BONNEVILLE DAM

FISHWAY STATUS ANNUAL REPORT

2013

By

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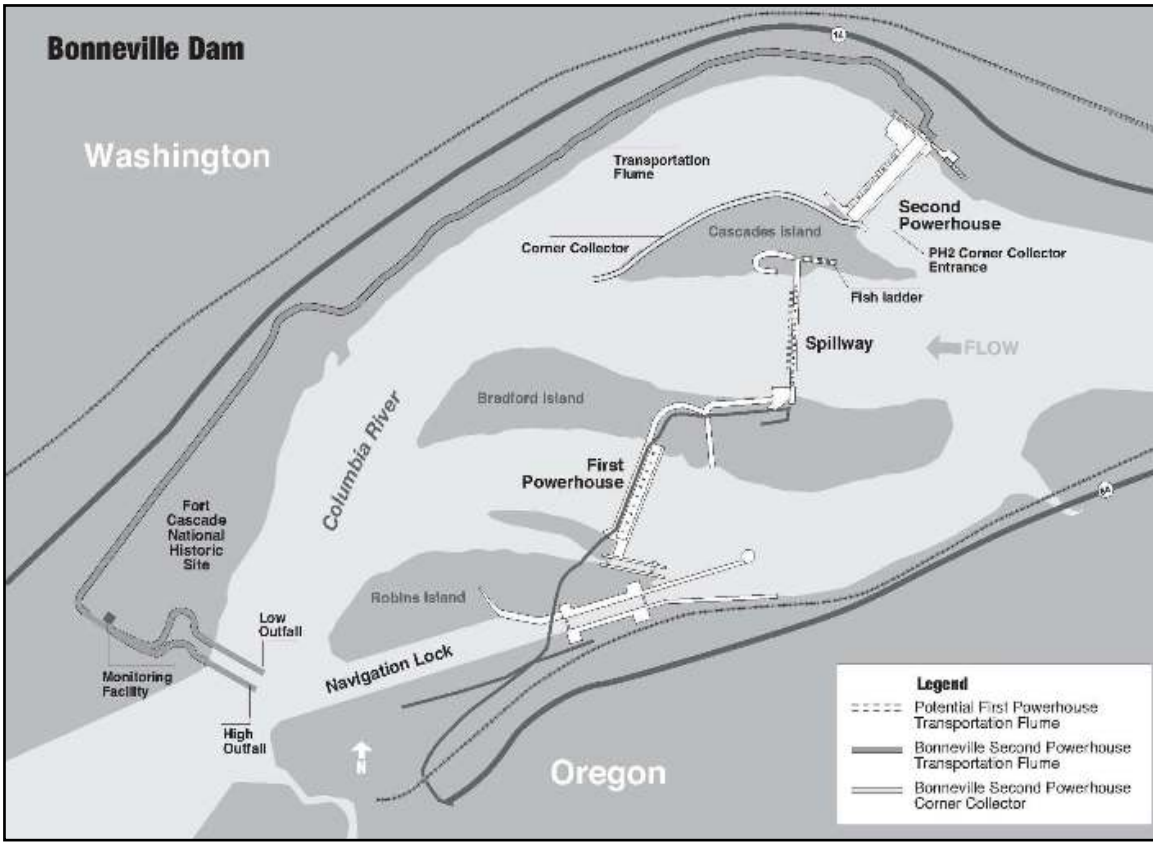
INTRODUCTION

The 2013 Fishway Status Annual Report for Bonneville Lock and Dam summarizes activities impacting fish at Bonneville Project from 1 December 2012 through 30 November 2013.

Primarily a synopsis of weekly reports, this document summarizes all activities affecting fish passage including maintenance outages, dewaterings, and recent modifications to fishway components. This document is required by the Corps of Engineers' Northwestern Division, as described in the Fish Passage Plan (FPP). The FPP contains the following reporting requirements: "The (weekly) reports shall include: any out of criteria situations observed and subsequent corrective actions taken; equipment malfunctions, breakdowns or damage, along with a summary of resulting repair activities; adult fish control calibrations; STS and VBS inspection; any unusual activities which occurred at the project which may affect fish passage." Project biologists and operators perform inspections of the fish passage facilities three times per day, seven days per week during fish passage season, and three times per day at least three times per week during winter maintenance season as outlined in the FPP.

The Project includes two powerhouses, a spillway and two navigation locks. The older of the two navigation locks has not operated since early 1993. There are four adult fish ladders for upstream migration, located at each powerhouse and the north and south ends of the spillway. There are three Juvenile Bypass Systems (JBS) for downstream migration: an Ice and Trash Sluiceway (ITS) at Powerhouse 1 (PH1), a downstream migration transportation channel (DSM) at Powerhouse Two (PH2), and the corner collector at PH2 (B2CC).

Figure 1. Bonneville Lock and Dam.



FISHWAY OPERATION AND ACTIVITIES

Fish Passage Plan Violations

Project Fisheries and the control room operators conduct inspections each day during fish passage season, and at least 3 days per week during winter maintenance. Project Biologists conducted 323 daily fishway inspections, and the National Oceanic and Atmospheric Administration (NOAA) Fisheries conducted 9 fishway inspections. Listed below are the FPP violations and the percentage of days the item was **in** criteria based on Project Biologist's inspections only. Items in criteria 100% of the time are not listed.

Table 1. Fish Passage Plan violations and percent in criteria.

