

Sockeye Salmon reintroduction strategies in the CRB: pros, cons and surprises



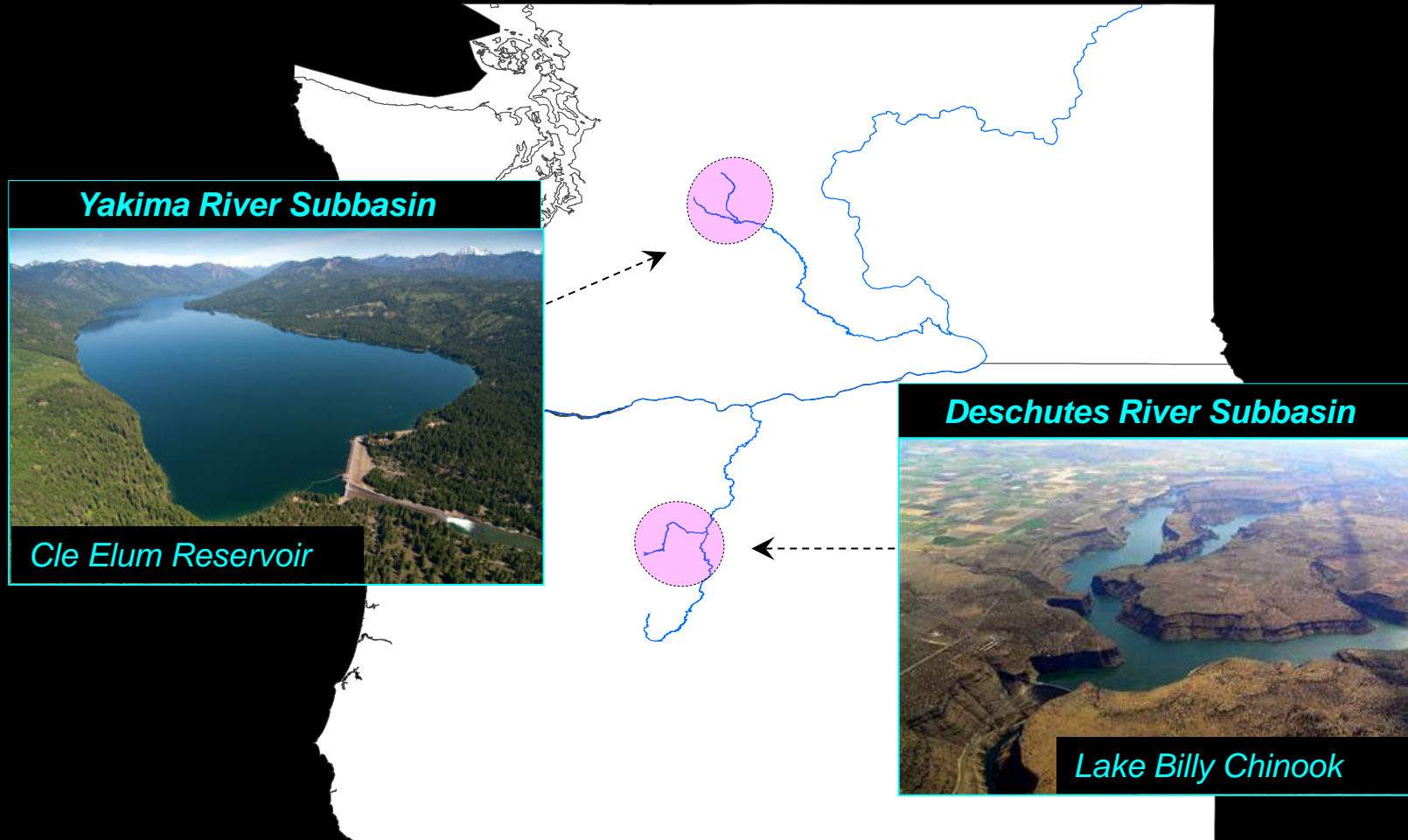
Andrew P. Matala, Shawn R. Narum, Peter F. Galbreath
Columbia River Inter-Tribal Fish Commission

Brian Saluskin, Mark Johnston
The Confederated Tribes and Bands of the Yakama Nation

Jeff Hogle
Confederated Tribes of the Warm Springs Reservation

Comparison of two reintroductions

- Extirpation of indigenous anadromous populations



Strategy: what to consider

✓ ecosystem requirements /concerns

- Predation risks (e.g., lake trout)
- Intra-specific interaction / competition (e.g., kokanee)
- Disease risks (introduced into the reservoir)
- Carrying capacity (redds, rearing density)
- limnology (neutrients & prey availability)

Strategy: what to consider

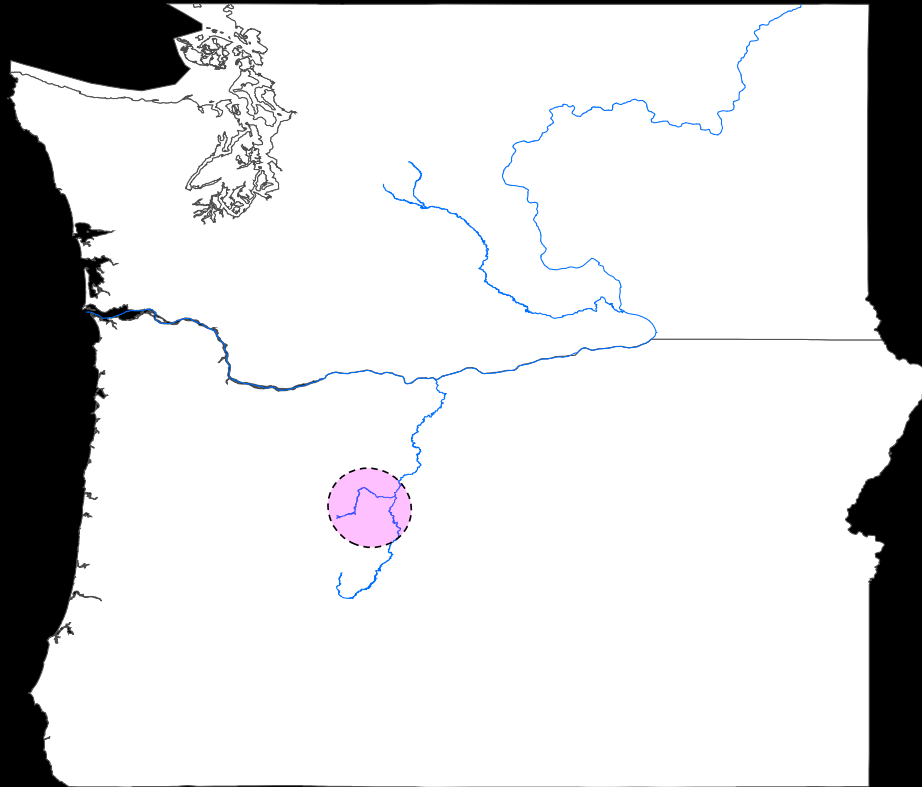
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✓ logistical factors

- Conservation concerns (bull trout? Fishing)
- Co-management plans (feasibility, agency contributions)
- Upstream & downstream migration (passage)
- Hatchery component? (juvenile release)
- Stock source/s (local or out-of-basin)

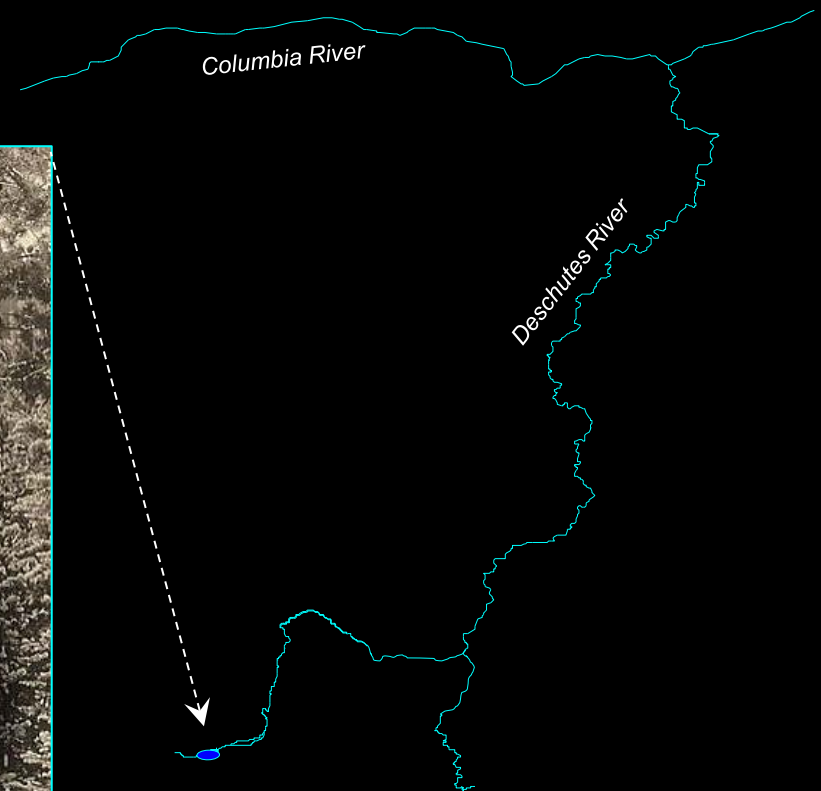
Reintroduction: Deschutes River Sub-basin



