



FISH PASSAGE CENTER

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MEMORANDUM

TO: Mark Drobish, USFWS

FROM: Brandon R. Chockley

DATE: January 13, 2016

RE: 2015 Dworshak National Fish Hatchery Report

The Fish Passage Center has been marking Chinook and steelhead from the Dworshak National Fish Hatchery facility over the last several years as part of the Smolt Monitoring Program (SMP) and the Comparative Survival Study (CSS). The SMP provides information for in-season management of the hydrosystem and post-season analyses to the federal, state, and tribal fishery agencies. The CSS is a multi-year program that estimates survival rates over different life stages for spring and summer Chinook and steelhead produced in major hatcheries. We would like to share with you an update of some of the information we developed under these studies for the spring Chinook and summer steelhead used from Dworshak National Fish Hatchery facility in 2015 and past years.

Under the Smolt Monitoring Program, information is collected on the timing and migration speed from the hatchery to Lower Granite Dam. 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.

The tables below describe the median travel times for each year's release to Lower Granite Dam, along with the minimum and maximum travel time estimates for both spring Chinook (Table 1) and steelhead (Table 2) from Dworshak NFH. These tables also provide the 95% confidence limits around the estimated median travel time. Beginning in 2008, Dworshak NFH began releasing additional PIT-tagged steelhead into the Clearwater River Basin. For comparison purposes, separate travel times are provided for each of the steelhead release sites since 2008, along with all sites combined (Table 2).

Table 1. Dworshak NFH Spring Chinook Travel Times to Lower Granite Dam

Release Date	Migration Year	Travel Time (Days)			95% Confidence Limits	
		Min	Med	Max	Lower	Upper
4/7	1997	3.2	31.9	97.6	31.0	32.8
3/23-3/26	1998	2.8	28.1	78.2	27.8	28.1
4/7-4/8	1999	4.6	27.7	133.7	27.4	28.2
3/23, 4/5-4/6	2000	3.9	27.3	86.8	27.2	27.3
3/28	2001	3.9	30.4	151.1	30.3	30.4
3/27-3/28	2002	3.4	38.1	77.6	38.1	38.2
3/19-3/20	2003	6.0	49.4	121.4	49.0	49.7
3/31-4/1	2004	6.2	32.2	74.9	32.0	32.4
4/4-4/6	2005	5.6	30.2	76.0	30.2	30.2
3/27-3/29	2006	2.7	35.6	78.7	35.4	35.9
3/28-3/29	2007	4.4	27.8	76.9	27.4	28.4
4/2-4/3	2008	5.6	34.6	88.3	34.5	34.9
3/25-3/26	2009	5.5	43.5	89.2	43.3	43.6
3/31	2010	10.1	27.2	66.2	27.2	27.2
3/23-3/24	2011	2.8	40.0	77.4	39.4	40.2
3/26, 4/1	2012	4.3	31.2	93.6	30.8	31.4
4/1-4/2	2013	4.1	30.4	67.3	30.3	30.4
4/9-4/10	2014	3.1	25.4	62.4	25.4	25.5
3/25-3/26	2015	3.7	29.4	63.8	29.4	29.5

Table 2. Dworshak NFH Steelhead Travel Times to Lower Granite Dam

Release Date(s)	Release Site(s)	Migration Year	Travel Time (Days)			95% Confidence Limits	
			Min	Med	Max	Lower	Upper
4/28-5/2	DWOR	1997	1.2	3.3	64.8	2.7	4.0
4/27-4/30	DWOR	1998	2.3	4.7	48.8	4.5	5.0
4/26-4/30	DWORMS	1999	1.5	6.2	60.1	5.8	6.5
5/3-5/5	DWORMS	2000	1.6	3.5	66.6	3.5	3.5
4/23-4/26	DWORMS	2001	2.5	6.8	110.0	6.7	7.0
4/22-4/25	DWORMS	2002	2.4	5.7	47.4	5.5	6.4
4/24	DWORMS	2003	0.6	7.1	54.8	6.6	7.7
4/29-4/22	DWORMS	2004	2.9	8.8	34.0	8.4	9.3
4/18-4/22	DWORMS	2005	3.4	11.2	60.8	10.4	11.6
4/17-4/21	DWORMS	2006	1.0	10.5	52.7	8.1	12.6
4/16-4/19	DWORMS	2007	1.9	14.6	52.7	13.0	15.8
4/14	CLEARC	2008	3.6	16.4	44.0	15.4	17.4
4/14	CLWRSF		4.5	23.9	56.5	23.6	24.5
4/21-4/24	DWORMS		0.5	8.6	49.5	8.4	8.8
4/14,4/21-4/24	All Sites		0.5	11.5	56.5	11.1	11.9
4/15	CLEARC	2009	3.5	8.5	64.2	8.5	8.6
4/15	CLWRSF		3.7	10.6	54.8	10.4	11.2
4/14-4/17	DWORMS		2.5	6.5	54.2	6.5	6.6
4/14-4/17	All Sites		2.5	7.5	64.2	7.48	7.54
4/14	CLWRSF	2010	3.4	11.8	55.5	11.5	12.5
4/19-4/22	DWORMS		2.4	10.1	66.3	9.8	10.4
4/14-4/22	All Sites		2.4	9.9	66.3	9.7	10.2
3/21-3/24	CLEARC	2011	4.0	12.4	100.4	12.1	12.7
3/21-3/24	CLWRSF		4.5	27.8	94.3	23.6	30.9
3/28-3/31	DWORMS		1.7	8.6	85.2	8.2	9.1
3/21-3/31	All Sites		1.7	12.6	100.4	12.4	12.8

