



Grant County
PUBLIC UTILITY DISTRICT
Excellence in Service and Leadership

Priest Rapids Fish Forum
Meeting

Wednesday, 7 January 2015
9:00 a.m. – 12:00 p.m.

Grant PUD, 11 Spokane St., Suite 205B, Wenatchee, WA
Call-In Number: 1-800-977-8002, Bridge: 7422882

AGENDA

- I. Welcome and Introductions (9:00 to 9:10)
- II. Agenda Review (9:10 to 9:20)
 - A. Additional agenda items (All)
 - B. Approve November and December Meeting Notes (All)
 - C. Review Action Items from December meeting (All)
- III. Update on Wanapum Dam (9:20-9:30)
- IV. Update on WSMP (9:30-10:15)
 - A. Update on juvenile rearing (Rose and Miller)
 - B. WSMP annual report update (Clement)
 - C. Phase 2 Sturgeon Conservation Program (Ecopath/Ecosim) (All)
 - D. Other white sturgeon items (All)
- V. Update on PLMP (10:15-11:20)
 - A. Lamprey passage and monitoring (Clement)
 - B. Update on annual report and presentation (Clement)
 - C. NNI Concept Paper Discussion (Rose)
 - D. Other lamprey items (All)
- VI. Bull Trout M&E Annual Report (11:20-11:35)
 - A. Review M&E report (Clement)
- VII. Benthic Community Survey Report (11:35-11:50)
 - A. Review benthic community survey report (Clement)
 - B. Schedule presentation (All)
- VIII. Schedule a Fish Ladder Tour in Jan or Feb (11:50-12:00)
- IX. Next Meeting: 4 February 2015 – Grant PUD Natural Resources Wenatchee Office



Grant County **PUBLIC UTILITY DISTRICT**

Priest Rapids Fish Forum

Wednesday, 7 January 2015
Grant PUD Wenatchee Office

PRFF Representatives

Stephen Lewis, USFWS
Bob Rose, YN
Doris Squeoachs, Wanapum
Jason McLellan, CCT
Mike Clement, GCPUD
Debbie Williams, GCPUD

Patrick Verhey, Chad Jackson, WDFW
Pat McGuire, WDOE
Aaron Jackson, Carl Merkle, CTUIR
Keith Hatch, BIA
Chris Mott, GCPUD
Tracy Hillman, Facilitator

Attendees:

Pat McGuire, WDOE
RD Nelle, USFWS
Doris Squeoachs, Wanapum
Jason McClellan, CCT (Via phone)
Kirk Truscott, CCT
Jim Powell, BCAHS (Via phone)
Debbie Williams, GCPUD

Patrick Verhey, WDFW
Bob Rose, YN
Chad Jackson, WDFW (Via phone)
Steve Lewis, USFWS (Via phone)
Chris Mott, GCPUD
Mike Clement, GCPUD
Tracy Hillman, Facilitator

Distributed Items:

1. 2014 Bull Trout Monitoring and Evaluation Report for the Priest Rapids Project.
2. Ecopath with Ecosim Model Memo

Action Items:

1. Tracy Hillman will send a Doodle to PRFF members to select a date for the Fishway Tour in February.
2. Tracy Hillman will ask Donella Miller, YN, to provide an update to the PRFF at next month's meeting regarding juvenile sturgeon growth rates for fish on station as well as comparing their growth to past years.
3. Tracy Hillman will find someone with experience using the Ecopath with Ecosim model to give a presentation to the PRFF. The model was previously used to model juvenile spring/summer Chinook in the Salmon River basin; Hillman will distribute the paper from that study.
4. Mike Clement will resend the "Lamprey in Priest Rapids Project – Adult Lamprey Passage Assessment using HD PIT, 2010-2013" presentation to the PRFF to help formulate questions/comments.
5. Comments to the Bull Trout M&E Annual Report are due to Joe LeMoine, Grant PUD, by Monday, 12 January 2015.

Final Meeting Minutes

I. Welcome and Introductions

II. Agenda Review

A. **Additional agenda items** – No additions were made to the agenda.

B. **Meeting Minute approval** – 05 November 2014 – Approved. 03 December 2014 – Approved.

C. **Action Items from last meeting:**

1. Grant PUD will provide their clarification and understanding of NNI and identify which tasks and associated elements relate to the Pacific Lamprey Management Plan. **Complete**
2. The Pacific Lamprey Small Group will meet on Monday, 5 January at the USFWS office in Wenatchee to discuss lamprey NNI. **Complete**
3. Debbie Williams will send the PRFF Box.net link to Patrick Verhey. **Complete**
4. Jim Powell will check with biologists at the University of British Columbia to see if they have used the Ecopath with Ecosim model on white sturgeon. Chris Mott will check with the Colville Tribes to see if they have used the model on sturgeon in the Upper Columbia. Tracy Hillman will contact Paul Anders to see if he has used the model on sturgeon in the Kootenai system. **Complete**
5. Chris Mott will prepare a memo that describes the information currently available and what information is needed to populate the Ecopath with Ecosim model in the Priest Rapids Project Area. **Complete**
6. Chad Jackson will prepare an SOA for the release of juvenile sturgeon in 2016. The SOA will be similar to the 2015 SOA. **Ongoing**

III. **Update on Wanapum Dam and Fish Passage** – Mike Clement gave an update on the status of Wanapum Dam. As repairs to the dam continue, Grant PUD is operating Wanapum Reservoir within a four-foot range between 558 and 562 feet elevations. Mike believes they will be able to achieve a normal operation level of 571.5 feet by April 2015.

Mike Clement indicated that Grant PUD reopened specific shoreline locations on 7 January. Several shoreline areas remain closed. Two boat launches, Upper Wanapum and Wanapum State Park, are now accessible. Patrick Verhey asked that a map notifying the public to open areas be posted to the Grant PUD internet website.

Mike stated that the right-bank ladder at Wanapum Dam is fully operational and providing fish passage. The left-bank ladder at Wanapum Dam is dewatered for annual maintenance.

IV. **Tour of Ladder** –In order to select a date for the annual ladder tour, **Tracy Hillman will send a Doodle Poll to PRFF members for selecting a tour date during the 2nd or 3rd week of February.**

V. Update on WSMP

A. **Juvenile Rearing Update** – Bob Rose said that to the best of his knowledge, juvenile sturgeon rearing at Marion Drain are doing well. Mike Clement and others asked that Donella Miller provide a growth report at next month's meeting. They asked that growth be plotted and compared to past years. **Tracy Hillman will contact Donella Miller, YN.**

- B. **White Sturgeon Management Plan (WSMP) Annual Report Update** – Mike Clement reported that the annual WSMP is being prepared and should be available for review by the end of the month; a 30 day review period will be provided. The annual report will then be sent to the Washington Department of Ecology (WDOE), and subsequently to the Federal Energy Regulatory Commission, for approval. Paul Grutter, Golder Assoc., will give a presentation on 2014 activities during the March PRFF meeting.
- C. **Phase 2 Sturgeon Conservation Program (Ecopath/Ecosim)** – Chris Mott noted that Grant PUD and others continue to evaluate the feasibility and application of using the Ecopath with Ecosim model as a way to estimate sturgeon carrying capacity within the project area. This information may be used to determine how many juvenile sturgeon will be released into the project area annually. Mike Clement noted that Grant PUD isn't opposed to using the model, but would like to have some reassurance that the PRFF will use it if time and resources are invested in populating the model. Members were unable to provide that reassurance because of their lack of experience with the model. Bob Rose suggested that Grant PUD outline the kind of data the model requires and have the PRFF review it before deciding to use the model. Bob questioned how to characterize the baseline conditions of the Wanapum Reservoir and if the model could consider those conditions. Mike Clement noted that resident fish baseline data were collected during relicensing, and again a few years ago by WDFW via the resident fish management plan, and that a resident survey will be conducted again in a few years. Tracy Hillman is currently looking for someone with experience using the model to give the PRFF a presentation. **The model was used to model juvenile Chinook salmon in the Salmon River basin; Tracy Hillman will distribute the paper from that study.**
- D. **Other White Sturgeon Items** – Chad Jackson said that he is preparing a draft SOA for the release of juvenile white sturgeon in the Priest Rapids Project Area in 2016. The SOA will be similar to the 2015 SOA. Chad reported that a harvest on white sturgeon planted by CRITFC is still in the design phase.

VI. Update on PLMP

- A. **Lamprey Passage and Monitoring** – Mike Clement reported that of the unique PIT-tagged adult lamprey detected at Priest Rapids Dam in 2014, about 91% of them passed Priest Rapids Dam. About 61% passed Wanapum Dam. He noted that it is important to point out that flow and operational conditions at Wanapum Dam were not normal in 2014. This winter, Grant PUD will install PIT arrays upstream and downstream from the Off-Ladder Adult Fish Trap (OLAFT) in the left-bank ladder at Priest Rapids Dam. These arrays will help identify possible lamprey passage issues near the OLAFT.
- B. **Update on Annual Report and Presentation** – Mike Clement stated that Blue Leaf Environmental will give a comprehensive passage efficiency report and presentation at the February PRFF meeting. Mike asked members to provide questions that they would like addressed during the February presentation. Bob Rose asked that the slide presentation be distributed to PRFF members a few days before the meeting in order to help facilitate questions. **Mike Clement will resend the "Lamprey in Priest Rapids Project – Adult Lamprey Passage Assessment using HD PIT, 2010-2013" presentation to the PRFF to help formulate questions/comments.**
- C. **NNI Concept Paper Discussion** – The PRFF continued their review and discussion on the revised draft NNI Concept Paper prepared by the Yakama Nation, Umatillas, WDFW, Colville

Tribes, and USFWS. The purpose of the Concept Paper is to develop a five-year action plan for Pacific lamprey. Mike Clement said that Grant PUD provided their comments on the draft NNI Concept Paper. The PRFF will convene the Pacific Lamprey Small Group on Thursday, 29 January 2015 at Grant PUD in Ephrata to discuss lamprey NNI and resolve differences in definitions and tasks.

D. Other Lamprey Items – The PRFF will tour the adult fish ladders in February. **Tracy Hillman will send a Doodle to select a date.**

E. Bull Trout M&E Annual Report – On 15 December 2014, the PRFF received the Draft 2014 Bull Trout Monitoring and Evaluation Plan for their review. Comments on the draft report are due to Joe LeMoine, Grant PUD, by Monday, 12 January 2015.

VII. Benthic Community Survey Report - On 19 December 2014, the PRFF received the Draft Wanapum Drawdown Benthic Community Survey Report, which includes characterization of benthic communities and habitat that was exposed as a result of the Wanapum reservoir drawdown. Comments on the draft report are due to Grant PUD on Tuesday, 20 January 2015.

VIII. Next Meeting – 4 February 2015 at Grant PUD in Wenatchee, WA.

**2014 Bull Trout Monitoring and Evaluation Report for the Priest
Rapids Project**

By
Public Utility District No. 2 of Grant County, Washington
Priest Rapids Hydroelectric Project
FERC Project Number 2114

December 2014

Executive Summary

The Public Utility District No. 2 of Grant County, Washington (Grant PUD) owns and operates Wanapum and Priest Rapids dams on the Columbia River, known collectively as the Priest Rapids Hydroelectric Project (Project), operated under the terms and conditions of the Federal Energy Regulatory Commission (FERC) Hydroelectric Project License No. 2114. The following is a report on Grant PUD's bull trout monitoring and evaluation program, in accordance with the Bull Trout Monitoring and Evaluation Plan (BTMEP) and the Bull Trout Hydrologic and Water Quality Study Plan (BTWQP); note that the reporting requirements for these two plans have been combined into one report. The goal of the BTMEP and BTWQP is to, on a yearly basis, monitor and evaluate bull trout (*Salvelinus confluentus*) presence in the Project and collect hydrologic and water quality data related to Project operations and acclimation activities. This information and these data are collected in order to evaluate the potential Project-related impacts on bull trout and to specify the basis for identifying measures Grant PUD will implement to address any Project-related impacts to bull trout.

The following summarizes results from 2014 efforts, followed by details in the main body of the document.

Wanapum Dam Incident Response

On February 27, 2014, a horizontal fracture was discovered in the spillway monolith No. 4 at Wanapum Dam. The fracture opened a crack on the upstream face of the structure approximately 2 inches high by 65 feet long on the spillway monolith. Grant PUD immediately initiated its Emergency Action Plan (EAP; level B) and began to draw the Wanapum Reservoir down in a steady controlled state.

Initial calls were made to National Oceanic Atmospheric Administration (NOAA) Fisheries and U.S. Fish Wildlife Service (USFWS) on February, 28, 2014 informing them of potentially developing fish passage issues at Wanapum Dam and concerns related to the developing situation at Wanapum monolith spillway 4.

On March 2, 2014, Grant PUD fisheries staff conducted fish removal and salvage activities within the Wanapum right bank ladder in anticipation of the ladder becoming inoperable. The Wanapum left bank ladder was previously dewatered for routine annual maintenance.

As of March 4, 2014, the Wanapum Reservoir had been lowered to a safe operating elevation range between 545 feet and 541 feet. As a result of the drawdown, the fish ladder exits at Wanapum Dam were dewatered, preventing upstream migrating fish from passing Wanapum Dam. Both fish ladders at Priest Rapids Dam are operational and were not impacted as a result of the Wanapum Reservoir drawdown.

To address fish passage at Wanapum Dam as a result of the Wanapum spillway fracture discovered on monolith 4, Grant PUD developed an Interim Fish Passage Operations Plan (IFPOP), which was intended to provide upstream passage for adult salmonids, steelhead, bull trout and Pacific lamprey through or around the Project. Development of the IFPOP occurred in consultation with the NOAA Fisheries, USFWS and Priest Rapids Coordinating Committee (PRCC). The PRCC is made up of representatives from National Marine Fisheries Service (NMFS), USFWS, Washington Department of Fish and Wildlife (WDFW), Yakama Nation (YN), the Confederated Tribes of the Colville Reservation (CCT), Confederated Tribes of the Umatilla Reservations (CTUIR) and Grant PUD.

Grant PUD submitted the IFPOP to the FERC on March 21, 2014. FERC issued an order approving the IFPOP on March 26, 2014, and required Grant PUD to file monthly reports that document its consultation with the PRCC and resource agencies and actions taken. In addition, Grant PUD was required to include changes to the plan, meeting minutes, copies of agency correspondence, and any other documentation of consultation.

