ADULT FISH FACILITIES MONITORING REPORT

McNary Lock and Dam

2010

By

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INTRODUCTION

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 of the entrances. At the north end of the powerhouse, two of the downstream entrances are used during normal operation with the other downstream and side entrances closed.

One conduit from the forebay supplies the gravity-flow auxiliary water and also 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 are capable of providing 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

Crews did not modify the Washington ladder during the winter maintenance season of 2010. Crews installed new exit bulkheads in 2009, and performed maintenance for the 2010 season from 9 to 17 December, 2009. Staff published results in the 2009 report.

The Oregon ladder was the focus of the 2010 winter maintenance season, with the ladder receiving several modifications. Crews installed new exit bulkhead slots at the ladder's two exits. They also installed lamprey passage slots and associated gates in Exit Weirs 335 through 338, on each side of the weirs' concrete pedicles. The University of Idaho installed camera supports for the lamprey passage study. Crews removed lips at the upstream visitor view window orifice to improve lamprey passage. Contractors covered sections of grating at Diffusers 12 through 14 with painted steel plates to also improve lamprey passage. The 2011 outage focused on replacement of the Oregon ladder's exit traveling screens.

Other modifications to the ladders may be found in this report's text.

Operations and Maintenance

Fishway Activities

Table 1 outlines each ladders' fish counting schedule. This was the fifth season counters used computers to tally the fish and the second season of video monitoring of adult lamprey passage. Picketed leads were in place during the counting season. In June, water clarity made fish identification difficult. Issues mentioned in this report appeared to have had very little effect on fish counts. In November, a technician installed random access memory (RAM) upgrades on the stations' computers.

Table 1. Fish Counting Schedule, 2010.

Dates	Activity
1 Jan – 31 Mar	No counting.
1 Apr – 31 Oct	Visual counting daily 0400-2000 hours PST. 1 July to 30 September: video of night lamprey passage reviewed.
1 Nov – 31 Dec	No counting.

The University of Idaho radio-tracked adult Chinook and steelhead past the dam as part of a broader, ongoing study. Adult salmonid passive integrated transponder (PIT) tag also detection continued. Also, the University continued trapping, radio-tracking and PIT

tagging adult lamprey as part of another study. From June 14 to November 14, they examined night lamprey passage at the Oregon ladder.

Staff monitored water temperatures from June 20 to September 16, 2010. The monitoring started five days late due to the delayed arrival of a new shuttle. The purpose of this specific effort, ongoing since 1999, is to determine if thermal barriers exist and to take corrective action if necessary. The recorders tallied temperatures hourly in one location at each ladder's exit. Also, for comparison, technicians installed a probe at the juvenile facility separator.

The juvenile fish facility for juvenile fish bypass/transport and adult fallbacks operated from 1 to 20 January and 1 April to 29 December, except on May 12 form October 26-28, when orifices were closed for rectangular screen cleaning mechanism repairs. Other brief outages occurred when switching in and out of emergency bypass. The juvenile report has more details about that facility's operation.

Fish Ladders and Collection Channel

Table 2 outlines each ladder's operation and maintenance schedule:

Table 2. Fish Ladder Operating Schedule, 2010.	
Ladder/Dates	Activity
Washington	
1 Jan – 31 Dec	Ladder in service. No outage. Outage was in December, 2009.
Oregon	
1 Jan – 12 Jan	Ladder in service. 3 January orifice flow.
12 Jan – 26 Feb	Ladder out of service for inspection, maintenance and lamprey improvements.
26 Feb – 31 Dec	26 February orifice flow, ladder in service. 27 February normal flow resumes.

Due to improvements causing a long scheduled outage on the Oregon ladder for 2010, the region agreed to dewater the Washington ladder in December, 2009, as we described in the 2009 report. Therefore, crews did not dewater the north ladder until February, 2011, and there were no winter inspections or maintenance to report for the Washington ladder until the February, 2011 dive inspection. We continue to be concerned about the integrity of the concrete entrance bulkheads which face Spillbay 1, and any erosion which may be occurring on these bulkheads. We will discuss operations of the PUD unit later in the Auxiliary Water Section.

During the season at the Washington exit, staff checked the set points one to three times per week. They noted slight drifts, round offs, or unrecorded adjustments of a tenth or two. However, they logged approximately 19 adjustments throughout the year due to debris on the picketed leads, for flow adjustments at the count station or weir issues. On 23 February, following an alarm, staff inspected Tilting Weir 334.

