CENWW-OD-WM DUGGER 6 March, 2013

MEMORANDUM THRU:
Tim Roberts, Acting Operations Manager, McNary Lock and Dam

FOR Chief, Operations Division
ATTN: John Bailey / Ann Setter

SUBJECT: Submission of 2012 Juvenile Fish Collection and Bypass Report, McNary Dam Juvenile Fish Facility.

1. Enclosed find the 2012 Juvenile Fish Collection and Bypass Report for McNary Dam as requested.

2. If you have any questions contact Carl Dugger or Bobby Johnson at McNary Dam, (541) 922-2263 and (541) 922-2212, respectively.

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Enclosure

2012 Juvenile Fish Collection and Bypass Report

McNary Dam Juvenile Fish Facility

Prepared by

Carl R. Dugger

U.S. Army Corps of Engineers

6 March 2013

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JUVENILE FISH FACILITY

Facility Description

Trash racks keep most debris from entering the intake 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 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 into the ice and trash sluice, the dewatering pit and the 48-inch facility supply line, which supplies the transport facility.

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 retains fish and allows the excess water to be removed. The screen is kept cleaned by the side, rectangular and transition brushes. The side dewatering valves, brushes and channel elevation have a PLC (Programmable Logic Controller) with associated software. 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 in the spring and fall to bypass fish. The separator sorts the fish by size with smaller smolts exiting down the A flume and larger 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 primary Passive Integrated Transponder (PIT) tag gates used to bypass most PIT tagged fish, sample gates used for smolt monitoring and secondary PIT tag gates used for PIT tag studies, secondary bypass or transport. When open, these secondary bypass gates return the fish to the river down ten-inch diameter bypass lines, which usually occurs in the spring. When closed, they send the smolts to the raceways for summer transport collection.

McNary has eight raceways, four of which can be used for trucking. There are also two sample raceways. From the raceways, the fish can be off loaded on to barges at the dock or trucks at the loading bay. In the past, fish transport started with barge operations then transported by truck as fish numbers dropped. 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 of these tanks. Inside the building is the wet lab where the sample is examined. The full flow flume, adult

return line and all facility lines have PIT tag detectors and associated equipment. The sample timer and PIT tag monitoring equipment are in the building. The 48-inch line from the juvenile collection channel feeds the head box, water add-ins and separator up well. The head box supplies water to the rest of transport facility. All flow is gravity fed.

Facility Modifications (Maintenance and Improvements)

The main improvement for the winter of 2011-2012 was the installation of a new full flow flume along with a bypass pipe, a new separator adult return to river line, a new PIT tag return line, a new barge/bypass line and new secondary bypass "A" and "B" lines, all of which share a common outfall in the middle of the river near the downstream boat restricted zone. Table 1 details problems and improvements in the new system.

Table 1. New Bypass Line Issues.

Date	Issue
Mar 16	Contractor water tested secondary lines, no problems.
Mar 21	Contractor completed below water line work.
Mar 22 & 29	COE tested all lines: flume and fittings leaks, primary flush line out of service. Contractor resolved issues.
Mar 31	Paint peeling in new flume.
Apr 1	COE found fish under barge/bypass gate. Gate lowered and clamped in place.
Apr 4	Contractor repainted flume.
Apr 9	Contractor adjusted water cannon pump.
Apr 25	Water cannon and pipe access walkway grating failed. Contractor reattached some grating.
May 10	More pipe access walkway grating found loose. Contractor reattached.
May 14 to 16	NOAA studies junction box hydraulic jump. No delay of smolts.
May 30 to Jun 6	Walkway grating loose and reattached again. Access protocol set.
Jun 1	After discussions, contractor repaired barge/bypass gate.
Jun 18	Loose walkway grating found.
Late Jun	Grating reattached to pier 20. Old facility supports removed.
Jul 10 to 14	Second study of junction box hydraulic jump. No delay of smolts.
Jul 11	Loose walkway grating found. Replaced partly in August.
Jul 16 & 23	District personnel examine grating.
Jul 25	NOAA examines separator adult return to river line.
Aug 16	Contractor replaced walkway grating & found water cannon pump missing.
Aug 10 to 16	Contractor worked on access to flume by separator, adult return and PIT access, kill switch for primary flush line and reinforced the above ground walkway.
Aug 24	Power failure. Had to close primary flush line manually.
Aug 29	COE test cameras at separator adult return line.
Sep 12	District personnel examine facility for clean up contract.
Sep 12 to 28	COE inspects adult passage separator return line with cameras.

Table 1 Continued. New Bypass Line Issues.

Nov 5 to Dec 20	Contractor completed grating repairs to the end of the pipe, replaced water cannon pump and completed separator access to the walkway.
Late Dec	Paint peeling from corrugated flume. Contractor to repair in spring, 2013.

The river depth and flow at the new outfall should provide for better fish survival.

On March 22, COE personal salvaged three steelhead adults from the collection channel after the water test. On April 1 and 3, the biologist found six unclipped sockeye smolts under the barge/bypass gate while releasing the sample. Five fish were lost. On April 25, river flow was 445 kcfs and the tailwater elevation was 272 feet when the water cannon pump and part of the supply line were washed away. For the year, casual observations of the junction box hydraulic jump revealed no passage problems for adult salmonids.

During the winter, the contractor extended the west raceway drain which should improve juvenile lamprey passage. They installed a dual head bird hazing water cannon. Finally, the contractor removed all of the old bypass systems except the separator adult return to river line.

Details of maintenance and improvements made during the winter of 2011-2012 to enhance system performance over previous seasons are listed below:

1. The project performed all scheduled preventative maintenance at the juvenile channel and facility.
2. The project completed installation of proximity switches on Extended Length Submersible Bar Screens (ESBSs) replacing transducers.
3. ESBS and Vertical Barrier Screen (VBS) rehabilitations continued.
4. The mechanics installed new bleeder lines in the channel air system.
5. The electricians rewired channel access lighting and resolved other electrical issues.
6. The fisheries staff refurbished orifice valves controllers and oil reservoirs.
7. The project repaired the transition screen cleaning device and found water in the air line.
8. A contractor rehabilitated the Temporary Spillway Weirs (TSW's).
9. The project constructed spill hoist Project Maintenance (PM's).
10. The project completed repairs to the powerhouse trash rack cleaning hoist.
11. The fisheries staff rehabilitated the PIT tag and sample gates.
12. We repaired the separator porosity unit.
13. The staff built and installed new raceway tailscreens, which pass juvenile lamprey. The screens appeared to have worked very well.
14. We installed safety ladders in the east raceways.
15. The staff repaired the east raceway gantry.
16. The staff refurbished the barge loading boom, sample raceway release valves and the raceway inflow movable flumes.
17. We replaced multiple gaskets at the facility.
18. The project removed old research study equipment.

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

1. In April, the electrical staff replaced three orifice attraction lights and three light switches.
2. In April, the fisheries staff installed two steps at the orifice traps which freed both orifices for operation.
3. In May, the staff installed a new flush valve in the "B" side PIT tag line downstream of the slide gate.
4. Also, in May, we installed a water spray system to reduce foam in the separator.
5. In June, we replaced an oil reservoir for Raceway 4's release valve.
6. Also, in June, we replaced three channel orifice operators.
7. In September, the staff repaired a main flume cover and replaced a wind sock after a storm.
8. In October, the staff removed separator porosity unit screens for rebuilding, which will be completed in the winter.
9. In December, we replaced six flush line supply valves which were no longer operable.
10. Also in December, the fisheries staff replaced two truck loading line dewatering valve actuators and two raceway supply valve actuators.
11. In late December, a contractor mobilized in order to replace the three steel forebay bulkheads in the collection channel with concrete.

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

Operations and Maintenance

Bypass and Transport Operations

On March 22, from 1130 to 1900 hours, the fisheries staff used 1 to 8 orifices to pool the collection channel so we could test the channel and the new bypass systems. At the facility, we tested all gates. No problems were found. On March 29, from 0830 to 1030 hours, 12 orifices were opened to test the systems again. We found five leaks in the new corrugated section of the full flow flume, which the contractor repaired. From 1230 to 1530 hours, the switch to primary bypass was completed.

On March 31, we found paint peeling from the inside of the new corrugated flume. On April 2, the system was in secondary bypass, from 1311 to 1351 hours, for examination of the hydraulic jump at the primary/secondary junction box. All sample and PIT gates were off. On April 3, the rectangular screen cleaning device in the channel failed. After regional discussion, the fisheries staff switched to emergency bypass (on April 3, from 0930 to 1330 hours) so the contractor could repaint the flume and the project could repair the rectangular dewatering screen cleaning device.

After letting the paint dry, on April 9, at 0745 to 1200 hours, the fisheries crew switched the system to primary bypass operations. With ESBS installations beginning on April 9, the spring bypass season commenced with alternating days of primary and secondary bypass operations. Fish began to be routed through the secondary bypass on April 10 with the data day starting at 0700 hours. Both bypass methods allow for PIT tag detection. Primary bypass provides easier fish passage through the operating project while secondary bypass allows for smolt monitoring and studies. The sample gates were only active during secondary bypass.

During the bypass season, on April 12 from 1325 to 1347 hours, the system was in primary bypass so an FPOM group could examine the hydraulic jump at the junction box. On June 23, we went to primary bypass twice for a total of 32 minutes to flush a six to seven foot sturgeon out of the system. On both occasions, we left the sample gates on.

During secondary bypass, ice block checks three times a day for unknown blockages in the bypass lines revealed no problems. However, the new location of the outfall made it difficult for us to observe the outfall even with a spotting scope, which was hard to keep sufficiently stable at that observation distance. Also, at times, high tailwater elevations obstructed the view.

After regional discussion, no barge transport occurred at McNary this season.

On August 17, at 0700 hours, again after regional talks, McNary began collection for truck transport with all PIT and sample gates operational. Collection for transport allows for PIT tag diversion and smolt monitoring. This season, water balloon checks of the PIT tag release lines revealed no obstructions. Fish trucking is described in the appropriate section below.

On August 24, from 0816 to 1820 hours, we placed the system in primary bypass due to a power outage for transformer and relay work. For this outage, we had to close the new full flow flume flush line manually. From September 3 at 0842 hours to September 6 at 0700 hours, facility personnel placed the system in primary bypass as large amounts of forebay debris entered the raceways. On September 21, from 1700 to 1800 hours, we placed the system in primary bypass to remove algae from the full flow flume section upstream of the separator. We turned all systems and gates off at the facility except during the cleaning.

