



# FISH PASSAGE CENTER

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## MEMORANDUM

TO: Brian Leth, IDFG

FROM: Brandon R. Chockley

DATE: January 2, 2015

RE: 2014 Clearwater Hatchery Report

The Fish Passage Center has been marking Chinook and steelhead from the Clearwater 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 and steelhead 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 and steelhead used from the Clearwater Hatchery facility in 2014 and 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 for each year's release of spring and summer Chinook to Lower Granite Dam. Also provided are estimates of the 95% confidence limits around the estimated median travel times. For comparison, separate travel times are provided for each of the different release locations as well as for all release sites combined (Table 1). Table 2 provides the same travel time data for the steelhead releases since 2008. In addition, we are providing you with the estimated 10%, 50%, and 90% passage dates of yearling spring and summer Chinook (Table 3) and steelhead (Table 4) at Lower Granite Dam. As with the travel time tables, Tables 3 and 4 provide these estimates for each individual release site as well as all release sites combined for each year.

**Table 1.** Travel times (release to LGR) of Clearwater Hatchery yearling spring (2006–2014) and summer (2011–2014) Chinook.

Migration Year	Species Released	Release Site	Release Date(s)	Travel Time (Days)			95% Confidence Limits	
				Min	Med	Max	Lower	Upper
2006	SpCH	CROOKP	4/3	22.6	36.3	73.4	33.8	41.0
	SpCH	CROOKR	3/27	11.6	41.4	83.1	41.2	41.5
	SpCH	POWP	3/22	14.5	42.9	78.9	42.6	43.4
	SpCH	REDP	3/30	8.5	37.5	82.2	37.3	37.8
	SpCH	All Sites	3/22-4/3	8.5	40.6	83.1	40.5	40.8
2007	SpCH	CROOKP	3/29	21.1	42.3	74.9	35.4	44.3
	SpCH	CROOKR	3/28	10.1	35.3	80.8	34.7	35.5
	SpCH	POWP	3/23	8.3	31.1	60.6	30.7	31.8
	SpCH	REDP	3/6, 3/31	10.6	33.0	80.2	32.7	33.4
	SpCH	All Sites	3/6-3/31	8.3	33.2	80.8	33.0	33.5
2008	SpCH	CROOKP	3/26	39.4	68.2	99.2	63.2	72.6
	SpCH	CROTRP	3/24	26.2	49.7	107.9	49.0	50.9
	SpCH	POWP	3/19-3/20	16.0	47.4	102.6	47.1	47.6
	SpCH	REDP	3/26	29.6	52.5	108.1	50.7	53.1
	SpCH	SELWY1	4/2-4/3	6.4	30.8	84.5	30.0	31.5
	SpCH	All Sites	3/19-4/3	6.4	45.7	108.1	45.5	46.2
2009	SpCH	CLEARC	3/30	4.2	27.0	66.7	26.7	27.4
	SpCH	CROOKR	4/6	5.0	36.6	78.8	36.1	37.1
	SpCH	POWP	3/23, 4/1	9.3	40.4	84.4	38.6	41.4
	SpCH	REDP	4/8	4.9	37.7	80.3	37.5	38.4
	SpCH	SELWY1	4/2	4.4	24.3	69.8	23.8	24.6
	SpCH	All Sites	3/23-4/6	4.2	31.4	84.4	30.8	31.7
2010	SpCH	CLEARC	3/25	7.7	29.0	75.6	28.7	29.2
	SpCH	POWP	3/2	46.7	59.2	96.0	58.4	59.3
	SpCH	*REDR + REDP	3/29	15.1	36.0	85.2	35.4	36.3
	SpCH	SELWY1	3/24	8.1	30.7	79.0	30.7	30.7
	SpCH	All Sites	3/2-3/29	7.7	33.2	96.0	32.7	33.4
2011	SpCH	CLEARC	3/24-3/25	3.2	30.0	115.6	29.5	30.6
	SuCH	CROOKR	3/28	4.9	36.4	106.7	35.9	36.6
	SpCH	POWP	4/5	1.8	28.5	84.4	28.3	28.7
	SpCH	REDP	3/28	7.2	43.4	93.4	42.6	43.6
	SpCH	SELWY1	3/23	4.0	33.6	60.4	33.3	33.9
	Sp/Su CH	All Sites	3/23-4/5	1.8	32.5	115.6	32.5	32.6
2012	SpCH	CLEARC	3/22	3.8	28.2	57.4	27.4	28.4
	SuCH	CROOKR	3/26	4.2	28.3	144.2	28.0	28.4
	SpCH	POWP	3/27	5.3	28.9	87.0	28.5	29.3
	SpCH	REDP	3/28, 4/3-4/4	5.5	29.3	71.5	28.4	29.8
	SpCH	SELWY1	3/21	4.1	28.5	62.4	28.1	29.1
	Sp/Su CH	All Sites	3/21-4/4	3.8	28.4	144.2	28.4	28.6
2013	SpCH	CLEARC	3/19	16.0	40.6	59.0	39.7	41.0
	SuCH	CROOKR	3/20	13.3	43.5	102.8	43.0	43.6
	SpCH	POWP	3/20-3/21	10.0	41.3	83.7	40.6	41.6
	SpCH	REDP	3/27-4/3	11.7	41.4	81.0	40.5	41.5
	SpCH	SELWY1	3/18-3/19	10.8	31.4	78.9	29.4	32.6
	Sp/Su CH	All Sites	3/18-4/3	10.0	41.1	102.8	40.7	41.4
2014	SpCH	KOOS	3/28	1.3	27.5	69.5	27.4	27.7
	SpCH	MEADOC	3/20	6.3	34.6	81.5	34.4	35.1
	SuCH	POWP	3/31	5.3	25.9	83.1	25.6	26.4
	SpCH	REDP	3/25	3.9	41.5	226.2	41.4	41.5
	Sp/Su CH	All Sites	3/20-3/31	1.3	31.0	226.2	30.6	31.3