In the spring, there were two exit alarms, one 338 Weir alarm, one low water alarm and eight regulating weir alarms. Three of these alarms were related to debris on the picketed leads, which were being checked daily starting in the second week of May. Most of the time, resetting the regulating weir and adjusting the tilting weir resolved the problem. Also, on May 31, technical staff examined the regulating and tilting weirs. On 28 June, debris on the picketed leads caused multiple alarms with the ladder osculating. The lead hoist was out of service, so the general maintenance crew cleaned the leads with other equipment. The hoist returned to service the next day. Unfortunately, the hoist was in and out of service most of the remainder of the season.

During the first week of July, multiple regulating weir alarms occurred with the ladder being but in manual at times. Severe forebay changes along with debris on the leads probably contributed to the problem. On 5 July, the ladder was osculating again. The next day the electrical and technical staffs worked on the exit's PLC and weirs. Unfortunately, regulating weir alarms and weir adjustments continued with forebay changes and debris loads still being an issue. At times, the PLC and tilting weirs would also alarm. Occasional regulating weir alarms and adjustments with one low water alarm continued into September.

In Mid-September, the technical staff examined the exit area again. On 23 September, the Washington exit alarmed due to a lack of power possibly caused by scheduled maintenance on the tilting weirs on 22 and 23 September. Even after this work, approximately 13 regulating weir, two low water and one weir 340 alarms occurred into December along with several exit alarms in late November. The problems mentioned above were usually quickly resolved that day and the alarms were reset. One other possible cause for these alarms may have been dirty sensor still wells, which were be flushed out during the 2010-2011 maintenance season. Finally, during the year, crews performed scheduled maintenance on the exit weirs.

On March 23, crews lowered the picketed leads. They cleaned the picketed leads during the year as dictated by debris loads. The spill program, storms and milfoil influxes increased the frequency of cleaning and on several occasions, when the general maintenance crew was not available, the biologist and a member of the fisheries staff or an operator cleaned the leads. When the exit inspection points were out of criteria, it was generally due to debris or milfoil on the leads along with weir issues. On 1 November, crews raised the picketed leads and winterized the count stations. None of the issues mentioned above appeared to affect fish passage. The "Results" section below discusses criteria.

At the Washington entrance, bulkheads remained in Weir W1. In the spring, during high tailwater elevations, W1 would have approximately one foot of water flowing over it. W2 and W3 remained in automatic operation all year with slight calibration drifts. At times, possibly due to the spill program and also during low tailwater elevation, W2 either ran slightly deeper or shallower than W3, though both weirs were generally in criteria. Crews performed scheduled maintenance throughout the year.

On 11 March, though in criteria, it was noted that W2 and W3 were not moving. In early April, each weir was out of criteria once because of this. On 11 April, operators adjusted W2 and W3. On 15 April, crews calibrated both weirs and they began moving properly. In late May, W2 alarmed three times and was reset. In early June, both weirs were put in manual operation for 1.5 hours due to spill turbulence and excessive searching by the weirs. On 11 and 23 June, both entrances alarmed and were reset. On 9 July, crews calibrated both weirs again. Spill turbulence was possibly causing the alarms and calibration drifts. On 25 July, both weirs alarmed and were reset. It was noted that the entrances were occasionally hitting their lower sill limits, which staff adjusted during low tailwater elevations.

On July 28, staff noted that the light emitting diode (LED) reading for W2 was 0.6 feet shallower than the control room's computer readout. The technical staff found a burnt wire on a coil which would not allow the weir to rise. Crews replaced the wire and maintenance staff asked the fisheries staff to use the dial indicator on the weir's cable drum until crews could replace the LED, which should happen next maintenance season. On 26 August, after having been noted reading improperly, crews calibrated W3 again. On 8 November, crews replaced a shorted wire at the weirs with no affect on criteria. The "Results" section below will discuss criteria. Fish passage and counts appeared to be unaffected by these problems. We will discuss issues with the auxiliary water supply in the Auxiliary Water Supply section (below).

