Grant County
PUBLIC UTILITY DISTRICT

Powering Our Way of Life.

VIA ELECTRONIC FILING

April 12, 2019

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 2018 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)(6) Avian Predation Control Program**
- **Article 401(a)(7) Northern Pikeminnow Removal Program**
- **Article 401(a)(8) - Priest Rapids Dam Alternatives Spill Measures Evaluation Plan**
- **Article 404 - Fishery Operation Plan**

Dear Ms. Bose,

Please find enclosed the 2018 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)(6) Avian Predation Control Program, Article 401(a)(7) Northern Pikeminnow Removal Program, 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.

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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 1, 2019 for review and comment. After a 30 day comment period, comments were received from USFWS and are addressed directly within the report. All comments received by the USFWS were editorial in nature.

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

Respectfully,

Ross Hendrick
Manager – License & Environmental Compliance

Cc PRCC

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CALENDAR YEAR 2018

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

Public Utility District No. 2 of Grant County, Washington

April 2019

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 (Grant PUD 2004) and the Priest Rapids Project Salmon and Steelhead Settlement Agreement (SSSA; Grant PUD 2006). 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

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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, 2018. 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 National Marine Fisheries Service (NMFS), United States Fish and Wildlife Service (USFWS), Washington Department of Fish and Wildlife (WDFW), Yakama Nation (YN), Confederated Tribes of the Umatilla Reservation (CTUIR), the Colville Confederated Tribes (CCT) and the Public Utility District No. 2 of Grant County, Washington (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).

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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.

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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 Section 15.3 of the Priest Rapids Salmon and Steelhead Settlement Agreement annual contributions into the NNI Fund for yearling Chinook were terminated in 2005. The next performance standard check-in for yearling Chinook evaluation is 2025 or 2026.

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).

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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 Section 15.3 of the Priest Rapids Salmon and Steelhead Settlement Agreement annual contributions into the NNI Fund for juvenile sockeye were terminated. The next performance standard check-in for juvenile sockeye is 2025 or 2026.

Steelhead

Grant PUD completed the third consecutive year, Project-wide juvenile steelhead survival evaluation in 2017. Based on the three consecutive arithmetic year average (2015-2017) performance standards for juvenile steelhead have been achieved (87.0%; SE=0.02; Skalski et al. 2018, Hatch et al 2018; Table 4).

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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 2015-2017.

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	90.8% (SE=0.017)
3 Year Consecutive Average (2015-2017)			**87.0% (SE- 0.020)**

* Priest Rapids Project total estimated survival divided by half.

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 steelhead at the Priest Rapids Project per the Section 15.3 of the Priest Rapids Salmon and Steelhead Settlement Agreement and therefore annual contributions into the NNI Fund for juvenile steelhead has been terminated. The next performance standard check-in for juvenile steelhead is 2025 or 2026.

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, sockeye and steelhead 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, sockeye and steelhead at the Priest Rapids Project per Section 15.3 of the Priest Rapids Salmon and Steelhead Settlement Agreement and

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therefore annual contributions into the NNI Fund for yearling Chinook, sockeye and steelhead has ended.

Performance standards for summer sub-yearling Chinook have not been achieved yet nor has the PRCC determined the best way to move forward to conduct survival evaluations. Life history strategies and current technology preclude the PRCC from conducting Project-wide survival evaluations on active summer sub-yearling migrates. Grant PUD continues to achieve NNI for summer sub-yearling Chinook via contributions into the NNI Fund, through hatchery compensation and habitat projects throughout the upper Columbia River Basin.

The annual contribution made into the NNI account prior to February 15, 2018 was $573,323.50.

No-Net-Impact Fund Contributions

The total amount of for annual contributions into the NNI Fund made by Grant PUD since 2006 is $21,996,856.95, (2006-2018). NNI Funds have been utilized by the PRCC to fund 33 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 8,334 birds were hazed during 2018 of which 43% were Caspian terns. In addition, 317 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 567,307 northern pikeminnow during 2018. Removal methods included set lining (4,558), beach seining (554,559), electrofishing (5,371), and angling (2,819). An additional 1,037 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 17 to June 15, 2018 for spring out-migrants and from June 16, 2018 to August 17, 2018 for summer migrants. The Priest Rapids Fish Bypass (PRFB) was operated from April 18 to August 18, 2018 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 9,550,527 fish into the upper Columbia River and its tributaries in 2018. Conservative estimates of fish propagation expenditures across all species was approximately $9,027,497, in 2018, and over $155,404,170 across all species since the inception of Grant PUD’s hatchery programs. Of the $155.4 million spent to-date, about 41%

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comprised capital investments used to build new and/or modify existing facilities to meet Grant PUD's supplementation program needs. The remaining 59% 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, 103 total projects have been unanimously approved by one of two committees for funding using one of the three funding accounts. Of those, 61 are completed and 42 are currently active and underway.

As of the end of December, $1,753,669 dollars was spent on committee-approved projects in 2018. To date, $27,308,003 have been appropriated for specific project expenditures by the PRCC and/or PRCC Habitat Subcommittee.

Five new projects were approved in 2018 by the two committees; one from Fund 601; four from Fund 602. The 2018 deposit for the NNI-601 was $573,323.50; the Habitat Supplemental-602 was $1,127,731.59 and Habitat BiOP-603 was $402,851.02.

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1.0 Introduction

Public Utility District No. 2 of Grant County, Washington (Grant PUD) owns and operates two hydroelectric dams on the Columbia River; Wanapum and Priest Rapids, known altogether as the Priest Rapids Project (Project), and is operated under the terms and conditions of the Federal Energy Regulatory Commission (FERC) Hydroelectric Project License No. P-2114 issued by FERC on April 17, 2008.

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 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 (HRFCPPA; Grant PUD 2004) and the Priest Rapids Project Salmon and Steelhead Settlement Agreement (SSSA; Grant PUD 2006). 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 Service (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[3];
    - 401(a)(6) Avian Predation Control Program[3]
    - 401(a)(7) – Northern Pikeminnow Removal Program[3]
    - 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.

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

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

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

The activities and plans covered in this report occurred in consultation with the Priest Rapids Coordinating Committee (PRCC) and its hatchery and habitat subcommittees and the Priest Rapids Fish Forum (PRFF). The PRCC and its hatchery and habitat subcommittees are made up of representatives from National Marine Fisheries Service (NMFS), United States Fish and Wildlife Service (USFWS), Washington Department of Fish and Wildlife (WDFW), Yakama Nation (YN), Confederated Tribes of the Umatilla Reservation (CTUIR), the Colville Confederated Tribes (CCT) and the Public Utility District No. 2 of Grant County, Washington (Grant PUD).

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, 2018. 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;

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- 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 2018, PRCC representatives participated in a total of 14 meetings, conference calls, and/or WebEx conferences. Meeting agendas and minutes for these meetings can be viewed at PRCC Meeting Minutes. The PRCC – Policy Committee did not meet in 2018.

In 2018, the PRCC approved one Statement of Agreement (SOA). Under this SOA, the PRCC agreed to the following;

1). SOA 2018-01 (as amended on January 31, 2018) replaced and superseded SOA's 2017-01, 2007-16 and 2007-05. Also, while in effect, SOA 2018-01 supersedes Section 12.1 of Priest Rapids Salmon and Steelhead Settlement Agreement included on the Yakama Nation signature page dated August 2006. Additionally, SOA 2018-01 superseded SOA 2017-02, but only those sections that specifically discuss the steelhead survival evaluation schedule.

2). The PRCC agreed that Grant PUD shall provide coho hatchery compensation for the Upper Columbia at a rate equivalent to 14% (7% per project) to meet Grant PUD's No-Net-Impact coho hatchery obligation. Fourteen percent (14%) will be the mortality rate through the 2032 recalculation.

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3). The PRCC agreed that as long as Grant PUD is providing agreed-to funding (O&M and M&E) and/or equivalent in-kind services (such as facility use for propagation[4]) in support of the Mid-Columbia Coho Reintroduction Program, Grant PUD is fulfilling its coho mitigation obligation for the term of this SOA.

4). The PRCC agreed that at this time there is no compelling evidence[5] to suggest that juvenile coho are experiencing differential project passage mortality rates greater than 14% and therefore survival evaluations for coho are not required at this time.

5). The PRCC agreed to modify the juvenile survival evaluation check-in schedule for yearling Chinook, sockeye, and steelhead with the first check-in occurring in 2025/2026[6]. Survivals will be estimated every 10 years thereafter. Provided study results are accepted by the PRCC, the newest estimate of survival (e.g., 2025, 2026).

PRCC Hatchery Subcommittee 2018 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 2018.

