

Annual Adult Fish Passage Report

McNary Lock and Dam

2012

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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 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.

Facilities Modifications

During the winter maintenance season of 2012, on the Washington and Oregon ladders, the project had new electrical supply lines installed for the exit cranes. A contractor will

install new cranes in 2013. On the Oregon ladder, at the count station, we repaired the picketed leads and installed new PIT tag detectors. Also, on entrance weir SFEW2 we installed stilts for a lamprey passage study. Any in season modifications can be found in the report's text.

Operations and Maintenance

Fishway Activities

Table 1 outlines both ladders' fish counting schedule. This was the seventh season computers were used to tally the fish and the fourth season of adult lamprey video monitoring. The project had picketed leads in place during the counting season.

Table 1. Fish Counting Schedule.

Dates	Activity
1 Jan – 29 Feb	No counting.
1 Mar – 31 Mar	Counts by video tape review.
1 Apr – 31 Oct	Visual counting daily 0400-2000 hours PST.
1 Jul – 30 Sep	Night lamprey passage video reviewed.
1 Nov – 31 Dec	Counts by video tape review.

Video tape review will continue to February 28, 2013 for both ladders when they are in service. The review will occur at the Washington count station with the Oregon side being winterized.

Adult salmonid PIT tag detection and the adult lamprey passage study are ongoing. During the winter, a contractor examined adult fallback passage at the powerhouse.

We monitored water temperature from June 15 to September 17 this year. The purpose of this specific effort, ongoing since 1999, is to determine if thermal barriers exist and take corrective action if needed. Our probes recorded temperatures hourly in one location at each ladder's exit. Also, we had a probe at the juvenile facility separator for comparison.

We operated the juvenile fish facility for juvenile fish bypass/transport and adult fallbacks from March 29 to December 20. Brief outages are discussed in this report's juvenile section and in the 2012 juvenile report.

Adult Fish Trap Operations

McNary has no active tagging program and no outside agencies tagged at McNary this year.

Fish Ladders and Collection Channel Schedules

Table 2 outlines both ladders' operation and maintenance schedules.

Table 2. Fish Ladder Operating Schedule.

Ladder/Dates	Activity
Washington	
1 Jan – 1 Feb	Ladder in service.
1 Feb – 16 Feb	Ladder out of service for inspection and maintenance.
16 Feb – 31 Dec	Ladder in service.
Oregon	
1 Jan – 4 Jan	Ladder in service.
4 Jan – 31 Jan	Ladder in orifice flow for inspection and maintenance. Not dewatered.
31 Jan – 31 Dec	Ladder in service.

Washington Ladder Outage

On January 31, the operators switched the Washington ladder to orifice flow. On February 1, the general maintenance crew completed installation of 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.

2. The fisheries staff examined the submerged orifices removing about one dozen partial orifice blockages and dozens of sticks from 0.25 to six inches in diameter. We also removed one each: a railroad tie, a car tire, a bucket lid and a pitch fork. No fish were seen. During this time, we also examined Diffuser 12 with no problems found.

3. Pacific States Maritime Fisheries Commission (PSMFC) and Corps of Engineers (COE) personnel performed maintenance on the ladder's adult PIT tag detectors and associated equipment. The University of Idaho did maintenance on the duplex antennas.

4. On February 2, the fisheries staff examined Diffuser Gratings 1 through 11 using an underwater camera, 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. We also examined this area with the camera for district engineers.

5. All entrance weirs received preventative maintenance. We also examined these weirs with the camera for district biologists for possible lamprey improvements. On February 8, we lowered W1 to confirm that the weir does run shallower than W2 and W3. Again, we used the camera.

Operations of the PUD unit will be discussed later in the Auxiliary Water Section. On February 16, the project removed the 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. With the sensor still wells having been cleaned, fewer set point adjustments occurred than previous years after the initial setting. The exit was in automatic mode most of the year. Exit issues effects on criteria points will be discussed in the Results Section.

The mechanical and general maintenance staffs performed scheduled maintenance on the exit weirs and picketed lead hoist along with the exit trash hoist. Also, the general maintenance crew cleaned the count station backboards as needed. In season issues will be reflected in Table 3. There were three regulating weir alarms, two low water alarms and one exit weir alarm all of short duration, which the operators reset, that are not included in Table 3.

During the power outages of February 9, the ladder was already out of service. During scheduled maintenance, on July 10 and November 20, the electricians found the failed limit switches on Weir 340 and on Weir 335, respectively.