\* Only 9 PIT-tagged fish from the REDP release were detected at LGR. These 9 fish were combined with the REDR release for estimation of timing data.

**Table 2.** Travel times (release to LGR) of Clearwater Hatchery steelhead (2008–2014).

Migration Year	Release Site	Release Date(s)	Travel Time (Days)			95% Confidence Limits	
			Min	Med	Max	Lower	Upper
2008	CLWRSF	4/7-4/15	3.8	18.8	48.8	18.1	19.3
	CROOKR	4/7-4/9	15.1	38.3	88.1	37.2	38.7
	LOLOC	4/21	7.8	19.5	42.0	18.5	21.4
	MEAD2C	4/18	10.8	21.8	48.5	20.7	22.9
	MILL2C	4/18	15.1	26.8	53.4	24.3	28.4
	REDR	4/10-4/11	18.2	33.3	83.8	32.5	34.3
	All Sites	4/7-4/21	3.8	29.0	88.1	28.5	29.5
2009	CLWRSF	4/14-4/16	3.7	9.4	68.2	9.2	9.5
	CROOKR	4/17	4.5	24.4	52.1	23.4	25.3
	LOLOC	4/28	3.4	9.1	41.3	8.6	9.5
	REDP	4/13	7.6	17.3	81.0	14.5	20.9
	REDR	4/13	8.3	23.7	70.8	13.8	25.9
	All Sites	4/13-4/28	3.4	10.2	81.0	10.0	10.4
2010	CLWRSF	4/15-4/19	3.4	11.8	55.5	11.5	12.5
	CROOKR	4/14	10.7	30.2	55.2	27.4	34.7
	KOOS	4/20	2.6	7.5	51.9	6.8	8.3
	REDP	4/12	9.5	24.5	73.8	22.7	25.9
	All Sites	4/12-4/20	2.6	14.0	73.8	13.5	14.4
2011	CLWRSF	4/12-4/18	1.4	20.8	87.8	20.4	21.4
2012	MEAD2C	4/10-4/11	4.4	16.6	68.5	16.3	17.2
	NEWSOC	4/12	5.5	31.7	59.9	30.5	32.7
	All Sites	4/10-4/12	4.4	18.1	68.5	17.5	18.4
2013	CLWRSF	4/9	3.4	6.5	38.4	6.1	6.8
	MEAD2C	4/8-4/12	0.7	12.7	74.5	11.3	13.6
	NEWSOC	4/10	6.4	31.5	56.1	30.6	32.4
	All Sites	4/8-4/12	0.7	11.7	74.5	11.0	12.5
2014	CLWRSF	4/14	3.4	7.4	63.2	6.8	7.8
	MEAD2C	4/16	2.5	8.8	71.5	8.5	9.3
	NEWSOC	4/17	4.6	16.5	52.4	12.4	19.2
	All Sites	4/14-4/17	2.5	8.7	71.5	8.5	9.0

**Table 3.** Estimated 10%, 50%, and 90% passage dates of PIT-tagged Clearwater Hatchery yearling spring and summer Chinook at Lower Granite Dam.

Migration Year	Species Released	Release Site	Release Date(s)	10% Passage Date	50% Passage Date	90% Passage Date
2006	SpCH	CROOKP	4/3	5/1	5/10	5/20
	SpCH	CROOKR	3/27	4/25	5/7	5/18
	SpCH	POWP	3/22	4/25	5/4	5/10
	SpCH	REDP	3/30	4/27	5/6	5/15
	SpCH	All Sites	3/22-4/3	4/26	5/6	5/14
2007	SpCH	CROOKP	3/29	4/26	5/10	5/17
	SpCH	CROOKR	3/28	4/17	5/1	5/14
	SpCH	POWP	3/23	4/14	4/22	5/3
	SpCH	REDP	3/6, 3/31	4/21	5/3	5/15
	SpCH	All Sites	3/6-3/31	4/16	4/30	5/13

**Table 3 (continued).** Estimated 10%, 50%, and 90% passage dates of PIT-tagged Clearwater Hatchery yearling spring and summer Chinook at Lower Granite Dam.