On 3 January, 2010 orifice flow began at the Oregon ladder, which had been in automatic operation. On 12 January, crews installed the exit bulkheads. That day, they delayed the outage about two hours to examine the exit bulkhead slot. Staff removed 13 steelhead adults, four bass and 2 adult lampreys. Staff removed two 50 gallon drums, one two by two foot piece of plywood, two woody debris blockages and about one dozen 0.5 to 6 inch diameter sticks from the ladder. Also, on January 12, staff salvaged 12 steelhead and two carp from the exit weir area. Crews only removed one woody debris blockage along with any sticks that had accumulated on the floor of the ladder.

The ladder was out of service for an extended period for contractors to install new exit bulkhead slots and lamprey passage improvements along with monitoring equipment. Also, the Corps performed all ladder maintenance, repaired the north traveling screen and performed maintenance on the south screen. After personnel completed the contracts, the facility resumed orifice flow on 26 February. On 27 February, the ladder returned to normal operations after technicians calibrated the exit and placed it in automatic operation. The entrances were in manual mode and crews returned them to automatic

operation by 1 March. See the "Auxiliary Water" section for a description of the supply conduit, juvenile facility and fish pump operations.

During the Oregon ladder dewatering, crews:

1. Inspected the upper ladder;
2. Performed regular maintenance on the regulating and tilting weirs, stationary weirs and counting station structures, which were for the most part in good condition;
3. Cleaned and painted the count station window floor panel, back board and picketed lead;
4. Installed lamprey and bulkhead slot improvements;
5. Maintained the traveling screens;
6. Installed four new debris baskets on the north traveling screen;
7. Cleaned the staff gauges and sensor stillwells;
8. Removed small piles of sticks from the exit pool and debris from the picket lead supports;
9. Removed debris and fish at the ladder's submerged orifices as described above;
10. Removed two orifice obstructions;
11. Removed a few small debris piles from the floor of the ladder;
12. Maintained the ladder's adult PIT tag detectors and associated equipment;
13. Installed two new PIT tag detectors at the count station; and
14. Maintained the duplex antennas.

In February, a physical examination of Diffusers 3 through 14 revealed a broken support on the west most section of the grating at Diffuser 11. A camera inspection in January did not reveal this problem. On February 22, crews replaced the support and grating. On 24 February, a dive of the remainder of the Oregon ladder's grating revealed no more problems. During February, a contractor installed the lamprey "walkways" at Diffusers 12 through 14. Also, crews maintained the diffuser's valves.

Crews maintained all entrance weirs, including North Fishway Entrance Weir (NFEW)1, which was available to run automatically for the adult lamprey passage test, which we will discuss later in this report.

During the season, many of the issues discussed about the Washington ladder also affected the Oregon ladder. The Oregon exit was in automatic operation most of the year. Staff checked the Oregon exit set points one to three times per week. They noted slight drifts, round offs, or unrecorded adjustments of a tenth or two. For the year, they observed approximately 18 set point adjustments, usually caused by debris on or removed from the picketed leads along with exit weir issues. During the year, the crews performed scheduled maintenance on the tilting and regulating weirs. In early March, technical staff examined all weirs. Also, staff programmed the count station window cleaning mechanism to run automatically.

On 23 March, crews lowered the picketed leads. Also for March and April, alarms sounded on only one regulating weir and three tilting weirs. Staff quickly reset them. Finally, by the second week of April the lamprey monitoring cameras were in place. By the second week of May, debris loads required daily monitoring of the picketed leads until crews raised the leads on 1 November. In the third week of May, a researcher reported debris, which the project could not remove, in one of the lamprey orifices at Weir 335. On 26 May from 1400 to 1523, the ladder was on orifice flow to attempt to remove the debris, again, with no success. The researchers moved their camera to another lamprey slot.

In May, four tilting weir alarms sounded, and staff reset them. On 20 June, technical staff adjusted the tilting weirs. On 24 June, crews repaired the count station window cleaning mechanism, which had been briefly out of service. From late June to mid-September, Weir 340 had repeated alarms due to encoder issues. During the first half of July, severe forebay elevation changes and debris loads caused repeated regulating weir alarms, which staff reset. Also, crews repeatedly cleaned the picketed leads.

On 14 July at 1300, after the study showed no ill effect of the lamprey orifices on salmon passage, staff opened all lamprey orifices at the region's request. On 1August, an Oregon ladder exit alarm occurred. Examination of the alarm revealed Eurasian milfoil clogging the ladder's picketed leads resulting in approximately one foot of flow over the leads and adjacent walkway. Crews reduced the ladder flow level set point and were able to respond about mid day to clean the leads. An Ice Harbor crane operator assisted with the project. Crews located much of the forebay debris along the Oregon shore, thus changing winds had caused the problem over night. Fish passage remained unaffected though a couple shad were trapped in a small corner enclosure and later dipped free.

