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October 6, 2020

MEMORANDUM

TO: Council Members

FROM: Stacy Horton, Washington staff

SUBJECT: Upper Columbia River Spring Chinook Life Cycle Survival Estimates from Passive Integrated Transponder (PIT) Tagging and Detection

BACKGROUND:

Presenter: Dan Rawding, Columbia River Salmon Recovery Coordinator

Summary: The Upper Columbia River spring Chinook Evolutionary Significant Unit (ESU) was listed for protection under the US Endangered Species Act in 1999 and a recovery plan was developed to rebuild the spring Chinook Salmon in the ESU. Despite over 15 years of efforts, in the last status review NOAA Fisheries concluded this ESU remained at a high extinction risk. In 2017, the Independent Scientific Advisory Board was asked to conduct a review to inform Upper Columbia River spring Chinook recovery and research efforts. The impetus for the review was that despite a decade of habitat restoration actions Upper Columbia River spring Chinook populations remain at high risk of extinction. One of the Board's recommendations was additional life cycle modeling to identify limiting factors and assist with restoration planning. In response, a multistate release-recapture model was developed to estimate reach specific detection and survival through the extensive Columbia River Passive Integrated Transponder (PIT) tag detection network. To demonstrate this approach, spring Chinook salmon parr and smolts were tagged with PIT tags at juvenile outmigration traps on the Methow, Entitat, and Wenatchee Rivers for brood years 2009 to 2013. Further information on the model and results may be found in the 2019 Comparative Survival Study (CSS) report.

Relevance: As one of two endangered salmon populations in the Columbia River basin, the Council has recommended investment in actions for the Upper Columbia spring Chinook to improve habitat, conduct research, provide for monitoring, passage improvements, conservation actions, adult reach survival standards, and NOAA BiOp targets for inriver migration and passage in an effort to improve conditions. The 2020 Addendum has identified a strategy indicator for the proportion of adult salmon and steelhead consumed by pinnipeds, with an emphasis on upper Columbia spring Chinook and winter steelhead. The NOAA Marine Fisheries Advisory Committee's (MAFAC) Columbia Basin Partnership Task Force target for Upper Columbia spring Chinook is now part of the 2020 Addendum for both wild and hatchery populations.

Background: The 2018 ISAB Report [Review of Spring Chinook Salmon in the Upper Columbia River](#) looked at habitat, research, monitoring, prioritization and coordination of recovery actions for Upper Columbia spring Chinook and found that "The recovery program in the Upper Columbia Basin is one of the better examples of an explicit strategy to guide local recovery actions, monitoring, and adaptive management." Analysis of limiting factors directs the priority of work conducted. The ISAB recommended improvements in the integration of limiting factors analysis, density dependence analysis, and life-cycle modeling; rigorous RM&E programs; continued investigations of the effects of summer Chinook, pinnipeds, harvest and other sources of mortality; cost effectiveness analysis; the evaluation of the effectiveness of habitat actions through experiments and monitoring; continued validation and monitoring of the life-cycle model; and encouraged a process for coordinating activities across groups, committees and subbasins and finally, to design and coordinate RM&E activities for the entire Upper Columbia watershed.

More Info: 2019 Comparative Survival Study (CSS) report
<http://www.fpc.org/documents/CSS/2019CSSAnnualReport.pdf>.

Survival Estimates of Wild Upper Columbia Spring Chinook Salmon from Passive Integrated Transponder (PIT) Tag Data

Dan Rawding



Presentation Outline

- Background
- Data Collection
- Model
- Results
- Next steps



UC Spring Chinook Recent Timeline

- NOAA listed as “Endangered” under ESA (1998)
- UCSRB recovery plan (2007)
- NOAA status review high risk of extinction (2016)
- ISAB recommended additional quantitative estimates and these to be incorporated into life cycle models to address all H’s/limiting factors (2018)



