



FISH PASSAGE CENTER

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MEMORANDUM

TO: Charlie Morrill (WDFW)
Jay Hesse (Nez Perce Tribe)

Michele DeHart

FROM: Michele DeHart

DATE: January 4, 2019

SUBJECT: Response to questions from the January 2, 2019 Fish Passage Center Memo entitled: "Cumulative proportion passage of subyearling Chinook at Lower Granite Dam in late June through July".

In response to your request, the Fish Passage Center (FPC) staff has reviewed the questions posed by Jay Hesse (Nez Perce Tribe) regarding our June 2, 2019 memo entitled: "Cumulative proportion passage of subyearling Chinook at Lower Granite Dam (LGR) in late June through July" (attached for reference). Below is a brief summary of the questions and our responses, followed by more detailed explanations of the responses.

- **Does this include the entire emigration period, period of JBS operation, transportation operation period, other?**
 - The data summarized in the January 2, 2019 FPC memo included the entire period of sampling for the SMP at LGR for each of the years analyzed.
- **How would these results differ if only natural origin production was described?**
 - Due to the fact that a large proportion of hatchery subyearling fall Chinook that are released above LGR are released unmarked, we are unable to use SMP data to accurately estimate cumulative proportion passage of only wild/natural subyearling fall Chinook at LGR.
 - Using PIT-tag data, the average proportion of PIT-tagged wild/natural subyearling fall Chinook from the Clearwater and mainstem Snake rivers that were detected at LGR by June 30th was 0.485.

- The average proportion of PIT-tagged wild/natural subyearling fall Chinook from the Clearwater and mainstem Snake rivers that were detected at LGR increased to 0.580, 0.688, 0.749, and 0.841 by July 7th, July 15th, July 21st, and July 31st, respectively.
- When compared to the run-at-large data from the SMP, it appears that timing of PIT-tagged wild/natural subyearling fall Chinook from the Clearwater and mainstem Snake rivers is later.
- **How would these results differ if only Clearwater natural origin production was described?**
 - Using PIT-tag data, the average proportion of PIT-tagged Clearwater River wild/natural subyearling fall Chinook that were detected at LGR by June 30th was 0.045.
 - The average proportion of PIT-tagged Clearwater River wild/natural subyearling fall Chinook that were detected at LGR increased to 0.100, 0.175, 0.212, and 0.295 by July 7th, July 15th, July 21st, and July 31st, respectively.
 - The average proportion of PIT-tagged wild/natural subyearling fall Chinook from the mainstem Snake River that were detected at LGR was 0.646, 0.752, 0.858, 0.919, and 0.965 by June 30th, July 7th, July 15th, July 21st, and July 31st, respectively.

Does this include the entire emigration period, period of JBS operation, transportation operation period, other?

The summaries provided in the January 2, 2019 FPC memo (attached for reference) were based on data from SMP sampling at LGR over the last ten years (2009-2018). These data included the entire period of sampling for the SMP at LGR: from the time that sampling started (typically late March) to the end of sampling (typically at the end of October), for each year.

How would these results differ if only natural origin production was described?

Prior to migration year 2000, hatchery production of subyearling fall Chinook above LGR was relatively low (Figure 1). Beginning with migration year 2000, production numbers increased to annual releases totaling ≥ 1.5 million subyearling fall Chinook juveniles. In more recent years (2008-2018), total subyearling fall Chinook production numbers have been in the 4.1-5.3 million range (Figure 1). It is standard protocol for SMP crews at LGR to record all subyearling Chinook in the sample as being clipped or unclipped, and to record whether an unclipped subyearling Chinook was tagged with a coded-wire-tag (CWT) or not. While the presence of an adipose clip or CWT signifies hatchery origin, the lack of these two things does not necessarily signify wild/natural origin, as a significant proportion (~0.30-0.45) of the annual releases of hatchery subyearling fall Chinook that have been released above LGR were released unmarked (i.e., unclipped and not tagged with a CWT) (Figure 1).

Releases of hatchery subyearling fall Chinook above LGR typically occur in late May through mid-June. Although, there were large releases of experimental hatchery groups (i.e., surrogates) to the Snake and Clearwater rivers that extended into mid-June and mid-July, respectively. These subyearling fall Chinook surrogate releases were terminated after migration

year 2012. There is no doubt that the timing data provided in our January 2, 2019 memo were highly influenced by the timing of the large production releases over the last ten years. Unfortunately, with such a large proportion of hatchery releases being unmarked, the FPC cannot accurately estimate cumulative proportion passage of only wild/natural subyearling Chinook at LGR using data from the SMP.

