ADULT AND JUVENILE FISH FACILITY MONITORING REPORT
LOWER MONUMENTAL DAM
2011

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INTRODUCTION

The following report on fishway activities at Lower Monumental Dam is required under the Endangered Species Act consultation on the operation of the Federal Columbia River Power System and its associated fish passage facilities. This report summarizes the operation and maintenance of adult fish passage facilities at Lower Monumental Dam, including the results of visual inspections of fishways conducted by fisheries staff during the adult fish passage period of March 1 to December 31, 2011. Inspection readings are provided in Appendix 1. Recommendations are provided for correcting problems found. This report also contains a synopsis of juvenile fish facility operations. Additional information on juvenile fish collection and transportation activities at Lower Monumental Dam can be found in the, "2011 Juvenile Fish Collection and Bypass Report, Lower Monumental Juvenile Fish Facility".

River Conditions

During the 2011 collection season, the average daily flow exceeded 100.0 kcfs on 79 days and exceeded 150 kcfs on 49 of these days. The highest daily average flow for the season was 216.4 kcfs on June 9. The lowest daily average flow for the season occurred on September 25 with a flow of 21.2 kcfs. The average flow for the season was 97.8 kcfs. Spill occurred for 154 days from April 1 through midnight on August 31, with a maximum spill of 104.0 on June 9. River temperature averaged 56.1^{o} F for the season and ranged from 42.1^{o} F on April 8 to 66.6^{o} F on August 12.

ADULT FISH FACILITY

Facility Description

The adult fishways at Lower Monumental are comprised of north and south shore fish ladders. The upper ladders extend from the forebay to tailwater and include ladder exits, slotted weirs, upper diffusers, overflow weirs with orifices, and fish counting stations with picketed leads. The

lower ladders contain collection channels, channel diffusers, and ladder entrances. The north shore lower fish ladder has two north shore entrances (NSE-1 and NSE-2) and two south powerhouse entrances (SPE-1 and SPE-2). The south shore lower fish ladder has two entrances (SSE-1 and SSE-2). Auxiliary water is supplied by three turbine-driven pumps (fish pumps) located in the north side of the powerhouse. The water is pumped into a supply conduit that extends under the north and south shore lower ladders, distributing water to the lower ladder diffusers. Excess water from the juvenile fish bypass system (approximately 180-200 cfs) additionally contributes to the auxiliary water supply during the juvenile fish bypass/collection season.

Facility Modifications

1. North shore picketed leads were raised 1.5 inches to facilitate adult lamprey passage.
2. A staff gauge with floating indicator was fabricated and was installed in the south powerhouse collection channel. In the past algae growth and the inability to access the existing staff gauge for cleaning in season, made accurate readings here impossible. Now, the staff gauge is well above water level so algae growth is no longer an issue.

Operations and Maintenance

Fish Ladders and Collection Channels

The adult fishways were in service throughout 2011 with the exception of the winter maintenance season. Inspection and maintenance on the north and south shore fishways occurred from January 1 to February 2 and February 2 to March 2, respectively. Water up of the south shore ladder was delayed till March 2 to accommodate University of Idaho installation of lamprey PIT tag detection equipment.

The upper fish ladders are annually dewatered for maintenance activities including: debris removal, diffuser grate and structural support inspections, picketed lead, staff gauge, and fish counting window cleaning, maintenance of count station window cleaning mechanisms, and packing of leaks in expansion joints. Twenty four hours prior to dewatering, the auxiliary water is shut off to discourage newly arriving fish from starting up the ladders. The fish exit is then bulkheaded off, any exit pool fish are removed and released to the forebay, and the upper ladders are partially dewatered leaving about 4 inches running through ladder weir orifices. This flow is maintained to move any remaining fish to tailwater. Approximately a day latter, the flow is reduced to two inches and maintenance personnel go down the ladder through the orifices to remove debris, move remaining fish to tailwater, and inspect the full length of the channel.

