FISHERY RESEARCH

IPC AND LSRCP MONITORING AND EVALUATION PROGRAMS IN THE STATE OF IDAHO: CALENDAR YEAR 2017 AND BROOD YEAR 2011 HATCHERY CHINOOK SALMON REPORTS

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OVERVIEW

This report contains summaries of LSRCP and IPC hatchery Chinook Salmon programs at both the calendar (2017) and brood year (2011) level. The report contains two chapters that describe monitoring and evaluation of the programs during 2017 (Chapter 1) and the performance of brood year 2011 cohorts both in the hatchery and as returning adults from 2014-2016 (Chapter 2).

CHAPTER 1

2017 CALENDAR YEAR HATCHERY CHINOOK SALMON REPORT:

IDAHO POWER COMPANY AND LOWER SNAKE RIVER COMPENSATION PLAN MONITORING AND EVALUATION PROGRAMS IN THE STATE OF IDAHO

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INTRODUCTION

This report details hatchery-origin spring, summer, and fall Chinook Salmon monitoring, evaluation, and management for calendar year 2017. Information is reported for Chinook Salmon from five different hatcheries operated by the Idaho Department of Fish and Game (IDFG). These facilities include three hatcheries funded by the Lower Snake River Compensation Plan (LSRCP) and two hatcheries funded by the Idaho Power Company (IPC).

The LSRCP hatchery program specified the use of fish hatcheries to compensate for the salmon and steelhead mortality caused by the construction and operation of the four lower Snake River dams. The strategy was to produce and release enough juvenile anadromous salmonids to meet the program's adult return goals. The adult return goals were based on the estimated adult and juvenile fish losses that would result from operation of the four dams. Original loss estimates for spring- and summer-run Chinook Salmon attributable to the four lower Snake River dams were derived by applying a 15% smolt mortality rate at each of the four dams (a total estimated loss of 48%) (U.S. Army Engineer District 1975). That expected loss was multiplied by the estimated average return of spring/summer Chinook Salmon adults (122,200) to the Snake River from 1959-1961 (pre-dam construction) to estimate an annual average loss of 58,677 spring and summer Chinook Salmon. The loss estimate became the annual escapement goal of 58,677 spring- and summer-run (50,677 spring-run and 8,000 summer-run) Chinook Salmon to Lower Granite Dam (LGD [i.e. above the project area] [LSRCP 1991]). Additionally, an assumed 4:1 ratio of catch to above LGD escapement was used to estimate an additional loss of 234,708 in the coastwide commercial, tribal, and recreational fisheries downstream of the project area. These combined catch and escapement estimates resulted in a total mitigation goal of 293,385 adults produced annually for the LSRCP program (Table 1). It was anticipated that the majority of the harvest mitigation benefits would be distributed downstream of the project area. However, lower than expected returns of hatchery fish produced within the program and the depressed status of natural-origin fish influenced Columbia River fisheries management programs. The anticipated 4:1 distribution of benefits downstream: upstream of the project area has not been realized. Based on recent natural-origin and hatchery-origin return abundances and the current ESA listing status of Snake River stocks, it is likely that the current distribution of harvest benefits will continue into the foreseeable future.

Table 1. Adult spring- and summer-run Chinook Salmon mitigation goals for LSRCP-funded hatcheries located in Idaho and operated by IDFG. Return goals listed for satellite facilities are a subset of the overall hatchery return goal (in bold font).

			LSRCP Adult Return Mitigation Goals		
Hatchery	**First Year of Operation**	**Run Type**	**Below Lower Granite Dam**	**Above Lower Granite Dam**	**Total**
McCall	1979	Summer	**32,000**	**8,000**	**40,000**
Sawtooth	1985	Spring	**77,780**	**19,445**	**97,225**
Clearwater Hatchery	1990	Spring	**47,660**	**11,915**	**59,575**
CLW - Powell	1989	Spring	10,212	2,553	12,765
CLW - Red River	1986	Spring	10,212	2,553	12,765
CLW - Crooked River	1990	Spring	27,236	6,809	34,045
Total for LSRCP Facilities Operated by IDFG			**157,440**	**39,360**	**196,800**
Total for all LSRCP Facilities			**234,777**	**58,677**	**293,454**

Idaho Power Company (IPC) owns and maintains two spring/summer Chinook Salmon hatcheries that are operated by IDFG. These hatcheries were constructed as mitigation for the construction and ongoing operation of the Hells Canyon Dam Complex (Brownlee, Oxbow, and Hells Canyon dams). Rapid River Fish Hatchery resulted from mitigation mandated by the Federal Energy Regulatory Commission (FERC) that required IPC to transplant a run of spring Chinook from the Snake River to the Salmon River. Mitigation goals established through the Hells Canyon Settlement Agreement specify juvenile production targets of three million spring Chinook Salmon smolts at the Rapid River Fish Hatchery and one million summer Chinook Salmon smolts at the Pahsimeroi Fish Hatchery (Table 2). A complete description of mitigation goals and hatchery programs can be found in Sullivan et al. 2018.

Table 2. Adult spring and summer run Chinook Salmon release goals for IPC-funded hatcheries located in Idaho and operated by IDFG.

Hatchery	First Year of Operation	Run Type	Smolt Release Goal
Rapid River	1965	Spring	3,000,000
Pahsimeroi	1968	Summer	1,000,000
		TOTAL	**4,000,000**

Between 2017 and 2020, the Marine Fisheries Advisory Council convened the Columbia Basin Partnership Task Force (Partnership), including members from public utilities, state governments, commercial fishers, non-governmental organizations, water users, and tribal governments, established qualitative and quantitative goals for Chinook Salmon, Steelhead, Sockeye Salmon, and Coho Salmon in the Columbia basin. Setting these goals provided stakeholders in the Columbia basin with a common currency to use during discussions regarding the status of anadromous fish. In the Partnership framework, hatchery and wild/ natural origin fish were considered separately for both qualitative and quantitative goals. Qualitative goals for hatchery fish included supplementation, mitigation, and conservation, while quantitative goals were set using historical escapement estimates and harvest estimates. Based on this process which included substantial IDFG staff technical input, the quantitative escapement goal for adult spring/ summer run Chinook Salmon above Lower Granite Dam was set at 90,000 hatchery fish and 127,000 wild/natural fish (NOAA 2019). The IDFG Commission formally adopted these goals by including them in the latest Idaho Fisheries Management Plan (IDFG 2019).

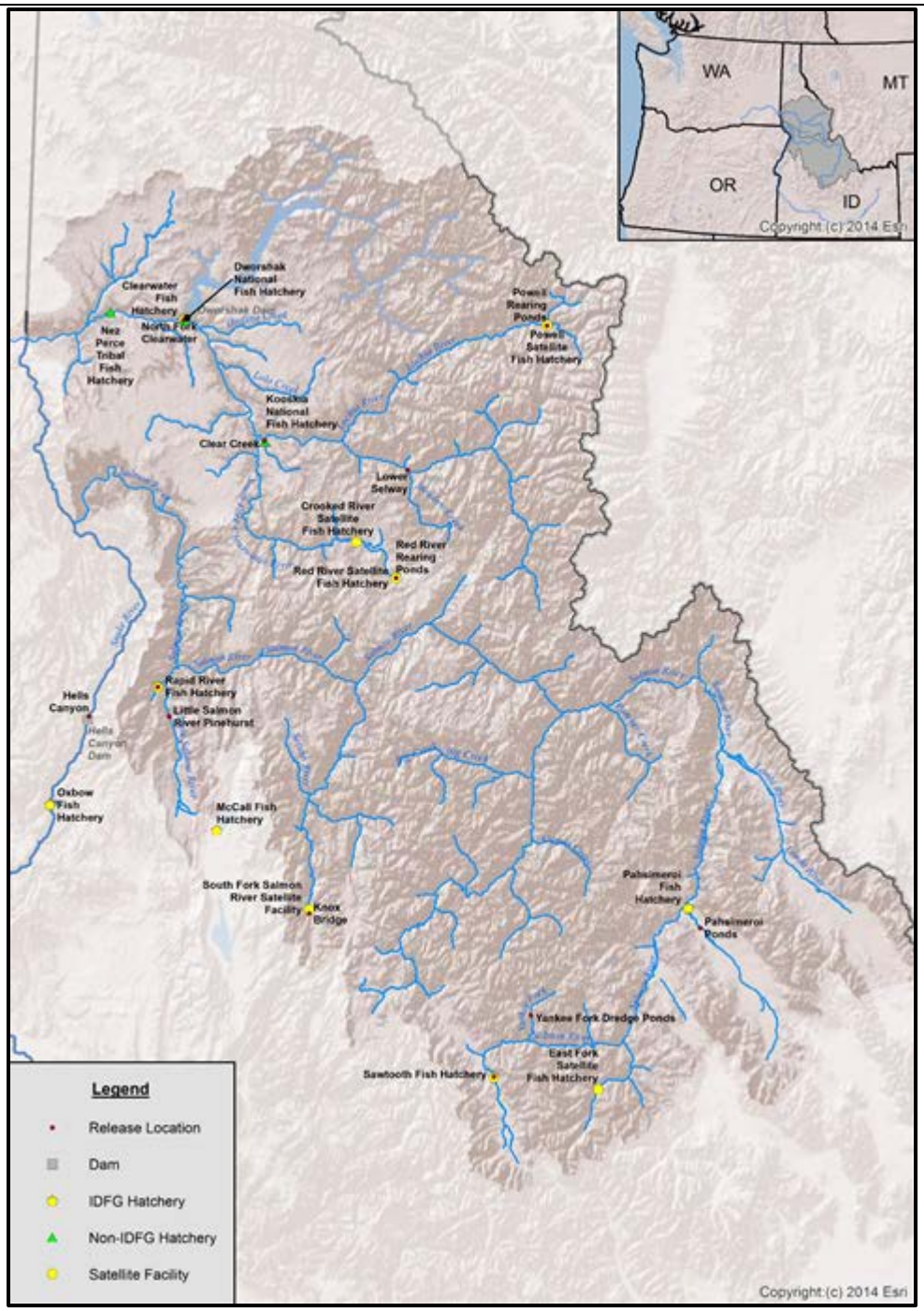

Figure 1. State-, federally-, and tribally-operated anadromous fish hatcheries located in the Clearwater, Salmon, and mid-Snake river basins along with associated satellite facilities and juvenile release locations.

JUVENILE PRODUCTION AND RELEASE

Juvenile Chinook Salmon were released between mid-March and late-April of 2017. Release goals were met or exceeded at all facilities except for Sawtooth which met 85.4% of its release goal. We did not release juveniles in Hells Canyon in 2017 because of high river flows. Release locations are shown in Figure 1.

Table 3. Juvenile Chinook Salmon released in 2017 from hatcheries operated by IDFG.

Migr. Year	Hatchery	Rel. Site	Release Date(s)	AD Only	AD/CWT	CWT Only	No Tag	PIT TAG*	Total Release
2017	McCall (Seg)	SFSR-Knox	4/5	820,825	124,481	0	0	25,917	945,306
2017	McCall (Int.)	SFSR-Knox	4/5	0	0	162,604	188	25,938	162,792
		McCall Total Release		**820,825**	**124,481**	**162,604**	**188**	**51,855**	**1,108,098**
2017	Rapid River	Rapid R. Ponds	3/13 - 4/27	2,897,520	119,002	0	0	51,902	3,016,522
2017	Rapid River	Little Sal. R.	3/18	200,000	0	0	0	0	200,000
2017**	Rapid River	Hells Can. Dam	--	0	0	0	0	0	0
		Rapid River Total Release		**3,097,520**	**119,002**	**0**	**0**	**51,902**	**3,216,522**
2017	Clearwater	Red River	4/11	1,167,008	122,672	0	0	17,082	1,289,680
2017	Clearwater	Powell Pond	3/15	189,315	117,670	0	309,732	25,468	616,717
2017	Clearwater	Selway R. (Spring)	4/7	230,992	115,483	133,672	3,748	12,696	483,895
2017	Clearwater	Selway R. (Summer)	4/7	142,500	0	0	12,696	17,088	155,196
2017	Clearwater	Clear Cr	3/21	651,971	116,263	0	0	9,585	768,234
2017	Clearwater	NF Clearwater	4/4	0	389,115	0	0	17,067	389,115
		Clearwater Total Release		**2,381,786**	**861,203**	**133,672**	**326,176**	**98,986**	**3,702,837**
2017	Sawt (Seg.)	Sawtooth Weir	3/29	993,721	118,574	0	0	18,892	1,112,295
2017	Sawt (Int.)	Sawtooth Weir	3/29	0	0	115,856	2,768	1,985	118,624
2017	Pahsimeroi	Pahsimeroi	4/20	118,163	0	0	0	0	118,163
2017	Sawtooth	Yankee Fork	4/19	188,280	0	0	0	2,490	188,280
		Sawtooth Total Release		**1,300,164**	**118,574**	**115,856**	**2,768**	**23,367**	**1,537,362**
2017	Pahsimeroi (Seg)	Pahsimeroi Ponds	4/20-4/24	934,893	118,867	0	0	21,368	1,053,760
2017	Pahsimeroi (Int)	Pahsimeroi Ponds	4/16-4/24	0	0	67,199	160	1,003	67,359
		Pahsimeroi Total Release		**934,893**	**118,867**	**67,199**	**160**	**22,371**	**1,121,119**
		Totals		**8,535,188**	**1,342,127**	**479,331**	**329,292**	**248,481**	**10,685,938**

* PIT tag total is not in addition to other mark/tag columns but is included in those groups.

** No releases in Hells Canyon in 2017 because of high river flows.

Juvenile Survival

Juvenile survival rates of PIT-tagged Chinook Salmon are estimated from release site to LGD using the PitPro program (Westhagen and Skalski 2009) developed in the School of Aquatic and Fishery Sciences at the University of Washington. Survival rates to LGD varied by release site. Chinook released at Red River site had the lowest survival to LGD in 2017 and the lowest average survival over the last ten years. Chinook released from the NF Clearwater and Clear Creek had the highest survival in the Clearwater in 2017 (Table 4). In the Salmon River, Chinook released from the three Sawtooth release groups (segregated, integrated, and Yankee Fork) had the lowest survivals to LGD. Chinook released from Pahsimeroi (segregated and integrated) had the highest survivals to LGD. The yearly-weighted average (weighted by release number) for all groups combined was higher in 2017 than the previous nine year weighted average (Table 5). Venditti et al. (2018) completed a paired release evaluation of juvenile Sawtooth integrated Chinook in 2017. Their results suggest that survival to LGD was not significantly different for Chinook released from Sawtooth Hatchery when compared to Chinook released at the County Line Bridge (approximately 15 miles upstream of Sawtooth Hatchery [Venditti et al. 2018]). These results prompted project managers to move the entire Sawtooth integrated release to the County Line Bridge. The impetus for this change was to expand the spawning distribution of Chinook above the Sawtooth weir.

Table 4. Juvenile hatchery Chinook Salmon survival and travel time estimates to Lower Granite Dam (LGD) for release year 2017.

Release Group	PIT Tags Released	Release Date	Size at Rel. (fpp)	Km to LGD	Average Travel Days	50% Passage Date	80% Arrival Window	Survival ± 95% CI
Clear Creek	9,585	3/20-3/21	16.2	176	28	4/24	4/14-5/3	79.8 (77.0-82.6)
Powell Pond	25,468	3/15	15.2	321	38	4/24	4/14-5/3	62.6 (60.7-64.6)
Red River Pond	17,082	3/23-3/29	16.0	299	33	4/30	4/15-5/12	51.4 (48.5 - 54.3)
Selway River	17,088	4/7	16.1	240	19	4/26	4/13-5/5	75.0 (70.5-79.4)
NF Clearwater[1]	8,491	3/19	16.1	116	21	4/21	3/31-5/2	79.0 (75.1 - 82.9)
NF Clearwater[2]	8,576	3/19	16.1	116	21	4/22	3/31-5/2	80.4 (76.3 - 84.4)
SFSR (Seg.)	25,919	4/5	20.0	457	32	5/6	4/29-5/12	68.3 (64.9 - 71.6)
SFSR. (Int.)	25,938	4/5	21.0	457	31	5/6	4/27-5/12	72.5 (69.0 - 76.0)
Pahsimeroi (Seg.)	21,368	4/20-4/24	13.4	630	13	4/28	4/25-5/5	74.3 (71.8 - 76.8)
Pahsimeroi (Int.)	1,003	4/16-4/24	13.4	630	14	4/29	4/25-5/5	87.3 (72.5 - 102.1)
Rapid River Ponds	51,902	3/13-4/27	16.7	283	29	5/2	4/21-5/11	65.7 (63.9 - 67.6)
Sawtooth Weir (Seg.)	18,803	3/29	19.1	747	27	4/27	4/17-5/8	60.7 (58.7 - 62.8)
Sawtooth Weir (Int.)	1,984	3/29	16.2	747	28	4/29	4/17-5/9	60.5 (53.4 - 67.5)
Yankee Fork	2,490	4/17-4/19	16.7	730	35	5/6	4/30-5/12	62.0 (47.4 - 76.6)

1 This estimate is for the baffle study treatment group released into the NF Clearwater.
2 This estimate is for the baffle study control group released into the NF Clearwater.