Powerhouse 1	*Occurrences*	*In Criteria*
PH1 S differential	90	72.1%
PH1 N differential	20	93.8%
Gate Position: PH1 gate 1	1	99.7%
Gate Position: PH1 gate 2	36	88.9%
Gate position: PH1 gate 64	77	76.2%
Gate position: PH1 gate 65	7	97.8%
PH1 velocity meter/PCC velocity	1	99.7%
PH1 ITS end gate	25	92.3%
PH1 ITS chain gates	25	92.3%
BI Fish Exit	1	99.7%
Head at BI picket leads	1	99.7%
Depth over weir at BI	47	85.4%
Depth over weir at A-branch	156	51.7%
A-branch diffusers FG3-3, FG3-4, FG3-5, FG3-6	323	0.0%
PH1CC diffusers	323	0.0%
Depth over weir at B-branch	49	84.8%
B-branch diffusers	47	85.4%
B branch entrance gates	45	86.1%
B branch differential	50	84.5%
Cascades Island diffusers	13	96.0%
Cascades Island differential	8	97.5%
Depth over weir at UMT	6	98.1%
Spillway Bays	1	99.7%
Powerhouse 2		
Head or depth: PH2 NUE	61	81.1%
Head or depth: PH2 NDE	36	88.9%
Head or depth: PH2 SUE	24	92.6%
Head or depth: PH2 SDE	26	92.0%
PH2 velocity meter/PCC velocity	88	72.8%
PH2 diffuser positions	107	66.9%
Depth over PH2 weir 38	2	99.4%
WA Shore Picket Leads	1	99.7%
WA Shore Fish Exit	1	99.7%
Depth over PH2 weir 37	3	99.1%
PH2 JBS orifices	2	99.4%
DSM Channel elevation	7	97.8%
Unit priority	4	98.8%
Avian Arrays	119	63.2%
Calibration once a week	5	98.5%
Missed inspection by Project Biol.	1	99.7%

Out of criteria details

The following paragraphs are explanations for items (Table 1) that were out of criteria more than 90% of the reporting year or were unusual circumstances.

PH1 Collection Channel (PH1CC) diffusers were out of criteria the entire fish passage season. FG 2-19 failed to open at water-up in 2006. The collection channel, however, remained within FPP criteria. The diffuser is currently undergoing repairs as part of the 2013/2014 winter maintenance.

A-branch diffusers FG 3-3 and FG 3-5 both became mechanically bound in 2012, resulting in motor failure. In April of 2013, investigation of diffuser FG3-6 indicated the diffuser gate was jammed and not opening or closing completely. These failures contributed to out of criteria items during the month of August. Maintenance crews attempted to manually open and close FG 3-5 according to tailwater elevations through this period to help maintain entrance differentials at PH1.

The “B” branch of the Bradford Island ladder was out of service from September 2012 to February 2013 in order to conduct repairs to FV 4-4. With A-branch and the Bradford Island ladder above the junction pool watered up, flows in the ladder were unbalanced causing below-criteria “depth over weir” water levels in the upper ladder and above-criteria water levels in A-branch.

The intake gate for the Ice and Trash Sluiceway (ITS) was discovered to be in serious disrepair on 01 September; the gate cable was frayed and the guide wheels needed repair. Bulkheads were placed in front of all chain gates to allow workers into the ITS, where they facilitated the complete removal of the intake gate. Plating was placed over the guide slot and the ITS was re-opened on 25 September with no intake gate in place.

The PH2 velocity meter was found to be reading incorrectly and was removed in 2009. Project maintenance crews constructed a new meter, which was installed in March of 2013.

PH2 diffuser B3 had a badly deteriorated diffuser gate, which was removed to facilitate repairs and is therefore open. Diffusers A2 and B7 have gates stuck in the closed condition. Repairs to these diffusers will not be possible until the next dewatering, likely the winter of 2014/15.

The Washington Shore ladder (WA shore), including the South Monolith, was out of service in November 2012, as was the DSM. This allowed construction workers early access to the North Monolith in order to construct and install a lamprey passage system (LPS), to make additional repairs in the North Monolith area, and allowed the removal of large quantities of sand and silt from the WA shore Auxiliary Water Supply (AWS) and accompanying diffuser chambers. The WA shore ladder returned to service in February 2013 and the DSM in March 2013. Further construction caused the North Monolith (upstream and downstream entrances, or NUE and NDE) and DSM to be out of service from October to November of 2013.

Fish Unit 2 (FU2) came out of service in October 2013 for digital governor installation and maintenance to the servo motor. After LPS construction completed in November 2013, the north upstream entrance (NUE) remained closed to increase differentials at the other three PH2 entrances.

Gantry 7 (PH2 +90 deck crane) began a scheduled overhaul in August 2012, causing it to be out of service through the winter of 2012/13. In preparation, Submersible Traveling Screens (STSs) were removed at the end of July 2012 from units 13 through 17. They remained installed in units 11, 12, and 18. When the DSM was taken out of service for the WA Shore LPS construction in November 2012, Vertical Barrier Screens (VBSs) were removed from units 11, 12, and 18 to prevent fish from being directed into a gatewell with no means of egress. The crane returned to service in February 2013, and in early March STSs were installed in units 13-17 and VBSs were installed in units 11,12 and 18.

