2014 Juvenile Fish Collection and Bypass Report
McNary Dam Juvenile Fish Facility

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February 2015

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Introduction

McNary Dam is located at river mile 292 on the Columbia River, and is the first dam downstream of the confluence of the Snake and Columbia Rivers. Juvenile Fish bypass operations occurred for the twentieth year at McNary Dam Juvenile Fish Facility (JFF) in 2014. The bypass system was watered up between the hours of 0800 to 1200 on March 28, and ESBSs were installed beginning April 7th. Primary bypass occurred from March 28th to September 29th, alternating days of primary and secondary bypass.

This season's total collection was an estimated 4,464,404 juvenile salmonids, Of these, an estimated 4,461,967 (99.95% of the total passage) were bypassed in 2014 (Table 15). The numbers of fish bypassed and the percentages of total collected by species group were 1,003,654 yearling Chinook (99.9%), 2,406,589 subyearling Chinook (100.0%), 230,028 clipped Steelhead (100.0%), 66,388 unclipped Steelhead (100.0%), 3,350 clipped Sockeye (100.0%), 682,999 unclipped Sockeye (99.9%) and 68,959 Coho (100.0%).

Pacific States Marine Fisheries Commission (PSMFC) technicians examined 3,252 fish for gas bubble trauma (GBT) in 2014. Examinations were conducted April 15th through August 5th. After examination the fish were sent to sample recovery raceways and released along with fish from the sample.

Juvenile hatchery Chinook salmon, hatchery coho salmon, hatchery steelhead and hatchery sockeye salmon in the Columbia River Basin are normally designated by fin clips, usually the adipose fin but occasionally one of the pectoral or ventral fins. Before 1998, Idaho Fish and Game (IDFG) was the only agency that released sizeable numbers of unclipped hatchery fish. Starting in 1998, increasing numbers of unclipped hatchery fish were released by state, federal, tribal, or other agencies (FPC), therefore, the reported clipped/unclipped fish collected, sampled, bypassed, and transported no longer represent hatchery/wild origins of these fish.

Corps of Engineers personnel included: supervisory biologist Carl Dugger, assistant biologist Bobby Johnson, biological technicians: Suzzette Frazier, James Davis, Kurt Hubbard, Jeff McLaren, Denise Griffith and maintenance personnel: Ken LePage and Steven Schular. Representing Pacific States Marine Fisheries Commission (PSMFC) was biologist Rosanna Mensik.

Facility Description

Trash racks keep most debris from entering the intact of McNary's 14 turbines. When clean, trash racks help to keep fish passing in good condition. The fish enter the turbine intact and are diverted into the gatewell slots by extended length submersible bar screens. Each unit has three gatewell slots and associated fish screens. Vertical barrier screens in each gatewell slot keep the fish from entering the turbine. Each gatewell slot has two orifices with generally only one being open. The fish pass through these twelve-inch orifices to the juvenile collection channel. McNary usually operates with 42 orifices.

The channel flow runs from north to south. The dewatering structure and associated equipment are at the southern end of the powerhouse. Here there are the two side-dewatering valves, which regulate the channel elevation, which changes with orifice flow volume associated with turbine operation and forebay elevation changes. There is also a set of three floor-dewatering valves that are generally set at approximately 60 percent open, which remove excess water. Excess water from the all these valves goes either into the ice and trash sluice, which is now part of the emergency bypass route; the dewatering pit, which leads to the Oregon ladder's auxiliary closed channel and the north adult powerhouse entrances; or the 48-inch juvenile facility supply line. This line supplies the bypass facility feeding the head box, water add-ins and separator up well. The head box supplies water to the rest of facility. All flow is gravity fed.

Bar screen in the side and on the floor of the channel retains fish and allows the excess water to be removed. The screen is kept cleaned by the side, rectangular and transition brushes. The side dewatering valves, brushes and channel elevation have a PLC with associated programming. In the transition area, the channel funnels down to the full flow transport flume where the fish exit. The transport flume takes the fish to the separator. Just upstream for the separator is the primary bypass gate. This gate is used during fish passage season to switch between primary and secondary bypass. The separator sorts the fish by size with the small smolts exiting down the A flume and the large smolts going down the B flume. Adult salmonids and other miscellaneous fish are released at the separator's return to river line. The separator building is where technicians record fish counts, monitor the separator and perform other duties.

Downstream of the separator in the two flumes are the PIT tag gates, the sample gates and the secondary bypass gates, which tie back the A and B lines back into the full flow flume. The sample and PIT tag systems each have two count tanks with associated equipment and two holding tanks. The "A" and "B" sides each have a set. Inside the building is the wet lab where the sample is examined. There are also two sample raceways. The full flow flume, adult return line and all facility lines have PIT tag detectors and associate equipment. The sample timer and PIT tag monitoring equipment are in the building.

Facility Modifications (Maintenance and Improvements)

Maintenance and improvements for the winter of 2013-2014 made to enhanced system performance over previous seasons are listed:

1. We continued ESBS (new motors, chains, gearboxes and brushes) and VBS (new mesh) rehabilitation along with ESBS programming adjustments.
2. The project did all channel and facility preventative maintenance.
3. The project repaired the transition and side screen cleaning devices.
4. The project rehabilitated the hoist support in the channel and replaced a section of air line.
5. During maintenance, we found no problems with the south side dewatering valve.
6. The project welded close three forebay study orifice valves near the traps.
7. We replaced three orifice covers.
8. We also washed the orifice covers.
9. The project replaced two orifice light fixtures.
10. We removed the orifice trap flumes at 4A, 5A and 6B slots in the channel.
11. The project rewired the channel control system.
12. We replaced one over flow screen at the transition area in the channel
13. We cleaned debris and other objects form the emergency bypass route.
14. A contractor rebuilt the separator porosity unit's perforated plates.
15. We rehabilitated two winterization drains at the juvenile facility.
16. We rerouted two flush lines for the sample tank anesthetic chambers.
17. PSMFC installed a new PIT tag control system at the facility.
18. The fisheries staff rehabilitated the PIT and sample gates.
19. A contractor installed a new pump and supply lines for the bird hazing water sprinkler.
20. The contractor also installed ladder by the return to river drier, reinforced the return to river supports, added a flush line to the return to river drier, installed steps and handles at the junction box along with a locking device at the separator adult flush valve.
21. We install lamprey friendly screens in the PIT tag sample tanks.
22. We rebuilt the sample tanks' net frames.
23. We removed the A side direct barge loading gate.
24. We removed old sturgeon study water lines.
25. The project finally wired the heat strips for the shop's air handler.
26. We completed switching add-in water valves to PVC.
27. We installed a flange on the old adult return to river line.
28. We installed a clevis on the barge loading line replacing a chain.
29. The fisheries staff plumbed the separator spray bar with PVC.
30. The project did spill hoist preventative maintenance.
31. We welded the full flow pipe's access hatch on the 6th floor of the powerhouse closed.
32. In February, we had to thaw out the new adult flush line as it had frozen.

Some of this work continued into the season. Other maintenance items during the year are:

1. In May, we adjusted the plumping for the GBT flush line's pump and installed a missing stop plug.
2. Also, from May to September, we worked the separator observation buildings doors.
3. Finally, in May, we repaired an air leak on raceway 8's operator.
4. From mid-May to mid-June, we installed handles and latches on the full flow flume's covers.
5. In June, we replaced wood steps at the facility.
6. In July, a contractor installed tint on the separator observation building's west facing windows.
7. From late August to mid-November, we removed the direct barge loading lines. Some of the PVC was brittle.
8. Again, in late August, we repaired seams in the return to river line by the drier.
9. In September, we removed the non functional raceway spray bar system.
10. Also, in September, we repaired three main flume covers.
11. Finally, in September, we added voice mail to the separator building's phone system.
12. In October, a contractor repaired the facility's roof.
13. Also, in October, another contractor installed new weather stripping on the shop doors.
14. Again, in October, a different contractor installed three access gates to the facility's back fence.
15. In October, the project installed removable plugs in the roadway drains above the channel.
16. Finally, in October, we began rehabilitation of the separator. We found lead paint, which will cause the work to go well into the winter maintenance season.
17. Again, In October, we had the outside lighting at the facility repaired.
18. In December, the project began replacing electrical junction boxes and conduit in the channel.
19. Also, in December, we installed an extended frost plug on the equalizing valve at the primary bypass gate.
20. During the year, PSMFC continued to work on the interference by detector number 4 in the full flow flume.

Further maintenance issues will be covered in the remaining text of this report.

River Conditions

River flows in 2014 were slightly higher in April and May but, slightly lower for the rest of the season than the 2010-2013 average (Table 1). A peak hourly flow of 378.0 kcfs was recorded on May 28th while a minimum hourly flow of 55.5 kcfs occurred on September 23rd. The highest average flow day during the 2014 fish passage season was May 28th with an average of 374.5 kcfs. The minimum average daily flow of 70.1 kcfs was recorded September 20th (Figure 1). The court ordered summer spill implementation plan began at midnight on April 10 with 40% of the flow going through spill bays to improve fish passage. June 17 through August 31, 50% of the flow was passed through the spill bays. The peak hourly spill of 244.2 kcfs was reported on May 28th. Maximum average daily spill occurred on May 28th with an average spill of 227.7 kcfs.

In the Biological Opinion for the Columbia River, NOAA Fisheries set minimum flow targets at McNary Dam to aid in salmonid migration. The flow target for April 20th through June 30th was 220-260 kcfs. The average seasonal flow for this period was 292.2 kcfs with the average flows meeting the standard 70 of 72 days. The peak daily flow average for this period was 378.0 kcfs on May 28th. From July 1st through August 31st, the target was 200 kcfs. The average seasonal flows for this period were 191.6 kcfs with the average flows meeting the standard 22 of 62 days. The peak daily flow for this period was 293.9 kcfs on July 1th.

Table 1: Average monthly river flow and spill at McNary Dam, 2010-2014.[1]

Month	2010	2011	2012	2013	2014	2010 -2013 Average
			Flows (kcfs)			
Apr	120.2	281.1	317.2	226.2	240.0	236.9
May	195.3	365.0	349.6	288.3	310.2	301.7
Jun	318.5	465.5	344.6	248.9	285.1	332.5
Jul	190.2	325.2	326.3	214.3	223.2	256.1
Aug	124.0	203.0	207.6	156.5	159.5	170.1
Sep	81.6	116.5	114.6	96.5	91.7	100.2
			Spill (kcfs)			
Apr	36.0	135.3	166.3	94.3	101.4	106.7
May	78.5	219.9	176.8	141.7	167.8	156.9
Jun	156.0	307.2	202.1	112.7	144.4	184.5
Jul	95.0	193.1	191.0	111.4	112.1	140.5
Aug	61.4	105.8	104.1	78.4	79.9	85.9
Sep	1.1	2.7	11.0	1.9	1.7	3.7

[1]Seasons varied in length but average daily flows were recorded through the end of September.

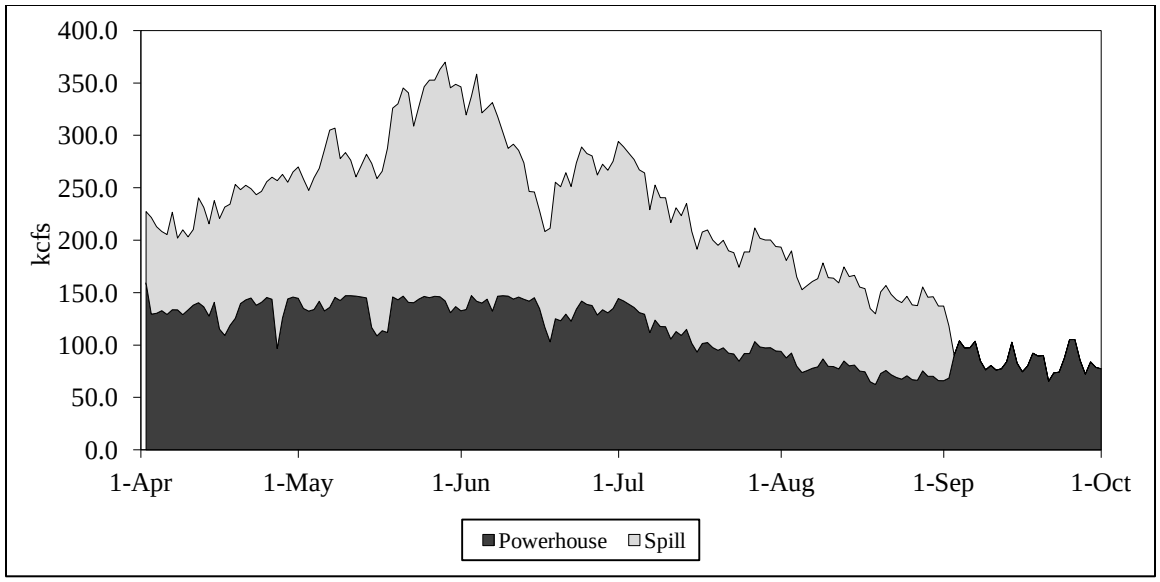

Figure 1. Average daily powerhouse discharge and spill at McNary Dam, 2014.