Landmarks & History

Suttle Lake – nursery

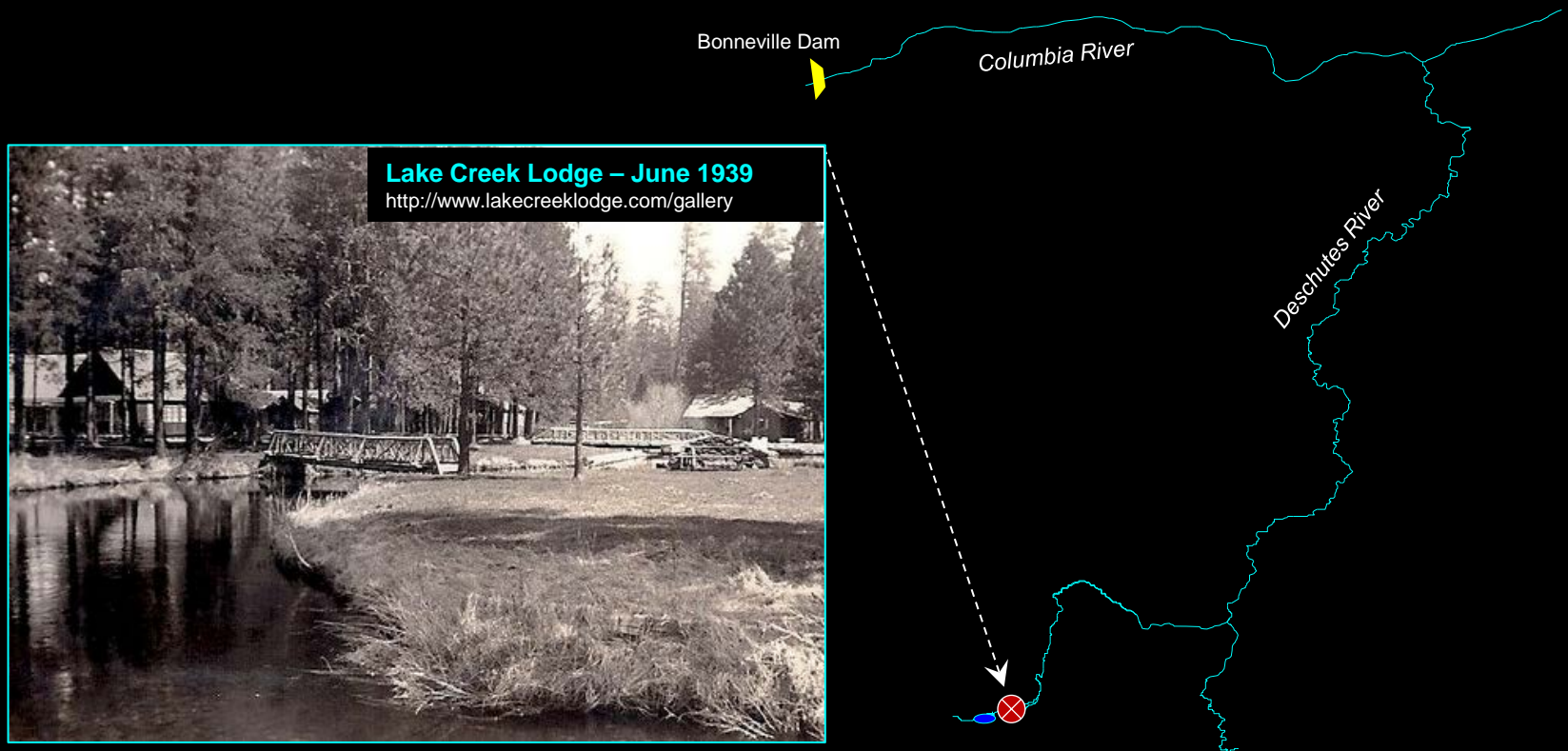
Pre 1930: free migratory corridor



Landmarks & History

Lake Creek – outlet stream

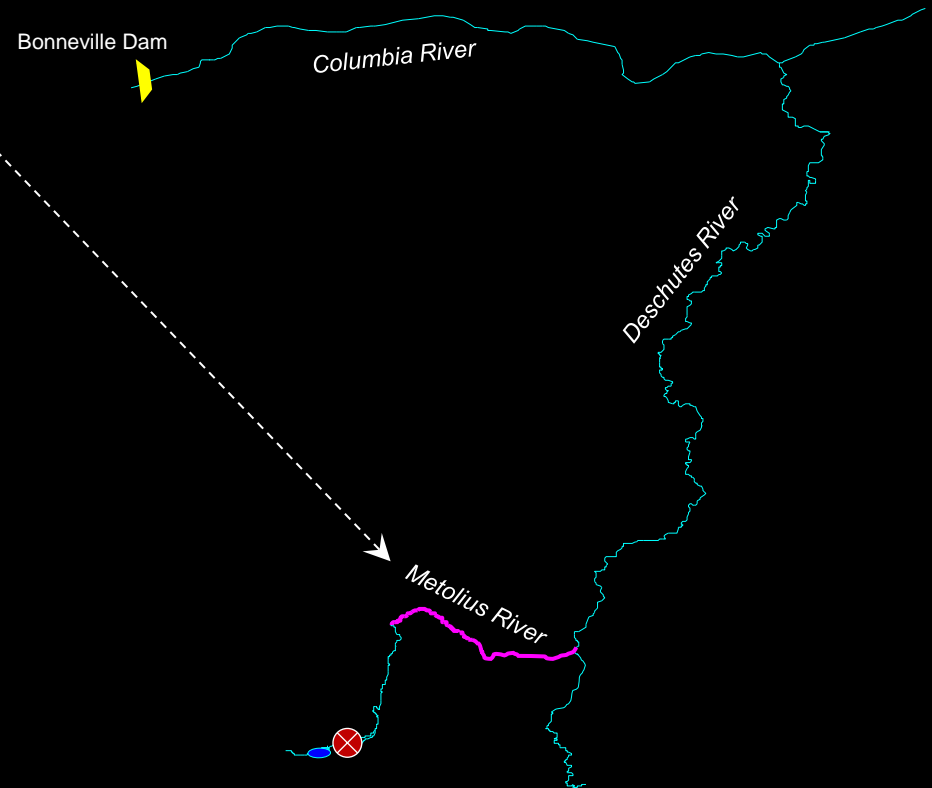
- ⊗ 1930's: 1.2m dam & upright screens installed
- 1940's: “bluebacks” no longer ascend to Suttle Lake



Landmarks & History

Lake Creek – outlet stream

1950's: Sockeye observed spawning in **Metolius River**



Landmarks & History

Pelton Dam & Round Butte Dam

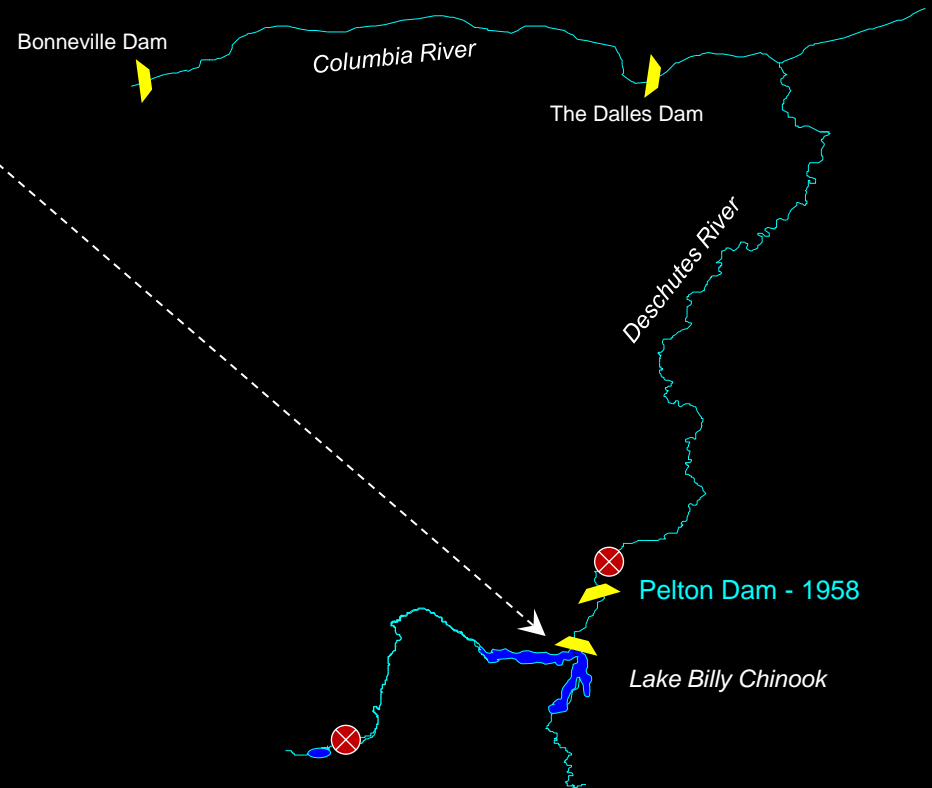
- ⊗ 1964 - anadromous *O. nerka* population extirpated
Sockeye Salmon genes may persist in upper basin

