Grant County
PUBLIC UTILITY DISTRICT

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VIA ELECTRONIC FILING

April 14, 2017

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 2016 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 2016 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 (USFWS), Washington Department of Fish and Wildlife, Colville Confederated Tribes, Yakama Nation and the Columbia River Inter-Tribal Fish Commission on March 8, 2017 for review and comment. After a 30 day comment and review period, comments were received from USFWS and are addressed in Appendix B of this report.

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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 2016 Activities under Priest Rapids Hydroelectric Project

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CALENDAR YEAR 2016

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

Public Utility District No. 2 of Grant County, Washington

April 2017

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 (BiOp) 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 Progress and Implementation 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 2008a & USFWS 2007), and SSSA for the Priest Rapids Project (PRP) completed during the calendar year January 1, through December 31, 2016. 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 (NNI) 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.

Yearling Chinook

Grant PUD conducted three consecutive years of performance standard evaluations during 2003-2005 to determine project-wide survival for yearling Chinook for the PRP (Table 1). The three year consecutive arithmetic average of 86.6% exceeded the required standard of 86.49% per the 2008 NMFS Biological Opinions for the Priest Rapids Project (Anglea et al. 2003, Anglea et al. 2004a and 2004b, Anglea et al. 2005). 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 Salmon and Steelhead Settlement Agreement, the survival estimates for yearling Chinook that were originally scheduled to be re-evaluated at five-year intervals (next study would have been 2010). However, because of concern over juvenile steelhead survival through the Priest Rapids Project, NMFS and the PRCC agreed that the yearling Chinook evaluation originally scheduled for 2010 would occur in 2014 (SOA 2011-06).

Table 1 Survival estimates and standard errors (SE) in parenthesis (development and total Project) 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% (SE=0.0442)
2004	N/A	N/A	86.4% (SE=0.0309)
2005	N/A	N/A	86.9% (SE=0.0214)
3 Year Consecutive Average			**86.6% (SE=0.0322)**
2014[1]	94.5% (SE=0.013)	96.1% (SE=0.009)	90.8% (SE=0.0150)

[*] Performance Standard Requirement = 86.49%

[1] Required Check-in per Statement of Agreement 2011-06; Wanapum Drawdown

At the request of NMFS and PRCC; Grant PUD conducted a yearling Chinook performance standard check in 2014 during the Wanapum fracture event. In preparation for that evaluation, the PRCC developed SOA 2014-02. Under this SOA,

> *"…the PRCC agreed that the Priest Rapids Reservoir survival and Priest Rapids Top-spill Bypass survival and behavior evaluations (if valid) will be counted as progress towards meeting performance standards in the Priest Rapids Project for juvenile steelhead and yearling Chinook. The PRCC will determine how valid results would be incorporated into future performance standards calculations."*

The survival estimate for yearling Chinook migrating through the PRP in 2014, when including survival estimate from the Wanapum Development (under a drawdown scenario) was 90.8% (CI=95%; SE=0.015; Skalski et al. 2014). This is 4.3% above the required juvenile salmonid and steelhead Project passage survival standard of 86.49% (Table 1; NMFS 2008a).

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 Development was 96.1% (SE=0.001). The Wanapum and Priest Rapids dams ("concrete") passage survival was 98.8% and 97.1% respectively (Table 2; Hatch et al. 2015). 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 2). Although the fracture at Wanapum impacted day to day operation of the powerhouse, Wanapum Fish Bypass (WFB) and spillway, observed survival at Wanapum Dam exceeded 97.0%. Specific details on the behavior and survival evaluation can be reviewed in Hatch et al. (2015) and Skalski et al. (2014).

Yearling Chinook performance standards for the Priest Rapids Project were achieved in 2005 and again confirmed in 2014 after a myriad of capital improvements (as required per the 2004 and 2008 NMFS Biological Opinions) had been completed at both Wanapum and Priest Rapids dams. These capital improvements include the Wanapum Fish Bypass, Priest Rapids Fish Bypass, Advanced Hydro Turbine System (at Wanapum Dam), enhanced avian wire arrays (at Wanapum and Priest Rapids dams), enhanced predator removal program, and implementation of "fish mode" at both dams. With these enhancements, a high level of survival (>95%) has been documented for yearling Chinook passing through the completed capital improvements at Wanapum and Priest Rapids dams.

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

Table 2 **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

Per Section 15.3 of the Salmon and Steelhead Settlement Agreement;

> *"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." Section 15.3 further states that "Grant PUD will reduce its annual NNI Fund contributions as progress toward meeting these performance standards is achieved" and "when the parties determine that the performance standards have been achieved on a species-by-species basis, the NNI Fund annual contributions for that species will be terminated".*

Grant PUD is achieving No-Net-Impact (NNI) for yearling Chinook at the Priest Rapids Project per the 2008 NMFS Biological Opinion and Priest Rapids Salmon and Steelhead Settlement Agreement and therefore annual contributions into the NNI Fund for yearling Chinook were terminated in 2005. The next performance standard check-in for yearling Chinook evaluation is 2019.

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. The two year arithmetic average performance standard for sockeye through the Project was 91.6% (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, which would also serve as the initial five year check-in for sockeye (SOA 2011-06). The PRCC also agreed that for 2012 through 2016, the NNI contribution for sockeye would be based on the current two year survival average for sockeye. For 2017 (and beyond), the NNI contribution for sockeye would be based on a new

three year sockeye survival average, based on 2016 study results, 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 move the third year of juvenile sockeye survival evaluation from 2016 to 2015.

Based on the results of the 2015 sockeye performance evaluation study, 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=0.015) (Skalski et al. 2009b; Skalski et al. 2010 and Hatch et al. 2016) (Table 3). The 91.7% exceeds the required standard of 86.49%.

Table 3 Survival estimates and standard errors (SE) in parenthesis (development and total Project) 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 (Required Standard=86.49%)
2009	97.3% (SE=0.009)	94.6% (SE=0.011)	92.1% (SE=0.014)
2010	94.1% (SE=0.014)	96.8% (SE=0.014)	91.1% (SE=0.019)
2015	94.1% (SE=0.011)	97.5% (SE=0.00)	91.8% (SE=0.012)
3 Year Consecutive Average			**91.7% (SE=0.015)**

Per Section 15.3 of the SSSA;

> *"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." Section 15.3 further states that "Grant PUD will reduce its annual NNI Fund contributions as progress toward meeting these performance standards is achieved" and "when the parties determine that the performance standards have been achieved on a species-by-species basis, the NNI Fund annual contributions for that species will be terminated."*

Grant PUD is achieving NNI for sockeye at the Priest Rapids Project per the 2008 NMFS Biological Opinion and Priest Rapids Salmon and Steelhead Settlement Agreement and therefore annual contributions into the NNI Fund for juvenile sockeye has been terminated. The next performance standard check-in for juvenile sockeye is 2020.

Steelhead

The current Project-wide survival for juvenile steelhead based on only two consecutive arithmetic year average (2015-2016) is 85.2% (SE=0.03; Table 4). The third consecutive year, Project-wide survival evaluation will be conducted in 2017. Survival information from 2015-2017 will then be used to develop an updated Project-wide juvenile steelhead survival estimate based on a three consecutive arithmetic year average. The next performance standard check-in for juvenile steelhead is 2022.

Table 4 Survival estimates and standard errors (SE) in parenthesis (development and total Project) for juvenile steelhead for the Priest Rapids Project for years 2003-2005 and 2015-2016.

Year	Wanapum Development	Priest Rapids Development	Total Survival for Priest Rapids Project (Required Standard=86.49%)
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)	83.2% (SE=0.026)
2010	85.5% (SE=0.019)	90.4% (SE=0.017)	77.3% (SE=0.022)
3 Year Consecutive Average			**81.1% (SE=0.026)**
2015	85.5% (SE=0.017)	94.1% (SE=0.028)	83.7% (SE=0.027)
2016	93.04%*	93.04%*	86.6% (SE=0.032)
2017	N/A	N/A	TBD
3 Year Consecutive Average (2015-2017)			**TBD**

* Priest Rapids Project total estimated survival divided by half.

Juvenile Steelhead Survival

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.

Since the development of the SAP, PRCC has conducted several evaluations funded through the NNI Fund ($5,448,678) to determine potential reasons for lower than expected juvenile steelhead survival within the Priest Rapids Project. All of these NNI funded projects are associated with research activities to determine the potential impacts of avian and fish predation on juvenile salmonids migrating through 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 Project. 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 represented a large threat to the out-migration of listed UCR steelhead. 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 light of the information presented above and the 2008 BiOp issued by NMFS (as updated by the 2010 and 2014 Supplemental BiOps; http://www.salmonrecovery.gov/BiologicalOpinions/FCRPSBiOp.aspx.) for the Federal Columbia River Power System (FCRPS); 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.

Under the 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 out-migrating juvenile salmon and steelhead and develop and implement a management plan to decrease predation rates, if warranted.

Under the IAPMP a colony-based habitat management actions were implemented on Goose Island (Potholes Reservoir in Grant County, Washington; federal lands) from 2014-2016. These management actions include both passive (matrix of ropes and flagging) and active nest dissuasion measures (hazing, walk-throughs, boat based activities, kites, lasers, etc.).

Results to date indicate that Caspian tern nest dissuasion measures (active and passive) were largely successful where implemented. However, despite the successful reduction or elimination of Caspian tern colonies at managed sites in the first 2 years of the IAPMP implementation, reduction in the overall number of terns in the Columbia Plateau has not been substantial because of increases in nesting at other sites in the region.

For example, Roby et al. (2016) estimated that in 2015 terns nesting on Twinning Island consumed 2.6% (95% CI=1.8–3.9%) of UCR steelhead. In 2016, Roby et al. (2017) reported that the Caspian tern predation rate observed at an unmanaged colony in the vicinity (within 30 miles) of the Priest Rapids Project was 4.1% (North Potholes Island). At a tern colony in the John Day Dam Reservoir (Blalock Islands) a 10-fold increase in breeding pairs from 2014 to 677 nest in 2015 was documented (Roby et al. 2016). Roby et al. (2016) further reported that juvenile salmonids made up 67.3% of the diet of Caspian terns nesting on the Blalock Islands in 2015; which is consistent with results from previous years for Caspian terns nesting at Crescent Island. Roby et al (2016) further reported that a larger proportion of the salmonids in the Blalock Islands tern diet were steelhead (34%) compared to the tern diet at Crescent Island. Roby et al. (2016) also estimated that Caspian terns nesting on the Blalock Islands consumed approximately 550,000 juvenile salmonids in 2015 (95% CI= 310,000–800,000), which included ~240,000 steelhead (95% CI= 130,000–350,000).

As illustrated above, although nesting may have been disrupted; foraging and lofting activities continue to occur at the Priest Rapids Project and at other areas throughout the Columbia Basin Plateau. These “new” lofting areas have made it difficult to conduct tag recoveries and therefore calculate predation rates.

No-Net-Impact Fund Adjustments

To evaluate steady progress toward meeting performance standards and to adjust the NNI Fund, Grant PUD, in consultation with the PRCC, conducts performance standard evaluations. Based on these evaluations, performance standards for both yearling Chinook and juvenile sockeye has been achieved for the Priest Rapids Project.

Per Section 15.3 of the SSSA;

"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." Section 15.3 further states that "Grant PUD will reduce its annual NNI Fund contributions as progress toward meeting these performance standards is achieved" and "when the parties determine that the performance standards have been achieved on a species-by-species basis, the NNI Fund annual contributions for that species will be terminated."

Grant PUD is achieving NNI for yearling Chinook and sockeye at the Priest Rapids Project per Section 15.3 of the Priest Rapids Salmon and Steelhead Settlement Agreement and therefore annual contributions into the NNI Fund for yearling Chinook and juvenile sockeye has ended.

Performance standards for juvenile steelhead have not been achieved yet nor has the PRCC determined the best way to move forward to conduct survival evaluations for summer sub-yearling Chinook. Life history strategies and current technology preclude the PRCC from conducting Project-wide survival evaluations on active summer sub-yearling migrates.

The annual contribution made into the NNI account prior to February 15, 2016 was $1,967,449.75.

No-Net-Impact Fund Contributions

The total amount of for annual contributions into the NNI Fund made by Grant PUD since 2006 is $19,705,736.77 (2006-2016). NNI Funds have been utilized by the PRCC to fund 25 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.

Avian and Fish Predator Control

Grant PUD continues to implement avian and fish predator removal and control programs at the Priest Rapids Project. A total of 8,641 birds were hazed during 2016 of which 43% were Caspian terns. In addition, 330 piscivorous waterbirds were lethally removed and included common merganser, double-crested cormorant and three separate gull species (California, herring, and ring-billed).

Additionally, Grant PUD removed a total of 55,663 northern pikeminnow during 2016. Removal methods included set lining (3,504), beach seining (47,754), electrofishing (1,286), and angling (3,330). An additional 1,227 northern pikeminnow were removed as part of a fishing derby funded by the PRCC via the NNI Fund.

Project Operations (Turbines and Bypasses)

The Wanapum Fish Bypass (WFB) was in full open operation (20 kcfs) from April 13 to June 15, 2016 for spring out-migrants and from June 16, 2016 to August 15, 2016 for summer migrants. The Priest Rapids Fish Bypass (PRFB) was operated from April 15 to August 16, 2016 and was operated at a fixed flow volume of 27 kcfs. The exact flow volume is determined by forebay elevation. The Wanapum and Priest Rapids turbines were operated in "fish mode" for the same timeframes identified above.

Hatchery Program Implementation

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 6,887,622 fish into the upper Columbia River and its tributaries in 2016. Conservative estimates of fish propagation expenditures across all species was approximately $8,231,064 in 2016, and over $137,953,650 across all species since the inception of Grant PUD's hatchery programs. Of the $127.95 million spent to-date, about 46% comprised capital investments used to build new and/or modify existing facilities to meet Grant PUD's supplementation program needs. The remaining 54% has been used to support operations and maintenance (O&M) and monitoring and evaluation (M&E) activities associated with the programs.

Habitat Program Implementation

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, 93 total projects have been approved for funding using one of the three funding accounts (601, NNI Fund-25 projects; 602, Habitat Supplemental Fund-37 projects; and 603, Habitat Conservation Fund-31 projects, respectively.) Of those, 47 are completed and 46 are currently active and underway. As of the end of December 2016, $9,535,808 dollars have been spent on habitat committee approved projects and another $23,904,108 are appropriated for specific project expenditures.

Six new projects were approved in 2016 by the PRCC and/or PRCC Habitat Subcommittee with four from Fund 601, two from Fund 602. The 2016 deposit for the NNI-601 was $1,967,449.75; the Habitat Supplemental-602 was $1,040,995.86 and Habitat BiOP-603 was $371,867.07.

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1.0 Introduction

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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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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 (NNI) 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 1.35 (T&C 1.35). Over the course of 2016, PRCC representatives participated in a total of 15 meetings, conference calls, and/or WebEx conferences. Meeting agendas and minutes for these meetings can be viewed at PRCC Meeting Minutes.