Fish Collection

Migration and Passage

"Collection" is a term that is used for any fish that cross the separator during secondary bypass. All fish at McNary Dam are returned to the river, "Bypassed". Collection is only recorded on an "every-other-day" basis. Juvenile fish that arrived throughout the year at McNary Dam were bypassed back to river through the juvenile fish facility (secondary bypass) or directly to the tailrace without passing through the juvenile fish facility (primary bypass). Fish can also be passed through the emergency bypass (flow is discharged through the north end of the ice/trash sluiceway). Secondary bypass took place on alternate days from April 7th until September 30th to allow the sampling of fish under the Smolt Monitoring Program.
With the continued increase in numbers of unmarked hatchery origin juvenile salmonids and different mark and release strategies employed by agencies and organizations within the basin, it is not possible to accurately differentiate between unmarked wild/naturally produced and unmarked hatchery origin juveniles. Fish are recorded as clipped or unclipped in the daily sampling.

An estimated 4,464,404 juvenile salmonids were collected at McNary Dam this season (Table 2). Composition by species in 2014: 1,004,596 yearling Chinook, 2,407,283 subyearling Chinook, 230,095 clipped Steelhead, 66,411 unclipped Steelhead, 3,350 clipped Sockeye, 683,687 unclipped Sockeye and 68,982 Coho. Collection totals do not include fish passing during emergency or primary bypass operations. Daily fish passage and river flow information is provided in Figure 2.

Table 2. Annual collection, bypass, and transport at McNary Dam, 2010-2014[1].

Year[1]	Yearling Chinook	Subyearling Chinook	Clipped Steelhead	Unclipped Steelhead	Clipped Sockeye	Unclipped Sockeye	Coho	Total
Collection								
2010	1,224,094	1,951,233	198,382	61,658	2,600	846,320	47,445	4,331,732
2011	952,682	2,487,088	225,936	70,063	5,615	131,149	71,810	3,944,343
2012	1,040,187	1,390,995	178,139	69,750	8,025	547,759	72,876	3,307,731
2013	1,098,880	1,779,323	200,145	55,207	10,723	303,914	43,803	3,491,995
2014	1,004,596	2,407,283	230,095	66,411	3,350	683,687	68,982	4,464,404
Bypass								
2010	1,222,563	1,496,969	198,186	61,542	2,598	845,306	47,275	3,874,439
2011	949,771	975,593	225,786	69,877	5,414	127,050	71,277	2,424,768
2012	1,039,959	1,174,739	178,122	69,740	7,999	547,535	72,876	3,090,970
2013	1,098,057	1,778,752	200,108	55,189	10,721	303,666	43,799	3,490,292
2014	1,003,654	2,406,589	230,028	66,388	3,350	682,999	68,959	4,461,967
Truck								
2010	0	146,694	0	10	0	80	40	146,824
2011	9	408,132	0	9	70	1,022	95	409,337
2012	49	214,232	0	0	25	148	0	214,454
2013	0	0	0	0	0	0	0	0
2014	0	0	0	0	0	0	0	0
Barge								
2010	173	299,909	56	30	0	190	70	300,428
2011	24	1,060,689	8	100	100	2,693	260	1,063,874
2012	0	0	0	0	0	0	0	0
2013	0	0	0	0	0	0	0	0
2014	0	0	0	0	0	0	0	0
Total Transported								
2010	173	446,603	56	40	0	270	110	447,252
2011	33	1,468,821	8	109	170	3,715	355	1,473,211
2012	49	214,232	0	0	25	148	0	214,454
2013	0	0	0	0	0	0	0	0
2014	0	0	0	0	0	0	0	0

[1]Seasons varied in length.

Peak collection occurred on May 11th with a daily total passage of 300,558. Peak collection dates and daily passage totals by species group were: May 11th yearling Chinook (194,300), July 2nd subyearling Chinook (264,064), May 1st clipped Steelhead (36,600), May 11th unclipped Steelhead (7,800), May 23rd clipped Sockeye/Kokanee (2,200), May 19th unclipped Sockeye/Kokanee (110,059), and May 21st Coho (9,204) (Table 3).

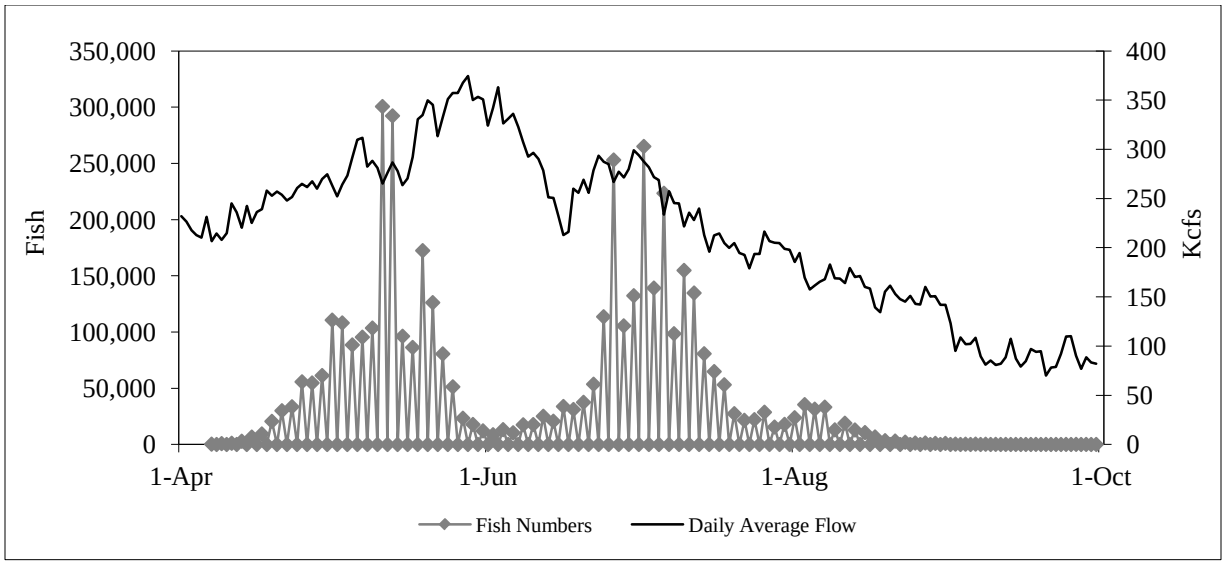

Figure 2. Daily juvenile salmonid passage all species vs. daily average flow at McNary Dam, 2014.

Table 3. Annual peak passage days at McNary Dam, 2010-2014.

Year	Yearling Chinook	Subyearling Chinook	Clipped Steelhead	Unclipped Steelhead	Clipped Sockeye	Unclipped Sockeye	Coho	Total
2010	May 21 (164,219)	June 26 (195,163)	May 5 (27,816)	May 5 (6,907)	May 11 (500)	May 29 (223,329)	June 2 (5,201)	May 29 (253,134)
2011	May 7 (152,806)	July 24 (111,300)	April 29 (24,927)	May 19 (6,600)	May 5 (500)	May 9 (15,007)	May 25 (5,405)	May 7 (197,252)
2012	May 17 (101,806)	July 20 (89,405)	May 1 (22,619)	April 29 (11,200)	May 7 (1,200)	May 11 (105,601)	May 17 (7,600)	May 17 (181,008)
2013	May 9 (202,853)	July 10 (175,208)	May 3 (37,018)	May 11 (5,802)	May 13 (2,401)	May 17 (33,827)	May 19 (3,600)	May 9 (233,863)
2014	May 11 194,300	July 2 264,064	May 1 36,600	May 11 7,800	May 23 2,200	May 19 110,059	May 21 9,204	May 11 300,558

Adult Fallbacks

A total of 1,274 adult salmonids were bypassed from the separator to the tailrace in 2014 (Table 4). The composition of adult salmonids that fell back through the system and were released from the McNary juvenile fish separator was: 238 adult Chinook, 62 jack Chinook, 215 clipped Steelhead, 581 unclipped Steelhead, 140 Sockeye and 38 Coho. In 2013, peak fallback activity occurred in September (Table 5).

Table 4. Annual totals of adult salmonids released from the juvenile fish separator at McNary Dam, 2010-2014.[1]

Year[1]	Adult Chinook	Jack Chinook	Clipped Steelhead	Unclipped Steelhead	Sockeye	Coho	Pink	Total
2010	366	200	876	1,008	101	18	0	2,569
2011	385	331	637	1,008	162	37	1	2,561
2012	538	548	611	956	205	34	0	2,892
2013	254	183	182	662	28	2	0	1,311
2014	238	62	215	581	140	38	0	1,274

[1]Seasons varied in length. See text.

Table 5. Monthly totals of adult salmonids released from the juvenile fish separator at McNary Dam, 2014.

Month	Adult Chinook	Jack Chinook	Clipped Steelhead	Unclipped Steelhead	Sockeye	Coho	Pink	Total
April	3	0	49	142	0	0	0	194
May	96	12	83	197	0	0	0	388
June	30	16	14	29	23	0	0	112
July	8	3	7	10	104	0	0	132
August	11	0	8	16	13	0	0	48
September	90	31	54	187	0	38	0	400
Total	238	62	215	581	140	38	0	1,274

All salmonid fallbacks collected were examined for condition and ranked using a standard protocol (Table 6). Overall, 79.2% of the fish examined were classified as good condition, which is lower than 2013 (82.5%). The percentage of each species group that were in good condition was: adult Chinook 93.3%, jack Chinook 96.8%, clipped Steelhead 70.2%, unclipped Steelhead 75.9%, Sockeye/Kokanee 70.0% and Coho 97.4%.

Table 6. Condition of adult salmonids released from the juvenile fish separator at McNary Dam, 2014.

Condition	Adult Chinook	Jack Chinook	Clipped Steelhead	Unclipped Steelhead	Sockeye	Coho	Pink	Total
Good	222	60	151	441	98	37	0	1,009
Fair	12	0	41	90	17	1	0	161
Poor	4	1	22	35	13	0	0	75
Dead	0	1	1	15	12	0	0	29
Total	238	62	215	581	140	38	0	1,274

Separator Efficiency

In addition to separating adult fish from juvenile fish, the separator at the McNary juvenile fish facility is designed to separate smaller juvenile salmonids (Chinook, Coho and Sockeye) from the larger individuals (Steelhead) which are more aggressive in raceways and barges. This is intended to reduce stress from inter-species aggression that may result from holding different sized juveniles together in the same sample holding tank. Separator efficiency is defined as the percentage of a group in the sample that was collected in the desired location.

Separator efficiency by species in 2014 was: yearling Chinook 57.0%, subyearling Chinook 65.7%, clipped Steelhead 79.1%, unclipped Steelhead 63.5%, Sockeye 20.9% and Coho 24.2% (Table 7). As in past years, Sockeye and Coho were the least efficiently separated species where over 75% exited from the "B" side or large fish side of the separator.

Table 7. Annual separator efficiency in percent at McNary Dam, 2010-2014.

Year	Yearling Chinook A-side	Subyearling Chinook A-side	Clipped Steelhead B-side	Unclipped Steelhead B-side	Sockeye A-side	Coho A-side
2010	63.5	64.8	87.1	68.1	27.5	24.5
2011	48.1	62.4	79.8	72.0	25.9	19.6
2012	43.7	48.8	88.5	65.7	20.5	21.8
2013	49.8	41.8	85.6	80.5	21.3	14.8
2014	57.0	65.7	79.1	63.5	20.9	24.2

Sampling

A total of 30,216 juvenile salmonids (0.7% of the total passage) were sampled in 2014. Sample percentages by species group were: yearling Chinook 0.6%, subyearling Chinook 0.7%, clipped Steelhead 0.7%, unclipped Steelhead 0.9%, clipped Sockeye 0.8%, unclipped Sockeye 0.6% and Coho 0.8% (Table 8). Sample rates ranged from a low of 0.5%, during the peak of the spring and summer migrations, to a high of 25.0% at the end of the season (Table 9).

Table 8. Annual percentage of total juvenile salmonids passing that were sampled at McNary Dam, 2010-2014.

