Appendix D

Operations for Non-Listed Species (Lamprey, etc.)

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1. INTRODUCTION

This Appendix describes special operations that are implemented for lamprey and other non-listed fish species that may pass a project via the juvenile or adult passage facilities. These operations are regionally coordinated with the Fish Passage Operations & Maintenance (FPOM) workgroup and supplement operations for ESA-listed salmonids described in the current Fish Passage Plan (FPP), available online at: http://www.nwd-wc.usace.army.mil/tmt/documents/fpp/.

2. BONNEVILLE DAM OPERATING PROTOCOLS FOR LAMPREY

2.1. Lamprey Passage Improvements.

Several adult lamprey passage improvements have been made to Bonneville Dam fish ladders, including:

2.1.1. Bradford Island: In 2004, a Lamprey Passage System (LPS) was installed to the FV 3-9 AWS channel and then expanded with PIT-tag detection in 2006. In 2011, counting improvements, including video verification at the exit flume and 1" picket lead spacers were added. In 2012, these spacers were upgraded and improved to insure sufficient lamprey passage while not interfering with adult salmonid passage. In 2014, NOAA Fisheries installed a picket lead sill ramp and ¾" spaced picket leads in the crowder slot. The remaining picket leads were raised with new spacers to 1.5" off the sill.

2.1.2. Cascades Island: In 2006, half-duplex PIT-tag detectors were installed along the picket leads to help track lamprey. In 2009, an LPS was installed, complete with a bollard floor guidance path and a variable-width entrance weir. In 2013, the LPS was extended to allow fully volitional passage to the forebay with PIT-tag detection and video verification at the new exit, adjacent to FV 5-9.

2.1.3. Washington Shore: In 2001, guidance plates were installed over the diffuser grates. In 2005, a lamprey ramp and trap box were installed at the North Downstream Entrance (NDE). In 2008, an LPS was added to the FV 6-9 AWS channel, similar to the LPS at the Bradford Island FV 3-9 AWS. In 2010, 1" picket lead spacers were installed to provide lamprey passage under the leads. In 2011, NOAA Fisheries installed a picket lead sill ramp as well as ¾" crowder picket leads in the crowder slot. In 2013, the picket lead spacers were modified to provide a 1.5" gap off the sill. Additionally, the NDE lamprey trap was removed and replaced with a Lamprey Flume System (LFS) for attraction and guidance from the NDE area to an LPS that terminates in a trap box on the +55 deck.

Beginning in 2010, Fish Unit output is reduced during nighttime hours June 1–August 31 (lamprey passage season) to operate the Washington Shore ladder entrances at a head of 0.5 feet to encourage lamprey to enter the ladder. This operation is also described in **FPP Chapter 2 - Bonneville Dam, section 2.5.4**.

2.2. Adult Lamprey Passage Facilities Description.

2.2.1. Powerhouse One (PH1): At the Bradford Island ladder, the FV 3-9 AWS channel is equipped with a LPS that allows lamprey to bypass the serpentine section of the fish ladder and exit directly into the forebay adjacent to the ladder exit. The picket leads that block passage of adult salmonids into the AWS channel are raised 1" off the ladder floor, allowing lamprey to pass under the leads and into the AWS channel.

2.2.2. Spillway. The Cascades Island fish ladder entrance is equipped with a variable-width weir entrance gate. This entrance is coupled with a bollard field on the floor of the ladder, leading to a LPS located in the entrance bay. This LPS bypasses the overflow weirs and provides a direct route to the forebay. This LPS is currently being converted into a fully volitional passage route with an exit directly into the forebay, adjacent to the Cascades Island fish ladder exit**.**

2.2.3. Powerhouse Two (PH2). The Washington Shore ladder FV 6-9 AWS channel is equipped with an LPS that allows lamprey to bypass the serpentine section of the ladder and exit directly into the exit channel of the ladder. The picket leads that block passage of adult salmonids into the AWS channel are raised 1.5" off the ladder floor, allowing lamprey to pass under the leads and into the AWS channel.

2.3. Adult Lamprey Migration Timing and Counting.

2.3.1. Adult lamprey migration season at Bonneville Dam is March 1–November 30 with the majority of the run passing in June and July. LPS maintenance is scheduled for December 1 through the end of February.

2.3.2. Adult lamprey counting is conducted in conjunction with other adult fish counting. Counting hours and visual/video counting periods are shown in **FPP Chapter 2 - Bonneville Dam**, **Table BON-3.** In addition to count window operations, each volitional passage LPS is equipped with a mechanical counting system and video verification in the exit sections.

2.4. Lamprey Passage System (LPS) Operation & Maintenance.

2.4.1. General. Maintain adequate water depth for lamprey passage in all LPS flumes.

2.4.2. Dewatering. When adult lamprey are recovered during dewaterings, they will be transported and released into the Bonneville forebay whenever possible. Fish recovered during dewaterings, including lamprey, will not be held for other uses.

