

Cowlitz River steelhead hatchery broodstock genetic stock identification

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Changes came to lower Columbia steelhead hatchery programs



- Chambers Creek stock, aka early hatchery winter stock, released for generations in lower Columbia River tributaries
- To reduce risks, NOAA will not permit out of ESU stocks for release from Mitchell Act and Cowlitz hatcheries, and eventually all others
- In the Cowlitz (and Kalama), developing new locally derived early-returning hatchery winter steelhead stock to replace Chambers stock
- In order to prevent accidental inclusion of Chambers stock in new broodstock, use genetic tools to identify and then exclude Chambers stock fish

Selecting broodstock is a common use of our genetic tools

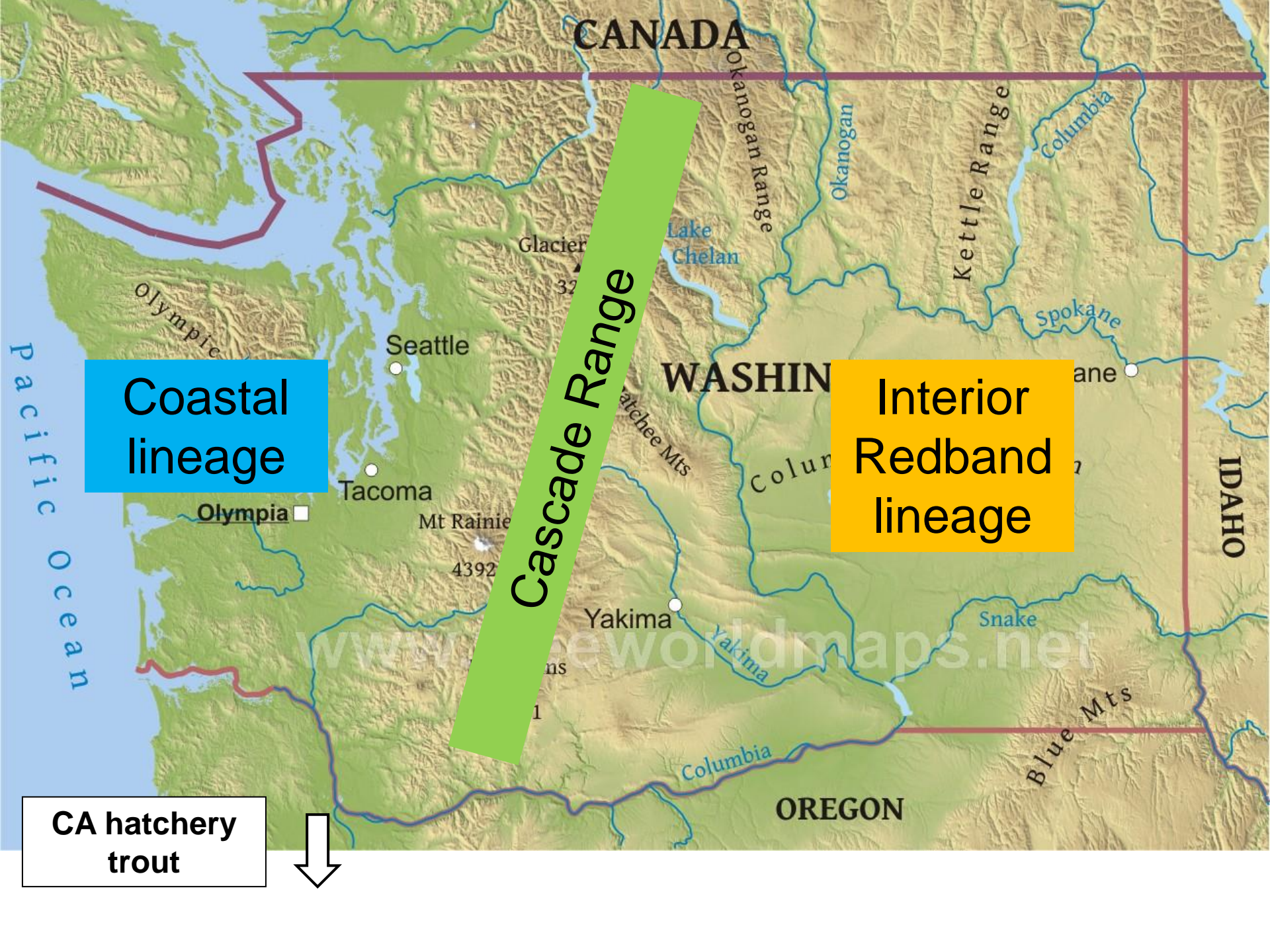
- Used to make sure fish from only the correct stock are used in broodstock
 - Upper Columbia Chinook
 - Puget Sound Chinook
- Can also be used to help avoid spawning relatives with one another
 - Captive brood programs
- Cowlitz project similar to ongoing projects
 - NF Lewis winter steelhead
 - Kalama early winter steelhead