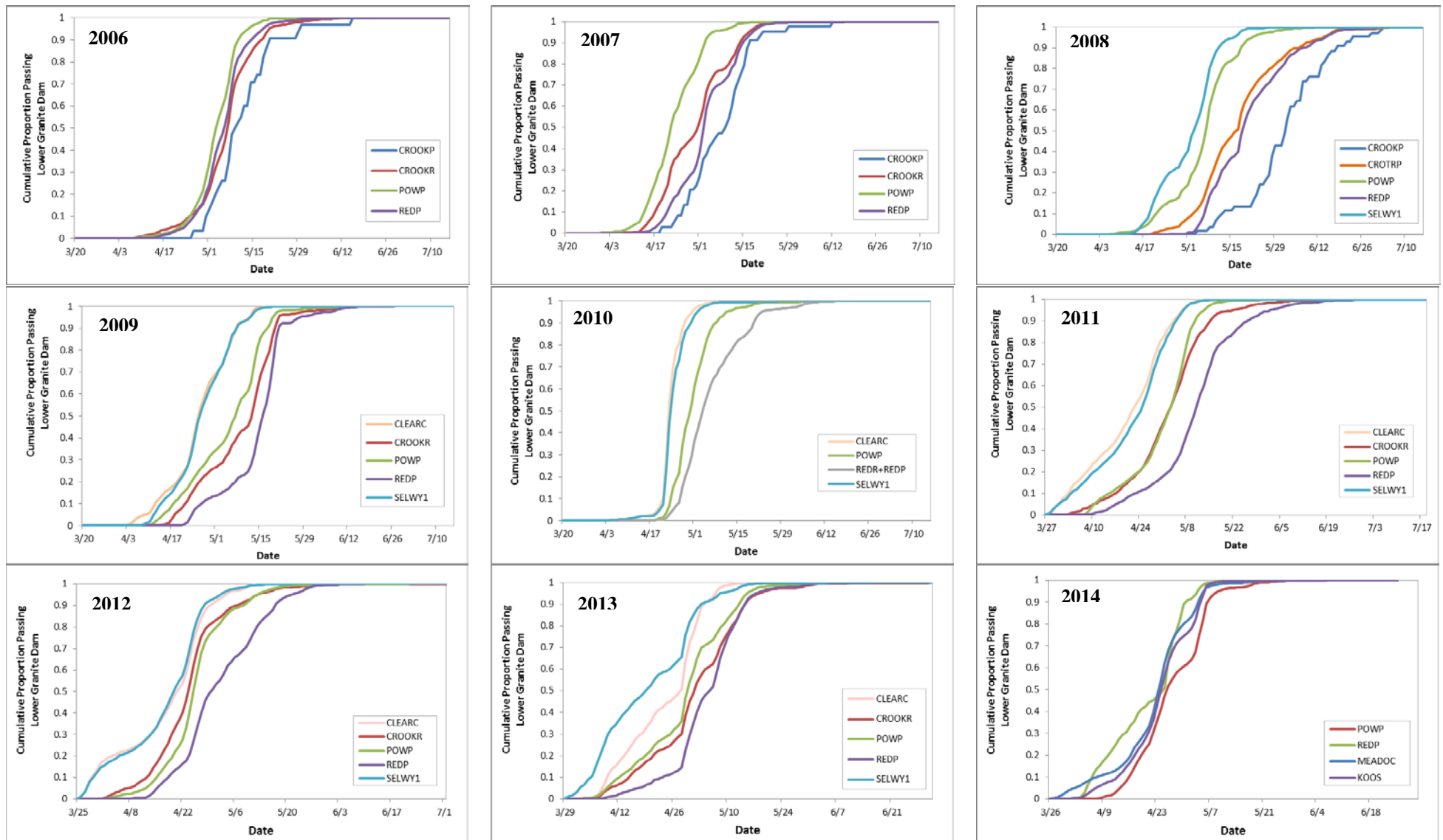
Migration Year	Species Released	Release Site	Release Date(s)	10% Passage Date	50% Passage Date	90% Passage Date
2008	SpCH	CROOKP	3/26	5/12	6/2	6/18
	SpCH	CROTRP	3/24	5/3	5/17	6/6
	SpCH	POWP	3/19-3/20	4/21	5/7	5/18
	SpCH	REDP	3/26	5/7	5/19	6/8
	SpCH	SELWY1	4/2-4/3	4/19	5/3	5/11
	SpCH	All Sites	3/19-4/3	4/22	5/9	5/29
2009	SpCH	CLEARC	3/30	4/12	4/26	5/8
	SpCH	CROOKR	4/6	4/22	5/13	5/20
	SpCH	POWP	3/23, 4/1	4/18	5/8	5/18
	SpCH	REDP	4/8	4/27	5/16	5/21
	SpCH	SELWY1	4/2	4/14	4/26	5/8
	SpCH	All Sites	3/23-4/6	4/17	5/3	5/19
2010	SpCH	CLEARC	3/25	4/22	4/23	4/28
	SpCH	POWP	3/2	4/24	4/30	5/8
	SpCH	REDR + REDP*	3/29	4/27	5/4	5/20
	SpCH	SELWY1	3/24	4/22	4/24	4/20
	SpCH	All Sites	3/2-3/29	4/22	4/27	5/10
2011	SpCH	CLEARC	3/24-3/25	4/3	4/23	5/4
	SuCH	CROOKR	3/28	4/17	5/3	5/15
	SpCH	POWP	4/5	4/15	5/3	5/11
	SpCH	REDP	3/28	4/23	5/11	5/26
	SpCH	SELWY1	3/23	4/4	4/25	5/5
	Sp/Su CH	All Sites	3/23-4/5	4/9	4/29	5/12
2012	SpCH	CLEARC	3/22	3/29	4/21	4/30
	SuCH	CROOKR	3/26	4/13	4/24	5/7
	SpCH	POWP	3/27	4/15	4/25	5/9
	SpCH	REDP	3/28, 4/3-4/4	4/19	4/30	5/17
	SpCH	SELWY1	3/21	3/29	4/20	4/28
	Sp/Su CH	All Sites	3/21-4/4	4/6	4/24	5/8
2013	SpCH	CLEARC	3/19	4/9	4/28	5/4
	SuCH	CROOKR	3/20	4/15	5/2	5/15
	SpCH	POWP	3/20-3/21	4/12	4/30	5/13
	SpCH	REDP	3/27-4/3	4/23	5/6	5/15
	SpCH	SELWY1	3/18-3/19	4/5	4/19	5/3
	Sp/Su CH	All Sites	3/18-4/3	4/10	4/30	5/13
2014	SpCH	KOOS	3/28	4/13	4/24	5/5
	SpCH	MEADOC	3/20	4/8	4/24	5/4
	SuCH	POWP	3/31	4/16	4/26	5/7
	SpCH	REDP	3/25	4/24	5/5	5/19
	Sp/Su CH	All Sites	3/20-3/31	4/15	4/26	5/6