Formed Lake Billy Chinook (LBC)



Round Butte Dam - 1964

Oregon Historical Society



LBC: stocking history

Sockeye Salmon: 1937-1961



<u>Release location</u>	<u>Year/s</u>	<u># released</u>	<u>Stock origin</u>
Lake Creek	1948	41,178	Bonneville Hatchery
Suttle Lake	1937	15,000	Bonneville Hatchery
	1952 - 1958	741,051	Leavenworth Hatchery
Deschutes River	1952 - 1959	125,000	Bonneville Hatchery
Metolius River	1951	75,960	Unknown
	1952 - 1957	191,994	Leavenworth & Metolius
	1960	26,438	Santiam & mix
	1961	42,619	Cascade

1,259,240

LBC: stocking history

kokanee: 1961 - 1995



<u>Release location</u>	<u>Year/s</u>	<u># released</u>	<u>Stock origin</u>
Pelton Reservoir	1965 – 1974	1,379,047	Unknown
	1978 – 1980	143,601	Suttle Lake
	1981 – 1995	618,297	Paulina Lake
Metolius R./ Suttle Lake	1961 – 1973	382,333	Unknown
Lake Billy Chinook	1970 – 1971	325,665	Unknown
Odell Lake	1963 – 1970	824,679	Kootenay Lake, B. C.
	1966 – 1971	627,771	Flathead Lake
	1967	48,008	Lake Whatcom
Paulina Lake	1978 – 1980	392,652	Suttle L./ Paulia L.
Wickiup Reservoir	1965 – 1974	834,275	Unknown
	1978 – 1985	548,251	Suttle L./ Paulia L.

6,124,579

Reintroduction plan/ strategy

- **Managers:**
Confederated Tribes of the Warm Springs Reservation (CTWSR)
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- **Rationale #1:**
Despite stocking history, **anadromous genes** may persist that
can help found a natural spawning Sockeye population

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Despite stocking history, **anadromous genes** may persist that
can help found a natural spawning Sockeye population
- **Rationale #2:**
avoid introduced diseases; protect **existing fisheries – bull trout**

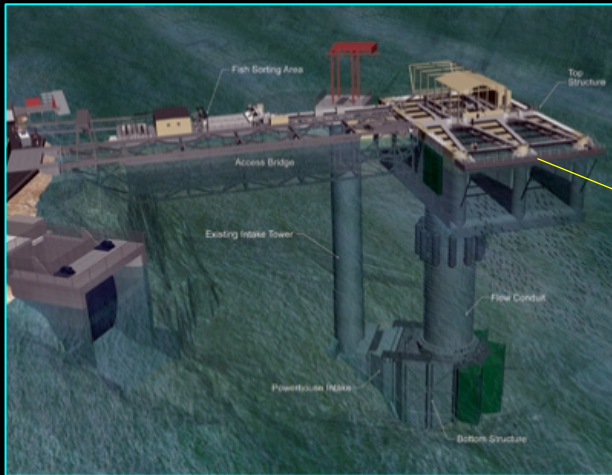


** sport fishery

Strategy to Initiate anadromy

- **smolt release** = “emigrating” February 01 – July 01 (**began 2010**)
- **emigrating** = “volunteering” into the SWW

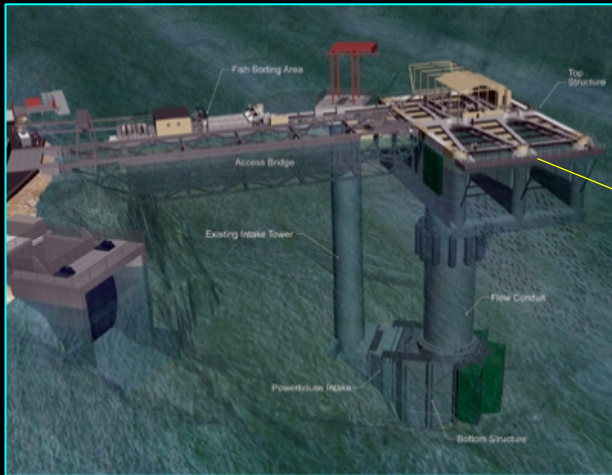
SWW = selective water withdrawal



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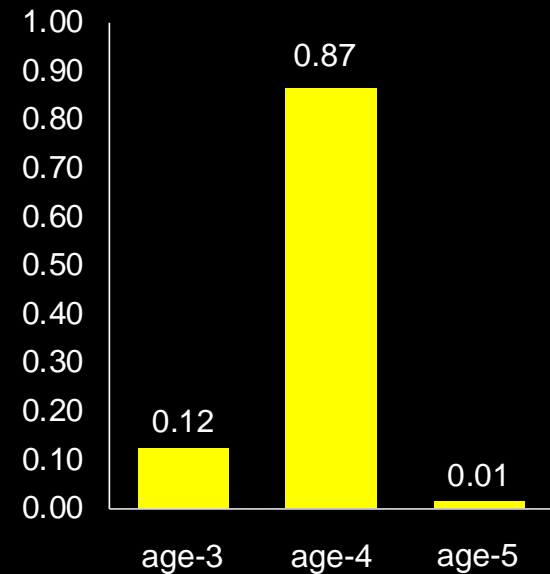


- **Hatchery Component: broodstock**
 - ✓ returning natural-origin adults
 - ✓ Deschutes River origin
 - ✓ N ~50; surplus **released** into **LBC**

Release / Escapement Results

- majority age-4
- Mean FL comparable to Columbia stocks: Wenatchee, Osoyoos, Redfish

<u>Year</u>	<u>smolt release</u>	<u>Pelton trap</u>
2010	49,734	10
2011	225,761	23
2012	5,126	98
2013	25,265	33
2014	155,031	27
2015	38,702	36
2016	49,497	536
2017	439,458	57



Next: continued monitoring

- Evaluate relative reproductive success (**RRS**) & **survival**
 - ✓ **RRS** - adult **Sockeye** released into LBC vs. **kokanee** spawners
(2017 *kokanee* abundance = **434,600**)

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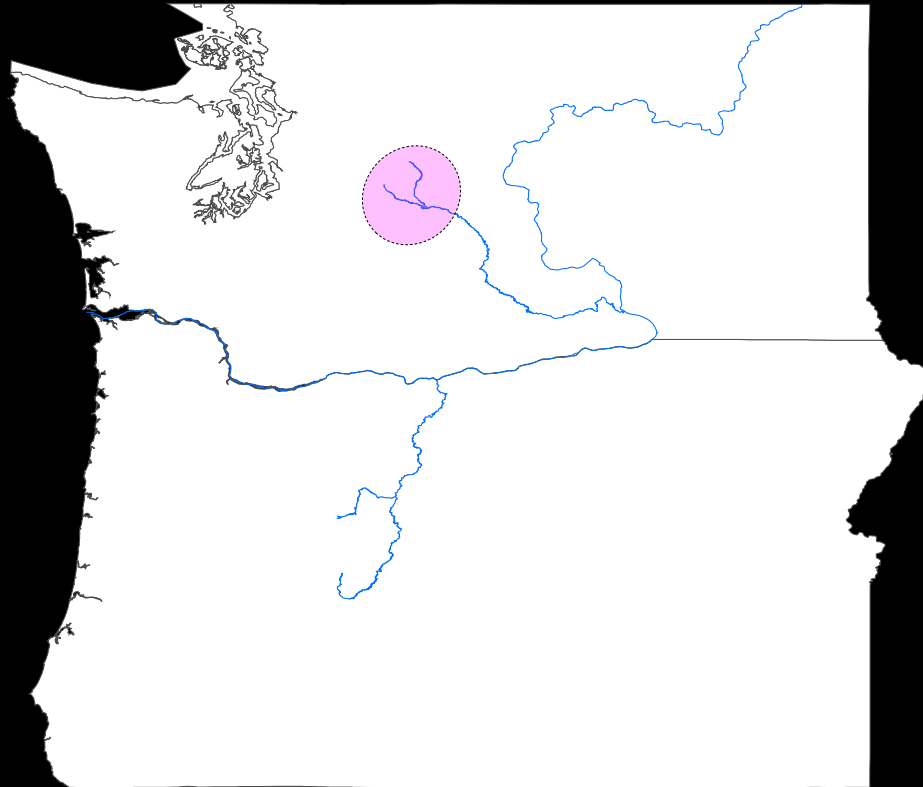
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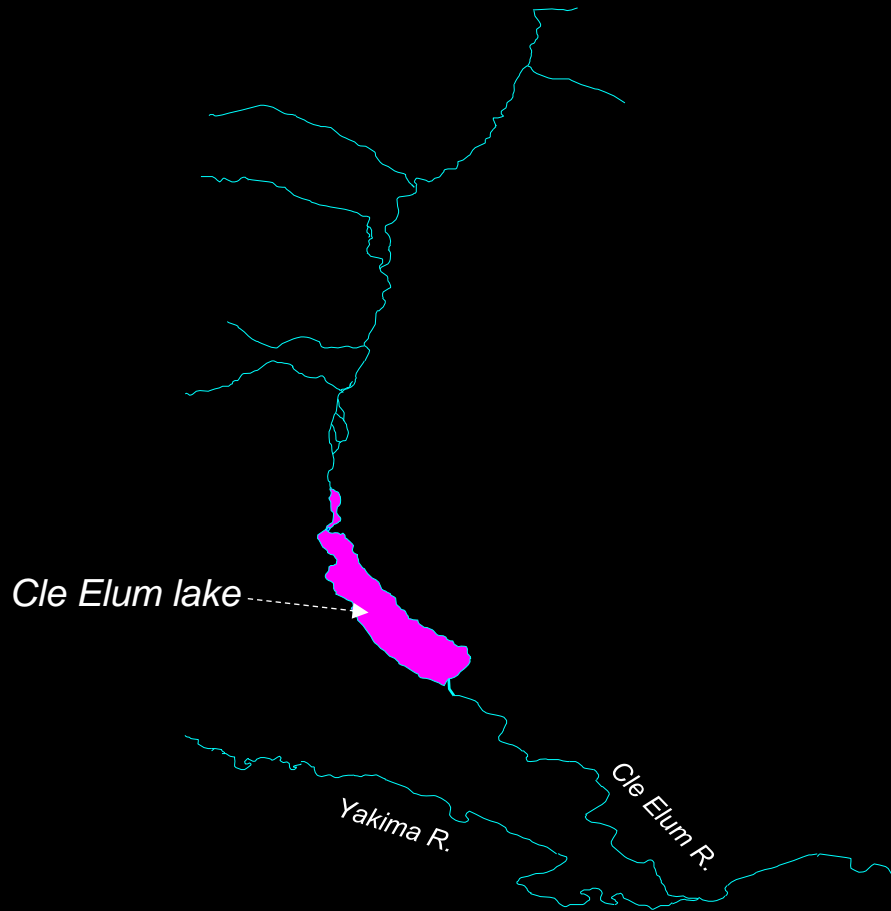
- In-season or “real time” genetic assignment of returns (i.e. origin)

