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MEMORANDUM

TO: Ralph Steiner, IDFG

FROM: Brandon R. Chockley

DATE: January 4, 2017

RE: 2016 Rapid River Hatchery Report

The Fish Passage Center has been marking Chinook from the Rapid River Hatchery facility over the last several years as part of the Comparative Survival Study (CSS). The CSS is a multi-year program that estimates survival rates over different life stages for spring and summer Chinook produced in major hatcheries. We would like to share with you an update of some of the information we developed under the CSS for the Chinook used from the Rapid River Hatchery facility in 2016 as well as past years.

With the marking efforts over the past several years, data on the timing and migration speed from release to Lower Granite Dam are also available. In addition, as part of the CSS study, juvenile survival estimates are developed for the hydrosystem between Lower Granite and Bonneville dams, as well as survival to adulthood of different passage histories.

Table 1 provides estimates of minimum, median, and maximum travel times from each year's release of spring Chinook from Rapid River Hatchery to Lower Granite Dam. Also provided are estimates of the 95% confidence limits around the estimated median travel time.

Table 1. Rapid River Hatchery Spring Chinook Travel Times to Lower Granite Dam

Release Date	Migration Year	Travel Time (Days) [†]			95% Confidence Limits	
		Min	Med	Max	Lower	Upper
17-Mar	1997	1.5	34.9	115.8	34.4	35.4
16-Mar	1998	n/a	19.5	60.0	19.5	19.6
18-Mar	1999	1.4	37.1	134.8	36.9	37.2
17-Mar	2000	5.5	30.2	63.1	30.1	30.3
15-Mar	2001	7.6	30.1	79.9	30.1	30.2
18-Mar	2002	4.2	30.7	70.2	30.6	30.9
17-Mar	2003	5.7	32.3	66.0	32.2	32.4
15-Mar	2004	8.3	33.6	68.3	33.5	33.6
15-Mar	2005	8.7	33.6	59.4	33.4	33.8
17-Mar	2006	3.7	26.2	131.7	26.1	26.3
15-Mar	2007	4.5	20.3	66.9	20.2	20.5
3/17,3/19	2008	5.0	25.6	65.0	25.5	25.6
16-Mar	2009	4.0	35.0	72.4	34.6	35.2
15-Mar	2010	4.9	28.1	63.2	27.9	28.3
15-Mar	2011	4.6	34.3	71.2	34.1	34.5
12-Mar	2012	2.3	25.2	64.2	25.0	25.4
12-Mar	2013	6.1	28.5	64.8	28.1	28.9
17-Mar	2014	4.5	23.3	63.1	23.1	23.4
17-Mar	2015	5.0	24.1	54.3	23.8	24.6
14-Mar	2016	3.4	22.4	57.0	22.3	22.6

[†] Prior to MY 2000, travel times are based on the date of release and date of arrival at LGR. For MY 2000 and beyond, travel times are based on date of detection at the Rapid River Hatchery PIT-tag detection site (RPJ) and arrival at LGR.

We are also providing a table that presents the estimated 10%, 50%, and 90% passage dates of Rapid River yearling Chinook juveniles at Lower Granite Dam for each of the years of tagging (Table 2). Figure 1 is provided as an illustration of how the arrival timing of the 2016 smolt release compared to last year's release, as well as the average of the most recent 10 years (2006–2015).

Table 2. Estimated 10%, 50%, and 90% passage dates of Rapid River Hatchery yearling Chinook at Lower Granite.

