



FISH PASSAGE CENTER

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MEMORANDUM

TO: Cassie Sundquist, IDFG

FROM: Brandon R. Chockley

DATE: January 4, 2017

RE: 2016 Sawtooth Hatchery Report

The Fish Passage Center has been marking spring Chinook and sockeye from Sawtooth Hatchery 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, steelhead, and sockeye produced in major hatcheries. We would like to share with you some of the information we developed under the CSS for the Chinook and sockeye used from Sawtooth Hatchery in 2016 and past years.

With the marking efforts over the past several years, information on the timing and migration speed from the hatchery to Lower Granite Dam is 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 Chinook from Sawtooth Hatchery to Lower Granite Dam. Also provided are estimates of the 95% confidence limits around the estimated median travel time. For comparison purposes, separate travel times are provided for each of the different release sites, when applicable, as well as for all release sites combined. Table 2 provides the above mentioned travel time estimates for the Sawtooth Hatchery sockeye releases that the CSS has provided analyses and/or tags for marking through migration year 2015. Releases of hatchery sockeye from Sawtooth Hatchery were discontinued after 2015.

Table 1. Travel times (release to LGR) of Sawtooth Hatchery yearling spring Chinook.

Migration Year	Release Site	Release Date	Travel Time (Days)			95% Confidence Limits	
			Min	Med	Max	Lower	Upper
2007	SAWT	4/11	15.0	26.6	48.1	26.4	26.9
2008	SAWT	4/23	12.8	20.4	49.7	20.2	20.6
2009	SAWT	4/14	8.3	22.0	49.0	21.6	22.3
2010	SAWT	4/9	15.7	29.3	70.4	28.5	29.6
	YANKFK	4/20	11.2	29.9	57.6	29.6	30.2
	All Sites	4/9, 4/20	11.2	29.6	70.4	29.2	29.8
2011	SAWT	4/1	12.2	39.5	68.3	39.3	39.6
	YANKFK	4/19-4/20	15.2	24.5	45.6	23.8	24.8
	All Sites	4/1, 4/19-4/20	12.2	39.3	68.3	39.2	39.3
2012	SAWT	4/6	10.3	27.9	61.4	27.4	28.3
	YANKFK	4/3-4/4	13.4	28.8	54.4	27.0	29.8
	All Sites	4/3-4/4, 4/6	10.3	28.0	61.4	27.4	28.3
2013	SAWT	4/5	14.7	35.0	56.8	34.7	35.3
2014	SAWT	4/4	11.1	30.4	52.3	30.4	30.5
	YANKFK	4/24-4/25	10.6	22.4	34.5	21.4	23.3
	All Sites	4/4, 4/24-4/25	10.6	30.3	52.3	30.1	30.4
2015	SAWT	4/1-4/3	9.9	34.8	54.9	34.2	35.0
	YANKFK	4/20	14.2	18.6	42.0	18.2	19.5
	All Sites	4/1-4/, 4/20	9.9	33.7	54.9	33.4	34.0
2016	SAWT	4/1	9.3	24.9	53.7	24.8	25.3
	YANKFK	4/19	8.9	19.9	45.4	19.6	20.20
	All Sites	4/1, 4/19	8.9	24.5	53.7	24.4	24.7

Table 2. Travel times (release to LGR) of Sawtooth Hatchery sockeye.

Migration Year	Release Site	Release Date	Travel Time (Days)			95% Confidence Limits	
			Min	Med	Max	Lower	Upper
2009	SAWTRP	5/7	6.4	12.4	54.3	12.36	12.37
2010	SAWTRP,	5/4	12.4	17.5	39.0	17.47	17.61
	RLCTRP						
2011	RLCTRP	5/12	4.6	11.1	63.6	11.03	11.29
2012	RLCTRP	5/10	5.6	10.7	61.6	10.57	10.83
2013	RLCTRP	5/9	4.0	6.3	75.1	6.27	6.30
2014	RLCTRP	5/8-5/9	7.0	8.8	55.5	8.79	8.86
2015	RLCTRP	5/4-5/5	6.0	8.6	20.6	8.55	8.69