The B2CC avian array was taken down in 2011 to accommodate barge crane access to the B-branch ladder repair site. The spillway and PH2 tailrace arrays were removed October 2012 to

facilitate barge access for the spillway erosion repair as well as LFS construction activities. These arrays were all replaced in March 2013. The B2CC and PH2 arrays were again removed in October 2013 for barge access associated with continued LFS construction, and will be repaired in 2014. A single line was removed from the PH1 tailrace on 10 October 2013 due to a double crested cormorant that became caught in the line. It will be replaced along with the others in 2014.

STS/VBS Inspections

Submersible traveling screens (STS) and vertical barrier screens (VBS) are typically inspected once a month. Each STS has a timer that automatically shows elapsed time of operation, with one month of continuous operation equaling 720 hours. Bonneville uses an underwater video camera to inspect STSs and VBSs. This gives the project the ability to inspect the screens while they are installed and while the unit is running, and has eliminated the need to dip gatewells. PH2 STSs are normally installed from the end of February until December 15 in operational units for juvenile fish passage and for adult fallbacks. PH1 screens have been permanently removed.

STSs were installed between the dates of 12-26 March 2013. The DSM was taken out of service to repair the WA Shore LFS on 12 October 2013. STSs were removed from units 12-18 between 9-11 October 2013 to prevent fish from being directed into a gatewell with no means of egress. All STSs were removed by 18 December 2013 for winter maintenance.

Table 2. STS and VBS Inspections 2011-2012

Unit	STS Install Dates	STS Removal Dates	STS and VBS Inspection Dates and Run Hours Between Inspections				
11	N/A		Unit OOS				
12	3/12/13	12/16/13	5/6/13	7/8/13	8/19/13	9/26/13	12/16/13
			1268	677	327	463	1453
13	3/13/13	12/16/13	5/6/13	7/8/13	8/19/13	9/26/13	12/16/13
			1253	676	859	822	1453
14	3/26/13	12/18/13	5/6/13	7/8/13	8/19/13	9/26/13	12/18/13
			940	653	682	235	1146
15	3/13/13	12/17/13	5/6/13	7/8/13	8/19/13	9/26/13	12/17/13
			1261	669	475	469	1075
16	3/14/13	12/16/13	5/6/13	7/8/13	8/19/13	9/26/13	12/16/13
			1065	47	197	315	1437
17	3/14/13	12/16/13	5/6/13	7/8/13	8/19/13	9/26/13	12/16/13
			1209	673	968	673	441
18	3/12/13	12/16/13	5/6/13	7/8/13	8/19/13	9/26/13	12/16/13
			1269	672	986	855	1456

Zebra/Quagga Mussels

Through monthly inspections of the monitoring station at PH1 and of all dewatered fishways, no indication of zebra or quagga mussel colonization was found. It is widely believed that their arrival is inevitable. The Project stays involved in regional preparation for zebra/quagga mussel arrival by sending project personnel to training and seminars to stay abreast of the latest information concerning these invasive species. Monitoring will continue with hopes that control programs can be initiated at the first indication of the mussel's arrival in the Pacific Northwest.

Avian Abatement Measures

Avian arrays are strung over the PH1 tailrace, spillway tailrace, PH2 tailrace, and over the B2CC plunge pool. The spillway, PH2, and the B2CC arrays were removed to facilitate the work associated with the spillway erosion repair and the LFS construction in late 2012. These arrays were reinstalled in March 2013. The spillway and PH2 arrays remained in place until October 2013 when they were removed to accommodate additional repairs to the LFS. They are scheduled to be reinstalled in early 2014. One wire is broken at the PH1 array and will be repaired in early 2014.

USDA Wildlife Service's avian hazing occurred from May through July 2013. This was done from the tailrace side of the powerhouses, the spillway, and the shoreline.

Auxiliary Water System (AWS) Closures

The AWSs were closed on several occasions for varying reasons during the 2012-2013 reporting year. AWS valves were closed for winter maintenance, trashrack cleaning, floating trash, remotely operated vehicle (ROV) fishway inspections, LPS pump maintenance, and emergency maintenance. WA Shore underwent an early closure for construction, necessitating the extended closure of FV 6-9. During the winter maintenance period in 2012-2013, with both B-branch and WA Shore ladders dewatered, the Cascades Island exit was employed. The watering-up and dewatering procedures to utilize the CI exit caused FV 5-3/4/9 to be closed for relatively brief periods of time. Trashracks are usually cleaned multiple times each month with more frequent cleanings during fall and winter season. AWSs are closed for extended periods of time to float trash off the racks when debris issues become ubiquitous. These longer closures usually occur overnight. ROV fishway inspections occur twice a year, once in the summer and once during the winter. In early fall 2012, the trunnion bracket for FV 4-4 sheared from the wall, leaving the valve in the open position, and Bradford Island B-branch underwent an emergency dewatering requiring the FV 4-3/4 AWS to be closed. During the summer ROV fishway inspection a diffuser access hatch in Cascades Island was discovered unattached. The emergency dive repair that ensued required that the FV 5-3/4 AWS to be closed for a few hours. Table 3 shows the number of closures and total closure time per fish valve.

Table 3. Fish Valve closures and closure times.

