Annual Juvenile Fish Passage Report

McNary Lock and Dam

2013

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JUVENILE FISH FACILITY

Facility Description

Trash racks keep most debris from entering the intact of McNary's 14 turbines. When clean, trash racks help to keep fish passing in good condition. The fish enter the turbine intact and are diverted into the gatewell slots by extended length submersible bar screens. Each unit has three gatewell slots and associated fish screens. Vertical barrier screens in each gatewell slot keep the fish from entering the turbine. Each gatewell slot has two orifices with generally only one being open. The fish pass through these twelve- inch orifices to the juvenile collection channel. McNary usually operates with 42 orifices.

The channel flow runs from north to south. The dewatering structure and associated equipment are at the southern end of the powerhouse. Here there are the two side-dewatering valves, which regulate the channel elevation, which changes with orifice flow volume associated with turbine operation and forebay elevation changes. There is also a set of three floor-dewatering valves that are generally set at approximately 60 percent open, which remove excess water. Excess water from the all these valves goes to the ice and trash sluice, the dewatering pit and the 48-inch facility supply line. This line supplies the transport facility feeding the head box, water add-ins and separator up well. The head box supplies water to the rest of facility. All flow is gravity fed.

Water from the dewatering pit is added to the north adult powerhouse entrances. Bar screens in the side and on the floor of the channel retain fish and remove the excess water. The screens are kept cleaned by the side, rectangular and transition brushes. The side dewatering valves, brushes and channel elevation have a Programmable Logic Circuit (PLC) with associated programming. In the transition area, the channel funnels down to the full flow transport flume where the fish exit. The transport flume takes the fish to the separator.

Just upstream for the separator is the primary bypass gate. This gate is used during fish passage season to switch between primary and secondary bypass. The separator sorts the fish by size with the small smolts exiting down the A flume and the large smolts going down the B flume. Adult salmonids and other miscellaneous fish are released at the separator's return to river line. The separator building is where technicians record fish counts, monitor the separator and perform other duties.

Downstream of the separator in the two flumes are the PIT tag gates, the sample gates and the secondary bypass gates which tie back into the full flow flume. The sample and PIT tag systems each have two count tanks with associated equipment and two holding tanks. The "A" and "B" sides each have a set. Inside the building is the wet lab where the sample is examined. There are also two sample raceways. The full flow flume, adult return line and all facility lines have PIT tag detectors and associate equipment. The sample timer and PIT tag monitoring equipment are in the building. McNary has eight raceways, a truck loading deck and barge loading dock along with associated equipment. Transport did not occur this year.

Facility Modifications (Maintenance and Improvements)

The main improvement for the winter of 2012-2013 was the installation of three concrete bulkheads, which replaced steel bulkheads, facing the forebay in the juvenile collection channel. The grating above these new bulkheads was also covered with Plexiglas. This work was completed on March 18.

The following are other maintenance and improvements made to enhance system performance over previous seasons:

1. The project cleaned trash racks.
2. We continued ESBS (new motors, chains and brushes) and VBS (new mesh) rehabilitation.
3. The technical staff reprogrammed the ESBS controllers (change from bypass to timer mode).
4. The project did all channel and facility preventative maintenance.
5. The project repaired the transition and rectangular screen cleaning devices.
6. The fisheries staff enhanced the valve's handle for facility emergency water supply.
7. The project did spill hoist preventative maintenance.
8. A contractor repainted parts of full flow flume.
9. We rebuilt the separator porosity unit's perforated plates.
10. We repainted the porosity unit.
11. We repaired sample tank crowding devices.
12. The fisheries staff rehabilitated the PIT and sample gates.
13. We installed new flume gaskets.
14. The fisheries staff improved the attachment of the water supply line for the bird hazing cannon.
15. The project installed new LAN lines for the new computer.
16. We installed a projector in facility's conference room.
17. We installed new tailscreen hoists.
18. The project did the five year camera inspection of the full flow flume and pipe.

Some of this work continued into the season. Other maintenance items during the year included:

1. In February, we noted the channel's trolley support required repair next winter.
2. In April, the electricians calibrated all supply and drain valves.
3. In May, a contractor installed new shop doors.
4. In June, the technical staff reprogrammed the channel's PLC.
5. Also, in June, district personnel inspected the facility for a cleanup contract next winter.
6. In June, we adjusted the sample tanks' crowding devices' drive chains.
7. In July, the project installed a new heat pump for separator observation building.
8. In August, the side screen cleaning device received a new motor.
9. In September, a new anesthesia pump was installed.
10. In October, we replaced an oil reservoir for raceway 3's back flush valve.

11. Again, in October, we removed the separator porosity unit's screens for rebuilding.
12. Also, in October, we removed the B side direct barge loading gate, which is not in use.
13. Finally, in October, we completed rehabilitation of the gatewell dipping trap.
14. In November, the fisheries staff rehabilitated the primary gate operator.
15. In November, our new underwater camera was delivered.
16. Also, in November, we replaced the outside phone ringer.
17. Again, in November, the electricians rewired the lights in the wet lab.
18. Finally, in November, we installed new handles on the main flume covers.

Further maintenance issues will be covered in the remaining text of this report.

Operations and Maintenance

Bypass Operations

On March 26, from 0800 to 1030, the fisheries staff re-watered the system and began primary bypass. All sample and PIT gates were off.

With ESBS installation beginning on April 5, spring bypass season with alternating days of primary and secondary bypass with the data day starting at 0700 hours began on April 6, which was the first day of secondary bypass. Both bypass methods allow for PIT tag detection. Primary bypass eliminates fish passage through the Juvenile Fish Facility (JFF). Secondary bypass (through the JFF) allows for smolt monitoring and studies. The sample gates were only activated during secondary bypass. The PIT tag system gates remained off as the bypass lines provide a better route for the fish than the PIT lines.

During the bypass season, on June 19, from 0800 to 0802, the system was in primary bypass due to high flows resulting from work on the channel's CPU. Due to seven smolts being lost by the adult flush line opening, the system was returned to secondary bypass as the channel issue was resolved quickly. The fisheries staff screened the opening later that day. Also, from 0826 to 0829, the system was in primary bypass to ensure the adult flush line was operating properly, which it was. Both times the sample gates were left on.

On June 20, from 0000 to 0700, the system was in primary bypass due to two technicians having severe family problems with no one available to cover the system as we were under staffed by one technician having not yet been replaced. The sample gates were off.

On June 24, at 0700, the collection channel again had a high water alarm due to issues with the CPU. We switched the system to primary bypass as normally scheduled. The main flume overflowed for approximately 20 minutes. We rescued one smolt at the main flume flush opening and 16 smolts at the junction box. No fish were lost thanks to the quick response of the fisheries staff. We clamped down the flume covers at the junction box and referred the over flow issue to district engineers.

Overflow at an entry hatch in the main flume where it passes through the powerhouse on the

6th floor also threatened the project's computer system. The project re-sealed the hatch. During winter maintenance, we will weld the hatch closed, as it is not needed.

On June 25, from 0700 to 1200, the system remained in primary bypass so the issue in the collection channel could be resolved and tested. Five hours of sampling were missed.

On August 24 and 26, secondary bypass did not occur due to failure of the side screen cleaning device's motor, which the project replaced.

On September 15, from 2100 to 0000, the system was in primary bypass so the technician on duty could check the juvenile collection channel and both ladders' exits for debris after a severe thunderstorm had passed. They turned the sample gates off.

On September 17, the system was in primary bypass from 1038 to 1110 due to lack of flow over the porosity unit. The technician assisting in the camera inspections and VBS cleaning closed three orifices at unit 5 without opening spare orifices resulting in a severe drop in channel elevation. The biologist responded quickly by returning to the proper orifice count. No harm to fish of interest or the system occurred. Some juvenile shad were lost at the porosity unit. We had left the sample gates on.

On September 30, at 0700, the project concluded bypass season, with the start of fall primary bypass. We turned all systems and gates off. The facility remained watered to avoid possible freeze breakage. During fall primary bypass season, PIT tag detection only occurs in the full flow flume. The fisheries staff monitored the channel 24/7.

On November 27, from 1400 to 1746, we switched the system to emergency bypass due to failure of the side screen cleaning device. The switch was delayed as a fuse had to be replaced in one of the floor valves. The fisheries staff winterized part of the channel and the facility. The project began maintenance. There is no PIT tag detection during emergency bypass.

On December 19, at 0700, we closed the orifices after ESBS's had been raised to dewater the channel for the winter maintenance season. After the clearance was in place, from 0900 to 1130, we evacuated the upper emergency bypass channel. Then from 1230 to 1330, we evacuated the lower emergency bypass channel. Two sturgeons, six Chinook adults, two Chinook jacks and 50 to 75 steelhead adults were returned to the river. Two Chinook and two steelhead smolts were also noted. Miscellaneous fish included walleye, smallmouth bass, channel catfish and adult shad. We observed no lamprey adults or juveniles.

After regional discussion, no transport occurred at McNary this season. In fact, due to the success of the new outfall location, the region terminated transportation at McNary completely. With no transport in the future occurring, the district and the project need to examine mothballing the parts of the facility related to transport.

Although transport will not be occurring here, the McNary natural resources manager and mechanic will still be responsible for maintenance of the fish trailers.

On October 25, the fish truck from Lower Granite project used McNary's full flow flume just upstream of the junction box for an emergency fish release. The project and district need to examine modifying this area to make an emergency release easier to do, especially if the driver is by himself or herself.

During the winter, there were three power outages at the facility, which had no ill effect. For the season, one outage date occurred at the facility and channel, respectively. These outages were due to work in the powerhouse. On August 27, while in primary bypass, three facility outages totaling one hour occurred. After the outages, we had to reset the sample gates' PLC, PSMFC had to examine the PIT tag computers and we had to reset the bird hazing sprinkler. On September 16, from 0808 to 0810, a power outage occurred in the channel. This is the third year power outages occurred in the collection channel during the season. The biologist stabilized the channel elevation after the power returned. He noted no ill effect. The new PLC programming helped.

In early April, the powerhouse had pressure issues with the air supply, which they resolved by mid-April. On September 14 and 16, the station service air had more issues. On all occasions, the reduced pressure had no adverse effect on the facility or channel, both of which have a back up compressor. We only noted a slow recovery of pressure in our systems.

Turbine and Spill Operations

The one percent hard criteria for unit operation ran from April 1 to October 31, inclusive. We have no records of units running outside the constraint for long periods of time. We saw only short test runs of units returning to service, along with slight variances which occurred during the season. On one occasion, the project reduced a unit's load to the lower end of the one percent criteria for about 24 hours, due a high VBS differential.

During the soft one percent criterion in March, November and December, the project ran units outside the constraint at BPA's request. This affected VBS differential readings.

North powerhouse loading for temperature abatement was replaced with a saw tooth pattern (an alternating pattern of units on/off) this year per the Fish Passage Plan (FPP), using the best available data. Also, the unit priority established for the new outfall location is a north powerhouse pattern. After regional discussion, the saw tooth pattern was used from about July 3 to August 31, especially during unit testing from July 5 to 18. The unit outages during the rest of the summer met this pattern. We noted no heat stress mortality this year. Temperature monitoring occurred from June 15 to August 31, inclusively. The smolt monitoring staff publishes the results in a separate report.

On March 22 the project installed the top spill weirs (TSW's) at bays 19 and 20. The TSW in bay 19 was attached to a crane. The TSW in bay 20 was attached to a hoist. The bay 20 TSW had a bent frame, which district engineers approved for use on April 2. From April 1 to 10, spill in excess of powerhouse capacity occurred. On April 10, at 0001, the spring spill program began with TSW's in use. For the spring, 40 percent of flow is scheduled to be

spilled. However, due to high flows in excess of powerhouse capacity, 40 to 59 percent of total flow was spilled during the spring program.

On May 20, the project altered the spill pattern for repairs of the Washington entrance weir, W3. On June 6, the project altered the pattern for forebay debris removal. The region approved both changes.

From June 10 at 1015 to June 13 at 1030, the project removed both TSW's and replaced them with standard spill gates. FPP approved spill patterns were used. The switch to standard spill bays is timed with the projected start of sub yearling Chinook out migration.

