2014 Juvenile Fish Collection and Bypass Report
Little Goose Dam Juvenile Fish Facility

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Introduction

This report summarizes activities and results associated with the collection, transportation and bypass of out-migrating juvenile steelhead *Oncorhynchus mykiss*; Chinook salmon *Oncorhynchus tschawytscha*; sockeye salmon *Oncorhynchus nerka*; and coho salmon *Oncorhynchus kisutch* at Little Goose Dam (LGS) in 2014. The data represented in this report was collected from April 1 through October 31, 2014 by the United States Army Corps of Engineers (USACE) and Oregon Department of Fish and Wildlife (ODFW) Smolt Monitoring Program (SMP) and transportation biologists and technicians.

Little Goose Lock and Dam (LGS), located at river mile (RM) 70.3, is the third of four hydroelectric dams impounding the lower Snake River. Little Goose Dam is 2,655 feet long and impounds Lake Bryan, a 10,025-acre reservoir with normal operating elevations ranging from 633-638 feet above mean sea level (msl). Lower Monumental Dam impounds the Snake River below LGS, forming Lake Herbert G. West, creating tailwater elevations at LGS ranging from 537-544 feet msl. LGS is comprised of five major components; the powerhouse, navigation lock, earthen embankment, spillway and adult and juvenile fish passage facilities.

The juvenile fish collection and bypass system at LGS extends from the upstream face of the dam downstream to the Juvenile Fish Facility (JFF) and tailwater area. System components include 18 extended length submersible bar screens (ESBS), 18 vertical barrier screens (VBS), 36 gatewell orifices, a collection channel, a dewatering structure, and a corrugated flume, which routes fish diverted from the forebay to the JFF. The JFF consists of a fish separator, routing flumes, fish holding raceways, a sampling and marking laboratory, truck and barge loading facilities, and a passive integrated transponder (PIT) tag detection and diversion system.

The objective of the transport program is to improve survival of out-migrating smolts, resulting in increased adult salmon and steelhead returns. Operating parameters are set forth annually in the Fish Passage Plan (FPP) and the Fish Operations Plan (FOP).

River Conditions

River Flows

Below average winter and spring precipitation preceded a hot and dry summer. As a result, flows were 84% of average for the 2014 water year (FPC Weekly Report 14-28). Monthly flows were below the five year average for all months except May (Table 1). During the 2014 fish passage season, April 1 through October 31, the average daily flow past LGS was 52.5 kcfs. The maximum average daily flow of 139.3 kcfs occurred on May 25 and the minimum average daily flow of 12.4 kcfs occurred on September 26 (Figure 1).

Spill to aid juvenile fish passage occurred from April 3 through August 31, 2014, in accordance with the 2014 Fish Operation Plan (FOP). The spill target of 30% of total flow was maintained during that interval. Spill averaged 30.7% of total flow during this period. Flow decreased to below 33 kcfs on July 26 and, in accordance with the FOP, spill was changed to a constant rate of between 7 and 11 kcfs, whichever more closely provided the target spill rate of 30% of the total flow. The Temporary Spillway Weir was installed into spillbay one on April 3 and removed on August 4.

Table 1. Comparisons of average monthly flow and spill in kcfs at Little Goose Dam JFF 2009-2014.

Month	2009	2010	2011	2012	2013	2014	2009-2013 Average
			Flow (kcfs)				
Apr	84.50	40.28	103.34	113.60	56.68	74.33	79.68
May	111.04	64.83	133.19	102.07	79.99	99.66	98.22
Jun	109.48	124.58	163.98	87.38	55.41	84.92	108.16
Jul	50.43	49.51	93.50	46.35	33.44	45.53	54.65
Aug	32.02	29.81	42.07	28.38	23.16	26.87	30.80
Sep	21.84	22.62	33.61	21.09	18.37	19.93	23.51
Oct	21.26	18.97	26.58	18.09	21.75	17.55	21.33
			Spill (kcfs)				
Apr	24.48	11.41	30.08	36.99	16.30	22.37	23.74
May	31.13	19.40	81.37	32.28	24.75	29.34	37.79
Jun	30.88	40.91	73.32	31.86	16.62	24.95	38.72
Jul	15.09	14.83	28.54	17.89	10.57	13.97	17.38
Aug	10.11	9.40	14.00	9.52	7.64	8.73	10.13
Sep	0.20	0.18	0.39	0.18	0.50	0.17	0.29
Oct	0.00	0.00	0.00	0.00	0.00	0.00	0.00

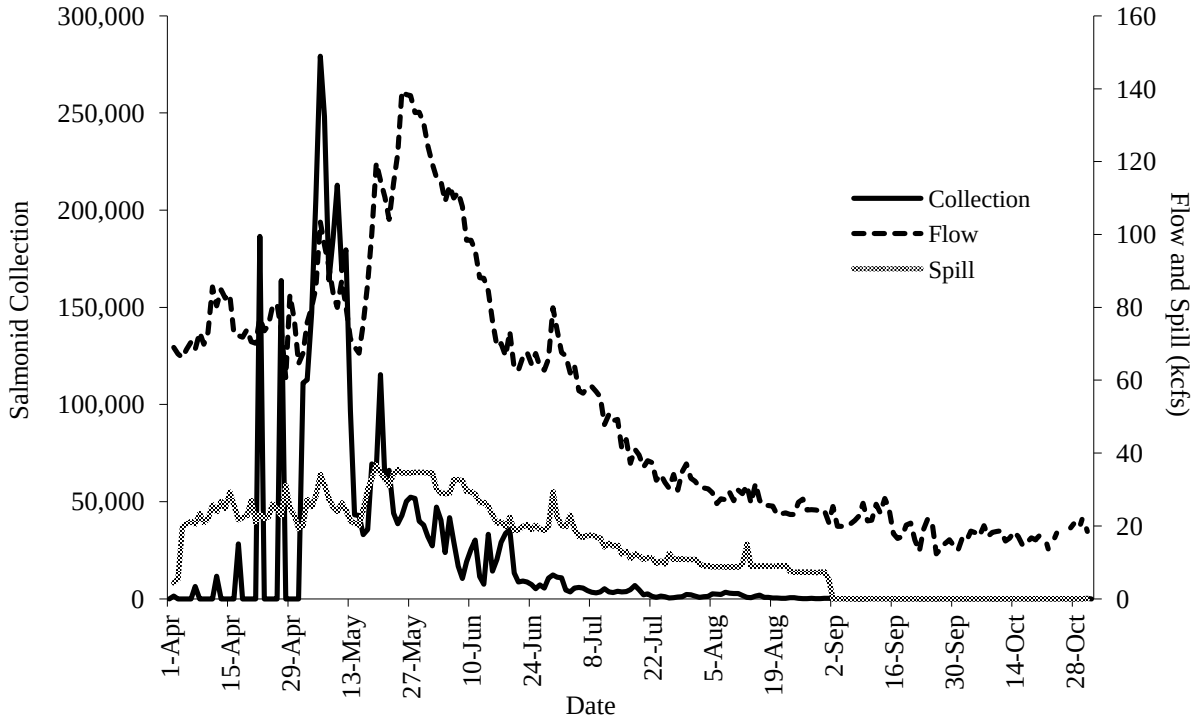

Figure 1. Total river flow, spill, and number of juvenile salmonids collected at Little Goose Dam during the fish collection and transport season, 2014.

In accordance with the FCRPS BIOP (Federal Columbia River Power System Biological Opinion), Minimum Operating Pool (MOP) operations, to enhance lotic conditions and improve fish migration, were placed into effect during the juvenile fish passage season from April through August. To improve navigational safety during low flows, forebay elevations were increased from MOP elevations (633-634 feet MSL), to MOP +2 (634-636 feet MSL) from mid-

July through the end of MOP restrictions on August 31. All deviations from the FPP and FOP were coordinated through the Technical Management Team (TMT), as necessary, to meet real-time operational requirements.

River Temperature

The average daily river temperature during the fish passage season was 59.9°F. Average monthly water temperatures were within the range of the five year average temperatures for each month. The maximum river temperature of 69.3°F was recorded on August 16 and was slightly above the five year average maximum of 69.2°F. The 2014 minimum river temperature of 45.3°F was recorded the first day of the season, April 2, and was slightly above the five year average minimum of 44.9°F. As per the Water Management Plan, river temperatures were tempered by scheduled cool water releases from Dworshak Reservoir. Supplemental flow from Dworshak averaged 11.4 kcfs at 44.6°F for the month of July and 9.0 kcfs at 46.2°F for the month of August (Columbia River Dart). Temperatures recorded daily in the LGS JFF averaged 66.3°F during July and 68.2°F during August.

Total Dissolved Gas (TDG) data are automatically collected and transmitted to the Columbia River Operational and Hydromet Management System (CROHMS) hourly to provide information for spill and gas saturation management. The USACE Reservoir Control Center (RCC) coordinates efforts to maintain dissolved gas saturation levels in accordance with the Washington State TDG Level Variance Standard of 120% saturation in the project tailwater or 115% in the forebay of the next project downstream as measured over 12 consecutive hours. In 2014, TDG was monitored in the forebay from April 1 through August 31 and in the tailwater year around.

The average daily TDG level in the LGS forebay, from April 3 through August 31, 2014 was 110.7% saturation. Total Dissolved Gas saturation ranged from 103.3% on April 3 to 117.2% on June 1. Total dissolved gas saturation levels exceeded 115% from May 26 through June 2 in the LGS forebay. The TDG saturation averaged 115.8% during that interval.

The TDG level in the LGS tailrace ranged between 107.9% on August 31 to 116.7% on May 31, averaging 112.4% during the spill to aid fish passage season, April 3 through August 31. Tailwater TDG levels did not exceed 120% saturation during the 2014 spill for fish passage season. Forebay TDG levels at Lower Monumental Dam (LMN) ranged from 102.9% on April 3 to 118.3% on June 2, averaging 111.6% from April 3 through August 31. The LMN forebay TDG levels exceeded 115% from May 27 through June 3, averaging 116.6% saturation during that interval (USACE via Columbia River DART).

Turbidity

Water clarity was measured during adult fish passage facility inspections. Measurements were taken in the adult fish ladder using a secchi disc lowered to a maximum depth of just over 6 feet. The fish ladder water supply is gravity fed from the forebay and is representative of river conditions. High turbidity was recorded during peak outflow from May 25 through June 5, with secchi measurements ranging between 1.6 and 3.0 feet. Turbidity was lowest during periods of low flow, from July through October, with secchi measurements ranging from 5.2 feet to over 6.0 feet.

Fish Migration, Bypass, Collection and Transportation

The juvenile fish bypass and collection facility was placed into primary bypass operations on March 17. Collection for transport began on May 1 at 0700 hours and ended on October 31 at 0700 hours. An estimated total of 3,755,595 salmonid smolts were collected for transport during this period. Of this total 3,744,814 smolts were barged, 7,967 were trucked, 71 were bypassed and 2,743 were facility mortalities.