Debris loads at the exit were not as severe as last year. However, when available we still had the fisheries technicians check the picketed leads. By late March, we were checking

the leads daily. By late April, we were cleaning the leads daily including the weekends at times. In May, the general maintenance staff removed a large root wad from weir 337.

The debris loads began to fluctuate. However, in late June and early July we had another peak. At this time, the project passed some of the debris out the navigation lock. Most of the debris to this point was woody with tumbleweeds. By August, the debris load had decreased but now consisted mostly of Eurasian milfoil. In November and December, the debris load again increased and consisted almost totally of tumbleweeds.

Table 3. In Season Washington Ladder Exit Issues.

Date	Time	Issue	Reason/ Result
24 Jan	1.6 hours.	Ladder out of criteria.	Not recorded.
25 Jan	One hour.	Ladder out of criteria.	Not recorded.
29 Jan	Brief.	Exit alarm.	Electrical work.
9 Feb	Two hours total.	Power outages.	Breaker trip.
27 Feb – 1 Mar	Three days.	Power outage. Weirs in manual.	Crane electrical work.
29 Feb- 31 Dec	For season.	Picketed leads lowered.	Counting season.
25 Mar	Brief.	Lower water alarm.	Reset, set points adjusted.
11 Apr	Brief.	Power outage.	Test spill backup power.
May - Jun	Each event was brief.	Multiple alarms three times and six set point adjustments.	Possibly weir 340.
3 Jul	Brief.	Ladder osculating.	Set points adjusted.
10 Jul – 19 Aug	40 days. Each event was brief.	Multiple alarms three times and four set point adjustments.	Weir 340 lower limit switch. Replaced.
Aug - Sep	Each event was brief.	Multiple alarms twice and four set point adjustments.	Late August high forebay elevation. Possibly weir 335.
Mid-Sep	Brief.	Window brush low twice.	Project repaired.
3 Oct	Overnight.	Storm debris impacted on picketed leads.	Project cleaned.
23 Oct	21 minutes.	Power outage.	Test spill backup power.
14, 16 & 21 Nov	Brief.	Picket leads clogged three times.	We cleaned leads and set points changed once.
20 Nov – 5 Dec	15 days. Each event was brief.	Ladder flow fluctuating. Set point adjusted three times.	Upper limit weir 335 failed. Switch replaced.

Late Dec	Brief.	Low water alarm.	Set points changed.
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Washington Ladder Entrance-Season

At the Washington entrance, weir W1 remains in standby. Testing this winter confirmed that W1 does operate shallower than W2 and W3. 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 will be discussed in the Results Section. In season issues will be reflected in Table 4.

Table 4. In Season Washington Ladder Entrance Issues.

Date	Time	Issue	Reason/Result
24 & 27 Jan	Brief.	Tailwater sensor/transducer.	Replaced.
27 Feb – 1 Mar	Three days.	Power outage. Weirs in manual.	Crane electrical work.
6 – 15 Mar	9 days.	W3 not moving. Weir out of criteria four times.	Adjust weir's lower limit.
28 Mar – 18 Apr	21 days.	W2 and W3 excessively searching up and down. Weirs out of criteria. Spill turbulence.	Technical staff resolved and calibrated.
11 Apr	Brief.	Power outage.	Test spill backup power.
11 Jun	1 day.	Calibration drifts.	Calibrated weirs.
6 – 13 Aug	7 days.	Weirs continuously moving within 1.5 feet.	Adjusted limits.
29 Aug, 2 & 4 Sep	Brief.	W3 out of criteria.	Weir calibrated.
23 Oct	21 minutes.	Power outage.	Test spill backup power.
2 – 19 Nov	17 days.	Weirs not moving.	Resolved issue and calibrated weirs.

From August 6 to 13, when the weirs were continuously moving, we never found them out of criteria. From November 2 to 19, even though the weirs were not moving, we found them always in criteria. During the spill, turbulence makes it difficult for the technical staff to keep the entrance weirs calibrated. When spill is not occurring, the project is better able to keep the weirs calibrated.

The Washington ladder problems discussed appeared to have not affected fish passage. Issues with the auxiliary water supply will be discussed in the Auxiliary Water Supply Section.

