2017 Annual Fishway Status Report for Bonneville Project

Eagle Creek Fire – 03 September 2017

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Table of Contents

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.
CC---------- Collection Channel - 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.
FU---------- Fish Unit. Provides auxiliary water to PH2 entrance diffusers.
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.
MU---------- Main Unit. PH1 turbine units 1-10, PH2 units 11-18.
MUB---------- Main Unit Breaker
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.

1. INTRODUCTION

1.1 Introduction

This **2017** Project Fisheries Annual Report for Bonneville Project summarizes activities occurring from **01 December 2016 through 30 November 2017** and is required by the Fish Passage Plan (FPP), per section 3.3.4.

The Project includes two powerhouses, a spillway and one operating navigation lock. There are four adult fish ladders, located at each powerhouse and the north and south ends of the spillway for upstream migration. 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).

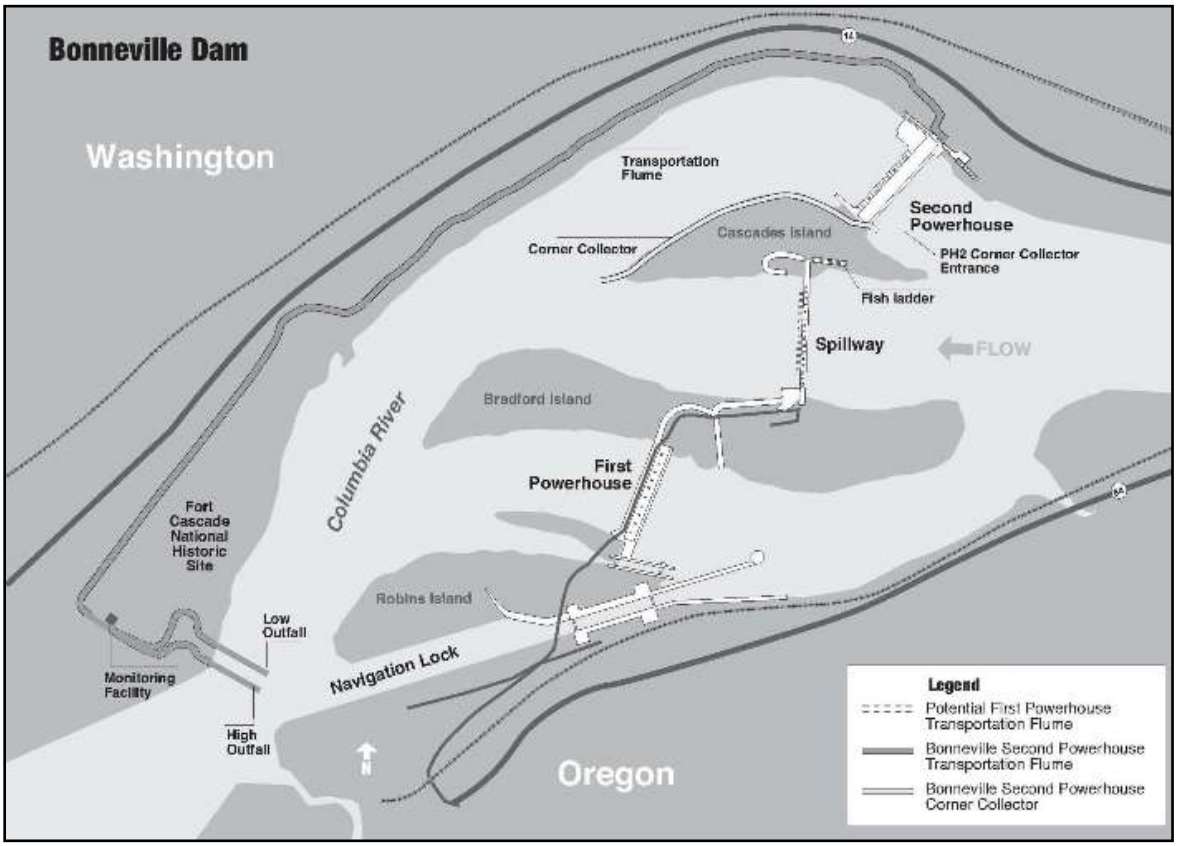


Figure 1. Bonneville Lock and Dam.

2. OPERATIONS

2.1 Fish Facility Outages

Table 1 shows the outage dates for Bonneville fishways, fish facilities, and lamprey passage structures.

Table 1. Seasonal fish facility outages.

Fish Facility	OOS Date 2016	In Service Date 2017	OOS Date 2017	Reason for Outage
BI Ladder	N/A	N/A	24-Nov	Winter maintenance
A-branch	N/A	N/A	24-Nov	Winter maintenance
B-branch	N/A	N/A	24-Nov	Winter maintenance
CI Ladder	NA	NA	*	
WA Shore Ladder	28-Nov	27-Feb	NA	Winter maintenance
UMT	28-Nov	09-Mar	NA	Winter maintenance
BI LPS	27-Oct	31-Mar	31-Oct	Winter maintenance
CI LPS	27-Oct	31-Mar	31-Oct	Winter maintenance
WA AWS LPS	27-Oct	28-Feb	31-Oct	Winter maintenance
NDE LFS/LPS	N/A	21-Jun	24-Aug	Low number of fish collected
B2CC	1-Sep	22-Mar	1-Sep	Opens with kelt trigger / closes with spill
DSM	11-Dec	21-Feb	27-Dec	Winter maintenance
AFF	01-Nov	5-Mar	15-Nov	Winter maintenance
SMF	31-Oct	3-Mar	31-Oct	Winter maintenance

*CI ladder was dewatered from 06-09 March for emergency repairs – see 17BON03.