Date	Communication Type	Topic
1/23/2018	Monthly PRCC Meeting	General Committee Business SOA 2018-10 (as Amended).
2/28/2018	Conference Call	General Committee Business
3/28/2018	Monthly PRCC Meeting	General Committee Business
4/04/2018	Conference Call	General Committee Business
4/27/2018	Monthly PRCC Meeting	General Committee Business
5/23/2018	Monthly PRCC Meeting	General Committee Business
6/27/2018	Conference Call	General Committee Business
7/25/2018	Monthly PRCC Meeting	General Committee Business
8/29/2018	Conference Call	General Committee Business
9/26/2018	Monthly PRCC Meeting	General Committee Business
10/24/2018	Monthly PRCC Meeting	General Committee Business
11/05/2018	Conference Call	General Committee Business
11/26/2018	Conference Call	General Committee Business
12/11/2018	Monthly PRCC Meeting	General Committee Business

1.3 Adaptive Management

The protection, mitigation, and enhancement (PME) measures contained in the SSSA and BiOp are implemented according to the principals of adaptive management. In the SSSA, adaptive management is an active systematic process for continually improving management policies and practices by sequential learning from the outcomes of operational programs. Adaptive management employs management programs that are designed to experimentally compare selective policies or practices by evaluating alternative hypotheses about the system being

[4] Modification to production at existing facilities will be reviewed and approved by the PRCC Hatchery Subcommittee.

[5] "Compelling" evidence for example could be the review of existing PIT tag data using an analysis as provided by Skalski and Townsend (2016) in which results indicates that coho survival is significantly lower than other species and are experiencing differential mortality rates in project passage. In all cases, the information should be empirical and related to Project survival.

[6] The modified check-in schedule is based on the survival evaluations that were conducted in the 2014-2017 timeframe.

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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 (sec.4.3, SSSA, 20006).

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 in 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

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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);
- Columbia Basin Regional Pacific Lamprey Conservation and Tribal Summit;
- 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;
- Washington/British Columbia Chapter, American Fisheries Society conferences (as presenters and session organizer);
- Western Division, American Fisheries Society conference (as presenters and also officer of the Western Division);
- 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 – Douglas PUD, Wenatchee, WA;
- Grant PUD's annual aquatic invasive species (AIS) meeting;
- Hatchery Evaluation Technical Team (HETT);
- Chief Joseph Hatchery Annual Program Review;
- Salmon Recovery Conference (Presenter);

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- Upper Columbia Science Conference Steering Committee;
- Columbia River Basin partnership Task Force;
- Independent Scientific Advisory Board Review of Upper Columbia Spring Chinook Salmon (Tours and Presentations);
- Integrated Recovery Technical Advisory Group;
- Upper Columbia Salmon Recovery Board (reports reviewer and contributors);
- Pacific Northwest Northern Pike Forum;
- Bilateral Okanagan Basin Technical Working Group;
- Okanagan Fry Release Ceremony;
- Confederated Tribes of the Colville Reservation – First Salmon Ceremony;

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% 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.

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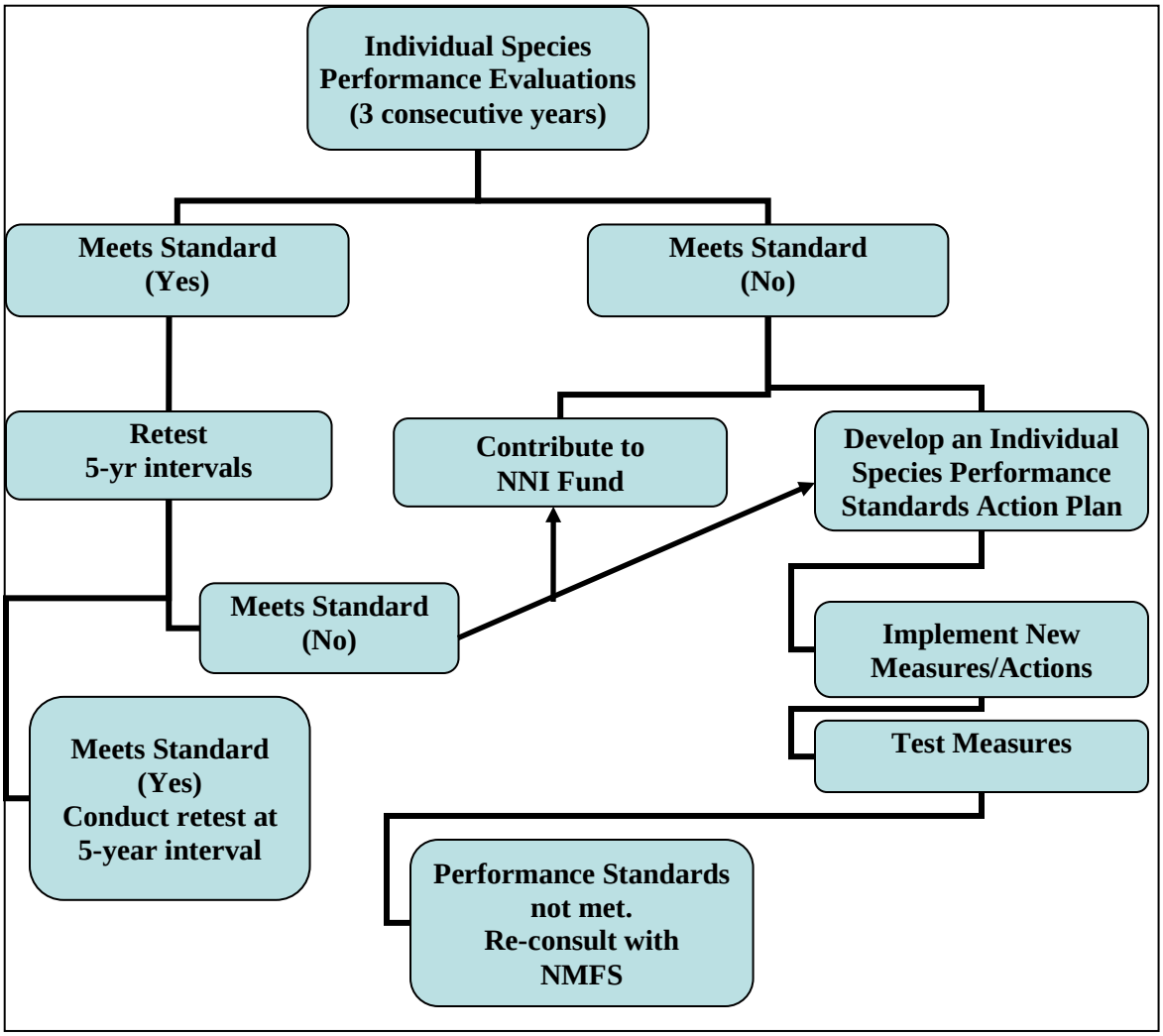

Figure 1 Flow chart showing proposed decision process used to achieve juvenile salmonid project survival requirements for the Priest Rapids Project.

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 6). 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).

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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.

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% (NMFS 2008a).

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 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 were terminated in 2005. The next performance standard check-in for yearling Chinook evaluation is 2025-2026.

2.1.2 Juvenile Steelhead

Grant PUD completed the third consecutive year of Project-wide steelhead survival evaluation in 2017. Based on the three consecutive arithmetic year average (2015-2017) performance standards for juvenile steelhead have been achieved (87.0%; SE=0.02; Skalski et al., 2018) (Table 7). Results were formally accepted by the PRCC and approved by NMFS on December 22, 2017.

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*

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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 steelhead 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 steelhead has been terminated. The next performance standard check-in for juvenile steelhead is 2025-2026.

Table 7 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 2015-2017.

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	90.8% (SE=0.017)
3 Year Consecutive Average (2015-2017)			**87.0% (SE- 0.020)**

* Priest Rapids Project total estimated survival divided by half.

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 8). The 91.7% exceeds the required standard of 86.49%.

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Table 8 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 2025-2026.