Fish valve	Reason for closure	Closures	Total closure time
FV 5-3	Winter maintenance	1	1 day, 22 hours
FV 5-4	Winter maintenance	1	1 day, 22 hours
FV 5-9	Winter maintenance	1	41 minutes
FV 6-9	Winter maintenance	1	3 months, 5 days
FV 1-1	Trashrack cleaning	36	13 hours, 8 minutes
FV 3-7	Trashrack cleaning	22	11 hours, 22 minutes
FV 3-9	Trashrack cleaning	24	6 hours, 30 minutes
FV 5-3	Trashrack cleaning	1	3 hours, 40 minutes
FV 5-4	Trashrack cleaning	1	3 hours, 40 minutes
FV 6-9	Trashrack cleaning	1	21 minutes
FV 1-1	Floating trash	2	15 hours, 52 minutes
FV 3-7	Floating trash	1	10 hours
FV 3-9	Floating trash	1	9 hours, 30 minutes
FV 6-9	Floating trash	1	9 hours, 30 minutes
FV 1-1	Remotely operated vehicle inspection	2	13 hours, 47 minutes
FV 3-7	Remotely operated vehicle inspection	2	13 hours, 47 minutes
FV 4-3	Remotely operated vehicle inspection	2	5 hours
FV 4-4	Remotely operated vehicle inspection	2	5 hours

FV 5-3	Remotely operated vehicle inspection	1	3 hours, 50 minutes
FV 5-4	Remotely operated vehicle inspection	1	3 hours, 50 minutes
FV 5-9	LPS pump maintenance	1	47 minutes
FV 4-3	Emergency maintenance	1	4 months, 26 days
FV 4-4	Emergency maintenance	1	4 months, 26 days
FV 5-3	Emergency maintenance	1	3 hours
FV 5-4	Emergency maintenance	1	3 hours

Fish counts

The Corps of Engineers contracted with the Normandeau Associates, Inc. for all fish counting during the 2012-2013 fish passage season. The fish count season is year round with visual counts from March until November and video counts during the rest of the year. All fish count numbers may be found at Fish Counts and Reports.

Fishway Temperature Monitoring

Project biologists monitor fishway temperatures throughout the fish passage season, from March through November. Temperature probes are installed in the upper Bradford Island and WA shore fishways, the Adult Fish Facility (AFF), and the Juvenile Monitoring Facility (JMF). These fishway probes were not operational until 21 July 2013. Additionally, the Technical Management Team (TMT) tracks BON forebay temperature on their website. The TMT temperature is publically accessible real-time, and is the standard utilized per the FPP to determine when high-temperature fish sampling restrictions are operative in BON facilities. In 2013, these temperatures were available from 21 March - 18 September 2013. Detailed daily temperatures can be found in the weekly reports.

Figure 2. 2013 Bonneville Forebay Temperatures.

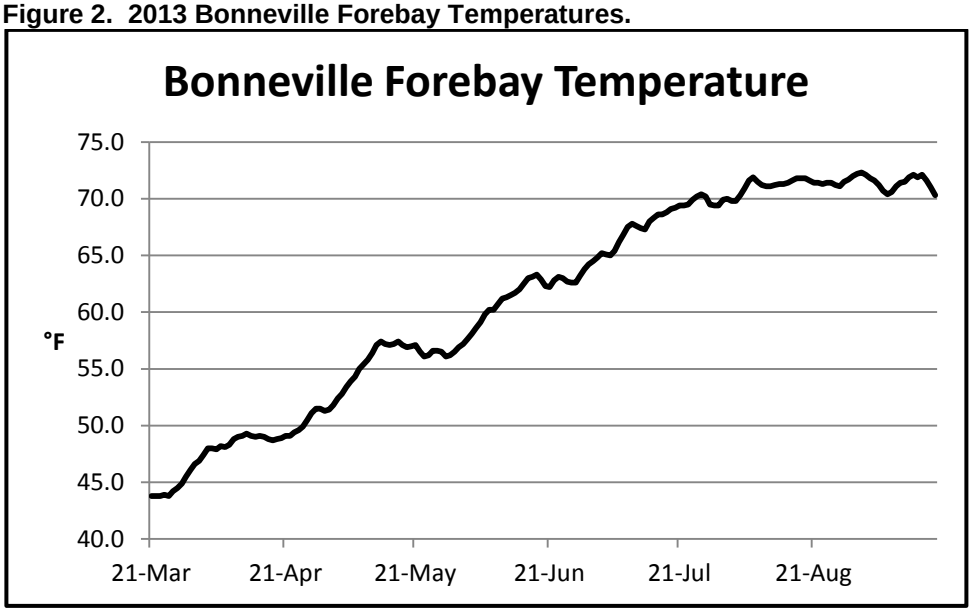
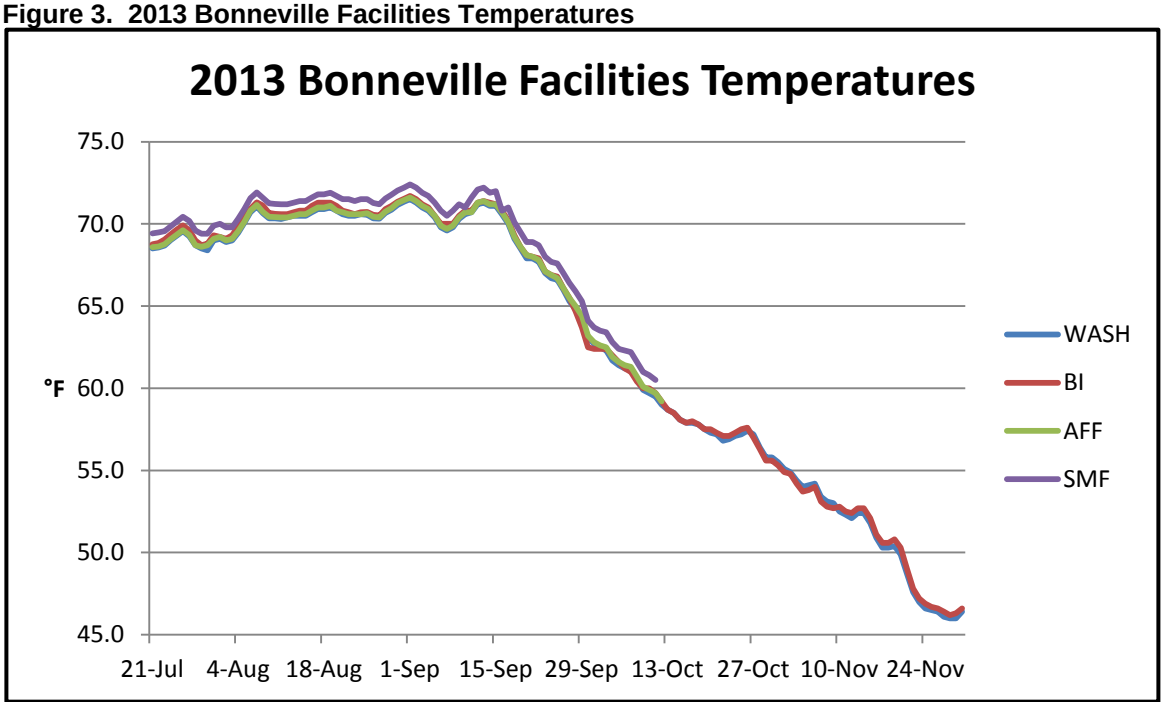