The PRCC representatives also convened a joint sub-yearling Chinook workshop, which also included representatives from the Chelan and Douglas Habitat Conservation Plan Coordinating Committee (HCP-CC) and regional experts. The workshop was specifically convened to review existing and current information related to sub-yearling Chinook fish passages models, life history patterns (in Snake River basin and Mid-Columbia), tag technology limitations and to determine a potential path forward with regards to sub-yearling Chinook survival evaluations within the respected Projects.

The PRCC representatives generally agreed that life history strategies for sub-yearling summer Chinook and current limitations in tag technology preclude Grant PUD from conducting evaluations to estimate survival for sub-yearling summer Chinook actively migrating throughout the Priest Rapids Project. In an effort to document this general consensus, Grant PUD presented a draft Statement of Agreement (SOA; 2016-05) for consideration by the PRCC to defer survival evaluations for sub-yearling summer Chinook to a timeframe in the future as had been done in the past (SOA's 2009-04, 2011-06 and 2015-03). A single dissenting party has precluded this SOA from being approved during 2016.

In addition to SOA 2016-05 discussed above, three other SOA's were also presented to the PRCC for approval in 2016 and included the following; (1) suspension of gas bubble trauma (GBT) smolt monitoring until further notice, (2) modification in the frequency of performance standard evaluations for yearling Chinook and sockeye from 5 to 10 years (SOA 2016-03), and (3) decoupling in the species linkages between sub-yearling summer Chinook and steelhead used to calculate No-Net-Impact (NNI) contributions.

Of these three presented SOA's, consensus was reached only on the suspension of GBT smolt monitoring in 2016. The SOA related to the modification in the frequency of performance standard evaluations for yearling Chinook and sockeye from 5 to 10 years was elevated to the PRCC-Policy representatives and is discussed in Section 1.2.2 below. Discussion on the decoupling in the species linkages, which is used to calculate NNI funding contributions, is still ongoing.

PRCC Hatchery Subcommittee 2016 meeting schedule and approved SOA's are found in Section 5.1. PRCC Habitat Subcommittee activities can be found in Section 6.0.

Table 5 Priest Rapids Coordinating Committee meetings, conference calls and WebEx conferences conducted during 2016.

Date	Communication Type	Topic
1/27/2016	Monthly PRCC Meeting	General Committee Business
2/24/2016	Monthly PRCC Meeting	General Committee Business
3/23/2016	Monthly PRCC Meeting	General Committee Business
4/27/2016	Monthly PRCC Meeting	General Committee Business
5/25/2016	Monthly PRCC Meeting	General Committee Business
6/21/2016	Workshop	Sub-yearling summer Chinook
6/22/2016	Monthly PRCC Meeting	General Committee Business
7/27/2016	Monthly PRCC Meeting	General Committee Business
8/24/2016	Monthly PRCC Meeting	General Committee Business
9/28/2016	Monthly PRCC Meeting	General Committee Business
10/12/2016	Conference Call	Sub-yearling/NNI Calculations
10/26/2016	Monthly PRCC Meeting	General Committee Business
11/16/2016	Monthly PRCC Meeting	General Committee Business
12/07/2016	Conference Call	General Committee Business
12/13/2016	Meeting/Conference Call	Sub-yearling/NNI Calculations
12/14/2016	Monthly PRCC Meeting	General Committee Business

1.2.2 Priest Rapids Coordinating Committee – Policy Committee

In May of 2016, Grant PUD submitted a SOA to the PRCC requesting that the frequency in the performance standard schedule for 2 separate species (yearling Chinook and sockeye) should be modified from a five (5) year to a ten (10) year evaluation cycle. Grant PUD did not propose a modification in the frequency for juvenile steelhead performance schedule and therefore that schedule was to remain on a five year cycle. Grant PUD also proposed that a single species (surrogate species) could be utilized to represent the spring migrant species (spring yearling Chinook or sockeye) for the purpose of conducting a 10 year check-in; if the PRCC could reach consensus on an appropriate surrogate.

The rationale presented by Grant PUD for the modification in the frequency of performance standard testing for yearling Chinook and sockeye (from every five (5) years to every ten (10) years) included the following;

- Performance standards for yearling Chinook based on a 3 year consecutive year average (2003-2005) were meet in 2005 (86.6%). The required standard is 86.49%;
- Capital improvements per the 2004 and 2008 NMFS Biological Opinions were completed between 2005 and 2014 (Wanapum Future Unit Bypass, Priest Rapids Top-spill, Advanced Hydro Turbine System installed at Wanapum Dam, enhanced avian wire arrays at Wanapum and Priest Rapids dams, enhanced predator removal program, implementation of "fish mode" at both projects, etc.);
- A high level of survival (>95%) has been documented for both yearling Chinook and sockeye passing through the completed capital improvements at Wanapum and Priest Rapids dams (Wanapum Future Unit Bypass, Priest Rapids Top-spill, Advanced Hydro Turbine System installed at Wanapum Dam);
- Performance standards for sockeye based on a 3 year consecutive year average (2009, 2010 and 2015) were met in 2015 (91.7%). The required standard is 86.49%;
- Performance standards for yearling Chinook (per the required check-in in 2014) was 90.8%, which exceeds the required performance standard of 86.5%;
- Grant PUD is achieving no-net-impact for yearling Chinook and sockeye at the Priest Rapids Project per the 2008 NMFS Biological Opinion and Priest Rapids Salmon and Steelhead Settlement Agreement.

After several months of discussion, consensus could not be reached among the PRCC representatives due to a single dissenting party and therefore the issue was elevated to the PRCC Policy Committee.

On November 8, 2016, the PRCC Policy Committee met to discuss the modification in the frequency of performance standard evaluations for yearling Chinook, sockeye and steelhead from 5 to 10 years (SOA 2016-03). It was suggested that a change from a 5 to a 10 year check-in would be only for a one-time event.

This action would result in foregoing a check-in during 2019 and deferring the check-in until 2024. While the PRCC Policy Committee expressed strong interest in a one-time check-in deferral, a decision was not made by the PRCC Policy Committee and Grant PUD withdrew SOA 2016-03 due to lack of consensus.

Although unrelated to SOA 2016-03, a large part of the discussion focused on how the check-in would relate to Coho mitigation. The PRCC Policy Committee directed the PRCC to address the Coho mitigation that needs to take place as outlined in the SSSA and indicated that they were willing to revisit the suggested one-time only check-in deferral to 10 years.

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 salmonid 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 NMFS 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 NMFS 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) meet 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 meetings 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;
- Priest Rapids Fish Forum Pacific Lamprey Sub-group(s)
- 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);
- USFWS 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 – Chelan PUD, 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. The product of each development's survival performance standard (93%), gives the survival performance standard of 86.49% (0.93 X 0.93) for the total Priest Rapids Project.

Over the last decade, Grant PUD has conducted dam and reservoir smolt survival evaluations, evaluating progress towards meeting a 93 percent juvenile development 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 used the decision process below (Figure 1) as its basic approach to strive towards maintaining and meeting the 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.

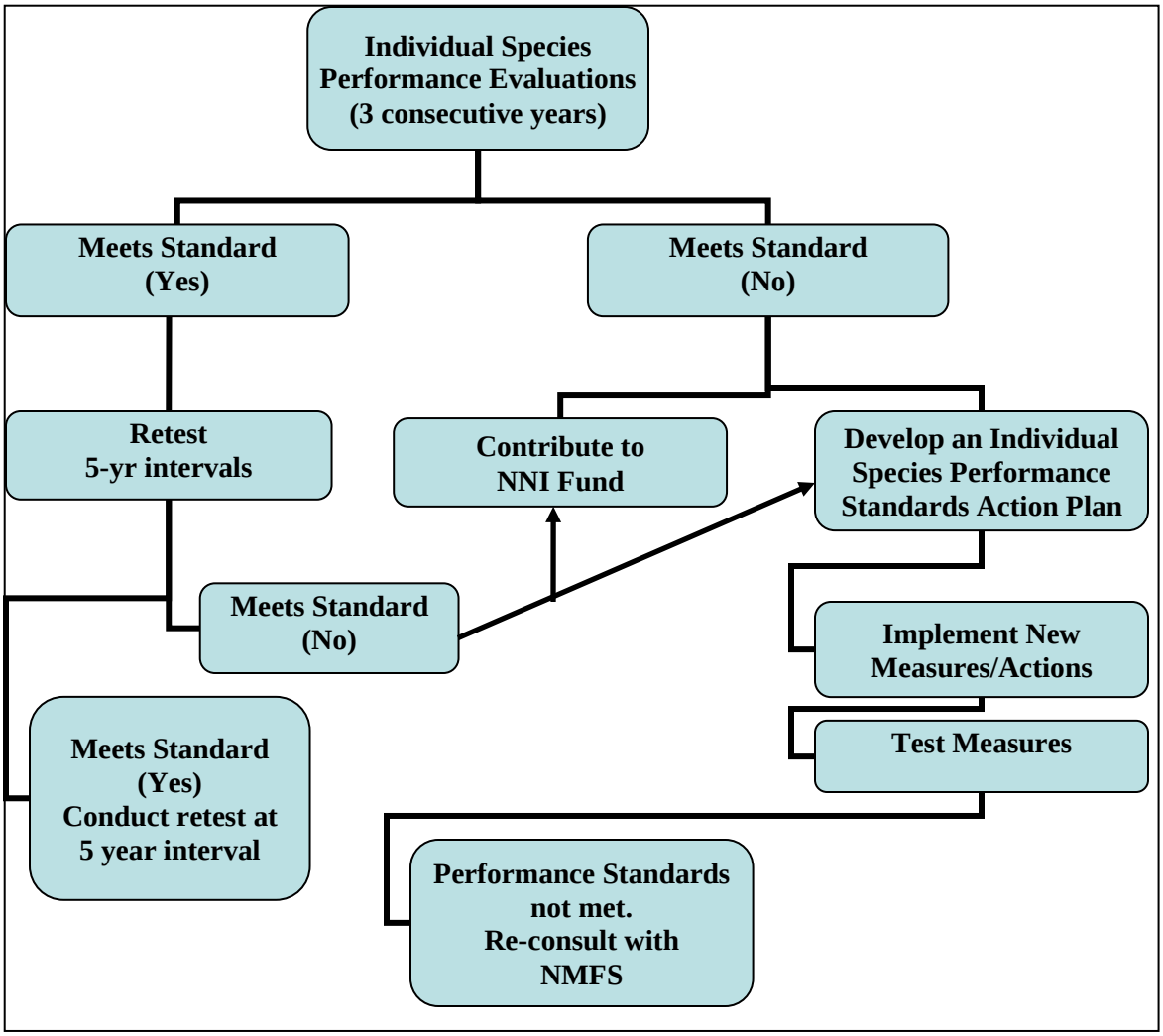

Figure 1 Flow chart showing proposed decision process used to achieve juvenile salmonid project survival requirements for the Priest Rapids Project.

2.1.1 Yearling Chinook

Grant PUD conducted three consecutive years of performance standard evaluations during 2003-2005 to determine Project-wide survival for yearling Chinook for the PRP (Table 7). The three year consecutive arithmetic average of 86.6% exceeded the required standard of 86.49% per the 2008 NMFS Biological Opinions for the Priest Rapids Project (Anglea et al. 2003, Anglea et al. 2004a and 2004b, Anglea et al. 2005). 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 Salmon and Steelhead Settlement Agreement, the survival estimate for yearling Chinook that was originally scheduled to be re-evaluated at five-year intervals (next study would have been 2010) was postponed until 2014 because of concern over juvenile steelhead survival through the Priest Rapids Project. NMFS and the PRCC agreed that the yearling Chinook evaluation originally scheduled for 2010 would occur in 2014 (SOA 2011-06).

Table 6 Survival estimates and standard errors (SE) in parenthesis (development and total Project) 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% (SE=0.0442)
2004	N/A	N/A	86.4% (SE=0.0309)
2005	N/A	N/A	86.9% (SE=0.0214)
3 Year Consecutive Average			**86.6% (SE=0.0322)**
2014[1]	94.5% (SE=0.013)	96.1% (SE=0.009)	90.8% (SE=0.0150)

* Performance Standard Requirement = 86.49%

[1] Required Check-in per Statement of Agreement 2011-06; Wanapum Drawdown

At the request of NMFS and PRCC; Grant PUD conducted a yearling Chinook performance standard check in 2014 during the Wanapum fracture (drawdown) event. In preparation for that evaluation, the PRCC developed SOA 2014-02. Under this SOA,

> *"the PRCC agreed that the Priest Rapids Reservoir survival and Priest Rapids Top-spill Bypass survival and behavior evaluations (if valid) will be counted as progress towards meeting performance standards in the Priest Rapids Project for juvenile steelhead and yearling Chinook. The PRCC will determine how valid results would be incorporated into future performance standards calculations."*

The survival estimate for yearling Chinook migrating through the PRP in 2014, when including survival estimate from the Wanapum Development (under a drawdown scenario) was 90.8% (CI=95%; SE=0.015; Skalski et al. 2014). This is 4.3% above the required juvenile salmonid and steelhead Project passage survival standard of 86.49% (Table 7; NMFS 2008a).

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 development was 96.1% (SE=0.001). The Wanapum and Priest Rapids dams ("concrete") passage survival was 98.8% and 97.1% respectively (Table 8 8; Hatch et al. 2015). 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 8). Although the fracture at Wanapum impacted day to day operation of the powerhouse, Wanapum Fish Bypass (WFB) and spillway, observed survival at Wanapum Dam exceeded 97.0%. Specific details on the behavior and survival evaluation can be reviewed in Hatch et al. (2015) and Skalski et al. (2014).

Yearling Chinook performance standards for the Priest Rapids Project were achieved in 2005 and again confirmed in 2014 after a myriad of capital improvements (as required per the 2004 and 2008 NMFS Biological Opinions) had been completed at both Wanapum and Priest Rapids dams. These capital improvements include the Wanapum Fish Bypass, Priest Rapids Fish Bypass, Advanced Hydro Turbine System (at Wanapum Dam), enhanced avian wire arrays (at Wanapum and Priest Rapids dams), enhanced predator removal program, and implementation of "fish mode" at both dams. With these enhancements, a high level of survival (>95%) has been documented for yearling Chinook passing through the completed capital improvements at Wanapum and Priest Rapids dams.

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

Table 7 Number of tags that passed at each dam by route with 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

Per Section 15.3 of the Salmon and Steelhead Settlement Agreement;

> *"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." Section 15.3 further states that "Grant PUD will reduce its annual NNI Fund contributions as progress toward meeting these performance standards is achieved" and "when the parties determine that the performance standards have been achieved on a species-by-species basis, the NNI Fund annual contributions for that species will be terminated".*

Grant PUD is achieving No-Net-Impact (NNI) for yearling Chinook at the Priest Rapids Project per the 2008 NMFS BiOp and Priest Rapids Salmon and Steelhead Settlement Agreement and therefore annual contributions into the NNI Fund for yearling Chinook was ended in 2005. The next performance standard check-in for yearling Chinook evaluation is 2019.