\*Only 9 PIT-tagged fish from the REDP release were detected at LGR. These 9 fish were combined with the REDR release for estimation of timing data.

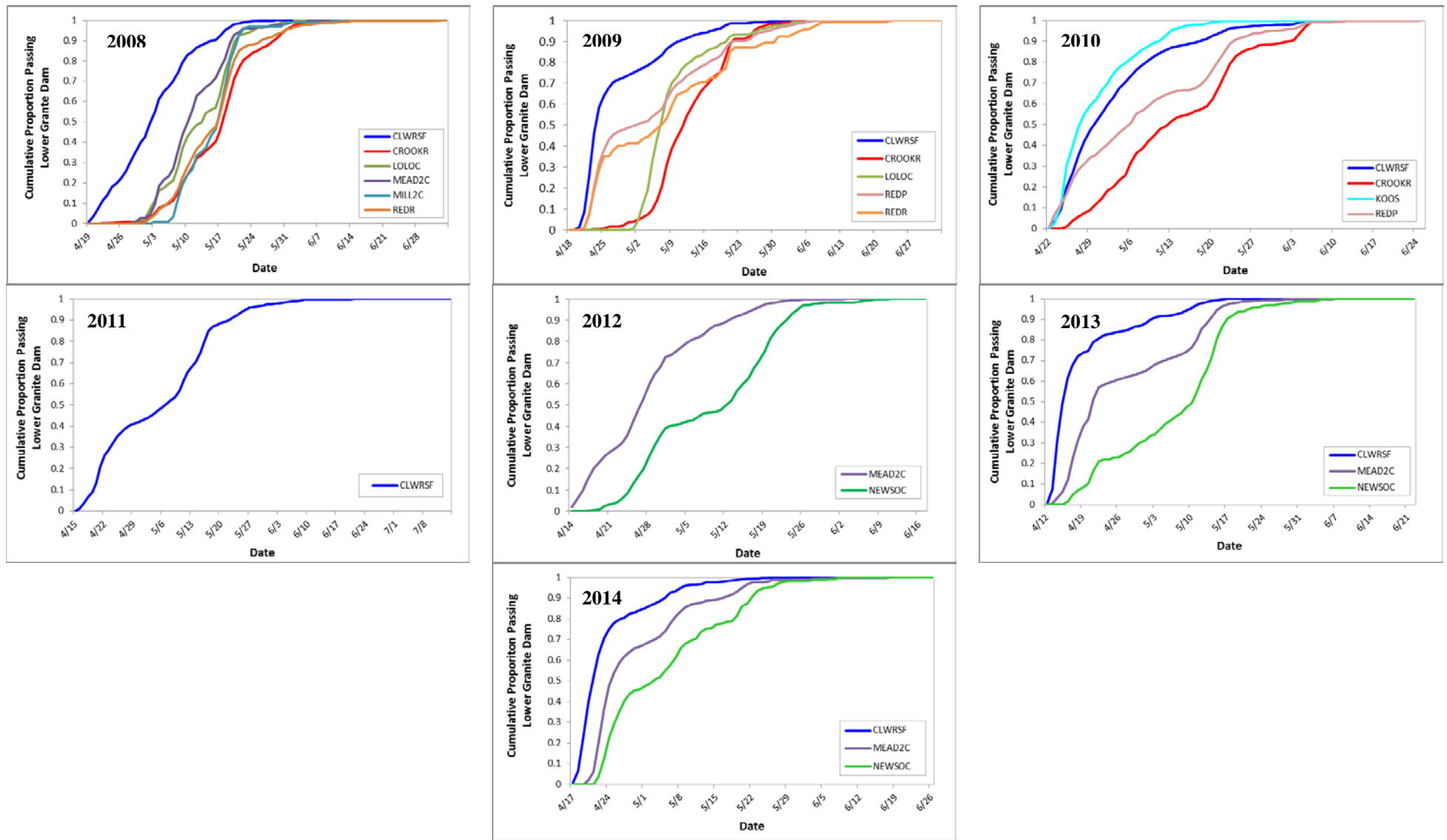
**Table 4.** Estimated 10%, 50%, and 90% passage dates of PIT-tagged Clearwater Hatchery steelhead at Lower Granite Dam.