Oregon Ladder Outage

On January 4, the operators started the Oregon ladder which had been in automatic operation on orifice flow were it remained for maintenance. Due to the exit crane being out of service along with the 1000 cfs supply intake valve requiring a new closure chain and the roto-valves at the diffusers requiring replacement, the ladder could not be dewatered. We could only do maintenance on the above water systems.

For the Oregon ladder above the water line, the following repairs and inspections were made:

1. The fisheries staff visually inspected the upper ladder. 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 mechanics repaired the damaged picketed leads. The fisheries staff cleaned staff gauges, sensor still wells and removed light debris. A contractor installed additional lamprey study equipment.

From January 17 to 29, the contractor installed the new electrical supply line for the exit crane. On January 24 and 25, this work caused issues with the weirs' fuses, count station electrical and PIT tag system.

On January 31, Weir 340 had a fuse issue which the project resolved.

2. The fisheries staff inspected and removed two debris wads for the ladder's submerged orifices.

3. PSMFC preformed maintenance on the ladder's adult PIT tag equipment. The University of Idaho did maintenance on the duplex antennas.

4. The 1000 cfs supply conduit could not be closed; however, the fisheries staff was still able to do an underwater camera inspection of all diffuser grating with no problems found. The diffusers' supply valves received maintenance.

5. All entrance weirs received preventative maintenance. The fisheries staff did camera inspections for district personnel at the weirs to examine them for possible lamprey improvements.

On January 31, the project removed the exit and juvenile bypass stop logs returning the ladder to automatic operation. Auxiliary water operations will be discussed in that section.

Oregon Ladder Exit-Season

During the season at the Oregon exit, the fisheries staff checked the set points one to three times a week. With the sensor still wells having been cleaned, fewer set point adjustments occurred than previous seasons. For the year, the exit was in automatic operation. Exit issues affect on criteria points will be discussed in the Results Section.

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

We monitored debris along the Oregon shore. When available, fisheries technicians helped. Though the debris load changed frequently, there was only one serious debris problem at the exit on October 3 as reflected in Table 5, the Oregon exit in season table.

Table 5. In Season Oregon Ladder Exit Issues.

Date	Time	Issue	Reason/Result
24 Feb	Brief.	Exit out of criteria.	Operators reset.
27 Feb	Brief.	Electrical issues.	Project resolved.
29 Feb – 31 Dec	For Season.	Picketed leads lowered.	Counting season.
29 Feb	11.5 hours.	Ladder on orifice flow.	Count station PIT tag detectors replaced.
7 Mar	One day.	Weir encoder upgrades.	Technical staff completed. Set point adjusted.
14 Mar	Brief.	Ladder flow.	Set points adjusted.
20 Mar	Brief.	Regulating weir alarm.	Set points adjusted.
Apr - Sep	Brief.	Three regulating and one power alarm.	Reset all. One set point adjustment.
11 Sep	One day.	Debris on shore.	Resource maintenance removed one load.
3 Oct	Overnight.	Storm debris impacted on picketed leads.	Project cleaned.
13 Nov	Brief.	Dirty back board.	Cleaned.
14 Nov	Brief.	Second time counting computer shutdown.	Adjusted settings.
18 Nov	Brief.	All weirs alarm.	Set points adjusted.
24 Nov	Brief.	High flow.	Set points adjusted.
2 Dec	Brief.	Ladder flow.	Set points adjusted.
18 Dec	One day.	At 0002, program failed. Alarms. Tilting weirs lying down. Exit in manual.	Technical staff examined program and adjusted set points twice.

On February 29, not only did we install new PIT tag detectors at the count station but we also had the ladder on orifice flow for contractor diving at the old juvenile fish facility outfall. None of the issues mentioned above affected fish passage.

Oregon Exit Traveling Screens

On January 19, the project removed the traveling screens and wash pump from service as the pump had failed. After this, the project performed maintenance on both screens and repaired the pump. With the 1000 cfs supply conduit open all winter, the fisheries staff monitored the differential on the screens with no problems observed. On March 7, the project returned the screens and pump to service.

For the season, the system received scheduled maintenance. Multiple false screen alarms occurred all year which the operators reset. Most of the time, the south screen had the false alarms. Our differential monitoring revealed no problems. On December 18, the technical staff looked into the program to see if they could eliminate these false alarms. The operators also reset twelve wash pump alarms. Table 6 reflects other in season issues.

Table 6. In Season Oregon Traveling Screen Issues.

