BONNEVILLE DAM

FISHWAY STATUS ANNUAL REPORT

2014

By

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1. INTRODUCTION

The 2014 Fishway Status Annual Report for Bonneville Lock and Dam summarizes activities impacting fish at Bonneville Project from 1 December 2013 through 30 November 2014.

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).

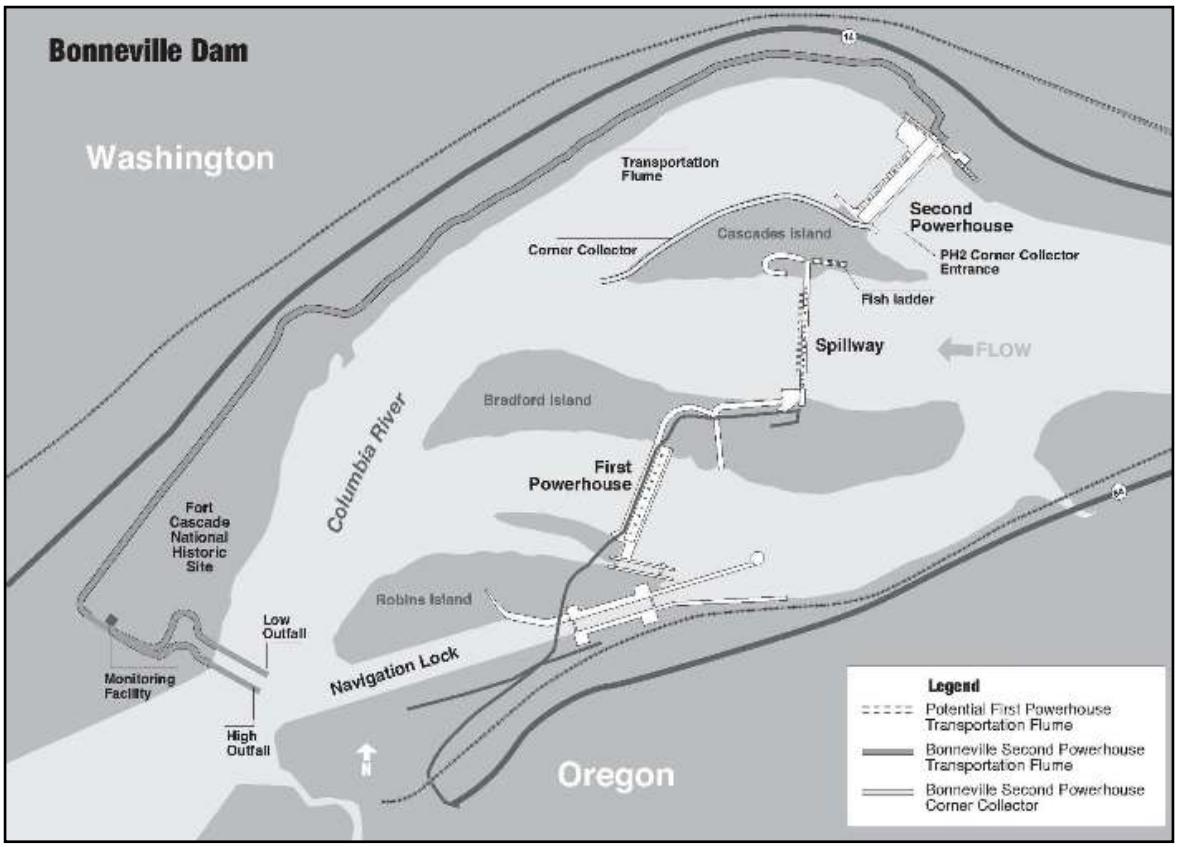

Figure 1. Bonneville Lock and Dam.

2. 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 310 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 (Table 1). Items in criteria 100% of the time are not listed. Explanations for items that were out of criteria more than 90% of the reporting year or were unusual circumstances are given below.

