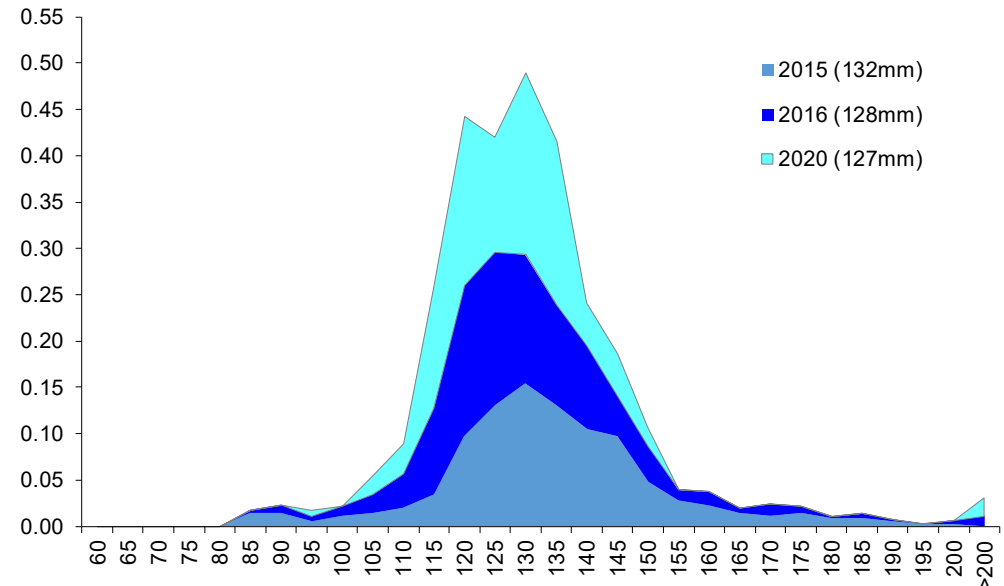
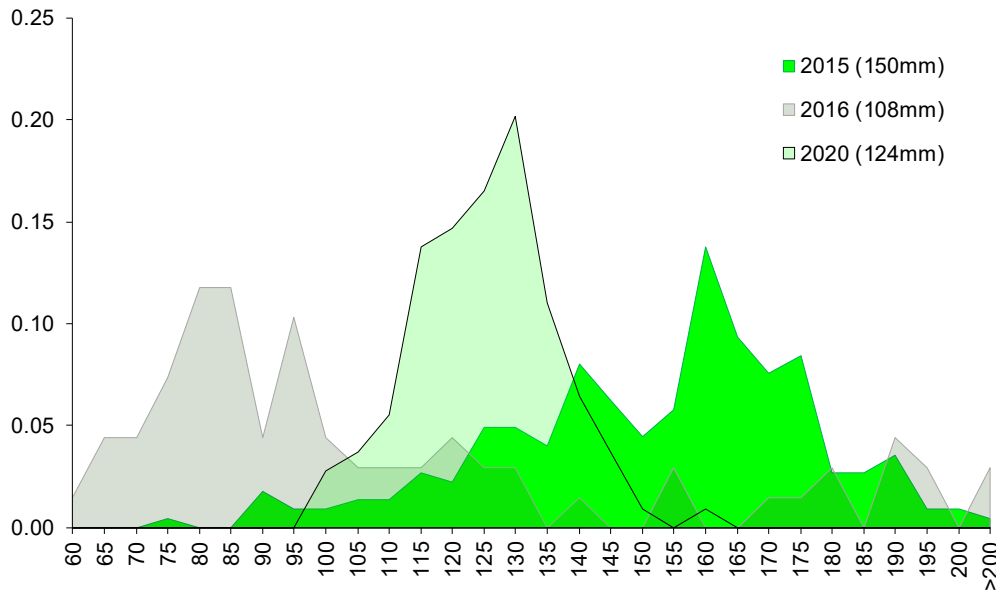


Smolt Monitoring: smolt growth & size

Size-at-age differs between stocks: spawning habitat? emergence time?

