



FISH PASSAGE CENTER

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MEMORANDUM

TO: Travis Collier, USFWS

FROM: Brandon R. Chockley

DATE: January 4, 2017

RE: 2016 Leavenworth National Fish Hatchery Report

The Fish Passage Center has been marking Chinook from the Leavenworth National Fish Hatchery facility since 1997 as part of the Smolt Monitoring Program (SMP). For purposes of this program, passage data are collected on both the juvenile and adult life stages. The SMP provides information for in-season management of the hydrosystem and post-season analyses to the federal, state, and tribal fishery agencies. We would like to provide an update of some of the information we developed under this study for the Chinook used from the Leavenworth National Fish Hatchery facility in 2016 and past years.

Under the Smolt Monitoring Program, information is collected on the timing, migration speed, and survival of juveniles from the hatchery to McNary Dam. Table 1, below, provides estimates of minimum, median, and maximum travel times from each year's release to McNary Dam. Also provided are estimates of the 95% confidence limits around the estimated median travel time.

In addition, we are providing estimates of the 10%, 50%, and 90% passage dates of Leavenworth NFH spring Chinook juveniles at McNary Dam for each of the years of tagging (Table 2). Also, Figure 1 is provided as an illustration of how the arrival timing of the 2016 smolt release compared to the previous year and the current 10-year average arrival timing (2006–2015).

Table 1. Leavenworth Hatchery Spring Chinook Travel Times to McNary Dam

Release Date	Migration Year	Travel Time (Days)			95% Confidence Limits	
		Min	Med	Max	Lower	Upper
17-Apr	1997	8.6	28.7	52.2	22.7	41.8
20-Apr	1998	10.3	21.7	55.1	21.2	22.2
19-Apr	1999	6.8	27.8	55.7	27.3	28.1
18-Apr	2000	11.9	36.1	79.2	34.6	36.9
17-Apr	2001	11.3	37.0	72.0	36.9	37.2
22-Apr, 24-Apr	2002	3.6	35.9	64.4	25.9	26.0
21-Apr	2003	5.8	27.6	110.1	27.4	27.7
19-Apr	2004	0.1	25.2	107.2	25.1	25.1
15-Apr	2005	11.9	29.8	116.7	29.4	30.1
17-Apr	2006	22.8	28.5	48.2	28.3	28.8
18-Apr	2007	7.7	30.8	65.1	30.4	31.2
28-Apr	2008	3.9	19.9	55.9	19.8	20.1
28-Apr	2009	8.8	25.4	69.8	24.9	25.7
23-Apr, 26-Apr	2010	8.1	22.2	50.9	21.9	23.0
19-Apr, 20-Apr	2011	9.4	28.2	61.5	27.4	28.6
17-Apr, 18-Apr	2012	6.0	28.8	88.0	28.5	29.1
23-Apr, 24-Apr	2013	6.8	24.8	63.6	24.1	25.2
22-Apr, 23-Apr	2014	5.5	22.0	54.6	21.4	22.6
14-Apr, 15-Apr	2015	8.9	23.8	54.1	23.3	24.7
21-Apr ¹	2016	0.01	17.3	44.4	17.0	17.6

¹ Accidental release of 380 PIT-tagged fish in January 2016 not included in travel time estimates.

