



FISH PASSAGE CENTER

2501 SW First Avenue, Suite 230, Portland, OR 97201-4752

Phone: (503) 230-4099

Fax: (503) 230-7559

<http://www.fpc.org/>

e-mail us at fpcstaff@fpc.org

MEMORANDUM

TO: Salmon Managers
Fishway Inspectors
Rick Klinge, Douglas PUD
Chuck Peven, Chelan PUD
Chris Carlson, Grant PUD
Cal Sprague, COE Portland District
Rex Baxter, COE Walla Walla District

FROM: Larry Basham

DATE: June 17, 2002

RE: **Fishway Inspections – March-May 2002**

State and federal inspectors completed inspections at the lower and upper Columbia River and Snake River dams from March (Bonneville, The Dalles and John Day) and April and May (all projects except Wells H. in May). I accompanied fishway inspectors at the three PUD projects, the four Snake River dams, and the four lower Columbia River projects on one inspection during the 2 or 3 inspections completed to date. Pre-Season meetings were completed with Grant and Douglas County PUD biologists and project personnel in March 2002. Overall, most fish facilities were operating near full capacity by mid-March 2002.

Water temperatures have been cooler than normal this spring and adult fish passage was somewhat delayed in their arrival at Bonneville Dam and upstream projects. After an initial freshet in mid-April, flows reduced to fairly low levels until mid- to late-May when flows again increased in the Columbia and Snake River basins. Overall, adult fish passage should have been satisfactory at most projects through this spring season with few failures or out of criteria conditions.

For the 2002 fishway inspection season, personnel from State and Federal fishery agencies are “veterans” with experience from 2 years to over ten seasons at the projects (see list below). Again, this experience by the agency personnel smoothens the operation of the inspection program and their help is greatly appreciated each month.

<u>Agency</u>	<u>Inspector</u>	<u>Dams inspected</u>
NMFS	Ed Meyer	Bonneville
NMFS	Larry Swenson	McNary
NMFS	Melissa Jundt	Priest Rapids & Wanapum
ODFW	Doug Case	The Dalles & John Day
ODFW	Josh Hanson	Little Goose & Lower Granite

WDFW
WDFW
WDFW
WDFW
WDFW

Denise McCarver
Glen Liner
Steve Gacek
Stewart Mitchell
Steve Richards

Rock Island & Rocky Reach
Rock Island & Rocky Reach
Rock Island & Rocky Reach
Wells
Ice Harbor & Lower Monumental

Bonneville Dam – Three fishway inspections of the adult and juvenile fish facilities were completed at Bonneville Dam on March 25, April 4, and May 14. River Q was 118.7, 133, and 202 kcfs for the respective inspections with about 139 kcfs spill during the May inspections. For the season, the WA Powerhouse will be prioritized for turbine operations. A test of daytime spill quantities will be ongoing through the fish passage season. New spill patterns have been developed for the season. Water turbidity ranged between 4.8 and 7 ft for the three inspections with the water temperature rising from 46 - 53°F (March to May).

Powerhouse I – The main entrances to the powerhouse collection channel were submerged with corresponding head differentials of 5.8 ft/1.2 ft, 5.0 ft/1.1 ft, and 6.9 ft/1.2 ft and 8.4 ft/1.2 ft, 8.3 ft/1.3 ft, and 8.5 ft/1.3 ft at respective Gates 2 and 64 using the PLC readings for the March through May inspections. The staff gage reading on the north end of the powerhouse gave channel to tailwater head differential readings that were within 0.2 ft of the PLC reading during the 3 inspections. The water velocity in the powerhouse collection channel was reported only during the May inspection at the north end of the channel and read 0.8 fps (less than criteria) and ranged between 2.1 and 2.3 fps at the south end of the channel (all satisfactory readings). The five sluice/orifice gates were operating during the inspections. The depth of water over the main Bradford fish ladder weirs was 1.0, 1.1, and 0.9 ft, with 1.2, 1.2, and 1.1 ft measured at the A-Branch and 1.2, 1.0, and 1.0 ft at the B-Branch fish ladder for the respective March – May inspections. The exit from the ladder was rated satisfactory only during the May inspection; the exit had sticks across the racks during the March and April inspections and required cleaning. The picketed lead section was fairly clear of debris and head loss across the leads looked to be within criteria. Also, during the March inspection, the FV1-1 trashrack had more than 0.5 ft drawdown and required cleaning.