Table 2 (continued). Dworshak NFH Steelhead Travel Times to Lower Granite Dam

Release Date(s)	Release Site(s)	Migration Year	Travel Time (Days)			95% Confidence Limits	
			Min	Med	Max	Lower	Upper
4/4-4/6	CLEARC	2012	3.3	12.7	60.4	11.5	14.3
4/3-4/6	CLWRSF		4.5	21.5	64.4	21.1	22.0
4/12	DWORMS		1.5	5.4	55.4	5.3	5.5
4/11	LOLOC		6.6	32.4	64.4	28.7	35.4
4/3-4/12	All Sites		1.5	9.6	64.4	9.4	10.4
4/9-4/10	CLEARC	2013	3.3	6.6	49.6	6.3	7.5
4/10	CLWRSF		3.5	11.8	61.0	11.4	14.7
4/17	DWORMS		3.4	5.0	42.3	4.8	5.3
4/15-4/16	LOLOC		2.4	28.3	51.8	27.4	28.5
4/9-4/17	All Sites		2.4	6.6	61.0	6.4	6.8
4/15	CLEARC	2014	3.3	7.6	40.8	7.4	8.3
4/14-4/15	CLWRSF		3.5	8.8	41.2	8.6	9.3
4/15-4/23	DWORMS		1.7	5.2	47.8	4.9	5.3
4/18-4/21	LOLOC		1.7	19.0	61.9	18.4	19.6
4/14-4/23	All Sites		1.7	7.6	61.9	7.5	7.8
4/14	CLEARC	2015	4.6	8.3	35.2	8.1	8.7
4/17	CLWRSF		4.5	7.6	49.6	7.5	7.8
4/22	DWORMS		2.8	5.7	48.6	5.3	5.9
4/20	LOLOC		4.5	20.4	45.7	18.6	21.0
4/14-4/22	All Sites		2.8	7.3	49.6	7.1	7.4

As with past years, we are providing you with tables that present the estimated 10%, 50%, and 90% passage dates of yearling spring Chinook (Table 3) and steelhead (Table 4) juveniles at Lower Granite Dam for each of the years of tagging. As with the travel time tables, we provide the estimated 10%, 50%, and 90% passage dates for each of the steelhead release sites since 2008 (Table 4).

Table 3. Estimated 10%, 50%, and 90% passage dates of Dworshak NFH yearling spring Chinook at Lower Granite Dam.

Migration Year	Release Date(s)	10% Passage Date	50% Passage Date	90% Passage Date
1997	4/7	26-Apr	11-May	18-May
1998	3/23-3/26	11-Apr	23-Apr	2-May
1999	4/7-4/8	25-Apr	6-May	21-May
2000	3/23, 4/5-4/6	23-Apr	3-May	12-May
2001	3/28	18-Apr	28-Apr	5-May
2002	3/27-3/28	15-Apr	4-May	15-May
2003	3/19-3/20	23-Apr	8-May	26-May
2004	3/31-4/1	17-Apr	3-May	8-May
2005	4/4-4/6	27-Apr	6-May	10-May
2006	3/27-3/29	8-Apr	2-May	11-May
2007	3/28-3/29	11-Apr	22-Apr	8-May
2008	4/2-4/3	21-Apr	8-May	18-May
2009	3/25-3/26	20-Apr	8-May	19-May
2010	3/31	22-Apr	27-Apr	7-May
2011	3/23-3/24	10-Apr	2-May	11-May
2012	3/26, 4/1	14-Apr	26-Apr	12-May
2013	4/1-4/2	19-Apr	2-May	10-May
2014	4/9-4/10	13-Apr	5-May	17-May
2015	3/25-3/26	14-Apr	24-Apr	6-May

Table 4. Estimated 10%, 50%, and 90% passage dates of Dworshak NFH steelhead at Lower Granite Dam.

