Grant County
PUBLIC UTILITY DISTRICT

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April 11, 2016

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
Mail Code: DHAC, PJ-12
888 First Street, N.E.
Washington, D.C. 20426

RE: **Priest Rapids Hydroelectric Project No. 2114**
License Compliance Filing – Calendar Year 2015 Activities Under Priest Rapids Hydroelectric Project

- **Article 401(a)(1) - Downstream Passage Alternatives Plan**
- **Article 401(a)(2) - Progress and Implementation Plan**
- **Article 401(a)(3) - Habitat Plans**
- **Article 401(a)(4) - Artificial Propagation, Hatchery and Genetic Management and Monitoring and Evaluation Plans**
- **Article 401(a)(8) - Priest Rapids Dam Alternatives Spill Measures Evaluation Plan**
- **Article 404 - Fishery Operation Plan**

Dear Ms. Bose,

Please find enclosed the 2015 Calendar Year Activities Under Priest Rapids Hydroelectric Project consistent with the requirements of Article 401(a)(1) Downstream Passage Alternatives Action Plan, Article 401(a)(2) Progress and Implementation Plan, Article 401(a)(3) Habitat Plans, Article 401(a)(4) Artificial Propagation, Hatchery and Genetic Management, and Monitoring and Evaluation, Article 401(a)(8) Priest Rapids Dam Alternatives Spill Measures Evaluation Plan and Article 404 Fishery Operations Plan (collectively referred to as the Fishery Articles) of the Priest Rapids Hydroelectric Project License (Project).

On June 15, 2012 the Federal Energy Regulatory Commission (FERC) issued an Order modifying and approving Public Utility District No.2 of Grant County, Washington's (Grant PUD's) May 1, 2012 request to modify the filing protocol and deadlines for the Fishery Articles. Under this Order, Grant PUD is required to file an annual report with FERC by April 15.

Grant PUD distributed this annual report to members of the Priest Rapids Coordinating Committee including National Marine Fisheries Service, U.S. Fish and Wildlife Service, Washington Department of Fish and Wildlife, Colville Confederated Tribes, Yakama Nation and the Columbia River Inter-Tribal Fish Commission on February 29, 2016 for review and comment. After a 30 day comment and review period, no comments were received.

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FERC staff with any questions should contact Tom Dresser at 509-754-5088, ext. 2312.

Respectfully,

Ross Hendrick
License Compliance Manager

Enclosures: Calendar Year 2015 Activities under Priest Rapids Hydroelectric Project

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CALENDAR YEAR 2015

ACTIVITIES UNDER PRIEST RAPIDS HYDROELECTRIC PROJECT LICENSE (FERC NO. 2114)

Public Utility District No. 2 of Grant County, Washington

March 2016

Executive Summary

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 altogether as the Priest Rapids Project (Project), and is operated under the terms and conditions of the Federal Energy Regulatory Commission (FERC) Hydroelectric Project License No. P-2114 issued by FERC on April 17, 2008.

Grant PUD operates the Project through the coordinated operation of the seven-dam system and other Columbia Basin entities with current operational agreements with the fishery agencies, tribal representatives and other operators to provide protection and improvement 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 (SSSA). The Project is also subject to the requirements 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 of 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 State Department of Ecology (WDOE), and the BiOp for the Priest Rapids Project issued by the United States Fish and Wildlife (USFWS) regarding the effect of the Project on bull trout.

This report is intended to fulfill the annual reporting requirement for the following License Articles:

- 401(a)(1) - Downstream Passage Alternatives Action Plan, including:
    - NMFS BiOp: 1.2 (Wanapum) and 1.11 (Priest Rapids)
    - NMFS and USFWS Fishway Prescriptions: 8 (Wanapum) and 14 (Priest Rapids);
- 401(a)(2) - Progress and Implementation (P&I) Plan, including:
    - 401(a)(3) - Habitat Plan[1];
    - 401(a)(6) Avian Predation Control Program[1]
    - 401(a)(7) – Northern Pikeminnow Removal Program[1]
    - NMFS BiOp: 1.33
    - NMFS and USFWS Fishway Prescription: 24
- 401(a)(4) - Artificial Propagation, Hatchery and Genetic Management, and Monitoring and Evaluation (for all species)
- 401(a)(8) - Priest Rapids Dam Alternative Spill Measures Evaluation; and
- 404 - Fishery Operations Plan Report.

[1] In FERC's approval of the following individual management plans, FERC directed Grant PUD to provide an annual account of the respective implementation activities in the annual P&I Plan

These license articles require that annual plans and reports be filed with FERC to document compliance with the requirements of the Project License and to propose plans for the coming year.

On May 1, 2012, Grant PUD filed a request with FERC to combine these individual reports into one comprehensive report and change the filing deadline to April 15 annually. The combination of the reports and revised filing date would ease coordination with the natural resource agencies and result in a more efficient review and approval process. FERC issued an Order on June 15, 2012 approving Grant PUD's request.

This report provides a description of the activities related to the implementation of protection, enhancement and mitigation measures required within the FERC License and issued orders, BiOp (NMFS & USFWS), and SSSA for the Priest Rapids Project completed during the calendar year January 1, through December 31, 2015. Information incorporated into this report is based upon activities occurring within the Priest Rapids Coordinating Committee (PRCC) and related subcommittees (Hatchery and Habitat) associated with achieving performance standards for:

- juvenile salmonids, juvenile and adult salmonids passage measures;
- predator control programs;
- No-Net-Impact and habitat funds, and
- hatchery supplementation and monitoring and evaluation.

Specific details on the suite of activities covered by this report can be found in Sections 2 through 5 below.

The activities and plans covered in this report occurred in consultation with the PRCC and its hatchery and habitat subcommittees and the Priest Rapids Fish Forum (PRFF). The PRCC and its hatchery and habitat subcommittees are made up of representatives from NMFS, USFWS, Washington Department of Fish and Wildlife (WDFW), Yakama Nation (YN), Confederated Tribes of the Umatilla Reservation (CTUIR), the Colville Confederated Tribes (CCT) and Grant PUD.

In conclusion of Grant PUD's response to the emergency drawdown of Wanapum Reservoir and termination of the Interim Fish Passage Operations Plan (IFPOP); Grant PUD filed a letter with FERC (January 30, 2015; 2015 Documentation) requesting that FERC determine that the emergency response would be under control as of May 1, 2015 and would be ready for Endangered Species Act (ESA) analysis and also end implementation of the Interim Fish Passage Operations Plan (IFPOP). FERC approved Grant PUD's request to discontinue implementation of the IFPOP on March 19, 2015. (2015 Documentation).

On June 12, 2015, Grant PUD filed a draft biological assessment with FERC which described the actions taken by Grant PUD in response to the emergency drawdown of the Wanapum Reservoir, the biological effects of Grant PUD's response to the emergency drawdown on federally listed Upper Columbia River (UCR) spring-run Chinook salmon, UCR steelhead, and bull trout, and the implementation of the IFPOP approved by the Commission on March 26, 2014.

On September 11, 2015, FERC requested NMFS and USFWS's concurrence with FERC's not likely to adversely affect determinations on federally listed UCR spring-run Chinook salmon, UCR steelhead, and bull trout, as well as their critical habitat (2015 Documentation). NMFS

filed a letter (2015 Documentation) finding that the emergency measures implemented under the IFPOP did not exceed the take limit set forth in NMFS's 2008 Biological Opinion (BiOp) nor were listed species or critical habitat affected in manner or extant material different from that BiOp analysis and therefore a new consultation under the ESA is not necessary. The USFWS responded to FERC that they believed that an "adversely to affect" would be more appropriate for the emergency situation (2015 Documentation). The USFWS communicated to FERC that they would issue an after the fact BiOp on implementation of the IFPOP as allowed under Section 7 of the ESA (135 days).

Grant PUD has achieved performance standards for yearling Chinook. The three year (2003-2005) consecutive arithmetic average of 86.59% for yearling Chinook exceeds the Project standard of 86.49% (Anglea et al. 2003, Anglea et al. 2004a and 2004b, Anglea et al. 2005; Table 1). During the required check-in for yearling Chinook in 2014, survival was estimated at 90.8% (CI=95%; SE=0.015), which is 4.3% above the required juvenile salmonid and steelhead Project passage survival standard of 86.49% (NOAA-Fisheries 2008).

Based on point estimates[2], survival for yearling Chinook utilizing the various passage routes at Wanapum and Priest Rapids dams (bypass, spillway and powerhouse) was greater than 96%, with the exception of powerhouse survival at Priest Rapids Dam (92.6%; Table 3). Although the fracture at Wanapum impacted day to day operation of the powerhouse, WFUB and spillway, observed survival at Wanapum Dam exceeded 97.0%. Specific details on the behavior and survival evaluation and can be reviewed in Hatch et al. (2015) and Skalski et al. (2014). Based on the current schedule, the next yearling Chinook evaluation is scheduled to occur in 2019.

Juvenile sockeye performance standards have also been achieved for the Priest Rapids Project. The three year (2009, 2010 and 2015) arithmetic average performance standard for juvenile sockeye passage through the Project is 91.7% (SE=0.0008; Skalski et al. 2009b; Skalski et al. 2010 and Hatch et al. 2016). Based on the current schedule, the next juvenile sockeye evaluation is scheduled to occur in 2020.

Grant PUD continues to strive to achieve juvenile steelhead performance standards for the Priest Rapids Project. In 2015, the survival estimate for juvenile steelhead migrating through the Priest Rapids Project was 83.7% (SE=0.027). Observed Wanapum development-level (reservoir and dam) passage survival for migrating juvenile steelhead was 85.5% (SE=0.017), while survival through Priest Rapids was 94.1% (SE=0.028). Passage survival at Wanapum and Priest Rapids dams ("concrete") was 97.1% (SE=0.014) and 99.6% (0.006), respectively. During 2015, point estimates for juvenile steelhead utilizing the various passage routes at Wanapum and Priest Rapids dams (bypass, spillway and powerhouse) was greater than 97.0%.

To determine potential reasons for low juvenile steelhead survival through the Priest Rapids Project, the PRCC developed a juvenile steelhead performance standard action plan (SAP) in 2012. The SAP was developed to document progress towards achieving the juvenile steelhead survival standards for the Priest Rapids Project, as required under Terms and Conditions 1.2 and 1.11 of the 2008 NMFS BiOp and assist with determining what additional measures and/or studies may be necessary to improve juvenile steelhead survival.

[2] Point Estimates are based on proportion of fish that are detected downstream at one or more locations that had been assigned a given passage route at each dam.

Since the development of the SAP, PRCC has conducted several evaluations funded through the No-Net-Impact fund (NNI fund; $3,567,010) to determine potential reasons for lower than expected juvenile steelhead survival within the Priest Rapids Project. A major finding of these evaluations indicates that avian predation by Caspian terns (*Hydroprogne caspia)* is one of the primary reasons for lower than expected survival for juvenile steelhead migrating through the Priest Rapids Projects. Evans et al. (2013) estimated that predation rates by Caspian terns on steelhead smolts tagged and released by Grant PUD during study years 2008-2010 ranged from 12.8% to 20.8%, indicating that predation by Caspian terns was a substantial source of smolt mortality within the Priest Rapids Project. The studies referenced above indicate that the tern colony located some 30 miles away represents a large threat to the out-migration of listed UCR steelhead. In Evan et al. 2013; they reported that annual consumption on UCR steelhead by terns has averaged 15.7% for years 2008 and 2010 (95% CI 14.1-18.9%).

To evaluate steady progress toward meeting performance standards and to adjust the NNI Fund, Grant PUD, in consultation with the PRCC, conducts survival studies. The results of these studies are used to estimate survival rates based on an arithmetic three-year average of the annual estimates. The annual contribution made into the NNI account prior to February 15, 2015 was $1,944,780.95.

The total amount of for annual contributions into the NNI Fund made by Grant PUD since 2006 is $25,551,548 (2006-2016). NNI Funds have been utilized by the PRCC to fund 23 separate projects ranging from predator removal, adult fish passage, habitat restoration, instream flow enhancements, avian predator evaluations, land acquisitions, fish screen monitoring, diversion assessment, and various research activities.

Grant PUD continues to implement avian and fish predator removal and control programs at the Priest Rapids Project. During the 2015 avian control effort, 5,906 birds were hazed, 54% of which were Caspian terns, and 707 birds were lethally removed. Additionally, Grant PUD removed a total of 845,205 northern pikeminnow during 2015. Removal methods included set lining (9,305), beach seining (831,167), electrofishing (718), and angling (4,015).

During 2015, outflow from the Wanapum Fish Bypass (WFB) was alternated between 15 and 20 kcfs between May 1, 2015 and June 15, 2015. The PRCC was interested in determining if the difference between these two operational scenarios (i.e. 15 kcfs flow vs. 20 kcfs flow) had a significant impact on fish passage efficiency (FPE) for juvenile steelhead and sockeye. FPE through the WFB for juvenile sockeye increased by approximately 7% when flow was reduced from 20 kcfs to 15 kcfs. However, an 11% decrease in FPE for juvenile steelhead was observed when flow through the bypass was reduced (20 kcfs to 15 kcfs). Due to the limited number (5) of test replicates, there was not enough statistical power within the evaluation to determine if the reduction in bypass flow (statistically) had an impact on the FPE of out-migrating salmonid smolts through the WFB.

The Priest Rapids Fish Bypass (PRFB) was completed in April 2014 and began operation during the start of the annual fish-spill program on April 18, 2014. The PRFB was designed to operate at a fix flow volume of 26 kcfs, with exact flow volume determined by forebay elevation. Hatch et al. (2015) reported the FPE for yearling Chinook and juvenile steelhead passing through the PRFB was 38.1% and 47.2%, respectively. Survival estimates for yearling Chinook and steelhead were derived via a paired-release study. Based on detection histories, the PRFB passage survival estimate was 99.8% for yearling Chinook and 99.6% for steelhead.

In 2015, Grant PUD collected information on FPE for juvenile sockeye and steelhead passing through the Priest Rapids turbines and derive survival estimates for both species passing via the turbines. Based on detection histories, FPE for both juvenile sockeye and for steelhead passing through the powerhouse was 34.8% for sockeye and 46.4% for juvenile steelhead. Passage survival for sockeye and steelhead passing through the Priest Rapids turbines was 93.4 and 95.5% respectively. Overall survival at Priest Rapids Dam ("concrete') based on point estimates was greater than 96.8% for both species. Juvenile sockeye survival at the "concrete" was 97.3%, while juvenile steelhead was 96.9%.

Grant PUD implements 11 hatchery programs as mitigation for the Project effects on anadromous salmonids and steelhead that pass through the Project area or are affected by Project operations. Under the 2006 SSSA Grant PUD agreed to achieve and maintain "no net impact" from the Project on steelhead; spring, summer and fall Chinook; sockeye; and coho salmon. In part, Grant PUD accomplishes this objective through hatchery propagation. Grant PUD's hatchery programs released approximately 7,253,854 fish into the upper Columbia River and its tributaries in 2015. Conservative estimates of fish propagation expenditures across all species was approximately $8,976,656 in 2015, and over $129,588,563 across all species since the inception of Grant PUD's hatchery programs. Of the $129 million spent to-date, about 47% comprised capital investments used to build new and/or modify existing facilities to meet Grant PUD's supplementation program needs. The remaining 53% has been used to support operations and maintenance and monitoring and evaluation activities associated with the programs.

The PRCC Habitat Subcommittee is the primary forum for implementing and directing habitat protection and restoration measures for the Project's anadromous fish programs covered under both the Biological Opinion and the SSSA. Since 2006, 84 total projects have been approved for funding using one of the three funding accounts (NNI Fund - 601, Habitat Supplemental Fund - 602, and Habitat Conservation Fund-603). Of those, 38 are completed and 46 are currently active and underway. Twelve new projects were approved in 2015 by the PRCC and/or PRCC Habitat Subcommittee with one from 601, seven from 602, and four from 603. The 2015 deposit for the NNI-601 is $1,944,780.95; the Habitat Supplemental-602 is $1,029,001.58; and Habitat BiOP-603 is $367,582.44.

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1.0 Introduction

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 altogether as the Priest Rapids Project (Project), and is operated under the terms and conditions of the Federal Energy Regulatory Commission (FERC) Hydroelectric Project License No. P-2114 issued by FERC on April 17, 2008.

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This report is intended to fulfill the annual reporting requirement for the following License Articles:

- 401(a)(1) - Downstream Passage Alternatives Action Plan, including:
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    - NMFS and USFWS Fishway Prescriptions: 8 (Wanapum) and 14 (Priest Rapids);
- 401(a)(2) - Progress and Implementation (P&I) Plan, including
    - 401(a)(3) - Habitat Plan[3];
    - 401(a)(6) Avian Predation Control Program[1]
    - 401(a)(7) – Northern Pikeminnow Removal Program[1]
    - NMFS BiOp: 1.33
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[3] In FERC's approval of the following individual management plans, FERC directed Grant PUD to provide an annual account of the respective implementation activities in the annual P&I Plan

These license articles require that annual plans and reports be filed with FERC to document compliance with the requirements of the Project license and to propose plans for the coming year.

On May 1, 2012, Grant PUD filed a request with FERC to combine these individual reports into one comprehensive report and change the filing deadline to April 15 annually. The combination of the reports and revised filing date would ease coordination with the natural resource agencies and result in a more efficient review and approval process. FERC issued an Order on June 15, 2012 approving Grant PUD's request.

The activities and plans covered in this report occurred in consultation with the Priest Rapids Coordinating Committee (PRCC) and its hatchery and habitat subcommittees and the Priest Rapids Fish Forum (PRFF). The PRCC and its hatchery and habitat subcommittees are made up of representatives from NMFS, USFWS, Washington Department of Fish and Wildlife (WDFW), Yakama Nation (YN), Confederated Tribes of the Umatilla Reservation (CTUIR), the Colville Confederated Tribes (CCT) and Grant PUD.

On January 30, 2015, Grant PUD filed a letter with FERC requesting that FERC determine that the emergency response would be under control as of May 1, 2015 and was ready for Endangered Species Act (ESA) analysis and to end implementation of the Interim Fish Passage Operations Plan (IFPOP) (2015 Documentation). FERC approved Grant PUD's request to discontinue implementation of the IFPOP on March 19, 2015. In that order, FERC approved the schedule for completing the analysis of the effects of the emergency response and filing a draft biological assessment of federally-listed species was accepted (2015 Documentation).

On June 12, 2015, Grant PUD filed a draft biological assessment with FERC which described the actions taken by Grant PUD in response to the emergency drawdown of the Wanapum Reservoir, the biological effects of Grant PUD's response to the emergency drawdown on federally listed Upper Columbia River (UCR) spring-run Chinook salmon, UCR steelhead, and bull trout, and the implementation the IFPOP approved by the Commission on March 26, 2014.

On September 11, 2015, FERC requested NMFS and USFWS's concurrence with FERC's not likely to adversely affect determinations on federally listed UCR spring-run Chinook salmon, UCR steelhead, and bull trout, as well as their critical habitat (2015 Documentation). NMFS filed a letter (2015 Documentation) finding that the emergency measures implemented under the IFPOP and employed by Grant PUD did not exceed the take limit set forth in NMFS's 2008 BiOp nor were listed species or critical habitat affected in manner or extant material different from that BiOp analysis and therefore a new consultation under the ESA was not necessary. The USFWS responded to FERC that they believed that an "adversely to affect" would be more appropriate for the emergency situation (2015 Documentation). The USFWS communicated to FERC that they would issue an after the fact BiOp on implementation of the IFPOP as allowed under Section 7 of the ESA (135 days).

1.1 Purpose of Report

This report provides a description of the activities related to the implementation of protection, enhancement and mitigation measures required within the FERC License and issued orders, BiOps (NMFS & USFWS), and SSSA for the Project completed during the calendar year January 1, through December 31, 2015. Information incorporated into this report is based upon

activities occurring within the PRCC and related subcommittees (Hatchery and Habitat) associated with achieving performance standards for:

- juvenile salmonids, juvenile and adult salmonids passage measures;
- predator control programs;
- No-Net-Impact and habitat funds,
- hatchery supplementation and monitoring and evaluation, and
- Provide summary information which identifies actions and activities that were required as a result of the Wanapum Fracture.

Specific details on the suite of activities covered by this report can be found in Sections 2 through 5 below.

1.2 Roles and Responsibilities of the Priest Rapids Coordinating Committee

As defined in the SSSA, the PRCC has the role and responsibility to coordinate the implementation of the adaptive management programs contained in the SSSA. Specific roles and responsibilities (but not limited to) identified within the SSSA include the following;

- Approve or modify annual Progress & Implementation (P&I) Plans; approve or modify the Performance Evaluation Program; review Performance Evaluation Reports;
- Advocate decisions of the Committee in all relevant regulatory forums;
- Establish such subcommittees as it deems useful;
- Coordinate adaptive management programs contained in the SSSA including Hatchery and Habitat subcommittees (Section 5.1);
- Make decisions (except for the implementation of the anadromous fish activities set forth in Appendix A of the SSSA) related to the implementation of SSSA (Section 5.4);
- Serve as a forum to coordinate the implementation of the SSSA and to consider issues that arise (Section 5.5.1);
- Assesses new information as it becomes available through the implementation of this Agreement or otherwise (Section 5.5.2);
- May from time to time recommend to FERC amendments to the new license to reflect the best available scientific information on means and measures to achieve the applicable performance standards for the Project (Section 5.5.2);
- Coordinate as appropriate the design and implementation of research and monitoring programs consistent with SSSA (Section 5.5.3);
- Coordinate activities listed above, the sharing of data and information, and the conduct of other activities under the SSSA with related activities associated with other hydropower operations on the Columbia River in order to promote efficiencies and the use of best available scientific information and analysis in the implementation of the SSSA, including, but not limited to, participation in studies relating to the assessment of project related juvenile and adult delayed mortality (Section 5.5.3);

- Seek to resolve disputes at the subcommittee level (Section 6.3); and
- Conduct other business as may be appropriate for the efficient and effective implementation of these measures.

1.2.1 Priest Rapids Coordinating Committee

Grant PUD continues to support the PRCC (per Term &Condition (T&C) 1.35). Over the course of 2015, PRCC representatives were involved in a total of 12 meetings, conference calls and or WebEx conferences (Table 1). Meeting agendas and minutes for the monthly PRCC meetings can be viewed at PRCC Meeting Minutes.

A single Statement of Agreement (SOA) was approved by the PRCC during 2015. SOA 2015-03 deferred sub-yearling Chinook survival studies for one year and committed the parties to discuss and take action on SOA 2015-02. SOA 2015-02 was a proposal to defer survival evaluations until a three year study period of 2019-2021. PRCC Hatchery Subcommittee 2015 meeting schedule and approved statement of agreements are found in Section 5.1 and the PRCC Habitat Subcommittee activities can be found in Section 6.0.

Table 1 Priest Rapids Coordinating Committee Meetings, Conference Calls and WebEx Conferences conducted during 2015.

Date	Communication Type	Topic
1/28/2015	Monthly PRCC Meeting	General Committee Business
2/25/2015	Monthly PRCC Meeting	General Committee Business
3/25/2015	Monthly PRCC Meeting	General Committee Business
4/22/2015	Monthly PRCC Meeting	General Committee Business
5/27/2015	Monthly PRCC Meeting	General Committee Business
7/21/2015	Monthly PRCC Meeting	General Committee Business
8/26/2015	Monthly PRCC Meeting	General Committee Business
9/23/2015	Monthly PRCC Meeting	General Committee Business
10/28/2015	Monthly PRCC Meeting	General Committee Business
11/17/2015	Monthly PRCC Meeting	General Committee Business
12/04/2015	Monthly PRCC Meeting	General Committee Business
12/15/2015	Monthly PRCC Meeting	General Committee Business

1.3 Adaptive Management

The protection, mitigation, and enhancement (PME) measures contained in the SSSA and BiOp are implemented according to the principals of adaptive management. In the SSSA, adaptive management is an active systematic process for continually improving management policies and practices by sequential learning from the outcomes of operational programs. Adaptive management employs management programs that are designed to experimentally compare selective policies or practices by evaluating alternative hypotheses about the system being managed. The sequence of adaptive management steps include: (1) problem assessment, (2) project design, (3) implementation, (4) monitoring, (5) evaluation, and (6) adjustment of future decisions. Adaptive management is not considered complete until the planned management actions have been implemented, measured and evaluated and the resulting new knowledge has been fed back into the decision-making process to aid in future planning and management. The fundamental objective of adaptive management with respect to the Project is to achieve the passage performance standards by 2013.

Grant PUD and PRCC have been utilizing this approach over several decades and included such approach in the issued 2004 & 2008 NMFS BiOps, SSSA, WQC, the FERC License and Orders. Key examples of application of the approach include implementation of juvenile salmonid behavior and survival evaluations, calculation of NNI Funds, predator control programs, planning, designing, prototype testing, construction and biological testing as it relates to the Wanapum Fish Bypass (WFB), design and current construction of the Priest Rapids Fish Bypass (PRFB), and implementation of the various hatchery and habitat programs. Specific details are provided Sections 2 through 5 below.

1.4 Performance Evaluation Program

The 2008 National Oceanic Atmospheric Administration Fisheries (NOAA Fisheries) BiOp, (T&C 1.33; T&C 1.33) requires Grant PUD to prepare an annual summary report (Performance Evaluation Program) which reflects all activities and progress during the previous calendar year. The purpose of this report is to provide a reliable technical basis to assess the degree to which Grant PUD is improving juvenile and adult passage survivals, habitat productivity improvements, and supplementation for the listed anadromous fishery resources affected by the Project. This annual report is also required to include results of monitoring, modeling, or other analyses that take place in the calendar year to evaluate the degree to which the actions are likely to improve juvenile and adult survivals. In addition, where appropriate, the Performance Evaluation Program is supposed to measure and evaluate individual actions within each category, assess the contribution of the action to the desired objective, and provide a basis for identifying new options and priorities among those options for further progress in meeting objectives. Grant PUD believes that this report fulfills the requirement of T&C 1.33, as specific programs and updates to those programs are illustrated below in Sections 2 through 5.

Grant PUD is required to coordinate the design of its Performance Evaluation Program with the development of relevant parallel monitoring or evaluation systems by other hydropower operators in the Columbia Basin and the Northwest Power Planning Council (T&C 1.34; 2008 NOAA BiOp). The purpose of this coordination is to promote technical consistency and compatibility among efforts to:

- contribute to a comprehensive evaluation of stock performances throughout the Columbia Basin
- promote the use of the best available science; and
- provide opportunities for the efficient sharing of monitoring activities, data management systems, analytical modeling, and other activities.

Grant PUD regularly and routinely participates in local forums to promote technical consistency and compatibility among efforts to contribute to a comprehensive evaluation of stock performances throughout the Columbia Basin. For example, technical and policy staff from the Public Utility Districts of Chelan, Douglas and Grant Counties (PUDs) meets regularly to discuss potential fish evaluations and resource issues. Grant PUD staff also participates in Chelan and Douglas PUD's respective Habitat Conservation Plan (HCP) Hatchery and HCP Habitat subcommittees to coordinate among the various programs. These meeting have led to the development of several hatchery sharing agreements among the PUDs as well as the development of consistent monitoring and evaluation programs related to hatchery supplementation.

