

Perspective on the status of Parentage-Based Tagging

Christian Smith

US Fish and Wildlife Service

Abernathy Fish Technology Center

What is Parentage-Based Tagging (PBT)?

- Use of parentage analysis to determine age and origin of hatchery-produced fish
- How is PBT different from the plethora of other study types which employ parentage analysis to track organisms, including salmon?
 - Scale
 - Nature of the application (i.e., questions associated with partial replacement of Coded-Wire Tag system)

Subsample of Milestones

- Early 2000s Concept introduced by Carlos Garza as a possible solution to problems with CWT system. Formal description published in 2005.
- 2006 Peer-reviewed publication of required analysis methods
- 2010 Software implementing analysis methods developed and distributed
- 2011 Report documenting successful application in Snake River Steelhead and Chinook Salmon
- 2013 Thesis documenting successful application in Sacramento River Chinook Salmon. Peer-reviewed documentation of successful application in Snake River Steelhead
- 2014 Thesis documenting successful application in Klamath River Coho Salmon. Collection of PBT samples for all Columbia River hatchery programs initiated
- 2015 Publication of PSC-funded economic and operational feasibility study. Fishgen.net launched.
- 2017 & 2018 peer-reviewed documentation of the feasibility of PBT in BC Coho Salmon and Chinook Salmon

Parentage-based tagging in California hatcheries



Hatchery programs with current broodstock sampling

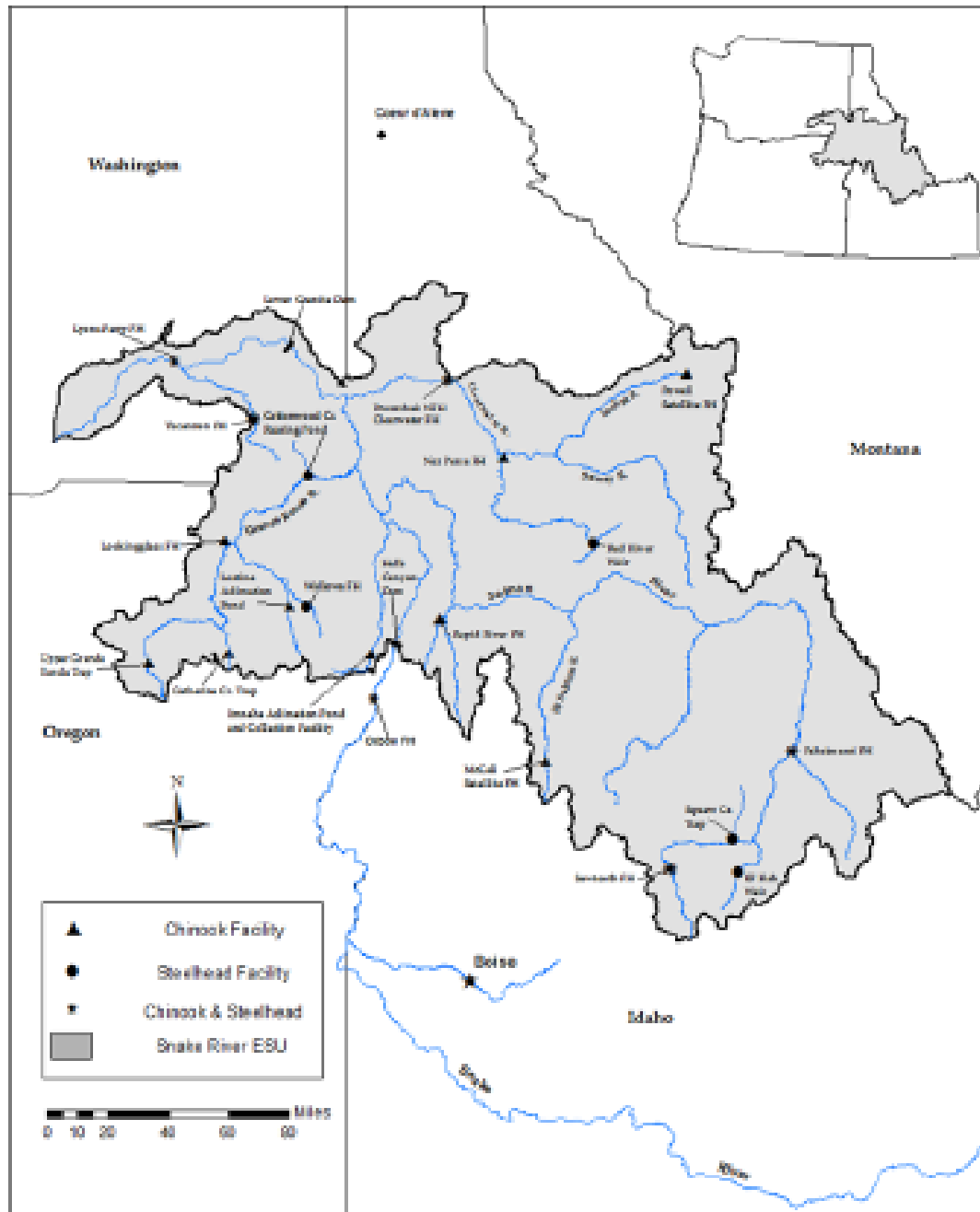
Steelhead: Russian River; Central Valley (four programs)

Coho salmon: Klamath River-Iron Gate; Russian River

Chinook salmon: Trinity River- spring and fall run; Feather & San Joaquin River- spring run; Sacramento- winter run

- Initially used 96 loci via TaqMan
- Plan to move to haplotype genotyping* via GTSeq

* C. Garza pers comm.



