McNary Lock and Dams Annual Adult Fish Report 2011

Prepared by

Bobby Johnson
US Army Corp of Engineers
Current Supervisory Fisheries Biologist

And

Denise Griffith
US Army Corps of Engineers
Current Assistant Fisheries Biologist

Originally prepared by Carl Duggar

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ADULT FISH FACILITIES

Facilities Description

The adult fish passage facilities at McNary consist of separate north and south shore facilities. The north shore (Washington) facilities include a fish ladder with a counting station, a small 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. In normal operations, the facility only uses the two of the downstream entrances. 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 Wasco/Klickitat Public Utility District (PUD), and then distributes flow through diffusers at the bottom of the ladder and in the transportation channel. The old fish lock, located adjacent to the generator, acts as the bypass route when the generator is not in service, distributing the flow to the same diffuser system.

The south shore (Oregon) facilities include a fish ladder with a counting station, two south shore entrances, a powerhouse collection system, a gravity-flow auxiliary water system and a pumped auxiliary water supply system. The powerhouse collection system has one side entrance weir and three downstream weirs into the spillway basin at the north end of the powerhouse, twelve floating orifices located across the powerhouse, and a common transportation channel for all the entrances. At the north end of the powerhouse, two of the downstream entrances are used during normal operation while the other downstream and side entrances are closed.

One conduit from the forebay supplies the gravity-flow auxiliary water and supplies the diffusers at the bottom of the ladder at tailwater level. Three electric pumps with variable-pitched blades pump additional auxiliary water. Two pumps can provide the required flow when the third pump's intake and discharge are sealed with bulkheads, to prevent water from flowing through the pump to the river. The electric pumps supply the auxiliary water for the diffusers at the entrances and the transportation channel. Finally, the 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.

Facilities Modifications

During the winter maintenance season of 2011, on the Washington ladder, the fisheries staff enlarged the downstream exit sensor's still well opening. The mechanics installed stilts on the picketed leads for adult lamprey passage. To improve lamprey passage, the general maintenance crew removed the flow vanes upstream of the downstream picketed leads. The fisheries staff removed a temperature probe still well.

On the Oregon ladder, a contractor installed new exit traveling screens. The Project programmed these screens so they could be started manually. The Project removed the gates on the exit weirs' lamprey passage slots. A contractor installed camera supports for the lamprey passage study. The mechanics installed lamprey passage stilts below the picketed leads. In season modifications can be found in the report's text.

Operations and Maintenance

Fishway Activities

Table 1 below outlines both ladders' fish counting schedule. This was the sixth season computers were used to tally the fish and the third season of adult lamprey video monitoring. Picketed leads were in place during the counting season.

Table 1. Fish Counting Schedule, 2011.

Dates	Activity
1 Jan – 31 Mar	No counting.
1 Apr – 31 Oct	Visual counting daily 04:00-20:00 hours PST.
1 Jul – 30 Sep	Night lamprey passage video reviewed.
1 Nov – 31 Dec	No counting.

Adult salmonid Passive Integrated Transponder (PIT) tag detection and the adult lamprey passage study are ongoing. During the juvenile passage season, a contractor examined fish activity at the new Oregon exit traveling screens. During the winter, a contractor also examined adult fallback passage at the powerhouse.

Water temperature recording occurred from June 14 to September 15 this year. The purpose of this specific effort, ongoing since 1999, is to determine if thermal barriers exist and take corrective action if needed. Probes recorded temperatures hourly in one location at each ladder's exit. Also, a probe was at the juvenile facility separator for comparison.

The juvenile fish facility operated for juvenile fish bypass/transport and adult fallbacks from March 27 to December 21. Brief outages are discussed in this report's juvenile section and in the 2011 juvenile report.

Fish Ladders and Collection Channel Schedules

Table 2 outlines both ladders' operation and maintenance schedules.

Table 2. Fish Ladder Operating Schedule, 2011.	
Ladder/Dates	Activity
Washington	
1 Jan – 15 Feb	Ladder in service.
Feb 15 – Feb 26	Ladder out of service for inspection and maintenance.
Feb 26 – Dec 31	Ladder in service.
Oregon	
1 Jan – 11 Jan	Ladder in service.
11 Jan – 15 Feb	Ladder out of service for inspection and maintenance.
15 Feb – 31 Dec	Ladder in service.