Date	Time	Issue	Reason/Result
27 Apr – 8 May	Eleven days.	Debris trough and discharge pipe partially blocked with woody material.	Biologist and mechanics monitored and removed.
13 Jun	Unknown	Biologist found north screen in manual.	Operator returned to automatic.
3 Oct	Overnight.	Storm debris impacted screens' trough.	Project cleaned.

When available the fisheries technicians monitored the traveling screen system. The operators set the system to run eight cycles per day for 20 minutes each time. Also, the technical staff set the screens and wash pump to run when a 3-inch or greater screen differential occurred. 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. The spill program and hydraulic gradients continue to cause calibration drifts for all entrance weirs. We made calibration checks as often as possible and scheduled maintenance occurred throughout the year. Calibration was easier to maintain when no spill was occurring.

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.

On March 14, the project adjusted the depth of SFEW1 and SFEW2 in order to increase the south powerhouse pool differential and return it to criteria.

On June 19, the biologist noted NFEW3 out of criteria because the weir’s cables were too far out of the water. The next day, the technical staff calibrated the weirs. However, the problem continued until June 25 when the technical staff replaced a loss gear which had caused the weir’s reading not to match the cable length. The weir had been further out of criteria than the readings indicated.

For the year, the project believes the lamprey passage stilts on SFEW2, which allowed flow under the weir, made it difficult for the project to maintain weir depth criterion at the south entrance. However, we were able to keep the south pool differential in criteria. In August, the district discussed solutions to the criteria issue and examined all entrance weirs.

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

Entrance weirs effects on inspection points will be discussed in the Results Section. The problems discussed here appeared to have not affected fish passage. Issues with auxiliary water will be discussed in that section.

Lamprey Passage

Lamprey passage testing related to the Oregon entrances are reflected in Table 7. The fisheries technicians, when available, monitored the entrance weirs.

Table 7. Lamprey Passage and the Oregon Entrances.

Date	Time	Event
23 Feb	Brief.	Ball of wire removed from SFEW2.
23 Feb	Couple hours.	Camera inspection of bulkhead slot.
23 – 25 Feb	Two days.	SFEW2 removed for stilt installation.
24 Feb	One day.	Guide replaced on SFEW2.
28 Feb	Brief.	Programmed SFEW2 for operation with stilts.
15 Jun – 30 Sep From 2100 to 0400	3.5 months.	SFEW1, NFEW2 and NFEW3 programmed to lower at night.
15 - 25 Jun	10 days.	SFEW2 turned off manually.
24 Jun	Brief.	Limits adjusted on SFEW1 and SFEW2.
25 Jun - 30 Sep	Brief.	SFEW2 programmed to lower.

28 Jun	Brief.	SFEW1 and SFEW2 calibrated.
2 Jul	One day.	Noted slack in SFEW2's cables. Limit adjusted.
2 – 3 Jul	Two days.	Cameras and frames installed at SFEW1 and SFEW2.
9 Jul, 24 Jul, 6 Aug & Aug 20	Brief.	Project helped adjust camera frames.
20 Jul	One day.	Project installed access handrails around SFEW1 and SFEW2 controls.
Mid-Sep	One day.	Camera frames removed.

From February 23 to 25, while SFEW2 was removed from its slot, the south entrance was out of criteria. The camera inspection found what appeared to be a wood bulkhead at the bottom of SFEW1 and SFEW2's bulkhead slots. Each bulkhead was about eight feet tall.

When programming the entrance weirs to lower for lamprey passage at night, the program only allows for all four weirs to operate the same. Initially, we turned SFEW2 off at night. Later, the technical staff programmed the weir to lower to 253.5 feet.

Once the project helped to installed camera frames, SFEW1 and SFEW2 could not be raised above 267.0 feet.

On July 14, the biologist noted when NFEW2 and NFEW3 were down, that NFEW1's cables had a severe vibration. On July 25, the general maintenance crew examined all north entrance weir cables and found no problem. The project will continue to monitor the issue.

Oregon Channel Velocity

The velocity meter is located in the Oregon ladder just downstream of the south powerhouse pool. The velocity reading history is recorded in Table 8.

Table 8. Velocity Meter Use.

Date	Issue
Start season.	Old meter still out of service. Took surface readings.
3 May	Tried to install new meter. Could not remove old cable without crane support.
30 May	New meter and cable installed.
5 Jun	Meter wired into electricity, functional.
9 Jul	Set point adjusted.
Early Aug	Noted probe out of water. Electricians cut cable too short.
8 Aug	Return to doing surface readings.
Early Dec	New cable delivered. Will be installed winter 2013.