Fishway Exit Passage Systems (WFEPS) were installed at Wanapum Dam on April 15 (on left-bank) and April 26 (right-bank) and were operated throughout the fish passage season. April 15, also marked the date that Grant PUD began to trap migrating spring chinook at Priest Rapids Dam and haul them to a select release point above Wanapum Dam. Trap and haul efforts were conducted until modifications to the fish ladders on Wanapum Dam were evaluated under working conditions and found to be suitable for passage.

Grant PUD filed Interim Operation Status Updates on May 1, June 6, September 12, and November 21, 2014. Status updates provided can be reviewed at [Grant PUD IFPOP Status Reports](#).

Bull Trout Observations

Three bull trout were observed passing the Priest Rapids Dam fish ladder count stations between April 15 and November 15, while no observations were made at the Wanapum fish ladder count station because draw down operations prevented annual fish count observations (see Section 2.0 for more detail). While a total of three bull trout were observed ascending the fish ladders at Priest Rapids and Wanapum dams, no PIT-tagged bull trout were detected in 2014 at full duplex PIT tag detectors at Priest Rapids Dam. No bull trout were observed during any phase of the Wanapum Dam incident response, juvenile bypass activities, gatewell dipping, turbine maintenance activities, fishway maintenance activities, White Sturgeon Program activities, Hanford Reach Fall Chinook Protection Program, hatchery activities, or any other activities in the Project. During screw trap operations in 2014, 13 bull trout were collected in the White River and four bull trout were collected in Nason Creek.

Hydrologic and Water Quality Monitoring

Grant PUD, in coordination with the Priest Rapids Fish Forum (PRFF), USFWS agreed to monitor and report daily averages of Project elevation (feet), discharge (thousand cubic feet per second (kcfs)), temperature (°Celsius) and total dissolved gas (TDG; percent saturation (%SAT)). Project operations/water quality daily averages are reported in Appendix A of this report.

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1.0 Introduction

The Public Utility District No. 2 of Grant County, Washington (Grant PUD) owns and operates two hydroelectric dams on the Columbia River; Wanapum and Priest Rapids, known collectively as the Priest Rapids Hydroelectric Project (Project), operated under the terms and conditions of the Federal Energy Regulatory Commission (FERC) Hydroelectric Project License No. P-2114.

Grant PUD operates the Project through the coordinated operation of a seven-dam system and other Columbia Basin entities with current operational agreements with the fishery agencies and other operators to provide protection and enhancement for a range of fisheries and other resources within and downstream of the project. These agreements include the Hanford Reach Fall Chinook Protection Program Agreement, the Hourly Coordination Agreement, and the Priest Rapids Project Salmon and Steelhead Settlement Agreement. The Project is also subject to the provisions of the FERC license and related laws and regulations, as well as to the requirements (incorporated by reference in the license) of the Biological Opinion for the Priest Rapids Project issued by the National Marine Fisheries Service (NMFS) for its effects on anadromous salmon, the Clean Water Act Section 401 Water Quality Certification (WQC) issued by the Washington Department of Ecology (WDOE), and the Biological Opinion for the Project issued by the United States Fish and Wildlife Service (USFWS; 2007) regarding the effects of the Project on bull trout (*Salvelinus confluentus*).

A 401 WQC was issued by the WDOE on April 3, 2007, and amended March 6, 2008, for the operation of the Project. A new license for the Project was issued by FERC on April 17, 2008 (FERC 2008). Under FERC License Article 401(a)(10) and the 401 WQC (Section 6.2 (5)(b)), Grant PUD was required, in consultation with the Priest Rapids Fish Forum (PRFF), to develop and submit for approval a Bull Trout Monitoring and Evaluation Plan (BTMEP) within one year of issuance of the license. The BTMEP was implemented upon FERC approval on June 4, 2009. In accordance with the BTMEP, Grant PUD monitored for bull trout during all Project related activities where bull trout could potentially be seen or encountered in 2014. In addition, in accordance with FERC License Article 401(a)(25) and Reasonable and Prudent Measure 2 of the USFWS Bull Trout Biological Opinion for the Project (USFWS 2007), Grant PUD, in consultation with the Priest Rapids Fish Forum (PRFF), developed the Bull Trout Hydrologic and Water Quality Study Plan (BTWQP). The BTWQP was implemented upon FERC approval on February 17, 2010. The goal of the BTMEP and BTWQP is to, on a yearly basis, monitor and evaluate bull trout presence in the Project and collect hydrologic and water quality data related to Project operations. This information and these data are collected in order to evaluate the potential Project-related impacts on bull trout and to specify the basis for identifying measures Grant PUD will implement to address any Project-related impacts to bull trout.

The following sections present a summary of the results from Grant PUD's 2014 monitoring efforts under the BTMEP and BTWQP (note that FERC approved the combination of both reporting requirements into a single report with approval of the BTWQP on February 17, 2010).

1.1 Wanapum Incident Response

On February 27, 2014, a horizontal fracture was discovered in the spillway monolith No. 4 at Wanapum Dam. The fracture opened a crack on the upstream face of the structure approximately 2 inches high by 65 feet long on the spillway monolith. Grant PUD immediately initiated its

Emergency Action Plan (EAP; level B) and began to draw the Wanapum Reservoir down in a steady controlled state.

Initial calls were made to National Oceanic Atmospheric Administration (NOAA) Fisheries and USFWS on February, 28, 2014 informing them of potentially developing fish passage issues at Wanapum Dam and concerns related to the developing situation at Wanapum monolith spillway 4.

On March 2, 2014, Grant PUD fisheries staff conducted fish removal and salvage activities within the Wanapum right bank ladder in anticipation of the ladder becoming inoperable. The Wanapum left bank ladder was previously dewatered for routine annual maintenance.

As of March 4, 2014, the Wanapum Reservoir had been lowered to a safe operating elevation range between 545 feet and 541 feet. As a result of the drawdown, the fish ladder exits at Wanapum Dam were dewatered, preventing upstream migrating fish from passing Wanapum Dam. Both fish ladders at Priest Rapids Dam are operational and were not impacted as a result of the Wanapum Reservoir drawdown.

To address fish passage at Wanapum Dam as a result of the Wanapum spillway fracture discovered on monolith 4, Grant PUD developed an Interim Fish Passage Operations Plan (IFPOP), which was intended to provide upstream passage for adult salmonids, steelhead, bull trout and Pacific lamprey through or around the Project. Development of the IFPOP occurred in consultation with the NOAA Fisheries, USFWS and Priest Rapids Coordinating Committee (PRCC). The PRCC is made up of representatives from National Marine Fisheries Service (NMFS), USFWS, Washington Department of Fish and Wildlife (WDFW), Yakama Nation (YN), the Confederated Tribes of the Colville Reservation (CCT), Confederated Tribes of the Umatilla Reservations (CTUIR) and Grant PUD.

Grant PUD submitted the IFPOP to the FERC on March 21, 2014. FERC issued an order approving the IFPOP on March 26, 2014, and required Grant PUD to file monthly reports that document its consultation with the PRCC and resource agencies and actions taken. In addition, Grant PUD was required to include changes to the plan, meeting minutes, copies of agency correspondence, and any other documentation of consultation. Status updates can be reviewed at [Grant PUD IFPOP Status Reports](#)

Fishway Exit Passage Systems (WFEPS) were installed at Wanapum Dam on April 15 (on left-bank) and April 26 (right-bank) and were operated throughout the fish passage season. April 15, also marked the date that Grant PUD began to trap migrating spring chinook at Priest Rapids Dam and haul them to a select release point above Wanapum Dam. Trap and haul efforts were conducted until modifications to the fish ladders on Wanapum Dam were evaluated under working conditions and found to be suitable for passage. Grant PUD filed its Interim Operation Status Updates on May 1, June 6, September 12 and November 21, 2014.

In addition to modifications being made to the fish ladders at Wanapum Dam, Grant PUD supported a trap and haul effort of adult salmonids at the Priest Rapids Off-Ladder Adult Fish Trap (OLAFT). Fish were diverted into trucks at the Priest Rapids OLAFT and transported above Wanapum Dam. Trap and haul efforts were conducted until modifications to the fish ladders on Wanapum Dam were evaluated under working conditions and found to be suitable for passage. There were no bull trout encountered during the trap and haul period or during any of the fish ladder modifications at Wanapum Dam.

2.0 Bull Trout Observations

In 2014, three bull trout were observed passing the Priest Rapids Dam fish ladder count station between April 15 and November 15. There were no observations recorded at Wanapum Dam because the fish viewing window was inoperable during the draw down period (see Section 1.1). Table 1 displays the information related to observations made at the Priest Rapids Dam count stations in 2014. Table 2 shows the number of bull trout that use the right-bank and left-bank fish ladders at both Priest Rapids and Wanapum dams from 2007 through 2014. Figure 1 through 3 provide photographs, location and date of each bull trout observed passing the Priest Rapids Dam fish count station. No PIT-tagged bull trout were detected at the Priest Rapids Dam fish count stations in 2014.

No bull trout were observed during any phase of the Wanapum Dam incident response, juvenile bypass activities, gatewell dipping, turbine maintenance activities, fishway maintenance activities, Hanford Reach Fall Chinook Protection Program, hatchery activities, or any other activities in the Project.

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Table 1 Bull trout observations at Priest Rapids Dam Fish Count Station in 2014.

Date	Time	Ladder	Number	Estimated Total Length
6/13/2014	10:48	Left	1	26
6/17/2014	7:41	Right	1	23
6/21/2014	12:20	Right	1	25

Table 2 Number of bull trout Passing Priest Rapids and Wanapum Dam's Fish Count Station's from 2007 through 2014.

Year	Priest Rapids Dam		Wanapum Dam	
	Left Bank	Right Bank	Left Bank	Right Bank
2007	0	1	1	0
2008	2	3	0	0
2009	5	1	3	0
2010	5	2	5	2
2011	5	3	9	3
2012	4	1	2	1
2013	9	1	10	1
2014	1	2	Unknown*	Unknown*

Note:* The fish count station at Wanapum Dam was inoperable during the draw down (see Section 1.1 for more detail).



Figure 1 A bull trout with an estimated length of 26 inches passing Priest Rapids left bank count station on June 17, 2014 at 10:48.

B11123026003 1:PR Blue Right Jun 17, 2014 7:41:42 AM PDT

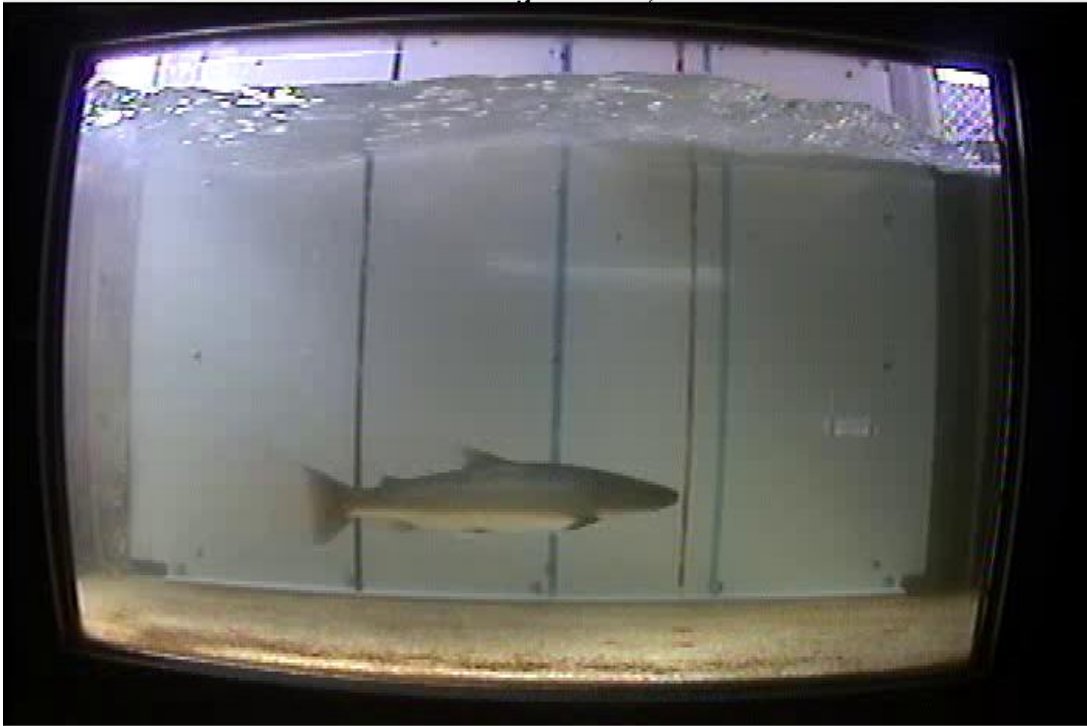


Figure 2 A bull trout with an estimated length of 23 inches passing Priest Rapids right bank count station on June 13, 2014 at 07:41.

B11123026003 1:PR Blue Right Jun 21, 2014 12:20:34 PM PDT



Figure 3 A bull trout with an estimated length of 25 inches passing Priest Rapids right bank count station on June 21, 2014 at 12:20.

3.0 Bull Trout Observations and Handling on Nason Creek and White River

Grant PUD monitors the White River and Nason Creek, through the YN operation of screw traps, as part of Grant PUD’s spring Chinook hatchery supplementation program. A map showing the location of the screw traps is provided in Figure 4 below. The YN operates screw traps for spring Chinook salmon and additionally records bull trout observations on the White River and Nason Creek. During screw trap operations in 2014, The YN identified four bull trout collected from Nason Creek and 13 collected from the White River (see Table 3 for more details). A length and life stage was assigned to each fish captured.

Table 3 Bull trout data from Nason Creek and White River screw traps.