Reintroduction: Yakima River Sub-basin



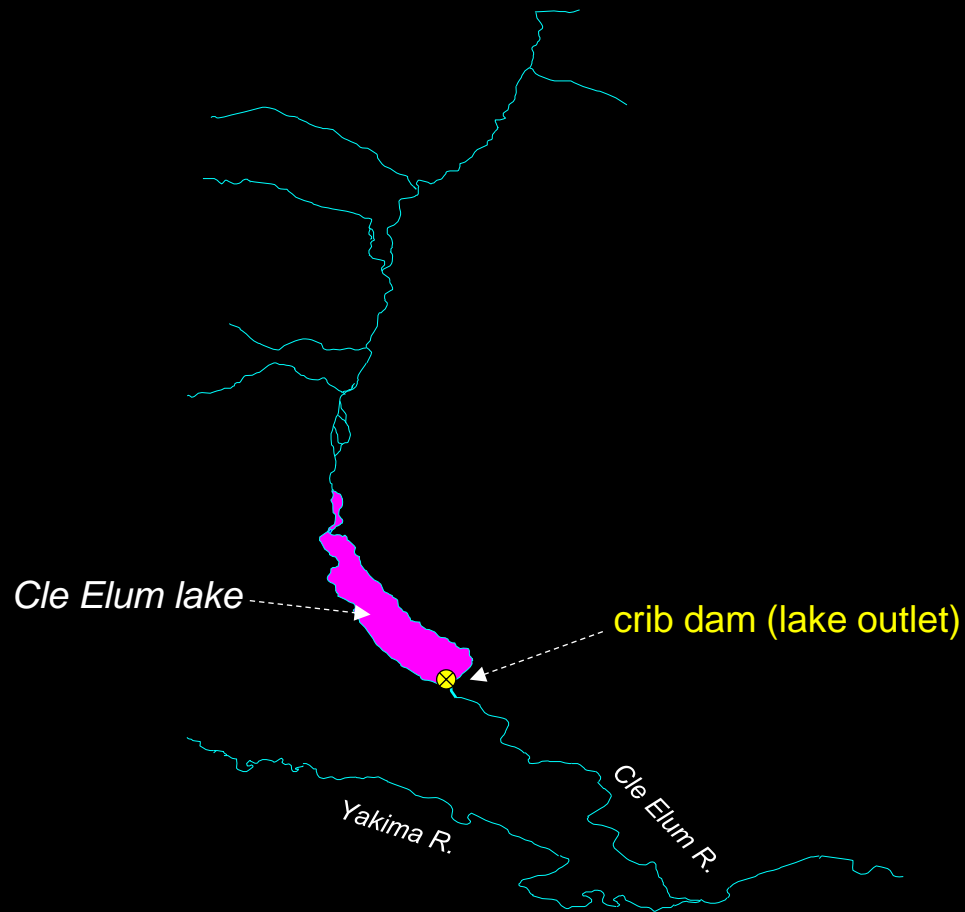
Landmarks & History

- **historically** - Yakima sub-basin Sockeye abundance ~200,000



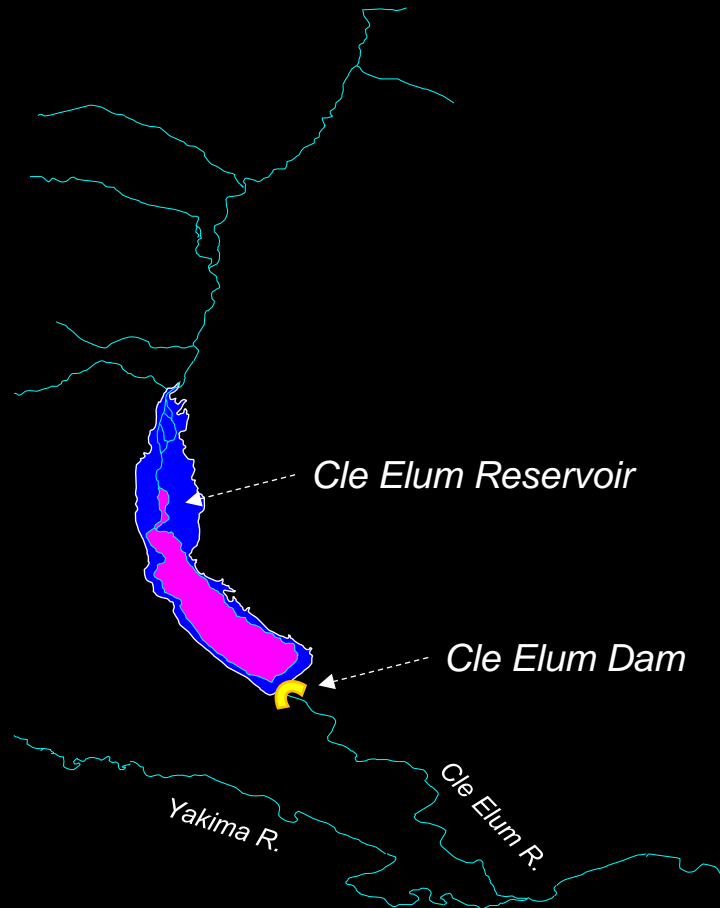
Landmarks & History

- 1906 - Sockeye migration impeded, population severely declines



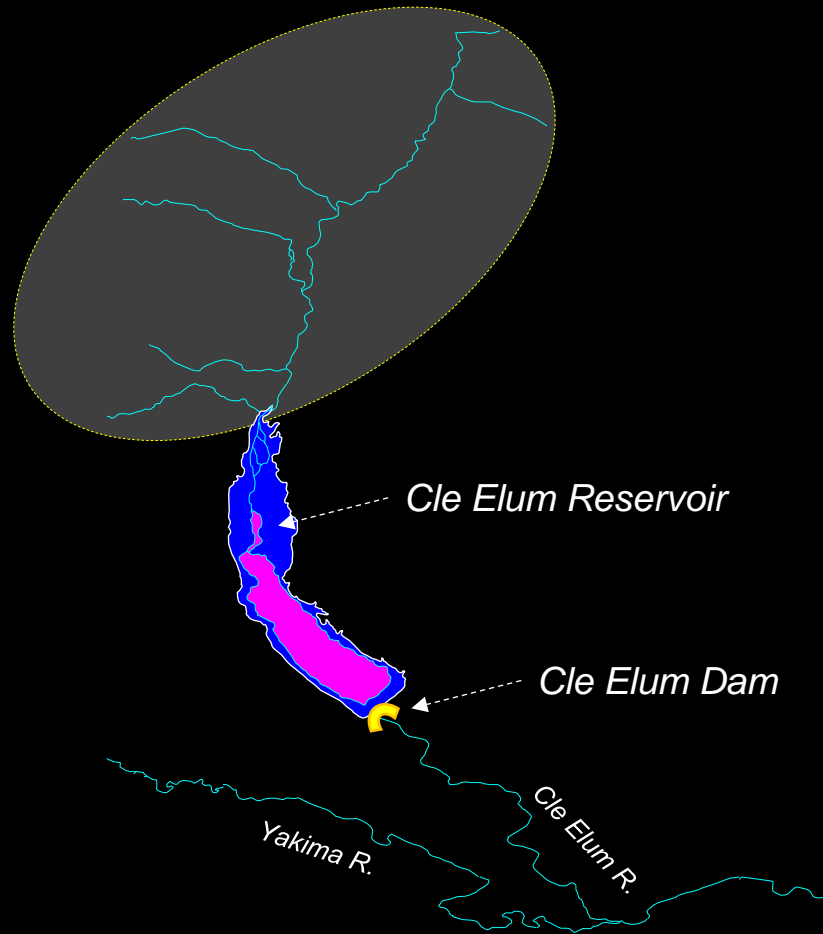
Landmarks & History

- 1933 – Cle Elum Dam transforms lake into storage reservoir (no fish passage)