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

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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 this SOA, the PRCC agreed to specific measures and items that Grant PUD implemented over the 10-year term of the SOA. This SOA expired in December 2017 (SOAs) and therefore in the interim the PRCC will be defaulting to the language included within Priest Rapids Salmon and Settlement Agreement until a "new" SOA can be developed and approved by the PRCC. The specific language referenced above which states the following:

> *Compensation for coho in the Wenatchee, Entiat and Methow river basins will be assessed within 6 months following the signing of the Settlement Agreement, following the development of an anticipated long-term coho hatchery program and/or the establishment of a threshold population of naturally reproducing coho in the above three subbasins. The PRCC Hatchery Subcommittee shall make the*

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determination as to whether a hatchery program and/or naturally reproducing population of coho is present in any or all of the three basins. Should the Hatchery Subcommittee determine that such a program and/or population of coho exist in any or all of the three basins, then the Hatchery Subcommittee shall determine the most appropriate means to satisfy NNI for the Wenatchee, Entiat, and Methow river basins. Programs to meet NNI for the Wenatchee, Entiat and Methow river basins may include but are not limited to; 1) Provide operation and maintenance funding in the amount equivalent to 14% (7% per project) juvenile project passage loss or 2) provide funding for acclimation or adult collection facilities both in the amount equivalent to a total of 14% for the Priest Rapids Project. The programs selected to achieve NNI for the three subbasins will utilize an interim value of project survival, based upon the three-year average juvenile project mortality of 7% per each dam and reservoir. This interim value of total Project mortality will remain until specific passage and survival studies can be conducted and verified by the PRCC on coho passing through the Priest Rapids Project, and until and the evaluation of ongoing programs/populations in the Wenatchee, Entiat, and Methow subbasins by the PRCC is accomplished.

In January of 2017, the PRCC agreed via SOA 2017-01 that survival estimate for yearling Chinook salmon would be used as a surrogate for coho salmon survival. This surrogate survival would then be used to estimate NNI hatchery compensation for upper Columbia Basin coho salmon that enter the Priest Rapids Project. The PRCC and PRCC Hatchery Subcommittee approved an SOA (SOA 2017-06) that confirmed that a presentation by the Yakama Nation addressed the evaluation requirement in SOA 2007-16.

On January 23, 2018, the PRCC approved an SOA that outlined Grant PUD's coho obligation and future juvenile survival evaluation schedule for yearling Chinook, sockeye and juvenile steelhead (SOA 2018-01).

2.1.6 Schedule

Table 9 illustrates the updated survival evaluation time for the various covered species. As discussed above, Grant PUD has achieved survival standards for yearling Chinook, sockeye and steelhead. Per SOA 2018-01, the PRCC agreed that future survival evaluations for yearling Chinook, sockeye and juvenile steelhead would occur in 2025 and 2026. SOA 2016-05 deferred summer sub-yearling Chinook survival evaluations until 2020. Under SOA 2018-01, the PRCC agreed that Grant PUD coho mitigation would be accomplished via hatchery compensation for 2018-2032.

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Table 9 Performance standards survival evaluation schedule for covered species migrating through the Priest Rapids Project 2017-2024.

Species	2020	2021	2022	2023	2024	2025	2026
Spring Chinook	Standards Achieved					X[1]	
Steelhead	Standards Achieved					X[2]	
Sockeye	Standards Achieved						X[3]
Summer sub-yearling Chinook	X[4]	X[5]	X[6]	.	.	.	.

[1] Check-in for yearling Chinook per Statement of Agreement 2018-01. Study schedule may be modified per PRCC.
[2] Check-in for juvenile steelhead per Statement of Agreement 2018-01. Study schedule may be modified per PRCC.
[3] Check-in for sockeye per Statement of Agreement 2018-01. Study schedule may be modified per PRCC
[4-6] Year 1-3 of proposed summer sub-yearling Chinook evaluation

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 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, sockeye and steelhead have been terminated.

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 $21,996,856.95 (2006-2018). NNI Funds have been utilized by the PRCC to fund 33 separate projects ranging from predator removal, adult fish passage, habitat restoration, instream flow

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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, 2018 was $573,323.50.

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 Operations 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 ten 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 2018, the WFB was operated at 20 kcfs during the entire juvenile salmonid outmigration (April 17 – August 17, 2018). When inadvertent spill occurred, water was passed through the tainter gates as agreed upon by the PRCC spill representatives.

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Non-turbine surface-spill passage route at Priest Rapids Dam began on April 18, 2018through the Priest Rapids Fish Bypass (PRFB). The PRFB was operated at ~27 kcfs during the downstream migration of juvenile salmonids through the entire fish spill season (April 18-August 18, 2018).

The fish-spill periods were closely matched with the juvenile migration timing, with greater than 95% of the yearling spring out-migrants passing during the spring fish-spill period between April 17 and May 23, 2018 (FPC 2018). The combined spring and summer fish-spill periods from April 17 through August 18 encompassed greater than 99% of the entire 2018 outmigration (FPC 2018).

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. In 2018, the Wanapum sluiceway was not available for adult fallback and the WFD was use instead, with approval from the PRCC. 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 on 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) is operated from August 16–November 15 for adult salmonid/steelhead fallback. Gate 22 was used for adult steelhead fallback in 2018.

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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).

Monthly ladder inspections occurred at Wanapum and Priest Rapids dams on April 24, May 23, June 27, July 27, August 28, September 25 and October 31 of 2017. Inspection results are made available to Grant PUD, and best efforts are made to resolve identified issues in a timely manner.

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 gate slot at the west end of the collection channel, 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

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auxiliary water at Wanapum Dam is supplied by the gravity supply conduit through two inline butterflies 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.

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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 3, 2018, Grant PUD submitted its updated GAP to FERC for approval (Keeler 2018). FERC approval of the GAP for 2018 was received on April 4, 2018.

The 2018 plan updated last year's GAP (2017) 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 2018 included minimizing involuntary spill by scheduling maintenance operations based on predicted flows and attempting to maximize turbine flows by setting minimum generation requirements to power purchasers. Operational abatement measures also included the participation in regional operators meetings to discuss regional TDG abatement measures, coordination of regional spill amounts and locations, and implementation of preemptive spill to avoid periods of high involuntary spill. In addition, Grant PUD consulted with WDOE (when necessary) on any non-routine operational changes that may have affected 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 2012), to determine the impact, if any, the operation has on TDG. Results from these evaluations are presented in Keeler 2014 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 (https://www.grantpud.org/water-quality).

On July 13, 2018 the WDOE approved Grant PUD's *Final Summary of Total Dissolved Gas Monitoring within the Priest Rapids Hydroelectric Project – Year 10 Report* (Year 10 Report; Grant PUD 2018), in which Grant PUD demonstrated that it had fully implemented the conditions of the 401 WQC associated with TDG, had achieved reasonable compliance with the TDG water quality standards, and the operation of the Project is protective of the aquatic uses within the Project. The Year 10 Report included provisions consistent with Section 6.4.11(f) of the 401 WQC, which includes providing WDOE with a compliance GAP for review and approval by October 31 of the applicable year. The compliance GAP will be updated every 5 years for the remainder of the Project license (starting in 2019), and will include any applicable information on new or improved technologies and a review of any additional reasonable and

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feasible gas abatement options. In addition, a compliance analysis of the previous 10 years of TDG data will also be completed every 5 years concurrent with the 5-year compliance GAP, which will help demonstrate Grant PUD's ability to consistently achieve compliance with the provisions of TDG water quality standards.

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 2018, 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, , 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 Dam

Grant PUD is required to implement and fund an avian predation control program at the Priest Rapids Project (T&C 1.9 & 1.19; NMFS 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 2018

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 lethally removed 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 23, 2018 through June 8, 2018. From June 11, 2018 through June 22, 2018, two Wildlife Services crews worked eight-hour shifts, five days per week at Wanapum and Priest Rapids dams.

During the 2018 avian control effort, 8,334 birds were hazed, 43% of which were Caspian terns (Hydroprogne caspia). A total of 317 piscivorous waterbirds were lethally removed during 2018. Table 10 shows the overall season results.

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Table 10 Total control actions made by Wildlife Services and through Priest Rapids Project, mid-Columbia, 2018.

		Hazed		Lethally Removed	
Common Name	**Scientific Name**	**Wanapum**	**Priest Rapids**	**Wanapum**	**Priest Rapids**
Caspian tern	*Hydroprogne caspia*	266	3,315	0	0
Common merganser	*Mergus merganser*	424	372	7	14
Double-crested cormorant	*Phalacrocorax auritus*	119	251	9	18
Gull, California	*Larus californicus*	357	485	18	75
Gull, Herring	*Larus argentatus*	0	0	0	0
Gull, Ring-billed	*Larus delawarensis*	520	2,225	33	143

2.8.2 Avian Control Efforts Proposed in 2019

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 forebays of Wanapum and Priest Rapids dams in 2019.

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 2018

During the 2018 fishing effort, 567,307 northern pikeminnow were removed by the following methods:

- 4,558 in the set-line fishery;
- 554,559 in the beach seine fishery;
- 5,371 in the electrofishing fishery; and
- 2,819 in the angling fishery.

The average length of northern pikeminnow removed in 2018 varied between fisheries. The average length for the set-line fishery was 295 mm ± 70 mm (n = 851). Northern pikeminnow caught in the beach seine fishery ranged from 6 mm to 76 mm (0.25 in ~ 3 in) with an average of 17.3 mm (0.68 in). The average length of northern pikeminnow caught in the electrofishing fishery was 97 mm ± 46 mm (n = 1,027). The average length of northern pikeminnow removed in the angling fishery was 401 mm ± 52 mm (n = 825).