Migration Year	Release Date(s)	Release Site(s)	10% Passage Date	50% Passage Date	90% Passage Date
1997	4/28-5/2	DWOR	1-May	3-May	15-May
1998	4/27-4/30	DWOR	2-May	3-May	13-May
1999	4/26-4/30	DWORMS	30-Apr	4-May	25-May
2000	5/3-5/5	DWORMS	6-May	7-May	16-May
2001	4/23-4/26	DWORMS	29-Apr	2-May	17-May
2002	4/22-4/25	DWORMS	26-Apr	30-Apr	21-May
2003	4/24	DWORMS	25-Apr	28-Apr	20-May
2004	4/19-4/22	DWORMS	25-Apr	29-Apr	9-May
2005	4/18-4/22	DWORMS	26-Apr	1-May	10-May
2006	4/17-4/22	DWORMS	21-Apr	1-May	18-May
2007	4/16-4/19	DWORMS	22-Apr	1-May	13-May
2008	4/14	CLEARC	20-Apr	30-Apr	12-May
	4/14	CLWRSF	24-Apr	8-May	19-May
	4/21-4/24	DWORMS	28-Apr	2-May	16-May
	4/14,4/21-4/24	All Sites	27-Apr	2-May	17-May
2009	4/15	CLEARC	20-Apr	23-Apr	6-May
	4/15	CLWRSF	22-Apr	25-Apr	11-May
	4/14-4/17	DWORMS	6-May	11-May	8-May
	4/14-4/17	All Sites	20-Apr	23-Apr	8-May

Table 4 (continued). Estimated 10%, 50%, and 90% passage dates of Dworshak NFH steelhead at Lower Granite Dam.

Migration Year	Release Date(s)	Release Site(s)	10% Passage Date	50% Passage Date	90% Passage Date
2010	4/14	CLWRSF	25-Apr	17-May	27-May
	4/19-4/22	DWORMS	25-Apr	30-Apr	19-May
	4/14-4/22	All Sites	25-Apr	1-May	20-May
2011	3/21-3/24	CLEARC	30-Mar	2-Apr	1-Apr
	3/21-3/24	CLWRSF	2-Apr	14-Apr	23-May
	3/28-3/31	DWORMS	1-Apr	6-Apr	11-May
	3/21-3/31	All Sites	1-Apr	6-Apr	14-May
2012	4/4-4/6	CLEARC	12-Apr	22-Apr	30-Apr
	4/3-4/6	CLWRSF	15-Apr	26-Apr	16-May
	4/12	DWORMS	5-Apr	18-Apr	3-May
	4/11	LOLOC	26-Apr	13-May	23-May
	4/3-4/12	All Sites	14-Apr	22-Apr	8-May
2013	4/9-4/10	CLEARC	13-Apr	16-Apr	9-May
	4/10	CLWRSF	16-Apr	21-Apr	12-May
	4/17	DWORMS	21-Apr	22-Apr	6-May
	4/15-4/16	LOLOC	29-Apr	13-May	20-May
	4/9-4/17	All Sites	17-Apr	22-Apr	11-May
	4/15	CLEARC	19-Apr	23-Apr	6-May
2014	4/14-4/15	CLWRSF	20-Apr	23-Apr	7-May
	4/15-4/23	DWORMS	26-Apr	28-Apr	7-May
	4/18-4/21	LOLOC	27-Apr	8-May	26-May
	4/14-4/23	All Sites	22-Apr	28-Apr	15-May
	4/14	CLEARC	20-Apr	22-Apr	30-Apr
2015	4/17	CLWRSF	23-Apr	25-Apr	8-May
	4/22	DWORMS	25-Apr	27-Apr	7-May
	4/20	LOLOC	28-Apr	10-May	21-May
	4/14-4/22	All Sites	23-Apr	27-Apr	9-May

Figure 1 is provided as an illustration of how the LGR arrival timing of the 2015 release of yearling spring Chinook compared to last year's release, as well as the average of the most recent 10 years (2005–2014).