Natural Origin Population Performance

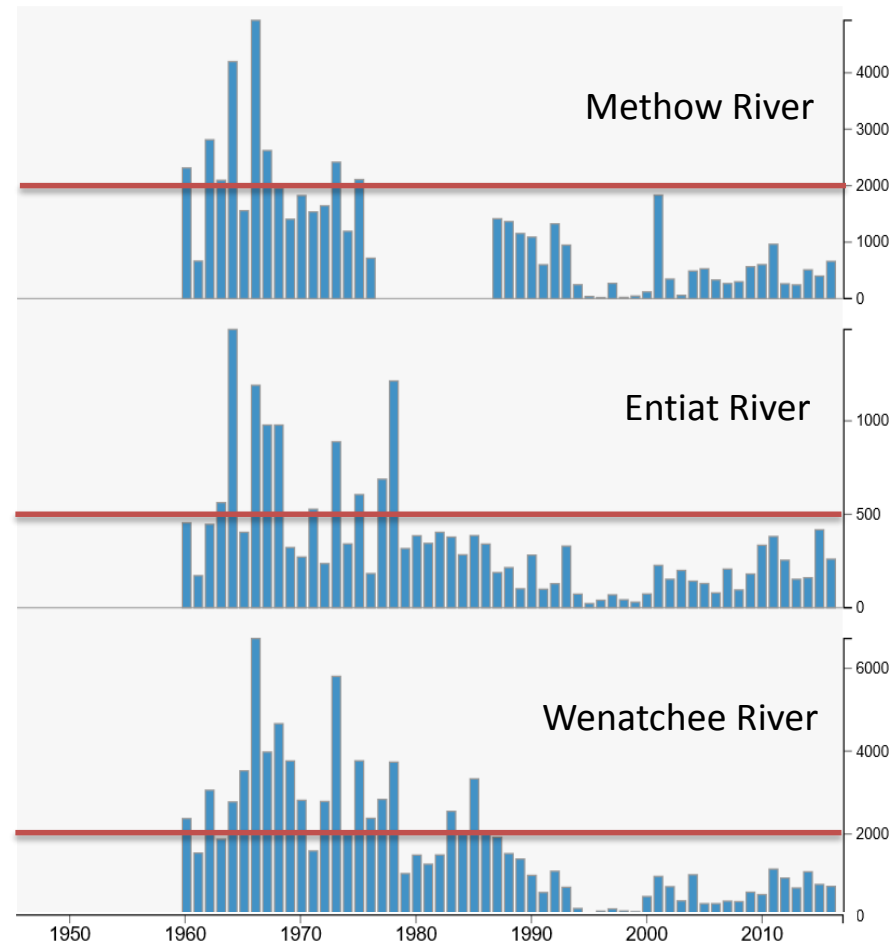
Highest abundance prior to 1980

Lowest abundance in late 1990's

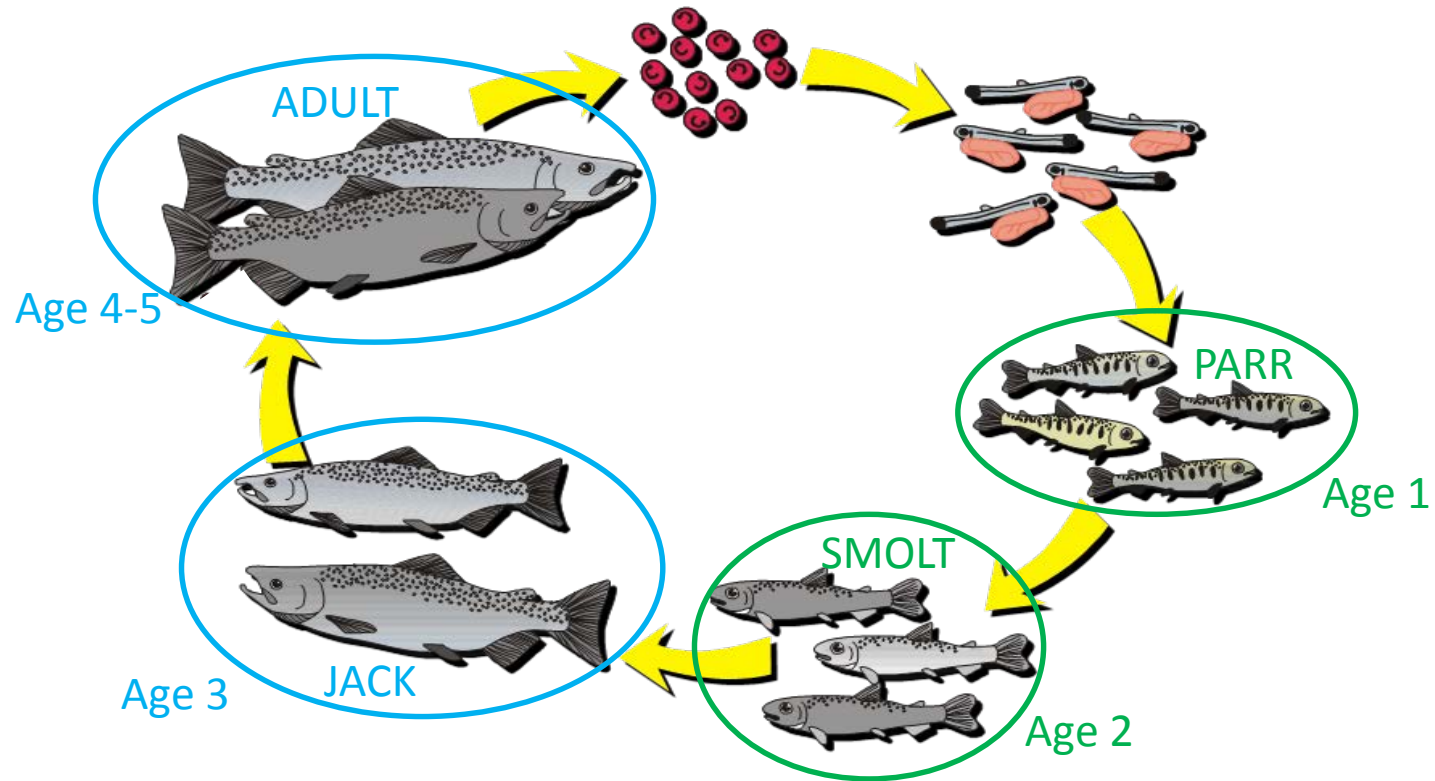
Increase in abundance after 2000

Below ESA delisting goal (red line)