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.

Auxiliary Water Supply

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, on January 24, the unit tripped off line for 1.3 hours. On January 29, the county switched the PUD system to bypass. The unit’s winter outage is reflected in Table 9.

Table 9. Washington Ladder Auxiliary Water Supply Winter Outage.

Date	Time	Event
31 Jan – 17 Feb	18 days.	PUD system removed from service.
1 Feb	Two hours.	Conduit stop logs installed.
7 Feb	One day.	Cleaned intakes of conduits 1, 3 and 4.
14 Feb	Two hours.	Camera inspection of conduits’ intakes. Debris noted only at conduit 2.
16 Feb	One hour.	Cleaned intake to conduit 2.
16 Feb	Two hours.	Remove conduit stop logs.

During the outage, PUD personnel noted two baffles in the bypass diffuser chamber were loose. On February 17, when restarting the unit, the county went straight to unit operation and did not use the bypass part of the system.

In season unit outages and issues are recorded in Table 10. When the unit was out of service, the bypass system operated well, so 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. Inspection points will be discussed in the Results Section.

Table 10. In Season PUD Unit Outages and Events.

Dates	Time	Event
27 Feb to 1 Mar	Three days.	Power outage. PUD used back up power.
11 Apr	One day.	The two loose diffusers were reattached by PUD personnel. Repairs occurred four days before bypass was needed.
15 - 16 Apr	17.7 hours.	Unit out of service, cooler leak.
17 Apr	One hour.	Unit tripped off, no record why.

25 Apr	1.3 hours.	Unit down for scheduled maintenance.
21 May	24 minutes.	Unit tripped off, no record why.
18 & 21 Jun	1.9 hours total.	Unit down twice for transformer testing.
4 Sep	3.6 hours.	Unit down for fire inspection.
13 Sep	1.2 hours total.	Unit down twice for line switching.
26 to 27 Sep	1.2 hours.	Unit tripped off, no record why.
9 Oct	One hour total.	Unit down twice for transformer maintenance.
30 Oct	1.2 hours total.	Unit down twice for line switching.
21 Dec	1.1 hours.	Unit tripped off, no record why.

Oregon Ladder Auxiliary Water Supply - The Juvenile System

The juvenile system's operation is reflected in Table 11. The juvenile system supplied the Oregon ladder's north powerhouse entrances with approximately 450 cfs when operational and not in emergency bypass. When the system was functional or in emergency bypass, it did pass adult fallbacks and juvenile fish. This system is discussed in the Juvenile Section of this report.

Table 11. The Juvenile System's Operation.

Date	Time	Event
1 Jan – 29 Mar	Three months.	System not operational. No juvenile water to Oregon ladder.
29 Mar – 3 Apr	Five days.	System functional and supplying flow.
3 – 9 Apr	Six days.	Emergency bypass for brush repairs. No juvenile water to Oregon ladder.
9 Apr – 6 Nov	Seven months.	System functional and supplying flow.
6 Nov – 20 Dec	1.5 months.	Emergency bypass for brush repairs. No juvenile water to Oregon ladder.
20 – 31 Dec	Eleven days.	System not operational. No juvenile water to Oregon ladder.

The loss of this 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

This year, the supply conduit was never closed due to conduit's intake valve's lifting chain requiring replacement, the failure of the exit crane and the failure of many of the conduit's discharge valves to the diffusers. During the year, the project did maintenance on the conduit's discharge valves.

Oregon Ladder Auxiliary Water-Fish Pumps

The winter outage and any long term fish pump outages are outlined in Table 12.

Table 12. Long Oregon Fish Pump Outages.*

Affected Pump(s)	Dates	Reason for Outage
1	4 Jan – 31 Jan 22 – 25 Feb	Annual maintenance. Contract dive and SFEW2 stilt installation.
2	1 Jan – 31 Dec	Overhaul.
3	4 Jan – 31 Jan 22 – 25 Feb 21 – 27 Feb	Annual maintenance. Contract dive and SFEW2 stilt installation. Relay replacement.

*Only outages involving two or more calendar days are included.

The February outages were coordinated with the region and left the ladder out of criteria during a low fish passage period. Fish Pump 2 still requires a major overhaul which would necessitate the need for a contractor to do the work, hopefully in 2013. In October, the project removed our equipment from the pump and in November, we re-watered it.