Nason Creek	Date	Species	Fork Length (mm)	Stage*
	3/17/2014	Bull Trout	140	SA
	4/9/2014	Bull Trout	145	SA
	5/27/2014	Bull Trout	169	SA
	7/1/2014	Bull Trout	147	SA
White River	Date	Species	Fork Length (mm)	Stage*
	4/24/2014	Bull Trout	29	J
	5/20/2014	Bull Trout	27	J
	5/21/2014	Bull Trout	30	J
	5/21/2014	Bull Trout	28	J
	5/22/2014	Bull Trout	27	J
	5/27/2014	Bull Trout	27	J
	5/27/2014	Bull Trout	29	J
	5/31/2014	Bull Trout	31	J
	6/1/2014	Bull Trout	32	J
	6/8/2014	Bull Trout	31	J
	7/29/2014	Bull Trout	47	J
	8/7/2014	Bull Trout	51	J
	10/5/2014	Bull Trout	229	SA
<p>Note: *Actual data provided to Grant PUD included varying references to life stages. A “J” is used in this table to indicate juvenile life stages. “SA” is used to denote the sub-adult life stage, consistent with previous Grant PUD reports for fish between 127 and 330 mm.</p>				

Grant PUD also conducted short-term spring Chinook acclimation activities at one location in the White River Basin between March and May, 2014. Fish were acclimated in tanks on the bank at Grant PUD’s Bridge Site located at river mile 2. Water was pumped from the White River to the acclimation tanks via a “pump-basket” set-up with water being returned via outflow pipes. No bull trout were observed during the setup, operation, or demobilization of the acclimation site.

In 2014 Grant PUD contracted with the WDFW and the YN to collaboratively conduct an electrofishing study that focused on collecting and tagging juvenile spring Chinook on Nason Creek. WDFW and YN staff also captured 18 bull trout and PIT-tagged 16 of them. All bull trout

were released in close proximity to their collection site unharmed. Table 4 includes a list of all bull trout captured and PIT-tagged on Nason Creek during the electrofishing study.

Table 4 Bull trout captured and PIT tagged on Nason Creek.

Date	Stream	Capture Type	Species	Stage*	Length (mm)	Pit Tag
9/24/2014	Nason	Remote: Electofish	BLC	SA	205	3DD.003B9EC8EC
9/24/2014	Nason	Remote: Electofish	BLC	SA	218	3DD.003B9EC930
9/24/2014	Nason	Remote: Electofish	BLC	SA	177	3DD.003B9EC932
9/25/2014	Nason	Remote: Electofish	BLC	J	120	3DD.003B9EC5F7
9/25/2014	Nason	Remote: Electofish	BLC	SA	176	3DD.003B9EC5D3
9/30/2014	Nason	Remote: Electofish	BLC	SA	233	3DD.003B9EC991
10/1/2014	Nason	Remote: Electofish	BLC	SA	215	3DD.003B9EC75E
10/8/2014	Nason	Remote: Electofish	BLC	SA	168	3DD.003B9EC3F7
10/9/2014	Nason	Remote: Electofish	BLC	SA	128	3DD.003B9ECDE7
10/17/2014	Nason	Remote: Electofish	BLC	SA	212	3DD.003B9EC367
10/21/2014	Nason	Remote: Electofish	BLC	SA	143	3DD.003B9EC547
10/21/2014	Nason	Remote: Electofish	BLC	SA	187	3DD.003B9EC510
10/21/2014	Nason	Remote: Electofish	BLC	SA	163	3DD.003B9EC554
10/21/2014	Nason	Remote: Electofish	BLC	SA	175	3DD.003B9EC53D
10/21/2014	Nason	Remote: Electofish	BLC	SA	190	3DD.003B9EC515
10/22/2014	Nason	Remote: Electofish	BLC	SA	170	3DD.003B9EC4FF

Note: *Actual data provided to Grant PUD included varying references to life stages. A “J” is used in this table to indicate juvenile life stages. “SA” is used to denote the sub-adult life stage, consistent with previous Grant PUD reports for fish between 127 and 330 mm.

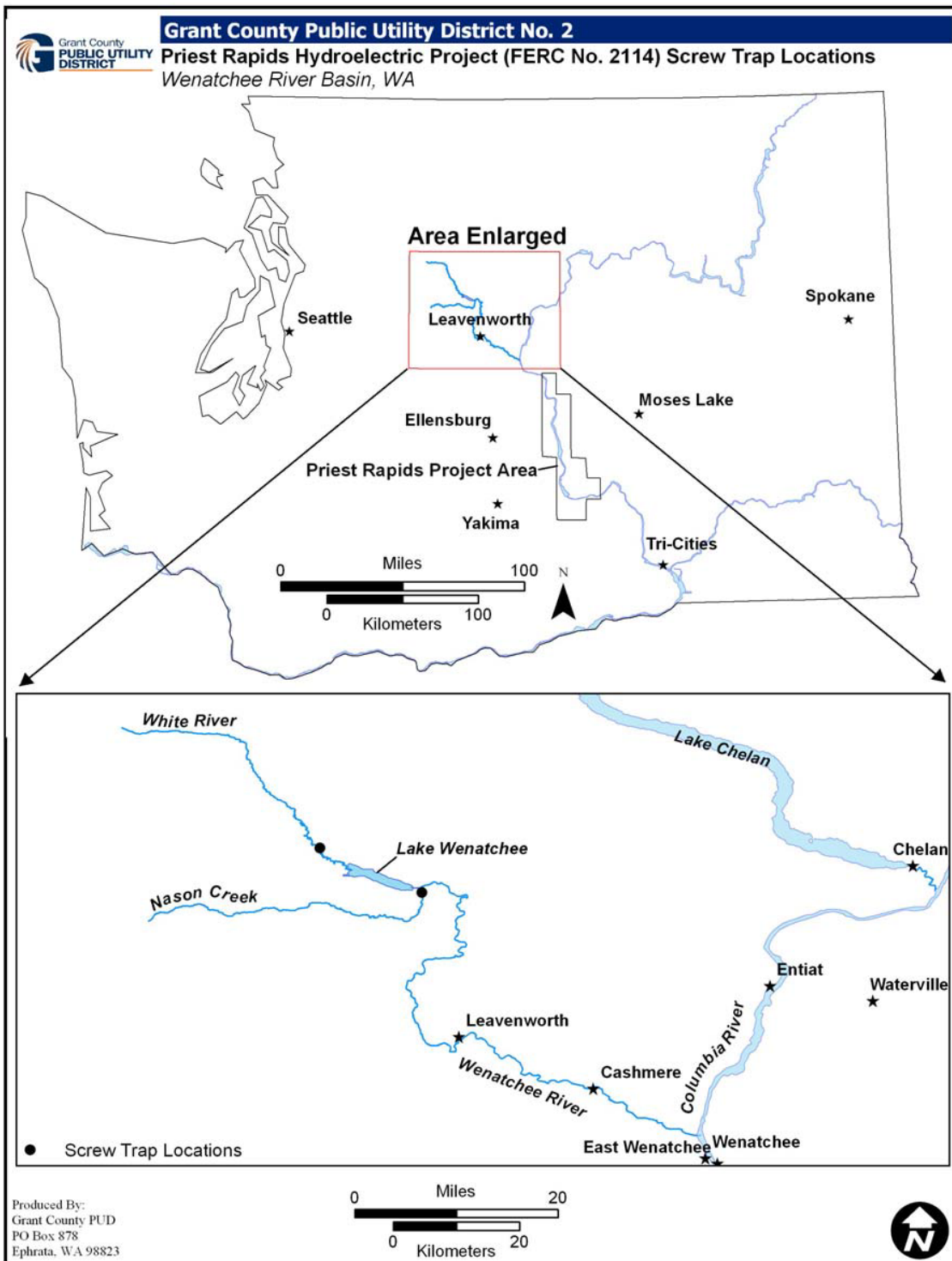


Figure 4 Screw Trap Locations on the White River and Nason Creek.

4.0 Hydrologic and Water Quality Monitoring

In the 2014, 5-year Bull Trout Monitoring and Evaluation Plan, Grant PUD, in coordination with USFWS, agreed to monitor changes in Project elevation, discharge, temperature, and total dissolved gas and report daily average values. Appendix A contains a listing of daily averages as recorded throughout the Project.

5.0 Summary

In 2014, bull trout monitoring occurred throughout all Grant PUD programs in accordance with the BTMEP, BTWQP, and Bull Trout Biological Opinion for the Project (USFWS 2007). Based on the number of bull trout encountered, Grant PUD did not exceed the total annual “take” limits based on the Biological Opinion for the Project (USFWS 2007), and no lethal take was documented as a result of Grant PUD’s 2014 operations. Table 5 below provides a summary of bull trout “take” in 2014 as defined by the Biological Opinion (USFWS 2007).

Table 5 Summary table of 2014 reporting period take on bull trout.

Project Element	Type of Take	Lethal Take		Non-lethal Take	
		Adult	Juvenile/Sub-Adult	Adult	Juvenile/Sub-Adult
Turbine Operations	Harm or Harass	0	0	0	0
Juvenile Fish Bypass	Harm or Harass	0	0	0	0
Spill Operations	Harm or Harass	0	0	0	0
Adult Fishways	Harass	0	0	3	0
Hydrograph Variation	Harm or Harass	0	0	0	0
Predator Control	Harm or Harass	0	0	0	0
White River Supplementation Program	Harass	0	0	0	17*
Nason Creek Electrofishing	Harass	0	0	0	18
	TOTAL	0	0	3	35

Note: *This number includes bull trout collection from the Nason Creek screw trap (4 of the 17 fish).

List of Literature

- Federal Energy Regulatory Commission, Order Issuing New License for Public Utility District No. 2 of Grant County, Docket Number P-2114-116 (April 17, 2008).
- Keeler, C. 2014. Summary of 2014 Annual Fish-Spill Season and Total Dissolved Gas Monitoring. Prepared for Public Utility District No. 2 of Grant County, Washington. October, 2014.
- LeMoine, J. 2014. Priest Rapids Project Bull Trout Monitoring and Evaluation Plan FERC Article 401 (a) (10) (25). Prepared for Public Utility District No. 2 of Grant County, Washington. March 2014
- National Marine Fisheries Service (NMFS). 2008. Endangered Species Act – Section 7 Consultation Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Consultation for the New License for the Priest Rapids Hydroelectric Project, FERC Project No. 2114. Portland, Oregon.
- United States Department of Interior Fish and Wildlife Service (USFWS). 2007. USFWS Biological Opinion on the Effects of the Priest Rapids Hydroelectric Project Relicensing on Bull Trout (FERC No. 2114). Spokane, Washington. USFWS Reference: 13260- 2006 -P-0008, 13 260-2001-F-0062.

Appendix A
Project Operations/Water Quality Daily Average Data.

DRAFT

Table A-1 Wanapum Daily Averages

Date	Wanapum Forebay			Wanapum Tailrace			
	Elevation (ft)	Temp (°C)	TDG (%SAT)	Elevation (ft)	Discharge (kcfs)	Temp (°C)	TDG (% SAT)
4/16/2014	543.51	6.4	110.0	492.59	148.3	6.5	112.6
4/17/2014	543.66	6.4	110.5	493.05	153.8	6.4	113.8
4/18/2014	543.42	6.4	110.1	492.98	159.4	6.4	113.0
4/19/2014	542.53	6.5	111.5	493.08	159.4	6.5	112.7
4/20/2014	542.66	6.6	108.4	492.58	152.2	6.6	109.8
4/21/2014	543.02	6.7	110.0	493.17	156.8	6.7	110.6
4/22/2014	543.06	6.9	109.8	492.82	155.6	6.9	112.7
4/23/2014	542.87	7.1	109.9	493.18	163.3	7.1	115.3
4/24/2014	543.03	7.2	113.8	492.77	156.0	7.3	116.9
4/25/2014	543.52	7.5	114.0	492.92	156.0	7.5	114.9
4/26/2014	543.47	7.7	114.0	493.50	168.4	7.8	117.8
4/27/2014	543.08	8.0	112.1	493.00	159.4	8.0	115.9
4/28/2014	543.24	8.1	111.0	493.40	168.8	8.1	116.5
4/29/2014	543.33	8.4	110.8	493.02	166.0	8.4	116.4
4/30/2014	543.55	8.6	112.0	493.16	164.6	8.7	116.5
5/1/2014	543.44	9.0	112.1	493.71	173.5	9.0	116.7
5/2/2014	543.45	9.3	112.1	492.81	158.2	9.3	115.5
5/3/2014	543.46	9.5	112.7	493.94	181.4	9.5	117.2
5/4/2014	543.56	9.6	112.8	494.15	179.5	9.6	117.2
5/5/2014	543.65	9.7	110.7	494.52	185.8	9.7	117.0
5/6/2014	542.87	9.8	113.6	493.61	174.7	9.8	117.4
5/7/2014	543.28	10.0	114.2	493.25	166.0	10.0	117.0
5/8/2014	544.24	9.8	114.3	494.62	185.8	10.0	117.9
5/9/2014	543.81	9.7	114.7	493.64	162.5	9.8	115.5
5/10/2014	544.16	9.9	113.2	493.37	168.1	9.9	115.8
5/11/2014	544.17	10.1	113.0	494.18	177.5	10.1	114.6
5/12/2014	543.81	10.2	112.9	493.77	174.1	10.3	116.4
5/13/2014	543.50	10.4	113.8	493.90	174.2	10.5	118.1
5/14/2014	544.08	10.6	114.9	493.79	177.7	10.7	116.7
5/15/2014	544.53	10.7	114.2	494.68	187.6	10.8	116.7
5/16/2014	544.58	10.9	114.4	494.77	190.0	11.0	117.7
5/17/2014	544.29	10.9	114.6	495.47	199.8	11.0	118.6
5/18/2014	543.84	10.9	115.6	494.53	196.1	11.0	118.2
5/19/2014	543.09	11.0	113.0	494.59	187.0	11.1	117.7
5/20/2014	543.19	11.1	114.3	494.65	196.2	11.2	119.6
5/21/2014	544.03	11.4	114.0	494.71	189.5	11.4	118.9
5/22/2014	544.05	11.6	116.4	494.77	198.7	11.6	120.1