<b>Migration Year</b>	<b>Release Site</b>	<b>Release Date(s)</b>	<b>10% Passage Date</b>	<b>50% Passage Date</b>	<b>90% Passage Date</b>
2008	CLWRSF	4/7-4/15	22-Apr	3-May	15-May
	CROOKR	4/7-4/9	7-May	18-May	29-May
	LOLOC	4/21	3-May	14-May	21-May
	MEAD2C	4/18	4-May	11-May	20-May
	MILL2C	4/18	8-May	17-May	21-May
	REDR	4/10-4/11	6-May	17-May	26-May
	All Sites	4/7-4/21	29-Apr	12-May	23-May
2009	CLWRSF	4/14-4/16	22-Apr	24-Apr	11-May
	CROOKR	4/17	6-May	12-May	22-May
	LOLOC	4/28	3-May	7-May	21-May
	REDP	4/13	23-Apr	2-May	22-May
	REDR	4/13	23-Apr	7-May	31-May
	All Sites	4/13-4/28	22-Apr	25-Apr	16-May
	2010	CLWRSF	4/15-4/19	25-Apr	30-Apr
CROOKR		4/14	30-Apr	13-May	2-Jun
KOOS		4/20	24-Apr	28-Apr	11-May
REDP		4/12	24-Apr	6-May	24-May
All Sites		4/12-4/20	25-Apr	1-May	21-May
2011	CLWRSF	4/12-4/18	20-Apr	7-May	22-May
2012	MEAD2C	4/10-4/11	17-Apr	27-Apr	13-May
	NEWSOC	4/12	25-Apr	12-May	23-May
	All Sites	4/10-4/12	17-Apr	28-Apr	8-May
2013	CLWRSF	4/9	14-Apr	16-Apr	3-May
	MEAD2C	4/8-4/12	16-Apr	21-Apr	14-May
	NEWSOC	4/10	20-Apr	11-May	17-May
	All Sites	4/8-4/12	15-Apr	21-Apr	14-May
2014	CLWRSF	4/14	19-Apr	21-Apr	5-May
	MEAD2C	4/16	22-Apr	25-Apr	17-May
	NEWSOC	4/17	23-Apr	3-May	22-May
	All Sites	4/14-4/17	21-Apr	25-Apr	16-May