On October 1, at 0001 hours, the McNary facility concluded transport season with the beginning of the fall bypass season. 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 took place in the full flow flume.

On November 6, from 0700 to 1100 hours, we switched the system to emergency bypass due to failure of the rectangular screen cleaning device. The fisheries staff winterized the facility and part of the channel. Project personnel began maintenance. There is no PIT tag detection during emergency bypass. During the switch, the staff salvaged 14 subyearling Chinook smolts from the raceways and the truck release line. We lost two of these smolts.

On December 20, from 0800 to 1600 hours, after the project raised the ESBSs, the fisheries crew closed channel orifices for winter maintenance season and evacuated fish to the river. We moved approximately 75 steelhead adults, l Chinook jack and 12 Chinook subyearlings. We lost 1unclipped adult steelhead and 1 unclipped Chinook smolt. We observed no lamprey adults or juveniles. The number of adult shad in the channel made it difficult for the staff to remove and count species of interest. The process was slowed by water in the bulkhead hoist pendant, which an electrician dried out.

This year, power outages affected both the channel and facility. These outages were due to work in the powerhouse. This is the second year power outages occurred in the collection channel

during the season. During the winter, there were 2 power outages that had no ill effect on the system. Table 2 reflects in season outages.

Table 2. Power Outages.

Facility outages				
Date	**Reason**	**Outage time**	**Sample gates off**	**PIT gates off**
Apr 23	Thunderstorm.	Brief.	Were off.	Were off.
Aug 20	Transformer 1.	0717 to 0737	0712 to 0738	0712 to 0745
Aug 23	Transformer 1.	1052 to 1122	1031 to 1123	1031 to 1123
Aug 23	Transformer 1.	1627 to 1732	1554 to 1733	1554 to 1733
Aug 24	Transformer 1.	0744 to 0852	0744 to 1820	0744 to 1820
Aug 24	Transformer 1.	1253 to 1315	Remained off.	Remained off.
Aug 24	Transformer 1.	1710 to 1716	Remained off.	Remained off.
Channel outages.				
Date	**Reason**	**Outage time**	**Effect**	
Jul 24 & 25	Powerhouse breaker.	None indicated.	Screen cleaners synchronized on July 25.	
Oct 2	Powerhouse breaker.	1426 to 1506	Biologist monitored channel level.	

On April 23, the system was in primary bypass. On August 20, the sample gates were briefly turned off at 0637 hours but the biologist returned them to service before a sample was missed. On August 20 and 23, we remained in collection. On August 24, we had the system in primary bypass and we had to close the main flume flush valve manually. During all power outages and from August 23 to 24, the facility's phones were out of service. The facility's electrical supply feeds off of transmission line 1, which is why the work on transformer 1 caused power outages.

On July 24, the project's air supply was out of service. Also, on September 10, the air was briefly out of service. Neither outage had an adverse affect on the facility or channel. The facility has a back up compressor and we limited operations in the channel.

Turbine and Spill Operations

The one percent hard criteria for unit operation is in effect 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 2 occasions the project reduced a unit's load to the lower end of one percent criteria due to high VBS differentials for a total of four days.

During the soft one percent criterion periods in March, November and December, the operating project ran units outside the constraint at BPA's requests, and for dive contacts in support of the installation and removal of study equipment. VBS differential readings were affected.

North powerhouse loading for temperature abatement did not occur this year. The new unit priority established for the new outfall location is a north powerhouse pattern. However, after discussion of the best available data, for most of August, the project ran units in an alternating on/off pattern. The unit outages at the time met this pattern. Temperature monitoring occurred

from June 15 to August 31, inclusively. The smolt monitoring staff publishes the results in a separate report.

From August 10 to 31, the project held the forebay elevation at 339.0 to 340.5 feet in support of at the Ice Harbor navigation lock. Neither the adult ladders or juvenile fishways were significantly affected by these forebay elevation changes.

From March 14 to April 10, spill in excess of powerhouse capacity occurred. Also in the spring, the project adjusted the spill for the juvenile bypass pipe contractor. The project had both TSW's rehabilitated, and we installed them on April 9. On April 10, at 0001, the spring spill program began with TSW's installed at Bays 19 and 20. For the spring, 40 percent of flow is scheduled to be spilled. However, due to high flows in excess of powerhouse capacity, 40 to 66 percent of total flow was spilled during the spring program.

On March 14 to 28, we could not adjust the spill at Bays 1 and 20 due to electrical bus maintenance for the cranes attached to the gates in these bays. On April 10, the hoist at Bay 20 required an electrical repair. On April 24, the project adjusted the TSW in Bay 20 for high forebay elevations. On May 13, the operators had to close both Bays 19 and 20 for 50 minutes due to a recreation boat entering the area. Bay 19 would not close completely at the time. The project resolved the problem later.

From June 7 to 8, the project closed Spill Bay 19 for TSW removal. On June 7, we closed Bay 20 for 1.7 hours then reopened it. From June 8 to 9, the project closed Bay 20 for TSW removal. The switch to standard spill bay configuration is timed with the projected start of sub yearling Chinook out migration.

On June 12, at 1200 hours, after regional discussion, the summer spill program began with 50 percent of total flow being spilled. Due to flow in excess of powerhouse capacity, 50 to 74 percent of total flow was spilled for the summer.

From July 13 to 16, Bay 19 was closed due to a failed gate coupler. On July 24, the project returned the hoist to automatic operation. On August 6 to 7, we resolved issues with Bay 8's hoist.

For the spring and summer season, the project made adjustments to the pattern for navigation safety. On September 1 at 0001 hours, 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.

On May 29 and on July 4, for 2.7 and 1.8 hours respectively, the project spilled forebay debris with gates raised higher. On September 5, 11 and October 2, the project spilled forebay debris with the help of a tug and boom. The tug was on loan from Lower Granite project. We used Bay 13 in September and October with the spill leaf split and the gate was open for 3.6, 3.0 and 1.6 hours, respectively.

Forebay Debris and Trash Racks

Floating debris consisted of 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. When in place, the TSWs helped pass the debris. The debris load was light to moderate from March to July. On May 29 and July 4, the project spilled the debris from along the spill face. From August to September, the load was moderate to heavy with half of it accumulating at the spillway. On September 1, when the spill was closed, the debris moved to the powerhouse.

As mentioned in the Bypass and Transport section, we had to switch to primary bypass due to the debris seen at the facility. On September 5, the tug and boom removed 4 loads of debris reducing the debris field 50 percent. Overnight, a northeast wind moved the debris to the Oregon shore allowing for collection to resume. On September 11, the tug again removed 4 loads of debris, which was spilled and reduced the debris field considerably. On October 2, we removed and spilled 1load of debris before the tug was returned. From September to December, the amount of debris was light to moderate, accumulations being light most of the time.

During the winter, we monitored trash rack differentials weekly. We saw no problems. This is the first winter we monitored the differential regularly. In February, the trash rack hoist returned to service. For the year, we continued monitoring with no issues seen. The project cleaned trash racks at all operations units with results recorded in Table 3. The amount is recorded as the number of 10 cubic yard truck loads.

We saw no fish of interest in the debris. In January, 2013, per the Fish Passage Plan, which was changed, we will check 4 racks and clean the racks based on what we find.

Table 3. Trash Rack Debris.

Date	Amount	Type	Fish Loss
Mar 21, 23 & 26	13.1	Tumbleweed and wood.	None.
Apr 16 & 17	11.7	Same plus two logs.	None.
May 21 & 22	4.0	Same.	None.
Jun 18, 19 & 21	2.0	Same.	None.
Jul 26, 27 & 30	1.5	Same plus milfoil.	None.

Gatewells

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. Also, we noted no blue/green algae in the gatewell slots this year. Finally, gatewell slots were examined daily, after any orifice blockage or inadvertent closure along with any other events discussed in other sections of this report.

In March and December, during installations and removals, we removed ESBS oil from a total of 13 slots with absorbent pads. On September 19, we removed hydraulic fluid from 12B slot. On October 25, we observed at 11C slot what appeared to be an oil sheen and later at 12B slot. The project found no source for the sheens and the pads absorbed little or no oil.

On December 10, the project installed the emergency bulkhead at 10C slot with Unit 10 being out of service. On December 15, with the headgates being lowered at 10A and 10B slots, 10C slot dewatered. We will rewater the slot in January or Febraury, 2013.

Extended-Length Submersible Bar Screens

This season marked the 16th year with a full compliment of extended-length submersible bar screens (ESBS) in place in all 14 units (42 screens, 3 per unit). From May 8 to December 4, the fisheries staff performed underwater camera inspections. We skipped six inspection dates due to trash rack cleaning, unit fish rescue, camera failure and other project operations or fisheries obligations. The purpose of the inspections is to look for the proper range of brush mechanism operation. From June 27 to July 9, the camera was out of service do to a cable issue. On July 10, we tested the Rigid Sea Snake camera for inspections and it worked well. Inspection results are recorded in Table 4.

Table 4. Results of ESBS Camera Inspections.

Date	Slot	Result
Jun 19	7C	Brush found short cycling. Operators reset.
Jun 27	11C	Same.
Oct 16	10B	Same.
Nov 27	1B, 4A & 7C	Brushes found short cycling. Operators reset.

We examined the ESBSs at Units 3, 8 and 14 (once, once and three times, respectively) due to the units being out of service long term. The staff examined all other units' ESBSs five to six times. We noted no significant smolt mortalities in the gatewell slots during camera inspections. When the project removed the screens in December, none showed any problems.

For fourth 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 March 30 to April 2, the project installed screens at Units 5 and 6, which were out of service. In order to keep the brush mechanisms functional, the project ran the screens even with the units being out of service. On April 9, after the facility was switched from emergency bypass to primary bypass, the project began installation of ESBSs at all remaining units and completed the work on April 14. The project also brought the three spare ESBSs to the intake deck. Finally, for the fourth year, the brush cycle time for all ESBSs remained at 60 minutes.

The cycle timing and screen rehabilitation along with installation of proximity switches seems to have reduced ESBS failures and repairs. Table 5 reflects issues that occurred with the screens during the year.

Table 5. ESBS Issues.