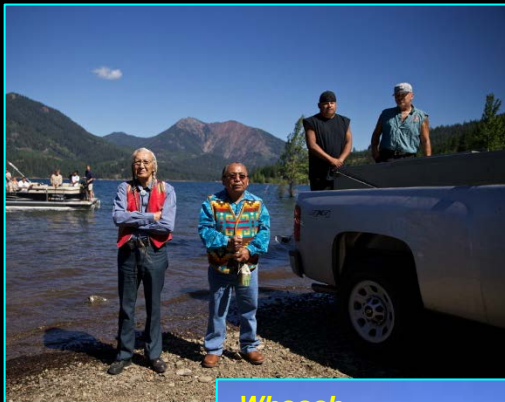
Landmarks & History

- 1933 – Sockeye cut off from 56 rkm of habitat...quick extirpation



Tribal Co-management

- Feasibility study yields favorable results – fish passage needed
 - Yakama Nation begins reintroduction in 2009
 - outplants originate from Lake Wenatchee & Osoyoos Lake
 - No hatchery component

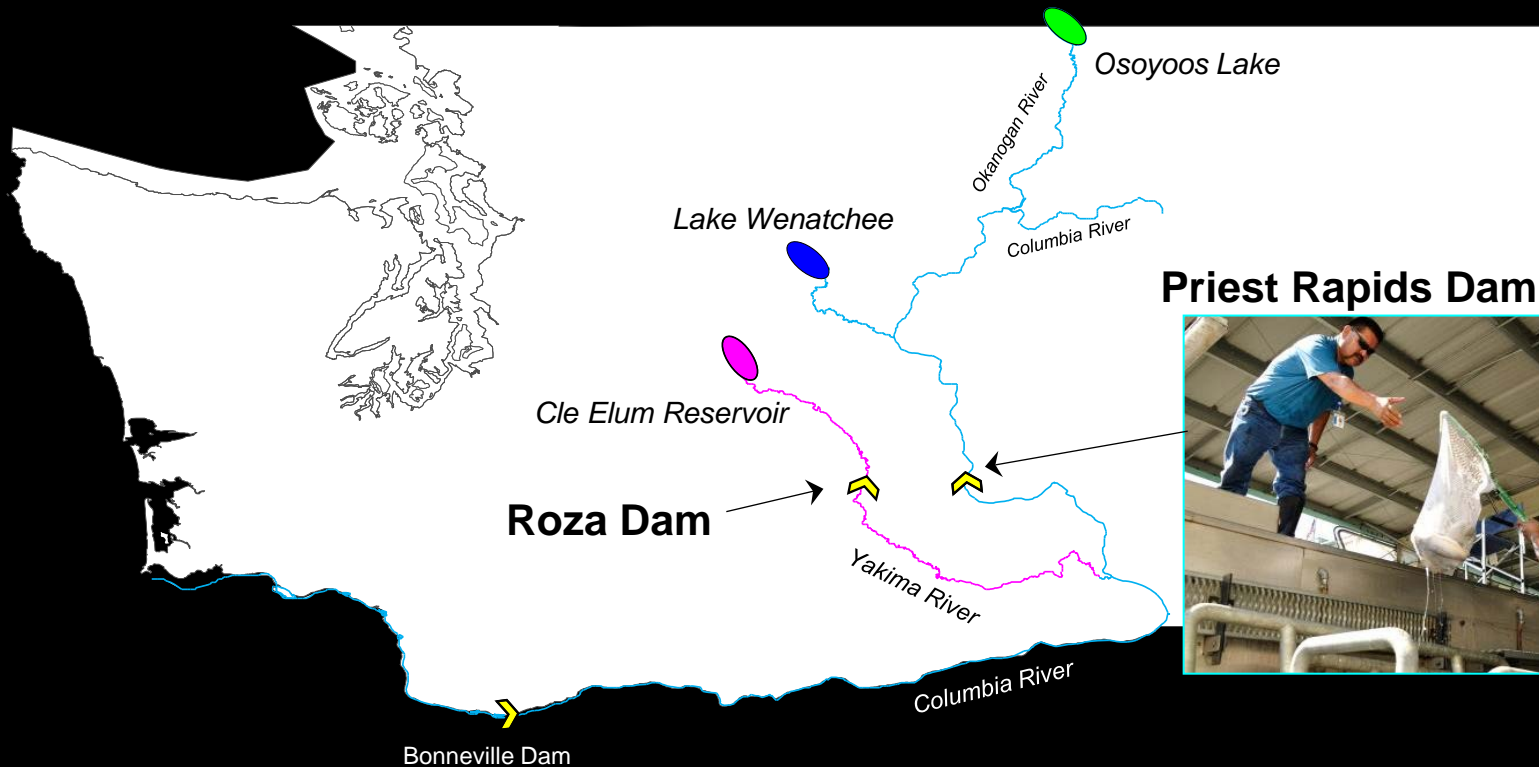


Whoosh



Site & collection details

- **Priest Rapids Dam**: collection site for outplants (2 donor stocks)
- **Roza Dam**: collection site for wild returning Sockeye
- **Passage**: adults currently transported by truck

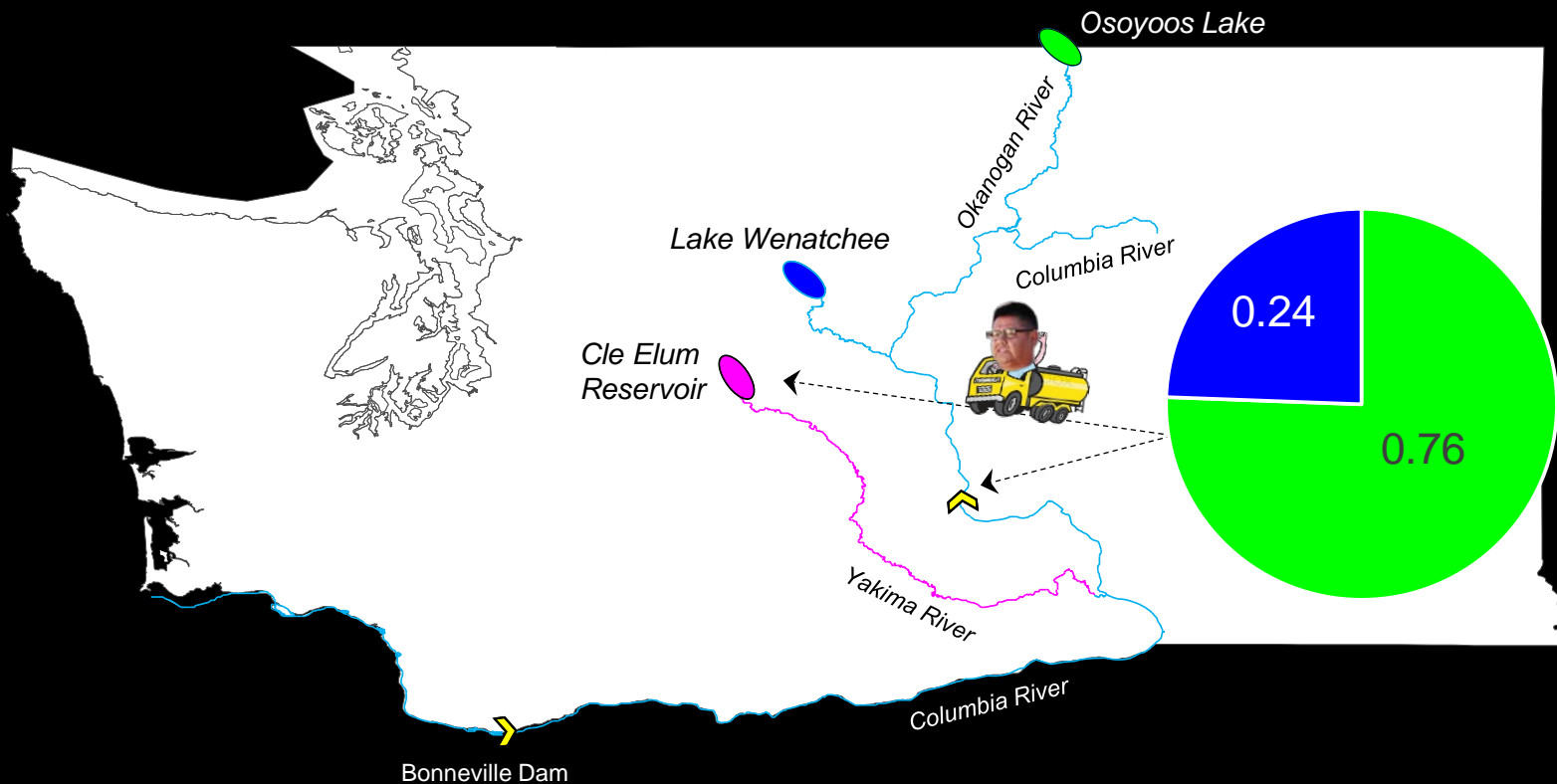


Priest Rapids Dam



Outplant “take”