2.2 Turbine Outages

Table 2 shows turbine outages that lasted 24 hours or longer. Note that turbine outages lasting less than 24 hours did occur but are not included for the sake of brevity. Lengthier unit outages at PH1 were due to main unit breaker replacements.

Table 2. Turbine outages lasting greater than 24 hours.

Unit	Reason for Outage	Start Date	End Date	Duration
7	MUB Replacement	2/22/16 1:03	10/25/17 16:54	1 year, 8 months, 3 days, 15 hours, 51 minutes
8	MUB Replacement	2/22/16 1:03	10/25/17 16:54	1 year, 8 months, 3 days, 15 hours, 51 minutes
12	Exciter Ground	9/14/16 20:07	3/23/17 16:28	6 months, 8 days, 20 hours, 21 minutes
1	Annual Maintenance	12/5/16 0:11	12/8/16 12:17	3 days, 12 hours, 6 minutes
10	Annual Maintenance	12/12/16 0:01	12/14/16 15:18	2 days, 15 hours, 17 minutes
11	Annual Maintenance/FGE Mods	12/15/16 0:06	1/20/17 13:17	1 month, 5 days, 13 hours, 11 minutes
13	FGE Mods	1/20/17 9:50	2/11/17 9:35	21 days, 23 hours, 45 minutes
14	FGE Mods	2/11/17 8:57	2/16/17 16:22	5 days, 7 hours, 25 minutes
14	FGE Install	3/6/17 7:01	3/18/17 9:06	12 days, 2 hours, 5 minutes
15	FGE Mods	3/18/17 9:13	3/22/17 12:17	4 days, 3 hours, 4 minutes
16	4 Year Overhaul/Wicket Gate Seals	3/27/17 7:09	6/22/17 11:52	2 months, 26 days, 4 hours, 43 minutes
9	MUB Replacement Prep	4/17/17 0:01	4/21/17 17:54	4 days, 17 hours, 53 minutes

10	MUB Replacement Prep	4/17/17 0:01	4/21/17 17:33	4 days, 17 hours, 32 minutes
3	4 Year Overhaul	4/24/17 8:31	6/8/17 16:34	1 month, 15 days, 8 hours, 3 minutes
14	STS Inspection/Camera Truck Stuck	5/2/17 9:18	5/3/17 16:27	1 days, 7 hours, 9 minutes
4	Annual Maintenance	5/22/17 0:03	6/8/17 16:32	17 days, 16 hours, 29 minutes
5	Annual Maintenance	6/12/17 0:00	6/29/17 14:57	17 days, 14 hours, 57 minutes
6	Annual Maintenance	6/12/17 0:01	6/29/17 14:50	17 days, 14 hours, 49 minutes
17	FGE Mods/STS Stuck	6/27/17 7:02	8/24/17 17:13	1 month, 28 days, 10 hours, 11 minutes
2	Annual Maintenance/Bank 1-2 Outage	7/10/17 0:01	7/27/17 7:12	17 days, 7 hours, 11 minutes
9	Bank 1-2 Outage	7/10/17 0:01	7/20/17 9:59	10 days, 9 hours, 58 minutes
11	Turbine Bearing/O-Ring Replacement	7/10/17 0:02	7/13/17 10:00	3 days, 9 hours, 58 minutes
15	FGE Mods	7/24/17 7:00	7/26/17 11:10	2 days, 4 hours, 10 minutes
9	Annual Maintenance	7/31/17 0:24	8/17/17 16:15	17 days, 15 hours, 51 minutes
11	Roof Replacement	8/7/17 0:03	8/11/17 9:25	4 days, 9 hours, 22 minutes
12	Roof Replacement	8/7/17 0:03	8/11/17 9:25	4 days, 9 hours, 22 minutes
13	Roof Replacement	8/7/17 0:03	8/11/17 9:25	4 days, 9 hours, 22 minutes
14	Roof Replacement	8/7/17 0:03	8/11/17 9:25	4 days, 9 hours, 22 minutes
18	Exciter Trip	8/21/17 9:30		
15	Thrust Collar Inspection / FGE Mod Repair	9/5/17 0:01	9/6/17 21:20	1 days, 21 hours, 19 minutes
13	Annual Maintenance	9/12/17 0:23	9/14/17 16:03	2 days, 15 hours, 40 minutes
2	Governor Calibration Issues/Control	9/12/17 14:20	9/21/17 14:31	9 days, 0 hours, 11 minutes
11	Roof Replacement	9/18/17 0:26	10/16/17 16:39	28 days, 16 hours, 13 minutes
12	Roof Replacement	9/18/17 0:26	10/9/17 16:38	21 days, 16 hours, 12 minutes
14	Roof Replacement	9/18/17 0:26	10/5/17 12:38	17 days, 12 hours, 12 minutes
13	Roof Replacement	9/18/17 0:26	10/5/17 12:33	17 days, 12 hours, 7 minutes
15	South Servo Seal Leakage	9/28/17 20:04	9/30/17 14:16	1 days, 18 hours, 12 minutes
17	4 Year Overhaul	10/10/17 7:17	11/22/17 13:46	1 month, 12 days, 6 hours, 29 minutes
15	FGE Repair / Thrust Collar Inspection	10/16/17 0:01	10/19/17 14:15	3 days, 14 hours, 14 minutes
12	Thrust Collar Inspection	10/16/17 0:01	10/17/17 15:39	1 days, 15 hours, 38 minutes
6	Slip Ring Maintenance	11/6/17 0:02	11/16/17 15:08	10 days, 15 hours, 6 minutes
3	Painting	11/6/17 0:03	11/16/17 14:56	10 days, 14 hours, 53 minutes