Table 2. Annual collection, bypass, and transport activity at Little Goose Dam JFF, 2009-2014.

	Chinook Yearling		Chinook Sub-yearling		Steelhead		Coho		Sockeye		
Year	Clip	Unclip	Clip	Unclip	Clip	Unclip	Clip	Unclip	Clip	Unclip	Total
Collection											
2009	1,315,352	404,911	333,313	519,124	1,935,602	582,074	4,389	55,155	19,992	13,678	5,183,590
2010	643,785	229,253	287,702	578,905	807,718	277,394	2,740	34,177	1,291	7,594	2,870,559
2011	1,125,551	323,791	232,116	508,188	868,702	263,726	0	41,631	3,487	20,869	3,388,061
2012	1,067,044	431,462	268,235	399,054	658,540	312,732	775	52,541	252	25,583	3,216,218
2013	768,720	257,791	155,896	297,206	864,292	310,421	50	36,839	15,952	6,683	2,713,850
2014	1,487,105	462,499	278,019	463,013	1,013,203	346,944	0	41,542	9,115	51,955	4,153,395
Bypass											
2009	531,880	220,144	2,180	7,121	1,160,734	299,337	0	2,825	1	5,825	2,230,047
2010	57,967	23,228	3	325	46,365	12,601	0	0	0	0	140,489
2011	56,672	46,496	1	92	216,725	21,908	0	401	0	5,227	347,522
2012	242,353	145,896	1	125	227,179	60,328	0	1,601	0	691	678,174
2013	24,036	22,662	5	343	56,575	9,627	0	200	0	2	113,450
2014	78,418	102,125	0	294	178,448	32,046	0	600	0	5,911	397,842
Truck											
2009	0	2	123	2,753	3	4	0	300	1	18	3,204
2010	11	15	79	10,452	7	11	0	19	1	10	10,605
2011	1	16	59	10,680	8	22	0	277	2	77	11,142
2012	1	0	133	6,306	17	26	0	7	0	106	6,596
2013	0	0	638	25,106	13	18	0	4	2	16	25,797
2014	0	4	400	7,520	4	6	0	0	0	33	7,967
Barge											
2009	782,309	184,253	328,224	505,511	774,611	282,643	4,408	51,964	19,975	7,793	2,941,691
2010	585,585	205,930	285,364	564,261	761,183	264,706	2,740	34,156	1,289	7,583	2,712,797
2011	1,067,450	276,919	230,973	494,558	651,617	241,734	0	40,943	3,480	15,416	3,023,090
2012	824,116	285,393	267,834	391,916	431,232	252,302	775	50,931	252	24,775	2,529,526
2013	744,193	235,046	155,117	271,046	807,600	300,745	50	36,635	15,950	6,657	2,573,039
2014	1,408,338	360,039	277,207	453,966	834,621	314,847	0	40,932	9,107	45,757	3,744,814
Total Transport											
2009	782,309	184,255	328,347	508,264	774,614	282,647	4,388	52,284	19,976	7,811	2,944,895
2010	585,596	205,945	285,443	574,713	761,190	264,717	2,740	34,175	1,290	7,593	2,723,402
2011	1,067,451	276,935	231,032	505,238	651,625	241,756	0	41,220	3,482	15,493	3,034,232
2012	824,117	285,393	267,967	398,222	431,249	252,328	775	50,938	252	24,881	2,536,122
2013	744,193	235,046	155,755	296,152	807,613	300,763	50	36,639	15,952	6,673	2,598,836
2014	1,408,338	360,043	277,607	461,486	834,625	314,853	0	40,932	9,107	45,790	3,752,781

During the month of April, prior to the start of the fish transport season, the facility was switched from primary to secondary bypass, for condition sampling and gas bubble trauma monitoring, every fifth day. An estimated total of 397,800 smolts entered the facility on sampling days in April. Of this total 397,771 were bypassed and 29 were facility mortalities. There are no passage estimates on dates when the facility was operated in primary bypass.

A total of 4,153,395 smolts were collected during the 2014 season (Table 2). Of those, 3,752,781 were transported, 397,842 were bypassed, and 2,772 were facility mortalities. Daily

barging and direct loading operations occurred from May 2 to May 30, alternate day barging occurred from June 1 to August 16. Transportation by truck began on August 16 and ended on October 31. Juvenile salmonids collected for transport were directly loaded into barge holds and truck tanks or were held in raceways and wet lab tanks prior to loading and transport. The maximum holding time prior to transport ranged from 24 to 48 hours. Barge transport time from Little Goose to the mid channel release point below Bonneville Dam was approximately two days. Barging accounted for approximately 99.8% of the smolts transported. The estimated species composition and clip type of the fish transported by barge was; clipped yearling Chinook 37.6%, clipped steelhead 22.3%, unclipped subyearling Chinook 12.1%, unclipped yearling Chinook 9.6%, unclipped steelhead 8.4%, clipped subyearling Chinook 7.4%, unclipped sockeye 1.2%, unclipped coho 1.1% and clipped sockeye 0.2%.

Table 3. Annual peak salmonid collection days and count by species group at Little Goose Dam JFF, 2009-2014.

	Yearling Chinook		Subyearling Chinook		Steelhead		Sockeye		Coho	
Year	Clip	Unclip	Clip	Unclip	Clip	Unclip	Clip	Unclip		Season
2009	May 23 (65,408)	April 28 (23,601)	June 04 (25,720)	June 04 (37,214)	April 27 (180,448)	April 26 (57,600)	May 20, 23 (3,200)	May 7, 8, 23 (1,000)	May 23 (7,800)	April 27 (288,500)
2010	May 20 (71,700)	May 2 (21,200)	June 12 (33,456)	June 12 (46,507)	May 20 (96,600)	May 20 (29,800)	May 29 (300)	May 20 (2,200)	May 20 (4,000)	May 20 (222,600)
2011	May 13 (121,429)	May 13 (28,802)	June 04 (16,859)	June 04 (39,613)	May 18 (58,203)	May 18 (27,400)	May 22 (700)	May 12 (1,406)	May 20 (4,400)	May 13 (225,048)
2012	April 30 (176,464)	April 30 (76,835)	June 16 (25,750)	June 04 (23,025)	April 30 (104,051)	April 30 (29,612)	May 29 (150)	May 23 (3,000)	May 19 (4,200)	April 30 (389,763)
2013	May 10 (156,233)	May 10 (44,008)	June 10 (15,290)	June 08 (14,452)	May 14 (107,846)	May 14 (46,209)	May 17 (4,600)	May 19 (2,400)	May 14 (5,200)	May 10 (280,443)
2014	May 06 (156,006)	April 22 (53,031)	June 02 (19,016)	June 03 (24,044)	April 22 (89,625)	May 08 (25,215)	May 20 (4,300)	May 10 (6,813)	May 10 (3,600)	May 06 (279,206)

Transportation by truck to the release sites at the Bonneville Juvenile Fish Facility Flume took approximately six hours. Trucked fish were transported in a saline solution of 1 to 2 mg/L of sodium chloride to reduce stress and treat presumed Columnaris disease. Of the 3,752,781 juvenile salmonids transported from Little Goose in 2014, 7,967 of them, or 0.2% of the total, were transported by truck. The species composition of salmonids transported by truck was; unclipped subyearling Chinook 94.4%, clipped subyearling Chinook 5.0%, combined steelhead 0.1%, unclipped sockeye 0.4% and unclipped yearling Chinook <0.1%. In 2014, all fish transport operations were performed without incident.

Fish bypassed during the transportation season, May 2 through October 31, included 69 Chinook and one sockeye fry, which were bypassed for continued growth, and one clipped steelhead bypassed due to apparent advanced disease. Fish collection and bypass numbers are provided in Appendix Table 1 and transport fish numbers are provided in Appendix Table 3.

The maximum daily estimated collection of 279,206 fish occurred on May 06 and accounted for 6.7% of the total season collection (Table 3). The composition of the collection

for that date was: clipped yearling Chinook 55.9%, clipped steelhead 24.4%, unclipped yearling Chinook 13.8%, unclipped steelhead 4.4%, unclipped sockeye 1.4% and unclipped coho 0.1%.

Adult Fallbacks

Fallbacks are adult salmonids that have migrated above the dam and have "fallen back" into the downstream juvenile fish collection and bypass system. Fallbacks collected at the separator were usually too large to pass between the separator bars and were released back to the river. Fallbacks were identified by species and fin clip and assessed for condition prior to being released.

A total of 4,724 adult salmon and steelhead fallbacks occurred in 2014 (Table 4). Of these 4,713 were bypassed from the separator. The remaining 11 were small Chinook jacks that passed through the separator bars and were collected in the sample and released back to the river. Daily numbers of adult fallbacks and fallback mortalities can be found in Appendix Table 4.

There were 1,846 steelhead fallbacks in April, May and June (Table 5). Of these there were 617 clipped and 768 unclipped which were classified as out-migrating kelts. Due to their post spawned condition, kelts collected during this period accounted for the majority of fish in fair (95%), poor (97%) and dead (98%) condition. Table 6 lists the numbers of fish by species and condition categories.

Other fish of particular interest that were bypassed back to the river from the separator included 4 bull trout, 57 adult pacific lamprey, and 27 white sturgeon. The 57 adult pacific lamprey were transported to one mile above the dam and released. In addition, another 20 adult lamprey collected in the sample were also transported and released above the dam.

Table 4. Total Annual Adult Salmonid Fallbacks at Little Goose Dam JFF, 2009-2014.

Year	Adult Chinook	Jack/mini Chinook	Clip Steelhead	Unclip Steelhead	Sockeye	Coho	Total
2009	1,192	1,372	2,997	2,131	11	35	7,738
2010	976	780	1,758	1,881	22	9	5,426
2011	1,683	1,020	1,996	1,549	17	14	6,280*
2012	1,064	1,077	1,215	1,399	9	21	4,785
2013	1,341	1,050	1,469	1,061	15	2	4,938
2014	992	557	1,521	1,422	46	186	4,724

*2011 total includes 1 Pink Salmonid.

Table 5. Monthly totals of fallbacks bypassed from separator at Little Goose Dam, 2014.

Month	Adult Chinook	Jack Chinook	Clip Steelhead	Unclip Steelhead	Sockeye	Coho	Total
April	1	0	57	89	0	0	147
May	122	14	644	730	0	0	1,510
June	81	7	90	236	0	0	414
July	71	12	21	31	30	1	166
August	17	7	97	70	11	0	202
September	209	102	336	143	3	51	844
October	491	415	276	123	2	134	1,441
Total	992	557	1,521	1,422	46	186	4,724

Table 6. Condition of adult salmonids released at Little Goose Dam, 2014.