On June 13, from 1508 to 1540, the project had bay 1 closed for maintenance on the crane that adjusts the gate.

On June 20, at 0001, the summer spill program began with 50 percent of total flow being spilled. Due to flow in excess of powerhouse capacity, 50 to 58 percent of total flow was spilled for the summer.

For the spring and summer season, the project made adjustments to the pattern for navigation safety. On September 1 at 0001, the spill program concluded. After that date, spill only occurred when flow was in excess of powerhouse capacity or for spill bay hoist testing. All changes made to the spill pattern followed the Fish Passage Plan.

Forebay Debris and Trash Racks

The floating debris was mostly tumbleweeds, woody material and Eurasian milfoil with manmade objects mixed in. When debris loads were fairly heavy, they affected juvenile and adult facilities. The adult facilities will be discussed in a separate report. The location of the debris depended on windstorms along with spill, flow changes and project operations which moved the debris throughout the forebay during the year. When in place, the TSW's helped pass the debris. Trash rack cleaning also removed floating debris.

The debris load was light to heavy from March to early April. On April 3, the project used the trash rack hoist to move floating debris so it could be spilled, which helped to reduce the load to light along with trash rack cleaning. By late April, the debris load increased to heavy again. On April 30, the project used the trash rack hoist to remove 2.8 ten-yard truck loads of debris from the surface. Again, trash rack cleaning also removed debris. In May, the debris load varied between light and heavy corresponding to trash rack cleaning. On May 21, from 1142 to 1515, the project rolled the units off and on while using the crane again to move debris to the TSW where it was spilled. By this time, there was a moderate amount of debris floating by the spill way also. On June 6, from 0900 to 1200, a special spill operation occurred, which removed this debris. The powerhouse debris was not moved at this time as it was very fine. From June to December, the powerhouse debris varied between very light and moderate. On September 1, when the spill was closed, the light amount of debris there moved to the powerhouse and had no adverse affect. Storms in September and October moved the debris but no increase was noted.

During the winter, we monitored trash rack differentials weekly. We saw no problems. This is the third winter we monitored the differential regularly. In January, the project checked and cleaned the trash racks as outlined in the FPP. For the season, we continued monitoring the differentials. Trash rack cleaning results are recorded in Table 1. The project cleaned trash racks at all operations units as needed. The amount is recorded as the number of ten-yard truck loads. Fish lost include smolts and juvenile lamprey. We returned seven live lamprey to the river.

On April 2 and 4, the project only cleaned units 7, 12 and 13 for installation of Fish Guidance Efficiency (FGE) study equipment. From April 8 to 11, we cleaned units 5 to 9 to reduce differentials, improve conditions for the study and improve orifice flow. On May 1 and 2, the project removed debris from units 8 to 14. Most of the debris was at unit 8, which was a de-scaling concern. On May 16, we only cleaned 1A slot. On September 18, the project cleaned 1A, 1B, 5A and 5B slots.

Table 1. Trash Rack Debris.

Date	Amount	Type	Fish Loss	Highest Differential
Jan 9 & 10	22.0	Tumbleweed and wood.	None.	3.2 feet @ 79 MW
Mar 18 & 19	25.5	Mostly tumbleweed.	None.	1.1 feet @ 50 MW
Apr 2 & 4	12.0	Mostly tumbleweed.	None.	1.5 feet @ 65 MW
Apr 8 to 11	47.0	Mostly tumbleweed.	None.	4.9 feet @ 65 MW
Apr 15 to 18	64.0	Mostly tumbleweed.	About ten smolts.	2.1 feet @ 62 MW
Apr 22 to 25	31.0	Mostly tumbleweed.	One smolt & one lamprey.	1.9 feet @ 62 MW
May 1 & 2	24.0	Mostly tumbleweed.	33 smolts.	1.5 feet @ 55 MW
May 16	3.0	Mostly tumbleweed.	3 smolts.	2.3 feet @ 61 MW
May 17 & 20 to 21	37.0 & one log	Mostly tumbleweed.	14 smolts & one lamprey.	1.6 feet @ 62 MW
Jun 17 to 19	32.0	Mostly tumbleweed.	Two lamprey.	1.3 feet @ 63 MW
Sep 18	5.0	Wood & milfoil.	None.	2.0 feet @ 63 MW

Gatewells

On December 10, 2012, the project installed the emergency bulkhead at 10C slot and on December 15, we dewatered the slot. On February 22, 2013, the project removed the bulkhead, re-watering the slot. On September 5, the project installed the emergency bulkhead at 13C slot. From September 9 to 25, the project had 13A, 13B and 13C slots dewatered during maintenance. By September 27, we removed the headgates and the bulkheads from unit 10's slots, re-watering them.

We observed no debris accumulations this year. We did remove some light woody debris during the season especially with trash rack cleaning as debris would inadvertently enter the slots. Once, we removed a 10 by 2 foot log. Also, we removed one piece of woody debris

from 6B slot, which had the ESBS rope pinned in the corner. Finally, we removed man made debris like milk crates or bottles, broom handles and children's toys. We noted no blue/green algae in the gatewell slots this year. We examined gatewell slots daily, after any orifice blockage or inadvertent closure along with any other events discussed in other sections of this report. We never noted no harm to fish.

In March and December, during ESBS maintenance and removal, we removed fish screen oil from a total of 10 slots with absorbent pads. During the season, we removed ESBS or other oil from a total of nine slots. In the winter, the project removed hydraulic fluid from 8C slot. For the season, we removed hydraulic fluid from three more slots. All fluids were contained and removed quickly.

On April 7, the water elevation in 9A slot was low due to high trash levels on the rack. The project cleaned trash racks the next day, returning the slot's elevation to normal.

Extended-Length Submersible Bar Screens

This season marked the 17th year with a full compliment of extended-length bar screens (ESBS) in place in all 14 units (42 screens, 3 per unit). From May 21 to December 3, the fisheries staff performed underwater camera inspections. We missed eight inspection dates due to trash rack cleaning, warm water temperatures, camera failures or installation and other project operations or fisheries obligations. The purpose of the inspections is to look for proper range of brush mechanism operation. From August 27 to September 7, the camera was out of service do to an o-ring issue. From October 22 to November 11, no inspections occurred after the camera failed, so the new camera could be installed in the canopy and tested. Abnormal inspection results are recorded in Table 2.

Table 2. Results of ESBS Camera Inspections.

Date	Slot	Result
Jun 11	Unit 7	Biologist briefly left screens in manual.
Jun 11	6C	Brush found short cycling. Operators reset.
Jul 8	2B	Brush found short cycling. Operators reset.
Jul 15 & 16	6C & 10C	Brushes found short cycling. Operators reset.
Jul 23	13A	Brush found short cycling. Operators reset.
Oct 8	2B	Brush found short cycling. Operators reset.
Oct 8	2A	Brush bar missing. Replaced ESBS on Oct 9. Slot last inspected Sep 8.

On August 20, we began to have issues with the old camera's cable. Fortunately, we had a new camera on order. On August 27, while doing inspections the camera failed. We replaced an o-ring. On October 22, the camera failed again, possibly a cable issue. The new camera happened to arrive that day. On November 5 and 6, the new camera was installed and tested. It has worked very well. In late November, we altered the canopy so the camera would move more freely in and out of it.

We examined the ESBS's as follows:

Unit	Number of Camera Inspections	Notes
1	6	
2	6	
3	2	Unit out of service long term.
4	1	Unit out of service long term.
5	5	
6	6	
7	7	
8	7	
9	5	
10	4	
11	2	Unit out of service long term.
12	4	
13	3	
14	3	

We noted no significant smolt mortalities in the gatewell slots during camera inspections.

For fifth year, in order to possibly improve juvenile lamprey survival for an early spring outmigration peak, and yet have minimal impact on juvenile salmonid passage, ESBS installation occurred in early April instead of late March. From April 5 to 11, the project installed ESBS's at units 1, 2, 4, 5, 6 and 8. Wind and study equipment installation delayed the work. The project got a two day extension from the region to complete the ESBS deployment.

Before April 17, we installed screens at units 7, 9, 11, 12 and 13. On April 18, we deployed unit 10's screens before the unit returned to service after a long outage. On May 13 and June 18, respectively, the project also installed ESBS's at units 3 and 14 before they returned to service after long outages. Finally, for the fifth year, the brush cycle time for all ESBS's remained at 60 minutes. The cycle timing and screen rehabilitation seem to have reduced ESBS failures and repairs. Table 3 reflects issues that occurred with the screens during the year.

Table 3. ESBS Issues.

Dates	Slot	Issue
Early April	All	PLC programming adjusted.
Apr 17	2A	Failed, alarmed, replaced.
Apr 17	13A	We raised screen for study equipment replacement.
Apr 22 to May 13	All	All PLC programming redone, checked and then matched.
Apr 26	2A	Screen alarmed and switched to timer mode.
Apr 28 & 29, May 4 & 5, May 6	2A	Short cycling, alarming and reset by operators. Problem continues. On May 6, PLC examined.
May 10	2A	Failed. Remote PLC used. Found cycling every minute. Operators able to set for every nine minutes.

May 13 to Oct 8	2A	On May 13, reprogrammed main PLC. Remained in timer mode.
May 13	Unit 6	PLC lighting issue fixed. Had been intermittent.
May 20	11B	Short cycling, alarm and reset.
May 23	Unit 4	PLC screen failed, ESBS operational, PLC fixed next day.
May 29 to Dec 11	3A	On May 29, alarmed, switched to timer mode. Later unit OOS for repairs. On Dec 11, 3A and 3B's ESBS raised.
Table 3 Continued:		
Jun 1 to Dec 18, & Jul 12	7B	On Jun 1, alarmed, switch to timer mode until raised on Dec 18. On Jul 12, alarmed and reset.
Jun 8	1A	Electrical cables repaired. Screen had been functional.
Jul 2	Unit 14	Fisheries switched the screens to auto just as unit returned to service.
Jul 8 & 9	2B	Short cycled and reset each day.
Aug 3 to Dec 17	8C	Alarmed on Aug 3 and set to timer mode until raised.
Aug 13	Unit 11	ESBS's pulled. Unit OOS. ESBS's used as spares.
Aug 9 to Dec 17, & Aug 27	10C	Alarmed on Aug 9 and set to timer mode until raised on Dec 17. On Aug 27, alarmed and reset.
Sep 3 to Oct 1, & Oct 5	Unit 13	ESBS's pulled for unit maintenance. On Oct 5, ESBS power supply to controller failed. Repaired.
Oct 5 to Dec 16	13A	Alarmed on Oct 5 and switched to timer mode until raised.
Oct 8 & 9 to Dec 18	2A	On Oct 8, ESBS inspection found brush missing. On Oct 9, replaced ESBS. New ESBS remained in timer mode until raised. Brush bar remains in bottom of slot.
Nov 2 & 3	10B	Brush bar can off last winter (Dec 2012) when ESBS pulled. Bar not retrieved. New bar installed last winter. On Nov 2, 2013, bar blocked headgate. On Nov 3, bar moved but still not retrieved.
Date	Slot	Issue
Nov 6	Unit 5	Found ESBS's not in communication with system program but cycling properly. Issue resolved.
Nov 23 to Dec 16	14B	On Nov 23, alarmed and set to timer mode until raised.
Dec 5 & 6	10A	On Dec 5, screen failed, replaced with screen stored at unit 3C slot. On Dec 6, screen switched to auto at 1950.
Dec 9 to 18	7A	On Dec 9, screen short cycled, alarmed and switched to timer mode until raised.
Dec 10 to 17	8A	On Dec 10, screen short cycled, alarmed and switched to timer mode until raised.
Dec 8, 10 & 12	9C	Screen short cycled, alarmed and reset.
Dec 11	Unit 4	ESBS's pulled as unit was OOS.
Dec 12	6C	Screen short cycled, alarmed and reset.

For the year, the problems were due to proximity switch failures, gearbox or motor issues, brush drive or coupler issues and electrical problems. Most fish screen failures, especially those repairs that required the ESBS's to be raised and/or fish screens to be replaced, resulted in unit outages. We noted no significant fish loses during ESBS's issues.