Date	Wanapum Forebay			Wanapum Tailrace			
	Elevation (ft)	Temp (°C)	TDG (%SAT)	Elevation (ft)	Discharge (kcfs)	Temp (°C)	TDG (% SAT)
5/23/2014	544.08	11.7	115.4	494.83	199.2	11.8	120.6
5/24/2014	544.11	11.8	114.3	494.89	203.7	11.9	121.1
5/25/2014	544.14	11.9	115.4	494.95	199.5	12.0	120.2
5/26/2014	544.17	11.8	115.3	495.01	214.4	11.9	122.0
5/27/2014	544.20	11.9	114.5	495.07	200.3	12.0	120.2
5/28/2014	544.22	11.9	114.4	495.13	183.6	12.0	118.2
5/29/2014	544.25	11.9	116.4	495.19	202.9	11.8	120.0
5/30/2014	544.28	12.3	121.0	495.25	178.8	12.1	120.9
5/31/2014	544.31	12.6	119.7	495.31	188.7	12.4	121.8
6/1/2014	544.34	12.8	120.6	495.38	212.3	12.6	125.6
6/2/2014	544.37	13.0	121.3	495.44	194.9	12.8	124.0
6/3/2014	544.39	13.4	118.9	495.50	195.2	13.2	121.7
6/4/2014	544.42	13.5	116.4	495.56	196.4	13.3	120.3
6/5/2014	544.45	13.6	115.4	495.62	198.1	13.4	119.5
6/6/2014	544.48	13.7	115.5	495.68	192.9	13.5	118.7
6/7/2014	544.51	13.9	114.4	495.74	170.5	13.7	114.5
6/8/2014	544.54	13.9	113.7	495.80	172.6	13.8	115.5
6/9/2014	544.57	14.1	112.7	495.86	179.2	13.9	115.9
6/10/2014	544.59	14.0	112.2	495.92	168.3	13.8	113.9
6/11/2014	544.62	13.9	113.3	495.98	161.0	13.8	113.2
6/12/2014	544.65	14.2	114.8	496.04	140.5	14.0	114.1
6/13/2014	544.68	14.1	109.9	496.10	143.6	13.9	110.6
6/14/2014	544.71	14.0	108.8	496.16	124.7	13.8	108.9
6/15/2014	544.74	14.0	110.5	496.22	119.1	13.9	110.1
6/16/2014	544.76	13.8	109.1	496.28	132.1	13.6	109.0
6/17/2014	544.79	13.6	110.9	496.34	153.6	13.4	110.6
6/18/2014	544.82	13.9	112.0	496.40	155.0	13.7	111.9
6/19/2014	544.85	14.0	113.8	496.46	188.8	13.8	117.1
6/20/2014	544.88	14.2	113.7	496.52	180.3	14.1	117.6
6/21/2014	544.91	14.6	113.9	496.58	194.4	14.4	117.6
6/22/2014	544.94	14.8	115.4	496.64	191.4	14.5	119.0
6/23/2014	544.96	15.2	115.6	496.70	196.4	15.0	119.2
6/24/2014	544.99	15.3	114.3	496.76	188.1	15.2	117.9
6/25/2014	545.02	15.4	116.2	496.82	188.9	15.2	118.7
6/26/2014	545.05	15.2	115.2	496.88	191.7	15.1	117.9
6/27/2014	545.08	15.3	113.9	496.94	189.3	15.1	117.3
6/28/2014	545.11	15.5	113.6	497.00	186.2	15.4	117.5
6/29/2014	545.13	15.4	112.2	497.06	200.7	15.3	117.6
6/30/2014	545.16	15.6	112.9	497.12	183.1	15.4	114.6

Date	Wanapum Forebay			Wanapum Tailrace			
	Elevation (ft)	Temp (°C)	TDG (%SAT)	Elevation (ft)	Discharge (kcfs)	Temp (°C)	TDG (% SAT)
7/1/2014	545.19	15.9	114.8	497.18	201.1	15.7	119.0
7/2/2014	545.22	16.0	117.4	497.24	193.1	15.8	120.7
7/3/2014	545.25	16.0	115.2	497.30	194.2	15.8	120.0
7/4/2014	545.28	15.9	115.1	497.36	177.7	15.7	117.5
7/5/2014	545.31	16.0	113.6	497.42	151.9	15.8	113.2
7/6/2014	545.33	16.4	113.1	497.48	171.6	16.3	115.1
7/7/2014	545.36	16.8	112.9	497.54	179.1	16.7	115.3
7/8/2014	545.39	17.2	114.2	497.60	154.3	16.9	113.6
7/9/2014	545.42	17.4	113.0	497.66	149.7	17.1	112.8
7/10/2014	545.45	17.2	112.4	497.72	159.1	17.0	112.7
7/11/2014	545.48	17.4	113.2	497.78	154.4	17.1	112.7
7/12/2014	545.50	17.3	113.1	497.84	161.2	17.1	113.3
7/13/2014	545.53	17.2	113.5	497.90	143.1	17.1	112.9
7/14/2014	545.56	17.6	113.2	497.96	138.9	17.2	112.6
7/15/2014	545.59	17.7	114.1	498.02	158.4	17.3	113.5
7/16/2014	545.62	17.9	114.5	498.08	156.5	17.5	114.2
7/17/2014	545.65	18.0	111.7	498.14	142.6	17.8	111.7
7/18/2014	545.68	17.9	109.8	498.20	140.6	17.8	109.8
7/19/2014	545.70	17.9	109.7	498.26	137.2	17.7	109.7
7/20/2014	545.73	18.0	110.3	498.32	130.7	17.8	109.7
7/21/2014	545.76	17.8	108.6	498.38	140.9	17.6	108.3
7/22/2014	545.79	17.9	109.8	498.44	130.2	17.7	109.0
7/23/2014	545.82	17.7	110.7	498.50	144.2	17.6	110.1
7/24/2014	545.85	17.5	109.8	498.56	149.6	17.4	110.3
7/25/2014	545.87	17.5	110.4	498.62	167.4	17.3	110.8
7/26/2014	545.90	17.6	112.4	498.68	151.1	17.4	111.2
7/27/2014	545.93	18.1	111.9	498.74	140.4	17.8	110.5
7/28/2014	545.96	18.5	112.6	498.80	143.8	18.3	111.7
7/29/2014	545.99	19.2	112.1	498.86	146.2	18.8	110.8
7/30/2014	546.02	19.5	111.7	498.92	130.5	19.1	N/A
7/31/2014	546.05	19.4	111.6	498.98	136.5	19.2	N/A
8/1/2014	546.07	19.4	111.9	499.04	137.7	19.3	N/A
8/2/2014	546.10	19.6	111.7	499.10	123.6	19.4	N/A
8/3/2014	546.13	19.9	111.0	499.16	116.0	19.5	N/A
8/4/2014	546.16	20.0	111.2	499.22	117.1	19.6	N/A
8/5/2014	546.19	19.9	109.7	499.28	122.3	19.7	N/A
8/6/2014	546.22	19.8	107.7	499.34	132.0	19.7	N/A
8/7/2014	546.24	19.9	108.4	499.40	135.0	19.7	N/A
8/8/2014	546.27	19.7	107.1	499.46	126.4	19.6	109.2

Date	Wanapum Forebay			Wanapum Tailrace			
	Elevation (ft)	Temp (°C)	TDG (%SAT)	Elevation (ft)	Discharge (kcfs)	Temp (°C)	TDG (% SAT)
8/9/2014	546.30	19.9	108.5	499.52	126.2	19.6	109.2
8/10/2014	546.33	19.9	110.0	499.58	122.8	19.6	110.8
8/11/2014	546.36	19.9	110.3	499.64	127.1	19.7	110.5
8/12/2014	546.39	20.0	110.4	499.70	119.6	19.9	110.3
8/13/2014	546.42	20.1	108.4	499.76	117.7	20.0	109.4
8/14/2014	546.44	20.2	107.6	499.82	115.7	20.1	109.3
8/15/2014	546.47	20.2	108.1	499.88	109.9	20.0	109.0
8/16/2014	546.50	20.1	107.0	499.94	96.3	19.9	108.5
8/17/2014	546.53	20.5	107.9	500.00	94.3	20.0	109.3
8/18/2014	546.56	20.2	110.1	500.06	118.1	20.1	111.1
8/19/2014	546.59	20.3	109.2	500.12	125.3	20.2	110.5
8/20/2014	546.61	20.2	108.1	500.18	114.2	20.1	109.7
8/21/2014	546.64	20.4	108.2	500.24	108.0	20.3	113.6
8/22/2014	546.67	20.3	106.9	500.30	108.3	20.2	113.2
8/23/2014	546.70	20.3	106.9	500.36	106.7	20.1	112.8
8/24/2014	546.73	20.2	107.1	500.42	92.4	20.1	114.1
8/25/2014	546.76	20.4	108.2	500.48	100.4	20.2	113.7
8/26/2014	546.79	20.3	108.5	500.54	119.4	20.1	113.6
8/27/2014	546.81	20.2	104.7	500.60	121.3	20.1	110.3
8/28/2014	546.84	20.1	102.8	500.66	115.3	20.1	106.4
8/29/2014	546.87	20.1	103.1	500.72	99.6	20.0	103.9
8/30/2014	546.90	19.8	102.8	500.78	96.2	19.7	103.5
8/31/2014	546.93	19.4	101.5	500.84	91.1	19.4	102.3
9/1/2014	546.96	19.4	102.1	500.90	75.0	19.2	102.4
9/2/2014	546.98	19.3	102.5	500.96	87.5	19.3	103.5
9/3/2014	547.01	19.3	101.3	501.02	81.3	19.2	102.1
9/4/2014	547.04	19.6	103.2	501.08	78.7	19.4	103.6
9/5/2014	547.07	19.7	105.0	501.14	71.8	19.5	106.3
9/6/2014	547.10	19.8	104.1	501.20	78.7	19.6	104.3
9/7/2014	547.13			501.26			
9/8/2014	547.16	19.5	104.0	501.32	61.1	N/A	N/A
9/9/2014	547.18	19.4	103.6	501.38	55.7	N/A	N/A
9/10/2014	547.21	19.5	104.9	501.44	73.0	19.4	105.7
9/11/2014	547.24	19.2	103.2	501.50	62.3	19.1	104.9
9/12/2014	547.27	19.1	104.1	501.56	63.6	18.9	105.8
9/13/2014	547.30	19.1	104.4	501.62	59.3	18.8	105.8
9/14/2014	547.33	19.0	104.2	501.68	47.2	18.8	105.7
9/15/2014	547.35	19.0	105.6	501.74	65.0	18.7	106.9
9/16/2014	547.38	19.0	108.4	501.80	77.1	18.8	109.6

Date	Wanapum Forebay			Wanapum Tailrace			
	Elevation (ft)	Temp (°C)	TDG (%SAT)	Elevation (ft)	Discharge (kcfs)	Temp (°C)	TDG (% SAT)
9/17/2014	547.41	18.9	107.8	501.86	72.0	18.8	108.6
9/18/2014	547.44	18.8	103.1	501.92	52.9	18.7	105.8
9/19/2014	547.47	18.8	100.8	501.98	59.8	18.7	103.0
9/20/2014	547.50	19.2	102.9	502.04	70.3	19.0	103.9
9/21/2014	547.53	19.5	106.4	502.10	67.9	19.3	107.3
9/22/2014	547.55	19.5	105.6	502.16	72.6	19.3	106.6
9/23/2014	547.58	19.4	104.3	502.22	72.6	19.3	105.5
9/24/2014	547.61	19.3	103.5	502.28	68.5	19.2	104.7
9/25/2014	547.64	19.0	102.4	502.34	71.4	19.0	103.9
9/26/2014	547.67	19.0	102.6	502.40	68.7	18.9	103.4
9/27/2014	547.70	19.0	102.4	502.46	71.0	18.9	103.7
9/28/2014	547.72	19.1	102.8	502.52	66.5	19.0	103.5
9/29/2014	547.75	18.9	102.2	502.58	70.0	18.8	103.3
9/30/2014	547.78	18.3	100.3	502.64	55.7	18.3	101.1
10/1/2014	547.81	18.1	100.5	502.70	59.2	18.0	101.1
10/2/2014	547.84	18.3	101.7	502.76	74.2	18.1	101.5
10/3/2014	547.87	18.3	104.5	502.82	78.1	18.2	105.1
10/4/2014	547.90	18.3	103.7	502.88	60.5	18.1	104.0
10/5/2014	547.92	18.3	103.4	502.94	72.4	18.1	102.9
10/6/2014	547.95	18.3	103.3	503.00	79.7	18.1	103.7
10/7/2014	547.98	18.3	105.6	503.06	85.4	18.2	105.5
10/8/2014	548.01	18.4	103.6	503.12	74.0	18.3	103.9
10/9/2014	548.04	18.4	102.8	503.18	74.4	18.3	102.5
10/10/2014	548.07	18.3	102.1	503.24	72.5	18.2	102.3
10/11/2014	548.09	18.0	101.4	503.30	54.3	N/A	N/A
10/12/2014	548.12	17.6	99.7	503.36	58.2	N/A	N/A
10/13/2014	548.15	17.7	102.8	503.42	77.9	17.8	103.2
10/14/2014	548.18	17.7	106.9	503.48	74.7	17.7	106.5
10/15/2014	548.21	17.5	103.7	503.54	77.9	17.5	104.9
10/16/2014	548.24	17.3	101.1	503.60	76.2	17.3	101.3
10/17/2014	548.27	17.1	100.7	503.66	66.9	17.1	101.1
10/18/2014	548.29	17.1	101.0	503.72	59.5	17.1	101.3
10/19/2014	548.32	17.1	101.4	503.78	50.1	17.0	102.0
10/20/2014	548.35	16.9	102.4	503.84	75.5	16.9	103.3
10/21/2014	548.38	16.7	104.3	503.90	73.9	16.7	104.8
10/22/2014	548.41	16.6	105.4	503.96	57.1	16.6	105.6
10/23/2014	548.44	16.4	100.4	504.02	70.5	16.4	101.2
10/24/2014	548.46	16.2	101.3	504.08	73.2	16.1	101.4
10/25/2014	548.49	16.0	103.8	504.14	70.3	15.9	103.9

Date	Wanapum Forebay			Wanapum Tailrace			
	Elevation (ft)	Temp (°C)	TDG (%SAT)	Elevation (ft)	Discharge (kcfs)	Temp (°C)	TDG (% SAT)
10/26/2014	548.52	15.8	102.3	504.20	56.8	15.8	102.5
10/27/2014	548.55	15.4	98.8	504.26	78.1	15.3	99.4
10/28/2014	548.58	15.2	102.8	504.32	91.5	15.2	102.7
10/29/2014	548.61	15.1	102.6	504.38	75.4	15.0	102.5
10/30/2014	548.64	15.2	100.3	504.44	95.0	15.2	100.5
10/31/2014	548.66	15.0	101.4	504.50	87.0	15.0	101.0
11/1/2014	548.69	14.8	99.0	504.56	81.1	14.8	99.6
11/2/2014	548.72	14.3	97.8	504.62	54.6	14.3	98.9
11/3/2014	548.75	14.3	97.4	504.68	73.1	14.3	98.4
11/4/2014	548.78	14.4	100.7	504.74	92.0	14.4	101.1
11/5/2014	548.81	14.4	101.0	504.80	84.3	14.4	101.3
11/6/2014	548.83	14.6	100.0	504.86	94.5	14.6	100.3
11/7/2014	548.86	14.3	97.6	504.92	91.0	14.3	98.0
11/8/2014	548.89	14.2	97.6	504.98	92.4	14.2	98.0
11/9/2014	548.92	14.1	98.9	505.05	89.7	14.1	99.2
11/10/2014	548.95	14.0	97.4	505.11	89.3	14.0	97.9
11/11/2014	548.98	13.4	96.1	505.17	89.2	13.5	96.6
11/12/2014	549.01	12.8	96.1	505.23	96.9	12.8	99.0
11/13/2014	549.03	12.4	96.8	505.29	122.0	12.4	101.8
11/14/2014	549.06	12.4	96.5	505.35	114.2	12.3	99.4
11/15/2014	549.09	12.0	95.1	505.41	104.5	12.0	96.8

