McNary Lock and Dams Annual Adult Fish Report 2018

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ADULT FISH FACILITIES

Introduction

McNary dam has specific requirements for aiding the passage of ESA listed Columbia River fish. These requirements are listed in the annual Fish Passage Plan. As part of the requirements, reports are written on a weekly and annual basis to describe fish related operations occurring on the project. The following document is a summary of adult fish passage operations that occurred at McNary Dam in 2018.

McNary dam's adult passage facilities consist of a separate south (Oregon) and north (Washington) shore facility which are described in detail in the facility description section below. Upstream migrants are present throughout the year thus adult facilities are operated year around. Maintenance of adult facilities are scheduled annually during the months of January and February, typically one ladder at a time, to minimize the impacts on the upstream migrants.

Facilities Description

The adult fish passage facilities at McNary consist of separate north and south shore facilities. The north shore (Washington) facility includes a fish ladder with a counting station, a collection system, and a gravity-flow auxiliary water supply system. The collection system has three downstream entrances and a side entrance into the spillway basin, which is closed. In normal operations, the facility only uses the two of the downstream entrances (W2 and W3). The gravity-flow auxiliary water supply system takes water from the forebay through two conduits, passes it through a ten megawatt generator owned by the North Wasco County Public Utility District (PUD), and then distributes flow through diffusers at the bottom of the ladder and in the entrance pool. The old fish lock, located adjacent to the generator, acts as the water supply bypass route when the generator is not in service, distributing the flow to the same diffuser system.

The south shore (Oregon) facility includes a fish ladder with a counting station, two south shore entrances (SFEW1 and SFEW2), a powerhouse collection system, a gravity-flow auxiliary water supply system and a pumped auxiliary water supply system. At the north end of the powerhouse collection system, one side entrance weir, which is closed, faces into the spillway basin and the three other weirs face downstream. During normal operation, two of the downstream entrances are used (NFEW2 and NEFW3). The system also includes twelve floating orifices located across the powerhouse and a common collection channel. One conduit from the forebay supplies gravity-flow auxiliary water to diffusers 7 to 14 at the bottom of the ladder. Three electric pumps with variable-pitched blades pump additional auxiliary water to the remainder of the ladder system from diffusers 1 to 7 and the collection channel. Two pumps can provide the required flow, generally, when the third pump's intake and discharge are sealed with bulkheads. Finally, the juvenile facility routes excess water from the primary dewatering structure in the

juvenile fish collection channel to the adult collection system at the north end of the powerhouse.

Winter Facilities Modifications and Improvements

On the Washington ladder, these modifications and improvements were made in 2018:

1. Rehabilitation of the drives were completed on exit tilting weirs 337 and 339.
2. A new picketed leads hoist was installed.
3. Temperature probe still wells were installed.
4. Exit dewatering pump replaced (oil less).

On the Oregon ladder, the project staff completed these modifications and improvements:

1. Rehabilitation of the drives were completed on exit tilting weirs 334, 335 and 336.
2. Temperature probe still wells were installed as time allowed.
3. The count station back board motor and drive were replaced.
4. The exit traveling screens access doors were improved.
5. One potable water line was repaired.
6. The exit floating trash rack was rehabilitated.
7. Exit weir 339 encoder was replaced.

In-season ladder modifications can be found in this report's text.

Operations and Maintenance

Fishway Activities

Table 1 below outlines both ladders' fish counting schedule. The project had picketed leads in place during the counting season.

Table 1. Fish Counting Schedule.	
Dates	Activity
Jan 1 – Feb 28	Day video counting (0400-2000 hours (PST)).
Mar 1 – 31	No counting.
Apr 1 – Oct 31	Visual counting daily (0400-2000 hours (PST)).
Jun 15 – Sep 30	Night lamprey passage video reviewed (2000-0400 hours (PST)).
Nov 1 – Dec 31	No counting.

The count stations were maintained as needed throughout the year. Adult salmonid PIT tag detection continued. NOAA fisheries continued their monthly ladder inspections. University of Idaho conducted an adult lamprey passage study.

Water Temperature Monitoring

Water temperature was monitored from April 1 to September 29. The probes recorded temperatures hourly and were downloaded weekly. In April, there were issues with the download shuttle. On June 8, the probe in the Oregon south shore tailwater area had to be replaced. On June 18, with decreased spill, the probe for the Oregon north powerhouse tailwater area was installed. On July 12, due to a faulty shuttle, the probes had to be removed and relaunched. Approximately 24 hours of data was lost and not retrievable. A shuttle was borrowed, and two new shuttles were ordered. Between August and October, preparation, and installation of a permanent, automated temperature monitoring system for both ladders occurred. On September 21, the automated system became fully functional. On October 29 and 30, the final still wells needed for the probes were installed (some probes were previously weighted).

Adult Fish Trap Operations

McNary has no active trapping program and no outside agencies trapped at McNary this year.

Fish Ladders and Collection Channel Schedules

Table 2 below outlines both ladders' operation and maintenance schedules.

Table 2. Fish Ladder Operating Schedule.	
Ladder/Dates	Activity
Washington	
Jan 1 – 2	Ladder in service.
Jan 2 – 30	Ladder out of service for inspection and maintenance.
Jan 30 – Dec 31	Ladder in service.
Oregon	
Jan 1 – Feb 1	Ladder in service.
Feb 1 – Feb 27	Ladder out of service for inspection and maintenance.
Feb 27 – Dec 31	Ladder in service.