significant variation

uniform



Revisiting Smolt Emigration

In order for this to work.....the reservoir must look like this



Revisiting Smolt Emigration

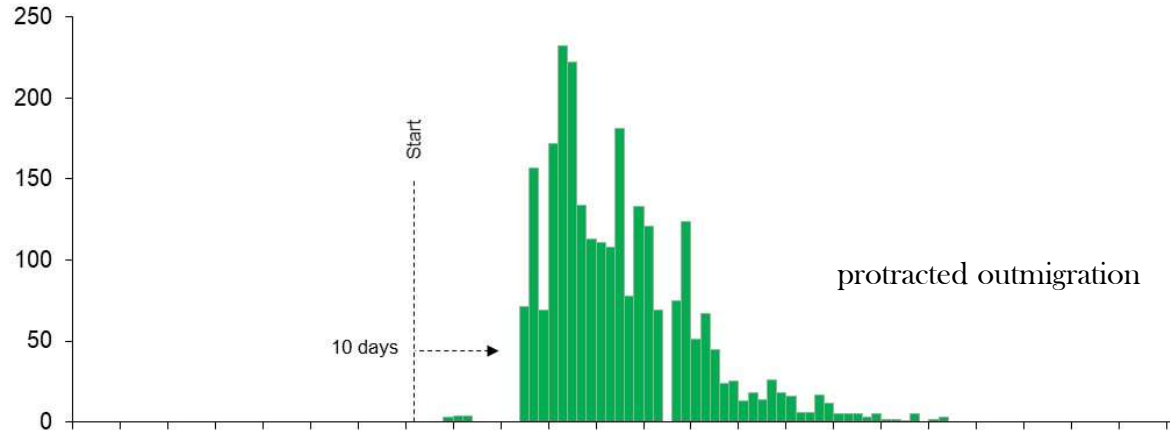
but in early spring it looks like this.



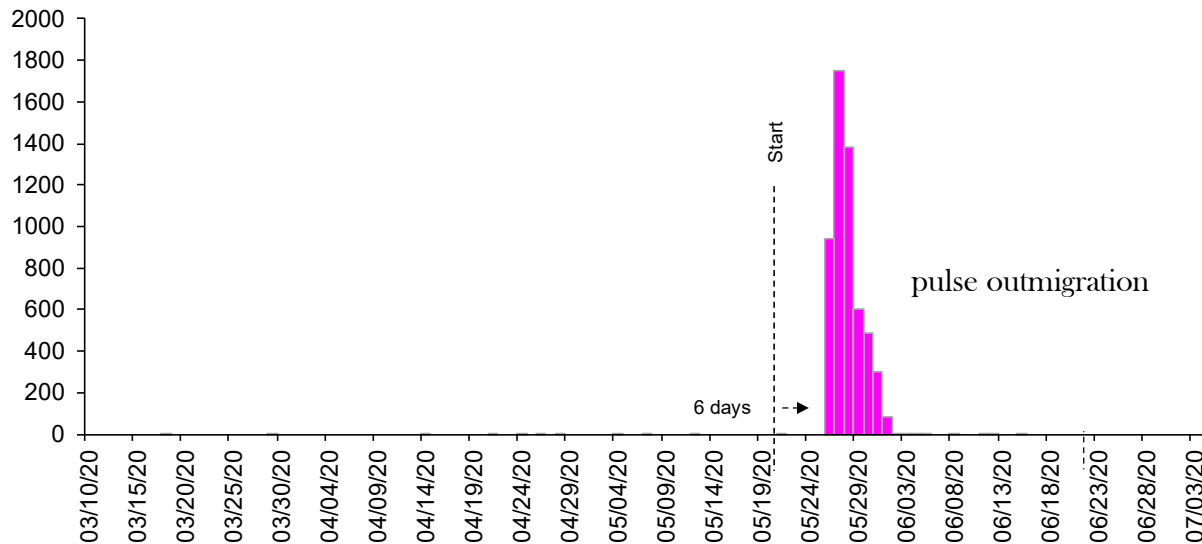
Revisiting Smolt Emigration:

- Start date for flume operations varies annually
- Emigration timing doesn't follow a natural schedule

2016 Chandler count



2020 Chandler count



Revisiting Smolt Emigration:

- Start date for flume operations varies annually
- Emigration timing doesn't follow a natural schedule
- In 2019 the reservoir failed to fill – no smolts got out



Coincidentally.....

- In 2020 we began seeing these on the spawning grounds
- They numbered in the thousands



Consequence of:
no emigration access?
delayed emigration?
rearing environment?
adaptation/ plasticity?
donor - origins
unknowns?



Effects of growth and emigration

In 2021 we began using a seining method to capture and tag smolts (?)