Arrival timing to LGD and subsequent entry timing into the estuary is an important consideration for hatchery origin spring and summer Chinook Salmon. Barging began on May 2, 2017 (CSS 2017) and based on the 50% passage date in Table 4, most of the Chinook released from IDFG hatcheries passed LGD before the date barging began in 2017.

Table 5. Hatchery Chinook Salmon survival estimates (percent survival) to Lower Granite Dam by release site from 2008-2017 and annual weighted averages across release sites from 2008 to 2016 for comparison.

Hatchery	Release Site	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Site Ave. (2008-2016)
Clearwater	Clear Cr.		78.7	80.7	78.9	75.5	82.7	79.9	74.0	62.6	**79.8**	**73.9%**
	Powell Pond*							73.7	77.1	68.5	**62.6**	**74.1%**
	Red R. Pond	65.9	36.2	70.3	32.2	64.8	59.2	45.0	44.2	60.3	**51.4**	**53.2%**
	NF Clearwater									92.5	**79.7**	**92.5%**
	Selway River	69.0	72.2	79.5	75.5	70.6	59.1	65.5	54.3	71.2	**75.0**	**68.1%**
McCall	SFSR (Seg.)	58.7	51.2	56.5	62.9	55.0	63.3	71.1	71.5	62.5	**68.3**	**61.6%**
	SFSR. (Int.)					59.2	70.0	71.8	76.4	68.2	**72.5**	**69.7%**
Pahsimeroi	Pahsimeroi (Seg.)	44.6	50.9	37.3	51.1	58.0	61.0	79.7	77.8	77.4	**74.3**	**60.0%**
	Pahsimeroi (Int.)					59.1	74.0	72.6	73.9	74.6	**87.3**	**71.6%**
Rapid R.	Rapid River Ponds	80.6	72.6	78.1	77.6	74.5	73.6	75.9	81.6	81.4	**65.7**	**77.3%**
Sawtooth	Sawtooth (Seg.)	34.1	36.6	42.3	53.1	47.4	57.1	65.1	70.6	68.0	**60.7**	**57.1%**
	Sawtooth (Int.)					42.6	58.3	62.0	56.5	61.1	**60.5**	**55.9%**
	Yank. Fk. Dredge Ponds			54.2	37.2	29.9	NA	39.4	43.2	61.9	**62.0**	**45.5%**
Yearly Weighted Average		**66.2**	**55.1**	**57.8**	**57.0**	**59.6**	**63.0**	**68.0**	**70.3**	**67.1**	**66.5**	**63.3**

*Releases prior to 2014 were spring Chinook Salmon (10 year mean survival of 68.1%)

ADULT RETURNS

Adult Chinook Salmon from brood years 2014, 2013, and 2012 returned to Idaho in 2017 as three-, four-, and five-year-old adults. This section outlines metrics of adult monitoring and adult accounting back to Bonneville Dam, LGD, sport harvest upstream of LGD, and to hatchery traps. Fall Chinook Salmon are not included in the majority of adult return summaries because of differences in management practices and data availability. We report sport harvest of fall Chinook in the Idaho Sport Harvest Section below. Reconstructed fall Chinook escapement estimates above LGD are available in Young et al. (2017).

Preseason Forecasted Adult Returns

Forecasts of adult returns for Snake River stocks are generated by an inter-agency technical workgroup including IDFG, the Nez Perce Tribe, the Oregon Department of Fish and Wildlife, and the Washington Department of Fish and Wildlife using sibling regressions. A regression of historic jack returns vs. two-ocean returns, from the same cohort, is used to forecast a hatchery's two-ocean return. The same methodology is used to forecast three-ocean returns from the previous year's two-ocean return. The regressions use hatchery-specific run reconstructions, by age, at the Columbia River mouth. The forecasted total adult return to the Columbia River mouth, for each hatchery, is the sum of the forecasted two- and three-ocean returns. Release group-specific inter-dam conversion rates based on historic data are applied to each hatchery-specific forecast to the Columbia River mouth to generate release group-specific forecasts to LGD.

Forecasts for offsite releases are generated using surrogate release groups. For example, to forecast a return for Rapid River spring Chinook Salmon released at Hells Canyon Dam, the forecasted adult return per smolt released for Rapid River Hatchery is multiplied by the known number of smolts released at Hells Canyon Dam. Table 6 shows the 2017 adult return forecast by hatchery and stock to the Columbia River mouth, Bonneville Dam, and LGD.

Table 6. Summary of forecasted adult (two- and three-ocean) spring/summer Chinook Salmon returns in 2017 by hatchery and release site to the Columbia River mouth, Bonneville Dam, and Lower Granite Dam.

		Pre-season forecast		
Hatchery	**Release Site**	**Columbia River Mouth**	**Bonneville Dam**	**Lower Granite Dam**
Clearwater	Upper Selway	961	812	593
Clearwater	Powell Pond	3,659	3,199	2,300
Clearwater	Red River	4,161	3,330	2,411
Clearwater	Clear Creek	1,772	1,486	1,085
Total Clearwater R.		**10,553**	**8,827**	**6,389**
Rapid River	Rapid River	25,847	20,936	15,809
Rapid River	Little Salmon R.	1,098	889	672
Rapid River	Hells Canyon Dam	3,172	2,569	1,940
Pahsimeroi	Pahsimeroi	1,129	982	707
Sawtooth	Sawtooth	7,116	6,295	4,973
McCall	Knox B.	6,809	6,145	3,994
Total Salmon R.		**45,171**	**37,816**	**28,095**
TOTALS		**55,724**	**46,643**	**34,484**

Adult Return Estimates to Bonneville and Lower Granite Dams Based on PIT Detections

In-season estimates of adult returns to release sites are used to set harvest limits and adjust fishing seasons in real time. In-season estimates are generated using adult Chinook PIT tag detections in the Columbia and Snake rivers. The majority of the release groups of Chinook Salmon returning to Idaho in 2017 were representatively tagged as juveniles prior to release. Juvenile PIT tags in Chinook Salmon released from Idaho are randomly designated as monitor mode (70% of PIT tags in a release group) or default mode (30% of PIT tags in a release group) through a Separation by Code request to PTAGIS each year. See CSS (2017) for a thorough description of these modes. Adult Chinook Salmon PIT tag detections at Bonneville, McNary, Ice Harbor, and Lower Granite dams are expanded using equation 1. Default mode PIT tag detections are not expanded and each detection accounts for one fish. The Hells Canyon and Little Salmon River release groups were not PIT tagged, so we used Rapid River tags as a surrogate to generate return estimates. PIT tags generally underestimate the number of untagged fish returning due to tag shedding and differential mortality (Cassinelli et al. 2012). Estimates of adult Chinook Salmon at Bonneville Dam and LGD are provided Tables 7 and 8.

Equation 1. Adult PIT tag expansion calculation for monitor mode PIT tags detected at Columbia and Snake River Dams.

$$PIT\ Expansion = (\#\ of\ juvenile\ Chinook\ released - \#of\ default\ mode\ PIT\ tags)/ \#of\ monitor\ mode\ PIT\ tags$$

Table 7. Escapement of segregated adult spring/summer Chinook Salmon to Bonneville Dam in return year 2017.

Hatchery	Release Site	One-Ocean	Two-Ocean	Three-Ocean	Total
Clearwater	Selway River	354	767	34	1,155
Clearwater	Powell Pond	441	1,241	82	1,764
Clearwater	NF Clearwater	730	-	-	730
Clearwater	Red River	533	2,296	1	2,830
Clearwater	Clear Creek	491	2,753	105	3,349
Total Clearwater R.		**2,549**	**7,057**	**222**	**9,828**
Rapid River	Rapid River Ponds	1,233	5,763	413	7,409
Rapid River	Hells Canyon Dam*	246	692	66	1,004
Rapid River	Little Salmon River*	98	231	32	361
Sawtooth	Sawtooth Weir	1,550	2,443	117	4,110
Sawtooth	Yankee Fork**	201	332	14	548
Pahsimeroi	Pahsimeroi Ponds	1,041	166	56	1,263
McCall	SF Salmon R. - Knox	1,475	1,238	47	2,760
Total Salmon R.		**5,844**	**10,865**	**745**	**17,455**
	GRAND TOTAL	**8,393**	**17,922**	**967**	**27,283**

* These releases did not have PIT tags, therefore estimates for these releases were generated using SARs from the Rapid River Hatchery release as a surrogate.

** This release did not have PIT tags, therefore estimates for this release were generated using SARs from the Sawtooth Hatchery release as a surrogate.

Table 8. Estimated escapement of segregated adult spring/summer Chinook Salmon to Lower Granite Dam in return year 2017.

Release Hatchery	Release Site	One-Ocean	Two-Ocean	Three-Ocean	Total
Clearwater	Selway River	313	576	0	889
Clearwater	Powell Pond	361	829	82	1,272
Clearwater	NF Clearwater	793	-	-	793
Clearwater	Red River	425	1,470	0	1,895
Clearwater	Clear Creek	490	1,476	1	1,967
Total Clearwater R.		**2,382**	**4,351**	**83**	6,816
Rapid River	Rapid River Ponds	1,028	4,391	275	5,694
Rapid River	Hells Canyon Dam*	205	527	44	776
Rapid River	Little Salmon River*	82	176	21	279
Sawtooth	Sawtooth Weir	1,439	1,732	117	3,288
Sawtooth	Yankee Fork**	187	235	14	437
Pahsimeroi	Pahsimeroi Ponds	833	125	0	958
McCall	SF Salmon R. – Knox	1,095	763	46	1,904
Total Salmon R.		**4,869**	**7,949**	**517**	13,336
GRAND TOTAL		**7,251**	**12,300**	**600**	**20,152**

* These releases did not have PIT tags; therefore, estimates for these releases were generated using SARs from the Rapid River Hatchery release as a surrogate.

** This release did not have PIT tags; therefore, estimates for this release were generated using SARs from the Sawtooth Hatchery release as a surrogate.

Adult Return Estimates to Bonneville and Lower Granite Dams Using Parentage Based Tagging

Since return year 2012, IDFG has used Parentage Based Tagging to estimate the stock- and age-specific returns of hatchery-origin Chinook Salmon to LGD. Estimates are derived using parentage analysis from tissue samples collected at the LGD fish trap, to partition out the LGD window count. The genetic and analytical methods used to decompose Chinook escapement over LGD can be found in Steele et al. (2018) and Camacho et al. (2019). In 2017, we used these decomposed escapement estimates for hatchery origin Chinook at LGD and PIT tag conversion rates to make PBT-based estimates of escapement over Bonneville Dam.

Comparisons of release group- and aggregate-level Parentage Based Tagging escapement estimates to PIT tag estimates at LGD in previous years suggest that PIT tags produced an estimate that was lower than actual return of Chinook to the Snake River basin (Belnap et al. 2019). We used the Parentage Based Tagging (PBT) data from the LGD fish trap with the PIT tag conversion rate estimates from Bonneville Dam to LGD to estimate chinook abundance at Bonneville Dam. We used post-season age-specific (i.e. jacks and adults calculated separately) PIT tag conversion rates between Bonneville Dam and LGD for each release group. The PBT estimate at LGD for each release group was divided by the age-specific PIT tag conversion rate for that release group to calculate the PBT estimate at Bonneville Dam. A minimum sample size of ten PIT tags was set for the conversion rate calculation because variance in small sample sizes can skew estimates. If ten PIT tags were not available within an age class for a given release group, surrogate PIT tags from all spring Chinook or all summer Chinook (depending on the run of the group of interest) for that age class were used to estimate the conversion rate from Bonneville to LGD.

The estimated return for the combined Clearwater River basin release groups was 102% of the pre-season forecast at Bonneville Dam. For the combined Salmon River release groups, the estimated return was 58% of the pre-season forecast. Comparisons for individual release groups were variable but generally ranged from 60-100% of the preseason forecasts (Table 9).

Table 9. Comparison of forecasted and actual returns of adult Chinook Salmon to Bonneville Dam in 2017. Adults includes 2- and 3-ocean age fish.

Release Hatchery	Release Site	Preseason Adult Forecast	Actual Return
Clearwater	Upper Selway	812	1,284
Clearwater	Powell Pond	3,199	2,172
Clearwater	Clear Creek	1,486	2,830
Clearwater	Red River	3,330	3,064
Total Clearwater R.		**8,827**	**9,350**
Rapid River	Rapid River Hatchery	20,936	13,827
Rapid River	Hells Canyon Dam	2,569	1,659
Rapid River	Little Salmon River	889	553
Sawtooth	Sawtooth Hatchery	6,295	3,606
Sawtooth	Yankee Fork	638	11
Pahsimeroi	Pahsimeroi Hatchery	982	820
McCall	SF Salmon River	6,145	2,466
Total Salmon R.		**38,454**	**22,942**
GRAND TOTAL		**47,281**	**32,292**

2017 LGD Trap Operation

Chinook Salmon were trapped five days per week (Mon-Fri) at LGD at a rate of 26% from March 13 through April 16 and 28% from April 17 through August 17. Tissue samples were collected at specific rates based on the presence or absence of an adipose fin. The goal for ad-clipped Chinook was to collect approximately 2,000 samples throughout the run. To achieve this, a subsample rate was set at 33.3% from March 7 to May 26 and adjusted to 50% from May 29 to August 17. The goal for unclipped Chinook was to collect tissue samples from all fish collected in the adult trap. Samples collected from unclipped Chinook Salmon were part of an ongoing study to estimate the stock composition of the wild return (see Camacho et al. 2019). Because it is impossible to visually distinguish wild from unclipped hatchery Chinook, all the unclipped fish that were sampled were analyzed using PBT. As a result, the sample rate for the unclipped hatchery group was higher than for the clipped hatchery group (Table 10).

Throughout the 2017 adult return, tissue samples were collected from 3,754 ad-clipped adults and 838 unclipped-hatchery origin adults. For the ad-clipped group, 1,997 (5.2% of the ad-clipped return) of the samples collected were used to estimate stock and age composition of the clipped hatchery return (Table 10). Of the 3,961 samples collected from unclipped Chinook, 827 assigned to the hatchery baseline (21.1% of the estimated unclipped hatchery-origin return) and were used to partition out the stock and age composition of the unclipped hatchery return (Table 10).

Table 10. Escapement of clipped and unclipped hatchery Chinook Salmon and summary of time stratification and sampling scheme for the 2017 adult migration at Lower Granite Dam.

Strata	Date Range	Chinook Escapement	Samples Collected	Samples Included in Analysis	Sample Rate
1	4/3-6/4	15,197	1,288	1,287	8.47%
2	6/5-6/11	8,547	763	220	2.57%
3	6/12-6/18	7,226	903	193	2.67%
4	6/19-6/25	2,783	366	75	2.69%
5	6/26-7/9	2,996	241	90	3.00%
6	7/10-7/23	1,220	137	76	6.23%
7	7/24-8/17	469	56	56	11.94%
Ad-clipped	**Total**	38,438	3,754	1,997	5.20%
1	4/3-6/4	726	141	141	19.42%
2	6/5-6/11	733	131	131	17.87%
3	6/12-6/18	889	222	222	24.97%
4	6/19-6/25	449	118	118	26.28%
5	6/26-7/9	617	99	99	16.05%
6	7/10-7/23	407	93	91	22.36%
7	7/24-8/17	140	34	33	23.57%
Unclipped	**Total**	3,961	838	835	21.08%

Partitioning Window Counts to Stock and Age

Adult Chinook Salmon returns to LGD by release site and age were estimated post-season using the salmonid compositional bootstrap intervals (SCOBI) method (Steinhorst et al. 2017; Camacho et al. 2017).

Table 11. Age structure of hatchery origin Chinook Salmon sampled at Lower Granite Dam in 2017 by clipped or unclipped adipose fin mark.

Mark	BY 2014	BY 2013	BY 2012	Unassigned	Failed to genotype	Total
AD clipped	548	1,320	83	46	3	2,000
Unclipped	283	498	46	8	5	840

Of the 2,000 ad-clipped hatchery origin samples that were included in the analysis, 1,951 assigned to the PBT baseline, 46 did not assign to a hatchery stock, 3 failed to genotype, and 23 were duplicate samples. Duplicate samples were not removed from this analysis because fish that were sampled more than once were likely fish that had fallen back over the dam, re-ascended the adult ladder, and were counted more than once at the window. Because duplicate fish were counted at the window more than once, they should be accounted for in the stock composition in the same proportions that they fellback and reascended. Of the 840 unclipped hatchery origin samples that were collected at LGD, 827 assigned to the PBT baseline, 8 did not assign to a hatchery stock, and 5 failed to genotype. Brood year 2013 (age- 4) was the predominant age class for both hatchery groups. Results from this analysis are presented in Table 11.

Table 12. Release group -specific brood year 2012, 2013, and 2014 returns of adult Chinook Salmon to Lower Granite Dam in 2017 based on PBT analysis (bootstrapped 90% confidence intervals).