2.3 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 follow procedures outlined in the FPP and detailed in the Fish Salvage Plan to minimize impacts on fish. Adult salmonids and adult lamprey are generally released into the forebay above the new navigation lock. Juvenile salmonids, juvenile lamprey, and sturgeon are generally released below the dam at the Hamilton Island boat launch. 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.

Table 3. Fish salvages at Bonneville December 2016 – November 2017.

Date	Location	Fish Found	Release Site	Notes
01-Dec	WA Shore Ladder	1 Pacific Lamprey (PL), >20 Peamouth & N. Pikeminnow	Forebay	
06-Dec	PH2 S Monolith	3 sculpin & 1 Smallmouth Bass	Tailrace	
07-Dec	PH2 N Monolith	1 Steelhead, 2 PL, & a variety of ~ 200 cyprinids and catastomids	Tailrace	
13-Dec	Nav Lock Still Basin	1 Steelhead mortality (see 16BON121) & 1 Peamouth	Forebay	
14-Dec	DSM	None	N/A	
15-Dec	Nav Lock	8 juvenile salmonids, 15 juvenile lamprey, dozens of Smallmouth Bass, shad, sculpin, & 2 crappie	Tailrace	
06-Mar	CI Upper Ladder	23 Steelhead	Forebay	
07-Mar	CI Entrance Pool	3 Steelhead	Forebay	
22-Mar	MU16 Tail Logs	3 sculpin & 1 catfish	Tailrace	
28-Mar	MU16 Draft Tube	None	N/A	
25-Apr	MU3 Tail Logs	11 juvenile salmonids & 1 sculpin	Tailrace	
26-Apr	MU3 Scroll Case	~700 juvenile salmonids	Tailrace	
27-Apr	MU3 Scroll Case	5 juvenile salmonids, 738 juvenile salmonid mortalities	Tailrace	17BON10
08-Jun	MU3 Tail Logs	~50 juvenile salmonids, 1 adult Chinook, 1 adult PL, 1 lamprey macrophthalmia, & ~10 sculpin	Forebay	
13-Jun	Nav Lock Tainer Valve	3 juvenile salmonids	Tailrace	
20-Jun	MU16 Tail Logs	13 adult PL, 1 lamprey macrophthalmia, & 3 Sculpin	Forebay	
18-Sept	MU8 Tail Logs	8 sculpin, 2 catfish, 3 sunfish, & 2 lamprey ammocetes	Tailrace	
21-Sept	MU2 Tail Logs	1 adult PL	Forebay	
11-Oct	MU17 Draft Tube	24 Sturgeon	Forebay	
07-Nov	MU18 Draft Tube	~120 sturgeon (6” to ~8’)	Forebay	
15-Nov	AFF	2 juvenile salmonids, 2 adult PL, 1 lamprey ammocoete, 77 buckets of shad, Peamouth, N. Pikeminnow, suckers, & carp	WA shore ladder (adjacent to AFF)	
27-Nov	BI (Junction Pool to Exit)	~125 salmonids, 1 PL, & ~50 Peamouth & N. Pikeminnow	Forebay	Winter Maint. dewatering
29-Nov	A-Branch	~12 salmonids, ~30 Peamouth & N. Pikeminnow	Forebay	
30-Nov	B-Branch	~8 salmonids, ~20 Peamouth & N. Pikeminnow	Tailrace	

2.4 Fish Unit Outages

A list identifying every closure for fish units 1 and 2 is shown in Table 4. Throughout the year, the fish units are cleaned using a crane-operated trash rake during working hours. On weekends when personnel are unavailable to operate the trash rake, debris accumulation may occur to the point of causing excessive drawdowns, requiring the units to be floated to prevent potential trash rack or unit damage. During high debris loading, this may also occur overnight between daytime trash raking. When floating, the units may be placed in standby between the hours of 2200 and 0500 to minimize impact on adult fish passage. An adjacent unit is then operated to pull trash away from the fish unit trashracks.

Table 4. List of fish unit outages.