Table A-2 Priest Rapids Daily Averages

Date	Priest Rapids Forebay			Priest Rapids Tailrace			
	Elevation (ft)	Temp (°C)	TDG (%SAT)	Elevation (ft)	Discharge (kcfs)	Temp (°C)	TDG (% SAT)
4/16/2014	486.42	6.7	109.6	412.07	158.6	6.9	111.9
4/17/2014	486.89	6.5	112.8	412.74	166.8	6.8	113.6
4/18/2014	485.63	6.5	112.5	412.94	177.1	6.7	113.4
4/19/2014	484.80	6.5	111.6	412.41	170.2	6.8	112.9
4/20/2014	484.35	6.6	110.7	411.90	160.8	6.9	112.1
4/21/2014	485.42	6.8	110.5	412.26	167.6	7.0	111.5
4/22/2014	485.50	6.9	110.7	411.93	165.8	7.2	113.0
4/23/2014	485.62	7.1	113.5	412.44	175.5	7.3	114.7
4/24/2014	485.48	7.2	114.7	411.89	167.5	7.4	115.4
4/25/2014	485.55	7.4	115.4	411.49	159.7	7.5	115.5
4/26/2014	486.38	7.6	115.0	412.54	179.9	7.7	116.3
4/27/2014	486.09	7.9	115.3	412.10	169.0	8.0	115.9
4/28/2014	485.94	8.1	114.5	413.04	184.0	8.2	115.6
4/29/2014	485.22	8.3	115.6	412.48	171.8	8.4	115.3
4/30/2014	485.73	8.6	116.3	412.32	175.0	8.7	116.6
5/1/2014	485.72	8.9	117.6	413.15	188.0	9.0	117.9
5/2/2014	485.05	9.3	116.2	412.61	173.6	9.4	116.2
5/3/2014	485.41	9.6	115.0	413.34	189.9	9.7	116.9
5/4/2014	486.17	9.6	115.0	413.42	190.8	9.7	117.0
5/5/2014	486.41	9.7	115.7	414.20	204.0	9.8	117.4
5/6/2014	484.79	9.7	115.4	413.78	189.6	9.9	115.9
5/7/2014	485.81	10.0	115.5	412.46	171.3	10.1	115.0
5/8/2014	486.89	10.1	117.1	413.69	197.5	10.2	118.3
5/9/2014	486.10	9.9	116.0	413.00	177.8	10.0	116.2
5/10/2014	485.82	9.8	113.4	412.56	173.9	10.0	114.4
5/11/2014	486.41	10.0	113.2	413.60	190.2	10.2	116.1
5/12/2014	486.11	10.3	114.8	413.39	183.3	10.5	114.7
5/13/2014	485.78	10.5	117.9	413.61	186.2	10.7	116.5
5/14/2014	485.59	10.7	117.4	413.18	182.6	10.9	117.0
5/15/2014	486.86	10.9	116.3	413.99	199.6	11.1	117.8
5/16/2014	487.19	11.1	116.1	413.53	198.1	11.2	119.0
5/17/2014	487.33	11.1	115.7	415.06	221.8	11.3	119.3
5/18/2014	486.93	11.1	116.8	414.59	214.6	11.2	119.7
5/19/2014	485.92	11.1	115.2	414.50	205.6	11.2	117.8
5/20/2014	485.51	11.2	117.9	415.16	216.7	11.4	119.0
5/21/2014	485.44	11.4	117.1	414.22	201.7	11.6	118.9
5/22/2014	486.37	11.7	118.3	414.96	214.8	11.8	119.1
5/23/2014	486.49	11.9	118.7	415.02	213.5	12.0	119.6

Date	Priest Rapids Forebay			Priest Rapids Tailrace			
	Elevation (ft)	Temp (°C)	TDG (%SAT)	Elevation (ft)	Discharge (kcfs)	Temp (°C)	TDG (% SAT)
5/24/2014	486.28	11.9	119.5	415.80	224.3	12.0	119.7
5/25/2014	486.42	12.0	118.3	414.81	212.2	12.2	119.3
5/26/2014	486.65	12.0	120.5	415.65	218.8	12.2	120.1
5/27/2014	486.10	12.0	118.5	415.32	220.7	12.2	119.7
5/28/2014	485.37	11.9	116.3	414.25	199.9	12.0	117.4
5/29/2014	485.11	12.0	117.0	415.68	224.7	12.1	118.7
5/30/2014	484.14	12.3	121.3	414.67	200.0	12.3	119.4
5/31/2014	485.39	12.7	119.8	413.39	192.6	12.8	119.5
6/1/2014	486.93	12.9	122.4	416.19	237.0	13.0	121.4
6/2/2014	485.14	13.2	125.6	416.31	228.2	13.2	122.8
6/3/2014	485.01	13.5	119.3	414.15	205.2	13.6	119.6
6/4/2014	485.32	13.7	118.4	415.12	214.6	13.8	119.3
6/5/2014	485.62	13.8	117.6	414.84	213.2	13.9	118.8
6/6/2014	484.66	13.8	119.0	415.25	212.0	13.9	118.9
6/7/2014	484.84	13.9	114.5	413.38	182.3	14.0	114.4
6/8/2014	485.44	14.2	113.8	413.26	182.8	14.2	114.2
6/9/2014	485.41	14.3	113.5	413.65	193.5	14.4	115.8
6/10/2014	484.97	14.3	112.6	413.33	181.6	14.3	113.5
6/11/2014	484.87	14.3	111.4	412.68	171.7	14.3	111.5
6/12/2014	484.58	14.3	113.5	411.75	157.9	14.4	113.5
6/13/2014	483.82	14.3	110.7	410.64	142.1	14.3	111.2
6/14/2014	484.42	14.1	107.1	410.38	138.3	14.1	109.2
6/15/2014	484.47	14.2	107.7	409.09	123.0	14.2	109.8
6/16/2014	485.26	14.0	107.3	409.81	135.7	14.0	109.7
6/17/2014	485.60	13.8	107.6	412.07	165.6	13.8	109.7
6/18/2014	484.89	14.0	109.8	412.37	167.5	13.9	110.9
6/19/2014	486.94	14.2	114.2	414.10	203.4	14.3	116.4
6/20/2014	486.49	14.4	115.3	413.55	190.9	14.4	117.0
6/21/2014	487.31	14.5	115.2	414.45	208.5	14.6	117.3
6/22/2014	487.26	14.9	118.2	414.34	204.9	14.9	118.5
6/23/2014	487.26	15.2	118.2	414.96	213.7	15.2	118.9
6/24/2014	486.59	15.6	116.0	414.34	204.3	15.6	117.5
6/25/2014	486.94	15.6	116.9	413.98	198.0	15.6	117.4
6/26/2014	487.55	15.5	117.8	414.41	205.9	15.6	118.3
6/27/2014	487.40	15.4	115.4	414.32	203.7	15.4	116.9
6/28/2014	487.61	15.7	115.6	413.68	196.7	15.6	117.3
6/29/2014	487.33	15.7	114.9	415.24	223.1	15.8	118.2
6/30/2014	486.98	15.7	114.3	414.08	197.1	15.7	115.7
7/1/2014	486.77	16.0	116.2	415.05	215.6	16.1	118.3

Date	Priest Rapids Forebay			Priest Rapids Tailrace			
	Elevation (ft)	Temp (°C)	TDG (%SAT)	Elevation (ft)	Discharge (kcfs)	Temp (°C)	TDG (% SAT)
7/2/2014	487.17	16.1	119.7	414.73	208.8	16.2	119.0
7/3/2014	487.42	16.2	116.5	414.53	208.0	16.2	117.9
7/4/2014	487.33	16.1	116.2	413.42	192.9	16.1	117.4
7/5/2014	487.54	16.3	112.4	411.54	159.2	16.3	113.8
7/6/2014	487.43	16.5	113.6	413.35	186.1	16.5	116.2
7/7/2014	466.81	17.0	113.3	413.55	185.3	17.0	115.7
7/8/2014	487.14	17.4	113.3	412.13	166.2	17.3	114.4
7/9/2014	487.11	17.6	111.2	411.51	157.2	17.5	113.4
7/10/2014	487.46	17.5	110.3	412.25	170.0	17.5	112.8
7/11/2014	487.38	17.5	111.2	412.00	164.3	17.5	113.3
7/12/2014	487.28	17.7	111.8	412.62	176.4	17.7	114.0
7/13/2014	486.45	17.6	111.3	411.52	155.9	17.6	113.5
7/14/2014	486.67	17.7	110.9	410.16	140.6	17.7	113.1
7/15/2014	487.74	17.9	111.7	412.11	168.8	17.9	114.2
7/16/2014	487.35	18.0	111.6	412.33	170.9	18.0	114.3
7/17/2014	487.12	18.1	110.1	411.06	151.4	18.1	113.0
7/18/2014	486.80	18.2	106.6	411.01	150.3	18.1	110.4
7/19/2014	486.83	18.3	106.5	410.52	144.2	18.2	110.5
7/20/2014	487.16	18.2	107.9	409.88	135.9	18.2	111.4
7/21/2014	486.62	18.0	106.1	411.07	152.9	18.0	110.2
7/22/2014	486.80	18.1	107.1	409.62	132.5	18.0	111.1
7/23/2014	487.44	18.0	108.5	411.07	152.9	18.0	111.9
7/24/2014	487.71	17.7	107.6	410.97	153.8	17.7	111.5
7/25/2014	487.80	17.6	109.3	412.79	180.5	17.6	113.4
7/26/2014	487.29	17.8	109.8	411.82	162.5	17.8	112.6
7/27/2014	486.62	18.1	110.2	411.38	154.8	18.0	112.9
7/28/2014	486.31	18.5	110.2	411.09	152.2	18.4	112.9
7/29/2014	486.22	18.9	109.6	410.74	146.3	18.9	112.8
7/30/2014	486.70	19.4	108.9	410.26	140.8	19.3	112.5
7/31/2014	487.23	19.5	109.1	410.29	141.1	19.5	112.4
8/1/2014	486.95	19.7	110.0	410.82	148.0	19.6	113.1
8/2/2014	486.74	19.8	110.3	409.46	128.4	19.7	113.0
8/3/2014	486.77	19.8	109.6	408.87	121.4	19.7	113.1
8/4/2014	486.57	20.1	109.6	408.55	118.3	19.9	112.8
8/5/2014	487.27	20.1	108.4	409.19	127.2	20.0	112.5
8/6/2014	486.28	20.0	106.2	410.24	141.3	20.0	110.8
8/7/2014	486.34	19.9	106.6	410.14	137.1	19.9	110.8
8/8/2014	487.23	20.0	106.6	409.26	129.6	19.9	110.7
8/9/2014	486.87	19.8	106.0	409.97	131.5	19.8	109.4