Grant PUD staff also participates in several regional forums to discuss and share ideas on a broad spectrum of fish protection and enhancement issues. These forums include:

- Priest Rapids Coordinating Committee;
- Priest Rapids Coordinating Committee – Hatchery Subcommittee;
- Priest Rapids Coordinating Committee – Habitat Subcommittee;
- Fall Chinook Working Group;
- Priest Rapids Fish Forum;
- Rocky Reach and Wells Habitat Conservation Plan – Hatchery Subcommittee;
- Rocky Reach Fish Forum;
- Regional Lamprey and White Sturgeon Technical Workgroups;
- Anadromous Fish Evaluation Program (AFEP) ACOE Columbia River Basin Symposia;
- Inland Avian Predation Working Group;
- Fish Tagging Forum;
- American Fisheries Society 145th Annual Meeting (presenters, symposia moderators, sponsorship);
- Washington/British Columbia Chapter, American Fisheries Society conferences (as presenters and session organizer);
- Hydro-Vision (national conference; presenter);
- Hydro-Vision International 2015 Technical Papers Committee
- Fish Passage (international conference; presenter);
- Regional Bull Trout Recovery forums;
- Army Corps of Engineers (CORPS) year-end Total Dissolved Gas (TDG) monitoring meeting;
- 100th Meridian Columbia River Basin Team for aquatic invasive species;
- Mid-Columbia Spring Operations Meeting – Douglas PUD, East Wenatchee, WA;
- Hydrolab HL4 (Water Quality) Training – Bellevue, WA;
- 7th National New Zealand Mudsnail (NZMS) Conference – USGS Western Fisheries Research Center, Seattle, WA;
- Washington Invasive Species Council (WISC) Quarterly Meeting – Confluence Technology Center, Wenatchee, WA;
- State Environmental Policy Act (SEPA) Training – Tacoma, WA;
- Grant PUD's annual aquatic invasive species (AIS) meeting;
- Hatchery Evaluation Technical Team (HETT)

- Chief Joseph Hatchery Annual Program Review

2.0 Priest Rapids Project

2.1 Progress in Achieving Performance Standards

Grant PUD is required to make steady progress towards achieving a minimum 91 percent combined adult and juvenile salmonid survival performance standard at the Priest Rapids and Wanapum developments (i.e., each dam and reservoir). The 91 percent standard includes a 93 percent development-level (reservoir and dam) juvenile performance standard. NMFS recognized that it is not currently possible to measure the 91 percent combined adult and juvenile survival standard.

Over the last decade plus, Grant PUD has conducted dam and reservoir smolt survival evaluations, evaluating progress towards meeting a 86.49% percent juvenile Project (Wanapum development and Priest Rapids development combined) passage survival. This standard can be measured at each development individually, or as a composite of survival at the two developments. To evaluate steady progress toward achieving the 93% juvenile salmonid development survival requirement and to strive toward achieving passage performance standards, Grant PUD has included a proposed decision process below (Figure 1).

Although not formally adopted by the PRCC, Grant PUD continues to use the decision flow chart presented below as a guide as it strives to maintain and meet performance standards for the Priest Rapids Project. As discussed above and as defined in the SSSA, adaptive management is a key component for continually improving management policies and practices by sequential learning from the outcomes of operational programs, such as evaluation of juvenile salmonid passage survival at the Project. Information on survival for specific species are included in Sections 2.1.1 through 2.1.5.

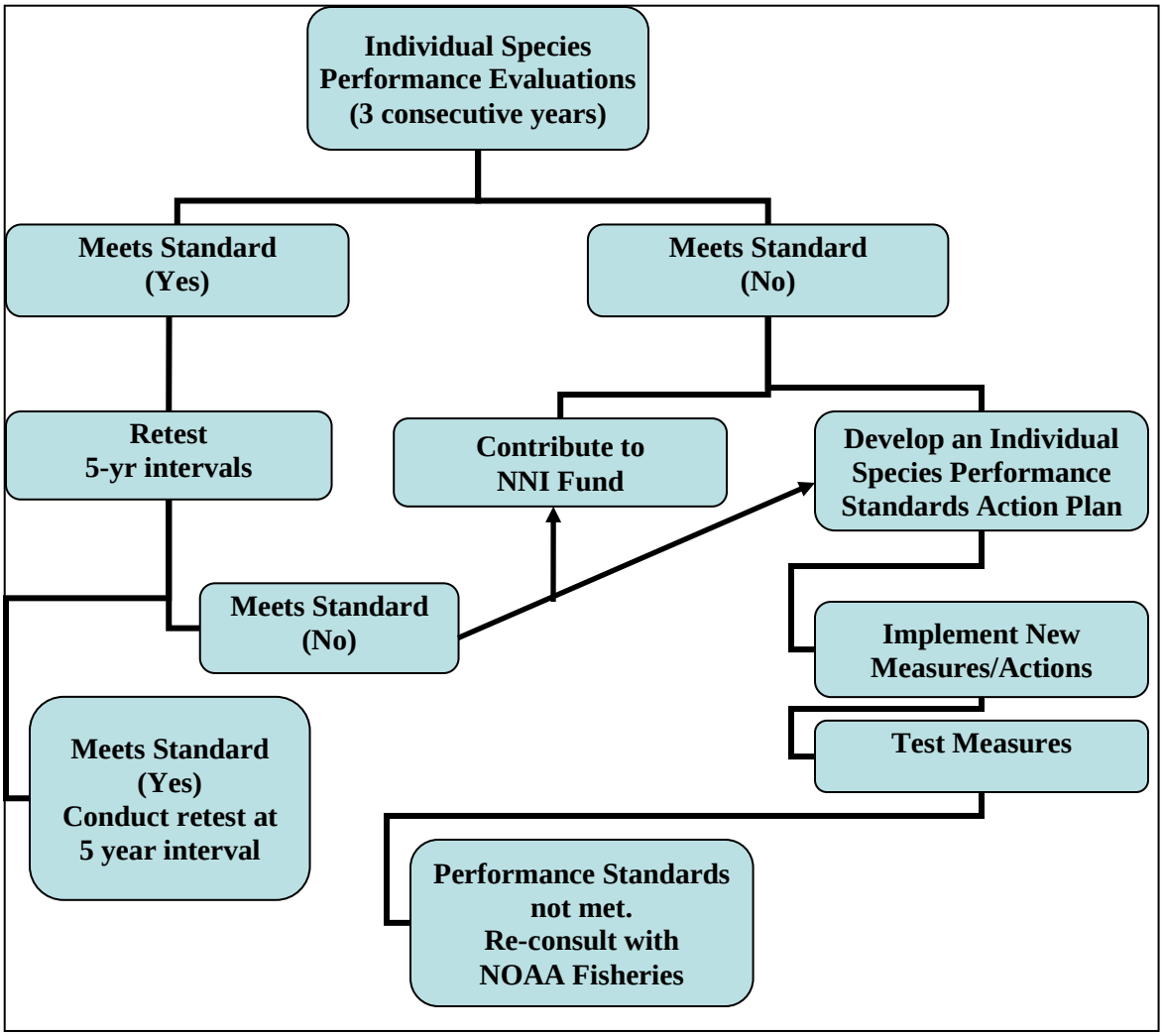

Figure 1 **Flow chart showing proposed decision process used to achieve juvenile salmonid project survival requirements for the Priest Rapids Project.**

2.1.1 Yearling Chinook

Performance standards for yearling Chinook were met for the Project in 2005 (Table 2). The three year (2003-2005) consecutive arithmetic average of 86.59% exceeds the Project standard of 86.49% (Anglea et al. 2003, Anglea et al. 2004a and 2004b, Anglea et al. 2005). Development and dam (Wanapum and Priest Rapids) specific survival standards could not be developed in 2003-2005 because of the tag technology used during that timeframe (Passive Integrated Transponders (PIT tags)). Results were formally accepted by the PRCC and approved by NMFS on September 28, 2005.

Per Section 15.7.2 (Timing and recalibration) of the SSSA, the survival estimates for yearling Chinook were originally scheduled to be adjusted at five-year intervals (2010, 2015, 2020, etc.). However, because of concern over juvenile steelhead survival through the Priest Rapids Project, the PRCC agreed that the yearling Chinook evaluation originally scheduled for 2010 would occur in 2014 (SOA 2011-06).

As a result of the fracture discovered on monolith #4 of the Wanapum Spillway in 2014, the PRCC and Grant PUD modified the evaluation to assure that survival and behavior data at the Project-wide level (Rock Island Tailrace to Priest Rapids Tailrace), development level (Wanapum Dam and Reservoir and Priest Rapids Dam and Reservoir), route specific level at each dam (bypasses, turbine and/or spillway) and survival and behavior data associated with the Wanapum Fish Bypass and the newly installed Priest Rapids Fish Bypass could be collected. Results from that evaluation have been included in Section 2.1.1.1 and Table 2 below.

2.1.1.1 Yearling Chinook Study Results

The survival estimate for yearling Chinook migrating through the Priest Rapids Project in 2014 was 90.8% (CI=95%; SE=0.015), which is 4.3% above the required juvenile salmonid and steelhead Project passage survival standard of 86.49% (NOAA-Fisheries 2008). Observed development-level (reservoir and dam) passage survival for yearling Chinook migrating through Wanapum was 94.5% (SE=0.013), while survival through Priest Rapids was 96.1% (SE=0.001). The Wanapum and Priest Rapids dams ("concrete") passage survival was 98.8% and 97.1% respectively (Table 2).

Based on point estimates[4], survival for yearling Chinook utilizing the various passage routes at Wanapum and Priest Rapids dams (bypass, spillway and powerhouse) was greater than 96%, with the exception of powerhouse survival at Priest Rapids Dam (92.6%; Table 3). Although the fracture at Wanapum impacted day to day operation of the powerhouse, WFB and spillway, observed survival at Wanapum Dam exceeded 97.0%. Specific details on the behavior and survival evaluation and can be reviewed in Hatch et al. (2015) and Skalski et al. (2014). Based on the current schedule, the next yearling Chinook evaluation is scheduled to occur in 2019.

Table 2 Survival estimates and standard errors in parenthesis (total project, development, and dam) for yearling Chinook for the Priest Rapids Project for years 2003-2005 and 2014.

Year	Wanapum Development	Priest Rapids Development	Total Survival for Priest Rapids Project*
2003	N/A	N/A	86.6%
2004	N/A	N/A	86.4%
2005	N/A	N/A	86.7%
3 Year Consecutive Average			86.6% (SE=0.0322)
2014[1,2]	94.5% (SE=0.013)	96.1% (SE=0.009)	90.8% (SE=0.015)

* Performance Standard Requirement = 86.49%
[1] Wanapum Drawdown
[2] Required Check-in per Statement of Agreement 2011-06

[4] Point Estimates are based on proportion of fish that are detected downstream at one or more locations that had been assigned a given passage route at each dam.

Table 3 **Number of tags that passed at each dam by route with the corresponding percentage of tags which were detected downstream in 2014. The percentage of tags listed for all routes reflects passage survival for all passage routes for yearling Chinook, including unknown passage location and gatewell dipped fish, however, fish with upstream movement during last detection were excluded.**

	Wanapum Dam		Priest Rapids Dam	
Passage Route	**Number Passed**	**Detected Downstream (%)**	**Number Passed**	**Detected Downstream (%)**
Wanapum Fish Bypass or Priest Rapids Fish Bypass	27	96.3	415	99.8
Spillway	99	97.0	293	98.0
Powerhouse	225	98.2	352	92.6

2.1.2 Juvenile Steelhead

The PRCC has been overseeing rigorous investigations on the downstream passage behavior and survival of juvenile steelhead through the Project since 2004 (Robichaud et al. 2005, Sullivan et al. 2009, Thompson et al. 2012, Timko et al. 2007, 2008, 2010, and 2011, Wright et al. 2010). The 2006 juvenile survival evaluation was invalidated by the PRCC due to the standard error being greater than ±2.5% (SE=0.0302) (PRCC Meeting Minutes). Meanwhile the 2007 study was primarily an evaluation focused on handling and tagging effects within a survival study and was not designed to determine juvenile steelhead survival.

As reported in previous annual progress and implementation reports the juvenile steelhead performance standard for the Project based on a 3 year consecutive average for juvenile steelhead has not been achieved (Table 3; Skalski et al. 2009-2011). During 2016, Grant PUD will conduct year 3 of the third consecutive year of required steelhead evaluations and will be able to develop an updated juvenile survival estimate. Survival estimates for 2014 and 2015 are included in Table 4 below (Skalski et al. 2016).

Table 4 Survival estimates and standard errors in parenthesis (total project and development) for juvenile steelhead for the Priest Rapids Project for years 2008-2010 and 2014-2015. No studies were conducted in 2011-2013.

Year	Wanapum Development	Priest Rapids Development	Total Survival for Priest Rapids Project*
2008	95.8% (SE=0.024)	86.4% (SE=0.023)	82.8% (SE=0.031)
2009	94.4% (SE=0.019)	88.1% (SE=0.021)	83.1% (SE=0.026)
2010	85.5% (SE=0.019)	90.4% (SE=0.017)	77.3% (SE=0.022)
3 Year Consecutive Average			81.05% (SE=0.019)
2014[1]	92.9% (SE=0.014)	100% (SE=0.020)	91.9% (SE=0.012)
2015	85.5% (SE=0.017)	94.1% (SE=0.028)	83.7% (SE=0.027)

* Performance Standard Requirement = 86.49%

[1] Wanapum Drawdown

In 2012, Grant PUD in consultation with NOAA-Fisheries and the PRCC developed a juvenile steelhead performance standard action plan (SAP). The SAP was developed to document progress towards achieving the juvenile steelhead survival standards for the Priest Rapids Project, as required under Terms and Conditions 1.2 and 1.11 of the 2008 NMFS BiOp and assist with determining what additional measures and/or studies may be necessary to improve juvenile steelhead survival.

Since the development of the SAP, Grant PUD and PRCC has conducted several evaluations funded through the No-Net-Impact fund (NNI fund; $3,567,010) to determine potential reason for lower than expected juvenile steelhead survival within the Priest Rapids Project. A major finding of these evaluations has indicated that one of the primary reasons for lower than expected survival for juvenile steelhead migrating through the Priest Rapids Projects is avian predation by Caspian terns (*Hydroprogne caspia*).

Evans et al. (2011 and 2013) and Hostetter et al. (2012) reported that juvenile steelhead are preferred and more likely to be predated upon by terns, compared to all other salmonids in the Columbia River Basin. Roby et al. (2011) further reported that juvenile steelhead migrating through the Priest Rapids Project (mid-Columbia) are being preyed upon by terns that have established a nesting colony within the Columbia Plateau, Goose Island, Potholes Reservoir, approximately 30 miles from the Priest Rapids Project. Evans et al. (2013) estimated predation rates by Caspian terns (nesting on Goose Island) on steelhead smolts tagged and released by Grant PUD during years 2008-2010 ranged from 12.8% to 20.8%, indicating that predation by Caspian terns was a substantial source of smolt mortality within the Priest Rapids Project. The studies referenced above indicate that the Goose Island colony represents a large threat to the out-migration of listed UCR steelhead, as Evans et al. (2013) reported that annual consumption on UCR steelhead by terns has averaged 15.7% for years 2008 and 2010 (95% CI 14.1-18.9%).

In addition to the work funded via the PRCC and Grant PUD through the NNI Funds; the U.S. Army Corps of Engineers (Corps), U.S. Bureau of Reclamation (USBOR), and Bonneville Power Administration (BPA) were tasked with the development of an Inland Avian Predation Management Plan (IAPMP) and associated Environmental Assessment for managing avian predators that prey on ESA-listed fish in the Columbia and Snake rivers via the 2008 BiOp

issued by NOAA-Fisheries (as updated by the 2010 and 2014 Supplemental BiOps; http://www.salmonrecovery.gov/BiologicalOpinions/FCRPSBiOp.aspx.) for the Federal Columbia River Power System (FCRPS). Under this Federal BiOp, the Corps, USBOR, and BPA (referred to as action agencies) were directed to address inland avian predation through several Reasonable and Prudent Alternative elements which included the following;

> RPA 47: The Action Agencies will develop an avian management plan for Corps-owned lands and associated shallow-water habitat.
>
> RPA 68: The Action Agencies will monitor avian predator populations in the mid-Columbia River and evaluate their impacts on outmigrating juvenile salmon and steelhead and develop and implement a management plan to decrease predation rates, if warranted.

Based on research funded by the PRCC via the NNI Fund and efforts implemented by the action agencies under their FCRPS BiOp, several key results have been documented, including; (1) dissuasion is successful in preventing terns from nesting on Goose Island, (2) satellite telemetry is a powerful tool for monitoring Caspian tern dispersal and behavior following management activities at a breeding colony, (2) tracking of Caspian terns satellite-tagged on Goose Island has indicated that displaced terns are reluctant to leave the region and have nested or tried to nest at other locations in the Columbia Plateau (e.g. Blalock Islands, Twinning Island, and Lake Lenore), (4) use of traditional foraging areas by Goose Island terns (i.e. Priest Rapids Project) was reduced, but terns continue to forage within the Priest Rapids Project Area as confirmed by satellite tags, and (5) a 12.7% reduction in predation rates on juvenile steelhead by Caspian terns pre-management activities (2008-2013) compared to post-management activities (2014) was observed.

2.1.2.1 Juvenile Steelhead Study Results

Based on point estimates[5], survival for juvenile steelhead utilizing the various passage routes at Wanapum and Priest Rapids dams (bypass, spillway and powerhouse) during 2014 was greater than 97%, with the exception of powerhouse survival at Wanapum and Priest Rapids Dam (94.1% and 93.8% respectively; Table 5). Although the fracture at Wanapum impacted day to day operation of the powerhouse, WFB and spillway, observed survival at Wanapum Dam was 97.8 %. Specific details on the behavior and survival evaluation and can be reviewed in Hatch et al. (2014) and Skalski et al. (2014).

In 2015, the survival estimate for juvenile steelhead migrating through the Priest Rapids Project was 83.7% (SE=0.027; Table 4). Observed development-level (reservoir and dam) passage survival for juvenile steelhead migrating through Wanapum was 85.5% (SE=0.017), while survival through Priest Rapids was 94.1% (SE=0.028). The Wanapum and Priest Rapids dams ("concrete") passage survival was 97.1% (SE=0.014) and 99.6% (0.006), respectively.

During 2015, point estimates for juvenile steelhead utilizing the various passage routes at Wanapum and Priest Rapids dams (bypass, spillway and powerhouse) was greater than 97.0%, (Table 6).

[5] Point Estimates are based on proportion of fish that are detected downstream at one or more locations that had been assigned a given passage route at each dam.

Table 5 **Route specific survival estimates for juvenile steelhead migrating through Wanapum and Priest Rapids dams in 2014. Survival estimates (point estimates) are based on the proportion of fish that were detected downstream that had been assigned a given passage route.**

	Wanapum Dam		Priest Rapids Dam	
Passage Route	**Number Passed**	**Detected Downstream (%)**	**Number Passed**	**Detected Downstream (%)**
Wanapum Future Bypass or Priest Rapids Top-Spill Bypass	36	100.0	507	99.6
Spillway	164	99.4	236	97.0
Powerhouse	152	94.1	276	93.8

Table 6 **Route specific survival estimates for juvenile steelhead migrating through Wanapum and Priest Rapids dams in 2015. Survival estimates (point estimates) are based on the proportion of fish that were detected downstream that had been assigned a given passage route.**

	Wanapum Dam		Priest Rapids Dam	
Passage Route	**Number Passed**	**Detected Downstream (%)**	**Number Passed**	**Detected Downstream (%)**
Wanapum Future Bypass or Priest Rapids Top-Spill Bypass	271	97.0%	495	99.6%
Spillway	5	100%	0	n/a
Powerhouse	244	91.8%	380	95.5%

As mentioned above, Grant PUD will conduct year 3 of three consecutive years of juvenile steelhead survival and behavior evaluations. Information collected during 2016 will be used in conjunction with information from 2014 and 2015 to develop an updated 3 year consecutive average of juvenile steelhead survival for the Priest Rapids project. This updated estimate will be used to update contributions into the NNI Fund in the spring of 2017 as defined within the Priest Rapids Salmon and Steelhead Settlement Agreement.

As in previous evaluations conducted in 2014 and 2015, Grant PUD proposes to conduct a survival and passage behavior study at Wanapum and Priest Rapids dams and the associated reservoirs during the spring smolt out-migration in 2016 using acoustic-tag tracking techniques (2016 Documentation). Tasks that will be covered during that evaluation include the following:

1. Estimate Project survival for steelhead smolts passing through the Wanapum and Priest Rapids developments, using the paired-released model (similar to Skalski et al. 2014);

2. Estimate FPE through the bypass and any other non-turbine passage routes and relative route-specific survival for steelhead smolts at Wanapum and Priest Rapids dams (similar to Skalski et al. 2014);
3. Estimate migration rate, forebay residence times, and tag detection efficiency of steelhead smolts through Wanapum and Priest Rapids developments (similar to Hatch et al. 2015).

Continue to support the evaluation of avian predation impacts through the recovery of PIT tags at avian nesting colonies on the Mid-Columbia Plateau with collaborative efforts between Grant PUD and Real Time Research in conjunction with NOAA Fisheries, USGS-Oregon Cooperative Fish and Wildlife Research Unit, and Oregon State University.

2.1.3 Juvenile Sockeye

Grant PUD conducted two consecutive years of paired release-recapture evaluations to estimate juvenile sockeye survival through the Wanapum and Priest Rapids developments in 2009 and 2010 (Table 7). The two year arithmetic average performance standard for sockeye smolt passage through the Project was 91.6% (SE=0.011; Skalski et al. 2009b; Skalski et al. 2010).

As a result of the high survival observed for juvenile sockeye, the PRCC agreed to defer the third year of juvenile sockeye survival evaluation until 2016. The PRCC also agreed that the 2016 evaluation would also serve as the initial five year check-in study for sockeye (SOA 2011-06). The PRCC also agreed that for 2012 through 2016, the NNI Fund update would be based on the two year (2009 and 2010) survival average for sockeye. In spring 2017, the NNI Fund update would be based on survival information from 2009, 2010 and 2016 if validated by the PRCC (SOA 2011-06). In October 2014, the PRCC modified the juvenile sockeye salmon survival and behavior evaluation per SOA 2014-04. The schedule modification moved the third year of juvenile sockeye survival evaluation up one year (from 2016 to 2015). Based on the current schedule, the next juvenile sockeye evaluation is scheduled to occur in 2020.

Table 7 Survival estimates and standard errors in parenthesis (total project and development) for juvenile sockeye for the Priest Rapids Project for years 2009-2010 and 2015.

Year	Wanapum Development	Priest Rapids Development	Total Survival for Priest Rapids Project*
2009	97.3% (SE=0.009)	94.6% (SE=0.011)	92.1% (SE=0.014)
2010	94.1% (SE=0.014)	96.9% (SE=0.014)	91.1% (SE=0.019)
2015	94.1% (SE=0.011)	97.5% (SE=0.009)	91.8% (SE=0.012)
3 Year Consecutive Average			91.7% (SE=0.008)

* Performance Standard Requirement = 86.49%

2.1.4 Sub-yearling Chinook

In 2008 and 2009, Grant PUD conducted two pilot sub-yearling acoustic tag survival evaluations in the Priest Rapids Project Area. Based on the results of the pilot evaluations, the PRCC agreed that life-history strategies and technology and/or methodology was not available to conduct sub-yearling summer Chinook survival evaluation. Specific limiting factors identified at this time included battery life (related to active tags) and variety of life-history strategies illustrated within a population of sub-yearling Chinook.

In 2011, the PRCC agreed that survival evaluations for sub-yearling Chinook would occur over a three year consecutive timeframe period starting in 2016 (per SOA 2011-06; 2016-2018). The PRCC also agreed that they would determine the feasibility of conducting a sub-yearling Chinook survival evaluation in September of 2015.

Per SOA 2015-03, the PRCC agreed to defer year 1 (2016) of the sub-yearling Chinook survival evaluation, but requested that a sub-yearling Chinook workshop occur prior to May 2016. After the workshop, the PRCC will determine next steps. Grant PUD is working in coordination with the Public Utility Districts of Chelan and Douglas Counties to develop a workshop agenda, which may include, but is not limited to, the following topics;

1. Snake River fall Chinook life history studies;
2. USACE Snake River dam fish passage studies;
3. USACE Willamette River and lower Columbia River fish passage studies;
4. Recent life history pilot studies by Douglas PUD;
5. Recent life history studies by Chelan PUD;
6. Recent life history and dam passage pilot studies by Grant PUD;
7. Tag technology and study logistics updates;
8. Tagging technique and tag effects updates;
9. Effects of barotrauma on performance; and
10. Survival model updates.

2.1.5 Coho

In August 2007, the PRCC approved a 10 year SOA 2007-5 (2007-2017), which established coho as a "Covered Species", per the definition within the SSSA. Under the SOA, the PRCC agreed to specific measures and items that would implemented over the 10 year term of the SOA. This SOA expires in 2017 and will need to be revisited in 2016 (SOAs).

2.1.6 Schedule

The PRCC developed a performance standard survival evaluation schedule in December of 2011 (SOA 2011-06; Table 8). The PRCC modified the juvenile sockeye salmon (SOA 2014-04) and sub-yearling Chinook (SOA 2015-03) survival and behavior evaluations in October 2014 and November 2015 respectively. Per SOA 2014-04, the juvenile sockeye evaluation was moved up one year from 2016 to 2015. Meanwhile, the sub-yearling Chinook evaluation was deferred by one year (SOA 2015-03).

Table 8 Performance Standards Survival Evaluation Schedule for Covered Species migrating through the Priest Rapids Project 2014-2021.

Species	2014[1]	2015	2016	2017	2018	2019	2020	2021
Spring Chinook	X[2]	.	.	.	.	X[3]	.	.
Steelhead	X[4]	X[5]	X[6]	.	.	.	.	X[7]
Sockeye		X[8]	.	.	.	.	X[9].	.
Summer Chinook	.	.	.	X[10]	X[11]	X[12]	.	

[1] PRCC may need to modify the survival evaluation check-in schedule for spring Chinook and steelhead survival evaluations, if the Priest Rapids Top-spill is **NOT** completed prior to the outmigration in spring of 2014.
[2] 2014 would serve as the 5 year check-in for yearling Chinook and would occur after completion of the Priest Rapids Top-spill.
[3] 2019 would be a 5 year check-in for yearling Chinook if standards are met in 2014.
[4] 2014 would serve as the year 1 of a 3 year consecutive evaluation for summer steelhead.
[5] 2015 would serve as the year 2 of a 3 year consecutive evaluation for summer steelhead.
[6] 2016 would serve as the year 3 of a 3 year consecutive evaluation for summer steelhead.
[7] 2021 would serve as the 5 year check-in for juvenile steelhead if standards are achieved during 2014-2016.
[8] 2016 would serve as the 5 year check-in for sockeye survival.
[9] 2020 would serve as the 5 year check-in for sockeye if survival standards are met in 2016.
[10] PRCC agreed per Statement of Agreement 2015-03 to defer the sub-yearling Chinook evaluation by 1 year.
[11] 2018 would serve as the year 2 of a 3 year consecutive evaluation for sub-yearling Chinook (if feasible).
[12] 2019 would serve as the year 3 of a 3 year consecutive evaluation for sub-yearling Chinook (if feasible).

2.2 No Net Impact Fund

The PRCC recognized that the performance standards for the Project may not be achieved for certain stocks through 2003. The purpose of the NNI is to provide the PRCC with additional financial capacity to undertake measures to improve survival of juvenile salmonids prior to the time when the Project attains applicable juvenile project survival standards.

The NNI Fund is intended to provide near-term compensation for annual survivals that are less than the survival objectives in the performance standards for the Project for spring Chinook, steelhead, summer Chinook and sockeye. Per the Salmon and Steelhead Settlement Agreement, annual contributions to the fund would be reduced as progress towards meeting performance standards for each species is achieved. Once the PRCC has determined that performance standards have been achieved on a species-by-species basis, the NNI Fund annual contributions for that species will be terminated.