In addition, we are providing you with the estimated 10%, 50%, and 90% passage dates of yearling spring Chinook (Table 3) and sockeye (Table 4) juveniles from Sawtooth Hatchery arriving at Lower Granite Dam for each of the years of tagging. As with the Chinook travel time tables, Table 3 provides separate estimates for each of the release sites, when applicable, as well as the entire release for each year. Figure 1 is provided as an illustration of the arrival timing of the 2016 Chinook release from Sawtooth Hatchery (SAWT) to Lower Granite Dam compared to the previous year and the current 9-year average (2007–2015). Figure 2 provides an illustration of the arrival timing of the Chinook releases from Yankee Fork Salmon River (YANKFK) to Lower Granite Dam (2010–2012 and 2014–2016). Figure 3 is provided as an illustration of the arrival timing of the sockeye releases to Lower Granite Dam (2009–2015).

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

Migration Year	Release Site	Release Date(s)	10% Passage Date	50% Passage Date	90% Passage Date
2007	SAWT	4/11	2-May	8-May	13-May
2008	SAWT	4/23	10-May	14-May	19-May
2009	SAWT	4/14	28-Apr	6-May	17-May
2010	SAWT	4/9	1-May	8-May	20-May
	YANKFK	4/20	13-May	20-May	25-May
	All Sites	4/9, 4/20	1-May	11-May	21-May
2011	SAWT	4/1	2-May	11-May	16-May
	YANKFK	4/19-4/20	10-May	14-May	20-May
	All Sites	4/1, 4/19-4/20	2-May	11-May	16-May
2012	SAWT	4/6	26-Apr	3-May	17-May
	YANKFK	4/3-4/4	25-Apr	30-Apr	17-May
	All Sites	4/3-4/4, 4/6	26-Apr	3-May	17-May
2013	SAWT	4/5	6-May	10-May	14-May
2014	SAWT	4/4	23-Apr	4-May	10-May
	YANKFK	4/24-4/25	9-May	17-May	20-May
	All Sites	4/4, 4/24-4/25	23-Apr	5-May	13-May
2015	SAWT	4/1-4/3	25-Apr	6-May	11-May
	YANKFK	4/20	6-May	9-May	14-May
	All Sites	4/1-4/3, 4/20	26-Apr	6-May	12-May
2016	SAWT	4/1	17-Apr	26-Apr	6-May
	YANKFK	4/19	6-May	9-May	15-May
	All Sites	4/1, 4/19	17-Apr	27-Apr	9-May

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

Migration Year	Release Site	Release Date(s)	10% Passage Date	50% Passage Date	90% Passage Date
2009	SAWTRP	5/7	16-May	19-May	21-May
2010	SAWTRP,	5/4	18-May	22-May	24-May
	RLCTRP				
2011	RLCTRP	5/12	20-May	23-May	27-May
2012	RLCTRP	5/10	17-May	20-May	29-May
2013	RLCTRP	5/9	15-May	16-May	18-May
2014	RLCTRP	5/8-5/9	16-May	17-May	20-May
2015	RLCTRP	5/4-5/5	12-May	13-May	14-May

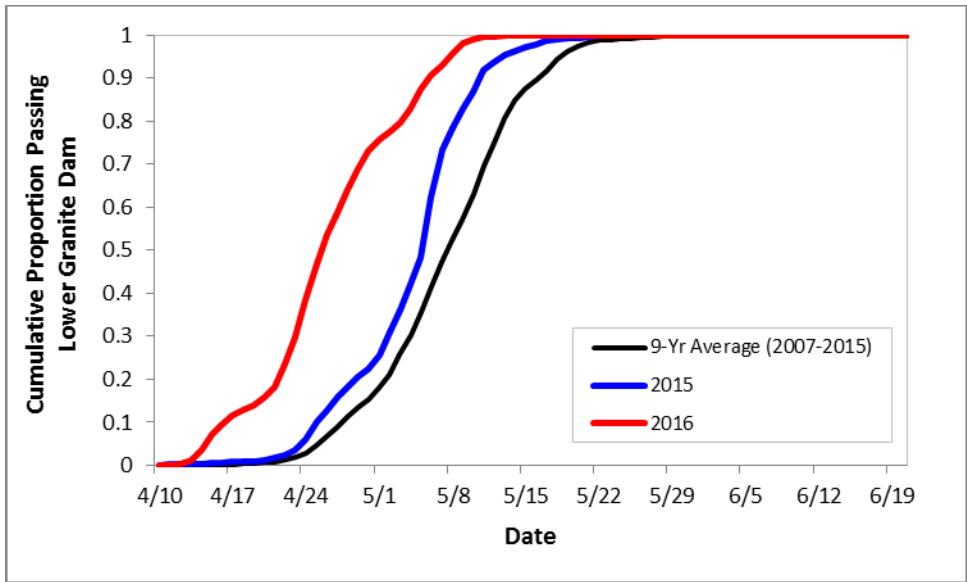


Figure 1. Cumulative passage timing to Lower Granite Dam of Sawtooth Hatchery yearling spring Chinook released at SAWT release site.