Unit	Reason	OOS	RTS	Duration		
				Trash	Lamprey	Misc.
F1	Winter Maint.	11/25/16 3:00	3/2/17 11:50			97 D, 8 H, 50 M
F2	Winter Maint.	11/25/16 3:00	2/28/17 9:44			95 D, 6 H, 44 M
F2	Operations	2/28/17 18:19	2/28/17 19:03			43 M
F1	Float Trash	3/13/17 0:12	3/13/17 1:40	1 H, 27 M		
F2	Float Trash	3/19/17 22:07	3/20/17 1:02	2 H, 55 M		
F2	Float Trash	3/21/17 21:25	3/22/17 1:08	3 H, 43 M		
F2	Float Trash	3/24/17 21:18	3/25/17 4:01	6 H, 42 M		
F1	Float Trash	3/26/17 0:10	3/26/17 1:37	1 H, 27 M		
F2	Float Trash	3/31/17 18:12	3/31/17 19:52	1 H, 39 M		
F1	Float Trash	3/31/17 19:30	3/31/17 19:45	15 M		
F2	Float Trash	4/1/17 11:04	4/1/17 12:19	1 H, 15 M		
F1	Water in Turbine Bearing	4/2/17 8:23	4/3/17 15:34			1 D, 7 H, 11 M
F2	Operations	4/2/17 18:24	4/2/17 19:02			37 M
F2	Float Trash	4/4/17 15:46	4/4/17 17:02	1 H, 15 M		
F2	Float Trash	4/8/17 18:39	4/8/17 19:40	1 H		
F2	Float Trash	4/16/17 0:16	4/16/17 1:06	50 M		
F2	Float Trash	5/9/17 19:57	5/9/17 23:12	3 H, 15 M		
F2	Float Trash	5/12/17 18:24	5/12/17 18:55	31 M		
F2	Float Trash	5/14/17 0:13	5/14/17 1:22	1 H, 9 M		
F2	Float Trash	5/14/17 21:07	5/14/17 22:33	1 H, 25 M		
F2	Float Trash	5/19/17 19:04	5/19/17 21:09	2 H, 5 M		
F2	Float Trash	5/26/17 18:35	5/26/17 19:52	1 H, 17 M		
F2	Float Trash	5/28/17 0:30	5/28/17 2:08	1 H, 38 M		
F2	Float Trash	5/30/17 0:42	5/30/17 1:52	1 H, 10 M		
F2	Float Trash	5/31/17 19:48	5/31/17 21:11	1 H, 23 M		
F2	Float Trash / Lamprey Ops	6/1/17 3:04	6/1/17 4:16	16 M	56 M	
F2	Float Trash / Lamprey Ops	6/1/17 21:33	6/2/17 4:32	59 M	6 H	
F2	Float Trash / Lamprey Ops	6/2/17 21:34	6/3/17 4:29	55 M	6 H	
F1	Lamprey Ops	6/3/17 2:33	6/3/17 3:55		1 H, 21 M	
F2	Float Trash / Lamprey Ops	6/3/17 18:00	6/4/17 0:19	4 H	2 H, 19 M	
F1	Lamprey Ops	6/4/17 0:19	6/4/17 2:13		1 H, 54 M	
F2	Float Trash / Lamprey Ops	6/4/17 2:12	6/4/17 4:34	33 M	1 H, 48 M	
F2	Float Trash / Lamprey Ops	6/4/17 18:20	6/5/17 4:30	4 H, 10 M	6 H	
F2	Float Trash / Lamprey Ops	6/5/17 21:30	6/6/17 4:30	1 H	6 H	
F2	Float Trash / Lamprey Ops	6/6/17 20:42	6/7/17 4:42	2 H	6 H	
F2	Float Trash / Lamprey Ops	6/7/17 21:27	6/8/17 4:34	1 H, 6 M	6 H	
F2	Float Trash / Lamprey Ops	6/8/17 21:28	6/9/17 4:28	59 M	6 H	

F2	Float Trash / Lamprey Ops	6/9/17 17:50	6/10/17 4:29	4 H, 38 M	6 H	
F2	Float Trash	6/10/17 19:10	6/10/17 20:00	50 M		
F2	Float Trash / Lamprey Ops	6/10/17 21:32	6/11/17 4:25	53 M	6 H	
F2	Float Trash / Lamprey Ops	6/11/17 21:22	6/12/17 4:38	1 H, 16 M	6 H	
F1	Float Trash / Lamprey Ops	6/12/17 21:29	6/13/17 4:28	58 M	6 H	
F2	Float Trash / Lamprey Ops	6/13/17 21:28	6/14/17 4:24	56 M	6 H	
F2	Float Trash / Lamprey Ops	6/14/17 22:39	6/15/17 4:32	32 M	5 H, 20 M	
F2	Float Trash / Lamprey Ops	6/15/17 21:29	6/16/17 4:27	57 M	6 H	
F2	Float Trash / Lamprey Ops	6/16/17 21:29	6/17/17 4:29	1 H	6 H	
F2	Float Trash / Lamprey Ops	6/17/17 21:33	6/18/17 4:28	55 M	6 H	
F2	Float Trash / Lamprey Ops	6/18/17 21:29	6/19/17 4:29	1 H	6 H	
F2	Float Trash / Lamprey Ops	6/19/17 21:29	6/20/17 4:31	1 H, 1 M	6 H	
F2	Float Trash / Lamprey Ops	6/20/17 21:29	6/21/17 4:32	1 H, 3 M	6 H	
F2	Float Trash / Lamprey Ops	6/21/17 21:30	6/22/17 4:30	1 H	6 H	
F1	Float Trash / Lamprey Ops	6/22/17 21:29	6/23/17 4:40	1 H, 11 M	6 H	
F2	Float Trash / Lamprey Ops	6/23/17 20:03	6/24/17 4:27	2 H, 24 M	6 H	
F1	Float Trash	6/24/17 18:49	6/24/17 19:22	33 M		
F2	Float Trash	6/24/17 19:26	6/24/17 20:03	36 M		
F2	Float Trash / Lamprey Ops	6/24/17 22:08	6/25/17 4:35	35 M	5 H, 51 M	
F2	Float Trash / Lamprey Ops	6/25/17 21:28	6/26/17 4:27	59 M	6 H	
F2	Float Trash / Lamprey Ops	6/26/17 21:26	6/27/17 4:50	1 H, 23 M	6 H	
F2	Float Trash / Lamprey Ops	6/27/17 21:43	6/28/17 4:29	46 M	6 H	
F2	Float Trash / Lamprey Ops	6/28/17 21:28	6/29/17 4:29	1 H, 1 M	6 H	
F2	Float Trash / Lamprey Ops	6/29/17 21:35	6/30/17 4:26	51 M	6 H	
F2	Float Trash / Lamprey Ops	6/30/17 21:30	7/1/17 4:28	57 M	6 H	
F2	Float Trash / Lamprey Ops	7/1/17 22:18	7/2/17 4:31	31 M	5 H, 41 M	
F1	Lamprey Ops	7/2/17 22:00	7/3/17 1:25		3 H, 25 M	
F2	Float Trash / Lamprey Ops	7/3/17 1:26	7/3/17 4:36	36 M	2 H, 34 M	
F2	Float Trash / Lamprey Ops	7/3/17 22:00	7/4/17 4:33	33 M	6 H	