<https://www.streamnet.org/data/coordinated-assessments/>



Spring Chinook Salmon Life Cycle

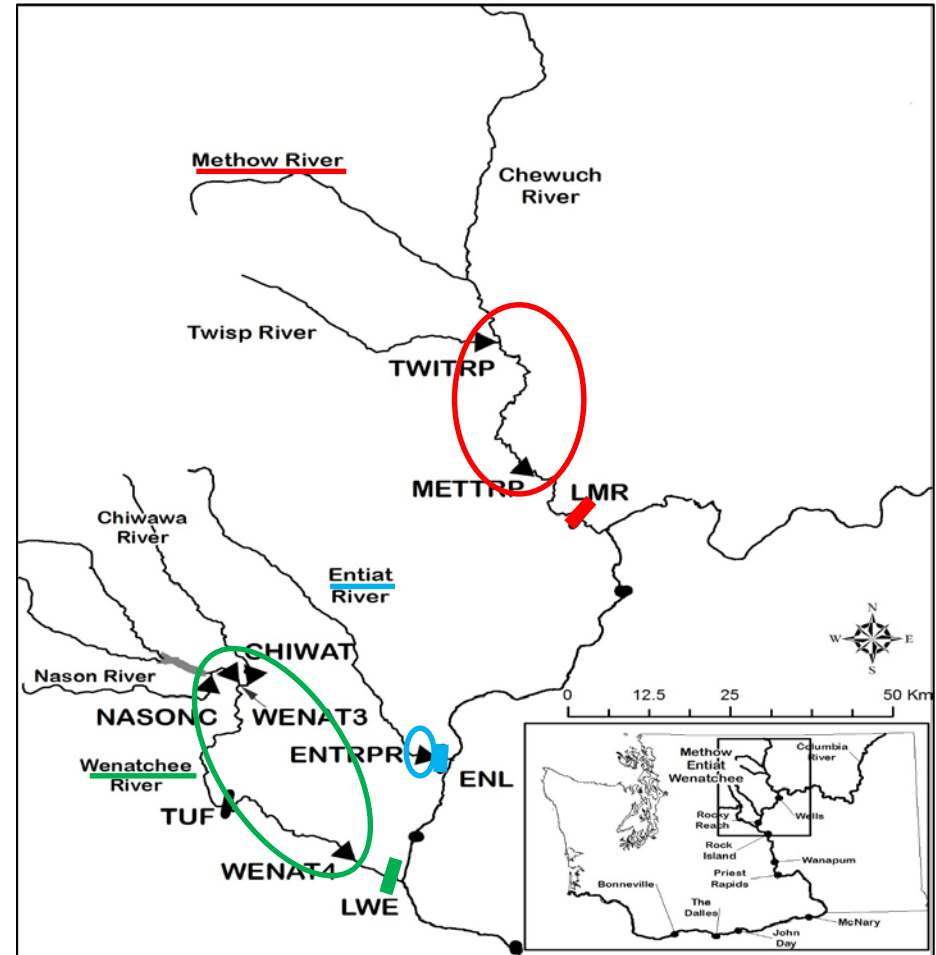


Data Collection

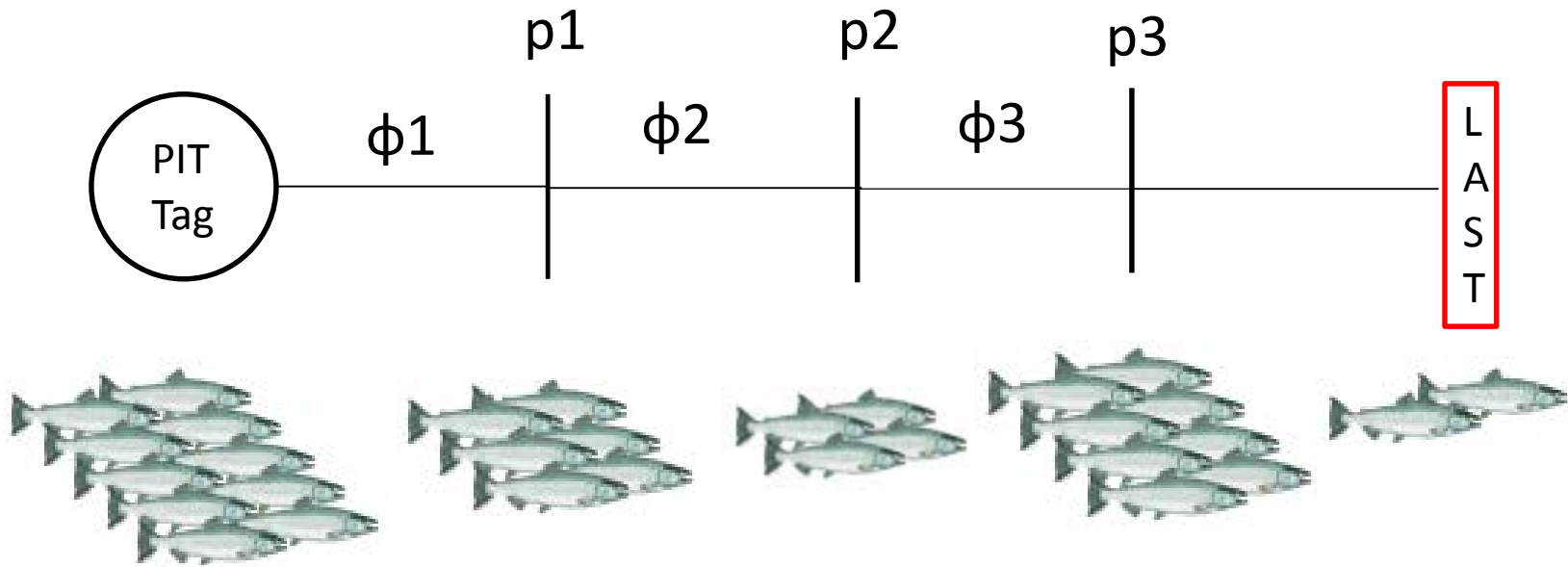


