



FISH PASSAGE CENTER

847 NE 19th Avenue, #250, Portland, OR 97232

Phone: (503) 833-3900 Fax: (503) 232-1259

www.fpc.org/

e-mail us at fpcstaff@fpc.org

MEMORANDUM

TO: Derek Freyer, COE

FROM: Michele DeHart, FPC

DATE: January 24, 2019

RE: Comments on acoustic tag studies conducted in 2018

At your request, we have reviewed “Yearling Chinook salmon and juvenile steelhead passage and survival through the FCRPS” (Harnish et al. 2018) and “Survival and passage of yearling and subyearling Chinook salmon and juvenile steelhead at Lower Granite Dam, 2018” (Ham et al. 2018). Both these studies use JSATS tagged fish to estimate concrete and in-river survival of fish collected in juvenile bypass systems either at Lower Granite or McNary Dams. Harnish et al (2018) is intended to estimate juvenile survival through the hydrosystem between Lower Granite and Bonneville under the 2018 planned operations of spill to the 115%/120% gas cap at all projects. Ham et al. (2018) uses the performance standards criteria and the virtual/paired-release (VIPRE) study design to estimate survival through the Lower Granite project, including the recently constructed juvenile bypass system. None of the survival estimates generated by these two studies incorporate the whole effect of hydropower on the salmonid lifecycle, since acoustic tags cannot determine the impacts of delayed mortality on estuarine and ocean survival. Below is a summary of our comments on acoustic tag studies as they relate to these studies, as well as some specific comments on these draft reports.

Ham et al. (2018) - Survival and passage of Yearling and subyearling Chinook salmon and juvenile steelhead at Lower Granite Dam, 2018

- Acoustic tag studies are designed to measure mortality that occurs at the dam and through the hydrosystem, and cannot be used to assess mortality due to passage that occurs downstream of the projects, in the estuary, or in the ocean. Passage through turbines or juvenile bypass systems during the freshwater outmigration significantly reduce smolt-to-

adult returns (SARs), while smolts that pass through the spillway have higher SARs. Survival estimates generated by these tagging studies are misleading because they do not incorporate the total mortality due to dam passage and do not include all data regarding salmon life-cycle survival (Haeseker et al. 2012, Petrosky and Schaller 2010, Tuomikoski et al. 2010, FPC Memos [Oct. 6, 2010](#); [Jan. 19, 2011](#); [July 14, 2011](#)).

- The rejection rates of yearling Chinook (2.7%), steelhead (6.9%), and subyearling Chinook (13.6%) due to size and/or condition of collected fish indicate that the samples do not represent the run-at-large. When only the largest or healthiest fish are selected for the study, the generated survival estimates will be artificially inflated when compared to the actual impact on populations (FPC Memos [June 24, 2009](#); [Mar. 24, 2011](#); [Feb. 15, 2012](#); [Mar. 23, 2012](#); [Jan. 4, 2013](#); [Feb. 11, 2013](#); [Mar. 19, 2013](#); [May 22, 2013](#); [July 11, 2013](#); [Aug. 2, 2013](#); [Dec. 3, 2013](#); [Jan. 14, 2014](#); [May 2, 2014](#); [Feb. 3, 2015](#); [Nov. 9, 2016](#)).
- The sample size required by acoustic tag studies mean that the tail ends of the run do not provide sufficient numbers of juveniles to be included in the study. This means that early or late migrating runs, often representing unique populations, are not included in these survival studies. The 2018 studies did not sample 20% of the yearling Chinook run, 30% of the Steelhead run, and 60% of the subyearling Chinook run. Although the report indicates that a larger portion than 40% of the subyearling Chinook run was sampled, that number is not included in the report so it is not possible to determine how representative actual sampling was.
- In tables 4.4 and 4.12, survival estimates from both the VIPRE and ViRDCt models are presented, along with a weighted average of the two results. The descriptions of these survival estimates indicate that the dam-passage fish used to generate the estimates are largely the same between both methods. Therefore, it does not make sense to provide a weighted average of these results and their inclusion is misleading.
- The spring water flow was higher than the 10-year average, and total dissolved gas often exceeded the planned operations of 115%/120% caps. The study results should be used with reservations about applicability to other years, or regarding the planned 2018 operations. This issue has been raised in other anomalous years without a resolution on what variation in flow and spill are considered representative of the passage experience (FPC Memos [Feb. 15, 2012](#); [Jan. 4, 2013](#); [Feb. 11, 2013](#); [May 22, 2013](#); [Dec. 3, 2013](#); [May 2, 2014](#); [Feb. 3, 2015](#); [Sept. 19, 2018](#)).

Harnish et al. (2018) - Yearling Chinook salmon and juvenile steelhead passage and survival through the FCRPS, 2018

- This report includes survival estimates using fish tagged at Lower Granite or McNary Dam. However, only the tagging details, including rejection rates, from McNary Dam are included in this report. Collection and tagging details are essential for understanding the overall applicability of a study, and all information and metadata from Lower Granite need to be included in this report.

- This study generates in-river survival estimates from acoustic tag data and reports survival estimates from NOAA using PIT-tags. Both of these methods are limited to fish that pass through a minimum of one bypass (in the case of acoustic tags) or two bypasses (in the case of the NOAA PIT-tag analysis). These methods are limited in sample size and are likely to overestimate in-river mortality when compared to the portion of the run that passes via spillbays (FPC Memos [Feb. 3, 2015](#); [Feb. 22, 2018](#)). Using PIT-tagged fish from above Lower Granite Dam may provide a more accurate survival estimate to compare to acoustic tag data.
 - Using the FPC method of estimating reach survival (see FPC Memo [Feb. 22, 2018](#)), yearling Chinook survival from Lower Granite to Bonneville of PIT-tagged fish was 0.644 (0.568 – 0.678) compared to the Harnish et al. (2018) estimate of 0.555 (0.530 – 0.580). Steelhead survival over the same reach was 0.682 (0.651 – 0.707) compared to 0.568 (0.546 – 0.590).
 - The difference between the FPC method of calculating survival and those reported in this study indicate that fish collected and tagged in juvenile bypass systems have lower survival than those that pass via spillways.
- As described in this report, the flow was considerably above the 10-year average during the spring season and spill exceeded the planned 115%/120% gas caps for much of the study period. Survival estimates from 2018 cannot be used to draw conclusions about in-river survival under spill to the 115%/120% spill cap.
- As stated above, acoustic tags provide very limited information regarding the effects of the hydrosystem on salmon populations. Passage through the hydrosystem is known to have impacts on survival in the estuary and ocean, and management decisions regarding dam operations should be made with regard to the entire life cycle, not just at and between projects.