Figure 3. 2013 Bonneville Facilities Temperatures



FISH FACILITY AND TURBINE OUTAGES

Table 4. Fish Facility Outages of at least 24 hours.

Fish Facility	OOS Date 2012	In Service Date 2013	OOS Date 2013	Reason for Outage
BI Lamprey Passge Structure	26 Nov 12	17 Apr 13	16 Oct 13	Winter maintenance
CI Lamprey Passge Structure	20 Sep 12	24 Jun 13	04 Oct 13	Winter maintenance; NOAA terminated early due to low passage.
WS Lamprey Passage Structure	11 Nov 12	06 May 13	16 Oct 13	Winter maintenance
Bradford Island Ladder	N/A	N/A	03 Dec 13	Winter maintenance
A-branch Ladder	N/A	N/A	03 Dec 13	Winter maintenance
B-branch Ladder	25 Sep 12	20 Feb 13	03 Dec 13	Winter maintenance
Cascades Island ladder	N/A	N/A	N/A	
Cascades Island Exit		13 Nov 12	12 Feb 13	Winter maintenance
UMT	13 Nov 12	12 Feb 13	N/A	Winter maintenance
WS Ladder	13 Nov 12	13 Mar 13	N/A	Winter maintenance
DSM 2	11 Nov 12	06 Mar 13	TBD: Jan 2014	Winter maintenance; closed 11 Oct – 31 Oct 2013 for NDE LFS construction.
B2CC	16 Sep 12	01 Mar 13	01 Sep 13	Reopened nightly from 11 Oct to 30 Oct 2013 due to NDE LFS construction; closed for winter.

AFF	07 Nov 12	19 Mar 13	28 Oct 13	
JMF	31 Oct 12	12 Mar 13	12 Oct 13	Early 2013 outage for NDE LFS construction; system in bypass for winter.

Table 5. Fish Unit Outages and Reduced Loads.

Dates	Fish Unit 1
11/10/12 - 3/11/13	OOS for WA shore dewatering and maintenance
Dates	**Fish Unit 2**
11/10/12 - 2/28/13	OOS for WA shore dewatering and maintenance
10/15/13 - Present	OOS for LFS construction and maintenance

Fish units 1 and 2 were placed on standby at other times during the year to "float" trash away from the trash racks. When drawdown measured one foot or greater, fish units were shut down. An adjacent unit was then operated to pull trash away from the fish unit trashracks. This procedure helped prevent debris and silt from accumulating in front of the fish units. Most of the unit outages associated with the floating of trash and debris occurred between 2400 and 0300 to minimize impact on adult fish passage.

Table 6. Turbine Outages of at least 24 hours.

