

Risk Management of Non-target Fish Taxa as Related to Salmon Supplementation

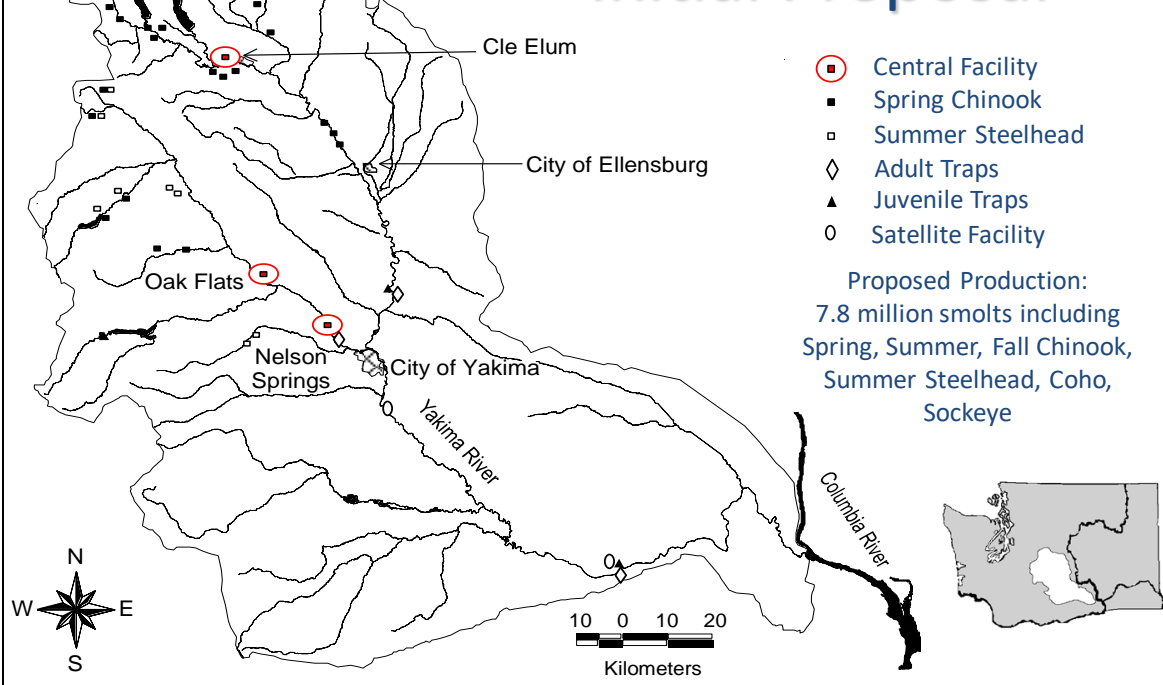
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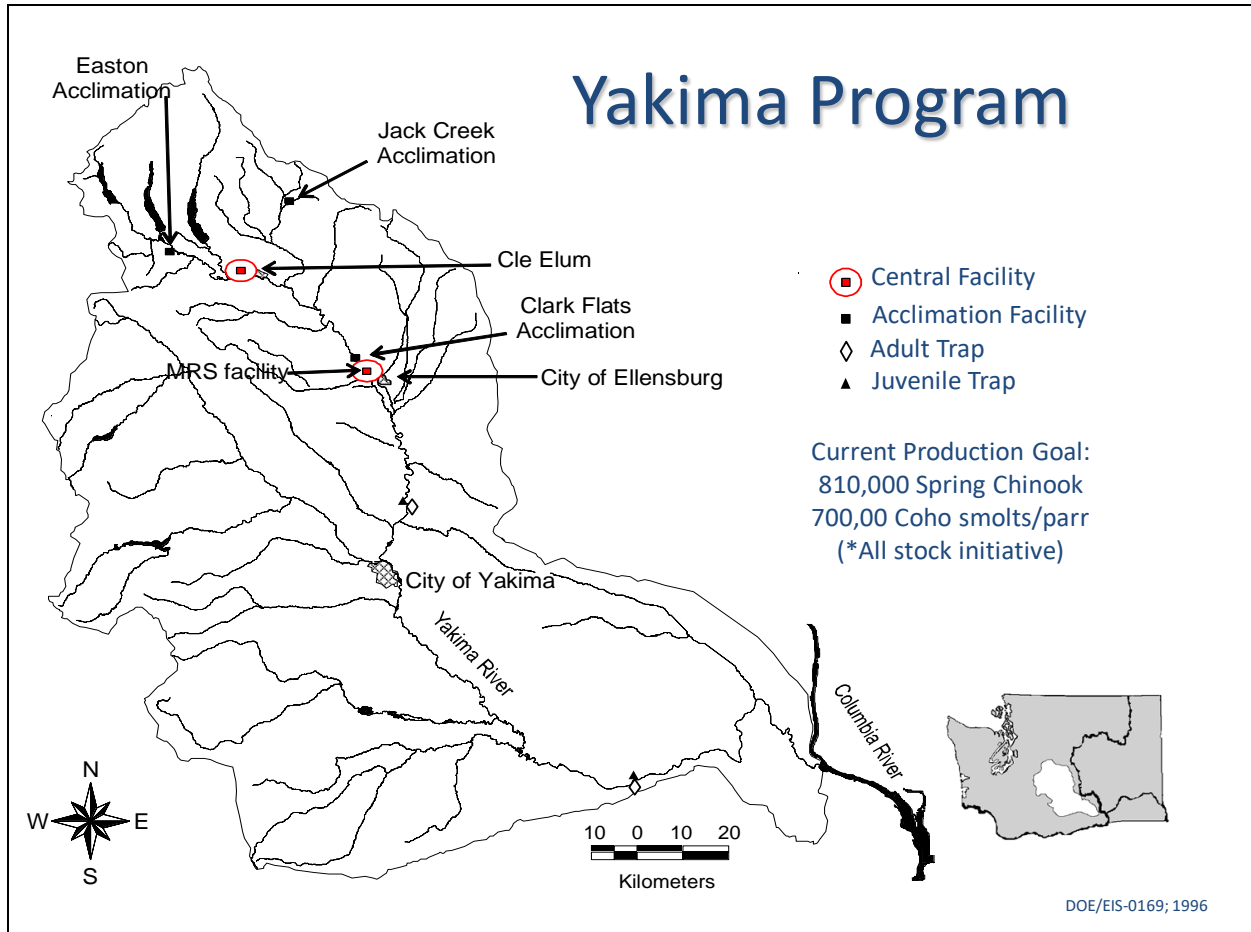
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Salmon supplementation and reintroduction programs have the potential to negatively impact other valued fish taxa, which are not the target of enhancement (non-target taxa). The Yakima/Klickitat Fisheries Project's (YKFP) Non-target Taxa of Concern (NTTOC) monitoring program is one monitoring and evaluation (M&E) component of the YKFP and sets the bar for evaluating ecological risks associated with salmon supplementation and reintroduction projects. In this talk, we evaluate the effects of spring Chinook Salmon *Oncorhynchus tshawytscha* supplementation and Coho Salmon *O. kisutch* reintroduction (hereafter supplementation) to non-target fish taxa in the upper Yakima Basin following implementation of production scale salmon supplementation and reintroduction.