Fish	Chinook		Chinook Jack		Steelhead		Sockeye		Coho	
Condition[1]	Clip	Unclip	Clip	Unclip	Clip	Unclip	Clip	Unclip		Total
Good	454	491	237	314	1,322	1,137	4	38	182	4,179
Fair	16	15	0	3	110	177	0	4	3	328
Poor	5	3	2	1	68	88	0	0	0	167
Dead	5	3	0	0	21	20	0	0	1	50
Total	480	512	239	318	1,521	1,422	4	42	186	4,724

[1] Condition ratings for live fish were determined subjectively based on the presence/absence and severity of fungus, headburn, fin wear, and other injuries.
Note: Table 6 does not separate post spawned "kelt" steelhead from pre-spawned healthier steelhead.

Separator Efficiency

Separator efficiency is a measure of how efficiently fish entering the facility are separated by size. Smaller fish, primarily salmon smolts, are expected to enter through the narrowly spaced "A" side sorter bars and the larger fish, primarily steelhead, should enter through the more widely spaced "B" side sorter bars. Table 7 gives efficiency expressed as the percentage of each group, passing through the desired side of the separator, for 2009-2014. Efficiency rates are based on expanded sample counts.

Separator efficiency was highest for clipped and unclipped yearling Chinook , with 81.8% and 78.6%, respectively, entering on the A-side. Separator efficiency was lowest for unclipped sockeye at 37.6% entering on the A-side. Separator efficiency was noticeably lower than in recent years for unclipped steelhead, with 54.7% entering the B side (Table 7).

Table 7. Annual juvenile salmonid separator efficiency (%) at Little Goose Dam JFF, 2009-2014.

	Yearling Chinook		Subyearling Chinook		Steelhead		Coho		Sockeye	
	Clip	Unclip	Clip	Unclip	Clip	Unclip	Clip	Unclip	Clip	Unclip
Year	A-side	A-side	A-side	A-side	B-side	B-side	A-side	A-side	A-side	A-side
2009	66.0	61.7	52.4	52.3	89.8	68.0	21.0	26.5	19.9	20.8
2010	69.8	68.3	57.3	54.7	87.8	69.4	15.1	27.6	12.8	43.1
2011	73.6	69.9	58.0	57.7	76.9	67.3	-----	32.9	22.6	38.2
2012	75.1	72.3	59.1	59.9	83.7	64.8	45.2	42.1	0.0	37.7
2013	71.5	71.2	53.8	48.8	82.1	62.1	100.0	23.7	64.5	52.4
2014	81.8	78.6	58.5	56.5	75.9	54.7	-----	41.3	49.5	37.6

Sampling

The fish sampling system was operated without incident throughout the 2014 season. Sampling procedures followed the smolt monitoring guidelines developed by the Fish Passage Center and the USACE. The resulting data were used for management of facility and fish transport operations. Collection and fish condition data were also transmitted daily to the FPC electronic database in support of the Smolt Monitoring Program (SMP).

Sample rates were set by USACE project biologists. To obtain the target sample of 300 to 500 smolts, sample rates were varied between 0.25% and 100% as fish migration numbers fluctuated. The percentage of each species sampled was dependent on the timing of migration and the overall sample rate in effect at that time (Table 8).

Table 8. Annual percentage of total juvenile salmonids collected that were sampled at Little Goose Dam JFF, 2009-2014[1].

	Yearling Chinook		Subyearling Chinook		Steelhead		Sockeye		Coho	
Year	Clip	Unclip	Clip	Unclip	Clip	Unclip	Clip	Unclip		Total
2009	0.7	0.8	2.7	6.3	0.5	0.7	19.9	20.8	2.5	1.4
2010	0.9	1.0	1.7	6.3	0.8	0.9	1.9	1.1	0.9	2.1
2011	0.6	0.8	2.8	6.9	0.7	0.8	2.3	1.8	1.7	1.8
2012	0.5	0.7	3.0	8.0	0.8	0.9	2.4	1.5	0.9	1.8
2013	0.6	0.8	5.1	15.4	0.8	1.0	0.7	1.5	0.8	2.6
2014	0.4	0.7	3.0	6.1	0.6	0.6	0.6	0.9	0.6	1.4

[1]All other research fish and sample mortality are included in percentages

All sample fish were examined to determine species and clip type. In addition, Chinook salmon age class was determined as subyearling or yearling. All yearling Chinook salmon in the sample were examined for characteristics typical of holdover or Lyons Ferry Hatchery fall Chinook salmon. All unclipped yearling and subyearling Chinook salmon, coho, and sockeye salmon were scanned for coded wire tags. Chinook, sockeye and coho fry were defined by length, under 60 mm, and were bypassed for continued growth. None of the 2014 hatchery releases above LGS were marked with elastomer eye tags.

Fish condition data were collected daily on a random subsample of 100 fish of the dominant species. Condition metrics included weight, length, descaling, injury, disease, predation, and "other" monitored conditions including pink fin, fin hemorrhage, fin discoloration, pop eyes, and eye hemorrhage. Injury and descaling data were used by managers to assess passage conditions at the dam where data were collected. All additional, or "non-condition", sample fish were examined for fresh descaling greater than 20%.

Pound counts (number of fish per pound) were taken daily during condition sampling and provided to the USACE from May 2 through October 31. Additional weights were also taken on non-condition salmonids if the target number of 25 per group was not present in the condition sample. During transport, when the sample rate was set below 100%, weights were also recorded on all non-salmonid species in the sample to determine their contribution to barge loading densities.

A total of 56,096 fish were sampled during the 2014 season. Of these 53,913 were examined for descaling, 71 were salmonid fry, 321 were sample mortalities, and 1,791 smolts were removed from the separator during Gas Bubble Trauma monitoring (Table 9).

Fish Condition

Fish condition was monitored daily by SMP biologists and biological aids. The primary purpose for condition monitoring was to identify juvenile salmonids that were descaled or had other significant injuries incurred during passage at Little Goose Dam.

Descaling

All live smolts in the sample were examined for descaling. A smolt was considered descaled if more than 20% of the scales were missing from either side of the fish. Only descaling that appeared fresh enough to have occurred at LGS was recorded. Prior to 2009, all descaling, old or new, was recorded.

Table 9. Weekly sample as percent of collection total and sample totals at LGS JFF, 2014.

Week Ending	Weekly % Sampled (%)	Yearling Chinook Clip	Yearling Chinook Unclip	Subyearling Chinook Clip	Subyearling Chinook Unclip	Steelhead Clip	Steelhead Unclip	Sockeye Clip	Sockeye Unclip	Coho	Totals[1]
3-Apr	25.0	15	72	0	0	200	36	0	29	0	352
10-Apr	26.2	148	506	0	0	765	174	0	87	0	1,680
17-Apr	3.1	229	516	0	1	296	100	0	84	0	1,226
24-Apr	0.6	216	295	0	1	472	43	0	6	1	1,034
1-May	0.3	126	98	0	0	230	54	0	2	1	511
8-May	0.4	2,126	649	0	0	1,438	309	0	71	28	4,621
15-May	0.3	1,476	241	0	4	495	252	0	40	24	2,532
22-May	0.7	1,393	334	0	12	720	376	45	27	65	2,972
29-May	0.9	479	395	57	194	1,099	563	12	28	120	2,947
5-Jun	1.0	47	59	803	1,217	266	123	0	22	13	2,550
12-Jun	2.0	18	49	1,029	1,463	201	102	0	4	2	2,868
19-Jun	2.2	20	44	1,671	1,757	124	36	0	4	3	3,659
26-Jun	3.7	3	34	825	1,128	109	20	0	11	2	2,132
3-Jul	5.1	5	10	1,057	1,841	64	11	0	7	0	2,995
10-Jul	7.6	3	1	740	1,574	52	5	0	9	0	2,384
17-Jul	10.2	0	1	638	2,171	23	5	0	2	0	2,840
24-Jul	9.6	0	0	358	1,526	4	0	1	4	0	1,893
31-Jul	41.3	0	0	352	2,752	6	1	0	4	0	3,115
7-Aug	25.0	1	0	333	2,580	4	1	0	5	0	2,924
14-Aug	16.4	0	0	184	2,258	0	0	0	2	0	2,444
21-Aug	47.8	1	0	156	2,770	0	0	0	3	0	2,930
28-Aug	100.0	0	0	128	2,112	0	1	0	1	0	2,242
4-Sep	100.0	0	0	52	940	3	0	0	2	0	997
11-Sep	100.0	0	0	9	249	0	2	0	8	0	268
18-Sep	100.0	0	0	10	236	0	1	0	4	0	251
25-Sep	99.4	0	0	5	165	1	1	0	5	0	177
2-Oct	100.0	0	2	1	55	0	0	0	3	0	61
9-Oct	100.0	0	2	0	51	0	0	0	6	0	59
16-Oct	100.0	0	0	14	422	0	1	0	1	0	438
23-Oct	100.0	0	0	11	205	0	0	0	2	0	218
30-Oct	100.0	0	0	22	537	0	0	0	7	0	566
31-Oct	100.0	0	0	6	204	0	0	0	0	0	210
Total Sampled		6,306	3,308	8,461	28,425	6,572	2,217	58	490	259	56,096
Total Collection		1,487,105	462,499	278,019	463,013	1,013,203	346,944	9,115	51,955	41,542	4,153,395
% of Sample		11.2	5.9	15.1	50.7	11.7	4.0	0.1	0.9	0.5	100.0
% of Coll.		0.4	0.7	3.0	6.1	0.6	0.6	0.6	0.9	0.6	1.4

[1]All research fish, GBT fish and sample mortality included in species group and clip type numbers.

Note: Little Goose JFF was in primary bypass mode, going to secondary bypass for 24 hour condition sampling on April 2,7,12, 17, 22, and 27. Collection for transport with daily 24 hour sampling began on May 1 at 0700 hours and ended October 31 at 0700 hours.

A total of 53,913 smolts were examined for descaling in 2014. The overall rate of descaling was 1.0%, which is similar to rates observed in previous years (Table 10). Several of the individual descaling rates for each species and fin clip group in 2014 were higher this year than in any of the previous five years. As in previous years, for some species such as coho and sockeye, this was likely due to relatively small sample sizes for the species.

Table 10. Annual descaling rates (%) for salmonids examined at Little Goose Dam JFF, 2009-2014.

	Yearling Chinook		Subyearling Chinook		Steelhead		Sockeye		Coho	
Year	Clip	Unclip	Clip	Unclip	Clip	Unclip	Clip	Unclip		Totals
2009	0.7	0.7	0.3	0.3	0.5	0.8	0.0	0.4	0.2	0.4
2010	0.5	0.3	0.3	0.3	0.3	0.2	0.0	0.0	0.6	0.3
2011	0.5	0.5	0.3	0.5	0.2	0.1	0.0	0.6	0.3	0.4
2012	1.0	0.6	0.5	0.9	0.8	1.4	0.0	1.9	0.6	0.9
2013	0.7	1.0	0.8	1.0	0.6	0.8	0.9	1.1	0.7	0.9
2014	1.2	0.5	1.0	0.9	1.0	1.2	0.0	3.4	1.9	1.0

Note: GBT sample numbers not included in descaling rate calculations.