To evaluate steady progress toward meeting performance standards and to adjust the NNI Fund, Grant PUD, in consultation with the PRCC, conduct survival studies. The results of these studies are used to estimate survival rates based on an arithmetic three-year average of the annual estimates. Table 8 includes a planned implementation schedule for conducting these evaluations. The annual contribution made into the NNI account prior to February 15, 2015 was $1,967,449.75.

The annual contributions into the NNI Fund made by Grant PUD since 2006 totals $25,551,548 (2006-2016). NNI Funds have been utilized by the PRCC to fund 23 separate projects ranging from predator removal, adult fish passage, habitat restoration, instream flow enhancements, avian predator evaluations, land acquisitions, fish screen monitoring, diversion assessment, and various research activities.

2.3 Description of Turbine Operating Criteria and Protocols

Project turbines are operated in a protocol referred to as "Fish Mode" and also "Ganging Units" during the juvenile salmonid out-migration season (typically mid- to late-April through mid- to late-August), based on smolt index counts conducted by WDFW at the Rock Island Smolt Monitoring Station in order to maximize turbine passage survival rates of juvenile salmonids. Fish Mode was the result of using Hill Curves, Theoretical Avoidable Losses calculations, turbine discharge rates, head, and fish survival curves (based on 1996 and 2005 balloon-tag evaluations of salmonid smolts through the turbines) to determine the operating range of the turbines and maintain a minimum fish survival rate of 95 percent. For Wanapum Dam, this means an operating range of 11.8 to 15.7 thousand cubic feet per second (kcfs) per turbine, and for Priest Rapids Dam, turbine units are operated between 9.0 to 17.4 kcfs. Upon further investigation of the issue concerning smolt-passage survival through turbines, it was determined that passage survival rates for out-migrating juvenile salmonids were influenced, not only by how a turbine is operated (i.e. Fish Mode), but also how the dam's powerhouse, overall, is operated. This determination led to the concept of "ganging" turbine units in conjunction with operating turbines in Fish Mode. Ganging units is defined as concentrating operating turbines into blocks of adjacent units, thus reducing the edge-effect in regard to predation by fish and birds on salmonid smolts as smolts exit a turbine's draft tube (LGL Limited, 2003).

When turbines are required, ganged units are operated first and shutdown last because it has been demonstrated that juvenile salmonids are drawn to turbines closest to the spillway, and that their survival is highest when passing through blocks of turbines being operated in Fish Mode.

Turbines furthest from the spillways (Unit 1 at Wanapum and Unit 10 at Priest Rapids) are the first turbines to discontinue operation during daylight hours when the powerhouses are operating at less than full capacity during juvenile and adult fish-migration seasons. The discharge from these turbines may adversely affect adult salmonids' ability to efficiently locate the entrances to the adult fishways adjacent to these turbine discharges.

2.3.1 Turbine Operation and Inspection Schedule

Turbines are operated as needed for producing electricity and do not have an operation season or schedule. Turbines are inspected as necessary based on the number of hours operated and other associated stresses.

2.4 Description of Spillway Operating Criteria and Protocols

The WFB was designed to operate at five different flow volumes: 20 kcfs, 15 kcfs, 10 kcfs, 5 kcfs and 2.5 kcfs. In the past seven years, the WFB has been operated at 20 kcfs during the downstream migration of juvenile salmonids, with the exception of 2014 during the Wanapum fracture incident. During the outmigration flows through the WFB ranged between 3-5 kcfs due to forebay elevations associated with the emergency drawdown. During 2015, the PRCC agreed to a 15 kcfs vs 20 kcfs test to determine if differences in fish passage efficiency due to flow volumes through the bypass was detectable. Due to lack of the number of replicates in testing between the two different flow volumes, not enough statistical power was present to determine, statistically, differences in passage efficiency. During 2016, the WFB will be operated at 20 kcfs during the entire juvenile salmonid outmigration.

In 2008, the PRCC established that the bypass would be operated at 15 kcfs if future tailwater conditions were less than 488.0 ft. in elevation or tailwater discharge was less than 60 kcfs. With

a tailwater below 488.0 ft., the outflow from the WFB at 20 kcfs becomes unstable and starts to undulate. This undulation causes a condition that is believed to be less conducive for migrating juvenile smolts, with a likely increase in total dissolved gas (TDG) that could ultimately decrease survival. At this described lower tailwater elevation, when the outflow from the WFB is reduced, this undulating jet of water is returned to a surface-skimming flow, which entrains less air and is better for fish passage survival. Grant PUD will make best efforts to maintain the Wanapum tailwater elevations to stay within the range of 488.0 ft. to 498.0 ft. during the smolt out-migration season during non-extreme river condition periods.

The WFB was operated continuously during the juvenile salmonid out-migration season in 2015 (April 19 – August 13). During 2015, the PRCC agreed to a 15 kcfs vs 20 kcfs test to determine if differences in fish passage efficiency was detectable. This test operation occurred between May 1, 2015 and June 15, 2015. After June 15, 2015 the WFB was operated at 20 kcfs.

During 2016, the WFB will be operated at 20 kcfs during the entire juvenile salmonid outmigration. In the event of inadvertent spill, water will be spilled through the tainter gates in a manner agreed upon by the PRCC spill representatives.

Non-turbine surface-spill passage route at Priest Rapids Dam beginning on April 20, 2015 was through the newly completed Priest Rapids Fish Bypass (PRFB). The PRFB was operated at ~26 kcfs during the downstream migration of juvenile salmonids through the entire fish spill season (April 20-August 14, 2015).

The fish-spill periods were closely matched with the juvenile migration timing, with greater than 98% of the yearling spring out-migrants passing during the spring fish-spill period between April 19 and June 14, 2015 (FPC 2015). The combined spring and summer fish-spill periods from April 19 through August 14 encompassed greater than 99% of the entire 2015 outmigration (FPC 2015).

Due to the fact that 2015 was a moderately low flow year overall compared to the last 10-years, minimal involuntary/inadvertent spill occurred within the Project and at upstream projects. Further details can be reviewed in Carson (2015).

Grant PUD, in consultation with the PRCC fish spill representatives, uses, and will continue to use, the smolt index counts from the Rock Island Smolt Monitoring Station to determine when annual spring fish-spill at both developments is initiated (before 2.5 percent of the juvenile spring migrants have passed the Project - typically mid- to late-April) and summer fish-spill is terminated (when over 95.0 percent of the summer juvenile migrants have passed; typically mid- to late-August). Typically, the end of the spring fish-spill overlaps with the beginning of the summer fish-spill, providing continuous fish-spill from April to August.

2.4.1 Spillway Operation and Inspection Schedule

The spillways are operated on the schedule outlined above during the juvenile salmonid out-migration season, and are operated on an as-needed basis during the remainder of the year. Inspections typically occur during the late summer/early fall low river-flow period, with any necessary maintenance occurring during the low river-flow winter months when the tainter gates are unlikely to be needed.

2.5 Description of Sluiceways Operating Criteria and Protocol

The sluiceway at Wanapum Dam is fully opened to provide an adult salmonid fish fallback route when the WFB is closed at the end of the juvenile salmonid out-migration season, typically in mid- to late-August. The WFB serves as the adult salmonid fallback route while it is in operation. The sluiceway remains open until November 15 of each year. The sluiceway at Priest Rapids Dam is un-pinned and then operated as a surface-spill sluiceway following the end of the salmonid out-migration, typically in mid to late-August, to provide an adult salmonid fallback route, and remains fully open for adult fallback until November 15 of each year.

2.5.1 Sluiceway Operation and Inspection Schedule

The sluiceways are operated on the schedule outlined in the above section. Inspections occur during the non-operation periods.

Construction activity for the PRFB was completed by April 1, 2014, which included the modification of tainter gate 22 to operate as a "sluice-gate" when needed. Modified gate 22 (of the PRFB) was operated from August 14–November 15 for adult salmonid/steelhead fallback. Gate 22 was used for adult steelhead fallback in 2015.

2.6 Adult Fishways Operating Criteria, Protocols and Schedule

Fishway ladders are operated with a water depth over weirs of 1.0-1.2 ft. Debris from trash racks and picketed leads is quickly removed from ladder exits when water surface differentials exceed 0.5 ft., or as debris begins building up at the exit from the fish ladder. All submerged orifices and overflow weir crests are cleared of debris prior to the adult fish migration season and are kept free of debris during the fish-passage season. Fishway entrances are operated with a head differential range of 1.0 to 2.0 ft.

Grant PUD operates the fishways within the criteria ranges outlined above, and targeted heads are maintained whenever possible. When targeted heads cannot be maintained, the fishways are operated at maximum capable output to meet entrance and channel flow requirements.

Collection channel transport velocities of 1.5 to 4.0 feet per second (fps) (target 2.0 fps) are maintained through the powerhouse collection channels and through the lower end of the fish ladders. All collection channel orifice gates remain closed during the adult fish-passage season, per agreement with the PRCC.

Fishway inspections are conducted by a project operator at least once per day (walk-through) to ensure that fish facilities are operating within criteria limits. A daily log of the inspections is compared with the computerized printout to assure correct calibration of the fishway control system. At the discretion of NOAA Fisheries or Fish Passage Center (FPC), at least one inspection of the fishways is conducted by one of these agencies each month during the adult fish-passage season (April 15–November 15).

In regards to adult fish passage at Wanapum Dam, per Grant PUD's requirements under the USFWS BiOp for bull trout (2007) at least one fish ladder needs to be operational year-round. Currently the Wanapum left-bank Fish Ladder is fully operational and providing fish passage. The Wanapum right-bank Fish ladder is currently dewatered for typical annual O&M. Both adult fish ladders at Wanapum Dam will be operational by April 1, 2016.

Monthly ladder inspections occurred at Wanapum and Priest Rapids dams on April 29, May 12, June 23, July 30, August 26, September 17 and October 28 of 2015. Inspection results are made

available to Grant PUD, and problem-area solutions are immediately resolved after the inspection is completed.

2.6.1 Left Bank Adult Fishway at Wanapum Dam

The left-bank adult fishway at Wanapum Dam is comprised of a powerhouse collection channel and the connecting east-shore ladder. The ladder has two slotted fish entrances (SE1 and SE2) but only one (SE2) is kept open. The collection channel consists of 20 leaf-gate orifices (OG1-20). The SE3 entrance is now located at the OG-20, and it will remain open during the adult-passage season. All collection channel orifice gates remain closed during the adult passage season. The auxiliary water at Wanapum Dam is comprised of a combination of gravity flow originating from the forebay through two inline valves, and pumped water from two turbine-driven pumps drawing water from the tailrace. Both gravity and pumped water empty into the attraction water supply channel before being directed into left-bank diffusion chambers (LDC) in the powerhouse collection channel (LDC27-50), junction pool (LDC24-26), and ladder (LDC2-23). Butterfly valves control auxiliary water to LDC25-50 and chimneys control auxiliary water to LDC2-24. At the ladder exit, butterfly valve LV7 provides forebay gravity water to diffusion chamber LDC1. Grant PUD operates the diffusion chambers to keep the ladder within required fishway criteria during the fish passage period.

2.6.2 Right Bank Adult Fishway at Wanapum Dam

The fishway, adjacent to the spillway, has three fish entrances (REW1, RSE2 and REW3) but only one (RSE2) is used. REW2 was changed to a slotted entrance (RSE2) in 1996, while REW1 remains as a backup mechanical gate. REW3 faces the spillway and is bulkheaded. Right-bank auxiliary water at Wanapum Dam is supplied by the gravity supply conduit through two inline valves fed by the forebay. The lower diffusion chambers (RDC25-32) are fed by individual butterfly valves from the attraction water supply channel. Water is provided to the remaining lower ladder diffusion chambers (RDC2-24) by attraction water supply channel chimney overflow. The upper ladder diffusion chamber RDC1 is fed by the forebay through butterfly valves RV9 and 10. Grant PUD operates the diffusion chambers to keep the ladder within required fishway criteria during the fish passage period.

2.6.3 Fishway Inspections and Dewatering

Dewatering of the fishways for inspection and maintenance is conducted during the periods of minimum fish migration. In order to shorten the ladder shutdown periods, dewatering operations are carefully planned in advance. A schedule for the inspection and maintenance is worked out in cooperation with the PRCC, PRFF, and the FPC. The required frequency of the dewatering for maintenance is determined from Grant PUD's experience gained through yearly inspections.

During all dewatering that may involve fish handling, trained personnel are present to provide technical guidance and assure sound fish handling. Every effort is made to remove fish prior to the system becoming fully dewatered. All adult anadromous species recovered are released upstream of the dam.

2.6.4 Normal Winter Maintenance Period (December 1 – February 28)

The fishways may be dewatered to allow annual maintenance of fish facility equipment, including pumps, diffuser gratings, valves, and orifice and entrance gates as necessary to assure their readiness during the adult fish-migration period. All fishway dewaterings are recorded and

a report is completed by the project biologist or technician. Fish biologists or technicians are present at all dewaterings to assure proper fish handling procedures are followed.

2.6.5 Scheduled Maintenance

Maintenance which requires dewatering, or that will have a significant effect on fish passage, is done during the winter maintenance period of December 1 through February 28. Maintenance of facilities that does not affect fish passage may be conducted during the rest of the year. Concurrent outages of both fishways are avoided whenever possible to provide an upstream fish passage route at the dams at all times. When facilities are not being maintained during the winter maintenance period, they are operated according to the normal operating criteria, unless otherwise coordinated with NOAA Fisheries, FPC, PRCC, and the PRFF.

2.6.6 Unscheduled Maintenance

Unscheduled maintenance that significantly impacts the operation of a fish-passage facility is coordinated with FPC, NOAA Fisheries, PRCC, and the PRFF. The decision on whether to dewater the ladder and make repairs during the fish passage season or wait until the winter maintenance period is made after consultation with the FPC, NOAA Fisheries, PRCC, and the PRFF. If part of a fish-passage facility malfunctions or is damaged during the fish-passage season and the facility can still be operated within criteria without any detrimental effects on fish passage, repairs are not conducted until the winter maintenance period or until minimal numbers of fish are passing the dam. If part of a facility that may significantly impact fish passage is damaged or malfunctions, it is repaired as soon as possible.

2.7 Total Dissolved Gas Abatement

On January 30, 2009, Grant PUD submitted to FERC and the WDOE a final Gas Abatement Plan (GAP), developed in consultation with the PRCC and WDOE (Hendrick 2009). On July 10, 2009, FERC approved and modified the GAP; the modification required FERC approval of annual updates to the plan. On January 30, 2015, Grant PUD submitted its updated GAP to FERC for approval (Keeler 2015). FERC approval of the GAP for 2015 was received on April 1, 2015. The 2015 update to the original 2009 GAP included details on operational and structural measures that Grant PUD planned to implement over the next four years. These measures are intended to result in compliance with WDOE's water quality standards for TDG at the Project.

In accordance with the GAP, Grant PUD monitored TDG levels in the forebay and tailrace of both Wanapum and Priest Rapids dams during the fish-spill season, as well as used data from the CORPS Pasco TDG monitor as Grant PUD's next downstream forebay TDG compliance point.

There were no exceedances of TDG observed during the 2015 fish-spill season. The primary explanation for the absence of exceedances in TDG levels during the 2015 fish-spill season can likely be attributed to the fact that 2015 was a moderately low flow year overall compared to the last 10-years, and thus required minimal involuntary spill efforts within the Project and at upstream projects (which resulted in lower incoming TDG levels). Additionally, pre-emptive spill efforts undertaken by Grant PUD helped reduce or eliminate larger involuntary spill events. For example, if upstream flow predictions were anticipated to be higher than predicted power-load demand, which would lead to involuntary spill, pre-emptive spill was initiated several hours prior to the high flows, thus making room to store the excess water until it could be passed through the turbines (e.g. when power-load demand increased). This reduced the need to involuntarily spill larger amounts of water through the tainter-gates, which typically leads to

higher TDG levels. The lower, longer sustained, pre-emptive spill did not lead to TDG levels in excess of TDG water quality standards.

Grant PUD strives to meet TDG standards, as well as achieve juvenile and adult salmonid and steelhead fish passage and survival standards for the Project, all while meeting regional energy loads and demands. Grant PUD attempted to reduce TDG when feasible by implementing operational TDG abatement measures in 2015, including attempting to maximize turbine flows by setting minimum generation requirements (and thus maximizing turbine flows and reducing involuntary spill), participation in regional spill/project operation meetings, implementation of the regional Spill Priority List, and continuing to preemptively spill based on anticipated high flow/low power load time periods. Examples of structural abatement measures include the construction of spillway deflectors at Wanapum Dam (2000), the construction of the WFB (2008), and the construction of the PRFB (2014). Grant PUD believes that by implementing these measures over the next two years (as part of the ten-year compliance schedule that began in 2008) it is implementing the most current reasonable and feasible measures to alleviate for elevated TDG values that occur during the fish-spill season. In accordance with the GAP and Section 6.4.11(c) of the WDOE 401 Water Quality Certification, Grant PUD provided the WDOE and PRCC with a summary report of TDG monitoring efforts during the 2015 fish-spill season (Keeler 2015a). This report can be viewed at: Water Quality Monitoring Data).

2.8 Avian Predation Control at Wanapum and Priest Rapids Dam

Grant PUD is required to implement and fund an avian predation control program at the Priest Rapids Project (T&C 1.9 & 1.19; NMFS 2008). The overall goal is to reduce avian-related mortalities to salmon and steelhead populations affected by the Project. A specific measure identified includes installation and avian arrays/wires across the Wanapum and Priest Rapids powerhouse tailrace area and assure/maintain them in good condition to exclude avian predators. Arrays at both facilities were completed prior to the 2009 smolt out-migration and Grant PUD maintains a cooperative work agreement with the United States Department of Agriculture Wildlife Services (Wildlife Services) to repair, replace and maintain avian wire arrays at both developments. Wildlife Services also collects data to evaluate the avian predator control program.

2.8.1 Avian Predator Control Methods in 2015

Grant PUD entered into a five year cooperative work agreement with Wildlife Services to conduct bird hazing and other wildlife control duties. Up to four Wildlife Services crews worked two shifts at Wanapum and Priest Rapids dams during the day beginning on April 27, 2015. Throughout the peak salmonid smolt migration, Wildlife Services personnel hazed birds with pyrotechnics to move the threat away from the developments seven days a week for approximately 16 hours per day. Piscivorous waterbirds were lethally removed when hazing actions were unsuccessful at deterring foraging birds. Avian control measures were completed on June 27, 2015.

During the 2015 avian control effort, 5,906 birds were hazed, 54% of which were Caspian terns (*Hydroprogne caspia*) and 707 birds were lethally removed (Table 9). Gut contents of euthanized birds were not examined in 2015. Table 9 shows the overall season results.

Table 9 Total control actions made by Wildlife Services through the Priest Rapids Project, mid-Columbia, 2015.

		Hazed		Lethally Removed	
Common Name	**Scientific Name**	**Wanapum**	**Priest Rapids**	**Wanapum**	**Priest Rapids**
Caspian tern	*Hydroprogne caspia*	1,234	1,951	0	0
Common merganser	*Mergus merganser*	94	236	28	23
Double-crested cormorant	*Phalacrocorax auritus*	121	145	6	9
Gull, California	*Larus californicus*	179	80	90	29
Gull, Herring	*Larus argentatus*	11	6	10	2
Gull, Ring-billed	*Larus delawarensis*	663	1,186	251	259

2.8.2 Avian Control Efforts Proposed for 2016

Grant PUD will enter into an additional five year cooperative work agreement with USDA-APHIS-WS. Wildlife Services personnel will continue angling for northern pikeminnow from the Wanapum transformer deck as well as conducting bird hazing efforts in both the tailrace and forebay of Wanapum and Priest Rapids dams in 2016.

2.9 Northern Pikeminnow Removal at Wanapum and Priest Rapids Dam

Grant PUD is required to implement and fund a northern pikeminnow removal program at the Project (T&C 1.10 & 1.18; NMFS 2008). The long-term program goal is aimed at reducing juvenile salmon and steelhead mortality associated with predation by northern pikeminnow at the Project improving juvenile passage survival.

2.9.1 Efforts in 2015

During the 2015, 845,205 northern pikeminnow were removed by the following methods:

- 9,305 in the set line fishery;
- 831,167 in the beach seine fishery;
- 718 in the electrofishing fishery; and
- 4,015 in the angling fishery.

The average length of northern pikeminnow removed in 2015 varied between fisheries. The average length for the set line fishery was 293 mm ± 64 mm (n= 866). Northern pikeminnow caught in the beach seine fishery ranged from 6.35 mm to 76.2 mm (0.25"-3") with an average of about 16.4 mm (0.645"). The average length of northern pikeminnow removed in the angling fishery was 392 mm ± 126 mm (n=2,262). The average length of northern pikeminnow removed in the electrofishing fishery was 117 mm ± 47 mm (n=97).

2.9.2 Efforts Proposed in 2016

Grant PUD will continue to utilize set lines, beach seines, angling and electrofishing as proven, cost effective, methods for pikeminnow removal. Grant PUD plans to operate at least one set line boat and an electrofishing boat in 2016. Grant PUD will continue to beach seine as much as possible in 2016. When set line catch per unit of effort drops during the spawning period, personnel will focus their time and energy on beach seining and electrofishing. Additionally, as

in previous years, Grant PUD will utilize USDA-WS personnel to angle for pikeminnow from the transformer deck of Wanapum Dam.

2.10 Adult Fish Counting

Grant PUD is required to maintain the video adult fish counting equipment at both developments to provide reliable fish count information and submit annual reports for inclusion in regional databases (T&C 1.2; NMFS 2008). The video fish-counting (VFC) system configuration at each dam has digital video cameras in each fishway streaming data to digital video recorders (DVRs) at each dam. These DVRs are networked and accessed by fish counters via PCs from the fish-counting room at Wanapum Maintenance Center. Data from the DVRs are played back in fast-forward mode on the PCs, and fish are identified and counted by the fish counters via a separate tallying program. At the end of each day fish counts from Priest Rapids and Wanapum dams are posted to Grant PUD's web page Grant County PUD Fish Counts. The Project fish-counting season runs April 15 through November 15, annually.

Grant PUD continues to investigate equipment and methods to help remedy periodic slowdown of video playback during heavy use. There were no data-accuracy problems experienced in 2015. The fish counters took a quality control test and all fish counters were within acceptable accuracy.

2.10.1 2016 Video Fish Counting Operations

Grant PUD will continue to count fish at Priest Rapids and Wanapum dams in 2016 using the same basic methodology as in 2015. In 2014, the fish crowder's backgrounds at Priest Rapids and Wanapum dams were modified to improve removal for cleaning. Upgrades to the video fish counting equipment will continue to be investigated in the 2016 fish counting season. Daily fish counts for 2015 and an annual summary can be viewed at Grant County PUD Fish Counts.

2.11 Adult Steelhead Downstream Passage

Grant PUD is required to operate the project sluiceways at both dams continually from the end of summer spill until November 15 to provide a safer passage route for adult steelhead fallbacks (Term &Condition 1.23; NMFS 2008). If in-season monitoring indicates that these time frames could be modified to improve adult downstream fish passage, Grant PUD is required to discuss in-season study results with the PRCC, and upon approval by NMFS, modify the time frame for operating project sluiceways.

During 2015, summer fish-spill ended at on August 13, 2015 at Wanapum Dam and on August 14, 2015 at Priest Rapids Dam. Immediately following the end of summer fish-spill, the sluiceway at Wanapum Dam and Gate 22 at Priest Rapids Dam (see 2.5.1 above) were opened and operated 24/7 through November 15, 2015.

3.0 Wanapum Dam

Wanapum Dam consists of a 14,680-acre reservoir and an 8,637-foot-long by 186.5-foot-high dam spanning the Columbia River. The dam consists of left and right embankment sections; left and right concrete gravity dam sections; a left bank and right bank fish passage structure, each with an upstream fish ladder; a gated spillway; an intake section for future generating units; a downstream fish top-spill bypass structure in one of the unused intake sections (unit No. 11); and a powerhouse containing 10 vertical shaft integrated Kaplan turbine/generator sets with a total authorized capacity of 1,038 MW.

3.1 Wanapum Fish Bypass

The WFB was completed in early 2008 and began operation during the start of the annual fish-spill program on April 30, 2008 (Figure 2 and Figure 3). The WFB was designed to operate at different flow volumes (20, 15, 10, 5 and 2.5 kcfs). As reported in the past, when tailwater drops below an elevation of 488.0', the outflow from the WFB (at 20 kcfs) becomes unstable and starts to undulate, causing a condition that is believed to be less conducive for migrating juvenile smolts and also possibly producing greater TDG. At this lower tailwater elevation, when the outflow from the WFB is reduced, this undulating jet (of water) is returned to a surface-skimming flow, which is better for fish passage. Grant PUD, in consultation with the PRCC, agreed to maintain the Wanapum tailwater elevations to the best of its abilities to stay within the range of 488.0 to 498.0 feet during the salmonid out-migration season during non-extreme river condition periods.

During 2015, outflow from the WFB was alternated between 15 and 20 kcfs between May 1, 2015 and June 15, 2015. The PRCC was interested in determining if the difference between these two operational scenarios (i.e. 15 kcfs flow vs, 20 kcfs flow) had a significant impact on fish passage efficiency (FPE) for juvenile steelhead and sockeye. At the end of the 2015 evaluation season, there was approximately a 7% increase in sockeye FPE through the WFB when the flow was reduced from 20 kcfs to 15 kcfs, but during the same evaluation period, there was an 11% decrease in steelhead FPE when the bypass flow was reduced from 20 kcfs to 15 kcfs. Due to the limited number (5) of test replicates ran, there was not enough statistical power within the evaluation to determine if the reduction in bypass flow (statistically) had an impact on the FPE of out-migrating salmonid smolts through the WFB.

Figure 2 Aerial photograph of Wanapum Dam, mid-Columbia River, WA.

Figure 3 Photograph of Wanapum Dam Fish Bypass facility, looking downstream, mid-Columbia River, WA.

3.2 Wanapum Advanced Hydro Turbines

On October 2, 2003, and supplemented on April 5 and May 28, 2004, Grant PUD filed an application to amend its license for the Project seeking authorization to replace the 10 turbines at the Wanapum development. The Advanced Turbine replacement was proposed to provide increased power and hydraulic capacity, equal or improved survival of juvenile salmon passing through the units, and improved water quality by reducing the amount of spill over the dam during periods of high flows. The decision criteria for proceeding with the replacement of the remaining nine units over the next eight years was based on whether the Advanced Turbine testing results demonstrated equal or better survival than the existing turbines. Pursuant to FERC's July 23, 2004 Order, Grant PUD installed and tested an Advanced Turbine at Unit 8.

Consistent with the requirements of the BiOp and related FERC Order, a study was designed and conducted to test the hypothesis that survival of Chinook salmon smolts through a new Advanced Turbine would be equal to, or greater than, passage survival through an existing unit. On October 11, 2005, Grant PUD filed a report on the results of biological testing of the first installed Advanced Turbine unit, and in December 2005, FERC authorized continued installation of Advanced Turbines at the Wanapum Development (FERC 2005). Grant PUD completed the Advanced Turbine Upgrades at Wanapum Dam putting the tenth turbine into operation in October, 2013.

Sections 6.4.4(b) and 6.4.9 of the Project's 401 WQC (WDOE 2008), as well as Section II of the individual 401 WQC (WDOE 2004) for the Advanced Turbine installation project, required Grant PUD to conduct a field study to evaluate TDG after the installation of the tenth Advanced Turbine to determine the effect, if any, the Advanced Turbines have on TDG below Wanapum Dam. Article 401(a)(17) of the FERC License (FERC 2008) required FERC approval of the study plan prior to implementation.