Release Group	BY 2014		BY 2013		BY 2012	
	Ad-Clipped	Unclipped	Ad-Clipped	Unclipped	Ad-Clipped	Unclipped
NF Clearwater	288 (146-446)	0	1,739 (1,392-2,091)	38 (19-61)	286 (152-447)	9 (1-21)
Selway (parr)	0	0	0	0	24 (1-59)	6 (1-17)
Dworshak Hatchery Total	**288**		**1,777**		**325**	
Kooskia	99 (35-184)	6 (1-17)	1,258 (983-1,560)	46 (22-71)	51 (1-128)	0
Kooskia Hatchery Total	**105**		**1,304**		**51**	
Clear Creek	803 (596-1,031)	0	1,476 (1,183-1,786)	9 (1-20)	49 (1-123)	17 (1-34)
Powell	0	399 (328-474)	1,067 (783-1,380)	452 (377-531)	0	32 (15-53)
Selway (smolt)	225 (109-362)	74 (43-108)	635 (451-836)	320 (255-388)	12 (1-35)	5 (1-15)
NF Clearwater	656 (442-889)	16 (1-32)	0	0	0	0
Red River	869 (624-1,118)	6 (1-17)	1,888 (1,562-2,248)	17 (4-33)	105 (23-215)	0
Mill Creek	539 (347-752)	11 (1-24)	0	0	0	0
Clearwater Hatchery Total	**3,598**		**5,864**		**220**	
Nez Perce Tribal Hatchery	0	36 (16-58)	83 (35-132)	285 (225-349)	0	9 (1-21)
Lolo Creek* Newsome Creek*	0	0	0	0	0	5 (1-15)
NPT Hatchery Total	**36**		**368**		**14**	
Clearwater River Total	**4,027**		**9,313**		**610**	
Rapid River/Hells Canyon	2,962 (2,558-3,384)	22 (5-43)	11,650 (10,928-12,382)	86 (54-122)	502 (348-670)	0
Rapid River Hatchery Total	**2,984**		**11,736**		**502**	
Sawtooth (Segregated)**	1,643 (1,303-2,014)	16 (4-33)	2,465 (2,028-2,913)	23 (8-43)	169 (57-300)	15 (4-32)
Sawtooth (Integrated)	0	95 (59-133)	0	131 (91-172)	0	4 (1-11)
Yankee Fork	49 (1-124)	5 (1-15)	8 (1-25)	0	0	0
Sawtooth Hatchery Total	**1,808**		**2,627**		**188**	
Pahsimeroi (Segregated)	497 (307-706)	8 (1-19)	353 (187-521)	28 (10-48)	25 (1-57)	4 (1-13)
Pahsimeroi (Integrated)	0	9 (1-20)	0	84 (51-120)	0	25 (9-43)
Pahsimeroi Hatchery Total	**514**		**465**		**54**	
McCall (Segregated)	1,533 (1,200-1,818)	20 (5-38)	1,381 (944-1,686)	30 (13-51)	256 (126-410)	0
McCall (Integrated)	0	285 (227-344)	0	538 (458-620)	0	30 (12-50)
Johnson Creek	0	230 (177-288)	0	0	0	11 (1-24)
McCall Hatchery Total	**2,068**		**1,949**		**297**	
Salmon River Total	**7,374**		**16,777**		**1,041**	
Imnaha River	117 (33-222)	0	501 (304-711)	7 (1-18)	114 (37-227)	0
Lostine River	226 (95-377)	0	615 (382-871)	5 (1-16)	37 (1-113)	0
Catherine Creek	78 (12-163)	0	142 (60-230)	4 (1-12)	54 (1-135)	0
Grande Ronde R.	0	31 (11-55)	149 (71-241)	139 (96-183)	37 (1-113)	19 (4-37)
Lookingglass Creek	170 (72-277)	0	279 (150-431)	0	13 (1-35)	0
Oregon Total	**622**		**1,841**		**274**	
Tucannon River	0	124 (86-165)	0	72 (42-105)	0	5 (1-15)
NPTH Fall Chinook	0	4 (1-13)	17 (1-48)	9 (1-20)	0	9 (1-20)
Lyons Ferry Fall Chinook	8 (1-25)	13 (3-26)	0	9 (1-20)	0	4 (1-12)
Klickitat Hatchery	12 (1-35)	0	40 (1-117)	0	0	0
SF Walla Walla	0	0	65 (12-141)	0	0	0

Release Group	BY 2014		BY 2013		BY 2012	
	Ad-Clipped	Unclipped	Ad-Clipped	Unclipped	Ad-Clipped	Unclipped
Wells Hatchery	0	0	0	4 (1-12)	0	0
Total by Age	**12,184**		**28,147**		**1,943**	
Unknown* **	**125**					
Grand Total	**42,399**					

*PBT tracking to release site was not available for these releases.
**Estimates in the unclipped columns may include smolts released in the Yankee Fork Salmon River for BY2012.
***Unknown hatchery Chinook that did not assign to the parental baseline.

Comparison of PIT Tag and PBT Return Estimates to Lower Granite Dam

Since 2008, PIT-tagged hatchery Chinook Salmon are important as in-season management tool and for post-season estimates of returns to LGD. In-season, these estimates help to manage fisheries and broodstock acquisitions while post-season, they provide estimates of smolt-to-adult survival and return rates. However, limitations to PIT tag estimates are known and PIT tags can underrepresent untagged fish due to tag loss and differential survival of tagged and untagged fish (Cassinelli et al. 2012). Underrepresentation of stock- and age-specific untagged returns by PIT-tagged fish has been an ongoing issue, but the levels at which it occurs, by stock and age, had been previously unknown for many release groups. Starting in return year 2012, with the implementation of PBT and adult sampling at LGD, we now have an alternative method to estimate stock- and age-specific returns at LGD which provides the ability to evaluate PIT tag underrepresentation.

We compared the percent of the PBT estimates at LGD that were accounted for by PIT tags for each release group by age (Equation 2). For 2017 returns, PIT tag estimates accounted for 56% of the PBT-based estimates at LGD across all age groups and release sites combined (Table 13). The 44% underrepresentation across all groups equated to 17,737 hatchery Chinook Salmon that were unaccounted for with PIT tags.

Equation 2. Release site-specific PIT tag representation calculation using PIT tag estimates and PBT estimates.

$$\%\ PIT\ tag\ representation = \frac{Age\ specific\ end\ of\ season\ PIT\ Estimate}{Age\ specific\ end\ of\ season\ PBT\ Estimate}$$

We assume that the PBT estimates, which are ultimately based on the window count, are the correct estimate and unbiased in this estimate of unaccounted for Chinook Salmon. In reality, the estimate is likely biased high because current methodology used to estimate escapement over LGD using PBT does not account for fallback with reascension or night passage (i.e. fish that pass after counting hours end) that is detectable using PIT tags. When the window count is corrected for fallback with reascension and night passage rates, the corrected window count is lower than the reported window count. This translates to negatively biased PIT tag representation estimates. For all release sites combined, PIT tag estimates represented the PBT estimates at a higher rate for the BY2014 cohort (70%) than for the BY2013 (52%) and the BY2012 (41%) cohorts (Table 13).

Table 13. Comparison of PBT- and PIT tag-based estimates of returns to LGD in 2017.

	PBT ESTIMATE			PIT ESTIMATE			PIT REPRESENTATION		
Release Group	**BY2014**	**BY2013**	**BY2012**	**BY2014**	**BY2013**	**BY2012**	**BY2014**	**BY2013**	**BY2012**
Dworshak-NF Clearwater	288	1,777	295	52	950	56	18%	53%	19%
Kooskia-Clear Creek	105	1,304	51	0	1	73	0%	0%	143%
CFH-NF Clearwater	672	-	-	793	-	-	118%	-	-
CFH-Red River	875	1,905	105	425	1,470	0	49%	77%	0%
CFH-Selway	299	955	17	313	576	0	105%	60%	0%
CFH-Powell	399	1,519	32	361	829	82	90%	55%	256%
CFH-Clear Creek	803	1,485	66	490	1,476	1	61%	99%	2%
NPTH-Clearwater River	36	368	9	7	118	15	19%	32%	167%
CLEARWATER RIVER TOTAL	**3,477**	**9,313**	**575**	**2,441**	**5,420**	**227**	**70%**	**58%**	**39%**
Rapid R/Little Salmon R/Snake R	2,984	11,736	502	1,315	5,049	340	44%	43%	68%
Sawtooth-Upper Salmon R	1,659	2,488	184	1,439	1,732	117	87%	70%	64%
McCall SF Salmon R-Segregated	1,553	1,411	256	1,095	763	46	71%	54%	18%
McCall SF Salmon R-Integrated	285	538	30	340	306	13	119%	57%	43%
Pahsimeroi R	505	381	29	833	125	0	165%	33%	0%
SALMON RIVER TOTAL	**6,986**	**16,554**	**1,001**	**5,022**	**7,975**	**516**	**72%**	**48%**	**52%**
Lookingglass Creek	170	279	13	61	178	0	36%	64%	0%
Grand Ronde R	31	288	56	0	113	0	0%	39%	0%
Catherine Creek	78	146	54	79	140	0	101%	96%	0%
Lostine R	226	620	37	107	218	0	47%	35%	0%
Imnaha R	117	508	114	74	318	17	63%	63%	15%
NE OREGON TOTAL	**622**	**1,841**	**274**	**321**	**967**	**17**	**52%**	**53%**	**6%**
TOTAL BY AGE	**11,085**	**27,708**	**1,850**	**7,784**	**14,362**	**760**	**70%**	**52%**	**41%**
TOTAL		**40,643**			**22,906**			**56%**	

Fallback / Reascension Rates and After-Hours Passage Rates at Lower Granite Dam

Fallback with Reascension and After-Hours passage rates are sources of bias in the window count at Lower Granite Dam. The rate at which these two actions occur are of interest because fallback with reascension results in fish being counted more than once in dam window counts and potentially tissue sampled for PBT multiple times at the LGD adult trap (overestimate), while fish passing the counting window after counting hours results in some fish not being counted (underestimate). We defined fallback with reascension as a Chinook Salmon that ascended the adult ladder more than once. These ascension events are observable using in the detailed interrogation history for individual PIT tagged adults. We defined After-Hour passage as fish that were detected in the adult ladder outside of the normal counting hours (0400-2000). Because the counting window is below all PIT tag detectors in the LGD adult ladder, fish detected in the adult ladder in the first 15 minutes after the counting period ended were excluded from the after-hours estimate, while fish detected within the first 15 minutes of the counting period starting were counted as having passed after hours.

We estimated the fallback with reascension rate and after-counting-hours passage rate by release site for adults and jacks returning to LGD in 2017 (Tables 14 and 15).

Table 14. Fallback and reascension rates for PIT-tagged jack and adult Chinook Salmon by release site, at Lower Granite Dam in return year 2017 with return year 2016 totals for comparison.

	Adults (Two- and Three-Ocean)			Jacks (One-Ocean)		
Release Location	PIT Detections at LGD	Reascension Events	Percent	PIT Detections at LGD	Reascension Events	Percent
Clear Creek	23	6	26.09%	4	1	25.00%
Knox Bridge	54	1	1.85%	77	8	10.39%
Pahsimeroi Ponds	3	0	0.00%	14	1	7.14%
Powell Pond	43	5	11.63%	29	5	17.24%
Rapid River	94	23	24.47%	18	1	5.56%
Red River	21	3	14.29%	5	0	0.00%
Sawtooth Hatchery	21	0	0.00%	16	0	0.00%
Selway River	28	6	21.43%	11	1	9.09%
Yankee Fork	0	0	0.00%	1	0	0.00%
2017 TOTAL	**287**	**44**	**15.33%**	**175**	**17**	**9.71%**
2016 TOTAL	**609**	**19**	**3.10%**	**234**	**6**	**2.60%**

Table 15. Percent of after counting hours passage, by release site, at Lower Granite Dam in return year 2017 for jacks and adults with return year 2016 totals for comparison.

	Adults (Two- and Three-Ocean)			Jacks (One-Ocean)		
Release Location	PIT Detections at LGD	After-Hours Passage	Percent	PIT Detections at LGD	After-Hours Passage	Percent
Clear Creek	23	1	4.35%	4	0	0.00%
Knox Bridge	54	1	1.85%	77	5	6.49%
Pahsimeroi Ponds	3	0	0.00%	14	0	0.00%
Powell Pond	43	5	11.63%	29	1	3.45%
Rapid River	94	3	3.19%	18	3	16.67%
Red River	21	2	9.52%	5	0	0.00%
Sawtooth Hatchery	21	0	0.00%	16	0	0.00%
Selway River	28	0	0.00%	11	0	0.00%
Yankee Fork	0	0	0.00%	1	1	100.00%
2017 TOTAL	**287**	**12**	**4.18%**	**175**	**10**	**5.71%**
2016 TOTAL	**609**	**39**	**6.40%**	**105**	**5**	**4.80%**

In 2017, the fallback/reascension rate was higher for both adults and jacks than it was in 2016. More importantly, the fallback with reascension rate was substantially higher than the after-counting-hours passage rate for adults and jacks suggesting that the window count likely overestimated Chinook escapement above LGD in 2017. Fallback with reascension rates were higher for earlier arriving groups than for later arriving groups.

The net difference between fallback/reascension rates and after-hours passage resulted in the hatchery origin adult count at the LGD window being overestimated by 3,027 fish and the hatchery origin jack count being overestimated by 470 fish in 2017. Unfortunately, PIT tags are not a useful tool to directly assess the frequency of fallback that does not result in reascension as few tags that fallback are detected at PIT arrays below LGD. Previous work done by Boggs et al. (2004) evaluated how fallback with reascension and fallback without reascension biased window counts for Chinook Salmon >50cm using radio tags at four dams on the Columbia River and the four Lower Snake River dams between 1996 and 2001. The adjusted window count at LGD was lower than the reported window count in four of the five years evaluated. The estimated fallback with reascension rate in 2017 at LGD (15.33%) was higher than the range of rates (0.6%-5.8%) reported in this study which suggests that the reported window counts at LGD will continue to overestimate Chinook Salmon escapement if no correction for fallback with reascension is derived. The study also suggested that, on average, 71.7% of the spring-summer Chinook Salmon that fell back reascended the LGD adult ladder and remained upstream. If this average is applicable to recent passage conditions, the positive bias in the window count would be higher than the estimates we report here.

Hatchery Weir Returns

IDFG operated hatchery weirs trapped over 12,000 Chinook Salmon (Table 16). We estimated the age composition of adults returning to individual hatchery facilities using an age-length key derived from known age adults from CWTs, PIT tags and PBT samples collected from broodstock. After we developed an age-length key for each hatchery weir, we used the statistical computer program *R* (R Development Core Team 2010) and the *mixdist* library package (Macdonald 2010) to estimate the age composition for Chinook Salmon captured at each hatchery weir. The *Rmix* package was designed to estimate the parameters of a mixture distribution with

overlapping components, such as the overlapping length distributions associated with adult salmon returns composed of multiple age classes, and applies the maximum likelihood estimation method to a population based on a known age subsample.

Table 16. Adult spring/summer Chinook Salmon captured at IDFG hatchery weirs, by weir, sex, age, and origin for return year 2017.

		Males		Females	Total
Weir	**Origin****	**Jacks**	**Adults**	**Adults**	**Return**
SF Salmon R.	H-seg	383	1,405	659	**2,447**
SF Salmon R.	H-int	300	179	212	**691**
SF Salmon R.	N	29	29	40	**98**
Sawtooth	H-seg	929	484	432	**1,845**
Sawtooth	H-int	62	36	60	**158**
Sawtooth	N	29	22	16	**67**
Pahsimeroi	H-seg	516	180	277	**973**
Pahsimeroi	H-int	15	43	61	**119**
Pahsimeroi	N	10	51	41	**102**
		Jacks	**Adults**		
Red R/Crooked R*	H	410	920		**1,330**
Red R/Crooked R*	N	10	18		**28**
Powell*	H	268	704		**972**
Powell*	N	0	22		**22**
Rapid River*	H	925	2,878		**3,803**
Rapid River*	N	9	22		**31**
		Grand Total			**12,686**

* These facilities do not make a sex determination at trapping, so Adult numbers include males and females.
** H-Seg=- Segregated hatchery, H-Int= Integrated hatchery, N=Natural

Sport Fisheries in Idaho

In 2017, sport fisheries for Chinook Salmon were conducted on sections of the Clearwater, Salmon, and Snake rivers on hatchery Chinook Salmon returning to Clearwater Hatchery, Dworshak Hatchery , Kooskia Hatchery, Nez Perce Tribal Hatchery, Rapid River hatchery, McCall Fish Hatchery, Pahsimeroi Hatchery, and Sawtooth Hatchery. Tables 17 and 18 list the location, duration, and extent of these fisheries.

Bank fishing made up a greater proportion of the angler effort than boat fishing for spring and summer Chinook Salmon fisheries; however, boat fishing was higher than bank effort in the fall Chinook Salmon fisheries (Table 19).

The highest catch rate for Chinook caught occurred in the Upper Salmon River (8 hours/fish), while the highest catch rate for Chinook kept occurred in the Lower Salmon Fishery (10 hours/fish). The overall catch rate was higher in the spring and summer Chinook fishery (12 hours/fish caught) than the catch rate in the fall Chinook fishery (22 hours/fish caught). The hours/fish kept was relatively high during the fall Chinook fisheries compared to the spring and summer Chinook fisheries and is likely related to the high proportion of unclipped fish in the return.

Anglers were only allowed to keep adipose-clipped Chinook during the fall Chinook fishery (Table 19).

Returns of spring and summer Chinook Salmon in 2017 to Idaho contributed to a combined sport harvest of 2,565 adults and 1,384 jacks. The age and release group specific harvest rates and the overall age specific harvest rates reported in Table 20 were calculated using equation 3 and equation 4. The overall adult harvest rate was 9.9% and the jack harvest rate was 13.7% (Table 20).