Brood Years 2009-2013

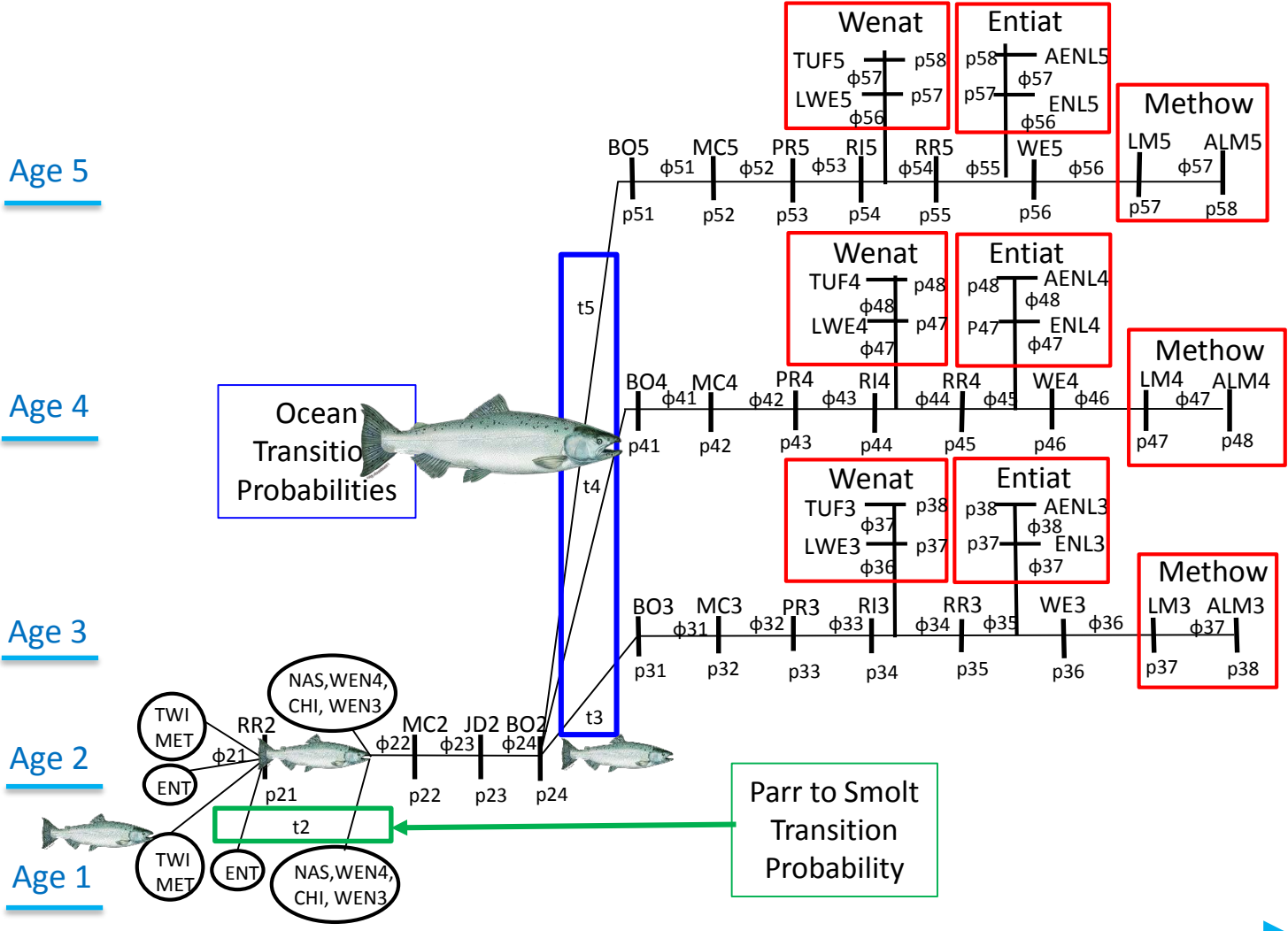
Methow Basin	8,000 tags
Entiat Basin	23,000 tags
Wenatchee Basin	62,000 tags
Upper Columbia	93,000 tags