2.1.2 Juvenile Steelhead

The current Project-wide survival for juvenile steelhead is based on only two consecutive arithmetic year average (2015-2016; 85.2% SE=0.03; Table 8). The third consecutive year Project-wide survival evaluation will be conducted in 2017. Survival information from 2015-2017 will then be used to develop a Project-wide juvenile steelhead survival estimate based on a three consecutive arithmetic year average. The next performance standard check-in for juvenile steelhead is 2022.

Table 8 Survival estimates and standard errors (SE) in parenthesis (development and total Project) for juvenile steelhead for the Priest Rapids Project for years 2003-2005 and 2015-2016.

Year	Wanapum Development	Priest Rapids Development	Total Survival for Priest Rapids Project (Required Standard=86.49%)
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)	83.2% (SE=0.026)
2010	85.5% (SE=0.019)	90.4% (SE=0.017)	77.3% (SE=0.022)
3 Year Consecutive Average			**81.1% (SE=0.026)**
2015	85.5% (SE=0.017)	94.1% (SE=0.028)	83.7% (SE=0.027)
2016	93.04%*	93.04%*	86.6% (SE=0.032)
2017	N/A	N/A	TBD
3 Year Consecutive Average			**TBD**

* Priest Rapids Project total estimated survival divided by half.

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.

Since the development of the SAP, PRCC has conducted several evaluations funded through the NNI Fund ($5,448,678) to determine potential reasons for lower than expected juvenile steelhead survival within the Priest Rapids Project. All of these NNI funded projects are associated with research activities to determine the potential impacts of avian and fish predation on juvenile salmonids migrating through 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 Project. 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 represented 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%).

In light of the information presented above and the 2008 BiOp issued by NMFS (NMFS 2008b; as updated by the 2010 and 2014 Supplemental BiOps; http://www.salmonrecovery.gov/BiologicalOpinions/FCRPSBiOp.aspx.) for the Federal Columbia River Power System (FCRPS); 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.

Under the 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 out-migrating juvenile salmon and steelhead and develop and implement a management plan to decrease predation rates, if warranted.

Under the IAPMP a colony-based habitat management actions were implemented on Goose Island (Potholes Reservoir in Grant County, Washington; federal lands) from 2014-2016. These management actions include both passive (matrix of ropes and flagging) and active nest dissuasion measures (hazing, walk-throughs, boat based activities, kites, lasers, etc.).

Results to date indicate that Caspian tern nest dissuasion measures (active and passive) were largely successful where implemented. However, despite the successful reduction or elimination of Caspian tern colonies at managed sites in the first 2 years of the IAPMP implementation, reduction in the overall number of terns in the Columbia Plateau has not been substantial because of increases in nesting at other sites in the region.

For example, Roby et al. (2017) estimated that in 2015 terns nesting on Twinning Island consumed 2.6% (95% CI=1.8–3.9%) of UCR steelhead. In 2016, Roby et al. (2017) reported that the Caspian tern predation rate observed at an unmanaged colony in the vicinity (within 30 miles) of the Priest Rapids Project was 4.1% (North Potholes Island). At a tern colony in the John Day Dam Reservoir (Blalock Islands) a 10-fold increase in breeding pairs from 2014 to 677 nest in 2015 was documented (Roby et al. 2017). Roby et al. (2017) further reported that juvenile salmonids made up 67.3% of the diet of Caspian terns nesting on the Blalock Islands in 2015; which is consistent with results from previous years for Caspian terns nesting at Crescent Island. Roby et al (2017) further reported that a larger proportion of the salmonids in the Blalock Islands tern diet were steelhead (34%) compared to the tern diet at Crescent Island. Roby et al. (2017) also estimated that Caspian terns nesting on the Blalock Islands consumed approximately 550,000 juvenile salmonids in 2015 (95% CI= 310,000–800,000), which included ~240,000 steelhead (95% CI= 130,000–350,000).

As illustrated above, although nesting may have been disrupted; foraging and lofting activities continue to occur at the Priest Rapids Project and at other areas throughout the Columbia Basin Plateau. These "new" lofting areas have made it difficult to conduct tag recoveries and therefore calculate predation rates.

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 9). 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).

[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.

In 2015, the survival estimate for juvenile steelhead migrating through the Priest Rapids Project was 83.7% (SE=0.027; Table 8). 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 9).

Table 9 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 Fish Bypass or Priest Rapids Fish Bypass	36	100.0	507	99.6
Spillway	164	99.4	236	97.0
Powerhouse	152	94.1	276	93.8

Table 10 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 Fish Bypass or Priest Rapids Fish Bypass	271	97.0%	495	99.6%
Spillway	5	100%	0	n/a
Powerhouse	244	91.8%	380	95.5%

In 2016, the survival estimate for juvenile steelhead migrating through the Priest Rapids Project was 86.6% (SE=0.032; Hatch et al. 2017). There was no fish release site in the Wanapum Dam tailrace, as seen in the 2014 and 2015 studies, just a Rock Island Dam tailrace release and a Priest Rapids Dam tailrace release. With no Wanapum releases, individual Development-level

(reservoir and dam) survival for Wanapum Dam and Priest Rapids Dam was not able to be estimated, just a Project-wide survival estimate.

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. The two year arithmetic average performance standard for sockeye through the Project was 91.6% (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, which would also serve as the initial five year check-in for sockeye (SOA 2011-06). The PRCC also agreed that for 2012 through 2016, the NNI contribution for sockeye would be based on the current two year survival average for sockeye. For 2017, the NNI contribution for sockeye would be based on a new three year sockeye survival average, based on 2016 study results, 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 from 2016 to 2015.

Based on the results of the 2015 sockeye performance evaluation study, 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=0.015) (Skalski et al. 2009b; Skalski et al. 2010 and Hatch et al. 2016) (Table 11). The 91.7% exceeds the required standard of 86.49%.

Table 11 Survival estimates and standard errors (SE) in parenthesis (development and total Project) 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 (Required Standard=86.49%)
2009	97.3% (SE=0.009)	94.6% (SE=0.011)	92.1% (SE=0.014)
2010	94.1% (SE=0.014)	96.8% (SE=0.014)	91.1% (SE=0.019)
2015	94.1% (SE=0.011)	97.5% (SE=0.00)	91.8% (SE=0.012)
3 Year Consecutive Average			**91.7% (SE=0.015)**

Per Section 15.3 of the SSSA;

> *"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." Section 15.3 further states that "Grant PUD will reduce its annual NNI Fund contributions as progress toward meeting these performance standards is achieved" and "when the parties determine that the performance standards have been achieved on a species-by-species basis, the NNI Fund annual contributions for that species will be terminated."*

Grant PUD is achieving NNI for sockeye at the Priest Rapids Project per the 2008 NMFS Biological Opinion and Priest Rapids Salmon and Steelhead Settlement Agreement and therefore annual contributions into the NNI Fund for juvenile sockeye has been terminated. The next performance standard check-in for juvenile sockeye is 2020.

2.1.4 Sub-yearling Chinook

In 2008 and 2009, Grant PUD conducted two pilot sub-yearling Chinook 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 starting in 2016 (per SOA 2011-06; 2016-2018). The PRCC also agreed 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 would determine next steps. Grant PUD, working in coordination with the Public Utility Districts of Chelan and Douglas Counties, conducted a sub-yearling Chinook workshop June 21, 2016. The workshop agenda included, the following topics;

1) Fish Passage Survival Model Updates

2) Snake River Chinook Salmon Life History Patterns

3) Sub-yearling Chinook Life History Diversities Observed in the Mid-Columbia:
    a. Post-Emergent Behavior of Sub-yearling Chinook in the Wells Reservoir and Implications for the Measurement of Passage Survival through the Wells Project
    b. Juvenile (and Adult) Sub-yearling Chinook Salmon Life History Information from the Okanogan River and Wells Pool
    c. The Life History of Sub-yearling Migrants from the Entiat River
    d. Comparing the Migration Patterns and Timing of Yearling Spring Chinook Salmon and Sub-yearling Summer Chinook Salmon through the Mainstem Columbia River Using Available PIT-Tag Data
    e. The Life-History Strategies of Upper Columbia Summer/Fall Chinook as Determined by Scale Analysis of Returning Adults

4) Availability of Study Fish
    a. Grant PUD Sub-yearling Survival and Behavior Pilot Studies: Application of Age-0 Fall Chinook Salmon
    b. Sub-yearling Data from the Rocky Reach Juvenile Bypass System
    c. Results of Wells Reservoir Fish Collection Studies

5) Tagging Effects and Available Tags and Detection Equipment
    a. Barotrauma
    b. Tag Hardware
    c. Tagging Effects

The overall conclusion from the June 21, 2016 sub-yearling workshop was that, at the present time, due to limitations in tag technologies, sub-yearling life-history strategies and survival study model designs, a statistically valid Project-wide survival study for summer sub-yearling Chinook was not possible.

Based on the result of the workshop, Grant PUD presented a draft Statement of Agreement (SOA; 2016-05) for consideration by the PRCC to defer survival evaluations for sub-yearling summer Chinook to a timeframe in the future as had been done in the past (SOA's 2009-04, 2011-06 and 2015-03). In January of 2017, the PRCC agreed that Project-wide survival and behavior evaluations for sub-yearling Chinook are not possible due to the complex life history strategy they exhibited and the current technology limitations (SOA 2016-04). Under this SOA, the PRCC also agreed to defer Project-wide survival evaluations for sub-yearling Chinook until 2020. In the meantime, the PRCC would continue to evaluate and/or monitor study designs, tag technology, and life history information to better understand future Project-wide survival study feasibility after 2020 (or before).

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 that SOA, the PRCC agreed to specific measures and items that would be implemented over the 10 year term of the SOA. This SOA expires in December 2017 (SOAs).

During 2016, Grant PUD provided an analysis to the PRCC that proposed that yearling Chinook estimated survival could serve as a surrogate for Coho when evaluating Coho performance standards within the Priest Rapids Project. Within this analysis, two sets of PIT-tag data bases were analyzed by Skalski et al. (2016). The first set was based on Coho, spring Chinook salmon, and steelhead hatchery releases above Rocky Reach Dam from the Winthrop and Methow hatcheries, and sockeye salmon releases from Osoyoos Lake. For these four release groups, survival was estimated from Rocky Reach Dam to McNary Dam and from McNary Dam to John Day Dam. The second set is based on PIT-tag releases of Coho, sockeye, spring Chinook, and summer Chinook salmon and steelhead from Rock Island Dam. Release sizes were an order of magnitude smaller in this second set of survival analyses than the first data set. Smolt survival was estimated from Rock Island Dam to McNary Dam and from McNary Dam to John Day Dam in this second set of analyses.

Skalski et al. (2016) reported that the results suggested that reach survival estimates for Coho and yearling Chinook from Rocky Reach Dam to McNary Dam had the most comparable values for associated detection probabilities and harmonic mean travel time with a mean ratio of 1.01 (SE = 0.03). In 6 of 6 years included in the comparison, reach survival was not significantly different between the two species. Additionally, survival between Coho and spring Chinook salmon was also the most comparable between McNary and John Day dams with a mean ratio of 1.02 (SE = 0.05). The survival of spring Chinook and Coho salmon was significantly correlated between Rocky Reach and McNary dams (r = 0.73, P = 0.096) but not between McNary and John Day dams (r = 0.509, P = 0.302; Skalski et al. 2016).

Grant PUD presented the above analysis to the PRCC in September of 2016 for consideration and requested feedback from the parties regarding the use of estimated survival for yearling Chinook salmon to be used as a surrogate for Coho salmon survival within the PRP. This

surrogate would then be used to estimate NNI hatchery compensation for upper Columbia Basin Coho salmon that enter the Priest Rapids Project.

In January of 2017, the PRCC agreed via SOA 2017-01 that yearling Chinook salmon would be used as a surrogate for coho salmon survival. This surrogate survival would then be used to estimate No-Net-Impact (NNI) hatchery compensation for upper Columbia Basin coho salmon that enter the Priest Rapids Project. At this time, the PRCC has not agreed to a specific survival rate to use for this calculation.

2.1.6 Schedule

Table 12 illustrates the updated survival evaluation time for the various covered species. As discussed above, Grant PUD has achieved survival standards for yearling Chinook and sockeye and therefore are conducting 5 year check-ins. Proposed SOA 2016-05 summer sub-yearling Chinook survival evaluations would be deferred until 2020. The next juvenile steelhead five-year check in will be 2022. The PRCC agreed that yearling Chinook salmon would be used as a surrogate for coho salmon survival per SOA 2017-01. The PRCC further agreed that yearling Chinook survival will be used to estimate No-Net-Impact (NNI) hatchery compensation for upper Columbia Basin coho salmon that enter the Priest Rapids Project.

Table 12 Performance standards survival evaluation schedule for covered species migrating through the Priest Rapids Project 2017-2024.

Species	2017	2018	2019	2020	2021	2022	2023	2024
Spring Chinook	.	.	X[1]	.	.	.	.	X[2]
Steelhead	X[3]	.	.	.	.	X[4]	.	.
Sockeye	.	.	.	X[5]	.	.	.	.
Summer sub-yearling Chinook	.	.	.	X[6]	X[7]	X[8]	.	.
Coho	PRCC Agreed to use Yearling Chinook as a Surrogate for Coho per SOA 2017-01							

[1] 2019 – 5 year check-in for yearling Chinook.
[2] 2024 – 5 year check-in for yearling Chinook.
[3] 2017 – Third consecutive year of juvenile steelhead evaluation.
[4] 2021 - 5 year check-in for juvenile steelhead. Next check-in 2026.
[5] 2020 – 5 year check-in for sockeye survival. Next check-in 2025.
[5] Proposed summer sub-yearling Chinook evaluation – Year 1 per Draft SOA 2016-05 (not approved by PRCC at this time).
[7] Proposed summer sub-yearling Chinook evaluation – Year 2 per Draft SOA 2016-05 (not approved by PRCC at this time).
[8] Proposed summer sub-yearling Chinook evaluation – Year 3 per Draft SOA 2016-05 (not approved by PRCC at this time).

2.2 No-Net-Impact

Grant PUD and the PRCC recognized that the performance standards for the Project may not be achieved for certain stocks via 2003 Project operations. The purpose of the No-Net-Impact (NNI) Fund 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.

Per Section 15.3 of the Salmon and Steelhead Settlement Agreement for the Priest Rapids Project 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."*

Section 15.3 further states that

> *"Grant PUD will reduce its annual NNI Fund contributions as progress toward meeting these performance standards is achieved" and "when the parties determine that the 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, conducts performance standard evaluations. Based on these evaluations, performance standards for both yearling Chinook and juvenile sockeye has been achieved for the Priest Rapids Project. Based on section 15.3 of the Priest Rapids Salmon and Steelhead Settlement Agreement annual contributions into the NNI Fund for yearling Chinook and juvenile sockeye have been terminated.

Performance standards for juvenile steelhead have not been achieved as yet, nor has the PRCC determined the best way to move forward to conduct survival evaluations for summer sub-yearling Chinook. Life history strategies and current technology preclude the PRCC from conducting Project-wide survival evaluations on active summer sub-yearling migrants.

The total amount of for annual contributions into the NNI Fund made by Grant PUD since 2006 is $19,705,736.77 (2006-2016). NNI Funds have been utilized by the PRCC to fund 24 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.