The lower ladders are typically dewatered to a depth of one foot providing a holding pool for fish. Once the target depth is obtained, maintenance personnel and biologists inspect entrance weirs, diffuser grates and exposed diffuser gate operating equipment. Staff gauges are then cleaned and debris is removed. The north shore water was lowered to $4/10^{th}$ of a foot for visual inspection of grating. The north channel was completely dewatered to replace fasteners on seven grating sections that were failed. Replacement of these diffuser grates and fasteners has been an issue for years and appears to be funded so that half will be replaced during the winter of 2013-

2014. The remaining half should be replaced the following year. Fish salvage included three unclipped juvenile steelhead and one channel catfish. All fish were released into the forebay.

Inspection of the lower south channel also revealed a section of grating with failed fasteners. The grating was returned to position and fastened in place. Fish salvage was not necessary. When dewatering for repair is necessary; fish are crowded to the entrance pools, netted, and placed in a 600 gallon container (or 32 gallon containers if fish numbers are very low). The large container is manipulated with the crane to release fish to tailwater and refill the tank if needed.

Auxiliary Water Supply

During the winter maintenance period, the auxiliary water supply conduit north of the regulating gate was partially dewatered and inspected.

Fish pumps 1, 2, and 3 were out of service (OOS) from January 2 to February 2 for annual maintenance. Annual maintenance consists of changing oil in pedestals, adjusting or replacing packing and shaft seals, inspecting and cleaning heat exchangers, inspecting and replacing broken shear pins on the wicket gates, adjusting brakes, removing trash and debris from the fish pump turbine, and a general mechanical and electrical inspection. AWS pump 1 was out of service from April 14 to April 19 due to excess oil leaking from the shaft seal. All fish pumps were rotated out of service monthly for scheduled maintenance.

The more significant pump outages are summarized in Table 1.

Table 1. Fish pump outages at Lower Monumental Dam, 2011 *

Affected Pump(s)	Dates	Reason for Outage/Comments
1, 2, 3	Jan 2 – Feb 2	Annual maintenance
1	Apr 14 – Apr 19	Shaft seal oil leak

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

Adult Fishway Inspections

Methods

The automated fishway control system consists of a computer in the control room that interfaces with process level controllers and receives information from remote terminal units. The terminal units are fed by sensors detecting entrance weir gate positions, collection channel water and tailwater elevations, upper diffuser pool levels, and water temperatures within the fishways. The automated fishway control system is based on a GE Fanuc Series 90 control program. The computer is used to change the control parameters of the terminal units and provides datum acquisition and storage. The remote terminal units control the fishway entrance weir gates according to set points that either regulate the gate depths below tailwater or channel to tailwater entrance head differentials. The computer printout contains the following information: dates; times (hour, minute, and second); channel temperatures; channel and tailwater elevations (feet

above mean sea level) for the north shore, south powerhouse, and south shore; gate elevations; gate depths; entrance heads; and set points for the gate depths and entrance heads.

Operating criteria involve normal and special operating conditions. Under normal operating conditions, NSE-1, NSE-2, SPE-1, SPE-2, and SSE-1 weir gates are operated to meet criteria of at least 8-foot depths (depth criteria) or be on sill if less than 8-foot depths (sill criteria). SSE-2 weir gate is operated with a 6-foot opening. Normal operating criteria for the rest of the ladder include maximums of 0.5-foot heads at the exits, maximums of 0.4-foot and 0.3-foot heads at the north and south shore picketed leads, respectively, 1.0-1.3 feet of water over the ladder weirs, 1.5-4.0 feet per second collection channel velocity, and 1.0-2.0-foot head differentials at all fishway entrances. Special operating conditions are used if normal operating criteria cannot be met. When only two fish pumps are operational, SSE-2 and SPE-2 may be closed and SPE-1 raised to provide 1.0-2.0 feet of entrance head differentials. This special operation was not required to maintain depth criteria this season.

Adult fishway inspections consist of observing facility operating conditions and recording visual readings from staff gauges, weir gate selsyns, and electronic meters. Wave action and large debris impacts have consistently resulted in loss of the south ladder tailwater staff gauge.

Readings of the lower south ladder and tailwater are therefore taken from an electronic panel in the service gallery. Inspections by fisheries staff are normally conducted three or more times per reporting week with day and times randomized. An average of 3.6 inspections per week was performed (160 inspections /44 weeks) in 2011. Depths and head differentials that were out of criteria, as well as other problems, were reported to powerhouse shift operators and/or maintenance staff for correction. Powerhouse operators conducted their own daily shift inspections in addition to the inspections performed by fisheries staff.