Cormack-Jolly-Seber Model



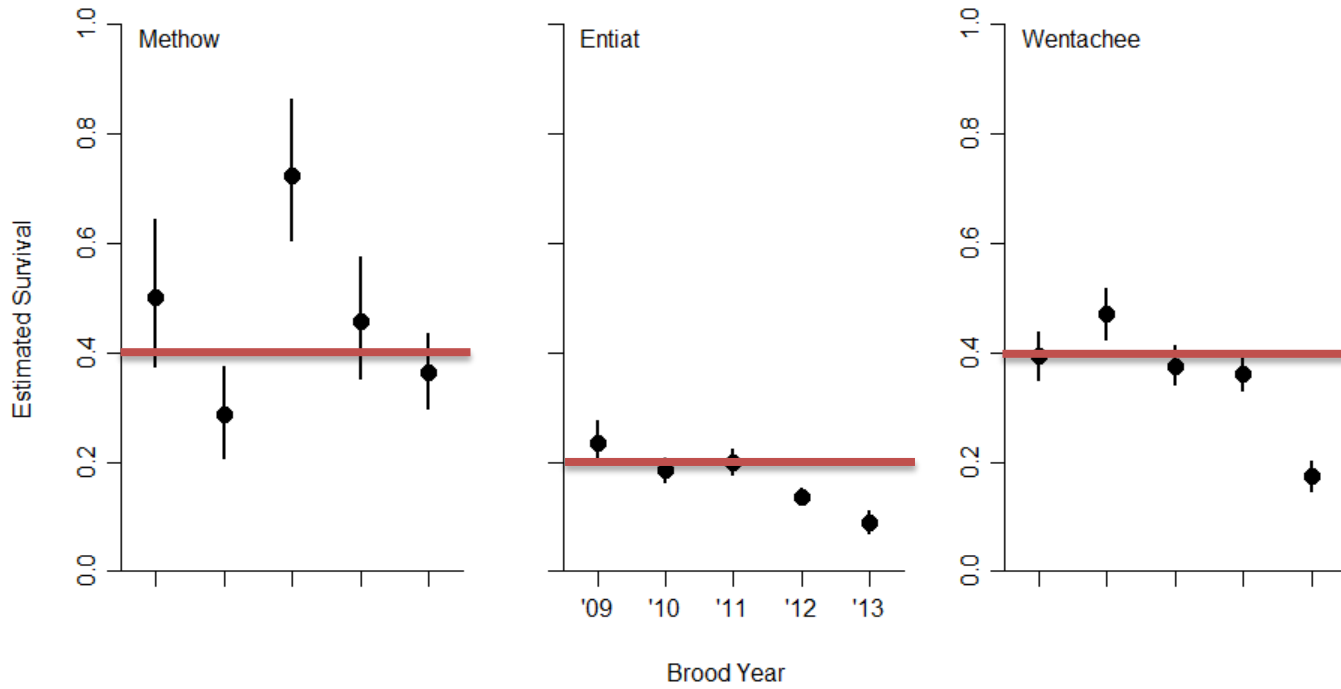
UC PIT Tag Survival Model



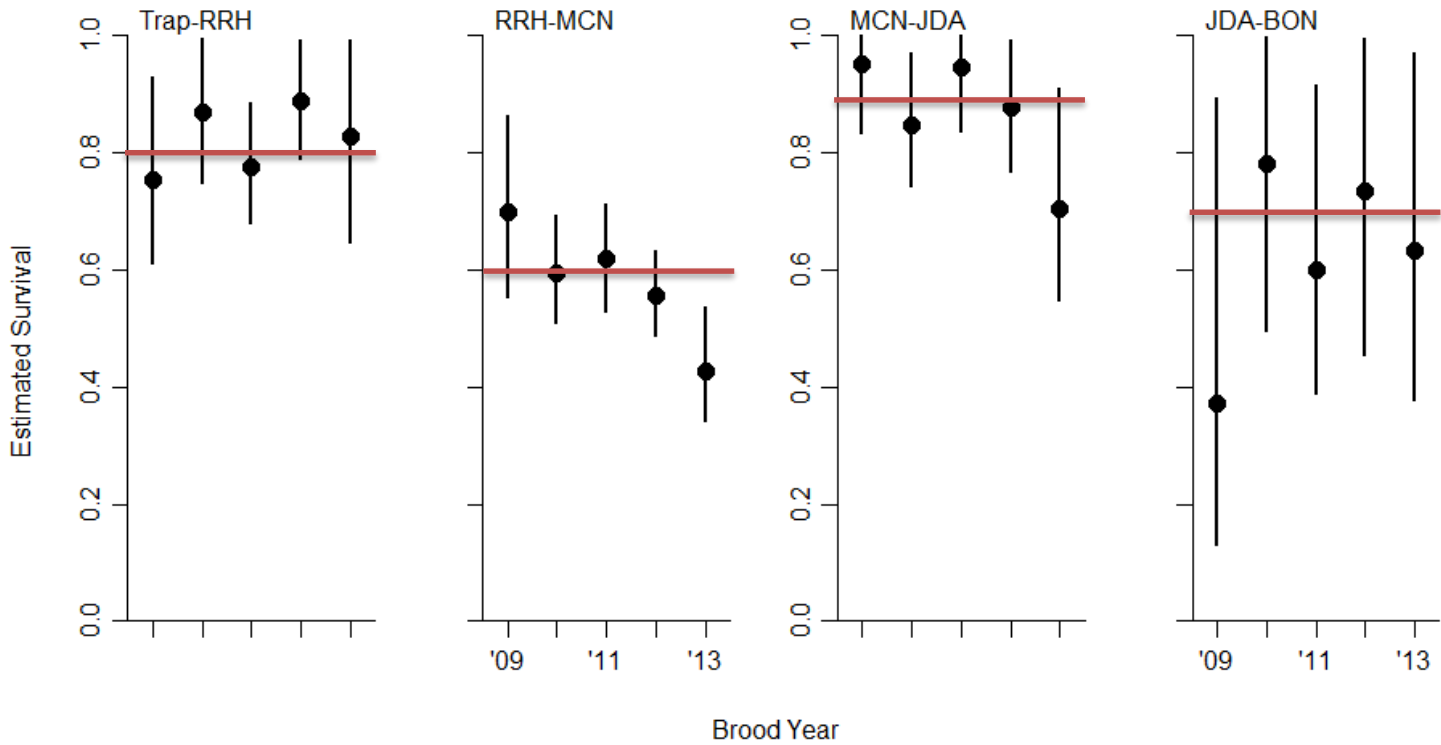
Juv. PIT Tagging Juv. Detection & Survival Adult PIT Tag Detection & Survival