Year	Yearling Chinook	Subyearling Chinook	Clipped Steelhead	Unclipped Steelhead	Clipped Sockeye	Unclipped Sockeye	Coho	Total
2010	1.6	2.9	2.0	1.7	1.4	1.2	1.4	2.1
2011	1.0	1.9	1.7	1.7	1.8	1.1	1.8	1.7
2012	0.8	1.7	1.1	1.2	0.7	0.6	1.0	1.2
2013	0.8	1.4	0.7	1.1	0.6	0.7	1.3	1.1
2014	0.6	0.7	0.7	0.9	0.8	0.6	0.8	0.7

Table 9. Weekly sample rates in percent and sample totals at McNary Dam, 2014.

Week Ending	Weekly Rate (%)[1]	Yearling Chinook	Subyearling Chinook	Clipped Steelhead	Unclipped Steelhead	Clipped Sockeye	Unclipped Sockeye	Coho	Total
Apr 3		0	0	0	0	0	0	0	0
Apr 10	10.0	28	7	32	41	0	0	0	108
Apr 17	3.6	377	19	116	155	0	42	7	716
Apr 24	1.2	553	12	238	52	0	173	15	1,043
May 1	0.7	1,003	8	425	103	0	385	38	1,962
May 8	0.5	883	8	330	80	0	121	37	1,459
May 15	0.5	2,252	12	290	91	1	1,219	94	3,959
May 22	0.5	557	20	38	26	0	1,213	68	1,922
May 29	0.6	253	95	26	12	16	483	67	952
Jun 5	4.0	255	396	44	32	10	434	180	1,351
Jun 12	1.6	143	904	13	9	0	48	42	1,159
Jun 19	1.0	14	790	15	4	0	18	13	854
Jun 26	0.6	5	2,713	13	3	0	4	4	2,742
Jul 3	0.5	5	2,496	5	1	0	4	2	2,513
Jul 10	0.5	0	3,073	2	0	0	3	0	3,078
Jul 17	0.5	0	1,399	0	1	0	0	0	1,400
Jul 24	0.7	0	836	1	0	0	0	0	837
Jul 31	1.3	0	798	0	0	0	0	0	798
Aug 7	1.3	0	1,661	0	0	0	1	0	1,662
Aug 14	0.9	0	383	0	0	0	0	0	383
Aug 21	1.7	0	393	0	0	0	0	0	393
Aug 28	6.4	0	299	0	0	0	0	0	299
Sep 4	11.5	0	292	0	0	0	1	0	293
Sep 11	25.0	0	165	0	0	0	1	0	166
Sep 18	25.0	0	61	0	0	0	0	0	61
Sep 25	25.0	0	49	0	0	0	1	0	50
Oct 2	25.0	0	56	0	0	0	0	0	56
Oct 9		0	0	0	0	0	0	0	0
Totals:	0.7	6,328	16,945	1,588	610	27	4,151	567	30,216
% of Sample		20.9	56.1	5.3	2.0	0.1	13.7	1.9	100.0
% of Passage		0.6	0.7	0.7	0.9	0.8	0.6	0.8	0.7

[1] Fish sampled/fish passage x100.

Incidental Species

In addition to salmonids, the McNary facility passed approximately 861,019 fish of various species. These consisted primarily of 789,140 juvenile American Shad (*Alosa sapidissima*), 59,953 juvenile (*macrophthalmia*) Pacific Lamprey (*Entosphenus tridentatus*), 4,326 Three-spine Sticklebacks (*Gasterosteus aculeatus*), 3,476 Smallmouth Bass (*Micropterus dolomieui*), 1,504 Peamouth (*Mylocheilus caurinus*), 590 Mountain Whitefish (*Prosopium williamsoni*), 454 Longnose Dace (*Rhinichthys spp.*), 420 Channel Catfish (*Ictalurus punctatus*) and 418 adult American Shad (*Alosa sapidissima*) (Table 10). These fish were bypassed to the tailrace below McNary Dam. Non-salmonid species released from the separator were not recorded.

Table 10. Passage of incidental species at McNary Dam, 2014.

Common Name	Scientific Name	Sampled	Passage
Pacific lamprey (adult)	*Entosphenus tridentatus*	3	10
Pacific lamprey (morph)	*E. tridentatus*	985	59,953
Pacific lamprey (ammocoete)	*E. tridentatus*	1	100
American shad (adult)	*Alosa sapidissima*	6	418
American shad (juvenile)	*A. sapidissima*	143,599	789,140
Bluegill/Pumpkinseed	*Lepomis spp*	3	12
Bullhead	*Ameiurus spp.*	4	128
Channel catfish	*Ictalurus punctatus*	8	420
Chinook Mini Jack	*Oncorhynchus tshawytscha*	0	0
Chiselmouth	*Acrocheilus alutaceus*	1	4
Common carp	*Cyprinus carpio*	7	74
Crappie	*Pomoxis spp.*	0	0
Crayfish	*Pacifastacus spp.*	7	130
Kokanee	*O. nerka*	1	4
Largemouth bass	*Micropterus salmoides*	0	0
Longnose dace	*Rhinichthys cataractae*	12	454
Mountain whitefish	*Prosopium williamsoni*	7	590
Northern Pikeminnow	*Ptychocheilus oregonensis*	0	0
Peamouth	*Mylocheilus caurinus*	22	1,504
Steelhead Kelt	*Oncorhynchus mykiss*	0	0
Redside Shiner	*Richardsonius balteatus*	2	75
Sandroller	*Percopsis transmontana*	0	0
Sculpin	*Cottus spp.*	1	4
Siberian Prawn	*Exopalaemon modestus*	5	148
Smallmouth bass	*M. dolomieui*	68	3,476
Sucker	*Catostomus spp.*	1	20
Three-spine stickleback	*Gasterosteus aculeatus*	161	4,326
Walleye	*Stizostedion vitreum*	1	4
Yellow perch	*Perca flavescens*	1	25
Total		144,906	861,019

Fish Condition

Descaling

The descaling percentage for all groups combined was 4.8% in 2014. This is higher than the overall rate of 3.5% for 2013 (Table 11). Annual descaling percentages in 2014 by species were: yearling Chinook 5.5%, subyearling Chinook 2.2%, clipped Steelhead 4.2%, unclipped Steelhead 4.4%, clipped Sockeye 11.1%, unclipped Sockeye 14.1% and Coho 5.7%.

Weekly descaling percentages for all species combined ranged from 0.7% to 13.5% for weeks with at least 100 fish examined (Table 12). The combined average descaling percentage was 6.5% during the spring migration period (April 1st to June 30th), 1.6% during the summer migration period (July 1st to August 31st) and 4.9% during the month of September. The 2014 seasonal migration descaling percentages were lower in the spring but higher in the summer and during September than in 2013 (4.7%, 1.9%, and 7.4% respectively). These percentages were calculated using full sample descaling data.

Table 11. Annual descaling rates in percent for fish sampled at McNary Dam, 2010-2014.

Year	Yearling Chinook	Subyearling Chinook	Clipped Steelhead	Unclipped Steelhead	Clipped Sockeye	Unclipped Sockeye	Coho	Total
2010	4.1	1.3	3.2	3.4	*0.0	7.1	3.3	2.6
2011	3.2	1.4	3.4	1.6	*5.1	7.2	2.7	1.9
2012	3.2	1.7	4.7	2.4	*7.5	5.0	2.0	2.5
2013	5.5	2.2	5.8	4.3	*6.0	8.5	3.5	3.5
2014	5.5	2.2	4.2	4.4	*11.1	14.1	5.7	4.8

* Fewer than 100 fish sampled.

Table 12. Weekly descaling percentages for fish sampled at McNary Dam, 2014.

Week Ending	Yearling Chinook	Subyearling Chinook	Clipped Steelhead	Unclipped Steelhead	Clipped Sockeye	Unclipped Sockeye	Coho	Total
Apr 3	---	---	---	---	---	---	---	---
Apr 10	*7.1	---	*6.3	*17.1	---	---	---	10.9
Apr 17	3.8	---	6.1	3.2	---	*0.0	*14.3	3.9
Apr 24	5.5	---	2.5	*3.8	---	5.4	*0.0	4.6
May 1	2.9	---	3.5	2.0	---	3.9	*0.0	3.2
May 8	4.3	---	2.1	*3.8	---	12.4	*2.7	4.4
May 15	6.9	*0.0	6.9	*3.3	*0.0	13.9	*3.2	8.9
May 22	6.2	*9.1	*2.6	*0.0	---	15.9	*10.3	12.3
May 29	6.7	*3.2	*3.8	*8.3	*6.3	20.3	*6.1	13.5
Jun 5	6.8	5.8	*6.8	*9.4	*20.0	16.3	7.8	10.0
Jun 12	5.1	6.7	*7.7	*0.0	---	*16.7	*2.4	6.7
Jun 19	*7.1	4.6	*13.3	*0.0	---	*38.9	*0.0	5.5
Jun 26	*0.0	1.8	*15.4	*33.3	---	*0.0	*25.0	1.9
Jul 3	*20.0	1.6	*0.0	*0.0	---	*25.0	*0.0	1.6
Jul 10	---	1.8	*0.0	---	---	*33.3	---	1.8
Jul 17	---	1.5	---	*0.0	---	---	---	1.5
Jul 24	---	1.7	*0.0	---	---	---	---	1.7
Jul 31	---	1.8	---	---	---	---	---	1.8
Aug 7	---	0.7	---	---	---	*0.0	---	0.7
Aug 14	---	0.8	---	---	---	---	---	0.8
Aug 21	---	1.8	---	---	---	---	---	1.8
Aug 28	---	3.7	---	---	---	---	---	3.7
Sep 4	---	2.1	---	---	---	*0.0	---	2.1
Sep 11	---	8.5	---	---	---	*0.0	---	8.5
Sep 18	---	*0.0	---	---	---	---	---	*0.0
Sep 25	---	*3.3	---	---	---	*0.0	---	*3.2
Oct 2	---	*3.6	---	---	---	---	---	*3.6
Total Descaled	343	363	67	27	3	581	32	1,416
Total Examined	6,262	16,516	1,583	608	27	4,107	566	29,669
Percent Descaled	5.5	2.2	4.2	4.4	*11.1	14.1	5.7	4.8

* Fewer than 100 fish sampled.
--- No fish sampled during the week.

Other Injuries and Disease

Daily subsamples of up to 100 juvenile salmonids of each species from the daily sample were examined for detailed injury and disease. Of the 7,554 fish subsampled, 970 (12.8%) were injured, descaled or exhibited symptoms of disease and 0.7% had multiple injuries or a combination of injury and disease. Clipped Steelhead had the highest incidence of injuries and disease at 17.2%. There were 466 clipped Steelhead examined. Predation marks caused by birds was the most commonly occurring injury. Unclipped Sockeye experienced the second highest incidence of injuries and disease (17.1% of 802 examined), followed by Coho (14.63%), sub-yearling Chinook (12.6%), unclipped Steelhead (12.6%), clipped Sockeye (11.1%) and yearling

Chinook (10.2%). Descaling is always a concern and is usually indicative of a problem within the system. In 2014, the average descaling percentage for the subsample (of up to 100 fish per species) was 6.1%. Bird predation was responsible for 9.1% of overall descaling. Birds accounted for 56.3% of the descaled unclipped Steelhead and 51.7% of the descaled clipped Steelhead

All fish in the sample were examined for lamprey marks. In 2014, 1.2% of all subyearling Chinook had wounds caused by lamprey. In previous years, the injury percentages for subyearling Chinook caused by lamprey were: 2.6% in 2013, 0.3% in 2012, 0.3% in 2011 and 0.3% in 2010. Lamprey bite marks are not as common on other species, because lamprey are not as aggressive in the spring.

Mortality

Total facility mortality for all groups combined was <0.1% in 2014 (Table 13). This is similar to last year's rate of <0.1%. Mortality rates by species were yearling Chinook <0.1%, subyearling Chinook <0.1%, clipped Steelhead <0.1%, unclipped Steelhead <0.1%, clipped Sockeye 0.0%, unclipped Sockeye 0.1% and Coho <0.1%. The overall facility mortality rate was <0.1% during the spring migration period, <0.1% during the summer migration period and 0.4% during the last month of facility operations. This compares to rates of 0.1%, <0.1%, and 0.6% during the respective periods in 2013. The facility mortality was lower this year due to the lack of a transport season. Since 1998, facility mortalities have been collected off the separator and factored into the collection and facility mortality totals.

Table 13. Annual facility mortality in percent at McNary Dam, 2010-2014.

Year	Yearling Chinook	Subyearling Chinook	Clipped Steelhead	Unclipped Steelhead	Clipped Sockeye	Unclipped Sockeye	Coho	Total
2010	0.1	0.4	0.1	0.1	0.1	0.1	0.1	0.2
2011	0.3	1.7	0.1	0.1	0.6	0.3	0.2	1.2
2012	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1
2013	0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1
2014	<0.1	<0.1	<0.1	<0.1	0.0	0.1	<0.1	<0.1

Weekly facility mortality rates varied from a low of 0.0% to a high of 0.9% (Table 14). The highest weekly facility mortality rate of 0.9% occurred during the week ending October 2nd. The lowest rate occurred during the week ending July 10th, in the middle of the season.