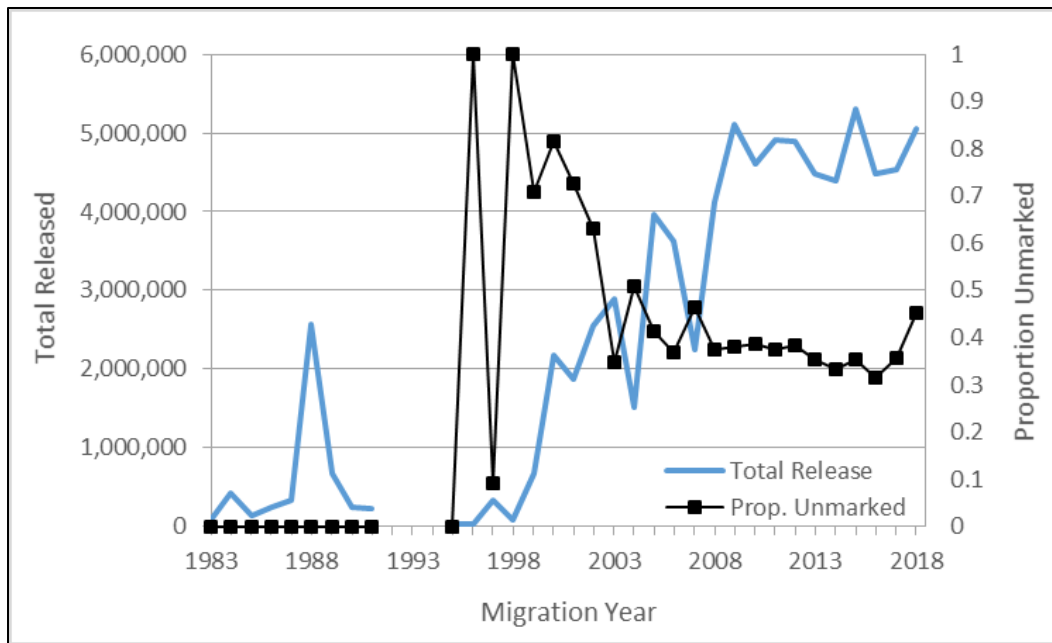


Figure 1. Total releases of hatchery origin subyearling fall Chinook released above Lower Granite Dam and proportions of those release totals that were released unmarked (i.e., unclipped and no CWT), 1983-2018.

One way to assess cumulative proportion passage of only wild/natural subyearling fall Chinook at LGR is to use PIT-tag detections. To our knowledge, PIT-tagging of wild/natural subyearling fall Chinook above LGR is fairly limited, with the Nez Perce Tribe marking fish in the Clearwater River (Coordinator ID: BDA and SRRT: 13W) and the U.S. Fish and Wildlife Service marking fish in the mainstem Snake River (Coordinator ID: WPC and SRRT: 15W). Over the last ten years (2009-2018), these efforts to PIT-tag wild/natural subyearling fall Chinook above LGR have occurred primarily in June-August on the Clearwater River and April-July in the mainstem Snake River. A very small proportion (≤ 0.01) of the marking in the mainstem Snake River has occurred in March and August through November.

Based on PIT-tags released in both the Clearwater and mainstem Snake rivers, FPC staff estimated the cumulative proportion of PIT-tagged wild/natural subyearling fall Chinook that were detected at LGR by June 30th, July 7th, July 15th, July 21st, and July 31st over the last ten years (2009-2018). Based on these ten years, we also estimated the average cumulative proportion of wild/natural subyearling Chinook that were detected at LGR by each of these notable dates. To account for changes in detection probability during spill operations, daily PIT-

tag counts were expanded by the daily proportion of the total discharge that passed through the powerhouse.

Over the last ten years, the proportion of PIT-tagged wild/natural subyearling fall Chinook that were detected at LGR by June 30th has ranged from 0.257 in 2013 to 0.674 in 2018 (Table 1). On average, approximately 0.485 (95% CI: 0.402-0.568) of PIT-tagged wild/natural subyearling fall Chinook were detected at LGR by June 30th (Table 1, Figure 2). The ranges of cumulative proportions detected for the other notable dates (July 7th, July 15th, July 21st, and July 31st) are provided in Table 1. In addition, Table 1 and Figure 2 provide estimates of the average cumulative proportion detected for each of the other notable dates.