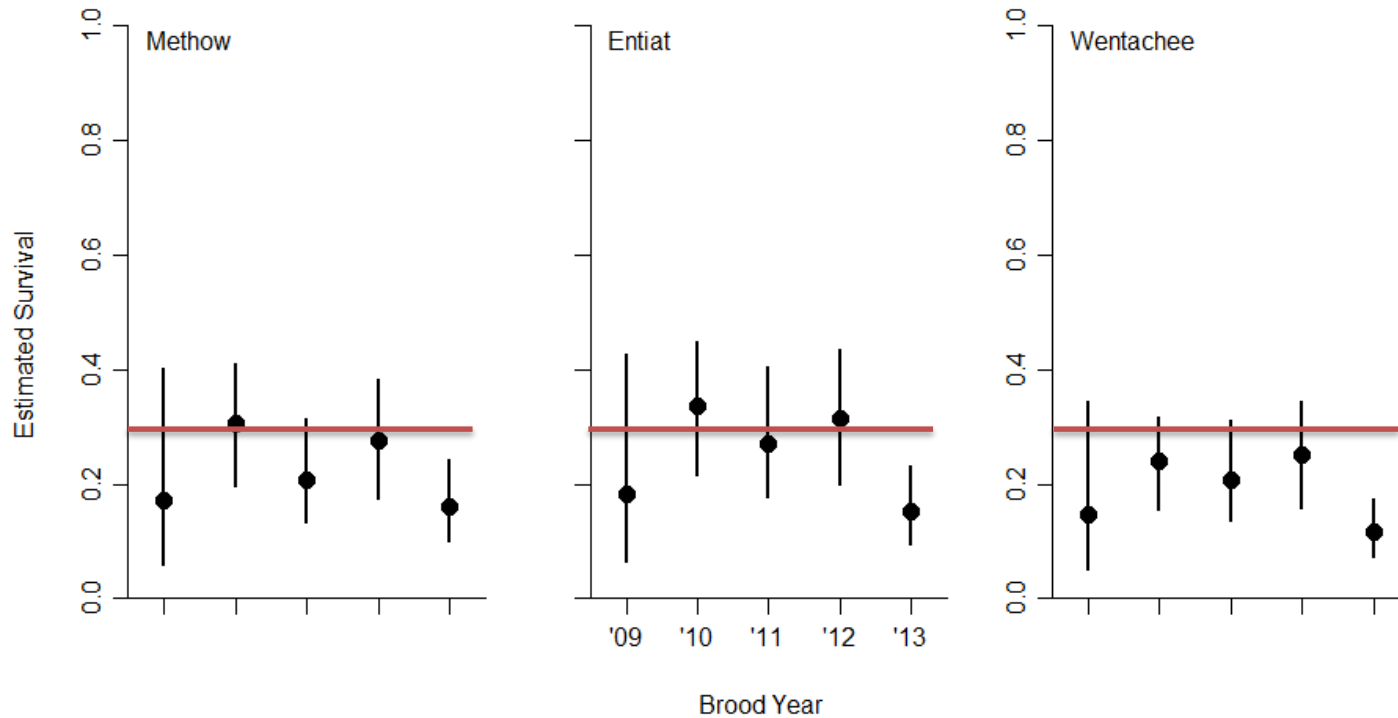
Parr to Smolt Survival



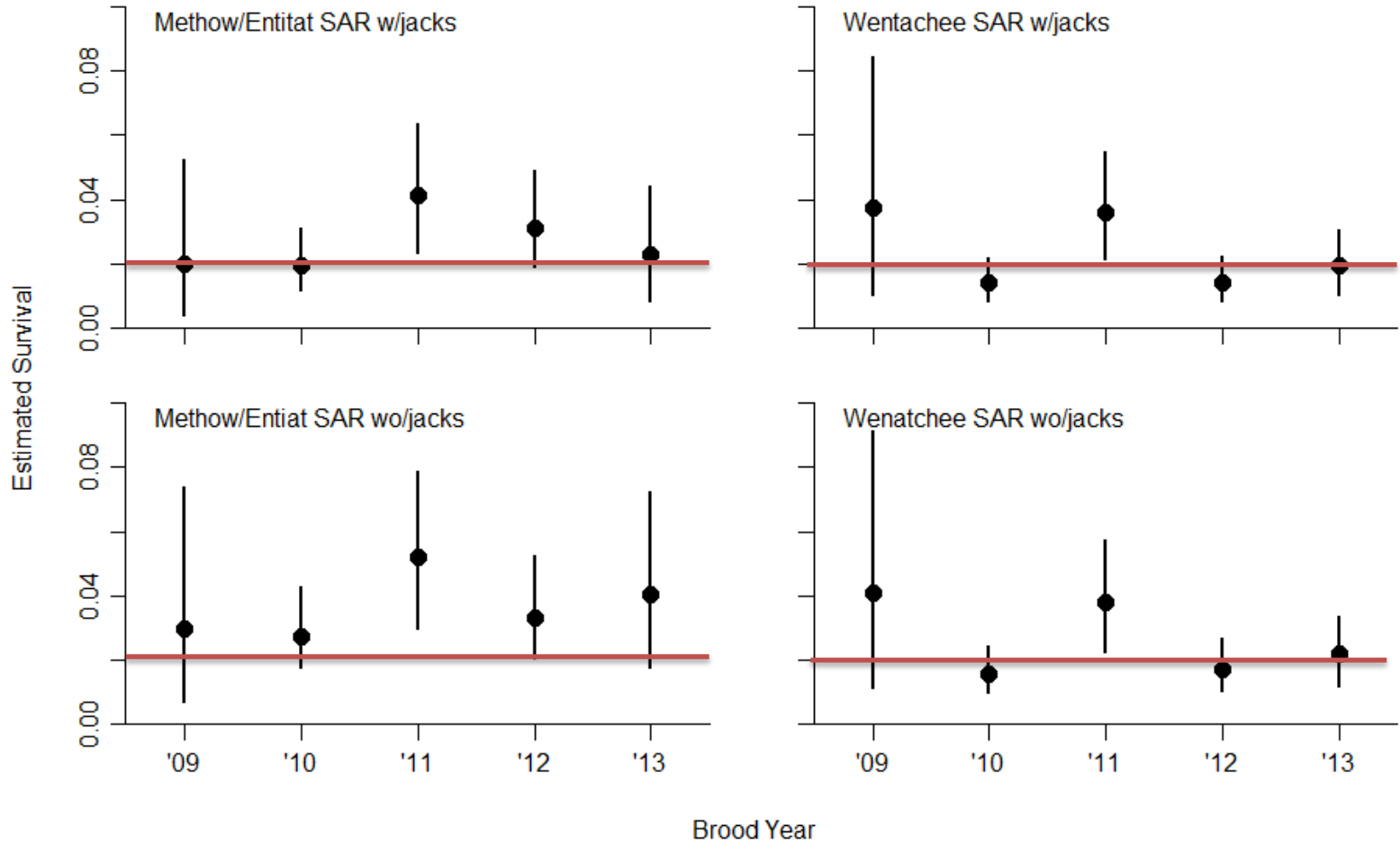
Entiat Smolt Survival