2.9.2 Efforts Proposed in 2019

Grant PUD will continue to utilize set-lines, beach seines, angling and electrofishing as proven, cost effective, methods for pikeminnow removal in 2019.

2.10 Adult Fish Counting

Grant PUD is required to maintain the adult fish-counting equipment at both developments to provide reliable fish count information and submit annual reports for inclusion in regional

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databases (T&C 1.2; NMFS 2008a). The annual Fish Passage report for 2018 was submitted to the US Army Corps of Engineers in February 2019. 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 ways in which to improve fish counting accuracy and efficiency, particularly with equipment, system design, and staff recommendations. There were no significant data-accuracy problems experienced in 2018. The fish counters took a quality control test and all fish counters were within acceptable accuracy.

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). 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 2018 salmonid smolt out-migration, the WFB was operated continuously at 20 kcfs.

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Figure 2 Photograph of Wanapum Dam Fish Bypass facility, looking downstream, mid-Columbia River, WA.

3.2 Wanapum Dam 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.

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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 2018 fish-spill season began on April 17, 2018 and concluded on August 17, 2018. The fish-spill periods were very closely matched with the juvenile migration timing, and greater than 99% of the yearling spring out-migrants passed during the spring fish-spill period between April 17 and June 14. The combined spring and summer fish-spill periods from April 17–August 17 encompassed greater than 99% of the entire 2018 outmigration.

During 2018, 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 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

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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.

Grant PUD originally anticipated having all twelve of the Wanapum gate seals replaced by spring 2018. However, due to the Wanapum fracture (during 2014), determination of proper trunnion alignment during the design phase, lack of bidders during the first bid attempt, and discovery of internal trunnion misalignment and internal trunnion cracking this project has been delayed. Although delayed, Grant PUD has completed four of the twelve gate seals completed to date. Grant PUD anticipates that the remaining eight gate seals to be completed by July 2020 and requested an extension of time to complete this work. The extension of time was granted (by FERC) on February 7, 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.

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 2018 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

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began on April 18 and ended on August 18, 2018. 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

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

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%%. 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 is in the process of installing “in-kind” Kaplan turbines at Priest Rapids Dam. The expected completion date for the Priest Rapids Dam turbine in-kind replacement project is 2025.

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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, https://www.ptagis.org/ 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.

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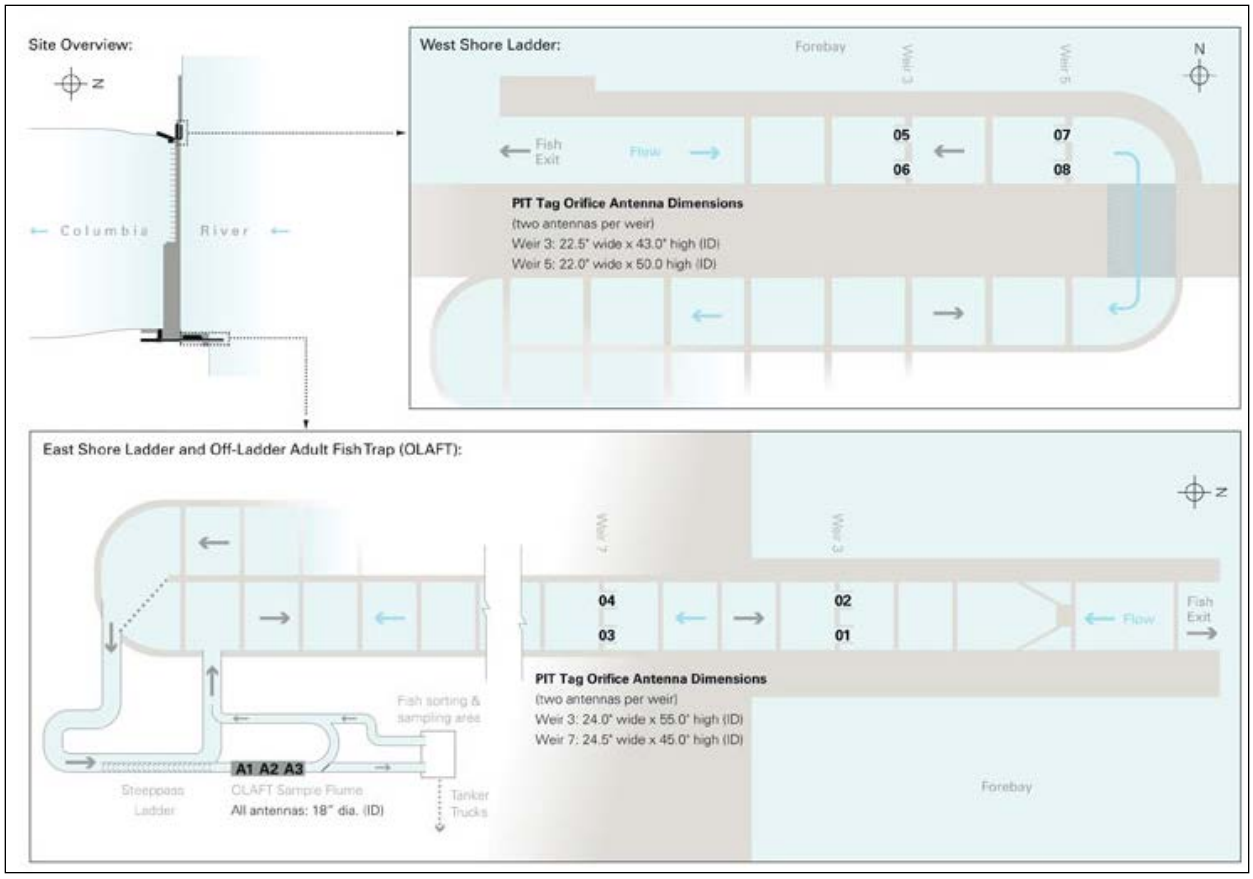

Figure 4 Plan view of upper regions of the fishway at Priest Rapids Dam showing location of PIT-tag detection antennae and associated identification number.

A total of 13,502 PIT-tag detections were observed at Priest Rapids Dam in 2018. Of these detections, 4,603 were from unique tags within five species of fish. Species of fish carrying PIT tags identified at Priest Rapids Dam in 2017 were Chinook, Coho, steelhead, sockeye, and northern pikeminnow. All detections and associated fish species are summarized in Table 11.

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 11 Summary of PIT-tag detection at Priest Rapids Dam in 2018.

Species	Number of Observations	Unique Tag Codes
Chinook Salmon	4,072	1,529
Coho salmon	665	213
Steelhead trout	3,971	1,239
Sockeye salmon	4,708	1,599
Northern pikeminnow	49	11
Unknown/ORPHAN	37	12
Totals	**13,502**	**4,603**

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

The YN operated the OLAFT at Priest Rapids dam from June 27 through July 6 to collect adult Sockeye salmon for their Lake Cle Elum and Cooper Lake reintroduction program. The WDFW

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sampled steelhead trout for the agency's stock-assessment program beginning on July 6 and continued through early-November 2018. The WDFW typically operated the trap on Mondays, Wednesdays, and Fridays of each week for steelhead trout sampling (July 6 – November 9). Concurrent with the WDFW steelhead sampling, the YN were on site at the OLAFT to collect adult Coho salmon for the mid-Columbia Coho reintroduction program from September 10 through 14. In addition, the WDFW trapped fall Chinook salmon to augment broodstock collection for Priest Rapids Hatchery (September 10–October 24). Additional sampling for fall Chinook run reconstruction was completed on October 24. The OLAFT was completely dewatered and winterized for the season on November 15, 2018.

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.

The PRCC HSC held seven meetings and one conference calls during 2018 (Table 12). In additon, the PRCC HSC held joint meetings with Douglas and Chelan PUD's Habitat Conservation Plan-Hatchery Committee(s) to review hatchery topics that were of interest to Douglas, Chelan, and Grant PUDs. Approval of documents such as implementation and broodstock collection plans and monitoring and evaluation reports were completed during 2018. Meeting minutes and statements of agreement for all years can be viewed at PRCC HSC SOAs.

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Table 12 Priest Rapids Coordinating Committee Hatchery Subcommittee 2018 meeting schedule.