Previous data (collected in 2008) indicated that the steelhead survival point estimate of passage through the Wanapum powerhouse was 95.2% (all turbines combined and based on the percentage of tags detected downstream that passed through the powerhouse). Survival estimates in 2009 and 2010 for juvenile steelhead indicated were 92.9% and 91.4% respectively. Survival

estimates for sockeye passing through the powerhouse was 96.2% in 2009 and 92% in 2010. See Section 2.1.1 through 2.1.5 for further details related to survival on individual species.

3.2.1 Description of Turbine Operating Criteria and Fishery Operations

Per Term and Condition 1.8 (NMFS 2008), Grant PUD operates the Wanapum turbines in a protocol referred to as "Fish Mode" and also "Ganging Units" during the juvenile salmonid out-migration season (typically mid- to late-April through mid- to late-August), based on smolt index counts conducted by WDFW at the Rock Island Smolt Monitoring Station in order to maximize turbine passage survival rates of juvenile salmonids. Fish Mode was the result of using Hill Curves, Theoretical Avoidable Losses calculations, turbine discharge rates, head, and fish survival curves (based on 1996 and 2005 balloon-tag evaluations of salmonid smolts through the turbines) to determine the operating range of the turbines and maintain a minimum fish survival rate of 95 percent. For Wanapum Dam, this means an operating range of 11.8 to 15.7 kcfs per turbine, and for Priest Rapids Dam, turbine units are operated between 9.0 to 17.4 kcfs.

Recent investigation of smolt passage survival through turbines determined that passage survival rates for out-migrating juvenile salmonids was influenced not only by turbine operation (i.e. "Fish Mode"), but by powerhouse operation. These determinations led to the concept of "ganging" turbine units in conjunction with operating turbines in fish mode. "Ganging units" is defined as concentrating operating turbines into blocks of adjacent units, thus reducing the "edge-effect" that may increase predation risks to smolts as they exit the turbine draft tube and enter the tailrace. Thompson et al. (2012) results showed that a high concentration of northern pikeminnow, along with some walleye and bass (smallmouth and largemouth), exist in the immediate tailrace of Wanapum Dam and are actively foraging on smolts. Turbines furthest from the spillways (Unit 1 at Wanapum and Unit 10 at Priest Rapids) are the first turbines to discontinue operation during daylight hours when the powerhouses are operating at less than full capacity during juvenile and adult fish-migration seasons. The discharge from these turbines may adversely affect adult salmonids' ability to efficiently locate the entrances to the adult fishways adjacent to these turbine discharges.

3.3 Wanapum Fish Spill

The 2015 fish-spill season began on April 19, 2015 and concluded on August 13, 2015. The fish-spill periods were very closely matched with the juvenile migration timing, and greater than 98% of the yearling spring out-migrants passed during the spring fish-spill period between April 19 and June 14. The combined spring and summer fish-spill periods from April 19–August 14 encompassed greater than 99% of the entire 2015 summer outmigration.

During 2015, the intent was to pass all non-turbine out-migrating salmonids and steelhead through the WFB; however involuntary spill occurred during some of the out-migration season which resulted in spill through the spillway at Wanapum Dam.

As mention above in Section 3.1 the outflow from the WFB was alternated between 15 and 20 kcfs between May1, 2015 and June 15, 2015. The PRCC was interested in determining if the difference between these two operational scenarios (i.e. 15 kcfs flow vs, 20 kcfs flow) had a significant impact on fish passage efficiency (FPE[6]) for juvenile steelhead and sockeye. Based

[6] Fish passage efficiency is defined as an estimate of passage for various species utilizing non-turbine passage routes. This estimate is reported as a percentage.

on results of the pilot evaluation, there was a 7% increase in sockeye FPE through the WFB when the flow was reduced from 20 kcfs to 15 kcfs, however an 11% decrease in steelhead FPE was observed when the bypass flow was reduced from 20 kcfs to 15 kcfs.

Due to the limited number (5) of test replicates ran, there was not enough statistical power within the evaluation to determine if the reduction in bypass flow (statistically) had an impact on the FPE of out-migrating salmonid smolts through the WFB.

Grant PUD is currently planning on replacing all of the Wanapum Dam spillway Tainter gate seals as part of the Wanapum Dam Interim Spill Regime Evaluation required under Section 6.2(1) of the WQC and Article 11 of the NMFS and USFWS's Section 18 fishway prescriptions, (all of which have been adopted into Article 406 of the FERC license; FERC 2008). Tainter gate seals are believe to be a potential source for juvenile salmonids mortality during spillway passage. Although the Spillway is currently operated during high flow conditions with inadvertent flow, it is a non-turbine passage route alternative in the event the WFUB is not operational. Grant PUD received approval by FERC in February 2012 to begin modifications. During scheduled maintenance outages, the current 2 inch protruding bolts will be recessed into the seals. The anticipated schedule for replacing the seals has been included in Table 10 with work anticipated to be completed by fall of 2018.

In consultation with the PRCC fish-spill representatives, smolt index counts from the Rock Island Smolt Monitoring Station are used to determine when annual spring fish spill at both developments is initiated (before 2.5% of the juvenile spring migrants have passed the Project – typically mid- to late-April) and also when summer fish spill is terminated (when over 95% of the summer juvenile migrants have passed; typically mid- to late-August). The end of the spring fish spill typically overlaps with the beginning of summer fish spill, providing continuous fish spill from April to August.

The spillways are operated (if needed) on the schedule outlined above during the juvenile salmonid out-migration season, and are operated on an as-needed basis during the remainder of the year. Inspections typically occur during the late summer/early fall low river-flow period, with any necessary maintenance occurring during the low river-flow winter months when the tainter gates are unlikely to be needed.

Table 10 Anticipated schedule for implementing the Wanapum tainter gate seal modifications.

Task Name	Start Date	End Date
Engineering	May 25, 2010 to Oct.10, 2011	
Review/Design Seal Assembly	May 25, 2010	Aug. 8, 2010
Analyze Gates per seismicity criteria	Dec. 31, 2010	Jun. 29, 2011
Issue/Review Preliminary Engineering Drawings	Jun. 29, 2011	Jul. 27, 2011
Final Design	Jul. 27, 2011	Oct. 10, 2011
FERC process	Jun. 29, 2011 – Jan. 24, 2012	
Construction Permitting (CORPS, WDFW, WDOE, & WDNR)	July 13, 2011 – Dec. 27, 2011	
Contract Prep and Award	Dec. 27, 2012 – Aug. 23, 2013	
Construction	Aug. 23, 2013 – May 3, 2018	
Demobilization	Apr. 3, 2018 – May 3, 2018	

4.0 Priest Rapids Dam

Priest Rapids Dam consists of a 7,725-acre reservoir and a 10,103-foot-long by 179.5-foot-high dam spanning the Columbia River. The dam consists of left and right embankment sections; left and right concrete gravity dam sections; a left and right fish passage structure, each with an upstream fish ladder; a gated spillway section; and a powerhouse containing 10 vertical shaft integrated Kaplan turbine/generator sets with a total authorized capacity of 855 MW.

4.1 Priest Rapids Fish Bypass

The Priest Rapids Fish Bypass (PRFB) was completed in April 2014 and began operation during the start of the annual fish-spill program on April 18, 2014 (Figures 4 through 6). The PRFB was designed to operate at a fix flow volume of 26 kcfs, with exact flow volume determined by forebay elevation. During 2014, acoustic tag technology was used to evaluate approach, behavioral and survival estimates for juvenile steelhead and yearling Chinook as they approached and passed through the PRFB. Along with survival estimates for salmonid and steelhead smolts using the PRFB as a passage route, the FPE of the PRFB was determined.

Hatch et al. (2015) reported the FPE for yearling Chinook and juvenile steelhead passing through the PRFB was 38.1% and 47.2%, respectively. Survival estimates for yearling Chinook and steelhead were derived via a paired-release study. Based on detection histories, the PRFB passage survival estimate was 99.8% for yearling Chinook and 99.6% for steelhead (Tables 13 and 14).

Figure 4 Priest Rapids Fish Bypass in operation looking upstream at gate(s) and spillway improvements, April 2014.

Figure 5 Priest Rapids Fish Bypass in operation, April 2014.

Figure 6 Priest Rapids Fish Bypass, April 2014.

4.2 Primary Juvenile Passage Options/Priest Rapids Fish Spill/Spill Program

During the 2015 smolt out-migration season, the PRFB was operated to pass juvenile salmonids and steelhead. The PRFB was designed to operate at a fix flow volume of 26 kcfs. Fish-spill began on April 20 and ended on August 14, 2015.

During 2015, the intent was to pass all non-turbine out-migrating salmonids and steelhead through the PRFB; however involuntary spill occurred during some of the outmigration season which resulted in spill through the spillway at Priest Rapids Dam. As a result, Grant PUD was able to collect information on FPE for juvenile sockeye and juvenile steelhead passing through the Priest Rapids spillway and derive survival estimates for both species passing via the spillway. Based on detection histories, FPE for both juvenile sockeye and for steelhead passing through the spillway was 0.1% for sockeye and 0.0% for juvenile steelhead. Passage survival for sockeye and steelhead passing through the Priest Rapids spillway was 100% and n/a respectively (Table 11 and Table 12).

Table 11 Route specific survival estimates for juvenile sockeye migrating through Priest Rapids Dam in 2015. Survival estimates (point estimates) are based on the proportion of fish that were detected downstream that had been assigned a given passage route.

Priest Rapids Dam		
Passage Route	**Number Passed**	**Detected Downstream (%)**
Priest Rapids Fish Bypass	732	99.5%
Spillway	1	100%
Powerhouse	184	93.4%

Table 12 Route specific survival estimates for juvenile steelhead migrating through Priest Rapids Dam in 2015. Survival estimates (point estimates) are based on the proportion of fish that were detected downstream that had been assigned a given passage route.

Priest Rapids Dam		
Passage Route	**Number Passed**	**Detected Downstream (%)**
Priest Rapids Fish Bypass	495	99.6%
Spillway	0	n/a
Powerhouse	429	95.5%

Juvenile passage in 2016 will be through the newly constructed PRFB. Involuntary spill will be passed through the remaining spillway gates at Priest Rapids. Grant PUD, in consultation with NMFS and the PRCC, using near real-time TDG and flow information to adjust/modify spill patterns as necessary.

4.3 Priest Rapids Turbine Operation

In 2015, Grant PUD collected information on FPE for juvenile sockeye and juvenile steelhead passing through the Priest Rapids turbines and derived survival estimates for both species passing via the turbines. Based on detection histories, FPE for both juvenile sockeye and for steelhead passing through the powerhouse was 34.8% for sockeye and 46.4% for juvenile steelhead. Passage survival for sockeye and steelhead passing through the Priest Rapids turbines was 93.4and 95.5% respectively (Table 11 and Table 12).

Overall survival at Priest Rapids Dam ("concrete') based on point estimates was greater than 96.8% for both species. Juvenile sockeye survival at the "concrete" was 97.3%, while juvenile steelhead was 96.9%.

Term and Condition 1.16 of the BiOp (adapted from Action 18, NMFS 2004), requires Grant PUD to operate the Priest Rapids turbines in non-cavitation mode and run at least two adjacent turbines at any one time. These turbine operations are in place for 95% of the juvenile spring migration (based on index counts at Chelan PUD's Rock Island Dam), and coordinated with the upstream projects. Grant PUD starts monitoring (Rock Island index counts) on or before April 1 of each year and non-cavitation turbine mode operations is initiated before 2.5% of the spring migration has passed. Non-cavitation turbine mode operations are concluded after 97.5% of the spring migration has passed, or on June 15, whichever occurs first.

At this time, Grant PUD expects installation of "in-kind" Kaplan turbines at Priest Rapids Dam. The expected start date for the Priest Rapids Dam turbine installation project is 2016, with a completion date in 2025. Grant PUD completed the competitive modeling phase of the project in 2014 and awarded a contract for the new turbine design.

4.4 Adult PIT-Tag Detection

Per Term and Condition 1.19 (NMFS 2008), Grant PUD maintained and operated the PIT tag detection system at Priest Rapids Dam. The PIT tag detection system was established in the Priest Rapids Dam fishways in spring 2003.

Priest Rapids Dam has two adult fishways, each with multiple non-overflow weirs in the uppermost sections. The adult PIT-tag detection system at Priest Rapids Dam is designed to detect upstream migrating fish bearing an ISO FDX-B PIT-tag (134.2 kHz). The PIT-tag detection system plans and specification document states the system is designed to be 95% efficient for the detection of Digital Angel's PIT-tag model TX1400ST or "supertag". Each fishway has two detection weirs located within the non-overflow sections (Figure 7). Each detection weir has two completely submerged orifices for fish passage equipped with PIT-tag antennae mounted to the upstream face of each orifice. Each antenna is controlled by a Digital Angel FS1001A Stationary Transceiver (Richmond & Anglea, 2008). Currently, Grant PUD is upgrading the PIT-tag readers and replacing a faulty antennae.

In addition to the antennae in the adult fishways, there are three antennae installed at the head of the sorting flume within the Off Ladder Adult Fish Trap (OLAFT). Only fish that have been trapped and pass through the sorting flume are interrogated by this antenna array. The adult fishways' PIT-tag detection system is functional during all times the adult fishways are passable to fish. The OLAFT's PIT-tag detection system is available only when the trap is being operated. All interrogation data collected at Priest Rapids Dam are uploaded to the Pacific States Marine Fisheries Commission's PIT-tag Information System (PTAGIS) web page, http://test.ptagis.org/ptagis/index.jsp. Biomark, Inc. of Boise, ID remotely monitors the detection system for functionality and performs periodic maintenance checks on site. All detection data reported within this report were obtained from the PTAGIS web site.

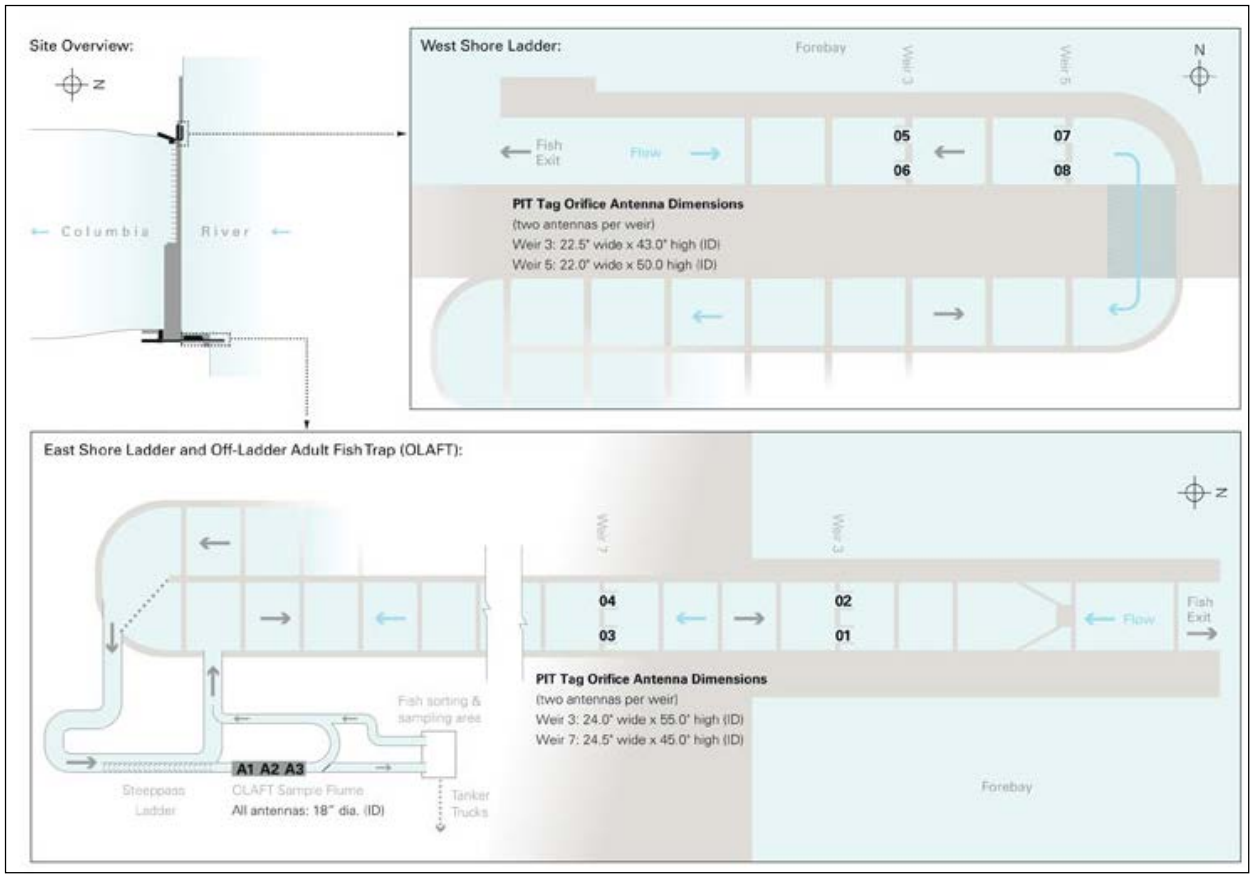

Figure 7 Plan view of upper regions of the fishways at Priest Rapids Dam showing location of PIT-tag detection antennae and associated identification numbers.

A total of 14,939 PIT-tag detections were observed at Priest Rapids Dam in 2015. Of these detections, 5,879 were from unique tags within six species of fish. Species of fish carrying PIT tags identified at Priest Rapids Dam in 2015 were Chinook salmon (*Oncorhynchus tshawytscha*), coho salmon (*O. kisutch*), steelhead trout (*O. mykiss*), sockeye salmon (*O. nerka*), rainbow trout and northern pikeminnow (*Ptychocheilus oregonensis*). All detections and associated fish species are summarized in Table 13. In following reports, per request of NOAA Fisheries, Grant PUD will try to determine adult passage survival estimates between Priest Rapids, Wanapum and Rock Island dams.

Table 13 Summary of PIT-tag detections at Priest Rapids Dam in 2015.

Species	Number of Observations	Unique Tag Codes
Chinook Salmon	5,802	2,319
Coho salmon	632	210
Steelhead trout	5,525	2,238
Sockeye salmon	2,754	1,038
Northern pikeminnow	52	12
Rainbow Trout	78	21
Unknown/ORPHAN	96	41
Totals	**14,939**	**5,879**

4.5 Adult Fish Trap (Off Ladder Adult Fish Trap/OLAFT)

The WDFW operated the OLAFT at Priest Rapids Dam from early-July through early-November 2015 to sample steelhead trout for the agency's stock-assessment program. The WDFW typically operated the trap on Mondays, Wednesdays, and Fridays of each week for steelhead trout sampling (July 6 – November 6). In addition, WDFW trapped fall Chinook salmon to augment Priest Rapids Hatchery broodstock collection (September 16–November 6). The YN operated the trap from late June to mid-July to collect adult sockeye for their Lake Cle Elum and Cooper Lake sockeye salmon reintroduction program. The YN operated the trap Monday through Friday (June 22-July 10). The YN operated the trap during late September to mid-October (September 25 – October 15) to collect Coho salmon for broodstock for the Mid-Columbia Coho Reintroduction Project. The Columbia River Inter-Tribal Fish Commission operated the OLAFT four days (July 10, 13, 15 and 20) to collect sockeye for age composition. The OLAFT was completely dewatered and winterized for the season on November 19, 2015.

5.0 Hatchery Mitigation Programs

Grant PUD implements 11 hatchery programs as mitigation for the Project effects on anadromous salmonids and steelhead that pass through the Project area or are affected by Project operations. Under the 2006 SSSA Grant PUD agreed to achieve and maintain "no net impact" from the Project on steelhead; spring, summer and fall Chinook; sockeye; and coho salmon. In part, Grant PUD accomplishes this objective through hatchery propagation. The substantive requirements of the SSSA were incorporated into the WQC conditions, NMFS and USFWS Section 18 prescriptions, and NMFS' 2008 terms and conditions to the incidental take statement for endangered salmon and steelhead. Grant PUD's FERC license requires implementation as defined in these documents and in the Hatchery and Genetic Management Plans (HGMPs) and Artificial Propagation Plans (APPs) required by License Article 401(a)(4).

5.1 Priest Rapids Coordinating Committee Hatchery Subcommittee

The 2008 NMFS BiOp and SSSA were adopted by FERC and FERC requires Grant PUD to continue to support the Priest Rapids Hatchery Subcommittee (PRCC HSC). This includes provision of sufficient facilitation, administration, and clerical support. This committee is the primary forum for implementing and directing supplementation measures for the Project's anadromous fish program. The PRCC HSC is comprised of NMFS, USFWS, WDFW, CCT, YN, CTUIR and Grant PUD.

During this reporting period the PRCC HSC met monthly except for August (Table 14) and made considerable progress in planning and making decisions related to the White River and Nason spring Chinook programs, and implementing monitoring and evaluation plans for all of Grant PUD's programs. Minutes were taken at all meetings and approved by the PRCC HSC. Significant decisions were formalized in one SOA and approval of documents such as implementation and broodstock collection plans and monitoring and evaluation reports were completed during 2015 (Table 15; PRCC SOAs). The SOA was approved by PRCC HSC consensus. Meeting minutes and statements of agreement for all years can be viewed at PRCC HSC SOAs.

Table 14 Priest Rapids Coordinating Committee Hatchery Subcommittee 2015 meeting schedule.

PRCC Hatchery Subcommittee	January 21, 2015	Meeting

PRCC Hatchery Subcommittee	February 19, 2015	Meeting
PRCC Hatchery Subcommittee	March 19, 2015	Meeting
PRCC Hatchery Subcommittee	April 16, 2015	Meeting
PRCC Hatchery Subcommittee	May 21, 2015	Meeting
PRCC Hatchery Subcommittee	June 18, 2015	Conference call
PRCC Hatchery Subcommittee	July 16, 2015	Meeting
PRCC Hatchery Subcommittee	September 17, 2015	Meeting
PRCC Hatchery Subcommittee	October 22, 2015	Conference call
PRCC Hatchery Subcommittee	November 19, 2015	Meeting
PRCC Hatchery Subcommittee	December 17, 2015	Conference call

Table 15 Statement of Agreements approved by the Priest Rapids Coordinating Committee Hatchery Subcommittee.

Years and SOA #	Title of Statement of Agreement	Date Approved
2015-01	Goat Wall Acclimation Plan	3/11/2015

5.2 Planning Documents Summary

All hatchery planning documents and associated M&E plans have been approved by the PRCC HSC and FERC, and have been submitted to NMFS (Table 16). NMFS issued a 13-year Section 10 take permit for the White River and Nason Creek spring Chinook programs in July 2013 and the permit was amended in June 2015 to include new ways of collecting and spawning broodstock. NMFS' action on all other permits for Grant PUD-funded programs is pending. During 2015, the HSC made progress on requesting alterations to broodstock collection for upper Wenatchee spring Chinook salmon. Permits for all remaining programs are anticipated to be issued in the future. A letter to extend Section 10 take permits for many of the hatchery programs whose permit deadlines expired was received from NOAA Fisheries in September 2013. This letter is intended to provide coverage until new permits can be issued.

Table 16 Hatchery planning documents.

Document	Approved by PRCC Hatchery Subcommittee	Submitted to NMFS for approval*	Approved by FERC	NMFS approval/ESA take permit
White River spring Chinook salmon (HGMP)	Aug. 20, 2009	Sept. 15, 2009	Feb. 7, 2012	July 3, 2013
Nason Creek spring Chinook salmon (HGMP)	Aug. 20, 2009	Sept. 15, 2009	Feb. 7, 2012	July 3, 2013, amended June 2015
Methow spring Chinook salmon (APP)*	Sept. 16, 2010	June 30, 2009	Dec. 14, 2011	Processing
Okanogan spring Chinook salmon (APP)*	Sept. 23, 2010	Sept. 30, 2009	Dec. 14, 2011	Processing
Wenatchee summer Chinook salmon (HGMP)	Sept. 17, 2009	Sept. 30, 2009	Nov. 15, 2011	Processing
Methow summer Chinook salmon (HGMP)	Sept. 17, 2009	Sept. 30, 2009	Nov. 15, 2011	Processing
Okanogan summer Chinook salmon (APP)*	Dec. 16, 2010	Sept. 30, 2009	Oct. 13, 2011	Processing
Fall Chinook salmon (HGMP & M&E)	Oct. 22, 2009	June 30, 2009	Feb. 7, 2012	Processing
Sockeye salmon (HGMP)	April 22, 2010	Sept. 30, 2009	Nov. 15, 2011	Processing
Coho salmon (APP)*	Oct. 11, 2010	Aug. 31, 2009	Oct. 13, 2011	Processing
Steelhead trout (APP)*	Sept. 23, 2010	Sept. 30, 2009	Dec. 14, 2011	Processing
Monitoring and Evaluation Plan covering all programs	Aug. 20, 2009	June 30, 2009	Approved as part of individual HGMP/APP filings.	N/A

*APPs are explanatory documents that explain the relationship between GPUDs responsibilities within a larger program covered by an HGMP submitted to NMFS by others.

5.3 Facility Development Summary

Grant PUD hatchery program facilities are generally complete and all are producing fish (Table 17). Feasibility assessment of converting the Dryden Pond to an overwinter acclimation facility was conducted in 2015.

Table 17 Facility status for planned species.

Program	Facility status
White River spring Chinook salmon	Based on Statement of Agreement 2013-01, approved by the Priest Rapids Coordinating Committee – Policy Committee on Feb. 8, 2013, no long-term acclimation facility will be constructed prior to 2026.
Nason Creek spring Chinook salmon	COMPLETE. Construction of the Nason Creek Acclimation Facility began in spring 2013 and was completed in fall 2014. The first spring Chinook salmon production for this program (BY13) was transferred to the Nason Creek Acclimation Facility for overwinter acclimation in October 2014. The first smolt release occurred during the spring of 2015.
Methow spring Chinook salmon	Methow Fish Hatchery, a Douglas PUD-owned facility, is operated by the Washington Department of Fish and Wildlife. Grant PUD entered into a long-term interlocal agreement with Douglas PUD in the 2nd quarter of 2013 for spring Chinook production capacity for adult holding, spawning, incubation, rearing, and release. The agreement is good through 2052.
Okanogan spring and summer Chinook salmon	COMPLETE. Chief Joseph Hatchery construction, partially funded by Grant PUD, was completed in May 2013. Production at the facility began in summer 2013 with adult holding, spawning, incubation, and early rearing of spring and summer Chinook salmon. Final acclimation and release occurs at various locations in the Okanogan basin. The first subyearling releases occurred in 2014 and the first yearlings were released in the spring of 2015.
Wenatchee summer Chinook salmon	Feasibility analysis for conversion of the Chelan PUD-owned Dryden Pond to an overwinter acclimation facility is in progress. Grant PUD completed permit-level designs in May 2012. Further design progress is dependent on outcome of the feasibility analysis. Fish are currently spawned, incubated, and early reared at Eastbank Hatchery. Spring acclimation and release into the Wenatchee River occurs at the existing Chelan PUD-owned Dryden Pond. The first smolt release for Grant PUD's portion of this program occurred in spring 2014.
Methow summer Chinook salmon	COMPLETE. Construction of the Carlton Overwinter Acclimation Facility began in spring 2013 and was completed in summer 2014. Prior to completion, summer Chinook were acclimated and released during the spring of 2014. Grant PUD's summer Chinook production was transferred to the facility from Chelan PUD's Eastbank Hatchery in fall 2014 for overwinter acclimation and release. The first smolts that were overwinter acclimated were released in spring 2015.
Fall Chinook salmon	A major renovation of Priest Rapids Hatchery began in May 2012 and was substantially completed in December 2013. Operation using the new trapping, spawning, and incubation components began in September 2013 and the new raceways and modified rearing ponds were first used in 2014. Additional upgrades are in progress.
Sockeye salmon	COMPLETE. Construction of the Penticton Sockeye Hatchery began in July 2013 and was completed in late summer 2014. The first production at the fry facility began with spawning in 2014.
Coho salmon	Funding agreement only (10-year agreement with Yakama Nation – expires 2018).
Steelhead trout	Production currently occurs at Wells Hatchery, owned by Douglas PUD. Facility modifications and upgrades have been designed, reviewed, and approved. A major renovation of this facility began in 2015. Dedicated space for Grant PUD's steelhead production is included in the approved design. Acclimation facilities in the Okanogan basin are operational, but Grant PUD worked on additional acclimation opportunities and facility upgrades to St. Mary's Acclimation Pond on Omak Creek, as well as new remote acclimation in portable tanks on Omak Creek. Permit level designs have been submitted by Grant PUD to CCT for a portable acclimation site above Mission Falls on Omak Creek.