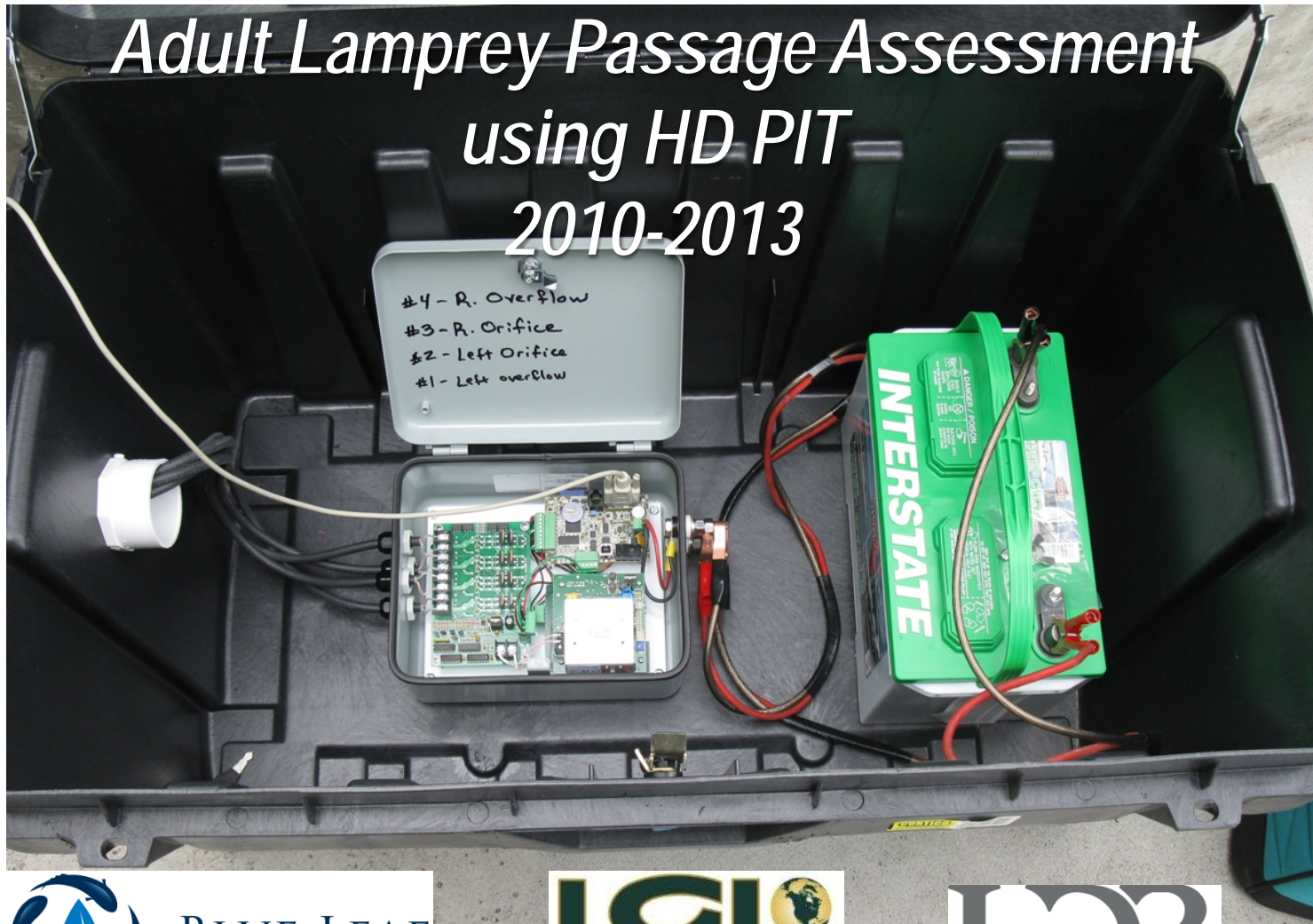
Date	Priest Rapids Forebay			Priest Rapids Tailrace			
	Elevation (ft)	Temp (°C)	TDG (%SAT)	Elevation (ft)	Discharge (kcfs)	Temp (°C)	TDG (% SAT)
8/10/2014	486.86	20.1	109.0	409.55	126.7	19.9	111.6
8/11/2014	485.81	20.0	109.8	410.06	126.6	19.9	112.2
8/12/2014	485.54	20.0	109.4	408.75	112.9	20.0	112.0
8/13/2014	485.42	20.1	107.7	409.61	121.2	20.1	110.7
8/14/2014	484.90	20.2	107.5	408.80	116.3	20.2	110.6
8/15/2014	484.91	20.3	107.9	408.17	113.4	20.2	110.9
8/16/2014	485.74	20.5	107.4	406.33	91.8	20.2	111.5
8/17/2014	486.80	20.3	106.8	406.72	98.3	20.2	112.4
8/18/2014	485.87	20.5	108.3	408.20	116.6	20.4	112.3
8/19/2014	485.54	20.5	109.2	409.88	137.3	20.4	112.5
8/20/2014	484.48	20.4	106.8	408.65	114.0	20.3	110.0
8/21/2014	485.04	20.3	106.2	408.02	110.6	20.2	110.8
8/22/2014	484.90	20.5	110.2	407.98	111.4	20.3	112.1
8/23/2014	484.55	20.5	110.7	408.19	111.0	20.4	111.8
8/24/2014	485.25	20.5	111.5	406.14	91.2	20.4	113.2
8/25/2014	485.25	20.5	111.4	406.97	97.5	20.3	113.0
8/26/2014	485.44	20.5	111.8	409.30	128.8	20.4	113.4
8/27/2014	484.48	20.4	111.3	409.08	125.9	20.4	112.7
8/28/2014	484.10	20.5	106.8	408.71	115.4	20.4	109.3
8/29/2014	486.24	20.2	103.4	407.98	99.6	20.2	104.5
8/30/2014	486.09	20.1	101.2	407.99	99.8	20.0	102.8
8/31/2014	486.51	19.8	100.4	407.29	95.5	19.6	102.2
9/1/2014	486.78	19.4	99.8	405.82	75.5	19.3	102.0
9/2/2014	486.31	19.4	101.2	407.23	94.4	19.2	102.9
9/3/2014	485.14	19.3	100.4	405.98	79.6	19.2	102.3
9/4/2014	485.67	19.3	99.7	406.02	80.9	19.2	101.9
9/5/2014	484.61	19.5	100.9	404.86	71.0	19.5	102.5
9/6/2014	485.11	19.6	104.6	404.22	75.7	19.6	105.5
9/7/2014	485.54			402.99			
9/8/2014	486.96	19.9	102.8	403.73	57.8	19.8	105.1
9/9/2014	487.43	19.6	100.7	403.62	56.9	19.5	103.4
9/10/2014	487.44	19.3	100.4	404.77	71.9	19.2	103.1
9/11/2014	487.10	19.2	100.3	404.30	62.1	19.1	102.5
9/12/2014	485.53	19.2	102.9	405.76	76.8	19.0	104.1
9/13/2014	484.53	18.9	103.1	404.37	62.8	18.8	104.0
9/14/2014	484.05	18.9	103.2	402.89	48.3	18.9	104.4
9/15/2014	484.68	19.0	103.7	404.82	59.1	18.9	104.6
9/16/2014	485.56	18.9	105.1	405.93	79.1	18.9	105.5
9/17/2014	484.95	19.0	108.0	405.80	77.2	18.9	107.6

Date	Priest Rapids Forebay			Priest Rapids Tailrace			
	Elevation (ft)	Temp (°C)	TDG (%SAT)	Elevation (ft)	Discharge (kcfs)	Temp (°C)	TDG (% SAT)
9/18/2014	483.62	19.0	106.5	404.09	59.0	18.9	107.1
9/19/2014	484.24	18.8	102.1	402.41	45.9	18.8	103.6
9/20/2014	486.52	18.9	101.6	404.83	70.8	18.9	103.0
9/21/2014	486.56	19.1	102.5	405.04	69.7	19.1	103.4
9/22/2014	486.05	19.4	105.4	405.92	77.9	19.3	105.1
9/23/2014	485.09	19.5	105.7	405.76	77.6	19.4	105.7
9/24/2014	484.16	19.3	103.4	404.88	71.1	19.3	104.2
9/25/2014	484.02	19.2	103.1	405.40	73.3	19.1	103.3
9/26/2014	484.95	19.0	102.3	404.50	65.9	18.9	102.6
9/27/2014	485.49	19.0	102.3	405.19	72.3	18.8	102.7
9/28/2014	485.16	19.0	103.3	404.32	63.9	18.9	103.6
9/29/2014	485.79	19.1	103.0	405.50	72.7	19.0	103.9
9/30/2014	484.11	18.8	100.9	403.71	56.6	18.6	101.9
10/1/2014	485.11	18.1	99.1	403.29	53.7	18.0	100.6
10/2/2014	485.92	17.8	99.3	405.33	73.8	17.7	100.1
10/3/2014	485.80	18.0	101.0	406.28	82.2	17.8	101.0
10/4/2014	485.55	18.1	104.3	403.68	57.8	18.0	103.8
10/5/2014	486.35	18.2	104.8	405.30	71.5	18.1	105.0
10/6/2014	485.74	18.3	103.6	406.72	86.6	18.2	104.3
10/7/2014	485.04	18.3	103.5	406.86	89.2	18.3	104.1
10/8/2014	484.93	18.4	103.9	405.21	72.6	18.2	104.2
10/9/2014	484.53	18.3	103.2	406.16	80.2	18.1	103.5
10/10/2014	484.85	18.3	102.4	404.33	63.4	18.2	102.8
10/11/2014	485.51	18.2	101.5	404.25	61.2	18.1	102.3
10/12/2014	485.39	17.8	100.2	402.72	49.0	17.6	101.1
10/13/2014	486.23	17.6	101.5	406.38	84.1	17.4	101.9
10/14/2014	485.68	17.6	102.3	405.61	76.3	17.3	102.0
10/15/2014	484.28	17.5	103.5	405.49	77.0	17.3	103.2
10/16/2014	485.10	17.3	102.5	406.11	82.6	17.0	102.4
10/17/2014	482.73	17.2	101.9	404.71	64.1	17.0	101.4
10/18/2014	484.87	17.1	100.5	403.92	57.4	16.9	100.8
10/19/2014	485.79	17.0	101.0	403.00	50.6	16.8	101.5
10/20/2014	485.86	17.0	101.8	404.87	72.2	16.8	101.9
10/21/2014	484.54	16.8	101.2	406.44	82.8	16.6	101.5
10/22/2014	483.80	16.6	103.0	404.16	58.1	16.4	102.6
10/23/2014	483.93	16.4	103.3	405.22	73.3	16.2	104.5
10/24/2014	484.75	16.2	100.2	403.87	57.6	16.0	100.8
10/25/2014	485.71	16.0	101.3	406.15	82.5	15.8	101.6
10/26/2014	483.76	15.7	101.2	404.05	59.3	15.4	101.3

Date	Priest Rapids Forebay			Priest Rapids Tailrace			
	Elevation (ft)	Temp (°C)	TDG (%SAT)	Elevation (ft)	Discharge (kcfs)	Temp (°C)	TDG (% SAT)
10/27/2014	484.07	15.3	99.6	405.13	71.5	15.1	99.9
10/28/2014	485.36	15.2	99.6	406.77	90.5	15.0	100.2
10/29/2014	484.06	15.2	101.0	406.09	78.8	15.0	100.6
10/30/2014	485.63	15.0	102.8	407.16	96.8	14.8	103.1
10/31/2014	484.79	15.1	100.6	407.01	91.0	14.9	101.0
11/1/2014	485.79	14.8	100.8	406.14	84.2	14.7	101.2
11/2/2014	483.07	14.4	98.1	404.13	59.8	14.2	98.8
11/3/2014	483.07	14.2	97.9	404.44	64.0	14.0	98.4
11/4/2014	485.54	14.2	98.5	407.23	94.7	14.1	99.1
11/5/2014	486.05	14.4	99.5	406.71	89.4	14.2	99.7
11/6/2014	485.25	14.4	102.2	406.94	91.3	14.2	102.4
11/7/2014	484.75	14.5	98.7	407.59	98.2	14.3	99.3
11/8/2014	484.89	14.2	98.4	407.07	91.3	14.1	98.8
11/9/2014	484.89	14.1	99.3	407.28	95.3	13.9	99.6
11/10/2014	484.41	13.9	97.8	406.83	90.5	13.7	98.2
11/11/2014	484.90	13.6	96.5	406.82	88.7	13.3	97.1
11/12/2014	484.88	12.8	96.2	406.93	93.1	12.6	96.8
11/13/2014	486.15	12.2	100.0	409.22	124.7	11.9	104.7
11/14/2014	486.30	12.1	100.8	409.36	123.0	11.8	102.7
11/15/2014	485.05	16.7	101.8	408.16	105.7	11.7	101.1

Lamprey in Priest Rapids Project

*Adult Lamprey Passage Assessment
using HD PIT
2010-2013*



BLUE LEAF
ENVIRONMENTAL



Alaska Research Associates, Inc.



Study Objectives

- Study Plan

- *“Assessment of Pacific Lamprey behavior and passage efficiency at Priest Rapids and Wanapum dams”*

- Relevant Objectives

- Determine the Fish Passage Efficiency (FPE) for adult lamprey at Priest Rapids and Wanapum dams and collaborative data sharing with ACOE and CPUD to assess adult passage in the Columbia River basin;
- Evaluate the passage of adult lamprey through sections of the Priest Rapids fishways where new structures have been installed to facilitate upstream movement.

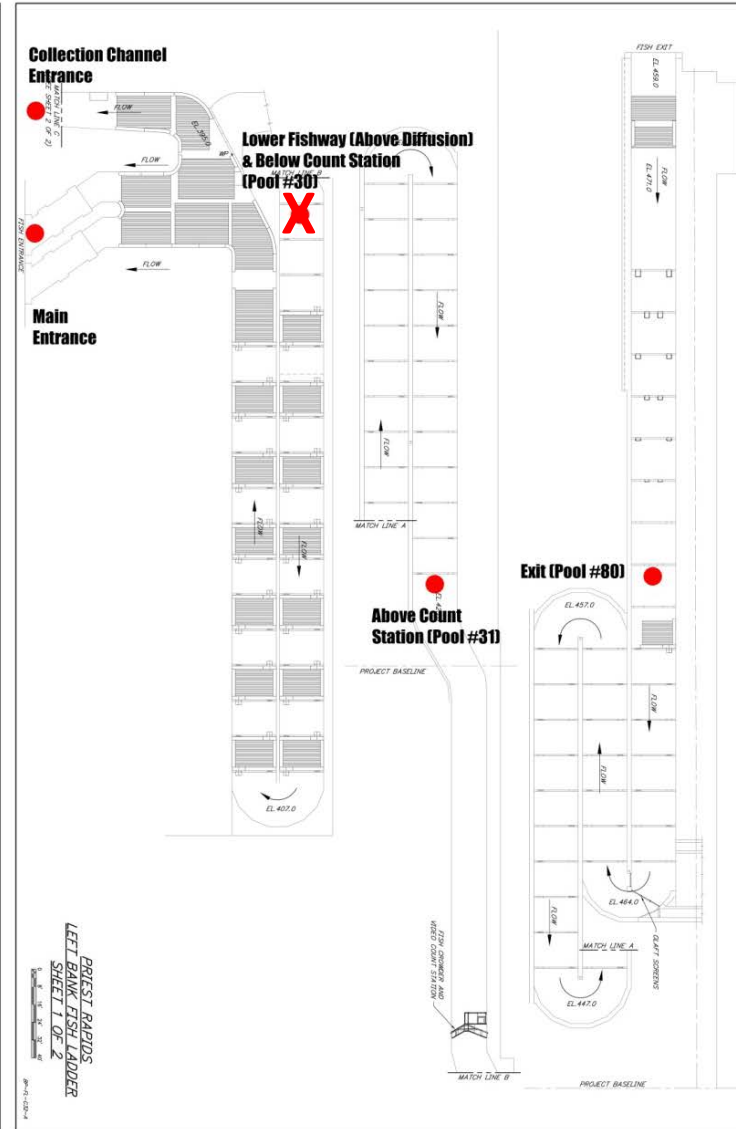
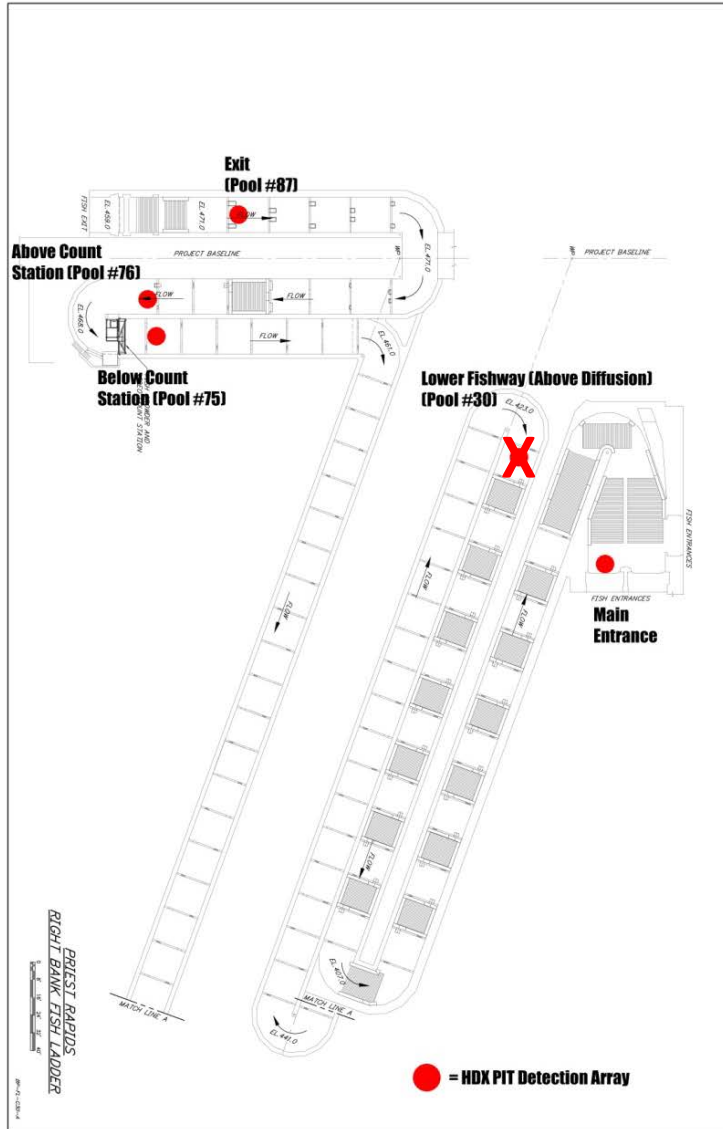
Study Approach – Passage Metrics

- HD PIT
 - Uniquely identifiable fish;
 - Application to entire size range of population;
 - Antennas installed at strategic locations;
- Fishway efficiency
 - Number of exits divided by number entrances
 - Fallback
 - And conversion rate (affected by potential mainstem spawning and overwintering??)
- Travel times
 - Time at location B minus time at location A.