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

Powerhouse 1	*Occurrences*	*In Criteria*
PH1 S differential	7	97.7%
PH1 N differential	6	98.1%
Gate position: PH1 gate 64	2	99.4%
PH1 ITS end gate	1	99.7%
Depth over weir at A-branch	60	80.6%
A-branch diffusers FG3-3, FG3-4, FG3-5, FG3-6	39	87.4%
Depth over weir at B-branch	1	99.7%
B-branch diffusers	14	95.5%
B branch differential	3	99.0%
Powerhouse 2		
Spillway Bays	48	84.5%
Cascades Island differential	3	99.0%
Depth over weir at UMT	10	96.8%
Head or depth: PH2 NDE	29	90.6%
Head or depth: PH2 SUE	39	87.4%
Head or depth: PH2 SDE	39	87.4%
PH2 diffuser positions	267	13.9%
Depth over PH2 weir 38	5	98.4%
Depth over PH2 weir 37	6	98.1%
PH2 JBS orifices	17	94.5%
STS operation	1	99.7%
PH2 fish unit F1	1	99.7%
Avian Arrays	278	10.3%
Calibration once a week	9	97.1%
Missed inspection by Project Biol.	6	98.1%

The intake gate for the Ice and Trash Sluiceway (ITS) was discovered to be in serious disrepair on 01 September 2013; the gate cable was frayed and the guide wheels needed repair. During a temporary closure, plating was placed over the guide slot and the ITS was re-opened on 25 September 2013 with no intake gate in place. This remains the condition of the ITS until a complete closure of the sluiceway can be coordinated for reinstallation.

A-branch diffuser FG 3-3 became mechanically bound in October 2014. Maintenance crews attempted to repair the motor and after electrical operation, the diffuser motor became bound again in the closed position. Currently FG 3-4 is manually open to help maintain entrance differentials at PH1.

Spillway bay 17 experienced a hoist brake failure in March 2014. The bay gate was dogged off at 2.9' during the spill season, which caused the spill pattern to be out of criteria during high flows. The gate was placed on sill (closed) once spill season was complete. Repairs are ongoing.

PH2 diffuser B3 had a badly deteriorated diffuser gate, which was removed to facilitate repairs and is therefore open. Diffusers A2, B4, B7, and B8 have gates stuck in the closed condition. Repairs to these diffusers will begin during the next dewatering, in the winter of 2014/15.

Fish Unit 2 (FU2) was out of service from October 2013 to February 2014 for digital governor installation and maintenance to the servo motor. FU1 was out of service from February to March 2014 for digital governor installation. During those months the north upstream entrance (NUE) remained closed to increase differentials at the other three PH2 entrances.

The B2CC and PH2 avian arrays were removed in October 2013 to allow barge access to the PH2 north monolith LFS, which underwent repairs during the winter of 2013/14. 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. The PH2 array and the one PH1 line were reinstalled in March 2014, at which point the anchor line to the B2CC array was found to be broken. The B2CC array was reinstalled in October 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 24-25 February 2014. STSs were removed from units 12-18 on 13-15 November 2014 due to large amounts of debris accumulation, which necessitated constant cleaning. They remained out through the winter maintenance period to prevent fish from being directed into a gatewell with no means of egress.

Table 2. STS and VBS Inspections 2013-2014

Unit	STS Install Dates	STS Removal Dates	STS and VBS Inspection Dates and Run Hours Between Inspections						
11	N/A	N/A	Unit OOS						
12	2/24/14	11/15/14	4/8/14	5/5/14	6/2/14	7/8/14	8/7/14	9/8/14	10/6/14
			1008	652	693	823	680	766	391
13	2/24/14	11/15/14	4/8/14	5/5/14	6/2/14	7/8/14	8/7/14	9/8/14	OOS
			1018	144	294	823	625	294	
14	2/24/14	11/15/14	4/8/14	5/5/14	6/2/14	7/8/14	8/7/14	9/8/14	10/6/14
			1010	648	694	818	510	286	420
15	2/25/14	11/14/15	OOS	OOS	OOS	Reset	8/7/14	9/8/14	10/6/14
							371	119	268
16	2/25/14	11/14/15	4/8/14	5/5/14	6/2/14	7/8/14	8/7/14	9/8/14	10/6/14
			1002	652	693	792	268	58	211
17	2/25/14	11/13/15	4/8/14	5/5/14	6/2/14	7/8/14	8/7/14	9/8/14	10/6/14
			999	652	693	816	660	379	306
18	2/25/14	11/13/15	4/8/14	5/5/14	6/2/14	7/8/14	8/7/14	9/8/14	10/6/14
			934	651	694	820	688	762	456

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, B2CC and PH2 arrays were removed in October 2013 to accommodate additional repairs to the WA shore NDE LFS. The spillway and PH2 arrays were reinstalled in early March 2014. One broken wire PH1 array was repaired at that time. The B2CC anchor line broke during the installation attempt and was repaired in late March 2014. The B2CC array was reinstalled in October 2014.