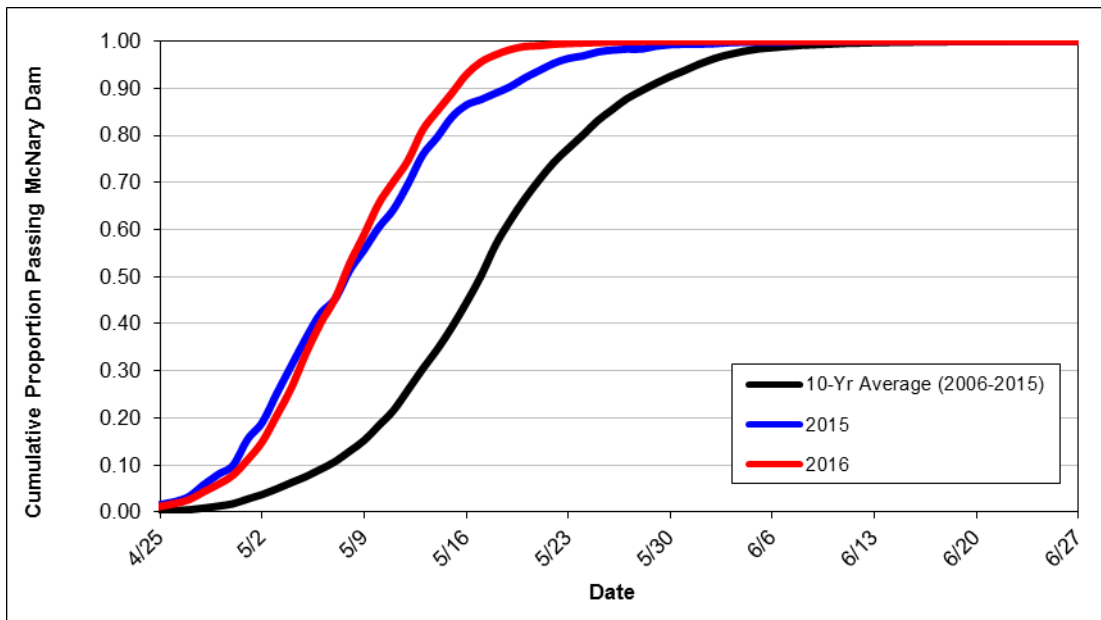


Figure 1. Cumulative passage timing of Leavenworth National Fish Hatchery spring Chinook to McNary Dam.

Table 2. Estimated 10%, 50%, and 90% passage dates of Leavenworth NFH spring Chinook at McNary Dam.

Migration Year	10% Passage Date	50% Passage Date	90% Passage Date
1997	1-May	14-May	22-May
1998	3-May	12-May	23-May
1999	7-May	17-May	25-May
2000	12-May	23-May	3-June
2001	15-May	24-May	31-May
2002	11-May	20-May	28-May
2003	7-May	19-May	31-May
2004	3-May	14-May	27-May
2005	5-May	15-May	3-June
2006	11-May	16-May	21-May
2007	7-May	19-May	31-May
2008	13-May	19-May	27-May
2009	16-May	24-May	1-June
2010	10-May	18-May	2-June
2011	7-May	19-May	29-May
2012	5-May	17-May	25-May
2013	8-May	18-May	1-June
2014	6-May	16-May	22-May
2015	1-May	8-May	19-May
2016 ¹	1-May	8-May	16-May

¹ Accidental release of 380 PIT-tagged fish in January 2016 not included in estimates of timing to MCN.

Table 3 below provides estimates of juvenile survival from release at the hatchery to McNary Dam, along with the upper and lower confidence limits on these estimates. To put in context the out-migration conditions that these spring Chinook juveniles may have experienced, Figure 2 provides the total spring flow volume (April 15–June 30) for the Upper Columbia River (as measured at Priest Rapids Dam), along with the average spring spill proportions at each of Rocky Reach, Rock Island, Wanapum, and Priest Rapids dams, for each migration year.

Table 3. Leavenworth Hatchery Spring Chinook survivals (Release to McNary Dam)

Release Date	Migration Year	Survival	Confidence Limits (95%)	
			Lower	Upper
17-Apr	1997	N/A	N/A	N/A
20-Apr	1998	0.546	0.491	0.602
19-Apr	1999	0.586	0.550	0.622
18-Apr	2000	0.593	0.520	0.667
17-Apr	2001	0.501	0.484	0.517
22-Apr, 24-Apr	2002	0.560	0.553	0.567
21-Apr	2003	0.662	0.655	0.669
19-Apr	2004	0.483	0.473	0.494
15-Apr	2005	0.526	0.500	0.553
17-Apr	2006	0.558	0.531	0.585
18-Apr	2007	0.593	0.571	0.615
28-Apr	2008	0.571	0.528	0.614
28-Apr	2009	0.481	0.442	0.520
23-Apr, 26-Apr	2010	0.662	0.603	0.721
19-Apr, 20-Apr	2011	0.426	0.383	0.469
17-Apr, 18-Apr	2012	0.590	0.551	0.629
23-Apr, 24-Apr	2013	0.674	0.537	0.811
22-Apr, 23-Apr	2014	0.568	0.518	0.617
14-Apr, 15-Apr	2015	0.498	0.426	0.569
21-Apr ¹	2016	0.519	0.479	0.558

¹ Accidental release of 380 PIT-tagged fish in January 2016 not included in survival estimation.

