



# FISH PASSAGE CENTER

847 NE 19<sup>th</sup> Ave., Suite 250, Portland, OR 97232

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

<http://www.fpc.org/>

e-mail us at [fpcestaff@fpc.org](mailto:fpcestaff@fpc.org)

## MEMORANDUM

TO: FPAC

FROM: Brandon Chockley

DATE: November 1, 2018

RE: Inflated collection estimates at Lower Granite Dam for yearling Chinook, steelhead, and subyearling Chinook, due to resampling of PIT-tagged study fish in 2018.

In 2018, a study was conducted at Lower Granite Dam (LGR) to evaluate the effects of increased spill on the passage and in-river survival of yearling Chinook, steelhead, and subyearling Chinook migrating through the Snake and Columbia river hydrosystem and provide juvenile salmon dam passage survival estimates at LGR. This study involved tagging yearling Chinook, steelhead, and subyearling Chinook that were sampled as part of the Smolt Monitoring Program (SMP) sample at LGR. Study fish were tagged with both PIT-tags and acoustic tags. Study fish were then released both above and below LGR. Unfortunately, some of the tagged study fish that were released above LGR were detected/observed in the LGR sample tank after their release, which means that these fish were resampled by the SMP crew at LGR. The resampling of these study fish resulted in an inflated estimate of collection and, therefore, inflated estimates of the passage index for one to six SMP samples, depending on the species. Due to these inflated estimates of collection and passage index, there is the potential for estimates of timing to be impacted by the resampling of study fish. SMP staff at LGR provided FPC staff with daily counts of study fish that were resampled over the 2018 season, by species. To assess the impact of this resampling, FPC staff re-estimated the daily collections and passage indices by subtracting the re-sampled fish. Below is a brief summary of our findings and a recommendation based on these findings. We also provide a more detailed summary of the results.

- It is important to note that data collected for the SMP are mostly used by the Fish Passage Advisory Committee (FPAC) to inform timing of run-at-large juvenile salmonids as they migrate through the FCRPS. Estimates of collection and the passage index are not intended to serve as population estimates.
- The resampling of study fish had very little impact on the estimates of total collection and total passage index.
  - For yearling Chinook, corrections resulted in a 0.013% reduction from the “original” estimate of total collection and a 0.011% reduction from the “original” estimate of total passage index.
  - For steelhead, corrections resulted in a 0.017% reduction from the “original” estimate of total collection and a 0.015% reduction from the “original” estimate of the total passage index.
  - For subyearling Chinook, corrections resulted in a 0.016% reduction from the “original” estimate of total collection and a 0.015% reduction from the “original” estimate of total passage index.
- Estimates of passage timing, based on estimates of collection or the passage index, were not impacted by the resampling of study fish.
- ***Given the minimal impact that the resampling of study fish had on total estimates of collection and passage index, and no impact on timing estimates, we recommend that the 2018 SMP database for LGR be left intact as is, with no corrections applied.***

## Methods:

In all, two yearling Chinook (both on May 17<sup>th</sup>), three steelhead (one each on May 9<sup>th</sup>, May 20<sup>th</sup>, and June 1<sup>st</sup>), and six subyearling Chinook (one each on June 10<sup>th</sup>, June 28<sup>th</sup>, and June 29<sup>th</sup> and three on June 30<sup>th</sup>) from this study were re-sampled in the SMP sample at LGR. To determine the impact of this resampling, we estimated the daily and overall collection counts for each species, using two methods. The first was to use the collection counts as they were originally reported by SMP personnel, which includes the resampled fish. Here-in, we refer to these estimates as the “original” estimates.

The second method was to estimate a new “corrected” daily collection count by reducing the daily sample count by the number of study fish that were re-sampled. These “corrected” sample counts were then used to estimate a “corrected” collection count, based on the sample rate that was used for that day’s sample. Finally, a “corrected” passage index was calculated from the “corrected” collection estimate.

Finally, we used the “original” and “corrected” estimates of collection and passage indices to estimate timing of yearling Chinook, steelhead, and subyearling Chinook at LGR. Although the FPAC typically uses the passage index to estimate timing, we estimated timing from both the daily collections and daily passage indices, to illustrate the potential bias of resampling.