USDA Wildlife Service's avian hazing occurred from May through July 2014. 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 2013-2014 reporting year. AWS valves were closed for winter maintenance, trashrack cleaning, and remotely operated vehicle (ROV) fishway inspections. Bradford Island was dewatered in November of 2014 for an inspection of the FV3-7 conduit and also for heavy construction as part of the Bradford Island bridge repairs. 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. 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 1-1	Winter maintenance	1	2 months, 25 days
FV 3-7	Winter maintenance	1	2 months, 25 days
FV 3-9	Winter maintenance	1	2 months, 25 days
FV 4-3	Winter maintenance	1	2 months, 25 days
FV 4-4	Winter maintenance	1	2 months, 25 days
FV 1-1	Brad Is conduit inspection and bridge work	1	16 days, 3 hours
FV 3-7	Brad Is conduit inspection and bridge work	1	16 days, 3 hours
FV 3-9	Brad Is conduit inspection and bridge work	1	16 days, 3 hours
FV 4-3	Brad Is conduit inspection and bridge work	1	16 days, 3 hours
FV 4-4	Brad Is conduit inspection and bridge work	1	16 days, 3 hours
FV 1-1	Trashrack cleaning	4	51 minutes
FV 3-7	Trashrack cleaning	19	8 hours, 29 min
FV 3-9	Trashrack cleaning	28	6 hours, 24 min
FV 6-9	Trashrack cleaning	5	3 hours, 11 min
FV 1-1	Remotely operated vehicle inspection	1	3 hours, 45 min

FV 3-7	Remotely operated vehicle inspection	1	3 hours, 45 min
FV 4-3	Remotely operated vehicle inspection	1	2 hours, 45 min
FV 4-4	Remotely operated vehicle inspection	1	2 hours, 45 min
FV 5-3	Remotely operated vehicle inspection	2	6 hours
FV 5-4	Remotely operated vehicle inspection	2	6 hours

Fish Counts

The Corps of Engineers contracted with the Normandeau Associates, Inc. for all fish counting during the 2013-2014 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). Probes are also installed in rest boxes of all four lamprey passage structures (LPS), which are located at Bradford Island, Cascades Island, the Washington shore auxiliary water supply channel, and at the PH2 north downstream entrance (NDE). 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 2014, these temperatures were available from 12 March - 24 September 2014. Detailed daily temperatures can be found in the weekly reports.

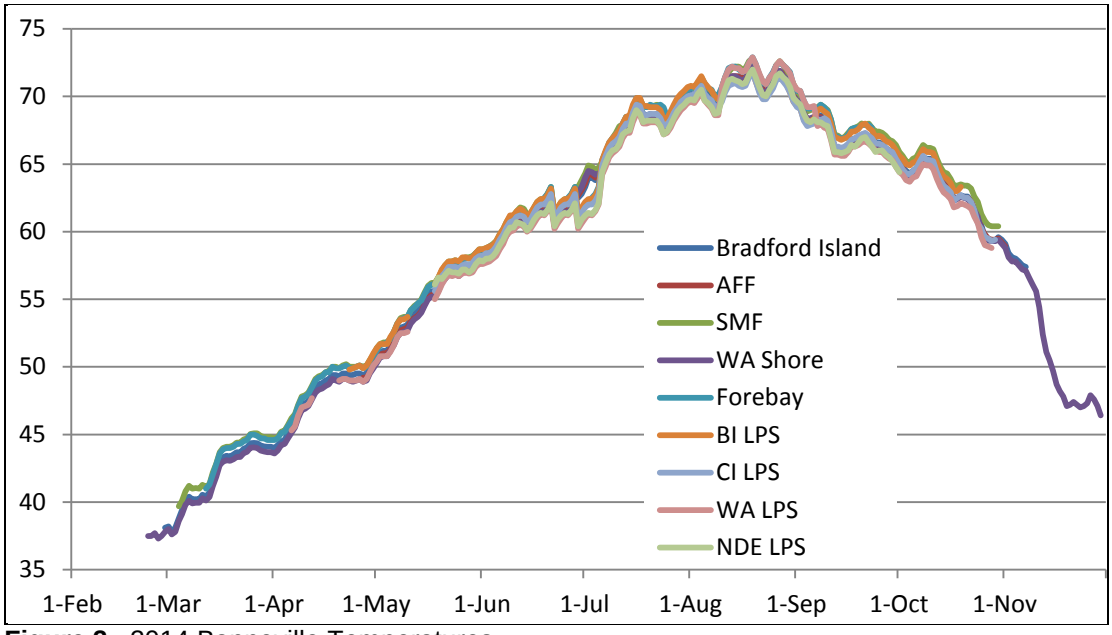

Figure 2. 2014 Bonneville Temperatures.