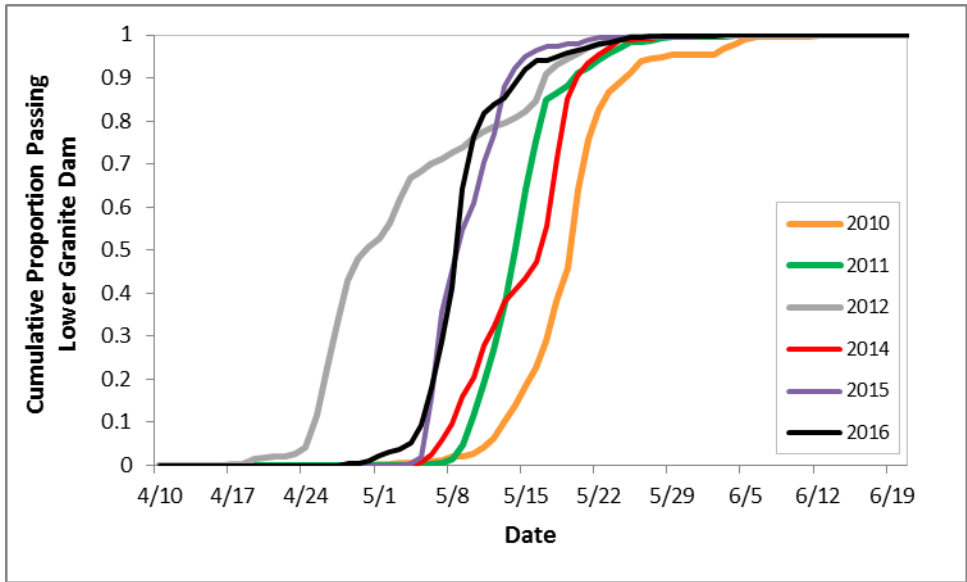


Figure 2. Cumulative passage timing to Lower Granite Dam of Sawtooth Hatchery yearling spring Chinook released at YANKFK release site.

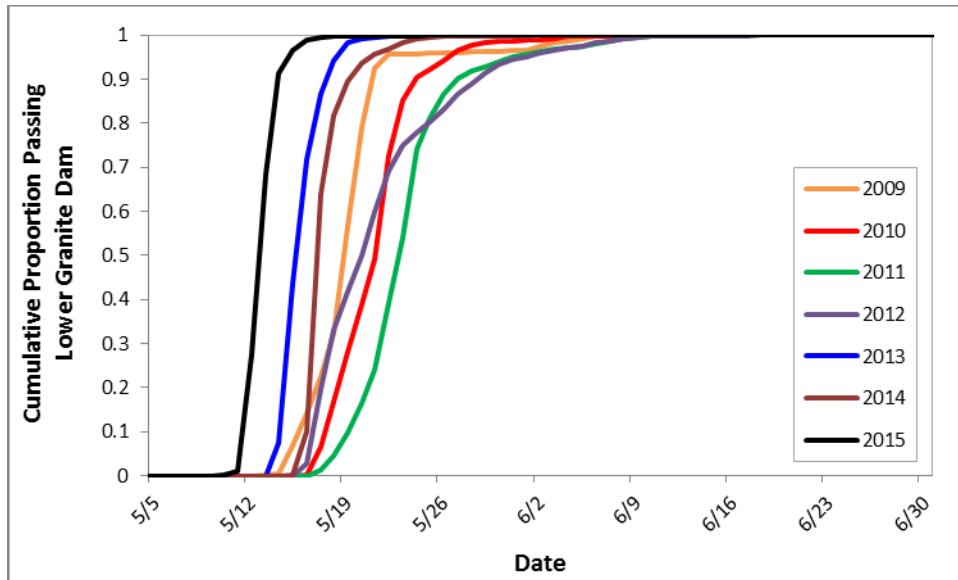


Figure 3. Cumulative passage timing to Lower Granite Dam of Sawtooth Hatchery sockeye.