Invasive Species

No invasive species were noted during the ladders' dewatering. The mussel station examinations revealed no problems during the season. There are stations in each ladder exit.

Lamprey Passage

There were no additions or changes to the current lamprey passage structures. There were no special operations of the ladders for adult lamprey passage.

Washington Ladder Outage

On January 1, the operators switched the Washington ladder to orifice flow. On January 2, the general maintenance crew completed installation of the exit and PUD conduit stop logs completing the dewatering to tailwater.

During the Washington ladder outage, the project did the following repairs and inspections:

1. The ladder exit was inspected, and debris was removed. Four lamprey ports were blocked with debris. Five ports were partially blocked. One regulating weir orifice was partially blocked. The regulating and tilting weirs, stationary weirs and counting station structures were in good condition and received maintenance.

General maintenance cleaned and painted the count station window floor panel and back board. The fisheries crew cleaned the staff gauges and sensors' still wells.

2. The fisheries staff examined the ladder stationary weirs and submerged orifices removing debris. Five orifices were partially blocked.
3. With new entrance stop logs available, the entrance pool was dewatered for the first time in 10 years. On January 5, the grating was physically examined, and no significant problems were found. Debris was removed and no blockages were observed.
4. PSMFC and COE personnel preformed maintenance on the ladder's adult PIT tag detectors and associated equipment as needed. The duplex antennas were examined.
5. During the ladder dewatering, two steelhead smolts and several unlisted species of fish were evacuated.
6. All entrance weirs received preventative maintenance, were calibrated and their limits were checked.
7. The debris at the PUD's conduits' intakes was compressed as there is no way to remove it.

Operations of the PUD unit will be discussed later in the Auxiliary Water Section. On January 30, orifice flow was resumed. The next day, the ladder was fully returned to service in automatic mode.

Washington Ladder Exit-Season

Before the winter outage, three exit alarms were reset. During the season, at the Washington exit, the fisheries staff checked the set points on each inspection. With the sensor still wells having been cleaned, the operators made set point adjustments as needed. The exit was in automatic mode most of the year. Exit issues effect on criteria points will also be discussed in the Results Section below.

Debris loads at the exit continue to be an issue. The picketed leads were checked daily or multiple times per day during the counting season and cleaned whenever required, which included holidays, nights, call-ins, and weekends at times. Exit trash racks were cleaned year-round. The debris loads fluctuate between minimal and heavy. From March to June, the peak debris loads occurred during high flow and after storms. The debris consisted mostly of tumbleweeds and some woody material. During this time, debris was passed down the navigation lock as needed. From June to December, in a lesser volume, aquatic vegetation was the principle debris component, which required removal.

The mechanical and general maintenance staffs performed schedule maintenance on the exit weirs, the picketed lead hoist, and the exit trash rack hoist. Also, the general maintenance crew cleaned the trash rack and the count station backboard as needed. The fisheries staff performed maintenance on the PIT tag station heat pumps as required. In season issues will be reflected in Table 3.

Table 3. In-Season Washington Ladder Exit Issues.		
Date	Issue	Reason/ Result
Mar 21	Water drain broken by PIT station.	Repaired.
Mar 31	Picketed leads lowered.	For counting season.
Apr 7	Forebay elevation sensor failed & tripped alarm. Out of criteria.	Exit in manual until sensor replaced. Operators adjusted weirs.
Apr 9	Sensor replaced.	Exit returned to automatic.
Apr 15	Count station differential = 0.6'.	Cleaned leads.
Apr 16	Exit crane.	Scheduled maintenance.
Apr 21	Regulating weir alarm.	Reset.
Apr 23	Brief power outage.	Electrical switching.
Apr 23	Log on stationary weir.	Removed.
May 4 & 6	High count station differential.	Cleaned leads.
May 10	Regulating weir alarm.	Reset.
May 10	Log on tilting weir 336.	Removed.
May 10	Exit control panel HVAC unit.	Examined.
May 13	High count station differential.	Cleaned leads.
May 16	High count station differential.	Cleaned leads/alarms reset.
May 20	Various issues.	Control program examined.
May 23	High count station differential.	Cleaned leads.
May 23	Low water alarm.	Reset.
May 25	Multiple alarms.	Reset.
May 30	High count station differential.	Cleaned leads.
May 30	Control program.	Upgraded.
May 31	Exit alarms.	Tested.
Jun 3	Loss of power alarm.	Reset.
Jun 3	Root wad in upstream count station opening.	Removed.
Jun 4	Railroad tie on stationary weir/large log on trash rack.	Removed in winter/removed that day.
Jun 8	Regulating weir alarm.	Reset.
Jun 19	Low water alarm.	Reset.
Jun 25	Brief power outage.	Electrical switching.
Jul 6	Regulating weir alarm.	Reset.
Jul 13	Exit alarm.	Reset.
Jul 22	Exit alarm.	Reset.
Jul 24	Regulating weir alarm.	Reset.
Jul 29	Two exit alarms.	Reset.
Aug 2	Exit weirs.	Electrical examination.
Aug 4	Log on picketed leads.	Removed.
Aug 10 & 14	Three regulation weir alarms.	Reset.
Aug 15	Area lighting.	Repaired.
Aug 22	One regulating weir alarm.	Reset.
Aug 24	One exit alarm.	Reset.