From December 16 to 19, when the project removed the screens from operational units, none of the ESBS's showed any problems. The project began maintenance as soon as each screen was raised.

Vertical Barrier Screens

Daily VBS head differential monitoring corresponded with ESBS's installation, which is discussed above. During the season, impinged debris on the VBS's continued to be a problem with all screens having been cleaned or examined at least once, except the screens at 4C, 14B and 14C. We cleaned the screen at 5B slot 24 times. The project cleaned VBS's on 358 occasions. Last year, we cleaned the screens on 422 occasions. This year, forty one of these included project inspections on May 7 at units 2 to 3 and 9 to 12, on May 28 at units 3 and 12 to 13 along with July 16 and October 21 at units 1, 5 to 7, 8, 10, 11 and 13.

For the season, the project cleaned four screens while exchanging them for rehabilitation or replacement. In late August, we cleaned 15 screens as a preventative measure before the spill closure occurred. We cleaned the remaining 298 screens for debris removal. On 114 occasions, we measured the differential at 1.5 feet or above. Last year on 92 occasions, we measured screens out of criteria. Screens with multiple readings out of criteria before being cleaned are counted only once. In November and December, the 25 differential readings out of criteria occurred when units were at 70 to 80 MW. During the course of the year, the fisheries staff was not present for only a few of the cleanings and did not record fish lost. Most of the fish lost were old and had accumulated over time. In the fall, mostly juvenile shad were noted. A majority of the debris was fine material along with Eurasian milfoil and some manmade objects. Table 4 reflects debris VBS cleaning by the month.

Table 4. VBS Cleaning by Month.

Month	Days	VBS's cleaned	Measured 1.5 feet or more	Lost Lamprey*	Live Lamprey*	Smolts lost*
Mar	None	None	None	None	None	None
Apr	2	2	2	0	0	0
May	6	13	7	1	0	123
Jun	16	66	35	70	3	123
Jul	19	62	22	61	0	588
Aug	9	22	5	0	0	11
Sep	11	51	14	1	0	0
Oct	8	33	4	0	0	3
Nov	7	48	24	0	0	0
Dec	1	1	1	0	0	0
Total	79	298	114	133	3	848

* Fish numbers are for all 358 cleanings.

On May 16, we cleaned the first VBS; we cleaned the last on December 5. Project operations including trash rack cleaning or debris removal, river flows and weather patterns affect the debris dispersal across the powerhouse. However, most VBS cleaning continues to occur at the south half of the powerhouse.

Criteria for cleaning of the screens is 1.5 feet or more of differential, at which time the unit loading is reduced to the lower end of the one percent peak efficiency curve (approximately 43 megawatts) until the screen can be pulled and washed with a fire hose. Also, reducing loads helps to slough debris off.

On May 5, unit 1 was briefly shutdown to "burp" the unit. This reduced the differential and the VBS was cleaned the next day. On June 6 and September 6, at units 6 and 1, respectively, loads were briefly reduced so the debris could slough off, and the VBS's were cleaned the next day. From September 27 to 28, unit 1 ran at a reduced load due to a high differential reading at 1B slot.

Unless adult and juvenile shad or debris abundance presents a hazard to the fish, smolts are dipped from the gatewell slots prior to pulling the VBS to prevent fish from exiting back through the turbine unit.

In order to reduce debris in the collection channel, we cleaned screens with the orifices closed at the slot and used adjacent orifices to maintain channel elevation. Also, during VBS cleaning, we operated the collection channel screen cleaners and the rectangular screen's air bubbler system more often to keep the channel's dewatering screens clean.

During cleaning and examinations, we inspected the VBS mesh and retaining clips, which we replaced as required along with documenting problems. On May 28, the project straightened a dogging point on a screen while doing examinations. On June 29, we replaced the top panel on the VBS at 6B slot. On July 22, the project replaced the screen at 7B slot with a screen from 11C slot. On September 17, the screen at 6A slot was replaced with one from 3C slot. Finally, on December 6, the VBS at 6B slot was replaced with a rehabilitated one. The project used units 3 and 11's slots to cycling out damaged screens and to store rehabilitated ones. By year's end, we also ensured both units had rehabilitated VBS's. Rehabilitation will continue to be an ongoing project.

The prototype bar screen VBS's remain at 4B and 4C slots. Due to the size of the screens, they are more difficult for the maintenance crew to lift than standard VBS's. The crew cleaned these screens in 4B and 4C slots once and never, respectively due to the unit being out of service long term.

Orifices and Collection Channel

From March 26 to December 19, the project generally had 42 orifices open. However, from August 24 to 28, we used 39 orifices and from September 30 to November 10, we used 40 orifices. We closed orifices at unit 4, which was out of service. On both times, we did this to

reduce the amount of flow through the side dewatering screen as the cleaning device was having issues. We only closed all orifices on November 27, for the switch into emergency bypass. Brief orifice swaps between units occurred for trash rack cleaning, VBS cleaning or forebay debris removal. More orifice issues are listed in Table 5.

Table 5. Orifice Issues.

Date	Issue	Result	Comment
Apr 7 to 8	Unit 9 low orifice flow.	Cleaned trash racks.	Monitored over night. No ESBS's installed.
Apr 8 to 9	Unit 8 low orifice flow.	Cleaned trash racks.	Monitored over night. No ESBS's installed.
Early Apr	Moisture in air supply.	Occurred for about one week.	Project compressor issue resolved.
Apr 12 to 13	Unit 5 orifices closed. Spares open.	For 26 hours. Unit on line.	Miscommunication. ESBS's installed. Low fish numbers.
Jun 28 to 29	Hydraulic leak.	Unit 11 orifices closed.	Spare orifices open at unit 12.
Sep 5 to 28	Unit 13 maintenance.	Slots dewatered.	Orifices closed and spares open at unit 12.
Sep 17	Orifice swaps incomplete.	Low water alarm.	During camera inspection and VBS cleaning, biologist resolved.
Oct 13 to 14	5B orifice closed for 8 hours. Unit on.	Low water alarm.	Technician cycled orifices improperly.

On April 8 and 9, cleaning the trash racks and increasing the orifice flow at units 8 and 9, resulted in channel water level alarms.

Twenty five orifice blockages occurred this year. Eleven were due to debris. On November 18, a blockage occurred at 2B slot, which was cleared. The next day during a camera inspection, the biologist noted woody debris in the slot, which the general maintenance crew removed. On the 14 other occasions, we removed ESBS ropes from the orifice inflows while doing gatewell observations. We cleared all of these obstructions immediately.
In all cases, we noted no harm to fish and we reviewed orifice cycling protocols when required. Orifice adjustments and cycling at times resulted in brief high/low water alarms which operators quickly reset.

We performed scheduled maintenance on the orifice operators, oil reservoirs and valves. Also, we replaced orifice attraction lights promptly as required. We also tightened channel walkway grating as needed. In spring and late fall, we continue to note moisture in the orifice air supply, which we bled off. In December, water in the air lines caused two orifice operator exhaust vents to freeze and damaged two orifice oil reservoirs. Severe winter weather in November and December made work in the channel difficult.

During the year, the technicians constantly monitored the collection channel when on primary or emergency bypass. During secondary bypass, we monitored the channel on day shift with spot checks at night when required. Also, we monitored the channel during VBS and trash

rack cleaning, forebay debris removal, power outages, oil leaks, spill closure, screen cleaner device failures and side dewatering valve issues along with other problems described in this report.

Adult fish continue to jump at the orifice jets. However, this year, we found no adult salmonids on the channel grating as we constantly monitored the netting. We did find one smolt on an orifice cover at 14A in July. During maintenance season, the fisheries staff will rehabilitate about five covers.

On August 11, overnight and before 0900, a plug in an old fisheries orifice at station service unit 2 failed. There was a jet of water coming from the unit's gatewell slot into the collection channel about a foot above the walkway grating. Much of the flow went through the grating with some also entering the channel. We found one lost 6 inch bass. We diverted the flow from the side screen cleaning device's upstream limit switch. The chief operator kept this station service unit out of service so no fish could be drawn into the gatewell slot and out the orifice. The maintenance chief was notified. The fisheries staff monitored the orifice overnight with no problems noted.

On August 12, by 0950, general maintenance had installed the headgate and emergency bulkhead into the unit's gatewell slot and we began pumping down the water level. At 1255, the mechanics had completed installation of a new plug into the orifice. By 1644, the project had the emergency bulkhead removed.

The other station service unit also has one unused and plugged fish orifice. Each main unit has one of these orifices per gatewell slot. These orifices are about six inches in diameter. The old orifices are located about one foot from the current north orifice operator for each slot. The result is the project has 43 more orifices to install new plugs in which we are planning to do. A plug failure at an operational main unit would force a unit outage.

Primary Dewatering Structure

In early March, we noted a support for the bulkhead hoist railing had begun to rust along with a section of air line. Engineers examined both. During the next winter outage, we will repaint the support and replace the air line. On March 25, the drive motor for the bulkhead hoist was repaired. Afterwards, we cleaned the lost gearbox oil from the channel's floor.

In mid-March, we tested the air burst system; all screen cleaners, valves and the control panel. The channel systems were operational and in automatic mode from March 26 to November 27. The project performed scheduled maintenance on all systems. Power and air supply issues are discussed in the Bypass Operations section of this report. None had an adverse effect on the channel systems. The power outage did cause a brief water elevation alarm.

Issues with the rectangular screen cleaning device are recorded in Table 6.

Table 6. Rectangular Screen Cleaning Mechanism Issues.

Date	Problem	Resolution
Winter	Brush would not rise, slipping. Part had to be ordered from Japan.	Clutch bearing in drive sprocket replaced.
Mid- Mar	Brush rubbing wall & jamming.	Lubed and trimmed brush.
Mar 26	Brush did not rise fully.	Upper limit switch adjusted.
May 14	Debris on brush.	Removed.
May 21	Brush stalled moving downstream.	Limit switch adjusted.
Aug 30	Brush stalled moving downstream.	Brush reset. Assume debris jam.
Aug 22	Alarm about 1 hour and stalled in the upstream lowered position.	Reset. Assume debris.
Aug 23	Inadvertently turned off for about 8 hours.	Restarted.

We set the cycle time interval of the rectangular screen cleaning device at 120 minutes. However, depending on debris loads, operations and other problems, we would briefly reduce the cycle interval. However, on October 18 to November 27 with debris loads low, the mechanism was set to run every 180 minutes.

During winter maintenance, the mechanics repaired the transition screen cleaning device. During the work, they replaced an o-ring in the air line to the latch pin. For the fifth year when operation, since a small percentage of the overall flow goes through the transition screen and the air burst system was keeping the screen clean, we decided to continue to leave the device off at night and only run it manually on day shift. We set the cycle time for the transition screen device at 180 minutes. After returning to service with the system, on April 15, the device failed on the D beam while cleaning. We raised the brush and left it on the D beam. Due to repeated problems with the device over the years, the mechanism remained out of service for the season and we will repair it in January, 2014. This may be another latch pin issue.

Issues with the side screen cleaning device are recorded in Table 7.

Table 7. Side Screen Cleaning Mechanism Issues.

Date/Time	Problem	Resolution
Mid-March	Over current trip when testing.	Reset. No problem found.
May 16	Alarmed twice. Restarted first time.	Second time, reset, no problem found.
May 27	Noise, set to cycle every 360 minutes over night.	Tightened motor shroud next day.
Aug 1	Alarmed and stalled going upstream.	Limit switch lubed and cleaned.
Aug 22/0635	Device would not function properly during scheduled check.	Electricians found water in the motor. Removed water.
Aug 22/1438	Rectifier failed.	Motor brake disabled.