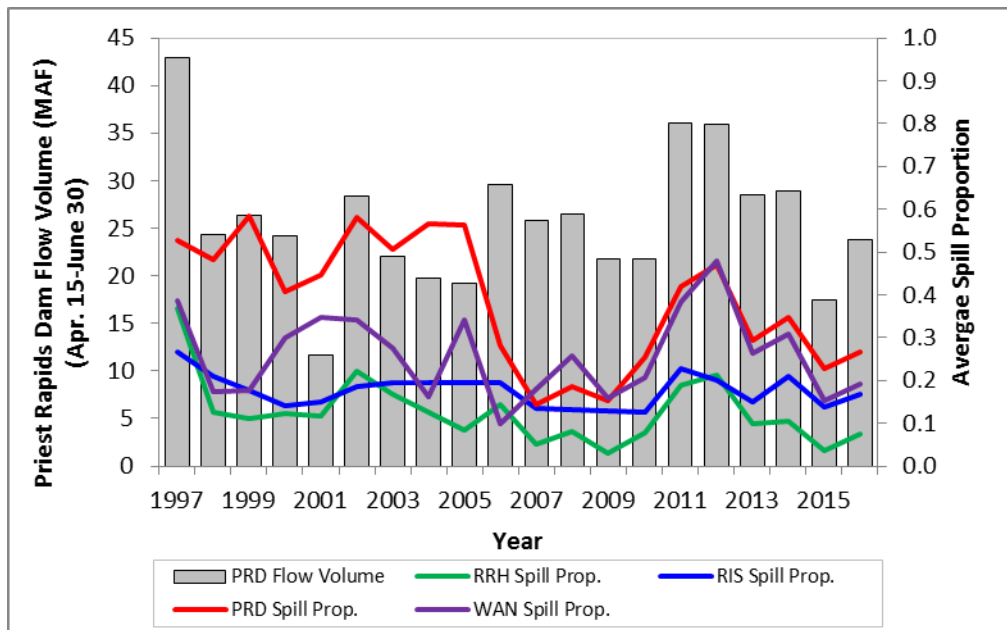


Figure 2. Total spring flow volume in the Upper Columbia River (at Priest Rapids Dam) and average spill proportion at Rocky Reach, Rock Island, Wanapum, and Priest Rapids dams. Spring period is April 15–June 30.

Finally, Table 4 contains estimates of SARs for MCN-to-BOA, both with and without jacks (90% confidence interval in parentheses). These SAR estimates were taken from Appendix B of the 2016 CSS Annual Report, which can be downloaded from the FPC webpage: www.fpc.org/documents/CSS.html. Figure 3 is provided to illustrate the time series of the SAR estimates (with jacks) over the years of available data for Leavenworth NFH spring Chinook. Please note that hatchery reports from previous years have only included “without jack” SAR estimates. Therefore, Figure 3 in this year’s report is different from what has been reported in past years.

Table 4. Overall MCN-to-BOA SARs for Leavenworth NFH Spring Chinook, 2000-2014. SARs are calculated with and without jacks. Numbers in parentheses represent 90% confidence intervals.