The next week, possibly due to the events on 1 August, the count station backboard mechanism failed and crews repaired it. On August 13, at the Oregon exit, after having just cleaned the leads, the general maintenance crew was called back within 30 minutes to clean them again as the wind had just changed direction forcing milfoil into the ladder resulting in the leads being over flowed. On August 26, the general maintenance crew cleaned the picketed leads which were again over flowed due to mats of Eurasian milfoil. The exit was in manual operation during the cleaning. The Oregon exit's regulating weir and tilting Weir 340 had alarmed.

On August 26, a crew attempted to raise the picketed leads 1.5 inches for adult lamprey passage, but these attempts failed. We subsequently modified the leads during the winter maintenance season. In September and early October, the exit was in manual mode briefly at times due to regulating and tilting weir alarms along with debris on the picketed leads. All issues were quickly resolved. On 23 September, the crews performed scheduled maintenance on the exit area.

On 14 October, the exit crane was found to have structural issues and personnel removed it from service. After this date, crews had to clean the leads with a portable crane until 1

November, when they raised the leads for the season and winterized the count station. They repaired the exit crane later in the year, but it cannot be used on the supply conduit intake valve or the traveling screen bulkheads. From mid-October to early December, multiple exit alarms occurred, which staff reset with adjustments made to the regulating and tilting weirs. Fish passage appeared unaffected by the issues discussed here. We will discuss criteria more in the Results section below.

The south traveling screen came on line in automatic operation with the ladder to start the season. Staff set the south screen to run 10 minutes eight times a day. On 25 March, crews completed replacement of the four debris baskets and other repairs on the north screen. On 1 April, the north screen returned to service. Twice in April, the wash pump alarmed and was reset. On 28 May, the north traveling screen alarmed and was found jammed. Staff examined the screen and removed it from service. At the time, the exit crane was also out of service for maintenance and repairs so crews could not install the screen's bulkheads. After consideration, we determined that the north screen would have to remain out of service until the winter maintenance season, when a contractor would replace both traveling screens.

On 13 June, as debris loads increased, staff programmed the south traveling screen to run 12 times a day. In late June, the south screen alarmed once and staff reset it. Starting in September and going to season's end, false differential alarms occurred regularly. However, differential monitoring all year by the fisheries staff revealed no problems. Also, trash rack differential readings all season revealed no problems. On 31 October, the south screen was found to not be rotating but examination of the screen revealed no problem. On 3 November, the screen was found not rotating again. This time, it was noted that the screen was slipping a gear. On 4 November, crews repaired the screen. The issues discussed here had no ill effect on fish passage or the auxiliary water supply. During the year, crews performed scheduled maintenance on the screens.

With start up, all operational entrance weirs were in automatic mode. In early March, staff reprogrammed South Fishway Entrance Weir (SFEW)1, SFEW2 and NFEW1 to lower as part of the lamprey passage program, which we will describe. NFEW1 is generally not functional during the year and was only used for the lamprey study. However, during the spring with high tailwater elevations, about one foot of flow went over NFEW1. On 8 March from 1506 to 1654, the ladder was on orifice flow so the third leaf of SFEW1 and SFEW2 could be removed. This will allow the weirs to be lowered deeper during the velocity and night lamprey passage study. From 9 to 10 March, SFEW1 was in manual operation for limit switch replacement and calibration.

In late March, water velocity measurements were taken at the south entrances for baseline information for the lamprey study. In early June, after several alarms, staff placed NFEW2 and NFEW3 in manual operation for about 1.5 hours. We believe heavy turbulence, caused by the high spill volume, had tripped the weirs. From 14 June to 14 November, on a schedule set by the researchers, the operators would lower SFEW1,

SFEW2 and NFEW1 to sill to reduce velocity and improve lamprey passage on selected nights, as set by the study plan.