Table 14. Weekly facility mortality in percent at McNary Dam, 2014.

Week Ending	Yearling Chinook	Subyearling Chinook	Clipped Steelhead	Unclipped Steelhead	Clipped Sockeye	Unclipped Sockeye	Coho	Total
Apr 3	---	---	---	---	---	---	---	---
Apr 10	0.4	0.0	0.0	0.0	---	100.0	---	0.2
Apr 17	0.2	0.2	0.1	0.0	---	0.4	0.0	0.2
Apr 24	0.3	0.0	0.2	0.3	---	0.2	0.0	0.3
May 1	0.0	0.0	0.0	0.0	---	0.0	0.1	0.0
May 8	0.0	0.0	0.0	0.0	---	0.1	0.0	0.0
May 15	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.1
May 22	0.1	0.0	0.0	0.1	---	0.1	0.0	0.1
May 29	0.1	0.0	0.1	0.1	0.0	0.2	0.0	0.1
Jun 5	0.5	0.1	0.1	0.1	0.0	0.5	0.1	0.3
Jun 12	0.2	0.0	0.0	0.0	---	0.2	0.0	0.0
Jun 19	0.0	0.0	0.1	0.0	---	0.1	0.0	0.0
Jun 26	0.0	0.0	0.1	0.0	---	0.0	0.0	0.0
Jul 3	0.0	0.0	0.0	0.0	---	0.1	0.0	0.0
Jul 10	---	0.0	0.0	---	---	0.2	---	0.0
Jul 17	---	0.0	---	0.0	---	---	---	0.0
Jul 24	---	0.0	0.0	---	---	---	---	0.0
Jul 31	---	0.0	---	---	---	---	---	0.0
Aug 7	---	0.1	---	---	---	0.0	---	0.1
Aug 14	---	0.0	---	---	---	---	---	0.0
Aug 21	---	0.0	---	---	---	---	---	0.0
Aug 28	---	0.1	---	---	---	---	---	0.1
Sep 4	---	0.1	---	---	---	0.0	---	0.1
Sep 11	---	0.2	---	---	---	0.0	---	0.2
Sep 18	---	0.4	---	---	---	---	---	0.4
Sep 25	---	0.5	---	---	---	0.0	---	0.5
Oct 2	---	0.9	---	---	---	---	---	0.9

---No fish collected during the week.

The overall sample tank mortality percentage for 2014 was 1.1% (Table 15). This is slightly down from 2013 (1.3%). It is important to note that subyearling Chinook mortality (64.1% of the total mortality sampled) drives the overall sample tank mortality percentage each year. The sample mortality percentage is the best available indicator of the actual facility mortality percentage during bypass operations. Mortalities that occurred or passed the separator between sampling intervals were bypassed directly to the tailrace and were not enumerated. The sample mortality percentage included mortalities recovered from the sample holding tanks and any mortality that occurred during the sampling process. It does not include mortalities from the recovery raceway.

Sampling activities accounted for 5 of the 329 (1.5%) mortalities recovered from the sample holding tanks. These mortalities represent 0.02% of the salmonids sampled. There were three categories for handling mortality: Fish pinched by the pre-anesthetic chamber gates (1), fish overdosed with MS222 and fish stranded in the flush pipe to the sorting trough (3). This lower when compared to 14 sampling activity mortalities in 2013, or 2.8% of the mortalities recovered that year.

The overall post-sampling mortality percentage was 0.2% in 2014, with a daily range of 0.0% to 2.4%. The peak occurred on a day with low sample numbers. The post-sampling mortality percentage was calculated using the mortalities recovered from the sample recovery raceway. Post-sampling mortality percentages for species sampled in 2014 were: yearling Chinook 0.2%, subyearling Chinook 0.3%, clipped Steelhead 0.0%, unclipped Steelhead 0.1%, clipped Sockeye 0.0%, unclipped Sockeye 0.0%, and Coho 0.0%.

Table 15. Annual sample mortality in percent at McNary Dam, 2010-2014.

Year	Yearling Chinook	Subyearling Chinook	Clipped Steelhead	Unclipped Steelhead	Clipped Sockeye	Unclipped Sockeye	Coho	Total
2010	0.6	1.0	0.4	0.3	5.6	1.0	0.8	0.9
2011	1.9	1.8	0.2	0.5	1.0	2.9	0.6	1.7
2012	0.5	0.9	0.3	0.5	1.9	0.8	0.0	0.8
2013	0.7	1.6	0.1	1.0	0.0	1.5	0.2	1.3
2014	1.0	1.2	0.3	0.3	0.0	1.1	0.2	1.1

Research

Gas Bubble Trauma (GBT) Monitoring

PSMFC personnel collected juvenile salmonids as they entered the separator and examined them for symptoms of Gas Bubble Trauma (GBT) as part of the Smolt Monitoring Program. Examinations were conducted April 15th through August 5th. The protocol states that 100 fish will be captured off the separator for examination for GBT. These can be any combination of yearling or subyearling Chinook or clipped or unclipped Steelhead. GBT occurred on a revolving schedule of Sunday and Thursday one week then Monday and Friday the next week. All fish were scanned for PIT tags immediately upon capture; those with tags were returned to the separator without examination. After examination, fish were sent to the sample recovery/holding raceway and bypassed along with fish from the daily sample. Fish examined for GBT were included in the daily collection totals. A total of 3,252 salmonids were examined for GBT at McNary in 2014. These included 1,229 yearling Chinook, 1,734 subyearling Chinook, 208 clipped Steelhead and 81 unclipped Steelhead. There were 4 (0.12%) fish showing symptoms of GBT.

Operations and Maintenance

Separator

The separator was functional during secondary bypass for sampling as described in the Bypass Operations section. The separator is five feet wide. The A, smaller smolt, section is 13 feet long while the B, larger smolt, section is nine feet long. The spacing between the A separator bars is approximately 11/16 inch while the spacing between the B bars is approximately 1 and 5/16 inch. After peak steelhead smolt out migration and with the beginning of adult shad fallbacks, PVC pipe is installed over the B bars to help exclude shad from the sample. Juvenile steelhead can still exit. The A side bars gradually slope up going downstream with the water depth going from approximately six to three inches. The B bars are approximately two inches below the downstream end of the A bars. The B-side water depth starts at approximately five inches and drops to three inches at the adult release gate.

Flow into the separator is depended on collection channel changes and debris blockage on the perforated plate just upstream of the separator. High flows were generally due to debris on the perforated plate, which technicians cleaned. During the spill program and project operations along with juvenile channel adjustments and other issues described in this report, the separator can experience fairly severe fluctuations. As described in the Bypass Operations section, a power outage at the facility also affects operations. We regularly tapped and back flushed the separator up well to improve flow. The end of the spill program had no significant affect on separator debris loads that night. However, we did see more juvenile shad and adult salmonids.

Debris issues as describe elsewhere in this report affect the separator and facility when operational. The separator exits had very few debris blockages, which we generally removed quite easily with no harm to fish noted. The technicians monitored and addressed all issues at separator. Debris blockages downstream of the separator were removed quickly with no fish lost. Also, at the facility, we removed algae all year as long when the facility was watered up.

For the year, facility mortality records were within normal ranges. Our worst incident is discussed here: On April 21, at 1100, while in primary bypass, we found the returned to river line overflowing just downstream of the barge/bypass gate. First, we had to reduce and stabilize the flow as a large number of fish had swum up from the secondary bypass line to the barge drier. Next, we had to go to the barge dock and rip-rap, where we retrieved 133 lost smolts, which were in various degrees of mortality. At 1200, we released the sample raceway out the barge boom, avoiding the secondary bypass line. Around 1300, a camera revealed the junction of the secondary bypass and return to river lines was fully blocked with debris. We broke two plungers in an attempt to remove the debris. At 1400, our next step was to open the top of the pipe, at which time; we removed the debris, which was woody material with pieces of tumbleweed. (The above total includes fish removed from the debris.) We also retrieved our two plungers. By 1700, a hatch was installed to cover the opening and allow future inspections of this junction.
With the start of the season, it was difficult to determine when the debris blockage may have begun to form. The last sample raceway release on April 20, before the blockage, gave no indication of an issue. The only observation we had made earlier was the flow at the barge drier appeared higher than last season but this could have been due to changes made in the off season.

On April 22, a district engineer examined the junction area for possible improvements as this has been an area of concern for the project.

The new access hatch at the junction allowed use to remove two sticks in May on separate occasions, which helped to avoid another blockage in this area. In August, similar to last year, we again observed subyearling Chinook resting just upstream of this junction. No blockages were found.

In early June, four juvenile lampreys were lost on the porosity units perforated plate. Procedures were reviewed. In November, when dewatering the separator, we found one lost unclipped subyearling chinnok and one lost juvenile lamprey. Descaling is discussed in the Forebay Debris section.

Facility operations: startup, primary, secondary and emergency bypass along with shutdown, are described in the Bypass Operations section. With fall primary bypass season, we keep the system watered up to help avoid frozen pipes so we only preformed light maintenance until November 12, when we began emergency bypass. At this time, with the facility dewatered, we completed winterization and began full maintenance. Winter maintenance is reported in the Facility Modifications section.

Other issues at the facility, which was functional as outlined in the Bypass Operations section, are listed in (Table 16) or elsewhere in this report.

Table 16. Facility Issues.

Date	Issue	Resolution
May 31	Poor correction factor.	Change out fish counter on A side.
Jun 21	Lost small bucket in B flume.	Ice checks, no blockage.
Jun 24	Few small welds on porosity unit broke.	We repaired.
Jun 27	Low porosity unit and separator floors from 1400 to 1420. Change in generation.	Side dewatering valves were able to restore the channel elevation.
Jul 11	Brief water fluctuations at separator. No channel alarms.	Water level self stabilized.
Jul 31	Broom head lost in A flume.	Ice checks, no blockage.
Early Nov	Separator unit needs rehabilitation: cleaned, primed and repainted with new floor screen.	Unit dewatered to begin work, which will take all winter.
Nov 11	Leak noted in joint at full flow flume and primary bypass gate.	Repair during winter outage.

Sample System and PIT Tag System

Reduced sampling due to high water temperatures is discussed in the Turbine Operations section of this report. Also, descaling is discussed in the Forebay Debris section of this report. Table 17 reflects other issues with the sample system.

Table 17. Sample System Issues.

Date	Issue	Resolution
Apr 14	Water line to sample raceway leaking in wet lab.	Repaired.
Apr 20	Sample gates left off 20 minutes at 1%.	One sample missed.
May 13	Water leak in wet lab floor.	Repaired.
May 14	After power outage, B side count tank water supply actuator's indicator malfunctioned.	Problem was intermittent and self resolved.
May 19	B side count tank indicator.	Electricians found no problem.
Jul 10	Oil reservoir on B sample holding tank leaking.	Replaced.

The sampling and pre-anesthetic systems worked well. For the season, we changed the sample rates with the data day at 0700. On April 6, at that time, we turned on the sample gates for the first day of secondary bypass. During the bypass season, we activated the gates every other morning to be operational during secondary bypass. Turning the sample gates on and off during issues and events are recorded in the Bypass Operations section. On September 30 at 0700, we shut down the sample system for the year. By mid-August, juvenile shad became a relevant part of the samples taken.

In late March, the A side PIT gate's air lines were replaced. In early April, after the system was checked, the PIT tag detection/deflection system (A and B gates) were turned off. During the bypass season, the gates were not used. All PIT tagged fish were still detected in the full flow flume during primary bypass and at the facility including the return to river lines during secondary bypass so no data was lost and these bypass routes are preferred over the smaller PIT tag release lines. The PIT system received scheduled testing and adjustment.

The secondary bypass slide gates, which also can serve as a PIT tag diversion system (C gate is on the A side and D gate is on the B side) have not been used in a PIT tag study for several years. These gates received no preseason adjustments; we left them off and open for the season.

This season, we had two bull trout and one white sturgeon detected by our PIT tag system.

Bypass Operations

On March 28, from 0800 to 1200, the fisheries staff re-watered the system and began primary bypass. All sample and PIT gates were off.

The juvenile bypass system began operation in primary bypass on March 28th. Extended length submersible bar screens (ESBS) were lowered into the gatewell slots of the turbine units beginning on April 7th. On April 6th, the facility was placed into secondary bypass. Primary bypass mode passed fish directly to the tailrace, while secondary bypass mode passed fish through the facility. Both bypass methods allow for PIT tag detection. Primary bypass reduces fish passage through the system. Secondary bypass allows for smolt monitoring and studies. The sample gates were only activated during secondary bypass. The PIT tag system gates remained off as the bypass lines provide a better route for the fish than the PIT lines. Alternate days of primary and secondary bypass continued until September 29th.