PRCC Hatchery Subcommittee	January 17, 2018	Meeting
PRCC Hatchery Subcommittee	February 21, 2018	Meeting
PRCC Hatchery Subcommittee	March 12, 2018	Meeting
PRCC Hatchery Subcommittee	April 18, 2018	Conference Call
PRCC Hatchery Subcommittee	May 16, 2018	Meeting
PRCC Hatchery Subcommittee	August 15, 2018	Meeting
PRCC Hatchery Subcommittee	September 19, 2018	Meeting
PRCC Hatchery Subcommittee	November 15, 2018	Meeting

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 13). 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. Significant progress was made during 2018 on obtaining Section 10 take permits for Grant PUDs unlisted hatchery programs (e.g., summer and fall Chinook salmon).

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Table 13 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	March 6, 2017
Okanogan spring Chinook salmon (APP)*	Sept. 23, 2010	Sept. 30, 2009	Dec. 14, 2011	Complete, held by CCT
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	Complete, held by CCT
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	NA
Coho salmon (APP)*	Oct. 11, 2010	Aug. 31, 2009	Oct. 13, 2011	Complete, held by YN
Steelhead trout (APP)*	Sept. 23, 2010	Sept. 30, 2009	Dec. 14, 2011	Complete, held by CCT
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 14).

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Table 14 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 is complete and the overwinter acclimation program at Nason Creek is ongoing. Maintenance activities for the Nason Creek Acclimation Facility in 2018 included shifting gravel away from the intake using hand tools. Streambed materials were moved from the river-left side to downstream of the intake.
Methow spring Chinook salmon	Methow spring Chinook are reared at the Methow Fish Hatchery, a Douglas PUD-owned and operated facility. Grant PUD entered into a long-term interlocal agreement (through 2052) with Douglas PUD for adult holding, spawning, incubation, rearing, and release.
Okanogan spring and summer Chinook salmon	Chief Joseph Hatchery construction, partially funded by Grant PUD, was completed in May 2013. Adult holding, spawning, incubation, and early rearing of spring and summer Chinook salmon is ongoing. Final acclimation and release occurs at various locations in the Okanogan basin.
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 Acclimation Facility is complete and overwinter acclimation of the Methow summer Chinook salmon program is ongoing.
Fall Chinook salmon	Renovation of Priest Rapids Hatchery is essentially complete and adult broodstock collection, holding, and spawning, egg incubation, and juvenile rearing and release is ongoing.
Sockeye salmon	Construction of the Penticton Sockeye Hatchery is complete and sockeye production is ongoing.
Coho salmon	Funding agreement. Grant PUD implemented a new 15-year agreement with the Yakama Nation in 2018 intended to fully meet Grant PUD's Coho obligations.
Steelhead trout	Production currently occurs at Wells Hatchery, owned and operated by Douglas PUD. Major renovations of this facility were completed in 2018 and included dedicated space for Grant PUD's steelhead production. A portion of the uvenile steelhead production is spring acclimated in two newly-installed 20 foot round tanks at St. Mary's Acclimation site on Omak Creek in the Okanogan basin. The acclimation intake from Omak Creek was completely re-developed in 2019 to ensure a more reliable water supply.

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5.4 Number of Fish Released and Dollars Invested Summary

Fish have been produced and released for Grant PUD's hatchery programs for multiple years. Significant program investments were made in 2018, including investments in operation, maintenance, and monitoring and evaluation of hatchery facilities (Table 15). Upgrades to Grant PUD's hatchery facilities included safety upgrades to the Nason Creek Acclimation Facility maintenance building and at Priest Rapids Hatchery. 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 15 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 2018	GPUD Program investment ($) in 2018*	GPUD Program investment ($) total*
White River spring Chinook salmon	2004-15	69,515	0	$185,799	$27,401,324
Nason Creek spring Chinook salmon	2004, 05, 2015-18	231,334	233,471	$965,780	$14,225,812
Methow spring Chinook salmon	2007-18	168,509	150,277	$1,008,808	$11,622,236
Okanogan spring Chinook salmon	2015-18	134,505	138,443	$164,611	$3,684,197
Wenatchee Summer Chinook salmon	2014-18	183,879	180,338	$642,546	$4,599,948
Methow Summer Chinook salmon	2014-18	188,218	209,490	$790,254	$9,316,234
Okanogan Summer Chinook salmon	2014-18	151,442	242,498	$430,983	$9,601,578
Fall Chinook salmon	1985-2018[a]	5,215,593	6,159,454	$1,609,263	$40,724,361
Sockeye salmon	2005-18	681,499	806,864	$1,091,104	$14,634,657
Coho salmon	2007-18	1,352,850	1,312,566[b]	$762,217	$6,787,267
Steelhead	2005-18	106,030	117,126	$1,376,132	$12,806,556
Total	**2004-18**	**8,483,376**	**9,550,527**	**$9,027,497**	**$155,404,170**

*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 16). A revised five-year M&E Plan for upper Columbia species was approved by the PRCC HSC in April 2013 (Hillman et al. 2013) and subsequently updated and approved in 2017 (Hillman et al. 2017). 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. Annual M&E implementation plans were approved for all of Grant PUD hatchery programs in 2018. Grant PUD has also invested in studies to help improve the

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performance of hatchery programs. These studies help inform topics such as optimal size-targets and growth of fish reared in the hatchery, optimal release time, and provide additional tools to improve imprinting.

Table 16 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	07-18	97-18	97-18
Nason Creek spring Chinook salmon	98-99*, 13-18	02-03*, 13-18	04-05*, 14-18	04-05*, 18	07-18	98-99*, 14-18	98-99*, 14-18
Methow spring Chinook salmon	96-99*, 05-18	96-99*, 05-18	01-18	02-18	02-18	96-18	96-18
Okanogan spring Chinook salmon	13-18	14-18	15-18	15-18	NA	18	18
Wenatchee summer Chinook salmon	13-18	13-18	13-18	14-18	14-18	14-18	14-18
Methow summer Chinook salmon	13-18	13-18	13-18	14-18	14-18	14-18	14-18
Okanogan summer Chinook salmon	13-18	13-18	13-18	14-18	13-18	13-18	13-18
Fall Chinook salmon	98-18	98-18	98-18	98-18	98-18	10-18	10-18
Sockeye salmon	04-12, 14-18	04-12,14-18	04-13, 15-18	04-13,15-18	04-18	04-18	04-18
Coho salmon	05-18	05-18	06-18	06-18	06-18	06-18	06-18
Steelhead trout (Methow)	05-12	05-12	05-12	05-12	05-12	05-12	05-12
Steelhead trout (Okanogan)	06-18	06-18	07-18	07-18	07-18	07-18	07-18

*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' steelhead program in the Okanogan Basin. The steelhead are reared at the Douglas PUD owned and operated, Wells Hatchery. Part of this requirement is to implement 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.

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

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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 2013 and ultimately approved.

5.6.3 Facilities

Since 2005, Grant PUD has funded releases of yearling steelhead smolts into the upper Columbia basin (Table 17). 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 were completed in 2017 and new staff hired by Douglas PUD took over the operation of Wells Hatchery.

Currently Omak Creek is the primary location used for brood collection for the Okanogan program, but other trapping locations and acclimation sites are used or developed as needed. The acclimation raceway on Omak Creek near the St. Mary's Mission was converted to a settling basin for sediment as two new 20 foot diameter circular fiberglass vessels were installed for spring-time acclimation, each with a capacity of 10,000 steelhead smolts as part of the locally-adapted yearling program. PIT-tag detections in 2014 suggested adult steelhead passage at Mission Falls can occur under certain environmental conditions but is not an annual event. Therefore, plans for developing an acclimation site above Mission Falls was put on hold until additional data can be collected as direct-plant smolt releases will still occur in Omak Creek

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above the falls. High flows during the spring freshet in 2017 caused considerable damage to the adult collection weir in Omak Creek but the necessary repairs to continue weir operation were made. For the 2018 brood collection, adult steelhead were collected with dipnets and at the weir on Omak Creek.

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 CCT. Grant PUD continues to renew the agreement with CCT to continue hatchery operations and to continue implementing the M&E program for summer steelhead in the Okanogan basin.

In spring 2018, 117,126 BY 2017 steelhead smolts were released into the Okanogan basin (including Omak Creek) as part of Grant PUD's mitigation requirement. Twelve 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 2018, approximately 18,249 locally-adapted BY 2018 fish were on-site at the Wells Hatchery as part of the Colville Confederated Tribes' steelhead program, and an additional 92,563 BY 2018 fish at Wells Hatchery are reserved for Grant PUD mitigation requirements. There were 19,985 PIT tags and 101,998 coded-wire tags (CWTs) placed in steelhead parr in November 2018. These fish are scheduled for release in two locations; Omak Creek at St. Mary's Pond, and hatchery fish destined for release in the Okanogan basin. Most if not all broodstock for the program have been collected in the Okanogan Basin during the past few years. Fish released in Omak Creek are from the locally adapted population. Both the locally adapted (from Omak Creek) and Wells stock are reared at Wells Fish Hatchery and will be released in the spring of 2019.