B-Branch - The computer system was not operating during the three inspections and readings were taken from the staff gages until spill was ongoing (May inspection). Head differential ranged from 1.4 ft to 1.6 ft during the inspections and was close to target of 1.5 ft; the tailwater staff gage was readable during March and April. Bay 18 was closed due to construction work in that bay for the March and April inspection. Bay 18 was open 4-ft during May and passage conditions appeared poor for adult salmon with that amount of spill. The north and south entrances were closed during the May inspection. The downstream entrances were operating. Entrance requirements were generally met during the inspections at the B-Branch Fishway; however, the new spill regime through the B-Branch and Cascades Island end spill bays (1 and 18) should be further examined. Radio telemetry studies should assess adult fish passage through the spillway with the higher flows now being used than in previous years of operation during daytime hours.

Cascades Island - The Cascades Island fishway entrance is similar in design to the B-Branch. Both downstream entrances were operating with the side entrances closed in May due to the spill regime. One side entrance was operating in March and April. Head differential ranged from 1.3 ft during April, to 2.3 ft in March, and then to an estimate of 2 to 3-ft in May using the channel staff gage and assuming a tailwater elevation near equal to the B-Branch reading. The computer system remained out of service, similar to the B-Branch Fishway. Entrance requirements were met during the April inspection but were on the high side in March and May; readings were greater than 2.0 ft. During the May inspection, Spillbay Gate 1 was opened about 4-ft. As noted for the B-Branch entrance gate, observation of passage conditions for adult salmon looked to be poor at the Cascades Island entrance with the higher levels of spill from the adjacent spill bays open to 4-ft. The depth of water over the ladder weirs ranged from 1.1 to 1.2 ft and was satisfactory for the 3-months.

WA shore fishway –Two small fish turbines supply about 5,000 cfs of water to four main entrance gates, two at each end of the powerhouse, and 12 floating orifice gates along the collection channel. Tailwater elevation permitting, the gates are operated 13 ft submerged below tailwater with the head differential between 1.0 and 2.0 feet with a target head of 1.5 feet.

The South Entrance gates were submerged about 11.0 ft, 11.8 ft, and 13.7 ft with corresponding head differentials between 1.0 – 1.2 ft for the respective March through May inspections. The entrance gates were on sill during the initial two inspections so no further gate depth was possible. The north shore entrance gates were submerged about 11 ft, 12 ft, and 14.4 ft with the head differentials ranging from 1.1 to 1.4 ft. During the March and April inspections, the gates were on sill. The floating orifice gates along the channel were operating satisfactorily. The water velocity meter was out of service during the initial inspection, but water velocity was reported at 2.3 fps during the April and May inspections. The exit from the fish ladder was clear of debris, as were the serpentine pool sections located upstream from the fish counting station. The depth of water over the ladder weirs was between 1.2 and 1.4 ft.

Overall, low tailwater elevations resulted in reduced gate depths at the OR and WA shore fishways. **The computer (PLC) system at the B-Branch and Cascades Island fish ladders should be fixed and operable as soon as possible; it has not been operational for this season.** Higher spill levels during the daytime may be causing passage problem through the spillway entrances and to fish passage in general. Visual observation of the entrances looked unfavorable compared to the lower levels of spill seen in previous years. **The Project should calibrate the SDE mechanical gate reading. The exit from the Bradford Island fish ladder had excessive debris and sticks on several inspections.**

Juvenile System – The WA shore juvenile bypass facility was operating with all screens and orifices as required. The project was operating the low outfall initially based on tailwater elevation at the juvenile fish facility but changed to the high outfall as river flows increased. **The orifice lenses were not clear enough in some cases to determine whether the orifice flow was smooth and the orifices not plugged with debris (continual problem).** The ice/trash sluiceway was partially operating at the old powerhouse.

The Dalles Dam – Doug Case, ODFW, completed inspections of the fish facilities at The Dalles Dam on March 26, April 10, and May 1. Project discharge was 110 kcfs, 191 kcfs, and 199 kcfs with flow passing through operating turbines during the March/April inspections and the May inspection also had 75 kcfs spill. Two fish turbines were operating at the OR fishway with a single fish turbine operating at the WA fishway. Water temperature rose from 43°F in March to 51°F by the May inspection. Turbidity readings ranged from 3.0 ft to 4.5 ft. When spill occurs for juvenile fish enhancement, the Northern spillbays are prioritized. Because of that factor, passage of adult salmon through the WA shore fish ladder has been substantial during the past few years.

Washington Shore - Wasco PUD operates a single turbine unit that supplies water to the diffusion system in the lower WA shore fish ladder and then through main entrance Gate, N-1. On the 3 inspections, Gate N-1 was submerged 9.0, 8.5, and 9.5 ft below tailwater elevation with head differential readings of 1.3, 1.6, and 1.5 ft for the respective March, April, and May inspections. The gate depths and head differentials at Weir N-1 were operated within the proper criteria range for the 3 inspection months. The PUD trash racks had 0.3 – 0.4 ft head differential during the 3 months. The depth of water reported over the fish ladder weirs was 1.0 ft on each inspection date.