Aug 27	New exit pool dewatering pump.	Installed.
Sep 7	Multiple exit alarms.	Reset.
Sep 9	One regulating weir alarm.	Reset.
Sep 12	Count station brush on bottom.	Two hours for airline replacement.
Sep 17	One regulating weir alarm.	Reset.
Sep 18	One high picketed lead differential alarm.	Reset.
Sep 26	Two high picketed lead differential alarms.	Reset.
Sep 27	Picketed leads.	Cleaned twice.
Sep 28 to Oct 4	Leads cleaned multiple times.	Aquatic vegetation.
Oct 5	High count station differential.	Leads cleaned.
Oct 5 to 11	Leads cleaned multiple times.	Aquatic vegetation.
Oct 7	One regulating weir alarm.	Reset.
Oct 17	Three high picketed lead differential alarms.	Leads cleaned and alarm reset.
Oct 25	Multiple exit alarms.	Reset.
Nov 1	Picketed leads raised/Count station winterized.	Adult fish counting concluded.
Nov 25	Low water alarm.	Reset.
Dec 18	Dewatering pumps.	Scheduled maintenance.
Dec 26	One exit alarm.	Reset.

Fish passage appeared unaffected by the events described in Table 3 above.

Washington Ladder Entrance-Season

At the Washington entrance, weir W1 remains in standby. In the spring, during high tailwater elevations, W1 would have approximately one-foot flow over it. After initial calibration, the project used W2 and W3 in automatic operation. Scheduled maintenance and calibration checks occurred throughout the year. Entrance issues effect on criteria points are also discussed in the Results Section. In-season problems will be reflected in Table 4 below.

With the new digital encoders and controls along with new weir motors and drive shafts installed in previous years, calibration drifts, especially during the spill season, have been greatly reduced.

The Washington ladder problems describe in Table 4 above appeared to have had no adverse effect on fish passage. Issues with the auxiliary water supply will be discussed in the Auxiliary Water Supply Section below.

Table 4. In-Season Washington Ladder Entrance Issues.		
Date	Issue	Reason/Result
Mar 4	Weir dial indicators.	Calibrated.
Mar 19	W3 encoder shaft replaced.	Resolved calibration issue.
Apr 8	W2 not functioning but in criterion.	Switched to manual mode.
Apr 9	W2 electrically repaired.	Returned to automatic mode.
Apr 15 to 18	W2 and W3 wide elevation fluctuations.	Heavy spill. Electricians examined and dampened weirs response.
Apr 22 to May 1	W3 out of calibration & in/out of criterion.	Electricians resolved the issue with control part replacement.
May 17	Large flow volume over W1, raised, in standby. High tailwater.	Operators raised W1, returning W2 & W3 to criteria.
May 27	W3 electrical control box damaged.	Possibly due to heavy spill.
May 30	Control program.	Upgraded.
May 31	W3 in manual for 6.3 hours, in criteria.	Control box repaired.
Jul 11	Entrance weirs.	Scheduled maintenance.
Jul 18 to 19	W3 out of criteria & not functioning. To manual mode.	Mechanics replaced drive chain. Returned to automatic.
Aug 22 to 29	PUD unit out of service. Entrance pool out of criteria, W2 & W3 moved excessively. Weirs to manual mode.	Operator moved weirs as need for tailwater changes. Pool stable. Weirs out of criteria at times.
Aug 29	W2 still in manual mode.	Operators returned to automatic.
Dec 18	Entrance dewatering pumps.	Scheduled maintenance.

Oregon Ladder Outage

On January 31, the operators switched the Oregon ladder to orifice flow. On February 1, project staff installed the exit and juvenile bypass stop logs, which allowed inspection and maintenance from the exit to tailwater to begin. Also, work mentioned in the Modifications section was done.

For the Oregon ladder outage, project staff did the following repairs and inspections:

1. The fisheries staff inspected the ladder exit and removed debris. Six partially to fully obstructed lamprey ports were found. The regulating and tilting weirs, stationary weirs and counting station structures were in good condition and received maintenance. The general maintenance crew cleaned and painted the count station window floor panel and back board. The fisheries staff cleaned staff gauges and sensor still wells.
2. The fisheries staff inspected the ladder stationary weirs and submerged orifices, removing debris. No blockages were found.
3. Due to the 1000 cfs axillary supply conduit being open and the water velocity it creates, the diffuser grating was not examined.

4. PSMFC and COE personnel preformed maintenance on the ladder's adult PIT tag equipment as needed. The duplex antennas were examined.
5. During ladder dewatering and debris removal, two adult steelhead, two steelhead smolts, 28 adult lamprey and several unlisted species of fish were evacuated. On February 22, eighteen adult lamprey mortalities were removed from the downstream count station "spacer". Project personnel filled the gaps around both the upstream and downstream "spacers" to exclude adult lamprey in the future.
6. All entrance weirs received preventative maintenance, were calibrated and their limits were checked.

Auxiliary water operations will be discussed in that section. On February 27, the Oregon shore ladder was fully returned to service in automatic mode.