5.4 Number of fish released and dollars invested summary

Fish have been produced and released for several of Grant PUD's hatchery programs for multiple years. The first release from the new Nason Creek Acclimation Facility occurred in 2015. Significant program investments were made in 2015, including investments in operation, maintenance, and monitoring and evaluation of hatchery facilities (Table 18). Expenditures in the Table below included capital construction, operation and maintenance, and monitoring and evaluation. Information provided in this report supersedes all previous reports.

Table 18 Approximate number of fish released and estimated dollars invested in support of Grant PUD's hatchery mitigation.

Program	Years that fish were released	Mean number of fish released per year	Number of fish released in 2015	GPUD Program investment ($) in 2015*	GPUD Program investment ($) total*
White River spring Chinook salmon	2004-15	69,470	42,195	$453,530	$26,878,223
Nason Creek spring Chinook salmon	2004, 05, 15	43,479	43,479	$834,597	$10,643,722
Methow spring Chinook salmon	2007-15	170,427	181,050	$696,366	$8,585,115
Okanogan spring Chinook salmon	2015	130,207	130,207	$261,324	$3,153,044
Wenatchee Summer Chinook salmon	2014-15	176.497	171,177	$696,065	$2,771,381
Methow Summer Chinook salmon	2014-15	193,113	188,834	$783,042	$7,130,765
Okanogan Summer Chinook salmon	2014-15	111,124	129,417	$684,193	$8,210,923
Fall Chinook salmon	1985-2015[a]	5,163,163	5,490,844	$1,984,725	$36,166,485
Sockeye salmon	2005-15	510,341	767,437	$1,155,905	$11,314,598
Coho salmon	2007-15	373,296	373,296[b]	$221,737	$4,420,069
Steelhead	2005-15	103,363	109,214	$1,205,172	$10,314,238
Total	**2004-15**	**6,868,159**	**7,253,854**	**$8,976,656**	**$129,588,563**

*ALL COSTS ARE ESTIMATES ONLY AND ARE LIKELY TO BE UNDERESTIMATES. These expenditures do not include Grant PUD staff labor or travel expenditures.

[a] First fish were released in 1972, but the data from the earlier releases is not as robust as the later dates.

[b] Coho program and related data reporting runs October 1 through September 30, previous year.

5.5 Monitoring and Evaluation Summary

Monitoring and Evaluation activities continued for all hatchery programs currently implemented by Grant PUD (Table 19). A revised five-year M&E Plan for upper Columbia species was approved by the PRCC HSC in April 2013 (Hillman et al. 2013). A request for proposals to implement the M&E plan in the Wenatchee Basin was also completed during 2013 and contracts to implement the work were signed in 2014. Grant PUD has also invested in studies to help improve the performance of hatchery programs. These studies will help inform topics such as optimal size-targets and growth of fish reared in the hatchery, and provide additional tools to improve imprinting.

Table 19 Monitoring and evaluation activities for Grant PUD hatchery programs, partially and fully funded by Grant PUD. The span of years that activities were conducted is in each cell.

Program	Brood Collection	Spawning	Tagging	Release	Juvenile Abundance	Redd Surveys	Carcass Recoveries
White River spring Chinook salmon	97-09	01-13	04-15	02, 04-15	07-15	97-15	97-15
Nason Creek spring Chinook salmon	98-99*, 13-15	02-03*, 13-15	04-05*, 14-15	04-05*, 15	07-15	98-99*, 14-15	98-99*, 14-15
Methow spring Chinook salmon	96-99*, 05-15	96-99*, 05-15	01-15	02-15	02-15	96-15	96-15
Okanogan spring Chinook salmon	13-15	13-15	13-15	2015	NA	NA	NA
Wenatchee summer Chinook salmon	13-15	13-15	13-15	14-15	14-15	14-15	14-15
Methow summer Chinook salmon	13-15	13-15	13-15	14-15	14-15	14-15	14-15
Okanogan summer Chinook salmon	13-15	13-15	14-15	15	14-15	14-15	14-15
Fall Chinook salmon	98-15	98-15	98-15	98-15	98-15	10-15	10-15
Sockeye salmon	04-12, 14-15	04-12,14-15	04-13, 15	04-13,15	04-15	04-15	04-15
Coho salmon	05-15	05-15	06-15	06-15	06-15	06-15	06-15
Steelhead trout (Methow)	05-12	05-12	05-12	05-12	05-12	05-12	05-12
Steelhead trout (Okanogan)	06-15	06-15	07-15	07-15	07-15	07-15	07-15

*Part of the captive brood program

5.6 Upper Columbia River Steelhead Supplementation Plan

Grant PUD is required under T&C 1.25 (NMFS 2008) to consult with the PRCC HSC (subject to NMFS approval) to develop an APP to rear 100,000 yearling UCR steelhead for release in the UCR basin. The PRCC HSC has agreed that Grant PUD's annual steelhead compensation responsibilities may be met, in part, by funding the Colville Tribes' 20,000 steelhead program in Omak Creek (Okanogan River). The remaining 80,000 steelhead are UCR steelhead reared at the WDFW-operated, Douglas PUD owned, Wells Hatchery. The PRCC HSC further agreed that as the Omak Creek program develops, it would decide on appropriate adjustments to the apportionment described above. Part of this requirement is to develop a comprehensive monitoring and evaluation program which includes monitoring in the natural environment and investigating the impacts of the hatchery program on the naturally produced steelhead population. This is subject to PRCC HSC approval, and the monitoring and evaluation program may be implemented in conjunction with ongoing or future monitoring and evaluation programs with other entities such as Chelan and Douglas PUDs through cost-sharing agreements.

5.6.1 Program Background

Originally listed as endangered in 1997 the status of UCR steelhead has changed several times; as of August 15, 2011 the upper Columbia distinct population segment (DPS) for steelhead was listed as threatened by NOAA Fisheries. This DPS includes all naturally spawned anadromous steelhead populations below natural and man-made impassable barriers in streams in the Columbia River Basin upstream from the Yakima River, Washington, to the U.S.-Canada border,

as well as six artificial propagation programs: the Wenatchee River, Wells Hatchery (in the Methow and Okanogan rivers), Winthrop National Fish Hatchery, Omak Creek, and the Ringold steelhead hatchery programs.

Beginning in 2005, Grant PUD released hatchery steelhead into the Methow basin and co-funded M&E activities as part of its mitigation requirement using facilities at Wells Hatchery. In 2007, Grant PUD released yearling steelhead smolts into the Okanogan basin as part of a reintroduction program operated by the Colville Tribes at Cassimer Bar. Because of poor survival and inadequate hatchery infrastructure, Cassimer Bar was discontinued after the 2011 release and the entire program was moved to Wells Hatchery. In order to concentrate M&E efforts into a single basin Grant PUD's steelhead mitigation program has been released wholly into the Okanogan basin since 2012.

5.6.2 Hatchery Planning Documents

The Wells Hatchery Steelhead HGMP was completed and submitted to NOAA Fisheries in 2011. Currently, NMFS is evaluating the HGMP prior to issuing a new section 10 permit for the Upper Columbia steelhead hatchery programs. An extension to Section 10 permit 1395 was granted by NMFS on September 20, 2013 as the previous permit expired on October 2, 2013. The quantitative objectives for steelhead were approved by the PRCC HSC in January 2009. Grant PUD submitted an APP for both the Wells and Cassimer Bar programs to the PRCC and PRCC HSC on April 17, 2009, and to NMFS on September 30, 2009. The APP was approved by the PRCC HSC on September 23, 2010, submitted to FERC for approval on September 30, 2010, and approved by FERC on December 14, 2011.

An updated HGMP for the Okanogan steelhead program developed by the Colville Confederated Tribes was submitted to the PRCC HSC in July 2013 and approved by the PRCC HSC in August 2013. It was submitted to NMFS in September and is currently under consideration. Facilities

Since 2005, Grant PUD has funded releases of yearling steelhead smolts into the upper Columbia basin (Table 20). Grant PUD finalized a new long-term agreement with Douglas PUD in 2013 that will provide new infrastructure at the Wells Hatchery as part of an overall plan to re-design and modernize the facility. Through the agreement, Grant PUD will provide capital for spawning, incubation, and rearing infrastructure for its 100,000 smolt program. Designs for the modernization were completed in 2014. The construction bid was awarded and construction began in 2015.

Currently Omak Creek is the only location used for brood collection for the Okanogan program, but as the program expands, other trapping locations and acclimation sites may be used or developed. A spring-time acclimation raceway on Omak Creek near the St. Mary's Mission is currently used for the locally-adapted yearling program. PIT-tag detections in 2014 suggested adult steelhead passage occurred at Mission Falls. An acclimation site above Mission Falls on Omak Creek has been selected and surveyed. A preliminary design to be used for permitting purposes has been developed by Grant PUD and submitted to CCT. A construction schedule will be finalized in the spring of 2016, with a goal of having portable acclimation infrastructure ready for steelhead acclimation in the spring of 2017.

5.6.3 Operations and Maintenance

Grant and Douglas PUDs developed a new long-term agreement in 2013 for production of Grant PUD's steelhead mitigation program. This agreement covers reimbursement to Douglas PUD for Grant PUD's proportionate use of the Wells Hatchery facility for its steelhead program,

including operations and maintenance, monitoring and evaluation, and the capital improvements described in Section 5.6.3.

Grant PUD also continues to fund the Okanogan basin steelhead program managed by the Colville Confederated Tribes. The existing agreement between Colville Confederated Tribes and Grant PUD will end in February 2016 but a two-year contract is being developed which will extend the program, including brood collection, transport, acclimation (as needed), and all associated M&E activities through March 1, 2018.

In spring 2015, BY 2014 steelhead smolts were released into the Okanogan basin (in Omak Creek) as part of Grant PUD's mitigation requirement. Nine consecutive brood years have been released into the Okanogan basin as part of the Colville Confederated Tribes' steelhead program using locally adapted brood. As of December 2015, approximately 43,843 locally-adapted BY 2015 fish were on-site at the Wells Hatchery as part of the Colville Confederated Tribes' steelhead program, and an additional 70,950 BY 2015 fish at Wells Hatchery are reserved for Grant PUD mitigation requirements. Approximately 15,000 PIT tags and 42,000 coded-wire tags (CWTs) were placed in steelhead parr in November 2015. These fish are scheduled for release in 3 locations; Omak Creek above Mission Falls, Omak Creek at St. Mary's Pond (below Mission Falls), and hatchery fish destined for release in the Okanogan basin. Fish released in Omak Creek are from the locally adapted population, while Wells Hatchery stock are destined for other locations within the Okanogan basin. Both the locally adapted (from Omak Creek) and Wells stock are being reared at Wells Fish Hatchery and will be released in the spring of 2016.

The mean and total releases for the combined Wells and Omak programs between 2005 and 2015, and annual O&M, M&E, and capital costs are listed below (Table 20).

Table 20 Steelhead released and annual expenditures as part of the Grant PUD's mitigation requirements.

Calendar Year	Numbers of Fish Released	Annual Expenditures*		
		Capital**	O&M/M&E***	Expenditure Totals
2005	100,000	$542	$285,020	$285,562
2006	101,379	$1,626	$297,680	$299,306
2007	127,819	$2,037	$375,355	$377,392
2008	128,415	$6,269	$425,296	$431,565
2009	95,505	$7,510	$504,510	$512,020
2010	97,393	$7,800	$655,405	$663,205
2011	117,963	$8,376	$320,786	$329,162
2012	84,420	$10,619	$564,508	$575,127
2013	65,970	$114,920	$585,295	$700,215
2014	108,914	$4,258,733	$676,779	$4,935,512
2015	109,214	$0	$1,205,172	$1,205,172
Mean	103,363	--	--	--
Totals	**1,136,992**	**$4,418,432**	**$5,895,806**	**$10,314,238**

*ALL COSTS ARE ESTIMATES ONLY AND ARE LIKELY TO BE UNDERESTIMATES. Does not include Grant PUD staff labor or travel expenditures.

**These are amortized amounts.

***M&E costs include studies and hatchery evaluations.

5.6.4 Monitoring and Evaluation

As part of program expansion, a request to increase the number of brood collection from 16 to 54 has been made to NMFS with a decision pending. After transport from the collection site to Wells Hatchery the fish are spawned, incubated, and reared prior to transport and released back into select areas of the Okanogan basin. The production goal is 20,000 or more smolts to be released into Omak Creek in early May. Excess production above 20,000 fish will be out-planted into other approved tributaries. Current M&E activities conducted are shown in Table 21 and are consistent with Grant PUD's approved M&E Plan.

Table 21 Monitoring and Evaluation activities for Okanogan basin steelhead, funded by Grant PUD.

Activity	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Brood Collection	X	X	X	X	X	X	X	X	X	X
Spawning	X	X	X	X	X	X	X	X	X	X
Tagging		X	X	X	X	X	X	X	X	X
Release		X	X	X	X	X	X	X	X	X
Smolt Abundance		X	X	X	X	X	X	X	X	X
Carcass/Tag Recoveries		X	X	X	X	X	X	X	X	X
Redd Surveys		X	X	X	X	X	X	X	X	X

5.7 Upper Columbia River Spring Chinook Salmon Supplementation

UCR spring Chinook covered under this T&C (1.26; 2008 NMFS) are listed as Endangered (FR Vol. 64, No. 56, March 24, 1999). This Evolutionary Significant Unit (ESU) includes all naturally spawned populations of spring Chinook salmon in all river reaches accessible to spring Chinook salmon in Columbia River tributaries upstream of Rock Island Dam and downstream of Chief Joseph Dam in Washington, excluding the Okanogan River. Hatchery propagation of the White River, Nason Creek, Chiwawa River, Twisp River, Methow River, and Chewuch River spring Chinook stocks is included in the ESU.

5.8 White River Spring Chinook Salmon Program

The 2008 NMFS BiOp (T&C 1.27) required Grant PUD to continue to implement the White River spring-run Chinook salmon program. This included the possible development of rearing and acclimation facilities. The program was to be implemented to produce 150,000 yearling smolts. However, in 2012 the smolt production level was recalculated to a total of 74,556. This recalculation and a subsequent statement of agreement suspending the program through 2026 were approved by FERC in November 2013. Details regarding this agreement are found in Section 5.8.1.

5.8.1 Program Background

The White River spawning aggregate is within the UCR spring Chinook salmon ESU. In 1997, a spring Chinook captive broodstock program was initiated for the White River population as an emergency effort to reduce the risk of extinction. Adult escapement has remained low in the White River, but the captive-brood program is ending. The final egg collection for the first-generation portion of the captive-brood program occurred in 2009. The program was expected to transition to traditional adult-based supplementation at the captive-brood program's planned sunset in 2016. However, in 2012 resource co-managers determined that an adult-based

supplementation program as required is not feasible at this time, due primarily to the inability to collect sufficient broodstock to support a 74,556 smolt program. Members of the PRCC Policy and PRCC approved a statement of agreement in February 2013 (SOA 2013-01) to cease the captive brood program with the last release of fish in 2016 and last monitoring of captive brood fish in 2019. However, because of a severe outbreak of bacterial kidney disease in the adult broodstock in summer 2014, the PRCC-HSC decided to euthanize all remaining broodstock prior to the 2014 spawn. This action resulted in broodyear 2013 being the final class of the program, which was released in May, 2015. Monitoring of captive-brood program-produced fish will occur through 2018. The statement of agreement also states that Grant PUD will not be responsible for artificial propagation activities in the White River through broodyear 2026. Grant PUD will continue to monitor and evaluate spring Chinook salmon in the White River during this time period to meet the objectives of Grant PUD's M&E Plan. It is anticipated Grant PUD's total mitigation of 223,670 Wenatchee basin spring Chinook will be met through increased releases from Grant PUD's Nason Creek program. Any shortfalls that occur in the Nason Creek program through 2026 will be met through other hatchery alternatives as agreed to by the PRCC HSC. This has occurred through production of additional spring Chinook salmon in the Chiwawa spring Chinook salmon program. An Order approving these program changes was issued by FERC on November 1, 2013 (P-2114-263).

5.8.2 Hatchery Planning Documents

The quantitative objectives for spring Chinook were approved by the PRCC HSC in January 2009. The overall M&E plan, including White River spring Chinook, was submitted to NMFS on June 30, 2009, approved by the PRCC HSC on August 20, 2009 and submitted to FERC on June 28, 2010. A draft HGMP was submitted to the PRCC HSC on April 17, 2009 and to NMFS on June 30, 2009. The PRCC HSC approved the revised plan on August 20, 2009. The PRCC HSC-approved plan was resubmitted to NMFS on September 15, 2009. NMFS requested additional information from Grant PUD on October 22, 2009. An addendum to the HGMP was provided to NMFS in March 2010 and the application was released for public comment by NMFS March 18, 2010, submitted to FERC on June 28, 2010, and approved by FERC on February 7, 2012. A Section 10 ESA take permit was issued for this program by NMFS in July 2013.

5.8.3 Facilities

Because no permanent facilities will be developed for the White River program through 2026 (SOA 2013-01), a six-week period of acclimation for juveniles occurred each year until the captive brood program ceased in 2015. Juveniles were transferred each March from Little White Salmon National Fish Hatchery (LWSNFH) to temporary tanks placed on Grant PUD-owned property at mile two of the White River (Figure 8) and in net pens in Lake Wenatchee.

Figure 8 White River portable acclimation site for spring Chinook.

5.8.4 Operations and Maintenance

Since 2006, Grant PUD has maintained a contract with the U.S. Department of the Interior for services related to the current captive-broodstock program at LWSNFH near Cook, WA. This contract expired in April, 2015. The captive broodstock were held and spawned at the hatchery and their progeny were early reared there before transport to the White River for spring acclimation and release. Grant PUD also contracted with WDFW for transportation, final rearing, and release services associated with the White River spring Chinook acclimation program.

5.8.4.1 Fish Release

White River spring Chinook smolts released during 2015 were from BY 2013 (Table 22). Released fish were adipose-fin present and had a CWT in the base of the adipose-fin tissue. Additionally, approximately 20,000 fish had PIT-tags. A total of 28,500 fish were acclimated in 12 aluminum tanks at Grant PUD's property, located at White River rivermile 2, and 14,280 were acclimated in net pens in Lake Wenatchee, at the mouth of the White River. All tank and net-pen fish were released via trucked transport May 4 and May 5, 2015, respectively. Table 22 shows the numbers of White River spring Chinook salmon released by brood year, acclimation type, and location. Program expenditures to date are reflected in Table 23.

Table 22 Numbers of White River Chinook salmon released by brood year, acclimation type, and location.

Brood Year	Release Location	Approximate Number of Fish
2001	Egg basket in White River as fry	1,536
2002	Acclimation tanks in the White River	2,589
2003	Acclimation tanks in the White River	2,096
2004	Acclimation tanks in the White River	1,639
2005	Net pens in Lake Wenatchee	63,779
2006	Direct to White River as subyearlings & yearlings	139,644 and 142,033 respectively
2007	Net pens in Lake Wenatchee & Direct to Lake Wenatchee as yearlings	131,843
2008	Net pens in and at mouth of Lake Wenatchee and in White River	41,603
2009	Acclimation tanks and pens in White River, net pens in Lake and acclimation at River mile 11.5 via side channel and acclimation tanks.	112,596
2010	Acclimation tanks, bridge site	18,850
2011	Acclimation tanks into White and Wenatchee rivers. Net pens into Wenatchee River.	105,000
2012	Wenatchee River	97,713
2013	Wenatchee River	42,780
MEAN (all BY)		69,515
TOTAL		**903,701**

Table 23 Spring Chinook salmon annual expenditures for the White River program as part of Grant PUD mitigation.

Calendar Year	Annual Expenditures*		
	Capital**	O&M/M&E***	Totals
1997-2007	$255,010	$14,213,321	$14,468,331
2008	$216,105	$2,342,711	$2,558,816
2009	$268,893	$836,973	$1,105,866
2010	$452,926	$1,403,046	$1,855,972
2011	$1,282,984	$1,115,380	$2,398,364
2012	$281,025	$1,128,561	$1,409,586
2013	$0	$1,512,759	$1,512,759
2014	$0	$1,114,999	$1,114,999
2015	$0	$453,530	$453,530
Totals	**$2,756,943**	**$24,121,280**	**$26,878,223**

*ALL COSTS ARE ESTIMATES ONLY AND ARE LIKELY TO BE UNDERESTIMATES.
**Does not include Grant PUD staff labor or travel expenditures.
** M&E costs include studies and hatchery evaluations.

5.8.5 Monitoring and Evaluation

Since 2007, smolt abundance and emigration from the White River has been monitored using a rotary screw trap. The trap is located downstream of the Sears Creek Bridge. In 2015, the White River screw trap was operated from early March through November with periodic stoppages due to river conditions and contracting issues.

In an effort to reduce and evaluate precocious maturation, a feeding experiment was conducted in 2015 on BY 2013 juvenile White River spring Chinook salmon at LWSNFH. Size targets were the closest that were achieved during the three year experiment.

Fisheries managers continue to develop an approach for managing spring Chinook in the Wenatchee Basin, which will include the White River program. The concept is to manage the proportion of hatchery and natural-origin fish in the broodstock and on the spawning grounds to limit impacts to the White River spring Chinook spawning aggregate. The last fish release of the captive broodstock program occurred in 2015. Information on M&E activities can be found in Table 24.

Table 24 Monitoring and Evaluation activities for White River spring Chinook, partially or fully funded by Grant PUD.

Activity	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
Brood Collection	X	X	X	X	X	X	X	X	X	X	X	X	X						
Spawning					X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Tagging								X	X	X	X	X	X	X	X	X	X	X	X
Release						X		X	X	X	X	X	X	X	X	X	X	X	X
Smolt Abundance											X	X	X	X	X	X	X	X	X
Carcass Recoveries	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Redd Surveys	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

5.9 Nason Creek Spring Chinook Salmon Program

Under T&C 1.28 (2008 NMFS), Grant PUD will continue to implement artificial propagation for spring Chinook salmon in Nason Creek. An adult-based supplementation program began with the collection of broodstock in 2013. The first releases of the program took place from the Nason Creek Acclimation Facility in the spring of 2015. The current production goal is to release 223,670 smolts (125,000 for conservation and 98,670 for safety net).

5.9.1 Program Background

The Nason Creek spawning aggregate is within the UCR spring Chinook salmon ESU. In 1997, a spring Chinook captive-broodstock program was initiated for the Nason Creek population in an effort to reduce the risk of extinction. Improvement in adult escapement in Nason Creek has reduced the near-term risk of extinction, so the captive-broodstock program was discontinued. An adult-based supplementation program is being implemented with the intent to increase abundance of naturally spawning spring Chinook salmon in Nason Creek. The program was originally intended to produce 250,000 yearling smolts. However, in early 2012 the smolt production level was recalculated to 149,114. This recalculation and a subsequent statement of agreement suspending the White River spring Chinook program through 2026 were approved by FERC in November 2013. Shortfalls in the White River spring Chinook program through 2026 will be achieved through increased smolt releases (totaling 223,670) from the Nason Creek program.

In 2013, natural-origin adult spring Chinook were collected for broodstock at Tumwater Dam and from Nason Creek using tangle and dip nets. In 2014, all natural-origin broodstock were collected from Nason Creek using tangle and dip nets. While these brood collection methods were successful at collecting adults from the Nason Creek spawning aggregate, they were unable to collect the necessary number of adults to meet mitigation production goals in 2013 and 2014. In 2015, a the Nason Creek Section 10 ESA take permit was amended to allow for the collection and compositing of natural-origin broodstock at Tumwater Dam from the Nason or Chiwawa spawning aggregate. Beginning 2016, fish released from the Nason Creek Acclimation Facility will be a mix of Nason Creek and Chiwawa River origin. Production shortfalls in the Nason Creek program through 2026 will be supplemented through alternative hatchery production as approved by the PRCC HSC. Release shortfalls from the 2013 broodyear were met by funding the production and release of additional spring Chinook salmon as part of the Chiwawa Hatchery spring Chinook salmon program.

5.9.2 Hatchery Planning Documents

The PRCC HSC-approved HGMP was submitted to NMFS on September 15, 2009. The HGMP was released by NMFS for public comment on March 18, 2010, and the HGMP was submitted to FERC on June 28, 2010 and approved on February 7, 2012. The HGMP serves as an application for a Section 10 permit under the Endangered Species Act. A Section 10 ESA take permit was issued for this program by NOAA Fisheries in July 2013 and amended in May 2015.

5.9.3 Facilities

The Nason Creek hatchery program employs adult supplementation technologies to rear, acclimate, and release progeny of Nason Creek and Chiwawa River spring Chinook salmon. Beginning in 2013, immigrating adults were collected from the adult ladder at Tumwater Dam and by tangle-netting in Nason Creek. Through a long-term hatchery sharing agreement between Chelan PUD and Grant PUD, adult holding, spawning, egg incubation, and initial rearing occurs at the Eastbank Hatchery on the Columbia River near Wenatchee, WA. As subyearlings,

juveniles were transferred from Eastbank Hatchery to the Nason Creek Acclimation Facility (Figure 9) for overwinter acclimation. Overwinter acclimation occurs from October through release the following spring. Construction of the Nason Creek Acclimation Facility began in the spring of 2013 and was completed in the spring of 2014. The progeny of the 2013 broodstock were the first fish released from the acclimation facility. This cohort was released directly into Nason Creek from the acclimation facility at the yearling smolt stage in the spring of 2015.

Figure 9 Nason Creek Acclimation Facility.

5.9.4 Operation and Maintenance

Approximately 13,200 yearling spring Chinook were released into Nason Creek as a result of captive broodstock collected in 2002 and 2003 (Table 25). Monitoring and its associated expense were limited because the captive broodstock program was discontinued due to better than expected adult escapement in Nason Creek. However, capital and operations and maintenance expenses continue as the adult-based supplementation program develops (Table 26). Broodstock collection for the adult supplementation program began in 2013. The first releases for the program occurred in 2015.

Table 25 The numbers of Nason Creek and Chiwawa Program spring Chinook salmon released by brood year, acclimation type, and location.