WDFW has a comprehensive reference baseline for *O. mykiss* in WA

- Non-native hatchery rainbow trout
 - 3 strains at WDFW
- Two lineages of native steelhead/rainbow trout
 - Hatchery broodstocks
 - Native wild anadromous/resident populations
 - Native rainbow trout isolated upstream of barriers
- 189 to 383 SNP loci – depending on collection
 - Includes 3 loci that identify *O. clarki* and hybrids
 - Some include a sex ID marker
 - Some include run-timing (summer/winter) markers





Coastal
lineage

Interior
Redband
lineage

CA hatchery
trout





Avg F_{st} = 0.13

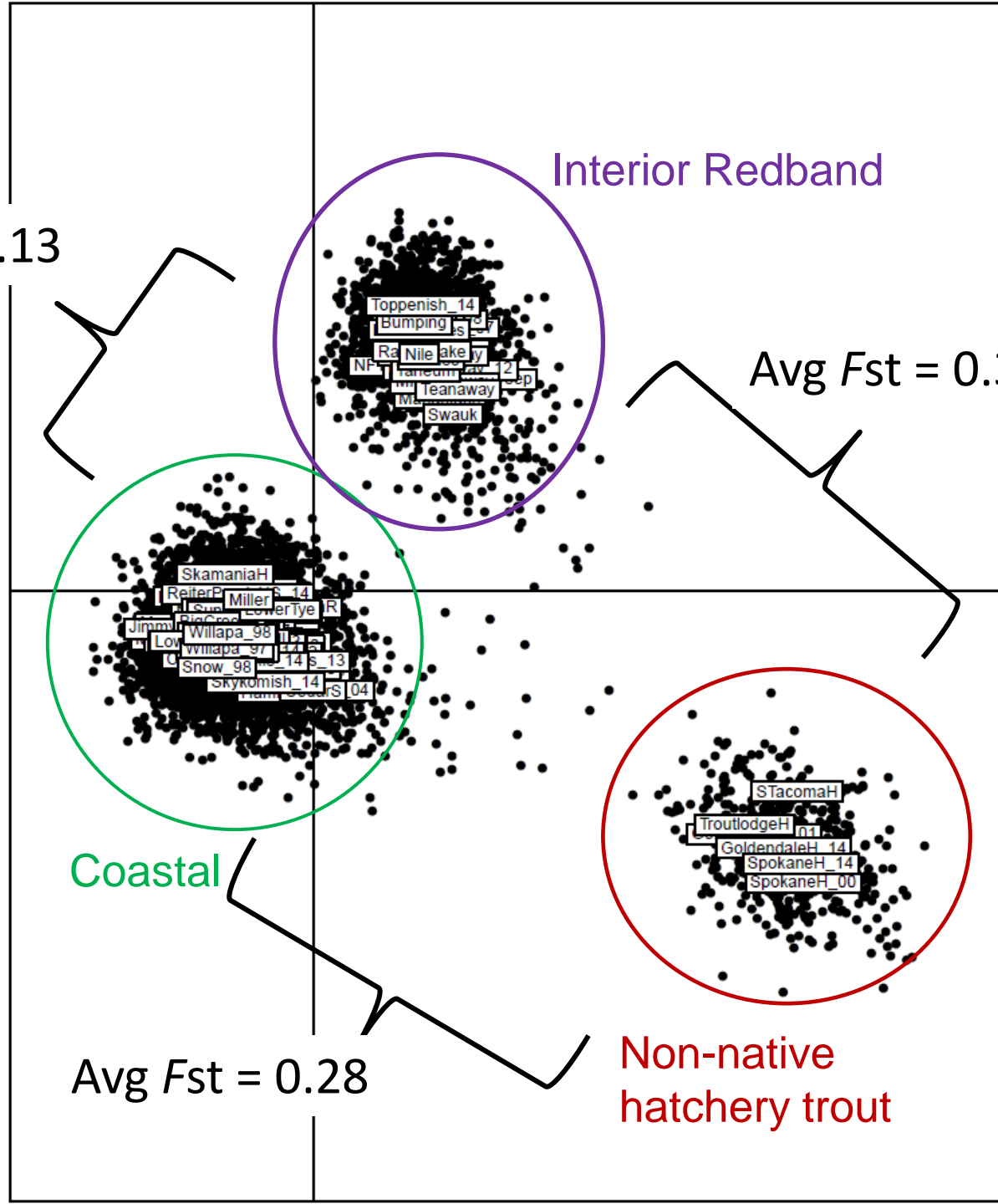
Interior Redband

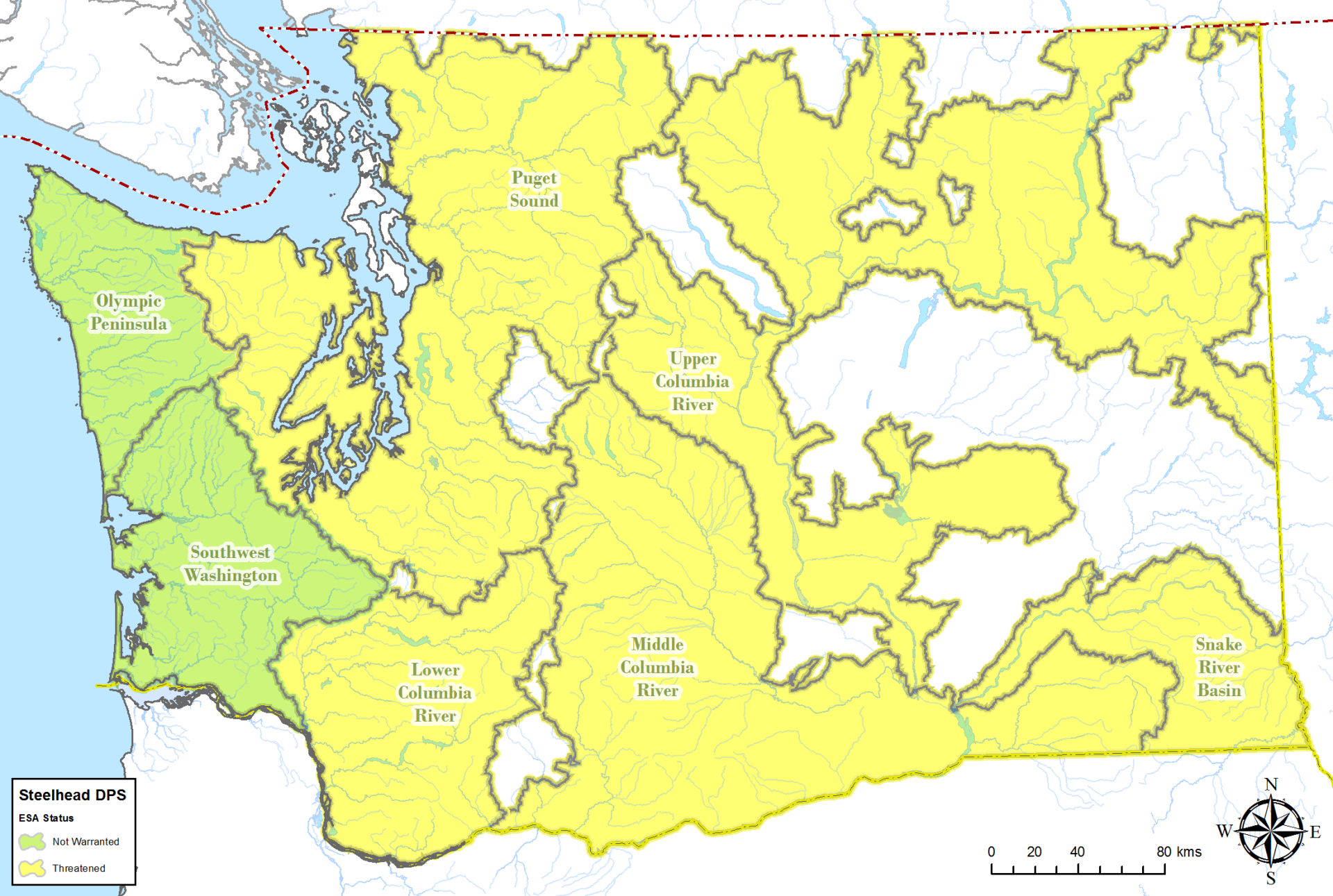
Avg F_{st} = 0.31

Coastal

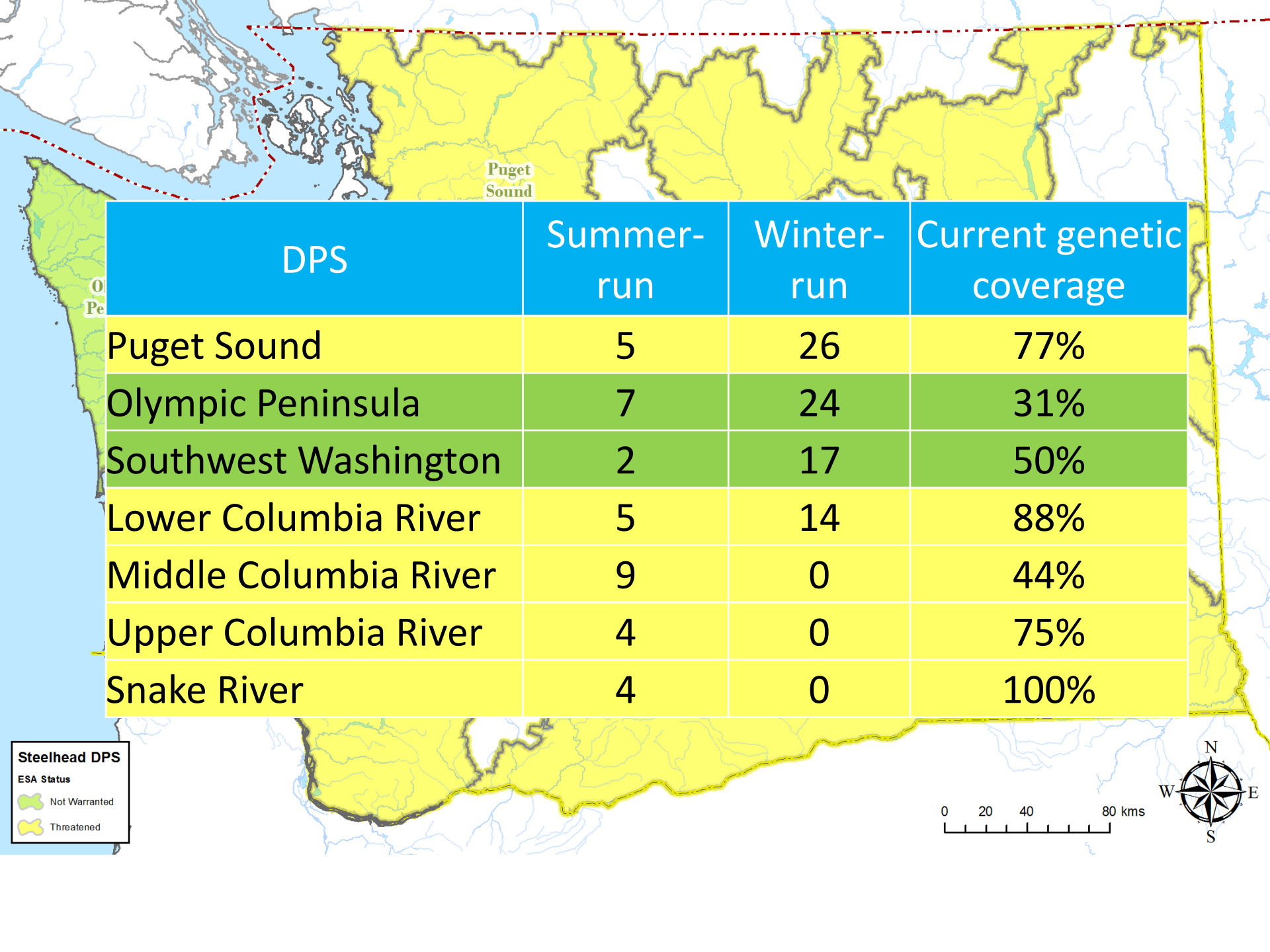