F2	Float Trash / Lamprey Ops	7/4/17 22:09	7/5/17 4:34	33 M	5 H, 51 M	
F2	Float Trash / Lamprey Ops	7/5/17 22:02	7/6/17 4:31	31 M	5 H, 58 M	
F2	Float Trash / Lamprey Ops	7/6/17 22:03	7/7/17 4:27	27 M	5 H, 57 M	
F2	Lamprey Ops	7/7/17 22:01	7/8/17 3:56		5 H, 54 M	
F2	Float Trash / Lamprey Ops	7/8/17 22:01	7/9/17 4:29	29 M	5 H, 59 M	
F2	Float Trash / Lamprey Ops	7/9/17 22:02	7/10/17 4:37	37 M	5 H, 58 M	
F2	Float Trash / Lamprey Ops	7/10/17 21:59	7/11/17 4:29	29 M	5 H, 58 M	
F2	Float Trash / Lamprey Ops	7/11/17 22:01	7/12/17 4:27	27 M	5 H, 58 M	
F2	Float Trash / Lamprey Ops	7/12/17 21:59	7/13/17 4:29	30 M	6 H	
F2	Float Trash / Lamprey Ops	7/13/17 21:59	7/14/17 4:29	30 M	5 H, 59 M	
F2	Float Trash / Lamprey Ops	7/14/17 22:02	7/15/17 4:27	27 M	5 H, 58 M	
F2	Float Trash / Lamprey Ops	7/15/17 21:59	7/16/17 4:27	28 M	6 H	
F2	Float Trash / Lamprey Ops	7/16/17 22:00	7/17/17 4:29	29 M	6 H	
F2	Float Trash / Lamprey Ops	7/17/17 22:02	7/18/17 4:29	29 M	5 H, 58 M	
F2	Float Trash / Lamprey Ops	7/18/17 22:04	7/19/17 4:33	33 M	5 H, 55M	
F2	Float Trash / Lamprey Ops	7/19/17 22:00	7/20/17 4:28	28 M	6 H	
F2	Float Trash / Lamprey Ops	7/20/17 22:00	7/21/17 4:30	30 M	6 H	
F2	Float Trash / Lamprey Ops	7/21/17 21:57	7/22/17 4:28	31 M	6 H	
F2	Float Trash / Lamprey Ops	7/22/17 22:04	7/23/17 5:07	1 H, 7 M	5 H, 55 M	
F2	Float Trash / Lamprey Ops	7/23/17 22:06	7/24/17 4:28	28 M	5 H, 54 M	
F2	Float Trash / Lamprey Ops	7/24/17 22:00	7/25/17 4:33	32 M	6 H	
F2	Float Trash / Lamprey Ops	7/25/17 22:00	7/26/17 4:37	37 M	6 H	
F2	Float Trash / Lamprey Ops	7/26/17 22:04	7/27/17 4:35	35 M	5 H, 56 M	
F2	Float Trash / Lamprey Ops	7/27/17 22:00	7/28/17 4:29	29 M	6 H	
F2	Float Trash / Lamprey Ops	7/28/17 22:03	7/29/17 4:31	31 M	5 H, 57 M	
F2	Float Trash / Lamprey Ops	7/29/17 22:01	7/30/17 4:29	29 M	5 H, 59 M	
F2	Float Trash / Lamprey Ops	7/30/17 22:02	7/31/17 5:07	1 H, 7 M	5 H, 57 M	