Turbine Unit	Date Out	Date In	Reason for Outage
11	25 Sep 12		High trust bearing temperatures
F1	10 Nov 12	11 Mar 13	WA shore lamprey construction, winter maintenance
F2	10 Nov 12	28 Feb 13	WA shore lamprey construction, winter maintenance
16	14 Jan 13	15 Jan 13	PH2 forebay dredging
17	14 Jan 13	30 Jan 13	PH2 forebay dredging
18	14 Jan 13	30 Jan 13	PH2 forebay dredging
6	28 Jan 13	31 Jan 13	Annual maintenance
10	11 Feb 13	14 Feb 13	Annual maintenance
14	04 Mar 13	28 Mar 13	TRD installation and testing
0	18 Mar 13	26 Mar 13	Pipe repairs
4	25 Mar 13	28 Mar 13	Annual maintenance
8	01 Apr 13	23 May 13	5-year overhaul
17	08 Apr 13	09 Apr 13	Cable repair
16	29 Apr 13	18 Jul 13	Digital governor and air gap installation
3	28 May 13	13 Jun 13	5-year overhaul
4	10 Jun 13	13 Jun 13	Bank 3/4 maintenance
9	17 Jun 13	20 Jun 13	Bank 9/10 maintenance, annual maintenance
5	24 Jun 13	27 Jun 13	Annual maintenance
6	24 Jun 13	27 Jun 13	Transformer maintenance
7	08 Jul 13	10 Jul 13	Bank 7/8 maintenance
8	08 Jul 13	10 Jul 13	Bank 7/8 maintenance
1	15 Jul 13	18 Jul 13	Bank 1/2 maintenance
2	15 Jul 13	18 Jul 13	Bank 1/2 maintenance
1	23 Jul 13	09 Oct 13	5-year overhaul
12	22 Jul 13	05 Sep 13	Digital governor installation
14	09 Sep 13	10 Oct 13	Digital governor installation

12	09 Oct 13	16 Oct 13	Blown servo seal
4	15 Oct 13	23 Dec 13	5-year overhaul
17	21 Oct 13	24 Dec 13	Digital governor installation / Overhaul
18	16 Dec 13		Digital governor installation

FISH REMOVAL

Fish passage facilities and turbine units are taken out of service and dewatered to allow for inspection, preventative maintenance, repairs, and modifications. As facilities and turbine units are dewatered, project biologists, outside agency personnel, and other project personnel follow procedures outlined in the FPP and detailed in the Fish Salvage Plan to minimize impacts on fish. Adult fish recovered are typically released into the forebay above the new navlock with the exception of sturgeon which are usually released below the dam at Hamilton Island. Juvenile salmonids are also released below the dam at Hamilton Island. The following is a summary of the number of fish that were removed during facility and turbine unit dewaterings. All fish were recovered in good condition unless otherwise noted.

Navigation Lock (03/02): 1 sculpin.

Unit 8 draft tube (04/02): 1 yearling Chinook Salmon.

Unit 16 draft tube (04/30): 20 juvenile salmonids.

Unit 8 tail logs (05/16): 1 Pacific Lamprey, 2 juvenile salmonids, and 50 sculpins.

Unit 3 head gates (05/28): 40 juvenile salmonids.

Unit 3 head gates (06/12): 15 juvenile salmonids.

AFF Recover Pool (06/18): ~1,500 American Shad & 63 Pacific Lamprey.

Between Cascade Island picket leads (06/26): ~50 Sockeye Salmon & ~30 Pacific Lamprey.

Unit 16 tail logs (06/26): 5 Pacific Lamprey & ~30 sculpin.

Unit 16 tail logs (07/18): 2 Pacific Lamprey & 12 sculpins.

Unit 13 draft tube (07/23): 10 White Sturgeon, 1 Bullhead, & 1 Pacific Lamprey.

Unit 1 draft tube (07/24): 8 White Sturgeon & 3 Pacific Lamprey.

Unit 17 draft tube (10/22): 33 White Sturgeon & 2 Channel Catfish.

Bradford Island Proper (12/03): 16 Pacific lamprey, 10 Steelhead Trout, 4 Chinook Salmon, 25 White Sturgeon, 2 American Shad, & 170 Peamouth.

B-Branch (12/04): 2 Steelhead Trout, 1 Chinook Salmon, & ~200 White Sturgeon.

A-Branch (12/04): 1 Chinook Salmon, 4 Steelhead Trout, & ~50 White Sturgeon.

Fishway Modifications and Substantial Maintenance (1996-Winter 2013/14)

POWERHOUSE ONE ADULT

2012. Replaced PIT tag antenna in Bradford Island serpentine section.
2012. Dredged along the exit channel for the Bradford Island fish ladder.
2011. Repaired erosion cavities under the B-branch ladder of Bradford Island.
2006-present. Sea lion exclusion devices (SLEDs) are installed at the fishway entrances to prevent sea lion access to the fish ladder.
2005/06. Bulkheads were installed in the orifice gate and telescoping gate slots. Gates were removed along with the associated electronic and mechanical equipment.
2005/06. Passive Integrated Transponder (PIT) tag detectors installed in four serpentine weirs in the Bradford Island fishway.
2004-present.Utilize ROVs for fishway inspections instead of divers.
2003/04. Installed new electronic velocity meter at the north end of the PH1CC. No longer used.
2002/03. PH1CC orifice gates and telescoping gates are closed and disabled. Studies indicated more fish exited these gates than entered. Weir gates were left in service.
2001/02. Extra orifices in the overflow weirs were filled with concrete.
2000/01. PIT tag detectors installed in four orifice weirs in A-branch and four orifice weirs in B-branch.
1998/99. FG3-10 through 17 disabled and filled with concrete. FG3-14 (at the junction pool) covered with metal plates instead of concrete.