Oregon fishway – About 4,800 to 5,260 cfs of water was directed to the auxiliary water supply system via the fish turbines. The South Entrance cables on Gate S-2 were broke prior to the March inspection date and during the April/May inspections, Gate S-2 was bulkheaded off. Gate S-1 was operating 10.1 ft and 10.7 ft depth with corresponding head differential of 1.7 ft for the respective April and May inspections. The COE may be looking for a mid-season remedy to fix this equipment.

At the West Entrance, two gates are operated, W-1 and W-2. Gate depths were about 7.7 ft, 10.0 ft, and 8.1 ft average for the April through May inspections with corresponding head differentials of 1.2 ft, 1.0 ft, and 1.8 ft. During March, the gate depths were 0.3 ft low, but with the head differential of 1.2 ft, flows should have been satisfactory to attract fish to that entrance. The electronic velocity meter was out of service for the three months; however, estimated water velocities for the three inspections ranged from 2.0 fps at the east end of the channel to about 3.0 fps at the south end of the channel. Water velocity has been satisfactory since the collection channel orifice gates were shut down.

The East fishway entrance has two operating gates, E-2 and E-3. These gates were submerged 10.8 ft, 13.6 ft, and 10.2 ft with corresponding head differentials of 1.4 ft, 1.2 ft, and 1.8 ft for the March through May inspection dates. These gates are pushing out a large quantity of attraction flow for the adult fish approaching the eastern end of the powerhouse. All gate depths and head differentials fell within the criteria range for the 3 inspections.

The exit from the fish ladder was clear of debris at the exit trash rack for the March through May inspections. The east ladder pickets required cleaning during the April and May inspection. The depth of water over the fish ladder weirs ranged from 1.0 to 1.1 ft and these readings were satisfactory.

The normal sluice gates, Gates 1-1, 1-2, and 1-3, were operating as required in April and May to improve juvenile fish passage conditions at the project. The North shore juvenile fish facility was operating satisfactorily in bypass mode for the 3 months.

Overall, the COE should continue repair and assure functionality of their PLC system so that operation of the fishways can be calibrated as needed and their readings at the main entrances kept in proper criteria, etc. We recommend that the PUD trashrack be cleaned on a regular weekly basis. Although this may sound contrary, the Project should look at flow Q from the fish turbines and consider operating in the upper guideline range of 4,500 to 4,800 cfs. Higher flows may be placing additional stress on the diffuser gratings, especially if or when debris loads in the river increase.

John Day Dam – Doug Case, ODFW, inspected the John Day adult fish facilities on March 26, April 10, and May 1. Project Q was 106.6 kcfs during the initial inspection and increased to 211 kcfs by the May inspection. On the May inspection, 59.5 kcfs flow was passing the project via spill. Turbidity was 6.0 ft in March and dropped to 3-ft in April was up to 4-ft in May. Water temperature rose from 42°F in March to 51°F on the May 1st inspection. Two to 3 north shore (WA) and three south shore (OR) fish pumps were operating to supply flow to the adult fishways. Fish facility equipment was working satisfactorily through the 3-months.

OR fishway – During the inspections, the South (OR shore or SE-1) fishway entrance was operating with the gate depth ranging between at 8.1 to 8.7 ft on the gage and from 8.2 to 8.5 ft at the panel. Head differential ranged between 1.1 and 1.5 ft using the staff gage readings and ranged from 1.5 to 1.8 ft at the panel board. For the three inspection dates (March – May), there was sufficient depth and head at the South Entrance to meet all criteria ranges. The two main entrances at the north powerhouse (Gates NE-1 & NE-2) were submerged from 8.0 to 8.5 ft using the gages and 8.0 ft submerged using the panel reading. Head differentials ranged from 1.4 to 1.6 ft during the March to May inspections. All gate depths and head differentials fell within the criteria range for the North Powerhouse Entrance Weirs. Water velocity recorded along the powerhouse collection channel averaged from 2.0 to 2.4 fps during the inspections. Ten floating orifice gates were operating satisfactorily along the powerhouse collection channel. The picketed lead section at the counting station required some sticks removed from the pickets during the March and April inspections but was clear during the May inspection. The exit from the fish ladder was clear of debris during each inspection. The depth of water over the weirs was 1.0 ft on each inspection.

WA fishway – One main entrance gate is operated at the WA shore fishway, Gate N-1. The Gage and LED readings were within 0.2 ft so no calibration was required during any inspection. The gate depth ranged from 7.5 ft in March to 8.2 ft in April, and up to 8.5 ft in May with the head differential reading 1.2 ft, 1.1 ft, and 1.8 ft during the respective month's inspection. Readings from the WA shore fish ladder were as follows: the

picketed lead section at the counting station and the exit from the fish ladder were clear of debris on each inspection date. The depth of water over the fish ladder weirs was 0.9 ft on the March through May inspections.