F2	Float Trash / Lamprey Ops	7/31/17 22:05	8/1/17 5:01	1 H, 1 M	5 H, 54 M	
F1	PH2 ROV Inspection	8/1/17 6:57	8/1/17 14:12			7 H, 14 M
F2	PH2 ROV Inspection	8/1/17 6:58	8/1/17 14:14			7 H, 16 M
F2	Float Trash / Lamprey Ops	8/1/17 21:45	8/2/17 4:59	1 H, 14 M	6 H	
F2	Float Trash / Lamprey Ops	8/2/17 21:45	8/3/17 4:57	1 H, 12 M	6 H	
F2	Float Trash / Lamprey Ops	8/3/17 21:44	8/4/17 5:00	1 H, 16 M	6 H	
F2	Float Trash / Lamprey Ops	8/4/17 21:48	8/5/17 5:04	1 H, 16 M	6 H	
F1	Float Trash / Lamprey Ops	8/5/17 21:45	8/6/17 5:02	1 H, 17 M	6 H	
F2	Float Trash / Lamprey Ops	8/6/17 21:47	8/7/17 5:00	1 H, 13 M	6 H	
F1	BPA Maint.	8/7/17 10:00	8/7/17 15:00			5 H
F2	BPA Maint.	8/7/17 10:00	8/7/17 15:54			5 H, 54 M
F1	Operations	8/7/17 15:00	8/7/17 15:06			6 M
F1	Float Trash / Lamprey Ops	8/7/17 21:46	8/8/17 5:02	1 H, 16 M	6 H	
F2	Operations	8/8/17 6:54	8/8/17 7:01			6 M
F2	Float Trash / Lamprey Ops	8/8/17 21:45	8/9/17 5:00	1 H, 15 M	6 H	
F1	Float Trash / Lamprey Ops	8/9/17 21:46	8/10/17 5:01	1 H, 15 M	6 H	
F2	Float Trash / Lamprey Ops	8/10/17 21:54	8/11/17 4:57	1 H, 3 M	6 H	
F2	Float Trash / Lamprey Ops	8/11/17 21:44	8/12/17 5:06	1 H, 22 M	6 H	
F1	Float Trash / Lamprey Ops	8/12/17 22:06	8/13/17 4:59	59 M	5 H, 54 M	
F2	Float Trash / Lamprey Ops	8/13/17 22:07	8/14/17 4:52	52 M	5 H, 53 M	
F2	Float Trash / Lamprey Ops	8/14/17 22:41	8/15/17 5:05	1 H, 5 M	5 H, 19 M	
F2	Float Trash / Lamprey Ops	8/15/17 21:55	8/16/17 5:02	1 H, 7 M	6 H	
F2	Float Trash	8/16/17 5:10	8/16/17 5:23	13 M		
F1	Float Trash / Lamprey Ops	8/16/17 21:44	8/17/17 0:27	16 M	2 H, 27 M	
F2	Float Trash / Lamprey Ops	8/17/17 0:27	8/17/17 5:01	1 H, 1 M	3 H, 32 M	
F2	Arcing & Temp Alarms	8/17/17 11:41	8/29/17 7:44			11 D, 20 H, 3 M
F1	Float Trash / Lamprey Ops	8/29/17 20:30	8/30/17 0:05	1 H, 30 M	2 H, 5 M	
F2	Float Trash / Lamprey Ops	8/30/17 0:40	8/30/17 5:01	1 H, 1 M	4 H, 20 M	
F1	Float Trash / Lamprey Ops	8/30/17 20:30	8/31/17 5:01	1 H, 30 M	1 H, 1 M	
F1	Float Trash	9/7/17 0:09	9/7/17 3:46	3 H, 37 M		
F2	Float Trash	9/7/17 3:48	9/7/17 4:30	42 M		
F2	Float Trash	9/9/17 1:49	9/9/17 3:08	1 H, 18 M		

F1	Float Trash	9/9/17 3:10	9/9/17 4:08	58 M		
F2	Float Trash	10/28/17 18:50	10/28/17 20:25	1 H, 34 M		
F1	Float Trash	10/28/17 20:27	10/28/17 22:29	2 H, 1 M		
F2	Float Trash	10/29/17 17:44	10/29/17 20:13	2 H, 29 M		
F2	Float Trash	11/14/17 1:10	11/14/17 2:16	1 H, 6 M		
F1	Float Trash	11/14/17 2:19	11/14/17 3:23	1 H, 4 M		
F1	Float Trash	11/21/17 21:13	11/21/17 22:54	1 H, 41 M		
F2	Float Trash	11/21/17 22:59	11/22/17 1:03	2 H, 3 M		
Total Durations:						
F1				23 H, 23 M	48 H, 7 M	99 D, 4 H, 21 M
F2				4 D, 20 H, 9 M	17 D, 12 H, 28 M	107 D, 17 H, 23 M

3. FISH PASSAGE PLAN COMPLIANCE

3.1 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 **298** daily 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 4). Items in criteria 100% of the time are not listed. Explanations for items that were in criteria less than 90% of the reporting year, or having unusual circumstances, are given below.

Table 5. Fish Passage Plan violations and percent in criteria.

