FABRICATE AND INSTALL THREE NEW FISH SCREENS ON WENATCHEE RIVER DIVERSIONS

PROJECT ID: 29028

WASHINGTON DEPARTMENT OF FISH & WILDLIFE
YAKIMA SCREEN SHOP (YSS)

The following represent YSS's response to concerns identified in the ISRP "Preliminary Review of Fiscal Year 2003 Proposals for the … Columbia Cascade Provinces", ISRP 2002-2, March 1, 2002.

CONCERN 1: O&M PLANS AND M&E PLANS FOR EFFECTIVENESS MONITORING SHOULD BE GIVEN IN DETAIL.

RESPONSE: The following represents a more complete description:

Operation and Maintenance (O&M) Plan

Operational Requirements

The screen must be operated with proper submergence (65% - 85% of drum diameter; 80% is optimal) to keep water velocity through the screen equal to or less than the 0.4 feet per second approach velocity criteria established by the National Marine Fisheries Service (NMFS) and WDFW. The approach velocity criteria have been established to prevent salmon, steelhead, trout and whitefish fry from becoming impinged on the screen. A bypass flow is required at all times, especially from spring start-up (April-May) until the end of smolt migration (typically by June 30). Bypass flows after this critical time may be reduced, but not eliminated, to adjust for declining instream flows.

Operational Procedures

When the fish screen was installed, the screen location was selected to insure that there is adequate elevation drop between the point-of-diversion (POD) and the screen site. Consequently, the screen will not inhibit the normal flow of water to the irrigation canal when running at the required submergence level (see above).

1. Open the diversion headgate until the diverted flow is approximately 10% - 15% greater than the consumptive demand. The additional water is for fish screen bypass operation and will be returned to the stream or river.

2. Adjust the check boards at the guides upstream of the paddlewheel, or control gate, to maintain the water level on the screen between the minimum (65%) and maximum (85%) lines painted on the screen structure. Paddlewheel rotation speed should be between 4 to 6 rpm. Adjust rotation speed by adding or removing check boards in the guides downstream of the paddlewheel.

3. Adjust the check boards in the fish bypass entrance so that the extra water diverted in Step 1 (10% - 15%) provides fish passage back to the stream or river. Check the bypass outfall at the river to see that it is unobstructed and free flowing. Normal spring bypass flows should be 6" - 8" over the boards. The bypass check boards should be removed once or twice a week for 10 - 15 minutes to flush sediment from in front of the screen.

4. After setting fish bypass flow, re-adjust the headgate, as needed, to achieve the desired canal flow downstream of the fish screen.

Maintenance Procedures

Pre-season

1. Inspect screen and paddlewheel drive system components for wear, breakage, or vandalism.

2. Inspect the drum side and bottom rubber seals for gaps, tears, or wear that allows openings greater than the maximum allowable opening of 3/32”.

3. Lube all bearings and universal joints with any multi-purpose grease.

4. Check oil level in gearboxes; fill as needed with any quality gear oil.

5. Add mineral oil to drive end chain well (½ gallon capacity). This should keep the drive chain lubricated for the entire irrigation season.

In-season

1. Lube bearings and universal joints monthly.

2. Check gearboxes for leakage; repair leaking seals and refill as needed.

3. Remove trash from in front of screen and in fish bypass entrance.

4. Add mineral oil to chain well as needed.

Post-season

1. Remove all check boards from the fish bypass to allow headgate leakage to return to the river.

2. If there is no diversion headgate, install check boards in the slots provided in front of the screen structure, isolating the screen to prevent flood damage.

3. Secure the site to protect it from other damage (falling trees or limbs, vandalism, etc.).

Monitoring and Evaluation (M&E) Plan

Evaluations are performed to determine if:

1. Flows in front of screens promote fish bypass without chance of delay or impingement;

2. Screens are adequately sealed to prevent fish injury or entrainment;

3. Screen submergence levels preclude fish roll-over or entrainment, yet promote debris removal;

4. Bypass outfall conditions promote safe fish access to the river;

5. Conditions in front of screens deter predation of juvenile salmonids.

Water Velocity Measurements

Velocity measurements are taken in front of all screens. A vertical pole is placed close to the front of the screen, but is never in contact with the screen face. The bottom of the pole rests on the concrete forebay floor (usually on the raised sill), but the pole is not allowed to come in contact with metal (e.g., walking platform, gantry, or girder) to reduce the likelihood of electrical interference. The probe is pointed upstream and is positioned within 10 cm of the screen face. Because the screens are typically constructed at an angle to the canal flow, all measurements are taken with the axes of the probe oriented parallel (sweep) and perpendicular (approach) to the screen face, not to canal flow. Measurements are taken across the screen face at 0.2 and 0.8 of the water depth when the forebay depth is $\geq$ 1.2 m. Measurements are taken only at 0.6 of the water depth where forebay depth is < 1.2 m. Velocity measurements are generally taken at either three or five evenly spaced positions across each screen or panel. Velocities are also measured in the bypasses. One measurement is recorded immediately inside the vertical slot bypass.