As part of program expansion, a request to increase the number of brood collected in the Okanogan basin from 16 to 54 was approved by NMFS. 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.

The mean and total releases for the combined Wells and Omak programs between 2005 and 2018, and annual O&M, M&E, and capital costs are listed below (Table 17).

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Table 17 Steelhead released and annual expenditures as part of the Grant PUD's mitigation requirements.

Calendar Year	Numbers of Fish Released	Annual Expenditures*		
		Capital**	O&M/M&E***	Expenditure Totals
2005	100,000	$542	$285,020	$285,562
2006	101,379	$1,626	$297,680	$299,306
2007	127,819	$2,037	$375,355	$377,392
2008	128,415	$6,269	$425,296	$431,565
2009	95,505	$7,510	$504,510	$512,020
2010	97,393	$7,800	$655,405	$663,205
2011	117,963	$8,376	$320,786	$329,162
2012	84,420	$10,619	$564,508	$575,127
2013	65,970	$114,920	$585,295	$700,215
2014	108,914	$4,258,733	$676,779	$4,935,512
2015	109,214	$0	$1,205,172	$1,205,172
2016	125,041	$26,324	$173,234	$199,558
2017	105,265	$1,169	$915,459	$916,628
2018	117,126	$418,232	$957,900	$1,376,132
Mean	106,030	--	--	--
Totals	**1,484,424**	**$4,864,157**	**$7,942,399**	**$12,806,556**

*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

Current M&E activities conducted are shown in Table 18 and are consistent with Grant PUD's approved M&E Plan.

Table 18 Monitoring and Evaluation activities for Okanogan basin steelhead, funded by Grant PUD.

Activity	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Brood Collection	X	X	X	X	X	X	X	X	X	X	X	X	X
Spawning	X	X	X	X	X	X	X	X	X	X	X	X	X
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
Smolt Abundance		X	X	X	X	X	X	X	X	X	X	X	X
Carcass/Tag 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

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5.7 Upper Columbia River Spring Chinook Salmon Supplementation

UCR spring Chinook covered under this T&C (1.26; NMFS 2008) 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. 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).

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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, 2017, or 2018.

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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, 2017, or 2018. Table 19 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 20.

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Table 19 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**

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Table 20 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
2017	$0	$226,270	$226,270
2018	$0	$185,799	$185,799
Totals	**$2,756,943**	**$24,644,381**	**$27,401,324**

*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 2018, Grant PUD continued monitoring and evaluation activities for the White River supplementation program (Table 21). Because there were no smolts released or broodstock collected in 2018 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 2018, two screw traps were operated in the White River from March through November with periodic stoppages due to river conditions. The goal of operating a secondary trap, which is operated adjacent to the primary trap, is to increase the number of fish available for the primary trap efficiency trials.

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 22.

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Table 21 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	16-17	18
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	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

5.9 Nason Creek Spring Chinook Salmon Program

Under T&C 1.28 (NMFS 2008), 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 (NCAF) 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. The fish that were to be produced 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

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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. 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 early 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. Progeny from natural-origin and hatchery-origin broodstock collected in 2015 and 2016 were released from NCAF in April of 2017 and 2018, respectively.

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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 22). 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 be implemented (Table 23). 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. 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 worked well despite very cold water conditions that created ice. The intake continued to work well through the 2017-18 acclimation season, with no problems experienced.

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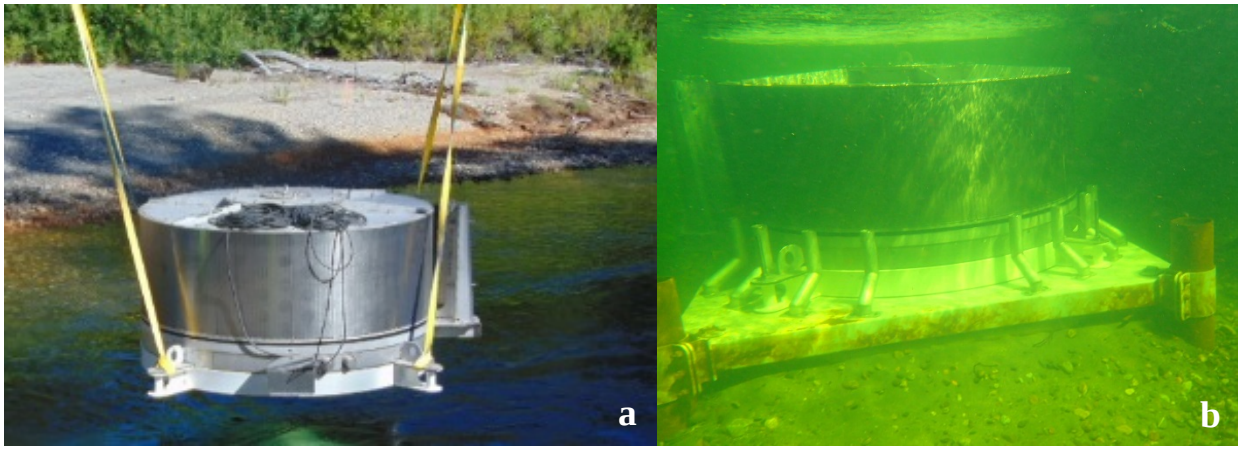

Figure 7 **New cylinder screen installed to replace the original cone screen as part of the intake restoration activities at Nason Creek Acclimation Facility in 2016. (a) is the screen during the installation process, and (b) is the screen fully installed on the intake platform.**

Table 22 **The number 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
2015	Nason Creek Acclimation Facility	243,127	Na/Chi composite
2016	Nason Creek Acclimation Facility	233,471	Na/Chi composite
Adult Return Broodstock Program Mean		231,334	
Adult Return Broodstock Program Total		1,156,671	

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Table 23 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
2017	$46,869	$747,713	$794,582
2018	$47,296	$918,484	$965,780
Totals	**$10,325,442**	**$3,900,371**	**$14,225,812**

*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 24). These activities include juvenile monitoring, redd surveys, carcass surveys, and stock assessments. Reproductive success studies funded by Bonneville Power Administration (BPA), Chelan PUD, and Grant PUD are ongoing.

Table 24 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	15-17	18
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

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to utilize excess rearing capacity at the Methow Fish Hatchery owned by Douglas PUD and operated by WDFW and later operated by Douglas PUD. 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 was received in 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. Douglas PUD began operating the facility in 2018. There is no current discussion regarding the potential for extensive upgrades at the hatchery.

5.10.4 Operation 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 150,277 yearling smolts were released from the Methow Hatchery on behalf of Grant PUD in 2017. This represents the tenth consecutive year fish have been released through cooperative agreement, and over 10.6 million dollars committed by Grant PUD to the program (Table 25). BY 2017 and 2018 fish are currently rearing at Methow Hatchery.

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Table 25 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
2017	191,115	$1,326,683
2018	150,277	$1,008,808
Mean	168,509	
Total	**2,022,109**	**$11,622,236**

*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 26.

Table 26 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 - 2018
Brood Collection	X	X	X
Spawning	X	X	X
Tagging			X
Release			X
Smolt Abundance		X	X
Carcass Recoveries		X	X
Redd Surveys		X	X

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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 27.

Table 27 Spring Chinook salmon annual expenditures for the Okanogan program as part of Grant PUD's mitigation requirement.

Calendar Year	Numbers of Fish Released[c] (Grant PUD Program)	Annual Expenditures[a]		
		Capital	O&M/M&E[b]	Totals
2010		$2,173,494	$0	$2,173,494
2011		$39,518	$0	$39,518
2012		$451,142	$0	$451,142
2013		$0	$79,085	$79,085
2014		$0	$185,523	$185,523
2015	130,207	$37,042	$224,282	$261,324
2016	96,283	$0	$125,668	$125,668
2017	173,085	$0	$203,832	203,832
2018	138,443	$0	$164,611	164,611
Mean	134,505			
Totals	**538,018**	**$2,701,196**	**$983,001**	**$3,684,197**

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.

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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.

The Riverside acclimation pond along the Okanogan River is used specifically for overwinter acclimation of the Methow Composite stock, up to 200,000 fish. The Leavenworth stock is released directly from the Chief Joseph Hatchery into the Columbia River.

A pilot weir on the Okanogan River downstream of Malott, WA has been operated by the CCT staff from 2012-2018 for the purpose of testing trapping (broodstock collection and harvest) 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 six years (2013-2018). 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. The listed population is 100% tagged with coded wire and the non-listed population is marked with 100% adipose fin clip. 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 2016 brood year fish, released in the spring of 2018, the number of segregated Leavenworth/Carson fish released into the Okanogan basin from the Chief Joseph Hatchery totaled 555,188 fish. The number of integrated Metcomp 10-J fish shipped to the Riverside acclimation pond on October 26, 2017 was 204,634, with 200,827 released volitionally on April 16, 2018.