POWERHOUSE ONE JUVENILE

2013/14. ITS gate removed for repairs, gate slot plated for fish passage during removal.
2012/13. Spillway erosion hole and ogee repair.
2010/11. Welded elevation indicators on chain gates 3B, 6C, and 10B.
2010. PH1 JBS outfall pipe removed.
2009/10. Removal of the wall separating the Powerhouse 1 downstream migrant channel (DSM1) from the ITS completed to improve surface passage at PH1. The floor was raised and sloped.
2009. All remaining PH1 screens scrapped.
2008/09. ITS automated chaingates installed in 3B, 6C, and 10B.
2004-2007. The Powerhouse 1 downstream migrant channel (DSM1) is disabled as a juvenile bypass route. Screens are not installed during fish passage season except from 15 September until 15 December for adult fallback. DSM1 runs south during this time.
2001-2003. Unit 8 extended submerged bar screens were deemed undesirable and replaced with standard STSs.
2001-present. The 2000 Biological Opinion (BiOp) required the removal of impediments to fish passage from the turbine environments. Removal and replacement of excess metal, with fish friendly alternatives, occurs as units go out of service for rehab.
2000-2010. Turbine rehab involves installing minimum gap runners on all PH1 main units.

POWERHOUSE ONE LAMPREY

2013/14. Lamprey passage structure pumps relocated from forebay location to within the AWS to minimize debris buildup.
2012. Picket lead modifications to insure one inch spacing between leads and sill plate and prevent lead bending. Spacers installed.
2011. Lamprey count improvements including video verification network at exit flume.
2011. Picket lead spacers for lamprey passage removed on 29 June.
2011. One inch picket lead spacers installed on 24 May to allow lamprey passage under leads.
2005/06. PIT tag detection and expanded lamprey ramp installed in the Bradford Island FV3-9 AWS channel.
2003/04. Lamprey ramp installed in the Bradford Island FV3-9 AWS channel.

CASCADES ISLAND FISHWAY/ UMT

2004-present. Utilize ROVs for fishway inspections instead of divers.

2004/05. UMT fish count window crowder and window cleaner removed.
2001/02. New diffuser covers built and installed.
2000/01. More PIT tag detectors installed in four orifice weirs.
1999/00. FG6-1 through 4 filled in with concrete.
1998/99. PIT tag detectors installed in four orifice weirs.
1996-2000. The UMT drain is blind flanged and no longer used.

CASCADES ISLAND LAMPREY
2012/13. Lamprey passage system extension into the forebay and conversion to volitional passage system.
2008/09. Lamprey ramp and bollards installed in CI entrance pool. Variable width entrance weir installed in May.
2005/06. Half duplex PIT tag detectors were installed along the picket leads to track lamprey.

POWERHOUSE TWO ADULT
2013. Modifications to the AFF to improve water velocity and sampling conditions.
2013. Replaced PIT antenna in WA Shore ladder serpentine section.
2013. Forebay dredging in front of the Fish Unit intakes.
2012/13. Repairs to the gates and guides on B-valves 3 and 4.
2012. Debris removal from the AWS and accompanying diffusers.
2011. SA-24 board replaced with new PH2 Collection Channel Fishway PLC.
2011. Reattached blown off diffuser grating in ladder at North Monolith and debris removal from AWS and accompanying diffusers.
2010/11. AFF sample flume modified to accommodate an auxiliary sample tank used by WDFW. CRITFC obtained and installed a new, larger sample tank complete with a PIT tag detector at the entrance to the tank.
2008/09. Picket leads installed perpendicular to existing AFF picket leads. Not used after 2009 sample season.
2007/08. Manufactured new FOG SLEDs.
2006/07. Installed new staff gauges in the monoliths.
2006/07. AFF lamprey orifice gate removed due to pulley failure resulting in salmon passage blockage and dewatering difficulties.
2005-present. SLEDs installed at fishway entrances to prevent sea lion access to the fish ladders.
2005/06. AFF count window crowder removed due to structural failure.
2004-present. Utilize ROVs for fishway inspections instead of divers.
2004/05. Repaired the AWS conduit.
2004/05. Installed new velocity meter at South Upstream Entrance (SUE).
2004/05. PIT tag detectors installed in four serpentine weirs.
2004/05. AFF brail pool modifications made. The brail pool is now the primary recovery pool.
2003/04. AFF electrical upgrades complete.
2003/04. Picket leads for the triangle section were removed.
2002/03. Removed old metal staff gauge frames from monolith entrances.
2001/02. PIT tag detectors installed in eight orifice weirs, four upstream and four downstream of the AFF.
1999/00. AFF exit ladder equipped with orifice PIT tag detectors.

POWERHOUSE TWO JUVENILE
2013. Gantry 7 rehabilitation.
2013. Turbulence Reduction Device (TRD) testing in Unit 14 A slot.
2013. Alarm installed on the 2-way rotating gate at the SMF.
2012. B2CC bulkhead converted to permanent hoist with automatic control.
2012. B2CC joint repair to fix spalling and decrease channel roughness.
2008/09. Release pipe attached to JMF outfall pipe for juveniles trucked from Walla Walla District.
2007/08. Behavioral Guidance Structure (BGS) installed in PH2 forebay. Removed in December 2010.
2007/08. PH2 Downstream Migrant transportation channel (DSM2) LED lights returned to halogen lights due to the unknown effects of LEDs.