Overall, the adult fish facilities were operating close to criteria at the fish ladders and main entrance gates during the 3-months, March to May. During March inspection, about 100 adult steelhead were observed holding in the pool below the fish counting station on the North Shore fish ladder. These fish appear to reside in this area and travel up and down through the fish counting window at this location. Only during the March inspection was a staff gage dirty.

Juvenile Fish Facility – The Smolt Monitoring facility was operating satisfactorily during the April and May inspections.

McNary Dam – Larry Swenson, NMFS, completed inspections of the fishways on April 24 and May 15. Project Q was 254.8 kcfs with 165 kcfs through the turbines and 85 kcfs through spill in April, and 181.9 kcfs river Q in May with no spill. River temperature was 49°F and 52°F with turbidity readings between 3.5 ft and 5.7 ft during the respective April and May inspections. A fishway status report was obtained prior to the inspections to compare on-site elevation readings with computer readings.

Oregon Fishway – Three fish pumps were operating with pump angles recorded at 20° to 22°. About 450 cfs flow from the juvenile bypass system is added to the powerhouse collection channel flow at the north end of the powerhouse, near the North Entrance gates. Gravity flow water from the forebay is also added in the lower end of the OR fish ladder. All auxiliary water systems were operating through both months.

The South Powerhouse and North Powerhouse entrance gates were submerged 9.1 to 9.3 ft below tailwater elevation, with the head differential reading 1.2 ft at the South entrances and 1.5 ft at the North Powerhouse entrances in April and May respectively. Both gate depths and head differentials were found within proper criteria range at the powerhouse entrances. The orifice gates along the collection channel were also operating satisfactorily. The velocity reported at the south end of the collection channel was about 1.1 fps, and at the northern end of the channel it ranged from 3.3 to 3.6 fps for the two inspections. The depth of water over the fish ladder weirs was 1.1 ft in April and 1.2 ft in May. The exit from the fish ladder and the fish counting facility was reported clear of debris.

Washington Fishway – The fish turbine operated by North Wasco PUD was supplying sufficient flow to the WA shore fishway entrances to meet criteria levels. Entrances WFE-2 and WFE-3 were operating with head differential of 1.5 ft and the gates submerged an average depth of 9.5 ft during the April inspection. In May, we found the computer printout or else the control system not operating correctly. A computer printout was picked up at the control room prior to and after taking site readings of the WA shore entrance elevations. The on site readings were 1.0 ft head differential and 10.8 ft gate depth. This gate depth reading was greater than the computer's reading by a foot. The exit from the fish ladder and the picket leads at the counting station were mostly clear of debris with some tumbleweeds reported in the April inspection on the upper section of the trashrack. The depth of water over the fish ladder weirs was 1.0 ft for both inspections.

Overall, the adult fish passage facilities at the OR fishway were operating within normal criteria at main entrance gates during the April and May inspections. At the WA shore, the computer printout was compared with the actual on site readings and found to be out of calibration. Sufficient head differential and gate depth were reported; however, the computer appeared to have a software problem and required repair. The velocity at the South end of the collection channel was slightly below criterion; about 1.1 fps was reported during the April and May inspections.

Juvenile Fish Facility – Debris in front of the project was mainly concentrated in front of Units 2C-9AB. The project was dipping trash/debris from the forebay of the project during the May inspection. About 90 Western

Grebe were swimming in the immediate forebay of the dam. One grebe was observed in Gatewell 7A and in Gatewell 9B with 2 grebes observed in the South end of the collection channel.

Priest Rapids Dam – Melissa Jundt, NMFS, completed inspections of the adult fish facilities on April 17 and May 14. Project discharge was 171.7 kcfs and 151.3 kcfs with spill at 99 kcfs and 61 kcfs during the April and May inspection, respectively. Water temperature was 44°F and 49°F with the turbidity reading 7.3 ft and 7.9 ft for the April and May inspections. Fish pumps (tailwater) and gravity-flow water (forebay) discharge water to a large supply pool that distributes this water through diffusers to the junction pool area and near the main fish entrance gates at the Left and Right Bank fishways.