During the bypass season, on May 26, from 2034 to 2234, the system was in primary bypass due to seven units tripping off line, which can affect flows and debris loads. The technician on duty went to the collection channel to insure the system was clean and stable. Four samples were missed, though the gates were left on.

On May 30, from 0937 to 1103, the system was in primary bypass for forebay debris removal and channel orifice adjustments, which affect separator conditions with high and low water flows occurring just before the switch to primary bypass. Nine samples were missed with the sample gates left on. On May 31 and June 2, for 10 and eight minutes, respectively, the system was in and out of secondary bypass for technician training. The sample gates were off. On June 2, the adult full flow flush line's supply valve had to be reset after the training was completed.

On September 30, at 0700, the project concluded the bypass season, with the start of fall primary bypass. We turned all systems and gates off. All fish were evacuated to the river. The facility remained watered to avoid possible freeze breakage. Partial winterization and maintenance began. During fall primary bypass season, PIT tag detection only occurs in the full flow flume. The fisheries staff monitored the channel 24/7.

On November 12, fall primary bypass season concluded with the start of emergency bypass due to severe winter weather and failure of the rectangular screen cleaning device, which will be discussed in the Primary Dewatering Structure section of this report.

On November 11, the wind was easterly, severe wave action washed over the forebay bulkheads and drenched the juvenile collection channel. The splashing was so vigorous, that the west wall of the channel was getting wet. Even in the area where the new concrete bulkheads have Plexiglas covers, the waves were washing under the covers and around their edges, which might have contributed to the failure of the rectangular screen device. Fortunately, the wind switched direction, which allowed the collection channel to dry out before the severe cold temperatures began.

On November 12, from approximately 0945 to 1315, with a week of severe winter weather forecasted, which included day time temperatures below freezing, in order to protect the channel and avoid freeze breakage at the facility, we switched the system from primary to emergency bypass for the remainder of the season. Before the switch, the west floor valve required new fuses and lighting in the valve pit had to be replaced. The next day, the area received about two inches of snow overnight. Considering the weather and rectangular device problems, the project was

fortunately that the channels issues were not worse. After the switch, the cold weather caused a fog effect in the channel, which was freezing.

The fisheries staff winterized part of the channel and the facility. The project began maintenance. There is no PIT tag detection during emergency bypass.

On December 22, at about 0815, by which time all ESBSs had been raised, we closed the orifices for the winter maintenance season. By approximately 1100, the upper emergency bypass channel had been evacuated of fish. By about 1330, the fish were evacuated from the lower emergency bypass channel to the river. We noted approximately 50 to 75 steelhead adults, which were clipped and unclipped. We noted one subyearling Chinook smolt along with three small mouth bass, two catfish, one chisel mouth, one walleye and a few juvenile shad. No other species of interest were noted.

On February 12, a 1.5 hour power outage had no ill effect on the facilities. Power outages for the season are listed here:

1. On May 14, from 1353 to 1405, the facility was without power due to transmission line 1, units 1 and 2 tripping off line. The sample gates were left on and no samples were missed.
2. On July 7, from 0630 to 0645 and July 10, from 1712 to 1751, the facility experienced power outages for a supply switch due to transform 1 maintenance. Since the facility was in primary bypass, this had no ill effect on the system. On July 10, the switch could not be completed.
3. On July 11, from 0851 to 0904, the switch was again attempted and completed. This time the system was in secondary bypass. No samples were missed though the sample gates were turned off during this power outage.
4. On August 5, two power outages totaling 58 minutes occurred due to a transmission line 1 outage. The sample gates were off and one sample was missed in the early morning.
5. On December 16, from 1530 to 1600, a power outage occurred for transmission line 1 testing with no ill effect at the facility.

With each outage, when in use, we had to reset the outfall's bird hazing sprinkler.

Spill Operations

Before the season, spill in excess of powerhouse capacity occurred as required. On March 4, the project installed TSW2 at bay 20 for the adult fallback study. The TSW was attached to a spillway hoist and tested. From March 4 to 20, the TSW was opened as needed by the researcher. Also, involuntary spill occurred most of March.

On March 24, the spill gate at bay 22 was split so it could be used for debris removal. On March 27, the gate was raised to 18 feet for 2.3 hours in an attempt to spill the forebay debris, with no result. On April 1, the gate was returned to its normal configuration.

From April 1 to 10, spill in excess of powerhouse capacity occurred. On April 4, the TSW in bay 20 was opened. On April 7 and 9, TSW1 was installed in bay 19 and attached to a spillway crane. On April 9, TSW1 was opened. On April 10, at 0001, the spring spill program began. For the

spring, 40 percent of flow is scheduled to be spilled. However, due to high flows in excess of powerhouse capacity, 40 to 61 percent of total flow was spilled during the spring program.

From May 29 at 1000 to May 30 at 1600, bay 22 was closed and had its leaf split for a regionally approved debris spill operation. However, the bay was used sparingly during the operation due to safety concerns. On May 29, from 1100 to 1700 and on May 30, from 0900 to 1100 bays 13 to 22 were closed, during these time, except as described here. From May 29 at 1100 to May 30 at 1000, the TSW at bay 19 was closed. On May 29, from 1100 to 1700, the TSW in bay 20 was closed and used sparingly for debris removal. On May 30, from 0900 to 1100, the TSW in bay 20 was closed and used as needed for debris removal.

From June 9 at 0715 to June 11 at 1210, the project removed both TSW's and replaced them with standard spill gates. FPP approved spill patterns were used. The switch to standard spill bays was regionally approved and timed with the projected start of sub yearling Chinook out migration.

On June 16, at 0001, the summer spill program began with 50 percent of total flow being spilled. The project was able to maintain the 50 percent level until September 1 at 0001, when the spill program concluded. For the spring and summer seasons, the project made adjustments to the pattern for navigation safety. All changes made to the spill pattern followed the Fish Passage Plan.

After September 1, a slight amount of spill occurred for spill bay hoist testing after scheduled maintenance had been preformed and the crane buses were replaced.

On September 5 and 6, the TSW was reinstalled and tested in bay 20 for the second phase of the adult fallback study. From November 15 to December 15, the TSW was opened as required by the researcher and spilled approximately 9.0 KCFS.

Turbine Operations

The one percent hard criteria for unit operation ran from April 1 to October 31, inclusive. We have no records of units running outside the constraint for long periods of time. We saw only short test runs of units returning to service along with slight variances which occurred during the season.

On one occasion, from April 12 to 13, units 1 and 2 ran at reduced loads at the lower end of one percent criteria due high VBS differentials. On August 1, the project briefly reduced load at units 7 and 9 so debris could slough off the VBSs. On August 27 and September 24, units 3 and 2, respectively, ran briefly outside the lower end of the criteria so VBSs could be reinstalled after cleaning.

This marked the first season that headgates could be set in the operating position. Headgates were in the operating position (down) at units 2, 3, 5, 6 and 8 to 10 to begin the season. On May 28 at 0600 to May 29 at 0700, on May 30 at 0700 to June 1 at 0700, June 2 at 0700 to June 3 at 0700 and June 5 at 0700 to June 6 at 0700, these units were ran at 50MW (lower one percent) to see if this would have an effect on the descaling issue noted in mid-May. No significant change in descaling has been observed.

Headgates in the down position reduces the turbine boil in the gatewell slots. This appears to have resulted in less mortality observed in the slots, in trash rack debris and on the VBSs when cleaning or when performing other operations.

During the soft one percent criterion in January to March, November and December, the project ran units outside the constraint at the BPA's request. VBS differential readings were affected.

This is the second season the saw tooth pattern (an alternating pattern of units on/off) was used along with the unit priority established for the new outfall location. In order to reduce heat stress, the saw tooth pattern was in affect from about July 15 to September 13. We noted no heat stress mortality this year. Temperature monitoring by PSMFC occurred from June 15 to August 31, inclusively. The smolt monitoring staff publishes the results in a separate report.
From August 5 to September 3, PSMFC reduced the sample to 100 fish due to sample tank temperatures at or near 70 degrees F. We monitored the sample tank temperature into mid-September. Also, on August 5, PSMFC halted GBT monitoring, which was never resumed.

Forebay Debris

The floating debris was mostly tumbleweeds, woody material in the spring and Eurasian milfoil in the summer with manmade objects mixed in. When debris loads were fairly heavy, they affected juvenile and adult facilities. The adult facilities will be discussed in a separate report. The location and amount of the debris varied depending on windstorms along with spill, flow changes and project operations, which moved the debris throughout the forebay. All year, the wind would move the debris from the powerhouse to the Oregon shore and back. When in place, the TSWs helped pass the debris. Trash rack cleaning also removed floating debris when done.

In January, the debris load was light to moderate, with trash rack cleaning reducing it to light. In March, debris accumulations went from light to heavy. Most of the debris was at the powerhouse with a light amount at the spillway. On March 19, the project tried to use the forebay deck crane's boom to move the debris toward the spillway with no success. On March 27, we tried to spill the debris and use the crane's boom again with no result. Trash rack cleaning did remove some of the debris but fresh debris kept coming in.

In April to May, the debris load at the powerhouse was moderate to heavy being affect by trash cleaning, new debris and other variables already mentioned. On May 8, from slots 12A to 14A, the project staff used the trash rack clam shovel to remove five ten-yard truck loads of surface debris. No fish were observed in the debris.

On May 29 and 30, the project used a tug and boom to move the debris in order to spill it. Half the debris was removed each day reducing the load to very light. However, by the first of June, new debris, mostly tumbleweeds, increased the load at the powerhouse to heavy. On June 4, we again used the trash rack clam shovel to remove six ten-yard truck loads of debris from 3C, 6C to 8C and 12C to 14A slots in about four hours. We observed no fish in the debris.

By July, weather and trash rack cleaning had reduced the debris load to moderate. From July to August, the debris dissipated from moderate to minimal.

From August to December, the powerhouse debris varied between minimal to light. On September 1, when the spill was closed, a very light amount of debris there moved to the powerhouse and had no adverse affect. The debris at the spillway was minimal to light all year.

On June 27 and 28, the project tested the powerhouse forebay pier nose air burst system and recorded the ones which required maintenance. This system is very helpful when removing debris.

From mid-May to mid-June, descaling was a concern, especially for sockeye smolts. Forebay debris removal and trash rack cleaning discussed below were partially done in response to descaling concerns. Other operations done to address this concern are listed here:

1. System checks were intensified and all operations were examined, including VBS cleaning. All work was being performed promptly and repeatedly.
2. On May 23, we sent ice blocks down the full flow pipe from the collection channel to the primary bypass gate. We observed no debris. Later, we ran the sea snake camera about 275 feet from the channel into the pipe with nothing observed.
3. On May 24, the project manager observed headgate positioning and VBS cleaning with nothing detrimental to report.
4. On May 29, we again examined the juvenile collection channel, which included the use of the camera and no problem was found.
5. In May and June, as discussed in the Turbine Operations section, we are tested the units with the headgates in the operating position at a reduced load to see if this would reduce descaling, with no result.
6. On June 3, we again examined the full flow pipe with the sea snake camera. This time we went from the collection channel to the primary bypass gate with nothing found.
7. On June 17, we conducted a camera inspection of the separator down wells, separator exits and count tunnels, which revealed no issues.

All efforts revealed no local cause for the descaling.

Trash Racks

During the winter, we monitored trash rack differentials weekly. We saw no problems. This is the fourth winter we monitored the differential regularly. On January 27 to 29, the project checked and cleaned the trash racks at units 1, 2 and 5 to 10, removing 39 ten-yard truck loads of debris, most of which was woody material and tumbleweeds. We observed no lost fish.

For the season, we monitored the differentials daily. Trash rack cleaning results are recorded in (Table 18).

Table 18. Trash Rack Debris.