Equation 3. Estimate of age and release group specific harvest rates for sport fisheries in Idaho.

$$Age\ and\ Release\ Group\ Specific\ Harvest\ Rate = \frac{Age\ and\ Release\ Group\ Specific\ Harvest\ Estimate}{Age\ and\ Release\ Group\ Specific\ PBT\ Estimate}$$

Equation 4. Estimate of overall age specific harvest rate for sport fisheries in Idaho.

$$Age\ Specific\ Harvest\ Rate = \frac{Age\ \ Specific\ Harvest\ Estimate}{Age\ Specific\ PBT\ Estimate}$$

Table 17. Dates and locations of spring/summer Chinook Salmon sport fisheries conducted in Idaho in 2017.

River	Date Open	Date Closed	Days Open	Downstream Boundary	Upstream Boundary	Miles Open
	4/22	6/11	51	Railroad Bridge in Lewiston	Cherrylane Bridge	20
Clearwater R.	4/22	6/11	51	Cherrylane Bridge	Orofino Bridge	23
	4/22	6/11	51	Orofino Bridge	Confluence with SF Clearwater R.	24
NF Clearwater R.	4/22	5/24	33	Mouth	Dworshak Dam	2
SF Clearwater R.	4/22	6/11	51	Mouth	Confluence American and Red rivers	62
MF Clearwater R.	4/22	6/11	51	SF Clearwater River	Confluence Lochsa and Selway rivers	23
Lochsa R.	4/22	7/14	84	Mouth	Confluence Colt Killed and Crooked Fork Cr.	69
Snake R.	4/22	7/31	101	Dug Bar	Hells Canyon Dam	51
	4/22	5/24	33	Rice Creek Bridge	Time Zone Bridge	46
Lower Salmon R.	4/22	7/2	72	Time Zone Bridge	Short's Creek	3
	4/22	5/24	33	Short's Creek	Vinegar Creek	23
Little Salmon R.	4/22	7/31	101	Mouth	U.S. 95 Bridge near Smokey Boulder Road	25
Upper Salmon R.	6/22	7/31	40	Mouth of Valley Creek	100 yds downstream of Sawtooth Hatchery weir	5

Table 18. Dates and locations of fall Chinook Salmon sport fisheries conducted in Idaho in 2017.

River	Date Open	Date Closed	Days Open	Downstream Boundary	Upstream Boundary	Miles Open
Clearwater R.	1-Sep	31-Oct	61	River Mouth	Highway 12 Memorial Bridge	2
Snake R.*	1-Sep	31-Oct	61	Idaho / Washington State Line	Hells Canyon Dam	109
Salmon R.	1-Sep	31-Oct	61	River Mouth	Eye-of-the-Needle Rapids	0.5

* Fishery between Cliff Mountain Rapids and Hells Canyon Dam remained open until November 17.

Table 19. Angler effort and catch data from all spring, summer, and fall Chinook Salmon sport fisheries conducted in Idaho in 2017.

Target Run	Fishery	Angler Hours			Total Salmon Caught	Total Salmon Released	Hours/Fish	
		Boat	Bank	Total			Caught	Kept
Spring/Summer Chinook	Clearwater River*	3,089	4,699	7,788	577	178	13	20
	Lower Salmon River	2,867	5,654	8,521	917	97	9	10
	Snake River	132	6,768	6,900	447	18	15	16
	Little Salmon River	0	22,015	22,015	1,697	130	13	14
	South Fork Salmon River**	-	-	-	-	-	-	-
	Upper Salmon River	34	8,322	8,356	1,001	267	8	11
	All Fisheries	6,122	47,458	53,580	4,639	690	12	14
Fall Chinook	Snake River	31,009	4,246	35,255	1,703	1,116	21	60
	Clearwater River	4,324	1,395	5,719	202	115	28	66
	All Fisheries	35,333	5,641	40,974	1,905	1,231	22	61

*Includes mainstem, North Fork, Middle Fork, South Fork, Selway, and Lochsa rivers.

**No fishery in 2017.

Table 20. Spring/summer Chinook Salmon sport harvest management metrics and harvest rates for adults and jacks, by release site for 2017.

Adults

Hatchery	Release Site	Final LGD PIT Estimate	Brood Need	Sport Harvest Share	ID Sport Harvest	LGD PBT Estimate****	Sport Harvest Rate
Dworshak	N.F. Clearwater R.	1,346	2,050		8	2,049	0.4%
Kooskia	Clear Creek	596	594		6	1,309	0.5%
Clearwater	N.F. Clearwater R.	0	280		0	0	0.0%
Clearwater	Selway River*	429	290		5	647	0.8%
Clearwater	Powell Pond**	829	434		238	1,551	15.3%
Clearwater	Clear Creek	755	518		5	1,525	0.3%
Clearwater	Red River	1,137	924		10	1,993	0.5%
NPTH	Clearwater R.	109	162		3	83	3.6%
Total Clearwater R. Adults		**5,201**	**5,252**	**0**	**275**	**9,157**	**3.0%**
Rapid.	Rapid River Ponds	6,810	2,400	2,205	1,904	12,152	15.7%
Sawtooth	Sawtooth/ Yankee F.	1,849	996	427	378	2,642	14.3%
Pahsimeroi	Pahsimeroi Ponds	125	670	0	0	378	0.0%
McCall	SF Salmon R.	809	850	0	8	1,637	0.5%
Total Salmon R. Adults		**9,593**	**4,916**	**2,632**	**2,290**	**16,809**	**13.6%**
GRAND TOTAL ADULTS		**14,794**	**10,168**	**2,632**	**2,565**	**25,966**	**9.9%**

Jacks

Hatchery	Release Site	Final LGD Estimate	Brood Need***	Non-Tribal Harvest Share**	ID Sport Harvest	LGD PBT Estimate****	Sport Harvest Rate
Dworshak	N.F. Clearwater R.	52	NA		12	288	4.2%
Kooskia	Clear Creek	0	NA		10	99	10.1%
Clearwater	N.F. Clearwater R.	793	NA		0	656	-
Clearwater	Selway River*	313	NA		8	225	3.6%
Clearwater	Powell Pond**	361	NA		50	399	12.5%
Clearwater	Clear Creek	490	NA		27	803	3.4%
Clearwater	Red River	425	NA		17	869	2.0%
NPTH	Clearwater R.	7	NA		0	0	-
Total Clearwater R. Jacks		**2,441**	**0**	**N/A**	**124**	**3,339**	**3.7%**

Jacks

Release Hatchery	Release Site	Final LGD PIT Estimate	Brood Need***	Non-Tribal Harvest Share**	ID Sport Harvest	LGD PBT Estimate****	Sport Harvest Rate
Rapid R.	Rapid River Ponds	1,315	100		767	2,962	25.9%
Sawtooth	Sawtooth/ Yankee F.	1,440	NA		446	1,692	26.4%
Pahsimeroi	Pahsimeroi Ponds	833	NA		20	497	4.0%
McCall	SF Salmon R.	1095	NA		24	1533	1.6%
Klickitat	Klickitat	1,095	NA		3	52	5.8%
Total Salmon R. Jacks		**5,778**	**100**	**N/A**	**1,260**	**6,736**	**18.7%**
GRAND TOTAL JACKS		**8,219**	**100**	**N/A**	**1,384**	**10,075**	**13.7%**

* The adult estimate from PIT tags is adjusted to only include adipose clipped returns

** This is a summer run. Estimates include unclipped returns

*** Brood needs and non-tribal harvest shares are not identified for Chinook Salmon jacks

**** PBT estimates only include ad-clipped returns except for Powell Summers which includes both clipped and unclipped estimates

Fishery Catch Composition of Sport Harvested Chinook Salmon

Harvest in fisheries in the Little Salmon River and the Upper Salmon River was assumed to be from the release groups released in those areas and the age determination was based on length-frequency analysis of harvested fish checked during creel surveys. For mixed-release group fisheries (e.g., Clearwater, Snake, and lower Salmon Rivers), release group and age composition was determined using creel and PBT data obtained from tissue samples of fish sampled during creel surveys. There were 146 tissue samples collected and analyzed from the Clearwater River fishery, 186 samples from the Snake River fishery, 598 samples from the lower Salmon River fishery, and 282 samples from the upper Salmon River fishery. The PBT samples from each river section were expanded by release group-specific tagging rates, and the proportion of each release group and age in the PBT-based release group composition was applied to the total estimated harvest for each fishery to generate a final release group and age composition. Table 21 summarizes the estimated age and release group composition of the 2017 Chinook Salmon harvest.

Table 21. Composition of 2017 spring/summer Chinook Salmon sport harvest in Idaho by fishery, release group, and age.

Fishery and Release Group	Age-3	Age-4	Age-5	Total
Clearwater River Fishery				
Dworshak	12	3	5	**20**
Kooskia	10	6	0	**16**
Clearwater (Powell)	50	238	0	**288**
Clearwater (Selway)	8	5	0	**13**
Clearwater (Clear Creek)	27	5	0	**32**
Clearwater (South Fork)	17	8	2	**27**
Nez Perce Tribal Hatchery	0	3	0	**3**
Total	**124**	**268**	**7**	**399**
Snake River Fishery				
Rapid River (Hells Canyon Dam)	86	326	8	420
Sawtooth-Upper Salmon	3	3	0	6
Klickitat Hatchery	0	3	0	3
Total	**89**	**332**	**8**	**429**
Lower Salmon River Fishery				
Rapid River Hatchery	227	455	2	**684**
McCall Hatchery	24	8	0	**32**
Pahsimeroi Hatchery	20	0	0	**20**
Sawtooth - Upper Salmon	64	20	0	**84**
Total	**335**	**483**	**2**	**820**
Little Salmon River Fishery*				
Rapid River Hatchery	454	1,100	13	**1,567**
Total	**454**	**1,100**	**13**	**1,567**
SF Salmon River Fishery**				
McCall (SFSR)	-	-	-	**-**
Total	**-**	**-**	**-**	**-**
Upper Salmon River Fishery				
Sawtooth - Upper Salmon	379	335	20	**734**
Total	**379**	**335**	**20**	**734**
Grand Total	***1,381***	***2,518***	***50***	***3,949***

* These are terminal fisheries so all harvest was assumed to be from the local release group.
** No fishery in 2017.

Fisheries targeting fall Chinook Salmon returns were conducted on the Clearwater, Salmon, and Snake rivers during 2017 and resulted in the harvest of 360 fall Chinook Salmon (Table 22).

Table 22. Summary of 2017 fall Chinook Salmon sport harvest in Idaho by fishery and age.

Fishery	BY2015	BY2014	BY2013	Total
Clearwater River Fishery	73	14	0	**87**
Snake River Fishery	90	163	20	**273**
Total	**163**	**177**	**20**	**360**

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CHAPTER 2

IDAHO POWER COMPANY AND LOWER SNAKE RIVER COMPENSATION PLAN CHINOOK SALMON FISH HATCHERY EVALUATIONS—IDAHO

Brood Year 2011
Hatchery Chinook Salmon Report

Project Progress Report

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ABSTRACT

This annual report provides a summary of brood year 2011 (BY11) Chinook Salmon *Oncorhynchus tshawytscha* released from Lower Snake River Compensation Plan (LSRCP) and Idaho Power Company (IPC) hatcheries operated by the Idaho Department of Fish and Game (IDFG).

Idaho-LSRCP (McCall [MFH], Clearwater [CFH], Sawtooth [SFH]), IPC (Rapid River [RRFH], and Pahsimeroi [PFH]) fish hatcheries collected 12,777,465 green eggs in 2011 and released 8,925,777 smolts in 2013. All facilities met their production targets for green eggs taken except Sawtooth. Facilities faced minor fish health issues, the most prevalent being bacterial kidney disease (BKD) which resulted in the culling of low numbers of eggs from production. None of the fish health issues affecting BY11 Chinook resulted in significant losses to production.

Representative groups of juveniles from each facility were PIT tagged to estimate survival from release to Lower Granite Dam (LGD). Estimated juvenile survival rates during the 2013 migration ranged from 54.5% at Powell Pond to 82.7% at Clear Creek. The weighted average juvenile survival across all groups was 65.6%.

BY11 adult Chinook returned as adults from 2014 through 2016. Adult returns are summarized by age and release site for each hatchery and include estimates of harvest (ocean, downriver, and terminal), below-weir dropouts, and escapement. Hatchery-origin Chinook Salmon released from LSRCP and IPC hatcheries in Idaho were harvested in tribal and non-tribal fisheries in the Columbia and Snake rivers downstream of LGD and in mainstem and tributary fisheries upstream of LGD. The number of each hatchery's brood-specific adult return that was harvested below LGD ranged from 737 fish for PFH to 7,174 for RRFH, with a total of 18,254 fish for all BY11 Chinook. The number of each hatchery's return to LGD that was harvested above LGD ranged from 436 fish for PFH to 20,840 for RRFH, with a total of 30,752 for all BY11 Chinook.

Smolt-to-adult survival (SAS) rates from adult Chinook returns ranged from 0.50% for PFH to 2.07% for MFH. Smolt-to-adult returns (SAR) above LGD ranged from 0.27% for PFH to 1.44% for RRFH. SAR's and SAS's were higher than the recent five-year averages at all facilities. Progeny-to-parent ratios (PPR) to the project area ranged from 6.5 at PFH to 21.8 at RRFH.

INTRODUCTION

The primary purpose of this report is to summarize activities at each of the LSRCP- and IPC-funded spring/summer Chinook Salmon hatcheries operated by IDFG and to estimate at what level each facility contributed to various adult return components. These include fisheries in the Pacific Ocean and Columbia River as well as the adult return upstream of LGD, the contributions to fisheries within Idaho, and the numbers of fish back to the respective hatchery trapping facilities. Additionally, life stage specific post-release survival is reported to address overall survival from release to return. In each annual report, a given brood year is summarized by consolidating the spawning, juvenile rearing and release information, and the adult returns from that particular brood year. Because of the five-year generation length of Chinook Salmon and the additional two years required to obtain all downriver harvest information, there is a seven-year lag associated with summarizing the productivity of a brood year. Hence, BY11 is finalized in the current 2017 report so that reporting is caught up to the most recent brood year that can be summarized.

Spawning and Eye-Up

Spawning was conducted across all spring/summer Chinook Salmon facilities in August and September 2011. Prespawn mortality was higher than the recent five-year average at Pahsimeroi and Rapid river, and lower than the recent five-year average at Sawtooth, McCall, and Clearwater. Prespawn mortality was higher for females than males at all facilities.

Average fecundity ranged from 3,695 eggs per female at Powell to 5,045 eggs per female at McCall Fish Hatchery (Table 23). Variation in fecundity between facilities in 2011 can be largely explained by the run type (spring vs. summer) of the fish at the facility. Fecundity was lower at facilities with spring Chinook Salmon programs (SF Clearwater, Powell, and Rapid River) while facilities with summer Chinook Salmon programs (McCall, and Pahsimeroi) had higher fecundities. The unweighted average fecundity of 4,324 across all facilities was lower than the recent five-year average of 4,455 eggs per female (Appendix A).

The green egg takes at all facilities except Sawtooth met or exceeded the level needed to fill the hatcheries to production targets in 2011 (Table 23). Eggs were transferred from Pahsimeroi to Sawtooth for rearing to defray some of the shortage at that facility, and the resulting juveniles were released at Pahsimeroi. Culling occurred at all facilities. The number of fish culled in 2011 was below the recent five-year average at McCall, Clearwater, Sawtooth, and Rapid River and equal to the five-year average at Pahsimeroi.

Table 23. Brood year 2011 spring/summer Chinook Salmon hatchery survival and production metrics for LSRCP and IPC hatcheries operated by IDFG (averages in parentheses).

Collection Facility / Stock	% Male Prespawn Mortality	% Female Prespawn Mortality	Males Spawned	Females Spawned *	Fecundity	Inventory **	Disease ***	Total Green Eggs Collected****
McCall	4.7%	17.8%	325	394	5,045	81	11	1,987,584
Sawtooth	0.0%	2.9%	120	203	4,949	0	8	1,004,691
SF Clearwater	4.2%	7.1%	337	393	3,797	4	35	1,492,289
Powell	2.1%	2.3%	448	542	3,695	0	41	2,002,718
Rapid River	5.4%	14.9%	1,088	1,088	4,049	11	29	4,405,312
Pahsimeroi	5.0%	16.0%	280	365	5,164	8	18	1,884,871
Total or (Mean)	**(3.6%)**	**(10.2%)**	**2,598**	**2,985**	**(4,281)**	**104**	**142**	**12,777,465**

* Total females spawned includes those females whose eggs were later culled.
** Females culled because of excess egg inventory.
*** Females culled because of disease concerns.
**** Total Green Eggs Collected may include eggs that were later culled and often includes eggs that were later transferred to another facility or organization. For numbers of eggs collected for hatchery-specific smolt releases, see Table 4.

Green-Egg-to-Release Survival

The number of green eggs collected, percent eye-up, number of eyed eggs, smolts released, and green-egg-to-release survival rates at each facility for BY11 are summarized in Table 24. The average percent eye-up was 91.1%, and the average green-egg-to-smolt survival rate was 73.8 % across all facilities.