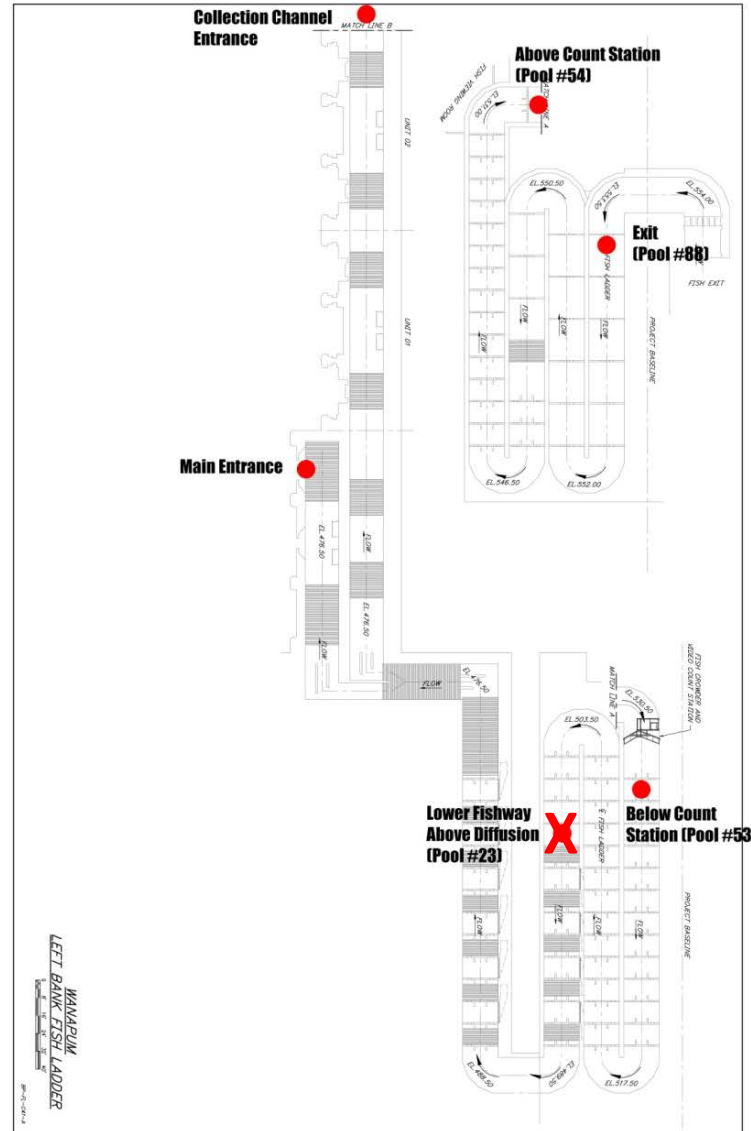
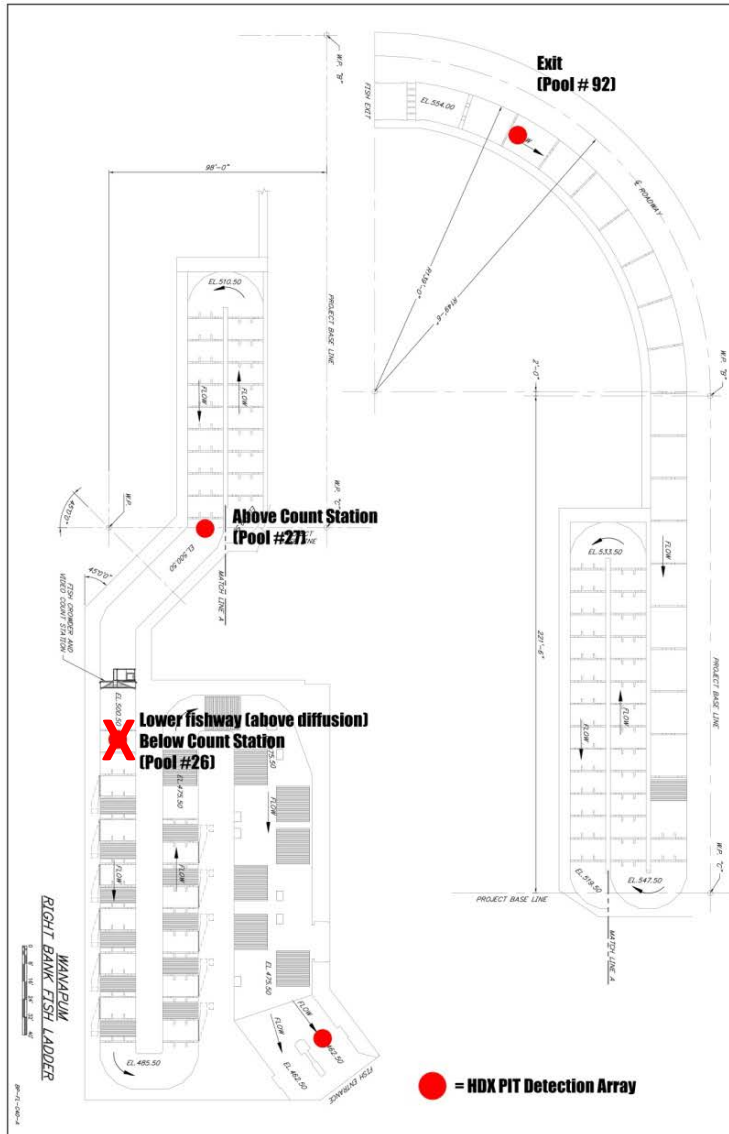
Study Activities

- Deploy and test HD PIT array;
 - Effort associated with array testing (beacon, efficiency testing)
- Operate array during lamprey passage;
- In-season data processing;
- Conduct analysis of lamprey detections to estimate passage metrics;

Priest Rapids arrays



Wanapum arrays



HD PIT - Configuration



HD PIT – Data Processing

- Diagnostics and download every two weeks;
- QA/QC Rx files;
- Review Rx files for valid codes;
- Import Rx files into Relational Database;
- QA/QC individual fish histories;
 - Data sharing USACE, U of I, Chelan PUD – regional contributions
 - Power outages lead to missed fish that are then “at large”
 - Long view of annual data sets will shed light on life histories
- Calculate metrics.

Background

2010 season

- GPUD implements PRFF approved study plan;
- Low run year – monitoring of tags applied downstream;
 - 470 fish tagged out of 6,234 counted at BON with 94 tagged fish (20%) predicted to make it past McNary.

2011 season

- Adult Monitoring Evaluation;
 - 1000 fish tagged out of 18,315 counted at BON with 200 tagged fish (20%) predicted to make it past McNary.

2012 season – robust run

- Continued Adult Monitoring Evaluation;
 - 1200 fish tagged out of ~100,000 counted at BON with 240 tagged fish (20%) predicted to make it past McNary.

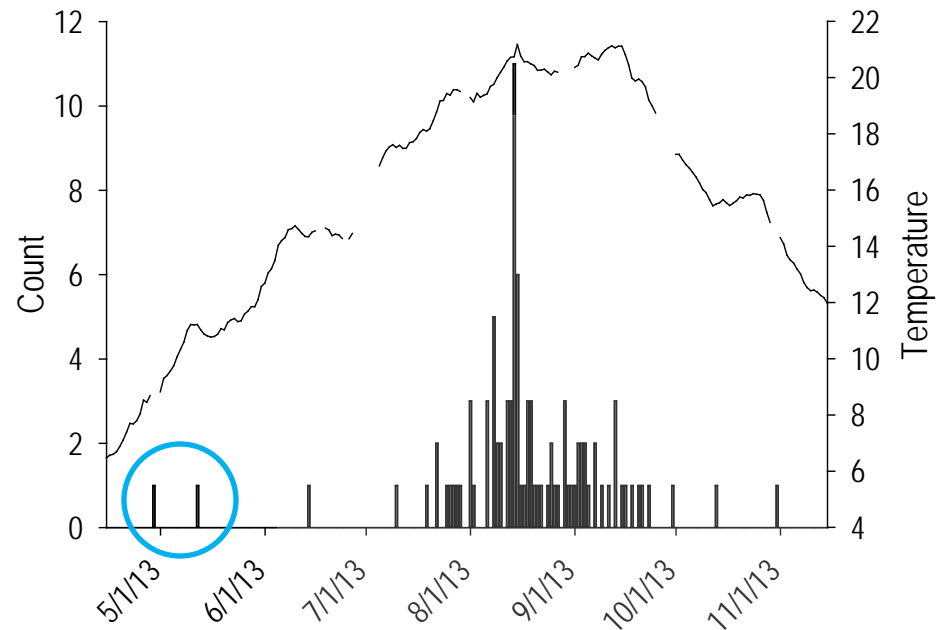
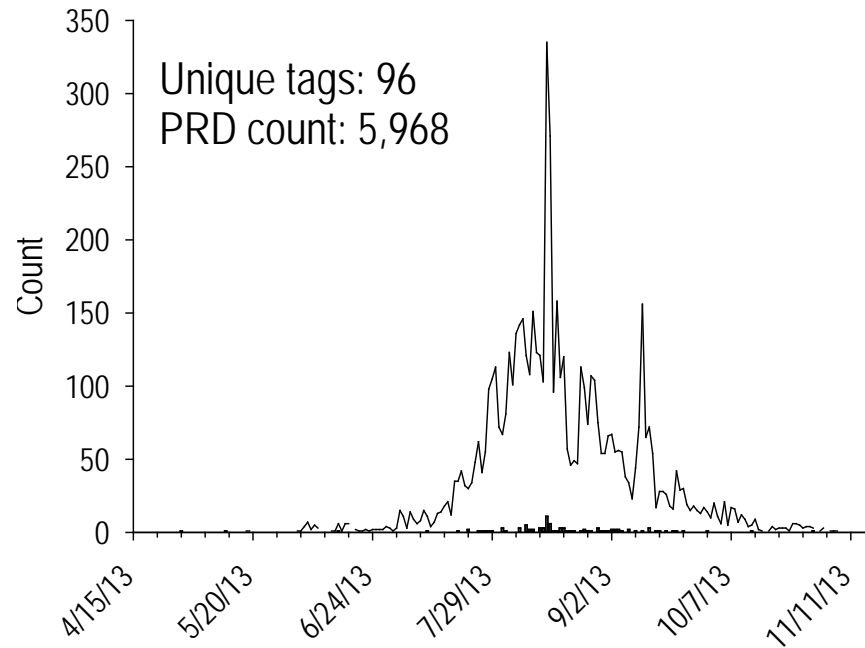
2013 season – robust run

- Continued Adult Monitoring Evaluation;
 - 901 fish tagged out of ~88,000 counted at BON with 180 tagged fish (20%) predicted to make it past McNary