2.4.3. Cleaning Criteria. When water levels in an LPS flume drop below the required level, the water supply pump intakes must be cleaned and debris removed.

2.4.4. Trapping. All LPSs are designed for volitional passage; however, LPSs may be temporarily set up with a trap box at the terminus while new potential locations are tested for usage by fish. These trap boxes are operated solely by research groups who are responsible for monitoring, handling, and transportation of lamprey from the boxes.

2.4.5. Water Temperature. Temperatures will be monitored in each LPS. When water temperature reaches 70° F, all fish handling activities will be coordinated through FPOM prior to any action to verify protocols that will be followed. Fish handling activities in the Adult Fish Facility (AFF) will implement protocols in **Appendix G**.

2.4.6. Winter Maintenance Season. From December 1 through the end of February, LPS maintenance will be scheduled, including: remove and winterize water supply pumps; inspect all pumps and repair/replace where necessary; power spray flumes and rest boxes to remove excessive algal growth and any debris; inspect all joints and re-caulk where necessary.

3. THE DALLES DAM OPERATING PROTOCOLS FOR LAMPREY

3.1. Adult Lamprey.

Passage improvements were made in the east fish ladder by installing 4 orifice ramps to eliminate 90° edges. Several concrete 90°s were also rounded with 2" radius. Picket leads were raised 1.5" for both north and east count stations. Steel plates were installed in the lower 14 weir orifices for lamprey attachment substrate.

3.2. Juvenile Lamprey.

Data are being collected in the powerhouse turbine cooling water strainers for informational purposes. These data will not be available as the strainers are now being replaced with self-cleaning mechanisms.

3.3. Dewatering Collections.

Lamprey are collected and returned to the forebay during fishway dewaterings. Tribal restocking efforts collect lamprey from some dewaterings. These lamprey are held for no longer than 10 hours.

4. JOHN DAY DAM OPERATING PROTOCOLS FOR LAMPREY

In the winter of 2013, an adult lamprey trap was installed behind the count station picketed leads of John Day Dam's south fish ladder. The following protocols will be implemented by agencies operating this trap. These protocols will be coordinated with fish agencies and tribes through the Fish Passage Operation and Maintenance Coordination Team (FPOM). The purpose of these protocols is to provide safe access for personnel and measures to limit handling stress to lamprey and reduce impact to salmonids migrating past the John Day South Ladder Lamprey Trap.

4.1. General Facility Protocols.

4.1.1. Users must have appropriate documentation for conducting research at the dam. This includes valid state transportation permits and federal or tribal permits that cover species targeted during the trapping period and users shall comply with all fish handling conditions in the permits. Note: If permit conditions are more restrictive than the following protocols, users must

follow the more restrictive directive. The U.S. Army Corps of Engineers (Corps) reserves the right to terminate trapping operations at any time.

4.1.2. Hard hats, long pants or raingear, steel-toed shoes or rubber boots are to be worn at all times. Shorts, tennis shoes, or sandals will not be permitted when operating the trap.

4.1.3. Users will be trained in the proper operation of the jib crane and hoist to insure fish and personnel safety. Jib crane and hoist training is required prior to operating this equipment. Currently the John Day Project Safety Office in conjunction with Project rigging crew have offered to provide training. Users may request training through the John Day Project Biologists.

4.1.4. Undesired fish will be released back into the fish ladder. In the unfortunate event of mortalities, see reporting requirements below.

4.1.5. Researchers shall perform no maintenance on Corps owned/installed equipment. Please contact the on shift project biologist or biotech to alert them of any problems.

4.1.6. Users must use a cotton mesh net or water retaining refuge net large enough to safely handle the largest fish passing the project during the trapping period.

4.1.7. Fish ladder water temperatures should be measured and recorded upon arrival and departure. Transport water should be within 2°F of the fish ladder water temperature and provided with aeration or oxygenation when needed.

4.1.8. Upper Thermal Limit. Currently there is no published literature to guide the determination of an appropriate upper temperature limit, above which the trap should not be operated. Trapping data for John Day Dam from 2008-2012 (Aaron Jackson, CTUIR) indicated a mean mortality rate of 0.8% within the temperature range of 14.8–22.8°C (58.6–73.0°F) and no relation between mortality and water temperature (WQM tailrace). Therefore, there is a need for trap operators to collect additional water temperature and mortality data to inform the determination of upper thermal limit.

4.2. Notification & Documentation

4.2.1. Users will sign in and out of at the project fisheries office and notify them when they set up and close down the trap.

4.2.2. Users will record the times the trap is lowered and raised and which agency they are representing on the sheet provided by the project biologists.