Avg F_{st} = 0.28

Non-native
hatchery trout

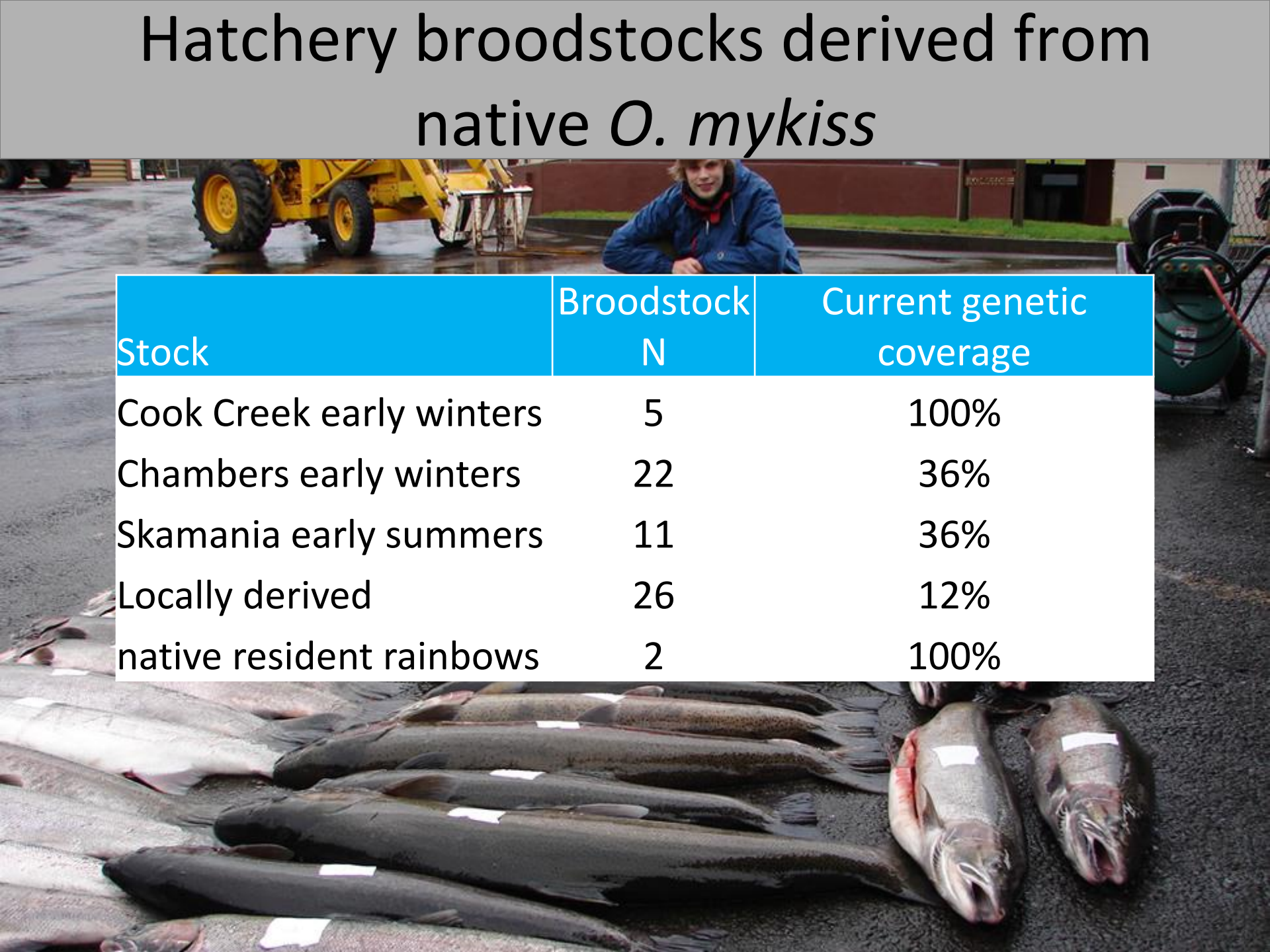




Primary goal: collections from all populations, from all DPS



Hatchery broodstocks derived from native *O. mykiss*



Stock	Broodstock N	Current genetic coverage