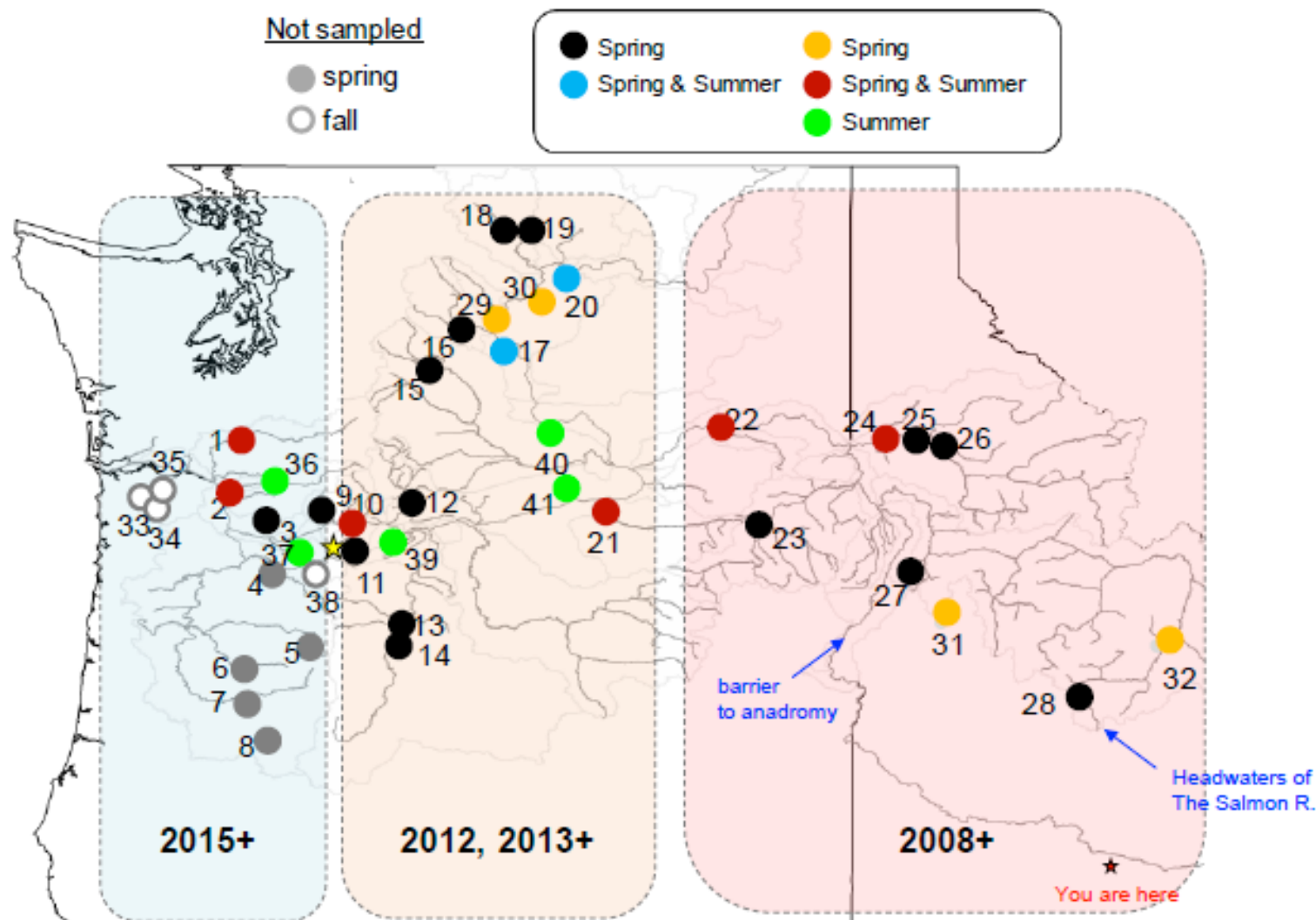
- Started with 2008 broodstock
- Initially used 96 loci via TaqMan
- Now using several hundred loci via GTSeq

Summary of ongoing PBT programs in the Columbia River (outside the Snake River)

- Chinook salmon
 - Sampling started 2012+ (Klickitat was 2008)
 - Same loci as Snake River PBT Program
 - 26 populations +
- Steelhead
 - Sampling started 2012
 - Same loci as Snake River PBT Program
 - 11 populations