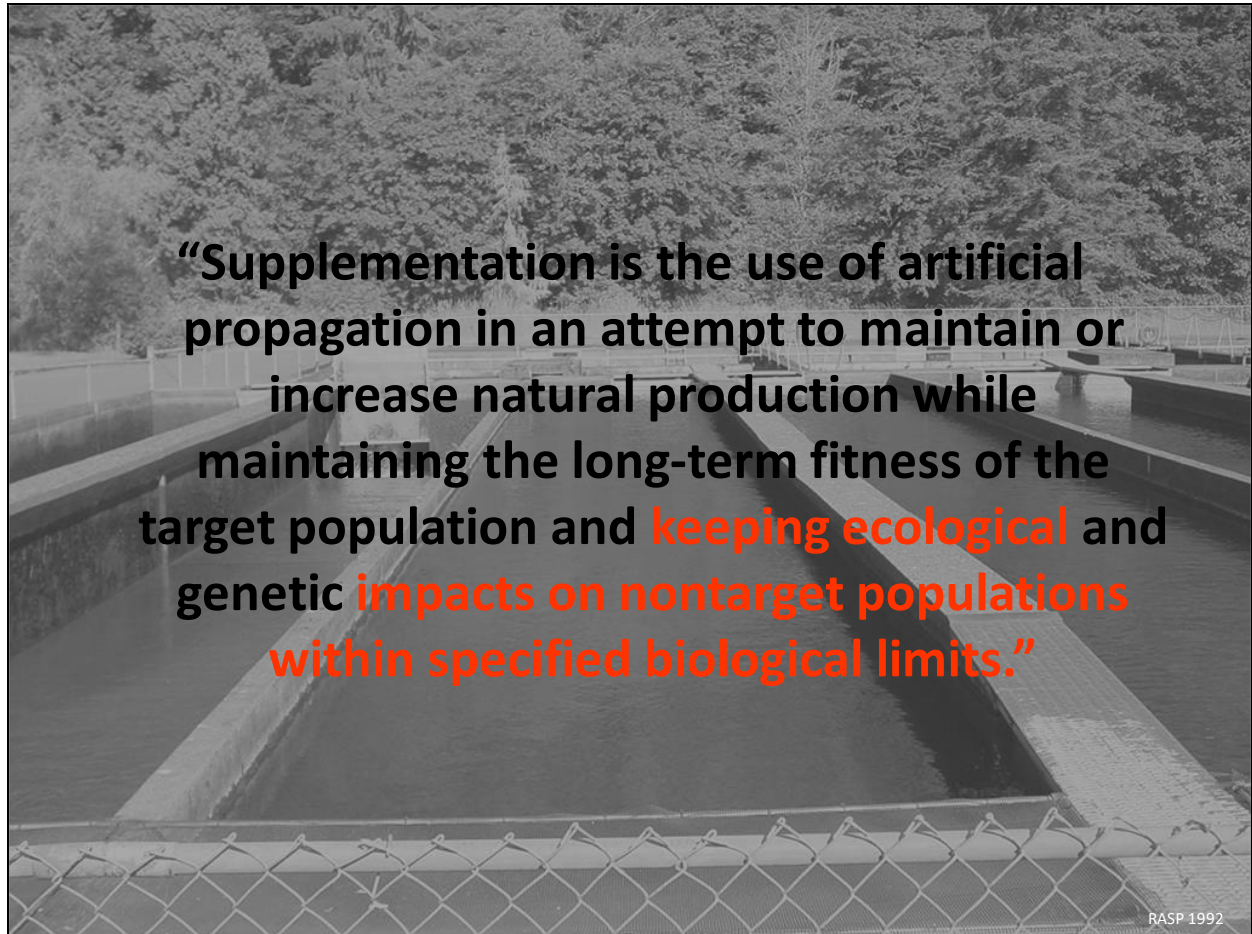
Yakima Program Initial Proposal



The initial conceptual design of the Yakima Fisheries Program as described in the Environmental Assessment in 1990 was large in scope and included a complex multi-species, multi-life stage production program and large geographic rearing and release plan.

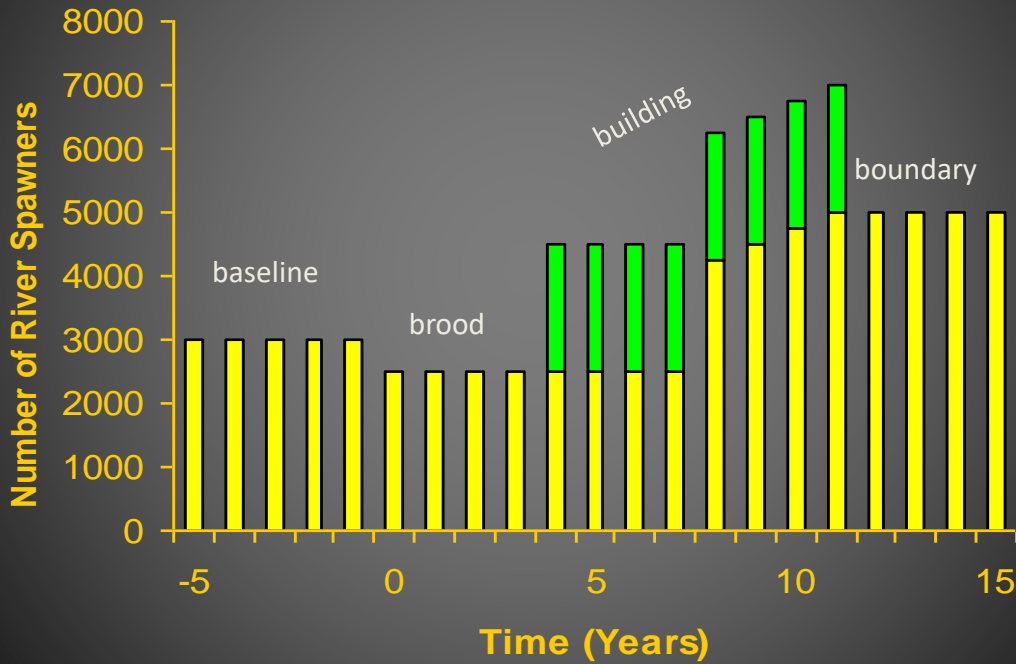


The final Yakima Fisheries Program conceptual design presented in the 1996 Environmental Impact Statement (EIS) was far reduced in size and scope than that contained in the 1990 assessment (i.e., single central facility (CESRF); lower production targets, etc.), although we acknowledged the program would be an all stocks initiative and that additional species would come online for production as additional funding became available. Construction was initiated on the MRS central facility in 2018 and was recently completed.