The annual contribution made into the NNI account prior to February 15, 2016 was $1,967,449.75.

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 Wanapum Fish Bypass (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 eight 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 was operated at 20 kcfs during the entire juvenile salmonid outmigration (April 12- August 15, 2016).

During 2017, 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 began on April 13, 2016 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 13-August 16, 2016).

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 12 and June 14, 2016 (FPC 2016). The combined spring and summer fish-spill periods from April 12 through August 16 encompassed greater than 99% of the entire 2016 outmigration (FPC 2016).

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 (spill only being thru the two fish bypasses, unless additional hydraulic capacity is needed) 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 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 16–November 15 for adult salmonid/steelhead fallback. Gate 22 was used for adult steelhead fallback in 2016.

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 NMFS 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 26, May 24, June 23, July 27, August 24, September 28 and October 25 of 2016. 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 (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 March 31. 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 NMFS, 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, NMFS, 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, NMFS, 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 12, 2016, Grant PUD submitted its updated GAP to FERC for approval (Keeler 2016). FERC approval of the GAP for 2016 was received on April 8, 2016.

The 2016 plan updated last year's GAP (2015) and includes details on operational and structural measures that Grant PUD plans. These measures are intended to result in compliance with WDOE's water quality standards for TDG at the Project.

Operational abatement measures implemented in 2016 included minimizing involuntary spill by scheduling maintenance operations based on predicted flows, continuing to participate in the

Hourly Coordination Agreement, which uses automatic control logic to maintain preset reservoir levels at the mid-Columbia River dams in order to meet load requirements and prevent involuntary spill, and attempting to maximize turbine flows by setting minimum generation requirements for its power purchasers. Operational abatement measures also included (when feasible) participation in regional operator meetings to discuss regional TDG abatement measures, coordination of regional spill amounts and locations, and implementation of preemptive spill to avoid periods of high volumes of involuntary spill. In addition, Grant PUD consulted with WDOE (when necessary) on any non-routine operational changes that may affect TDG, as well as manage fish-spill programs to meet TDG water quality standards through coordination with the PRCC. The PRCC approved SOA 2016-02 that suspended biological (smolt) monitoring for the purpose of gas bubble trauma (GBT) monitoring during "non-survival studies" years within the Project. Fixed-site monitoring will continue.

Structural TDG abatement measures include operation of both the Wanapum and Priest Rapids Fish Bypasses (WFB and PRFB), which are both designed to safely pass juvenile out-migrating salmonids while minimizing TDG uptake (Hendrick et. al 2009 and Keeler 2016). The installation of the advanced turbine systems at Wanapum Dam has been completed, with the final unit installed in October of 2013. Additionally, in accordance with the Terms and Conditions contained in the 401 WQC (WDOE 2007) Grant PUD conducted TDG evaluations with all 10 advanced turbines in operation in October of 2013 in accordance with the Wanapum Dam Advanced Turbine Total Dissolved Gas Evaluation (see Keeler 2012c), to determine the impact, if any, the operation has on TDG. Results from these evaluations are presented in Keeler 2014a and were submitted to the WDOE/PRCC and the FERC on December 13, 2013 and February 20, 2014, respectively.

Compliance monitoring for TDG occurred at Grant PUD's fixed-site monitoring stations (FSM stations). TDG data was collected on an hourly basis throughout the year and was reported to Grant PUD's water quality web-site (http://www.grantpud.org/environment/water-quality/monitoring-data). An annual report to WDOE summarized Grant PUD's TDG monitoring and fish-spill season results.

Exceedances of TDG standard were minimal during the 2016 fish-spill season, with a total of 17 exceedances of the 115/120 %SAT standard (based on daily average of the 12-highest consecutive hourly readings). There were no exceedances of the 1-hour 125 %SAT standard. The Priest Rapids forebay fixed-site monitoring station (FSM station) accounted for the majority of TDG exceedances (9 of 17), all of which can be attributed to river flow in excess of Wanapum Dam's current hydraulic capacity (~163 kcfs). When flows were above Wanapum Dam's hydraulic capacity, involuntary spill was required that contributed to elevated TDG levels, and because of the short distance between Wanapum and Priest Rapids dams (18 river miles (RM)), TDG levels did not have a chance to dissipate below the 115 %SAT by the time they reached the Priest Rapids Dam forebay FSM station. Additionally, of the nine exceedances recorded at the Priest Rapids Dam forebay FSM station, five corresponded with incoming TDG levels 115 %SAT or above recorded during the same time period at the Wanapum Dam forebay FSM station. Furthermore, river flow during these TDG exceedance events was approximately 32% above the 10-year average because of drum gate maintenance operations at Grand Coulee Dam, which attributed to inadvertent spill events within the Project.

Grant PUD strives to meet TDG standards, as well 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 2016, including attempting to maximize turbine flows by setting involuntary spill caps and minimum generation requirements (and thus maximizing turbine flows and reducing involuntary spill when feasible), 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 PRFB (2014). Grant PUD believes that it is implementing the most current reasonable and feasible measures to reduce elevated TDG levels that occur during the fish-spill season.

2.8 Avian Predation Control at Wanapum and Priest Rapids Dams

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 2008a). 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 2016

Grant PUD has entered into a five year cooperative work agreement with Wildlife Services to conduct bird hazing and other wildlife control duties. Wildlife Services hazed birds with pyrotechnics to remove the threat of avian predation on out-migrating smolts away from the developments seven days a week for approximately 16 hours per day during peak salmonid out-migration. Piscivorous waterbirds were killed when hazing actions were unsuccessful at deterring foraging birds. Four Wildlife Services crews worked two shifts, seven days per week, at Wanapum and Priest Rapids dams during the day beginning on April 25, 2016 through June 10, 2016. From June 13, 2016 through June 24, 2016, two Wildlife Services crews worked eight-hour shifts, five days per week at Wanapum and Priest Rapids dams.

During the 2016 avian control effort, 8,641 birds were hazed, 43% of which were Caspian terns (*Hydroprogne caspia*) and 330 birds were killed. Table 13 shows the overall season results.

Table 13 Total control actions made by Wildlife Services through Priest Rapids Project, mid-Columbia, 2016.

		Hazed		Lethally Removed	
Common Name	**Scientific Name**	**Wanapum**	**Priest Rapids**	**Wanapum**	**Priest Rapids**
Caspian tern	*Hydroprogne caspia*	788	2.914	0	0
Common merganser	*Mergus merganser*	89	225	182	17
Double-crested cormorant	*Phalacrocorax auritus*	274	309	131	11
Gull, California	*Larus californicus*	505	271	53	33
Gull, Herring	*Larus argentatus*	157	22	20	1

		Hazed		Lethally Removed	
Common Name	**Scientific Name**	**Wanapum**	**Priest Rapids**	**Wanapum**	**Priest Rapids**
Gull, Ring-billed	*Larus delawarensis*	1,201	1,886	88	76

2.8.2 Avian Control Efforts Proposed in 2017

As a continuation of current five year cooperative work agreement with USDA APHIS WA personnel will continue conducting bird hazing efforts in both tailrace and forebay of Wanapum and Priest Rapids dams in 2017.

2.9 Northern Pikeminnow Removal at Wanapum and Priest Rapids Dams

Grant PUD is required to implement and fund a northern pikeminnow removal program at the Project (T&C 1.10 & 1.18; NMFS 2008a). 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 2016

During the 2016 fishing effort, 55,663 northern pikeminnow were removed by the following methods:

- 3,504 in the set-line fishery;
- 47,754 in the beach seine fishery;
- 1,286 in the electrofishing fishery; and
- 3,330 in the angling fishery.

The average length of northern pikeminnow removed in 2016 varied between fisheries. The average length for the set-line fishery was 285 mm ± 66 mm (n = 657). Northern pikeminnow caught in the beach seine fishery ranged from 12.7 mm to 102 mm (0.5~4 in) with an average of about 19.1 mm (0.75 in). The average length of northern pikeminnow caught in the electrofishing fishery was 121 mm ± 54 mm (n = 378). The average length of northern pikeminnow removed in the angling fishery was 381 mm ± 56 mm (n = 530

2.9.2 Efforts Proposed in 2017

Grant PUD will continue to utilize set-lines, beach seines, angling and electrofishing as proven, cost effective, methods for pikeminnow removal in 2017.

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 2008a). 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 2016. The fish counters took a quality control test and all fish counters were within acceptable accuracy.

2.10.1 2017 Video Fish Counting Operations

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 2008a). 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.

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 Dam Fish Bypass

The Wanapum Fish Bypass (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 the 2016 salmonid smolt out-migration, the WFB was operated continuously at 20 kcfs. The FPE for the WFB in 2016 was 59.9% (Hatch et al. 2017), which was higher than in 2015 (50.4%), but lower than the FPE seen in 2010 (77.3%).

Figure 2 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. Grant PUD conducted TDG evaluations with all 10 advanced turbines in operation in October of 2013 in accordance with the Wanapum Dam Advanced Turbine Total Dissolved Gas Evaluation (see Keeler 2012), to determine the impact, if any, the operation has on TDG. Results from these evaluations were presented in Keeler 2014b and distributed to the WDOE/PRCC and the FERC on December 13, 2013 and February 20, 2014, respectively.

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 2008a), 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 2016 fish-spill season began on April 12, 2016 and concluded on August 15, 2016. 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 12 and June 14. The combined spring and summer fish-spill periods from April 12–August 15 encompassed greater than 99% of the entire 2016 summer outmigration.

During 2016, 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.

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 WFB 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 14 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 14 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 (Figure 3). The PRFB was designed to operate at a fixed-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.

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

During the 2016 smolt out-migration season, the PRFB was operated to pass juvenile salmonids and steelhead. The PRFB was designed to operate at a fixed-flow volume of 26 kcfs. Fish-spill began on April 13 and ended on August 16, 2016.

During 2016, 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 steelhead passing through the Priest Rapids spillway and derive survival estimates for steelhead passing via the spillway. Based on detection histories, FPE for steelhead passing through the spillway was 4.0% for juvenile steelhead. Passage survival for steelhead passing through the Priest Rapids spillway was 100% (Table 15).

Figure 3 Priest Rapids Fish Bypass in operation, April 2014.

Table 15 Route specific survival estimates for juvenile steelhead migrating through Priest Rapids Dam in 2016. Survival estimates (point estimates) are based on the proportion of fish that were detected downstream that had been assigned a given route.

Priest Rapids Dam		
Passage Route	**Percentage Passed**	**Detected Downstream (%)**
Priest Rapids Fish Bypass	58.6%	98.9%

Priest Rapids Dam		
Passage Route	**Percentage Passed**	**Detected Downstream (%)**
Spillway	4.0%	100%
Powerhouse	37.4%	93.1%

Juvenile passage in 2016 was through the newly constructed PRFB. The steelhead FPE of the PRFB in 2016 was 58.6% (Hatch et al. 2017). This has been the highest FPE seen at the PRFB to date; 47.2% in 2014 and 53.6% in 2015. Involuntary spill was 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 2016, Grant PUD collected information on FPE for juvenile steelhead passing through the Priest Rapids turbines and derived a survival estimate for passing via the turbines. Based on detection histories, FPE for steelhead passing through the powerhouse was 37.4% for juvenile steelhead. Passage survival for steelhead passing through the Priest Rapids turbines was 93.1%% (Table 17). The FPE of steelhead through the Priest Rapids powerhouse was 37.4% in 2016 (Hatch et al., 2017). Overall survival at Priest Rapids Dam ("concrete') based on point estimates was 97.7%.

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.

4.4 Adult PIT-Tag Detection

Per Term and Condition 1.19 (NMFS 2008a), 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 4). 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). In 2016, Grant PUD

replaced a faulty antennae and upgraded each antenna with Digital Angel FS2020 Stationary Transceiver.

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.

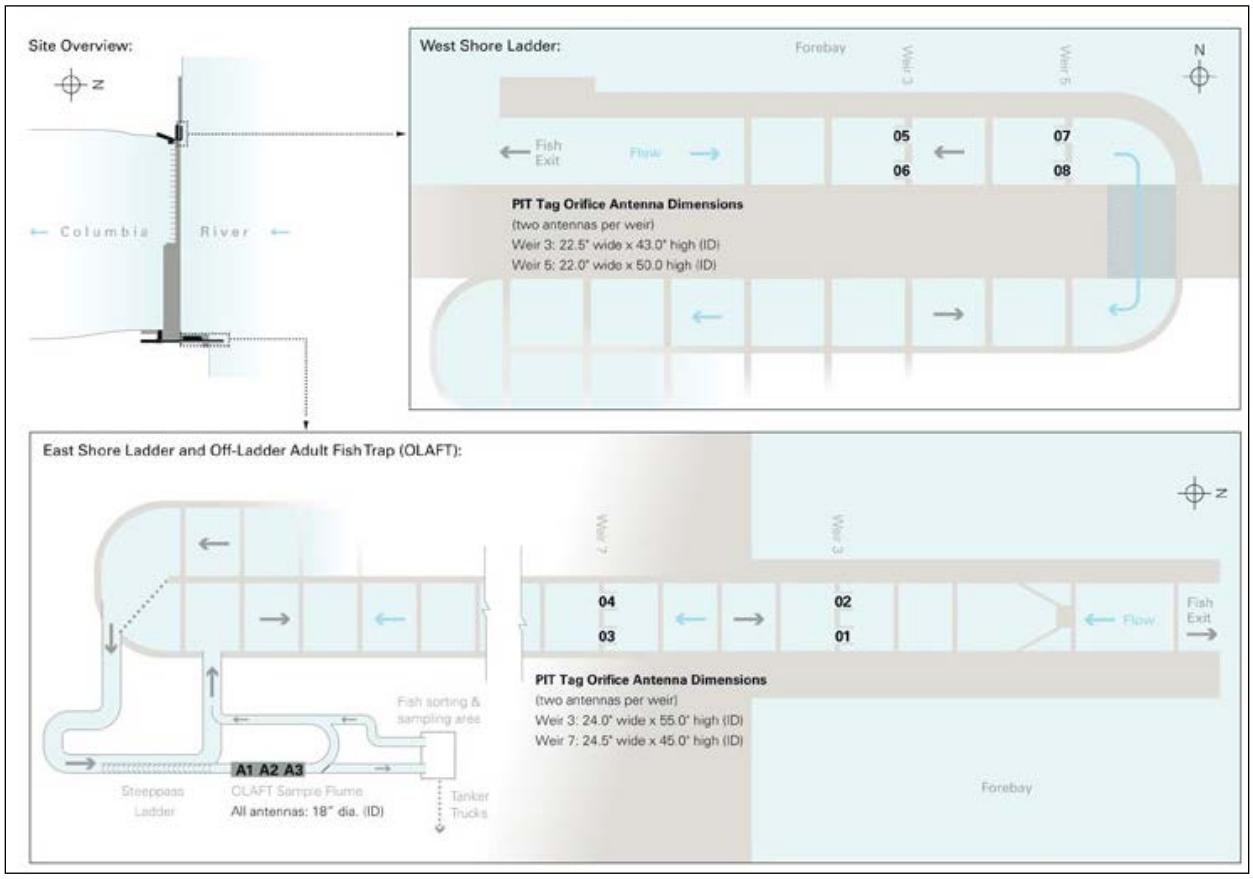

Figure 4 Plan view of upper regions of the fishways at Priest Rapids Dam showing location of PIT-tag detection antennae and associated identification number.