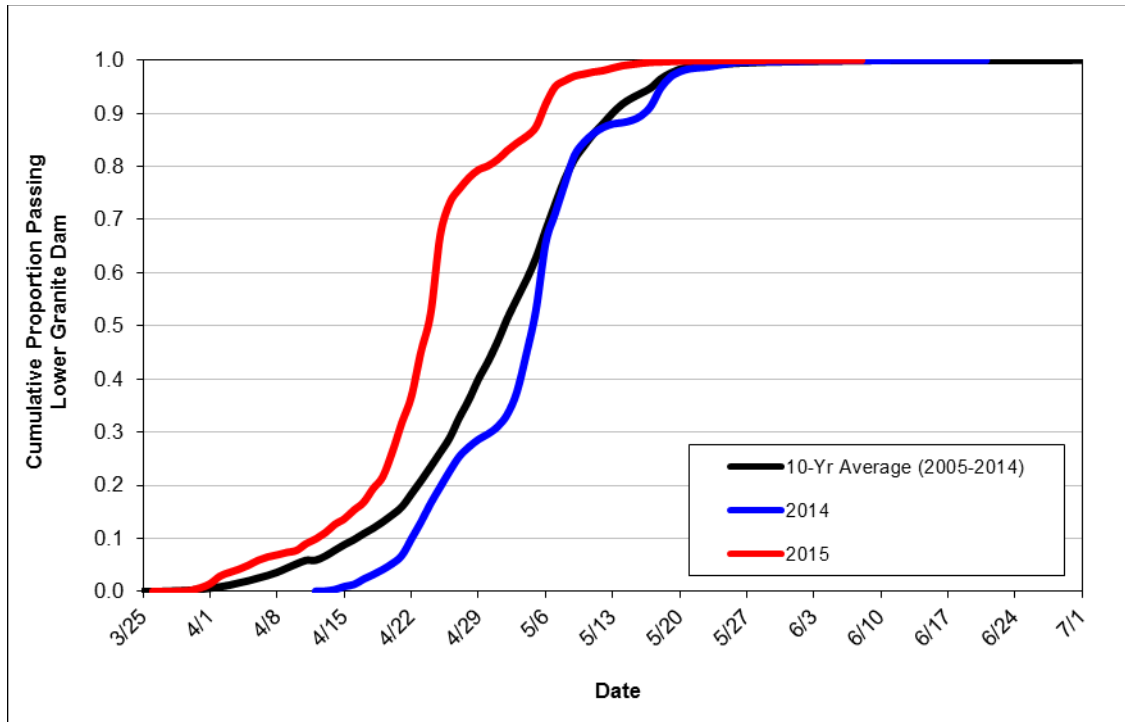


Figure 1. Cumulative passage timing of Dworshak NFH yearling spring Chinook to Lower Granite Dam.

We are providing five figures to illustrate the 2015 passage timing for steelhead reared by Dworshak NFH and released into the Clearwater River Basin (Figures 2–6). The first of these figures (Figure 2) illustrates the collective timing of the 2015 releases, compared to those in 2014, and the 10-year average (2005–2014). The second (Figure 3) is a comparison of the timing from the DWORMS release site in 2015 versus the seven previous years (2008–2014). The third (Figure 4) is a comparison of the timing from the CLWRSF release site in 2015 versus the seven previous years (2008–2014). The fourth (Figure 5) is a comparison of the timing from the CLEARC release site in 2015 versus six previous years (2008–2009 and 2011–2014). Finally, Figure 6 is a comparison of the timing from the LOLOC release site in 2015 to releases conducted in 2012–2014.

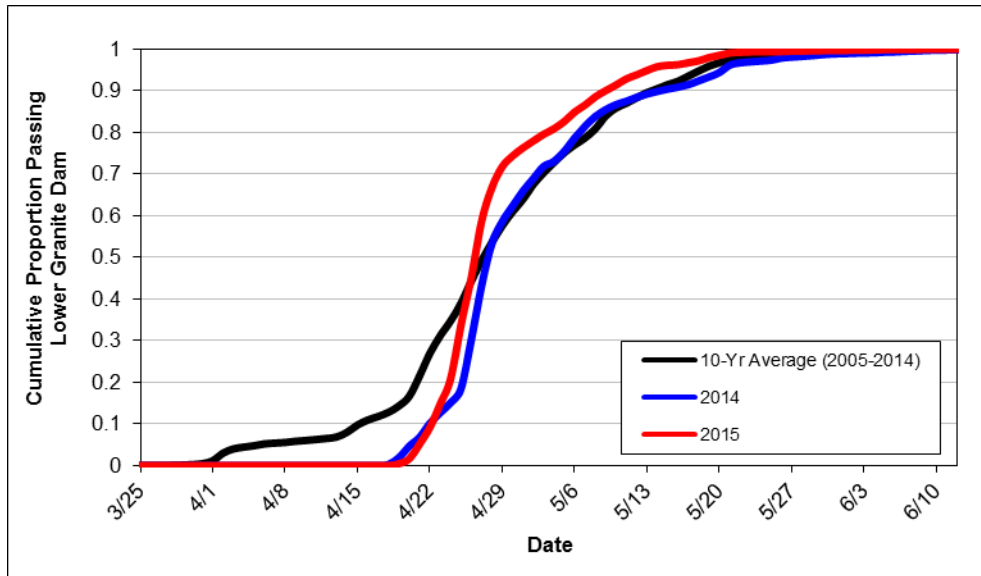


Figure 2. Cumulative passage timing of Dworshak NFH steelhead to Lower Granite Dam. Timing plots are collective timing of all release sites for each year.