Washington Ladder Outage

On February 14, the operators switched the Washington ladder to orifice flow. On February 15, the general maintenance crew installed the exit bulkheads.

During the Washington ladder dewatering, the Project did the following repairs and inspections:

1. We inspected the upper ladder. No fish were seen. 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. The fisheries staff removed several trash cans of tumbleweeds from the picketed lead flow vanes.
2. The fisheries staff examined the submerged orifices, removing about one dozen sticks from 0.5 to 2 inches in diameter and to 6 feet in length. They found no obstructed orifices. No fish were seen. During this time, we also examined diffusers 11 and 12 with no problems found.
3. Pacific States Maritime Fisheries Commission (PSMFC) and Corps of Engineers (COE) personnel performed maintenance on the ladder's s adult PIT tag detectors and associated equipment. The University of Idaho did maintenance on the duplex antennas.
4. On February 24, a dive contractor examined diffuser gratings 1 through 10 with no problems found. There continues to be concern over integrity of the concrete entrance bulkheads which face spillbay 1, and any erosion which may be occurring on these bulkheads.

5. Technicians performed scheduled maintenance on all entrance weirs.

We will discuss operations of the PUD unit later in the Auxiliary Water Section below. On February 26, crews removed exit stop logs and returned the ladder to automatic operation.

Washington Ladder Exit-Season

During the season at the Washington exit, the fisheries staff checked the set points one to three times per week. After crews cleaned the sensor still wells, very few set point adjustments occurred. The exit was in automatic mode most of the year. In the Results Section, we will discuss exit issues that affect criteria points.

The mechanical and general maintenance staffs performed scheduled maintenance on the exit weirs and picketed lead hoist along with the exit trash hoist. In season repairs and improvements included:

1. Repairing the trash rack hoist.
2. Repairing the count station window brush.
3. Installing lighting to allow night cleaning of the picketed leads.
4. Installing a new count station air condition unit.

After the maintenance season calibrations, there were eight regulating weir alarms, five low water alarms and three exit weir alarms during the year. These were all short duration, and operators reset them. Three power outages on March 23, September 28 and October 30 caused multiple alarms, which the operators quickly reset.

From May 31 to June 12, due to issues with weir 334, this weir along with weirs 335 and 336 were placed in manual operation at times. In the Results Section, we will discuss exit issue effects on criteria.

From March 31 to November 1, the picketed leads were in place. On May 13 and 14, severe thunderstorms occurred in the Region resulting in increased river debris loads, especially along the Washington shore and in the exit area. On May 18, the general maintenance crew cleaned the picketed leads three times in 10 hours. From 1530 to 1730 hours, the leads were raised as the Project discussed the debris with District personnel. That night, from 2100 to 0500 hours, the fisheries staff had the leads raised to avoid night blockages. This continued with the fisheries staff, operators or general maintenance crew raising the leads during the same hours on May 22, 25 through 27, 29, 31 and June 1 through 16. From May to July, the same crews cleaned the exit trash rack and picketed leads almost daily and at night at times. Woody debris and tumbleweeds were the main debris types. At times, operators also flushed the debris down the navigation lock.

From August to September, Eurasian milfoil became the main contributor to lead blockages. During this time, the leads were cleaned almost daily. None of the issues mentioned above appeared to affect fish passage.

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, W2 and W3 remained in automatic operation. The power outage on March 23 had no ill effect as the entrance stayed in criteria. Crews conducted scheduled maintenance throughout the year.

During the spill season, turbulence makes if difficult for the technical staff to keep the entrance weirs calibrated. From April to August, on six occasions, they recalibrated the weirs. This year, there appeared to be no pattern to the calibration drifts. By late July, the technical staff also began considering programming as a possible cause for the drifts. From late August to early October, the staff worked on the weirs' programming and calibration. From September 20 to October 20, both weirs' LED's were out of service. During this time, the fisheries staff used the hoist cable drum dial indicators for inspection measurements.