At the end of December 2018, the estimated number of 2017 broodyear on hand for the segregated and integrated programs is 277,166 and 211, 949 fish, respectively. The number of eggs on hand at the end of December 2018 for the 2018 broodyear for the segregated program, collected at the Chief Joseph Hatchery was 469,994. The integrated program continues to get eggs from the Winthrop National Fish Hatchery, with 196,794 eggs on hand at the end of December 2018. Both groups are scheduled for release in the spring of 2020.

5.11.5 Monitoring and Evaluation

The first juvenile spring Chinook (2013 brood) was released in 2015 into the Okanogan River as part of the new Chief Joseph Hatchery program returned in 2017. This action triggered the first monitoring activity for spring Chinook even though summer Chinook had already been actively monitored. The previously operated screw trapping program was expanded to include the migration timing of spring Chinook, although captures to date have been very low and no abundance estimates have been made. The expansion of juvenile PIT tag monitoring from summer Chinook to spring Chinook occurred as well. Spawning surveys were conducted in

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2018; redds were observed in Omak Creek Table 28. The monitoring and evaluation program is expected to expand as more spring Chinook return from earlier hatchery releases.

Table 28 Monitoring and evaluation activities for Okanogan Basin summer Chinook salmon.

Activity	2013	2014	2015	2016	2017	2018
Brood Collection	X	X	X	X	X	X
Spawning		X	X	X	X	X
Tagging			X	X	X	X
Release			X	X	X	X
Smolt Abundance						
Carcass Recoveries						X
Redd Surveys						X
Run Composition/Genetics Evaluations		X	X	X	X	X

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

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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. A biological opinion by NMFS was completed at the end of 2017 and an updated section 10 permit is expected in 2019.

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 29.

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Table 29 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
2016	5,374,672	1,631,588	$125,864	$1,196,380	$1,322,244
2017	6,159,454	1,830,736	$112,247	$1,497,016	$1,609,263
MEAN	5,215,593	1,482,476			
TOTALS	**156,467,798**	44,474,265	$24,946,903	$15,777,458	$40,724,361

*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.

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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 2012a and b, Richards et al. 2013, Richards and Pearsons 2014, Richards and Pearsons 2015, Richards and Pearsons 2016, Richards and Pearsons 2017, Richards and Pearsons 2018). Data collection associated with the hatchery M&E plan will continue in 2019.

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, and optimal smolt release time.

5.12.6 Hanford Reach Fall Chinook Protection Program

The 2017-2018 flow protection program began on October 15, 2017 with the implementation of the reverse load factoring. Spawning ground surveys were conducted on Vernita Bar during October 22, October 29, and November 5, November 12, November 19, and November 26, 2017. The peak count of 116 redds was the lowest number of redds counted since 2012 and less than the long-term median of 168 redds. The elevational distribution of the redds established the protection level flow for the 2017-2018 season at 60 kcfs.

During the Spawning Period river temperatures in the Hanford Reach were cooler than the long-term mean however by December the temperatures returned to the mean and remained similar to the mean for the remainder of the protection season. On Vernita Bar, spawn timing was later than previous years particularly in the above 50 kcfs elevation zone. The later than normal Initiation of Spawning date resulted in later dates for the End of Spawning and the start of Emergence and Rearing Periods. The slightly warmer water temperatures in January and average temperatures in February and March resulted in average end dates for the Rearing and Emergence Periods.

Hatch in the 36-50 kcfs zone occurred on December 12, 2017 and in the above 50 kcfs on 3 January 2018. Emergence in the 36-50 kcfs elevation zone occurred on 3 March 2018 and in the above 50 kcfs zone on 23 April 2018. During the entirety of the Post-Hatch and Emergence Periods discharge at the USGS Gage was maintained above the required Protection Level Flow.

During the Emergence and Rearing Periods the end of March and April discharge from Priest Rapids Dam was similar to the average flows from 1995 – 2017. By May, discharge from Priest Rapids Dam was well above the long-term mean. During the 85 days of the 2018 Emergence and Rearing periods, Grant PUD met all of the flow constraints established with the HRFCPPA.

The 2018 weekend minimum discharge constraints began on the weekend of April 28 and continued through the weekend of May 20. On all four of the CJAD II weekends the minimum constraints were met.

Flow management operations during the 2017-2018 season were highly successful. This continues the trend of high performance that began with the 2006 brood year and is significantly greater than the historical mean under the HRFCPPA.

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Protections for fall Chinook salmon for the 2018-2019 protection season began on October 15, 2018 and will continue through May or June 2019. There was a total of 130 redds counted in the index area during the final redd count and the distribution of those redds resulted in a Critical Elevation of 65 kcfs. Minimum discharge protections have been maintained through the writing of this report. Protections for BY 2018 will continue into 2019 and will be reported in the 2019-2020 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. In 2018 Grant PUD continued to operate under an extension of a Section 10 permit and at the request of NMFS Grant PUD re-submitted a request for consultation. A new Biological Opinion was finalized by NMFS in December of 2017 and new Section 10 permit is expected in 2019.

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

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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. 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 30.

5.13.1.3 Operation and Maintenance

Under the long-term hatchery sharing agreement between Chelan PUD and Grant PUD, broodstock for the 2018 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 2019 and subsequent release into the Wenatchee River.

Table 30 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
2017	191,233	$0	$648,049	$648,049
2018	180,338	($337,827)	$980,373	$642,546
Mean	**183,879**			
Totals	**919,397**	**$688,713**	**$3,911,235**	**$4,599,948**

*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.

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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 2018. 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. In 2018 Grant PUD continued to operate under an extension of a Section 10 permit, and at the request of NMFS, Grant PUD re-submitted a request for consultation. A new Biological Opinion was finalized by NMFS in December of 2017. A new Section 10 permit was expected in 2018 but is now pending in 2019.

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 early April. Costs associated with development of Methow summer Chinook salmon facilities are included in Table 31.

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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 2016 summer Chinook from Carlton Acclimation Facility occurred in April, 2018. In total, approximately 209,490 smolts were released from the Carlton Acclimation Facility in 2018 (Table 31).

Under the long-term hatchery sharing agreement between Douglas PUD and Grant PUD, broodstock for the program was, again, collected at Wells Dam in 2018. 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 2018 broodstock will be transferred to the Carlton Acclimation Facility in the fall of 2019 for acclimation and release in 2020.

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Table 31 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
2017	$10,846	$616,730	$627,576
2018	$25,233	$765,021	$790,254
Totals	**$5,565,169**	**$3,751,065**	**$9,316,234**

*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.

Table 32 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
2015	177,762
2016	209,490
MEAN	188,218
TOTAL	**941,092**

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.

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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 33).

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) and Omak (275,000 fish).

A pilot weir on the Okanogan River downstream of Malott, WA has been operated by the CCT for the years 2012-2018for the purpose of testing trapping (broodstock management and harvest) 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 2019 are in development. A full report will be provided during the Chief Joseph Hatchery annual program review in March.

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Table 33 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
2017	179,078	$0	$533,670	533,670
2018	242,498	$0	$430,983	$430,983
Mean	151,442			
Totals	**757,212**	**$7,035,089**	**$2,566,489**	**$9,601,578**

*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 2018. 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 2018 included yearling Chinook from BY 2016 and sub-yearlings from BY 2017.

The number of hatchery origin return progeny remaining on site for release from the Chief Joseph Hatchery as of December 2018 was 399,378 fish. The 2018 broodstock were collected for the integrated program was collected from the Okanogan River weir and purse seine while returns to the hatchery were collected for the segregated program. A total of 243 females were spawned for the BY 2018 integrated program, providing approximately 1,117,800 green eggs and 189 females provided approximately 869,400 green eggs for the segregated program. 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.

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Numerous monitoring and evaluation activities have been ongoing since the Chief Joseph summer Chinook hatchery program began in 2013 (Table 34), allowing the collection of a large data set and providing much information on both the natural and hatchery origin stocks of Okanogan summer Chinook.

As part of the M&E program, the temporary, pilot weir downstream of the town of Malott, WA on the Okanogan River was installed on August 12, making 2018 the seventh year of pilot weir operation. The weir operated for 38 non consecutive days and trapped 42 adult summer Chinook, six jack summer Chinook, 69 sockeye, and six 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.

The WHOOSHH ™ system was not used in 2018 but plans for its use in 2019 are in place if weir configuration permits operation. Aside from a longer trapping season (July through October is desired), the weir operation objectives are similar to 2018.