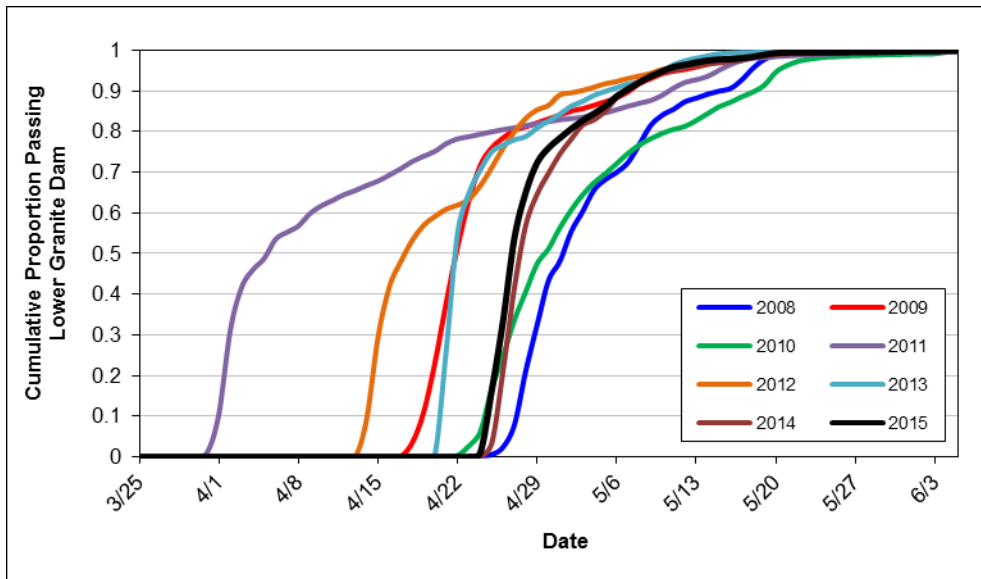


Figure 3. Cumulative passage timing of Dworshak NFH steelhead released at DWORMS release site to Lower Granite Dam.

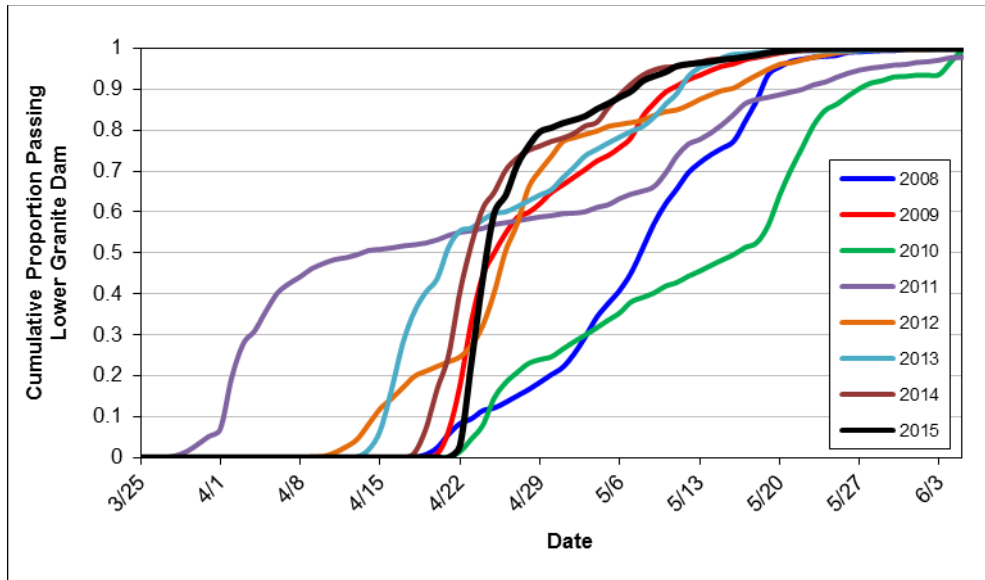


Figure 4. Cumulative passage timing of Dworshak NFH steelhead released at CLWRSF release site to Lower Granite Dam.

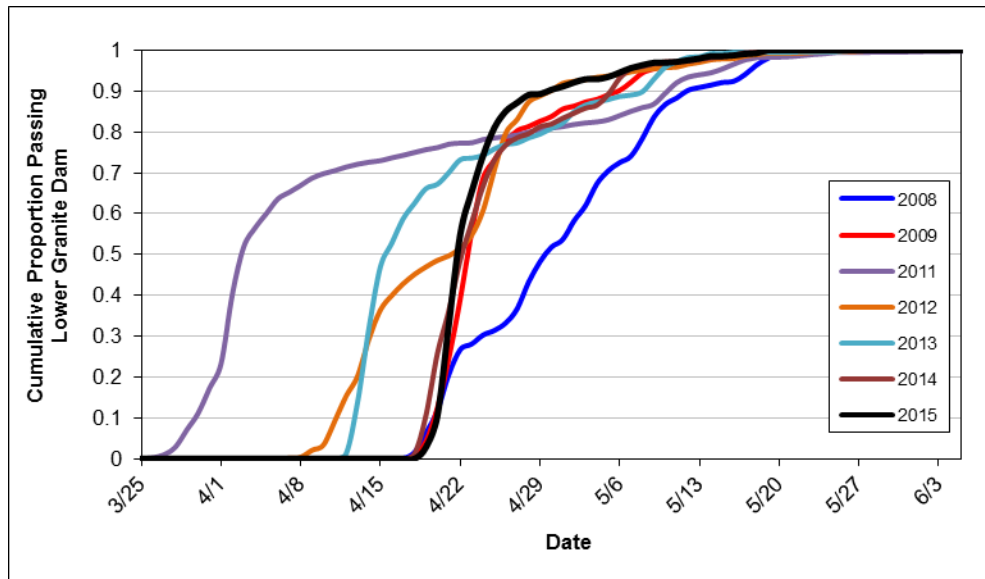


Figure 5. Cumulative passage timing of Dworshak NFH steelhead released at CLEARC release site to Lower Granite Dam.