Dates	Slot	Issue
Apr 26 to 30	10C	Electrical. Screen functional. Replaced.
Apr 28 to May 2	7C	Screen in bypass. Cycling improperly. Operators resolved.
May 26	2C	Screen failed. Replaced.
May 13 to Dec 18	7C	Screen alarmed and switched to bypass mode. During the year, found short cycling 22 times. Once from the top. Operators reset each time.
Jun 21 to 25	14A	Alarmed. To bypass mode. Failed twice. Check controller. Short cycling, failed again. Jun 24 replaced. Failed. Jun 25 replace again.
End June	Unit 3	Remove ESBSs unit out of service to winter 2013.
Jul 20 to 31	1A	Alarmed. To bypass mode. Broke electrical cable. Screen functional. Short cycled and reset. Cable repaired.
Jul 20 to Dec 16	1A	Remained in bypass mode until removed.
Aug to Dec	1A	Found short cycling five times and reset.
Aug 8	11A	Manual for 21 hours after camera inspection.
Aug 17 to Dec 18	7A	ESBS rope frayed. Monitored.
Sep 19	Four	1B, 1C, 13B and 13C found short cycling and reset.
Sep 22 to 23	1B	Short cycling and reset. Alarm. To bypass mode.
Sep 23 to Dec 16	1B	In bypass mode until removed.
Sep to Oct	1B	Found short cycling from the top seven times and reset.
Oct 11	1B	Replaced due to cycling at the top. Remained in bypass.
Early Oct	2C	Short cycled once and reset.
Oct 25	11C	Replaced due to possible oil leak but no problem found.
Nov 27	4A	Short cycle 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 ESBSs to be raised and/or fish screens to be replaced, resulted in unit outages. We noted no significant fish loses during ESBSs issues.

During the first week of December, the project took the spare ESBSs back to the yard and raised the screens at Units 8, 10 and 14, which were out of service past December 15. Also, on December 16, 18 and 19, the project raised the screens at Units 1, 2, 4 to 7, 9 and 11 to 13 to end the season. We did not work on December 17 due to high winds. On December 18, the general maintenance staff had difficulty releasing the screens from their deployed configurations on slots 6A and 6B, which delayed ESBS removal. During the work at 6A slot, the underwater camera was drawn into an open orifice and became damaged. We will have the cable repaired and we have a new camera on order. The project began maintenance as soon as each screen was raised.

Vertical Barrier Screens

On January 29, the project installed a VBS at 1C slot which was missing while the unit was out of service. Daily VBS head differential monitoring corresponded with ESBS installations, 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. We cleaned the screen at 5A slot 28 times. The project cleaned VBS's on 422 occasions. Last year, we cleaned the screens on 516 occasions. This year, forty-eight of these include inspections the project conducted on April 19 at Units 10 to 13, on May 15 and 16, at Units 2, 3, 4, 9 and 14 along with October 18 and November 5, at Units 8 to 14. From September 9 to 25, the project cleaned 4 screens when exchanging them for rehabilitation. We cleaned debris from the remaining 370 screens. On 92 occasions, the differential measured 1.5 feet to 2.0 feet. Screens with multiple readings out of criteria before being cleaned are counted only once. Table 6 reflects debris VBS cleaning by the month.

Table 6. VBS Cleaning by Month.

Month	Days	VBS's cleaned	Measured $\geq$ 1.5 feet
March	None	None	None
April	None	None	None
May	4	13	5
June	11	44	9
July	15	88	19
August	15	76	8
September	16	73	18
October	11	30	16
November	10	30	13
December	4	16	4
Total	86	370	92

Last year, on 157 occasions, we measured screens with differentials at 1.5 feet or above. On May 21, we cleaned the first VBS, with the last one cleaned on December 12. In November and December, we cleaned 43 screens with 16 measuring high when units were outside the soft one percent criterion. 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. On two occasions the length of time units were at reduced loads was extended as covered in the Turbine and Spill Operations section above. Reducing the load also allows debris to slough off the screen.

On nine occasions, the project "burped" units to slough off debris so the VBS could be cleaned at a later date. Burping is briefly taking the unit off line. Every time this reduced the VBS differential.

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. We noted no significant fish lost during VBS cleaning.

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. In September and November, the project replaced five VBSs at Units 3 and 13 with rehabilitated screens. We used Unit 3 as a staging area.

We had three other issues this year: On May 3, the project drilled a hole in the VBS access cover at 4A slot to improve measurement accuracy. The project had difficulty resetting VBSs at Unit 2, which at times required the unit to be briefly taken off line. The screen retainers need to be modified at this unit. In September, the general maintenance crew began to wash sponges off the back side of the VBSs.

The prototype bar screen VBSs 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 VBSs. The crew cleaned these screens in 4B and 4C slots six and two times, respectively. We generally clean these screens are one or two times a year. In comparison, we cleaned the standard screens at 2A, 4A and 5A slots 24, 16 and 28 times, respectively.

Orifices and Collection Channel

After completion of winter maintenance, as outlined in the Bypass and Transport section, on March 22, we used one to eight orifices to test the new system. On March 29, we began with 12 orifices and completed the switch to primary bypass with 42 orifices. For the year, until orifice closure on December 20, we maintained 42 orifices opened. We only closed all orifices in April and November, for the switches into or out of emergency bypass operations.

Eighteen orifice blockages occurred this year. Four were due to debris after trash rack or VBS cleaning along with storms. On 13 occasions, we removed ESBS ropes from the orifice inflows. The last obstruction occurred when the underwater camera became lodged in the orifice inflow at 6A slot. We cleared these obstructions as soon as we found them and we noted no harm to fish.

We performed scheduled maintenance on the orifice operators, oil reservoirs and valves occurred during the season. Also, we replaced orifice attraction lights promptly as required. In December, we noted moisture in the orifice air supply which we bleed off.
Orifice closures are outlined in Table 7. In all cases, we noted no harm to fish and we reviewed orifice cycling protocols when required. When needed, we opened makeup orifices always at nearby units. Orifice adjustments at times resulted in brief high/low water alarms which quickly reset.

Table 7. Orifice Closures.

Orifice closed	Orifice opened	Date	Time	Reason
Units 1 to 7	Units 8 to 14	Sep 5	3.6 hours.	Debris removal.
Units 1 to 3	Units 4, 5, 6 & 8	Sep 11	3.0 hours.	Debris removal.
Units 3 & 8	Units 11 & 12	Sep 11-20	As needed.	Possible VBS rehabilitation.
Unit 3	Unit 8	Sep 20-Nov 6	As needed.	VBS rehabilitation.
7A south	7A north	Sep 22-Dec 20	3 months.	ESBS roped frayed.
10C	none	Sep 27	24 hours.	No reason orifice closed.
Unit 1	Unit 2	Sep 29	2 hours.	Rectangular screen obstructed.
Units 1 & 2	Units 4, 5 & 6	Oct 2	1.6 hours.	Debris removal.
Two slots	none	Early Oct	Brief.	Orifices left closed after VBS cleaning.
Unit 11	Unit 12	Oct 25-26	1 day.	Possible oil at 11C slot.
Units 11 & 12	Units 13 and 14	Oct 26-29	3 days.	Possible oil at Units 11 & 12.
7A	11C	Oct 29	19 hours.	Orifice inadvertently closed at operational unit.
6A & 6B	none	Dec 18	Over night.	Orifices inadvertently closed for ESBS removal.
10C	11A	Dec 15-20	5 days.	Unit out of service. Slot dewatered.

On October 30, the biologist opened both orifices at 7A slot to help evacuated fish. We did a camera inspection later in the day which revealed no lose of smolts or lamprey.

During the spring and fall bypass seasons, the technicians constantly monitored the collection channel when primary or emergency bypass. During secondary bypass and the transport season, 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 and screen cleaner device failures along with other problems described in this report.

Adult fish continue to jump at the orifice jets. This year, we found only one unclipped adult steelhead on the channel grating and immediately repaired a small hole in the netting.

Primary Dewatering Structure

On March 22, 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 29 to April 3 and from April 9 to November 6 except for emergency bypass as described in the Bypass and Transport section. The two power and two air supply outages occurred in the channel this year, which we recorded in Table 2 and its narrative. None had an adverse effect on the channel systems. For the second power outage, the biologist turned the systems off before the outage and restarted them

once power returned. The power outages did cause brief water elevation alarms.

Issues with the rectangular screen cleaning device are recorded in Table 8.

Table 8. Rectangular Screen Cleaning Mechanism Issues.

Date	Problem	Resolution
Mar 22	Retraction cable slack.	Cable rewound.
Mar 29	Incomplete cycle.	Downstream limit switch adjusted.
Apr 1	Excessive noise.	Monitor.
Apr 3 at 0422 to Apr 5 at 1715	Drive motor bearing failed. Wrong motor brake installed.	Emergency bypass. Replace brake & refurbish bearing.
Sep 21	Brush too low after rising.	Adjust limit switch.
Oct 29	Woody debris in scissors arm.	Removed debris.
Nov 2 at 2030 to Morning Nov 3	Mechanism failed. Would not raise brush. One retraction cable loose.	Run air burst system hourly. Reattach cable.
Nov 3 to Jan, 2013	Brush would not rise, slipping. Found faulty clutch bearing in drive sprocket next to gearbox.	Ran air hourly. Nov 6 switch to emergency bypass. Replace bearing in winter.
Nov 13	Received bearing but not properly designed.	Ordered custom bearing from Japan. Due in Dec.

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.

Table 9 reflects the time line of events of September 27 when the rectangular screen was obstructed with debris. Unit 1 VBSs were covered with heavy debris before the project removed the unit from service. With the unit out of service most of the week, we did not clean the VBSs. When the head gate work began, this debris sloughed off the VBS's and caused the rectangular screen obstruction. The fisheries staff's quick reaction minimized the problem with no fish being lost. This was a rare event.

Table 9. September 27 Time Line.

Time (Hours)	Activity or Action
1340	Began raising Unit 1 head gates.
1400	Heavy debris noted at facility separator.
1415 to 1620	Fisheries staff to collection channel. Found rectangular screen blocked with milfoil. Swapped Unit 1 orifices with spares at Unit 2. Ran rectangular cleaning device twice along with air burst system. Cleared blockage. Swapped orifices back.
1538	Head gate work completed.
1608	Unit 1 returned to service.