Oregon Ladder Exit-Season

Before the winter outage, exit alarms were reset and weirs 335 and 336 were switched to bypass mode on January 25. The weir issues were resolved during the outage.

During the season, at the Oregon exit, the fisheries staff checked the set points on each inspection. With the sensor still wells having been cleaned, the operators made set point adjustments as needed. The exit was in automatic mode most of the year. Exit issues effect on criteria points will also be discussed in the Results Section below.

Debris loads at the exit continue to be an issue. The picketed leads were checked daily or multiple times per day during the counting season and cleaned whenever required, which included holidays, nights, call-ins, and weekends at times. Exit trash racks were cleaned year-round. The debris loads fluctuate between minimal to heavy with high flows and storms increasing the amount. Changes in wind direction affect the amount of debris along the Oregon shore as the debris moves to and from the powerhouse. From March to June, the debris consisted mostly of tumbleweeds and woody material. From June to December, Eurasian milfoil was the principle debris component along with woody material.

The mechanical staff performed schedule maintenance on the exit weirs. Also, the general maintenance crew cleaned the count station backboards as needed. In season issues are reflected in Table 5 below. None of the issue mentioned appeared to affect fish passage.

Table 5. In Season Oregon Ladder Exit Issues.

Date	Issue	Reason/Result
Mar 25	Weir 335 tripped alarm.	Reset.
Mar 27	Weir 338 tripped alarm.	Reset.
Mar 30	Picketed leads lowered.	For fish counting season.
Apr 16	Weir 335 tripped alarm.	Weir out of sequence. Reset.
Apr 16	Exit crane.	Scheduled maintenance.
Apr 21 & 22	Weir 335 tripped alarm each day.	Reset.

Apr 29 & 30	Low ladder flows.	Regulating weir set point adjusted.
Apr 30	Exit control program.	Updated.
May 10	Tilting weirs out of sequence.	Operator resolved.
May 13	Weir 335 tripped three alarms.	Reset each time.
May 16	Multiple exit alarms.	Reset.
May 30	Control program.	Upgraded again.
May 30	High picketed leads differential.	Leads cleaned.
May 30	Low head over weir.	Weir set points adjusted.
May 31	Exit alarms.	Scheduled test.
Jun 1	Low head over weir, high differential.	Leads cleaned. Set points adjusted.
Jun 18	Low head over weir.	Regulating weir set point adjusted.
Jun 28	Brief power outage.	Electrical switching.
Jul 29	Shad passage impeded.	Call in. Trash rack cleaned.
Aug 7	High count station differential.	Picketed leads cleaned.
Aug 9	Picketed lead flow.	Leads cleaned. Set points adjusted.
Aug 14	Low head over weir.	Set points adjusted.
Aug 16	Exit weirs out of sequence.	Operator adjusted weirs.
Aug 17	Low head over weir.	Issue unknown.
Aug 18	Trash rack debris.	Removed.
Aug 21 & 22	Multiple exit alarms due to debris issues.	Leads cleaned repeatedly.
Aug 24	Weirs 335 and 336 out of sequence.	Operator adjusted weirs.
Sep 4	Low head over weir.	Set points adjusted.
Sep 14 to 20	Intermittent high flows. Sep 16 to 18 leads cleaned. No debris.	Set point or program issue. Electricians to examine.
Sep 24	Previous week's flow.	No problem found.
Sep 25 & 27	Weir 340 out of sequence. Operators adjusted.	Electrical component replaced on Sep 27.
Sep 30	High count station differential/leads differential alarms.	Picketed leads cleaned.
Oct 10	Woody material on weir 337.	Removed.
Oct 19	Low head over weir. Flow swings.	Issue unknown. Monitor.
Oct 22	One-minute power outage.	Electrical switching
Nov 1	Leads raised/Count station winterized.	Adult fish counting concluded.
Nov 5	Flow swings. Weirs in manual mode 1.2 hours to clean sensor still wells.	After sensors read 0.1 to 0.2 higher. Weirs' set points adjusted.
Nov 7	Regulating weir alarm.	Reset.
Nov 21	High head over weir.	Tilting weir issue resolved.
Dec 16	Weir 338 tripped and alarmed.	Electricians resolved Dec 17.

Oregon Exit Traveling Screens

The traveling screens were not out of service this winter due to the 1000 cfs supply conduit not being closed, which will be discussed in the Auxiliary Water Section below. During the winter, the screens received scheduled maintenance. Also, the fisheries staff monitored the differentials on the screens with no problems observed.

For the season, the system continued to receive scheduled maintenance. Multiple false alarms were not an issue as sensor adjustments made last winter appeared to have resolved the problem. What few alarms there were this season got reset promptly with no issues observed. Our differential monitoring revealed no problems. The highest trash rack differential reading was 0.6 feet in late summer to early fall due to aquatic vegetation, which dissipated. When available, the fisheries staff monitored the traveling screen system. Most debris removal from the debris trough occurred from June to December.

For most of the season, the system was set to run six times a day for 20 minutes.

The issues discussed here had no ill affect on fish passage or the auxiliary water supply.