Table 24. Egg collection and survival metrics for brood year 2011 Chinook Salmon collected at LSRCP and IPC hatcheries operated by IDFG.

Collection Facility/ Stock	# Green Eggs Collected for Smolt Production	Eye Up Rate	# Eyed Eggs	Yearling Smolts Released	Green Egg to Smolt Survival
McCall	1,327,018	93.6%	1,221,763	1,074,850	81.0%
Sawtooth*	1,670,879	90.2%	1,507,803	1,226,253	73.4%
Clearwater**	3,341,099	93.5%	3,123,928	2,507,133	75.0%
Rapid River	4,405,312	92.2%	4,062,901	3,111,668	70.6%
Pahsimeroi	1,348,776	81.7%	1,101,900	1,005,873	74.6%
Total or (Weighted Mean)	**12,093,084**	**(91.1%)**	**11,018,295**	**8,925,777**	**(73.8%)**

* Includes eggs that were transferred from Pahsimeroi Hatchery, reared to smolts at Sawtooth Hatchery, then released as smolts from Pahsimeroi Hatchery
** Green egg estimate includes egg transfers from Kooskia (64,531), and McCall (334,137) hatcheries.

Fish Health

Fish health monitoring occurred during spawning and rearing. Kidneys from adult female Chinook Salmon were visually inspected for signs of bacterial kidney disease (BKD) by fish pathologists during spawning and a kidney sample was taken to the Eagle Fish Health Laboratory for analysis using the enzyme-linked immunosorbent assay (ELISA) method (Dixon 1987). Females culled because of disease occurred on the “table” (i.e. at the time of spawning) if pathologists observed granulomas in a female’s kidney or after spawning based on exceedance

of a suggested optical density of 0.25 based on ELISA values (Munson et al. 2010). Occasionally, when adult returns are not sufficient to meet broodstock goals, managers may decide to adjust the ELISA value threshold.

Routine sampling of juveniles occurred six months prior to release and four to six weeks prior to release. Additional sampling occurred if symptoms or increased mortality was observed earlier in the rearing cycle. Fish are also screened for *Aeromonas spp., Renibacterium Salmoninarum* (causative agent of BKD), *Myxobolus spp.* (causative agent of whirling disease), and *Ichthyophthirius multifiliis* (causative agent of "Ich"). Adult Chinook Salmon held for broodstock in 2011 were treated with formalin during holding at all facilities.

McCall Hatchery

Routine inspections detected *R. Salmoninarum*, resulting in the culling of eggs from 92 females and includes eggs that were later transferred to Clearwater Fish Hatchery. No pathogens were detected during the juvenile rearing cycle, and no major losses occurred as a result of fish health concerns.

Sawtooth Hatchery

Adults held for broodstock in 2011 were injected with erythromycin as a prophylactic treatment for bacterial kidney disease. After spawning, ELISA testing of kidney samples detected *R. Salmoninarum* at optical densities above 0.25 in eggs from eight females. These eggs were culled. Eggs from brood year 2011 were treated for *Ichthyophthirius multifiliis* or "Ich" five times. During the juvenile rearing cycle, a 28-day prophylactic regimen of erythromycin medicated feed was initiated to reduce the risk of BKD, but the fish stopped eating feed after the third week of the treatment. There were no major losses because of disease or fish health concerns during the rearing cycle for brood year 2011.

Clearwater Hatchery

Routine inspections detected *R. Salmoninarum*, resulting in the culling of eggs from 76 females. In the fall of 2012, fish health staff detected BKD in 40% (2 of 5) of samples of Red River juveniles, and during pre-release sampling in February of 2013, 38% (23 of 60) of samples of Red River juveniles sampled were positive for BKD. *Pseudomonas spp.* was also detected during the juvenile rearing cycle of the Red River group. In the Powell stock, BKD was detected in 12% (7 of 60) of samples analyzed. No major losses occurred because of fish health concerns during the rearing cycle for brood year 2011.

Rapid River Hatchery

Routine inspections detected *R. Salmoninarum*, resulting in the culling of eggs from 29 females. No pathogens were detected by Fish Health staff during the juvenile rearing cycle, and no major losses occurred because of fish health concerns.

Pahsimeroi Hatchery

Routine inspections detected *R. Salmoninarum* resulting in the culling of eggs from 18 females. Daily mortality (later attributed to BKD) increased in the two months prior to release, and a 21-day medicated feed treatment started in March of 2013. During pre-release sampling in March of 2013, BKD was detected in 60% (36 of 60) samples. The Pahsimeroi release was

delayed from April 1 to April 5 to accommodate a 21-day pre-release withdrawal period from the BKD medicated feed treatment. No major losses occurred on the rearing hatchery because of fish health concerns during the brood year 2011 rearing cycle.

Juvenile Releases

During the spring of 2013, 8,925,777 BY11 spring and summer Chinook Salmon smolts were released from three LSRCP and two IPC fish hatcheries located in Idaho. All facilities exceeded their release goals except for Sawtooth Fish Hatchery, which did not meet their release goal (68.1% of goal). Release numbers contributing towards the Sawtooth release goal include eggs from fish that were spawned at Pahsimeroi, transferred to Sawtooth for rearing, then released at Pahsimeroi (439,389 smolts; Table 25). Direct and volitional release strategies were employed depending on facility design and the presence of acclimation ponds. The majority of the Chinook from BY11 were adipose fin clipped to provide harvest opportunities in mark selective fisheries; however, some fish were released without adipose clips for supplementation and broodstock management purposes. Passive integrated transponder (PIT) tags were present in a portion of most release groups and provided juvenile survival estimates to LGD and adult escapement estimates. The weighted average size at release for BY11 smolts (18.0 fish per pound; FPP) was similar to the recent five-year average of 18.2 FPP (Appendix D).

Table 25. Release details of brood year 2011 Chinook Salmon from LSRCP and IPC facilities operated by IDFG.

Juv. Migr. Year	Hatchery-Program	Rel. Site	Release Date(s)	Release Type	AD Only	AD/CWT	CWT Only	No Tag	PIT TAG*	Total Release	Size at Release (fpp)
2013	McCall (Seg)	SFSR-Knox B.	3/25 - 3/28	Direct	700,964	120,037	0	0	27,952	821,001	17.1
2013	McCall (Int)	SFSR-Knox B.	3/26 - 3/28	Direct	0	0	253,849	0	25,952	253,849	16.6
McCall Total Release					**700,964**	**120,037**	**253,849**	**0**	**53,904**	**1,074,850**	
McCall Release Target										*1,000,000*	
2013	Rapid River	Rapid R. Pond	3/12 - 4/26	Volitional	2,377,396	120,272	0	0	51,899	2,497,668	15.8
2013	Rapid River	Little Salmon R.	3/14	Direct	200,000	0	0	0	0	200,000	18.5
2013	Rapid River	Hells Can. Dam	3/11 - 3/14	Direct	414,000	0	0	0	0	414,000	18.5
Rapid River Total Release					**2,991,396**	**120,272**	**0**	**0**	**51,899**	**3,111,668**	
Rapid River Release Target										*3,000,000*	
2013	Clearwater	Clear Creek	3/19	Direct	260,020	118,063	0	0	17,083	378,083	20.1
2013	Clearwater	Powell Pond	3/20-3/21	Direct	290,264	118,157	0	0	17,059	408,421	22.5
2013	Clearwater	Red River Pond	3/27-4/3	Direct	967,140	118,346	0	0	16,850	1,085,486	19.5
2013	Clearwater	Selway R.	3/18-3/19	Direct	176,754	116,909	132,250	783	17,063	426,696	20.0
2013	Clearwater	Crooked R.	3/20	Direct	0	0	207,023	1,424	25,451	208,447	20.0
Clearwater Total Release					**1,694,178**	**471,475**	**339,273**	**2,207**	**93,506**	**2,507,133**	
Clearwater Release Target										*2,335,000*	
2013	Saw (Seg)	Sawtooth Weir	4/5	Direct	652,732	0	0	0	21,282	652,732	23.0
2013	Saw (Int)	Sawtooth Weir	4/6	Direct	0	0	133,685	447	996	134,132	24.9
Sawtooth Total Release					**652,732**	**0**	**133,685**	**447**	**22,278**	**786,864**	
Sawtooth Release Target										*1,800,000*	
2013	Pah (Seg)	Pahsimeroi R.	4/5-4/17	Volitional	721,519	117,145	0	0	21,374	838,664	13.8
2013**	Pah (Seg)	Pahsimeroi R.	4/2-4/3	Direct	8,364	431,025	0	0	0	439,389	25.6
2013	Pah (Int)	Pahsimeroi R.	4/5-4/17	Volitional	0	0	167,209	0	998	167,209	14.0
Pahsimeroi Total Release					**729,883**	**548,170**	**167,209**	**0**	**22,372**	**1,445,262**	
Pahsimeroi Release Target										*1,000,000*	
GRAND TOTAL RELEASE					**6,769,153**	**1,259,954**	**894,016**	**2,654**	**243,959**	**8,925,777**	

* Numbers shown in PIT TAG column are not additional fish and are accounted for within the other mark group totals.

** This group was raised at Sawtooth Hatchery from Pahsimeroi Hatchery egg transfers because Sawtooth had open rearing space.

Juvenile Migration Timing and Survival

Representative groups of Chinook from all hatcheries were PIT tagged to evaluate migration timing and survival to LGD. These metrics are summarized for all PIT-tagged smolts from BY11 released in 2013 (Table 26). Similar to previous years, the majority of PIT-tagged Chinook smolts arrived at LGD between mid-April to mid-May.

In migration year 2013, juvenile survival estimates to LGD ranged from 54.5% from the Powell Pond release site to 82.7% from the Clear Creek release site. Migration year 2013 juvenile survival rates were higher than the five-year average at Clearwater, McCall, Pahsimeroi, and Sawtooth, and they were lower than the five-year average at Rapid River (Appendix D).

Table 26. Survival, migration, and arrival timing of brood year 2011 Chinook Salmon smolts at Lower Granite Dam (LGD) from releases at LSRCP and IPC fish hatcheries located in Idaho.

Rearing Hatchery	Release Site	Distance to LGD (km)	Number PIT Tagged	Number of Unique Detections at LGD	Estimated Survival Rate to LGD (95% CI)	Detection Probability	50% Arrival Date	80% Arrival Window (# of Days)
Clearwater	Powell Pond	321	17,059	1,552	54.5 (51.1-57.9)	16.7%	4/30	4/12 - 5/14 (32)
	Selway (smolt)	240	17,063	1,575	59.1 (55.8-62.4)	15.6%	4/18	4/4 - 5/5 (31)
	Red River Pond	299	16,850	1,812	59.2 (55.5-62.9)	18.2%	5/7	4/26 - 5/15 (19)
	Clear Creek	176	17,083	1,818	82.7 (77.9-87.5)	12.9%	4/29	4/9 - 5/5 (26)
	Crooked River	280	25,451	2,589	55.3 (52.8-57.8)	18.4%	5/2	4/15 - 5/15 (30)
McCall	Knox B (Seg)	457	25,950	3,319	63.3 (60.3-66.3)	20.2%	5/9	5/6 - 5/14 (8)
	KnoxB (Int)		25,952	3,156	70.0 (50.8-65.8)	17.4%	5/9	5/4 - 5/13 (9)
Sawtooth	Sawtooth (Seg)	747	21,282	3,326	57.1 (54.8-59.4)	27.4%	5/10	5/6 - 5/14 (8)
	Sawtooth (Int)		996	166	58.3 (50.8-65.8)	28.6%	5/10	5/4 - 5/13 (9)
Pahsimeroi	Pahsimeroi (Seg)	630	21,393	1,888	61.0 (57.7-64.3)	14.5%	4/28	4/17 - 5/6 (19)
	Pahsimeroi (Int)		998	94	74.0 (55.3-92.7)	12.7%	4/29	4/16 - 5/6 (20)
Rapid River	Rapid River	283	51,899	8,627	73.6 (71.5-75.7)	22.8%	5/9	5/3 - 5/13 (10)

Adult Returns and Harvest Information

Adult returns from brood year 2011 are listed by recovery year, area, and age of return in Table 27. Beginning in brood year 2011, adult escapement estimates above LGD are based on PBT estimates. New in this report are PBT-based escapement estimates to Bonneville Dam. These estimates were calculated by dividing the age and release site-specific PBT escapement estimates to LGD by age and release site-specific PIT tag conversion rates from Bonneville to LGD. These estimates, the harvest below Bonneville, and the harvest in the ocean are used to calculate the total estimates reported in Table 27 (Sullivan et al. 2018).

Table 27. Harvest and escapement of hatchery-origin Chinook Salmon from brood year 2011.

		Below LGD										Above LGD				TRIBUTARY ESCP.			
Hatchery Release Site and production type	Return Year	Ocean	Z 1-5 Sport Harvest	Z 1-5 Comm. Net Harvest	PBT at BONN	Z 6 Sport Harvest	Z 6 Tribal Harvest	Off-Route Harvest*	Total Harvest	Off-Route Weirs*	PBT at LGD	Off- Route Harvest**	ID Sport Harvest	ID Tribal Harvest	Total Harvest Above LGD	Off-Route Weirs*	Below Weir	Weir/Term	Total
	2016	0	65	0	1,227	0	175	0	240	0	818	0	246	91	337	7	28	236	1,292
MFH	2015	58	682	694	9,497	7	3,389	0	4,830	0	4,378	0	1,146	321	1,467	23	212	2,297	10,931
Knox B.	2014	0	403	24	4,227	0	107	0	534	0	2,456	0	235	254	489	0	9	1,557	4,654
Seg	Total	58	1,150	718	14,951	7	3,671	0	5,604	0	7,652	0	1,627	666	2,293	30	249	4,090	16,877
	2016	0	0	11	205	0	46	0	57	0	145	0	0	23	23	0	4	181	216
MFH	2015	35	0	43	3,341	0	1,022	0	1,100	4	1,844	0	0	91	91	1	33	957	3,419
Knox B.	2014	1	0	2	1,692	0	82	0	85	2	1,465	0	0	164	164	0	1	830	1,695
Int	Total	36	0	56	5,238	0	1,150	0	1,242	6	3,454	0	0	278	278	1	38	1,968	5,330
	2016	0	65	11	1,432	0	221	0	297	0	963	0	246	114	360	7	32	417	1,508
McCall	2015	93	682	737	12,838	7	4,411	0	5,930	4	6,222	0	1,146	412	1,558	24	245	3,254	14,350
Hatchery	2014	1	403	26	5,919	0	189	0	619	2	3,921	0	235	418	653	0	10	2,387	6,349
Total	Total	94	1,150	774	20,189	7	4,821	0	6,846	6	11,106	0	1,627	944	2,571	31	287	6,058	22,207
	2016	X	X	X	658	X	X	0	0	0	570	0	60	0	60	X	45	170	658
SFH	2015	X	X	X	4,397	X	X	0	0	0	3,072	0	596	449	1,045	X	101	831	4,397
Sawtooth	2014	X	X	X	565	X	X	0	0	0	452	0	113	0	113	X	19	441	565
Seg	Total	0	0	0	5,620	0	0	0	0	0	4,094	0	769	449	1,218	0	165	1,442	5,620
SFH	2016	0	19	10	86	0	15	0	44	3	72	0	14	0	14	0	0	86	115
PAH	2015	11	104	128	552	1	485	4	733	3	293	0	86	0	86	4	0	376	795
Ponds**	2014	0	12	0	115	0	0	0	12	0	100	0	9	0	9	0	0	62	127
Seg	Total	11	135	138	753	1	500	4	789	6	465	0	109	0	109	4	0	524	1,037
	2016	0	0	0	129	0	9	0	9	0	112	0	0	0	0	0	17	51	129
SFH	2015	7	0	0	707	0	255	0	262	0	440	0	0	0	0	0	76	161	714
Sawtooth	2014	0	0	0	544	0	10	0	10	0	435	0	122	10	132	0	11	245	544
Int	Total	7	0	0	1,380	0	274	0	281	0	987	0	122	10	132	0	104	457	1,387
	2016	0	19	10	873	0	24	0	53	3	754	0	74	0	74	0	62	307	902
Sawtooth	2015	18	104	128	5,656	1	740	4	995	3	3,805	0	682	449	1,131	4	177	1,368	5,906
Hatchery	2014	0	12	0	1,224	0	10	0	22	0	987	0	244	10	254	0	30	748	1,236
Total	Total	18	135	138	7,753	1	774	4	1,070	6	5,546	0	1,000	459	1,459	4	269	2,423	8,044
CFH -	2016	0	27	7	151	0	0	0	34	0	99	0	18	0	18	3	0	385	185
Powell	2015	0	220	65	4,421	0	57	0	342	0	3921	0	484	442	926	20	0	576	4,706
Pond	2014	0	21	0	164	0	0	8	29	0	150	0	127	0	127	28	0	138	185
Total	Total	0	268	72	4,736	0	57	8	405	0	4,170	0	629	442	1,071	51	0	1,099	5,076
CFH -	2016	0	68	28	305	0	0	0	96	0	203	0	108	37	145	0	0	112	401
Red R.	2015	0	385	209	5,363	0	251	0	845	30	4392	36	1,312	1174	2522	192	36	1,339	5,957
Pond	2014	0	55	40	698	0	54	0	149	0	611	0	183	27	210	38	0	136	793