Migration Year	Release Date(s)	10% Passage Date	50% Passage Date	90% Passage Date
1997	17-Mar	24-Apr	7-May	20-May
1998	16-Mar	24-Apr	3-May	10-May
1999	18-Mar	26-Apr	9-May	22-May
2000	17-Mar	26-May	4-May	12-May
2001	15-Mar	27-Apr	30-Apr	14-May
2002	18-Mar	18-Apr	4-May	13-May
2003	17-Mar	22-Apr	3-May	16-May
2004	15-Mar	18-Apr	30-Apr	5-May
2005	15-Mar	27-Apr	5-May	9-May
2006	17-Mar	27-Apr	6-May	15-May
2007	15-Mar	28-Apr	4-May	12-May
2008	3/17,3/19	4-May	10-May	18-May
2009	16-Mar	25-Apr	13-May	20-May
2010	15-Mar	28-Apr	11-May	19-May
2011	15-Mar	2-May	11-May	16-May
2012	12-Mar	25-Apr	8-May	17-May
2013	12-Mar	2-May	9-May	13-May
2014	17-Mar	27-Apr	6-May	16-May
2015	17-Mar	26-Apr	6-May	11-May
2016	14-Mar	22-Apr	28-Apr	8-May

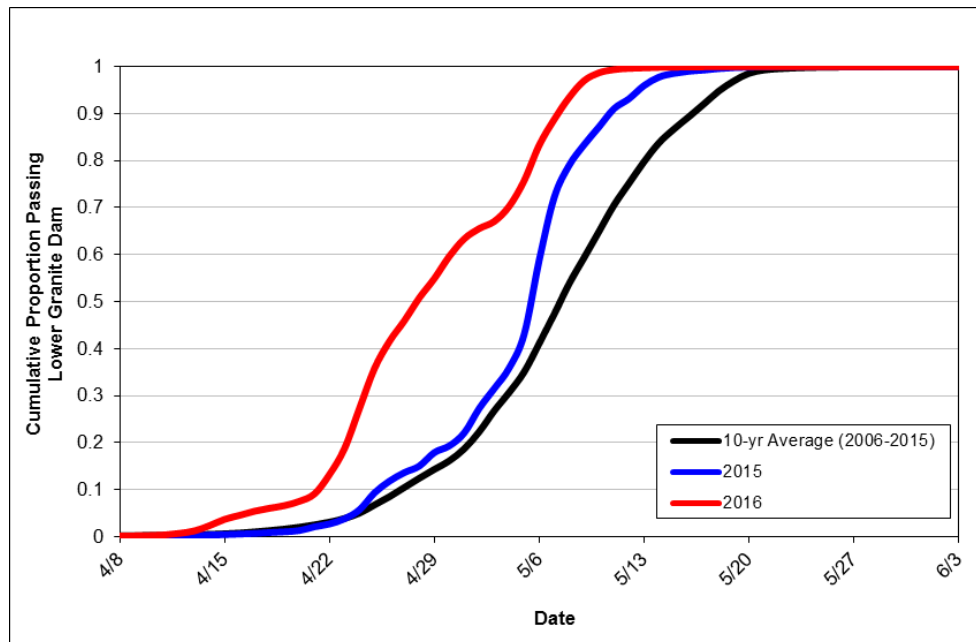


Figure 1. Cumulative passage timing of Rapid River Hatchery yearling Chinook to Lower Granite Dam.

Figures 2 and 3 are provided below to illustrate the out-migration conditions that these spring migrants may have experienced in the Snake and Middle Columbia rivers. Figure 2 provides the total spring flow volume (April 3–June 20) for the Snake River (as measured at Ice Harbor), along with the average spring spill proportions at each of Lower Granite, Little Goose, Lower Monumental, and Ice Harbor dams, for each migration year. Figure 3 provides the total spring flow volume (April 10–June 30) for the Middle Columbia River (as measured at Bonneville), along with the average spring spill proportions at each of McNary, John Day, The Dalles, and Bonneville dams, for each migration year.