Left Bank Fishway – At each end of the powerhouse, a slotted entrance is open to attract adult fish into the fishway/channel that leads to the fish ladder. No orifice gates will be operated this year at the project. Gate LSE-4 was recorded with 1.1 ft and 1.3 ft head differentials and Gate LSE-2 with 1.1 ft and 1.3 ft head differentials during the respective April and May inspections. Both gates were within criteria range of 1.0-2.0 ft. The LSE-2 met the target differential during May, but LSE-4 was less than the targeted differential on both inspections. Water velocity reported at the eastern end of the collection channel was 2.0-2.2 fps and fell within the criteria range of 1.5 to 4.0 fps. The water velocities through this area of the collection channel have improved substantially with no orifice gates operating than when the orifice gates operated. The exit from the fish ladder was reported clear of debris on each inspection date. The depth of water recorded over the ladder weirs was satisfactory at 1.1 and 1.0 ft recorded during the inspections.

Right Bank Fishway – Slotted entrance (RSE-1) was operating with 0.7 to 1.0 ft of head differential during the April inspection. There was considerable fluctuation in the tailwater elevation due to the large amount of spill; however, Melissa asked that the operators add more flow to the fishway. The operators responded and opened the Right Valves further and added water to the entrance pool. This improved the readings as the head differential rose to 1.5 ft. At the May inspection, the head differential was reported at 1.5 ft and was satisfactorily providing sufficient Q from that entrance gate. The fish ladder exit was reported clear of debris on each inspection, and the depth of water recorded over the fish ladder weirs was 1.0 ft during the inspections.

Overall, the adult fish passage facility was operating within criteria ranges (1.0 to 2.0 ft) at the main entrance gates when checking the computer reading; **however**, the RSE reading (on-site) during the April inspection showed that entrance was not supplying sufficient flow to keep the head differential above the minimum of 1.0 ft. The project engineer and operator increased flow at the Right Bank fishway (opened RVs) and this additional water improved conditions and the head differential rose to 1.5 ft after the changes were made to the system.

Wanapum Dam – Melissa Jundt, NMFS, completed inspections of the fish facilities on April 17 and May 14. Project discharge was 208 kcfs and 158 kcfs; spill is on going to pass juvenile fish at the project through the spring and summer seasons. Water temperature rose from 42°F to 47°F from the April to May inspection.

Left Bank Fishway – Two fish pumps were operating at 150-rpm average and supplying sufficient flow volume to the adult fishway. The Main Entrance gates are slotted and rely on meeting head differential criteria of 1.0 to 2.0 ft (range) with the preferred target of 1.5 ft at the LSE-2 and 1.25 ft at LSE-3. During the April and May inspections, the LSE-2 Gate had 1.3/1.4 ft and the LSE-3 Gate, 1.3/1.4 ft head differential, respectively. Both readings were within the proper range with LSE-3 meeting the target differential and LSE-2 fairly close. Orifice gates along the powerhouse collection channel will be closed for the season and future at the project. Water velocity was estimated at 2.0 to 2.1 fps. The exit from the fish ladder was reported with some minor amount of debris in April and clear of debris in May. The depth of water recorded over the fish ladder weirs was 1.1 ft during each inspection.

Right Bank Fishway – Gravity-fed water from the forebay of the project supplies flow to the main entrance gate (RSE-2). The head differential measured 1.2 ft and 1.4 ft and was within the criteria range of 1.0 to 2.0 ft. The exit from the fish ladder was clear of debris during each inspection date. Depth of water over the fish ladder weirs was 1.2 and 1.1 feet during the respective April and May inspection.

Overall, Wanapum Dam was operating their fishway within acceptable criteria range during the April and May inspection. One facility change that has occurred, or so it appears, is that the project can now operate and maintain their fishway in criteria with just the two fish pumps operating rather than using gravity-flow water from the forebay of the dam at the Left Bank fishway. This is probably a direct result of shutting down the orifice gates that operated along the powerhouse collection channel in previous years. The Left Bank fishway was always able to maintain criteria during low to medium river flow conditions but was lacking during periods of high flow when the system could not supply sufficient flow to the fishway. Potentially this problem may be improved or solved with the closure of the orifice gates.

Rock Island Dam – Glen Liner and Steve Gacek, WDFW, completed inspections of the fish facilities on April 23 and May 22. Project discharge was 193.5 kcfs and 133.9 kcfs during the respective months with fish spill at about 20% of river flow. As in previous years, the bulk of the river is passing through the new powerhouse with few turbine units operating at the old powerhouse. Turbidity was reported 8.0-8.6 ft and had water temperature readings between 42° and 50° F.

Left Bank Fishway – Water from the immediate forebay supplies flow through the diffusion system to the two downstream entrances. Gate depth criterion: 6.0 ft minimum and a head differential of 1 - 2 ft. The gates were submerged 6.9 ft below tailwater with the ΔH at 1.0 and 1.1 ft during the April and May inspections, respectively. The exit from the fish ladder and the picket lead section at the counting station were clear of debris during each inspection. The depth of water over the ladder weirs was 1.1 ft. All readings during the two inspections were satisfactory.