A total of 19,494 PIT-tag detections were observed at Priest Rapids Dam in 2016. Of these detections, 6,335 were from unique tags within seven species of fish. Species of fish carrying PIT tags identified at Priest Rapids Dam in 2016 were Chinook, Coho, steelhead, sockeye, white sturgeon, rainbow trout and northern pikeminnow. All detections and associated fish species are summarized in Table 16. In following reports, per request of NMFS, Grant PUD will try to determine adult passage survival estimates between Priest Rapids, Wanapum and Rock Island dams.

Table 16 Summary of PIT-tag detections at Priest Rapids Dam in 2016.

Species	Number of Observations	Unique Tag Codes
Chinook Salmon	6, 209	1,896
Coho salmon	322	99
Steelhead trout	4,760	1,786
Sockeye salmon	7,152	2,334
White Sturgeon	6	3
Northern pikeminnow	88	9
Rainbow Trout	18	8
Unknown/ORPHAN	939	200
Totals	**19,494**	**6,335**

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 2016 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 7). In addition, WDFW trapped fall Chinook salmon to augment Priest Rapids Hatchery broodstock collection (September 14–November 7). 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 21-July 7). The YN operated the trap during late September to mid-October (September 14 – October 6) to collect Coho salmon for broodstock for the Mid-Columbia Coho Reintroduction Project. The Columbia River Inter-Tribal Fish Commission operated the OLAFT seven days (June 29, 30, July 1, 6, 7, 12 and 22) to collect sockeye for age composition and for WHOOSHH evaluation. The OLAFT was completely dewatered and winterized for the season on November 17, 2016.

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 December (Table 17) and made considerable progress in planning and making decisions related to overwintering of summer Chinook at Dryden, 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 2016 (Table 18; 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 17 Priest Rapids Coordinating Committee Hatchery Subcommittee 2016 meeting schedule.

PRCC Hatchery Subcommittee	January 21, 2016	Meeting
PRCC Hatchery Subcommittee	February 18, 2016	Meeting
PRCC Hatchery Subcommittee	March 17, 2016	Meeting
PRCC Hatchery Subcommittee	April 21, 2016	Meeting
PRCC Hatchery Subcommittee	May 19, 2016	Conference call
PRCC Hatchery Subcommittee	June 16, 2016	Conference call
PRCC Hatchery Subcommittee	July 21, 2016	Conference call
PRCC Hatchery Subcommittee	August 18, 2016	Conference call
PRCC Hatchery Subcommittee	September 22, 2016	Conference call
PRCC Hatchery Subcommittee	October 20, 2016	Conference call
PRCC Hatchery Subcommittee	November 17, 2016	Meeting

Table 18 Statement of Agreements approved by the Priest Rapids Coordinating Committee Hatchery Subcommittee.

Years and SOA #	Title of Statement of Agreement	Date Approved
2016-01	Dryden Overwinter Feasibility	2/18/2016

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 19). 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 for the Nason Creek spring Chinook program. NMFS' action on all other permits for Grant PUD-funded programs is pending. 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 NMFS in September 2013. This letter is intended to provide coverage until new permits can be issued.

Table 19 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 substantially complete and all are producing fish (Table 20). An assessment of the feasibility of converting Dryden Pond to an overwinter acclimation facility completed in 2016, found that the project was not feasible due to limitations in Dryden Pond's phosphorus load allocation for the facility.

Table 20 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	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. Restoration of the Nason Creek Acclimation Facility intake was implemented in the spring of 2016, and substantially completed by the end of December 2016.
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	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 complete. The analyses found conversion of the facility to overwinter acclimation would not be feasible. Fish will continue to be spawned, incubated, and early reared at Eastbank Hatchery before they are transferred to the existing Chelan PUD-owned Dryden Pond for spring acclimation and release into the Wenatchee River. The first smolt release from Dryden Pond for Grant PUD's portion of this program occurred in spring 2014.
Methow summer Chinook salmon	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 to the incubation building and center channel were completed in 2016.
Sockeye salmon	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. A major renovation of this facility began in 2015 and is nearly complete. Facility modifications and upgrades were designed, reviewed, approved, and included dedicated space for Grant PUD's steelhead production. St. Mary's Acclimation Pond on Omak Creek in the Okanogan basin is operational. Plans to develop a new remote acclimation site above Mission Falls on Omak Creek was discontinued when the Colville Confederated Tribes concluded that fish passage above the falls was too uncertain to support the project.

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. Significant program investments were made in 2016, including investments in operation, maintenance, and monitoring and evaluation of hatchery facilities (Table 21). Upgrades to Grant PUD's hatchery facilities included restoration of the Nason Creek Acclimation Facility intake, including development of a backup intake system; installation of well water access, a restroom, and associated utility upgrades at Carlton Acclimation Facility; and upgrades to Priest Rapids Hatchery adult handling ponds center channel, incubation building, and facility drainage system. 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 21 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 2016	GPUD Program investment ($) in 2016*	GPUD Program investment ($) total*
White River spring Chinook salmon	2004-16	0	0	$111,032	$26,989,255
Nason Creek spring Chinook salmon	2004, 05, 2015-16	225,479	229,594	$1,821,728	$12,465,450
Methow spring Chinook salmon	2007-16	168,072	159,161	$701,630	$9,286,745
Okanogan spring Chinook salmon	2015-16	113,245	96,283	$125,668	$3,315,754
Wenatchee Summer Chinook salmon	2014-16	182,609	194,833	$537,972	$3,309,353
Methow Summer Chinook salmon	2014-16	184,613	167,615	$767,639	$7,898,404
Okanogan Summer Chinook salmon	2014-16	111,879	113,388	$329,021	$8,636,925
Fall Chinook salmon	1985-2016[a]	5,176,203	5,599,543	$1,626,369	$37,792,854
Sockeye salmon	2005-16	484,635	202,164	$1,135,106	$12,449,704
Coho salmon	2007-15	373,296	373,296[b]	$875,340	$5,295,409
Steelhead	2005-16	105,169	125,041	$199,558	$10,513,796
Total	**2004-16**	**7,125,200**	**6,887,622**	**$8,231,064**	**$137,953,650**

*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 22). 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 22 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	07-16	97-16	97-16
Nason Creek spring Chinook salmon	98-99*, 13-16	02-03*, 13-16	04-05*, 14-16	04-05*, 16	07-16	98-99*, 14-16	98-99*, 14-16
Methow spring Chinook salmon	96-99*, 05-16	96-99*, 05-16	01-16	02-16	02-16	96-16	96-16
Okanogan spring Chinook salmon	13-16	13-16	13-16	15-16	NA	NA	NA
Wenatchee summer Chinook salmon	13-16	13-16	13-16	14-16	14-16	14-16	14-16
Methow summer Chinook salmon	13-16	13-16	13-16	14-16	14-16	14-16	14-16
Okanogan summer Chinook salmon	13-16	13-16	14-16	15-16	14-16	14-16	14-16
Fall Chinook salmon	98-16	98-16	98-16	98-16	98-16	10-16	10-16
Sockeye salmon	04-12, 14-16	04-12,14-16	04-13, 15-16	04-13,15-16	04-16	04-16	04-16
Coho salmon	05-16	05-16	06-16	06-16	06-16	06-16	06-16
Steelhead trout (Methow)	05-12	05-12	05-12	05-12	05-12	05-12	05-12
Steelhead trout (Okanogan)	06-16	06-16	07-16	07-16	07-16	07-16	07-16

*Part of the captive brood program

5.6 Upper Columbia River Steelhead Supplementation Plan

Grant PUD is required under T&C 1.25 (NMFS 2008a) 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 NMFS. 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 NMFS 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 as a permit application in August 2013. It was submitted to NMFS in September and is currently under consideration.

5.6.3 Facilities

Since 2005, Grant PUD has funded releases of yearling steelhead smolts into the upper Columbia basin (Table 25). Grant PUD finalized a new long-term agreement with Douglas PUD in 2013 to 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 provided 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. Completion and operation of the Wells Hatchery upgrades are expected in 2017.

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 was selected and surveyed. However, while PIT tagged steelhead were detected below Mission Falls in 2015 and 2016, no fish were detected on the PIT tag array upstream of Mission Falls. It was concluded that fish passage above the falls was too uncertain, and future plans for an acclimation facility upstream of the falls was discontinued.

5.6.4 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 ended in February 2016 but a two-year contract was developed to extend the program, including brood collection, transport, acclimation (as needed), and all associated M&E activities through March 1, 2018.

In spring 2016, 125,041 BY 2015 steelhead smolts were released into the Okanogan basin (including Omak Creek) as part of Grant PUD's mitigation requirement. Ten 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 2016, approximately 34,761 locally-adapted BY 2016 fish were on-site at the Wells Hatchery as part of the Colville Confederated Tribes' steelhead program, and an additional 83,945 BY 2016 fish at Wells Hatchery are reserved for Grant PUD mitigation requirements. Approximately 20,000 PIT tags and 36,391 coded-wire tags (CWTs) were placed in steelhead parr in November 2016. These fish are scheduled for release in two locations; 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 reared at Wells Fish Hatchery and will be released in the spring of 2017.

The mean and total releases for the combined Wells and Omak programs between 2005 and 2016, and annual O&M, M&E, and capital costs are listed below (Table 23).

Table 23 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

Calendar Year	Numbers of Fish Released	Annual Expenditures*		
		Capital**	O&M/M&E***	Expenditure Totals
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
2016	125,041	$26,324	$173,234	$199,558
Mean	105,169	--	--	--
Totals	**1,262,033**	**$4,444,756**	**$6,069,040**	**$10,513,796**

*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.

5.6.5 Monitoring and Evaluation

As part of program expansion, a request to increase the number of brood collected in the Okanogan basin 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 24 and are consistent with Grant PUD's approved M&E Plan.

Table 24 Monitoring and Evaluation activities for Okanogan basin steelhead, funded by Grant PUD.

Activity	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
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
Release		X	X	X	X	X	X	X	X	X	X
Smolt Abundance		X	X	X	X	X	X	X	X	X	X
Carcass/Tag Recoveries		X	X	X	X	X	X	X	X	X	X
Redd Surveys		X	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 has ended. 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 5) and in net pens in Lake Wenatchee.

Figure 5 White River portable acclimation site for spring Chinook salmon.

5.8.4 Operations and Maintenance

Based on resource co-managers determination that an adult-based supplementation program was not feasible and subsequent discontinuation of the program in 2015, no operations and maintenance activities were conducted in association with the White River spring Chinook program in 2016.

5.8.4.1 Fish Release

Because the program was discontinued in 2015, there were no fish releases conducted within the White River spring Chinook program in 2016. Table 25 shows the numbers of White River spring Chinook salmon released by brood year, acclimation type, and location throughout the history of the release program. Program expenditures to date are reflected in Table 26.

Table 25 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 26 Spring Chinook salmon annual expenditures for the White River programs 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
2016	$0	$111,032	$111,032
Totals	**$2,756,943**	**$24,232,312**	**$26,989,255**

*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

In 2016, Grant PUD continued monitoring and evaluation activities for the White River supplementation program (Table 27). Because there were no smolts released or broodstock collected in 2016 the monitoring program focused solely on adult hatchery returns and natural production. 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 2016, the White River screw trap was operated from March through November with periodic stoppages due to river conditions.

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 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 30.

Table 27 Monitoring and Evaluation activities for White River spring Chinook, partially or fully funded by Grant PUD.

Activity	97-00	01	02	03	04	05	06	07	08	09	10-15	16
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	
Release			X		X	X	X	X	X	X	X	
Smolt Abundance								X	X	X	X	X

Activity	97-00	01	02	03	04	05	06	07	08	09	10-15	16
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

5.9 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, 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. Fish released from the Nason Creek Acclimation Facility in 2016 were of Nason Creek origin. As a result of reduced water availability at Nason Creek, Chiwawa River hatchery-origin fish that were being acclimated at the Nason facility were transferred to the Chiwawa acclimation facility in early March, and were ultimately released from the Chiwawa facility. 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 NMFS 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. Immigrating adults were collected for broodstock from the adult ladder at Tumwater Dam in 2016. 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 are transferred from Eastbank Hatchery to the Nason Creek Acclimation Facility (Figure 6) for overwinter acclimation. Overwinter acclimation occurs from October through release the following spring, typically in late April. Progeny of the 2013 broodstock were the first fish released from the acclimation facility, in 2015. Natural-origin progeny of the 2014 broodstock were released directly into Nason Creek from the acclimation facility at the yearling smolt stage in the spring of 2016. Chiwawa River hatchery-origin progeny were reared at Nason Creek Acclimation Facility until early March, when they were transferred to Chiwawa Hatchery due to insufficient water availability at the Nason Creek facility. Those fish were released from Chiwawa Hatchery as yearling smolts in the spring of 2016.

Figure 6 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 28). Monitoring of fish in those releases

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 continues to develop (Table 29). The static, cone-shaped surface-water intake screen in Nason Creek experienced operational difficulties due to shifting stream bed load and design weaknesses in late 2015/early 2016. This screen was replaced with a rotating cylindrical screen in the summer of 2016 (Figure 7). Additionally, an emergency backup screen and separate pump were installed to ensure water delivery to the facility in the event of a primary screen failure. The new screen is currently working well despite very cold water conditions that have created ice.

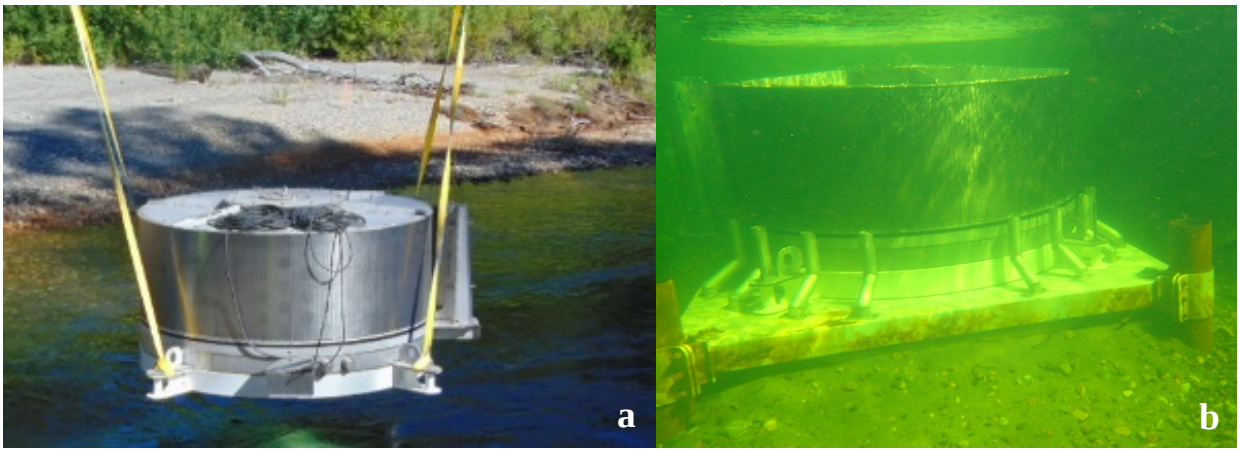

Figure 7 **New cylinder screen installed to replace the original cone screen as part of the intake restoration activities at Nason Creek Acclimation Facility in 2016. (a) is the screen suspended during the installation process, and (b) is the screen fully installed on the intake platform.**

Table 28 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 Fish Released	Stock Origin
Captive Broodstock Program			
2002	Acclimation tanks in Nason Creek	8,956	Nason
2003	Acclimation tanks in Nason Creek	4,244	Nason
Captive Broodstock Program Mean		6,600	Nason
Captive Broodstock Program Total		13,200	Nason
Adult Return Broodstock Program			
2012	Chiwawa Hatchery	~225,000	Chiwawa
2013	Nason Creek Acclimation Facility	43,479	Nason
	Chiwawa Hatchery	~182,000	Chiwawa
2014	Nason Creek Acclimation Facility	32,215	Nason
	Chiwawa Hatchery	197,379	Chiwawa
Adult Return Broodstock Program Mean		226,691	
Adult Return Broodstock Program Total		680,073	

Table 29 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
2016	$1,314,439	$507,289	$1,821,728
Totals	**$10,231,277**	**$2,234,173**	**$12,465,450**

*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 30). These activities include juvenile monitoring, redd surveys, carcass surveys,

and stock assessments. Reproductive success studies funded by Bonneville Power Administration (BPA) are ongoing.