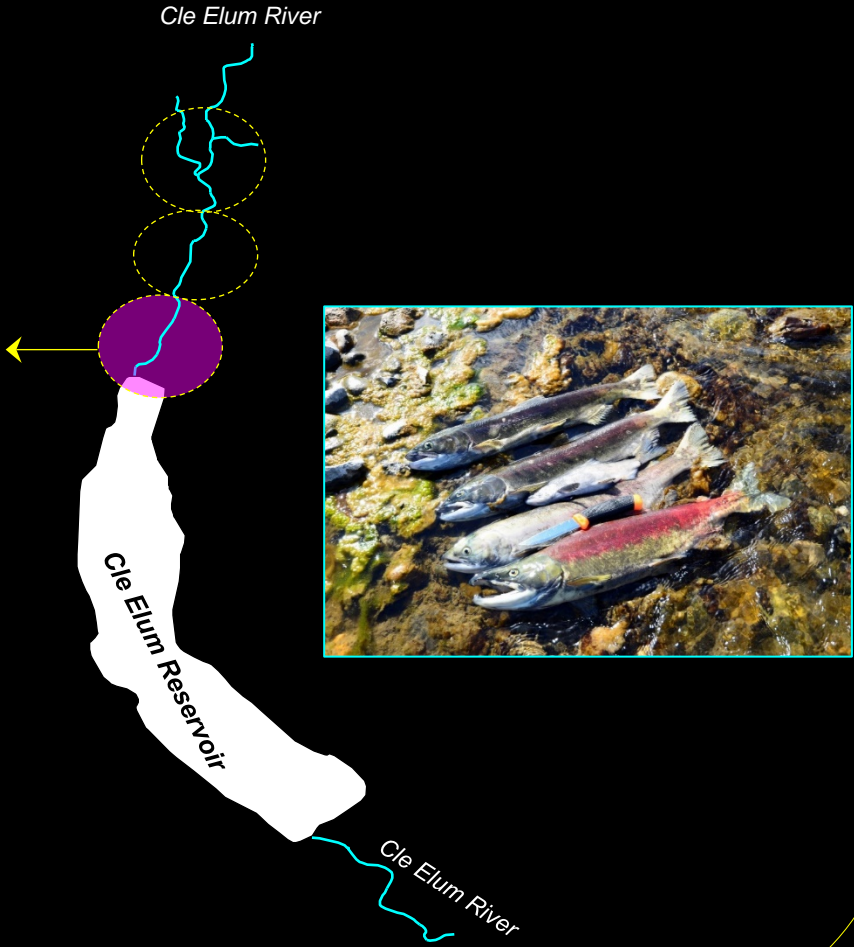
- based on Bonneville escapement estimates; most years n=10,000
- stock proportions (2013-2017) consistent with Columbia River return



Carcass surveys: 2013-2017



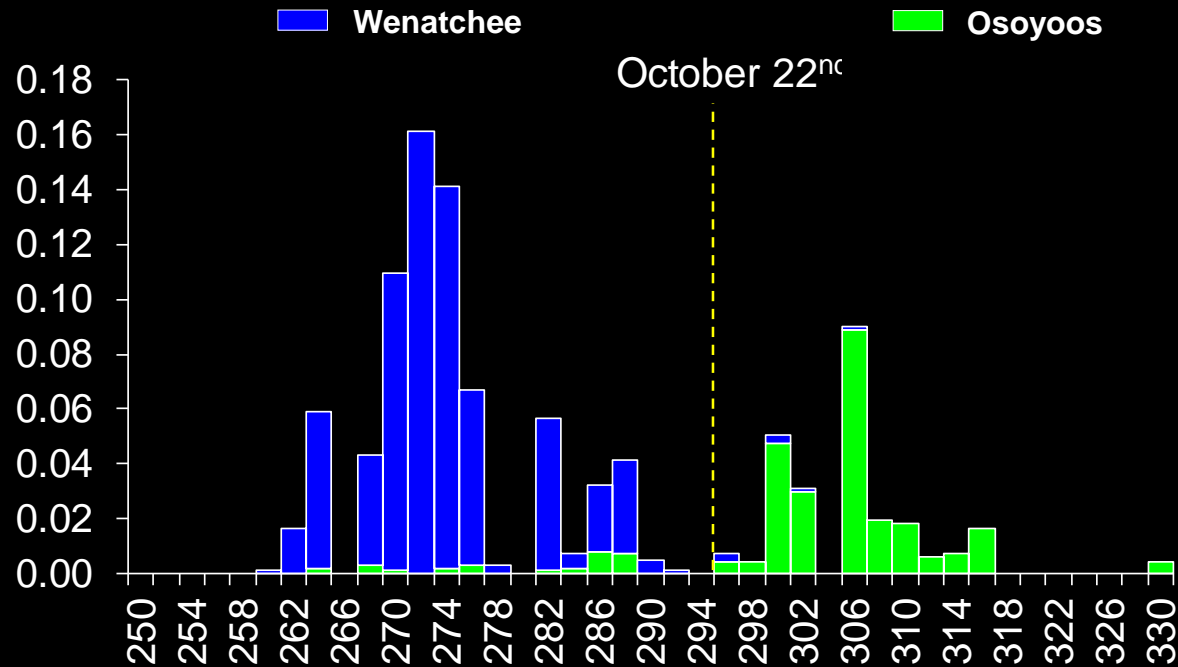
Carcass surveys: 2013-2017



Demographics

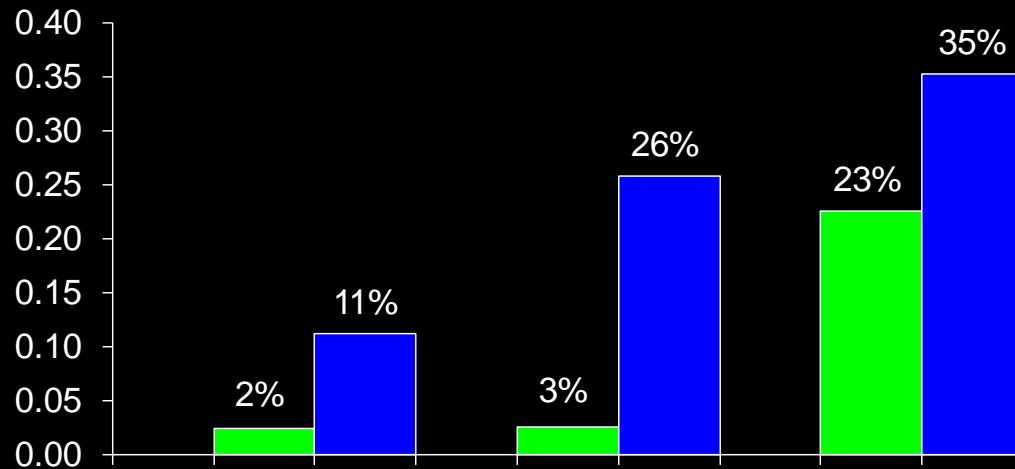
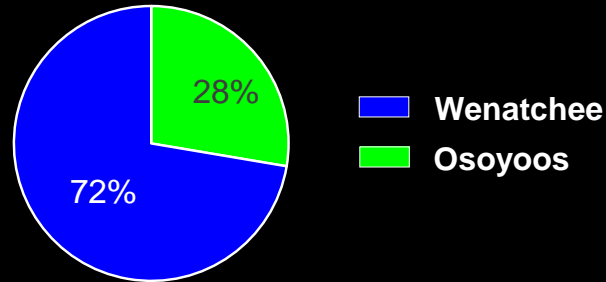
spawning distribution