		Brush restarted in auto.
Aug 22/2235	Device would not function properly on scheduled check.	Fisheries staff reset and left in auto.
Aug 23/0200	Alarmed/Stopped in the upstream clean position. Incomplete cycle.	At 0645, turned off.
Aug 23/0949	Device would not stay on limit without brakes. Need new motor. Primary bypass.	Ran brush and limit switch manually to complete cycle every three hours.
Aug 27/1041	New motor installed. Access slot covered.	Returned to auto and bypass schedule.
Sep 7	Timing alarm.	No problem found. Possibly debris jam.
Sep 10	Stalled going upstream. Turned off for about two hours.	Parked device, no problem found. Debris jam?
Sep 11	Electrical cord tray liner loose.	Reattached.
Sep 19	Stalled and alarmed going upstream, in same location. Over current trip.	Reset. Not an electrical problem. Monitor.
Sep 20	Device stalled again.	Reset. Problem not found.
Sep 25	Device stalled again. Same location. Turned off for 6 hours.	Reset. Mechanics found no problem. It may be underwater or debris?
Oct 8	Brush rose and stalled briefly.	No problem found, debris?
Oct 18	Repeated brush stalling.	Set cycle time from 180 to 240 minutes.

We had the cycle time interval of the mechanism set at 180 minutes. However, depending on debris loads, operations and other problems, we would briefly reduce or increase the cycle interval. As mention in the Orifice and Collection Channel section, in August and September, we reduced the orifice count. This was related to the issues with the side cleaning device so we could reduce the amount of debris that might impinge on the screen if the mechanism were to fail.

Issues with the side screen cleaning device which lead to the switch to emergency bypass on November 27 are outlined in Table 8.

Table 8. Side Screen Mechanism Issues Leading to Emergency Bypass.

Date/Time	Description
Nov 26/0315	Electrical cord carrier broken. Water from road drains had frozen the carrier to cord tray. Device stalled and then parked. Out of service.
Nov 26/0955	Ice thawed. Cord carrier spliced. Device ran manually by fisheries staff as needed. Tried to keep ice free. New carrier two to three weeks to get.
Nov 26	New carrier ordered. Last replaced in 2008. Mechanics working to divert road drains.
Nov 27/0200	Electrical cord carrier froze and broke again. Device parked and out of service.

Nov 27	Ice cleared, carrier spliced but splice did not hold.
Nov 27/1200	Due to the importance of the device and lack of a new carrier, we decide to switch to emergency bypass due to mechanical failure.
Nov 27/ 1400 to 1746	Switch to emergency bypass completed. Cord carrier will be replaced January, 2014. Cord tray will be rehabilitated.
Nov 27/1600	Road drains plugged.

The channel's water elevation meter had no problems this year. High/low water alarms always occur with the start up and shutdown of the channel when flow is over the dewatering structure. Brief alarms also occurred at times when managing the orifices, during the power outage and sudden unit load changes.

Issues that caused screen cleaning mechanisms' alarms were described above. Monitoring the channel throughout the year, when possible, served as a back up to the alarm system. In fact, the technicians had a later furlough date for the fifth season in a row so they were available to monitor the channel into December.

In April, the control panel indicator lights were replaced. On July 3, a shroud was placed over the PLC to protect it. For the most part, the control system operated well this season.

However, on June 19, an electrical technician replaced the battery in the central processor. The side dewatering valves were briefly out of service. When power returned, the valves searched for their setting. This resulted in the valves driving down and casing a high water alarm. The technician and a fisheries staff member returned the channel to normal operations with 20 minutes. However, the high water resulted in the fish loss mentioned in the Bypass Operations section. The biologist reviewed preventative maintenance timing with the project's staff. Later, the technician adjusted the side valves so they would not bottom out after a power outage.

On June 24, at 0700, the central processor's main power supply began to intermittently fail. The result was the side dewatering valves searching of their start point each time the power cut out. Despite previous adjustments, the side valves closed which again caused a high water alarm. The fisheries staff was able to stabilize the channel manually in about 20 minutes. The technical staff worked on the control system but did not find the power supply issue. At 1435, they returned the channel to automatic operation. At 1600, the assistant biologist again found the side valves closing and returned them to manual operation. Overnight, the fisheries staff monitored the channel and operated the valves manually. The processor was also resetting the screen cleaning mechanisms' timers so the fisheries technician had to run them manually also.

On June 25, the lead of the technical staff examined the issue and found the faulty processor power supply, which he replaced by 0830. Also, the lead reprogrammed the system so the valves would not close after a power loss or processor issue. The fisheries staff monitored the channel until 1200 when secondary bypass began. June 24 and 25 are also discussed in the Bypass Operations section.

For most of the season, both side dewatering valves were operational in automatic mode and operated well. As described above, issues with the central processor's power supply and control program affect the valves operation. However, once these issues were resolved, the valves' overall operation was improved. Also, orifice usage and project operations briefly affected the functioning of the valves, causing them to search in order to reestablish channel elevation, which at times could result in a brief water alarm. Nevertheless, one issue developed later.

On November 5, between 0700 and 0930 the south side dewatering valve jammed, which may explain an early water alarm. The biologist reported it immediately. Interestingly, by 1100, before the technical staff could examine the valve, it returned to normal operation. On November 7, the technical staff crew leader looked at the side dewatering valves and found no problems.

On November 8, from about 1000 to 1200, the south side dewatering valve jammed in the same location. From about 1200 to 1400, the technical staff found nothing wrong with the PLC or electrical system and returned the valve to automatic operation. At that time, we assumed the problem was mechanical, which will require the channel to be dewatered during the winter maintenance season. Until then, the fisheries staff monitored the channel 24/7. On November 10, after these issues with the valve, the biologist reopened the closed orifice at unit 4 to increase the opening on the side dewatering valve so the likelihood of it jamming at the lower operating range would decrease.

When the channel systems were operation, the main floor de-watering valves were open and set at approximately 65 percent. We did not adjust their settings and they were not affected by any issues discussed above. The one problem we continue to have with these valves is leakage and mist causing their fuses to fail. Also, the mist causes the lighting on the access way to the floor valves to fail.

For the season, the rectangular screen air burst system worked well on station service air. In early April, the electricians adjusted the backup compressor and we confirmed the timer settings. The system's cycle time remained at one zone every ten minutes. On July 1, the electricians did scheduled maintenance on the compressor. From July 4 to 8, we turned off the backup compressor due to noise. No problem was found. On July 8, August 7 and 8, the electrical staff adjusted the limits on the compressor. The air burst system continues to be very useful for operations involving debris discussed in this report.

On March 13 and 14, the camera inspection of the full flow pipe found in the older section upstream of the separator three points of erosion: one in each bend and one where the pipe transitions to the primary gate. The project will examine these areas for repair. In November and December, PSMFC had interference at PIT tag detector number 4 in the full flow pipe. Eventually, they found a faulty breaker, which the project will replace in January, 2014.

Separator

The separator was functional during secondary bypass for sampling as described in the Bypass Operations section. The separator is five feet wide. The A, smaller smolt, section is 13 feet long while the B, larger smolt, section is nine feet long. The spacing between the A separator bars is approximately 11/16 inch while the spacing between the B bars is approximately 1 and 5/16 inch. After peak steelhead smolt out migration and with the beginning of adult shad fallbacks, PVC pipe is installed over the B bars to help exclude shad from the sample. Juvenile steelhead can still exit. The A side bars gradually slope up going downstream with the water depth going from approximately six to three inches. The B bars are approximately two inches below the downstream end of the A bars. The B-side water depth starts at approximately five inches and drops to three inches at the adult release gate.

Flow into the separator is dependent on collection channel changes and debris blockage on the perforated plate just upstream of the separator. High flows were generally due to debris on the perforated plate, which technicians cleaned. During the spill program and project operations along with juvenile channel adjustments, the separator can experience fairly severe fluctuations. As described in the Bypass Operations section, a power outage at the facility also affects operations. We regularly tapped and back flushed the separator upwell to improve flow. The end of the spill program had no significant effect on separator debris loads that night. However, we did see more juvenile shad and adult salmonids.

Debris issues as describe elsewhere in this report affect the separator and facility when operational. The separator exits had very few debris blockages, which we generally removed quite easily, with no harm to fish noted. The technicians monitored and addressed all issues at separator. Technicians quickly removed debris blockages downstream of the separator with no fish lost. Also, at the facility, we removed algae all year, as long when the facility was watered up. For the year, facility mortality records were within normal ranges. In early May, four juvenile lamprey were lost on the porosity unit's perforated plate.

With fall primary bypass season, we keep the system watered up to help avoid frozen pipes, so we only preformed light maintenance until November 27, when we began emergency bypass. At this time, with the facility dewatered, we completed winterization and began full maintenance.

Over the winter, the project rehabilitated the porosity unit's perforated plates by installing new screens. In July, the welds on the plates began to fail. For the remainder of the season, at times, the fisheries staff mechanics had to weld areas along the edges of the screens to keep the plates smooth. On September 12, the downstream edge on one of the screens was found to be warped and had to be repaired. In November, we removed the porosity screens and made arrangements for a contractor to replace the plates and weld the units properly. The contractor should be finished by early March, 2014.

Other issues at the facility, which was functional as outlined in the Bypass Operations section, are listed in Table 9 or elsewhere in this report.

Table 9. Facility Issues.

Date	Issue	Resolution
Apr 1	A hydraulic jump downstream of barge drier in return to river line.	Found a hammer and debris in pipe. No fish in system.
Apr 4	Air conditioning failing in facilities' PIT tag room.	Units charged.
Apr 6	Main flume flush line took 45 minutes to open. No problem found.	Revised winter maintenance protocol.
Apr 8	Still a hydraulic jump downstream of barge drier in return to river line.	District engineers examined.
Jun 3	Sample raceway truck loading valve found open.	Closed. No adverse affect on sample fish.
May 30	Primary gate control has air leak. Does not affect operation.	Parts ordered. In November, parts installed.
Jul 2	Facility PIT tag monitoring computers found off. No reason found.	PSMFC turned back on.
Jul 25	20 inch lake trout in separator.	Pictures taken and fish released.
Jul to Aug	Smolts noted holding in hydraulic jump downstream of barge drier at times after sample release.	Flush release line repeatedly. Ask district engineers to look into a change.
Late Aug	Grounds sprinkler noted hitting main flume flush line valve & controls.	Resource maintenance capped sprinklers.
Sep 15	Air conditioning failing in facilities' PIT tag room.	Units repaired.
Sep 15 to 18	After storm: Sample room dry lab lost phone service, four flume covers damaged and facility lost potable water.	Overtime project resolved all issues.
Nov 21	Winterization drain frozen and cracked for A side flush line. Clam shells found in drain.	Diverted leakage. Replace line January, 2014. Clams reported to district.
Nov 27	Multiple frozen pipes found.	All thawed.

Sample System and PIT Tag System

The sampling and pre-anesthetic systems worked well. For the season, we changed the sample rates with the data day at 0700. On April 6, at that time, we turned on the sample gates for the first day of secondary bypass. During the bypass season, we activated the gates every other morning to be operational during secondary bypass. The Bypass Operations Section records when staff turned the sample gates on and off during issues and events. On September 30 at 0700, we shut down the sample system for the year. Table 10 reflects other issues with the sample system.

Table 10. Sample System Issues.

Date	Issue	Resolution
Apr 6	Pump for anesthesia system not working. Valve left closed.	Opened valve and reviewed protocol.
Jul 5	One B side counter inadvertently reset to zero.	Estimated count and reviewed protocol.
Jul 10	B side sample gate opening quickly and hard.	Gate's air pressure adjusted.
Jul 10 to 11	Jul 10's sample not released.	Released on Jul 11.
Jul 29	Sample gates turned on late.	Missed two samples.
Aug 21	One B side counter failed.	Counter replaced and estimated count.
Mid-Sep to Sep 24	Pump for anesthesia system working intermittently.	Pump replaced.

In early April, after the system was checked, the PIT tag detection/deflection system (A and B gates) remained off. During the bypass season, the gates were not used. All PIT tagged fish were still detected in the full flow flume during primary bypass and at the facility including the return to river lines during secondary bypass, so no data were lost. These bypass routes are preferred over the smaller PIT tag release lines. The PIT gates did receive scheduled testing and adjustment. During this work, we immediately released any stray fish that entered the system.

The secondary bypass slide gates, which also can serve as a PIT tag diversion system (C gate is on the A side and D gate is on the B side), have not been used in a PIT tag study for several years. These gates received no preseason adjustments; we left them off and open for the season.