Inspection Results

Visual readings were recorded and compared with automated control system readings to check for calibration problems. The automated control system readings and mechanical reading systems were routinely calibrated in 2011. High variability between wave crests and troughs created by spill reduces the accuracy of biologists' staff gauge readings in the tailrace. Thus the automated control system printout was also compared to visual reading to ensure fishways were in criteria. Data from fishway inspections was entered into an Excel spreadsheet (Appendix 1). The average compliance of all criteria points in 2011 was 98.6%. A summary of fish ladder performance and variability is provided in Table 2. Ladder entrance weir gates were on sill proportionately less in 2011 than in 2010 due to a non-typical extended period of high river flow which leads to higher tailwater levels.

Ladder exits: North and south shore ladder exit head differentials were in criteria on 100% of the inspections.

Ladder weirs: The depths over the weirs of the north shore ladder were within criteria on 100% of the inspections.

Depths over the weirs of the south shore ladder were within criteria on 98.7% of inspections. The two out of criteria readings of 0.8 feet were due to malfunction of the upper diffuser (GS7).

The problem was corrected by cycling the diffuser in local mode and then returning it to remote operation.

Counting stations: The head differential across the north shore counting station picketed leads was in criteria on 100% of inspections. The south shore counting station met criteria on 100% of inspections. Lack of a crane operator kept the south side picketed leads from being lowered until April 2.

Entrance heads: North shore entrance head differential was in criteria on 98.8% of inspections. It was out of criteria on two inspections with depths of 0.8' and 0.9 feet. Both occurred while one of the AWS pumps was rotated out of service for scheduled maintenance.

South powerhouse entrance head was in criteria on 96.9% of inspections. It was out of criteria on five inspections (differentials of 0.9', 0.8', 0.9', 0.8', and 0.9 feet). Three of these occurred while one of the AWS pumps was rotated out of service for maintenance. The remaining two out of criteria depths were likely the result of spill affecting the accuracy of staff gauge readings. Both were in depth criteria on the automated control system.

South shore entrance head differential was in criteria on 100% of inspections.

North shore entrance (NSE-1 & 2) depths: NSE-1 weir gate was in depth or sill criteria on 99.4% of inspections. The gate was out of criteria on one occasion with a depth of 7.9 feet. The ongoing difficulty reading tailwater staff gauges during spill was likely responsible for this deficiency as the gate was in depth criteria on the automated control system.

NSE-2 weir gate was in depth criteria on 98.8% of inspections. It was out of criteria on two inspections with depth readings of 7.9 feet. Both were within criteria on the automated control system and were likely related to difficulty reading tailwater staff gauges during spill.

South powerhouse entrance (SPE-1 & 2) depths: SPE-1 weir gate was in depth or sill criteria on 99.4% of inspections (39.4% depth, 60.0% sill). The one out of criteria reading of 7.2 feet was due to the gate being out of adjustment. The oversight was corrected following the inspection.

SPE-2 weir gate was in depth criteria or sill on 98.8% of inspections (38.8% depth, 60.0% sill). The gate was out of criteria on two occasions with both having depths of 7.9 feet. Both were within criteria on the automated control system and were likely related to difficulty reading the tailwater staff gauge during spill.

South shore entrances (SSE-1 & 2): SSE-1 weir gate was in depth or sill criteria on 98.7% of inspections (62.9% depth, 35.8% sill). The gate was out of criteria on two inspections with depths of 7.9' and 7.5 feet. The 7.9 feet reading was in depth criteria on the automated control system. The 7.5 feet reading was due to the gate malfunctioning in remote operation. The gate was adjusted in local mode and no further problems occurred.

SSE-2 weir gate was in criteria on 90% of inspections. The gate was out of criteria on sixteen occasions. One of these reading occurred at the beginning of the season when the gate was inadvertently raised to 7.0 feet. The remaining fifteen out of criteria readings occurred between

September 15 and October 11 due to a blown gearbox seal and the time required for part procurement and repair. While out of service the gate was in the closed position.