Middle Fishway – Gravity-flow water from the forebay of the project is directed through the diffusion system to the downstream gate and the side entrance. The downstream gate was submerged 8.4 ft and 8.7 ft (criteria = 8.5 ft or $>$) with the ΔH reported at 1.1 and 1.2 ft in April and May, respectively. The side entrance is fixed-open and depends on “head” only to be within criteria. The gate depth was considered satisfactory as the gate was within 0.1 ft of criteria during the April inspection and was at 8.7 ft during the May inspection. Head differential was within criteria range during each inspection (1.0 to 2.0 ft). The exit from the fish ladder and the picket lead section at the counting window was reported clear of debris during the inspection. The depth of water over the ladder weirs was 1.1 ft on each inspection date.

Right Bank Fishway – The gravity flow water (100% open) plus three fish pumps supply water to the Right Bank Fishway. The attraction water jet was operating at this fishway as required. The main entrances are fixed-open at 3-ft and require a minimum head differential of 1.0 ft to be within criteria. The RPEs were reported with 1.1 and 1.3 ft average “head”, 1.0 and 1.1 ft “head” at the LPE, and 0.9 and 1.2 ft at the TRE (downstream) entrance during the April and May inspections, respectively. Because of the tailwater elevation (>575 ft elev.),

the TRE was 0.1 ft less than desired criterion level during the April inspection. The velocity in the left powerhouse collection channel ranged from 3.8 fps to 4.2 fps. The exit from the fish ladder and the picket lead section at the counting station was clear of debris. The depth of water recorded over the fish ladder weirs was 1.1 feet.

Overall, the adult fishway entrances were close to acceptable criteria for the April and May inspections. The head differential was on the low end of criteria in April when flows and tailwater elevations were high. The project will inspect the diffuser gratings in the Middle Fishway on a monthly basis this year with a video camera to assure the gratings are intact this year. The initial inspection this year found the gratings in good condition and in place.

Rocky Reach Dam – The adult fish facilities were inspected by Glen Liner and Steve Gacek on April 23 and May 22, respectively. The project was operating three fish pumps from 85 to 58% open and flow was distributed to the LPEs, RPEs, and the spillway entrance. Project discharge during the April inspection was 182.8 kcfs with 29 kcfs spill while the May inspection had 144.6 kcfs flow and 22 kcfs spill. Water temperature rose from a chilly 42°F in April to 49°F in May. Water turbidity was near 11 ft on each inspection date.

Fishway Entrances -The left powerhouse entrance gates (LPE-1 and LPE-2) are operated to maintain a minimum gate depth of 10 feet or greater while maintaining the head differential between 1-2 ft. The right powerhouse entrances (RPE-1 and RPE-2) are fixed-open at 3-ft and must maintain head differential between 1 and 2-ft to meet criteria standards. This season, the spillway entrance, MSE will be operated with a minimum gate depth of 10 ft or greater depending on tailwater elevation while maintaining head differential listed above. At the LPEs, gate depths of 12.2 and 11.0 ft with head differentials of 1.3 and 1.4 ft were reported for the respective April and May inspections. At the RPEs, the head differential was 1.0 and 1.1 ft respectively during April and May. The Main Spillway Entrance was submerged 12.2 and 11.4 ft with corresponding head differentials of 1.1 and 1.0 ft for April and May, respectively. Velocity through the transportation channel was reported at 1.7 fps and 1.5 fps for the two inspections. The exit from the fish ladder and picket lead section was clear of debris. The depth of water over the ladder weirs was 1.0 ft on each inspection date. Orifice gates operating along the collection channel were in slots 1, 2, 3, 14, 16, and 20.

Overall, the fishway was operating at satisfactory criteria levels relating to gate depth and head differentials at the main entrance gates for the April and May inspections. Thad Mosey reported that the cable on the MSE was broken (late May) and originally thought that divers would have to retrieve the cable and the project pull the gate for repair sometime the week of June 3. However, the project was able to pull up the gate and the work should be completed on June 5 or 6.

Wells Dam – Stewart Mitchell, WDFW inspected the adult fish facilities on April 22. Project discharge was 193 kcfs with 9 main turbine units operating and the remainder of flow through the spillbays used to enhance juvenile fish passage at the project. River temperature was 43°F with the turbidity reading 11 ft. To assess calibration of the computer readings; staff gages and deck sensor gages located at the entrance gates are read and recorded. These readings are then compared to the computer readings that are simultaneously phoned in from the shift operator. The readings should come within 0.2 ft of each other to assure calibration of the computer system on a normal inspection.

East and West Fishways – At the Wells project, both the east and west fishways are of similar design. Two fish pumps are located on each shore and supply attraction flow to the fishway entrances. The downstream gate operates at 8-ft open with head differential targeted for 1.5 ft at both fishway entrances.