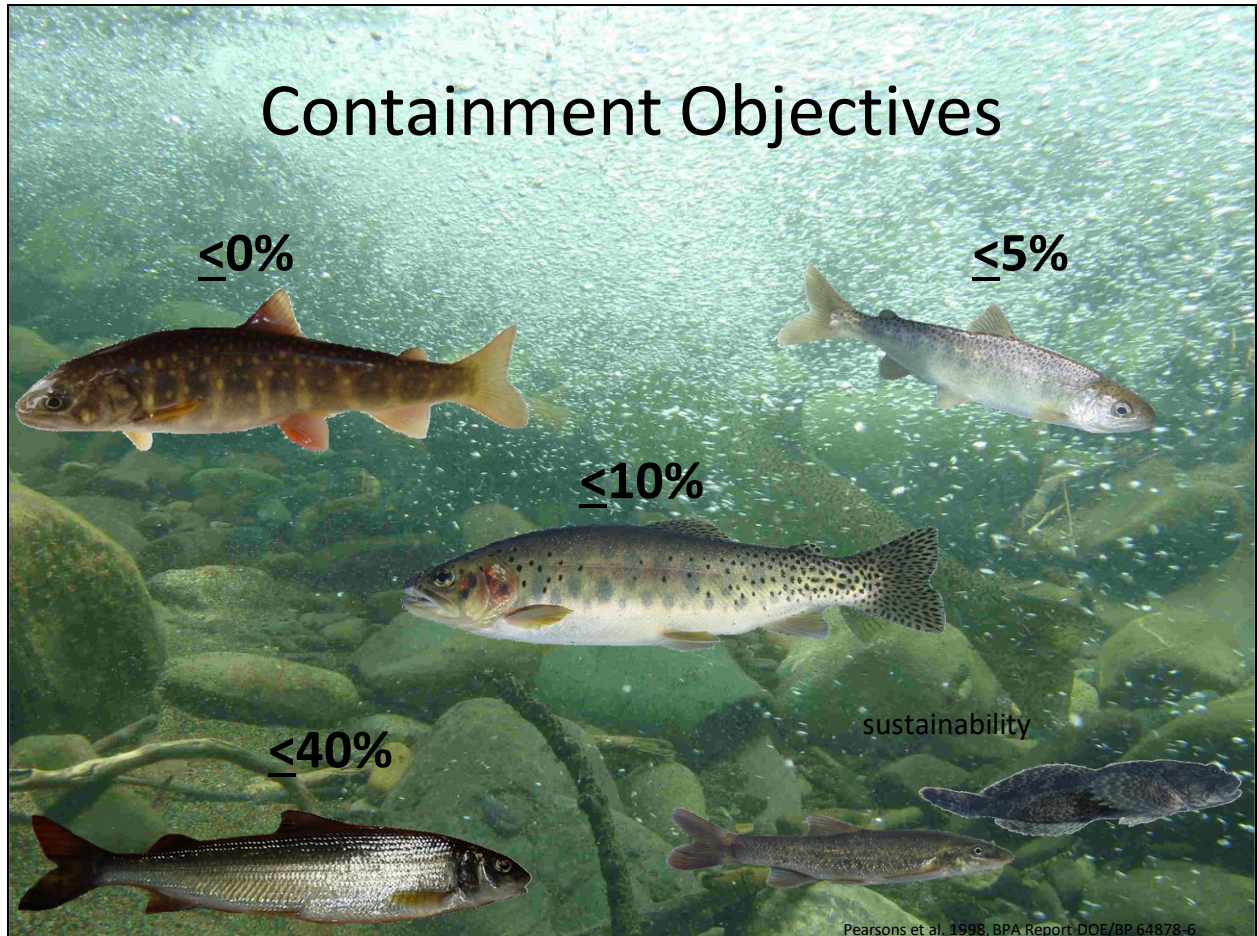
The Regional Assessment of Supplementation Project (RASP; 1992) definition of supplementation.

Supplementation Chronology



Pearsons 2002, Fisheries

Theoretical chronology of supplementation as proposed by Pearsons (2002). The end goal is to increase the number of natural river spawners of the target taxa. Interaction potential with other valued fish species, termed non-target taxa of concern (NTTOC), is likely to be dynamic, changing in strength and direction as the abundance of the target taxa changes while progressing through the various stages of supplementation.