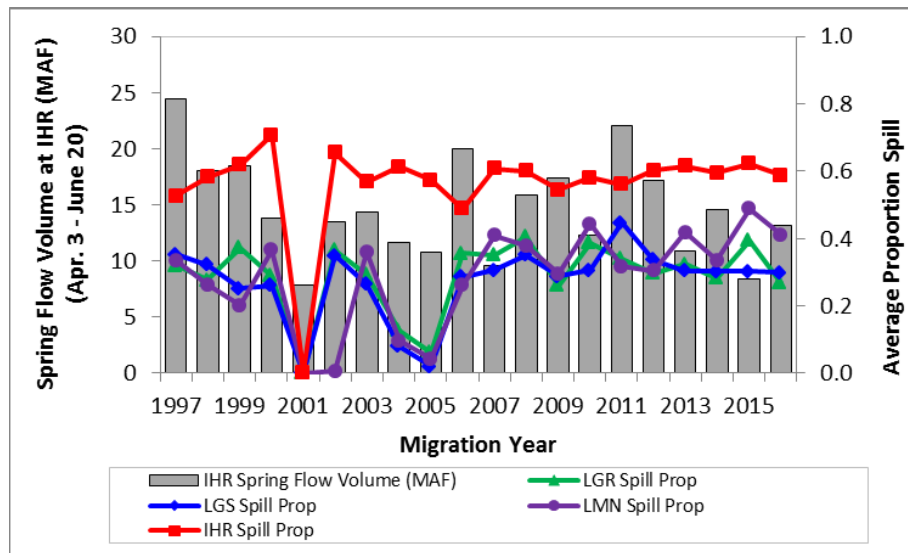


Figure 2. Total spring flow volume in the Snake River (at Ice Harbor Dam) and average spill proportion at Lower Granite, Little Goose, Lower Monumental, and Ice Harbor dams. Spring period in the Snake River is April 3–June 20.

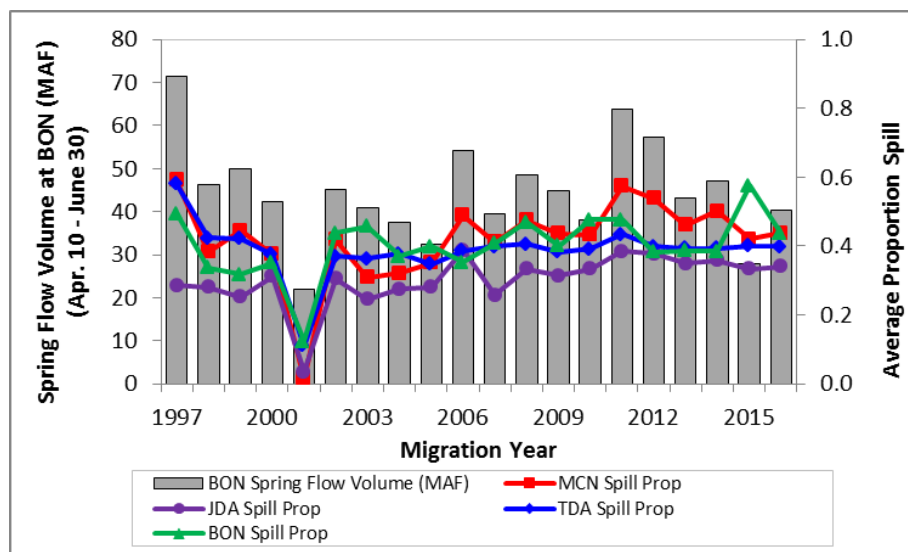


Figure 3. Total spring flow volume in the Middle Columbia River (at Bonneville Dam) and average spill proportion at McNary, John Day, The Dalles, and Bonneville dams. Spring period in the Lower Columbia River is April 10–June 30.

Finally, Tables 3 and 4 contain estimates calculated for Rapid River Hatchery Chinook by the CSS. The estimates provided include: (1) juvenile survival in the hydrosystem between Lower Granite and Bonneville dams (Table 3), (2) the proportion of the juvenile population destined for transportation (Table 3), and (3) the smolt-to-adult returns (SAR) for several passage categories (Table 4). Those passage categories are SAR(T), SAR(C₀), and Overall SARs, where SAR(T) represents smolts transported from Lower Granite, Little Goose, or Lower Monumental Dam, SAR(C₀) represents smolts migrating in-river (undetected at Snake River transportation collector sites), and Overall SAR is the estimated SAR for the overall hatchery release. All of these SAR estimates are for the LGR-to-GRA reach and jacks are excluded. The data presented in Tables 3 and 4 were taken from various chapters and appendices of the 2016 CSS Annual Report and past reports, all of which can be downloaded from the FPC webpage www.fpc.org/documents/CSS.html. Figure 4 is a time series of the Overall SAR (without jacks) over the eighteen years of available data from Rapid River Hatchery.