At the **East** fishway, the channel and tailwater elevations were within 0.2 ft of each other with the deck and staff gages showing 1.5 ft head differential and the computer reporting 1.3 ft of head. The computer, deck and staff gages read the same elevation in the channel but were 0.2 ft different in the tailwater elevation reading. Depth of water over the ladder weirs was 1.2 ft. The east fish ladder reported a differential through the exit pool to the forebay of 0.8 ft. The normal head through that exit trash rack ranges from 0.5 ft to 0.8 ft.

At the **West** fishway, all measuring gages and computer readings were within 0.1 ft for channel elevation and for the tailwater elevation. The head differential measured was 1.5 ft for the staff and deck gage and 1.4 ft for the computer. The end gate was back to the normal position of 8.0 ft open. The depth of water over the fish ladder weirs was 1.2 ft. The exit from the west bank fish ladder was 0.7 ft.

No May inspection was completed at Wells Dam.

Overall, the adult fish facilities were found operating satisfactorily during the April inspection. No problem areas were noted. The adult trapping schedule will be included when it is initiated this summer and fall.

Ice Harbor Dam – Steve Richards, WDFW completed inspections of the adult fish facilities on April 18 and May 30. Project Q was 105 kcfs and 132.3 kcfs with 45 kcfs spill during the respective April and May inspection. Water temperature rose from 48°F to 53°F with turbidity reading of about 3.5 ft and 6.0 ft from April to May. Eight pumps were operating and supplying water to the South Shore and 3 pumps to the North Shore fishway. In addition about 250 cfs of excess flow from the juvenile bypass system is continually shunted to the South fishway whenever the bypass system is operated.

South Shore – The South Shore entrance was submerged 7.9 ft and 7.6 ft below tailwater with head differentials at 1.8 ft. and 1.4 ft at the respective April and May inspection. The North powerhouse entrance was submerged 10.6 ft and 15.5 ft with respective 1.0 ft and 1.2 ft head differentials. Seven orifice gates were operating along the powerhouse collection channel. The water velocity averaged 1.7 fps in the collection channel for the 2 months. The South entrance gate was not on sill and further depth was attainable to meet the required 8.0 ft depth. The fish ladder was reported with 1.1 ft depth of water over the weirs during both inspections. The exit trash rack was reported clear of debris. The head loss across the picketed leads at the counting station was 0.1 ft and was clear of debris.

North Shore – The North Shore entrance was submerged 8.2 ft average and 9.5 ft with 1.4 ft head differential for the respective April and May inspections. The gate depths and head differential were within criteria range and looking satisfactory. No calibration was required. The fish ladder had 1.1 and 1.0 ft depth of water over the weirs and was satisfactory. The exit trash rack and picketed leads were clear of debris on each inspection date.

Overall, it appeared that the Project should have lowered the South powerhouse Weir to move closer to the 8-ft depth required; the gate was not on sill and there was sufficient head (1.8 ft and 1.4 ft) to adjust the Weir to a depth of 8.0 ft or greater.

Lower Monumental Dam – Steve Richards, WDFW inspected the adult and juvenile fish facilities on April 18 and May 22. Project Q was near 100 kcfs in April and up to 119 kcfs in May. As much as possible, spill will be limited at this project in 2002 as the tailwater area below the spill basin had severe erosion and damage. When flow exceeds powerhouse turbine capacity, only then will flow be spilled; spill has occurred during the 2002 season with the high flows in the Snake River. Water temperature rose from near 48°F to 54.6°F with the turbidity reading up to 4.0 ft in May. Three turbine-driven pumps normally operate and with excess flow from the juvenile bypass system supply water to the adult fishway.

North Shore – The North Shore entrance was submerged about 8.3 ft and 8.1 ft below tailwater elevation with the head differential reading 1.6 ft and 1.7 ft, respectively for the April and May inspection. The South Powerhouse entrance gates were at 8.1 ft in April, and on sill with 9.8 ft gate depth in May. Head differential was 1.5 ft in April and 1.0 ft in May at the SPEs. The water velocity through the powerhouse collection channel was recorded at near 2.0 fps for the two inspection dates. All readings taken at the North shore entrances were considered satisfactory as the head differentials fell within the range of 1.0 to 2.0 ft and the gate depth was greater than the 8.0 ft minimum at the north shore and the south powerhouse gates.

The north fish ladder was reported with 1.1 ft depth of water over the ladder weirs. The picketed lead section at the count station as well as the exit from the fish ladder was clear of debris.

South Shore – Flow to the South Shore entrance gates is provided from the North Shore water supply source. The gate depth at SSE-1 was 8.1 ft and 10.7 ft with head differential of 1.5 ft and 1.3 ft for the respective April and May 2002 inspection. Gate SSE-2 is a continuous open gate with a 6-ft opening. All readings were satisfactory.