		Below LGD										Above LGD				TRIBUTARY ESCP.			
Hatchery Release Site and production type	Return Year	Ocean	Z 1-5 Sport Harvest	Z 1-5 Comm. Net Harvest	PBT at BONN	Z 6 Sport Harvest	Z 6 Tribal Harvest	Off-Route Harvest*	Total Harvest	Off-Route Weirs*	PBT at LGD	Off- Route Harvest**	ID Sport Harvest	ID Tribal Harvest	Total Harvest Above LGD	Off-Route Weirs*	Below Weir	Weir/Term	Total
Red River	Total	0	508	277	6,366	0	305	0	1,090	30	5,206	36	1,603	1,238	2,877	230	36	1,587	7,151
CFH -	2016	0	0	5	37	0	0	0	5	0	37	0	0	0	0	0	4	0	42
Crooked	2015	0	0	342	1,193	0	0	0	342	1	520	0	0	0	0	5	15	85	1,535
River	2014	0	0	4	336	0	4	0	8	2	70	0	0	0	0	1	4	51	340
Crooked R	Total	0	0	351	1,566	0	4	0	355	3	627	0	0	0	0	6	23	136	1,917
CFH -	2016	0	56	0	79	0	0	0	56	0	56	0	0	1	1	3	0	3	135
Selway	2015	0	62	0	3,509	3	61	10	136	3	2,839	0	194	408	602	97	0	589	3,571
River***	2014	0	15	0	551	0	14	0	29	0	463	0	123	0	123	6	0	144	566
Selway	Total	0	133	0	4,139	3	75	10	221	3	3,358	0	317	409	726	106	0	736	4,272
CFH -	2016	0	0	6	101	0	0	0	6	0	82	0	12	1	13	0	0	22	107
Clear	2015	0	83	207	2,821	4	0	17	311	7	2,279	9	505	177	691	0	0	101	3,111
Creek	2014	0	13	26	253	0	0	0	39	0	218	0	68	0	68	32	0	72	292
Clear Cr.	Total	0	96	239	3,175	4	0	17	356	7	2,579	9	585	178	772	32	0	195	3,510
	2016	0	151	46	673	0	0	0	197	0	477	0	138	39	177	6	4	522	870
	2015	0	750	823	17,307	7	369	27	1,976	41	13,951	45	2,495	2,201	4,741	314	51	2,690	18,880
CFH	2014	0	104	70	2,002	0	72	8	254	2	1,512	0	501	27	528	105	4	541	2,176
Total	Total	0	1,005	939	19,982	7	441	35	2,427	43	15,940	45	3,134	2,267	5,446	425	59	3,753	21,926
	2016	0	324	124	2,485	0	0	0	448	0	1,849	0	237	264	501	0	0	235	2,933
RRFH -	2015	81	2,614	1,158	35,694	21	531	323	4,728	0	29,840	0	9,328	7,160	16,488	0	0	3,194	39,547
RRFH	2014	0	373	137	4,641	0	0	72	582	0	4,154	0	813	190	1,003	0	0	901	5,151
Seg	Total	81	3,311	1,419	42,820	21	531	395	5,758	0	35,843	0	10,378	7,614	17,992	0	0	4,330	47,631
	2016	0	26	10	199	0	0	0	36	0	148	0	19	21	40	0	0	19	235
RRFH -	2015	6	209	93	2,858	2	43	26	379	0	2,389	0	746	573	1,319	0	0	256	3,167
L. Sal. R.	2014	0	30	11	372	0	0	6	47	0	333	0	868	2	870	0	0	72	413
Seg	Total	6	265	114	3,429	2	43	32	461	0	2,870	0	1,633	596	2,229	0	0	347	3,814
RRFH-	2016	0	54	21	412	0	0	0	74	0	307	0	3	0	3	0	0	10	486
HC	2015	13	433	192	5,916	3	88	54	784	0	4,946	0	471	0	471	0	0	1,845	6,555
Dam****	2014	0	62	23	769	0	0	12	97	0	689	0	145	0	145	0	0	165	854
Seg	Total	13	549	235	7,097	3	88	66	955	0	5,942	0	619	0	619	0	0	2,020	7,895
Rapid	2016	0	404	154	3,096	0	0	0	558	0	2,304	0	259	285	544	0	0	264	3,654
River	2015	101	3,257	1,443	44,468	26	662	402	5,890	0	37,175	0	10,545	7,733	18,278	0	0	5,295	49,268
Hatchery	2014	0	465	171	5,782	0	0	90	726	0	5,176	0	1,826	192	2,018	0	0	1,138	6,418
Total	Total	101	4,125	1,768	53,346	26	662	492	7,174	0	44,655	0	12,630	8,210	20,840	0	0	6,697	59,340
PFH -	2016	0	0	0	450	0	76	0	76	0	375	0	40	0	40	0	0	257	450
PAH	2015	0	167	89	3,207	0	262	0	518	0	1,703	0	346	0	346	0	0	1,015	3,463
Ponds	2014	0	0	0	450	0	0	0	0	0	191	0	50	0	50	0	0	289	450
Seg	Total	0	167	89	4,107	0	338	0	594	0	2,269	0	436	0	436	0	0	1,561	4,363
PFH -	2016	2	0	0	30	0	16	0	18	0	20	0	0	0	0	0	0	4	32

		Below LGD										Above LGD				TRIBUTARY ESCP.			
Hatchery Release Site and production type	Return Year	Ocean	Z 1-5 Sport Harvest	Z 1-5 Comm. Net Harvest	PBT at BONN	Z 6 Sport Harvest	Z 6 Tribal Harvest	Off-Route Harvest*	Total Harvest	Off-Route Weirs*	PBT at LGD	Off- Route Harvest**	ID Sport Harvest	ID Tribal Harvest	Total Harvest Above LGD	Off-Route Weirs*	Below Weir	Weir/Term	Total
PAH	2015	0	5	3	181	0	95	0	103	1	100	0	0	0	0	0	0	190	189
Ponds	2014	0	0	7	402	0	15	0	22	1	348	0	0	0	0	0	0	322	409
Int	Total	2	5	10	613	0	126	0	143	2	468	0	0	0	0	0	0	516	630
	2016	2	0	0	480	0	92	0	94	0	395	0	40	0	40	0	0	261	482
PAH	2015	0	172	92	3,388	0	357	0	621	1	1,803	0	346	0	346	0	0	1,205	3,652
Hatchery	2014	0	0	7	852	0	15	0	22	1	539	0	50	0	50	0	0	611	859
Total	Total	2	172	99	4,720	0	464	0	737	2	2,737	0	436	0	436	0	0	2,077	4,993
GRAND TOTAL		215	6,587	3,718	105,990	41	7,162	531	18,254	57	79,984	45	18,827	11,880	30,752	460	615	21,008	116,510

* Off-route refers to recoveries outside of the anticipated migration route back to a release site

** Eggs for this release were collected at Pahsimeroi, transferred to Sawtooth, and reared to smolts. Smolts were released from Pahsimeroi.

*** These releases had no CWT and a surrogate was used to generate downriver harvest and stray rates.

**** These releases were "off-site," meaning there was not a hatchery weir for fish to return to. Estimates of weir returns here are surrogate estimates of returns to terminal areas.

X These fields were not valid for that release group based on mark type, or there was not enough data to make an estimate based on a lack of markings/tags.

Adult returns from BY11 provided harvest opportunities in tribal, sport and commercial fisheries in the Columbia and Snake River basins in 2014, 2015, and 2016 including 18,254 fish harvested in fisheries downstream of Lower Granite Dam and 30,752 fish harvested in fisheries above LGD (Table 28). Based on the total return, Rapid River had the highest harvest rate and Sawtooth had the lowest. Overall, 42.1% of the total adult return from IDFG facilities was harvested in tribal, sport, and commercial fisheries.

Table 28. Returns, estimated harvest, and harvest rates above and below Lower Granite Dam from brood year 2011 Chinook Salmon released from Idaho Power Company and Lower Snake River Compensation Plan facilities in Idaho.

Hatchery	Total Adult Returns	Harvest Below LGD	Harvest Above LGD	% of Total Adult Return Harvested Below LGD	% of Total Adult Return Harvested	Total Adult Return Above LGD (PBT)	% of Total Adult Return Above LGD Harvested Above LGD
McCall	22,207	6,846	2,571	30.8%	42.4%	11,106	23.1%
Rapid R.*	59,340	7,174	20,840	12.1%	47.2%	44,655	46.7%
Clearwater	21,926	2,427	5,446	11.1%	35.9%	15,940	34.2%
Sawtooth	8,044	1,070	1,459	13.3%	31.4%	5,546	26.3%
Pahsimeroi	4,993	737	436	14.8%	23.5%	2,737	15.9%
TOTAL	**116,510**	**18,254**	**30,752**	**15.7%**	**42.1%**	**79,984**	**38.4%**

* Includes Little Salmon River and Hells Canyon Dam releases and harvest

Smolt-to-Adult Returns and Smolt-to-Adult Survival

Brood year 2011 smolt-to-adult survival rates (SAS) ranged from 0.50% for the Pahsimeroi Ponds release to 2.07% for the Knox Bridge (McCall Fish Hatchery) release (Sullivan et al. 2018; Table 29). Brood year 2011 smolt-to-adult returns (SAR) from release-site to Lower Granite Dam ranged from 0.27% for the Pahsimeroi Ponds release to 1.44% for the Rapid River release (Table 29). Estimates of SAR were higher than the recent 5-year average for McCall, Rapid River, Clearwater, and Sawtooth, and lower than the recent 5-year average for Pahsimeroi. Estimates of SAS were higher than the recent 5-year average for all facilities.

Table 29. Brood year 2011 smolt-to-adult returns from release site to Lower Granite Dam and smolt-to-adult survivals for all Chinook Salmon release groups from LSRCP and IPC hatcheries operated by IDFG.

Hatchery	Life Stage	Release Site	Number Released	Returns Above LGD (PBT)	Smolt-to-Adult Returns (SAR)	Total Adult Production	Smolt-to-Adult Survival (SAS)
McCall	Seg. Smolt	Knox B.	821,001	7,652	0.93%	16,877	2.06%
	Int. Smolt	Knox B.	253,849	3,454	1.36%	5,330	2.10%
McCall Hatchery Total			**1,074,850**	**11,106**	**1.03%**	**22,207**	**2.07%**
Rapid River	Smolt	RR Hatch	2,497,668	35,843	1.44%	47,631	1.91%
	Smolt	L. Sal. R.	200,000	2,870	1.44%	3,814	1.91%
	Smolt	HC Dam	414,000	5,942	1.44%	7,895	1.91%
Rapid River Total			**3,111,668**	**44,655**	**1.44%**	**59,340**	**1.91%**
Clearwater	Smolt	Powell	408,421	4,170	1.02%	5,076	1.24%
	Smolt	Red River	1,085,486	5,206	0.48%	7,151	0.66%
	Smolt	Crooked R.	208,447	627	0.30%	1,917	0.92%
	Smolt	Clear Cr.	378,083	2,579	0.68%	3,510	0.93%
	Smolt	Selway	426,696	3,358	0.79%	4,272	1.00%
Clearwater Hatchery Total			**2,507,133**	**15,940**	**0.64%**	**21,926**	**0.87%**
Sawtooth	Seg. Smolt	Saw. Hat.	652,732	4,094	0.63%	5,620	0.86%
	Seg. Smolt	Pahsim. P.	439,389	465	0.11%	1,037	0.02%
	Int. Smolt	Saw. Hat.	134,132	987	0.74%	1,387	0.66%
Sawtooth Hatchery Total			**1,226,253**	**5,546**	**0.45%**	**8,044**	**0.66%**
Pahsimeroi	Seg. Smolt	Pahsim. P.	838,664	2,269	0.27%	4,363	0.52%
	Int. Smolt	Pahsim. P.	167,209	468	0.28%	630	0.38%
Pahsimeroi Hatchery Total			**1,005,873**	**2,737**	**0.27%**	**4,993**	**0.50%**
BROOD YEAR TOTAL			**8,925,777**	**79,984**	**0.90%**	**116,510**	**1.31%**

Progeny-to-Parent Ratio

Progeny- to-parent ratios (PPR) reflect the number of adult returns that were produced for each parent spawned in 2011. The PBT adult return estimates at LGD were used to estimate PPRs to LGD (i.e. Progeny-to-Parent at LGD). The total adult return estimate (i.e. Total Progeny) includes the adult return estimate to Bonneville based on PBT and PIT tag conversion rates, harvest downstream of Bonneville, and ocean harvest (Sullivan at al. 2018; Table 30).

Table 30. Progeny-to-parent ratios for brood year 2011 hatchery Chinook Salmon from LSRCP and IPC hatcheries operated by IDFG. Project area is measured as returns to LGD.

Collection Facility /Stock	Total Parents (Actual Spawned + Prespawn Morts)	Total Progeny to LGD (excluding Jacks)	Progeny-to-Parent at LGD	Total Progeny (excluding Jacks)	Progeny to Parent Ratio (Total)
McCall	732	7,185	9.82	15,858	21.66
Rapid River	2,429	39,479	16.25	52,922	21.79
SF Clearwater	938	5,152	5.49	7,935	8.46
Powell*	1,012	9,276	9.17	11,815	11.67
Sawtooth	517	4,559	8.82	6,808	13.17
Pahsimeroi	635	2,198	3.46	4,134	6.51
Total	**6,263**	**67,849**	**10.83**	**99,472**	**15.88**

* Includes returns from the Powell Ponds, Selway River, and Clear Creek smolt releases. 'Total Parents' includes fish spawned at Rapid River and Dworshak whose eggs were transferred to Clearwater Hatchery to meet production needs.

SUMMARY

Spawning, Rearing, and Release

Spawning operations in BY11 produced sufficient numbers of green eggs to meet hatchery production goals at all facilities except Sawtooth. Green-egg to smolt survival was lower than the five-year average at all facilities. We released 8,925,777 brood year 2011 smolts (98% of the release goal) from IDFG facilities between March-April 2013 (Table 31).

Table 31. Juvenile release numbers compared to release goals for brood year 2011 hatchery Chinook Salmon from LSRCP and IPC hatcheries operated by IDFG.

Hatchery	Smolt Release Goal	Smolts Released (BY2010)	Release % of Target
McCall	1,000,000	1,074,850	107.5%
Rapid River	3,000,000	3,111,668	103.7%
Clearwater	2,335,000	2,507,133	107.4%
Sawtooth	1,800,000	1,226,253	68.1%
Pahsimeroi	1,000,000	1,005,873	100.6%
Total	9,135,000	8,925,777	97.7%

Adult Survival Rates

Mitigation goals for the three LSRCP-funded hatcheries outlined in this report (see Table 1, Chapter 1) are based on the expected number of adults returning to Lower Granite Dam. To provide some measure of how the BY2011 releases performed relative to mitigation goals, we compared the SAS and SAR observed for the BY2011 releases at each facility to those needed to achieve annual mitigation goals based on the smolt release targets for BY2011. None of the three LSRCP funded facilities achieved the SAS needed to reach the basinwide adult mitigation goals. McCall was the closest to meeting their goal (52%), followed by Clearwater (35%), and Sawtooth (12%). McCall and Clearwater exceeded the SARs needed to reach the project area adult mitigation goal above LGD while Sawtooth did not (Table 32).

Table 32. Adult mitigation goals and actual return numbers for brood year 2011 hatchery Chinook Salmon from LSRCP facilities operated by IDFG. SARs were estimated from release-site to Lower Granite Dam.

Hatchery	Mitigation Goal Above LGD	SAR to Achieve Mitigation Goal Above LGD	Brood Year 2011 Actual SAR	Basinwide Mitigation Goal	SAS to Achieve Basinwide Mitigation Goal	Brood Year 2011 Actual SAS
McCall	8,000	0.80%	1.03%	40,000	4.00%	2.07%
Clearwater	11,915	0.51%	0.64%	59,575	2.55%	0.88%
Sawtooth	19,445	1.08%	0.45%	97,225	5.40%	0.66%

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Appendix A. In-hatchery metrics for spawning and early rearing of Chinook Salmon at McCall, Pahsimeroi, Clearwater, Rapid River, and Sawtooth fish hatcheries for brood years 1991 through 2011.