Oregon Ladder Entrances-Season

After initial calibration, NFEW2, NFEW3, SFEW1 and SFEW2 remained in automatic operation. With the new digital encoders and controls along with new weir motors and drive shafts installed in previous years, calibration drifts during the spill season due to hydraulic gradients have been greatly reduced. Calibration checks and scheduled maintenance occurred as needed throughout the year. At the Oregon north powerhouse entrance, weir NFEW1 remains in standby. In the spring, during high tailwater elevations, NFEW1 would have approximately one-foot flow over it. Entrance issues effect on criteria points are also discussed in the Results Section. In-season problems will be reflected in Table 6 below.

The fisheries staff performed maintenance on the PIT tag station heat pumps as required.

Finally, the nine open floating orifice gate entrances remained functional this year and were adjusted as required. Stop logs remained in W8, W14 and W21. Due to funding, no progress has made on rehabilitation/replacement of these gates.
The problems discussed here appeared to have not affected fish passage. Issues with auxiliary water will be discussed in that section below.

Oregon Channel Velocity

The velocity readings continued to be taken from surface observations in the powerhouse collection channel. The same issues mentioned in this report which affected flows at the powerhouse entrances, probably also affected velocity measurements. Criteria will be discussed in the Results section.

Table 6. In-Season Oregon Ladder Entrance Issues.		
Date	Issue	Reason/Result
Mar 4	Weir dial indicators.	SFEW1 & NFEW2 calibrated.
Apr 9	Weir dial indicators.	SFEW2 and NFEW3 calibrated.
May 25	All weirs out of criteria.	Inadvertently in manual mode after fish pump 3 outage.
May 30	Control program.	Upgraded.
Jun 1	North pool differential, NFEW2 & NFEW3 were out of criteria.	NFEW2 & NFEW3 jammed. Issue resolved.
Jun 3	NFEW3 in criterion but jammed.	Issue resolved. Weir left in manual.
Jun 8	SFEW1, SFEW2 & NFEW3 out of criteria.	NFEW3 is in manual, calibration drifts & hydraulic gradients.
Jun 10	NFEW3 after 7 days.	Back to automatic mode.
June 29 to Jul 2	North powerhouse entrance control panel view out.	Electrical resolved.
Jul 6	South entrance weirs in manual.	Resolve control system issues.
Jul 17	South powerhouse entrance control panel view overheating.	Shroud installed.
Aug 14	NFEW2 & NFEW3 out of criteria. All weirs manual mode.	Two fish pump outages for 48 minutes total.
Sep 2	SFEW1 & SFEW2 adjusted high (shallow) twice.	Operator switched to manual each time. Indicators not functioning.
Sep 3 & 4	Electrical staff revolved Sep 2 issue.	Control system repaired.
Sep 12	NFEW2 & NFEW3 out of criteria.	Fish pump 2 out of service.
Sep 14	NFEW2 & NFEW3 out of criteria.	Fish pump 2 still out of service.
Sep 17 to 20	NFEW2 & NFEW3 out of criteria. North tailwater elevation sensor.	Weirs' level set points adjusted. Tailwater sensor examined.
Oct 19	NFEW2 & NFEW3 out of criteria.	Calibration drifts possible.
Oct 29	SFEW2, NFEW2 & NFEW3 out of criteria.	Low tailwater elevation & a fish pump outage.
Oct 29	SFEW1 and SFEW2 adjusted high (shallow).	Operated put in manual mode, adjusted, and returned to automatic.
Dec 8	SFEW1 ran up to its upper limit.	Operator reset weir.
Dec 12 to 13	SFEW1 & SFEW2 without power 23.1 hours. In criteria/tailwater stable.	Conduit failed. Water in control panel. Repaired.
Dec 17	NFEW2 & NFEW3 out of criteria. Low tailwater.	No auxiliary water from juvenile channel. Electrical work.
Dec 18 to 31	NFEW2 & NFEW3 out of criteria. Low tailwater.	No auxiliary water from juvenile channel.

Washington Ladder Auxiliary Water Supply

The Washington ladder received its auxiliary supply water through the Wasco/Klickitat Public Utility District (PUD) project's turbine or the conduit bypass when either was operational. Conduits 1 and 3 are used during bypass. Conduits 3 and 4 are used during unit operation. Conduit 2 is only used for equalization.

Before the unit's winter outage, there were no problems. The unit's winter outage occurred from January 2 to 31.

Passage season unit outages and issues are recorded in Table 7 below. When the unit was out of service, the bypass system operated well, and unit outages had little effect on inspection criteria points or fish passage. Bypass conduit valves automatically switch between the two supply systems resulting in continuous flow into the ladder. Inspection points will be discussed in the Results Section.

Table 7. Passage Season PUD Unit Outages and Events.

Dates	Time	Event
May 14 to 22	0859 to 1522 hours.	Exciter replacement.
May 31	1025 to 1130 hours.	Conduits' intake debris compacted/flow improved. One low entrance pool alarm.
Aug 20	0402 to 1512 hours.	Brush issue resolved. 20 to 30 delay in bypass opening.
Aug 22 to 29	1830 to 1140 hours.	Brush and control repairs. Inspection.
Sep 17	0555 to 0955 hours.	Switching for transformer maintenance.
Sep 21	1100 to 1143 hours.	Switching for transformer maintenance.
Oct 19	0830 to 1131 hours.	Scheduled maintenance.