VIOLATIONS	Occurrences	In Criteria (%)
No inspections by Project Biologists	14 out of 313	95.50%
No calibration	6 out of 40	85.00%
PH1 Violations		
PH1 S differential	8	97.30%
PH1 N differential	10	96.60%
Gate Position: PH1 WG-2	24	91.90%
Gate position: PH1 WG-64	24	91.90%
PH1 velocity meter / CC velocity	6	98.00%
Depth over weir at BI	1	99.70%
Depth over weir at A-branch	74	75.20%
A-branch diffusers FG3-3 – FG3-8	298	*0%
PH1CC diffusers	1	99.70%
Depth over weir at B-branch	2	99.30%
B-branch entrance differential	6	98.00%
PH2 Violations		
Cascades Island diffusers	7	97.70%
Cascades Island entrance differential	20	93.30%
Depth over weir at UMT	1	99.70%

Spillway Bays	1	99.70%
Head or depth: PH2 NDE	162	*54.4%
Head or depth: PH2 SUE	12	96.00%
Head or depth: PH2 SDE	9	97.00%
PH2 diffuser positions	298	*0%
Depth over PH2 weir 37	100	*66.4%
Depth over PH2 weir 38	96	*67.8%
Avian Arrays	298	*0%

*FG 3-3 experienced mechanical trouble in March 2016. The diffuser was set to the open position and unplugged to prevent further damage. It should be closed below tailwaters of 8.2' msl. Repairs are in progress during the 2017/18 winter maintenance.

*FG3-4 diffuser shaft was found to be vibrating unusually. The diffuser was closed on 29 Dec 2016 to prevent further damage to the gate. Repairs are in progress during the 2017/18 winter maintenance.

*FG3-8 was found to be banging loudly on 11 May and was closed prevent further damage to the gate. It should be open above tailwaters of 28.2' msl. Repairs are in progress during the 2017/18 winter maintenance.

*The water depth over the A-branch weir often reads 1.2', which is higher than the 1.1' maximum prescribed in the FPP. The cause is thought to be leakage from the FV3-7 conduit into the ladder near the staff gauge, as water frequently upwells between the gravel and concrete margin of the fishway in that vicinity. Repairs are in progress during the 2017/18 winter maintenance.

*The NDE was found to be stuck and unable to open past 5' in July. It was kept in manual at 5.9', awaiting repair, until it was found to have fixed itself (become unstuck) in December. During that time gate submergence was less than 13' (out of criteria).

*PH2 diffuser B4 was discovered to have its stem bent on 24 May. It likely occurred while closing and is believed to be stuck open. It should be closed at tailwaters above 31.0' and below 11.0' msl.

*****Bonneville had the majority of its avian lines broken due to ice storms during the 2016/17 winter. Avian lines will be replaced after spillbay rock removal in 2018.

3.2 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, allowing inspection of the screens while they are installed and while the unit is running. PH2 STSs are generally installed in operational units from the end of February until December 15 for juvenile fish passage and for adult fallbacks. PH1 screens have been permanently removed.

Table 6. STS / VBS inspections.

Unit	STS Install Dates	STS Removal Dates	STS / VBS Inspection Dates & Run Hours Between Inspections								
11	23-Feb	18-Dec	3-Apr	1-May	6-Jun	6-Jul	7-Aug	11-Sep	2-Oct	6-Nov	4-Dec
			938	650	860	955	418	747	157	516	669
12	8-Mar	18-Dec	3-Apr	1-May	6-Jun	6-Jul	7-Aug	11-Sep	2-Oct	6-Nov	4-Dec
			279	648	857	1042	207	373	158	631	674
13	23-Feb	16-Dec	3-Apr	1-May	6-Jun	6-Jul	7-Aug	11-Sep	2-Oct	6-Nov	4-Dec
			932	651	863	1003	135	268	95	770	674
14	22-Feb	18-Dec	3-Apr	1-May	6-Jun	6-Jul	7-Aug	11-Sep	2-Oct	6-Nov	4-Dec
			658	649	810	485	---	1	1	---	---
15	22-Feb	19-Dec	3-Apr	1-May	6-Jun	6-Jul	7-Aug	11-Sep	2-Oct	6-Nov	4-Dec
			850	640	854	947	49	45	78	445	668
16	22-Feb	19-Dec	3-Apr	1-May	6-Jun	6-Jul	7-Aug	11-Sep	2-Oct	6-Nov	4-Dec
						507	32	325	501	749	672
17	22-Feb	19-Dec	3-Apr	1-May	6-Jun	6-Jul	7-Aug	11-Sep	2-Oct	6-Nov	4-Dec
			935	650	853	---	---	427	500	191	291
18	22-Feb	20-Dec	3-Apr	1-May	6-Jun	6-Jul	7-Aug	11-Sep	2-Oct	6-Nov	4-Dec
			935	650	863	1055	422	---	---	346	---

3.3 Avian Abatement Measures

USDA Wildlife Service's avian hazing occurred from April through July 2017. This was done from the tailrace side of the powerhouses, the spillway, and the shoreline.

3.4 Fish Counts

The Corps of Engineers contracted with Normandeau Associates, Inc. for all fish counting during the 2017 fish passage season. The fish count season is year round with visual counts from March until December and video counts during the rest of the year. All fish count numbers may be found at the Fish Passage Center.