The fisheries staff monitored the weirs with only one problem noted. The first night, the weirs lowered late because Daylight Savings Time was not programmed into the system. On 16 June, the programming was changed. During most of the study, they employed an extra fish counter to review video tape each day. On 11 July, with a fish pump outage, crews raised SFEW1 to increase flow out of SFEW2. Later in July, we asked the researchers trapping lamprey in the Oregon ladder to improve their safety procedures during trapping. For the year, NFEW3's LED readout was out of service and staff had to use the cable drum indicator for elevation measurements. During the season, crews performed scheduled maintenance on all entrance weirs.

The spill program, which ran from 10 April to 31 August, appeared to affect NFEW2, NFEW3 and the north pool differential. We will discuss fish pump and juvenile facility outages below. The NFEW2 and NFEW3 drifted in and out of criteria a few times this year, and the north pool differential was hard to maintain. SFEW1 and SFEW2 had similar and more frequent drifts in and out of criteria for the same reasons. Also, lowering and raising the weirs for the lamprey study may have affected the weirs' calibration drifts. The south pool differential had similar effects, but stayed in criteria more reliably.

These issues caused calibration drifts and possibly hydraulic gradients, low tailwater elevations and reduced powerhouse flow. The issues discussed in this report affected the inspection points' criteria, which we will discuss in the Results section below. Criteria points were easier to maintain when all three fish pumps were on line, and none of the problems we discussed were occurring. Also, during the year, for short term fish pump outages and other events affecting flow, staff occasionally placed the operational weirs in manual mode. Finally, the staff adjusted twelve floating entrances as required. These problems did not appear to affect fish passage and fish counts. We will discuss issues with the auxiliary water supply in the Auxiliary Water Supply section.

There is a velocity meter in the Oregon ladder just downstream of the south powerhouse pool. The meter's accuracy was again sporadic this year. Most of the time, staff had to take measurements from surface observations. Some of the issues that affected flows at the powerhouse entrances probably also affect the meter and measurements. Finally, the project hopes to replace the meter in the near future. We will discuss criteria the Results section.

Auxiliary Water Supply

The Washington ladder received its auxiliary supply water through the PUD project's turbine or the conduit bypass when either was operational. The PUD and conduit were out of service for maintenance in December, 2009. The PUD had no 2010 maintenance

season, just like the Washington ladder. There were various outages of this unit during the year (see Table 3, below), but the bypass system worked well during all the outages.

With the fish passage period not yet occurring, staff did not monitor inspection points criteria. For the passage season, with the bypass working each time, unit outages had little effect on inspection criteria points or fish passage, because the bypass conduit

Table 3. 2010 Wasco County PUD Turbine Outages.

Date	Duration (hours)	Reason
1/1	0.85	None given
2/12	0.62	None given
2/18	4.2	None given
3/3	1.6	Low cooling water flow
3/6-7	12.4 (2 outages)	Transmission Line 7 trip outs
3/8-18	3 (4 outages)	None given
4/30	1.1	None given
7/16	10.5	BPA substation work
7/25	2.5 (2 outages)	None given
8/19	0.27	Testing
8/20	1.1	None given
9/1-21	5 (4 outages)	Transformer T7 replacement
9/19	59	None given
10/26-31	2 (2 outages)	None given
11/6-8	2.3 (2 outages)	None given
12/13	0.4	Fire alarm caused by core drilling
12/13	0.93	None given

valves automatically switched between the two systems, resulting in continuous flow into the fishway.

The juvenile system, when not down for maintenance or in emergency bypass, supplies the Oregon shore fishway's north powerhouse entrances with approximately 450 cubic feet per second (CFS). This additional flow occurred from 1 April to 22 November with two interruptions. On 12 May, crews closed the channel orifices for seven hours for retraction cable replacement on the rectangular screen cleaning mechanism. From 26 to 28 October, the juvenile system was in emergency bypass for replacement of retraction springs on the rectangular mechanism. When not available, the loss of this flow can affect the north powerhouse pool differential's criteria. We discussed the juvenile system in the juvenile report.

Staff closed the 1000 CFS auxiliary conduit on 3 December, 2009 to help prevent winter freeze damage and to prepare for the long winter maintenance season on the Oregon ladder. During the outage, crews maintained the conduit's intake valve. On 1 March, the conduit returned to service for the fish passage season. On 1 April, crews closed the

conduit for two hours in order to remove the north traveling screen's bulkheads. During the year, crews maintained the conduit's diffuser supply valves.