North shore collection channel velocity: The velocity unit is located in north shore collection channel in the transition area between unit 1 and unit 2. The sending unit is positioned in the channel's length and width to avoid non-characteristic high or low readings that are not representative of overall velocity conditions. Accurate velocity readings require the inspector to wait for the digital display to warm up and achieve a duplication of its peak reading.

Velocities were in criteria on 98.8% of inspections (criteria: 1.5-4.0 ft/s). Out of criteria readings occurred on two inspections. On both occasions the channel velocity was 1.3 ft/s. These deficiencies may be due to the inspector simply not waiting for the equipment to stabilize at peak velocity.

The installed channel velocity meter failed to provide accurate readings beginning on October 26. This was likely due to algal growth on the sensor plate. As the plate is not accessible while the ladder is watered up, three readings were taken at the same location on three different days with our portable velocity meter. A correction factor was calculated from the average of these readings and was applied to the remaining season's readings.

Recommendations

1. Leave pumps permanently installed in the auxiliary water supply conduit to reduce the preparation time for dewatering the lower ladders.
2. Have a contractor remove sand and debris from the supply conduit and replace all original ladder diffuser grates, support structures, and mud valves.
3. Replace the plastic picketed leads at the north shore with stainless steel leads to eliminate the expansion and warping that the plastic exhibits with hot temperatures. Construct the downstream leads so that the vanes are oriented at an angle to the water flow to prevent algae and debris from adhering to the vanes.
4. Modify the south shore picketed leads from a single set to a double set, and install an electric hoist system. This will allow for easier cleaning of the leads and prevent fish from becoming trapped between the leads during cleaning.
5. Modify the method of attachment of the ladder exit debris booms to withstand turbulent waters.
6. Operate the number of fish pumps needed to keep the fishway in criteria, such as three pumps during periods of higher tailwater levels, and two pumps at higher speeds when tailwater is lower. Manipulate weir gate depths and entrance head differentials as needed to keep all inspection points in criteria.
7. Finish rebuilding the fish pumps to fix the bearing housing attachment problems so that three reliable fish pumps are available to meet criteria.
8. Fully open the north shore Diffuser N1 and N2B gates to obtain higher head differentials at main entrances, greater weir depths, and increase total system discharge.
9. Improve south shore fishway conditions by either reversing the direction Diffuser S1 gates move with increasing tailwater or converting them from automatic operation to a fixed setting.
10. Verify the condition and settings for all diffuser gates and calibrate position indicators to actual gate position when the AWS is unwatered for inspection and maintenance.

11. Clean the channel velocity meter probe during the winter maintenance period to remove algae and determine if algae growth is hindering its function.

Table 2. Summary of adult fishway inspections at Lower Monumental Dam, 2011 [1]

			------Not Enough Depth------			-------Too Much Depth-------		
Criteria and Locations	**No. in Criteria/ No. on Sill/ No. of Inspections**	**% In Criteria/ % On Sill**	**No./% Within 0.01-0.1 Foot**	**No./% Within 0.11-0.2 Foot**	**No./% >0.2 Foot**	**No./% Within 0.01-0.1 Foot**	**No./% Within 0.11-0.2 Foot**	**No./% >0.2 Foot**
North Channel Water Velocities	158 *** 160	98.8 ***	*** ***	*** ***	*** ***	*** ***	*** ***	*** ***
Differentials								
North Ladder								
Ladder Exit	160 *** 160	100.0 ***	*** ***	*** ***	*** ***	0 0.0	0 0.0	0 0.0
Ladder Weirs	160 *** 160	100.0 ***	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
Counting Station	160 *** 160	100.0 ***	*** ***	*** ***	*** ***	0 0.0	0 0.0	0 0.0
South Ladder								
Ladder Exit	159 *** 159	100.0 ***	*** ***	*** ***	*** ***	0 0.0	0 0.0	0 0.0
Ladder Weirs	157 *** 159	98.7 ***	0 0.0	2 1.3	0 0.0	0 0.0	0 0.0	0 0.0
Counting Station	159 *** 159	100.0 ***	*** ***	*** ***	*** ***	0 0.0	0 0.0	0 0.0
Coll. Channels								
North Shore Entrance	158 *** 160	98.8 ***	1 0.6	1 0.6	0 0.0	0 0.0	0 0.0	0 0.0
South Powerhouse Entrance	155 *** 160	96.9 ***	3 1.9	2 1.3	0 0.0	0 0.0	0 0.0	0 0.0
South Shore Entrance	159 *** 159	100.0 ***	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
Weir Depths								
NSE-1[2]	159 Not Applic. 160	99.4 ***	1 0.6	0 0.0	0 0.0	*** ***	*** ***	*** ***
NSE-2[2]	158 Not Applic. 160	98.8 ***	2 1.3	0 0.0	0 0.0	*** ***	*** ***	*** ***
SPE-1[2]	63 96 160	39.4 60.0	0 0.0	0 0.0	1 0.6	*** ***	*** ***	*** ***
SPE-2[2]	62 96 160	38.8 60.0	2 1.3	0 0.0	0 0.0	*** ***	*** ***	*** ***
SSE-1[2]	100 57 159	62.9 35.8	1 0.6	0 0.0	1 0.6	*** ***	*** ***	*** ***
SSE-2	144 Not Applic. 160	90.0 ***	0 0.0	0 0.0	0 0.0	*** ***	*** ***	*** ***