The south fish ladder was reported with 1.1 ft of water over the ladder weirs. The picketed leads and the exit from the fish ladder were clear of debris during each inspection. Relating to the juvenile system, gatewells and all operating orifices appeared clear of debris.

Overall, the adult fish facilities were operating within acceptable criteria ranges for the April and May inspections.

Little Goose Dam – Josh Hanson, ODFW, inspected the adult fish facilities on April 24 and May 15. Project discharge was 75.4 kcfs with 33.1 kcfs spill and 63.0 kcfs on the respective April and May inspections. Water temperature rose from 48° F to 51°F with the turbidity reading at 2.0 ft in April and 4.9 ft in May. Three turbine-driven pumps operating at about 75-rpm average, and excess flow from the juvenile bypass system were supplying water to the adult fishway.

The South Shore fishway entrances, SSE-1 and SSE-2 were submerged 8.3 ft and 9.0 ft with 2.0 ft head differential using the staff gage and the FSC Board Readings for the April and May inspections. During both inspections, the SSEs were on sill so no further depth could be attained even if desired. Channel velocity recorded at the south end of the channel registered about 0.1-0.2 fps (**obviously the meter required calibration as the surface velocity was estimated at least 1.0 fps**). The water velocity ranged between 2.3 and 3.0 fps at the north shore channel. No orifice gates operate along the powerhouse collection channel. North Powerhouse entrance gates, NPE-1 and NPE-2 were on sill during each inspection and were submerged 4.85 ft average depth in April and 6.0 ft average depth in May. Head differentials were at 2.0 ft in April and 1.8 ft in May. The North Shore Entrances, NSE-1 and NSE-2 were submerged 6.25 ft and 6.1 ft (FSC Reading) with the “head” at 1.8 ft. and 1.6 ft for the respective April and May inspections. The exit from the fish ladder and the picket lead section at the counting station appeared clear of debris; however, 0.2 ft head loss was recorded through the exit trash racks and would indicate debris is beginning to build on the trash racks during the May inspection. The depth of water over the ladder weirs was 1.1-1.2 ft.

Overall, the water velocity reported at the South end of the collection channel indicated that the velocity meter was not functioning. The South shore and North powerhouse gates were on sill during each inspection. Head differential was at the high end of the range and should have provided additional flow and velocity through the entrance gates. The tailwater and NPE staff gages were not readable on either the April or May inspection.

Lower Granite Dam – Josh Hanson, ODFW inspected the adult fish facilities on April 23 and May 16. During the inspections, project Q was 73.3 kcfs and 70 kcfs with 22-35% spill. For 2002, the project is operating spillbay 1 as a surface collector and will normally be spilling water from April through the spring and summer. Water temperature was rose from 48.4°F (taken at the count station) to 50.8°F from April to May with the turbidity reading ranging between 2.3 and 3.5 ft. Two electric fish pumps (1 and 2) were supplying flow to the adult fishway entrances and powerhouse collection channel.

The **South Shore** entrances were submerged 8.0 to 8.35 ft average depth with ΔH of 2.0 ft and 1.7 ft for the respective April and May inspections using the FSC Board readings and the staff gages. Both readings at the South shore entrance gates were satisfactory and within allowable criteria ranges. The **North Powerhouse** entrances were submerged an average of 6.1 ft and 7.0 ft with ΔH of 1.4 and 1.2 ft using staff gage readings and 1.1 ft and 0.9 ft using the FSC Board reading. The staff gage readings were 0.3 ft different from the FSC so the project should calibrate their equipment for the North Powerhouse. The velocity in the powerhouse collection channel was about 1.1 fps at the south end of the powerhouse collection channel and 1.9 fps at the North Shore for the two inspections. Four orifice gates operate along the powerhouse collection channel [1, 4, 7 and 10]. At the North shore, Gates NSE-1 and NSE-2 were submerged 5.6 ft below tailwater elevation with the head differential reading of 1.1 ft and 1.5 ft at the staff gage and 1.1 ft and 1.2 ft using the FSC reading.

The exit from the fish ladder was reported clear of debris; the picket lead section at the counting station was reported with 0.2 ft and 0.3 ft head across the pickets and required cleaning. The depth of water over the fish ladder weirs was 1.1 ft during the April and May inspection.

Overall, the NPEs were on sill during the April and May inspection so no further depth could be attained. The water velocity at the south end of the collection channel was less than the 1.5 ft minimum criteria for each month. **The project should check calibration of the NPE and NSE readings.** All head differentials were satisfactory. A new staff gage was placed at the N.Shore entrance this past winter and allows inspectors opportunity to check calibration.