Table 30 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	16
Brood Collection	X					X	X	X	X
Spawning			X			X	X	X	X
Tagging				X			X	X	X
Release				X				X	X
Smolt Abundance					X	X	X	X	X
Carcass Recoveries	X					X	X	X	X
Redd Surveys	X					X	X	X	X
Run Composition/Genetics Evaluations						X	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 Inter-local 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. The HSC recalculated Grant PUD's number of spring Chinook salmon to 134,126 beginning with BY 2012.

5.10.2 Hatchery Planning Documents

The Methow spring Chinook HGMP was reviewed by NMFS and a biological opinion was completed. 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 early 2017.

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 159,161 yearling smolts were released from the Methow Hatchery on behalf of Grant PUD in 2016. This represents the ninth consecutive year fish have been released through cooperative agreement, and over 9.2 million dollars committed by Grant PUD to the program (Table 31). BY 2015 and 2016 fish are currently rearing at Methow Hatchery.

Table 31 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
2016	159,161	$701,630
Mean	168,072	
Total	**1,680,717**	**$9,286,745**

*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 32.

Table 32 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 - 2015	2016
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 33.

Table 33 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

Calendar Year	Numbers of Fish Released[c] (Grant PUD Program)	Annual Expenditures[a]		
		Capital	O&M/M&E[b]	Totals
2015	130,207	$37,042	$224,282	$261,324
2016	96,283	$0	$125,668	$125,668
Mean	113,245			
Totals	226,490	**$2,701,196**	**$614,558**	**$3,315,754**

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 2012-2016 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 four years (2013-2016). 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 the 2014 brood year fish, released in the spring of 2016, the number of segregated Leavenworth/Carson released into the Okanogan basin from the Chief Joseph Hatchery totaled 526,136 fish.

On October 25, 2016, 202,326 fry from BY 2015 were transferred to the Riverside pond for overwinter acclimation. The number of eyed eggs on hand at Chief Joseph Hatchery through November for BY 2015 was 744,871, which will be released directly from the hatchery. 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 August and operated for 30 days, trapping 169 adult summer Chinook, 3 sockeye, and 2 steelhead. 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. The program is currently operating under an extension of a previous permit issued during 2003 for all non-listed salmonid programs in the upper Columbia River. The date of a new permit 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 8).

Figure 8 Priest Rapids Hatchery incubation room.

5.12.4 Operations and Maintenance

Historical and current information regarding Priest Rapids Hatchery releases and associated expenditures are reflected in Table 34.

Table 34 Priest Rapids Hatchery Fish Releases 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
2015	5,599,543	1,641,623	$663,470	$962,900	$1,626,369
MEAN	5,176,203	1,464,712			
TOTALS	**144,933,672**	**41,011,941**	**$24,708,792**	**$13,084,063**	**$37,792,854**

*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, Richards and Pearsons 2016). Data collection associated with the hatchery M&E plan will continue in 2017.

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

5.12.6 Hanford Reach Fall Chinook Protection Program

Protections for fall Chinook salmon from the 2015 BY began on October 15 and continued through May 30, 2016. Based on HRFCPPA criteria and redd counts in the Vernita Bar index area, spawning began October 21 in both the below 50 kcfs zone and the above 50 kcfs zone and continued through November 22 for both the below and above 50 kcfs zones. There was a total of 702 redds counted in the index area during the redd survey on November 22 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 April 29, 2016. Rearing Period protections began at the start of emergence and continued through May 30, 2016.

Operations to protect the 2015 brood year of fall Chinook salmon in the Hanford Reach were highly successful. During the entirety of 2015-2016 Post-Hatch and Emergence Periods discharge from Priest Rapids Dam was maintained above 70 kcfs. However, on December 7, 2015 the USGS gage downstream of Priest Rapids Dam recorded one 15-minute discharge reading at 50.2 kcfs. We believe this was an erroneous data recording at the gage. At the time of this sudden drop recorded at the USGS gage, discharge from Priest Rapids Dam remained stable and above 70 kcfs. During the 96 days of the 2016 Emergence and Rearing periods, Grant PUD met all of the flow fluctuation constraints established with the HRFCPPA. The 2016 weekend-minimum discharge constraints began on the weekend of April 9 and continued through the weekend of April 30. On three of the four CJAD II weekends the minimum constraint was met. On April 24 (the third Sunday of the CJAD II protections) discharge from Priest Rapids Dam dropped 4 kcfs below the minimum flow constraint of 173.3 kcfs for approximately 5 hours. Although minor exceedances occurred, the trend of high performance that began with the 2006 brood year continues and is significantly greater than the historical mean under the HRFCPPA (99% constraints met or minor exceedances).

Protections for fall Chinook salmon for the 2016-2017 protection season began on October 15, 2016 and will continue through May or June 2017. Based on redd counts in the Vernita Bar index area, the Initiation of Spawning was determined to be on October 19 for the below 50 kcfs and the above 50 kcfs elevation zone. The End of Spawning was determined to be November 20, 2016. There was a total of 637 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 2016 will continue into 2017 and will be reported in the 2017-2018 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.

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.

In February of 2016 the HSC agreed (SOA 2016-1) that continuing to pursue overwintering at Chelan PUD's Dryden Acclimation Facility (per SOA 2009-09) for the foreseeable future was not feasible because CPUD does not support overwintering at the facility due primarily to limitations associated with meeting the Wenatchee River Total Maximum Daily Load (TMDL) requirements for phosphorus. Grant PUD had requested consideration of overwinter facility modifications of Chelan PUD's Dryden Acclimation Facility. This triggered an intensive feasibility assessment, particularly around the limitations associated with meeting the Wenatchee River TMDL requirements for phosphorus. As a result of the feasibility assessment, Chelan PUD does not support modification of the Dryden Acclimation Facility but does support co-funding a preliminary feasibility and design for facility improvements at Eastbank Hatchery to meet TMDL requirements. Henceforth, Grant PUD will continue to rear Wenatchee Summer Chinook at the Eastbank Hatchery and spring acclimating at Dryden Acclimation Facility.

Costs associated with development of Wenatchee summer Chinook salmon facilities are included in Table 35.

5.13.1.3 Operation and Maintenance

Under the long-term hatchery sharing agreement between Chelan PUD and Grant PUD, broodstock for the 2016 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 2017 and subsequent release into the Wenatchee River.

Table 35 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
2016	194,833	$0	$537,972	$537,972
Mean	**182,609**			
Totals	**547,826**	**$1,026,540**	**$2,282,813**	**$3,309,353**

*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.

5.13.2 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 2016. 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).

5.13.2.1 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.

5.13.2.2 Facilities

Through a long-term hatchery sharing agreement between Chelan PUD and Grant PUD, adult holding, spawning, egg incubation, and initial rearing occurs at Eastbank Hatchery on the Columbia River near Wenatchee, WA. Fish are transferred from Eastbank Hatchery to the Carlton Acclimation Facility adjacent to the Methow River. The facility, which was completed in February 2014, provides overwinter acclimation (Figure 9). Overwinter acclimation occurs from October through release the following spring, typically in late April. Costs associated with development of Methow summer Chinook salmon facilities are included in Table 39.

Figure 9 Carlton Acclimation Facility rears Methow summer Chinook using eight 30-foot diameter round tanks.

5.13.2.3 Operations and Maintenance

A forced release of broodyear 2014 summer Chinook from Carlton Acclimation Facility occurred in May, 2016. In total, approximately 167,615 smolts were released from the Carlton Acclimation Facility in 2016 (Table 36).

Under the long-term hatchery sharing agreement between Douglas PUD and Grant PUD, broodstock for the program was, again, collected at Wells Dam in 2016. Adults collected were transferred to Eastbank Hatchery where they were held and spawned. Incubation and early rearing is occurring at Eastbank Hatchery. Fish produced from the 2016 broodstock will be transferred to the Carlton Acclimation Facility in the fall of 2017 for acclimation and release in 2018.

Table 36 The number of Methow summer Chinook released from the Carlton acclimation facility.

Brood Year	Number of Fish Released
2012	197,391
2013	188,834
2014	167,615
MEAN	184,613
TOTAL	**553,840**

Table 37 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
2016	$246,441	$521,198	$767,639
Totals	**$5,529,090**	**$2,369,314**	**$7,898,404**

*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.

5.13.2.4 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.

5.13.3 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 38).

5.13.3.1 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.

5.13.3.2 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 2012-2016 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 2017 are in development. A full report will be provided during the Chief Joseph Hatchery annual program review in March.

Table 38 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
2016	113,388	$0	$329,021	$329,021
Mean	111,879			
Totals	335,636	**$7,035,089**	**$1,601,836**	**$8,636,925**

*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.

5.13.3.3 Operations and Maintenance

Summer Chinook broodstock for the Chief Joseph Hatchery were first collected in 2013 and have been collected annually through 2016. 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.

The smolt releases from the Chief Joseph hatchery program in the spring of 2016 included 401,215 yearling Chinook from BY 2014 and 218,393 sub-yearlings from BY 2015.

As of December 2016, 213,638 BY 2014 integrated program (NOR) fish were transferred to the Omak and Similkameen acclimation ponds and 232,638 BY 2014 segregated fish (HORs) were held at Chief Joseph hatchery. Both groups of fish are scheduled for release in the spring of 2017.

A total of 287 males and 297 females were spawned for the BY 2016 integrated program, and the cumulative survival through October was 86%, resulting in 1,485,000 green eggs on site at the end of 2016. The segregated program yielded a green-egg take of 1,190,000 eggs from 244 adult males and 238 females. Through October there was a cumulative survival of 86%. These fish are scheduled for release as yearlings in the spring of 2018.

5.13.3.4 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 August, making 2016 the fifth year of pilot weir operation. The weir operated for 30 days and trapped 169 adult summer Chinook, 3 sockeye, and 2 steelhead. 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.

New activities in 2016 included the installation and operation of a fish transport system (WHOOSHH ™). The system was used to move 16 adult broodstock from the weir trap to the trucks for transport to the hatchery.

5.14 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.

5.14.1 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 a long-term sockeye mitigation opportunity, the PRCC HSC approved Grant PUD's plan to fund an experimental program to reintroduce sockeye into Skaha Lake in British Columbia in 2008. 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 39.

5.14.2 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.

5.14.3 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 2017. A fully functioning laboratory is operated by ONA, where samples are taken and analyses are run for both the hatchery operations and monitoring and evaluation components of the program.

Table 39 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
2016	202,164	$0	$1,135,106	$1,135,106
Mean	484,635			
Totals	5,815,623	**$4,832,735**	**$7,616,969**	**$12,449,704**

*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.

5.14.4 Operations and Maintenance

Similar to 2015, a large number of adult sockeye were counted at both Bonneville and Wells dams in 2016, however, unlike the year before, the migrating population did not suffer large mortality due to drought conditions. In 2016, a total of 342,498 and 216,036 adult sockeye were counted at Bonneville and Wells dams, respectively. Brood was collected via normal methodologies using beach seines near the town of Oliver, B.C., Canada. As a result of the large escapement to the Canadian portion of the Okanagan River, for the first time, hatchery staff were able to collect brood to meet the full capacity of the Penticton sockeye facility. At the end of 2016, 5,297,000 eggs were being incubated for release in the spring of 2017. The eggs will be shocked, picked, and thermally marked in order to differentiate between hatchery and natural-origin populations. Generally, these fish spend a year rearing in Skaha Lake before smolting the following spring.

5.14.5 Monitoring and Evaluation

The monitoring and evaluation plan originally designed for the program continued to be implemented (Table 40). Objectives investigated in 2016 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 40 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	2016
Brood collection	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
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	X	X	X	X
Carcass recoveries	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

5.15 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.

5.15.1 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.

5.15.2 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.

5.15.3 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. However, due to low adult returns in 2015 and 2016, the program has increasingly relied on the OLAFT at Priest Rapids Dam for broodstock collection. After collection, 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 41.

Table 41 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	1,158,565	$221,737
2016	1,097,563	$875,340
Mean	1,400,866	
TOTAL	**14,008,658**	**$5,295,409**

*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.

5.15.4 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. A smolt trap is operated in the Wenatchee River, Nason Creek, and the Methow 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 42.

Table 42 Monitoring and evaluation activities for Wenatchee and Methow Coho salmon that are partially funded by Grant PUD.

Activity	2005	2006 - 2015	2016
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 8 meetings, two conference calls, and one field trip to projects in British Columbia were held by the PRCC Habitat Subcommittee members during calendar year 2016 (Table 43). Agendas and meeting minutes are available at Grant PUD's website.

Table 43 Priest Rapids Coordinating Committee Habitat Subcommittee 2016 meetings.

PRCC Habitat	January 7, 2016	Meeting
PRCC Habitat	February 11, 2016	Meeting
PRCC Habitat	March 9, 2016	Meeting
PRCC Habitat	April149, 2016	Meeting
PRCC Habitat	May 12, 2016	Meeting
PRCC Habitat	July 14, 2016	Meeting
PRCC Habitat	August 11, 2016	Conference Call
PRCC Habitat	September 11, 2016	Meeting
PRCC Habitat	October 13, 2016	Field Trip

PRCC Habitat	November 10, 2016	Meeting
PRCC Habitat	December 8, 2016	Conference Call

Since 2006, 93 total projects have been approved for funding using one of the three funding accounts (601, NNI Fund-25 projects, 602, Habitat Supplemental Fund-37 projects, 603, Habitat Conservation Fund-31 projects, respectively.) Of those, 47 are completed and 46 are currently active and underway. As of the end of December 2016, $9,535,808 dollars have been spent on habitat committee approved projects and another $23,904,108 are appropriated for specific project expenditures.