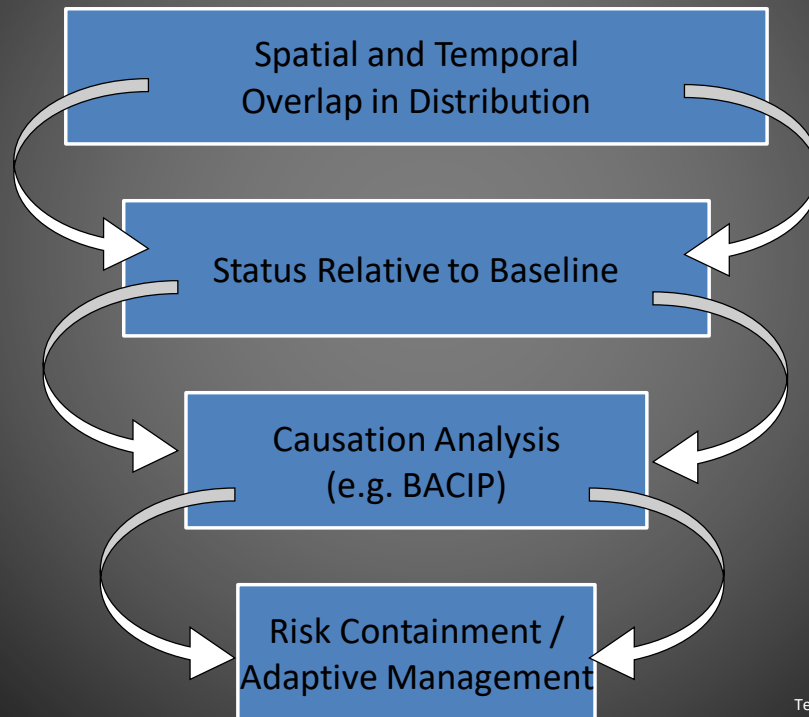
In 1998, containment objectives (CO) were established for our non-target taxa of concern. These objectives serve as benchmark values against which trends in abundance, size (and biomass), and distribution for each NTTOC can be judged relative to baseline, pre-supplementation conditions. Containment objectives for each NTTOC were agreed upon after extensive discussions between the co-managers with input from special interest groups (namely angler groups). Listed and protected taxa have the most conservative containment objectives (0%) followed by locally rare taxa (5%; Mountain Sucker, Naturally Produced Fall Chinook), 10% for valued utilization taxa (Mainstem Yakima River Rainbow Trout and Cutthroat Trout), 40% for valued utilization taxa in tributaries (Rainbow Trout and Cutthroat Trout) and Mountain Whitefish in the main stem Yakima River, and finally, simple sustainability for common native species such as dace and sculpins.

Methods.....



The large suite of species monitored (NTTOC) requires a large diverse set of sampling methods from night snorkeling and night boat electrofishing to counts at permanent facilities as well as tributary electrofishing surveys. We would like to acknowledge the huge contribution made from numerous individuals through the years and the long-term contributions of the co-managers and continued support from the Bonneville Power Administration.