On October 12, the technical staff found electrical issues with weir W2. The weir was in manual mode overnight and the staff replaced the parts the next day. On October 20, the staff also installed new electrical parts at W3. On November 8, the staff found W3 requiring a new hoist motor. They removed the weir from service, leaving it at the depth it had failed at. Data indicated motor possibly failure on November 1. The weir was only out of criteria during very low tailwater elevations. On November 16, the electrical staff replaced the motor and returned the weirs to automatic operation. Through fisheries staff observations and Project repairs, these weirs should be in criteria more often.

In the Results Section, we will discuss entrance weirs effects on inspection criteria. The problems discussed did not appear to effect fish passage. In the Auxiliary Water Supply Section, we will discuss associated issues.

Oregon Ladder Outage

On January 3, the operators started the Oregon ladder, which had been in automatic operation on orifice flow. On January 11, general maintenance staff installed the exit and juvenile bypass logs, dewatering the ladder. Contract work on the exit traveling screens delayed the ladder dewatering. Also, after pumps did not reduce the ladder's water level, general manitance reset the stop logs on January 24 and 25.

During the Oregon ladder dewatering, staff conducted the following repairs and inspections:

1. The fisheries staff visually inspected the upper ladder. They evacuated one non-clipped steelhead adult and non-clipped Coho adults from the exit weir area. 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, back board, and picketed leads. The fisheries staff cleaned the lamprey orifices, staff gauges, sensor still wells and removed light debris. A contractor replaced the exit traveling screens. Another contractor installed lamprey study equipment. After resetting exit bulkheads, we found no fish.
2. The fisheries staff inspected and removed debris for the ladder's submerged orifices. We removed several dozen sticks that were 0.5 to two inches in diameter. Also, the staff removed six pieces of wood that were six inches in diameter. We found no obstructed orifices. We evacuated one clipped steelhead adult, one adult lamprey and one clipped juvenile steelhead from the ladder. After the exit stop log resetting, the staff evacuated one clipped and one non clipped juvenile steelhead along with one clipped and one non- clipped adult steelhead.
3. PSMFC and COE performed maintenance on the ladder's adult PIT tag detectors and associated equipment. The University of Idaho maintained the duplex antennas.
4. After closure of the 1000 cubic feet per second (CFS) supply conduit, on February 7 to 10, the fisheries staff used an underwater camera to examine all diffuser gratings. At diffuser 14 we found a dislodged lamprey passage improvement plate. On February 14, the mechanics reattached the plate. We found no other problems. Crews maintained the diffusers' valves.
5. Crews performed preventative maintenance on all entrance weirs.

We will discuss auxiliary water operations in that section. On February 15, the Project removed the exit and juvenile bypass stop logs, returning the ladder to automatic operation.

Oregon Ladder Exit-Season

During the season at the Oregon exit, the fisheries staff checked the set points one to three times a week. After crews cleaned the sensor still wells, very few set point adjustments occurred. For the year, the exit was in automatic operation. In the Results Section, we will discuss exit issues' effects on criteria points.

The mechanics performed scheduled maintenance on the tilting and regulating weirs. No in season repairs or improvements occurred.

After initial calibration, during the year, there were three regulating weir alarms, one individual exit weir alarm and two exit alarms, all short duration, which operators reset.

From June 21 to 23, after alarming, due to encoder issues at weirs 336 and 338, these weirs were in manual operation at times until staff resolved the issues. In early November, the technical staff examined the exit programmable logic controller (PLC) to ensure it was functioning properly. On September 29, the Project noticed that two downstream picketed leads needed repair. However, the damage was not significant enough to affect fish passage so the Project will conduct the repairs during the winter maintenance season.

From March 31 to November 1, the picketed leads were in place. Unlike the Washington exit, from May to July, Oregon exit debris was not a significant issue. With spill season ending at the end of August, woody debris increased along the Oregon shore and near the exit. For September, this debris, along with Eurasian milfoil, was a concern with the Project cleaning the picketed leads daily at times. In late September, Resource maintenance staff installed a log boom across the exit and cleaned debris from the Oregon shore. None of the issues mentioned above affected fish passage.