Six new projects were approved in 2016 by the PRCC and/or PRCC Habitat Subcommittee with four from Fund 601, two from Fund 602. The individual projects, separated by funding account, are listed in Table 44.

Table 44 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
JSAT Steelhead & Pikeminnow Derby	601	Steelhead Study/Predation	2011	2011	$2,008,635	$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	$2,051,303	$2,253,521
Electrofishing Boat	601	Predation	2013	Ongoing	$129,859	$125,000
Intake Screen Assessment	601	Infrastructure Improvement	2014	Ongoing	$21,202	$102,815
Hanford Reach Survival	601	Study	2014	Ongoing	$79,303	$79,906
Smolt Migration Drawdown	601	Study	2014	2016	$224,513	$225,000
Wenatchee Instream Flow	601	Flow Improvement	2014	Ongoing	$107,179	$456,241
MVID Instream Flow	601	Flow & Fish Passage	2014	Ongoing	$1,359,363	$1,400,000

Grouped Project Titles	Account	Benefits	Year Initiated	Year Completed	Expenditures to Date	Total Approved Cost
Barkley Construction (50%)	601	Flow and Habitat Improvement	2015	Ongoing	$62,668	$350,000
2016 Pikeminnow	601	Predation	2016	2016	$18,647	$25,000
Subyearling Workshop	601	Study	2016	Ongoing	$11,006	$15,000
Larval/Age 0 Predator	601	Study	2016	Ongoing	$0	$10,000
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
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	2016	$299,380	$299,380
Natapoc Appraisal	602	Land Appraisal	2014	Closed	$20,000	$20,000
McIntyre Dam Fish Study	602	Fish Passage	2014	Ongoing	$19,127	$32,941

Grouped Project Titles	Account	Benefits	Year Initiated	Year Completed	Expenditures to Date	Total Approved Cost
Spawning Platforms	602	Habitat Improvement	2014	Ongoing	$267,176	$391,200
Primary Appraiser	602	Land Appraisals	2014	Ongoing	$42,100	$50,000
Nason Creek Side Channel	602	Habitat Improvement	2014	2016	$9,992	$10,000
Silver Side Channel	602	PIT Tag Assessment	2014	Ongoing	$95,258	$123,638
Newby Narrows	602	Land Acquisition	2014	Ongoing	$352,335	$352,550
ORRI Spawning Platform #3	602	Spawning Habitat Improvement	2015	Ongoing	$234,912	$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	$418,980	$437,700
Buckley II	602	Land Acquisition	2015	Ongoing	$185,433	$231,683
1890s Side Channel	602	Habitat Improvement	2015	Ongoing	$0	$140,283
Barkley-Wilson	602	Acquisition	2016	Ongoing	$292,654	$303,500
Stormy Creek	602	Fish Passage	2016	Ongoing	$7,818	$91,500
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
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

Grouped Project Titles	Account	Benefits	Year Initiated	Year Completed	Expenditures to Date	Total Approved Cost
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	$14,720	$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 45). The 2016 annual contribution made into the NNI account $1,967,449.75. The 2016 annual deposit into the Habitat Supplemental was $1,040,995.86, while the contribution into the Habitat BiOP fund was $371,867.07.

Table 45 Priest Rapids Coordinating Committee Habitat account balances and expenditures as of December 31, 2016.

Account	Beginning Balance	Expenditures	Unencumbered Balance
No Net Impact Fund	$5,588,472	$1,393,019	$4,195,453
Habitat Supplemental Fund	$5,004,065	$1,167,099	$3,836,966
Habitat Fund (BiOp)	$1,623,649	$701,600	$922,049
Total	**$12,216,186**	**$3,261,718**	**$8,954,468**

7.0 Consultation

Grant PUD distributed a draft of the 2016 Calendar Year Activities Under Priest Rapids Hydroelectric Project report 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 to the PRCC for review on March 8, 2017.

The members of PRCC which includes the NMFS, USFWS, WDFW, CCT, YN, CRITFC and the Wanapum Band for a 30 day comment and review period. Comments were received from USFWS and are addressed within the report and in Appendix B of this report.

List of Literature

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Appendix A
Priest Rapids Project 2016 Spill Summary

2016 PRIEST RAPIDS DAM INADVERTENT SPILL PATTERN - During non-Fish-Spill Season

(03/18/2016)

Total Spill In KCFS	Gate Number																					Total Opening
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	In Feet
1.3											Closed					1				Closed	Closed	Closed	1
2.6											Closed					1	1			Closed	Closed	Closed	2
3.9											Closed				1	1	1			Closed	Closed	Closed	3
5.2											Closed			1	1	1	1			Closed	Closed	Closed	4
6.5											Closed		1	1	1	1	1			Closed	Closed	Closed	5
7.8											Closed		1	1	1	2	1			Closed	Closed	Closed	6
9.1											Closed		1	1	1	2	1	1		Closed	Closed	Closed	7
10.4											Closed		1	1	2	2	1	1		Closed	Closed	Closed	8
11.7											Closed		1	1	2	2	1	1	1	Closed	Closed	Closed	9
13.0											Closed	1	1	1	2	2	1	1	1	Closed	Closed	Closed	10
14.3											Closed	1	1	1	2	2	2	1	1	Closed	Closed	Closed	11
15.6											Closed	1	1	2	2	2	2	1	1	Closed	Closed	Closed	12
16.9											Closed	1	1	2	2	3	2	1	1	Closed	Closed	Closed	13
18.2											Closed	1	1	2	3	3	2	1	1	Closed	Closed	Closed	14
19.5											Closed	1	1	2	3	3	2	1	1	Closed	Closed	Closed	15
20.8											Closed	1	1	3	3	3	2	1	1	Closed	Closed	Closed	16
22.1											Closed	1	2	3	3	3	2	1	1	Closed	Closed	Closed	17
23.4											Closed	1	2	3	3	3	2	2	1	Closed	Closed	Closed	18
24.7										1	Closed	1	2	3	3	3	2	2	1	Closed	Closed	Closed	19
26.0										1	Closed	2	2	3	3	3	2	2	1	Closed	Closed	Closed	20
27.3									1	1	Closed	2	2	3	3	3	2	2	1	Closed	Closed	Closed	21
28.6									1	2	Closed	2	2	3	3	3	2	2	1	Closed	Closed	Closed	22
29.9								1	1	2	Closed	2	2	3	3	3	2	2	1	Closed	Closed	Closed	23
31.2							1	1	1	2	Closed	2	2	3	3	3	2	2	1	Closed	Closed	Closed	24
32.5							1	1	2	2	Closed	2	2	3	3	3	2	2	1	Closed	Closed	Closed	25
33.8							1	1	2	2	Closed	2	3	3	3	3	2	2	1	Closed	Closed	Closed	26
																							26
35.1						1	1	1	2	2	Closed	2	3	3	3	3	2	2	1	Closed	Closed	Closed	27
36.4						1	1	2	2	2	Closed	2	3	3	3	3	2	2	1	Closed	Closed	Closed	28
37.7						1	1	2	2	2	Closed	3	3	3	3	3	2	2	1	Closed	Closed	Closed	29
39.0						1	1	2	2	3	Closed	3	3	3	3	3	2	2	1	Closed	Closed	Closed	30
40.3						1	1	2	2	3	Closed	3	3	4	3	3	2	2	1	Closed	Closed	Closed	31
41.6						1	1	2	2	3	Closed	3	3	4	4	3	2	2	1	Closed	Closed	Closed	32
42.9						1	1	2	2	3	Closed	3	4	4	4	3	2	2	1	Closed	Closed	Closed	33
44.2						1	1	2	3	3	Closed	3	4	4	4	3	2	2	1	Closed	Closed	Closed	34

45.5			1	1	1	2	3	3	Closed	3	4	4	4	3	2	2	1	Closed	Closed	Closed	35
46.8			1	1	2	2	3	3	Closed	3	4	4	4	3	2	2	1	Closed	Closed	Closed	36
48.1			1	1	2	3	3	3	Closed	3	4	4	4	3	2	2	1	Closed	Closed	Closed	37
49.4			1	2	2	3	3	3	Closed	3	4	4	4	3	2	2	1	Closed	Closed	Closed	38
50.7			1	2	3	3	3	3	Closed	3	4	4	4	3	2	2	1	Closed	Closed	Closed	39
52.0			1	2	3	3	3	3	Closed	4	4	4	4	3	2	2	1	Closed	Closed	Closed	40
53.3			1	2	3	3	3	4	Closed	4	4	4	4	3	2	2	1	Closed	Closed	Closed	41
54.6		1	1	2	3	3	3	4	Closed	4	4	4	4	3	2	2	1	Closed	Closed	Closed	42
55.9		1	1	2	3	3	4	4	Closed	4	4	4	4	3	2	2	1	Closed	Closed	Closed	43
57.2		1	1	3	3	3	4	4	Closed	4	4	4	4	3	2	2	1	Closed	Closed	Closed	44
58.5		1	2	3	3	3	4	4	Closed	4	4	4	4	3	2	2	1	Closed	Closed	Closed	45
59.8		1	2	3	3	4	4	4	Closed	4	4	4	4	3	2	2	1	Closed	Closed	Closed	46
61.1		1	2	3	3	4	4	4	Closed	4	4	5	4	3	2	2	1	Closed	Closed	Closed	47
62.4		1	2	3	3	4	4	4	Closed	4	5	5	4	3	2	2	1	Closed	Closed	Closed	48
63.7		1	2	3	3	4	4	4	Closed	4	5	5	4	3	3	2	1	Closed	Closed	Closed	49
65.0		1	2	3	3	4	4	4	Closed	4	5	5	4	3	3	2	2	Closed	Closed	Closed	50
66.3		1	2	3	3	4	4	4	Closed	4	5	5	4	4	3	2	2	Closed	Closed	Closed	51
67.6		1	2	3	3	4	4	4	Closed	4	5	5	5	4	3	2	2	Closed	Closed	Closed	52
68.9		1	2	3	3	4	4	4	Closed	4	5	5	5	4	3	3	2	Closed	Closed	Closed	53
70.2		1	2	3	3	4	4	4	Closed	4	5	5	5	4	4	3	2	Closed	Closed	Closed	54
71.5		1	2	3	3	4	4	4	Closed	4	5	5	5	4	4	3	3	Closed	Closed	Closed	55
72.8		1	2	3	3	4	4	4	Closed	5	5	5	5	4	4	3	3	Closed	Closed	Closed	56
74.1		1	2	3	3	4	4	5	Closed	5	5	5	5	4	4	3	3	Closed	Closed	Closed	57
75.4		1	2	3	4	4	4	5	Closed	5	5	5	5	4	4	3	3	Closed	Closed	Closed	58
76.7		1	2	3	4	4	5	5	Closed	5	5	5	5	4	4	3	3	Closed	Closed	Closed	59
78.0	1	1	2	3	4	4	5	5	Closed	5	5	5	5	4	4	3	3	Closed	Closed	Closed	60
79.3	1	2	2	3	4	4	5	5	Closed	5	5	5	5	4	4	3	3	Closed	Closed	Closed	61
80.6	1	2	3	3	4	4	5	5	Closed	5	5	5	5	4	4	3	3	Closed	Closed	Closed	62
81.9	1	2	3	4	4	4	5	5	Closed	5	5	5	5	4	4	3	3	Closed	Closed	Closed	63
83.2	1	2	3	4	5	4	5	5	Closed	5	5	5	5	4	4	3	3	Closed	Closed	Closed	64
84.5	1	2	3	4	5	5	5	5	Closed	5	5	5	5	4	4	3	3	Closed	Closed	Closed	65
85.8	1	2	3	4	5	5	5	5	Closed	5	5	6	5	4	4	3	3	Closed	Closed	Closed	66
87.1	1	2	3	4	5	5	5	5	Closed	5	5	6	6	4	4	3	3	Closed	Closed	Closed	67
88.4	1	2	3	4	5	5	5	5	Closed	5	6	6	6	4	4	3	3	Closed	Closed	Closed	68
89.7	1	2	3	4	5	5	5	5	Closed	5	6	6	6	5	4	3	3	Closed	Closed	Closed	69
91.0	1	2	3	4	5	5	5	5	Closed	6	6	6	6	5	4	3	3	Closed	Closed	Closed	70
92.3	1	2	3	4	5	5	5	6	Closed	6	6	6	6	5	4	3	3	Closed	Closed	Closed	71
93.6	1	2	3	4	5	5	6	6	Closed	6	6	6	6	5	4	3	3	Closed	Closed	Closed	72
94.9	1	2	4	4	5	5	6	6	Closed	6	6	6	6	5	4	3	3	Closed	Closed	Closed	73
96.2	1	2	4	4	5	6	6	6	Closed	6	6	6	6	5	4	3	3	Closed	Closed	Closed	74
97.5	1	2	4	4	5	6	6	6	Closed	6	6	6	6	5	5	3	3	Closed	Closed	Closed	75