Temporal differences between stock

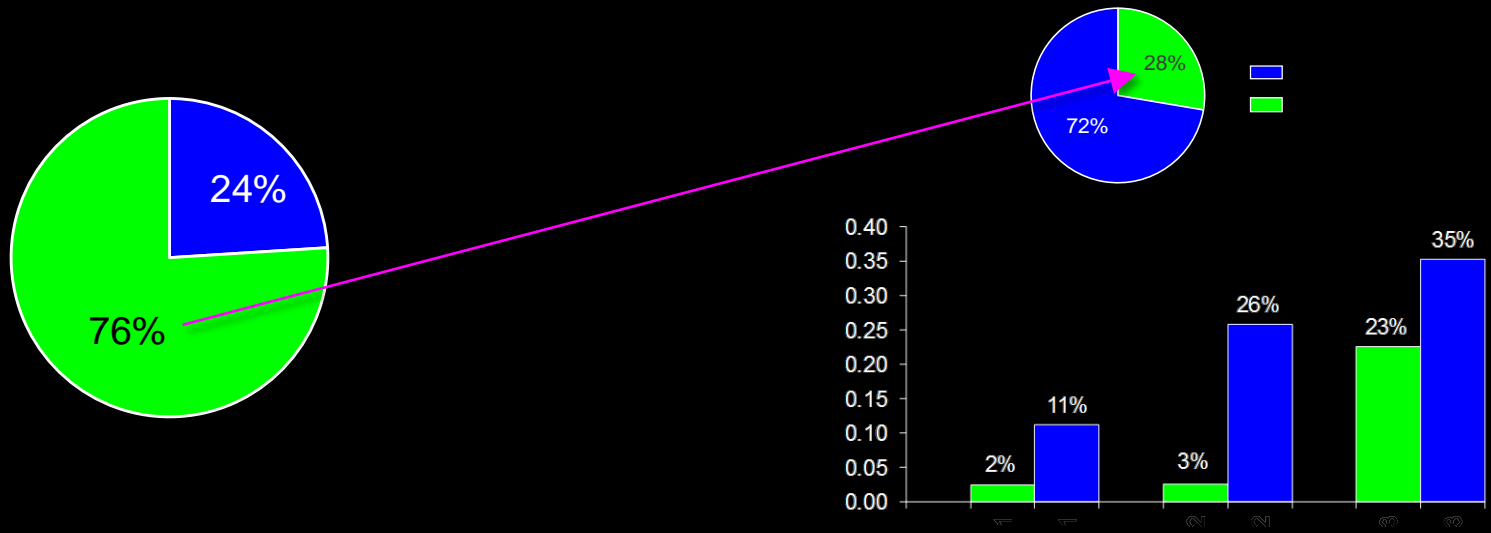


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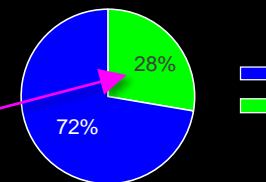
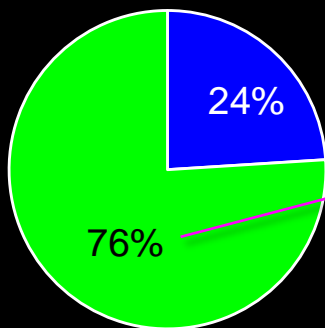
Spatial differences between stock



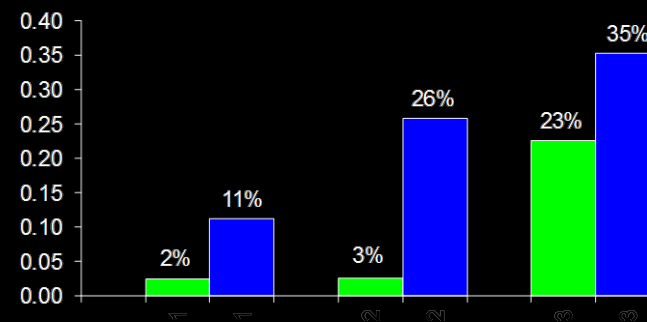
Osoyoos fate?



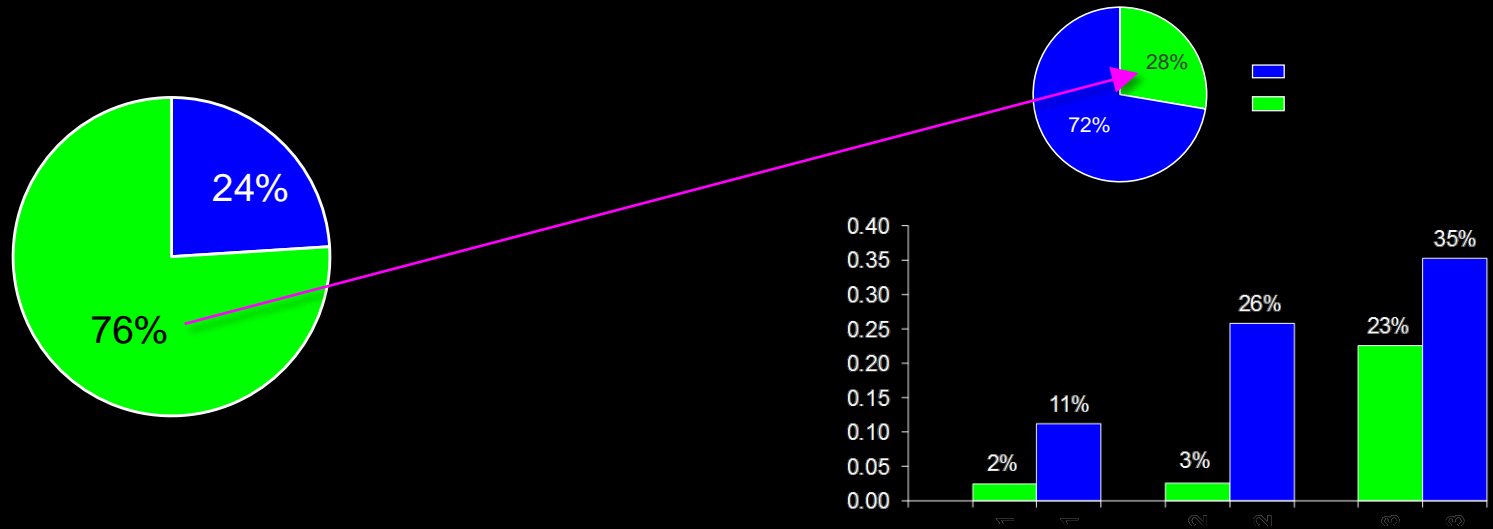
Osoyoos fate?



SENSE
THIS PICTURE MAKES NONE



Osoyoos fate?

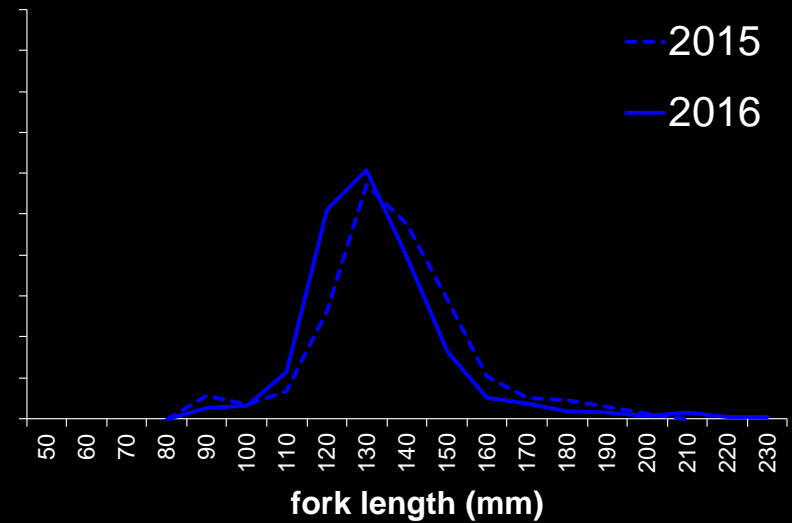
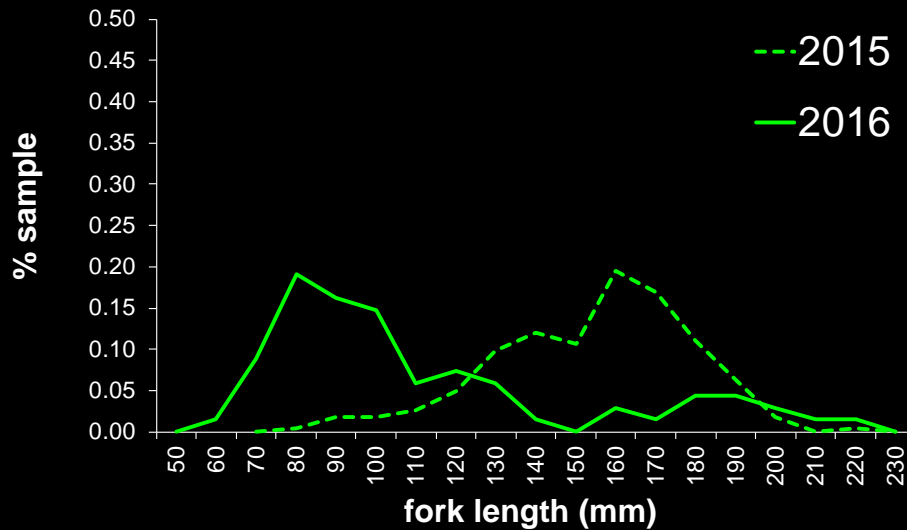