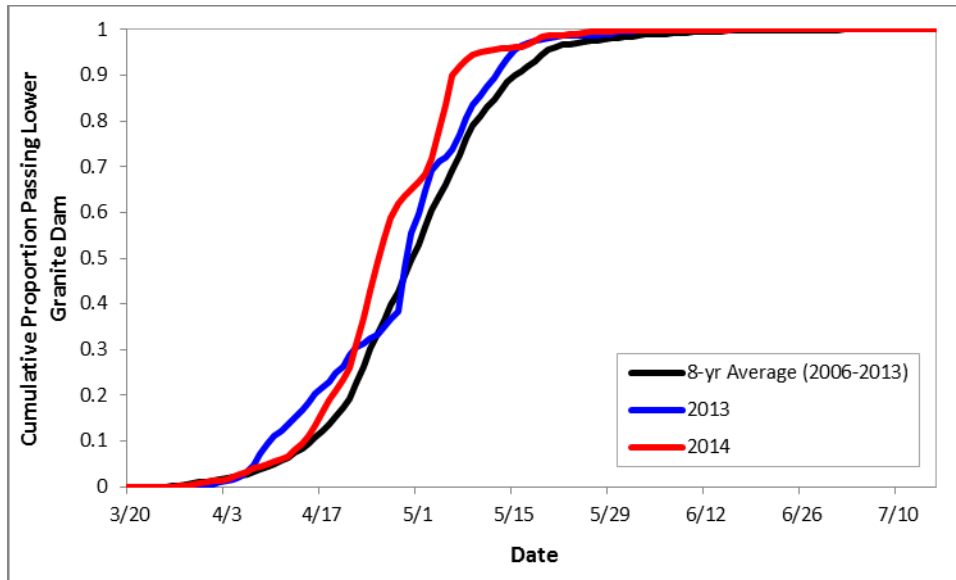
Figure 1 is provided as an illustration of the arrival timing of each group of Clearwater Hatchery Chinook (i.e., each release site) to Lower Granite Dam. Separate sub-figures are provided for each migration year (2006–2014). Figure 2 is provided as an illustration of the arrival timing of each group of Clearwater Hatchery steelhead (i.e., each release site) to Lower Granite Dam. As with the Chinook, separate sub-figures are provided for each migration year (2008–2014). Finally, Figure 3 and 4 are provided as illustrations of the cumulative 2014 arrival timing compared to that from 2013 and the current 8-year average (2006–2013) for yearling Chinook (Figure 3) and 6-year average (2008–2013) for steelhead (Figure 4).



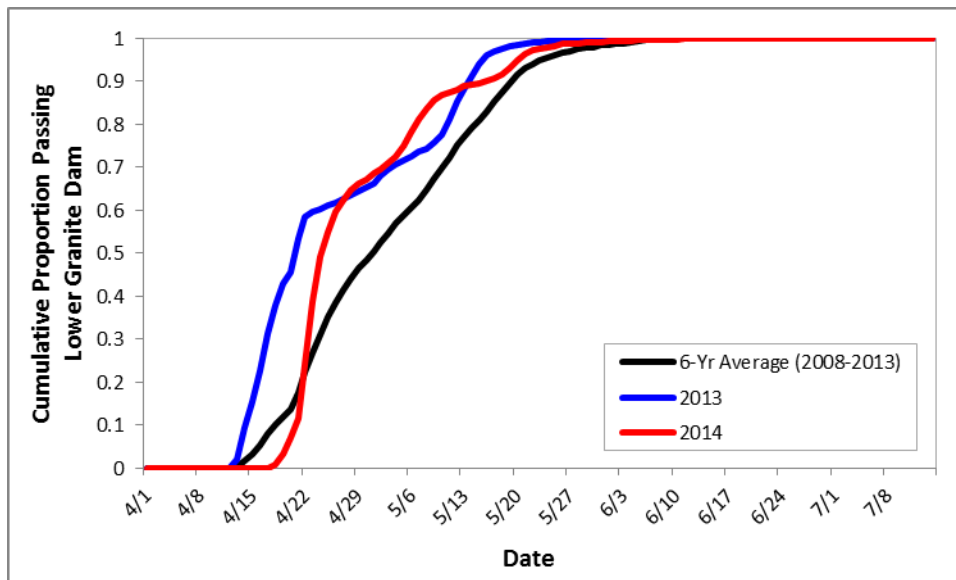
**Figure 1.** Cumulative passage timing of Clearwater Hatchery yearling spring and summer Chinook to Lower Granite Dam (2006–2014). Only 9 PIT-tagged fish released at REDP in 2010 were detected at LGR. These fish were combined with the REDR releases for a single timing curve. Summer Chinook releases were at CROOKR in 2011–2013 and POWP in 2014. Note the different scales for the X-axes.



**Figure 2.** Cumulative passage timing of Clearwater Hatchery steelhead to Lower Granite Dam (2008–2014). Note the different scales for the X-axes.



**Figure 3.** Cumulative passage timing of Clearwater Hatchery yearling spring and summer Chinook (all release sites combined) to Lower Granite Dam in 2014, 2013, and the current 8-year average (2006–2013).