[1] Data from Appendix 1.
[2] "On sill" means the weirgate is resting on its sill and meets "on sill" criteria at this location

SYNOPSIS OF JUVENILE FISH FACILITY OPERATION

Facility Description

Juvenile fish facilities at Lower Monumental Dam consist of: standard length submersible traveling screens, twelve inch orifices, a collection channel that terminates in a dewatering structure, transport flume, separator, and fish distribution system including, PIT tag bypass, sampling, holding facilities distribution, and barge and truck loading.

Each of the 18 bulkhead slots contains two orifices for diverting fish into the collection channel. Eighteen to 21 orifices are open at any one time with a minimum of one orifice open on all bulkhead slots of operating units. Lights are directed at each open orifice to enhance fish movement into the collection channel. The collection channel terminates at the primary dewatering structure where all but 30 cfs flow is removed. That remaining 30 cfs flow and fish are routed through the transport flume to the separator. Upon reaching the separator, adult and non-target fish are released to the river and juvenile fish pass below the separator bars and enter the distribution system. The distribution system directs the fish to their target locations.

Facility Modifications

The following modifications were made to the JFF prior to or during the 2011 fish collection season:

1. Installed a shade roof over con-x storage unit. This protects the contents from the high solar heat gain previously observed.
2. Modified safety cables at raceways to remove metal splinter hazard.
3. Completed the JFF archive in stairwell wasted space, and finished storage shelf improvements in the room off JFF shop.
4. Built UV light protective covers over direct load barge hoses and over plastic position indicators for sample dewatering valves to extend life of vinyl and plastic components.

Operation and Maintenance

Turbine Operations

Efforts were made to operate all turbine units within one percent of the peak efficiency from April 1 to October 31. Deviations were infrequent and brief or required by BPA.

Unit outages from April 1 through October 31 were fairly common. Total unit unavailable time through this period was 2,272.4 hours. The unit and total time unavailable was: Unit 1 (429.7 hours), Unit 2 (487.4 hours), Unit 3 (368.6 hours), Unit 4 (466.7 hours), Unit 5 (564.3 hours) and Unit 6 (798.8 hours). Causes included: trash rack raking, STS/VBS installation/inspection and repair, annual maintenance, voltage regulator repair, and slip ring cleaning. It is impractical to

list these occurrences and the time required individually in this report, but most are noted in the Lower Monumental seasonal weekly reports.

Debris/Trash Racks

Trash rack raking occurred March 11 and 12. A total of 115 cubic yards of debris was removed in this operation.

Submersible Screens

The submersible traveling screens (STSs) were inspected and tested on March 10 and were installed on March 13 and 14. Screen inspection began with the on deck inspection March 10. Inspection was done monthly by underwater video camera thereafter through November. The only STS problems during the 2011 season were in gatewells 3B twice (August 1 and October 3), 3C (July 6), 2C twice (September 7 and November 7) and 4C (September 7). Screens had missing clips, and/or tears and were repaired and/or replaced generally within a day of when discovered. The STS in 2C was replaced a week post discovery.