Fish Facility and Turbine Outage Tables

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

Fish Facility	OOS Date 2013	In Service Date 2014	OOS Date 2014	Reason for Outage
BI Lamprey Passage Structure	16 Oct 13	23 Apr 14	20 Oct 14	Winter maintenance
CI Lamprey Passage Structure	04 Oct 13	14 May 14	30 Oct 14	Winter maintenance
WS Lamprey Passage Structure	16 Oct 13	01 Apr 14	29 Oct 14	Winter maintenance
NDE Lamprey Flume System	30 Aug 13	19 May 14	02 Oct 14	Winter maintenance
Bradford Island Ladder	03 Dec 13	27 Feb 14	10 - 24 Nov 14	FV3-7 conduit inspection and Bradford bridge repair
A-branch Ladder	03 Dec 13	27 Feb 14	10 - 24 Nov 14	FV3-7 conduit inspection and Bradford bridge repair
B-branch Ladder	03 Dec 13	27 Feb 14	10 - 24 Nov 14	FV3-7 conduit inspection and Bradford bridge repair
Cascades Island ladder	N/A	N/A	03 Dec 14	Winter maintenance
UMT	N/A	N/A	03 Dec 14	Winter maintenance
WA Shore Ladder	N/A	N/A	08 Dec 14	Winter maintenance
DSM 2	11 Oct 13	18 Feb 14	---	Winter maintenance
B2CC	01 Sep 13	17 Mar 14	01 Sep 14	
AFF	28 Oct 13	01 Apr 14	19 Nov 14	Winter maintenance
SMF	12 Oct 13	03 Mar 14	31 Oct 14	Winter maintenance. Early 2013 outage for LFS construction on WA shore.

Table 5. Fish Unit Outages and Reduced Loads.

Dates	Fish Unit 1
2/10/14-3/20/14	Digital governor install and servo repairs
Dates	**Fish Unit 2**
10/15/13 - 2/7/14	Digital governor install and servo repairs
2/16/14 - 2/17/14	Water in turbine bearing

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. Some daytime trash floating occurred in late November 2014 when debris accumulation caused excessive fish unit drawdowns.

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
4	15 Oct 13	19 Dec 13	5-year overhaul
17	21 Oct 13	13 Dec 13	Digital governor installation / Overhaul
18	16 Dec 13	29 Feb 14	Digital governor installation
6	22 Jan 14	23 Jan 14	Cooling water pump/strainer mod
0	26 Jan 14	30 Jan 14	Annual inspection
10	18 Feb 14	27 Feb 14	Annual maintenance / Turbine bearing seal repair
14	20 Feb 14	21 Feb 14	Digital governor repair
15	05 Mar 14	10 Apr 14	Digital governor installation
6	17 Mar 14	01 May 14	5-year overhaul
13	14 Apr 14	22 May 14	Digital governor installation / Overhaul
4	21 Apr 14	01 Jul 14	Stator cleaning
15	22 Apr 14	05 Jun 14	Ground on stator
3	16 Jun 14	23 Jun 14	Bank 3/4, annual maintenance
7	30 Jun 14	14 Jul 14	Bank 7/8 repairs
8	30 Jun 14	14 Jul 14	Bank 7/8 repairs
2	07 Jul 14	04 Sep 14	5-year overhaul
1	21 Jul 14	31 Jul 14	Bank 1/2, annual maintenance
5	23 Jul 14	24 Jul 14	230 KV line BPA maintenance
6	23 Jul 14	24 Jul 14	231 KV line BPA maintenance
7	23 Jul 14	24 Jul 14	232 KV line BPA maintenance
8	23 Jul 14	24 Jul 14	233 KV line BPA maintenance
9	04 Aug 14	13 Aug 14	Bank 9/10, annual maintenance
15	04 Aug 14	07 Aug 14	Annual maintenance
16	11 Aug 14	14 Aug 14	Annual maintenance
17	18 Aug 14	21 Aug 14	Annual maintenance
5	02 Sep 14	25 Sep 14	Annual maintenance and wicket bushings
13	03 Sep 14	14 Nov 14	4-year overhaul
17	01 Sep 14	02 Sep 14	Water in turbine bearing
15	08 Sep 14	19 Sep 14	T12 annual maintenance
16	08 Sep 14	19 Sep 14	T12 annual maintenance
17	08 Sep 14	19 Sep 14	T12 annual maintenance
18	08 Sep 14	19 Sep 14	T12 annual maintenance
12	21 Sep 14	01 Oct 14	T11 bi-annual maintenance
14	21 Sep 14	01 Oct 14	T11 bi-annual maintenance
12	06 Oct 14	09 Oct 14	Annual maintenance
14	14 Oct 14	16 Oct 14	Annual maintenance
9	10 Nov 14	13 Nov 14	Low oil level