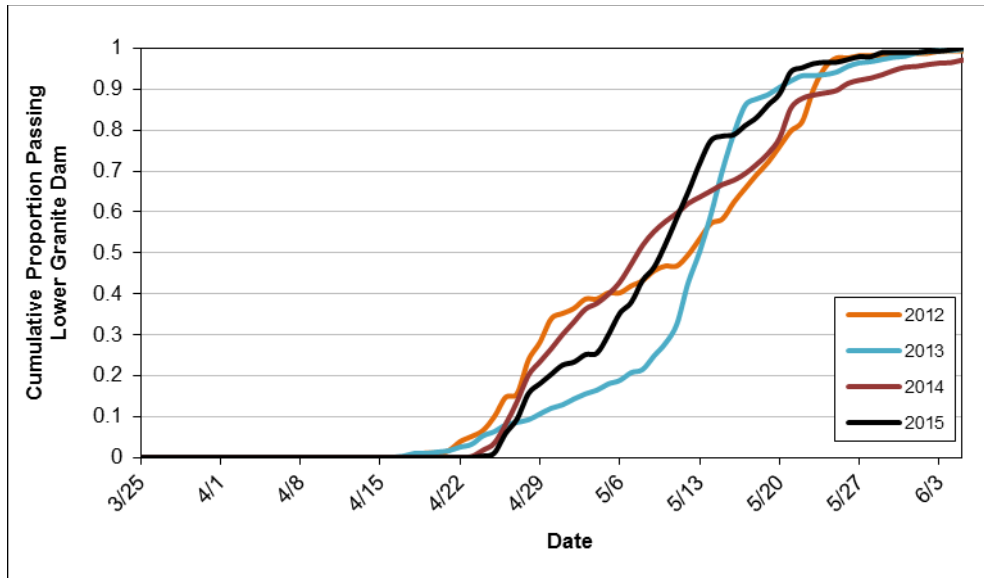


Figure 6. Cumulative passage timing of Dworshak NFH steelhead released at LOLOC release site to Lower Granite Dam.

Figures 7 and 8 are provided below to illustrate the out-migration conditions that these spring migrants may have experienced in the Snake and Lower Columbia rivers. Figure 7 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 8 provides the total spring flow volume (April 10–June 30) for the Lower Columbia (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.

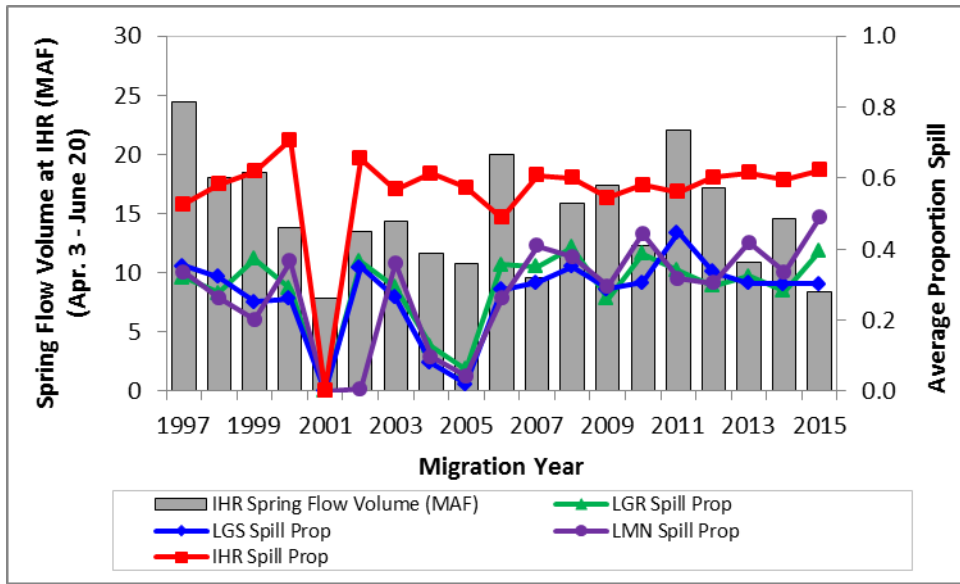


Figure 7. Total spring flow volume in the Snake River (at Ice Harbor Dam) and average spill proportion at Lower Granite, Little Goose, Lower Monumental, and Ice Harbor dams. Spring period in the Snake River is April 3–June 20.