When compared to the data for the run-at-large that were presented in the January 2, 2019 FPC memo, it appears that timing of wild/natural subyearling fall Chinook from the Clearwater and mainstem Snake rivers is later, as a much smaller proportion of the PIT-tag detections had occurred by the June 30th, July 7th, July 15th, July 21st, and July 31st dates (Figure 2). For example, the average cumulative proportion of PIT-tagged wild/natural subyearling fall Chinook that were detected at LGR by June 30th was 0.485 (95% CI: 0.402-0.568) (Table 1, Figure 2), whereas the average cumulative proportion that had passed LGR by June 30th from the SMP data was 0.842 (95% CI: 0.797-0.851) (Figure 2). In addition, timing of PIT-tagged wild/natural subyearling fall Chinook was more variable between years (Figure 2).

Table 1. Cumulative proportion of PIT-tagged wild/natural subyearling Chinook from the Clearwater and mainstem Snake rivers that were detected at Lower Granite Dam by June 30th, July 7th, July 15th, July 21st, and July 31st for each of the last ten years (2009-2018).

Migration Year	Total Detections	June 30	July 7	July 15	July 21	July 31
2009	785	0.608	0.773	0.894	0.916	0.942
2010	1,073	0.482	0.538	0.635	0.713	0.774
2011	707	0.563	0.622	0.745	0.857	0.932
2012	705	0.434	0.507	0.575	0.641	0.688
2013	397	0.257	0.396	0.483	0.514	0.546
2014	333	0.365	0.455	0.556	0.686	0.761
2015	505	0.470	0.539	0.733	0.775	0.832
2016	788	0.634	0.723	0.820	0.824	0.832
2017	288	0.368	0.559	0.677	0.779	0.984
2018	307	0.674	0.691	0.758	0.781	0.851
Average (95% CI)		0.485 (0.402-0.568)	0.580 (0.506-0.655)	0.688 (0.609-0.766)	0.749 (0.677-0.820)	0.814 (0.733-0.895)

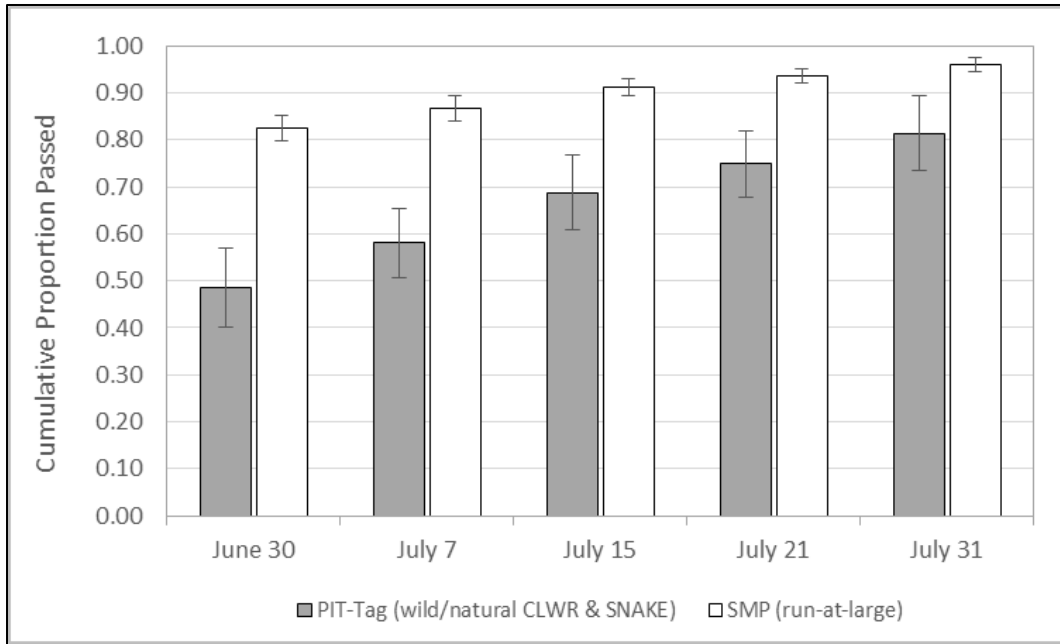


Figure 2. Average cumulative proportion passage (and 95% confidence interval) of subyearling fall Chinook passing LGR by June 30th, July 7th, July 15th, July 21st, and July 31st over the last ten years (2009-2018). Grey bars represent timing of PIT-tagged wild/natural subyearling fall Chinook from the Clearwater and mainstem Snake rivers and white bars represent timing based on run-at-large data from the SMP (data from Table 1 of January 2, 2019 FPC memo).