Of the 53,913 smolts examined for descaling in 2014, 39.6% or 21,358 smolts were examined as part of condition subsampling. During condition subsampling, fish with descaling equal to or greater than 20% were differentiated into two categories; descaling associated with dam passage and descaling on fish with bite marks indicative of predation attempts by birds, fish, or mammals. Recording fish as "descaled with predation" did not necessarily signify that the descaling was caused by the attempted predation, merely that the fish was descaled and that predation marks were also present on that fish. The rate of descaling observed in the condition subsample was 1.3% or 288 descaled smolts. Of the 288 descaled smolts observed in the condition subsample, descaling presumably associated with dam passage was 50.7% of the condition descale total and the rate of descaling on fish with predation marks present was 49.3% of the condition descale total. The rate of descaling observed in the non-condition sample was 0.8% from a sample size of 32,555 salmon. Note that all descaling documented from the non-condition sample does not differentiate between descaling presumed to have occurred as a result of passage through the dam and descaling on fish with evidence of attempted predation.

For fish in the condition subsample, in addition to descaling of 20% or greater, we also recorded partial descaling. Partial descaling was considered scale loss above background levels of approximately 5% scale loss but below the 20% threshold for descaling. The rate of partial descaling was 2.9% of the 21,358 smolts examined for condition in 2014.

Overall weekly descaling rates per species and clip types are listed in Table 11. Note in 2009, descaling associated with predatory attempts was not included in the total descaling rate, while in 2010 through 2014, it was included. The average weekly descaling rate ranged from 0.0% to 7.6%. Weekly descaling rates were variable throughout the season and, as in previous years, appeared to coincide with peak migrations, increased river discharge, increased river debris, and/or small sample sizes. Overall, descaling rates were highest during the month of May for all species except subyearling fall Chinook; rates were highest for subyearling fall Chinook during the peak of their outmigration in June and July. In May of this year, the facility and fish were adversely affected by debris from spring run-off. In addition, the structural failure of the trash sheer boom on March 5 left the juvenile collection system vulnerable to excessive amounts of debris all season. Orifice blockages within the juvenile collection channel were numerous this year. Toward the end of the sampling season, descaling rates increased again, particularly for subyearling fall Chinook salmon and sockeye salmon. Similar results have occurred in previous years, and as in 2014, were likely a consequence of small sample sizes accompanied by increased predation attempts and Columnaris disease.

Table 11. Weekly descaling rates (%) for salmonids examined at Little Goose Dam JFF, 2014.

	Yearling Chinook		Subyearling Chinook		Steelhead		Sockeye		Coho	
Week Ending	Clip	Unclip	Clip	Unclip	Clip	Unclip	Clip	Unclip		Total[1]
3-Apr	0.00	0.00	-----	-----	0.00	0.00	-----	7.41	-----	0.57
10-Apr	0.77	0.21	-----	-----	0.41	0.00	-----	0.00	-----	0.32
17-Apr	1.85	0.00	-----	-----	0.40	0.00	-----	1.19	-----	0.49
24-Apr	0.58	0.38	-----	-----	1.34	0.00	-----	0.00	0.00	0.86
1-May	0.00	0.00	-----	-----	0.00	0.00	-----	0.00	0.00	0.00
8-May	1.57	1.11	-----	-----	0.96	1.39	-----	1.45	0.00	1.29
15-May	1.41	0.00	-----	-----	1.94	2.82	-----	5.41	4.17	1.61
22-May	0.89	0.62	-----	0.00	0.90	1.09	0.00	3.70	3.13	0.95
29-May	0.22	0.55	0.00	0.00	0.94	1.10	0.00	0.00	1.67	0.74
5-Jun	0.00	0.00	0.91	0.43	0.41	0.85	-----	4.55	0.00	0.62
12-Jun	0.00	0.00	0.81	0.42	2.66	2.13	-----	0.00	0.00	0.76
19-Jun	0.00	0.00	0.80	1.13	1.67	0.00	-----	0.00	0.00	0.96
26-Jun	0.00	0.00	0.64	0.94	2.80	0.00	-----	0.00	0.00	0.89
3-Jul	20.00	10.00	0.59	0.62	3.23	0.00	-----	0.00	-----	0.73
10-Jul	0.00	0.00	2.01	1.00	3.92	0.00	-----	11.11	-----	1.41
17-Jul	-----	0.00	0.98	0.90	5.56	0.00	-----	0.00	-----	0.95
24-Jul	-----	-----	0.58	0.74	0.00	-----	-----	0.00	-----	0.71
31-Jul	-----	-----	1.45	1.04	0.00	0.00	-----	50.00	-----	1.11
7-Aug	100.00	-----	1.21	0.51	0.00	0.00	-----	0.00	-----	0.62
14-Aug	-----	-----	1.09	0.81	-----	-----	-----	100.00	-----	0.87
21-Aug	0.00	-----	1.92	0.51	-----	-----	-----	0.00	-----	0.59
28-Aug	-----	-----	1.57	0.71	-----	100.00	-----	0.00	-----	0.81
4-Sep	-----	-----	1.92	0.22	0.00	-----	-----	50.00	-----	0.41
11-Sep	-----	-----	0.00	0.86	-----	0.00	-----	25.00	-----	1.21
18-Sep	-----	-----	0.00	0.88	-----	0.00	-----	0.00	-----	0.83
25-Sep	-----	-----	0.00	1.88	0.00	0.00	-----	0.00	-----	1.74
2-Oct	-----	0.00	0.00	2.04	-----	-----	-----	0.00	-----	1.82
9-Oct	-----	0.00	-----	6.00	-----	-----	-----	0.00	-----	5.17
16-Oct	-----	-----	7.14	2.39	-----	0.00	-----	0.00	-----	2.53
23-Oct	-----	-----	9.09	5.85	-----	-----	-----	0.00	-----	5.96
30-Oct	-----	-----	4.55	5.42	-----	-----	-----	42.86	-----	5.85
6-Nov	-----	-----	16.67	7.35	-----	-----	-----	-----	-----	7.62
Total Exam	5,920	3,066	8,166	27,706	6,166	2,112	53	466	258	53,913
% Desc	1.2	0.5	1.0	1.0	1.0	1.2	0.0	3.4	1.9	1.0
Median	0.22	0.00	0.98	0.88	0.90	0.00	0.00	0.00	0.00	0.88

[1] Descaling figures do not include sample mortalities or fish examined for GBT.
[2] "-----" means species group not present in sample during this week.

Injuries

A total of 21,358 smolts from the condition subsample were examined for injuries in 2014. Of the fish examined, 9.8% or 2,087 individual smolts were observed with one, or more than one, injury (Table 12). A total of 2,100 individual injuries were observed this year. The vast majority of injuries involved damage to fins at 92.0% of the total followed by operculum injury (3.6%), eye injury (1.8%), body injury (1.5%), and head injury (1.1%) (Table 13). The highest rates of injury this year were observed in sockeye salmon followed by subyearling fall Chinook salmon.

Prior to 2009, we recorded injuries based solely on the presence of an injury, with no attempt made to determine the age or origin of the injury. From 2009 to date, only fresh injuries presumed to have occurred during passage through Little Goose Dam have been recorded. From 2003 through 2008, minor scale loss and abrasions were included in the body injury category greatly inflating the reported injury rate (Table 12).

Table 12. Annual injury rates (%) for salmonids examined at Little Goose Dam, 2003-2014.

	Yearling Chinook		Subyearling Chinook		Steelhead		Sockeye		Coho	
Years	Clipped	Unclip	Clipped	Unclip	Clipped	Unclip	Clipped	Unclip		Total
2009	0.2	0.3	0.2	0.2	0.3	0.3	0.0	1.2	0.3	0.2
2010	1.1	0.5	0.1	0.3	1.5	0.3	0.0	4.8	0.0	0.5
2011	0.7	1.4	0.6	1.7	1.9	1.8	0.0	3.6	0.9	1.5
2012	2.5	2.7	4.9	6.0	2.0	3.3	0.0	1.8	2.7	4.6
2013	3.4	4.3	8.9	17.0	1.8	1.6	0.0	3.2	2.9	12.1
2014	8.4	8.5	9.0	12.3	4.3	3.4	13.3	12.9	8.6	9.8

Disease

Data on the presence of disease symptoms were collected from fish in the condition subsample to provide relative information about fish health. Disease classifications included fungus, presumed Columnaris, presumed BKD, body parasites, deformity, and other disease such as cysts or tumors. This year was the first season we identified and documented parasites to genus which included fish louse (*Argulus*), gill lice (*Salmincola*) and leech (*Piscicola*). We also documented types of deformity which included spinal curvatures such as scoliosis and lordosis, and also dwarfism or truncated body.

A total of 894 smolts or 4.2% of the total condition subsample were observed with one or more symptoms of disease (Table 13). Of the 900 individual signs of disease observed this year, presumed Columnaris was the most prevalent at 68.2% of the total, followed by parasites (15.4%), deformity (10.3%), other disease (3.1%), fungus (2.7%), and presumed BKD (0.2%). Note that the majority of "other" diseases this season consisted of observations of sick subyearling fall Chinook smolts exuding clear fluid from an inflamed vent, coupled with abdominal distention. We observed several subyearling fall Chinook smolt mortalities with these symptoms which prompted us to collect a specimen for the Oregon Department of Fish Wildlife Fish Health Lab in LaGrande Oregon. Preliminary results were positive for the intestinal protozoan parasite *Ceratomyxa Shasta*. *C. Shasta* is a parasite of the Pacific Northwest known to cause losses in hatchery reared and wild salmonids and also contributes significantly to prespawing mortality of adult salmonids. Subsequent culture results were positive for a systemic *Aeromonas* infection. Observations of overall disease were highest in unclipped sockeye salmon and unclipped subyearling fall Chinook salmon.

Predation Marks

We recorded bite marks, on fish from the condition subsample, which were indicative of predation attempts by bird, fish, lamprey, and mammalian predators such as mink and otter. We observed a total of 435 smolts with one or more predatory wounds for an overall rate of 2.0% of the total condition subsample. The majority of marks observed in the subsample were indicative of attempted predation by fish at approximately 43.8% of the 436 total individual bite marks

recorded, followed by fish bites (36.5%), and lamprey bites (19.7%). We did not observe any mammalian bite marks this year. Steelhead sustained the highest rate of predatory attempts, which were predominately a result of predation attempts by birds (Table 13).

Table 13. Percent of fish examined that were injured, had predation marks or had signs of disease by species and clip type at Little Goose Dam, 2014.