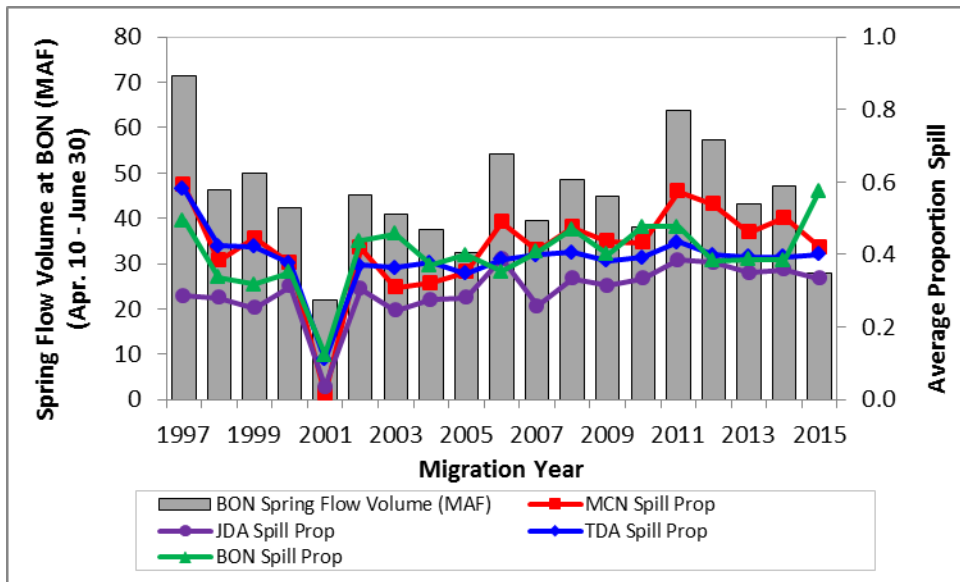


Figure 8. Total spring flow volume in the Lower Columbia River (at Bonneville Dam) and average spill proportion at McNary, John Day, The Dalles, and Bonneville dams. Spring period in the Lower Columbia River is April 10–June 30.

Finally, Table 5 contains estimates calculated for Dworshak NFH Chinook by the CSS. The estimates provided include: (1) juvenile survival in the hydrosystem between Lower Granite and Bonneville dams, (2) the proportion of the juvenile population destined for transportation, and (3) the smolt-to-adult survival (SAR) for several passage categories. Those passage categories are SAR(T), SAR(C₀), and Weighted SAR_{LGR-to-LGR}, 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 Weighted SAR_{LGR-to-LGR} is an estimate that is obtained by taking the proportion of the total population of smolts (tagged and untagged) at Lower Granite Dam in each study category and multiplying by the respective study category's SAR_{LGR-to-LGR}. In effect, the weighted SAR_{LGR-to-LGR} is the estimated SAR for the overall hatchery release (without jacks). The data presented in Table 5 were taken from various chapters and appendices of the 2015 CSS Annual Report, which can be downloaded from the FPC webpage www.fpc.org/documents/CSS.html. Figure 9 is a time series of the Weighted SAR_{LGR-to-LGR} over the years of available data for Dworshak NFH spring Chinook.

Table 5. Dworshak NFH Spring Chinook Survivals from CSS.

Release Date(s)	Migration Year	Juvenile Survival (LGR-BON)	Proportion Transported	T/C Ratio	Adult Survival		
					SAR(T) %	SAR(C ₀) %	Weighted SAR _{LGR-to-LGR}
4/7	1997	0.49	0.48	1.75	0.83	0.47	0.62
3/23-3/26	1998	0.51	0.71	0.72	0.90	1.25	1.00
4/7-4/8	1999	0.54	0.74	0.99	1.18	1.19	1.18
3/23, 4/5-4/6	2000	0.48	0.66	0.99	1.00	1.01	1.00
3/28	2001	0.24	0.98	8.76	0.36	0.04 ^A	0.36
3/27-3/28	2002	0.62	0.57	1.24	0.62	0.50	0.57
3/19-3/20	2003	0.68	0.54	1.21	0.26	0.21	0.24
3/31-4/1	2004	0.50	0.84	0.89	0.28	0.32	0.29
4/4-4/6	2005	0.51	0.84	1.43	0.20	0.14 ^B	0.19
3/27-3/29	2006 ^C	0.52	0.52	0.95	0.36	0.38	0.35
3/28-3/29	2007 ^C	0.67	0.08	1.84	0.59	0.32	0.36
4/2-4/3	2008 ^C	0.51	0.34	1.53	0.80	0.52	0.57
3/25-3/26	2009 ^C	0.44	0.34	1.29	0.49	0.38	0.53
3/31	2010 ^C	0.71	0.19	0.70	0.37	0.52	0.47
3/23-3/24	2011 ^C	0.42	0.35	0.63	0.13	0.21	0.17
3/26, 4/1	2012 ^C	0.60	0.20	0.94	0.50	0.53	0.47
4/1-4/2	2013 ^{C,D}	0.71	0.22	0.87	0.56	0.65	0.54
4/9-4/10	2014 ^{C,E}	0.74	0.39				

^A Assumed SAR(C₀) same as SAR(C₁) for 2001.