Cook Creek early winters	5	100%
Chambers early winters	22	36%
Skamania early summers	11	36%
Locally derived	26	12%
native resident rainbows	2	100%

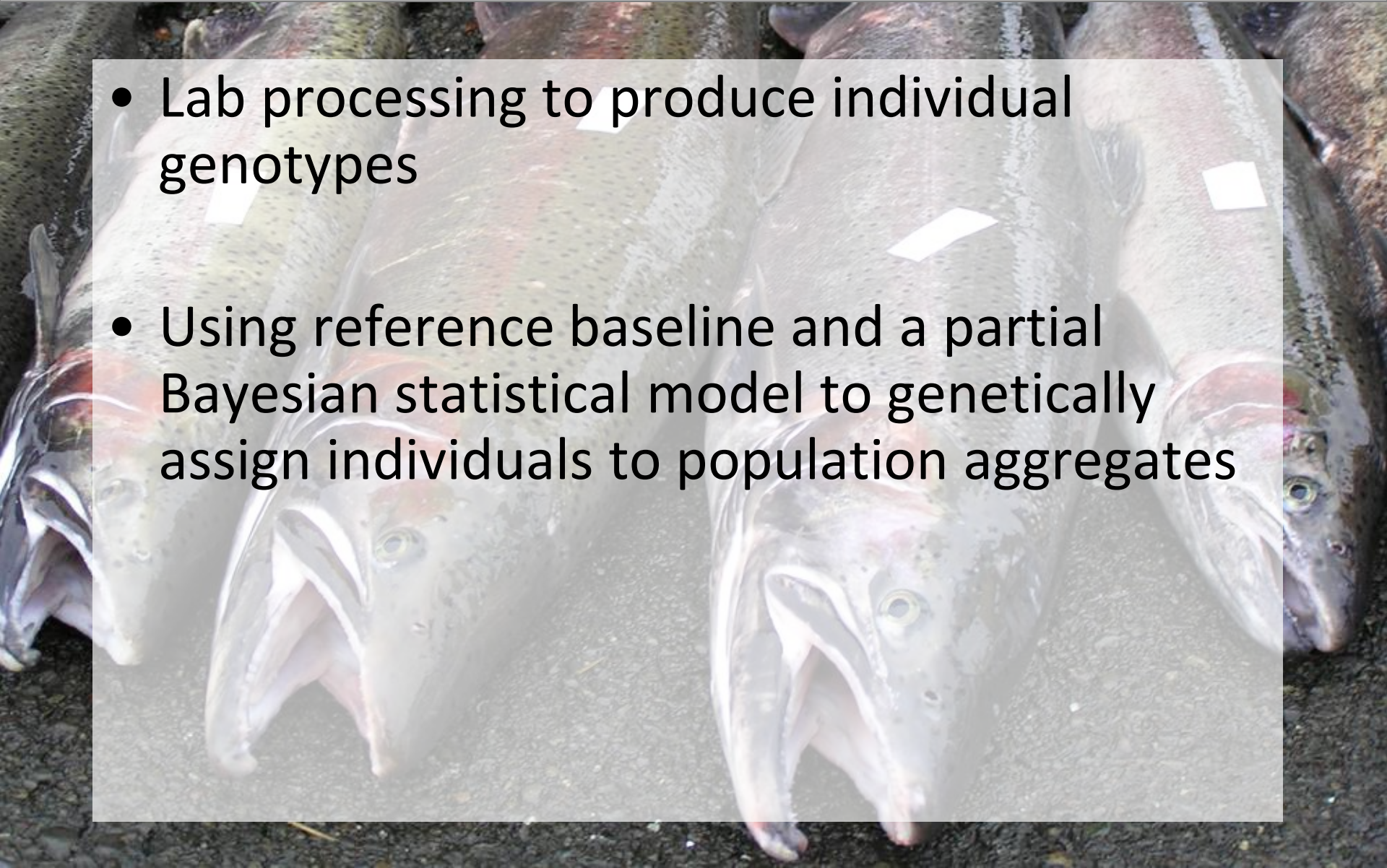
Lower Columbia *O. mykiss* reference baseline