Brood Year	Release Location	Number of Nason Origin fish Released
Captive Broodstock Program		
2002	Acclimation tanks in Nason Creek	8,956
2003	Acclimation tanks in Nason Creek	4,244
Captive Broodstock Program Mean		6,600
Captive Broodstock Program Total		13,200
Adult Return Broodstock Program		
2013	Nason Creek Acclimation Facility	43,479
Adult Return Broodstock Program Mean		43,479
Adult Return Broodstock Program Total		43,479

Table 26 Spring Chinook salmon annual expenditures for the Nason Creek program as part of Grant PUD's mitigation requirement for the operation of the Priest Rapids Project.

Calendar Year	Annual Expenditures*		
	Capital	O&M/M&E***	Totals
2004-2009**	$1,023,577	$253,683	$1,277,260
2010	$177,359	$80,989	$258,348
2011	$393,551	$103,962	$497,513
2012	$502,910	$79,808	$582,718
2013	$5,714,051	$57,146	$5,771,197
2014	$1,105,390	$316,699	$1,422,089
2015	$0	$834,597	$834,597
Totals	**$8,916,838**	**$1,726,884**	**$10,643,722**

*ALL COSTS ARE ESTIMATES ONLY AND ARE LIKELY TO BE UNDERESTIMATES.
**Breakdown of costs from 2004-2009 unavailable.
***Does not include Grant PUD staff labor or travel expenditures and includes studies.

5.9.5 Monitoring and Evaluation

Grant PUD continued monitoring and evaluation activities for the Nason Creek supplementation program (Table 27). These activities include juvenile monitoring, redd surveys, carcass surveys, and stock assessments. Reproductive success studies funded by Bonneville Power Administration (BPA) are ongoing.

Table 27 Monitoring and Evaluation activities for Nason Creek spring Chinook salmon, partially or fully funded by Grant PUD.

Activity	Year							
	98-99	00-01	02-03	04-06	07-12	13	14	15
Brood Collection	X					X	X	X
Spawning			X			X	X	X
Tagging				X			X	X
Release				X				X
Smolt Abundance					X	X	X	X
Carcass Recoveries	X					X	X	X
Redd Surveys	X					X	X	X
Run Composition/Genetics Evaluations						X	X	X

5.10 Methow River Spring Chinook Salmon Program

Methow spring Chinook are included in the UCR spring Chinook salmon ESU. In August 2004, Douglas PUD and Grant PUD entered into a 10-year Interlocal Agreement enabling Grant PUD to utilize excess rearing capacity at the Methow Fish Hatchery owned by Douglas PUD and operated by WDFW. Under this agreement, Grant PUD has the ability to request use of excess rearing capacity for five groups of fish. In September 2004, the Chelan/Douglas PUD HCP and the PRCC HSC agreed upon the framework regarding current and future plans for Douglas PUD to raise mitigation and study fish for Grant PUD.

5.10.1 Program Background

In June 2013, Douglas and Grant PUDs entered into a new long-term agreement for excess capacity at Methow Hatchery for Grant PUD's spring Chinook program. In 2014, the PRCC HSC approved Grant PUD's request to rear up to 201,000 spring Chinook per year at Douglas PUD's Methow Hatchery from 2014 - 2024. This action was subsequently approved by the PRCC.

5.10.2 Hatchery Planning Documents

The Methow spring Chinook HGMP is currently under review by NMFS. Quantitative objectives for the program were approved by the PRCC HSC in January 2009. Grant PUD submitted an APP for its Methow spring Chinook program to the PRCC HSC on April 17, 2009 and to NMFS on June 30, 2009. The APP was approved by the PRCC HSC on September 16, 2010, submitted to FERC on September 30, 2010, and approved by FERC on Dec. 14, 2011. A renewed Section 10 permit for this program is anticipated in 2016.

5.10.3 Facilities

The Methow Hatchery has a long history of operation by WDFW and the current facilities are meeting Grant PUD's program needs. There is no current discussion regarding the potential for extensive upgrades at the hatchery.

5.10.4 Operations and Maintenance

Broodstock collection primarily occurs at Wells Dam around the first of May and lasts up to two months. Monthly health examinations including length and weight samples of juveniles are conducted and growth is monitored regularly.

Approximately 158,131 yearling smolts were released from the Methow Hatchery on behalf of Grant PUD in 2015. This represents the eighth consecutive year fish have been released through cooperative agreement, and over 8.5 million dollars committed by Grant PUD to the program (Table 28). BY 2014 and 2015 fish are currently rearing at Methow Hatchery.

Table 28 Spring Chinook salmon smolts released and annual expenditures for the Methow hatchery into the Methow basin as part of Grant PUD's mitigation requirement.

Calendar Year	Numbers of Fish Released	Annual Expenditures*
		O&M**/M&E***
2005	-	$544,874
2006	-	$500,407
2007	152,451	$490,577
2008	150,509	$599,761
2009	109,488	$512,935
2010	187,865	$976,937
2011	210,336	$691,546
2012	186,029	$1,027,507
2013	185,687	$1,328,496
2014	181,050	$1,215,709
2015	158,141	$696,366
Mean	169,062	
Total	**1,521,556**	**$8,585,115**

*ALL COSTS ARE ESTIMATES ONLY AND ARE LIKELY TO BE UNDERESTIMATES
**Does not include Grant PUD staff labor or travel expenditures.
***Includes studies and hatchery evaluations.

Under its agreement with Douglas PUD, Grant PUD has co-funded the M&E program for Methow spring Chinook since 2005, as well as other hatchery evaluations, and original and contemporary capital expenses. A list of M&E activities can be found in Table 29.

Table 29 Monitoring and Evaluation activities for the Methow spring Chinook salmon hatchery program that is partially or fully funded by Grant PUD.

Activity	2005	2006	2007 - 2014	2015
Brood Collection	X	X	X	X
Spawning	X	X	X	X
Tagging			X	X
Release			X	X
Smolt Abundance		X	X	X
Carcass Recoveries		X	X	X
Redd Surveys		X	X	X

5.11 Okanogan Basin Spring Chinook

Hatchery compensation for Okanogan basin spring Chinook is satisfied through an agreement with the PRCC HSC for annual smolt releases of 110,000 into the Okanogan basin each year through the Chief Joseph Hatchery program, operated by the Colville Confederated Tribes and funded by the Bonneville Power Administration and Grant, Douglas, and Chelan PUDs.

5.11.1 Program Background

Grant PUD began discussions with the Colville Confederated Tribes in 2006 regarding the proposed Chief Joseph Hatchery. In August of the following year, a Memorandum of Understanding was signed with BPA, Chelan PUD, Grant PUD, and Colville Confederated Tribes to fund the Chief Joseph Hatchery through a cost-share agreement.

In 2010, a tri-party agreement with BPA, Colville Confederated Tribes, and Grant PUD was signed allocating funds for the construction and operation of the Chief Joseph Hatchery. Grant PUD funded 18.3% of the proposed construction costs for the facility ($10 million USD), which was completed in 2013. Grant PUD is also committed to funding 18.3% of the operation, maintenance, repair, and replacement of the facility, which is expected to produce 2.9 million spring and summer Chinook annually. Annual costs to date for the spring Chinook portion of Grant PUD's overall production can be found in Table 30.

Table 30 Spring Chinook salmon annual expenditures for the Okanogan program as part of Grant PUD's mitigation requirement.

Calendar Year	Numbers of Fish Released[c] (Grant PUD Program)	Annual Expenditures[a]		
		Capital	O&M/M&E[b]	Totals
2010		$2,173,494	$0	$2,173,494
2011		$39,518	$0	$39,518
2012		$451,142	$0	$451,142
2013		$0	$79,085	$79,085
2014		$0	$185,523	$185,523
2015	130,207	$37,042	$224,282	$261,324
Mean	130,207			
Totals	**130,207**	**$2,664,154**	**$488,890**	**$3,153,044**

a ALL COSTS ARE ESTIMATES ONLY AND ARE LIKELY TO BE UNDERESTIMATES

b Does not include Grant PUD staff labor or travel expenditures and includes studies and hatchery evaluations.

c Total numbers of fish released constitutes Grant PUD's proportion of the full supplementation program (comprised of 196,917 Methow Composite fish and 514,596 Okanogan fish).

5.11.2 Hatchery Planning Documents

Grant PUD submitted an APP for the Okanogan spring Chinook program to the PRCC HSC on April 17, 2009 and to NMFS on September 30, 2009. The APP was approved by the PRCC HSC on September 23, 2010. The HGMP and APP were submitted to FERC on September 30, 2010 and the APP was approved on Dec. 14, 2011.

5.11.3 Facilities

The construction of the Chief Joseph Hatchery, funded under the Northwest Power and Conservation Council's Fish and Wildlife Program (BPA funding) and Grant PUD cost-share, began in June 2010 and was completed in spring 2013. Production of spring and summer Chinook began in July 2013.

A pilot weir on the Okanogan River downstream of Malott, WA was installed and operated during the summers of 2012-2015 for the purpose of testing trapping and passage effectiveness, as well as to evaluate the potential for using a similar structure in adult management of summer Chinook salmon (both hatchery and natural-origin fish). In general, results to date have been positive and plans transferring the pilot weir into a semi-permanent weir for trapping operations in the future are under discussion. Full program reviews between all parties occur annually in March.

5.11.4 Operations and Maintenance

Spring Chinook broodstock for the Chief Joseph Hatchery has been collected for three years (2013-2015). Currently there is an integrated, ESA-listed population using a Methow Composite stock from the Winthrop National Fish Hatchery, released from the Riverside acclimation pond and non-ESU listed, segregated Leavenworth/Carson stock released directly from the hatchery. Both populations are 100% adipose clipped and are tagged with CWTs. For the integrated program, permit number 18928 was issued by NMFS and designated as a 10(j) experimental population for the reintroduction of spring Chinook salmon into the Okanogan basin.

For BY 2013, 196,917 Methow Composite fish and 514,596 Okanogan fish were released in late April 2015.

For BY 2014, 204,380 Methow Composite fish were transported to the Riverside acclimation pond November 2, 2015 at 27 fish per pound. For the same brood year, the number of segregated Leavenworth/Carson stock on hand at the hatchery totaled 527,355 fish at 25 fish per pound. Both groups will be released in April 2016.

A total of 209,956 eyed eggs were transferred from the Winthrop National Fish Hatchery for the BY 2015 Methow Composite integrated population. This production group will be reared and ultimately transferred to an acclimation site for overwinter acclimation in 2016. The number of eyed eggs on hand at Chief Joseph Hatchery through November for BY 2015 was 880,018 and both groups are scheduled for release in the spring of 2017.

5.11.5 Monitoring and Evaluation

As with proposed design and construction and O&M costs, Grant PUD is committed to funding 18.3% of the M&E costs for the Chief Joseph Hatchery spring Chinook program. As part of the M&E program, the pilot weir on the Okanogan River was installed in July and operated for 36 non-consecutive days, trapping 54 adult summer Chinook, 4 sockeye, and 3 steelhead. Trapping effort was reduced in 2015 because of high water temperatures and local wildfires. Objectives for trap operation were to continue testing operations and evaluate trap design, broodstock collection, and adult management. The picket spacing was designed to allow adult sockeye passage while restricting adult Chinook passage. In addition to successful weir and trap operation, underwater video and information on run timing and origin data were collected.

5.12 Fall Chinook Protection Program

As part of Grant PUD's fall Chinook Protection Program under the SSSA, Grant PUD was required to develop and implement a comprehensive Fall Chinook Protection Program for the fall Chinook salmon population in the mid-Columbia region affected by the Project. The Program was comprised of the following components: Program Performance Standards, a Passage Program for the Project, the HRFCPPA, and a Fall Chinook APP (HGMP) as described in the SSSA, including facility improvements to the Priest Rapids Hatchery.

5.12.1 Program Background

As part of its overall Fall Chinook Protection Program related to artificial propagation, Grant PUD produces 5 million fall Chinook smolts as mitigation for spawning areas inundated by Project reservoirs. Further, to achieve NNI Grant PUD is required to provide facilities capable of producing an additional 1 million fall Chinook sub-yearling smolts. This NNI component of the overall production was recalculated from 1 million to 325,543 sub-yearling smolts by the PRCC HSC in early 2012. Grant PUD is also required to compensate for impacts of flow fluctuations within the Hanford Reach, through production of an additional 1 million fry, to take advantage of the available rearing habitat within its reservoirs. Due to the anticipated low survival of fry released into Project reservoirs, the PRCC HSC agreed in spring 2013 to convert Grant PUD's annual 1 million fry obligation to sub-yearling smolt releases of 273,961 (SOA 2013-07). With these adjustments, Grant PUD's total fall Chinook obligation is currently 5,599,504 sub-yearling smolts released annually. These mitigation revisions were approved by FERC on November 1, 2013 (P-2114-263).

Grant PUD continues to consult with the PRCC HSC to review the performance of the Fall Chinook Protection Program, and determine its continued ability to achieve its performance standards.

5.12.2 Hatchery Planning Documents

The Hanford Reach Fall Chinook salmon HGMP and M&E plan was submitted for review to the PRCC HSC on January 1, 2009 and April 17, 2009. The plan was submitted to FERC on August 27, 2010 and approved on February 7, 2012. An approved plan by NMFS will result in an extended Section 10 Permit that will only cover production at Priest Rapids Hatchery and a previous permit issued during 2003 for all non-listed salmonid programs in the upper Columbia River. The date of a new permit extension to be issued by NMFS is unknown.

5.12.3 Facilities

Grant PUD, in consultation with the PRCC, developed the Priest Rapids Hatchery facilities improvements as outlined in Section 9.6 of the SSSA. Overall design of the renovated facility to produce Grant PUD's mitigation of 5.6 million fall Chinook salmon sub-yearling smolts (plus an additional design capacity for 100,000 smolts) was completed and approved by the PRCC HSC. Construction of the facility, which produces both Grant PUD's current mitigation requirements, and 1.7 million smolts and 3.5 million eyed-eggs for the CORPS, began in spring 2012 and is complete. New components of the facility were operational for all broodstock collection, spawning, and incubation activities in the fall of 2013 and the facility was completed in January, 2014 (Figure 10).

Figure 10 Priest Rapids Hatchery incubation room.

5.12.4 Operations and Maintenance

Historical and current information regarding Priest Rapids Hatchery egg take, release, and associated expenditures are reflected in Table 31.

Table 31 Priest Rapids Hatchery Fish Release and Costs.

			Annual Expenditures		
Brood Year	Grant Fish Released	Other Fish Released	Capital	O&M**/ M&E***	TOTAL
1985				$-	
1986				$-	
1987				$-	
1988	5,404,550	0		$-	
1989	6,431,100	0		$-	
1990	5,239,700	93,800		$-	
1991	5,158,700	1,841,400		$-	
1992	5,451,000	1,683,159		$-	
1993	5,008,476	1,697,360		$-	
1994	5,002,000	1,700,000		$-	
1995	5,000,000	1,700,000		$-	
1996	4,944,700	1,699,400		$-	
1997	5,029,070	1,708,530		$-	
1998	4,841,800	1,663,000		$-	
1999	5,156,000	1,700,000		$461,545	$461,545
2000	5,119,100	1,743,450		$598,792	$598,792
2001	5,041,060	1,737,975		$581,134	$581,134
2002	5,071,640	1,705,965		$664,368	$664,368
2003	5,114,560	1,700,000		$501,156	$501,156
2004	4,899,835	1,700,000		$714,149	$714,149
2005	5,180,752	1,695,538		$732,716	$732,716
2006	5,024,634	1,718,467		$746,409	$746,409
2007	4,548,306	0		$821,250	$821,250
2008	5,067,926	1,720,388	$230,336	$737,252	$967,588
2009	5,064,043	1,712,608	$227,367	$543,893	$771,260
2010	5,081,184	1,717,206	$2,044,281	$724,359	$2,768,640
2011	5,271,247	1,785,701	$9,613,911	$922,045	$10,535,956
2012	5,091,902	1,730,959	$9,690,605	$918,078	$10,608,683
2013	5,600,000	1,666,713	$1,719,387	$988,727	$2,708,114
2014	5,490,844	1,548,699	$519,435	$1,465,290	$1,984,725
MEAN	5,160,523	1,458,160			
TOTALS	**134,334,129**	**39,370,318**	**$24,045,322**	**$12,121,163**	**$36,166,485**

*ALL COSTS ARE ESTIMATES ONLY AND ARE LIKELY TO BE UNDERESTIMATES
**Does not include Grant PUD staff labor or travel expenditures.
***Includes studies and hatchery evaluations.

5.12.5 Monitoring and Evaluation

Data collection in fulfillment of the Priest Rapids Hatchery M&E Program was initiated in September 2010. Data was collected primarily at the Priest Rapids Hatchery volunteer trap beginning in September, at the hatchery during spawning, and in the Columbia River during and

after spawning. Otolith marks were available to help determine hatchery and natural origin of adults. Annual reports that present the current year as well as previous years data have been completed (Hoffarth and Pearsons 2012 a, b, Richards et al. 2013, Richards and Pearsons 2014, Richards and Pearsons 2015). Data collection associated with the hatchery M&E plan will continue in 2016.

Pilot studies were conducted to evaluate alternative means to achieve desired broodstock and offspring characteristics as well as evaluating carcass recovery bias.

5.12.6 Hanford Reach Fall Chinook Protection Program

Protections for fall Chinook salmon from the 2014 BY began on October 15 and continued through June 3, 2015. Based on HRFCPPA criteria and redd counts in the Vernita Bar index area, spawning began October 22 in the below 50 kcfs zone and on October 28 in the above 50 kcfs zone and continued through November 23 for both the below and above 50 kcfs zones. There was a total of 252 redds counted in the index area during the redd survey on November 23 and the distribution of those redds resulted in a Critical Elevation of 70 kcfs. Minimum discharge protections were maintained through the End of Emergence on May 2, 2015. Rearing Period protections began at the start of emergence and continued through June 3, 2015.

Operations to protect the 2014 brood year of fall Chinook salmon in the Hanford Reach were highly successful. The minimum flow requirement during the Post-Hatch Period was exceeded for one two-hour period in December and one daily delta constraint was exceeded by 5.6 kcfs. The remaining discharge constraints were met during the Spawning, Pre-Hatch, and Emergence periods. This continues the trend of high performance that began with the 2006 brood year and is significantly greater than the historical mean under the HRFCPPA (93% constraints met or minor exceedances). Fall Chinook salmon stranding and entrapment surveys were completed during each Rearing Period in 2011, 2012, and 2013 as part of the follow-up monitoring plan required by the HRFCPPA (see Article 401(a)(5)). A report of results from 2013 (Hoffarth et al. 2013) was filed with FERC in January 2014.

Protections for fall Chinook salmon for the 2015-2016 protection season began on October 15, 2015 and will continue through May or June 2016. Based on redd counts in the Vernita Bar index area, the Initiation of Spawning was determined to be on October 21 for the below 50 kcfs and the above 50 kcfs elevation zone. The End of Spawning was determined to be November 22, 2015. There was a total of 702 redds counted in the index area during the final redd count and the distribution of those redds resulted in a Critical Elevation of 70 kcfs. Minimum discharge protections were maintained through the writing of this report. Protections for BY 2015 will continue into 2016 and will be reported in the 2016-2017 FERC report.

5.13 Summer Chinook

The objective of the Summer Chinook Protection Program is to achieve NNI from the operations of the Project on summer Chinook salmon populations that pass through the Project. Grant PUD's original summer Chinook mitigation obligation was for artificial propagation of 834,000 juvenile salmonids on an annual basis. This number was recalculated to 659,816 by the PRCC HSC in 2012 and approved by FERC on November 1, 2013 (P-2114-263). These fish are divided for release into each of the Wenatchee, Methow, and Okanogan rivers. Details about each of these individual programs can be found below.

5.13.1 Wenatchee Summer Chinook Program Background

Hatchery mitigation for summer Chinook salmon is used to mitigate for unavoidable losses associated with the Project. This mitigation is intended to result in NNI. In a partnership with

Chelan PUD, Grant PUD produces fish at Eastbank Hatchery on the Columbia River (spawning, incubation, and early rearing) with final acclimation and release taking place at the Dryden Pond on the Wenatchee River.

5.13.1.1 Hatchery Planning Documents

Versions of the HGMP were distributed to the PRCC HSC for review and comment in October 2007, June 2008, and on April 14, 2009. The revised HGMP was approved by the PRCC HSC on September 17, 2009, submitted to NMFS on September 30, 2009 and submitted to FERC on January 28, 2011. The HGMP was approved by FERC on November 15, 2011. Grant PUD is currently operating under an extension of a previous permit and waiting for a response from NMFS relative to a new Section 10 permit (anticipated for issuance in the summer of 2015).

5.13.1.2 Facilities

Adult summer Chinook are collected for broodstock from the run-at-large at the right and left-bank traps at Dryden Dam, and at Tumwater Dam if the weekly quotas cannot be achieved at Dryden Dam. Broodstock collection occurs from about 1 July through 15 September with trapping occurring up to 24 hours per day, seven days a week. If natural-origin broodstock collection falls short of expectation, hatchery-origin adults can be collected to make up the difference. Adult summer Chinook are spawned and reared at Eastbank Fish Hatchery. Juvenile summer Chinook are transferred from the hatchery to Dryden Acclimation Pond in March. They are released from the pond in late April to early May.

Grant PUD developed a basis of design (BOD) for modification of the Dryden Acclimation Pond so that it could be used for overwinter acclimation. The BOD was approved by the HSC on February 27, 2012 and was sent to Chelan PUD for consideration. Chelan PUD does not support modifications of this facility at this time primarily because of concerns related to meeting phosphorous management associated with the Wenatchee River Total Maximum Daily Load requirement administered by WDOE. The WDOE has calculated the maximum allowable phosphorous discharge that would be permitted from the Dryden Pond Facility. Grant PUD has been exploring different cost-effective options, such as development of an ultra-low phosphorous feed and the reduction of fish size, to accommodate the desired number of summer Chinook salmon at Dryden Pond. Grant PUD will acclimate fish during the spring of 2016 with the expectation that a decision on the future of modification and overwintering at Dryden Pond will be made in 2016. This approach was approved by the PRCC HSC in 2009 (SOA-2009-09).

Costs associated with development of Wenatchee summer Chinook salmon facilities are included in Table 32.

5.13.1.3 Operations and Maintenance

Under the long-term hatchery sharing agreement between Chelan PUD and Grant PUD, broodstock for the 2015 program was collected from adult collection facilities on the Wenatchee River. Adults collected were transferred to Eastbank Hatchery where they were held and spawned. Incubation and early rearing also occurred at Eastbank Hatchery until transfer to the Dryden Acclimation Pond in spring 2016 and subsequent release into the Wenatchee River.

Table 32 Summer Chinook salmon number of fish released and annual expenditures for the Wenatchee program as part of Grant PUD's mitigation requirement for the operation of the Priest Rapids Project.

Calendar Year	Number of Fish Released	Annual Expenditures*		
		Capital	O&M**/M&E*	Totals
1997-2007	--	$130,000	NA	$130,000
2008	--	$32,442	NA	$32,442
2009	--	$159,422	NA	$159,422
2010	--	$344,081	NA	$344,081
2011	--	$58,141	NA	$58,141
2012	--	$300,269	$148,978	$449,247
2013	--	$2,185	$367,721	$369,906
2014	181,816	$0	$532,077	$532,077
2015	171,177	$0	$696,065	$696,065
Mean	**176,497**			
Totals	**352,993**	**$1,026,540**	**$1,744,841**	**$2,771,381**

*ALL COSTS ARE ESTIMATES ONLY AND ARE LIKELY TO BE UNDERESTIMATES
**Does not include Grant PUD staff labor or travel expenditures.
***Includes studies and hatchery evaluations.

5.13.1.4 Monitoring and Evaluation

Grant PUD began contributing to the M&E of the Wenatchee summer Chinook program in 2012. Previously, Chelan PUD had been conducting long-term monitoring of their summer Chinook salmon mitigation program.

5.14 Methow Summer Chinook Program Background

Hatchery mitigation for summer Chinook salmon is used to mitigate for unavoidable losses associated with the Project. This mitigation is intended to result in NNI. The numbers of fish were recalculated in 2012 and this recalculation applies to fish released in 2015. The summer Chinook salmon to be released into the Methow River was recalculated to 200,000. This recalculation was approved by FERC on November 1, 2013 (P-2114-263).

5.14.1.1 Hatchery Planning Documents

Versions of the HGMP were distributed to the PRCC HSC for review and comment in October 2007, June 2008, and on April 14, 2009. The revised HGMP was voted on and approved by the PRCC HSC on September 17, 2009, submitted to NMFS on September 30, 2009, and submitted to FERC on January 28, 2011. The HGMP was approved by FERC on November 15, 2011. Grant PUD is waiting for a response from NMFS relative to a Section 10 permit.

5.14.1.2 Facilities

The PRCC HSC approved the modification of Eastbank Hatchery to accommodate Grant PUD's summer Chinook mitigation for ultimate release into the Wenatchee and Methow river basins. The modifications include the capacity to hold adults, incubate eggs, and rear fish prior to transfer to an acclimation site. Modifications were completed in 2012.

Fish are transferred from Eastbank Hatchery to the Carlton Acclimation Facility adjacent to the Methow River. The PRCC HSC approved Grant PUD's final design of the Carlton Acclimation

Facility and construction began in spring 2013. The facility, which was completed in February 2014, is capable of providing overwinter acclimation (Figure 11).

Costs associated with development of Methow summer Chinook salmon facilities are included in Table 34.

Figure 11 Carlton Acclimation Facility rears Methow summer Chinook using eight 30 foot round tanks.

5.14.1.3 Operations and Maintenance

A volitional release of broodyear 2013 summer Chinook from Carlton Acclimation Facility began in April and ended on 12 May 2015. Very few fish emigrated during that period, and the majority of the fish were forced released on 13 May 2015. In total, approximately 188,834 smolts were released from the Carlton Acclimation Facility in 2015 (Table 33).

Approximately 190,000 broodyear 2014 juvenile summer Chinook were transferred to Carlton in October 2015.

Under the long-term hatchery sharing agreement between Douglas PUD and Grant PUD, broodstock for the program was collected at Wells Dam in 2015. Adults collected were transferred to Eastbank Hatchery where they were held and spawned. Incubation and early rearing will also occur at Eastbank Hatchery. Fish produced from the 2015 broodstock will be transferred to the Carlton Acclimation Facility in the fall of 2016 for acclimation and release in 2017.

Table 33 The number of Methow summer Chinook released from the Carlton acclimation complex.

Brood Year	Number of Fish Released
2012	197,391
2013	188,834
MEAN	193,113
TOTAL	**386,225**

Table 34 Summer Chinook salmon annual expenditures for the Methow program as part of Grant PUD's mitigation requirement for the operation of the Priest Rapids Project.

Calendar Year	Annual Expenditures*		
	Capital	O&M**/M&E***	Totals
1997-2007	$130,000	$-	$130,000
2008	$32,442	$-	$32,442
2009	$159,422	$-	$159,422
2010	$356,065	$-	$356,065
2011	$80,400	$-	$80,400
2012	$660,498	$125,038	$785,536
2013	$3,677,041	$339,752	$4,016,793
2014	$186,781	$600,284	$787,065
2015	$0	$783,042	$783,042
Totals	**$5,282,649**	**$1,848,116**	**$7,130,765**

*ALL COSTS ARE ESTIMATES ONLY AND ARE LIKELY TO BE UNDERESTIMATES
**Does not include Grant PUD staff labor or travel expenditures.
***Includes studies and hatchery evaluations.

5.14.1.4 Monitoring and Evaluation

Grant PUD began contributing to the M&E of the Methow summer Chinook program in 2012 and will continue to fund M&E activities for the duration of the project. Previously, Chelan PUD had been conducting long-term monitoring of their summer Chinook salmon mitigation program.