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

^C Estimates for migration years 2006 through 2013 reflect use of new methodology developed for random pre-assignment of “monitor mode” and “return-to-river mode” operations. See 2015 CSS Annual Report for details.

^D Migration year 2013 is incomplete with Age 2-salt adult returns through 9/14/2015.

^E No adult returns to date, only juvenile metrics are available.

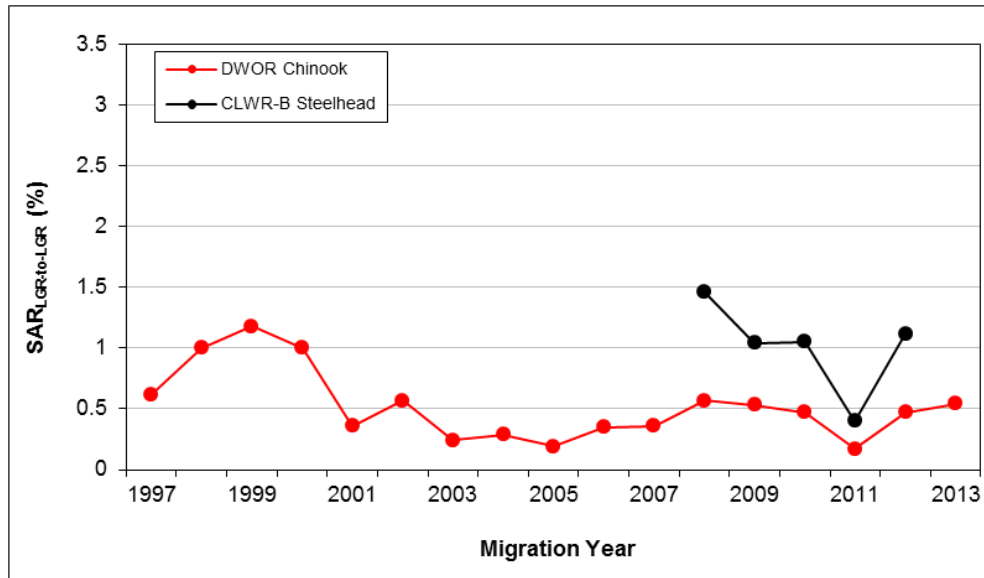


Figure 9. Weighted SAR_{LGR-to-LGR} for Dworshak NFH spring Chinook (1997–2013) and Clearwater-B hatchery steelhead (2008–2012). Migration year 2013 is incomplete for yearling Chinook, with Age 2-salt adult returns through 9/14/2015.

More representative tagging for Snake River hatchery steelhead began in coordination among CSS, LSRCP, and IPC in migration year 2008. This increased sample size of PIT tags allowed for finer-scale analyses than in previous years. Since this time, the CSS has grouped and analyzed hatchery steelhead by run (A-run or B-run) and release drainage (e.g., Salmon River, Clearwater River, etc.). Therefore, estimates of SARs are not available for individual hatcheries. However, steelhead reared at Dworshak NFH are part of the Clearwater-B group, which also includes hatchery steelhead from Clearwater Hatchery. Estimates of juvenile survival in the hydrosystem, proportion transported, and various SARs for Clearwater-B hatchery steelhead are provided in Table 6. The data presented in Table 6 were taken from various chapters and appendices of the 2015 CSS Annual Report, which can be downloaded from the FPC webpage www.fpc.org/documents/CSS.html. Overall SAR_{LGR-to-LGR} is for this hatchery steelhead group is also provided in Figure 9.

Table 6. Clearwater-B hatchery steelhead Survivals from CSS. The Clearwater-B hatchery steelhead group is comprised of hatchery steelhead reared at Dworshak NFH and Clearwater Hatchery.

Migration Year ^A	Juvenile Survival (LGR-BON)	Proportion Transported	T/C Ratio	Adult Survival		
				SAR(T) %	SAR(C ₀) %	Weighted SAR _{LGR-to-LGR}
2008	0.47	0.30	1.55	1.96	1.26	1.46
2009	0.61	0.22	0.74	0.99	1.34	1.04
2010	0.52	0.31	0.76	0.90	1.18	1.05
2011	0.48	0.26	1.14	0.47	0.41	0.40
2012	0.69	0.14	1.06	1.21	1.14	1.12
2013 ^B	0.54	0.15				
2014 ^B	0.67	0.25				

^A Estimates for migration years 2006 through 2013 reflect use of new methodology developed for random pre-assignment of “monitor mode” and “return-to-river mode” operations. See 2014 CSS Annual Report for details.

^B No adult returns have been analyzed to date, only juvenile metrics are available.

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: Pete Hassemer, IDFG
Bill Tweit, WDFW
Jay Hesse, Nez Perce
Tom Rien, ODFW
Howard Schaller, USFWS
Erick Merrill, NPCC
Jim Ruff, NPCC
FPAC