This was the last winter that crews used the exit crane for exit log installation. Since then, the crane could only be used for picketed lead cleaning. The traveling screen contractor closed and opened the supply conduit intake valve and installed the traveling screen bulkheads. Installation of a new exit crane is scheduled for the winter of 2013.

Oregon Exit Traveling Screens

In January and February, a contractor installed two new traveling screens. On March 1, after testing, the screens came online. The technical staff or operators set the system to run four to 12 times per day for 20 minutes each time. The "eight cycles per day" operation was used most often. Also, the technical staff set the screens and wash pump to run whenever a 3-inch or greater screen differential occurred. During the season, the system received scheduled maintenance.

From March 1 to 4, the screens were out of service for dive installation of study equipment. In early March, the Project resolved issues with the wash pump. On May 12, the biologist found the system had been inadvertently set to run 24 times a day. The operators reset the system to six times a day. On May 25 and June 12, respectively, the biologist found the north and south screens, respectively, in bypass and reset them to automatic mode. The screens do not cycle when in bypass. Possibly the screens were set to bypass after multiple false alarms. In December, the Project modified the access doors to the screens' debris trough so they could be opened more quickly for debris removal. Initially, the traveling screens had multiple differential alarms which appeared to be false. The technical staff found calibration of the differential sensors difficult due to the orientation of the walkway grating, which limited access after the contractor installed the new screens.

In late April the technical staff reprogrammed the screens' controller, which helped to reduce the number of false differential alarms. The technical staff also suspected that

research equipment may have triggered some of these false alarms. The exit study occurred from April to August. As the season progressed, the number of false differential alarms decreased until December when multiple alarms again occurred. For the year, these alarms would be for both or for an individual screen. However, measured differential readings never reached a level of concern that would indicate most of the differential alarms were false.

During the year, operators reset three wash pump alarms. There were no other issues with the pump.

Measured traveling screen trash rack differentials remained low. The highest reading was 0.7 feet in late September. By year's end, the readings measured 0.1 to 0.2 feet again. The issues discussed here had no ill effect on fish passage or the auxiliary water supply.

Oregon Ladder Entrances-Season

After initial calibration, NFEW2, NFEW3, SFEW1 and SFEW2 remained in automatic operation. The spill program and hydraulic gradients continue to cause calibration drifts for all entrance weirs. Scheduled maintenance occurred throughout the year.

In the Results Section, we will discuss the effects of entrance weirs on inspection points. The problems discussed below did not appear to affect fish passage. We will discuss issues with auxiliary water in that section.

On June 13, staff programmed NFEW2, NFEW3, SFEW1 and SFEW2 to lower from 2100 to 0400 hours for night adult lamprey passage. From June 15 to September 30 the Fish Passage Plan (FPP) called for the weirs to be lowered. On July 28, researchers installed lamprey passage study cameras near SFEW2. In early September, they installed three new cameras by SFEW2. When operations allowed, the fisheries staff monitored the nightly lowering.

On June 20, SFEW 1 and SFEW2 did not lower due to the technical staff leaving the weirs in manual, after calibration work. On September 9, the fisheries staff noted that NFEW2 and NFEW3 were only lowering 1.5 feet. The biologist asked the technical staff to examine the problem. On October 2, the fisheries staff noted that the weirs were still lowering so the biologist asked the operators to turn the program off. Just before this, the fisheries staff again noted that NFEW2 and NFEW3 were not lowering as deeply as required.

Finally, the twelve floating entrances functioned well this year and technicians adjusted them as required.

Oregon Ladder North Powerhouse Entrance-Season

At the Oregon north powerhouse entrance, weir NFEW1 remains in standby. In the spring, during high tailwater elevations, NFEW1 would have approximately one foot of flow over it.