Figures 4 and 5 are provided below to illustrate the out-migration conditions that these spring migrants may have experienced in the Snake and Middle Columbia rivers. Figure 4 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 5 provides the total spring flow volume (April 10–June 30) for the Middle 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.

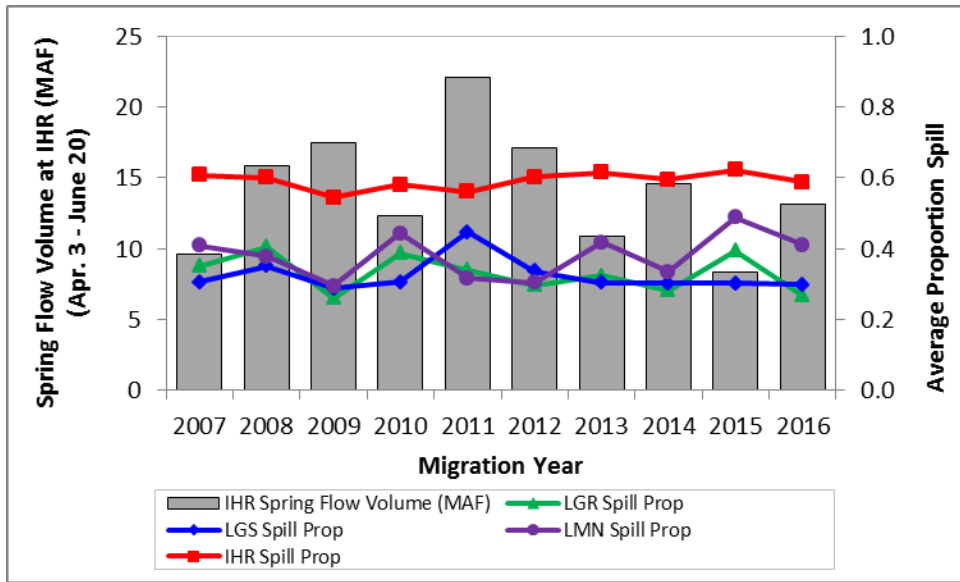


Figure 4. Total spring flow volume in the Snake River (at Ice Harbor Dam) and average spill proportion at Lower Granite, Little Goose, Lower Monumental, and Ice Harbor dams. Spring period in the Snake River is April 3–June 20.

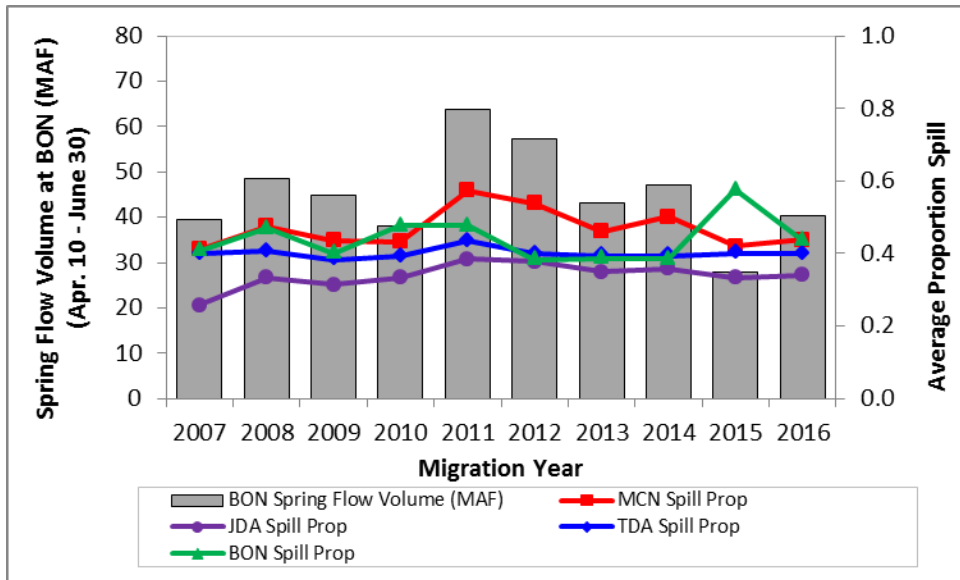


Figure 5. Total spring flow volume in the Middle Columbia River (at Bonneville Dam) and average spill proportion at McNary, John Day, The Dalles, and Bonneville dams. Spring period in the Lower Columbia River is April 10–June 30.