4. WATER QUALITY MONITORING

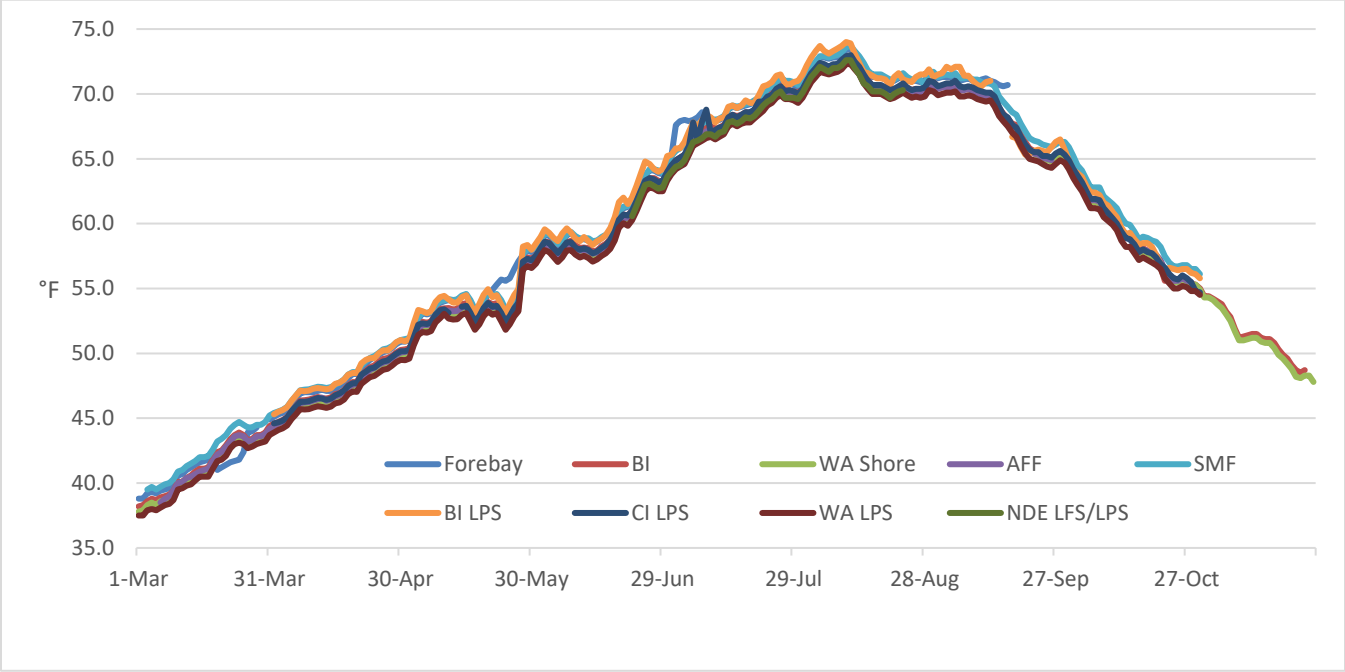
4.1 Zebra/Quagga Mussels

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.

4.2 Fishway Temperature Monitoring

Project biologists monitor fishway temperatures throughout the fish passage season, from 01 March through 30 November. Temperature probes are installed in the upper Bradford Island and WA shore fishways, the Adult Fish Facility (AFF), and the Smolt Monitoring Facility (SMF). 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 2017, these temperatures were available from 01 March - 22 September. Detailed daily temperatures can be found in the weekly reports and are available upon request.

Figure 2. 2017 Bonneville temperatures.



5. FISHWAY MODIFICATIONS (1996 - present)

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

2015/16. Modified Bradford crowder station to reduce lamprey mortality due to crowder run-over and those dying in area behind crowder. Perf plate in count slot, skirt in bottom of crowder, plating on sides of crowder.
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

2016. Gaps in picket leads fixed with addition of new pickets to reduce lamprey incursion into AWS.
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

2017. Remove Collection Channel velocity meter.
2017. Permanent SLIBs (Sea Lion Incursion Devices) were fabricated and installed on top of FOGs to prevent Sea Lions from entering the fishway.
2017. An opening in the wall separating the crowder area of the main ladder from the AWS was covered with screen to prevent possible Sockeye incursion into the AWS.
2017. Installed ID plates at bases of "C" diffusers in the collection channel for ROV inspections.
2017. The base of the AWS picket leads was modified to reduce possible Sockeye incursion into the AWS.
2016/17. Flow control plates installed in 'A' and 'B' gatewells of all PH2 units, plating on upper sections of VBSs.
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

2016. LED lighting improvements to DSM.
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 hydro-cannon 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

2017. Blackout blinds were installed over visitor center viewing windows in order to reduce in-ladder nighttime light pollution.
2017. The count station crowder was modified with perf plating and a rubber "skirt" to reduce incidences of lamprey being run over. Grating was installed on the downstream side of the crowder to reduce fish incursion into the area behind the crowder.
2016/17. FLS velocity barrier plate installed to reduce areas of high velocity.
2016/17. Removed lamprey plating in N entrance area, replaced with orifice plates. AWS LPS extensions and new pump system. Orifice slots drilled in lower serpentine weir walls; trial rest boxes installed.
2016. LFS repairs. Divers replaced missing hatch, hydraulic air entrainment 'dampener' installed.
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.

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2017. Fish Passage Plan for Corps of Engineers Projects. U. S. Army Corps of Engineers, Northwestern Division, Portland, Oregon.

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