**Results:**

***Estimates of Total Collection and Passage Indices***

*Yearling Chinook*

The resampling of study fish resulted in an overestimate of 400 total yearling Chinook in the collection. The estimates of total collection for yearling Chinook in 2018 were 3,041,152 for the “original” method and 3,040,752 for the “corrected” method (Table 1). This equated to an estimated 0.013% reduction from the “original” estimate of total collection (Table 1). The overestimate of 400 yearling Chinook in the collection resulted in an overestimate of the passage index by approximately 520 yearling Chinook juveniles. The estimates of total passage index for yearling Chinook in 2018 were 4,639,023 for the “original” method and 4,638,503 for the “corrected” method, which equated to an estimated 0.011% reduction from the “original” estimate of total passage index (Table 1).

*Steelhead*

The resampling of study fish resulted in an overestimate of 423 total steelhead in the collection. The estimates of total collection for steelhead in 2018 were 2,522,963 for the “original” method and 2,522,540 for the “corrected” method (Table 1). This equated to an estimated 0.017% reduction from the “original” estimate of total collection (Table 1). The overestimate of 423 steelhead in the collection resulted in an overestimate of the passage index by approximately 571 steelhead juveniles. The estimates of total passage index for steelhead in 2018 were 3,924,786 for the “original” method and 3,924,215 for the “corrected” method, which equated to an estimated 0.015% reduction from the “original” estimate of total passage index (Table 1).

*Subyearling Chinook*

The resampling of study fish resulted in an overestimate of 85 total subyearling Chinook in the collection. The estimates of total collection for subyearling Chinook in 2018 were 537,743 for the “original” method and 537,658 for the “corrected” method (Table 1). This equated to an estimated 0.016% reduction from the “original” estimate of total collection (Table 1). The overestimate of 85 subyearling Chinook in the collection resulted in an overestimate of the passage index by approximately 133 subyearling Chinook juveniles. The estimates of total passage index for subyearling Chinook in 2018 were 882,223 for the “original” method and 882,090 for the “corrected” method, which equated to an estimated 0.015% reduction from the “original” estimate of total passage index (Table 1).

**Table 1.** “Original” and “Corrected” estimates of total collection and passage index for yearling Chinook (CH1), steelhead (ST), subyearling Chinook (CH0) at Lower Granite Dam in 2018.

<b>Species</b>	<b>“Original” Collection</b>	<b>“Corrected” Collection</b>	<b>Percent Reduction</b>	<b>“Original” Passage Index</b>	<b>“Corrected” Passage Index</b>	<b>Percent Reduction</b>
CH1	3,041,152	3,040,752	0.013%	4,639,023	4,638,503	0.011%
ST	2,522,963	2,522,540	0.017%	3,924,786	3,924,215	0.015%
CH0	537,743	537,658	0.016%	882,223	882,090	0.015%

### *Estimates of Timing*

For other analyses and reports, the FPC staff typically focuses on the estimated 10%, 50%, and 90% passage dates, based on the passage index, when describing juvenile timing from SMP data. However, for illustrative purposes for this analysis, we estimated timing based on both daily collections and the daily passage index. The resampling of study fish in 2018 had no impact on estimates of timing. This is true for timing based on daily collection estimates or daily passage indices (Table 2).

**Table 2.** Estimated 10%, 50%, and 90% passage dates for yearling Chinook (CH1), steelhead (ST), and subyearling Chinook (CH0) based on “original” and “corrected” daily collections or passage index.

Species	Collection or Passage Index	“Original”			“Corrected”		
		10%	50%	90%	10%	50%	90%
CH1	Collection	13-Apr	4-May	13-May	13-Apr	4-May	13-May
	Passage Index	12-Apr	3-May	12-May	12-Apr	3-May	12-May
ST	Collection	12-Apr	3-May	20-May	12-Apr	3-May	20-May
	Passage Index	11-Apr	1-May	20-May	11-Apr	1-May	20-May
CH0	Collection	21-May	29-May	4-Jul	21-May	29-May	4-Jul
	Passage Index	22-May	1-June	8-Jul	22-May	1-June	8-Jul

### **Conclusions:**

Overall, there was minimal impact from the resampling of study fish on the daily and overall estimates of collection and passage index for yearling Chinook, steelhead, and subyearling Chinook in 2018. In addition, the resampling of PIT-tagged study fish had no impact on estimates of timing at LGR. Given these results, we recommend that the 2018 SMP database for LGR be left intact as-is, with no corrections applied.