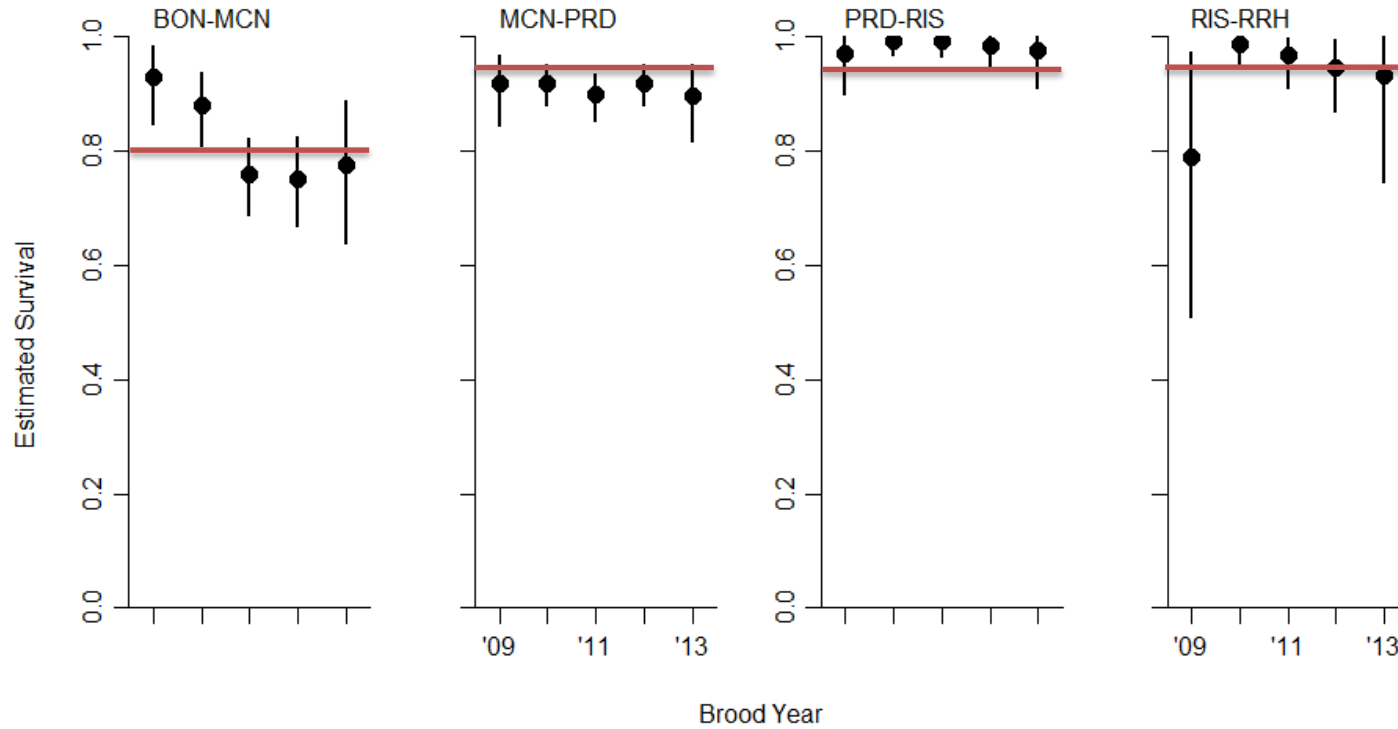
Smolt Survival Trap to Bonneville



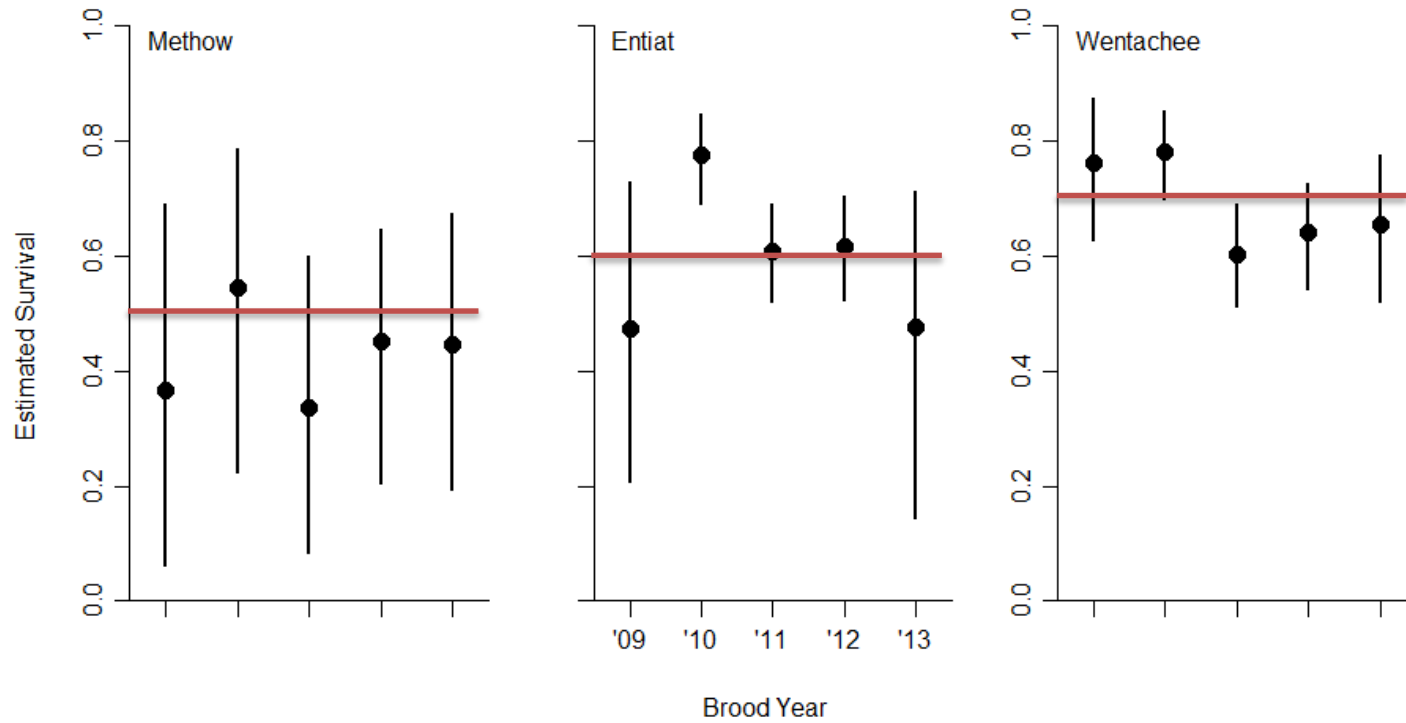
Ocean Survival (BON-BON)