Facility	Brood Year	Male Prespawn Mortality	Female Prespawn Mortality	Fecundity	Green Eggs Collected	Percent Eye-up	Females Culled (Fish Health)
McCall	1991	11.9%	14.8%	5,102	704,016	90.4%	0
Rapid River		7.6%	12.5%	3,886	2,553,218	94.5%	0
Clearwater		13.6%	9.1%	4,840	12,100	66.4%	0
Sawtooth		2.6%	6.2%	5,191	922,000	86.2%	0
Pahsimeroi		0.0%	2.2%	5,025	437,157	96.7%	0
McCall	1992	17.9%	19.5%	4,493	1,428,819	86.0%	7
Rapid River		21.9%	26.5%	3,852	4,534,400	91.3%	0
Clearwater		6.9%	3.6%	4,058	543,878	91.0%	0
Sawtooth		1.5%	2.8%	4,503	468,300	90.5%	0
Pahsimeroi		0.0%	2.8%	4,918	172,139	97.6%	0
McCall	1993	9.7%	7.0%	4,863	1,731,515	91.5%	41
Rapid River		20.9%	21.0%	4,344	4,228,155	93.3%	51
Clearwater		23.3%	6.1%	4,600	1,651,269	84.4%	0
Sawtooth		0.0%	4.2%	5,332	369,340	92.5%	0
Pahsimeroi		0.0%	0.0%	5,765	167,200	94.8%	0
McCall	1994	14.0%	14.0%	4,958	689,203	88.0%	0
Rapid River		15.3%	25.2%	4,221	514,962	91.3%	6
Clearwater		5.6%	3.8%	4,607	327,085	92.8%	0
Sawtooth		5.3%	0.0%	4,276	29,933	87.6%	0
Pahsimeroi[1]		NA	NA	NA	NA	NA	NA
McCall	1995	0.0%	9.3%	4,707	268,307	93.4%	0
Rapid River		3.3%	18.6%	3,771	132,001	87.3%	0
Clearwater		0.0%	0.0%	4,818	9,635	74.0%	0
Sawtooth		0.0%	0.0%	3,688	7,377	68.0%	0
Pahsimeroi		0.0%	2.8%	3,513	144,971	91.8%	0
McCall	1996	3.0%	14.6%	4,384	486,644	89.6%	0
Rapid River		6.0%	7.7%	3,561	1,171,610	93.3%	0
Clearwater		1.2%	4.8%	3,962	590,371	91.1%	0
Sawtooth		0.0%	0.0%	5,174	51,743	87.0%	0
Pahsimeroi		0.0%	0.0%	4,758	85,660	93.6%	0
McCall	1997	7.1%	9.4%	4,497	2,532,059	86.2%	31
Rapid River		13.1%	17.4%	3,930	5,407,913	93.1%	238
Clearwater		8.8%	5.8%	3,610	2,759,300	89.1%	172
Sawtooth		0.0%	7.0%	4,915	260,840	89.0%	0
Pahsimeroi		5.9%	5.9%	5,370	171,836	90.4%	0
McCall	1998	19.2%	13.5%	4,793	1,433,237	80.8%	29
Rapid River		14.1%	17.3%	4,715	3,720,135	87.4%	66
Clearwater		10.7%	12.6%	4,800	1,228,047	81.9%	54
Sawtooth		12.9%	10.0%	5,165	139,469	93.0%	0
Pahsimeroi		13.3%	13.3%	5,700	74,105	79.6%	0
McCall	1999	9.9%	8.7%	4,423	1,892,572	83.7%	28
Rapid River		1.0%	2.0%	4,406	634,520	91.5%	6
Clearwater		3.3%	8.0%	4,940	148,554	83.0%	3
Sawtooth		3.5%	7.7%	5,303	63,642	93.3%	0

Facility	Brood Year	Male Prespawn Mortality	Female Prespawn Mortality	Fecundity	Green Eggs Collected	Percent Eye-up	Females Culled (Fish Health)
Pahsimeroi		1.8%	10.2%	4,701	371,354	81.0%	0
McCall		6.5%	5.1%	4,377	1,580,053	86.0%	38
Rapid River		2.5%	6.4%	3,900	5,101,200	92.1%	69
Clearwater	2000	16.1%	9.6%	3,846	2,750,100	86.5%	221
Sawtooth		1.8%	2.2%	5,163	454,355	92.6%	0
Pahsimeroi		11.5%	14.0%	5,154	633,906	88.4%	11
McCall		21.2%	24.7%	4,354	1,793,667	74.8%	40
Rapid River		30.8%	36.0%	3,796	4,946,188	89.5%	425
Clearwater	2001	8.6%	8.3%	3,954	4,577,790	91.4%	307
Sawtooth		7.3%	8.6%	4,950	1,529,051	89.7%	85
Pahsimeroi		3.9%	17.5%	5,000	1,699,097	88.7%	13
McCall		18.3%	38.4%	4,747	1,804,033	87.3%	37
Rapid River		16.9%	22.1%	3,522	4,839,228	87.7%	198
Clearwater	2002	8.8%	13.6%	3,982	3,657,588	95.8%	103
Sawtooth		4.1%	29.1%	5,348	1,037,558	88.7%	3
Pahsimeroi		1.5%	9.9%	4,917	1,293,123	90.8%	14
McCall		17.6%	45.9%	5,401	2,598,233	83.1%	63
Rapid River		31.9%	48.2%	5,290	3,530,501	92.6%	104
Clearwater	2003	4.9%	14.8%	4,855	399,620	92.6%	171
Sawtooth		11.5%	8.3%	5,290	174,575	83.5%	1
Pahsimeroi		7.4%	7.5%	5,587	1,257,180	87.4%	121
McCall		9.9%	21.3%	4,460	2,038,292	86.5%	48
Rapid River		12.6%	24.3%	3,596	4,382,092	93.2%	86
Clearwater	2004	15.1%	5.2%	3,950	2,915,056	94.0%	81
Sawtooth		2.2%	1.8%	4,912	1,999,254	87.7%	10
Pahsimeroi		5.0%	2.6%	4,404	1,620,513	86.9%	70
McCall		11.6%	7.4%	4,602	2,001,830	88.8%	49
Rapid River		5.5%	11.0%	3,641	4,478,430	89.2%	20
Clearwater	2005	1.3%	4.3%	3,939	795,663	95.8%	5
Sawtooth		20.0%	15.4%	3,985	1,183,537	88.9%	4
Pahsimeroi		3.0%	10.0%	4,636	1,335,191	80.2%	43
McCall		5.5%	9.4%	4,470	1,931,415	86.9%	64
Rapid River		2.8%	7.6%	3,429	4,439,991	93.6%	58
Clearwater	2006	1.4%	7.4%	3,468	2,807,896	95.8%	11
Sawtooth		33.1%	68.1%	3,729	223,758	84.4%	3
Pahsimeroi		4.9%	6.1%	4,885	1,349,657	94.4%	35
McCall		9.8%	8.1%	4,560	1,527,720	84.8%	42
Rapid River		2.1%	9.6%	3,814	6,414,726	74.9%	143
Clearwater	2007	5.8%	28.9%	3,661	2,517,871	93.6%	15
Sawtooth		0.1%	4.1%	5,231	376,693	82.4%	1
Pahsimeroi		4.0%	11.5%	4,961	1,007,091	97.1%	12
McCall		30.2%	34.4%	4,833	2,073,280	68.5%	15
Rapid River		2.1%	9.3%	3,915	7,407,180	93.4%	644
Clearwater	2008	1.2%	3.5%	4,345	4,637,192	93.4%	103
Sawtooth		2.2%	3.2%	4,956	2,946,299	93.3%	10
Pahsimeroi		3.0%	0.5%	4,786	1,630,995	87.6%	1
McCall	2009	23.0%	33.0%	4,987	2,330,792	89.1%	80
Rapid River		3.9%	8.4%	4,224	5,440,512	96.5%	67

Facility	Brood Year	Male Prespawn Mortality	Female Prespawn Mortality	Fecundity	Green Eggs Collected	Percent Eye-up	Females Culled (Fish Health)
Clearwater		2.4%	3.3%	4,126	3,387,415	95.2%	61
Sawtooth		1.7%	0.4%	4,958	2,568,097	94.0%	28
Pahsimeroi		5.0%	5.0%	5,127	1,593,189	91.8%	41
McCall		10.0%	12.7%	5,297	2,240,173	90.0%	83
Rapid River		4.8%	9.7%	3,983	5,803,231	96.0%	203
Clearwater	2010	1.2%	23.0%	3,888	2,160,540	95.8%	33
Sawtooth		2.5%	2.2%	4,907	1,736,980	89.2%	7
Pahsimeroi		3.3%	4.8%	4,823	1,403,439	91.2%	3
McCall		4.7%	17.8%	5,045	1,987,584	93.6%	5
Rapid River		5.4%	14.9%	4,049	4,405,312	96.0%	29
Clearwater	2011	3.0%	4.4%	3,574	3,829,144	93.4%	76
Sawtooth		0.0%	2.9%	4,949	1,004,691	85.5%	8
Pahsimeroi		5.0%	16.0%	4,602	1,676,600	89.3%	18
McCall		15.7%	19.5%	4,829	2,020,676	84.0%	57
Rapid River	5 year Average	3.1%	8.9%	3,873	5,901,128	90.4%	223
Clearwater		2.4%	13.2%	3,898	3,102,183	94.6%	45
Sawtooth		7.9%	15.6%	4,756	1,570,365	91.8%	10
Pahsimeroi		4.0%	5.6%	4,916	1,396,874	92.0%	18

[1] No BY 1994 data available for Pahsimeroi because there was no production.

Appendix B. Green-egg-to-smolt survival rates for LSRCP and IPC facilities operated by IDFG for brood years 1991 through 2011. Recent 5-year average was calculated using brood years 2006-2010 for comparison to brood year 2011.

Brood Year	McCall	Sawtooth	Clearwater	Rapid River	Pahsimeroi
1991	95.2%	97.5%	85.9%	88.5%	85.8%
1992	86.9%	50.5%	89.6%	83.6%	75.8%
1993	82.7%	97.9%	82.4%	83.4%	88.2%
1994	96.4%	95.3%	93.0%	89.6%	NA
1995	95.2%	95.6%	90.9%	66.1%	77.3%
1996	96.0%	95.6%	93.3%	90.5%	76.6%
1997	84.1%	96.3%	80.9%	93.5%	79.0%
1998	98.8%	95.2%	77.9%	87.2%	72.6%
1999	90.8%	96.2%	90.7%	89.9%	76.2%
2000	92.6%	91.7%	82.2%	87.6%	80.4%
2001	98.0%	78.0%	88.1%	78.5%	71.0%
2002	88.2%	88.3%	77.2%	NA	90.6%
2003	77.6%	92.5%	75.9%	NA	77.6%
2004	77.9%	88.6%	93.6%	85.3%	81.8%
2005	82.2%	84.2%	94.9%	81.2%	74.0%
2006	78.8%	77.8%	76.9%	89.5%	76.9%
2007	82.1%	72.9%	77.1%	63.7%	86.5%
2008	57.9%	64.1%	67.0%	78.3%	71.7%
2009	86.6%	71.4%	59.5%	73.6%	74.5%
2010	87.5%	83.8%	82.6%	95.4%	73.2%
2011	81.0%	73.4%	75.0%	70.6%	74.6%
Recent 5-year Average	**78.6%**	**74.0%**	**72.6%**	**80.1%**	**76.6%**

Appendix C. Age composition of total (harvest, and escapement) Chinook Salmon returns from LSRCP and IPC facilities operated by IDFG for brood years 1991 through 2011.

Brood	Clearwater			McCall			Pahsimeroi			Rapid River			Sawtooth		
Year	1 Ocean	2 Ocean	3 Ocean	1 Ocean	2 Ocean	3 Ocean	1 Ocean	2 Ocean	3 Ocean	1 Ocean	2 Ocean	3 Ocean	1 Ocean	2 Ocean	3 Ocean
1991	38.5%	0.0%	61.5%	23.4%	62.3%	14.3%	10.0%	90.0%	0.0%	6.5%	65.0%	28.5%	22.2%	66.7%	11.1%
1992	3.1%	68.3%	28.6%	21.1%	65.7%	13.2%	4.4%	75.6%	20.0%	2.5%	30.5%	67.0%	20.0%	57.5%	22.5%
1993	5.1%	77.6%	17.3%	12.4%	74.9%	12.8%	5.0%	60.4%	34.7%	4.5%	83.6%	11.8%	13.1%	71.5%	15.3%
1994	3.0%	77.3%	19.7%	6.3%	50.9%	42.7%	NA	NA	NA	9.0%	77.7%	13.3%	20.0%	20.0%	60.0%
1995	7.6%	39.4%	53.0%	6.4%	89.4%	4.1%	8.3%	86.0%	5.7%	13.4%	41.6%	44.9%	0.0%	27.9%	72.1%
1996	5.0%	57.7%	37.3%	18.7%	76.9%	4.4%	31.4%	67.5%	1.1%	6.6%	74.3%	19.1%	26.0%	60.4%	13.6%
1997	5.8%	85.8%	8.5%	15.9%	73.3%	10.8%	15.3%	76.3%	8.3%	5.8%	88.9%	5.3%	15.2%	70.6%	14.2%
1998	1.9%	65.7%	32.5%	6.6%	67.2%	26.2%	4.9%	70.8%	24.2%	8.9%	60.6%	30.5%	16.3%	69.4%	14.3%
1999	3.3%	84.7%	11.9%	18.5%	74.1%	7.3%	15.4%	81.7%	3.0%	19.3%	72.7%	8.0%	34.4%	65.6%	0.0%
2000	7.2%	90.0%	2.8%	18.1%	78.7%	3.2%	23.7%	74.2%	2.1%	8.4%	89.3%	2.3%	28.9%	66.6%	4.5%
2001	17.2%	72.7%	10.1%	22.6%	73.8%	3.6%	15.0%	71.2%	13.9%	12.6%	83.5%	4.0%	31.6%	63.2%	5.2%
2002	4.1%	79.4%	16.4%	13.6%	75.6%	10.8%	8.2%	62.3%	29.5%	2.3%	75.4%	22.3%	19.5%	61.3%	19.2%
2003	7.4%	71.6%	21.0%	8.7%	77.5%	13.8%	10.4%	64.2%	25.3%	3.9%	71.5%	24.6%	10.8%	63.8%	25.4%
2004	9.9%	85.4%	4.7%	20.8%	74.7%	4.6%	12.4%	62.5%	25.1%	15.7%	82.3%	2.0%	21.4%	73.3%	5.3%
2005	26.2%	71.5%	2.3%	29.9%	65.0%	5.1%	16.8%	77.6%	5.6%	25.5%	70.9%	3.6%	34.7%	63.7%	1.6%
2006	22.3%	65.7%	12.0%	34.0%	60.2%	5.8%	24.0%	66.4%	9.6%	22.5%	72.5%	5.1%	36.7%	55.9%	7.4%
2007	10.3%	78.4%	11.3%	22.9%	71.8%	5.3%	18.9%	76.9%	4.2%	10.3%	81.5%	8.1%	24.4%	58.3%	17.3%
2008	30.2%	68.1%	1.7%	45.2%	50.5%	4.3%	42.7%	55.8%	1.5%	32.1%	64.5%	3.4%	53.0%	43.3%	3.7%
2009	15.1%	78.3%	6.6%	15.3%	79.4%	5.3%	5.5%	92.1%	2.4%	11.1%	87.3%	1.6%	21.4%	71.2%	7.5%
2010	21.2%	77.8%	1.0%	25.9%	69.1%	5.1%	34.7%	64.1%	1.2%	14.8%	82.8%	2.4%	37.8%	58.0%	4.2%
2011	9.9%	86.1%	4.0%	27.6%	64.8%	7.7%	10.3%	79.4%	10.3%	10.8%	83.0%	6.2%	10.4%	78.0%	11.6%
Recent Five-year Average	**19.8%**	**73.7%**	**6.5%**	**28.7%**	**66.2%**	**5.2%**	**25.2%**	**71.1%**	**3.8%**	**18.2%**	**77.7%**	**4.1%**	**34.7%**	**57.3%**	**8.0%**

Appendix D. Number of juveniles released, size at release, juvenile survival to LGD, and SAR and SAS for smolts released from LSRCP and IPC facilities for brood years 1991 through 2011 by facility and by funding source. Adult returns to LGD are based on parentage based tagging estimates from brood year 2011 forward. Total adult returns are based on PBT estimates at LGD and PIT tag conversion rates from Bonneville to LGD from brood year 2011 forward.