Table 4 (below) outlines long term fish pump outages. On 3 January, crews shut down all three pumps for the winter maintenance season. They inspected the bearings and repaired an oil leak on Fish Pump 1. On 27 February, all three pumps returned to service for the fish season. After initial adjustments, the fish pumps ran all season with blade angles of 22 to 30 degrees, depending on how many pumps were in use and ladder requirements. As pumps came on or off line, operators adjusted the blade angles. During the year, crews performed scheduled maintenance on all three pumps.

Table 4. Oregon Shore Fish Pump Outages at McNary Dam, 2010.*

Affected Pump(s)	Dates	Reason for Outage/Comments
1	3 Jan – 27 Feb 30 Jun – 31 Aug	Annual maintenance. Bearing, oil leak. Transformer T2 replacement.
2	3 Jan – 27 Feb	Annual maintenance.
3	3 Jan – 27 Feb 31 Aug – 29 Oct 4 Nov – 8 Nov 11 Nov – 20 Dec	Annual maintenance. Transformer T1 replacement. Oil leak. Bearing issue, cooling water, oil leak.

*Includes only outages involving two or more calendar days.

During the season, various fish pumps were in and out of service for short periods of time for the following reasons:

1. Leaf removal at SFEW1 and SFEW2;
2. Vibration testing;
3. Valve installation in the potable water cooling supply;
4. Repair of packing leaks;
5. Maintenance of diffuser valves;
6. DC ground isolation;
7. Changing bearing cooling water limits;
8. Transformer replacement outages;
9. Installation of bus switches;
10. Ground repairs;
11. Routine maintenance;
12. BPA transmission line work;
13. High temperature problems in guide bearings;
14. Alarm system problems;

15. Problems with potable cooling water well;
16. Flow issues;
17. Repair of cover plates;
18. Removal of stop logs;
19. Plate flood pump failure;
20. Oil leaks and repairs;
21. Flow meter repairs; and
22. Testing operations.

On 12 November, operators removed Pump 3 from service for work on the pump's cooling water system and an oil leak repair. On 20 December, after two false starts, Pump 3 returned to service. For most of the year, with outages noted above, two to three fish pumps were available. When the three pumps were on line together and the conduit was open along with the juvenile system being functional, the Oregon ladder entrances were in criteria or very close to it. However, with the many issues we already discussed in this report, and their possible interactions, keeping the Oregon ladder entrances in criteria was quite a challenge. We will discuss criteria in the Results section below. Despite these issues and intermittent fish pump outages, fish passage remained timely and consistent all season with fish passage this year comparable to previous years.

Adult Fish Trap Operations

McNary does not have an active adult fish trap. However, the University of Idaho continues to use a removable adult lamprey trap in the Oregon ladder for a migration study using PIT and radio tags.

Adult Fishway Inspections

Methods

From March 1 to December 31, Corps' fisheries personnel conducted one to four inspections each week; average was 2.7 and 2.8 per week for the Washington and Oregon ladders respectively. The report week ran Friday to Thursday for a total of 44 report weeks. However, the first report week was only four days long. Also, holidays shorten some weeks. Finally, the project had a personnel change in the project biologist position which also reduced the opportunity to conduct more inspections. The result was 121 total inspections for the Oregon ladder's criteria points, except for the channel velocity, which had only 108 inspections being randomly missed throughout the season.

The Washington ladder had 120 inspections with no inspection occurring on 23 November due to icy conditions. Finally, staff inspected both ladders while recording no data, especially after problems. Staff recorded fishway measurements from staff gauge readings and tape measurements from the ultra sonic wells, usually every one to seven days between approximately 0900 to 1600 hours. They determined entrance weir depths from LED's or cable spool dial indicators. Also, Fish Passage Center staff conducted a monthly measured inspection of the adult fishways.

Staff inspected the adult fishway system, visually examining or measuring 18 reference locations, resulting in 14 inspection criteria points. These inspection points included six weir entrance depths:

1. South shore entrances (SFEW1 and SFEW2);
2. North powerhouse entrances (NFEW1 and NFEW2); and
3. North shore entrances (W1 and W3).

They also measured the head differential at the three main entrances and 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 fishways are as follows:

1. Water depth over the ladder weirs: 1.0-1.3 feet;
2. Maximum head on picketed leads: 0.5 feet;
3. All fishway entrance differentials: 1.0 to 2.0 feet;
4. North shore entrances (W1 and W3) weir depths: 8.0 feet or greater;
5. North powerhouse entrances (NFEW1 and NFEW2) weir depths: 9.0 feet or greater;
6. South shore entrances (SFEW1 and SFEW2) weir depths: 9.0 feet or greater; and
7. Collection channel velocity: 1.5 to 4.0 feet per second.