Finally, the tables below contain estimates calculated for Sawtooth Hatchery Chinook (Tables 5 and 6) and sockeye (Tables 7 and 8) by the CSS. The estimates provided include: (1) juvenile survival in the hydrosystem between Lower Granite and Bonneville dams (Tables 5 and 7), (2) the proportion of the juvenile population destined for transportation (Tables 5 and 7),

and (3) the smolt-to-adult survival (SAR) for several passage categories (Tables 6 and 8). Those passage categories are SAR(T), SAR(C₀), and Overall SAR, 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 SAR estimates are for the LGR-to-GRA reach and jacks are excluded for Chinook. The data presented in Tables 5-8 were taken from various chapters and appendices of the 2016 CSS Annual Report, which can be downloaded from the FPC webpage www.fpc.org/documents/CSS.html. Figure 6 is a time series of the Overall SAR over the years of available data from Sawtooth Hatchery.

Table 5. Sawtooth Hatchery spring Chinook juvenile survivals and estimated proportion transported (with 90% confidence intervals) from CSS.

Release Date(s)	Migration Year ^A	Juvenile Survival (LGR-BON)	Proportion Transported
4/11	2007	0.71 (0.63-0.81)	0.45 (0.44-0.47)
4/23	2008	0.56 (0.39-0.84)	0.59 (0.56-0.62)
4/14	2009	0.56 (0.43-0.79)	0.39 (0.37-0.40)
4/9, 4/20	2010	0.55 (0.44-0.71)	0.33 (0.31-0.34)
4/1, 4/19-4/20	2011	0.55 (0.41-0.76)	0.58 (0.57-0.60)
4/3-4/4, 4/6	2012	0.58 (0.51-0.68)	0.49 (0.47-0.51)
4/5	2013	0.59 (0.49-0.72)	0.51 (0.49-0.52)
4/4, 4/24-4/25	2014	0.57 (0.42-0.88)	0.46 (0.44-0.47)
4/1-4/3, 4/20	2015	0.53 (0.42-0.70)	0.19 (0.18-0.21)

^A All migration years 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.

Table 6. Sawtooth 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(s)	Migration Year ^A	TIR	SAR(T) %	SAR(C ₀) %	Overall SAR %
4/11	2007	2.08 (1.27-3.66)	0.85 (0.61-1.12)	0.41 (0.26-0.59)	0.63 (0.50-0.79)
4/23	2008	1.88 (1.08-4.11)	1.23 (0.89-1.61)	0.66 (0.32-1.03)	1.00 (0.75-1.25)
4/14	2009	4.19 (2.08-10.67)	0.79 (0.48-1.13)	0.19 (0.09-0.32)	0.39 (0.25-0.54)
4/9, 4/20	2010	1.51 (0.78-2.56)	0.60 (0.35-0.89)	0.40 (0.27-0.54)	0.45 (0.32-0.60)
4/1, 4/19-4/20	2011	0.85 (0.20-4.47)	0.09 (0.02-0.18)	0.11 (0.03-0.22)	0.08 (0.03-0.13)
4/3-4/4, 4/6	2012	1.93 (0.94-5.22)	0.49 (0.29-0.72)	0.25 (0.11-0.42)	0.40 (0.27-0.54)
4/5	2013	1.36 (0.88-2.02)	0.79 (0.58-1.02)	0.58 (0.41-0.76)	0.69 (0.54-0.85)
4/4, 4/24-4/25	2014 ^B	1.08 (0.54-2.15)	0.31 (0.18-0.46)	0.29 (0.16-0.42)	0.32 (0.23-0.42)

^A All migration years 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 Adult returns for migration year 2014 are incomplete with Age 2-salt adult returns through 9/16/2016.

Table 7. Sawtooth Hatchery sockeye juvenile survivals and estimated proportion transported (with 90% confidence intervals) from CSS.