Table 3. Rapid River Hatchery spring Chinook juvenile survivals and estimated proportions transported (with 90% confidence intervals) from CSS.

Release Date	Migration Year ^A	Juvenile Survival (LGR-BON)	Proportion Transported ^B
17-Mar	1997	0.33 (0.24-0.45)	0.54
16-Mar	1998	0.59 (0.52-0.66)	0.86
18-Mar	1999	0.57 (0.49-0.67)	0.80
17-Mar	2000	0.58 (0.48-0.83)	0.68
15-Mar	2001	0.33 (0.28-0.40)	0.97
18-Mar	2002	0.71 (0.60-0.84)	0.67
17-Mar	2003	0.66 (0.57-0.78)	0.55
15-Mar	2004	0.35 (0.27-0.51)	0.89
15-Mar	2005	0.54 (0.42-0.69)	0.87
17-Mar	2006	0.55 (0.50-0.61)	0.71 (0.68-0.71)
15-Mar	2007	0.63 (0.56-0.72)	0.35 (0.34-0.35)
3/17,3/19	2008	0.55 (0.50-0.61)	0.59 (0.58-0.59)
16-Mar	2009	0.71 (0.62-0.85)	0.44 (0.43-0.44)
15-Mar	2010	0.71 (0.65-0.79)	0.23 (0.22-0.23)
15-Mar	2011	0.61 (0.53-0.70)	0.51 (0.50-0.52)
12-Mar	2012	0.79 (0.73-0.86)	0.42 (0.42-0.43)
12-Mar	2013	0.90 (0.81-1.02)	0.39 (0.38-0.40)
17-Mar	2014	0.72 (0.65-0.80)	0.47 (0.46-0.48)
14-Mar	2015	0.55 (0.47-0.65)	0.19 (0.18-0.20)

^A Estimates for migration years 2006 through 2015 reflect use of new methodology developed for random pre-assignment of “monitor mode” and “return-to-river mode” operations. See 2016 CSS Annual Report for details.

^B Confidence interval for proportion transported not available for migration years 1997-2005.

Table 4. Rapid River Hatchery spring Chinook TIR, SAR by study category (T vs. C₀), and Overall SARs (with 90% confidence intervals). SAR estimates are for LGR-to-GRA reach and are without jacks.