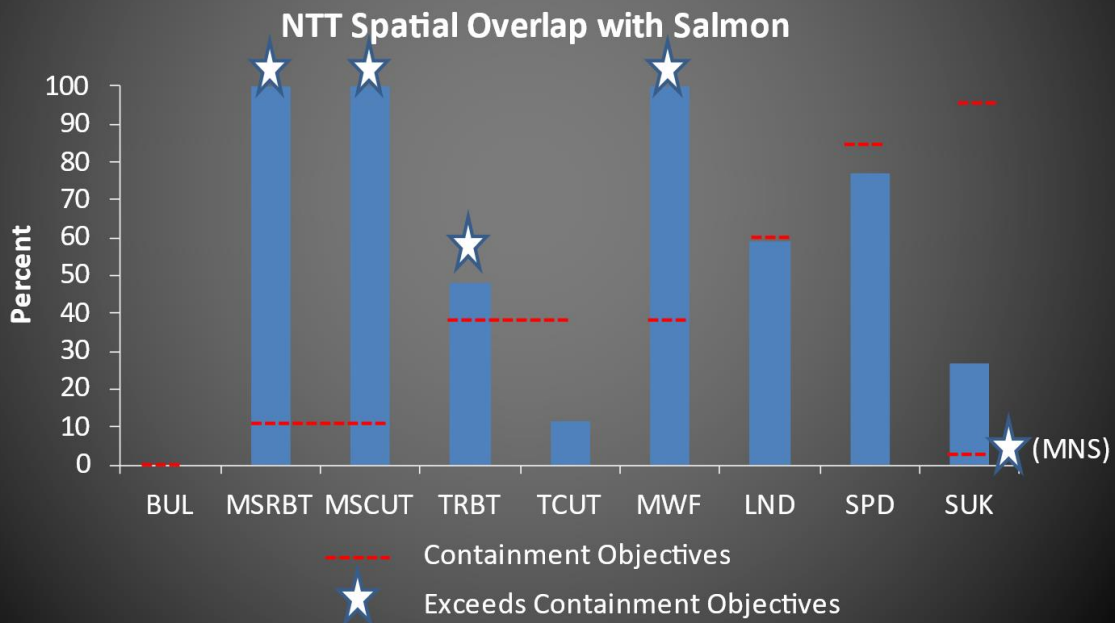
Risk Management Sieve



Temple and Pearsons 2013

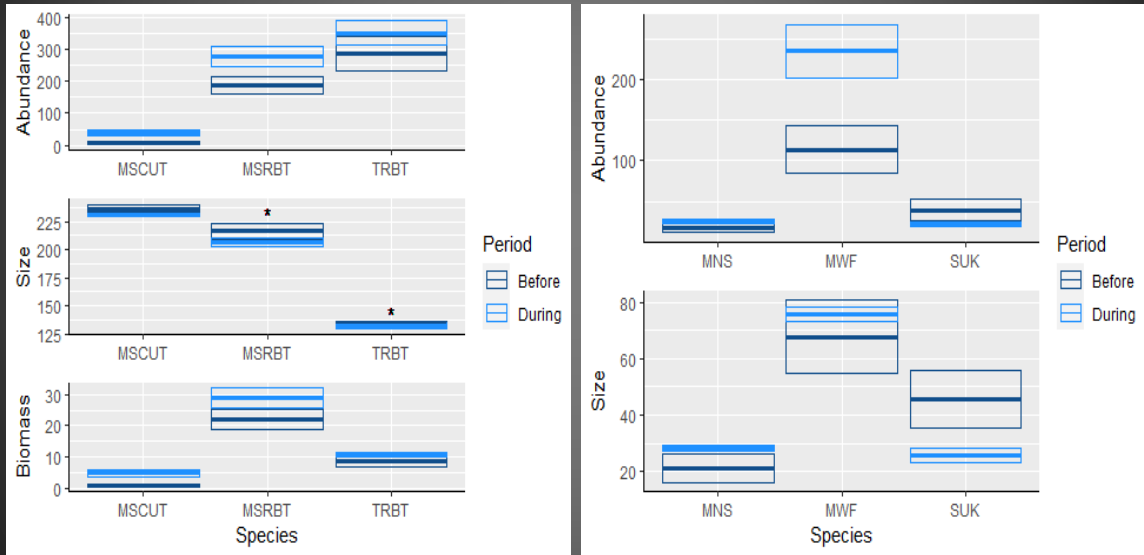
We adopted what we call the “Sieve” approach to managing ecological risks to NTTOC. First we determine if there is spatial or temporal overlap between the target taxa (Chinook and Coho in this case) and NTTOC. We quantify overlap and when overlap exceeds our containment objectives, the next stage in the sieve is triggered. Second, we determine if there have been changes in NTTOC status (abundance, size, or spatial distribution), relative to baseline conditions (before supplementation versus during supplementation comparisons). Third, if before versus during comparisons in NTTOC monitoring variables exceed our containment objectives, that triggers more refined analysis or additional experiments to determine causation. Finally, if declines in monitoring variables suggest supplementation actions negatively influence NTTOC beyond our objectives, we flag the issue and recommend risk containment actions to adaptively manage and remove or eliminate those risks.