From May 22 to June 4, NFEW2's light emitting diode (LED) was inoperable and the fisheries staff recorded readings from the cable drum dial indicator. In mid June, the technical staff calibrated both weirs. On October 26, they again calibrated the weirs. The next day, the biologist found NFEW2 with slack cables and NFEW3 rising with faulty LED readings. The technical staff examined the weirs and at first suspected that NFEW2's rollers were jamming. On November 1, the biologist found the weirs in the same condition. The operators switched the weirs to manual overnight. On November 3, the biologist found the weirs operating as before. That day, the technical staff found corroded wires on both weirs and replaced them.

Oregon Ladder South Powerhouse Entrance-Season

On June 18, 20 and 23 through 30, the technical staff calibrated SFEW1, SFEW2, the tailwater elevation sensor and the entrance pool elevation sensor. On June 28, the fisheries staff found that SFEW2's LED had failed. Staff would replace it during the winter maintenance season. Until then, staff used the weir's cable drum dial indicator for measured readings.

Oregon Channel Velocity

The velocity meter is in the Oregon ladder just downstream of the south powerhouse pool. The fisheries staff did not use the meter this year due to its sporadic readings. The staff took measurements from surface observations. We ordered a new meter during the winter maintenance season. The same issues mentioned in this report, which affected flows at the powerhouse entrances, probably also affected velocity measurements. We will discuss criteria in the Results Section below.

Washington Ladder Auxiliary Water Supply

The Washington ladder received its auxiliary supply water through the Wasco/Klickitat 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, on January 15, the unit tripped offline for 1.4 hours. On January 17, the PUD was on emergency power. On January 26, the unit was out of service for 1.2 hours. No reasons were recorded. Later, on January 26 at 1105 hours, the PUD removed the unit from service due to a blown seal. At 1300 hours, the PUD discovered that intake conduit 1 did not open when the system was switched to bypass.

The hydraulics had failed. The unit remained out of service with the bypass only providing half the normal flow. After regional discussion, the PUD and COE terminated the auxiliary water supply by installing the intake bulkheads. The PUD then removed and repaired conduit 1's hydraulic gate. From January 26 to February 15, the Washington ladder was operational without auxiliary water. For the most part, the ladder remained in criteria.

From January 26 to February 28, there was no auxiliary water as the PUD continued winter maintenance. At 0932 hours on February 28, the COE removed the intake bulkheads returning the ladder's auxiliary water with the bypass being functional. The unit remained out of service. On March 1, testing the unit tripped the transmission line. On March 2, at 0926 hours, the unit returned to service.

In season unit outages are recorded in Table 3 below. The number of unit trip outs is recorded when greater than one. From June 2 to July 18, at BPA's request, the PUD unit was removed from service nightly from 0000 to 0500 hours. On September 20 to 21, the unit tripped offline due to a 20 percent flow reduction caused by debris on the conduits' intake trash racks. On September 22, the unit was out of service 3.3 hours with the bypass functional so the COE could clean conduit 4's trash racks. Debris on these racks and conduit 3's racks still concern the Project. However, the ladder did stay in criteria.

Table 3. In Season PUD Unit Outages, 2011.

Dates	Length/Number	Reason for Outage
6 Mar	0.8 hours.	None recorded.
15 Mar	2.0 hours.	Transmission line tripped.
17 Mar	1.1 hours.	Unit 13 tested.
19 to 23 Mar	4.6 hours/5 trips.	None recorded.
29 to 30 Mar	6.8 hours/3 trips.	None recorded.
13 Apr	1.0 hours.	None recorded.
18 to 20 May	15.3 hours/3 trips.	Environmental dispatch/None recorded.
2 Jun to 18 Jul	Down 5.0 hours nightly.	BPA requested.
15 Jun	0.9 hours.	None recorded.
26 to 27 Jun	Brief/2 trips.	Relay issues.
7 to 13 Aug	Unit out of service.	Transformer bushing leak.
20 to 21Sep	5.3 hours/3 trips.	Debris on intake.
22 Sep	3.3 hours.	Clean intake trash rack.

During winter maintenance, the Project will clean the trash racks for all four intake conduits.

For the passage season, with the bypass working each time, unit outages had little effect on inspection criteria points or fish passage as the bypass conduit valves automatically switched between the two systems, resulting in continuous flow into the ladder. We will discuss inspection points in the Results Section.