Barge and Truck Loading Operations

After regional discussion, no barge or truck loading occurred at McNary this year. Further discussion then led to the elimination of transportation from McNary's operations. This will be the last year for this section to be in the yearend report.

Avian Predation Control

During the winter maintenance season, a contractor installed a temporary pump and water line for the hazing water cannon. The fisheries staff winterized the sprinkler. In March, the fisheries staff secured the temporary water line. In February, 2014, another contractor will install a permanent system for the hazing cannon.

We continued to use propane cannons with timers set as needed. We deployed the cannons near the end of the bypass pipe and around the spill basin. Wind did decrease the efficiency of the cannons. The propane cannons require constant monitoring and adjustment.

This year, we again had two shifts of APHIS personnel hazing. We did not haze protected white pelicans, and there was no lethal removal of any piscivorous avian species. Heavy hazing of grebes again proved very effective. Also, we added three electronic gull distress calls to our efforts. Table 11 reflects hazing techniques used at McNary, and issues encountered.

Table 11. Hazing at McNary.

Hazing Type	Dates
1. Sprinkler cannon at out fall.	Tested late March.
A. Water cannon's use.	Mar 26 to Sep 9.
B. Adjusted cannon's spray pattern.	Apr 3.
C. Pump for cannon tripped, reset.	May 13 and 14.
D. Began turning pump off at night manually.	May 14.
E. Water cannon pump tripped, reset.	Aug 1, 18 and 26.

F. Pump developed bearing issue, cannon turned off.	Sep 9.
2. Propane cannons use, five total.	Apr 23 to Sep 25.
A. Propane cannons disturb barge traffic.	End May remove from navigation lock wing wall, installed on bypass walkway.
B. Propane cannons disturb public.	Sep 5 removed cannons from pipe walkway.
3. APHIS hazing seven days a week.	Apr 1 to Aug 3.
A. APHIS hazing 16 hours a day.	Apr 21 to Jul 13.
4. Three gull distress calls ordered in late Jul deployed.	Sep 2 to Dec 16.

With casual observations, it appears gulls, cormorants, pelicans, grebes and bald eagles over winter in the general area of the project.

We conducted daily bird counts from March 27 to September 30. We only missed a few count days. This was the second year; we entered the counts into a regional data base. This data was entered in four zones: forebay, spill, powerhouse and bypass outfall. For this report, to maintain continuity with previous years, we have the tailwater area in which the spill and powerhouse are combined. For spill timing, see the Turbine and Spill section of this report. We counted all areas once a day, usually in the morning.

For the tailwater area, the technicians or biologists performed the counts from the separator building using binoculars. We reported the week's highest daily counts for each species from the tailwater area with the bypass outfall being reported separately. When spilling, we observed most of the birds feeding or roosting in the spill basin. All species moved freely between the powerhouse and spill basin, however pelicans preferred calmer water, while gulls and terns preferred the spill. We noted pelicans along the navigation lock wing wall or along the Oregon shore, possibly feeding on adult shad or carp. Gulls and terns are difficult to distinguish apart in distant flight. We occasionally saw grebes, ospreys, blue herons, kingfishers or mergansers. With the conclusion of spill, most birds, especially gulls, moved to the powerhouse outfall to feed. However, they continued to roost around the spill basin. In September, the birds were probably mostly feeding on juvenile shad. Tailwater peak counts of the predominating species are recorded in Table 12.

Table 12. Tailwater Predatory Bird Counts.

Species	First Observation	Spill Peak		Non Spill Peak		Last Observation
		Date	Number	Date	Number	
Gull	Apr 9	May 22	125	Sep 18	231	Sep 30
Pelican	Apr 20	Jun 20	20	Sep 6	3	Sep 21
Cormorant	Mar 30	Jul 28	42	Sep 27	94	Sep 30
Tern	Apr 14	May 22	75	Sep 6	6	Sep 10

After the conclusion of counting, during casual observations, we saw gull and cormorant

counts fairly high at times, which might indicate that they continued to feed on juvenile shad. Also, the birds own migration patterns may have affected counts. Into December, we observed gulls roosting or feeding and cormorants mostly roosting along with occasional mergansers. Sporadically, we noted rafts of mergansers and gulls along with an occasional bald eagle, blue heron, grebe or kingfisher.

When primary bypass began, birds were not initially observed at the outfall. However, this year, we did note that cormorants and pelicans did adapt to the river's flow at the outfall and were able to feed there. Bypass outfall counts are recorded in Table 13.

Table 13. Bypass Outfall Predatory Bird Counts.

Species	First Observation	Spill Peak		Non Spill Peak		Last Observation
		Date	Number	Date	Number	
Gull	Apr 14	May 14	52	Sep 17	28	Sep 30
Pelican	Apr 22	Jul 11 & 19	12	NA	None	Aug 8
Cormorant	May 19	Aug 8	10	Sep 28	15	Sep 28
Tern	Apr 16	Apr 27	25	Sep 5	2	Sep 5

After the counting season, we observed gulls, cormorants and mergansers at the bypass outfall at times. After November 27, during emergency bypass, we occasionally observed gulls at that outfall. However, this outfall is at the northern edge of the powerhouse flow, which may have also attracted the birds.

We performed bird counts of the forebay area with the unaided eye once daily while doing gatewell observations, usually in the morning. Again, we reported the week's highest daily count per species. The results of these observations are in Table 14. Due to the low numbers of other species, we only recorded gulls and grebes in the table. Most of the gulls we noted were juveniles feeding on the floating forebay debris. At times, we noticed groups of gulls or grebes that would be outside the normal counting zone. Occasionally, we saw terns, pelicans, blue herons, kingfishers, mergansers or a loon. We also observed osprey, as there are three nest sites on project. The roosting rocks by the Washington boat dock cannot be seen from the powerhouse deck. During other inspections, we sometimes noted large numbers for pelicans, gulls or cormorants there.

Table 14. Forebay Predatory Bird Counts.

Species	First Observation	Spill Peak		Non Spill Peak		Last Observation
		Date	Number	Date	Number	
Grebe	Apr 5	Apr 20	70	Sep 2	10	Sep 2
Gull	Apr 26	Jul 7	26	Sep 23	2	Sep 30

After the counting season, we observed an occasional gull, blue heron, merganser, bald eagle, cormorant, pelican or a small group of grebes in the forebay, with groups of birds sometimes observed on the rock or rafting in the river.

It is difficult to observe and count grebes due to their behavior, the various locations where they appeared, and system operations. There is no accurate way to enumerate grebes. Grebes passed into the gatewell slots and juvenile collection channel from April to November, reflecting somewhat the patterns seen in the forebay. We estimated for the gatewell slots this year a total of 12 grebes, which was low compared to last year's estimate of 18 grebes. There were 75 grebes in the slots two years ago. This year, we removed three grebes from the slots. The remaining nine grebes passed to the collection channel. These birds all passed out of the system. We release one grebe from the separator; other grebes passed during primary bypass.

Cooling Water Strainers

Table 15 reflects the results of this year's main unit cooling water strainer examinations. Most smolts lost were sub yearling Chinook at unit 1. We also observed crayfish and juvenile shad.

Table 15. Cooling Water Strainer Results.

Date	Lamprey Lost	Lamprey Alive	Smolts Lost	Smolts Alive
Jan 8	1	0	0	0
Feb 5	8	3	0	0
Mar 5	26	6	0	0
Apr 9	24	0	0	0
May 7	13	0	10	0
Jun 4	107	4	2	1
Jul 2	14	0	45	0
Aug 6	21	0	22	0
Sep 10	1	0	0	0
Oct 1	0	0	0	0
Nov 12	1	0	0	0
Dec 3	1	0	0	0

RIVER CONDITIONS

River flows in 2013 were slightly higher in April and May but, slightly lower for the rest of the season than the 2009-2012 average (Table 16). A peak hourly flow of 357.9 kcfs was recorded on May 12th while a minimum hourly flow of 54.2 kcfs occurred on September 23rd. The highest average flow day during the 2012 fish passage season was May 12th with an hourly average of 356.7 kcfs. The minimum average daily flow of 66.9 kcfs was recorded September 9th (Figure 1). The court ordered summer spill implementation plan began at midnight on April 10 with 40% of the flow going through spill bays to improve fish passage. June 17 through August 31, 50% of the flow was passed through the spill bays. The peak hourly spill of 209.8 kcfs was reported multiple times on May 11th and May 12th. Maximum average daily spill occurred on May 12th with an hourly average spill of 209.2 kcfs.

In the Biological Opinion for the Columbia River, NOAA Fisheries set minimum flow targets at McNary Dam to aid in salmonid migration. The flow target for April 20th through June 30th was 220-260 kcfs. The average seasonal flow for this period was 261.6 kcfs with the average flows meeting the standard 62 of 72 days. The peak daily flow average for this period was 356.7 kcfs on May 12th. From July 1st through August 31st, the target was 200 kcfs. The average seasonal flows for this period were 185.6 kcfs with the average flows meeting the standard 19 of 62 days. The peak daily flow for this period was 287.9 kcfs on July 4th.

Table 16: Average monthly river flow and spill at McNary Dam, 2009-2013.[1]

Month	2009	2010	2011	2012	2013	2009 -2012 Average
			Flows (kcfs)			
Apr	213.0	120.2	281.1	317.2	226.2	209.7
May	263.5	195.3	365.0	349.6	288.3	276.3
Jun	286.3	318.5	465.5	344.6	248.9	361.8
Jul	167.5	190.2	325.2	326.3	214.3	258.0
Aug	119.0	124.0	203.0	207.6	156.5	164.7
Sep	79.3	81.6	116.5	114.6	96.5	98.0
			Spill (kcfs)			
Apr	68.4	36.0	135.3	166.3	94.3	93.4
May	113.5	78.5	219.9	176.8	141.7	138.4
Jun	134.5	156.0	307.2	202.1	112.7	205.3
Jul	84.2	95.0	193.1	191.0	111.4	143.5
Aug	57.6	61.4	105.8	104.1	78.4	83.2
Sep	1.4	1.1	2.7	11.0	1.9	4.0

[1]Seasons varied in length but average daily flows were recorded through the end of September.

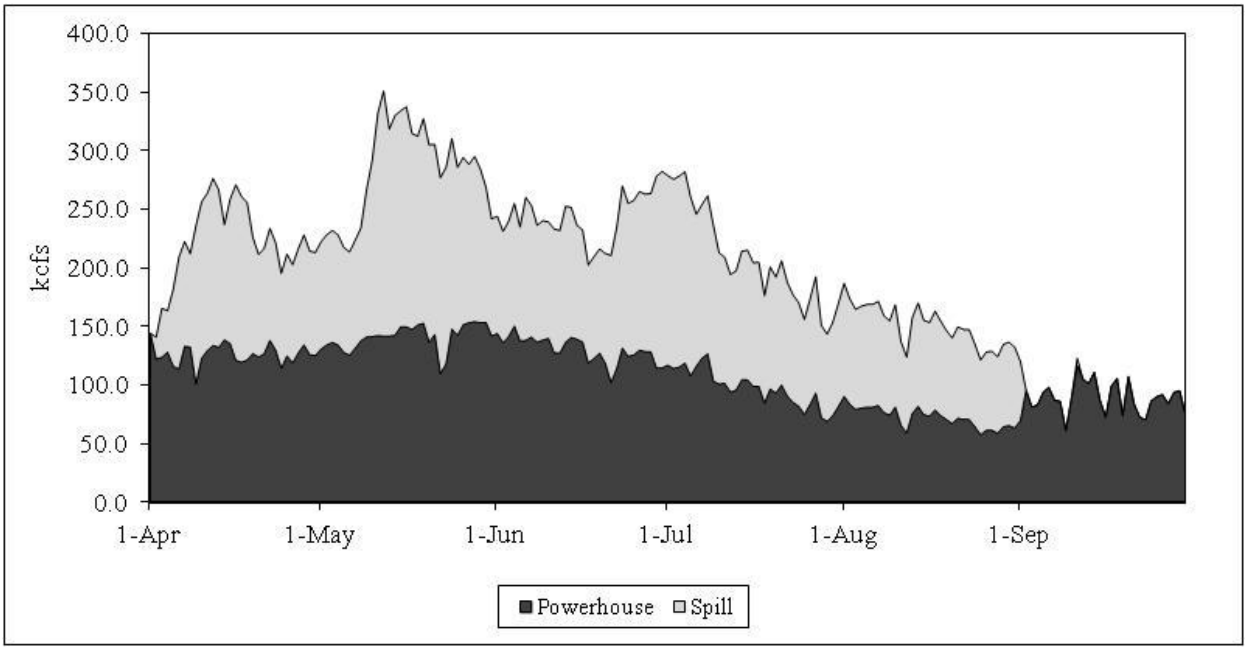

Figure 1. Average daily powerhouse discharge and spill at McNary Dam, 2013.