Table 34 Monitoring and evaluation activities for Okanogan Basin summer Chinook salmon.

Activity	2013	2014	2015	2016	2017	2018
Brood Collection	X	X	X	X	X	X
Spawning	X	X	X	X	X	X
Tagging	X	X	X	X	X	X
Release		X	X	X	X	X
Smolt Abundance	X	X	X	X	X	X
Carcass Recoveries	X	X	X	X	X	X
Redd Surveys	X	X	X	X	X	X
Run Composition/Genetics Evaluations	X	X	X	X	X	X

5.13.4 Sockeye Salmon Program Background

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

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agreement is in effect through 2021 at which time an evaluation by the respective committees with provide future program direction.

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 35.

5.13.5 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.

5.13.6 Facilities

Construction of the 25,000 square foot 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. Grant PUD approved the asset management plan drafted by ONA that will be used to troubleshoot, maintain, and repair/replace parts and equipment. 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. The laboratory has the capability to test for fish health, disease, biometrics, and ageing.

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Table 35 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
2017	2,918,500	$0	$1,093,849	$1,093,849
2018	806,864	$0	$1,091,104	$1,091,104
Mean	681,499			
Totals	9,540,987	**$4,832,735**	**$9,801,922**	**$14,634,657**

*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.

5.13.7 Operations and Maintenance

A total of 1,222,506 sockeye fry were released from the Penticton Hatchery in 2018 using three distinct thermal marks with the objective of evaluating release strategies by month. With a large number of predators in Skaha Lake, it is still unknown if releasing fish earlier in the year will result in higher survival rates than the traditional May release period. A better than predicted return of adult sockeye escaped to the Okanagan River in 2018, allowing the ONA staff to collect 2,225 females for spawning, resulting in an egg take of 4,148,460 for the 2018 brood year. The eggs will be shocked, picked, and thermally marked in order to differentiate between hatchery and natural-origin populations. ONA will continue thermally marking three distinct groups and releasing fish over three different time periods into Skaha Lake. Generally, these fish spend a year rearing before smolting the following spring.

The 12-year reintroduction program concluded with the 2016 broodyear smolt outmigration and final evaluation. Broodyear 2018 shifted into a hatchery production phase as a result of no outstanding issues or risks identified with the reintroduction program.

5.13.8 Monitoring and Evaluation

The monitoring and evaluation plan originally designed for the program continued to be implemented (Table 36). Objectives investigated in 2018 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. Significant monitoring activities such as in-lake sampling, population estimates,

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densities, and survival, growth rates all are incorporated into the comprehensive M&E plan carried out by ONA. In an ongoing effort to better understand survival rates, juvenile sockeye are also being collected and tagged prior to emigration from Skaha Lake.

Table 36 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	2017	2018
Brood collection	X	X	X	X	X	X	X	X	X		X	X	X	X	X
Spawning	X	X	X	X	X	X	X	X	X		X	X	X	X	X
Tagging	X	X	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	X	X
Smolt abundance	X	X	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	X	X
Redd surveys	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

5.14 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. In 2007, 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. In 2018, Grant PUD entered into a new 15-year funding agreement with the Yakama Nation for continued O&M and M&E of the reintroduction program. This $13,955,992.00 million agreement is for the period 2018 – 2033. The PRCC HSC agreed in SOA 2018-01 that through this funding agreement Grant PUD is fulfilling its coho mitigation obligation.

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.

5.14.1 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.

5.14.2 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.

5.14.3 Operations and Maintenance

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

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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, 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 37.

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Table 37 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
2017	912,974	$729,641
2018	1,312,566	$762,217
Mean	1,352,850	
TOTAL	**16,234,198**	**$6,787,267**

*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.

5.14.4 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 38.

Table 38 Monitoring and evaluation activities for Wenatchee and Methow coho salmon that are partially funded by Grant PUD.

Activity	2005	2006 - 2017	2018
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

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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 six meetings and four conference calls were held by the PRCC Habitat Subcommittee members during calendar year 2018 (Table 39). Agendas and meeting minutes are available at Grant PUD's website.

Table 39 Priest Rapids Coordinating Committee Habitat Subcommittee 2018 meetings.

PRCC Habitat	January 11, 2018	Meeting
PRCC Habitat	February 8, 2018	Meeting
PRCC Habitat	March 6, 2018	Meeting
PRCC Habitat	April 12, 2018	Meeting
PRCC Habitat	May 23, 2018	Meeting
PRCC Habitat	June 14, 2018	Meeting
PRCC Habitat	July 12, 2018	Meeting
PRCC Habitat	September 13, 2018	Field Trip
PRCC Habitat	September 18, 2018	Conference Call
PRCC Habitat	October 11, 2018	Meeting
PRCC Habitat	December 13, 2018	Meeting

Since 2006, 103 total projects have been unanimously approved by one of two committees for funding using one of the three funding accounts: 601-NNI Fund, 602-Habitat Supplemental Fund, and 603-Habitat Conservation Fund. Of those, 61 are completed and 42 are currently active and underway. As of the end of December 2018, $24,058,138 dollars have been spent on committee-approved projects since 2006. The total number of dollars to be used for habitat projects approved by the PRCC and/or PRCCHSC is $27,308,003. The Figure 10 below shows a breakdown of the type of different projects that have been committee-approved, that are either completed or still ongoing.

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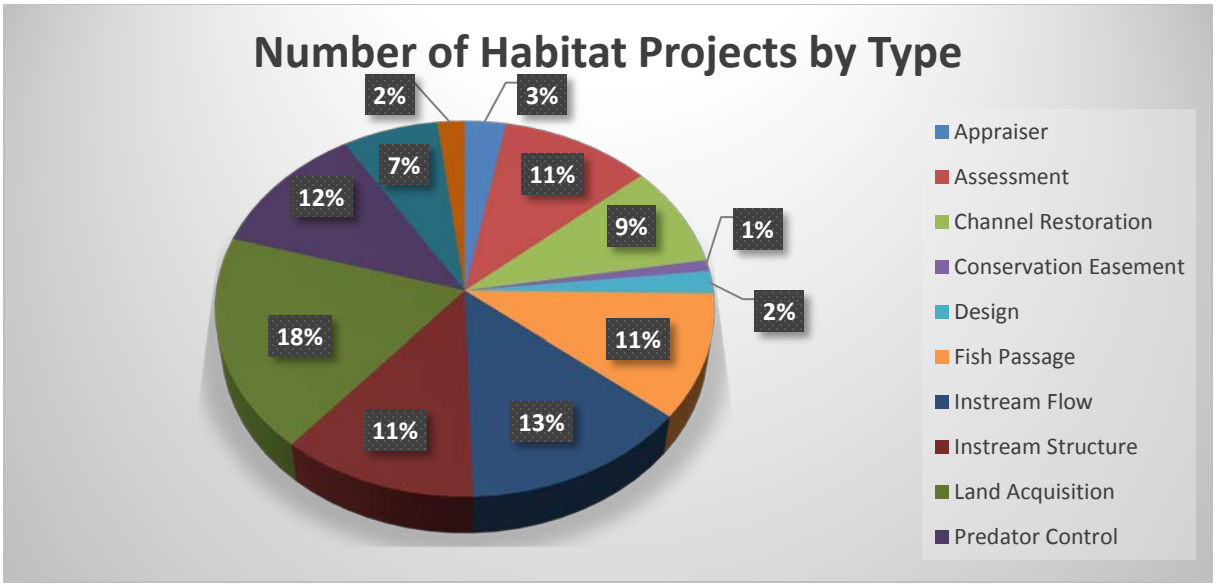

Figure 10 The total number of projects (categorized by type) that have been approved by the committee since 2006.

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 40). The 2018 annual contribution made into the NNI account was $573,323.50. The 2018 annual deposit into the Habitat Supplemental was 1,127,731.59, while the contribution into the Habitat BiOP fund was 402,851.02. The total expenditures spent on habitat projects in 2018 for the three funding accounts was $1,753,669.

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Table 40 Priest Rapids Coordinating Committee Habitat account balances and expenditures as of December 31, 2018.

Account	Beginning Balance	Expenditures	Unencumbered Balance
No Net Impact Fund	$6,030,094	$726,339.81	$5,024,196
Habitat Supplemental Fund	$6,182,689	$954,412.25	$5,011,684
Habitat Fund (BiOp)	$2,348,268	$72,917.13	$1,719,021
Total	**$14,561,051**	**$1,753,669**	**$11,754,901**

7.0 Consultation

Grant PUD distributed a draft of the 2018 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 1, 2019.

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 directly within the report. All the comments received by the USFWS were editorial in nature.

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