Oregon Ladder Auxiliary Water-The Juvenile System

From March 27 to November 18 the juvenile system, when not down for maintenance, supplied the Oregon ladder's north powerhouse entrances with approximately 450 CFS. Three interruptions occurred on March 31, April 11, and September 13 for a total of 19.5 hours due to events discussed in the Juvenile Report. From November 18 to December 21, this flow was not available as the juvenile system was in emergency bypass. The loss of this flow does affect the criteria of the north powerhouse pool differential, which we discuss in the Results Section. The juvenile system was not available most of March and late December. No matter the operation mode, when functional, the juvenile system does allow for the passage of adult fallbacks.

Oregon Ladder Auxiliary Water-1000 CFS Conduit

From January 1 to February 6, the auxiliary water conduit was open. On February 6, the exit screen contractor closed the conduit's intake valve, improving conditions for winter maintenance. During the outage, crews maintained the valve. From March 1 at 1630 hours to March 3 at 1001 hours, the valve was open. From March 3 to March 4 at 1430 hours, a dive contractor closed the valve to install study equipment at the exit traveling screens. From March 4 to December 31, the valve was open. During the year, crews maintained the conduit's diffuser supply rotary valves.

Oregon Ladder Auxiliary Water-Fish Pumps

Long term fish pump outages, involving two or more calendar days, are outlined in Table 4 below.

Table 4. Long Term Oregon Fish Pump Outages, 2011.

Affected Pump(s)	Dates	Reason for Outage
1	3 Jan – 23 Feb	Annual maintenance.
2	3 Jan – 31 Dec	Annual/Overhaul.
3	3 Jan – 23 Feb	Annual maintenance.

On January 2, a fish pump alarm occurred, which operators reset. On January 3, the Project removed all three pumps from service for the winter maintenance season. From January 4 to 6, a dive contractor helped place fish pump 2's intake and discharge stop logs. On January 13, the biologists salvaged one catfish and one perch from dewatered pump 2. After inspection, the Project determined fish pump 2 would require major overhaul, which would necessitate the need for a contractor to do the work, which will go late into 2012. The Project completed winter maintenance on pumps 1 and 3, which returned to service. During the season, when functional, fish pumps 1 and 3 ran with 30-degree blade angles.

Short term fish pump outages, outages less than two calendar days, are outlined in Table 5 below. The number of fish pump outages is recorded when greater than one.

Table 5. Short Oregon Fish Pump Outages, 2011.			
Pump(s)	Dates	Length/Number	Reason for Outage
3	28 Feb	1.3 hours.	Change connector.
1	29 Mar	0.3 hours.	Lubrication.
1	27 Apr	0.8 hours.	Inadvertent trip.
1,3	27 Apr	1.0 hours/2 outages.	Lamprey study.
3	17 May	2.0 hours.	Bearing temperature monitoring device.
1,3	21 May	0.5 hours.	Transmission line trip.
1,3	6 Jun	0.6 hours.	Bus switch.
1,3	13 Jun	0.8 hours/2 outages.	Bus switches.
3	22 Jul	0.5 hours.	Bus switch.
3	28 Jul	0.5 hours.	Bus switch.
3	31 Jul	0.5 hours.	Bus switch.
1,3	16 Aug	Brief.	Test cooling water back flow preventer.
1,3	8 Nov	0.4 hours.	Ground isolation.
1	8 to 9 Nov	19.8 hours.	Exciter failed.
1,3	5 Dec	0.2 hours.	Low cooling water flow.

On April 27, the biologist twice asked the operators to reduce both pumps' blade angles to zero degrees for a camera inspection of SFEW2 for the lamprey program. In early May, the Project replaced pump 1's cover plate. On June 1, operators observed that pump 1's stator wedge had moved. The Project reset it the next day. On July 25, the fish pumps alarmed. After the operators reset the alarm, no problems were found. On November 8, after working on electrical grounds, fish pump 1 failed to restart. The next day, Project repaired the pump's exciter. In early December, two bus switches occurred, but no fish pump outages were recorded. During the year, crews maintained both pumps and the valves which regulate the flow from the fish pumps.