During the season, the side screen cleaning mechanism had only one issue. On May 7, the mechanics inadvertently ran the device which was then not properly parked. The biologist

resolved the problem. 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 the cycle interval. Also, the project performed scheduled maintenance on the device. Power outages had no adverse effect on the mechanism.

During winter maintenance, the electrical staff repaired the transition screen cleaning device. During the work, they found water in the air line for the latch pin. Also, they repaired two air leaks. After returning to service with the system, on April 16, the device failed as it would not move laterally. The mechanism remained out of service for the season and we will repair it in January, 2013. This is the fourth consecutive year we have decided to leave the transitional screen cleaner device off at night and only run it manually on day shift whenever it was available for service. Only a small percentage of the overall channel flow goes through the transition screen and the air burst system was keeping the screen clean. When operational, we set the cycle time for the transition screen device at 180 minutes. The power and air outages did not affect the device.

The channel's water elevation meter and PLC operated well this year. The elevation meter had no problems this year. High/low water alarms always occur with the start up and shutdown of the orifices when flow is over the dewatering structure. Brief alarms also occurred at times when managing orifices, during the power outages, sudden unit load changes and during the September 27 debris incident. Issues that caused screen cleaning mechanism alarms are 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 fourth season in a row so they were available to monitor the channel into December.

For most of the season, both side dewatering valves operated satisfactory in automatic mode. However, two power outages resulted in water alarms as the side dewatering valves searched for proper positions when power resumed. Dewatering valves either opened too far or closed too far, causing channel water level fluctuations. Orifice usage and project operations also briefly affected the functioning of the valves causing them to search in order to reestablish channel elevation which at times could result in water alarms.

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 the power outages did not affect them.

For the season, the rectangular screen air burst system worked well on station service air. On April 25, we confirmed the timer settings. The system's cycle time remained at one zone every ten minutes. On September 15, we found the backup compressor running continuously. We turned the compressor off and will repair it January, 2013. The air burst system was very useful during rectangular screen cleaning device failures and the September 27 debris incident along with other operations involving debris discussed in this report. The power and powerhouse air outages had no adverse effect on the air burst system.

Separator

The separator was functional during secondary bypass and collection for transport as described in the Bypass and Transport Section. The separator is five feet wide. The A side (smaller smolt section) is 13 feet long, while the B side (larger smolt section) is nine feet long. The spacing between the A side separator bars is approximately 11/16 inch while the spacing between the B separator bars is approximately 1 and 5/16 inch. After the peak steelhead smolt out migration and with the beginning of adult shad fallbacks, PVC pipe is installed over the B side bars to help exclude shad from the sample and raceways. Juvenile steelhead can still exit. The A side bars gradually slope upward in a downstream direction with the water depth decreasing from approximately six to three inches. The B-side 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 depended 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 and Transport Operations section, power outages at the facility also affect 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, from September 3 to 6, we had the system in primary bypass due to excessive debris loads. Also, on September 27, we had the debris incident described above. Other debris issues as describe elsewhere in this report affected the separator and facility when they were in operation. The separator exits had very few debris blockages, which we generally removed quite easily with no harm to fish noted. However, on May 19, a blockage at the “B” side exit did result in the lost of one unclipped sockeye. The technicians monitored and addressed all issues at separator.

We quickly removed other debris blockages downstream of the separator with no fish lost. From September 1 to 3, heavy debris loads in the raceways made truck loading difficult. On September 23 and 25, we loaded the truck without the use of the raceway gantry. Debris loads and fish numbers were down. Also, at the transport facility, we removed algae all year as long as the facility was watered. For the year, facility mortality records were within normal ranges.

During the fall primary bypass season, we keep the system watered up to help avoid frozen pipes so we only preformed light maintenance until November 6 when we began emergency bypass. At this time, with the separator and transport facility dewatered, we completed winterization and began full maintenance. Other issues at the facility, which was functional as outlined in the Bypass and Transport section, are listed in Table 10 or elsewhere in this report.

Table 10. Facility Issues.

Date	Issue	Resolution
Mar 22	Test systems. Found leaks and flush line issue.	Contractor fixed. No facility problems.
Apr 10 to Aug 19	No flush water for bypass release. Contract missed.	Used raceway 4.
May 26 to 29	GBT water line pump failed.	Installed new foot valve. New pump ordered.
Jun 23	6 to 7 foot sturgeon in separator.	Fish released. System in bypass.
Jul 1	11 juvenile lampreys lost on perforated plate.	Reviewed protocol.
Sep 15 & 21	West raceway gantry stalled.	Monitored.
Sep 23 to 25	Gantry failed.	Not available for use.
Sep 24 to 25	Gantry repaired.	Replaced control system.

Sample System and PIT Tag System

The sampling and pre-anesthetic systems worked well. For the year, we changed the sample rates with the data day at 0700 hours. On April 10, at that time, we turned on the sample gates for the first day of secondary bypass. During the spring bypass season, we activated the gates every other morning to be operational during secondary bypass. During the transport season, the staff had the gates on 24 hours per day, 7 days per week. Turning the sample gates on and off during issues, power outages and events is discussed in the Bypass and Transport Operations Section and reflected also in Table 2. After each power outage, we checked the sample timer and found no problems. On October 1, at 0001 hours, we shut down the sample system for the year. Table 11 reflects other issues with the sample system.

Table 11. Sample System Issues.

Date	Issue	Resolution
Jun 18	Technician turned off “A” sample gate early, missed one sample.	Reviewed protocol. Not a full sample.
Jul 19	PSMFC adjusted timer.	No sample missed.
Aug 20	Possible power outage. PSMFC started sampling 30 minutes early.	Not a full sample day.
Sep 3 to 6	Primary bypass for debris.	Gates off.

The primary PIT tag detection/deflection system (A and B gates) worked well. After the system check during the spring bypass season, we leave these slide gates turned off except as reported in Table 12. With the gates off, all PIT-tagged fish were still detected in the full flume during primary bypass and at the facility including the return to river lines during secondary bypass, so no data was lost and these bypass routes are preferred over the smaller PIT tag release lines. During the spring season, with the gates off, no problems in the Bypass and Transport Section and in Table 2 before August 17 had any effect on this system. During transport, when we had the gates on, the Bypass Section and Table 2 list PIT tag gate outages. Table 12 records other PIT tag use. For the first study, NMFS lost two unclipped sockeye smolts.

Table 12. Other PIT Tag Gate Uses and Issues.

Date Gates On or Date Issue	Use or Issue
May 8 to 9, 0700 to 0700, On.	NMFS steelhead straying study.
May 26 to 29, 0700 to 0700, On.	NMFS steelhead straying study.
Jun 30 to Aug 15, 0700 to 0700, On.	PNNL tag retention study.
Jun to Sep, Issue.	Air conditioning leaking water in the facility PIT tag room, monitored then repaired.
Sep 3 to 6, Issue, gates off.	Primary bypass for debris.

During transport, when we went to a 20 percent or higher sample rate, we operated the PIT-tag gates to override the sample gates. Due to the low numbers of smolts, the override probably had very little effect on the sample or the diversion of PIT tagged fish. Throughout the spring bypass and transport seasons, the PIT gates received scheduled testing and adjustment. During the scheduled work, any stray fish which entered the system we released immediately. When in use, we conducted water balloon tests of the system's release lines, daily to weekly, revealing no problems.

The secondary PIT tag detection/diversion system was not used this year as no study required its utilization. This system uses the secondary bypass gates as PIT tag slide gates (C gate is on the A side and D gate is on the B side). These gates received no preseason adjustments and we left them off except as described here. On April 10 at 0700 hours, we turned the gates on briefly to leave them open for secondary bypass. When transport season began at 0700 hours on August 17, we turned the gates on momentarily and closed them so all fish would divert to the raceways. For the fall bypass season, we reopened the gates which remained deactivated. The gates were not affected by any other events.

Barge and Truck Loading Operations

In July, after regional discussions, it was determined that the combination of the new outfall location and river flows was effective enough to enable cancelation of the barge transport season. This is the second time barging has been canceled since the facility was completed in 1994. For the future, the region is considering discontinuing fish transport from McNary Dam altogether.

On August 17, at 0700 hours, we began collection for truck transport. For the season, due to low fish numbers, A and B side fish were loaded into one raceway. We had 12 and 16 truck trips respectively in August and September for a total of 28 trips. Table 13 reflects issues which

occurred during these trips. Other problems with the facility during transport season are discussed elsewhere in this report. However, juvenile shad were not an issue this year.

Table 13. Truck Season Issues.

Date	Issue
Jul 18	Test run. Found release valve needing replacement at Bonneville.
Aug 18	First trip. Release valve still leaking. Aug 22 valve repaired.
Aug 18 to 30	Daily trucking to mitigate fish handling during warm water.
Aug 19	Truck fuel tank vent clogged & delayed return three hours.
Aug 20	Facility power outage delayed trip 20 minutes.
Aug 24	No trip due to facility power outage.
Aug 31	No trip as planned to go to every other day trucking.
Sep 1 to 3	Daily trucking due to debris loads.
Sep 2	Replaced wipers on truck & tightened oxygen tank fitting.
Sep 4 to 6	No trip due to primary bypass for debris.
Sep 7 to Oct 1	Every other day trucking to season's end.
Sep 23 & 25	Loaded truck without raceway gantry. No fish issues.
Sep 25	Project Biologist went on trip. Contractor delayed release 30 minutes. Release fitting at site needed repair. Saw one lost smolt. Public sheep viewing at Philippi Canyon delayed return.

Avian Predation

Table 14 reflects hazing efforts at McNary. The duel head water cannon sprinkler at the bypass outfall was operational for only a short period due to the lost of the pump during high tailwater and spill volumes. Due to issues with the outfall walkway grating, the contractor did not replace the pump until mid-December. We borrowed three propane cannons from Ice Harbor Project and later bought five cannons along with spare bottles. We installed timers on the cannons so they would only operate during day light and fire every five minutes. We deployed the cannons near the end of the bypass pipe and around the spill basin. Wind did decrease the efficiency of the cannons. This year, we added a second shift of APHIS hazing. Hazing of pelicans and lethal removal of other species were not allowed. At the start of the season, with bird numbers down, for the first time, heavy hazing of grebes proved very effective.

Table 14. Hazing at McNary.

Hazing Type	Dates
Sprinkler cannon at out fall.	Apr 3 to 25. Failed.
APHIS hazing seven days a week.	Apr 1 to Aug 4. May 28 no hazing.
APHIS hazing 16 hours a day.	Jun 4 to Aug 4.
Propane cannons.	May 11 to Oct 4. May 22 timers installed.