5.14.2 Okanogan Summer Chinook Background

Hatchery mitigation for summer Chinook salmon is used to mitigate for unavoidable losses associated with the Project. This mitigation is intended to result in NNI. Grant PUD began discussions with the Colville Confederated Tribes in 2006 regarding a potential cost-share in the proposed Chief Joseph Hatchery. In August of the following year, a Memorandum of Understanding was signed with the BPA, Grant PUD, Chelan PUD, and Colville Confederated Tribes to fund the Chief Joseph Hatchery through a cost-share agreement. In 2010, a tri-party agreement with BPA, Colville Confederated Tribes, and Grant PUD was signed allocating funds for the construction and operation of the Chief Joseph Hatchery. Grant PUD funded 18.3% of the proposed construction costs (Table 35).

5.14.2.1 Hatchery Planning Documents

Grant PUD submitted an APP for the Okanogan summer Chinook program to the PRCC Hatchery Subcommittee on April 17, 2009 and to NMFS on September 30, 2009. The APP was approved by the PRCC HSC on September 23, 2010. The HGMP and APP were submitted to FERC on September 30, 2010 and approved by FERC on Oct. 13, 2011.

5.14.2.2 Facilities

Construction of the Chief Joseph Hatchery funded under the Northwest Power and Conservation Council's Fish and Wildlife Program (BPA funding) and Grant PUD cost-share began in early June 2010. The facility was completed in spring 2013 and production of spring and summer Chinook began in July 2013. Acclimation ponds for the integrated yearling summer Chinook program are located at Similkameen (designed for 250,000 fish), Riverside (275,000 fish), and Omak (275,000 fish).

A pilot weir on the Okanogan River downstream of Malott, WA was installed and operated during the summers of 2012-2015 for the purpose of testing trapping and passage effectiveness, as well as to evaluate the potential for using a similar structure in adult management (both hatchery and natural-origin fish). In general, results to date have been positive and plans for trapping operations in 2016 are in development. A full report will be provided during the Chief Joseph Hatchery annual program review in March.

Table 35 Summer Chinook salmon annual expenditures for the Okanogan program as part of Grant PUD's mitigation requirement for the operation of the Priest Rapids Project.

Calendar Year	Number of fish released in Grant PUD program	Annual Expenditures*		
		Capital	O&M/M&E**	Totals
2010		$6,026,506	$0	$6,026,506
2011		$109,572	$0	$109,572
2012		$802,030	$0	$802,030
2013		$0	$199,869	$199,869
2014	92,831	$0	$485,734	$485,734
2015	129,417	$96,981	$587,212	$684,193
Mean	**111,124**			
Totals	**222,248**	**$6,938,108**	**$1,272,815**	**$8,210,923**

*ALL COSTS ARE ESTIMATES ONLY AND ARE LIKELY TO BE UNDERESTIMATES

**Does not include Grant PUD staff labor or travel expenditures and includes studies and hatchery evaluations.

5.14.2.3 Operations and Maintenance

Summer Chinook broodstock for the Chief Joseph Hatchery were first collected in 2013 and have been collected annually through 2015. The program includes both hatchery-origin (segregated program) and natural-origin (integrated program) summer Chinook. The first year the facilities operated at less than full capacity by design, but since then, broodstock numbers have been limited by the available brood. Grant PUD's mitigation for this program is 278,000 summer/fall Chinook released into the Okanogan or Columbia rivers. The general marking plan is 100% adipose clip for both groups, and CWT 100,000 of the segregated program and 100% of the integrated program.

For BY 2013, 290,665 integrated Summer Chinook were released from the Omak acclimation pond in the spring of 2015. The number of fish, released from the segregated program in 2015 was 416,530.

As of November 2015, 256,924 BY 2014 integrated program (NOR) fish were transferred to the Omak and Similkameen acclimation ponds and 402,886 BY 2014 segregated fish (HORs) were held at Chief Joseph hatchery. Both groups of fish are scheduled for release in the spring of 2016.

Extremely warm water caused high adult brood mortality in 2015. Spawning concluded in November and the final fry production numbers have not been determined but program goals will not be fully met, primarily due to *Columnaris* despite using 100% well water to reduce disease spreading.

A total of 208 males and 203 females were spawned for the BY 2015 integrated program, and the cumulative survival through October was 77%. The segregated program yielded a green-egg take of 830,000 eggs from 170 adult males and 166 females. Through October there was a cumulative survival of 81%. These fish are scheduled for release as yearlings in the spring of 2017.

5.14.2.4 Monitoring and Evaluation

As with proposed design and construction and O&M costs, Grant PUD is committed to funding 18.3% of the M&E costs for the spring Chinook program produced by the Chief Joseph Hatchery.

As part of the M&E program, the temporary, pilot weir downstream of the town of Malott, WA on the Okanogan River was installed in July and operated for the fourth year in 2015 and operated for 36 non-consecutive days, trapping 54 adult summer Chinook, 4 sockeye, and 3 steelhead. Trapping effort was reduced in 2015 because of high water temperatures and local wildfires. Objectives for trap operation were to continue testing operations and evaluate trap design, broodstock collection, and adult management. The picket spacing was designed to allow adult sockeye passage while restricting adult Chinook passage. In addition to successful weir and trap operation, underwater video and information on run timing and origin data were collected.

5.15 Sockeye Protection Program

Grant PUD, in consultation with the PRCC, has developed and implemented a comprehensive Sockeye Protection Program for the sockeye populations in the mid-Columbia region affected by the Project. This includes a program to achieve NNI of the operations of the Project on sockeye populations that pass through the Project area and is comprised of the following components: Program Performance Standards, a Passage Program for the Project, 7% compensation provided through an Artificial Propagation Program, and 2% compensation provided through the habitat program described (in the SSSA). Grant PUD's overall requirement is to strive to artificially propagate up to 1,143,000 sockeye smolts. As approved by the PRCC HSC in 2010, Grant PUD is meeting NNI through funding of the Okanagan Nation Alliance's Skaha Reintroduction Program and through development of a new hatchery facility in Penticton, B.C., with capacity for an eight million sockeye egg program. This agreement is in effect through 2021.

5.15.1 Program Background

There are two sockeye populations within the upper Columbia River, the Wenatchee and Okanogan river stocks, neither of which are listed under the Endangered Species Act. These populations are healthy enough to allow tribal fisheries in Washington and Canada, with periodic

recreational fisheries in Lake Wenatchee, the mainstem Columbia River, and selected tributaries and lakes.

Recognizing that the Okanogan River, which includes nursery/rearing lakes in British Columbia, is the best option for long-term sockeye mitigation opportunity the PRCC HSC approved in 2008 Grant PUD's plan to fund an experimental program to reintroduce sockeye into Skaha Lake in British Columbia. On Oct. 21, 2010, the PRCC HSC approved extending this sockeye program for an additional five years (SOA-2010-08) and on Nov. 1, 2011, Grant PUD entered into a long-term agreement with the Okanagan Nation Alliance (ONA) to co-fund a new sockeye hatchery, hatchery operations and maintenance costs, and a monitoring and evaluation program. The number of sockeye salmon released and the associated cost of implementation of sockeye mitigation activities, including development of the sockeye salmon facility, were included in Table 36.

5.15.2 Hatchery Planning Documents

The HGMP was developed for the sockeye reintroduction program and the quantitative objectives were approved by the PRCC HSC in January 2009. Grant PUD submitted an HGMP to the PRCC HSC on April 17, 2009 and to NMFS on September 30, 2009. The HGMP was submitted to FERC January 28, 2011 and approved by FERC on Nov. 15, 2011.

5.15.3 Facilities

Construction of the Penticton Sockeye Hatchery began in July 2013 and was completed and commissioned in 2014. The hatchery is operated by ONA as part of the 12-year reintroduction program of sockeye salmon to Skaha Lake. To date most of the mechanical deficiencies from new construction have been resolved. ONA has drafted an asset management plan that is intended to be used to troubleshoot, maintain, and repair/replace parts and equipment. The plan is expected to be finalized in 2016. Additionally, two full-time hatchery positions were filled in 2015.

Table 36 Sockeye fry released into Skaha and/or Osoyoos Lake funded by Grant PUD as part of the ONA 12-year Reintroduction program.

Calendar Year	Numbers of Fish Released	Annual Expenditures*		
		Capital	O&M/M&E**	Totals
2005	795,630	**$-**	$377,203	$377,203
2006	602,870	**$-**	$504,115	$504,115
2007	644,252	**$-**	$263,685	$263,685
2008	385,724	**$-**	$340,137	$340,137
2009	703,189	**$-**	$738,056	$738,056
2010	383,633	**$-**	$391,184	$391,184
2011	392,040	**$-**	$553,915	$553,915
2012	364,946	$453,737	$604,921	$1,058,658
2013	573,738	$2,397,663	$669,206	$3,066,869
2014	0	$1,981,335	$883,536	$2,988,081
2015	767,437	$0	$1,155,905	$1,155,905
Mean	510,314			
Totals	5,613,459	**$4,832,735**	**$6,481,863**	**$11,314,598**

*ALL COSTS ARE ESTIMATES ONLY AND ARE LIKELY TO BE UNDERESTIMATES

**Does not include Grant PUD staff labor or travel expenditures and includes studies and hatchery evaluations.

5.15.4 Operations and Maintenance

This year marked the beginning of the final year of the original Skaha reintroduction program (year 12 of 12), which began in 2003 and, from which, the first sockeye were released in 2004. Despite the large return of adult sockeye returning to the Columbia River this year (510,706 sockeye counted at Bonneville Dam), only 187,055 fish were counted at Wells Dam. High mortality from the drought and warm water conditions resulted in relatively few sockeye on the spawning grounds of the Okanagan River, making broodstock collection challenging. Brood was collected via normal methodologies using beach seines near the town of Oliver. To assist with adult collection, a picket weir was installed on the Okanagan River near the town of Penticton. A total of 538 adult sockeye were spawned in 2015, resulting in 485,032 eggs. Hatchery staff noted that the eggs collected were of poor quality and hatching rate is expected to be lower than normal. The eggs will be shocked, picked, and thermally marked in order to differentiate between hatchery and natural-origin populations. Hatchery fry will be released in 2016 upon reaching an approximate weight of 1 gram. Generally, these fish spend a year rearing in Skaha Lake before smolting the following spring. Initial challenges related to start-up operations of the new facility were resolved. Two new hatchery personnel were hired in 2015 and are becoming more familiar with the program.

5.15.5 Monitoring and Evaluation

The monitoring and evaluation plan originally designed for the program continued to be implemented. Objectives investigated in 2015 included; 1) relative survival of sockeye fry in Skaha Lake compared with the existing population in Osoyoos Lake, 2) interactions between sockeye fry, kokanee, and mysid shrimp, and 3) fry-to-smolt production in Skaha Lake.

Table 37 Monitoring and evaluation activities for Okanogan River sockeye salmon; partially funded by Grant PUD.

Activity	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Brood collection	X	X	X	X	X	X	X	X	X		X	X
Spawning	X	X	X	X	X	X	X	X	X		X	X
Tagging	X	X	X	X	X	X	X	X	X		X	X
Release	X	X	X	X	X	X	X	X	X	X	X	X
Smolt abundance	X	X	X	X	X	X	X	X	X	X	X	X
Carcass recoveries	X	X	X	X	X	X	X	X	X	X	X	X
Redd surveys	X	X	X	X	X	X	X	X	X	X	X	X

5.16 Coho Protection Program

A coho salmon reintroduction program intended to develop a locally adapted and naturally spawning population from lower Columbia River stock is being implemented by the Yakama Nation. Grant PUD entered into a 10-year funding agreement with the Yakama Nation to assist in development of the program. This $7.4 million agreement is for the period 2008 - 2018.

As a result of the coho program, coho salmon redds and carcasses have been observed in the Wenatchee and Methow rivers and harvest has been provided. However, the extent to which natural production is occurring is less clear.

5.16.1 Hatchery Planning Documents

The HGMP and APP for the UCR coho reintroduction program were submitted to FERC in February 2011 and approved by FERC on October 13, 2011.

5.16.2 Facilities

Funding provided by Grant PUD and other partners involved with the Mid-Columbia coho Restoration Program, is being used by the Yakama Nation to develop and operate facilities to support the program.

5.16.3 Operations and Maintenance

Hatchery supplementation of coho salmon in the Upper Columbia River occurs in two river basins; the Wenatchee and Methow.

Adult broodstock for the Wenatchee Basin occurs at Dryden and Tumwater Dams. Although Dryden Dam has been the primary source of brood collection in the past, Tumwater Dam has become increasingly significant as program collections shift toward incorporating more upper basin returning adults, which have successfully ascended Tumwater Canyon to Tumwater Dam. Adults are transported to the Leavenworth National Fish Hatchery where they are spawned. Eggs are incubated at both the Leavenworth National Fish Hatchery and the Yakama Nation operated Peshastin Incubation Facility. After initial incubation, the eyed-eggs from both incubation facilities are transported to Willard National Fish Hatchery between early December and early January for long-term rearing until they reach the pre-smolt stage. At the smolt stage, fish are transferred from the Willard National Fish Hatchery back to the Wenatchee Basin for acclimation and release at remote sites in Beaver Creek and Nason Creek.

Adult broodstock for the Methow Basin is collected primarily at Wells Dam. Wells Dam is used as the primary collection location to ensure representative samples of hatchery origin adults from all acclimation sites and natural origin fish from throughout the basin are obtained. Supplementary broodstock collection occurs at Winthrop National Fish Hatchery and rely on volitional swim-ins to the hatchery holding pond and adult collection weir. Adults collected for broodstock are transported and spawned at Winthrop National Fish Hatchery. Juvenile coho salmon are held on station until released into acclimation ponds the following spring.

The coho reintroduction program and data reporting run on a cycle of October 1 through September 30. Therefore, coho program summary information for the current year of this report is incomplete. Annual smolt releases and costs are presented in Table 38.

Table 38 Total number of coho smolts released as part of the Yakama Nation coho reintroduction program.

Year	Numbers of Fish Released*	Annual Expenditures*
2007	1,561,768	$0
2008	1,509,093	$43,504
2009	1,424,578	$727,094
2010	1,443,480	$624,459
2011	1,297,974	$665,274
2012	1,529,678	$486,637
2013	1,501,323	$249,215
2014	1,484,636	$1,402,149
2015**	NA	$221,737
Mean	1,469,066	
TOTAL	**11,752,530**	**$4,420,069**

*Grant PUD funds the activities associated with rearing and releasing approximately 373,296 fish annually. These expenditures do not include Grant PUD staff labor or travel expenditures.
** Number of fish released and final annual expenditures for 2015 is currently unavailable and will be included in 2016 report.

5.16.4 Monitoring and Evaluation

As part of the reintroduction program, the Yakama Nation has established an extensive monitoring and evaluation program in both basins where hatchery supplementation is occurring. Regular spawning-ground surveys are conducted in main stems and tributaries, while redds and live fish are enumerated and carcasses are collected for tag recovery and acquiring biological data (Table 39). A smolt trap is operated in the Wenatchee River during the juvenile coho salmon out-migration to provide smolt-abundance estimates. Other M&E activities partially funded by Grant PUD are listed in Table 40.

Table 39 Summary of coho red surveys in the Wenatchee Basin and Methow Basin, 2014 (2015 numbers not yet available).

River	Redds	Carcasses Recovered
Wenatchee*	1,495	804
Methow*	718	422

Table 40 Monitoring and evaluation activities for Wenatchee and Methow coho salmon that are partially funded by Grant PUD.

Activity	2005	2006 - 2014	2015
Brood Collection	X	X	X
Spawning	X	X	X
Tagging		X	X
Release		X	X
Smolt Abundance		X	X
Carcass Recoveries		X	X
Redd Surveys		X	X

6.0 Priest Rapids Coordinating Committee Habitat Subcommittee

The PRCC Habitat Subcommittee is the primary forum for implementing and directing habitat protection and restoration measures for the Project's anadromous fish programs covered under

both the Biological Opinion and the SSSA. Under the provisions of these mandates and obligations, three funds were created by Grant PUD (Section 6.2). Since January 2005, the PRCC Habitat Subcommittee has met monthly to undertake and oversee the planning and implementation of the necessary program elements to support habitat protection and restoration programs. The committee operates on consensus regarding decisions directly linked to project management.

FERC requires Grant PUD to continue to support the PRCC Habitat Subcommittee. This includes provision of sufficient facilitation, administration, and clerical support. Minutes are recorded and approved by the PRCC Habitat Subcommittee. A total of 10 meetings, two conference calls, and one field trip to projects in British Columbia were held by the PRCC Habitat Subcommittee members during calendar year 2015 (Table 41). Agendas and meeting minutes are available at Grant PUD's website.

Table 41 Priest Rapids Coordinating Committee Habitat Subcommittee 2015 meetings.

PRCC Habitat	January 15, 2015	Meeting
PRCC Habitat	February 15, 2015	Meeting
PRCC Habitat	March 12, 2015	Meeting
PRCC Habitat	April 9, 2015	Meeting
PRCC Habitat	June 11, 2015	Meeting
PRCC Habitat	July 9, 2015	Meeting
PRCC Habitat	August 13, 2015	Meeting
PRCC Habitat	September 10, 2015	Meeting
PRCC Habitat	October 8-9, 2015	Field Trip
PRCC Habitat	November 12, 2015	Meeting
PRCC Habitat	November 30, 2015	Conference Call
PRCC Habitat	December 2, 2015	Conference Call

Since 2006, 84 total projects have been approved for funding using one of the three funding accounts (601, NNI Fund, 602, Habitat Supplemental Fund, 603, Habitat Conservation Fund). Of those, 45 are completed and 39 are currently active and underway. Ten new projects were approved in 2015 by the PRCC and/or PRCC Habitat Subcommittee with one from Fund 601, six from Fund 602, and three from Fund 603. The individual projects, separated by funding account, are listed in Table 42.

Table 42 Summary of habitat projects to date, funded in part or wholly approved by the PRCC and/or PRCC Habitat Subcommittee. Projects are grouped by type; No-Net Impact (601), Habitat Conservation (602), and Habitat (603) funding accounts, by year completed and whether they have been completed or still ongoing.

Grouped Project Titles	Account	Benefits	Year Initiated	Year Completed	Expenditures to Date	Total Approved Cost
Predator Study	601	Predator Removal	2008	2012	$2,428,176	$2,447,907
McIntyre Dam	601	Fish Passage	2008	2013	$1,770,055	$1,770,055
ORRI Phase I	601	Habitat Restoration	2009	2009	$411,000	$411,000
Tall Timber	601	Conservation Easement	2010	2010	$55,000	$55,000

Grouped Project Titles	Account	Benefits	Year Initiated	Year Completed	Expenditures to Date	Total Approved Cost
JSAT Steelhead & Pikeminnow Derby	601	Steelhead Study/Predation	2011	2011	$2,008635	$2,012,939
Pikeminnow Derby	601	Predation	2012	2012	$23,669	$25,000
Fish Screen Monitoring, Northern Pikeminnow Bridge 1, GeoChemical Analysis	601	Habitat Improvement/Predator removal/Land Acquisition/Research	2012	Ongoing	$427,770	$1,571,959
Electrofishing Boat	601	Predation	2013	Ongoing		$125,000
Intake Screen Assessment	601	Infrastructure Improvement	2014	Ongoing	$3,947	$10,2815,
Hanford Reach Survival	601	Study	2014	Ongoing	$69,183	$79,906
Smolt Migration Drawdown	601	Study	2014	Ongoing	$224,513	$225,000
Wenatchee Instream Flow	601	Flow Improvement	2014	Ongoing	$0	$456,241
MVID Instream Flow	601	Flow & Fish Passage	2014	Ongoing	$109,750	$1,400,000
Barkley Construction (50%)	601	Flow and Habitat Improvement	2015	Ongoing	$0	$350,000
Nason Creek-Godwin & Hardesty	602	Land Acquisition	2007	2007/2009	$650,059	$897,910
Trinidad Creek	602	Land Acquisition	2010	Ongoing	$84,851	$117,000
Vertical Drop Structure 13	602	Spawning Habitat Improvement	2011	Ongoing	$58,835	$65,141
Sugar Dike	602	Land Acquisition	2011	Ongoing	$174,598	$190,000
Nason Creek B+ Reconnection, Wenatchee Nutrient Enhancement, Entiat Stormy Reach	602	Habitat Restoration and Assessment/Land Acquisition	2011/2012	Ongoing	$748,488	$1,001,571
Lower Wenatchee Instream Flow	602	Water Acquisition	2012	2012	$300,000	$300,000
ORRI Phase II, Icicle Creek Boulder Field, Shuttleworth Creek & Tyee Ranch	602	Habitat Restoration Fish Passage Assessment, Water Acquisition and Conservation Easement	2012	Ongoing	$1,146,539	$1,210,254
Roaring Creek Flow Restoration and Diversion	602	Fish Passage & Instream Flow	2013	Ongoing	$57,249	$160,000

Grouped Project Titles	Account	Benefits	Year Initiated	Year Completed	Expenditures to Date	Total Approved Cost
Robinson Property Acquisition	602	Land Acquisition	2013	Ongoing	$265,212	$270,065
Tyee Ranch Conservation Easement	602	Attorney/Consulting Fees	2013	2013	$1,000	$1,000
Entiat Stormy Phase II	602	Land Appraisals	2013	2013	$1,700	$1,700
Entiat Cottonwood Phase II	602	Land/Water Acquisition	2013	Ongoing	$5,000	$10,000
Barkley Irrigation Diversion	602	Irrigation Improvements	2014	Ongoing	$259,493	$299,380
Natapoc Appraisal	602	Land Appraisal	2014	Closed	$20,000	$20,000
McIntyre Dam Fish Study	602	Fish Passage	2014	Ongoing	$16,712	$32,941
Spawning Platforms	602	Habitat Improvement	2014	Ongoing	$267,176	$391,200
Primary Appraiser	602	Land Appraisals	2014	Ongoing	$28,900	$50,000
Nason Creek Side Channel	602	Habitat Improvement	2014	Ongoing	$8,102	$10,000
Silver Side Channel	602	PIT Tag Assessment	2014	Ongoing	$94,584	$123,638
Newby Narrows	602	Land Acquisition	2014	Ongoing	$352,335	$352,550
ORRI Spawning Platform #3	602	Spawning Habitat Improvement	2015	Ongoing	$183,821	$367,368
White River Gage Station	602	Stream Flow Monitoring	2015	Ongoing	$0	$60,000
Lower Nason Side Channel	602	Land Acquisition	2015	2016	$143,600	$143,600
Entiat Enlow Floodplain Protection	602	Habitat Improvement	2015	Ongoing	$387,798	$437,700
Buckley II	602	Land Acquisition	2015	Ongoing	$185,433	$231,683
1890s Side Channel	602	Habitat Improvement	2015	Ongoing	$0	$140,283
Nason Creek-Godwin	603	Land Acquisition	2007	2007	$3,409	$3,409
Fulton Diversion Dam & Omak Creek	603	Fish Passage/Culvert Replacement	2006	2006	$147,942	$150,971
Skookumchuck & Kitsap County LiDAR	603	Land Acquisition & Topographic Survey Data	2006	2007	$516,719	$524,000
Upper Columbia Basin LiDAR	603	Topographic Survey	2007	2007	$60,000	$60,000
Wenatchee River Irrigation Diversion & Antoine Creek	603	Water Acquisition & Habitat Restoration	2007	2008	$85,950	$91,970

Grouped Project Titles	Account	Benefits	Year Initiated	Year Completed	Expenditures to Date	Total Approved Cost
Mission Creek Barrier Removal, Blackbird Island Phase I & Entiat River Knapp-Wham	603	Fish Passage/Habitat Restoration/Irrigation Diversion	2008	2009	$123,141	$132,935
Blackbird Island Phase II	603	Habitat Restoration	2009	2009	$133,398	$136,500
Bonaparte Creek	603	Livestock Exclusion	2009	2010	$24,078	$27,578
Trinidad Creek	603	Land Acquisition	2010	Ongoing	$84,851	$117,000
Nason Creek LWP	603	Alternative Analysis Design and Report	2010	2011	$45,722	$49,583
White River Nason View Cedar Bend	603	Land Acquisition	2010	2012	$455,600	$454,422
Libby Creek	603	Land Acquisition	2011	Ongoing	$142,830	$206,600
Entiat Stormy Reach Phase II	603	Land Acquisition	2012	2012	$10,000	$10,000
White River Gage Station, Nason Creek Lower White Pine Ponds, Lower Chewuch Beaver Project & Barkley Irrigation Diversion	603	O&M Streamflow Monitoring	2012	Ongoing	$271,563	$300,866
Okanogan River Discharge Monitoring	603	O&M Stream Flow Monitoring	2013	2015	$90,952	$90,952
Icicle/Peshastin Irrigation Flow Analysis	603	Instream Flow Improvement	2013	Ongoing	$165,836	$174,847
Icicle Creek PIT Array	603	Fish Passage Evaluation	2014	2016	$167,097	$167,098
Barkley Construction	603	Flow and Habitat Improvement	2015	Ongoing	$0	$350,000
Bonaparte Creek Gage Station	603	Stream Flow Monitoring	2015	Ongoing	$0	$21,860
Lower Wenatchee Instream Flow	603	Instream Flow Improvement	2015	Ongoing	$0	$122,487

6.1 Habitat Plan

Grant PUD, in consultation with the PRCC Habitat Subcommittee, developed a draft habitat plan for Chinook salmon and steelhead affected by operation of the Project, as required under the 2004 and 2008 Biological Opinions issued by NMFS, and the 2006 SSSA. This plan was developed to shepherd the development and implementation of the protection and restoration programs that promote the rebuilding of self-sustaining and harvestable populations of Chinook salmon and steelhead, and to mitigate for a portion of unavoidable losses resulting from Project operations. This plan was submitted to FERC on June 30, 2009 and received FERC approval on March 5, 2010. As required by Grant PUD's license (Article 401(a)(3)), this plan is now being updated and finalized in consultation with the PRCC Habitat Subcommittee. A guidance

document was also produced, reviewed, and approved by the PRCC in 2014 that provides more direction as to the supporting roles to each respective committee.

6.2 Habitat Account

Grant PUD allocates annual funds to a Priest Rapids Habitat Conservation Account in order to finance tributary or mainstem habitat projects to benefit UCR spring Chinook and UCR steelhead (Habitat Fund – BiOp). The SSSA requires additional allocations related to projects identified in the Project Habitat Plan for non-listed species (Habitat Supplemental Fund), and projects to help achieve juvenile survival standards (NNI Fund). Deposits to these accounts occur annually on February 15, concurrent with the filing of this annual FERC report. Expenditures from the NNI Fund occur in consultation with the PRCC, and expenditures of the Habitat Supplemental and Habitat BiOp funds are in consultation with the PRCC Habitat Subcommittee (Table 43). The 2016 deposit for the NNI-601 is $1,967,449.75; the Habitat Supplemental-602 is $1,040,995.86; and Habitat BiOP-603 is $371,867.07.

Table 43 Priest Rapids Coordinating Committee Habitat account balances and expenditures as of December 31, 2015.

Account	Beginning Balance	Expenditures	Unencumbered Balance
No Net Impact Fund	$4,999,7789	$2,626,171	$2,373,607
Habitat Supplemental Fund	$4,333,201	$1,563,180	$2,770,021
Habitat Fund (BiOp)	$1,252,296	$714,049	$538,247
Total	**$10,585,275**	**$4,903,400**	**$5,681,875**

7.0 Consultation

Grant PUD meets monthly with the PRCC, which includes representatives of NMFS, USFWS, WDFW, Colville Confederated Tribes, and Yakama Nation. In addition, all reports and documents, including this one, are distributed to the PRCC 30 days prior to filing with FERC for review and comments.