STSs were operated in "cycle" mode while the average fork length of subyearling chinook and/or sockeye/kokanee were greater than 120 mm (March 14 through May 31), and in continuous "run" mode when either was less than 120 mm (May 31 to August 16). From August 16 to December 16 they again were operated in cycle mode as fish length exceeded 120 mm.

Vertical Barrier Screens

The vertical barrier screens (VBSs) were inspected by underwater video camera in July. Additionally, they were spot-checked monthly during STS inspections. No problems were found.

Gatewells

Dipping the bulkhead slots (gatewells) yielded 73 cubic yards of debris this season. Gatewells were normally less than 10% covered. Gatewell drawdown was out of criteria on June 26 with readings in gatewells 2B and 2C that were 0.4' over the allowable 1' deviation from the initial annual reading. The unit was taken out of service and fifty one cubic yards of debris were raked from unit 2 trash racks at that time. Gatewells exceeded the 50% debris criterion seven times this season; once in unit 1, four times in unit 2, and once in unit 6. High flow and a heavy debris load was the cause. In all cases debris was promptly removed as soon as a crew was available.

Orifices/Collection Channel

During the 2011 season the number of open orifices varied from 18 to 21 according to forebay level. With the Lower Monumental reservoir at minimum operating pool, water discharge through an orifice is reduced. During this period, extra orifices were opened to supply additional water to the adult fishway. Orifices were cycled and backflushed with air daily to remove debris. Orifice fouling was a problem while high flows and a large debris load were occurring.

Orifice lights were checked daily. If a light was not working, the operating orifice was switched to the other orifice in the slot until repairs could be made.

Primary Dewaterer

Three major problems occurred regarding the primary dewaterer this season. 1. The programmable logic controller, controlling the mechanical screen cleaner and weirs, had undergone electrical maintenance over the winter and its switch had inadvertently been left in the off position. After water up, seeing that the gear would work in manual though not in auto, the mechanical cleaner was operated manually, as often as hourly, and a trouble report was issued to have the problem corrected. Eventually it was. 2. The brake on the primary dewaterer mechanical screen cleaner failed on June 2. It took weeks to determine why the cleaner was drifting off the east travel limit switch, and thereby, was thwarting the automated systems begin-cycle commands. It was additionally out of service for approximately a month until brake repair parts arrived. A replacement motor and brake assembly has been added to our emergency parts supply. 3. The weir drive gearbox for weir #6 had a drive gear failure early in the season. The weir stem was set to an acceptable elevation and an adjustment nut was used to hold it in place. A new gear will be machined and installed this winter.

The bubbler system maintained a clean screen through the period with some help via manual cycling of the mechanical screen cleaning system. The compressed air screen cleaner functioned well, as usual, and the system as a whole functioned very well keeping debris from plugging the inclined screen. No other breakdowns occurred during the transport season but occasional adjustment of the cables and cable tension device of the mechanical screen cleaner was required.

Wet Separator/Distribution and Sampling Systems

Sudden water level drops occurred at the separator again this year. Water level fluctuations in the forebay, automatic adjustments of the weirs at the primary dewaterer, and the closing and opening of orifices were the main causes. As has been the case for the last few years, the separator was run at a higher water level to mitigate this problem. The tech section at the dam is investigating the problem to pin down the root cause so that a solution can be formulated.

A Smith Root counter box worked poorly in early April. The cause was a loose wire at the plug. It was repaired and a new racking arrangement is being developed to prevent the cable from the plugs from being crimped and stressed.

No problems occurred with the PIT-tag diversion gates this season. Gate position sensors were installed five years ago. These sensors act to prevent the over-travel problem we once had and by so doing they eliminated gate failure problems caused by metal fatigue.

Barge Loading Operations

Barge loading operations occurred from May 8 through August 16. Barge loading went very smoothly this season. The downstream mooring bit guide for the downstream mooring bit, having been deformed in a collision by a barge years ago, has had a problem with sticking low in

the guides and not floating. Additionally it has been taking on water. Plans are being made to pull the mooring bit and take measurements to find the problem.