Unless **Osoyoos** are spawning in the lake.....

gillnetting for lake trout yields sockeye bycatch (n=124)
= 100% **Osoyoos**; ripe; expressing gametes

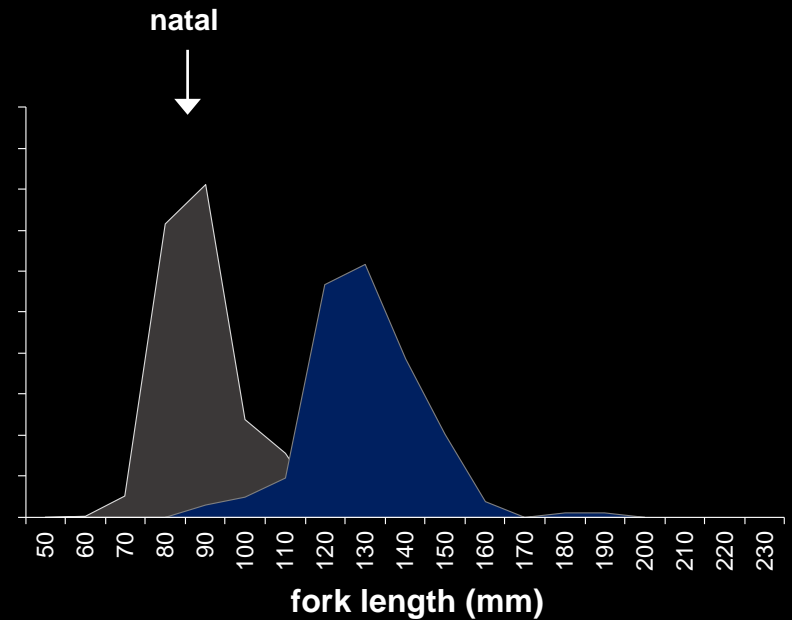
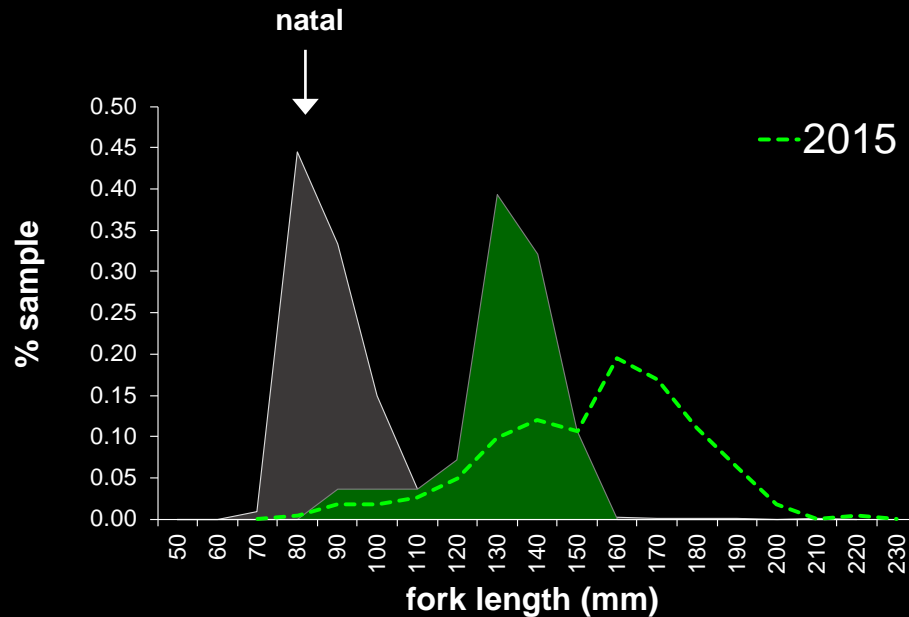
smolt size-at-age

✓ significant temporal variation for **Osoyoos**



smolt size-at-age

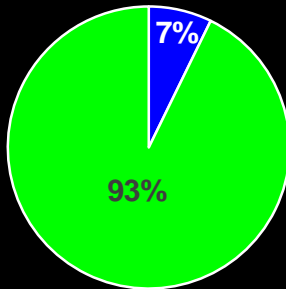
- ✓ large ***age-1** smolts emigrating from **Cle Elum reservoir** compared to smolts from **natal regions**



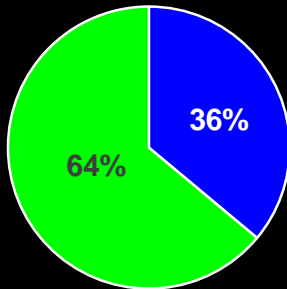
productivity: juvenile progeny

Wenatchee
Osoyoos

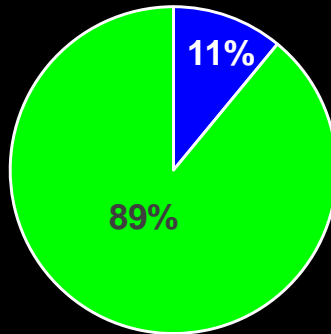
Outplants (n = 4500)



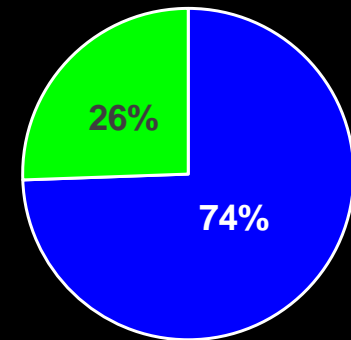
returns (n = 671)



2013 spawners
(overall)



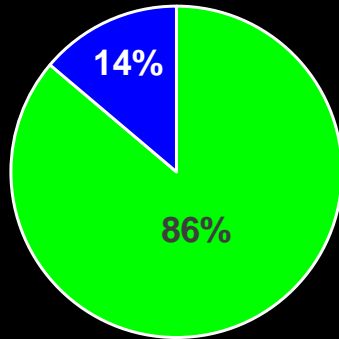
emigrating smolts
(brood year 2013)



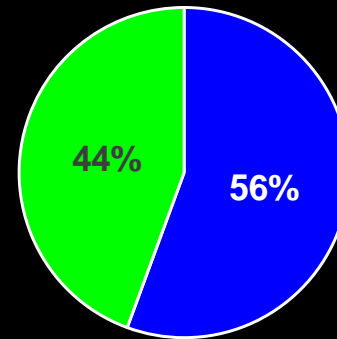
age-1 smolts (2015)
age-2 smolts (2016)

productivity: adult progeny

2012 spawners
(overall)

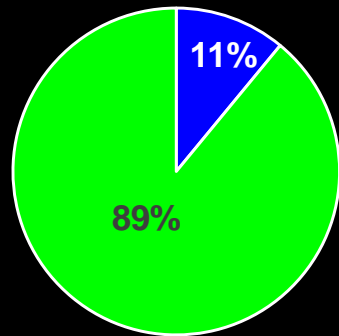


brood year 2012 returns
(ages 3, 4 & 5)

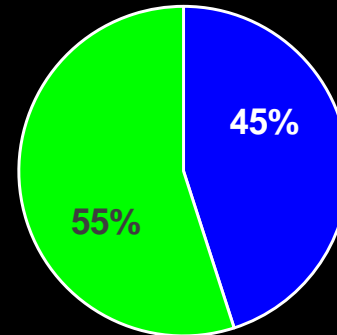


■ Wenatchee
■ Osoyoos

2013 spawners
(overall)



brood year 2013 returns
(ages 3 & 4)



acclimation / adaptation

Cle Elum Reservoir:

- high elevation (~ 2200')
- cold water; oligotrophic
- minimal development

Lake Wenatchee:

- high elevation (~1875')
- cold water; oligotrophic
- minimal development
- Inlet stream spawning



acclimation / adaptation

Cle Elum Reservoir:

- high elevation (~ 2200')
- cold water; oligotrophic
- minimal development



Osoyoos Lake:

- lower elevation (~910')
- warm water; eutrophic
- significant development / agriculture
- Inlet stream spawning



Better equipped to tolerate thermal conditions in lower Yakima River (?)

Strategy: what to consider

no “one size fits all” approach

- ✓ Consider stock source
 - **In-basin:** kokanee (or residualized sockeye) – Deschutes
 - **Exogenous:** two stocks with differential life histories – Cle Elum
- ✓ Consider predator threats & management
 - **Native:** bull trout, steelhead, Chinook – Deschutes
 - **Introduced:** lake trout – Cle Elum
- ✓ Consider kokanee interaction
 - **High abundance:** competition, sport fishery – Deschutes
 - **Low abundance:** or absence: minor competition – Cle Elum
- ✓ Consider environmental factors
 - **Cold water:** facilitates migration and survival – Deschutes
 - **Warm water:** Thermal barrier in lower river – Cle Elum
- ✓ Consider likely responses to novel environment
 - Spawning interaction/ behavior, carrying capacity, size-at-age

Is this guy done yet?

I'm spent, but I still look good



ACCORDS project funding



Yakama Nation biologists & technical staff



Megan Moore, Janae Cole