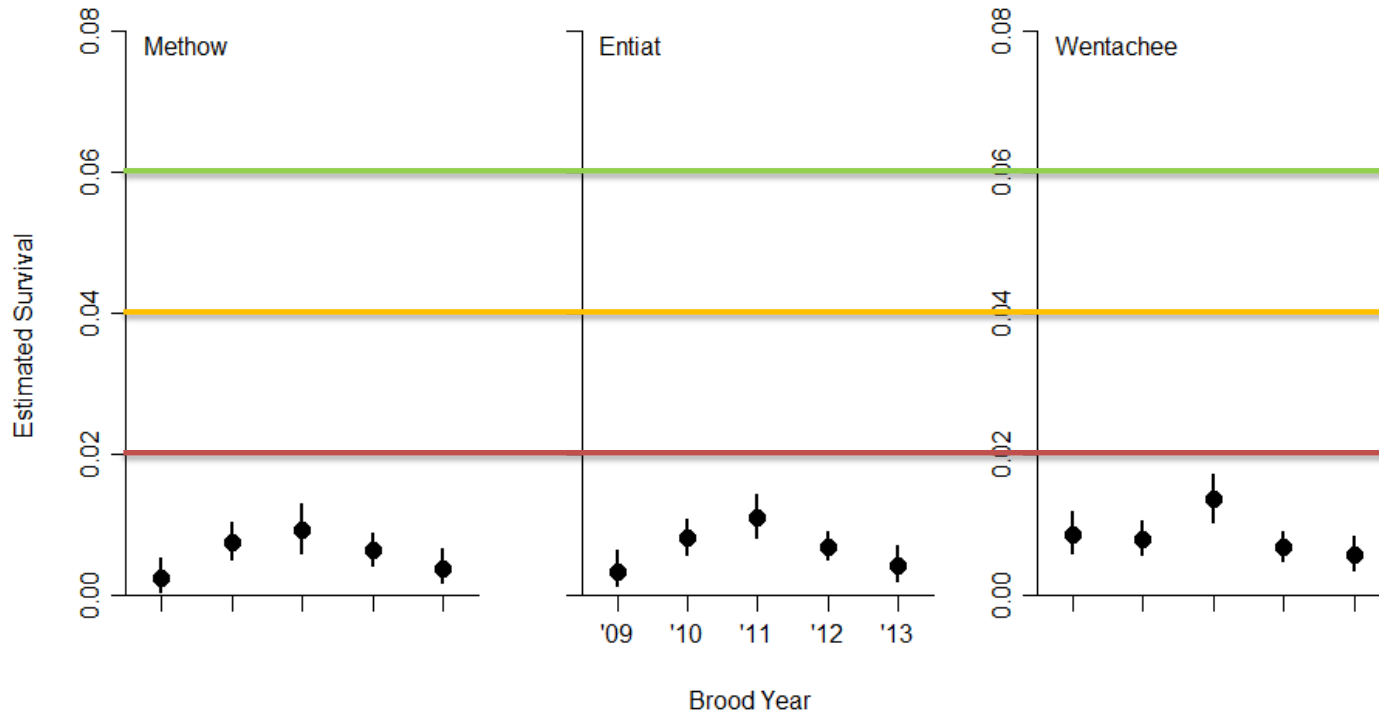
Entiat Adult Survivals



Adult Survival Bonneville to Tributary Mouth



Smolt to Adult Survival (NPCC Goal 4%)



Summary

- Parr to smolt survival is lower for Entiat vs Methow and Wenatchee juveniles
- Smolt survival from screw traps to BON is ~ 25%
- Adult survival from BON to tributary is ~50-70%
- SAR to and from the upper most dam is <1%, which is well below NPCC goal of 4%



Next Steps

- Add brood years (2004-08, 2015, 2016)
- Add parr electroshocking data
- Separate survival estimates for summer & fall parr
- Covariates (e.g. spill, discharge, etc.)
- Other species (e.g. steelhead, sockeye, etc.)
- Life Cycle Models (Wenatchee, Entiat, Methow)



Comparative Survival Study



<http://www.fpc.org/documents/CSS/2019CSSAnnualReport.pdf>