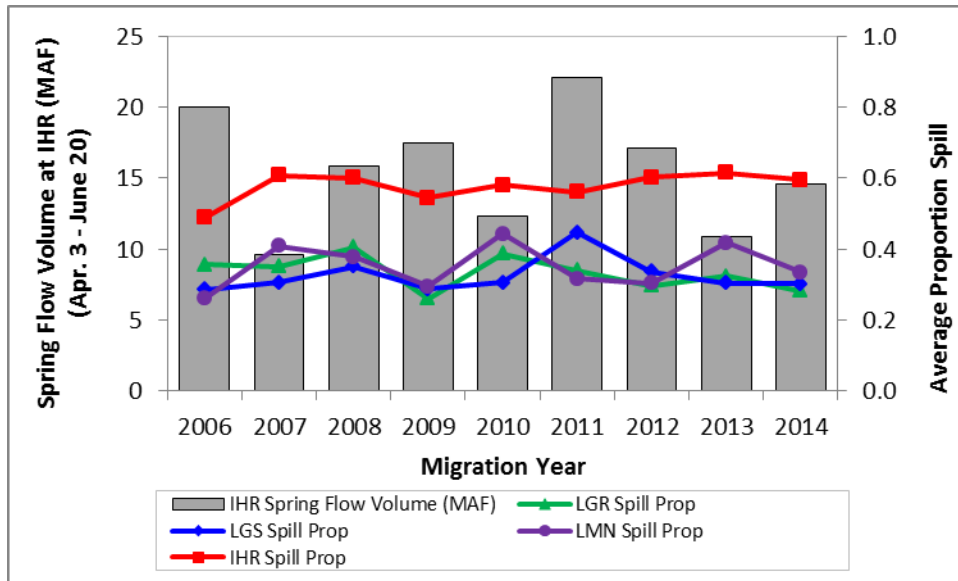


**Figure 4.** Cumulative passage timing of Clearwater Hatchery steelhead (all release sites combined) to Lower Granite Dam in 2014, 2013, and the current 6-year average (2008–2013).

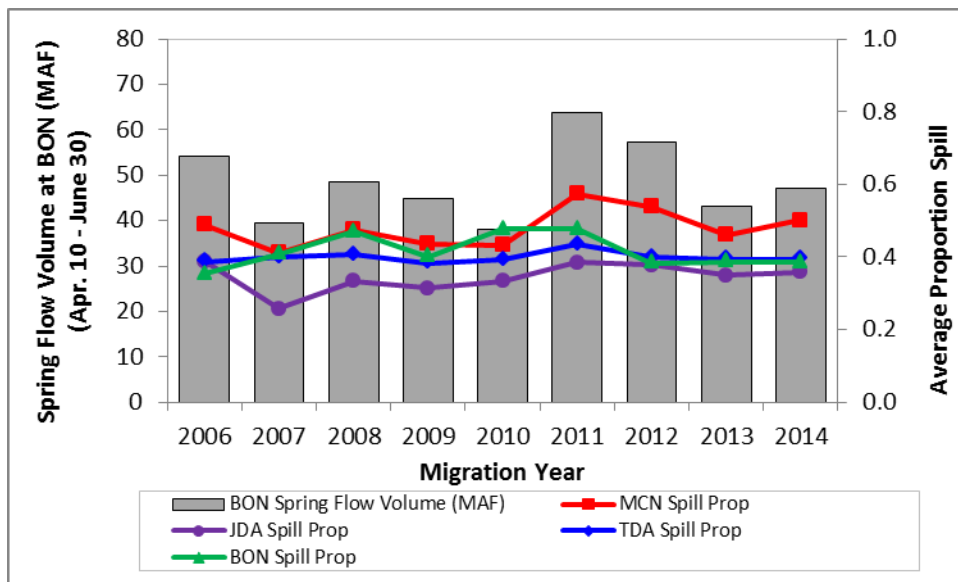
Figures 5 and 6 are provided below to illustrate the out-migration conditions that these spring migrants may have experienced in the Snake and Lower Columbia rivers. Figure 5 provides the total spring flow volume (April 3–June 20) for the Snake River (as measured at Ice Harbor), along with the average spring spill proportions at each of Lower Granite, Little Goose,



Lower Monumental, and Ice Harbor dams, for each migration year. Figure 6 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 5.** 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 6.** 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 Clearwater Hatchery 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(C<sub>0</sub>), and Weighted SAR<sub>LGR-to-LGR</sub>, where SAR(T) represents smolts transported from Lower Granite, Little Goose, or Lower Monumental Dam, SAR(C<sub>0</sub>) represents smolts migrating in river (undetected at Snake River transportation collector sites), and Weighted SAR<sub>LGR-to-LGR</sub> 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<sub>LGR-to-LGR</sub>. In effect, the Weighted SAR<sub>LGR-to-LGR</sub> 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 2014 CSS Annual Report, which can be downloaded from the FPC webpage [www.fpc.org/documents/CSS.html](http://www.fpc.org/documents/CSS.html). Figure 7 is a time series of the Weighted SAR<sub>LGR-to-LGR</sub> over the years of available data for Clearwater Hatchery spring and summer Chinook.

More representative tagging for Snake River steelhead hatcheries 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, CSS has been grouping and analyzing 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 Clearwater Hatchery are part of the Clearwater-B group, which also includes hatchery steelhead from Dworshak NFH. Estimates of juvenile survival in the hydrosystem, proportion transported, and various SARs for Clearwater-B hatchery steelhead are provided in Table 6 (2008–2011). The data presented in Table 6 were taken from various chapters and appendices of the 2014 CSS Annual Report, which can be downloaded from the FPC webpage ([www.fpc.org/documents/CSS.html](http://www.fpc.org/documents/CSS.html)). A time series of the overall SAR<sub>LGR-to-LGR</sub> for Clearwater-B hatchery steelhead group is also provided in Figure 7.