Fish Passage

Migration and Passage

Juvenile fish that arrived throughout the year at McNary Dam were bypassed back to river through the juvenile fish facility (secondary bypass) or directly to the tailrace without passing through the juvenile fish facility (primary bypass). Fish can also be passed through the emergency bypass (flow is discharged through the north end of the ice/trash sluiceway). Secondary bypass took place on alternate days from April 7th until September 30th to allow the sampling of fish under the Smolt Monitoring Program.

With the continued increase in numbers of unmarked hatchery origin juvenile salmonids and different mark and release strategies employed by agencies and organizations within the basin, it is not possible to accurately differentiate between unmarked wild/naturally produced and unmarked hatchery origin juveniles. Fish are recorded as clipped or unclipped in the daily sampling.

An estimated 3,491,995 juvenile salmonids passed McNary Dam this season (Table 17). Composition by species in 2013: 1,098,880 yearling Chinook, 1,779,323 subyearling Chinook, 200,145 clipped Steelhead, 55,207 unclipped Steelhead, 10,723 clipped Sockeye, 303,914 unclipped Sockeye and 43,803 Coho. Passage totals do not include fish passing during emergency or primary bypass operations. Daily fish passage and river flow information is provided in Figure 2.

Table 17. Annual collection, bypass, and transport at McNary Dam, 2009-2013[1].

Year[1]	Yearling Chinook	Subyearling Chinook	Clipped Steelhead	Unclipped Steelhead	Clipped Sockeye	Unclipped Sockeye	Coho	Total
Collection								
2009	1,303,737	1,836,921	359,391	108,349	13,746	92,629	69,885	3,784,658
2010	1,224,094	1,951,233	198,382	61,658	2,600	846,320	47,445	4,331,732
2011	952,682	2,487,088	225,936	70,063	5,615	131,149	71,810	3,944,343
2012	1,040,187	1,390,995	178,139	69,750	8,025	547,759	72,876	3,307,731
2013	1,098,880	1,779,323	200,145	55,207	10,723	303,914	43,803	3,491,995
Bypass								
2009	1,301,926	1,353,698	359,208	108,279	13,703	92,149	69,356	3,298,319
2010	1,222,563	1,496,969	198,186	61,542	2,598	845,306	47,275	3,874,439
2011	949,771	975,593	225,786	69,877	5,414	127,050	71,277	2,424,768
2012	1,039,959	1,174,739	178,122	69,740	7,999	547,535	72,876	3,090,970
2013	1,098,057	1,778,752	200,108	55,189	10,721	303,666	43,799	3,490,292
Truck								
2009		32,815	0	4	0	34	15	32,868
2010		146,694	0	10	0	80	40	146,824
2011		408,132	0	9	70	1,022	95	409,337
2012	49	214,232	0	0	25	148	0	214,454
2013	0	0	0	0	0	0	0	0
Barge								
2009		414,822	65	9	43	382	448	415,965
2010		299,909	56	30	0	190	70	300,428
2011		1,060,689	8	100	100	2,693	260	1,063,874
2012	0	0	0	0	0	0	0	0
2013	0	0	0	0	0	0	0	0
Total Transported								
2009		447,637	65	13	43	416	463	448,833
2010		446,603	56	40	0	270	110	447,252
2011		1,468,821	8	109	170	3,715	355	1,473,211
2012	49	214,232	0	0	25	148	0	214,454
2013	0	0	0	0	0	0	0	0

[1]Seasons varied in length.

Peak passage occurred on May 9th with a daily total passage of 233,863. Peak passage dates and daily passage totals by species group were: May 9th yearling Chinook (202,853), July 10th subyearling Chinook (175,208), May 3rd clipped Steelhead (37,018), May 11th unclipped Steelhead (5,802), May 13th clipped Sockeye/Kokanee (2,401), May 17th unclipped Sockeye/Kokanee (33,827), and May 19th and May 31st Coho (3,600) (Table 18).

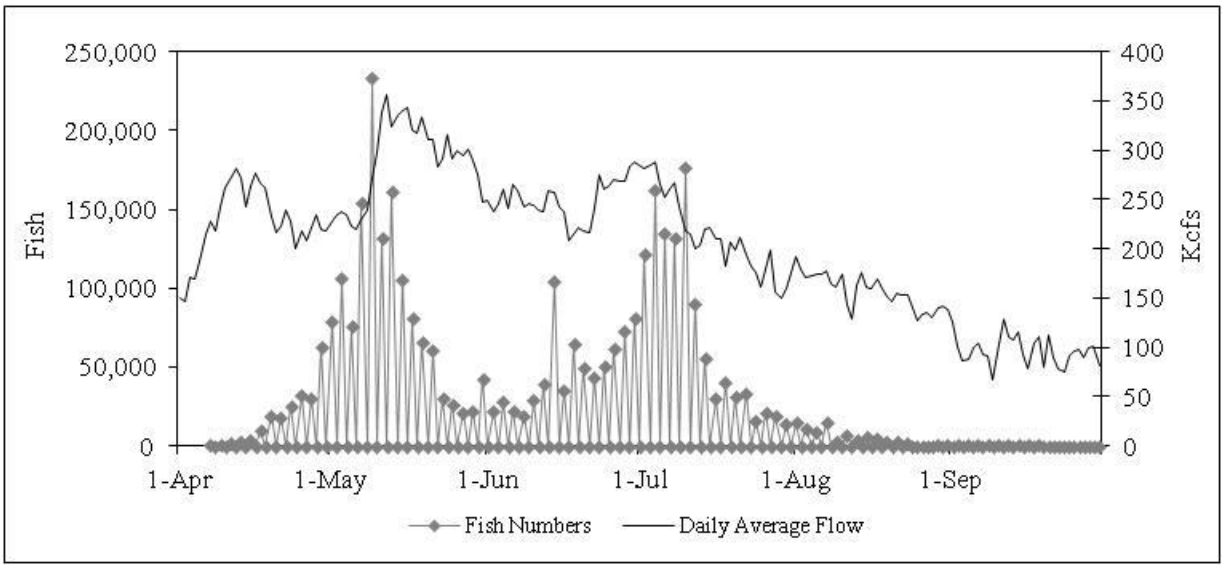

Figure 2. Daily juvenile salmonid passage all species vs. daily average flow at McNary Dam, 2013.

Table 18. Annual peak passage days at McNary Dam, 2009-2013.

Year	Yearling Chinook	Subyearling Chinook	Clipped Steelhead	Unclipped Steelhead	Clipped Sockeye	Unclipped Sockeye	Coho	Total
2009	May 19 (144,417)	June 24 (87,710)	May 7 (52,407)	May 7 (12,202)	May 19 (3,100)	May 19 (8,407)	May 23 (10,205)	May 19 (183,851)
2010	May 21 (164,219)	June 26 (195,163)	May 5 (27,816)	May 5 (6,907)	May 11 (500)	May 29 (223,329)	June 2 (5,201)	May 29 (253,134)
2011	May 7 (152,806)	July 24 (111,300)	April 29 (24,927)	May 19 (6,600)	May 5 (500)	May 9 (15,007)	May 25 (5,405)	May 7 (197,252)
2012	May 17 (101,806)	July 20 (89,405)	May 1 (22,619)	April 29 (11,200)	May 7 (1,200)	May 11 (105,601)	May 17 (7,600)	May 17 (181,008)
2013	May 9 (202,853)	July 10 (175,208)	May 3 (37,018)	May 11 (5,802)	May 13 (2,401)	May 17 (33,827)	May 19 (3,600)	May 9 (233,863)

Adult Fallbacks

A total of 1,311 adult salmonids were bypassed from the separator to the tailrace in 2013 (Table 19). The composition of adult salmonids that fell back through the system and were released from the McNary juvenile fish separator was: 254 adult Chinook, 183 jack Chinook, 182 clipped Steelhead, 662 unclipped Steelhead, 28 Sockeye and 2 Coho. In 2013, peak fallback activity occurred in September (Table 20). In previous years peak fallback activity occurred in September and October. Counts of adult fallbacks at McNary ended September 30th in 2013 September 30th in 2012, September 29th in 2011, September 30th in 2010 and September 30th in 2009

.

Table 19. Annual totals of adult salmonids released from the juvenile fish separator at McNary Dam, 2009-2013.

Year[1]	Adult Chinook	Jack Chinook	Clipped Steelhead	Unclipped Steelhead	Sockeye	Coho	Pink	Total
2009	456	785	2,054	1,610	131	96	0	5,132
2010	366	200	876	1,008	101	18	0	2,569
2011	385	331	637	1,008	162	37	1	2,561
2012	538	548	611	956	205	34	0	2,892
2013	254	183	182	662	28	2	0	1,311

[1]Seasons varied in length. See text.

Table 20. Monthly totals of adult salmonids released from the juvenile fish separator at McNary Dam, 2013.

Month	Adult Chinook	Jack Chinook	Clipped Steelhead	Unclipped Steelhead	Sockeye	Coho	Pink	Total
April	1	2	23	126	0	0	0	152
May	44	55	48	177	0	0	0	324
June	8	18	8	73	10	1	0	118
July	1	5	1	10	16	0	0	33
August	3	0	6	23	2	1	0	35
September	197	103	96	253	0	0	0	649
Total	254	183	182	662	28	2	0	1,311

All salmonid fallbacks collected were examined for condition and ranked using a standard protocol (Table 21). Overall, 82.5% of the fish examined were classified as good condition, which is lower than 2012 (83.9%). The percentage of each species group that were in good condition was: adult Chinook 89.4%, jack Chinook 91.3%, clipped Steelhead 88.5%, unclipped Steelhead 76.3%, Sockeye/Kokanee 71.4% and Coho 100.0%. There were no adult salmonid mortalities recovered from the walkway grating in the juvenile collection channel during the course of the season.

The emergency bypass channel was unwatered on December 19. Two sturgeons, six Chinook adults, two Chinook jacks and 50 to 75 steelhead adults were returned to the river. Two Chinook and two steelhead smolts were also noted. Miscellaneous fish included walleye, smallmouth bass, channel catfish and adult shad. We observed no lamprey adults or juveniles. These fish were moved from the collection channel to the tailrace through the emergency bypass route.

Table 21. Condition of adult salmonids released from the juvenile fish separator at McNary Dam, 2013.

Condition	Adult Chinook	Jack Chinook	Clipped Steelhead	Unclipped Steelhead	Sockeye	Coho	Pink	Total
Good	227	167	161	505	20	2	0	1,082
Fair	15	6	12	101	5	0	0	139
Poor	6	6	8	40	2	0	0	62
Dead	6	4	1	16	1	0	0	28
Total	254	183	182	662	28	2	0	1,311

Separator Efficiency

In addition to separating adult fish from juvenile fish, the separator at the McNary juvenile fish facility is designed to separate smaller juvenile salmonids (Chinook, Coho and Sockeye) from the larger individuals (Steelhead) which are more aggressive in raceways and barges. This is intended to reduce stress from inter-species aggression that may result from holding different sized juveniles together in the same raceway. Separator efficiency is defined as the percentage of a group in the sample that was collected in the desired location.

Separator efficiency by species in 2013 was: yearling Chinook 49.8%, subyearling Chinook 41.8%, clipped Steelhead 85.6%, unclipped Steelhead 80.5%, Sockeye 21.3% and Coho 14.8% (Table 22). As in past years, Sockeye and Coho were the least efficiently separated species where over 70% exited from the "B" side or large fish side of the separator.