4.2.3. Lamprey may be held up to 48 hours in the juvenile fish facility. Researchers will notify Project Fisheries and the Control Room whenever lamprey are held.

4.2.4. Users will scan all collected lamprey for full and half-duplex PIT tags and provide code information of previously-tagged animals to appropriate USACE personnel and interested parties. Because they are of research value, tagged fish must be returned to the forebay.

4.2.5. Any and all mortalities must be immediately reported to a Project Biologist. The Project Biologist will examine the mortality and should take photos and file a memorandum for the record (MFR). The researcher shall give a detailed report including:

(a) Species;
(b) Origin;
(c) Length (cm);
(d) Weight (g);
(e) Tags: recovery of radio or acoustic tags, scanning for full and half-duplex PIT-tags;
(f) Injuries;
(g) Cause and time of death or discovery;
(h) Future preventative measures.

4.2.6. All mortalities are included in the Project Fisheries weekly report and the reports are submitted to regional Fish Passage Operation and Maintenance (FPOM) group.

4.2.7. When trapping is completed for the season, users will properly shut down the trap. For example the basket should placed in pass through mode by removing the upstream side panel or removing the entire basket from the fishway.

5. NWW PROJECTS OPERATING PROTOCOLS FOR LAMPREY

5.1. Raceway Tailscreens.

5.1.1. By 2012, lamprey-friendly raceway tailscreens were installed at all of the juvenile fish facilities that collected for transportation (Lower Granite, Little Goose, Lower Monumental and McNary dams) to allow collected lamprey to be returned to the river rather than transported. The new tailscreen wire mesh diameter is 16.0 mm (0.063") with an open width/height of 8.6 mm (0.337"), open diagonal dimension of 12.1 mm (0.477") and overall screen open area of 71.0%.

5.1.2. Lower Monumental tested a perforated plate tailscreen that can be cleaned with brushes without entangling lamprey. The plate is $^{1}/_{4}$" thick with 0.312"x1.0" slots that are spaced $^{1}/_{4}$" apart oriented vertically in a side-staggered pattern. With consensus of regional partners, the remaining mesh tailscreens at Lower Monumental were replaced with these perforated plate tailscreens in the 2012-13 winter maintenance season.

5.2. McNary Dam.

5.2.1. Unit trash racks are raked during the winter maintenance period prior to January 15 to minimize the potential for lamprey entanglement in built-up debris when river flow increases.

5.2.2. ESBSs are installed and operating prior to April 16 (two weeks later than other NWW projects) to allow juvenile lamprey passage directly through turbines without bypass collection.

5.2.3. During lamprey passage season from June 15–September 30, the ladder entrance weirs at SFE and NFE are lowered to sill during nighttime hours (2100-0400) to reduce velocities and encourage lamprey entrance into the ladder. This operation has been implemented since 2010. During the 2013-14 winter maintenance period, a prototype structure designed for adult lamprey

passage will be installed at SFE 2. This structure will provide a deep-slot under the entrance weir gate with lower water velocities for lamprey. Consequently, the SFE2 weir will not need to be lowered to sill at night with the prototype structure in place.

5.2.4. During the 2009-10 winter maintenance period, horizontal slots were cut at the bottom of the stem walls in the upper section of the Oregon shore ladder to allow adult lamprey attachment along a level pathway through the weir. Plating was also attached on the diffuser gratings near the ladder walls to create a continuous path for lamprey attachment.

5.3. Other Improvements for Adult Lamprey.

5.3.1. During the 2011-12 winter maintenance period at Ice Harbor and Lower Monumental dams, improvements were made to the upper fish ladder weirs for adult lamprey, including:

5.3.1.(a) Horizontal slots were cut into weirs at the floor to allow adult lamprey attachment along a level pathway through the weir.

5.3.1.(b) Ramps were installed in the upper ladder weirs from the ladder floor to the bottom of elevated salmon orifices to assist lamprey in maintaining attachment as they maneuver through these areas.

5.3.1.(c) Plates were installed on diffuser grating adjacent to orifices in the Ice Harbor north ladder to provide attachment surfaces for lamprey in higher-velocity areas.

5.3.1.(d) Similar lamprey orifices and plating were installed in the Little Goose and Lower Granite ladders during the 2012-13 winter maintenance period. Three of the weirs at Lower Granite, which did not have lamprey orifices cut due to time constraints, will have the orifices cut during the 2013-14 winter maintenance period.

5.3.2. At all projects in 2011, picketed leads were raised and secured 1.5” off the ladder floor at the count stations to enable adult lamprey passage through a low-velocity passage route under the picketed leads around the adult fish count slot.

5.3.3. Fallback adult lamprey collected off fish separators and other areas of the juvenile fish facilities at Lower Monumental, Little Goose and Lower Granite are released into the forebay rather than being bypassed back into the tailrace or transported downstream.