How would these results differ if only Clearwater natural origin production was described?

As with the previous question, this question cannot be answered with data from the SMP, as: 1) there is no way to accurately quantify timing of wild/natural subyearling Chinook given the large proportion of unmarked hatchery fish that are released above LGR and 2) there is no way to determine river of origin for the SMP sample at LGR. However, this may be answered with PIT-tag data. Based on only the PIT-tags that were released in the Clearwater River, FPC staff estimated the cumulative proportion that were detected at LGR by June 30th, July 7th, July 15th, July 21st, and July 31st over the last ten years (2009-2018). We also estimated the average cumulative proportion of Clearwater River wild/natural subyearling fall Chinook that were detected at LGR by each of these notable dates. To account for changes in detection probability during spill operations, daily PIT-tag counts were expanded by the daily proportion of the total discharge that passed through the powerhouse.

Over the last ten years, the proportion of PIT-tagged Clearwater River wild/natural subyearling fall Chinook that were detected at LGR by June 30th has ranged from 0.000 in 2009-2012 and 2014 to 0.183 in 2016 (Table 2). On average, approximately 0.045 (95% CI: 0.005-0.085) of PIT-tagged Clearwater River wild/natural subyearling fall Chinook were detected at LGR by June 30th (Table 2, Figure 3). The ranges of cumulative proportions detected for the other notable dates (July 7th, July 15th, July 21st, and July 31st) are provided in Table 2, as are the estimates of the average cumulative proportion detected for each of the other notable dates. It should be noted that total number of detections for PIT-tagged Clearwater River wild/natural subyearling fall Chinook at LGR was relatively low (e.g., ≤ 100) in four of the 10 years we

analyzed (Table 2). It should also be noted that there was high variability in the estimates of cumulative proportion passing LGR, particularly for the later dates (e.g., July 15th, July 21st and July 31st) (Table 2, Figure 3).

Table 2. Cumulative proportion of PIT-tagged Clearwater River wild/natural subyearling Chinook that were detected at Lower Granite Dam by June 30th, July 7th, July 15th, July 21st, and July 31st for each of the last ten years (2009-2018).

Migration Year	Total Detections	June 30	July 7	July 15	July 21	July 31
2009	57	0.000	0.092	0.116	0.169	0.199
2010	314	0.000	0.020	0.054	0.114	0.152
2011	44	0.000	0.000	0.000	0.000	0.030
2012	239	0.000	0.000	0.000	0.000	0.052
2013	221	0.013	0.021	0.047	0.057	0.094
2014	74	0.000	0.000	0.015	0.015	0.037
2015	192	0.047	0.071	0.308	0.390	0.526
2016	289	0.183	0.300	0.516	0.526	0.548
2017	159	0.093	0.342	0.495	0.649	0.978
2018	66	0.115	0.155	0.195	0.195	0.336
Average (95% CI)		0.045 (0.005-0.085)	0.100 (0.021-0.179)	0.175 (0.051-0.298)	0.212 (0.067-0.356)	0.295 (0.104-0.486)