Table 22. Annual separator efficiency in percent at McNary Dam, 2009-2013.

Year	Yearling Chinook A-side	Subyearling Chinook A-side	Clipped Steelhead B-side	Unclipped Steelhead B-side	Sockeye A-side	Coho A-side
2009	48.9	53.0	83.6	64.9	17.0	20.5
2010	63.5	64.8	87.1	68.1	27.5	24.5
2011	48.1	62.4	79.8	72.0	25.9	19.6
2012	43.7	48.8	88.5	65.7	20.5	21.8
2013	49.8	41.8	85.6	80.5	21.3	14.8

Sampling

A total of 38,479 juvenile salmonids (1.1% of the total passage) were sampled in 2013. Sample percentages by species group were: yearling Chinook 0.8%, subyearling Chinook 1.4%, clipped Steelhead 0.7%, unclipped Steelhead 1.1%, clipped Sockeye 0.6%, unclipped Sockeye 0.7% and Coho 1.3% (Table 23). Sample rates ranged from a low of 0.5%, during

the peak of the spring and summer migrations, to a high of 25.0% at the end of the season (Table 24).

Table 23. Annual percentage of total juvenile salmonids passing that were sampled at McNary Dam, 2009-2013.

Year	Yearling Chinook	Subyearling Chinook	Clipped Steelhead	Unclipped Steelhead	Clipped Sockeye	Unclipped Sockeye	Coho	Total
2009	1.5	3.3	1.7	2.2	1.3	1.8	2.0	2.4
2010	1.6	2.9	2.0	1.7	1.4	1.2	1.4	2.1
2011	1.0	1.9	1.7	1.7	1.8	1.1	1.8	1.7
2012	0.8	1.7	1.1	1.2	0.7	0.6	1.0	1.2
2013	0.8	1.4	0.7	1.1	0.6	0.7	1.3	1.1

Table 24.

Week Ending	Weekly Rate (%)[1]	Yearling Chinook	Subyearling Chinook	Clipped Steelhead	Unclipped Steelhead	Clipped Sockeye	Unclipped Sockeye	Coho	Total
Apr 4	0.0	0	0	0	0	0	0	0	0
Apr 11	9.9	227	9	3	65	0	0	31	335
Apr 18	5.3	521	41	54	100	0	105	67	888
Apr 25	1.2	524	25	288	100	0	178	25	1,140
May 2	0.8	651	3	372	45	3	240	9	1,323
May 9	0.5	2,183	9	362	55	12	216	13	2,850
May 16	0.5	1,372	11	129	78	22	339	35	1,986
May 23	0.5	499	14	53	15	11	541	49	1,182
May 30	1.3	534	29	25	28	11	209	81	917
Jun 6	2.0	1,419	286	91	66	4	221	197	2,284
Jun 13	2.0	414	1,135	63	35	1	43	57	1,748
Jun 20	0.9	138	2,164	21	13	1	11	11	2,359
Jun 27	1.0	7	1,542	9	6	0	6	3	1,555
Jul 4	1.0	9	4,350	7	1	0	6	0	4,373
Jul 11	1.0	2	4,401	4	0	1	20	1	4,429
Jul 18	1.0	1	2,154	0	0	0	6	0	2,161
Jul 25	1.0	0	796	0	0	0	7	0	803
Aug 1	5.0	0	3,364	0	0	0	37	1	3,402
Aug 8	5.0	0	1,754	0	0	1	20	0	1,775
Aug 15	6.7	0	1,315	0	0	0	9	0	1,324
Aug 22	5.0	0	525	0	0	0	2	0	527
Aug 29	5.7	0	147	0	0	0	1	0	148
Sep 5	14.7	0	231	0	0	0	3	0	234
Sep 12	25.0	0	373	0	0	0	7	0	380
Sep 19	25.0	0	236	0	0	0	2	0	238
Sep 26	25.0	0	85	0	0	0	0	0	85
Oct 3	25.0	0	33	0	0	0	0	0	33
Total Sampled		8,501	25,014	1,481	607	67	2,229	580	38,479
% of Sample		22.1	65.0	3.8	1.6	0.2	5.8	1.5	100.0
% of Passage		0.8	1.4	0.7	1.1	0.6	0.7	1.3	1.1

[1] Fish sampled/fish passage x100.

Transportation

No transport this season

Bypass

The juvenile bypass system began operation in primary bypass on March 27th. Extended length submersible bar screens (ESBS) were lowered into the gatewell slots of the turbine units between April 9th and April 14th. The delay was to allow for the passage of juvenile Pacific Lamprey. On April 6th, the facility was placed into secondary bypass. Primary bypass mode passed fish directly to the tailrace, while secondary bypass mode passed fish through the facility. PIT tag detections were possible in either bypass mode. Secondary bypass took place every other day to index juvenile salmonid passage by Smolt Monitoring Program personnel. Alternate days of primary and secondary bypass continued until September 30th. October 1st, the facility was placed in primary bypass. Primary bypass continued until November 27, when the system was switched to emergency bypass mode. The collection channel was unwatered on December 19, 2013.

An estimated 3,490,292 juvenile salmonids (99.95% of the total passage) were bypassed in 2013 (Table 51). The numbers of fish bypassed and the percentages of total collected by species group were 1,098,057 yearling Chinook (99.9%), 1,778,752 subyearling Chinook (100.0%), 200,108 clipped Steelhead (100.0%), 55,189 unclipped Steelhead (100.0%), 10,721 clipped Sockeye (100.0%), 303,666 unclipped Sockeye (99.9%) and 43,799 Coho (100.0%). Daily bypass information is provided in Appendix 1, Table 13. These numbers do not include fish routed during the primary bypass mode of operation.

There were four incidents where the secondary bypass operation was interrupted and the facility had to be placed in primary bypass mode. This accounted for 72 hours of lost sampling. The facility was placed into primary bypass on June 6th for 9 hours, June 25th for 12 hours, August 24th until August 28th where 48 hours were missed and September 15th for 3 hours. The first three occurrences were due to the limit switch on the screen brushes in the collection channel. In September, there was a flash flood of one inch of rain in twenty minutes. Debris plugged the picketed leads of the ladders and there was concern for debris in the channel. The decision was made to go to primary until the crisis was past.

Incidental Species

In addition to salmonids, the McNary facility passed approximately 1,523,104 fish of various species. These consisted primarily of 1,421,904 juvenile American Shad (*Alosa sapidissima*), 86,614 juvenile (macrophthalmia) Pacific Lamprey (*Entosphenus tridentatus*), 5,134 Three-spine Sticklebacks (*Gasterosteus aculeatus*), 3,632 Smallmouth Bass (*Micropterus dolomieui*), 1,496 Peamouth (*Mylocheilus caurinus*), 898 Mountain Whitefish (*Prosopium williamsoni*), 732 Longnose Dace (*Rhinichthys spp.*), 514 Yellow Perch (*Perca flavescens*) and 482 Crayfish (*Pacifastacus spp.*) (Table 25). These fish were bypassed to

the tailrace below McNary Dam. Non-salmonid species released from the separator were not recorded.

Table 25. Passage of incidental species at McNary Dam, 2013.

Common Name	Scientific Name	Sample	Collection
Pacific lamprey (adult)	*Entosphenus tridentatus*	7	86
Pacific lamprey (morph)	*E. tridentatus*	1,396	86,614
Pacific lamprey (ammocoete)	*E. tridentatus*	0	0
American shad (adult)	*Alosa sapidissima*	4	32
American shad (juvenile)	*A. sapidissima*	328,707	1,421,904
Bluegill/Pumpkinseed	*Lepomis spp*	16	64
Bullhead	*Ameiurus spp.*	2	8
Channel catfish	*Ictalurus punctatus*	5	112
Chinook Mini Jack	*Oncorhynchus tshawytscha*	1	10
Chiselmouth	*Acrocheilus alutaceus*	0	0
Common carp	*Cyprinus carpio*	69	380
Crappie	*Pomoxis spp.*	3	12
Crayfish	*Pacifastacus spp.*	26	482
Kokanee	*O. nerka*	2	110
Largemouth bass	*Micropterus salmoides*	10	136
Longnose dace	*Rhinichthys cataractae*	41	732
Mountain whitefish	*Prosopium williamsoni*	15	898
Northern Pikeminnow	*Ptychocheilus oregonensis*	7	310
Peamouth	*Mylocheilus caurinus*	99	1,496
Steelhead Kelt	*Oncorhynchus mykiss*	0	0
Redside Shiner	*Richardsonius balteatus*	2	14
Sandroller	*Percopsis transmontana*	1	10
Sculpin	*Cottus spp.*	4	234
Siberian Prawn	*Exopalaemon modestus*	6	136
Smallmouth bass	*M. dolomieui*	134	3,632
Sucker	*Catostomus spp.*	1	20
Three-spine stickleback	*Gasterosteus aculeatus*	351	5,134
Walleye	*Stizostedion vitreum*	2	24
Yellow perch	*Perca flavescens*	23	514
Total		330,934	1,523,104

Fish Condition

Descaling

The descaling percentage for all groups combined was 3.5% in 2013. This is higher than the overall rate of 2.5% for 2012 (Table 26). Annual descaling percentages in 2013 by species were: yearling Chinook 5.5%, subyearling Chinook 2.2%, clipped Steelhead 5.8%, unclipped Steelhead 4.3%, clipped Sockeye 6.0%, unclipped Sockeye 8.5% and Coho 3.5%.

Weekly descaling percentages for all species combined ranged from 1.3% to 9.9% for weeks with at least 100 fish examined (Table 27). The combined average descaling percentage

was 4.7% during the spring migration period (April 1st to June 30th), 1.9% during the summer migration period (July 1st to August 31st) and 7.4% during the month of September. All the 2013 seasonal migration descaling percentages were higher than in 2012 (3.3%, 1.3%, and 2.7% respectively). These percentages were calculated using full sample descaling data. Daily descaling information is provided in Appendix 1, Table 14.

Table 26. Annual descaling rates in percent for fish sampled at McNary Dam, 2009-2013.

Year	Yearling Chinook	Subyearling Chinook	Clipped Steelhead	Unclipped Steelhead	Clipped Sockeye	Unclipped Sockeye	Coho	Total
2009[1]	2.1	0.8	2.1	1.0	3.8	5.4	1.8	1.3
2010	4.1	1.3	3.2	3.4	*0.0	7.1	3.3	2.6
2011	3.2	1.4	3.4	1.6	*5.1	7.2	2.7	1.9
2012	3.2	1.7	4.7	2.4	*7.5	5.0	2.0	2.5
2013	5.5	2.2	5.8	4.3	*6.0	8.5	3.5	3.5

[1]Descaling by predators not included.
* Fewer than 100 fish sampled.

Table 27. Weekly descaling percentages for fish sampled at McNary Dam, 2013.