Oregon Ladder Auxiliary Water-The Juvenile System (JFF)

The juvenile fish system was operated for juvenile and adult fallback bypass from March 26 to December 19. From December 10 to 19, the juvenile system was in emergency bypass and did not supply 450 cfs to the Oregon north powerhouse entrance. From December 19 to March 2019, the juvenile system will be out of service. This system is discussed in the 2018 Juvenile Report.

The loss of JFF bypass flow does affect the criteria of the north powerhouse pool differential and entrances which will be seen in the Results Section.

Oregon Ladder Auxiliary Water-1000 CFS Conduit

The conduit's intake valve was not closed this winter for maintenance or during the year. According to the Operations Manual, this valve is only to be closed during an emergency and not for maintenance season. For maintenance, the conduit's discharge valves located near the diffusers are to be closed. However, this cannot be done as these valves need replacement. Thus, the conduit remained open.

Oregon Ladder Auxiliary Water-Fish Pumps

The winter outage occurred on January 31 to February 27. All required electrical and mechanical maintenance was preformed at this time.

During the season, the fish pumps ran with 22-degree blade angles. When one or more fish pumps had an outage, the blade angle was increased on the remaining pump(s). Fish pump outages are outlined in Table 8 below. Despite these fish pump outages, fish passage remained timely and consistent all season. With two to three fish pumps operational, the Oregon ladder entrances remained in criteria for the most part. Criteria will be discussed in the Results Section below.

Table 8. Oregon Fish Pump Outages.

Pump(s)	Dates	Time	Reason for Outage
2	Feb 27 to Mar 1	Extended winter outage. 1320 hours.	Exciter issues need to be resolved.
3	May 23 to 24	0943 to 0856 hours.	Discharge logs in place for two pump operation flow data. 3 weirs shallow.
2	May 28 to 29	1512 to 1318 hours.	Governor oil pump issue resolved.
1, 2 & 3	May 31	0922 to 0933 hours. 1321 to 1415 hours. 1655 to 1712 hours.	Bus switching and electrical system testing. Fish pump 2 brief exciter issue during first outage.
1, 2 & 3	Jun 1	1616 to 1634 hours.	Blade angles to zero. Free up NFEW2 and NFEW3.
1, 2 & 3	Jun 3	1400 to 1405 hours.	Blade angles to zero. Free up NFEW2 and NFEW3.
1	Jun 7	0524 to 0835 hours.	Governor oil pump issue resolved.
3	Jun 21	2050 to 2055 hours.	Governor oil alarm tripped pump off.
2	Jun 25 to 28	1342 to 1740 hours.	Pump in standby. Station service testing and upgrades.
3	Jun 26	0750 to 0850 hours.	Thrust bearing oil level indicator issue.
1 & 3	Jun 28	1350 to 1400 hours. 1714 to 1740 hours.	Station service upgrade testing, including station service unit 2 recently repaired.
2	Jul 2	0708 to 0957 hours.	Pump in standby. Station service upgrade testing.
1, 2 & 3	Jul 2	1459 to 1507 hours.	Pump in standbys. Station service upgrade testing.
1	Aug 14	0700 to 1504 hours.	Two bus switches for station service upgrades. Avoid restarting pump.
3	Aug 14	0700 to 0725 hours. 1454 to 1504 hours.	Two bus switches for station service upgrades. Restarting pump was acceptable.
2 & 3	Aug 22	1518 to 1529 hours.	Cooling system backflow preventer test.

2	Sep 10	0607 to 0731 hours.	Bus switching for station service upgrades.
2	Sep 12 to 15	0623 to 2352 hours.	Bus feed failed. Required repair.
3	Sep 20	0902 to 1000 hours.	Potable cooling water issue.
2	Sep 26	0655 to 0707 hours.	Bus switching related to BPA outage.
1, 2 & 3	Sep 26	0736 to 0741 hours.	Bus switching related to BPA outage.
1	Sep 26	0741 to 1119 hours.	86 relay issue resolved.
1, 2 & 3	Sep 28	2215 to 2258 hours.	Bus switching related to BPA outage.
1	Oct 29 to 30	0450 to 0844 hours.	Electrical staff resolved farval issue.
1	Nov 7	1220 to 1419 hours.	Farval maintenance.
2	Nov 25 to 26	0856 to 0846 hours.	Governor pump issue.
2	Dec 6	0611 to 0615 hours.	Pump tripped offline.
2	Dec 7	0607 to 0616 hours.	Bus switch.
1	Dec 17	0716 to 1031 hours.	Asbestos examination.
2	Dec 18	0955 to 1215 hours.	Bus switch, black start test & feed repair.

During the year, all pumps received scheduled maintenance. Fish pump 2's oil pump was specifically inspection on Aug 16.

Other

Adult Fish Salvage

Adult salmonid fish rescue for the year along with incidentals is recorded in Table 9 below. Incidentals were not strictly divided into adults and juveniles. To reduce handling stress, adult salmonids were not generally held to determine if the fish were clipped or not. Juvenile salmonids salvaged during the year were recorded in the 2018 Juvenile Report. This marks the first year all fish salvage has been recorded in annual reports.

No adult salmonid mortalities occurred on the juvenile channel walkway this season.

Table 9. Adult Fish Salvage.