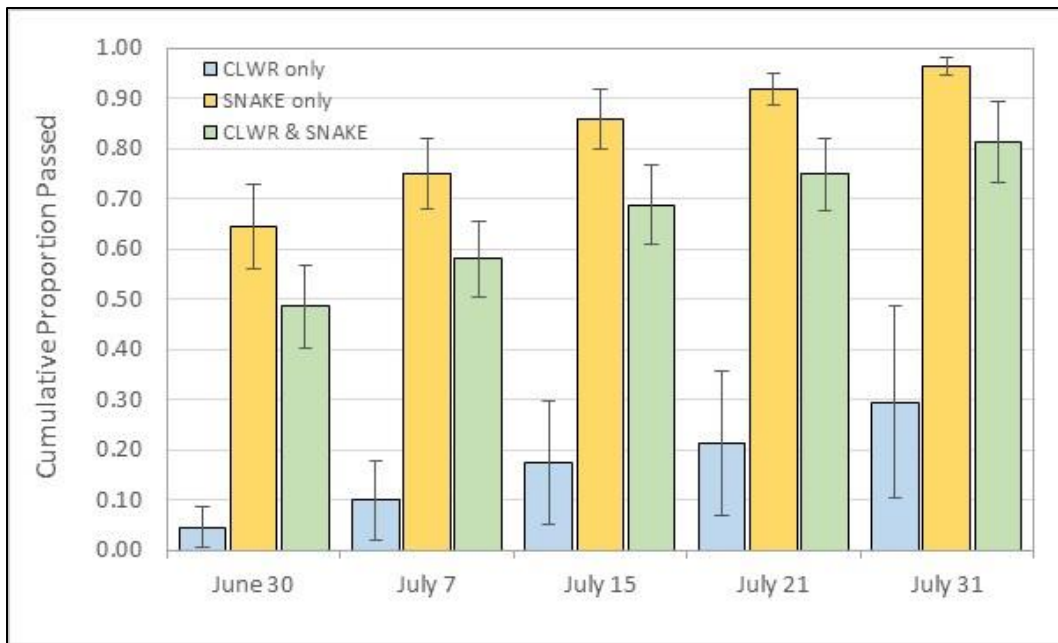


Figure 3. Average proportion (and 95% confidence interval) of PIT-tagged wild/natural subyearling fall Chinook from the Clearwater River (blue bars), mainstem Snake River (yellow bars), and Clearwater and Snake combined (green bars) that were detected at Lower Granite Dam by June 30th, July 7th, July 15th, July 21st, and July 31st over the last ten years (2009-2018).

In anticipation of the same question being asked for mainstem Snake River subyearling fall Chinook, we conducted the same analysis based on only the PIT-tags that were released in the mainstem Snake River. Over the last ten years, the proportion of PIT-tagged wild/natural subyearling Chinook from the mainstem Snake River that were detected at LGR by June 30th has ranged from 0.455 in 2014 to 0.900 in 2016 (Table 3). On average, approximately 0.646 (95% CI: 0.561-0.730) of PIT-tagged wild/natural subyearling Chinook from the mainstem Snake River were detected at LGR by June 30th (Table 3, Figure 3). The ranges of cumulative proportions detected for the other notable dates (July 7th, July 15th, July 21st, and July 31st) are provided in Table 3, as are the estimates of the average cumulative proportion detected for each of these other notable dates. It should be noted that total number of detections for mainstem Snake River fish were generally much larger than that for Clearwater River fish (Table 3).

Table 3. Cumulative proportion of PIT-tagged wild/natural subyearling Chinook from the mainstem Snake River that were detected at Lower Granite Dam by June 30th, July 7th, July 15th, July 21st, and July 31st for each of the last ten years (2009-2018).

Migration Year	Total Detections	June 30	July 7	July 15	July 21	July 31
2009	728	0.644	0.814	0.941	0.961	0.986
2010	759	0.620	0.687	0.801	0.885	0.952
2011	663	0.591	0.653	0.783	0.900	0.977
2012	466	0.587	0.686	0.778	0.867	0.912
2013	176	0.465	0.715	0.853	0.902	0.930
2014	259	0.455	0.568	0.690	0.853	0.941
2015	313	0.697	0.790	0.962	0.982	0.997
2016	499	0.900	0.973	1.000	1.000	1.000
2017	129	0.702	0.823	0.897	0.938	0.991
2018	249	0.794	0.807	0.879	0.907	0.962
Average (95% CI)		0.646 (0.561-0.730)	0.752 (0.681-0.822)	0.858 (0.799-0.918)	0.919 (0.889-0.950)	0.965 (0.946-0.984)



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MEMORANDUM

TO: Charlie Morrill (WDFW)

FROM: Michele DeHart

DATE: January 2, 2019

SUBJECT: Cumulative proportion passage of subyearling Chinook at Lower Granite Dam in late June through July.

At the December 18, 2018 FPAC meeting, you requested additional information regarding subyearling Chinook passage at Lower Granite Dam (LGR), in order to inform a future discussion about possibly initiating truck transportation in mid-July. In response to your request, the Fish Passage Center (FPC) staff has summarized subyearling Chinook passage data from the Smolt Monitoring Program (SMP) at LGR over the last ten years (2009-2018). Specific to your request, we have estimated the cumulative proportion of subyearling Chinook that have passed LGR by the end of June and into July. Below is a brief summary of our findings, followed by more detailed information.

- Over the last ten years, the average proportion of subyearling Chinook that pass LGR by June 30th was approximately 0.824.
- The average proportion of subyearling Chinook that pass LGR increased to 0.867, 0.912, 0.936, and 0.959 by July 7, July 15, July 21, and July 31, respectively.