Facility	Brood Year	Juvenile Production Smolt Release	Size at Release (fpp)	Weighted Average Juvenile Survival	Adult Returns to LGD	SAR	Total Adult Returns	SAS
Clearwater (LSRCP)	1991	/	/	/	/	/	/	/
	1992	535,394	13.8	79.2%	620	0.116%	670	0.125%
	1993	828,325	18.5	60.4%	2,298	0.277%	2,442	0.295%
	1994	361,622	17.5	58.7%	416	0.115%	446	0.123%
	1995	7,905	17.6	48.8%	65	0.822%	65	0.822%
	1996	763,745	13.9	64.9%	4,359	0.571%	4,490	0.588%
	1997	1,582,014	16.4	74.3%	13,856	0.876%	16,793	1.061%
	1998	848,583	16.1	67.7%	6,062	0.714%	8,583	1.011%
	1999	297,297	12.5	63.0%	1,878	0.632%	1,965	0.661%
	2000	1,633,170	15.8	53.4%	6,756	0.414%	6,954	0.426%
	2001	1,618,593	22.0	51.2%	1,634	0.101%	1,754	0.108%
	2002	1,481,982	16.6	61.3%	2,136	0.144%	2,223	0.150%
	2003	1,505,666	15.7	67.3%	2,372	0.158%	2,870	0.191%
	2004	1,914,079	16.0	62.1%	6,569	0.343%	10,711	0.560%
	2005	1,670,006	15.8	72.0%	4,966	0.297%	6,515	0.390%
	2006	1,666,314	16.7	57.0%	6,153	0.390%	9,961	0.640%
	2007	2,145,480	16.6	51.5%	5,768	0.269%	7,577	0.353%
	2008	2,251,033	15.0	74.4%	7,721	0.343%	9,735	0.432%
	2009	2,438,452	16.8	54.3%	2,001	0.082%	2,404	0.099%
	2010	2,387,106	16.8	66.8%	8,041	0.337%	10,096	0.423%
	2011	2,507,133	20.2	61.8%	15,940	0.636%	21,926	0.875%
Clearwater Totals		**28,443,899**	**16.5**	**62.5%**	**99,611**	**0.350%**	**128,180**	**0.451%**
McCall (LSRCP)	1991	308,300	19.2	52.3%	290	0.094%	293	0.095%
	1992	824,224	26.9	54.5%	413	0.050%	413	0.050%
	1993	763,705	21.8	43.2%	4,690	0.614%	4,755	0.623%
	1994	351,340	17.9	54.6%	514	0.146%	534	0.152%
	1995	122,766	24.5	42.7%	1,254	1.021%	1,254	1.021%
	1996	393,872	17.5	59.1%	5,320	1.351%	5,435	1.380%
	1997	1,055,673	23.9	64.8%	21,650	2.051%	22,960	2.175%
	1998	845,244	23.3	67.0%	16,341	1.933%	16,846	1.993%
	1999	1,077,077	19.4	68.3%	8,583	0.797%	8,867	0.823%
	2000	1,062,870	23.0	59.2%	13,474	1.268%	15,024	1.414%
	2001	1,054,242	21.1	57.4%	5,918	0.561%	6,331	0.601%
	2002	914,060	20.9	56.0%	3,026	0.331%	3,866	0.423%

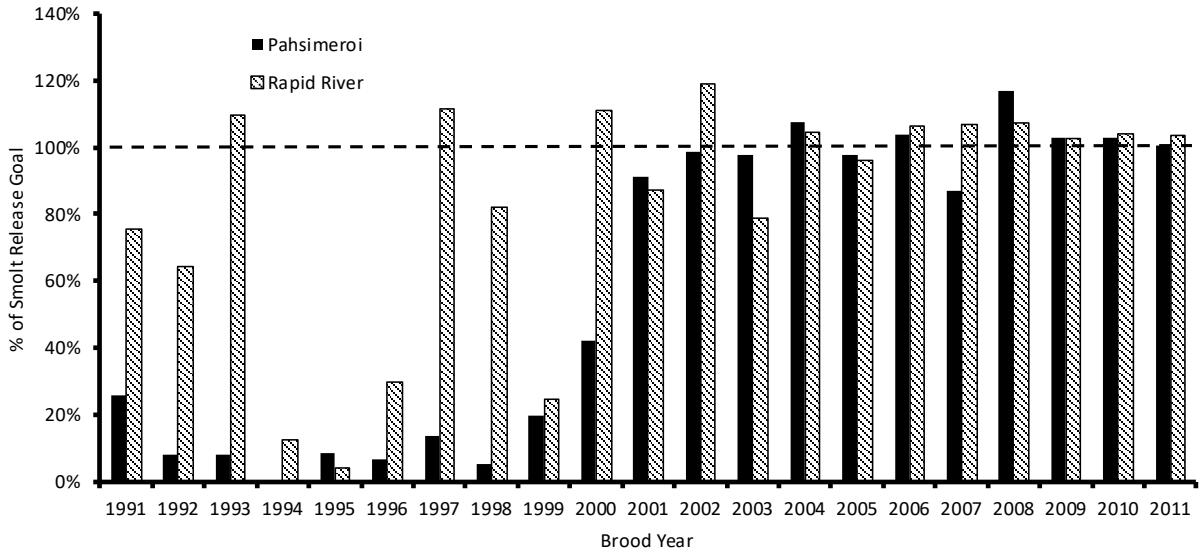
Facility	Brood Year	Juvenile Production Smolt Release	Size at Release (fpp)	Weighted Average Juvenile Survival	Adult Returns to LGD	SAR	Total Adult Returns	SAS
	2003	1,047,530	20.9	60.4%	3,390	0.324%	3,856	0.368%
	2004	1,094,264	18.1	63.8%	9,897	0.904%	10,692	0.977%
	2005	1,087,170	19.1	55.0%	10,773	0.991%	11,905	1.095%
	2006	1,060,540	18.4	58.7%	19,966	1.880%	22,800	2.150%
	2007	1,106,700	21.1	51.2%	6,274	0.567%	9,200	0.831%
	2008	1,037,600	20.8	56.5%	7,009	0.676%	9,472	0.913%
	2009	1,069,028	18.5	62.9%	3,508	0.328%	4,345	0.406%
	2010	1,028,353	20.0	55.9%	5,881	0.572%	8,815	0.857%
	2011	1,074,850	17.0	64.9%	11,106	1.033%	22,207	2.066%
McCall Totals		**18,379,408**	**20.6**	**57.5%**	**159,277**	**0.867%**	**189,870**	**1.033%**
	1991	144,925	25.0	18.6%	2	0.001%	2	0.001%
	1992	141,530	25.0	20.7%	33	0.023%	33	0.023%
	1993	103,695	22.0	23.0%	106	0.102%	106	0.102%
	1994	/	/	/	/	/	/	/
	1995	4,650	12.0	51.7%	43	0.925%	43	0.925%
	1996	43,161	13.9	62.8%	235	0.544%	235	0.544%
	1997	117,442	21.8	49.2%	1,171	0.997%	1,275	1.086%
	1998	/	/	/	/	/	/	/
	1999	/	/	/	/	/	/	/
	2000	265,642	15.4	58.5%	1,285	0.484%	1,361	0.512%
Sawtooth (LSRCP)	2001	960,193	20.1	60.8%	1,519	0.158%	1,589	0.165%
	2002	624,739	21.0	59.2%	724	0.116%	749	0.120%
	2003	134,769	19.0	22.0%	213	0.158%	213	0.158%
	2004	1,552,444	21.7	65.3%	6,114	0.394%	6,571	0.423%
	2005	995,262	17.2	57.5%	6,360	0.639%	6,871	0.690%
	2006	174,132	19.1	34.1%	1,089	0.630%	1,181	0.680%
	2007	274,644	13.9	37.7%	549	0.200%	641	0.233%
	2008	1,854,078	21.9	42.3%	8,209	0.443%	10,476	0.565%
	2009	1,735,179	23.0	48.7%	1,970	0.114%	2,192	0.126%
	2010	1,456,221	28.0	44.4%	4,617	0.317%	5,500	0.378%
	2011	1,226,253	20.5	57.3%	6,076	0.495%	8,044	0.656%
Sawtooth Total		**11,808,959**	**20.0**	**45.2%**	**40,315**	**0.341%**	**47,082**	**0.399%**
	1991	260,091	13.2	46.8%	58	0.022%	58	0.022%
	1992	81,367	13.9	32.6%	38	0.047%	38	0.047%
	1993	82,683	12.3	/	1	0.001%	1	0.001%
Pahsimeroi (IPC)	1994	/	/	/	/	/	/	/
	1995	85,838	20.0	50.5%	229	0.267%	229	0.267%
	1996	65,648	11.1	42.5%	280	0.427%	280	0.427%
	1997	135,669	9.9	58.6%	1,056	0.778%	1,056	0.778%

Facility	Brood Year	Juvenile Production Smolt Release	Size at Release (fpp)	Weighted Average Juvenile Survival	Adult Returns to LGD	SAR	Total Adult Returns	SAS
	1998	53,837	10.9	64.2%	850	1.579%	850	1.579%
	1999	197,124	8.0	68.0%	1,317	0.668%	1,348	0.684%
	2000	419,869	15.8	69.1%	3,425	0.816%	3,954	0.942%
	2001	909,926	15.2	71.4%	2,209	0.243%	2,842	0.312%
	2002	984,509	15.4	50.1%	527	0.054%	712	0.072%
	2003	975,252	18.2	22.1%	486	0.050%	604	0.062%
	2004	1,073,951	22.0	26.7%	1,157	0.108%	1,177	0.110%
	2005	978,463	16.5	53.0%	8,102	0.828%	9,135	0.934%
	2006	1,037,772	14.9	44.6%	12,073	1.160%	14,641	1.410%
	2007	870,842	11.3	50.9%	4,216	0.484%	5,859	0.673%
	2008	1,169,701	24.8	37.3%	681	0.058%	1,028	0.088%
	2009	1,030,028	14.1	51.1%	553	0.054%	623	0.060%
	2010	1,026,849	14.4	58.2%	2,082	0.203%	2,574	0.251%
	2011	1,005,873	17.4	63.2%	2,368	0.235%	4,993	0.496%
Pahsimeroi Totals		**12,445,292**	**15.0**	**50.6%**	**41,708**	**0.335%**	**52,002**	**0.418%**
	1991	2,260,500	24.4	62.9%	77	0.003%	77	0.003%
	1992	1,928,146	20.3	53.9%	8,684	0.450%	8,758	0.454%
	1993	3,286,455	19.0	72.3%	20,177	0.614%	20,972	0.638%
	1994	379,167	17.0	59.4%	614	0.162%	656	0.173%
	1995	122,017	20.5	39.3%	365	0.299%	365	0.299%
	1996	896,170	20.3	66.3%	10,154	1.133%	10,970	1.224%
	1997	3,347,284	17.9	73.1%	37,026	1.106%	53,204	1.589%
	1998	2,462,354	18.6	73.7%	24,316	0.988%	36,526	1.483%
	1999	736,601	19.8	69.5%	5,122	0.695%	5,995	0.814%
	2000	3,322,998	19.8	74.8%	12,168	0.366%	20,709	0.623%
Rapid River (IPC)	2001	2,615,067	18.8	69.2%	5,854	0.224%	7,953	0.304%
	2002	3,562,154	24.5	69.4%	7,110	0.200%	8,264	0.232%
	2003	2,361,430	19.5	73.6%	5,316	0.225%	6,653	0.282%
	2004	3,130,528	19.3	75.9%	14,274	0.456%	21,391	0.683%
	2005	2,882,728	20.0	74.2%	9,872	0.342%	14,785	0.513%
	2006	3,184,454	16.7	80.6%	40,061	1.258%	61,179	1.921%
	2007	3,205,711	19.8	72.6%	18,556	0.579%	20,440	0.638%
	2008	3,223,002	17.7	78.1%	16,543	0.513%	22,138	0.687%
	2009	3,083,181	18.6	77.6%	7,035	0.228%	9,043	0.307%
	2010	3,116,197	17.0	74.5%	22,157	0.711%	27,812	0.892%
	2011	3,111,668	18.5	73.6%	44,655	1.435%	59,340	1.907%
Rapid River Totals		**52,217,812**	**19.4**	**69.7%**	**310,136**	**0.594%**	**417,230**	**0.799%**
	1991	2,520,591	/	54.9%	135	0.005%	135	0.005%

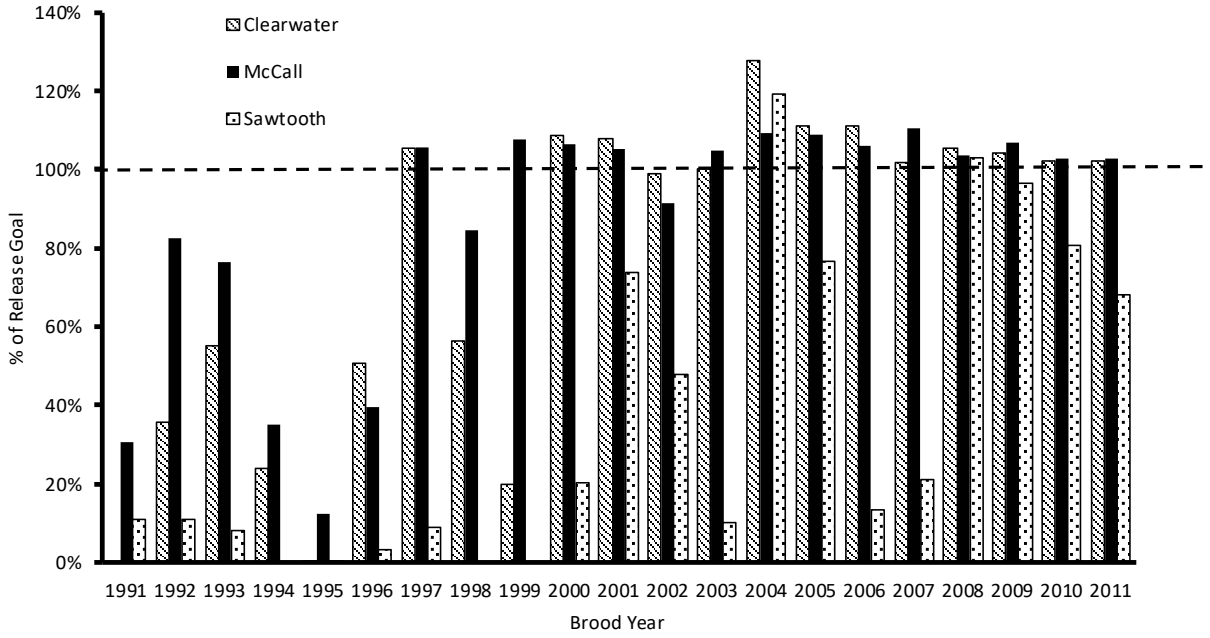
Facility	Brood Year	Juvenile Production Smolt Release	Size at Release (fpp)	Weighted Average Juvenile Survival	Adult Returns to LGD	SAR	Total Adult Returns	SAS
	1992	2,009,513	/	43.3%	8,722	0.434%	8,796	0.438%
	1993	3,369,138	/	72.3%	20,178	0.599%	20,973	0.623%
	1994	379,167	/	59.4%	614	0.162%	656	0.173%
	1995	207,855	/	44.9%	594	0.286%	594	0.286%
	1996	961,818	/	54.4%	10,434	1.085%	11,250	1.170%
	1997	3,482,953	/	65.9%	38,082	1.093%	54,260	1.558%
	1998	2,516,191	/	69.0%	25,166	1.000%	37,376	1.485%
	1999	933,725	/	68.8%	6,439	0.690%	7,343	0.786%
	2000	3,742,867	/	72.0%	15,593	0.417%	24,663	0.659%
IPC Facility Totals (PFH,RRFH)	2001	3,524,993	/	70.3%	8,063	0.229%	10,795	0.306%
	2002	4,546,663	/	59.8%	7,637	0.168%	8,976	0.197%
	2003	3,336,682	/	47.9%	5,802	0.174%	7,257	0.217%
	2004	4,204,479	/	51.3%	15,431	0.367%	22,568	0.537%
	2005	3,861,191	/	63.6%	17,974	0.466%	23,920	0.619%
	2006	4,222,226	/	62.6%	52,134	1.235%	75,820	1.796%
	2007	4,076,553	/	61.8%	22,772	0.559%	26,299	0.645%
	2008	4,392,703	/	57.7%	17,224	0.392%	23,166	0.527%
	2009	4,113,209	/	64.4%	7,588	0.184%	9,666	0.235%
	2010	4,143,046	/	66.4%	24,239	0.585%	30,386	0.733%
	2011	4,117,541	/	70.6%	47,023	1.142%	64,333	1.562%
IPC GRAND TOTAL		**64,663,104**	**/**	**62.3%**	**351,844**	**0.544%**	**469,232**	**0.726%**
	1991	453,225	/	35.5%	292	0.064%	295	0.065%
	1992	1,501,148	/	51.5%	1,066	0.071%	1,116	0.074%
	1993	1,695,725	/	42.2%	7,094	0.418%	7,303	0.431%
	1994	712,962	/	56.7%	930	0.130%	980	0.137%
	1995	135,321	/	47.7%	1,362	1.006%	1,362	1.006%
	1996	1,200,778	/	62.3%	9,914	0.826%	10,160	0.846%
	1997	2,755,129	/	62.8%	36,677	1.331%	41,028	1.489%
	1998	1,693,827	/	67.4%	22,403	1.323%	25,429	1.501%
LSRCP Facility Totals (MFH,CFH,SFH)	1999	1,374,374	/	65.7%	10,461	0.761%	10,832	0.788%
	2000	2,961,682	/	57.0%	21,515	0.726%	23,339	0.788%
	2001	3,633,028	/	56.5%	9,071	0.250%	9,674	0.266%
	2002	3,020,781	/	58.8%	5,886	0.195%	6,838	0.226%
	2003	2,687,965	/	49.9%	5,975	0.222%	6,939	0.258%
	2004	4,560,787	/	63.7%	22,580	0.495%	27,974	0.613%
	2005	3,752,438	/	61.5%	22,099	0.589%	25,291	0.674%
	2006	2,900,986	/	49.9%	27,208	0.938%	33,942	1.170%
	2007	3,526,824	/	46.8%	12,591	0.357%	17,418	0.494%
	2008	5,142,711	/	57.7%	22,939	0.446%	29,683	0.577%

Facility	Brood Year	Juvenile Production Smolt Release	Size at Release (fpp)	Weighted Average Juvenile Survival	Adult Returns to LGD	SAR	Total Adult Returns	SAS
	2009	5,242,659	/	55.3%	7,479	0.143%	8,941	0.171%
	2010	4,871,680	/	55.7%	18,539	0.381%	24,411	0.501%
	2011	4,808,236	/	61.3%	33,122	0.689%	52,177	1.085%
LSRCP GRAND TOTAL		**58,632,266**	**/**	**56.9%**	**299,203**	**0.510%**	**365,132**	**0.623%**

Appendix E. Percentage of smolt release goals met at PFH and RRFH from 1991 through 2011.



Appendix F. Percentage of Chinook smolt release goals met at Lower Snake River Compensation Hatcheries in Idaho.



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