Location	Date	Salmonids	Incidentals
Washington shore ladder. Winter maintenance.	Jan 2 & 5	None.	20 shad (mostly mortalities); 36 smallmouth bass and sculpins; 1 perch mortality; 2 carp.
Oregon shore ladder. Winter maintenance.	Feb 1, 5, 6 & 22	2 unclipped steelhead.	28 lampreys; 1 smallmouth bass, carp & sculpin; 1 perch and 1 stickleback mortality; 3 suckers (1 mortality). 18 lamprey mortalities on Feb 22.

Juvenile collection channel. Testing.	Mar 14	None.	1 crappie mortality.
Navigation lock valve #1.	May 16	None.	None.
Navigation lock valve #3.	May 22	None.	1 smallmouth bass.
Unit 6: scroll case & draft tube. Dewatering.	Oct 2 & 3	None.	1 sturgeon & 12 channel catfish.
Juvenile collection channel. Dewatering.	Dec 10 & 19	18 steelhead. Not examined.	3 channel catfish; 2 sturgeon & walleye; 6 smallmouth bass; 1 pike minnow & sculpin; 5 shad (2 mortalities).

Separator Adult Salmonid Fallbacks

Starting in 2018, adult fallbacks through the separator during secondary bypass days have been moved from the Juvenile Report to the Adult Report. These adults are recorded in Table 10 below. The data at that time was tallied and record by month without clip type noted. Any adults, which happened to arrive in the sample tanks, which is rare, were still recorded in the Juvenile Report. The Coho count includes a small number of jacks. The totals include mortalities, which also have a separate column. The kelt verse pre-spawn steelhead observations are subjective for the most part even with proper training. Shorten sampling seasons and changing spill programs have reduced the numbers of fallbacks observed in the separator.

Table 10. Separator Adult Salmonid Fallbacks.

Month	Chinook	Jack	Pre-spawn Steelhead	Kelt Steelhead	Sockeye	Coho	Total	Mortality
Apr	0	0	7	36	0	0	43	0
May	43	8	11	67	0	0	129	3
Jun	32	12	3	8	32	0	87	1
Jul	8	2	2	1	72	0	85	1
Aug	0	1	2	0	2	0	5	0
Sep	47	16	36	0	0	6	105	0
Total	130	39	61	112	106	6	454	5

Condition of adult salmonid fallbacks passing out of the separator are recorded in Table 11 below. Condition observations are for the most part subjective even though every observer is trained in the condition codes.

Table 11. Adult Salmonid Fallback Condition.

Condition	Chinook	Jack	Pre-spawn Steelhead	Kelt Steelhead	Sockeye	Coho	Total
Good	109	34	50	62	96	6	357
Fair	18	3	4	26	7	0	58
Poor	1	2	7	22	2	0	34
Dead	2	0	0	2	1	0	5
Total	130	39	61	112	106	6	454

Incidental Adult Fallbacks

Due to increased interest in incidental fish species, the fisheries staff began recording incidentals in the separator during secondary bypass days on June 22, 2018. This was the first-time incidentals were recorded since 1998. Again, adult incidentals in the sample tanks, which is rare are still recorded in the Juvenile Report. Also, shortened sampling seasons and changing spill programs have reduced the number of incidentals observed in the separator. Incidental adults are recorded in Table 12 below. Incidental juveniles pass out of separator quickly and were reported in the Juvenile Report.

Table 12. Separator Incidental Adult Fallbacks.

Species	Season count
Smallmouth bass	4
Carp	2
Channel catfish	1
Northern pikeminnow	1
Yellow perch	7
American shad	1,505
White sturgeon	1
Suckers	4
Pacific lamprey	4
Walleye	2
Whitefish	4

Adult Fishway Inspections

Methods

From March 1 to December 31, Corps' fisheries personnel conducted three measured inspections each week. The report week ran from Friday to Thursday for a total of 43 weeks. However, the first report week was eight days long and the last report week was 11 days long. Also, holidays shorten some weeks. The result was 132 inspections for both fishways. The Oregon ladder collection channel velocity measurement was missed twice. The Fish Passage Center also made monthly inspections of both fishways, reported separately.

Personnel recorded fishway measurements from staff gauge readings and tape measurements from the ultra sonic wells. We took entrance weir depths from the control system panel views and used the weirs' cable spool dial indicators as a reference. The staff did inspections one to four days apart between approximately 0800 to 1600 hours.

The staff performed adult fishway inspections by visually examining or measuring 18 reference locations resulting in 14 inspection criteria points. These inspection points included six weir entrance depths: south shore entrances (SFEW1 and SFEW2), north powerhouse entrances (NFEW2 and NFEW3), and north shore entrances (W2 and W3).

Also, the head differential at the three main entrances along with the powerhouse collection channel velocity. The final inspection points were at each ladder's exit for the head differential at the picketed leads and the head over weirs.

Operating criteria for the McNary adult fishway are as follows: 1.0-1.3 feet of water depth over the ladder weirs and a maximum head on picketed leads of 0.5 feet. All fishway entrance differentials are 1.0 to 2.0 feet. North shore entrances (W2 and W3) weir depths are 8.0 feet or greater, north powerhouse entrances (NFEW2 and NFEW3) weir depths are 8.0 feet or greater and south shore entrances (SFEW1 and SFEW2) weir depths are 8.0 feet or greater. Collection channel velocity is 1.5 to 4.0 feet per second.