**Table 5** Clearwater Hatchery spring and summer Chinook survivals from CSS.

Release Date(s)	Migration Year <sup>A</sup>	Species	Juvenile Survival (LGR-BON)	Proportion Transported	TIR	SAR(T) %	SAR(C <sub>0</sub> ) %	Weighted SAR <sub>LGR-to-LGR</sub> %
3/22-4/3	2006	SpCH	0.64	0.63	1.11	0.63	0.57	0.57
3/6-3/31	2007	SpCH	0.78	0.12	1.47	0.41	0.28	0.30
3/19-4/6	2008	SpCH	0.58	0.44	0.91	0.93	1.03	0.97
3/23-4/8	2009	SpCH	0.63	0.25	1.35	0.89	0.66	0.71
3/2-3/29	2010	SpCH	0.66	0.14	1.33	0.60	0.45	0.48
3/21-4/4	2011	SpCH	0.49	0.25	0.63	0.09	0.14	0.15
3/21-4/5	2012 <sup>B</sup>	SpCH	0.65	0.16	1.16	0.63	0.54	0.50
3/18-3/27	2013 <sup>C</sup>	SpCH	0.67	0.16				
3/26	2011	SuCH	0.62	0.38	0.33	0.08	0.26	0.18
3/26	2012 <sup>B</sup>	SuCH	0.63	0.15	0.83	0.19	0.23	0.29
3/20	2013 <sup>C</sup>	SuCH	0.63	0.23				

<sup>A</sup> Smolt migration year 2006 through 2010 use combined TWS and BWS data.

<sup>B</sup> Adult returns for migration year 2012 are incomplete with Age 2-salt adult returns through 9/14/2014.

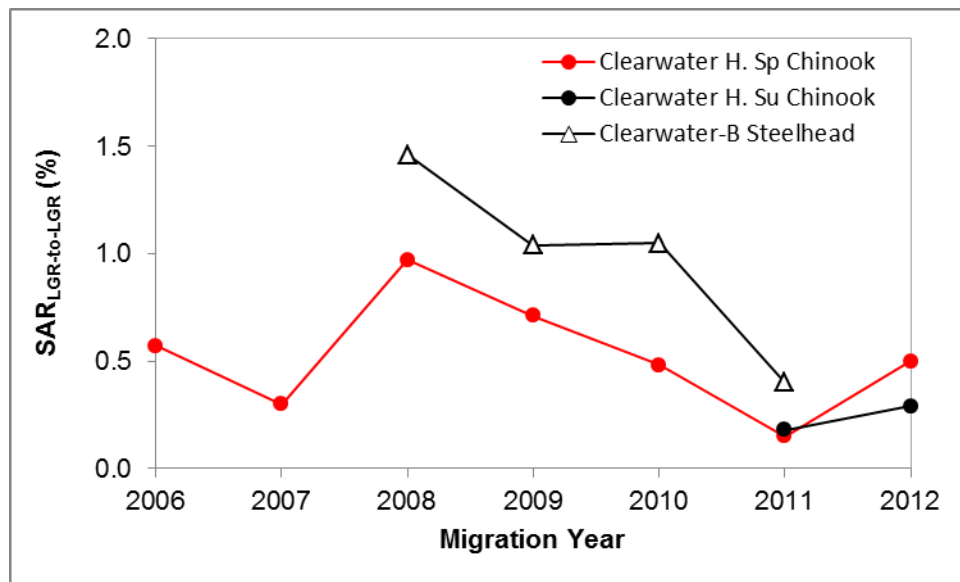
<sup>C</sup> No adult returns to date, only juvenile metrics available for estimation.

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

Release Date(s)	Migration Year <sup>A</sup>	Juvenile Survival (LGR-BON)	Proportion Transported	TIR	SAR(T) %	SAR(C <sub>0</sub> ) %	Weighted SAR <sub>LGR-to-LGR</sub> %
4/7-4/24	2008	0.47	0.30	1.55	1.96	1.26	1.46
4/13-4/28	2009	0.61	0.22	0.74	0.99	1.34	1.04
4/12-4/22	2010	0.52	0.31	0.76	0.90	1.18	1.05
3/21-4/27	2011	0.48	0.26	1.14	0.46	0.40	0.40
4/3-4/12	2012 <sup>B</sup>	0.69	0.14				
4/8-4/17	2013 <sup>B</sup>	0.54	0.15				

<sup>A</sup> 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.

<sup>B</sup> No adult returns have been analyzed to date, only juvenile metrics are available.



**Figure 7.** Weighted SAR<sub>LGR-to-LGR</sub> for Clearwater Hatchery spring Chinook (2006–2012), Clearwater Hatchery summer Chinook (2011–2012), and Clearwater-B hatchery steelhead (2008–2011). Chinook adult returns for migration year 2012 are incomplete, with Age 2-salt adult returns through 9/14/2014.

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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