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

We did daily bird counts from March 30 to September 30. This year, for the first time, 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.

This year, tailwater counts were conducted once a day. 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. We occasionally saw a loon, osprey or merganser. With the conclusion of spill, more birds, especially gulls, moved to the powerhouse flow to feed. Other species had a peak day as if they were migrating through.

Table 15. Predatory Bird Tailwater Counts.

Species	First Observation	Spill Peak		Non Spill Peak		Last Observation
		Date	Number	Date	Number	
Gull	Apr 1	May 9	204	Sep 8	44	Sep 30
Pelican	Apr 18	Jul 3	55	NA	None	Aug 5
Cormorant	Mar 30	Apr 1	18	Sep 5	6	Sep 22
Tern	Apr 4	Jun 26	35	Sep 14	42	Sep 22

After the conclusion of counting, at times, we observed night herons roosting on the facility barge dock. Also, during casual observations, we saw gull and cormorant counts fairly high at times which might indicate that they are feeding on juvenile shad. Into December, we observed gulls roosting or feeding and cormorants mostly roosting along with occasional mergansers or pelicans. Sporadically, we noted rafts of mergansers and gulls.

Bypass outfall counts are recorded in Table 16. Due to sprinkler cannon and walkways issues, hazing the outfall was difficult. From April 3 to 9, when the system was in emergency bypass, we observed no birds at that outfall.

Table 16. Predatory Bird Bypass Outfall Counts.

Species	First Observation	Spill Peak		Non Spill Peak		Last Observation
		Date	Number	Date	Number	
Gull	Mar 31	May 2	167	Sep 6 & 12	1	Sep 12
Pelican	Apr 15	Six days.	3	NA	None	Jul 21
Cormorant	May 22	May 22	3	NA	None	Jun 19
Tern	Mar 30	Jun 26	15	NA	None	Aug 16

Bird numbers fluctuated during the spill season. On May 12, 16, 17, June 11 July 20 and 21, we observed the pelican high count. From May 7 to 10, we observed 53 to 90 gulls roosting on the bypass outfall pipe, but installation of a bird wire eliminated the problem. Once spill concluded and with transport occurring, we observed one gull twice at the bypass outfall.

After the counting season, we observed small groups of gulls at the bypass outfall at times. In November and December, during emergency bypass, we observed gulls, cormorants and mergansers at that outfall. However, this outfall is at the northern edge of the powerhouse flow which may have also attracted the birds. We assumed that juvenile shad had become the focus of the birds and the bird numbers fluctuated with juvenile shad out migration and/or bird migration.

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. Most of the gulls we noted were juveniles feeding on the floating forebay debris. At times, we noticed groups of gulls; cormorants or grebes that would be outside the normal counting zone. Pelicans appeared to be feeding on adult shad. Occasionally, we saw blue and night herons along with kingfishers or a solitary loon. We also observed osprey as there are three nest sites on the project. The results of these observations are in Table 17. The roosting rocks by the Washington boat dock cannot be seen from the usual observation stations. During other inspections, we noted large numbers for pelicans, gulls or cormorants sometimes there. Also, at times, we saw rafts of pelicans or gulls when not formally counting.

Table 17. Predatory Bird Forebay Counts.

Species	First Observation	Spill Peak		Non Spill Peak		Last Observation
		Date	Number	Date	Number	
Grebe	Mar 30	Apr 26	61	Sep 18	1	Sep 18
Gull	Mar 30	Aug 22	36	Sep 1	12	Sep 30
Pelican	Apr 9	May 8	3	NA	None	Aug 7
Cormorant	Apr 1	Jun 3	3	Sep 26	1	Sep 26
Tern	Apr 5	Jun 8	3	NA	None	Jul 22

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

Grebe observations and counts are difficult due to their behavior, the various locations they appeared and system operations. There is no accurate way to count grebes. Grebes passed to the gatewell slots from April to June, reflecting somewhat the patterns seen in the forebay and collection channel. We estimated for the gatewell slots this year a total of 18 grebes which was low compared to last year's estimate of 75 grebes. This year, we removed 4 grebes from the slots. The remaining 14 grebes passed to the juvenile collection channel. These birds all passed out of the system. Two of them we released from the separator with the other grebes pasting during primary bypass.

Cooling Water Strainers

Table 18 reflects the results of this year's main unit cooling water strainer examinations. Of the smolts lost, seven were yearling Chinook, three were sockeye and the others were subyearling Chinook. We also saw juvenile perch, bass and shad along with crayfish.

Table 18. Cooling Water Strainer Results

Date	Lamprey Lost	Lamprey Alive	Smolts Lost	Smolts Alive
Jan	6	1	0	0
Feb	32	135	0	0
Mar	74	19	0	0
Apr	70	5	1	0
May	113	3	6	0
Jun	24	1	3	0
Jul	69	5	10	0
Aug	5	1	10	0
Sep	0	0	3	0
Oct	0	0	2	0
Nov	0	0	0	0
Dec	3	0	0	0

RIVER CONDITIONS

River flows in 2012 were significantly higher than the 2008-2011 average (Table 19). A peak hourly flow of 461.1 kcfs was recorded on June 28 while a minimum hourly flow of 71.0 kcfs occurred on September 23. The highest average flow day during the 2012 fish collection season was June 27 with an hourly average of 418.0 kcfs. The minimum average daily flow of 86.6 kcfs was recorded September 3 (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 349.3 kcfs was reported on June 28. Maximum average daily spill occurred on June 27 with an hourly average spill of 308.3 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 20 through June 30 was 220-260 kcfs. The average seasonal flow for this period was 348.5 kcfs with the average flows meeting the standard on 72 of 72 days. The peak daily flow average for this period was 418.0 kcfs on June 27. From July 1 through August 31, the target was 200 kcfs. The average seasonal flows for this period were 267.3 kcfs with the average flows meeting the standard on 50 of 62 days. The peak daily flow for this period was 390.6 kcfs on July 1.

Table 19: Average monthly river flow and spill at McNary Dam, 2008-2012.

Month	2008	2009	2010	2011	2012	2008 -2011 Average
			Flows (kcfs)			
Apr	154.1	213.0	120.2	281.1	317.2	168.9
May	295.6	263.5	195.3	365.0	349.6	262.8
Jun	359.0	286.3	318.5	465.5	344.6	365.4
Jul	215.4	167.5	190.2	325.2	326.3	230.2
Aug	134.3	119.0	124.0	203.0	207.6	146.3
Sep	85.8	79.3	81.6	116.5	114.6	90.8
			Spill (kcfs)			
Apr	45.0	68.4	36.0	135.3	166.3	63.1
May	143.7	113.5	78.5	219.9	176.8	130.2
Jun	191.2	134.5	156.0	307.2	202.1	202.6
Jul	109.1	84.2	95.0	193.1	191.0	123.1
Aug	65.5	57.6	61.4	105.8	104.1	73.6
Sep	1.4	1.4	1.1	2.7	11.0	1.6

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

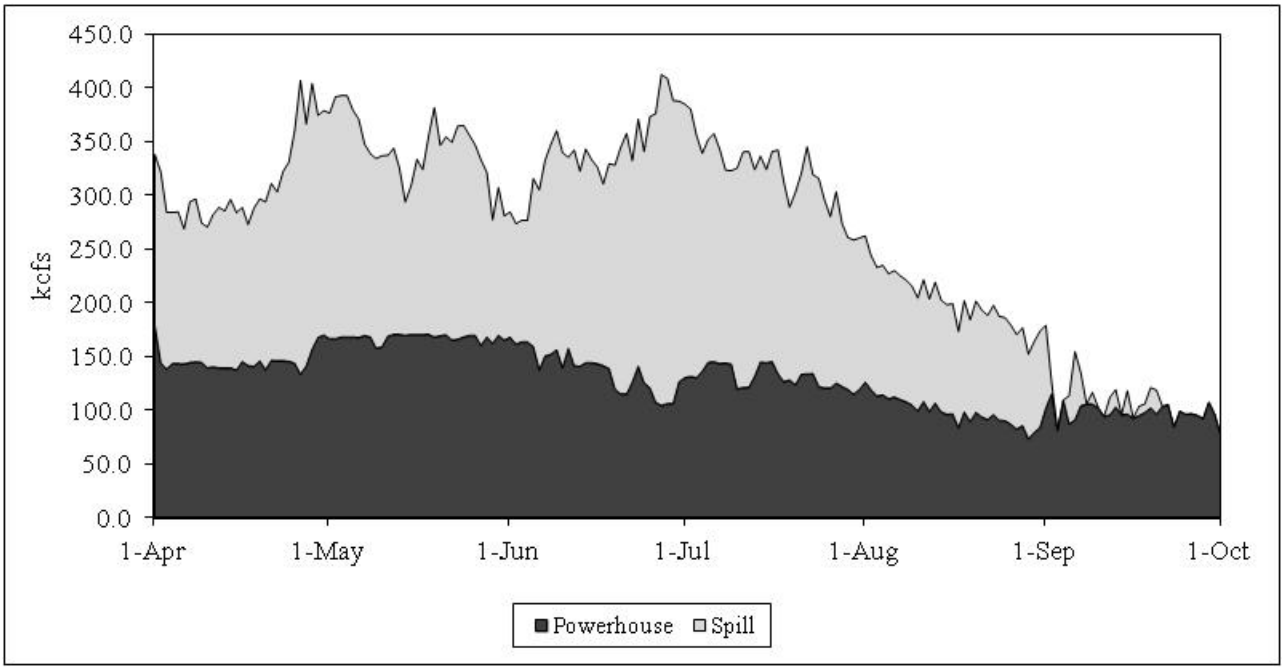

Figure 1. Average daily powerhouse discharge and spill at McNary Dam, 2012.

TRANSPORT OPERATIONS – MCNARY DAM

Fish Collection

Migration and Collection

Juvenile fish collected during the spring at McNary Dam were bypassed back to river through the juvenile fish transportation facility (secondary bypass) or directly to the tailrace without passing through the juvenile fish transportation facility (primary bypass). Fish may 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 through much of the season to allow the sampling of fish under the Smolt Monitoring Program.

The facility was operated in both primary and secondary bypass, alternating days from April 11 through August 17. On August 17 at 0700 hours, collection for continuous transportation began. Collection for transportation ceased September 30, at 0000 hours when the facility was placed in primary bypass.