Dates	Amount	Units or Slots Cleaned	Fish Loss in Debris	Highest Differential
Mar 24 to 27	32.0	Units 1 to 8, 14	One smolt & 15 lampreys. (All at 2B slot)	3.8 feet @ 75 MW (on 3/24)
Apr 1, 2 & 4	52.0	Units 7 & 9 to 14	Three lampreys. (All at 9A slot)	4.0 feet @ 79 MW (on 3/28)
Apr 29	4.3	1A, 3A, 5A & 9A slots	None.	1.3 feet @ 62 MW
May 12 to 15	44.0	All operational units	17 smolts. (14 at 7B slot)	1.6 feet @ 62 MW (on 5/13)
May 21 & 22	15.3	3B, 6B, 8A, 9A, 10 A 11C to 14C slots	One smolt.	2.0 feet @ 60 MW (on 5/21)
May 27	2.0	7A and 7B slots	None. (12 smolts floating in slots.)	1.0 feet @ 60 MW (on 5/24)
Jun 3 & 4	4.0	9A, 9B, 12A, 13A & 13B slots	None. (One smolt in 9A slot.)	1.1 feet @ 62 MW (on 6/1)
Jun 11 & 12	7.5	A and B slots at units 1, 2, 10 & 12 to 14 plus 10B slot.	None.	1.0 feet @ 62 MW (on both days)
Jul 1	12.3	A and B slots at units 3 and 6 to 8 plus 1B slot.	None. (69 smolts in slots - 62 of these at unit 1).	1.9 feet @ 60 MW (on 6/30)
Jul 15	2.3	Unit 3	None.	1.7 feet @ 62 MW (on 7/8)

The project cleaned trash racks at operational units as needed. The amount is recorded as the number of ten-yard truck loads. Fish lost are smolts and juvenile lamprey. We returned ten live lampreys to the river. Early in the season, the debris was woody material and tumbleweeds along with manmade material. From late May to mid-June it was mostly muddy tumbleweeds from bottom. After that, the debris was a mix of old and new materials plus Eurasian milfoil. Units 1 and 7 had their headgates in the raised position.

On October 30, the project cleaned 10 trash racks for the adult steelhead fallback study. Transducers were installed at each rack cleaned. We cleaned two additional racks at unit 1. We removed 2.5 ten-yard truck loads of debris, which consisted of woody material including logs, tumbleweeds and milfoil. No species of interest were seen in the debris.

On November 6, the project completed cleaning the rack at 2B slot. We removed half a ten yard truck load of debris. We observed no species of interest in the debris. For several years, we have not been able to get to the bottom of the rack. On November 4, the diver found a 25 foot long, 18 inch log lying vertically on the rack. The diver installed a chocker around the log and the project used the forebay deck crane to remove it.

On December 10 and 11, as a test, the project cleaned 7A, 7C, 13B and 13C slots, removing about one ten-yard truck load of debris. No species of interest were noted in the debris.

Gatewells

During the winter outage, starting February 10, the project removed oil from unit 4's gatewell slots. Also, on February 26, the project checked the unit's scroll case and other surfaces, removing oil as required.

In March and December, during ESBS maintenance and removal, we removed a slight amount of fish screen oil from a total of five slots.

During the season, we removed a slight amount of hydraulic fluid from a total of five slots. Also, on July 7, we removed a slight amount of transformer fluid from 2A slot. On September 20, we found the gearbox on the ESBS stored in 11C slot was leaking oil, which is a synthetic. We removed the oil and repaired the gearbox. All fluids were contained and removed quickly with absorbent pads and booms. When required, we closed the slots' gatewell orifices and open spare orifices in adjacent slots.

We observed no debris accumulations this year. We did remove some light woody debris during the season especially with trash rack cleaning as debris would inadvertently enter the slots. Finally, we removed man made debris like toilets sets and broom handles. We noted no blue/green algae in the gatewell slots this year. We examined gatewell slots daily, after any orifice blockage or inadvertent closure along with any other events discussed in other sections of this report. We never noted any harm to fish.

Extended-Length Submersible Bar Screens

In late March, our new camera arrived with a broken monitor, which the vendor replaced before inspections began.

This season marked the 18th year with a full complement of extended-length bar screens (ESBS) in place in all 14 units (42 screens, 3 per unit). From May 13 to December 9, the fisheries staff performed underwater camera inspections. We missed seven inspection dates due to trash rack cleaning, warm water temperatures and other project operations or fisheries obligations. The purpose of the inspections is to look for proper range of brush mechanism operation. There are no abnormal inspections to report.

We examined the ESBSs at units 1 to 3 seven times. We inspected units 6 to 8 and 12 to 14's screens six times. At units 5 and 10, we examined them five times. At unit 9, we inspected the ESBSs twice before the unit was removed from service for overhaul. Units 4 and 11 had no inspections due to them being out of service for rewind contracts. On July 22, we noted two lost juvenile lamprey on top of the screen at 9C slot. W e noted no significant smolt mortalities in the gatewell slots during camera inspections, with only 34 lost smolts note.

For the sixth year, in order to possibly improve juvenile lamprey survival for an early spring outmigration peak and yet have minimal impact on juvenile salmonid passage, ESBS installations occurred in early April instead of late March. From April 7 to 10, the project installed ESBSs at units 1, 2, 5 to 8, 10 and 12. On April 11, 14 and 15, we installed screens at units 3, 9, 13, and 14.

We did not deploy the screens at units 4 and 11 due to the units being out of service all season. The screens at units 4 and 11 were used as spares. Finally, for the sixth year, the brush cycle time for all ESBSs remained at 60 minutes. The cycle timing and screen rehabilitation seems to have reduced ESBS failures and repairs. Table 19 reflects issues that occurred with the screens during the year.

Table 19. ESBS Issues.

Dates	Slot/Unit	Issue
Early April	All units.	PLC programming adjusted.
Apr 11to 12	7B	Alarmed, in timer mode for two days.
Apr 11 to 13	Unit 8	Controller's panel view would not light up, screens functional.
Apr 14 to 16	13C	Alarmed, timer mode, controller worked on, alarmed in auto, returned to timer mode, screen functional.
Mid-Apr	10B	Brush bar lost in winter 2012-2103 retrieved from scroll case.
Apr 20	8C	Alarmed and recalibrated.
Apr 22	1A	Alarmed and recalibrated.
Late Apr	Unit 6	Controller's panel view would not light up, one week, screens functional.
Late Apr	7A	Short cycled three times for one week, recalibrated.
May 1 to 15	3C	Run and stop light both on, screen functional, controller issue resolved.
May 2 to 8	7A	Short cycled three times, recalibrated.
May 9	7A	Short cycled and switched to timer mode.
May 11 to 12	8C	Short cycled and recalibrated, once each day.
May 16	2A	Short cycled and recalibrated.
May 16	10C	Short cycled and recalibrated.
May 20	1C	Ground repaired, screen functional.
May 20	1B	Alarmed, motor failed, screen replaced.
May 20	Unit 10	Controller not communicating with screens, resolved.
May 27	8C	Short cycled and recalibrated.
Early Jun	Unit 6	Controller's panel view would not light up, one week, screens functional.
Jun 2, 7 & 9 to Aug 14	8C	Short cycled and recalibrated each day in June. 6/9 to timer mode. 8/14 after examination, returned to automatic mode, screen functional.
Jul 12	1A	Short cycled after unit restart, recalibrated, to timer mode.
Jul 12	1B	Short cycled after unit restart, recalibrated.
Jul 16	5A	Short cycled, recalibrated.
Aug 11	9C	Alarmed and recalibrated.
Aug 12	9C	Unit dewatered found brush bar in slot. On Dec 5, ESBS removed with bar attached. Found bar was lost different season.
Aug 13	1A	Short cycled and recalibrated.

Table 19. ESBS Issues Continued

Dates	Slot/Unit	Issue
Sep 7	8C	Not communicating with control system. Recalibrated multiple times. Screen functional.
Sep 20	1A	Breaker tripped and was reset. Screen functional.
Oct 1	10A	Alarmed and recalibrated.
Oct 18	1B	Breaker tripped and was reset. Screen functional.
Oct 27	6A	Alarmed and recalibrated.
Oct 29	7A	Replaced due to high motor amperage, screen had been in timer mode since May 9.
Oct 31, Nov 1 & 2	1B	Alarmed and recalibrated once each day. Nov 2 switched to timer mode.
Nov 11	1A	Alarmed and recalibrated.
Nov 12	1A & 1B	Programming adjusted due to excessive cycle counts noted. Screens functional.
Nov 16 & 17	8B	Short cycled, recalibrated each day. Nov 17 to 24 in timer mode.
Nov 17	8C	Short cycled, recalibrated and switched to timer mode to Nov 24. Next excessive cycle counts, recalibrated again.
Nov 18	6A	Short cycled, recalibrated.
Nov 23	1B	Excessive cycle count, program adjusted on Nov 24. Screen functional.
Nov 23	8C	Excessive cycle count and short cycling at panel view. Operator found computer system offline.
Nov 23	All units.	Computer system offline rebooted, 8C ESBS reset.
Nov 24	8B & 8C	Screens examined, out of timer mode, returned to automatic.
Nov 28	1B	Screen functional.
Dec 3 & 4	2C	Short cycled, recalibrated each day. Screen functional.
Dec 5	Units 5 & 9	Screens removed for season. Units out of service past season.
Dec 6	1B	No motor amperage when running. Breaker reset, screen recalibrated. New plug installed on power supply.
Dec 6 to 11	14B	Repeatedly found short cycling and recalibrated. Functional.
Dec 7 & 11	All units.	Computer system offline and rebooted each day, examined.
Dec 12 & 13	14B	Short cycled twice each day. Dec 13 to timer mode.
Dec 13	2B	Cycle twice with one push of the start button. Examined. Might explain screens in timer mode having excessive cycle counts.
End of Season	1A, 1B, 2B, 6A, 13C & 14B	Remained in timer mode until the ESBS was removed.

For the year, the problems were due to proximity switch failures or programming and electrical issues. Gearbox or motor issues, brush drive or coupler issues were less frequent with units having to go out of service only twice to replace an ESBS. We noted no fish loses during ESBS issues.

From December 16 to 19, when the project removed the screens from operational units, we noted two issues. The Screen in 3A slot appeared to have a brush bar that was not completely cleaning an upper corner on the screen. The brush bar on the screen in 8C slot appeared to be cycling one foot short of the top. We noted no lost species of interest on the screens. The project began maintenance as soon as each screen was raised and the programming was checked.

Vertical Barrier Screens

VBS rehabilitation continued over the winter. During the spring, the project relabeled the slots for easier identification. On May 27, the project installed tabs on the VBS guides at 2B and 2C slots to help hold the screens in place when reinstalling.
On April 13, we cleaned the first VBS with the last one cleaned on December 10. Project operations including trash rack cleaning or debris removal, river flows and weather patterns affect the debris dispersal across the powerhouse. However, most VBS cleaning continues to occur at the south half of the powerhouse.

As mentioned in the Turbine Operations section, From April 12 to 13, units 1 and 2 ran at a reduced load due to high differential readings. On August 1, units 7 and 9 were briefly shutdown to "burp" the unit, which reduced the differentials. All VBS were cleaned the next day.

Criteria for cleaning of the screens is 1.5 feet or more of differential, at which time the unit loading is reduced to the lower end of the one percent peak efficiency curve (approximately 43 megawatts) until the screen can be pulled and washed with a fire hose. Also, reducing loads help to slough debris off.

For the season, daily VBS head differential monitoring corresponded with ESBS installations, which is discussed above. During the year, impinged debris on the VBSs continued to be a problem with all screens having been cleaned at least once, except the screens at units 4 and 11, which were out of service and at 6C slot. We cleaned the screens at 1A and 1B slots 24 times. The project cleaned VBSs on 238 occasions for debris removal. Last year, we cleaned the screens on 298 occasions. On 23 occasions, we measured the differential at 1.5 feet or above. Last year, on 114 occasions, we measured screens out of criteria. Three of these occurred in November and December, when units were at 70 to 80 MW. Last year, in the same time frame, we had 25 readings out of criteria. We suspect these reductions are due partly to the new headgate position. In August, we began to clean the back of the screens, as needed; to help removed the fresh water sponge.

Cleanings for debris by month and mortalities noted are recorded in (Table 20). Cleanings for replacement and inspection are discussed separately. Most of the fish lost were old and had accumulated over time. In the fall, we noted mostly juvenile shad mortalities. We suspect the new headgate positioning ahs also reduced mortaility. A majority of the debris was fine material along with Eurasian milfoil and some manmade objects.

Table 20. VBS Cleaning by Month (Debris Removal Only).

Month	Days	VBSs cleaned	Measured 1.5 feet or more	Lost Lamprey	Live Lamprey	Smolts lost
Mar	None	None	None	None	None	None
Apr	5	12	9	6	0	0
May	3	7	0	5	2	63
Jun	15	54	4	25	0	113
Jul	16	49	1	4	1	86
Aug	7	30	4	0	0	47
Sep	7	25	2	0	0	1
Oct	7	26	0	0	0	0
Nov	6	23	2	0	0	0
Dec	4	12	1	0	0	0
Total 2014	70	238	23	40	3	310
Total 2013*	79	298	114	133	3	848

* In 2013, fish numbers are for all types of cleanings. In 2014, other cleanings had 30 additional smolt mortalities.