Week Ending	Yearling Chinook	Subyearling Chinook	Clipped Steelhead	Unclipped Steelhead	Clipped Sockeye	Unclipped Sockeye	Coho	Total
Apr 4	---	---	---	---	---	---	---	---
Apr 11	3.6	---	*0.0	*4.7	---	---	*0.0	3.4
Apr 18	4.8	---	*1.9	*2.0	---	4.8	*1.5	4.0
Apr 25	4.4	---	3.5	5.0	---	1.7	*4.0	3.8
May 2	6.5	---	9.7	*8.9	*0.0	3.0	*0.0	6.8
May 9	5.5	*0.0	5.5	*3.6	*8.3	4.2	*0.0	5.4
May 16	4.0	*0.0	3.9	*1.3	*0.0	9.9	*5.7	4.9
May 23	7.1	*0.0	*5.7	*0.0	*9.1	8.6	*10.2	7.8
May 30	6.8	*0.0	*8.0	*3.6	*18.2	14.6	*1.3	7.9
Jun 6	6.6	3.9	*5.6	*6.1	*0.0	14.4	3.6	6.7
Jun 13	4.4	3.1	*4.8	*6.1	*0.0	*17.5	*5.3	3.9
Jun 20	5.8	3.3	*4.8	*8.3	*0.0	*0.0	*0.0	3.4
Jun 27	*0.0	1.3	*0.0	*16.7	---	*0.0	*0.0	1.3
Jul 4	*22.2	2.0	*0.0	*0.0	---	*33.3	---	2.1
Jul 11	*0.0	1.5	*0.0	---	*0.0	*5.0	*0.0	1.5
Jul 18	*0.0	1.9	---	---	---	*16.7	---	2.0
Jul 25	---	1.4	---	---	---	*14.3	---	1.5
Aug 1	---	1.7	---	---	---	*11.1	*0.0	1.8
Aug 8	---	2.1	---	---	*0.0	*5.0	---	2.2
Aug 15	---	1.8	---	---	---	*0.0	---	1.8
Aug 22	---	1.9	---	---	---	*0.0	---	1.9
Aug 29	---	6.1	---	---	---	*100.0	---	6.8
Sep 5	---	6.6	---	---	---	*66.7	---	7.4
Sep 12	---	7.0	---	---	---	*14.3	---	7.2
Sep 19	---	9.5	---	---	---	*50.0	---	9.9
Sep 26	---	*4.8	---	---	---	---	---	*4.8
Oct 3	---	*3.0	---	---	---	---	---	*3.0

Total Descaled	464	540	86	26	4	186	20	1,326
Total Examined	8,439	24,518	1,479	601	67	2,195	579	37,878
Percent Descaled	5.5	2.2	5.8	4.3	*6.0	8.5	3.5	3.5

* Fewer than 100 fish sampled.
--- No fish sampled during the week.

Other Injuries and Disease

Daily subsamples of up to 100 juvenile salmonids of each species from the daily sample were examined for detailed injury and disease. Of the 8,758 fish subsampled, 1,015 (11.6%) were injured, descaled or exhibited symptoms of disease and 0.2% had multiple injuries or a combination of injury and disease. Unclipped Steelhead had the highest incidence of injuries and disease at 25.0%. There were 168 unclipped Steelhead examined. Predation marks caused by birds was the most commonly occurring injury. Clipped Steelhead experienced the second highest incidence of injuries and disease (19.9% of 361 examined), followed by unclipped yearling Chinook (13.9%), clipped yearling Chinook (13.9%), unclipped subyearling Chinook (10.9%), unclipped Sockeye (10.1%), Coho (7.2%), clipped subyearling Chinook (6.3%) and clipped Sockeye (0.0%).

Descaling is always a concern and is usually indicative of a problem within the system. In 2013, the average descaling percentage for the subsample (of up to 100 fish per species) was 5.0%. Bird predation was responsible for 11.5% of overall descaling. Birds accounted for 83.3% of the descaled unclipped Steelhead and 50.0% of the descaled clipped Steelhead

All fish in the sample were examined for lamprey marks. In 2013, 2.6% of all subyearling Chinook had wounds caused by lamprey. In previous years, the injury percentages for subyearling Chinook caused by lamprey were: 0.3% in 2012, 0.3% in 2011, 0.3% in 2010 and 1.0% in 2009. Lamprey bite marks are not as common on other species, because lamprey are not as aggressive in the spring.

Mortality

Total facility mortality for all groups combined was <0.1% in 2013 (Table 28). This is similar to last year's rate of <0.1%. Mortality rates by species were yearling Chinook 0.1%, subyearling Chinook <0.1%, clipped Steelhead <0.1%, unclipped Steelhead <0.1%, clipped Sockeye <0.1%, unclipped Sockeye 0.1% and Coho <0.1%. The overall facility mortality rate was 0.1% during the spring migration period, <0.1% during the summer migration period and 0.6% during the last month of facility operations. This compares to rates of <0.1%, 0.1%, and 1.2% during the respective periods in 2012. The facility mortality was lower this year due to the lack of a transport season. Since 1998, facility mortalities have been collected off the separator and factored into the collection and facility mortality totals. Daily mortality information is provided in Appendix 1, Table 14.

Table 28. Annual facility mortality in percent at McNary Dam, 2009-2013.

Year	Yearling Chinook	Subyearling Chinook	Clipped Steelhead	Unclipped Steelhead	Clipped Sockeye	Unclipped Sockeye	Coho	Total
2009	0.1	1.9	<0.1	0.1	0.0	0.1	0.1	1.0
2010	0.1	0.4	0.1	0.1	0.1	0.1	0.1	0.2
2011	0.3	1.7	0.1	0.1	0.6	0.3	0.2	1.2
2012	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1
2013	0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1

Weekly facility mortality rates varied from a low of 0.0% to a high of 0.9% (Table 29). The highest weekly facility mortality rate of 0.9% occurred during the week ending Sept 26. The lowest rate occurred during the week ending June 27, in the middle of the season.

Table 29. Weekly facility mortality in percent at McNary Dam, 2013.

Week Ending	Yearling Chinook	Subyearling Chinook	Clipped Steelhead	Unclipped Steelhead	Clipped Sockeye	Unclipped Sockeye	Coho	Total
Apr 4	---	---	---	---	---	---	---	---
Apr 11	0.3	1.1	0.0	0.3	---	---	0.0	0.3
Apr 18	0.1	0.1	0.1	0.1	---	0.0	0.0	0.1
Apr 25	0.1	0.0	0.0	0.0	100.0	0.0	0.0	0.1
May 2	0.1	0.0	0.0	0.0	0.3	0.1	0.1	0.1
May 9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
May 16	0.1	0.1	0.0	0.0	0.0	0.1	0.0	0.1
May 23	0.2	0.1	0.0	0.0	0.0	0.1	0.0	0.1
May 30	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0
Jun 6	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
Jun 13	0.1	0.0	0.1	0.1	0.0	0.1	0.0	0.0
Jun 20	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
Jun 27	0.0	0.0	0.0	0.0	---	0.0	0.0	0.0
Jul 4	0.0	0.0	0.1	0.0	---	0.0	---	0.0
Jul 11	0.5	0.0	0.0	---	0.0	0.0	0.0	0.0
Jul 18	0.0	0.0	---	---	---	0.0	---	0.0
Jul 25	---	0.0	---	---	---	0.0	---	0.0
Aug 1	---	0.2	---	---	---	0.1	0.0	0.2
Aug 8	---	0.1	---	---	0.0	0.0	---	0.1
Aug 15	---	0.2	---	---	---	0.0	---	0.2
Aug 22	---	0.2	---	---	---	0.0	---	0.2
Aug 29	---	0.1	---	---	---	0.0	---	0.1
Sep 5	---	0.5	---	---	---	0.0	---	0.5
Sep 12	---	0.3	---	---	---	3.6	---	0.3
Sep 19	---	0.6	---	---	---	0.0	---	0.6
Sep 26	---	0.9	---	---	---	---	---	0.9
Oct 3	---	0.8	---	---	---	---	---	0.8

---No fish collected during the week.

The overall sample tank mortality percentage for 2013 was 1.3% (Table 30). This is up

from 2012 (0.8%). It is important to note that subyearling Chinook mortality (78.7% of the total mortality sampled) drives the overall sample tank mortality percentage each year. The sample mortality percentage is the best available indicator of the actual facility mortality percentage during bypass operations. Mortalities that occurred or passed the separator between sampling intervals were bypassed directly to the tailrace and were not enumerated. The sample mortality percentage included mortalities recovered from the sample holding tanks and any mortality that occurred during the sampling process. It does not include mortalities from the recovery raceway.

Sampling activities accounted for 14 of the 494 (2.8%) mortalities recovered from the sample holding tanks. These mortalities represent 0.04% of the salmonids sampled. There were two categories for handling mortality: Fish pinched by the pre-anesthetic chamber gates (4), and fish stranded in the flush pipe to the sorting trough (10). This compares to 20 sampling activity mortalities in 2012, or 6.7% of the mortalities recovered that year.

The overall post-sampling mortality percentage was 0.4% in 2013, with a daily range of 0.0% to 12.5%. The peak occurred on a day with low sample numbers. The post-sampling mortality percentage was calculated using the mortalities recovered from the sample recovery raceway. Post-sampling mortality percentages for species sampled in 2013 were: yearling Chinook 0.3%, subyearling Chinook 0.5%, clipped Steelhead 0.2%, unclipped Steelhead 0.0%, clipped Sockeye 0.0%, unclipped Sockeye 0.2%, and Coho 0.0%.

Table 30. Annual sample mortality in percent at McNary Dam, 2009-2013.

Year	Yearling Chinook	Subyearling Chinook	Clipped Steelhead	Unclipped Steelhead	Clipped Sockeye	Unclipped Sockeye	Coho	Total
2009	0.9	2.2	0.2	0.2	0.0	0.2	0.1	1.7
2010	0.6	1.0	0.4	0.3	5.6	1.0	0.8	0.9
2011	1.9	1.8	0.2	0.5	1.0	2.9	0.6	1.7
2012	0.5	0.9	0.3	0.5	1.9	0.8	0.0	0.8
2013	0.7	1.6	0.1	1.0	0.0	1.5	0.2	1.3

Gas Bubble Trauma (GBT) Monitoring

PSMFC personnel collected juvenile salmonids as they entered the separator and examined them for symptoms of Gas Bubble Trauma (GBT) as part of the Smolt Monitoring Program. Examinations were conducted April 9th through August 31st. The protocol states that 100 fish of Chinook and Steelhead will be captured off the separator for examination for GBT. These can be any combination of yearling or subyearling Chinook or clipped or unclipped Steelhead. GBT occurred on a revolving schedule of Monday and Wednesday one week then Tuesday and Thursday the next week. All fish were scanned for PIT tags immediately upon capture; those with tags were returned to the separator without examination. After examination, fish were sent to the sample recovery/holding raceway and bypassed along with fish from the daily sample. Fish examined for GBT were included in the daily collection totals. A total of 3,814 salmonids were examined for GBT at McNary in 2013. These included 1,391 yearling Chinook, 2,124 subyearling Chinook, 194 clipped Steelhead

and 105 unclipped Steelhead. There were 22 (0.6%) fish showing symptoms of GBT.

Recommendations

1. Remove orifice traps and free up orifices. The 6B trap orifice funnel has no fish outlet, and can trap and strand fish.
2. Reinstall the forebay debris shields above the water level in and around Unit 4. These will prevent debris from entering the juvenile channel during storm events.
3. Move 48 inch supply valve to where it would be more accessible or install a wye drain.
4. Refinish channel floor and walls.
5. Reinstall second hoist on channel trolley.
6. Automate channel floor valves.
7. Motorize facility emergency water supply valves.
8. Rehabilitate channel brushes.
9. Rehabilitate and paint channel drain area.
10. Rehabilitate porosity unit again.
11. Install new GBT pipe.
12. Repaint facility.
13. Install new facility heating and cooling system.
14. Complete clean up contract on new outfall.
15. Mothball transport systems.
16. Install larger PIT tag shields around detectors to reduce debris blockages in flumes.
17. Install emergency truck release site at junction box.
18. Strip and repaint sorting trough in wet lab.
19. Rework the crowders to run smoother.
20. Replace netting on the sample holding tanks.
21. Replace plastic molding on the guillotine gates on the pre-anesthetic chambers.

List of Acronyms

BPA – Bonneville Power Administration
CRITFC – Columbia River Inter-Tribal Fish Commission
ESBS – extended-length submersible bar screen
FGE – fish guidance efficiency
FPC – Fish Passage Center
GBT – gas bubble trauma
MOP – minimum operating pool
NBS - National Biological Survey
NMFS – National Marine Fisheries Service (now NOAA Fisheries)
NOAA – National Oceanographic and Atmospheric Administration
OCFRU - Oregon Cooperative Fishery Research Unit
ODFW – Oregon Department of Fish and Wildlife
PIT – Passive Integrated Transponder (tag)

PITAGIS – Pit Tag Information System
PLC - programmable logic controllers
PNNL- Pacific Northwest National Laboratories
PSMFC – Pacific States Marine Fisheries Commission
RM – river mile
STS – submersible traveling screens
USFWS – U.S. Fish and Wildlife Service
VBS – vertical barrier screen
VI Tag- visible implant tag
WDFW – Washington Department of Fish and Wildlife