Methods:

As mentioned above, FPC staff reviewed subyearling Chinook passage data from the SMP at LGR over the last ten years (2009-2018). For each year, we estimated the cumulative proportion of subyearling Chinook that passed LGR by June 30th, July 7th, July 15th, July 21st, and July 31st. Based on these ten years, we also estimated the average cumulative proportion of subyearling Chinook that passed LGR by each of these notable dates.

Results:

Over the last ten years, the proportion of subyearling Chinook that have passed LGR by June 30th has ranged from 0.760 in 2013 to 0.890 in 2009 (Table 1). On average, approximately 0.824 (95% CI: 0.797-0.851) of subyearling Chinook have passed LGR by June 30th (Table 1, Figure 1). The ranges of subyearling Chinook cumulative passage proportions for other notable dates (July 7th, July 15th, July 21st, and July 31st) are provided below (Table 1). In addition, Table 1 and Figure 1 provide estimates of the average proportion passage for each of these other notable dates.

Table 1. Cumulative proportion of subyearling Chinook passing Lower Granite Dam by June 30th, July 7th, July 15th, July 21st, and July 31st for each of the last ten years (2009-2018).

Migration Year	June 30	July 7	July 15	July 21	July 31
2009	0.890	0.936	0.966	0.975	0.984
2010	0.831	0.875	0.913	0.936	0.961
2011	0.838	0.867	0.909	0.937	0.965
2012	0.844	0.880	0.914	0.948	0.967
2013	0.760	0.806	0.859	0.885	0.912
2014	0.806	0.855	0.890	0.917	0.942
2015	0.763	0.800	0.891	0.916	0.943
2016	0.846	0.904	0.947	0.951	0.959
2017	0.791	0.851	0.910	0.957	0.998
2018	0.870	0.893	0.926	0.939	0.962
Average (95% CI)	0.824 (0.797-0.851)	0.867 (0.841-0.893)	0.912 (0.894-0.931)	0.936 (0.920-0.952)	0.959 (0.945-0.974)

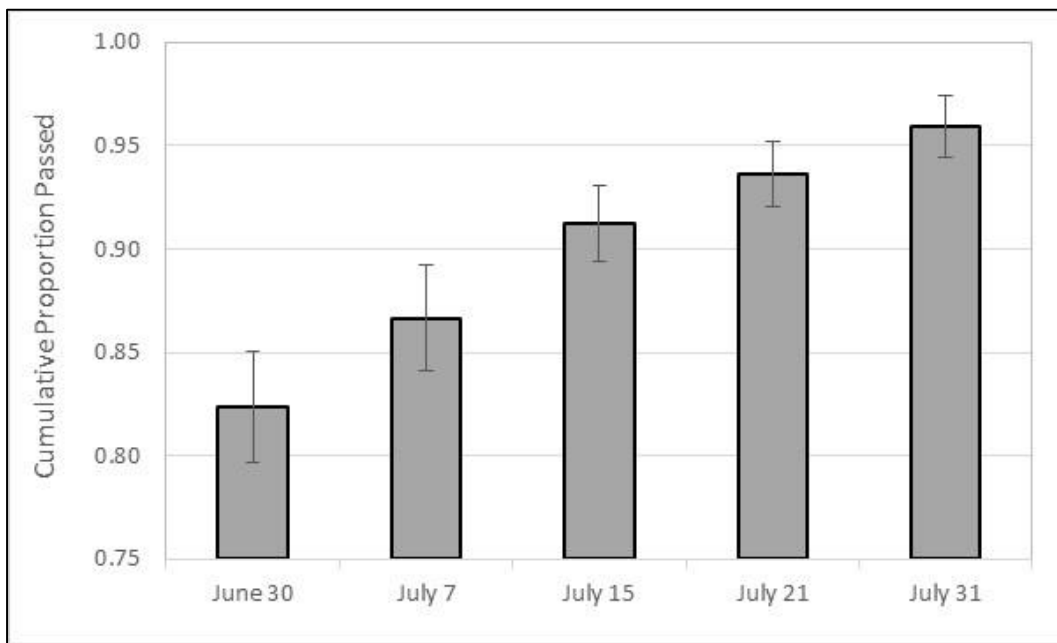


Figure 1. Average proportion (and 95% confidence interval) of subyearling Chinook passing Lower Granite Dam by June 30, July 7th, July 15th, July 21st, and July 31st over the last ten years (2009-2018).