In April, one screen was not examined for mortality. In May, 62 of the smolt mortalities came from three screens. Thirty five were from 7A slot, where the headgate is in the raised position. This compares to 6A slot, which had seven smolt mortalities with the headgate in the down (operating) position. This comparison was done for the project manager during the descaling issue. In June, three screens were not observed for mortality. On June 25, 65 of 85 mortalities were from unit 1, where the headgates are in the raised position. In July, 39 of the smolt mortalities were from unit 7, where the headgates are in the raised position. On August 2, twelve and 29 smolt mortalities came from units 7 and 9, respectively. Unit 9 headgates are in the lowered position. In September, one screen was not examined for mortality.

Inspections also include cleaning the screen but not because of debris build up. From April 29 to May 7, the project inspected the screens at 4A slot and units 9 to 14. We noted 13 smolt mortalities. From October 2 to November 18, we inspected the screens at unit 12, 13A, 13B and 14B slots. We observed no mortalities. Three screens were not examined for mortality. The inspections revealed no problems.

From May 20 to August 4, the project exchanged 8 damaged VBS's from 2B, 2C, 3C, 6C, 7A, 7B, 7C and 8B slots for rehabilitated screens using unit 11 as a stage area for the damaged and rehabilitated screens to be exchanged. By the end of the season, all the damaged screens stored at unit 11 had been removed and replaced with rehabilitated screens. Only 11B slot was without a new screen, which will be installed this winter. Before each old screen was removed for rehabilitation, it was also cleaned. On August 4, we observed 17 smolt mortalities at 7B slot, where the headgate is in the raised position. No other mortalities were noted. Four screens were not examined for mortality.

For all cleanings, unless adult and juvenile shad or debris abundance presents a hazard to the fish, smolts are dipped from the gatewell slots prior to pulling the VBS to prevent fish from exiting

back through the turbine unit. In order to reduce debris in the collection channel, we cleaned screens with the orifices closed at the slot and used adjacent orifices to maintain channel elevation. Also, during VBS cleaning, we operated the collection channel screen cleaners and the rectangular screen's air bubbler system more often to keep the channel's dewatering screens clean.

During cleaning and examinations, we inspected the VBS mesh and retaining clips, which we replaced as required along with documenting problems. No significant issues were found and VBS replacement occurred before major issues could arise.

The prototype bar screen VBSs remain in slots 4B and 4C. Due to the size of the screens, they are more difficult for the maintenance crew to lift than standard VBSs. We did not clean or examine these screens this year due to unit 4 being out of service for the full season.

Orifices and Collection Channel

Water was noted on the orifices' air line in March, November and December. In March, we removed the wood platforms that were under the three traps' orifices and repaired the adult jump netting on the handrail. On March 16, we washed the orifice covers. From March 28 to December 22, the project had 42 orifices open. This never varied during the season. We only closed all orifices on November 12, for the switches into emergency bypass. Brief orifice swaps between units occurred for trash rack cleaning, VBS cleaning, VBS exchanges or forebay debris removal.

Eight orifice blockages occurred this year. Six were due to debris. On the two other occasions, we removed ESBS ropes from the orifice inflows while doing gatewell observations. We cleared all of these obstructions immediately. In all cases, we noted no harm to fish and we reviewed orifice cycling protocols when required. Orifice adjustments and cycling at times resulted in brief high/low water alarms which quickly reset. More orifice issues are listed in (Table 21).

Table 21. Orifice Issues.

Date	Issue	Result	Comment
Mar 28 to May 16	Unit 4 orifice closed for residual oil from leak in winter.	Opened spare orifices at unit 3.	Unit 4 was out of service.
Mar 28 to Dec 22	4A south and 5A south orifices in use.	Now had spare orifices in these slots.	Changing out trap orifices resulted in this improvement.
Mar 28 to 31 & Apr 9 to Dec 22	6B south needed a light & the orifice cover was wrong style.	6B north orifice in use.	When removing the trap orifice, no light was installed and the wrong cover was used.
Early Apr	Reduced orifice flow.	Side valves running lower.	Trash rack cleaning improved orifice flow.
Apr 13 to Dec 22	At 1A slot, south orifice not in use.	Closed north & opened south.	Splashing on side brush limit switch was resolved years ago.
Apr 15 to 16	10B closed.	Spare at 9C open.	Closed for dewatering, this did not occur.

Table 21. Orifice Issues Continued.

Date	Issue	Result	Comment
Apr 21 to 22	Hydraulic fluid in slots.	Unit 9's orifices closed.	Spares open at unit 10 during clean up.
Early May	Air leak at 14A north.	Operator leaking.	Repaired.
May 13	Light at phone booth out.	Difficulty seeing phone at night.	Bulb replaced.
May 19	4A south light switch broken.	Orifice without lighting.	Switch replaced.
May 26	Units trip off line.	Possible debris blockages.	Staff checked channel with no issues found.
May 29 & 30	Forebay debris removal. Water alarms with orifice swaps.	Orifices at units 8 to 14 closed. Went to primary bypass on 30th.	Spares at units 1 to 7 for 4 and 2 hours, respectively.
Jul 7	Transformer fluid.	2A slot closed.	1C north open during clean up.
Jul 29	Broken handle.	6C south.	Replaced operator handle.
Aug 10	14A orifice closed.	Minimum of 7.5 hours. Side valves lower.	No fish lost, procedures reviewed.
Aug 31 to Sep 1	Spill closure and possible debris.	Channel monitored.	Before and after, no issues found.
Sep 20 to 27	ESBS gearbox oil in slot.	11C closed.	Spare at 11B open during clean up.
Oct 6	Orifice closed at 14B.	Closed 4 hours. Side valves low.	VBS cleaning procedures reviewed. No fish lost.
Oct 11	Orifice closed at 4C.	Closed 6 hours. Side valves lower.	Procedures reviewed, unit out of service.
Nov 13	Water in air lines.	Seven intake ports damaged.	Replaced ports on operators.
Nov 18	Cold weather.	4C south orifice would not cycle.	Staff thawed it out.
Nov 14 to 20	Water in air lines frozen.	Frozen bleeder lines and ports damaged.	Staff had to thaw lines repeatedly. Several ports replaced.
Nov 19 to Dec 2	Splashing freezing on walkway and possible clog.	6A south orifice closed. Walkway icy. No fish lost.	6A north orifice opened. Walkway thawed out.
Nov 24 to 29	Hydraulic fluid in slot.	5B closed.	Spare at 5A slot during clean up.
Dec 2	Splashing, possible clog.	6A north closed.	6A south open. Possible debris floating in slot. No fish lost.

We performed scheduled maintenance on the orifice operators, oil reservoirs and valves. Also, we replaced orifice attraction lights promptly as required. Severe winter weather in November made work in the channel difficult.

During the year, the technicians constantly monitored the collection channel when primary or emergency bypass. During secondary bypass, we monitored the channel on day shift with spot checks at night when required. Also, we monitored the channel during VBS and trash rack cleaning, VBS exchanges, forebay debris removal, the spill closure, units tripping off line, oil and fluid leaks, and screen cleaner device issues along with other problems described in this report.

Adult fish continue to jump at the orifice jets. This year, we found two adult salmonids, one unclipped sockeye and one unclipped steelhead, on the channel grating. Each time we added to or repaired the jump netting on the handrail. We did find one lost steelhead smolt on the side screen cleaning device's access platform.

Primary Dewatering Structure

During the winter, the project rehabilitated and replaced a support for the bulkhead hoist railing and a section of air line respectively. We also replaced a section of overflow screen by the transition floor screen. In mid-March, we tested the air burst system; all screen cleaners, valves and the control panel.

The channel systems were operational and in automatic mode from March 28 to November 12. During the season, the project performed scheduled maintenance on all systems. Channel systems were monitored when units tripped off line, during the spill closure, debris operations and 24/7 during primary bypass along with other issue mentioned in this report. With emergency bypass beginning on November 12, winter maintenance of all systems began. In December, the project began replacing all electrical junction boxes and some sections of conduit.

Issues with the rectangular screen cleaning device are recorded in (Table 22).

Table 22. Rectangular Screen Cleaning Mechanism Issues.

Date	Problem	Resolution
Mar 24	Stalled on downstream limit.	Crossing wiring from winter maintenance fixed.
Mar 28	Alarmed, failed and not traveling downstream, limit switch.	Ran manually every two hours.
Apr 1	Limit switch.	Electrician cleaned and adjusted switch.
Apr 16	Stick in west scissors arm.	Removed.
Apr 25	Stalled while traveling downstream.	Parked mechanism and ran it twice. No problems. Assume jammed on debris.

Table 22. Rectangular Screen Cleaning Mechanism Issues Continued.

Date	Problem	Resolution
Nov 11	At 1045, device alarm and stalled half way downstream.	Only restarted after opening and closing its breaker.
Nov 11	At 1330, the mechanism stalled again.	Restarted after opening and closing its breaker.
Nov 11	At 1400, device removed from service.	Use air burst system to keep screen clean.
Nov 11	At 2030, the mechanism stalled again when attempted to run.	Device remained out of service.
Nov 12	At 0830, last attempt to run device, stalled again.	System switched to emergency bypass.
Dec 8	Found gear oil in the motor, which raises/lowers brush, seal had failed.	Check for replacement parts.
Dec 15	New gearbox and motor installed.	Old parts rehabilitated.

We set the cycle time interval of the rectangular screen cleaning device at 120 minutes. On October 13, with debris loads low, the mechanism was set to run every 180 minutes for the remainder of the season to reduce wear on the device.

Issues with the side screen cleaning device are recorded in (Table 23).

Table 23. Side Screen Cleaning Mechanism Issues.

Date	Problem	Resolution
Winter	Device repeatedly stalled last fall.	Repaired.
Jul	Electric cord tray line warping.	Monitor. Remove in winter.
Jul 29 to Aug 7	Lost brush checker in channel. Found with camera in area where no issues could occur.	Checker was narrow and flexible. Arrived at separator. No harm to fish noted.
Aug 7	Indicator light out.	Replaced bulb.
Oct 13	Mechanism stalled 30 seconds traveling upstream.	No alarm. No issues. Assume brief debris jam.

We had the cycle time interval of the mechanism set at 180 minutes. On October 13, we increased the cycle time to 360 minutes to reduce wear and possible debris jams, though debris loads were greatly reduced to season's end.

During winter maintenance, the mechanics repaired the transition screen cleaning device. For the sixth year, we were going to continue to leave the device off at night and only run it manually on day shift. We set the cycle time for the transition screen device at 180 minutes.

After returning to the system service, the transition screen cleaning device was left off over the weekend as it has a history of failure. When it returned to service on March 31, the mechanism

functioned well once in the morning and was turned off. On April 1, at 1030, the device alarmed and failed the second time it was tried this season just as it was completing a cycle and was parking. As with the past few seasons, the mechanism remained out of service until the winter maintenance season when we will repair it in January, 2015.

The channel's water elevation meter had no problems this year. High/low water alarms always occur with the start up and shutdown of the channel when flow is over the dewatering structure. Brief alarms also occurred at times when managing the orifices; other issues mentioned in this report and sudden unit load changes. For example, on June 27, the powerhouse was asked to increase load from 500 to 700 megawatts. This sudden change reduced the flow from the channel's orifices resulting in a low water alarm. After 20 minutes, the side dewater valves were able to restore the channel elevation and the flow at the separator.

On July 30, we switched the side dewatering valves to manual operation at the PLC, and then we opened or closed orifices to check the high and low water alarms. The alarms came in at the control room and on the panel view in the channel. However, the alarm light in the channel did not come on. The light bulb was functional so we asked that the electrical staff check and repair the wiring, which they did.

Issues that caused screen cleaning mechanisms' alarms were described above. Monitoring the channel throughout the year when possible served as a back up to the alarm system. In fact, the technicians had a later furlough date for the sixth season in a row so they were available to monitor the channel into December.

During the winter maintenance season, the channel's control system was rewired. On October 7, 8 and 10, the control system's panel view back light worked intermittently. We could not read system values but the system continued to function flawlessly. An electrical technician resolved the issue by working on the bulb's connection and replacing the bulb. On October 22, a new bulb was installed. The control system operated well this season with no other issues.

During winter maintenance, no problem was found at the south side dewatering valve. For the season, both side dewatering valves were operational in automatic mode and operated well. Issues already recorded in this report, orifice usage and project operations briefly affected the channel elevation but the valves always reestablished the channel elevation, which at times, did result in a brief water alarm.

On July 7, for about 30 seconds, the side dewatering valves were in manual mode at the PLC while the operators were tracing an electrical problem. However, the problem was found and no power outage occurred in the channel.

On March 26, the west floor dewatering valve did not respond during testing. The electrical staff resolved the issue. When the channel systems were operation, the main floor de-watering valves were open and set at approximately 65 percent. On July 30, we opened the west flooring dewatering valve a small percentage (the blade was raised one inch) in order to have the side dewatering valves' percentage open decrease slightly (both valves closed three to four inches). Due to changes in project operations, the side valves had been operating at a higher percentage opening than usual. Finally, on November 12, new fuses had to be installed at the floor valves' controls before we could switch to emergency bypass. We also had to install new bulbs at the access platform to the floor valves. The floor valves were not affected by any issues discussed above.