	Yearling Chinook		Subyearling Chinook		Steelhead		Coho		Sockeye		
	Clip	Unclip	Clip	Unclip	Clip	Unclip	Clip	Unclip	Clip	Unclip	Total[1]
Injuries											
Eye	0.4	0.1	0.2	0.1	0.1	0.3	-----	0.9	0.0	0.4	0.2
Operculum	0.3	0.4	0.3	0.1	1.2	0.6	-----	0.0	0.0	1.1	0.4
Head	<0.1	0.2	0.1	0.1	0.1	0.0	-----	0.0	0.0	0.0	0.1
Body	<0.1	0.1	0.1	0.2	0.2	0.2	-----	0.0	0.0	0.0	0.1
Fin	7.7	7.8	8.4	11.8	2.8	2.3	-----	8.1	13.3	11.5	9.0
Total Injury	8.4	8.5	9.0	12.3	4.3	3.4	-----	8.6	13.3	12.9	9.8
Disease											
Fungus	0.1	0.2	0.1	<0.1	0.2	0.4	-----	0.0	2.2	0.7	0.1
Columnaris	0.0	0.0	0.7	5.3	<0.1	0.0	-----	0.0	0.0	7.9	2.9
BKD	0.0	0.0	0.0	<0.1	0.0	0.0	-----	0.0	0.0	0.0	<0.1
Parasites	0.4	0.4	0.3	0.5	0.5	4.5	-----	0.5	0.0	0.7	0.7
Deformity	0.4	0.2	0.4	0.5	0.2	0.2	-----	0.0	0.0	1.1	0.4
Disease Other	0.0	1.0	<0.1	0.2	0.0	0.2	-----	0.0	0.0	0.4	0.1
Total Disease	0.9	0.8	1.6	6.6	1.0	5.2	-----	0.5	2.2	10.4	4.2
Predation											
Bird	0.5	0.5	0.3	0.3	2.7	2.5	-----	0.9	0.0	0.7	0.7
Fish	1.4	0.7	1.0	1.0	0.2	0.5	-----	0.5	0.0	1.1	0.9
Lamprey	0.1	0.0	0.2	0.7	0.1	0.2	-----	0.0	0.0	0.4	0.4
Other	0.0	0.0	0.0	0.0	0.0	0.0	-----	0.0	0.0	0.0	0.0
Total Predation	2.0	1.3	1.5	2.0	3.0	3.2	-----	1.4	0.0	1.8	2.0
Misc. Conditions											
Pop Eye	0.1	0.1	0.1	<0.1	<0.1	0.1	-----	0.0	0.0	0.0	<0.1
Fin Hemorrhage	3.1	4.4	12.2	18.7	1.5	2.9	-----	1.4	2.2	6.5	12.1
Pink Fin	5.3	5.5	21.0	37.2	9.9	10.0	-----	2.7	0.0	4.7	24.3
Fin Discoloration	1.4	1.5	1.6	2.6	0.6	0.6	-----	0.5	0.0	3.6	1.9
Eye Hemorrhage	0.3	0.3	0.2	0.1	0.1	0.2	-----	0.0	0.0	0.4	0.1
Total Misc. Conditions	9.9	11.0	30.3	47.7	11.8	13.1	-----	4.1	2.2	12.2	32.1
Total sample size	2,304	1,105	2,879	10,785	2,745	994	0	222	45	279	21,358

[1] Overall disease and injury rates are less than the sum of the individual categories because some individual fish had more than one injury or disease.

The overall rate of bird bite marks in 2014 decreased slightly from last year and was similar to the previous five years (Table 14). The highest prevalence of bird bite marks was observed on clipped steelhead. Of the 159 total bird bites observed this season, most occurred in October at a rate of 1.9% of 1,294 smolts examined followed by May and April at rates of 1.4% and 1.3% of 6,219 smolts examined and 1,126 smolts examined respectively.

Other Miscellaneous Conditions

The Other Miscellaneous Conditions category included popeye (exopthalmos), hemorrhaged fin, pink fin, discolored fin, and hemorrhaged eye. We recorded a total 6,865

smolts with one or more miscellaneous conditions for an overall miscellaneous condition rate of 32.1% of the total condition subsample (Table 13). A total of 8,221 individual observations of miscellaneous conditions were found. Many smolts that we examined had multiple conditions. For example, pink and hemorrhaged fins often occurred on the same individual fish though in different fins. Pink fins constituted the majority of the observations in this category at 63.2% of the individual miscellaneous conditions total followed by hemorrhaged fin(s) (31.4%), fin discoloration (5.0%), eye hemorrhage (0.3%), and popeye (exopthalmos) (0.1%). Subyearling fall Chinook salmon had the highest rates in this condition category, due to the high incidence of pink and hemorrhaged fin(s).

Table 14. Annual bird bite rates (%) for salmonids examined at Little Goose Dam, 2009-2014.

	Yearling Chinook		Subyearling Chinook		Steelhead		Sockeye		Coho	
Year	Clipped	Unclip	Clipped	Unclip	Clipped	Unclip	Clipped	Unclip		Total
2009	0.9	0.4	0.3	0.3	2.5	2.9	0.0	0.4	1.0	0.9
2010	0.8	0.0	0.5	0.2	3.0	2.7	0.0	0.0	0.7	0.7
2011	0.8	0.3	0.1	0.5	2.4	2.3	0.0	1.8	0.0	0.7
2012	0.7	0.5	0.1	0.5	3.9	3.8	0.0	0.0	0.0	1.0
2013	1.0	1.0	0.1	0.5	1.8	2.6	2.2	1.6	1.4	0.8
2014	0.5	0.5	0.3	0.3	2.7	2.5	0.0	0.7	0.9	0.7

Mortality

Mortality at the JFF included fish that entered the JFF system dead as well as those that died at the facility. Mortality was recorded by location within the facility and was divided into total facility mortality (raceways, separator, and sample) and sample mortality. Raceways included barge holds, wet lab tanks and routing flumes. The rate of total facility mortality was low this year at 0.07% from a total collection of 4,153,395 smolts (Table 15). The average weekly total facility mortality rate in 2014 ranged from 0.0% to 11.5% (Table 16). The minimum weekly rates of 0.0% occurred frequently during the months of April and May when mortalities that occurred represented a small proportion of the total collection. Data show that on average, total facility mortality rates were lowest during the month of April at less than 0.1% from a collection total of 397,800 smolts. Increased mortality rates later in the collection season occurred when total collection numbers decreased and descaling, disease, predation, and injury rates increased. The average monthly mortality rate was highest in September at a rate of 5.4% from a collection total of 1,261 smolts. The maximum weekly mortality rate of 11.5% occurred during the week ending October 2 from a total weekly collection of 61 fish. As total mortality rates were skewed, median season mortality rates were determined for each species group/clip type and also for a combined total. The median season total facility mortality rate for all smolts was 0.4%. Daily mortality rates are provided in Appendix Table 2.

Table 15. Annual total facility mortality as a percentage of total collection at LGS JFF 2008-2014.

	Yearling Chinook		Subyearling Chinook		Steelhead		Sockeye		Coho		Pacific lamprey	
Year	Clip	Unclip	Clip	Unclip	Clip	Unclip	Clip	Unclip		Total	Ammocoete	Macropthalmia
2009	<0.1	0.1	0.8	0.7	<0.1	<0.1	<0.1	0.3	<0.1	0.2	-----	-----
2010	<0.1	<0.1	0.8	0.7	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	-----	-----
2011	0.1	0.1	0.5	0.6	<0.1	<0.1	0.1	0.7	<0.1	0.2	0.7	0.2
2012	<0.1	<0.1	0.1	0.2	<0.1	<0.1	0.0	<0.1	0.0	<0.1	0.5	0.3
2013	<0.1	<0.1	0.1	0.2	<0.1	<0.1	0.0	0.1	0.0	0.1	0.2	<0.1
2014	<0.1	0.1	0.2	0.3	<0.1	<0.1	0.1	0.5	<0.1	0.1	0.4	0.2

Note: Mortality rate for collected fish includes sample, raceway, and separator mortalities. Lamprey numbers are not included in "Totals" column.

Beginning in 2011, all SMP sites were directed to report juvenile lamprey collections in more detail. Lamprey numbers are not included in the overall salmonid mortality data in this report, but have been added to the mortality tables for future years' comparisons (Tables 15 and 17). The Pacific lamprey ammocoete total mortality rate in 2014 was 0.4% from a total collection count of 2,495 lamprey ammocoetes. The total mortality rate for Pacific lamprey macropthalmia this year was 0.2% from a collection total of 18,673 macropthalmia. We did not observe any notable peak in total facility mortality for either life stage of juvenile Pacific lamprey in 2014.

Table 16. Weekly total facility mortality in percent at Little Goose Dam JFF, 2014.

	Yearling Chinook		Subyearling Chinook		Steelhead		Sockeye		Coho	
Week Ending	Clip	Unclip	Clip	Unclip	Clip	Unclip	Clip	Unclip		Total[1]
3-Apr	1.7	0.0	-----	-----	0.0	0.7	-----	1.7	-----	0.3
10-Apr	0.4	0.1	-----	-----	0.0	0.0	-----	0.6	-----	0.1
17-Apr	0.0	0.0	-----	3.8	0.0	0.0	-----	0.0	-----	0.0
24-Apr	0.0	0.0	-----	0.0	0.0	0.0	-----	0.0	0.0	0.0
1-May	0.0	0.0	-----	-----	0.0	0.0	-----	0.0	0.0	0.0
8-May	0.0	0.0	-----	100.0	0.0	0.0	100.0	0.1	0.0	0.0
15-May	0.0	0.1	-----	0.0	0.0	0.0	-----	0.9	0.0	0.0
2-May	0.0	0.1	-----	0.1	0.0	0.0	0.0	0.7	0.0	0.0
29-May	0.1	0.1	0.2	0.0	0.0	0.0	0.0	0.8	0.0	0.1
5-Jun	1.4	2.1	0.1	0.2	0.1	0.1	-----	0.4	0.0	0.2
12-Jun	0.3	0.0	0.1	0.0	0.1	0.0	-----	1.5	0.7	0.1
19-Jun	0.1	0.0	0.2	0.3	0.2	0.1	-----	2.5	0.0	0.3
26-Jun	0.0	0.0	0.1	0.1	0.2	0.2	-----	0.0	0.0	0.1
3-Jul	0.0	0.0	0.1	0.0	0.2	0.0	-----	1.4	-----	0.1
10-Jul	0.0	0.0	0.1	0.1	0.3	0.0	-----	0.0	-----	0.1
17-Jul	-----	0.0	0.3	0.4	0.0	0.0	-----	15.0	-----	0.4
24-Jul	-----	-----	0.4	0.7	0.0	-----	50.0	0.0	-----	0.6
31-Jul	-----	-----	0.6	0.9	0.0	0.0	-----	100.0	-----	1.0
7-Aug	0.0	-----	0.6	0.8	0.0	0.0	-----	5.3	-----	0.8
14-Aug	-----	-----	0.5	1.2	-----	-----	-----	22.2	-----	1.1
21-Aug	0.0	-----	0.9	1.3	-----	-----	-----	25.0	-----	1.3
28-Aug	-----	-----	0.8	1.0	-----	0.0	-----	0.0	-----	1.0
4-Sep	-----	-----	0.0	1.9	0.0	-----	-----	0.0	-----	1.8
11-Sep	-----	-----	0.0	10.4	-----	0.0	-----	37.5	-----	10.8
18-Sep	-----	-----	10.0	4.2	-----	0.0	-----	25.0	-----	4.8
25-Sep	-----	-----	0.0	4.8	0.0	0.0	-----	0.0	-----	4.5
2-Oct	-----	0.0	0.0	12.7	-----	-----	-----	0.0	-----	11.5
9-Oct	-----	0.0	-----	3.9	-----	-----	-----	0.0	-----	3.4
16-Oct	-----	-----	0.0	0.9	-----	0.0	-----	0.0	-----	0.9
23-Oct	-----	-----	0.0	1.0	-----	-----	-----	0.0	-----	0.9
30-Oct	-----	-----	0.0	0.4	-----	-----	-----	14.3	-----	0.5
6-Nov	-----	-----	0.0	0.0	-----	-----	-----	-----	-----	0.0
Median Weekly Rate	0.01	0.0	0.1	0.8	0.0	0.0	25.0	0.6	0.00	0.4

