



Skagit River System Cooperative

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Subject: Juvenile Chinook salmon response to Fisher Slough restoration: effectiveness monitoring results

Please see our most recent technical report describing the juvenile Chinook salmon monitoring results at Fisher Slough ([report found here](#)).

The Fisher Slough Restoration Project, located in the south fork Skagit River tidal delta near the town of Conway, is intended to help recover the six populations of wild Chinook salmon present within the Skagit River and its natal estuary. We found the recently completed restoration of 45.9 acres of tidal habitat extent and connectivity within Fisher Slough provided significant benefits to fingerling Chinook salmon rearing in the Skagit River estuary. The monitoring results from the Fisher Slough Restoration Project are important beyond just knowing what happened at Fisher Slough for a number of reasons:

1. **Fisher Slough restoration is an important restoration piece in the overall Skagit Chinook recovery pie.** We found the increase in juvenile Chinook smolt carrying capacity resulting from the Fisher Slough restoration project to be nearly 22,000 smolts annually. This is approximately 5,000 Chinook smolts per year more than the prediction for Fisher Slough as a conceptual restoration project in the [Skagit Chinook Recovery Plan](#). The sum benefits of all implemented Chinook recovery actions need to meet the recovery goals. Right now, this project appears to be contributing more than expected toward that goal.
2. **The restoration design at Fisher Slough includes elements that are common to other river delta restoration projects in Puget Sound. Findings and lessons from Fisher Slough may help others to navigate the not-always-obvious pathway of designing, funding, and obtaining permission for restoration.** The Fisher Slough project proponents wanted to achieve multiple benefits often common to estuary restoration sites. Fish benefits were needed from the restoration, and the adjacent land owners needed flood protection and assurance of adequate drainage. Thus, the Fisher Slough project included two fundamental design elements: dike setback and a self-regulating floodgate. Dike setback creates new habitat area for fish rearing but also removes land from its “pre-restored” use, which in the case of Fisher Slough was agriculture. The floodgate protects adjacent land from flooding and aides in drainage but the floodgate (if not designed and operated properly) can also reduce the number of fish that access habitat located upstream of the floodgate site. Fisher Slough restoration likely would not have happened if both of these design elements were not part of the project. Without monitoring we would not know whether multiple benefits were being achieved.

From the standpoint of advancing the science of monitoring, I am excited we were able to statistically detect the influence of dike setback and floodgate operation on juvenile Chinook salmon from such a large and complex restoration project. Restoration from dike setback increased juvenile Chinook salmon abundance upstream of the floodgate approximately 1 order of magnitude (10x) relative to abundance during pre-dike setback years. We also found that weekly variability in floodgate operation influenced the number of juvenile Chinook salmon upstream of the floodgate by up to a factor of three (3x). Longer periods of the floodgate doors being open during the non-ebb stage of the

tidal cycle resulted in more juvenile Chinook salmon upstream of the floodgate. Overall, the results at Fisher Slough are positive for Skagit Chinook recovery (i.e., back to bullet #1). However, the monitoring results also show that structures such as floodgates (and tidegates) do have a strong influence on fish utilization of habitat and thus need to be designed and operated properly for fish if fish benefits are an important project goal.

3. **Fisher Slough monitoring results can serve as an example for possible indicators consistent with the RITT Monitoring Framework (Puget Sound Chinook Salmon Recovery: A Framework for the Development of Monitoring and Adaptive Management Plans [found here](#)).** We monitored indicators related to two ecosystem components defined in the RITT Framework (*Chinook Salmon; Natal Chinook Estuaries*). Our Chinook Salmon indicators relate to two Key Ecological Attributes (KEAs): *abundance* and *productivity*. Our Natal Chinook Estuary indicators relate to KEAs for *habitat connectivity* and *multiple ecosystem processes*, including indicators for estuarine habitats (extent & condition) and water quality.
4. **The restoration work at Fisher Slough is completed and the monitoring work is entering its final year (2015). The success of the monitoring work at Fisher Slough is largely due to a well thought out monitoring and adaptive management plan, a hypothesis based research approach and critical funding and support from NOAA, ESRP and private funders.** Thus far the monitoring effort has provided meaningful results not only for Fisher Slough but the lessons learned can be applied to other restoration projects with similar objectives. Links are listed below for the entire Fisher Slough Restoration Technical Report Series. There are three report types: 1) fish reports, 2) floodgate operation reports, and 3) overall monitoring reports which synthesize monitoring results from each year into the project's original working hypotheses (12 of them with sub-hypotheses for each). While the earlier linked report (above) is the comprehensive analysis of response of juvenile Chinook salmon to Fisher Slough restoration, the individual reports linked below serve as a written track record of the adaptive monitoring process and conclusions that occurred at Fisher Slough while documenting the methodologies used for each monitored parameter.

Fish Reports:

[2009 juvenile Chinook salmon and fish assemblage](#)

[2010 juvenile Chinook salmon and fish assemblage](#)

[2011 juvenile Chinook salmon and fish assemblage](#)

[2012 juvenile Chinook salmon and fish assemblage](#)

[2013 fish assemblage only](#)

[Juvenile Chinook salmon response to Fisher Slough Restoration, 2009-2013](#)

Floodgate Operation Reports: [Water Year 2011](#), [Water Year 2012](#), [Water Year 2013](#), [Water Year 2014](#), [Water Year 2015](#)

Overall Effectiveness Monitoring Reports: [Year 2011](#), [Year 2012](#), [Year 2013](#)

Thanks,

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Fisheries and Environmental Services Management for the Sauk-Suiattle and Swinomish Indian Tribes