Release Date(s)	Migration Year ^A	Juvenile Survival (LGR-BON)	Proportion Transported
5/7	2009	0.64 (0.52-0.83)	0.58 (0.57-0.59)
5/4	2010	0.50 (0.40-0.67)	--- ^B
5/12	2011	0.44 (0.35-0.57)	0.44 (0.43-0.45)
5/10	2012	0.35 (0.29-0.45)	0.67 (0.66-0.68)
5/9	2013	0.51 (0.42-0.65)	0.52 (0.51-0.54)
5/8-5/9	2014	0.52 (0.42-0.65)	0.66 (0.65-0.67)
5/4-5/5	2015	0.41 (0.33-0.51)	0.12 (0.11-0.14)

^A All migration years 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 Due to an error in pre-assignments, very few PIT-tagged sockeye smolts were transported. Therefore, estimates of proportion transported were not possible.

Table 8. Sawtooth Hatchery sockeye 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(s)	Migration Year ^A	TIR	SAR(T) %	SAR(C ₀) %	Overall SAR %
5/7	2009	1.04 (0.83-1.30)	1.21 (1.03-1.40)	1.16 (0.98-1.35)	1.15 (1.02-1.29)
5/4	2010 ^B	N/A	N/A	0.45 (0.29-0.60)	N/A
5/12	2011	0.88 (0.25-1.94)	0.07 (0.03-0.13)	0.08 (0.04-0.12)	0.10 (0.06-0.13)
5/10	2012	0.37 (0.18-0.69)	0.08 (0.04-0.12)	0.21 (0.13-0.30)	0.12 (0.08-0.15)
5/9	2013	0.99 (0.54-1.73)	0.16 (0.10-0.23)	0.16 (0.10-0.22)	0.15 (0.11-0.20)
5/8-5/9	2014 ^C	0.72 (0.45-1.04)	0.35 (0.23-0.48)	0.48 (0.39-0.58)	0.42 (0.34-0.50)

^A All migration years 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 Very few PIT-tagged Sawtooth hatchery sockeye estimated in T_x category with no adult returns. Therefore, estimation of TIR, SAR(T), and Overall SAR was not possible.

^C Adult returns for migration year 2014 are incomplete with Age 2-salt adult returns through 9/16/2016.

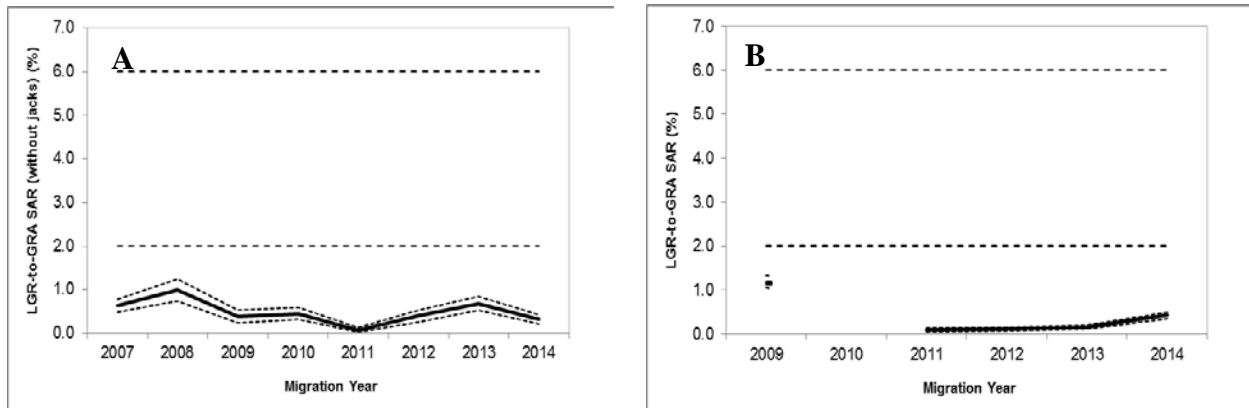


Figure 6. Overall SAR for Sawtooth Hatchery spring Chinook (without jacks) (A) and sockeye (B) (with 90% confidence intervals). The NPCC 2-6% SAR objectives for listed wild populations are shown for reference. Migration year 2014 is incomplete with Age 2-salt adult returns through 9/16/2016.

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.

c: Lance Hebdon, IDFG
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Jay Hesse, Nez Perce
Tom Rien, ODFW
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