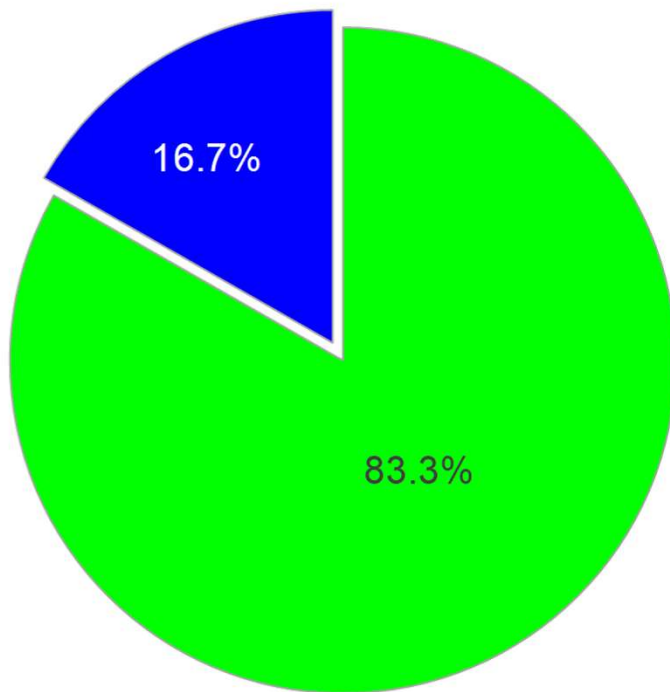


Smolt Monitoring: Juvenile Production

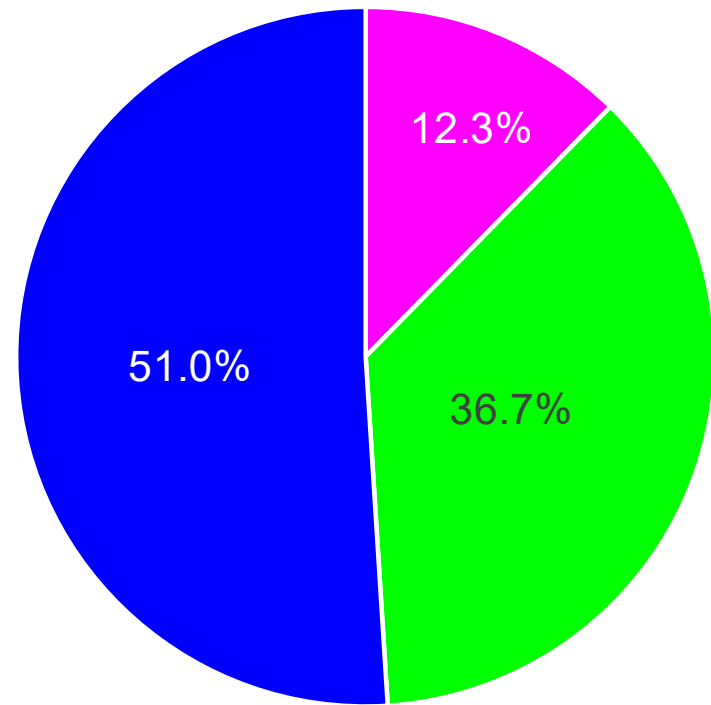
favours Wenatchee lineage

- Wenatchee
- Osoyoos
- hybrid

2018 total spawners



age-1+ smolt emigrants (2020)



Monitoring Juvenile Abundances & Production

Are stock-specific observations related to behavior & demographics:

- Juveniles/smolts that don't emigrate don't get "counted"
- relative growth rates – some fish get big fast, don't leave

Is it related to different habitats where fry emerge:

- lake (Osoyoos) vs. river (Wenatchee)
- lower river (Osoyoos) vs. upper river (Wenatchee)
- interspecific competition – lake rearing and juvenile lake trout
- predation pressure – lake trout (other species) preying on emergent fry

Is it related to different habitats where adults spawn:

- Exposed lake bed in lower section of river – may get inundated in spring
- Erraditic flows in fall (late spawners) – redd scour, redd superimposition

Much more to learn



That's all (but there's so much more)

| | | | | | |
|------------------|------|-----------------|------|-----------------|----------|
| Brian Saluskin | - YN | Charlie Strom | - YN | Peter Galbreath | - CRITFC |
| Kevin Segar | - YN | Simon Goudy | - YN | Hayley Nuetzel | - CRITFC |
| Andrew Maldonado | - YN | Arnold Barney | - YN | Jeremiah Newell | - CRITFC |
| Joe Blodgett | - YN | Ted Martin | - YN | Toby Kock | - USGS |
| Mark Johnston | - YN | Quin James | - YN | Richard Visser | - BOR |
| Chuck Carl | - YN | Michael Fiander | - YN | Pat Monk | - BOR |
| | | | | Paul Hoffarth | - WDFW |
| | | | | Rod O'connor | - GPUD |



- A. Matala