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Appendix A
Priest Rapids Project 2015 Spill Summary

2015 PRIEST RAPIDS DAM INADVERTENT SPILL PATTERN - During Fish-Spill Season - (5/02/2014)

Total Spill In KCFS	Gate Number																				Total Opening In Feet
	1	2	3	4	TSB 5	TSB 6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	
24.0	Closed	Closed	Closed	Closed	Closed	Closed	Closed		Fish-Spill		Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	0pen	0pen	0pen	11
25.3					Closed	Closed													1	Open	Open	Open	12
26.6					Closed	Closed												1	1	Open	Open	Open	13
27.9					Closed	Closed												2	1	Open	Open	Open	14
29.2					Closed	Closed											1	2	1	Open	Open	Open	15
30.5					Closed	Closed										1	1	2	1	Open	Open	Open	16
															1	1	1	2	1				
31.8					Closed	Closed									1	1	2	2	1	Open	Open	Open	17
33.1					Closed	Closed								1	1	1	2	2	1	Open	Open	Open	18
34.4					Closed	Closed							1	1	1	1	2	2	1	Open	Open	Open	19
35.7					Closed	Closed							1	1	1	2	2	2	1	Open	Open	Open	20
37.0					Closed	Closed							1	1	2	2	2	2	1	Open	Open	Open	21
												1	1	1	2	2	2	2	1				
38.3					Closed	Closed					1	1	1	1	2	2	2	2	1	Open	Open	Open	22
39.6					Closed	Closed					1	1	2	1	2	2	2	2	1	Open	Open	Open	23
40.9					Closed	Closed					2	1	2	1	2	2	2	2	1	Open	Open	Open	24
42.2					Closed	Closed				1	2	1	2	1	2	2	2	2	1	Open	Open	Open	25
43.5					Closed	Closed			1	1	2	1	2	1	2	2	2	2	1	Open	Open	Open	26
44.8					Closed	Closed		1	1	1	2	1	2	1	2	2	2	2	1	Open	Open	Open	27
46.1					Closed	Closed		1	2	1	2	1	2	1	2	2	2	2	1	Open	Open	Open	28
47.4					Closed	Closed		1	2	1	2	1	2	2	2	2	2	2	1	Open	Open	Open	29
48.7					Closed	Closed		1	2	1	2	2	2	2	2	2	2	2	1	Open	Open	Open	30
50.0					Closed	Closed	1	1	2	1	2	2	2	2	2	2	2	2	1	Open	Open	Open	31
51.3					Closed	Closed	1	1	2	2	2	2	2	2	2	2	2	2	1	Open	Open	Open	32

52.6				Closed	Closed	1	1	2	2	2	2	2	2	2	3	2	2	1	Open	Open	Open	33
53.9				Closed	Closed	1	1	2	2	2	2	2	3	2	3	2	2	1	Open	Open	Open	34
55.2				Closed	Closed	1	1	2	2	2	3	2	3	2	3	2	2	1	Open	Open	Open	35
56.5				Closed	Closed	1	1	2	2	2	3	2	3	3	3	2	2	1	Open	Open	Open	36
57.8				Closed	Closed	1	1	2	2	2	3	3	3	3	3	2	2	1	Open	Open	Open	37
59.1				Closed	Closed	1	2	2	2	2	3	3	3	3	3	2	2	1	Open	Open	Open	38
60.4				Closed	Closed	1	2	2	2	2	3	3	3	3	3	2	2	2	Open	Open	Open	39
61.7				Closed	Closed	1	2	2	2	3	3	3	3	3	3	2	2	2	Open	Open	Open	40
63.0				Closed	Closed	1	2	2	2	3	3	3	3	3	3	3	2	2	Open	Open	Open	41
64.3			1	Closed	Closed	1	2	2	2	3	3	3	3	3	3	3	2	2	Open	Open	Open	42
65.6			2	Closed	Closed	1	2	2	2	3	3	3	3	3	3	3	2	2	Open	Open	Open	43
66.9			2	Closed	Closed	2	2	2	2	3	3	3	3	3	3	3	2	2	Open	Open	Open	44
68.2		1	2	Closed	Closed	2	2	2	2	3	3	3	3	3	3	3	2	2	Open	Open	Open	45
69.5		2	2	Closed	Closed	2	2	2	2	3	3	3	3	3	3	3	2	2	Open	Open	Open	46
70.8		2	2	Closed	Closed	2	2	2	2	3	3	4	3	3	3	3	2	2	Open	Open	Open	47
72.1		2	2	Closed	Closed	2	2	2	3	3	3	4	3	3	3	3	2	2	Open	Open	Open	48
73.4		2	2	Closed	Closed	2	2	2	3	3	4	4	3	3	3	3	2	2	Open	Open	Open	49
74.7		2	2	Closed	Closed	2	2	3	3	3	4	4	3	3	3	3	2	2	Open	Open	Open	50
76.0		2	2	Closed	Closed	2	2	3	4	3	4	4	3	3	3	3	2	2	Open	Open	Open	51
77.3		2	2	Closed	Closed	2	2	3	4	4	4	4	3	3	3	3	2	2	Open	Open	Open	52
78.6		2	2	Closed	Closed	2	3	3	4	4	4	4	3	3	3	3	2	2	Open	Open	Open	53
79.9		2	2	Closed	Closed	3	3	3	4	4	4	4	3	3	3	3	2	2	Open	Open	Open	54
81.2		2	3	Closed	Closed	3	3	3	4	4	4	4	3	3	3	3	2	2	Open	Open	Open	55
82.5		2	3	Closed	Closed	3	3	3	4	4	4	4	4	3	3	3	2	2	Open	Open	Open	56
83.8		2	3	Closed	Closed	3	3	4	4	4	4	4	4	3	3	3	2	2	Open	Open	Open	57
85.1		2	3	Closed	Closed	3	3	4	4	5	4	4	4	3	3	3	2	2	Open	Open	Open	58
86.4		2	3	Closed	Closed	3	3	4	4	5	5	4	4	3	3	3	2	2	Open	Open	Open	59
87.7		2	3	Closed	Closed	3	3	4	4	5	5	4	4	4	3	3	2	2	Open	Open	Open	60
89.0		2	3	Closed	Closed	3	3	4	5	5	5	4	4	4	3	3	2	2	Open	Open	Open	61
90.3		2	3	Closed	Closed	3	3	4	5	5	5	5	4	4	3	3	2	2	Open	Open	Open	62

91.6		2	3	Closed	Closed	3	3	4	5	5	5	5	4	4	4	3	2	2	Open	Open	Open	63
92.9		2	3	Closed	Closed	3	3	4	5	5	5	5	4	4	4	3	3	2	Open	Open	Open	64
94.2		2	3	Closed	Closed	3	3	4	5	6	5	5	4	4	4	3	3	2	Open	Open	Open	65
95.5		2	3	Closed	Closed	3	4	4	5	6	5	5	4	4	4	3	3	2	Open	Open	Open	66
96.8		2	3	Closed	Closed	3	4	4	6	6	5	5	4	4	4	3	3	2	Open	Open	Open	67
98.1		2	3	Closed	Closed	3	4	4	6	6	6	5	4	4	4	3	3	2	Open	Open	Open	68
99.4		2	3	Closed	Closed	3	4	4	6	6	6	5	5	4	4	3	3	2	Open	Open	Open	69
100.7		2	3	Closed	Closed	3	4	4	6	6	6	5	5	5	4	3	3	2	Open	Open	Open	70
102.0		2	3	Closed	Closed	3	4	4	6	7	6	5	5	5	4	3	3	2	Open	Open	Open	71
103.3		2	3	Closed	Closed	3	4	4	6	7	6	6	5	5	4	3	3	2	Open	Open	Open	72
104.6		2	3	Closed	Closed	3	4	4	6	7	6	6	5	5	4	4	3	2	Open	Open	Open	73
105.9		2	3	Closed	Closed	3	4	4	6	7	7	6	5	5	4	4	3	2	Open	Open	Open	74
107.2		2	3	Closed	Closed	3	4	4	6	7	7	6	5	5	5	4	3	2	Open	Open	Open	75
108.5		2	3	Closed	Closed	3	4	4	6	7	7	6	6	5	5	4	3	2	Open	Open	Open	76
109.8		2	3	Open	Open	3	3	4	4	5	5	4	4	4	3	3	2	2	Open	Open	Open	77
111.1		2	3	Open	Open	3	3	4	4	5	5	5	4	4	3	3	2	2	Open	Open	Open	78
112.4		2	3	Open	Open	3	4	4	4	5	5	5	4	4	3	3	2	2	Open	Open	Open	79
113.7		2	3	Open	Open	3	4	4	4	5	5	5	5	4	3	3	2	2	Open	Open	Open	80
115.0		2	3	Open	Open	3	4	4	4	5	5	5	5	4	4	3	2	2	Open	Open	Open	81
116.3		2	3	Open	Open	3	4	4	4	5	5	5	5	4	4	3	3	2	Open	Open	Open	82
117.6		2	3	Open	Open	3	4	4	5	5	5	5	5	4	4	3	3	2	Open	Open	Open	83
118.9		2	3	Open	Open	3	4	4	5	6	5	5	5	4	4	3	3	2	Open	Open	Open	84
120.2		2	3	Open	Open	3	4	4	5	6	6	5	5	4	4	3	3	2	Open	Open	Open	85
121.5		2	3	Open	Open	3	4	4	5	6	6	5	5	4	4	4	3	2	Open	Open	Open	86
122.8		2	3	Open	Open	3	4	5	5	6	6	5	5	4	4	4	3	2	Open	Open	Open	87
124.1		2	3	Open	Open	3	4	5	6	6	6	5	5	4	4	4	3	2	Open	Open	Open	88
125.4		2	3	Open	Open	3	4	5	6	6	6	5	5	5	4	4	3	2	Open	Open	Open	89
126.7		2	3	Open	Open	3	4	5	6	6	6	6	5	5	4	4	3	2	Open	Open	Open	90
128.0		2	3	Open	Open	3	4	5	6	6	6	6	5	5	5	4	3	2	Open	Open	Open	91
129.3		2	3	Open	Open	3	4	5	7	6	6	6	5	5	5	4	3	2	Open	Open	Open	92

130.6	2	3	Open	Open	3	4	5	7	7	6	6	5	5	5	4	3	2	Open	Open	Open	93
131.9	2	3	Open	Open	4	4	5	7	7	6	6	5	5	5	4	3	2	Open	Open	Open	94
133.2	2	4	Open	Open	4	4	5	7	7	6	6	5	5	5	4	3	2	Open	Open	Open	95
134.5	2	4	Open	Open	4	5	5	7	7	6	6	5	5	5	4	3	2	Open	Open	Open	96
135.8	2	4	Open	Open	4	5	6	7	7	6	6	5	5	5	4	3	2	Open	Open	Open	97
137.1	2	4	Open	Open	4	5	6	7	7	6	6	5	5	5	4	3	3	Open	Open	Open	98
138.4	2	4	Open	Open	4	5	6	7	7	6	6	5	5	5	4	4	3	Open	Open	Open	99
139.7	2	4	Open	Open	4	5	6	7	7	6	6	6	5	5	4	4	3	Open	Open	Open	100
141.0	2	4	Open	Open	4	5	6	7	7	6	6	6	5	5	4	4	3	Open	Open	Open	101
142.3	2	4	Open	Open	5	5	6	7	7	6	6	6	5	5	4	4	3	Open	Open	Open	102
143.6	2	4	Open	Open	5	6	6	7	7	6	6	6	5	5	4	4	3	Open	Open	Open	103
144.9	2	4	Open	Open	5	6	6	7	7	7	6	6	5	5	4	4	3	Open	Open	Open	104
146.2	2	4	Open	Open	5	6	6	7	7	7	6	6	5	5	5	4	3	Open	Open	Open	105
147.5	2	4	Open	Open	5	6	6	7	7	7	7	6	5	5	5	4	3	Open	Open	Open	106
148.8	2	4	Open	Open	5	6	6	7	7	7	7	6	6	5	5	4	3	Open	Open	Open	107
150.1	2	4	Open	Open	5	6	6	7	7	7	7	6	6	5	5	4	3	Open	Open	Open	108
151.4	2	4	Open	Open	5	6	6	7	8	7	7	6	6	5	5	4	3	Open	Open	Open	109
152.7	2	4	Open	Open	5	6	6	7	8	7	7	7	6	5	5	4	3	Open	Open	Open	110
154.0	2	4	Open	Open	5	6	6	7	8	8	7	7	6	5	5	4	3	Open	Open	Open	111
155.3	2	4	Open	Open	5	6	6	7	8	8	7	7	6	6	5	4	3	Open	Open	Open	112
156.6	2	4	Open	Open	5	6	6	7	8	8	7	7	7	6	5	4	3	Open	Open	Open	113
157.9	2	4	Open	Open	5	6	6	7	8	8	7	7	7	6	5	5	3	Open	Open	Open	114
159.2	2	4	Open	Open	5	6	6	7	8	8	8	7	7	6	5	5	3	Open	Open	Open	115
160.5	2	4	Open	Open	5	6	6	8	8	8	8	7	7	6	5	5	3	Open	Open	Open	116
161.8	2	4	Open	Open	5	6	7	8	8	8	8	7	7	6	5	5	3	Open	Open	Open	117
163.1	2	4	Open	Open	5	6	7	8	9	8	8	7	7	6	5	5	3	Open	Open	Open	118
164.4	2	4	Open	Open	5	6	7	8	9	8	8	7	7	6	6	5	3	Open	Open	Open	119
165.7	2	4	Open	Open	5	6	7	8	9	9	8	7	7	6	6	5	3	Open	Open	Open	120
167.0	2	4	Open	Open	5	6	7	8	9	9	8	8	7	6	6	5	3	Open	Open	Open	121
168.3	2	4	Open	Open	5	6	7	8	9	9	8	8	7	6	6	5	4	Open	Open	Open	122

169.6		2	4	Open	Open	5	6	7	8	9	9	8	8	7	7	6	5	4	Open	Open	Open	123
170.9		2	4	Open	Open	5	6	8	8	9	9	8	8	7	7	6	5	4	Open	Open	Open	124
172.2		2	4	Open	Open	5	6	8	8	9	9	9	8	7	7	6	5	4	Open	Open	Open	125
173.5		2	4	Open	Open	5	6	8	8	9	9	9	8	8	7	6	5	4	Open	Open	Open	126
174.8		3	4	Open	Open	5	6	8	8	9	9	9	8	8	7	6	5	4	Open	Open	Open	127
176.1		3	4	Open	Open	6	6	8	8	9	9	9	8	8	7	7	5	4	Open	Open	Open	128
177.4		3	4	Open	Open	6	6	8	8	9	9	9	9	8	7	7	5	4	Open	Open	Open	129
178.7		3	4	Open	Open	6	6	8	8	9	9	9	9	8	8	7	5	4	Open	Open	Open	130
180.0		3	4	Open	Open	6	6	8	8	9	9	9	9	8	8	7	6	4	Open	Open	Open	131
181.3		3	4	Open	Open	6	7	8	8	9	9	9	9	8	8	7	6	4	Open	Open	Open	132
182.6		3	4	Open	Open	6	7	8	8	9	9	9	9	8	8	7	6	5	Open	Open	Open	133
183.9		3	4	Open	Open	6	7	8	8	9	9	9	9	8	8	7	7	5	Open	Open	Open	134
185.2		3	5	Open	Open	6	7	8	8	9	9	9	9	8	8	7	7	5	Open	Open	Open	135
186.5		3	5	Open	Open	6	7	8	9	9	9	9	9	8	8	7	7	5	Open	Open	Open	136
187.8		3	5	Open	Open	6	7	8	9	9	10	9	9	8	8	7	7	5	Open	Open	Open	137
189.1		3	5	Open	Open	6	8	8	9	9	10	9	9	8	8	7	7	5	Open	Open	Open	138
190.4		3	5	Open	Open	6	8	9	9	9	10	9	9	8	8	7	7	5	Open	Open	Open	139
191.7		3	5	Open	Open	6	8	9	9	10	10	9	9	8	8	7	7	5	Open	Open	Open	140
193.0		3	5	Open	Open	6	8	9	9	10	10	10	9	8	8	7	7	5	Open	Open	Open	141
194.3		3	5	Open	Open	6	8	9	9	10	10	10	9	9	8	7	7	5	Open	Open	Open	142
195.6		3	5	Open	Open	6	8	9	10	10	10	10	9	9	8	7	7	5	Open	Open	Open	143
196.9		3	5	Open	Open	6	8	9	10	10	10	10	9	9	8	8	7	5	Open	Open	Open	144
198.2		3	5	Open	Open	6	8	9	10	10	10	10	10	9	8	8	7	5	Open	Open	Open	145
199.5		3	5	Open	Open	6	8	9	10	10	10	10	10	9	9	8	7	5	Open	Open	Open	146
200.8		3	5	Open	Open	6	8	9	10	10	10	10	10	10	9	8	7	5	Open	Open	Open	147

Note: Spill based on reservoir elevation of 486 feet.
Fish Bypass is fully (3 gates) open
Top-Spill Bulkhead is located in spill bays 5 & 6

2015 WANAPUM DAM INADVERTENT SPILL PATTERN during FISH-SPILL

(April 2015)

Total Spill In KCFS	Gate Number 1	2	3	4	5	6	7	8	9	10	11	12	Sluice Gate	WFB	Total Opening In Feet
21.5	Closed	Closed	Closed	Closed	Closed	Closed						1		Open	
23.0	Closed	Closed	Closed	Closed	Closed	Closed					1	1		Open	
24.5	Closed	Closed	Closed	Closed	Closed	Closed				1	1	1		Open	
26.0	Closed	Closed	Closed	Closed	Closed	Closed			1	1	1	1		Open	
27.5	Closed	Closed	Closed	Closed	Closed	Closed			1	1	2	1		Open	
29.0	Closed	Closed	Closed	Closed	Closed	Closed			1	2	2	1		Open	
30.5	Closed	Closed	Closed	Closed	Closed	Closed		1	1	2	2	1		Open	
32.0	Closed	Closed	Closed	Closed	Closed	Closed		1	1	2	3	1		Open	
33.5	Closed	Closed	Closed	Closed	Closed	Closed		1	1	2	3	2		Open	
35.0	Closed	Closed	Closed	Closed	Closed	Closed		1	2	2	3	2		Open	
36.5	Closed	Closed	Closed	Closed	Closed	Closed		1	2	3	3	2		Open	
38.0	Closed	Closed	Closed	Closed	Closed	Closed		1	3	3	3	2		Open	
39.5	Closed	Closed	Closed	Closed	Closed	Closed		2	3	3	3	2		Open	
41.0	Closed	Closed	Closed	Closed	Closed	Closed		2	3	3	4	2		Open	
42.5	Closed	Closed	Closed	Closed	Closed	Closed		2	3	4	4	2		Open	
44.0	Closed	Closed	Closed	Closed	Closed	Closed		2	3	4	4	3		Open	
45.5	Closed	Closed	Closed	Closed	Closed	Closed		2	4	4	4	3		Open	
47.0	Closed	Closed	Closed	Closed	Closed	Closed	1	2	4	4	4	3		Open	
48.5	Closed	Closed	Closed	Closed	Closed	Closed	1	3	4	4	4	3		Open	
50.0	Closed	Closed	Closed	Closed	Closed	Closed	1	3	4	4	4	4		Open	
51.5	Closed	Closed	Closed	Closed	Closed	Closed	1	3	4	4	5	4		Open	
53.0	Closed	Closed	Closed	Closed	Closed	Closed	1	3	4	5	5	4		Open	
54.5	Closed	Closed	Closed	Closed	Closed	Closed	1	3	5	5	5	4		Open	
56.0	Closed	Closed	Closed	Closed	Closed	Closed	2	3	5	5	5	4		Open	
57.5	Closed	Closed	Closed	Closed	Closed	Closed	2	4	5	5	5	4		Open	

59.0	Closed	Closed	Closed	Closed	Closed	Closed	2	4	5	5	6	4	Open
60.5	Closed	Closed	Closed	Closed	Closed	Closed	2	4	5	6	6	4	Open
62.0	Closed	Closed	Closed	Closed	Closed	Closed	2	4	6	6	6	4	Open
63.5	Closed	Closed	Closed	Closed	Closed	Closed	2	4	6	6	6	5	Open
65.0	Closed	Closed	Closed	Closed	Closed	Closed	2	5	6	6	6	5	Open
66.5	Closed	Closed	Closed	Closed	Closed	Closed	2	5	6	6	7	5	Open
68.0	Closed	Closed	Closed	Closed	Closed	Closed	2	5	6	7	7	5	Open
69.5	Closed	Closed	Closed	Closed	Closed	Closed	2	5	7	7	7	5	Open
71.0	Closed	Closed	Closed	Closed	Closed	Closed	2	5	7	7	7	6	Open
72.5	Closed	Closed	Closed	Closed	Closed	Closed	2	5	7	7	8	6	Open
74.0	Closed	Closed	Closed	Closed	Closed	Closed	2	5	7	8	8	6	Open
75.5	Closed	Closed	Closed	Closed	Closed	Closed	3	5	7	8	8	6	Open
77.0	Closed	Closed	Closed	Closed	Closed	Closed	3	5	8	8	8	6	Open
78.5	Closed	Closed	Closed	Closed	Closed	Closed	3	5	8	8	8	7	Open
80.0	Closed	Closed	Closed	Closed	Closed	Closed	4	5	8	8	8	7	Open
81.5	Closed	Closed	Closed	Closed	Closed	Closed	4	6	8	8	8	7	Open
83.0	Closed	Closed	Closed	Closed	Closed	Closed	4	6	8	8	9	7	Open
84.5	Closed	Closed	Closed	Closed	Closed	Closed	4	6	8	9	9	7	Open
86.0	Closed	Closed	Closed	Closed	Closed	Closed	4	6	8	9	9	8	Open
87.5	Closed	Closed	Closed	Closed	Closed	Closed	4	7	8	9	9	8	Open
88.5	Closed	Closed	Closed	Closed	Closed	Closed	5	7	8	9	9	8	Open
90.0	Closed	Closed	Closed	Closed	Closed	Closed	5	7	9	9	9	8	Open
91.5	Closed	Closed	Closed	Closed	Closed	Closed	5	7	9	9	9	9	Open
93.0	Closed	Closed	Closed	Closed	Closed	Closed	5	8	9	9	9	9	Open
94.5	Closed	Closed	Closed	Closed	Closed	Closed	5	8	9	9	10	9	Open
96.0	Closed	Closed	Closed	Closed	Closed	Closed	5	8	9	10	10	9	Open
97.5	Closed	Closed	Closed	Closed	Closed	Closed	5	8	10	10	10	9	Open
99.0	Closed	Closed	Closed	Closed	Closed	Closed	6	8	10	10	10	9	Open
100.5	Closed	Closed	Closed	Closed	Closed	Closed	6	9	10	10	10	9	Open
102.0	Closed	Closed	Closed	Closed	Closed	Closed	6	9	10	10	11	9	Open

103.5	Closed	Closed	Closed	Closed	Closed	Closed	7	9	10	10	11	9	Open
105.0	Closed	Closed	Closed	Closed	Closed	Closed	7	9	10	11	11	9	Open
106.5	Closed	Closed	Closed	Closed	Closed	Closed	7	9	11	11	11	9	Open
108.0	Closed	Closed	Closed	Closed	Closed	Closed	7	9	11	11	11	10	Open
109.5	Closed	Closed	Closed	Closed	Closed	Closed	8	9	11	11	11	10	Open
111.0	Closed	Closed	Closed	Closed	Closed	Closed	8	10	11	11	11	10	Open
112.5	Closed	Closed	Closed	Closed	Closed	Closed	9	10	11	11	11	10	Open
114.0	Closed	Closed	Closed	Closed	Closed	Closed	9	10	11	11	12	10	Open
115.5	Closed	Closed	Closed	Closed	Closed	Closed	9	10	11	12	12	10	Open
117.0	Closed	Closed	Closed	Closed	Closed	Closed	9	10	12	12	12	10	Open
118.5	Closed	Closed	Closed	Closed	Closed	Closed	9	10	12	12	12	11	Open
120.0	Closed	Closed	Closed	Closed	Closed	Closed	9	11	12	12	12	11	Open
121.5	Closed	Closed	Closed	Closed	Closed	Closed	9	11	12	12	12	12	Open
123.0	Closed	Closed	Closed	Closed	Closed	Closed	10	11	12	12	12	12	Open
124.5	Closed	Closed	Closed	Closed	Closed	Closed	10	12	12	12	12	12	Open
126.0	Closed	Closed	Closed	Closed	Closed	Closed	10	12	12	12	13	12	Open
127.5	Closed	Closed	Closed	Closed	Closed	Closed	10	12	12	13	13	12	Open
129.0	Closed	Closed	Closed	Closed	Closed	Closed	10	12	13	13	13	12	Open
130.5	Closed	Closed	Closed	Closed	Closed	Closed	10	13	13	13	13	12	Open
132.0	Closed	Closed	Closed	Closed	Closed	Closed	10	13	13	13	14	12	Open
133.5	Closed	Closed	Closed	Closed	Closed	Closed	11	13	13	14	14	12	Open
135.0	Closed	Closed	Closed	Closed	Closed	Closed	11	13	14	14	14	12	Open
136.5	Closed	Closed	Closed	Closed	Closed	Closed	11	13	14	14	14	13	Open
138.0	Closed	Closed	Closed	Closed	Closed	Closed	12	13	14	14	14	13	Open
139.5	Closed	Closed	Closed	Closed	Closed	Closed	12	14	14	14	14	13	Open
141.0	Closed	Closed	Closed	Closed	Closed	Closed	12	14	14	15	14	13	Open
142.5	Closed	Closed	Closed	Closed	Closed	Closed	12	14	14	15	15	13	Open
144.0	Closed	Closed	Closed	Closed	Closed	Closed	12	14	14	15	15	14	Open
145.5	Closed	Closed	Closed	Closed	Closed	Closed	12	14	14	16	15	14	Open
147.0	Closed	Closed	Closed	Closed	Closed	Closed	12	14	15	16	15	14	Open

148.5	Closed	Closed	Closed	Closed	Closed	Closed	12	14	16	16	15	14		Open
150.0	Closed	Closed	Closed	Closed	Closed	Closed	12	14	16	16	16	14		Open
151.5	Closed	Closed	Closed	Closed	Closed	Closed	12	14	16	16	16	15		Open
153.0	Closed	Closed	Closed	Closed	Closed	Closed	12	14	16	17	16	15		Open
154.5	Closed	Closed	Closed	Closed	Closed	Closed	12	14	16	17	17	15		Open
156.0	Closed	Closed	Closed	Closed	Closed	Closed	13	14	16	17	17	15		Open
157.5	Closed	Closed	Closed	Closed	Closed	Closed	13	15	16	17	17	15		Open
159.0	Closed	Closed	Closed	Closed	Closed	Closed	13	15	16	17	17	16		Open
160.5	Closed	Closed	Closed	Closed	Closed	Closed	14	15	16	17	17	16		Open
162.0	Closed	Closed	Closed	Closed	Closed	Closed	14	16	16	17	17	16		Open

Note:

1. Spill based on reservoir elevation of 568 feet
2. Spillway with spill deflector (flip-lip) functioning in spillbays 1-12.
3. Spillbay discharge set at 1.5 kcfs/ft gate opening (568' forebay).
4. Deflector performance is assumed lost after 4 feet opening.
5. Spillbays 1-6 are not available for passing water.