2007/08. Units 14 and 18 are modified for new VBSs and improved FGE.
2006/07. New LED lights replace the halogen lights. The LED lights are cooler and will last years longer than the halogens. These lights were salvaged from DSM1.
2006/07. Units 11, 15, 16 are modified for new VBSs and improved FGE.
2005/06. B2CC PIT tag antenna installed.
2005/06. SMF full flow PIT tag antenna installed.
2005/06. Units 12 and 13 modified for new VBSs and improved Fish Guidance Efficiency (FGE).
2004/05. VBS modifications for Unit 17 result in screen failure. The design for the new VBSs is re-examined and redrawn.
2004/05. SMF Outfall hydrocannon piping is replaced.
2004/05. B2CC complete and online.
2003/04. Unit 17 VBSs and gatewells are modified to improve FGE. Modifications include gap closure devices on the STSs and modified VBSs.
2002/03. NOAA Fisheries fyke net frame is removed from the tailrace.
2002/03. Unit 15 gatewells are partially modified to improve FGE. Modifications include gap closure devices on the STSs.
2002/03. Biologists noticed places of ovality while inspecting the two mile pipe. The pipe has been monitored regularly to document potential changes.
2002-present. The 2000 BiOp required the removal of impediments to fish passage from the turbine environments. Removal and replacement of excess metal, with fish friendly alternatives, occurs as units come out of service for maintenance.
2001/02. Raised the DSM2 walkway grating to prevent fish from impacting it.
2001/02. Modified the DSM2 add-in screen to vertical bars to allow juveniles to move out of the add-in water and into the channel. The bars didn't reach the walkway so a perforated plate was added later in the season to prevent adults from jumping into the add-in section.
2001/02. Flume covers were added over the switch gates. This was to encourage fish to stay in the main channel and not seek shade by swimming under the switch gates.
2000/01. Saltwater rearing moved into the SMF.
2000/01. Modifications were made to the primary dewatering structure drain pipe to divert more water into the wetlands. This reduced the flow fluctuations and air bubbles under the perforated plate in the primary dewatering structure.
1998-2000. SMF construction completed. The facility goes online.

POWERHOUSE TWO LAMPREY
2013. Lamprey refuge boxes installed in the WA Shore ladder, near the UMT confluence.
2012/13. Construction of Lamprey Flume System and associated LPS at NDE on the north monolith.
2012/13. Picket lead modifications to insure 1 ½ inch spacing between leads and sill plate and prevent lead bending. Spacers installed.
2011. Picket lead spacers for lamprey passage removed on 29 June.
2010/11. NOAA installed a picket lead sill ramp to ease the transition from the ladder into the AWS. NOAA also installed ¾ inch crowder picket leads at the count station.
2010. One inch picket lead spacers installed on 25 May for lamprey passage under leads.
2007/08. Lamprey ramp installed in the Washington Shore FV6-9 AWS channel.
2004/05. Lamprey ramp installed at North Downstream Entrance (NDE).
2000/01. Lamprey plates are installed over the Washington Shore diffuser grates.

BASS LAKE
2006. The leaking drain is repaired. The lake holds water and coho are seen spawning in the outlet (Moffett Creek) of Bass Lake. The salvaged logs create log jams over the sink hole.
2004. Salvaged logs are placed in Bass Lake to provide habitat.

GLOSSARY

AFF----- ---------- Adult Fish Facility. Lab associated with the Washington Shore ladder. Adult fish are trapped for research purposes.
AWS----------Auxiliary Water Supply.
B2CC----------Powerhouse Two Corner Collector. A surface bypass system located in the southern corner of the Bonneville Second Powerhouse forebay.
BI--- ---------- Bradford Island Fishway.
BiOp ---------- Biological Opinion.
BPA----------Bonneville Power Association.
CI-- ---------- Cascades Island Fishway.
Collection Channel(CC) Part of the adult fishway spanning the length of the downstream side of each powerhouse.
DSM2---------- Downstream Migrant transportation channel (PH2). Transport channel for juvenile fish from gatewell orifices to the juvenile transport pipe.
FG---------- Fish diffusion gate.
FGE----------Fish Guidance Efficiency.
FOG ---------- Floating Orifice Gate.
Forebay---------- That area of a reservoir immediately upstream of a dam.
FPOM----------Fish Passage Operations and Maintenance Coordination Team
FPP ---------- Fish Passage Plan.
FV ---------- Fish Valve.
ITS ---------- Ice and Trash Sluiceway.
JBS ---------- Juvenile Bypass System.
JMF----------Juvenile Monitoring Facility. Lab associated with the PH2 JBS.
LFS----------Lamprey Flume System.
NDE---------- North Downstream Entrance. Refers to one of the four large overflow weir adult fishway entrances at PH2.
NUE---------- North Upstream Entrance. See NDE.
NOAA ---------- National Oceanic and Atmospheric Administration.
OOS ---------- Out of Service.
PH1 ---------- Bonneville Powerhouse One.
PH2 ---------- Bonneville Powerhouse Two.
PIT ------ ---------- Passive Integrated Transponder. A tag inserted into juvenile and adult fish. Detectors are installed at all fish passage systems.
Project---------- Bonneville Lock & Dam.
ROV----------Remotely Operated Vehicle.
SDE---------- South Downstream Entrance. See NDE.
SLED ---------- Sea Lion Exclusion Device
SUE---------- South Upstream Entrance. See NDE.
STS ---------- Submersible Traveling Screen.
Tailrace ---------- The portion of a river immediately downstream of a dam or powerhouse.
TDG----------Total dissolved gas.
UMT----- ---------- Upstream Migrant Transportation channel. This channel connects Cascades Island ladder to Washington Shore ladder through PH2.
VBS---------- Vertical Barrier Screen.
WDFW ---------- Washington Department of Fish & Wildlife.

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