Sample mortality for smolts during the 2014 season was low at 0.6% of 56,096 smolts sampled (Table 17). As in 2013, we observed increased sample mortality in late summer when river temperatures and outbreaks of disease such as Columnaris were on the rise. On average, monthly sample mortality rates were lowest in April at 0.2% from a sample total of 4,803 smolts,

and progressed steadily to the highest rate in September at 4.0% from a sample total of 1,260 smolts. The total sample mortality rate for Pacific lamprey ammocoetes was 20.4% of 54 total ammocoete sampled and the rate for Pacific lamprey macropthalmia was 5.6% from a total of 591 sampled in 2014 (Table 17). We did not observe any notable peak in sample mortality for either life stage of juvenile Pacific lamprey in 2014.

Table 17. Annual sample mortality as percent of total sample at Little Goose Dam JFF, 2009-2014.

	Yearling Chinook		Subyearling Chinook		Steelhead		Sockeye		Coho		Pacific Lamprey	
	Clip	Unclip	Clip	Unclip	Clip	Unclip	Clip	Unclip		Total	Ammocoetes	Macropthalmia
2009	0.4	0.4	1.0	1.1	0.1	0.2	0.0	2.8	2.7	0.8	-----	-----
2010	0.5	0.3	0.5	1.0	<0.1	0.2	0.0	1.2	0.6	0.8	-----	-----
2011	0.6	0.5	0.9	1.4	0.1	0.1	0.0	0.6	0.8	1.1	11.1	7.8
2012	0.4	0.3	0.3	0.5	0.2	0.2	0.0	0.8	0.0	0.4	10.8	4.5
2013	0.2	0.1	0.3	0.8	0.1	0.1	0.0	4.1	0.0	0.6	3.8	1.9
2014	0.3	0.3	0.3	0.8	0.2	0.1	1.7	4.7	0.4	0.6	20.4	5.6

Note: Mortality rate in sampled fish excludes research, raceway, and separator mortalities. Includes GBT sample fish. Pacific lamprey mortalities are not included in the total mortalities to facilitate across year comparisons. In 2014, the sample mortality rate for Pacific lamprey ammocoete includes 2 unknown ammocoetes.

Incidental Species

The total incidental fish collection was determined by using the sample rate to expand the number of incidental fish in the sample and adding the number of incidental fish removed from the separator to the expanded sample count. Incidental species were counted individually, except when handling large numbers of juvenile fish, such as American shad or Siberian prawn. When the number of juvenile fish was too large to practically count each individual, a weekly fish per pound calculation was obtained for these species; the result was then multiplied by the daily weight of the sampled species to obtain an estimated count for the day. All sampled incidental fish were returned to the river except for Siberian prawn. For the seventh consecutive season, we euthanized all Siberian prawn that occurred in the sample per the directive issued by Washington Department of Fish and Wildlife on July 24, 2007. With the exception of the 7,547 of frozen prawn given to the USGS for research, all Siberian prawn from the sample were frozen and returned to the river at the end of the fish passage season.

When the sample rate was less than 100%, incidental species were inadvertently collected and transported along with the smolts. Therefore, when the sample rate was below 100%, incidental fish species were weighed and the average weight was applied to the expanded sample count to determine their contribution to transport loading densities.

Incidental collections totaled 116,584 fish in 2014. This included an expanded sample count of 113,779 fish and crustaceans plus 2,805 fish from the separator (Table 18). Incidental collection counts were lower in 2014 than in 2013, but above the five year average of 110,747 fish (Table 19). The majority of the incidental catch this year consisted of Siberian prawn at 69.7% of the total number collected and the highest collection of prawn on record. Numbers of Pacific lamprey ammocoete and smallmouth bass were higher than in 2013. However, most other groups that contribute substantial numbers to the incidental collection, such as American shad and Pacific lamprey macropthalmia were lower in 2014 than in 2013.

Adult Pacific lamprey collections totaled 77 lamprey in 2014; 57 from the separator and 20 from the sample. The first adult Pacific lamprey of the season was collected June 10, the last on October 10, 2014. Upriver adult migrants were most frequently observed falling back into the

collection system from June through September. For the fourth consecutive year, USACE transported all Pacific adult lamprey captured at the facility to above the dam, releasing them at Little Goose Landing. In addition, to avoid exposure to sampling anesthesia, any adult lamprey found in the sample tanks were removed by the USACE prior to SMP sampling.

Table 18. Collection of incidental species at Little Goose Dam, 2014

Common Name	Scientific Name	Expanded Sample	Separator	Total Collection [1]
American Shad	*Alosa sapidissima*	1,444	355	1,799
Banded Killifish	*Fundus diaphanus*	111	0	111
Bass-Smallmouth	*Micropterus dolomieui*	3,420	108	3,528
Bass-Largemouth	*M. salmoides*	2	1	3
Bullhead	*Amierus sp.*	234	1	235
Bull trout	*Salvelinus confluentus*	0	4	4
Channel Catfish	*Ictalurus punctatus*	154	50	204
Chiselmouth	*Acrocheilus alutaceus*	9	1	10
Common carp	*Cyprinus carpio*	49	53	102
Crappie	*Pomoxis sp.*	360	527	887
Dace	*Rhinichthys sp.*	19	0	19
Kokanee	*Oncorhynchus nerka*	14	0	14
Lamprey Adult-Pacific	*Entosphenus tridentatus*	20	57	77
Lamprey Ammocoete-Pacific[2]	*E. tridentatus*	2,495	0	2,495
Lamprey Macropthalmia-Pacific	*E. tridentatus*	18,672	1	18,673
Mountain Whitefish	*Prosopium williamsoni*	146	17	163
Northerrn Pikeminnow	*Ptychocheilus oregonensis*	34	9	43
Peamouth	*Mylocheilus caurinus*	805	59	864
Rainbow Trout	*O. mykiss*	2	6	8
Redside Shiner	*Richardsonius balteatus*	0	0	0
Sandroller	*Percopsis transmontana*	2,675	1,006	3,681
Sculpin	*Cottus sp.*	391	0	391
Siberian Prawn	*Exopalaemon modestus*	81,310	0	81,310
Sucker	*Catostomus sp.*	679	383	1,062
Sunfish[3]	*Lepomis sp.*	677	114	791
Tadpole Madtom	*Noturus gyrinus*	3	0	3
Walleye	*Stizostedion vitreum*	0	14	14
White Sturgeon	*Acipenser transmontanus*	0	27	27
Yellow Perch	*Perca flavescens*	2	12	14
Other[4]	-----	52	0	52
Total		113,779	2,805	116,584

[1] Collection totals are estimated by expanding the sample counts, then adding the separator counts. Numbers include live and dead incidental fish.

[2]"lamprey ammocoete-Pacific" includes 20 unknown ammocoetes that were too injured for reliable identification to species.

[3].Sunfish collection total includes 785 bluegill/pumpkinseed and 6 warmouth.

[4] "Other" fish include expanded counts of 2 crayfish, and 1 unidentifiable/decomposed non-salmonid.

Research

ODFW and USACE personnel provide various types of research assistance during the fish passage season. Typically, ODFW provides research specimens that are collected on site via the sample. The summaries below describe each research or monitoring project that occurred at LGS in 2014.

Gas Bubble Trauma Monitoring

Biological technicians from the Washington Department of Fish and Wildlife (WDFW) examined juvenile salmonids for the presence of gas bubble trauma (GBT). When fish numbers

permitted, a maximum of 100 fish were sampled. Sampling occurred weekly from April 6 through July 28 when GBT monitoring was discontinued due to small sample sizes. Sampling was designed to determine the relative proportion of migrating juvenile salmonids passing the dam that exhibited symptoms of GBT in the unpaired fins and eye.

Table 19. Numbers of incidental species collected at Little Goose Dam JFF, 2009-2014

Common Name	Scientific Name	2009	2010	2011	2012	2013	2014
American shad	*Alosa sapidissima*	25,388	18,803	2,122	14,614	6,678	1,799
Banded Killifish	*Fundus diaphanous*	17	213	14	61	117	111
Bass-Smallmouth	*Micropterus dolomieu*	5,092	4,150	3,691	2,442	1,279	3,528
Bass-Largemouth	*M. salmoides*	32	3	7	6	2	3
Bullhead	*Amierus sp.*	374	323	390	511	291	235
Bull trout	*Salvelinus confluentus*	5	9	7	2	6	4
Channel Catfish	*Ictalurus punctatus*	618	369	235	353	381	204
Chiselmouth	*Acrocheilus alutaceus*	15	14	72	2	6	10
Common carp	*Cyprinus carpio*	145	722	294	139	96	102
Crappie	*Pomoxis sp.*	1,076	318	86	687	1,139	887
Dace	*Rhinichthys sp.*	10	29	24	12	3	19
Goldfish	*Carassius auratus*	0	1	0	0	0	0
Kokanee	*Oncorhynchus nerka*	14	0	55	0	0	14
Lamprey Adult-Pacific	*Entosphenus tridentatus*	125	11	63	32	28	77
Lamprey Ammocoete-Pacific	*E. tridentatus*	5,126	1,650	6,584[1]	1,903	525	2,495
Lamprey Macropthalmia-Pacific	*E. tridentatus*	88,415	57,802	11,108	4,749	55,077	18,673
Mountain Whitefish	*Prosopium williamsoni*	1,940	5,614	3,850	697	324	163
Northerrn Pikeminnow	*Ptychocheilus oregonensis*	565	73	72	52	41	43
Peamouth	*Mylocheilus caurinus*	2,798	6,057	7,631	1,077	1,292	864
Rainbow Trout	*O. mykiss*	17	99	12	2	0	8
Redside Shiner	*Richardsonius balteatus*	0	0	0	0	0	0
Sandroller	*Percopsis transmontana*	4,124	24,260	7,591	2,452	6,241	3,681
Sculpin	*Cottus sp.*	3,733	2,062	996	1,732	1,239	391
Siberian Prawn	*Exopalaemon modestus*	6,327	38,676	15,743	23,183	45,015	81,310
Sucker	*Catostomus sp.*	2,413	1,820	1,760	882	1,353	1,062
Sunfish[2]	*Lepomis sp.*	585	239	218	602	865	791
Tadpole Madtom	*Noturus gyrinus*	1	2	0	8	8	3
Walleye	*Stizostedion vitreum*	19	20	8	7	9	14
White Sturgeon	*Acipenser transmontanus*	5	11	12	15	16	27
Yellow Perch	*Perca flavescens*	46	14	55	43	17	14
Other		311	11	2	0	7	52
Total		149,336	163,375	62,702	56,265	122,055	116,584

Note- Numbers include expanded sample counts and separator releases

[1] Of the 6,584 ammocoetes collected in 2011, approximately 1,806 fish were not identified to species but were called Pacific lamprey based on the species composition of the sample.