Since 2008, staff could review the computer controlled automated fishway system record, but computers would no long print it out automatically, due to programming issues. When required, the project fisheries biologists reviewed the records, and asked for adjustments as needed. The records did reflect the general trends noted in the inspection data discussed below.

Inspection Results

Appendix 1 includes the readings for each criteria point during the fishways' inspections. Table 5 summarizes the results of the measured inspections conducted by the fisheries staff. This table does not include visual observations. Finally, the Operations and Maintenance section of this report gives detailed reasons as to why the fishways' criteria points may have been out of criteria, which can be related back to Table 5. We will summarize the table's results here, including some details. Late in the passage season, severe winter weather made it difficult to perform inspections.

On the Washington ladder, the counting station differential and weir (head over weir) were each out of criteria five times and on ten occasions respectively; which is 4.2 and 8.3 percent for each. This was due to debris or milfoil on the picketed leads along with set point and weir issues.

The Washington entrance pool differential was never out of criteria. W2 was out of criteria five times for 4.2 percent. W3 was out of criteria five times for 4.2 percent. This occurred at both W2 and W3 due to the weir requiring calibration due to the spill program or with low tailwater elevation. Crews adjusted the weirs' lower limits, eliminating the tailwater issue. The Washington ladder results were good this year and comparable to last year.

On the Oregon ladder, the count station differential and weir (head over weir) were out of criteria on three and seven occasions each; which is 2.5 and 5.8 percent of the time, respectively. These results were due to debris or milfoil on the picketed leads along with exit weir issues and are very similar to previous years.

As discussed previously in this report, the following contributed to point issues listed below, including:

1. The spill program;
2. Fish pump problems;
3. Weir problems; and
4. Having the juvenile facility in emergency bypass mode.

The south shore pool differential was out of criteria on seven occasions for 5.8 percent of the time, which is an improvement over last year's 15 percent. On four of these occasions, the south pool differential measured 0.9 feet, which is just one tenth out of criteria. The three other occasions were caused by fish pump outages.

The north powerhouse pool differential was out of criteria on 69 occasions for 57.0 percent of the time compared to 36.1 percent for 2009. On 17 and 20 occasions, the north pool differential measured 0.9 and 0.8 feet respectively. These 37 readings were related to the juvenile fish facility (which was no longer supplying the 450 CFS to the north entrance early and late in the season), low tailwater elevations with the spill program in the summer, fish pump outages and other issues already discussed. For the 32 readings below 0.8 feet, most occurred for the same reasons with a more severe affect.

SFEW1 and SFEW2 were out of criteria 22 and 24 times each. This was 18.2 and 19.8 percent of the time for each weir being out of criteria compared to last year when each weir was out of criteria at 42.9 and 12.0 percent. SFEW1 and SFEW2 on 17 and 10 occasions respectively were 0.1 to 0.2 feet outside of criteria. Issues discussed elsewhere in this report appeared to affect both weirs, especially the spill program, and possibly the lamprey passage study, causing slight calibration drifts. For some reason, SFEW2 appeared to have more severe calibration drifts than SFEW1, resulting in more readings below 8.8 feet.

NFEW2 and NFEW3 were out of criteria four times each yielding 4.2 percent, which compares to 12.1 and 8.3 percent in 2009, respectively. Each reading for NFEW2 and