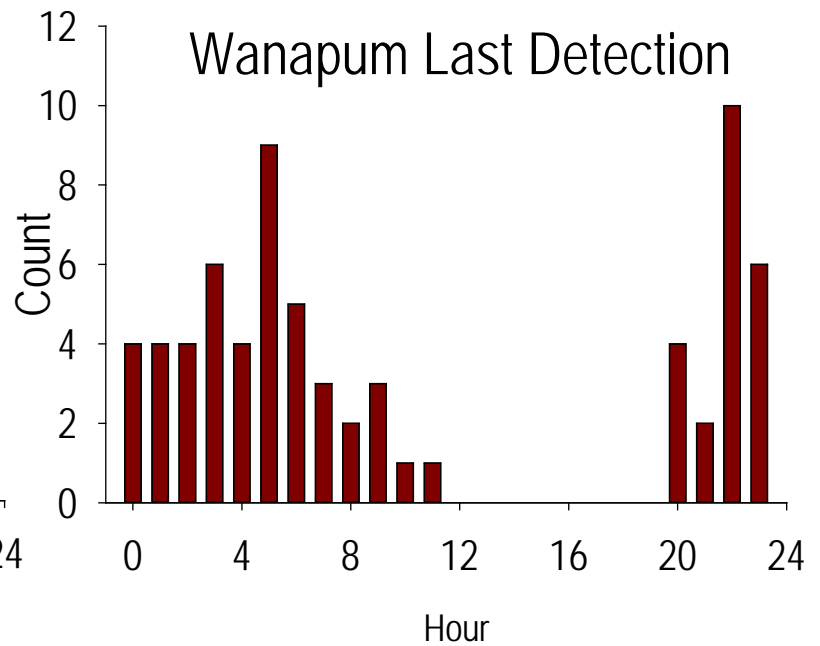
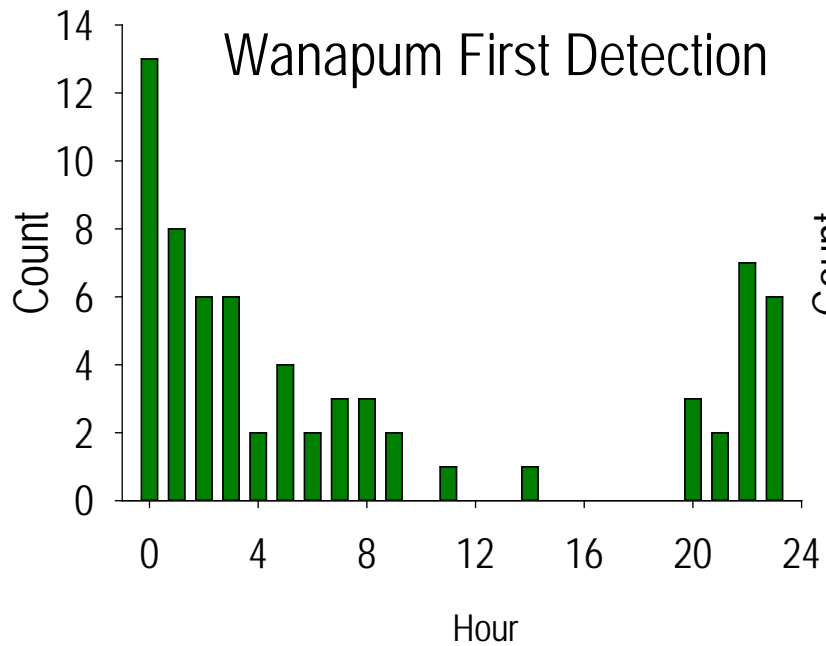
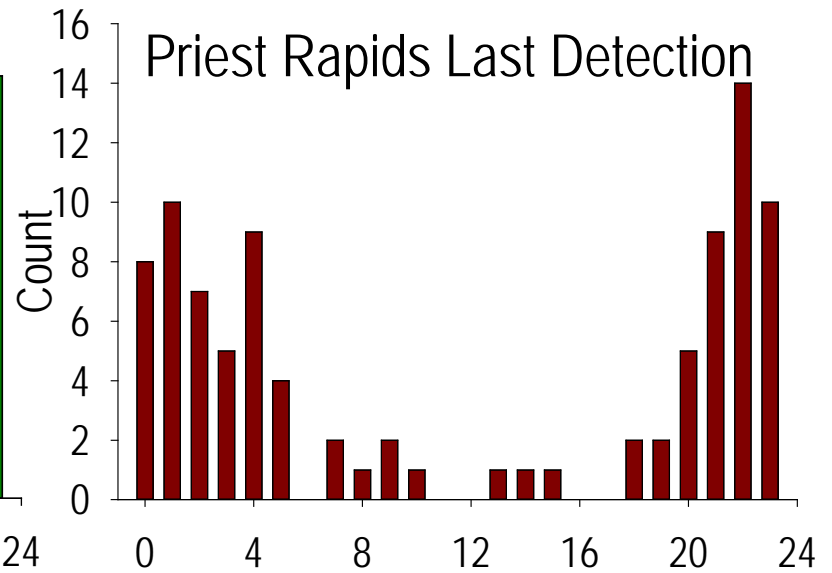
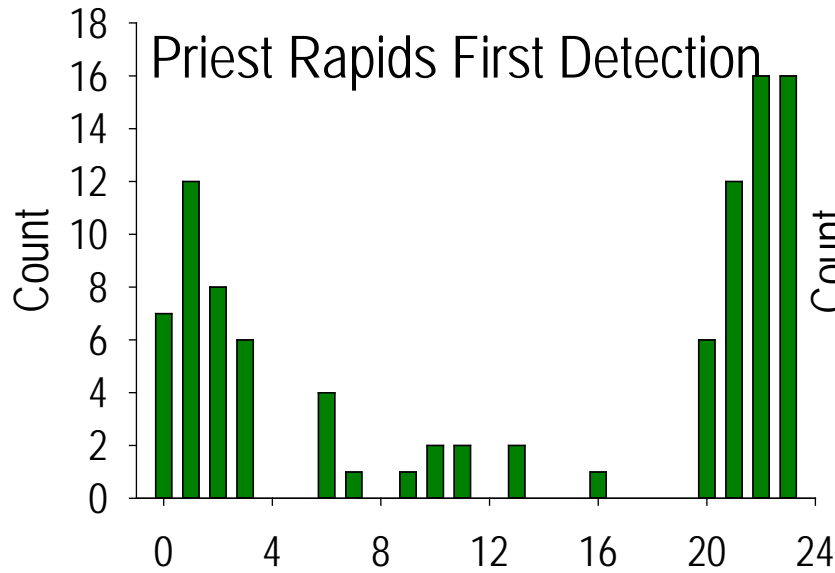
2013

Adult lamprey migration profile

- Arrival of tagged lamprey (tagged primarily at BON) occurred throughout the run at-large
- Most first-detections occurred during peak seasonal temperatures (>16° C)
- Monitoring in 2013 started in April and continued until fishway maintenance and dewatering
- 2014 monitoring will include all ladders that are in operation



2013 Diel Detection Patterns



HD PIT results – Combined 2010-2013

	PR	WA
Unique tags detected at dam	243	140
Total passage and exit	183	105
Right passage and exit	58	19
Left passage and exit	125	86
Total detected only at entrance	25	14
Right entrance	7	1
Left entrance	18	13
Total last detected in fishway	35	21
Right fishway	13	9
Left fishway	22	12
Total last in upstream pool	43-57	105

HD PIT results – FPE fishways

Fish Passage Efficiency (2010-2013)

	Left	Right	Total
Priest Rapids	69% (123 of 177)	72% (63 of 87)	70% (186 of 264)
Wanapum	79% (96 of 122)	53% (20 of 38)	73% (116 of 160)

Conservative/minimum estimates. Estimates do not account for fish at large. Detection efficiencies at PR exit readers ~75% from 2010-2012 (97% in 2013)

HD PIT – Fallback Events

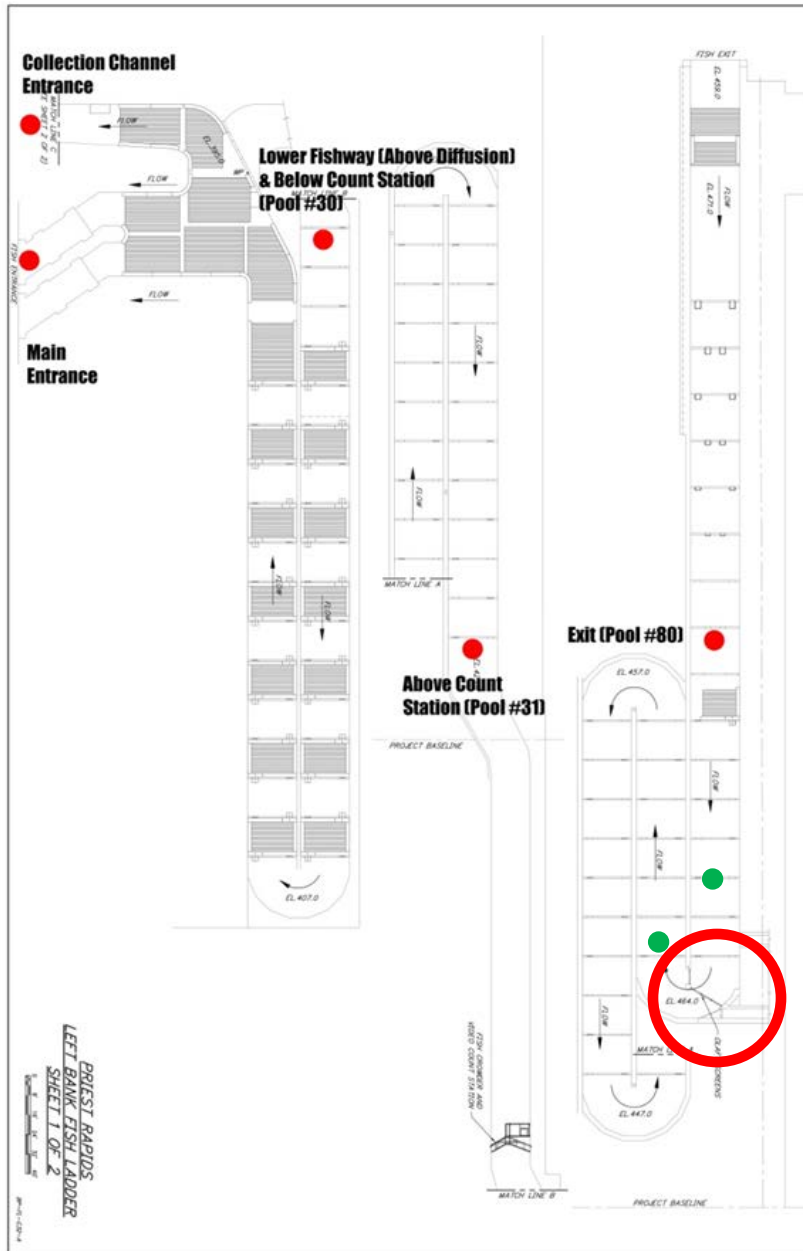
2010-2013	PR	WA
Fallback	3.8% (7 of 183)	2.9% (3 of 105)
Reascend	6	2
Net Fallback	1	1

HD PIT results – Passage Times

		2010-2012 combined	2013 Left	2013 Right
Priest Rapids	Median (d)	0.97	2.77	0.18
	Median (h)	23.21	66.50	4.32
	Count	60.00	35.00	22.00
Wanapum	Median (d)	1.00	0.66	0.56
	Median (h)	24.03	15.80	13.40
	Count	45.00	41.00	4.00

2013		Left entrance to count	Count to exit
Priest Rapids	Median (d)	0.08	1.5
	Median (h)	1.92	36.5
	Count	38	38

Priest Rapids left bank



- OLAFT is only feature unique to PR left fishway;
- Few adult lamprey reported in OLAFT



Priest Rapids Left Bank OLAFT



- OLAFT site is scheduled for installation of two new PIT readers during winter 2014-2015 to determine where passage delay occurs.
- Proposed PIT reader sites are just below and above the OLAFT entrance and exit.

Other observations

- 6 of 96 (6%) tags were from the previous tagging year, compared to 5% last year;
- Over-wintering/spawning behavior has implications for run-at-large counts
- 470 tags applied in 2010, 9 (2%) detected at PR;
- 1000 tags applied in 2011, 52 (5%) detected at PR;
- 1200 tags applied in 2012, 79 (7%) detected at PR
- 901 tags applied in 2013, 96 (11%) detected at PR
- 62% of fish exiting PR in 2013 were detected at WA;

Conclusions

- Grant PUD PLMP HD PIT program contributes substantially to the passage database, locally and regionally;
- Minimum FPE (<70%) and median travel times (1-2d) of tagged fish are in range of previous years data, except travel times for PR Left;
- Additional PIT stations at OLAFT in PR left should assess passage bottleneck;
- Grant PUD began maintaining entrance/exit readers active at all times when fishways are operational to evaluate winter movement
- Fallback fish usually re-ascend the dams;
- FPE is expected to improve through redetection of fish at large
- Study plan objectives are being achieved.

ECOPATH WITH ECOSIM MODEL

Purpose

The Priest Rapids Fish Forum (PRFF) is interested in investigating whether the Ecopath with Ecosim (EwE) model would be a useful tool to evaluate carrying capacity and stocking numbers of White sturgeon (*Acipenser transmontanus*) in the Priest Rapids Project Area (Project).

Model Introduction

The EwE model has been in development since the late 1990's and is centered at the University of British Columbia's Fisheries Center. The model is comprised of essentially three different parts: Ecopath, Ecosim, and Ecospace. Ecopath is a static, mass-balanced snapshot of the ecosystem. Ecosim is a dynamic module that introduces time to the equation. Ecospace uses spatial as well as temporal data to primarily investigate protected areas.

EwE is primarily a complex foodweb model that looks at trophic level biomass and their interactions. Each group in the model can be entered as entire populations or broken up into smaller sub levels, such as age/size classes.

Model Inputs

EwE begins with a simple linear equation for each group, or pool that the user enters into the model:

Production = catches + predation mortality + biomass accumulation + net migration + other mortality; or

$$P_i = Y_i + B_i \cdot M2_i + E_i + BA_i + P_i(1 - EE_i)$$

where P_i is the total production rate of (i), Y_i is the total fishery catch rate of (i), $M2_i$ is the total predation rate for group (i), B_i the biomass of the group, E_i the net migration rate (emigration – immigration), BA_i is the biomass accumulation rate for (i), while $MO_i = P_i \cdot (1 - EE_i)$ is the 'other mortality' rate for (i).

EwE parameterization sets up a linear equation for each group entered into the model and solves for one of the following parameters:

- Biomass;
- Production/biomass ratio;
- Consumption/biomass ratio; or
- Ecotrophic efficiency.

If all four parameters are entered into the model, the program will either calculate biomass accumulation or estimate the net migration rate. If only three of the parameters are entered, the following parameters must be entered for all groups:

- Catch rate;
- Net migration rate;

Biomass accumulation rate;
Assimilation rate; and
Diet compositions.

Current Information

Over the last several years, Grant PUD has conducted or funded several projects resulting in data that can be used to begin parameterizing the EwE model. Most of the data can be found in relicensing documents, such as:

Existing White sturgeon population structure
Juvenile stocking rates;
Juvenile survival;
Entrainment;
Seasonal consumption rates and species availability (i.e., juvenile salmonid);
Predator abundance;
Macro invertebrate abundance and densities; and
Water quality.

Obviously, the more data that can be entered into the model the better; however, it's not necessarily a requirement to exhaustively populate the model before useful information can be extracted. The model uses available data and becomes more predictable as data are added.

Recommendations

At this time, we are unaware of anyone that has used the EwE model to estimate carrying capacity for white sturgeon. In fact, we have no knowledge that anyone has included white sturgeon in an EwE model. Therefore, Grant PUD recommends that before any further investment of resources is used to begin populating the EwE model, the PRFF reaches an agreement by consensus that Grant PUD and the PRFF would use the model's output to determine future juvenile white sturgeon stocking in the Project beginning in 2016.