With only two operational fish pumps, keeping the Oregon ladder entrances in criteria was quite a challenge. Despite these fish pump outages, fish passage remained timely and consistent all season. We will discuss criteria in the Results Section.

Adult Fish Trap Operations

McNary does not have an active adult salmonid trap. This year, no researchers trapped adult lamprey as in previous years.

Adult Fishway Inspections

Methods

From March 1 to December 31, COE fisheries personnel conducted two to four measured inspections each week. The average was 3.0 inspections per week for both ladders. The report week ran from Friday to Thursday for a total of 44 weeks. However, the first and last report weeks were three and nine days long, respectively. Also, holidays shorten some weeks. The result was 132 total inspections for both ladders' criteria points, except for the Oregon ladder channel velocity, which had only 122 inspections due to it being randomly missed throughout the season. On May 17 and 18, the fisheries staff inspected the Oregon and Washington ladders, respectively. On September 1, the biologist lost the data for the Oregon entrances but remembered the differentials. On June 9, June 25 and November 24, the fisheries staff visually inspected both ladders. Also, the Fish Passage Center conducted a monthly inspection.

Personnel recorded fishway measurements from staff gauge readings and tape measurements from the ultrasonic wells. We took entrance weir depths from LED's or cable spool dial indicators. Inspections occurred one to five days apart between approximately 0900 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 (NFEW1 and NFEW2), and north shore entrances (W1 and W3). Also, staff measured 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 at of 1.0 to 2.0 feet. North shore entrances (W1 and W3) weir depths are 8.0 feet or greater, north powerhouse entrances (NFEW1 and NFEW2) weir depths are 9.0 feet or greater and south shore entrances (SFEW1 and SFEW2) weir depths are 9.0 feet or greater. Collection channel velocity is 1.5 to 4.0 feet per second.

Since 2008, the computer controlled automated fishway system record can be viewed but cannot be printed out automatically due to the lack of programming. When required, the fisheries staff viewed the records and asked for adjustments as needed. The records did reflect the general trends noted in the inspection data we discuss below.

Inspection Results

Appendix 1 contains the readings for each criterion point during the fishways' inspections. Table 6 below summarizes the results of the measured inspections conducted by the fisheries staff. This table does not include visual observations. The Operations and Maintenance Section of this report gives details which relate back to the fishways' criteria points and to Table 6. The table's results will be summaries here.

Washington Ladder

The counting station and weir (head over weir) differentials were out of criteria six and five times, respectively, which is 4.5 and 3.8 percent each. This was due to debris or milfoil on the picketed leads along with weir issues. For 2010, the values were 4.2 and 8.3 percent. The results are very similar to previous years.

The Washington entrance pool differential was out of criteria once for 0.8 percent. This was possibly due to PUD issues. This value is like previous years. For 2010, this value was 0.0 percent.

The Washington entrance weirs, W2 and W3 were out of criteria 23 and 20 times, respectively, which is 17.4 and 15.2 percent. Both weirs had calibration drifts due to the spill program and related turbulence. Also, weir programming and issues along with PUD problems account for the entrance weirs being out of criteria. For 2010, the values were 4.2 percent for both weirs. These results were like previous years.

Oregon Ladder

The count station and weir (head over weir) differentials were out of criteria three and six times, respectively, which is 2.3 and 4.5 percent each. These results were due to debris or milfoil on the picketed leads, exit weir and control issues along with low forebay elevation. For 2010, the values were 2.5 and 5.8 percent. The results were like previous years.

The north powerhouse pool differential was out of criteria 34 times for 25.8 percent. On 25 occasions (18.9 percent) the juvenile facility was not providing flow to the entrance. On two occasions, there was a fish pump outage. Spill caused hydraulic gradients and calibration issues may explain the remaining out of criteria occurrences. This value was 57.0 percent in 2010 and comparable to previous years.

The north powerhouse entrance weirs, NFEW2 and NFEW3 were out of criteria 44 times each for 33.3 percent. Spill turbulence, hydraulic gradients and possibly lamprey passage programming may have caused calibration drifts. One fish pump outage, and the juvenile facility no being available in March, half of November and December, may have also affected the entrance weirs. These weirs were out of criteria 3.3 percent in 2010, although this data is like past years.