Release Date	Migration Year	TIR	SAR(T) %	SAR(C ₀) %	Overall SAR %
17-Mar	1997	1.73 (1.08-2.85)	0.79 (0.57-1.01)	0.45 (0.31-0.63)	0.65 (0.52-0.79)
16-Mar	1998	1.66 (1.32-2.16)	2.00 (1.80-2.21)	1.20 (0.95-1.48)	1.88 (1.71-2.07)
18-Mar	1999	1.28 (1.11-1.51)	3.04 (2.78-3.31)	2.37 (2.07-2.68)	2.91 (2.69-3.13)
17-Mar	2000	1.32 (1.13-1.55)	2.10 (1.91-2.28)	1.59 (1.40-1.81)	1.94 (1.79-2.08)
15-Mar	2001	21.70 (13.3-54.1)	1.08 (0.96-1.21)	0.05 ^A (0.02-0.08)	1.06 (0.94-1.18)
18-Mar	2002	1.51 (1.20-1.91)	1.01 (0.86-1.16)	0.67 (0.55-0.79)	0.90 (0.79-1.01)
17-Mar	2003	1.07 (0.73-1.58)	0.25 (0.18-0.32)	0.23 (0.17-0.29)	0.24 (0.19-0.29)
15-Mar	2004	1.57 (0.88-3.67)	0.36 (0.29-0.43)	0.23 (0.11-0.39)	0.34 (0.28-0.41)
15-Mar	2005	2.36 (1.59-3.79)	0.27 (0.21-0.34)	0.12 ^B (0.07-0.16)	0.25 (0.20-0.31)
17-Mar	2006 ^C	1.35 (0.98-1.91)	0.57 (0.48-0.66)	0.42 (0.30-0.54)	0.50 (0.43-0.58)
15-Mar	2007 ^C	1.77 (1.25-2.57)	0.45 (0.34-0.57)	0.25 (0.19-0.31)	0.34 (0.28-0.40)
3/17,3/19	2008 ^C	1.52 (1.26-1.85)	1.47 (1.32-1.62)	0.97 (0.82-1.13)	1.30 (1.19-1.41)
16-Mar	2009 ^C	2.08 (1.69-2.57)	1.40 (1.21-1.60)	0.68 (0.57-0.79)	1.03 (0.92-1.14)
15-Mar	2010 ^C	1.33 (0.95-1.78)	0.57 (0.43-0.74)	0.43 (0.37-0.50)	0.48 (0.41-0.55)
15-Mar	2011 ^C	1.47 (1.02-2.25)	0.33 (0.26-0.41)	0.23 (0.15-0.29)	0.28 (0.23-0.33)
12-Mar	2012 ^C	0.94 (0.75-1.17)	0.86 (0.73-1.01)	0.92 (0.79-1.06)	0.83 (0.74-0.92)
12-Mar	2013 ^C	1.12 (0.94-1.33)	1.45 (1.25-1.67)	1.30 (1.19-1.43)	1.30 (1.18-1.42)
17-Mar	2014 ^{C,D}	2.11 (1.56-2.93)	0.56 (0.44-0.66)	0.26 (0.20-0.33)	0.42 (0.35-0.48)

^A Assumed SAR(C₀) same as SAR(C_i) for 2001.

^B In-river SAR is combination of groups C₁ and C₀.

^C Estimates for migration years 2006 through 2014 reflect use of new methodology developed for random pre-assignment of “monitor mode” and “return-to-river mode” operations. See 2016 CSS Annual Report for details.

^D Migration year 2014 is incomplete with Age 2-salt adult returns through 9/16/2016.

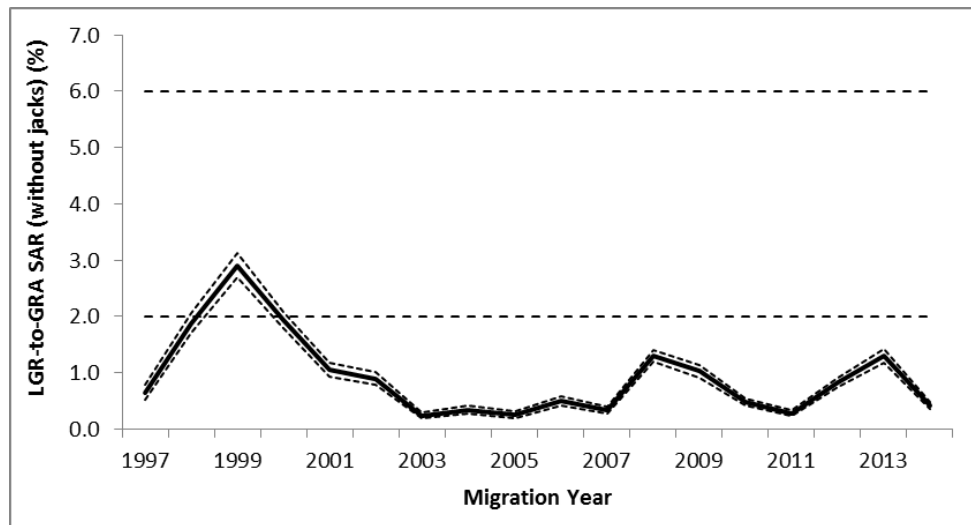


Figure 4. Overall SAR_{LGR-to-GRA} (without jacks) for Rapid River Hatchery spring Chinook releases (1997–2014) (with 90% confidence intervals). The 2014 NPCC 2-6% SAR objective for listed wild populations are shown for reference. Migration year 2014 is incomplete with Age 2-salt adult returns through 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.

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