Spatial Overlap in Distribution



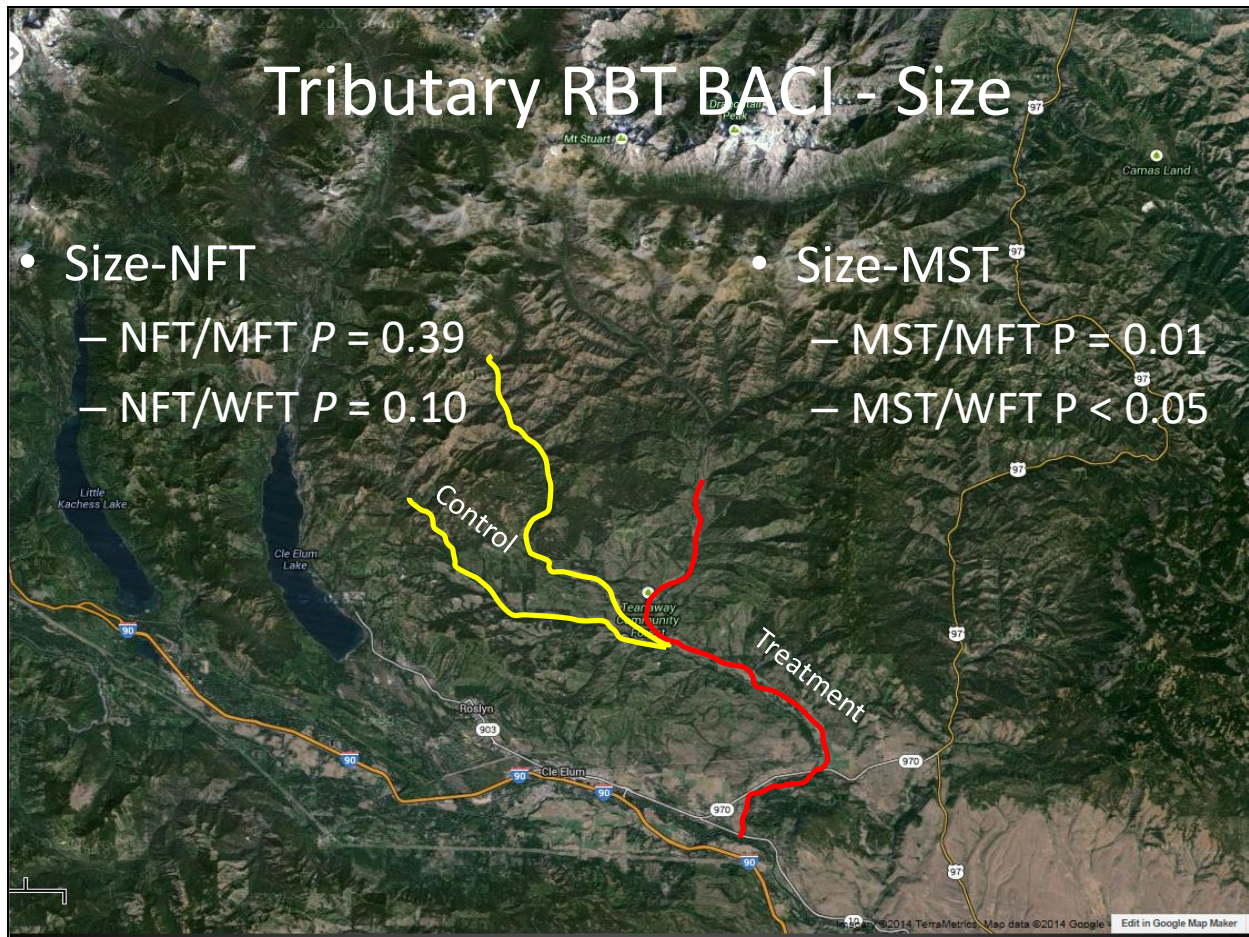
Rainbow and Cutthroat Trout (MSRBT and MSCUT, respectively), Mountain Whitefish (MWF), and Mountain Sucker in the mainstem Yakima River, and Rainbow Trout in upper Yakima Tributaries (TRBT) overlap in spatial distribution with supplemented spring Chinook and Coho salmon and the overlap exceeds our objectives. We evaluate Mountain Sucker status indirectly using the abundance, size structure, and biomass of all juvenile sucker species encountered.

Status – Change Relative to Baseline



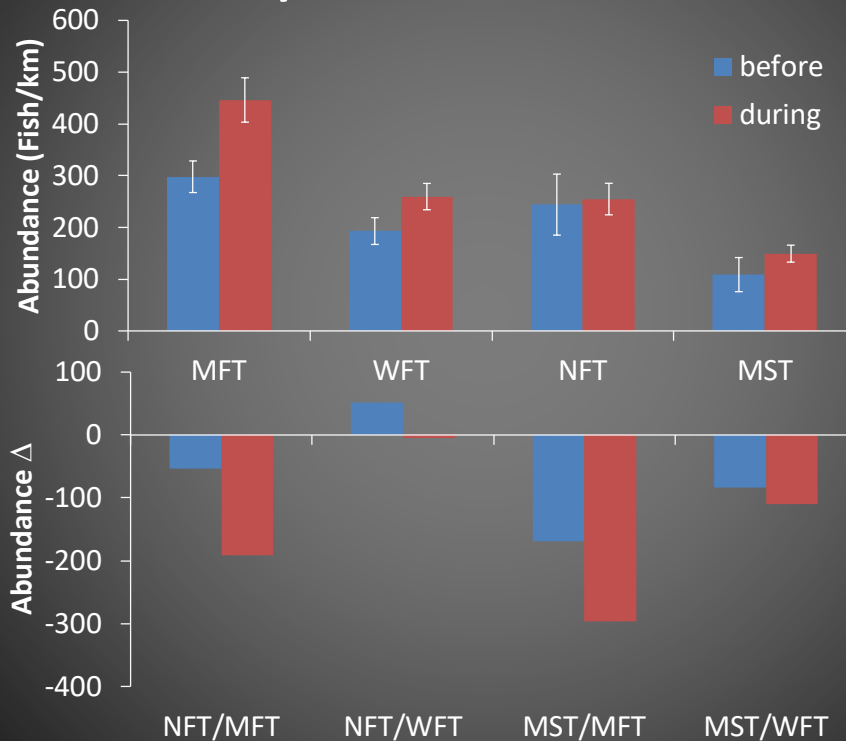
* Exceeds Containment Objective

Given the overlap in distribution between NTTOC and supplemented salmon, we compare the abundance, size, and biomass of trout and the abundance and size of non-trout NTTOC between pre-supplementation and during supplementation conditions. Statistical tests are one-way because we are more concerned with evaluating potential decreases in our monitoring variables. In the figure above, statistically significant declines are identified with an asterisk.