For the season, the rectangular screen air burst system worked well on station service air. In late June, the air tank was recertified. On September 14, for approximately three hours, a technician had left two air zones on, which caused the backup compressor to be running. We reviewed procedures. The system's cycle time remained at one zone every ten minutes. The air burst system continues to be very useful for operations involving debris discussed in this report.

PSMFC still reports interference at PIT tag detector number 4 in the full flow pipe. We will continue to work with them on this issue. On May 4, we noted one of the access doors to the PIT tag detectors in the full flow flume was coming off. On May 5, the mechanics repaired the door.

Cooling Water Strainers

Table 24 reflects the results of this year's main unit cooling water strainer examinations.

Table 24. Cooling Water Strainer Results

Date	Lamprey Lost	Lamprey Alive	Smolts Lost	Smolts Alive
Jan 7	0	0	0	0
Feb 4	24	0	0	0
Mar 4	115	1	0	0
Apr 1	93	2	0	0
May 7	17	0	28	0
Jun 3	68	6	1	0
Jul 1	23	0	40	1
Aug 5	3	0	23	0
Sep 2	0	0	4	0
Sep 30 (for Oct)	0	0	0	0
Nov 4	0	0	0	0
Dec 2	0	0	0	0

In May, the smolts lost were a mix of sockeye, yearling Chinook and steelhead mainly from units 1 and 14. In July and August, the lost smolts were sub yearling Chinook mostly from unit 1 along with unit 14. During the year, we also observed juvenile shad, perch and crayfish.

Avian Information

During the winter maintenance season, a contractor installed a new pump and water line for the hazing water cannon. The fisheries staff winterized the sprinkler. Due to concerns over the noise and for safety, this season, we discontinued the use of propane cannons. Instead, we deployed more gull distress calls, which are battery operated using solar panels at some locations and hawk decoys on the bypass pipe's walkway and around the spill basin. The distress calls required constant monitoring. We also have bird wires on the outfall pipe and across the powerhouse. This year, we again had two shifts of APHIS personnel hazing along with hazing from a boat three days a week. Hazing of pelicans was not done. Lethal removal of gulls and cormorants was allowed and occurred during hazing from the boat. Heavy hazing of grebes again proved very affective. Table 25 reflects hazing techniques used at McNary and issues encountered. In February, 2015, a contractor will install a slow start system on the sprinkler's pump to help resolve some of the issues seen in the table.

Table 25. Hazing at McNary.

Hazing Type	Dates
1. Sprinkler cannon at out fall on automatic. Photo cell turns off and on. Monitor system constantly.	Mar 27 to Oct 30
A. Oil leak at water pump, sprinkler out of service, consultation with contactor.	Apr 1 to 7
B. Oil leak repaired, unit out of service few hours.	Apr 9
C. Pump's lower seal failed, brief outage, monitor pump.	Apr 21
D. Contractor replaced pump's rotating assembly and seals. Nine hour outage.	Apr 29
E. Concern rose for pump's check valve. Pump to manual. Run 24/7. Later, contract said check not an issue.	Apr 30 to May 9
F. Pump tripped off line. Intake screen clogged.	May 6 to 7
G. Pump returned to automatic to help keep intake clean.	May 9
H. Pump out of service for maintenance a few hours.	May 19
I. Pump out of service briefly for examination.	Jun 2 & 5
J. Pump tripped off line. No reason found. Concern for pump.	Jun 18 to 19
K. Added oil to pump. Continue to monitor oil and intake.	Jun 25
L. Pump tripped off line for unknown amount of time.	Jul 6
M. Intake camera inspection found it partly clogged with algae.	Jul 7
N. We cleaned the intake.	Jul 9
O. Pump tripped off & reset. No time recorded. Intake cleaned.	Aug 10
P. Pump tripped off briefly. Intake cleaned.	Aug 28
2. APHIS hazing seven days a week.	Mar 30 to Aug 2
A. APHIS hazing 16 hours a day.	Apr 20 to Jul 10
B. APHIS hazing from a boat: Monday, Wednesday & Friday for one shift.	Apr 23 to Jul 10
3. Multiple gull distress calls deployed.	Late Mar to Oct 30
4. Bird deterrent tape on access walkway's handrail.	May 19 to Oct 30
A. Gulls noted roosting on outfall walkway handrails.	May 10
5. Bird wires on bypass pipe and across powerhouse remain in place.	Year round.
A. Gulls noted roosting on outfall walkway handrails. Bird wires checked.	May 10

In the tailwater area, birds did seem to adapt to the hazing by concentrating in the center of the spill basin. On one occasion, the boat was used to haze grebes in the forebay.

With casual observations, it appears gulls, cormorants, grebes and bald eagles over winter in the general area of the project.

We did daily bird counts from April 1 to September 30. We only missed a few count days or zones on a given day. This year, counting protocols and data recording changed again in order to

simplify the record keeping process. We keep the four zones: forebay, spill, powerhouse and bypass outfall. For this report, to maintain continuity with previous years, we have the tailwater area in which the spill and powerhouse are combined. For spill timing, see the Spill Operations section of this report. We counted all areas once a day, usually in the morning. Bird numbers fluctuated with smolt, juvenile lamprey and shad outmigration peaks.

For the tailwater area, the technicians or biologists performed the counts from the separator building using binoculars. We reported all daily counts in the weekly reports. Here we will report peak count's for each species from the tailwater area with the bypass outfall being reported separately. When spilling, we observed most of the birds feeding or roosting in the spill basin. All species moved freely between the powerhouse and spill basin, however pelicans preferred calmer water, while gulls and terns preferred the spill. We noted pelicans along the navigation lock wing wall or long the Oregon shore possibly feeding on adult shad or carp. Gulls and terns are difficult to distinguish apart. Most of the cormorants were noted roosting on the navigation lock wing wall. Also, this year, for the first time, we noted terns roosting on the wall. We occasionally saw grebes, ospreys, blue herons, night herons, kingfishers, loons or mergansers.

With the conclusion of spill, most birds moved to the powerhouse flow to feed, especially gulls. However, birds continued to roost around the spill basin. Terns and pelicans appeared to leave the area. Starting in mid-August and into September, the birds were probably mostly feeding on juvenile shad. Also, later in the year we noted more juvenile gulls and cormorants in our observations. Tailwater peak counts of the predominating species are recorded in (Table 26).

Table 26. Tailwater Predatory Bird Counts.

Species	First Observation	Spill Peak		Non Spill Peak		Last Observation
		Date	Number	Date	Number	
Gull	Apr 6	May 5	259	Sep 24	202	Sep 30
Pelican	Apr 20	Jul 10	50	Sep 2	5	Sep 3
Cormorant	Apr 3	Aug 11	56	Sep 24	69	Sep 30
Tern	May 25	Jun 30	24	NA	NA	Aug 31

After the conclusion of counting, during casual observations, we saw gull and cormorant counts fairly high at times which might indicate that they continued to feed on juvenile shad. The birds feed in the TSW flow for the adult bypass study as mentioned in the Spill Operations section. Also, their own migration patterns may have affected counts. Into December, we observed gulls roosting or feeding and cormorants mostly roosting along with occasional mergansers or grebes. Sporadically, we noted rafts of gulls around the project along with an occasional bald eagle, blue heron, night heron or kingfisher.

When primary bypass began, birds were not initially observed at the outfall. However, this year, we did note that cormorants and pelicans appeared to feed at the outfall more frequently. Gull and terns numbers appear to be down. Bypass outfall counts are recorded in (Table 27).

Table 27. Bypass Outfall Predatory Bird Counts.

Species	First Observation	Spill Peak		Non Spill Peak		Last Observation
		Date	Number	Date	Number	
Gull	Apr 20	May 10	46	Sep 14 & 16	12	Sep 30
Pelican	Apr 23	Aug 6 & 8	14	NA	NA	Aug 30
Cormorant	Apr 27	Aug 9, 15 & 16	10	Sep 30	21	Sep 30
Tern	Jun 23	Aug 6	5	Sep 25	1	Only day for non spill.

After the counting season, we observed gulls and cormorants at the bypass outfall at times. After November 12, during emergency bypass, we occasionally observed gulls and cormorants at that outfall. However, this outfall is at the northern edge of the powerhouse flow and near the TSW, which may have also attracted the birds.

We performed bird counts of the forebay area with the unaided eye once daily while doing gatewell observations usually in the morning. Again, we reported daily counts in the weekly report table dedicated to the bird observations. For this report, we will again report peaks. The results of these observations are in (Table 28). Due to the low numbers of other species, only gulls and grebes are recorded in the table. Also, grebes have spans of time when they are absent from the project. Most of the gulls we noted were juveniles feeding on the floating forebay debris. At times, we noticed groups of gulls or grebes that would be outside the normal counting zone. Also, occasionally, rafts of gulls would be noted on the forebay. Intermittently, we saw terns, pelicans, blue herons, night herons, kingfishers, mergansers or a loon. We also observed osprey as there are three nest sites on project. The roosting rocks by the Washington boat dock cannot be seen from the powerhouse deck. During other inspections, we noted large numbers for pelicans, gulls or cormorants sometimes there. On June 30, we found 30 decaying subyearling Chinook on the deck above spill bay 3. We can only assume a bird lost its lunch.

Table 28. Forebay Predatory Bird Counts.

Species	First Observation	Spill Peak		Non Spill Peak		Last Observation
		Date	Number	Date	Number	
Grebe	Apr 8	May 30	46	Sep 16	1	Only day for non spill.
Gull	Apr 11	Jul 1	37	Five days in Sep.	2	Sep 30

After the counting season, we observed an occasional gull, blue heron, night heron, bald eagle, cormorant, pelican, kingfisher or group of grebes in the forebay with groups of gulls sometimes roosting around or rafting on the forebay.

Grebe observations and counts are difficult due to their behavior, the various locations they appeared and system operations. There is no accurate way to enumerate grebes. Grebes passed to the gatewell slots and juvenile collection channel from April 12 to November 18, reflecting somewhat the patterns seen in the forebay. We estimated for the gatewell slots this year a total of 40 grebes, which was high compared to last year's estimate of 12 grebes. Twenty five of the grebes entered the slots from May 23 to June 5. During this time APHIS increased hazing at the forebay and on May 28, hazed the grebes with from a boat. This year, we removed 22 grebes from the slots. The remaining 18 grebes passed to the collection channel. These birds all passed out of the system. Three of them we released from the separator with the other grebes passing during primary bypass.

Recommendations

1. Remove orifice traps.
2. Install new plugs in experimental orifices on channel.
3. Reinstall unit 4 forebay debris shield.
4. Install drier to remove moisture form channel air lines.
5. Install a wye drain in the 48 inch supply line.
6. Refinish channel floor and walls.
7. Reinstall second hoist on channel trolley.
8. Automat channel floor valves.
9. Continue to rehabilitate channel brushes.
10. Rehabilitate, paint and deal with moisture in channel drain area.
11. Address erosion in old section of full flow flume above separator.
12. Repaint facility.
13. Install new facility heating and cooling system.
14. Mothball or remove transport systems.
15. Install larger PIT tag shields around detectors to reduce debris blockages in flumes.
16. Install emergency truck release site at junction box.
17. Install a new separator.
18. Motorize the separator supply valves.
19. Purchase a new boat and boom for forebay debris removal.
20. Strip and repaint sorting trough in wet lab.
21. Rework the crowders to run smoother.
22. Replace netting on the sample holding tanks.
23. Replace plastic molding on the guillotine gates on the pre-anesthetic chambers.

List of Acrynms

BPA – Bonneville Power Administration
CRITFC – Columbia River Inter-Tribal Fish Commission
ESBS – extended-length submersible bar screen
FGE – fish guidance efficiency
FPC – Fish Passage Center
GBT – gas bubble trauma
MOP – minimum operating pool
NBS - National Biological Survey
NMFS – National Marine Fisheries Service (now NOAA Fisheries)
NOAA – National Oceanographic and Atmospheric Administration
OCFRU - Oregon Cooperative Fishery Research Unit
ODFW – Oregon Department of Fish and Wildlife
PIT – Passive Integrated Transponder (tag)
PITAGIS – Pit Tag Information System
PLC - programmable logic controllers
PNNL- Pacific Northwest National Laboratories
PSMFC – Pacific States Marine Fisheries Commission
RM – river mile
STS – submersible traveling screens
USFWS – U.S. Fish and Wildlife Service
VBS – vertical barrier screen
VI Tag- visible implant tag
WDFW – Washington Department of Fish and Wildlife