Release Date(s)	Migration Year	MCN-to-BOA SARs (Without Jacks)	MCN-to-BOA SARs (With Jacks)
18-Apr	2000	1.84 (1.48-2.22)	1.87 (1.49-2.24)
17-Apr	2001	0.24 (0.11-0.37)	0.24 (0.11-0.37)
22-Apr, 24-Apr	2002	0.36 (0.34-0.38)	0.38 (0.35-0.40)
21-Apr	2003	0.42 (0.40-0.45)	0.45 (0.42-0.48)
19-Apr	2004	0.34 (0.31-0.37)	0.34 (0.31-0.38)
15-Apr	2005	0.09 (0.04-0.15)	0.11 (0.06-0.18)
17-Apr	2006	0.89 (0.72-1.06)	0.97 (0.80-1.16)
18-Apr	2007	0.46 (0.34-0.58)	0.53 (0.40-0.67)
28-Apr	2008	1.89 (1.64-2.17)	2.11 (1.84-2.40)
28-Apr	2009	0.59 (0.44-0.75)	0.65 (0.48-0.81)
23-Apr, 26-Apr	2010	0.82 (0.67-0.98)	1.23 (1.05-1.43)
19-Apr, 20-Apr	2011	0.35 (0.24-0.48)	0.38 (0.26-0.52)
17-Apr, 18-Apr	2012	1.05 (0.87-1.24)	1.19 (0.99-1.39)
23-Apr, 24-Apr	2013	0.69 (0.55-0.85)	0.77 (0.62-0.94)
22-Apr, 23-Apr	2014 ^A	0.59 (0.45-0.73)	0.75 (0.59-0.91)

^A Migration year 2013 is incomplete with Age 2-salt adult returns through 9/16/2016.

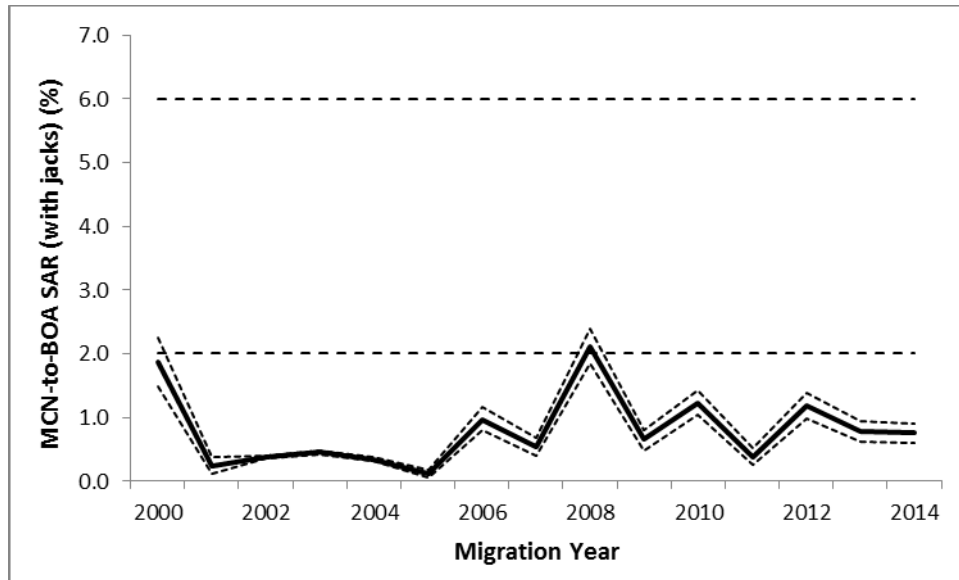


Figure 3. Overall MCN-to-BOA SAR (with jacks) for Leavenworth NFH spring Chinook (2000–2014). Dashed lines represent 90% confidence intervals. Migration year 2014 is incomplete for yearling Chinook, with Age 2-salt adult returns through 9/16/2016.

We hope that the information we have provided regarding the use and application of information from the marked groups over the last several years is of some use to you. If you would like any additional information regarding these releases please feel free to contact us.

- c: Lance Hebdon, IDFG
- Tim Copeland, IDFG
- Bill Tweit, WDFW
- Jay Hesse, Nez Perce
- Tom Rien, ODFW
- Steve Haeseker, USFWS
- Kyle Hanson, USFWS
- Erik Merrill, NPCC
- Tony Grover, NPCC
- Leslie Bach, NPCC
- Tom Kahler, Douglas County PUD
- Greg Mackey, Douglas County PUD
- FPAC