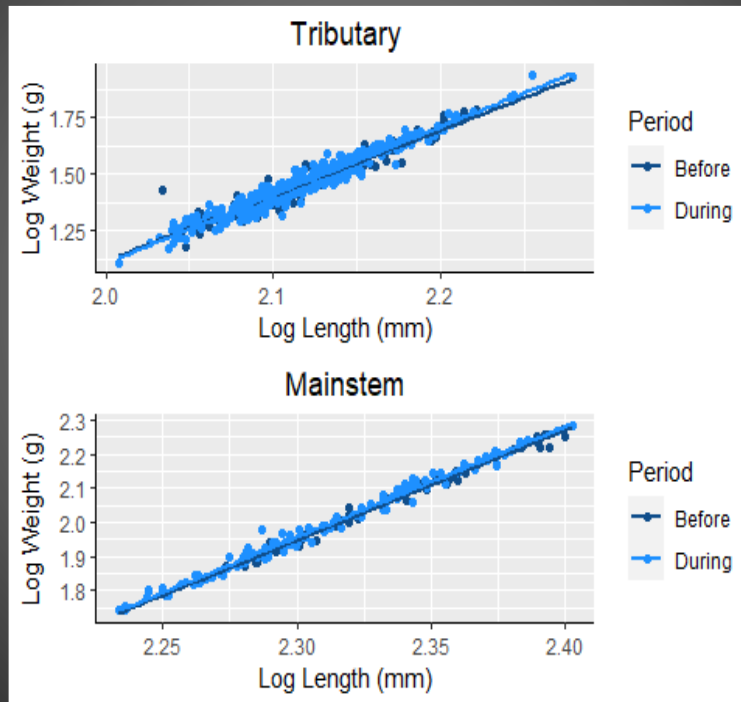
Similarly, because tributary Rainbow Trout size was decreased during the supplementation years relative to the baseline period, a more refined analysis is triggered. As we did for Rainbow Trout in the main stem Yakima River, we used a BACI statistical test to compare size in treatment relative to control locations. Rainbow Trout size in treatment locations in the North Fork Teaaway were not significantly different before versus during supplementation after accounting for size in control streams. Conversely, Rainbow Trout size in the main stem Teaaway river was significantly different. Thus, half the comparisons were significant and half were not.

Teaway RBT Abundance BACI



Since our tributary size BACI results were somewhat ambiguous, we extended the evaluation to include trends in tributary Rainbow Trout abundance in the Teaway Basin. Abundance in the Teaway has increased relative to baseline conditions suggesting the decrease size BACI does not translate to decreased survival. The abundance delta values (treatment stream minus control stream) above help visualize an abundance BACI test showing that post supplementation abundance of Teaway Basin Rainbow Trout is generally greater in treatment streams than in the control streams. This is informative given that 1/3 of the hatchery spring Chinook salmon production is released in the Teaway Basin.

RBT “Condition”



Finally, as a precaution, we evaluated Rainbow Trout condition (log transformed fish length and weight) before versus during salmon supplementation to determine if there are differences in the length versus weight relationship between the periods. As indicated in the figure above, the trend lines are very closely aligned suggesting no biologically important difference in trout size.

Risk Containment Monitoring Summary

- Naturally produced Spring Chinook widely distributed – (distributional overlap with NTT)
- Continue to observe small *O. mykiss* size differences in tributaries and main stem areas triggering risk containment analysis
- Weight of evidence suggests observed decrease not related to supplementation activities at this time
- New since our last S&M conference—post implementation risk containment monitoring now incorporates MRS Coho (Type I interactions)

To summarize, the NTTOC risk containment monitoring program is working as it was intended, flagging concern areas, providing a framework for evaluation, and making a process to make management recommendations under the adaptive management framework. At this time, we do not believe the changes we have observed in NTTOC monitoring variables are associated with our hatchery salmon supplementation activities. We have now extended our NTTOC evaluation to include direct releases of locally produced Coho salmon from the recently completed MRS Coho central facility as described in the Coho Master Plan.

The End.

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Thank you.