During the season, when functional, Fish Pumps 1 and 3 ran with 30 degree blade angles. Short term fish pump outages are outlined in Table 13. The number of fish pump outages is recorded when greater than one. The outages on February 13 and 29 were coordinated with the region.

Table 13. Short Oregon Fish Pump Outages.*

Pump(s)	Dates	Length/Number	Reason for Outage
1,3	8 Feb	17 minutes.	Bus switch.
1,3	13 Feb	10 hours.	Transmission line 1 and 2 maintenance.
1,3	29 Feb	6.9 hours.	Dive contract on old JFF pipes.
1,3	12 Mar	Brief.	Power outage.
1	29 Apr	12 minutes.	Grease pump failed.
1,3	20 Jun	15 minutes.	Calibration of NFEW2 and NFEW3.
3	21 Jun	12 minutes.	Low bearing cooling water flow.
3	7, 8, 11 & 12 Jul	25 minutes/One outage each day.	Low cooling water flow to guide bearing. Project examining problem.
1	17Jul	54 minutes.	Replace cooling water supply lines.
3	31 Jul	26 minutes.	Low bearing cooling water flow.
1	17 Aug	5 minutes.	Grease pump trip.
1,3	19 Aug	10 minutes.	Bus switch.
1,3	27 Aug	15 minutes.	Test cooling water back flow preventer.
1,3	5 Dec	36 minutes.	Test fish pump house carbon dioxide system.

*Outages less than two calendar days.

During the year, both pumps and valves which regulate the flow from the fish pumps received scheduled maintenance.

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. Criteria will be discussed in the Results Section.

Adult Fishway Inspections

Methods

From March 1 to December 31, Corps' fisheries personnel conducted three 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 eight and four days long, respectively. Also, holidays shorten some weeks. The result was 133 total inspections for both ladders' criteria points, except the Oregon ladder channel velocity, which had only 130 inspections due to it being randomly missed throughout the season. Also, the Fish Passage Center did a monthly inspection.

Personnel recorded fishway measurements from staff gauge readings and tape measurements from the ultra sonic wells. We took entrance weir depths from LED's or cable spool dial indicators. The staff did inspections every one to four days 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). They also inspected 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 is 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 reviewed but cannot be printed out automatically due to the lack of programming. When required, the fisheries staff can request a printout to reviewed and asked for adjustments as needed. The records did reflect the general trends noted in the inspection data discussed below.

For the start of 2012, the printer was not operational. In late May, the project installed a new printer in the control room so printouts could again be reviewed. On September 9 and 10, the technical staff resolved issues with the printer.

Inspection Results

Appendix 1 contains the readings for each criteria point during the fishways' inspections. The results of the measured inspections conducted by the fisheries staff are summarized in Table 14. 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 14. The table's results will be summaries here.

Table 14. Summary of Adult Fishway Inspections at McNary Dam.

Criteria and Locations	No. in Criteria/ No. of Inspections	% In Criteria	Not Enough Depth			Too Much Depth		
			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	89	68.5	***	***	***	***	***	***
	130		***	***	***	***	***	***
Counting Station Differential.	133	100.0	***	***	***	0	0	0
	133		***	***	***	0.0	0.0	0.0
Weir Head.	131	98.5	0	1	0	1	0	0
	133		0.0	0.8	0.0	0.8	0.0	0.0
South Shore Differential.	128	96.2	5	0	0	0	0	0
	133		3.8	0.0	0.0	0.0	0.0	0.0
North Powerhouse Differential.	106	79.7	13	11	3	0	0	0
	133		9.8	8.3	2.3	0.0	0.0	0.0
SFEW1 Depth	34	25.6	10	9	80	***	***	***
	133		7.5	6.8	60.2	***	***	***
SFEW2 Depth	9	6.8	7	11	106	***	***	***
	133		5.3	8.3	79.7	***	***	***
NFEW2 Depth	104	78.2	15	9	5	***	***	***
	133		11.3	6.8	3.8	***	***	***
NFEW3 Depth	105	78.9	15	7	6	***	***	***
	133		11.3	5.3	4.5	***	***	***
North Fish Ladder (WA)								
Counting Station Differential.	128	96.2	***	***	***	4	1	0
	133		***	***	***	3.0	0.8	0.0