Water velocities in front of the screens and in the bypass will be measured with either a Marsh-McBirney Model 511® electromagnetic water current meter or using a SonTek Acoustic Doppler Velocimeter (ADV). The Marsh-McBirney meter uses a bi-directional probe that allows measurement of flows in two directions (approach and sweep) simultaneously. Output is read visually from a panel gauge. The probe is securely mounted to a horizontal metal arm that extends approximately 12" from a vertical pole. The length of the horizontal arm and its position on the vertical pole are adjustable. The probe support assembly is positioned at least 30 cm downstream or outside the probe's sensors to minimize interference from the vertical pole when taking velocity readings. The ADV emits sound at a specific frequency. The frequency of this sound increases or decreases depending on whether the water is flowing toward or away from the ADV receiver. The difference between the frequency emitted and the frequency received is used to calculate the velocity of the water. The probe uses 3 receivers extending out an angle from the transmitter to calculate the 3 dimensional water velocity at a known point (10 cm) below the probe. Velocities are typically recorded at each point along the screen face for 20 seconds at a rate of ten per second and stored in a computer file.

Underwater Video

An underwater video system is used to investigate screen seal condition and to monitor debris build-up and fish presence. The camera is securely mounted on a vertical pole and adjusted as needed at each site. The camera is usually angled slightly downward to observe the area between the screen and the bottom seal where there is a potential for gaps to occur. The camera is usually moved from upstream to downstream, following the side and bottom seal/screen interfaces. Where there are signs of excessive debris or fish, images are also recorded showing the forebay area and/or bypass.

The system consists of a high-sensitivity remote camera (Sony, model HVM-352®) with a wide-angle lens (70º Sony, model VCL-06HS®). The camera is housed in a water-resistant case (Sony, model WPC-140®) and connected by 66 ft of quadraxial cable to an 8-mm camcorder (Sony, model CCD-FX710 Handycam Hi-8®) in a weatherproof housing. The case is fitted with external weatherproof controls, a 4" black and white monitor, and internal battery power supply for the system. The underwater camera operates at extremely low light levels (<1 lux), so that artificial light sources are not necessary to obtain video images during daylight hours.

General Data

Additional data collected during each evaluation include the following:

1. General site descriptions and photographs;

2. Screen and seal conditions;

3. Screen submergence levels;

4. Cleaning system operation and the incidence of head loss across the screen face;

5. Bypass flow conditions;

6. Bypass outfall flow conditions;

7. Fish presence; and

8. Observations of debris in the forebay or bypass presence or absence of operator control aids such as water gauges and drum submergence marks on screen frames.

Velocity, video, and other site inspection data are summarized for each site on each date it is visited. All velocity data are presented with respect to the NMFS velocity criteria in graphical form. Videotapes are viewed and screen captures of problems (cracked seals, bent screens, etc.) are created. Every site is rated based on six summary criteria:

1. Greater than 10% of recorded approach velocities in excess of 0.4 ft/s (NMFS criteria);

2. Bypass velocity slower than sweep velocities;

3. Damaged screen or seal;

4. Submergence outside criteria at least once;

5. Excessive sand, silt, or woody debris;

6. Bypass outfall sometimes less than 1 foot deep.

These ‘checklists’ or ‘report cards’ are useful to operations and maintenance staff responsible for performing site maintenance or alterations.

CONCERN 2: MONITORING AND EVALUATION FOR OVERALL BIOLOGICAL EFFECTS SHOULD BE INCLUDED.

RESPONSE: This particular method of monitoring and evaluation at fish screening sites has been employed in the Yakima and Walla Walla river basins

for at least the last five years. It has proven to be a valuable tool for the diversion owner and the WDFW in identifying physical problems at fish screening sites that may cause delay or injury to juvenile salmonid migration and which must be corrected. To that end, additional monitoring and evaluation for overall biological effects is beyond the scope of need to the diversion owner (or WDFW) and is therefore not included. However, other projects that are conducted within the Wenatchee river basin may satisfy this particular concern of the ISRP.

CONCERN 3: THE ISRP ASSUMES THAT OVERALL M&E IS THE RESPONSIBILITY OF OTHER PROJECTS, BUT THIS PROJECT SHOULD INCLUDE PRE-CONSTRUCTION DATA FROM THOSE PROJECTS AND ASSURE THAT DATA WILL BE AVAILABLE POST-CONSTRUCTION TO EVALUATE THE CUMULATIVE EFFECTS OF THIS AND OTHER PROJECTS.

RESPONSE: Again, the focus of this particular monitoring and evaluation effort is identifying physical problems at the proposed fish screening sites that may cause delay or injury to juvenile salmonid migration and which must be corrected. As now, any post construction data generated from this project will be available to any other project proponent for the purposes of a comprehensive evaluation of cumulative effects.