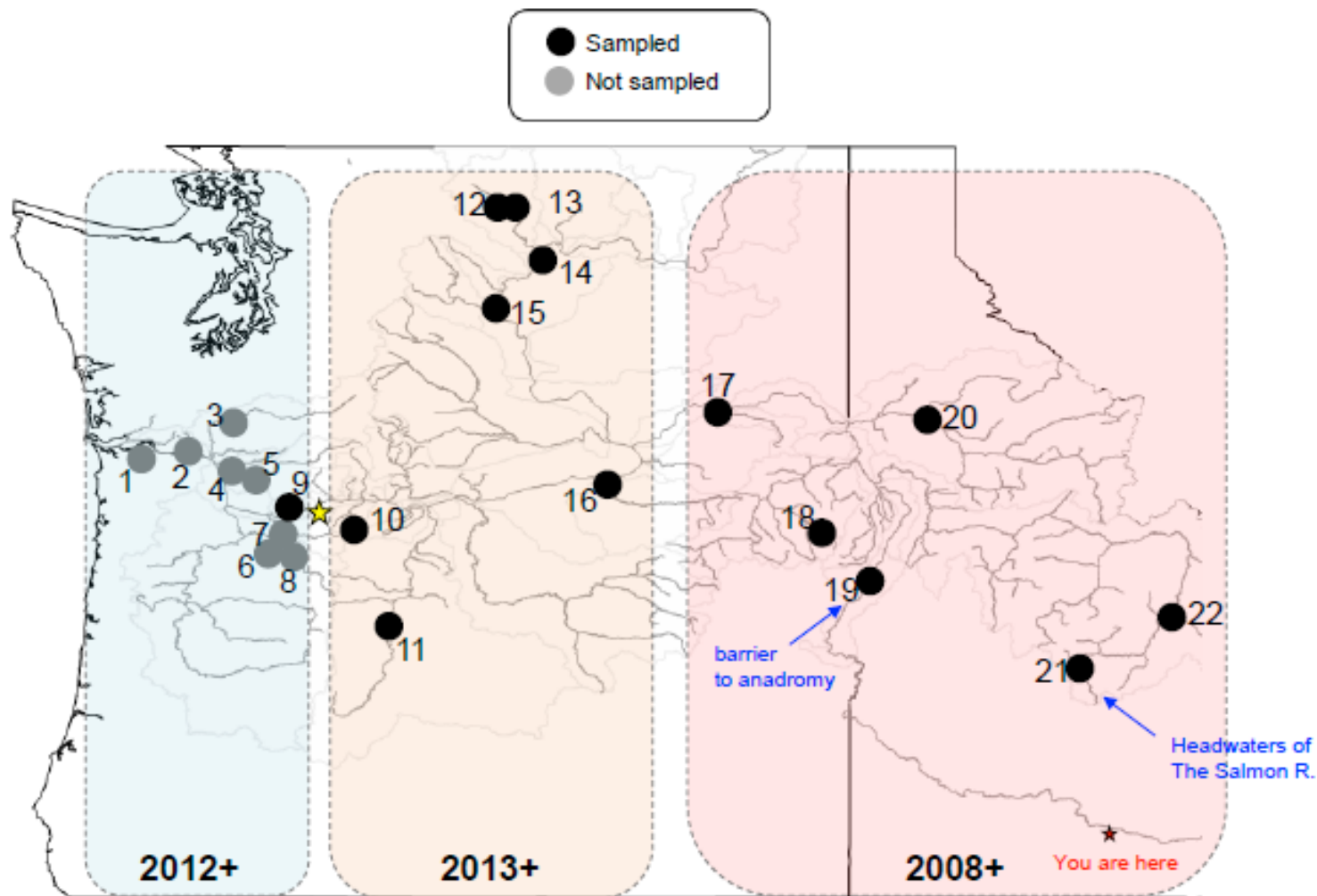


Chinook PBT broodstocks





steelhead PBT broodstocks



Summary of ongoing PBT programs in British Columbia

- Chinook salmon
 - Sampling started 2014
 - Using 390 loci via amplicon sequencing
 - 10 populations +
- Coho salmon
 - Sampling started 2012
 - Using 490 loci via amplicon sequencing
 - 25 populations +

Summary of ongoing PBT programs on Washington Coast

- Chinook salmon
 - Sampling started 2013+
 - 14 populations
 - Samples being collected, but not analyzed yet

Features of PBT

- Efficient method for marking hatchery production. Often allows a larger proportion to be marked than would otherwise be feasible
- Increases options for population monitoring
- Shares several of the same limitations as other tag types (including CWT), and introduces additional challenges
- Provides additional, potentially beneficial, information

What has changed since the PSC feasibility review?

- GBS vs ExN: Robust GBS protocols were developed and shared. These protocols have been successfully tested and adopted by many laboratories.
- Geographic scale at which PBT is feasible (publication of CDFO work on Coho Salmon and Chinook Salmon).

Acknowledgements

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- The findings and conclusions presented here are those of the author and do not necessarily represent the views of the U.S. Fish and Wildlife Service.