[2] Sunfish include bluegill/pumpkinseed and warmouth

A total of 1,791 smolts were handled by WDFW GBT personnel in 2014. Forty-two fish had been previously PIT tagged and were enumerated and released without examination. A total of 1,749 smolts were examined for GBT of those, 39.3% were subyearling Chinook salmon, 33.3% were yearling Chinook salmon and 27.3% were steelhead smolts.

During the 2014 season, GBT rates were low, perhaps in part due to below average outflows for the season. The only incidence of GBT in 2014 was reported on June 2 and corresponded to the peak forebay gas saturation daily average of 117.2% on June 1. The injury

was given the lowest rank of 1 (1%-5% coverage) and was observed in the dorsal fin of an unclipped subyearling Chinook. No mortality occurred during GBT sampling in 2014.

Lower Snake River Adult Lamprey Study- University of Idaho

The goals of this research were to determine fish ladder entrance preferences, migration timing through the ladders, turn around points within the ladder, fallback rates, and conversion rates of adult Pacific lamprey migrating through the lower Snake River dams. All lamprey for this study were collected and tagged with half duplex PIT tags and radio telemetry tags at John Day Dam, transported to and released in the tailrace of Ice Harbor Dam for upstream monitoring at the four lower Snake River dams. Most dams were already equipped with radio telemetry receivers due to ongoing adult salmonid passage studies. LGS was equipped with additional antenna in the vicinity of the ladder turn pool and transition areas for this study. Monitoring began in May of this year and is scheduled to end in October 2014.

Lower Columbia and Snake Rivers Adult Salmon Passage study; Lower Snake River Pacific Lamprey Radio Tracking Study - UC Davis and U of I**.**

Collection and tagging of adult salmon and steelhead was conducted at the Adult Fish Facility at Bonneville Dam to evaluate upriver salmonid passage in the lower Columbia and lower Snake Rivers from March 2014 through March of 2015. Fish were tagged with radio telemetry transmitters and/or PIT tags at the Bonneville Dam Adult Fish Facility and released to begin the monitoring process. Detection equipment was installed at target hydro-projects. The LGS adult ladder count window was modified to a minimum opening of 18" during the winter maintenance period for placement of a temporary PIT tag antenna. This antenna may stay deployed for five or more years if the data is deemed critical.

In addition, LGS antenna deployments for this study aided in detections of adult lamprey tagged for the lower Snake River radio tracking study conducted in the spring of 2014.

Lower Granite Dam Prototype Overflow Weir and Enlarged Orifice Biological Evaluation- UC Davis and Blue Leaf Environmental

This study continues the investigations into increasing survival and reducing passage delay of juvenile salmonids within the juvenile bypass systems operating on the Columbia and Snake River dams. During the winter of 2012, Lower Granite Dam (LGR) modified one of the orifice openings in gatewell 5A. A 10 inch orifice opening was enlarged to a 14 inch opening and fitted with a prototype light ring. In 2013 the modified opening was tested against a broad crested prototype weir and in 2014, tested against a sharp crested prototype weir. In 2014, evaluations of weir passage efficiency and gatewell residence time of run of the river PIT tagged hatchery yearling Chinook, hatchery steelhead, and Pacific lamprey macropthalmia continued. A total of 17 Pacific lamprey macropthalmia from the LGS sample and approximately 240 Pacific lamprey macropthalmia from the LGS raceways were given to Blue Leaf Environmental researchers on May 23 and June 3. Lamprey were transported to LGR, photographed, evaluated for condition, pit tagged, and released into the LGR juvenile collection channel and gatewells. After passage, subsamples of the study lamprey were collected in the sort by code tanks at Lower Granite Dam and examined for injury. In late spring of 2014, it was discovered that the weir was malfunctioning. Consequently, a portion of the fish that were tagged for this study were not released for monitoring.

Siberian Prawn Studies in the Lower Snake River- United States Geological Survey (USGS)

Beginning in late September of 2013, USGS researchers requested Siberian Prawn collections from the SMP sampling sites at Lower Granite, Little Goose, and Lower Monumental dams. Once a week in 2014, beginning July 27, ODFW biologists collected, froze, and retained all prawn in the sample for researchers to claim at the end of the season. Researchers are evaluating the fecundity, growth, abundance, niche, and feeding habits of Siberian prawns *Exopalaemon modestus*, opossum shrimp *Neomysis sp.*, and mud shrimp *Corophium sp.*, in the Little Goose and Lower Granite pools. Approximately 7,547 Siberian prawn were collected from the SMP sample at Little Goose Dam for this project this year.

Sample System/PIT Tag System

The PIT tag detection and diversion systems at the lower Snake and Columbia River dams are maintained and operated by the Pacific States Marine Fisheries Commission. PIT tagged salmonids have been monitored for movement and behavior in the Columbia and Snake rivers since 1987. At Little Goose Dam, there are 11 PIT tag monitors located throughout the JFF. Further discussion of the PIT Tag System, including the Divert During Sample (DDS) system, can be found in the Facility Operations & Maintenance portion of this report on page 26.

Miscellaneous Monitoring

Zebra Mussel Monitoring

As in previous years, the USACE personnel at the Little Goose JFF monitored the facility for zebra mussel (*Dreissena polymorpha)* or quagga mussel (*Dreissena rostriformis bugensis)* infestation. The zebra mussel monitor is a piece of substrate suspended in the adult fish ladder near the ladder exit. No zebra or quagga mussels were observed during the 2014 season.

Turbine Cooling Water Strainers

The USACE monitored turbine unit cooling water strainers for the sixth consecutive year at Little Goose Dam. Strainers are located in the piping associated with the cooling water intake valve for each of the six turbine units. Strainers were rotated and flushed weekly by the USACE and inspected for any fish entrapment, particularly juvenile lamprey. Results were reported throughout the season to TMT and in the USACE and ODFW weekly report.

Avian Predation Monitoring

Avian activity has been monitored and recorded at Little Goose Dam by the USACE and ODFW for many years to assist with the management of reducing bird predation of juvenile smolts. New protocols involving documenting bird behavior were established by the Portland District Bonneville Dam Fisheries Field Unit and implemented in 2012 and continued through the 2014 season. One of the main goals of the avian data collection process is to standardize bird survey methodologies amongst the eight Federal Columbia River Power System (FCRPS) hydro-projects. Collecting behavioral data will augment existing historical bird data and aid in bird hazing activities during the smolt outmigration.

USACE and ODFW personnel conducted avian surveys daily from April 1 through November 6. Surveys were typically conducted mid-afternoon during the juvenile fishway inspection. Only two specific bird behaviors were recorded this year: foraging and non-foraging. Behaviors recorded in previous years, but not utilized in the 2014 season included loafing/resting (on land or water), flyby, scavenging and predating. The survey list of piscivorous birds was also reduced this year and included American white pelican, Caspian tern, double crested cormorant, and seagulls. Bald eagle, great blue heron, osprey, and grebe and merganser spp. were removed from the survey list of piscivorous birds in 2014.

As in previous years, copies of the ODFW juvenile inspection form were forwarded to project USACE biologists. For the third consecutive year, ODFW survey results, along with the USACE survey results, were entered into a USACE database by USACE fishery personnel.

Facility Operations & Maintenance

The juvenile fish bypass system was inspected at a minimum twice daily during the fish passage season. The juvenile bypass system and the collection facility were not heavily impacted by debris, equipment and components for the most part, met operational reliability and overall excellence in operations helped make 2014 an exceptional year for safe fish passage.

Forebay Debris/Trashracks

We estimated the surface area covered by debris and the location of that debris in the forebay daily during JFF inspections. On March 5, the trash sheer boom cable separated rendering the equipment ineffective. Consequently, any upriver debris, if not entirely entrained in the current during spill operations, passed through the project via turbine intakes or the juvenile collection system. Moderate to substantial accumulations of woody debris were present in the Little Goose forebay from May through June triggering various debris related issues within the juvenile collection system. A tear in a VBS screen associated with turbine unit 1 was discovered on May 13 triggering a forced outage of the turbine unit and dewatering of gatewell 1A; repairs to the screen were made without incident. Orifice blockages were numerous from early through mid-June. The USACE attempted to remove forebay debris June 18 using a variety of techniques including wrangling debris with a boat and swapping usage of turbine units to pull debris toward the spillbays. These attempts were marginally effective. Increased orifice rotation, gatewell dipping, and a separator cleanout were all necessary to decrease debris accumulations within the juvenile collection system this year. Debris accumulations began to taper off briefly, before they increased again, from late August through mid-September due to rising pool elevations resulting from the termination of MOP restrictions. However, the frequency and degree of blockages in the orifices and problems with failed equipment did not reoccur.

Spillway Weir

The spillway weir (SW) was placed into operation on April 3 in the high crest (622 ft. msl) position. On April 24, riggers began to change the weir to the low crest (618 ft. msl) configuration because flows were projected to be above 80 kcfs for seven or more days. The change could not be made on April 24 due to high wind conditions. The change to low crest was completed at 1010 hours on April 25. On June 17, the weir was returned to the high crest position at 11:00 hours. On August 4 at 0825 hours, the weir was removed from service to

"smooth-out" flows for the remainder of the summer spill season. There were no debris blockages during the operation of the weir.

Turbine Operation

Efforts were made to operate all turbine units within 1% limitation of best efficiency from April 1 to October 31. Best efficiency operations provide greatest fish passage survival through operating turbines. Deviations outside the 1% criteria are reportable if it occurs for more than 15 minutes in duration and/or there are 5 or more periods of at least 5 minutes during a single calendar day. In 2014, there were no reportable 1% violations.