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 3,307,731 juvenile salmonids were collected at McNary Dam this season (Table 20). Composition by species in 2012: 1,040,187 yearling Chinook, 1,390,995 subyearling Chinook, 178,139 clipped steelhead, 69,750 unclipped steelhead, 8,025 clipped sockeye, 547,759 unclipped sockeye and 72,876 coho. Collection totals do not include fish passage during emergency or primary bypass operations.

Table 20. Annual collection, bypass, and transport at McNary Dam, 2008-2012[1].

Year[1]	Yearling Chinook	Subyearling Chinook	Clipped Steelhead	Unclipped Steelhead	Clipped Sockeye	Unclipped Sockeye	Coho	Total
Collection								
2008	752,385	1,184,841	210,156	66,779	5,250	97,060	78,675	2,395,116
2009	1,303,77	1,836,921	359,391	108,349	13,746	92,629	69,885	3,784,658
2010	1,224,04	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	1,040,17	1,390,995	178,139	69,750	8,025	547,759	72,876	3,307,731
Bypass								
2008	751,376	750,490	209,901	66,714	5,154	96,851	78,558	1,959,044
2009	1,301,96	1,353,698	359,208	108,279	13,703	92,149	69,356	3,298,319
2010	1,222,53	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	1,039,99	1,174,739	178,122	69,740	7,999	547,535	72,876	3,090,970
Truck								
2008	11	75,708	0	0	5	31	5	75,760
2009	0	32,815	0	4	0	34	15	32,868
2010	0	146,694	0	10	0	80	40	146,824
2011	9	408,132	0	9	70	1,022	95	409,337
2012	49	214,232	0	0	25	148	0	214,454
Barge								
2008	164	349,594	40	15	80	40	50	349,983
2009	196	414,822	65	9	43	382	448	415,965
2010	173	299,909	56	30	0	190	70	300,428
2011	24	1,060,689	8	100	100	2,693	260	1,063,84
2012	0	0	0	0	0	0	0	0
Total Transported								
2008	175	425,302	40	15	85	71	55	425,743
2009	196	447,637	65	13	43	416	463	448,833
2010	173	446,603	56	40	0	270	110	447,252
2011	33	1,468,821	8	109	170	3,715	355	1,473,211
2012	49	214,232	0	0	25	148	0	214,454

[1]Seasons varied in length.

Peak collection occurred on May 17 with a daily total collection of 181,008. Peak collection dates and daily collection totals by species group were: May 17 yearling Chinook (101,806), July 20 subyearling Chinook (89,405), May 1 clipped steelhead (22,619), April 29 unclipped steelhead (11,200), May 7 clipped sockeye/kokanee (1,200), May 11 unclipped sockeye/kokanee (105,601), and May 17 coho (7,600) (Table 22).

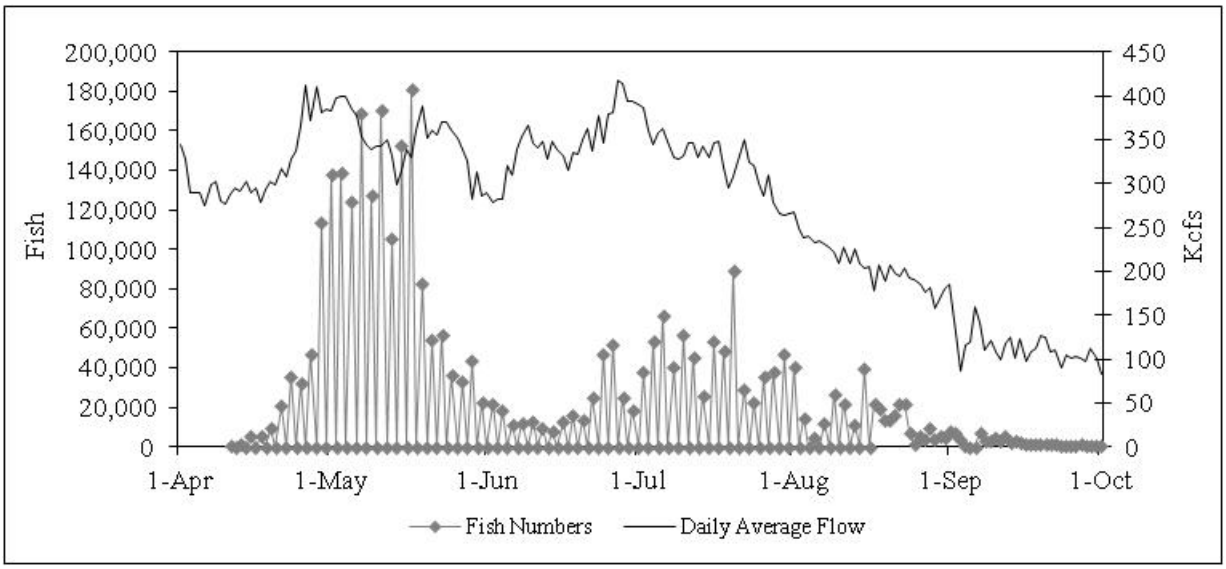

Figure 2. Daily juvenile salmonid collection all species vs. daily average flow at McNary Dam, 2012.

Table 21. Annual peak collection days at McNary Dam, 2008-2012.

Year	Yearling Chinook	Subyearling Chinook	Clipped Steelhead	Unclipped Steelhead	Clipped Sockeye	Unclipped Sockeye	Coho	Total
2008	May 19 (81,120)	July 6 (98,308)	May 9 (30,810)	May 13 (7,603)	May 17 (1,000)	May 25 (27,721)	May 29 (11,903)	May 13 (119,060)
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)

Adult Fallbacks

A total of 2,892 adult salmonids were bypassed from the separator to the tailrace in 2012 (Table 22). The composition of adult salmonids that fell back through the system and were released from the McNary juvenile fish separator was: 538 adult Chinook, 548 jack Chinook, 611 clipped steelhead, 956 unclipped steelhead, 205 sockeye and 34 coho. In 2012, peak fallback activity occurred in September (1,724, Table 23). In previous years peak fallback activity occurred in September and October. Counts of adult fallbacks at McNary ended September 30 in 2012, September 29 in 2011, September 30 in 2010, September 30 in 2009 and September 24 in 2008.

Table 22. Annual totals of adult salmonids released from the juvenile fish separator at McNary Dam, 2008-2012.[1]

Year[1]	Adult Chinook	Jack Chinook	Clipped Steelhead	Unclipped Steelhead	Sockeye	Coho	Pink	Total
2008	239	245	516	566	98	20	0	1,684
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

[1]Seasons varied in length. See text.

Table 23. Monthly totals of adult salmonids released from the juvenile fish separator at McNary Dam, 2012.

Month	Adult Chinook	Jack Chinook	Clipped Steelhead	Unclipped Steelhead	Sockeye	Coho	Pink	Total
April	0	0	79	149	0	0	0	228
May	131	26	59	262	0	0	0	478
June	54	4	12	65	68	0	0	203
July	4	1	5	4	131	0	0	145
August	10	15	33	50	6	0	0	114
September	339	502	423	426	0	34	0	1,724
Total	538	548	611	956	205	34	0	2,892

All salmonid fallbacks collected were examined for condition and ranked using a standard protocol (Table 24). Overall, 83.9% of the fish examined were classified as good condition, which is higher than 2011 (80.2%). The percentage of each species group that were in good condition was: adult Chinook (93.7%), jack Chinook (98.0%), clipped steelhead (85.9%), unclipped steelhead (68.6%), sockeye/kokanee (83.4%) and coho (94.1%). In addition, there was two adult salmonid mortalities recovered from the walkway grating in the juvenile collection channel during the course of the season, an unclipped steelhead and a jack Chinook.

Table 24. Condition of adult salmonids released from the juvenile fish separator at McNary Dam, 2012.

Condition	Adult Chinook	Jack Chinook	Clipped Steelhead	Unclipped Steelhead	Sockeye	Coho	Pink	Total
Good	504	537	525	656	171	32	0	2,425
Fair	17	3	47	162	16	1	0	246
Poor	7	3	33	109	13	0	0	165
Dead	10	5	6	29	5	1	0	56
Total	538	548	611	956	205	34	0	2,892

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 2012 was: yearling Chinook (43.7%), subyearling Chinook (48.8%), clipped steelhead (88.5%), unclipped steelhead (65.7%), sockeye (20.5%) and coho (21.8%, Table 25). 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 25. Annual separator efficiency in percent at McNary Dam, 2008-2012.

Year	Yearling Chinook A-side	Subyearling Chinook A-side	Clipped Steelhead B-side	Unclipped Steelhead B-side	Sockeye A-side	Coho A-side
2008	59.0	58.5	72.3	60.3	24.5	26.3
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

Sampling

A total of 38,457 juvenile salmonids (1.2% of the total collection) were sampled in 2012. Sample percentages by species group were: yearling Chinook (0.8%), subyearling Chinook (1.7%), clipped steelhead (1.1%), unclipped steelhead (1.2%), clipped sockeye (0.7%), unclipped sockeye (0.6%), and coho (1.0%, Table 26). Sample rates ranged from a low of 0.5%, during the peak of the spring and summer migrations, to a high of 20.0% at the end of the season (Table 27).

Table 26. Annual percentage of total juvenile salmonids collected that were sampled at McNary Dam, 2008-2012.

Year	Yearling Chinook	Subyearling Chinook	Clipped Steelhead	Unclipped Steelhead	Clipped Sockeye	Unclipped Sockeye	Coho	Total
2008	3.2	4.4	3.6	3.4	2.2	2.5	2.5	3.8
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

Table 27. Weekly sample rates in percent and sample totals at McNary Dam, 2012.