98.8	1	1	2	4	4	5	6	6	6	Closed	6	6	6	6	5	5	3	3	Closed	Closed	Closed	76
100.1	1	1	3	4	4	5	6	6	6	Closed	6	6	6	6	5	5	3	3	Closed	Closed	Closed	77
101.4	1	1	3	4	4	5	6	6	6	Closed	6	6	6	6	5	5	4	3	Closed	Closed	Closed	78
102.7	1	2	3	4	4	5	6	6	6	Closed	6	6	6	6	5	5	4	3	Closed	Closed	Closed	79
104.0	2	2	3	4	4	5	6	6	6	Closed	6	6	6	6	5	5	4	3	Closed	Closed	Closed	80
105.3	2	3	3	4	4	5	6	6	6	Closed	6	6	6	6	5	5	4	3	Closed	Closed	Closed	81
106.6	2	3	3	4	4	5	6	6	6	Closed	6	7	6	6	5	5	4	3	Closed	Closed	Closed	82
107.9	2	3	3	4	4	5	6	6	6	Closed	6	7	7	6	5	5	4	3	Closed	Closed	Closed	83
109.2	2	3	3	4	4	5	6	6	6	Closed	6	7	7	6	6	5	4	3	Closed	Closed	Closed	84
110.5	2	3	3	4	4	5	6	6	6	Closed	6	7	7	7	6	5	4	3	Closed	Closed	Closed	85
111.8	2	3	3	4	4	5	6	6	6	Closed	6	7	7	7	6	6	4	3	Closed	Closed	Closed	86
113.1	2	3	3	4	4	5	6	6	6	Closed	6	7	7	7	6	6	4	4	Closed	Closed	Closed	87
114.4	2	3	3	4	4	5	6	6	6	Closed	6	7	7	7	6	6	5	4	Closed	Closed	Closed	88
115.7	2	3	3	4	4	5	6	6	6	Closed	6	7	7	7	7	6	5	4	Closed	Closed	Closed	89
117.0	2	3	3	4	4	5	6	6	6	Closed	7	7	7	7	7	6	5	4	Closed	Closed	Closed	90
118.3	2	3	3	4	4	5	6	6	6	Closed	7	7	8	7	7	6	5	4	Closed	Closed	Closed	91
119.6	2	3	3	4	4	5	6	6	6	Closed	7	7	8	8	7	6	5	4	Closed	Closed	Closed	92
120.9	2	3	3	4	4	6	6	6	6	Closed	7	7	8	8	7	6	5	4	Closed	Closed	Closed	93
122.2	2	3	3	4	5	6	6	6	6	Closed	7	7	8	8	7	6	5	4	Closed	Closed	Closed	94
123.5	2	3	3	4	5	6	6	6	7	Closed	7	7	8	8	7	6	5	4	Closed	Closed	Closed	95
124.8	2	3	3	4	5	6	6	6	7	Closed	7	8	8	8	7	6	5	4	Closed	Closed	Closed	96
126.1	2	3	3	4	5	6	6	7	7	Closed	7	8	8	8	7	6	5	4	Closed	Closed	Closed	97
127.4	2	3	3	4	5	6	6	7	7	Closed	8	8	8	8	7	6	5	4	Closed	Closed	Closed	98
128.7	2	3	3	4	5	6	7	7	7	Closed	8	8	8	8	7	6	5	4	Closed	Closed	Closed	99
130.0	2	3	3	4	5	6	7	7	7	Closed	8	8	8	8	7	6	6	4	Closed	Closed	Closed	100
131.3	2	3	3	4	5	6	7	7	7	Closed	8	8	8	8	7	7	6	4	Closed	Closed	Closed	101
132.6	2	3	3	4	5	6	7	7	7	Closed	8	8	8	8	7	7	6	5	Closed	Closed	Closed	102
133.9	2	3	4	4	5	6	7	7	7	Closed	8	8	8	8	7	7	6	5	Closed	Closed	Closed	103
135.2	2	3	4	4	5	6	7	7	8	Closed	8	8	8	8	7	7	6	5	Closed	Closed	Closed	104
136.5	2	3	4	4	6	6	7	7	8	Closed	8	8	8	8	7	7	6	5	Closed	Closed	Closed	105
137.8	2	3	4	5	6	6	7	7	8	Closed	8	8	8	8	7	7	6	5	Closed	Closed	Closed	106
139.1	2	3	4	5	6	7	7	7	8	Closed	8	8	8	8	7	7	6	5	Closed	Closed	Closed	107
140.4	2	3	4	5	6	7	7	8	8	Closed	8	8	8	8	7	7	6	5	Closed	Closed	Closed	108
141.7	2	3	4	5	6	7	7	8	8	Closed	8	8	9	8	7	7	6	5	Closed	Closed	Closed	109
143.0	2	3	4	5	6	7	7	8	8	Closed	8	9	9	8	7	7	6	5	Closed	Closed	Closed	110
144.3	2	3	5	5	6	7	7	8	8	Closed	8	9	9	8	7	7	6	5	Closed	Closed	Closed	111
145.6	2	3	5	5	6	7	8	8	8	Closed	8	9	9	8	7	7	6	5	Closed	Closed	Closed	112
146.9	2	3	5	5	6	7	8	8	8	Closed	8	9	9	8	8	7	6	5	Closed	Closed	Closed	113
148.2	2	3	5	5	6	7	8	8	8	Closed	8	9	9	9	8	7	6	5	Closed	Closed	Closed	114
149.5	2	3	5	5	6	7	8	8	8	Closed	9	9	9	9	8	7	6	5	Closed	Closed	Closed	115
150.8	2	3	5	5	6	7	8	8	9	Closed	9	9	9	9	8	7	6	5	Closed	Closed	Closed	116

152.1	2	3	5	5	7	7	8	8	9	Closed	9	9	9	9	8	7	6	5	Closed	Closed	Closed	117
153.4	2	3	5	5	7	8	8	8	9	Closed	9	9	9	9	8	7	6	5	Closed	Closed	Closed	118
154.7	2	3	5	6	7	8	8	8	9	Closed	9	9	9	9	8	7	6	5	Closed	Closed	Closed	119
156.0	2	3	5	6	7	8	8	9	9	Closed	9	9	9	9	8	7	6	5	Closed	Closed	Closed	120
157.3	3	3	5	6	7	8	8	9	9	Closed	9	9	9	9	8	7	6	5	Closed	Closed	Closed	121
158.6	3	4	5	6	7	8	8	9	9	Closed	9	9	9	9	8	7	6	5	Closed	Closed	Closed	122
159.9	3	4	5	6	7	8	8	9	9	Closed	9	9	9	9	8	7	7	5	Closed	Closed	Closed	123
161.2	3	4	5	6	7	8	8	9	9	Closed	9	9	10	9	8	7	7	5	Closed	Closed	Closed	124
162.5	3	4	5	6	7	8	8	9	9	Closed	9	9	10	10	8	7	7	5	Closed	Closed	Closed	125
163.8	3	4	5	6	7	8	8	9	9	Closed	9	10	10	10	8	7	7	5	Closed	Closed	Closed	126
165.1	3	4	5	6	7	8	8	9	9	Closed	9	10	10	10	9	7	7	5	Closed	Closed	Closed	127
166.4	3	4	5	6	7	8	8	9	9	Closed	10	10	10	10	9	7	7	5	Closed	Closed	Closed	128
167.7	3	4	5	6	7	8	9	9	9	Closed	10	10	10	10	9	7	7	5	Closed	Closed	Closed	129
169.0	3	4	5	6	7	8	9	9	10	Closed	10	10	10	10	9	7	7	5	Closed	Closed	Closed	130
170.3	3	4	5	6	7	8	9	9	10	Closed	10	10	10	10	9	8	7	5	Closed	Closed	Closed	131
171.6	3	4	5	6	7	8	9	10	10	Closed	10	10	10	10	9	8	7	5	Closed	Closed	Closed	132
172.9	3	4	5	6	7	9	9	10	10	Closed	10	10	10	10	9	8	7	5	Closed	Closed	Closed	133
174.2	3	4	5	7	7	9	9	10	10	Closed	10	10	10	10	9	8	7	5	Closed	Closed	Closed	134
175.5	3	4	5	7	8	9	9	10	10	Closed	10	10	10	10	9	8	7	5	Closed	Closed	Closed	135
176.8	3	4	5	7	8	9	9	10	10	Closed	10	10	10	10	9	8	7	6	Closed	Closed	Closed	136
178.1	3	4	5	7	9	9	9	10	10	Closed	10	10	10	10	9	8	7	6	Closed	Closed	Closed	137
179.4	3	4	5	7	9	9	10	10	10	Closed	10	10	10	10	9	8	7	6	Closed	Closed	Closed	138
180.7	3	4	5	7	9	9	10	10	10	Closed	10	10	11	10	9	8	7	6	Closed	Closed	Closed	139
182.0	3	4	5	7	9	9	10	10	10	Closed	10	11	11	10	9	8	7	6	Closed	Closed	Closed	140
183.3	3	4	6	7	9	9	10	10	10	Closed	10	11	11	10	9	8	7	6	Closed	Closed	Closed	141
184.6	3	4	6	7	9	9	10	11	10	Closed	10	11	11	10	9	8	7	6	Closed	Closed	Closed	142
185.9	3	4	6	7	9	9	11	11	10	Closed	10	11	11	10	9	8	7	6	Closed	Closed	Closed	143
187.2	3	4	6	7	9	10	11	11	10	Closed	10	11	11	10	9	8	7	6	Closed	Closed	Closed	144
188.5	3	4	6	7	9	10	11	11	10	Closed	10	11	11	11	9	8	7	6	Closed	Closed	Closed	145
189.8	3	4	6	7	9	10	11	11	10	Closed	11	11	11	11	9	8	7	6	Closed	Closed	Closed	146
191.1	3	4	6	7	9	10	11	11	11	Closed	11	11	11	11	9	8	7	6	Closed	Closed	Closed	147
192.4	3	4	6	7	9	10	11	11	11	Closed	11	11	11	11	10	8	7	6	Closed	Closed	Closed	148
193.7	3	4	6	7	9	10	11	11	11	Closed	11	11	11	11	10	9	7	6	Closed	Closed	Closed	149
195.0	3	4	6	7	9	10	11	11	11	Closed	11	11	12	11	10	9	7	6	Closed	Closed	Closed	150
196.3	3	4	6	7	9	10	11	11	11	Closed	11	12	12	11	10	9	7	6	Closed	Closed	Closed	151

Note: Spill based on reservoir elevation of 486 feet.
Fish Bypass is fully (3 gates) open
TG-11 is non-functional

Appendix B
Summary Table of Agency/Tribal Comments and Grant PUD Responses

Submitting Entity	Date Received	Paragraph	Agency Comment	Grant PUD Response
USFWS	3-30-2017	3	Main comment involves the reporting of 2014 survival data (Table 1, 4 and report text). Why so much emphasis on 2014 results when this is a report for 2016? While 2014 survival tests were conducted they were done so for the fracture consultation and we have recently agreed to not use them for the 3 year averaging. For ex, the text (bottom para pg iii) opens with performance standards for the PR Project were "confirmed in 2014"...but again, that uses the ESA-consultation study data and should not be reported or described as meting the 3 year performance standard.	The reason for the emphasis on the 2014 study year was because it was the five-year check-in for yearling Chinook and also year-1 for the three year average to determine Project performance standard for steelhead. The 2014 steelhead data has been removed, and deemed biased due to the Wanapum Reservoir drawdown – thus facilitating a steelhead survival study in 2017. For yearling Chinook, based on previous yearling Chinook studies and looking at behavior between 2014 and other out-migration seasons/studies, the yearling Chinook data from the 2014 study is believed to be valid and used as the five-year check-in. The next five-year check-in study for yearling Chinook will be in 2019.

Submitting Entity	Date Received	Paragraph	Agency Comment	Grant PUD Response
		4	Last sentence in last para on Yearling Chinook section (pg iv) says next check-in is 2019? That still the case?	Yes – next 5-year check-in for yearling Chinook will be 2019
		5	Last sentence on pg iv (runs on to pg v) needs the word "year" after three so as to say three year sockeye survival average,...	True – the word “year” was added to text.
		6	Last sentence on pg v (runs to vi) implies conditions were consistent with previous years of evaluation but did not PR have significantly more spill in 2014 than the other years?	Referring to “conditions were consistent with previous years…”, is referring to both behavior seen by the yearling Chinook smolts (i.e travel time) and also river conditions (i.e. flows, reservoir elevations, ect.) The fact that one year may have more inadvertent spill than another year is just the results of amount of river flow that year and the reason for having three consecutive years of studies – to capture an “average” of river conditions, which can be a high flow year to a low water year and all points in-between.

Submitting Entity	Date Received	Paragraph	Agency Comment	Grant PUD Response
		7	pg vii. 2nd para: Evans et al 2013 is cited but in lit cited section Evan et al is 2011. Last sentence same para see reference to Evan el al 2013 (missing an "s").	Citation for Evans et al. 2013 has been added to the Lit. Cited Section, and the “s” was added to Evans.
		8	pg vii. Reference is made to NOAA 2008 BiOp but it is not really cited in the text (it is cited in your List of Literature as NMFS 2008).	The reference made (NOAA 2008) on page vii is referring to the BiOp for the FCRPS, while the NMFS 2008 reference is referring to the BiOP that was issued for the Priest Rapids Project. The citation for the FCRPS has been added to the Lit. Cited Section.
		9	pg vii. 2nd to last para: reference is made to using lasers as an active dissuasion measure but we have not done that (to date at least).	This reference to the use of lasers is not the laser that the PRCC was going to fund for Twinning Island. It is referring to the hand-held lasers that the OSU/RTR folks use for dissuasion on Goose Island.
		10	pg viii. 2nd para: a reference is made Real time Research 2017 but that is not in your List of Literature.	The report that the text is referencing is actually Roby et al. 2017. This citation has been added to the Lit. Cited section

Submitting Entity	Date Received	Paragraph	Agency Comment	Grant PUD Response
		11	pg viii. Last para on No-Net-Impact section provides a NNI contribution that does not reflect recent decision/agreement.	This (draft) report was written prior to the decision/agreement you reference was made. The "new/updated" NNI contribution for 2017 has been entered into this report.
		12	In the List of Literature section the references are not alphabetized (at least the first 6 references). Moving down, why does the first Anglea 2004 reference have an "a"? I thought protocol (like AFS) was that when you had a multiple reports by lead author in same year the first reference would be Anglea 2004. The second reference would Anglea 2004a., and so on.	Comment noted.

Appendix C
Agency Comments

From:	Curtis Dotson
To:	Debbie Firestone
Subject:	FW: comments on Activities Report 2016
Date:	Monday, April 10, 2017 4:16:42 PM

Comments from USFWS regarding the P&I Report

From: Craig, Jim [mailto:jim_l_craig@fws.gov]
Sent: Thursday, March 30, 2017 1:49 PM
To: Curtis Dotson <Cdotson@gcpud.org>
Subject: comments on Activities Report 2016

Curt,

Fresh with Tom D's admonishment in mind let me apologize that I will be unable to review the complete document - just didn't make sufficient time in my schedule for the review. I did look over the Executive Summary (ES) and have the following comments although even these are based on a quick review. Figured some level of review and comment were better than no comment. Also, I apologize for commenting this way but I could not do track changes with the pdf (think I need newer versions of Adobe) so old school will have to suffice.

I'll preface the following knowing that this draft report came before our recent negotiation on study results (esp use of 2014 data) and NNI funding etc so you may already be making some changes in the report text. Nonetheless here i go.

Main comment involves the reporting of 2014 survival data (Table 1, 4 and report text). Why so much emphasis on 2014 results when this is a report for 2016? While 2014 survival tests were conducted they were done so for the fracture consultation and we have recently agreed to not use them for the 3 year averaging. For ex, the text (bottom para pg iii) opens with performance standards for the PR Project (the whole enchilada right?) were "confirmed in 2014"...but again, that uses the ESA-consultation study data and should not be reported or described as meting the 3 year performance standard.

Just a Q 4 me. Last sentence in last para on Yearling Chinook section (pg iv) says next check-in is 2019? That still the case?

Last sentence on pg iv (runs on to pg v) needs the word "year" after three so as to say three year sockeye survival average,...

Last sentence on pg v (runs to vi) implies conditions were consistent with previous years of evaluation but did not PR have significantly more spill in 2014 than the other years?

pg vii. 2nd para: Evans et al 2013 is cited but in lit cited section Evan et al is 2011. Last sentence same para see reference to Evan el al 2013 (missing an "s").

pg vii. Reference is made to NOAA 2008 BiOp but it is not really cited in the text (it is cited in your List of Literature as NMFS 2008).

pg vii. 2nd to last para: reference is made to using lasers as an active dissuasion measure but we have not done that (to date at least).

pg viii. 2nd para: a reference is made Real time Research 2017 but that is not in your List of Literature.

pg viii. last para on No-Net-Impact section provides a NNI contribution that does not reflect recent decision/agreement.

If the last several comments have your eyes rolling now I am on to the really insignificant. In the List of Literature section the references are not alphabetized (at least the first 6 references). Moving down, why does the first Anglea 2004 reference have an "a"? I thought protocol (like AFS) was that when you had a multiple reports by lead author in same year the first reference would be Anglea 2004. The second reference would Anglea 2004a., and so on.

Sorry but need to move on to something else.

--
Jim Craig
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