There were numerous scheduled and unscheduled turbine unit outages during the fish passage season. Short term outages, less than 24 hours in duration were required to perform minor maintenance repairs, fish passage inspections and debris removal. Long term outages, greater than 24 hours are listed below.

Unit # 1

1) Planned outage starting December 2, 2013 to January 23, 2014, 538 hours duration in 2014 for Annual Maintenance.
2) Planned outage starting February 10, 2014, 58 hours duration for Exciter repair.
3) Forced outage starting May 13, 2014, 58 hours duration to repair torn VBS screens.
4) Forced outage starting July 25, 2014, 324 hours duration for Exciter repair.
5) Planned outage starting December 1, 2014, 394 hours duration for Annual Maintenance.

Unit # 2

1) Planned outage starting November, 25 2013 to January, 24 2014, 562 hours duration in 2014 for Exciter replacement.
2) Planned outage starting November 3, 2014, 514 hours duration for Annual Maintenance.

Unit # 3

1) Planned outage starting July 7, 2014 to January 8, 2015 (ERTS – Estimated eturn to service), 4248 hours duration in 2014 for 6-year overhaul.

Unit # 4

1) Forced outage starting May 14, 2014, 58 hours duration for Fish Screen failures and Governor Issues.
2) Planned outage starting October 6, 2014, 370 hours duration for Annual Maintenance.

Unit # 5

1) Planned outage starting March 24, 2014, 58 hours duration for spider crack inspection.
2) Forced outage starting August 12, 2014 to November 1, 2015 (ERTS), 3384 hours duration in 2014 due to T01 failure, such that unit may be used for station service, but is not connected to the grid.

Unit # 6

1) Planned outage starting August 11, 2014, 274 hours duration for Annual Maintenance.
2) Forced outage starting December 16, 2014, 130 hours duration due to problems removing the fish screens.

Extended-Length Submersible Bar Screens (ESBS)

All ESBSs performed satisfactorily with only three exceptions. Brushes on Unit 4 ESBSs were observed not working on May 15 and brushes on Unit 2 were not working on September 25 and October 20. In all cases, screen failures were reported and repaired in the same day. Drawdown inspections across trashracks and ESBS/VBS inspections were performed according to the FPP. All drawdown inspections were measured within criteria throughout the season. Video inspections and manual operation inspections showed all screens in good operating condition throughout the fish passage season.

Vertical Barrier Screens (VBS)

Inspections of all VBSs were performed by underwater video camera in the month of April. On April 2, a tear approximately 12 X 2 inches was found on the slot 1A VBS. All other inspections showed VBSs in good operating condition.

Gatewells

Gatewells were checked for debris and oil contamination daily. As needed, debris was removed using a dip basket or grappling hook. In 2014, the occasional oil films were observed on the water surface in several gatewells similar to previous years. Most oil films appeared to be organic (animal or vegetative) in appearance while some appeared to be petroleum base and may have been produced, in part, from rain-washed oil/grease residue associated with mechanical equipment and vehicles.

Orifices and Collection Channel

The collection channel was operated throughout the season with 18 to 22 open orifices depending on forebay elevations. Orifices were inspected and/or back-flushed two to five times per day. All orifice operations were manually performed throughout the year.

The collection channel was dewatered and removed from service on December 16. Fish salvage operations during the dewatering included releasing unharmed back to the river an estimated 75 adult steelhead, one coho, three sculpin, one Chinook smolt, and 25 juvenile lamprey (macropthalmia).

Primary Dewaterer/Primary Bypass Pipe

The primary dewatering structure and components functioned adequately throughout the season. Inspection of the primary dewaterer and manual operation of the cleaning brushes was performed daily. As in past years, the excess water was diverted to the adult fish channel pump chamber throughout the season to improve adult fish attraction and migration.

Bypass Flume/Pipe

The primary bypass flume functioned satisfactorily in 2014. During winter maintenance 2010, the flume outfall was relocated from near shore to mid channel. The relocation extended the release site approximately 400 feet north into the river mid-channel. This new section of

outfall is made of 36 inch corrugated metal pipe. The new point of release allows bypassed fish to migrate downstream with improved guidance. The flume was inspected during the winter maintenance period and observed in overall good condition and found free of obstructions and rough edges.

Separator

The separator was operated similarly to previous years. The water level was kept about one to two inches above the downstream end of the B-side separator bars. In some years, the facility is placed in primary bypass mode for short periods during the transport season in order to clean debris out of the separator. On June 18, the facility was placed in primary bypass from 1000 to 1200 hours to clean debris out of the separator. There was no estimate of the number of fish bypassed during the cleanout operation. During the winter maintenance period, the interior and exterior surfaces of the separator were cleaned and refurbished.

Sample System/PIT Tag System

The PIT tag detection and diversion systems at the lower Snake and Columbia River dams are maintained and operated by the Pacific States Marine Fisheries Commission. PIT tagged salmonids have been monitored for movement and behavior in the Columbia and Snake Rivers since 1987. At Little Goose Dam, there are 11 PIT tag monitors located throughout the JFF.

In previous years, the state of the Divert During Sample (DDS) system was manually changed by USACE project biologists and technicians based upon fish passage and sample rates. However, the DDS system was upgraded during the winter maintenance period in 2012/2013 to allow for automatic changes of state per entry of the sample rate, while still retaining the ability to override the automation and change the system manually.

At low sample rates ($\leq$20%), when large numbers of fish are passing through the system, the DDS setting is deactivated. When the DDS is deactivated, the PIT tag slide gate will not open when the sampling system is engaged. This setting helps avoid potential sample bias caused by diverting large numbers of untagged fish along with the targeted PIT tagged fish during a sampling event. At sample rates greater than or equal to 20%, (low numbers of fish passing through system), the potential for sample bias is lower and the DDS system is activated. An automated log of state changes to the system, trouble reports and power outages affecting the PIT tag interrogation equipment in 2013 can be obtained at www.ptagis.org.

DDS settings for the A and B side sample tanks followed recommendations for most of the season. Minor deviations typically occur daily at approximately 0700 hours as a result of equipment operation as the facility prepares for a new 24 hour sampling period. In addition, minor deviations occur as a result of split sample changes, separator cleanouts and/or power outages.

Pit Tag Detections

The passive integrated transponder (PIT) tag detection system records data on PIT tagged salmonids as they pass through the juvenile collection system. The PTAGIS database categorized all PIT tag detections based upon species, race, and clip/rearing type. An additional "orphan" category was used for detections of PIT tags for which the database contained no record of tagging and release. Fish dispositions were categorized based upon exit monitor detections: 1) to the river, 2) to transport holding areas, 3) to the smolt monitoring sample, and 4)

unknown. This last category included final detections of PIT tagged fish at locations that did not constitute an exit from the facility.

From April 1 through October 31, a total of 152,910 PIT tagged fish were detected within the juvenile collection/bypass system: 88,347 Chinook salmon, 60,680 steelhead, 2,241 sockeye salmon, 799 orphans of unknown species/rearing type, 795 coho salmon, 47 Pacific lamprey, and one white sturgeon. Of the total number of detections, 73.1% or 111,813 fish were routed to the river, 26.8% or 40,936 fish were routed to transport areas, and 0.1% or 161 fish had unknown disposition as they were last detected at locations that did not constitute an exit from the facility. PIT tagged fish in the subsample were treated as the other fish in the sample and were either routed back to the river, if the facility was operating in secondary bypass mode, or routed to a transport holding area when the facility operated in collection mode. Approximately 0.5% of the PIT tagged fish detected at LGS in 2014, or 722 PIT tagged smolts, were routed to the sample this year; 91% were transported and 9% were returned to the river during pre-transport operations (April 1- May 1). Prior to the start of the transportation season, all PIT tagged fish were routed back to the river. Approximately 35.1% or 53,611 of the total PIT tagged fish detected in 2014 were detected prior to the start of collection for transportation.

Barge and Truck Loading Operations

Barge loading and transport operations occurred from May 2 through August 16. All fish loading and barge operations at LGS were performed satisfactorily. Truck loading and transport operations occurred on alternate days from August 18 to October 31. In previous years, due to high numbers of fish collected, Lower Granite Fish Facility occasionally trucked Little Goose fish using a 3,500 gallon tank trailer. This “piggyback” operation delayed transport time for those fish transported from Lower Granite by approximately one hour. In 2014, Little Goose did not conduct any piggybacking operations with Lower Granite. In 2013, trucks originating at the Lower Granite Facility transported Little Goose fish on September 5, 7, 9 and October 31. Fish transported by truck from Little Goose were transported in a mild saline solution of 1 to 2 mg/L to reduce stress and treat Columnaris disease.

Avian Predation Deterrence

Springtime gull predation on juvenile salmon and steelhead at Little Goose has been significantly reduced since 1999 when the USDA Animal and Plant Health Inspection Service (APHIS) began bird hazing activities. Prior to 1999, 150 to 200 birds were common sight in the tailrace area during the smolt migration. On some days, up to 400 gulls were observed during the peak period in May. In 2014, APHIS bird hazing activities at Little Goose took place from April 7 through June 20. Additional hazing by project personnel using bird scare products including propane scare cannons, bird bangers and bird screamers continued intermittently through the remainder of the fish passage season. The water cannon located at the bypass outfall was used continuously throughout the season. Little Goose continued to use passive bird deterrent devices that included needle strips, bird wires and visual scare devices.

Facility Modifications

Several modifications were made prior to, during and after the 2014 season.

1. PSMFC installed a new PIT-tag detection system in the fish counting window slot in the adult ladder.
2. The counting window slot width was adjusted to a fixed 18-inch width.
3. Three holding tanks in the second floor wet lab at the Juvenile Fish Facility were relocated and re-plumbed to allow access to a ceiling mounted furnace.

Recommendations

1. Continue to write revisions and updates to the operations maintenance manual pertaining to new equipment and facility collection and transport procedures
2. Repair the trash/shear boom.
3. Install a new log boom between the floating guide wall and the trash/shear boom
4. Repair the emergency fish bypass/drain pipe outfall section. Install air and vacuum release valves to prevent back blow of the drain system.
5. Continue to rebuild orifice valve cylinders.
6. Replace all 72 in-line air control hand valves associated with the orifice valves and back-flushing operations.
7. Replace all 36 orifice push button electronic valve operators with manual 2-way valves.
8. Continue to remove scale and rough edges in the facility flumes, tanks, and transition areas
9. Compose a Standard Operating Procedures (SOP) for proper handling, collecting and transporting of Pacific adult lamprey from the JFF to their release site upstream of the dam. In addition, consider a similar SOP for the capturing, handling, and transporting of late season Pacific lamprey macropthalmia and metamorphosing Pacific ammocoete via truck.
10. Review protocols yearly to ensure effective communication between all parties during truck/barge loading, dewatering events, separator cleanouts, etc. This will ensure that fish are properly routed, flush water is available for fish transfer, and that there is sufficient water in holding tanks

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