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.

Bradford Island exit to junction pool (12/03/13): 5 Pacific lamprey, 7 steelhead, 1 chinook, 25 White sturgeon, 70 peamouth from the junction pool; 11 Pacific lamprey, 3 steelhead, 3 chinook, 2 shad, ~100 peamouth from the upper ladder.

B-branch diffuser pools (12/04/13): 2 steelhead, 1 chinook, ~200 White Sturgeon.

A-branch diffuser pools (12/04/13): 1 chinook, 4 steelhead, ~50 White Sturgeon.

Unit 17 tail logs (12/11/13): 1 Channel Catfish, 1 walleye, ~50 sculpin.

Unit 04 tail logs (12/18/13): 11 White Sturgeon, 10 sculpin spp., 10 suckers, 12 crayfish.

FG2-19 diffuser pit (01/13/14): 20 Pacific Lamprey, 1 sculpin spp. 1 lamprey had a damaged tail.

Unit 15 tail logs (04/08/14): 8 sculpin spp.

Unit 13 tail logs (04/15/14): 8 sculpin spp.

Willamette Falls Locks – chamber 3 (04/17/14): 2 unclipped Steelhead.

Unit 04 scroll case (04/22/14): 50 juvenile salmonids, 1 adult salmonids.

Unit 04 draft tube (04/22/14): 12 juvenile salmonids, 2 Chinook Salmon, 1 crayfish, 1 sucker, 20 juvenile lamprey.

Unit 06 tail logs (04/28/14): ~45 sculpin spp.

Unit 13 tail logs (05/20/14): 8 sculpin spp., 1 juvenile Chinook, 4 Pacific Lamprey.

Cascade Island AWS lamprey traps - USACE (05/20/14 – 07/02/14): 451 Pacific Lamprey.

Unit 04 tail logs (06/26/14): 2 steelhead, 8 Pacific Lamprey, 12 sculpin, 6 crawfish, 3 suckers.

Cascade Island exit to lower picket leads (07/01/14): 1 Sockeye Salmon, 1 Steelhead Trout, 50 Pacific Lamprey, 2 carp.

Unit 2 scroll case (07/07/14): 100 juvenile salmonids

Unit 2 draft tube (07/07/14): 30 Pacific Lamprey

Nav lock tainter valve #4 (07/19/14): 20 American Shad, 1 bass, 1 sculpin

Unit 2 tail logs (07/27/14): 15 sculpin, 3 crayfish, 2 pumpkinseed

Unit 13 draft tube (09/04/14): 3 White Sturgeon, 1 bullhead, 1 stickleback, 1 sculpin

Unit 5 tail logs (09/23/14): 10 redear sunfish, 3 suckers, 5 sculpins, 1 Northern Pikeminnow

Unit 13 tail logs (11/07/14): ~60 sculpin

Bradford Island junction pool (11/10/14): 20 salmonids, 100 White Sturgeon, 12 Pacific Lamprey

Adult Fish Facility (11/19/14): 40 White Sturgeon, 3 steelhead, 30 suckers, and 15 peamouth. One of the steelhead was in fair condition.

3. Fishway Modifications and Significant Maintenance (1996-Winter 2014/15)

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. Fry criteria screens placed on lamprey pumps.
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
2014/15. Picket lead spacing reduced and side gaps amended to block lamprey access to the AWS and ladder exit area above the lower pickets.
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
2013-2015. 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
2014. Testing of a flow control plate in Unit 15 A slot.
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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