Table 6. Summary of adult fishway inspections at McNary Dam, 2011.[1]								
			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	54	44.3	***	***	***	***	***	***
	122		***	***	***	***	***	***
Counting Station Differential.	129	97.7	***	***	***	1	1	1
	132		***	***	***	0.8	0.8	0.8
Weir Head.	126	95.5	1	0	1	3	1	0
	132		0.8	0.0	0.8	2.3	0.8	0.0
South Shore Differential.	119	90.2	9	4	0	0	0	0
	132		6.8	3.0	0.0	0.0	0.0	0.0
North Powerhouse Differential.	98	74.2	18	9	7	0	0	0
	132		13.6	6.8	5.3	0.0	0.0	0.0
SFEW1 Depth	117	88.6	2	4	9	***	***	***
	132		1.5	3.0	6.8	***	***	***
SFEW2 Depth	118	89.4	2	1	12	***	***	***
	132		1.5	0.8	9.1	***	***	***
NFEW2 Depth	88	66.7	8	11	25	***	***	***
	132		6.1	8.3	18.9	***	***	***
NFEW3 Depth	88	66.7	12	10	22	***	***	***
	132		9.1	7.6	16.7	***	***	***
North Fish Ladder (WA)								
Counting Station Differential.	126	95.5	***	***	***	1	2	3
	132		***	***	***	0.8	1.5	2.3
Weir Head.	127	96.2	0	0	0	4	1	0
	132		0.0	0.0	0.0	3.0	0.8	0.0
North Shore Differential.	131	99.2	1	0	0	0	0	0
	132		0.8	0.0	0.0	0.0	0.0	0.0
W2 Depth	109	82.6	3	1	19	***	***	***
	132		2.3	0.8	14.4	***	***	***
W3 Depth	112	84.8	0	3	17	***	***	***
	132		0.0	2.3	12.9	***	***	***

[1] Data from Appendix 1.

The south powerhouse pool differential was out of criteria 3 times for 9.8 percent. In early March, a contractor closed the 1000 CFS supply conduit during two inspections. Spill turbulence, hydraulic gradients and possibly lamprey passage programming may have caused calibration drifts with eight out of criteria occurrences occurring in June. Entrance weir depth may have also affected the pool differential. This value compares to previous years. For 2010, the differential was 5.8 percent out of criteria.

The south powerhouse entrances weirs, SFEW1 and SFEW2, were out of criteria 15 and 14 times, respectively for 11.4 and 10.6 percent. High flows creating hydraulic gradients and possibly lamprey passage programming may have caused calibration drifts, with the weirs being out of criteria at times from March to mid-June. These results were comparable to previous years. In 2010, the weirs were out of criteria 18.2 and 19.8 percent, respectively.

The collection channel velocity was out of criteria 68 times for 55.7 percent. Hydraulic gradients, the accuracy of surface readings and other issues already discussed probably contributed to this outcome. This is comparable to previous years. In 2010, the out of criteria percentage was 51.9 percent. We further discussed the meter in the Fish Ladder and Collection Channel Section (above).

Recommendations

1. Program ladders' computer systems to allow automatic control printout.
2. Install handrails on the ladders' walls for orifice inspection and debris removal.
3. Complete fish pump 2 repairs.
4. Replace Oregon ladder diffuser inflow rotary valves.
5. Install new velocity meter.
6. Close northern floating entrances to improve the north powerhouse pool differential.
7. Improve all entrance weir calibration so drifts occur less frequently.
8. Continue lamprey passage improvements on both ladders.
9. Replace bulkheads at Washington ladder entrance so the pool can be dewatered.
10. Replace Oregon exit picketed leads and back board.
11. Replace both ladders' exit cranes.
12. Install new chain or cable on 1000 CFS conduit intake valve.
13. Install new Washington exit trash rack hoist.
14. Seal Washington ladder leaks.
15. Fix or replace elevator on Washington shore.
16. Get Project, District and Region to better time the work with ladders' outages; and
17. Keep spare parts in stock.