Weir Head.	123	92.5	2	4	0	1	2	1
	132		1.5	3.0	0.0	0.8	1.5	0.8
North Shore Differential.	132	99.2	0	0	0	1	0	0
	133		0.0	0.0	0.0	0.8	0.0	0.0
W2 Depth	131	98.5	0	2	0	***	***	***
	133		0.0	1.5	0.0	***	***	***
W3 Depth	121	91.0	4	4	4	***	***	***
	133		3.0	3.0	3.0	***	***	***

Washington Ladder

The counting station and weir (head over weir) differentials were out of criteria five and ten times, respectively; which is 3.8 and 7.5 percent each. The results are fairly similar to previous years. For 2011, the values were 4.5 and 3.8 percent. This was due to debris or milfoil on the picketed leads, power outages and weir issues along which required set point adjustments.

The Washington entrance pool differential was out of criteria once for 0.8 percent. No reason was found. This value is similar to previous years. For 2011, this value was also 0.8 percent.

The Washington entrance weirs, W2 and W3 were out of criteria two and 12 times, respectively; which is 1.5 and 9.0 percent. These results were a slight improvement from previous years. For 2011, the values were 17.4 and 15.2 percent, respectively. Both weirs had calibration drifts due to the spill program and related turbulence. Also, W3 had bottom limit issues early in the year, which took time to resolve.

Oregon Ladder

The count station and weir (head over weir) differentials were out of criteria zero and two times, respectively; which is 0.0 and 1.5 percent each. The results were a slight improvement from previous years. For 2011, the values were 2.3 and 4.5 percent. The readings were due to debris or milfoil on the picketed leads and weir issues.

The north powerhouse pool differential was out of criteria 27 times for 20.3 percent. On 23 occasions (17.2 percent) the juvenile facility was not providing flow to the entrance. The other four occasions occurred in the fall during low tailwater elevations. This value was slightly better than previous years and was 25.8 percent in 2011.

The north powerhouse entrance weirs, NFEW2 and NFEW3 were out of criteria 29 and 28 times each for 21.8 and 21.1 percent, respectively. This data is similar to past years as these weirs were out of criteria 33.3 percent in 2011. Spill turbulence, hydraulic

gradients, low tailwater elevations and possibly lamprey passage programming may have caused calibration drifts. The juvenile facility not being available in March, a week in April, November and December may have also affected these entrance weirs. Finally, from June 19 to 25, NFEW3 had slack in its cables due to a loss gear, which put the weir farther out of criteria than we could record.

The south powerhouse pool differential was out of criteria five times for 3.8 percent. Hydraulic gradients, low tailwater and entrance weir depth which was affected by calibration drifts may have affected the pool differential. Despite problems with the south entrances discussed below, the project was able to maintain the south pool differential. This value is a slight improvement compared to previous years. For 2011, the differential was 9.8 percent out of criteria.

The south powerhouse entrances weirs, SFEW1 and SFEW2, were out of criteria 99 and 124 times, respectively for 74.4 and 93.2 percent. These results are very poor compared to previous years. In 2011, the weirs were out of criteria 11.4 and 10.6 percent, respectively. The lamprey passage stilts on SFEW2 appear to be the main issue. However, high flows creating hydraulic gradients and calibration drifts, along with possibly lamprey passage programming contributing to these drifts, also caused these weirs to be out of criteria.

The collection channel velocity was out of criteria 41 times for 31.5 percent. This is an improvement over 2011 when the velocity was out 55.7 percent. Hydraulic gradients, the accuracy of surface readings and other issues already discussed in this report probably contributed to this outcome. Though, the new velocity meter contributed to the improvement seen. The meter is further discussed in the Fish Ladder and Collection Channel Section above.

Recommendations

1. Program ladders' computer system to allow automatic control printout.
2. Install handrails on the ladders' walls for orifices inspection and debris removal.
3. Complete Fish Pump 2 repairs.
4. Replace Oregon ladder diffuser inflow (roto) valves.
5. Close northern floating entrances to improve the north powerhouse pool differential.
6. Improve all entrance weir calibration so drifts occur less frequently.
7. Continue lamprey passage improvements on both ladders.
8. Replace bulkheads at Washington ladder entrance so the pool can be dewatered.
9. Replace Oregon exit picketed leads and back board.
10. Install new Washington exit trash rack hoist.
11. Fix or replace elevator on Washington shore, which is a real safety issue (walking up those 128 steps could cause a heart attack; iced up steps in winter could cause a fall).
12. Develop "Critical Parts List," and keep critical parts in stock.