Week Ending	Weekly Rate (%)[1]	Yearling Chinook	Subyearling Chinook	Clipped Steelhead	Unclipped Steelhead	Clipped Sockeye	Unclipped Sockeye	Coho	Total
Apr 5	0.0	0	0	0	0	0	0	0	0
Apr 12	5.0	26	3	1	10	0	0	1	41
Apr 19	6.5	852	21	262	245	0	7	14	1,401
Apr 26	1.6	603	26	692	86	5	21	12	1,445
May 3	0.7	1,566	156	500	185	15	540	27	2,989
May 10	0.5	1,076	91	147	66	10	681	27	2,098
May 17	0.5	1,539	30	90	47	12	1,244	84	3,046
May 24	0.6	793	36	52	43	2	236	89	1,251
May 31	1.0	712	48	40	37	3	310	198	1,348
Jun 7	2.0	458	104	44	46	1	189	179	1,021
Jun 14	3.2	293	784	48	32	0	68	111	1,336
Jun 21	2.0	49	754	10	2	0	5	10	830
Jun 28	1.2	14	1,710	6	3	1	5	4	1,743
Jul 5	1.0	3	1,087	0	0	2	2	0	1,094
Jul 12	0.7	1	1,372	0	1	2	1	0	1,377
Jul 19	0.9	0	1,142	0	0	0	2	0	1,144
Jul 26	1.0	0	1,759	0	0	0	5	0	1,764
Aug 2	1.0	0	1,241	0	0	0	4	0	1,245
Aug 9	3.7	0	2,140	0	0	0	6	0	2,146
Aug 16	2.9	0	2,105	0	0	0	4	0	2,109
Aug 23	2.0	0	2,548	0	0	0	2	0	2,550
Aug 30	3.0	0	1,097	0	0	1	0	0	1,098
Sep 6	4.0	1	930	0	0	0	1	0	932
Sep 13	4.0	1	1,184	0	0	0	0	0	1,185
Sep 20	12.8	0	1,557	0	0	0	4	0	1,561
Sep 27	20.0	0	1,282	0	0	0	1	0	1,283
Oct 4	20.0	0	420	0	0	0	0	0	420
Total Sampled		7,987	23,627	1,892	803	54	3,338	756	38,457
% of Sample		20.8	61.4	4.9	2.1	0.1	8.7	2.0	100.0
% of Collection		0.8	1.7	1.1	1.2	0.7	0.6	1.0	1.2

Note: Collection and sampling conducted every other day from April 11 – August 17.
[1] Fish sampled/fish collected x100.

Transportation

An estimated 214,454 juvenile salmonids (6.5% of the total collection) were transported from McNary in 2012. The percentage of species transported from their respective collection totals ranged from 0.0% for coho, clipped steelhead and unclipped steelhead to 15.4% for subyearling Chinook. Fish managers opted not to barge this year due to high flows and low water temperatures. The McNary JFF remained in bypass until August 17 when collection for trucking began. Trucking continued through October 1. A total of 214,454 fish were trucked, representing 6.5% of the total collection and 100.0% of all salmonids transported. The majority of transported fish, 214,323 or 99.9%, were subyearling Chinook.

Bypass

The juvenile bypass system began operation in primary bypass on March 29. While in primary bypass, facility personnel discovered large sections of latex paint were peeling off the new bypass pipe. On April 3 the facility was placed into emergency bypass to dry and repaint those sections. Repairs were completed and the facility was placed into primary bypass on April 9. Extended length submersible bar screens (ESBS) were lowered into the gatewell slots of the turbine units between April 9 and April 14. The delay was to allow for the passage of juvenile Pacific Lamprey.

On April 10 the facility was placed into secondary bypass. Primary bypass mode passed fish directly to the tailrace, while secondary bypass mode passed fish through the collection 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 August 17, when collection for continuous transport began. Collection for transportation ceased at 0000 hours October 1, at which time the facility was placed in primary bypass. Primary bypass continued until November 6, when the system was switched to emergency bypass mode. The collection channel was unwatered on December 20.

An estimated 3,090,970 juvenile salmonids (93.4% of the total collection) were bypassed in 2012. The numbers of fish bypassed and the percentages of total collected by species group were 1,039,959 yearling Chinook (100.0%), 1,174,739 subyearling Chinook (84.5%), 178,122 clipped steelhead (100.0%), 69,740 unclipped steelhead (100.0%), 7,999 clipped sockeye (99.7%), 547,535 unclipped sockeye (100.0%) and 72,876 coho (100.0%). These numbers do not include fish routed through the primary bypass and full flow PIT tag system.

During the collection and transport season, the facility was placed in primary bypass mode three times. The facility was in primary for 10 hours on August 24 when the facility lost power due to an electrical problem. The facility was placed into primary a second time from September 3 to September 6 due to the large amount of debris that was entering the system. After clearing debris from the forebay the facility was placed back into collection at 0700 hours on September 6. The system was placed into primary a third time on September 21 for 1 hour to fix a hydraulic jump that had developed in the flume before the separator.

Incidental Species

In addition to salmonids, the McNary facility collected approximately 213,910 fish of various species. These consisted primarily of 121,305 juvenile (macrophthalmia) Pacific Lamprey (*Entosphenus tridentatus*), 76,615 juvenile American Shad (*Alosa sapidissima*), 5,265 Peamouth (*Mylocheilus caurinus*), 2,365 Three-spine Sticklebacks (*Gasterosteus aculeatus*), 2,325 Smallmouth Bass (*Micropterus dolomieui*), 1,230 Dace (*Rhinichthys spp.*), 945 Mountain Whitefish (*Prosopium williamsoni*), 740 Yellow Perch (*Perca flavescens*) and 460 Sculpin (*Cottus spp.*) (Table 28). Of these, 76,535 juvenile American Shad, 3,415 Peamouth, 1,195 juvenile Pacific Lamprey, 1,105 Smallmouth Bass, 960 Dace (*Rhinichthys spp.*) and 1,840 fish of other species were transported to locations below Bonneville Dam. The remaining fish were

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

Table 28. Collection of incidental species at McNary Dam, 2012.

Common Name	Scientific Name	Sample	Collection
Pacific lamprey (adult)	*Entosphenus tridentatus*	2	150
Pacific lamprey (morph)	*E. tridentatus*	1,174	121,305
Pacific lamprey (ammocoete)	*E. tridentatus*	1	100
American shad (adult)	*Alosa sapidissima*	8	80
American shad (juvenile)	*A. sapidissima*	10,065	76,615
Bluegill	*Lepomis macrochirus*	0	0
Bullhead	*Ameiurus spp.*	2	50
Channel catfish	*Ictalurus punctatus*	5	95
Chinook Mini Jack	*Oncorhynchus tshawytscha*	2	120
Chiselmouth	*Acrocheilus alutaceus*	3	205
Common carp	*Cyprinus carpio*	5	85
Crappie	*Pomoxis spp.*	0	0
Crayfish	*Pacifastacus spp.*	16	435
Kokanee	*O. nerka*	1	200
Largemouth bass	*Micropterus salmoides*	2	30
Longnose dace	*Rhinichthys cataractae*	47	1,230
Mountain whitefish	*Prosopium williamsoni*	21	945
Northern Pikeminnow	*Ptychocheilus oregonensis*	5	90
Peamouth	*Mylocheilus caurinus*	185	5,265
steelhead Kelt	*Oncorhynchus mykiss*	1	100
Redside Shiner	*Richardsonius balteatus*	2	50
Sandroller	*Percopsis transmontana*	0	0
Sculpin	*Cottus spp.*	8	460
Siberian Prawn	*Exopalaemon modestus*	13	420
Smallmouth bass	*M. dolomieui*	72	2,325
Sucker	*Catostomus spp.*	6	440
Three-spine stickleback	*Gasterosteus aculeatus*	67	2,365
Total		11,728	213,910

Fish Condition

Descaling

The descaling percentage for all groups combined was 2.5% in 2012. This is higher than the overall rate of 1.9% for 2011 (Table 29). Annual descaling percentages in 2012 by species were: yearling Chinook (3.2%), subyearling Chinook (1.7%), clipped steelhead (4.7%), unclipped steelhead (2.4%), clipped sockeye (7.5%), unclipped sockeye (5.0%) and coho (2.0%).

Weekly descaling percentages for all species combined ranged from 0.7% to 4.4% for weeks with at least 100 fish examined (Table 30). The combined average descaling percentage was 3.3% during the spring migration period (April 1 to June 30), 1.3% during the summer migration period (July 1 to August 31) and 2.7% during the month of September. The 2012 spring and late

season migration descaling percentages were higher than in 2011 (0.2% and 1.7% respectively). Descaling percentages for the summer migration were comparable to 2011 (1.3%). These percentages were calculated using full sample descaling data.

Table 29. Annual descaling rates in percent for fish sampled at McNary Dam, 2008-2012.

Year	Yearling Chinook	Subyearling Chinook	Clipped Steelhead	Unclipped Steelhead	Clipped Sockeye	Unclipped Sockeye	Coho	Total
2008	3.2	1.8	6.1	4.8	9.6	10.3	3.7	2.9
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

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

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 12,040 fish subsampled, 1,042 (9.9%) were injured, descaled or exhibited symptoms of disease and 0.7% had multiple injuries or a combination of injury and disease. Clipped sockeye had the highest incidence of injuries and disease at 17.6%. There were 51 clipped sockeye examined. Descaling of less than 50% (7.8%) was the most commonly occurring injury in clipped sockeye. Of the descaling, 0.0% was caused by predators. Clipped steelhead experienced the second highest incidence of injuries and disease (16.1% out of 609 examined), followed by unclipped steelhead (15.6%), unclipped sockeye (11.7%), clipped yearling Chinook (9.9%), unclipped subyearling Chinook (9.4%), unclipped coho (9.2%), unclipped yearling Chinook (8.4%), clipped subyearling Chinook (7.2%) and clipped coho (5.4%). Due to changes in FPC protocol we are no longer able to examine fry for injuries or descaling.

Descaling is always a concern and is usually indicative of a problem within the system. In 2012, the average descaling percentage for the subsample (of up to 100 fish per species) was 3.2%. Bird predation was responsible for 6.0% of overall descaling. Birds accounted for 25.6% of the descaled clipped steelhead, and 21.4% of the descaled unclipped steelhead. Bird marks in general, whether they caused descaling or not, were found on 5.9% of all clipped steelhead and 5.1% of all unclipped steelhead in the subsample.

All fish in the sample were examined for lamprey marks. In 2012, 0.3% 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 2011, 0.3% in 2010, 1.0% in 2009 and 1.8% in 2008. Lamprey bite marks are not as common on other species, because lamprey are not as aggressive in the spring.

Table 30. Weekly descaling percentages for fish sampled at McNary Dam, 2012.