Table 5. Summary of Adult Fishway Inspections at McNary Dam, 2010.[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	52	48.1	***	***	***	***	***	***
	108		***	***	***	***	***	***
Counting Station Differential.	118	97.5	***	***	***	1	1	1
	121		***	***	***	0.8	0.8	0.8
Weir Head.	114	94.2	5	0	0	2	0	0
	121		4.1	0.0	0.0	1.7	0.0	0.0
South Shore Differential.	114	94.2	4	0	3	0	0	0
	121		3.3	0.0	2.5	0.0	0.0	0.0
North Powerhouse Differential.	52	43.0	17	20	32	0	0	0
	121		14.0	16.5	26.4	0.0	0.0	0.0
SFEW1 Depth	99	81.8	10	7	5	***	***	***
	121		8.3	5.8	4.1	***	***	***
SFEW2 Depth	97	80.2	6	4	14	***	***	***
	121		5.0	3.3	11.6	***	***	***
NFEW2 Depth	117	96.7	4	0	0	***	***	***
	121		3.3	0.0	0.0	***	***	***
NFEW3 Depth	117	96.7	3	1	0	***	***	***
	121		2.5	0.8	0.0	***	***	***
North Fish Ladder (WA)								
Counting Station Differential.	115	95.8	***	***	***	1	2	2
	120		***	***	***	0.8	1.7	1.7
Weir Head.	110	91.7	1	0	0	5	4	0
	120		0.8	0.0	0.0	4.2	3.3	0.0
North Shore Differential.	120	100.0	0	0	0	0	0	0
	120		0.0	0.0	0.0	0.0	0.0	0.0
W2 Depth	115	95.8	1	0	4	***	***	***
	120		0.8	0.0	3.3	***	***	***
W3 Depth	115	95.8	1	1	3	***	***	***
	120		0.8	0.8	2.5	***	***	***

[1] Data from Appendix 1.

NFEW3 was 0.1 to 0.2 feet outside of criteria. These results reflect only a small influence on the weirs by the problems we discussed in this report.

Staff recorded the collection channel velocity 108 times for the season with the reading being out of criteria 56 times. This was 51.9 percent of the total with no readings were below 1.0 feet. The out of criteria percentage last year was 17.9 percent. The Fish Ladder and Collection Channel section above further discussed the meter. The results for the Oregon ladder were good, with only the north powerhouse pool differential and the channel velocity being out of criteria more than 20 percent of the time. The problems discussed in this report had no apparent effect on adult passage, as fish counts always seemed comparable to past years.

Recommendations

1. Program the computer system in the Control Room to permit an automatic control printout, as in previous years. The new computer's software does not allow this.
2. Install handrails on the ladders' walls to permit staff to safely inspect weirs and orifices from above. This would also aid in debris removal, and could provide a lookout and emergency egress assistance for employees walking the ladder during dewatering.
3. Install manual start on both Oregon exit traveling screens so staff can check their operation as needed.
4. After fifty plus years, upgrade any infrastructure which could possibly create issues in the future. For example, diffuser inflow valves: It is dangerous to close the tainter valve without first closing these diffuser valves, but they are not currently operable. This puts tremendous pressure on the critical tainter valve and risks an expensive, catastrophic failure of the valve.
5. Install a new velocity meter in the Oregon ladder. The old one is not reliable.
6. Close some of the northern floating entrances to improve the north powerhouse pool differential.
7. Improve exit and entrance weir calibration so alarms and drifts occur less frequently.
8. Continue lamprey passage improvements, including access plates over the diffusers on the Washington ladder.
9. Replace bulkheads at Washington ladder south entrance so the pool can be dewatered for inspections. It cost almost $7000 to have divers conduct the inspections this year, and a physical inspection is required every third year.
10. Replace traveling screens at Oregon exit (This was completed on March 1, 2011).
11. Replace both exit ladder cranes so that crews can perform certain essential tasks:
    a. Currently the Oregon side crane cannot open and close the tainter valve or install or remove the Oregon travelling screen bulkheads. A contractor crane on a barge must be brought in, at great expense, to perform those functions.
    b. The Washington crane cannot install or remove the exit bulkheads, picketed leads, or trash rack; crews must bring in a portable crane for these tasks.
12. Fix the leaks on the Washington ladder. This is much more than a cosmetic issue. The leaks are eroding the ladder, making the holes larger and larger, and more expensive to fix, each passing year. Also, the falling water is causing deterioration of the ladder and

dam substructure beneath the Washington ladder, and creates very hazardous conditions, especially during freezing conditions. Lastly, the leaks are robbing the ladder of the flows needed to optimize fish passage.

Acronyms

BPA – Bonneville Power Administration
CFS - cubic feet per second
LED - light emitting diode
NFEW - North Fishway Entrance Weir
PIT - passive integrated transponder
PST - Pacific Standard Time
PSMFC - Pacific States Maritime Fisheries Commission
PUD - Wasco/Klickitat Public Utility District
RAM - random access memory
SFEW - South Fishway Entrance Weir

Appendix 1 – Adult Report Table

(sent separately)