Truck Loading Operations

Juvenile fish were trucked by mini and midi-tankers from August 16 to October 1. Throughout the late season the mini and midi-tankers were used because of low fish numbers. A 2.5 mg/l salt solution was used to treat and/or ease suspected outbreaks of *columnaris*. Every day trucking occurred from September 22 through October 1 due to an extremely high incidence of *columnaris*.

Avian Predation

Areas of avian predation monitoring included: the forebay, turbine and spillway discharge, and the JFF bypass outfall. Seagull deterrent measures included: bird wires across the tailrace of the powerhouse, triple rainbird sprinklers at the exit of the bypass outfall pipe, bird deterrent spikes at common perching areas, and hazing under the animal control contract (APHIS). Gulls tended to rest in the forebay and chase juvenile fish as they jumped. They also spent time perched on the lock wall facing the tailrace. Bird wires were added along the top rail during the winter 08-09 which effectively reduced the perching normally seen there, however, to a great extent the perching only relocated to the deck in front of the hand rails.

The following data is based on bird counts taken during fish ladder inspections. These inspections are conducted at random times and so contain both counts during, as well as not during active hazing. During daylight hours, gulls were present if hazing was not occurring. In the absence of hazing, high juvenile fish numbers passing the dam via spill related to higher gull numbers. In the absence of hazing, gulls appeared to be fairly effective at feeding in the forebay and tailrace areas but the sprinklers on the bypass outfall prevented most gull feeding in that area.

Gull numbers were again low this year as compared to the past. They began to build in late-April and peaked in late May. Gull numbers fell off greatly by mid-June and began increasing again in mid-September as juvenile shad numbers increased. Gull numbers greatly increased from mid-September through mid-November reaching a high of 210 individuals on November 17 and 23.

During the transport season the maximum gull count in the forebay was 41 (May 15) with a daily seasonal average (DSA) of 6.4 (April 1 through September 30). In the turbine/spill discharge area the maximum gull count was 55 (May 6) with a (DSA) of 4.4. At the bypass pipe the maximum gull count was 26 (April 13) with a (DSA) of 1.4 and very few sightings in that area other than from April 13 through 22. Throughout the transport season hazing was effective at moving the birds out of the area but in the afternoon when the hazing ended the birds returned and resumed normal behaviors. Bird numbers correlated well with the peak of juvenile fish migration this season as has been the rule in the past, but this season as a whole had relatively low total gull numbers as was also the case in 2010.

Pelicans in numbers up to 75 were found in the tailrace from April 6 to July 22. A permit for APHIS to haze them at the bypass outfall was obtained from the state prior to the 2011 fish collection season. Pelicans at the bypass outfall were a problem anytime fish numbers were high and hazing was not occurring. As much as their duties would allow, Corps technicians hazed pelicans from the bypass outfall during periods not covered by APHIS. A count of pelicans from Lower Monumental Dam downstream to Burr Canyon was conducted 4 times during the peak of pelican activity (April 11 to May 29). The maximum number counted was 174.

Grebes, cormorants and mergansers were present in low numbers through the year but their numbers ballooned in the fall and winter as the shad juvenile outmigration peaked.

Recommendations

1. Design and fabricate screened overflow weirs on the sides of the separator to maintain a minimum water level under higher supply volumes. This will prevent water level drops in the separator.
2. Replace the separator adult fish release pipe with a pipe of larger diameter for the ease of accommodating larger fish.
3. Resolve the separator sudden water loss problem so that separator efficiency can be improved and fish safety can be achieved at optimum separator water levels. Also make sure the alarm system for the primary dewaterer will sound when the mechanical screen cleaner stops moving during its cycle.
4. Install a system to lock bypass slide gates in the sample holding tanks in the closed position. These gates were partially open for a time this season allowing an unknown number of fish to escape back to the river.
5. Include a second shift of bird hazer's for the period of peak juvenile fish passage.
6. Have guides of the downstream barge dock mooring bit repaired. Have all JFF mooring bits removed, rebuilt and reinstalled.

APPENDIX 1