The computer controlled automated fishway system record can be viewed but cannot be printed out automatically. When required, the fisheries staff can request a printout to review and asked for adjustments as needed.

Inspection Results

Appendix 1 contains the readings for each criterion point during the fishways' inspections. The results of the measured inspections conducted by the fisheries staff are summarized in Table 13 below. Visual observations were not included in this table. The Operations and Maintenance Section of this report gives details which relate back to the fishways' criteria points and to Table 13. The table's results for each ladder will be summaries below.

Washington Ladder

The counting station and weir (head over weir) differentials were out of criteria nine and one time, respectively, which is 6.8 and 0.8 percent each. This was due to debris or aquatic vegetation on the picketed leads, which were cleaned throughout the year and the forebay elevation sensor, which failed in April. Exit set points were adjusted as required.

The Washington entrance pool differential was never out of criterion for 0.0 percent.

The Washington entrance weirs, W2 and W3 were out of criteria two and five times each, which is 1.5 and 3.8 percent, respectively. Both weirs had slight calibration drifts early in the season. During the PUD unit outage, both weirs were inadvertently left in manual mode. Also, W3 had electrical issues which had to be resolved.

Oregon Ladder

The count station and weir (head over weir) differentials were out of criteria 3 and 8 times respectively, which is 2.3 and 6.1 percent each. The readings were due to debris or aquatic vegetation on the picketed leads, which were cleaned as required, set points requiring adjustment and weir issues.

The north powerhouse pool differential was out of criterion once for 0.8 percent. This reading was due to weir issues.

Table 13. Summary of Adult Fishway Inspections at McNary Dam, 2018. *								
			Not Enough Depth			Too Much Depth		
Criteria and Locations	**No. in Criteria/ No. of Inspections**	**% In Criteria**	**No./% Within 0.01-0.1 Foot**	**No./% Within 0.11-0.2 Foot**	**No./% >0.2 Foot**	**No./% Within 0.01-0.1 Foot**	**No./% Within 0.11-0.2 Foot**	**No./% >0.2 Foot**
South Fish Ladder (OR)								
Channel Velocity	116	89.2	***	***	***	***	***	***
	130		***	***	***	***	***	***
Counting Station Differential.	129	97.7	***	***	***	1	1	1
	132		***	***	***	0.8	0.8	0.8
Weir Head.	124	93.9	6	1	0	0	1	0
	132		4.5	0.8	0.0	0.0	0.8	0.0
South Shore Differential.	132	100.0	0	0	0	0	0	0
	132		0.0	0.0	0.0	0.0	0.0	0.0
North Powerhouse Differential.	131	99.2	0	0	0	1	0	0
	132		0.0	0.0	0.0	0.8	0.0	0.0
SFEW1 Depth	130	98.5	0	1	1	***	***	***
	132		0.0	0.8	0.8	***	***	***
SFEW2 Depth	129	97.7	1	1	1	***	***	***
	132		0.8	0.8	0.8	***	***	***
NFEW2 Depth	117	88.6	5	7	3	***	***	***
	132		3.8	5.3	2.3	***	***	***
NFEW3 Depth	116	87.9	2	6	8	***	***	***
	132		1.5	4.5	6.1	***	***	***
North Fish Ladder (WA)								
Counting Station Differential.	123	93.2	***	***	***	6	0	3
	132		***	***	***	4.5	0.0	2.3
Weir Head.	131	99.2	0	0	0	0	1	0
	132		0.0	0.0	0.0	0.0	0.8	0.0
North Shore Differential.	132	100.0	0	0	0	0	0	0
	132		0.0	0.0	0.0	0.0	0.0	0.0
W2 Depth	130	98.5	0	1	1	***	***	***
	132		0.0	0.8	0.8	***	***	***
W3 Depth	127	96.2	0	1	4	***	***	***
	132		0.0	0.8	3.0	***	***	***

*Data from Appendix 1.

The south powerhouse pool differential was never out of criterion for 0.0 percent.

The north powerhouse entrance weirs, NFEW2 and NFEW3 were out of criteria 15 and 16 times each for 11.4 and 12.1 percent, respectively. Tailwater sensor issues, low tailwater elevations, fish pump issues, set point settings, and weir issues contributed to these results. Also, in December the juvenile facility's flow was not available to the north powerhouse pool.

The south powerhouse entrance weirs, SFEW1 and SFEW2 were out of criteria two and three times each, for 1.5 and 2.3 percent, respectively. This year's results were due to fish pump and weir issues along with low tailwater.

The collection channel velocity was out of criteria 14 times, 10.8 percent. Hydraulic gradients, the accuracy of surface readings and other issues already discussed in this report probably contributed to this outcome.

Recommendations

1. Look into facing the Washington ladder exit east to reduce the amount of debris going down the ladder.
2. New diffuser grating for the Washington ladder.
3. New wire rope for Washington ladder entrance weirs.
4. Monitor the corner of the Oregon ladder count station where there was lamprey mortality.
5. Replace Oregon ladder diffuser inflow valves.
6. Upgrade 1000 cfs conduit system.
7. Upgrade fish pump system.
8. New diffuser grating for the Oregon ladder.
9. Develop a way to dewater the Oregon ladder powerhouse collection channel.
10. Finish rehabilitation or replacement of Oregon ladder floating orifice gates.