- 1,061 samples in
- 31 collections representing
- 29 populations in WA and OR falling into
- 6 aggregates
 - Coastal winters
 - Cascade winters
 - Gorge winters
 - Chambers – WDFW early hatchery winters
 - Puget Sound origin
 - Summers – includes WDFW early hatchery summers, aka Skamania
 - Willamette winters



Process

- Lab processing to produce individual genotypes
- Using reference baseline and a partial Bayesian statistical model to genetically assign individuals to population aggregates



Cowlitz hatchery early-arriving steelhead samples



- 64 samples were from the earliest arriving winter steelhead at the Cowlitz Hatchery
 - All were marked as hatchery fish by absence of adipose fin, but
 - Could be strays from two remaining Chambers programs releasing fish in and around the Lower Columbia (NF Lewis and Elochoman)
 - Obtained usable genetic data from 62

Few stray Chambers stock fish detected

- Of 62 fish, just two assigned to the Chambers aggregate

<u>Best Estimate – by population</u>	<u>count</u>
Lower Cowlitz @ Delameter winters	48
Lower Cowlitz @ Olequa winters	12
Chambers stock	2

<u>Best Estimate – by aggregate</u>	<u>count</u>
Cascade MPG of Lower Columbia	60
Chambers stock	2

Next steps

- No future genetic work planned
- Fish can be differentially marked so that future genetic identification is unnecessary





Thanks!

- Cowlitz Trout Hatchery staff
- Tacoma Power

Partners/collaborators/funders/sample collectors

- Maureen Small WDFW
- Todd Kassler WDFW
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- Douglas County PUD
- Grant County PUD
- Chelan County PUD
- Confederated Tribes of the Colville Reservation
- Seattle City Light
- Spokane Tribe of Indians
- Yakama Nation
- NOAA/NMFS
- Upper Skagit Indian Tribe
- Bill McMillan
- Skagit River system Cooperative

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- Gabe Temple WDFW
- Chris Frederiksen YN
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- Ben Goodman WDFW
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- WDFW general fund
- Quinault Indian Nation
- WDFW regional staff
- USFWS - Abernathy