Week Ending	Yearling Chinook	Subyearling Chinook	Clipped Steelhead	Unclipped Steelhead	Clipped Sockeye	Unclipped Sockeye	Coho	Total
Apr 5	---	---	---	---	---	---	---	---
Apr 12	*7.7	---	*0.0	*10.0	---	---	*0.0	*7.9
Apr 19	3.4	---	5.7	2.4	---	*28.6	*0.0	3.8
Apr 26	5.8	*0.0	3.0	*3.6	*20.0	*0.0	*0.0	4.2
May 3	2.9	*0.0	5.8	1.6	*6.7	2.6	*0.0	3.3
May 10	2.0	---	4.1	*0.0	*0.0	3.9	*3.7	2.8
May 17	2.7	*0.0	*4.5	*2.1	*0.0	4.9	*2.4	3.6
May 24	3.8	*0.0	*5.8	*2.3	*0.0	7.3	*2.2	4.4
May 31	3.9	*0.0	*12.5	*2.8	*0.0	5.2	1.0	4.0
Jun 7	2.2	*2.2	*4.5	*4.3	*0.0	10.2	2.2	3.9
Jun 14	2.4	1.9	*6.3	*3.1	---	*10.3	2.7	2.7
Jun 21	*6.1	3.1	*0.0	*0.0	---	*20.0	*10.0	3.5
Jun 28	*7.1	1.6	*0.0	*0.0	*0.0	*0.0	*0.0	1.7
Jul 5	*0.0	1.9	---	---	*50.0	*0.0	---	1.9
Jul 12	*0.0	1.9	---	*0.0	*50.0	*0.0	---	2.0
Jul 19	---	2.1	---	---	---	*0.0	---	2.1
Jul 26	---	0.9	---	---	---	*20.0	---	1.0
Aug 2	---	0.7	---	---	---	*0.0	---	0.7
Aug 9	---	1.6	---	---	---	*16.7	---	1.6
Aug 16	---	1.3	---	---	---	*0.0	---	1.3
Aug 23	---	0.7	---	---	---	*0.0	---	0.7
Aug 30	---	1.3	---	---	*0.0	---	---	1.3
Sep 6	*0.0	1.2	---	---	---	*0.0	---	1.2
Sep 13	*0.0	2.6	---	---	---	---	---	2.6
Sep 20	---	3.4	---	---	---	*0.0	---	3.4
Sep 27	---	2.5	---	---	---	*0.0	---	2.5
Oct 4	---	3.6	---	---	---	---	---	3.6
Total Descaled	253	393	88	19	4	164	15	936
Total Examined	7,944	22,948	1,886	799	53	3,311	756	37,697
Percent Descaled	3.2	1.7	4.7	2.4	*7.5	5.0	2.0	2.5

Note: Collection and sampling conducted every other day April 5 – Aug 16.
* Fewer than 100 fish sampled.
--- No fish sampled during the week.

Mortality

Total facility mortality for all groups combined was <0.1% in 2012 (Table 31). This is lower than last year's rate of 1.2%. 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 1.2% during the last month of facility operations. This compares to rates of 0.4%, 2.0%, and 0.5% during the respective periods in 2011. The facility mortality was lower this year due to the

delayed transport season. Since 1998, facility mortalities have been collected off the separator and factored into the collection and facility mortality totals.

Table 31. Annual facility mortality in percent at McNary Dam, 2008-2012.

Year	Yearling Chinook	Subyearling Chinook	Clipped Steelhead	Unclipped Steelhead	Clipped Sockeye	Unclipped Sockeye	Coho	Total
2008	0.1	0.8	0.1	0.1	0.2	0.1	0.1	0.4
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

Weekly facility mortality rates varied from a low of 0.0% to a high of 1.6% (Table 32). The highest weekly facility mortality rate of 1.6% occurred during the week ending Sept 27. The lowest rate occurred during the week ending April 12, at the beginning of the season.

Table 32. Weekly facility mortality in percent at McNary Dam, 2012.[1]

Week Ending	Yearling Chinook	Subyearling Chinook	Clipped Steelhead	Unclipped Steelhead	Clipped Sockeye	Unclipped Sockeye	Coho	Total
Apr 5	---	---	---	---	---	---	---	---
Apr 12	0.0	0.0	0.0	0.0	---	---	0.0	0.0
Apr 19	0.1	0.8	0.0	0.0	---	0.0	0.0	0.1
Apr 26	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
May 3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
May 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
May 17	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
May 24	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0
May 31	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
Jun 7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jun 14	0.1	0.0	0.0	0.1	---	0.0	0.0	0.0
Jun 21	0.1	0.1	0.0	0.0	---	0.0	0.0	0.1
Jun 28	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0
Jul 5	0.0	0.0	---	---	0.0	0.0	---	0.0
Jul 12	0.0	0.0	---	0.0	0.0	0.0	---	0.0
Jul 19	---	0.0	---	---	---	0.0	---	0.0
Jul 26	100.0	0.0	---	---	---	0.0	0.0	0.0
Aug 2	---	0.1	---	---	---	0.0	---	0.1
Aug 9	---	0.0	---	100.0	---	0.0	---	0.0
Aug 16	---	0.0	---	---	---	0.0	---	0.0
Aug 23	---	0.5	---	---	---	1.0	---	0.5
Aug 30	---	0.5	---	---	0.0		---	0.5
Sep 6	0.0	1.0	---	---	---	0.0	---	1.0
Sep 13	4.0	1.2	---	---	---		---	1.2
Sep 20	---	1.3	---	---	---	5.0	---	1.3
Sep 27	---	1.6	---	---	---	0.0	---	1.6
Oct 4	---	0.9	---	---	---	---	---	0.9

---No fish collected during the week.

[1]The McNary Fish Facility began collection for continuous transportation on Aug 17.

During transport operations, 91 (<0.1%) subyearling Chinook mortalities were recovered from fish transportation trucks. These mortalities are not included in any totals or rates detailed elsewhere in this report.

The overall sample tank mortality percentage for 2012 was 0.8 (Table 33). This is down from 2011 (1.6%). It is important to note that subyearling Chinook mortality (72.8% 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 20 of the 298 (6.7%) mortalities recovered from the sample holding tanks. These mortalities represent 0.05% of the salmonids sampled. There were four categories for handling mortality: Fish that were overexposed to anesthetics (1), fish pinched by the pre-anesthetic chamber gates (4), fish stranded in the flush pipe to the sorting trough (14), and fish that jumped from the sample tank (1). This compares to 32 sampling activity mortalities in 2011, or 3.0% of the mortalities recovered that year.

The overall post-sampling mortality percentage was 0.4% in 2012, with a daily range of 0.0% to 3.6%. 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 2012 were: yearling Chinook (0.2%), subyearling Chinook (0.6%), clipped steelhead (0.1%), unclipped steelhead (0.0%), clipped sockeye (0.0%), unclipped sockeye (0.3%), and coho (0.0% - Table 33).

Table 33. Annual sample mortality in percent at McNary Dam, 2008-2012.

Year	Yearling Chinook	Subyearling Chinook	Clipped Steelhead	Unclipped Steelhead	Clipped Sockeye	Unclipped Sockeye	Coho	Total
2008	0.7	1.2	0.4	0.6	0.9	1.1	0.3	1.0
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

Research

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 12 through August 30. 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. Prior to August 16, fish came over the separator every other day. Therefore, GBT sampling had to adjust to that schedule. Starting August 17, collection occurred every day and GBT examinations took place on Monday and Thursday. 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 transported or bypassed along with fish from the daily sample. Fish examined for GBT were included in the daily collection totals. A total of 4,038 salmonids were examined for GBT at McNary in 2012. These included 1,380 yearling Chinook, 2,379 subyearling Chinook, 190 clipped steelhead and 89 unclipped steelhead. There were 31 (0.8%) fish showing symptoms of GBT.

Examination of Neutrally Buoyant Acoustic Tags

PNNL was examining the performance of neutrally buoyant external acoustic tags in comparison to surgically implanted acoustic tags for survival estimates of juvenile salmonids passing through turbines. Study fish with the external tags were also tagged with a PIT tag. The separation by code system was being utilized at McNary to collect the study fish with the external tags while in secondary. The external tagged fish that were recovered were euthanized. Collection of the study fish began July 2 with the final fish taken July 14. A total of 29 clipped subyearling Chinook were recovered and euthanized. There were 257 untagged subyearling Chinook in the bycatch (89 clipped and 168 unclipped).

NOAA Non-native Predator Diet Analysis

NOAA was studying the role of non-native predators in food webs on the Columbia River through stable isotope analysis of Walleye and prey species in the John Day Reservoir. Fin clips were taken from salmonids and other prey species found in the sample. A small number of fish were lethally sampled. Sampling was conducted on four separate dates in the period of May 9 through June 14. A total of 108 fin clips were taken for this study at McNary in 2012. These included 28 yearling Chinook (13 clipped and 15 unclipped), 22 subyearling Chinook (11 clipped and 11 unclipped), 25 steelhead (13 clipped and 12 unclipped), 12 unclipped coho, 12 unclipped sockeye and 9 Pacific lamprey. From these fish, 13 were lethally sampled.

NOAA Effects of Barging on Straying

NOAA is studying the effects of barging on straying rates of steelhead. PIT tag diversion gates were turned on to collect juvenile steelhead previously tagged by NOAA. PIT tagged steelhead were euthanized for physiological analysis. Sampling was done on May 9, 27, 28 and 29. A total of 301 salmonids were handled and 100 steelhead were euthanized. The bycatch included 128 yearling Chinook (88 clipped and 40 unclipped), 6 subyearling Chinook (4 clipped and 2 unclipped), 6 unclipped steelhead, 1 unclipped coho, and 60 sockeye (1 unclipped and 59 clipped).

Recommendations

1. Strip and repaint sorting trough in wet lab;
2. Rework the crowders to run smoother;
3. Replace netting on the sample holding tanks;
4. Replace plastic molding on the guillotine gates on the pre-anesthetic chambers;
5. Rehabilitate orifice traps and free up orifices;
6. Install fish outlet on the 6B trap;
7. Reinstall Unit 4 forebay debris shield;
8. Move 48 inch JFF water supply valve outside where it would be accessible;
9. Refinish channel floor and walls;
10. Reinstall second hoist on channel trolley;
11. Install remote controls on channel floor valves;
12. Motorize facility emergency water supply valves;
13. Install new GBT pipe;
14. Repaint JFF facility;
15. Install new garage doors;
16. Install new facility heating and cooling system.

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 Commision
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