The Hanford Reach Fall Chinook Salmon Protection Program Report for the 2024– 2025 Protection Season

Prepared for:

Priest Rapids Coordinating Committee
Hanford Reach Working Group
and
Signatories to the Hanford Reach Fall Chinook Protection Program Agreement

To fulfill the requirements of:
Section 401(a)(5) of the Public Utility District No. 2 of Grant County, Washington's FERC Operating License
Section 6.2(1) of Public Utility District No. 2 of Grant County, Washington Water Quality Certification
Section C.6(c) of the Hanford Reach Fall Chinook Protection Program Agreement

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Executive Summary

This report details the annual implementation of the Hanford Reach Fall Chinook Flow Protection Program Agreement (HRFCPPA). The HRFCPPA establishes the obligations of the signatories to the protection of fall Chinook Salmon in the Hanford Reach by managing discharge into the Hanford Reach of the Columbia River.

The 2024-2025 flow protection program began on October 15, 2024 with the implementation of reverse load factoring. Redd surveys on Vernita Bar were conducted on October 20, October 27, November 3, and November 24. A peak count of 140 redds was observed on November 24. The 16th highest redd was in the 60-65 kcfs elevation zone, establishing the Critical Elevation for the 2024 – 2025 season at 65 kcfs[1].

For brood year 2024, river temperatures were above average throughout much of the Protection Program. Temperatures briefly dipped below average in February, during the Hatch Period, but otherwise tracked near or above the average for the duration of the Protection Program. Together, the temperatures from 2024 - 2025 resulted in a later than average start for the Initiation of Spawning and End of Spawning, later than normal timing of the beginning of Hatch, and earlier than average dates for Emergence and the end of the Protection period. Hatch in the 36–50 kcfs zone and the above 50 kcfs zone occurred on December 11, 2024. Emergence in the 36–50 kcfs elevation zone and above 50 kcfs zone occurred on March 10, 2025. Flows at the USGS Gage 12472800 below Priest Rapids Dam were maintained above the required Protection Level Flow throughout the Protection Periods.

Discharge was below average during the Emergence and Rearing Periods. At times, inflows to the Project were below the Protection Level Flow, presenting challenges for operating within the bounds of the Agreement. However, during this time, flows were maintained above the Protection Level Flow with little flow fluctuations.

The 2025 weekend-minimum discharge constraints began on the weekend of April 5 and continued through the weekend of April 26. The minimum constraint was met on all four of the Chief Joseph Accumulated Deficiency (CJAD II) weekends. On Sunday, May 18, during the Rearing Period, the flow from Priest Rapids Dam reduced from the daily lower target of 103 kcfs to 67 kcfs at average rate of 2.3 kcfs per hour starting around 08:00 until 02:00 on Monday, May 19. Flows increased to normal in the early morning hours of May 19. This flow exceedance was a result of lower than expected discharge from Rock Island Dam. Grant PUD managed the rate of reduction in flow on May 18 to reduce the likelihood of impacting juvenile fall Chinook Salmon.

Operations to protect the 2024 brood year of fall Chinook Salmon in the Hanford Reach were highly successful. Discharge from Priest Rapids Dam was consistently maintained above the Protection Level Flow. Eighty-three of 84 daily fluctuation constraints were met within the bounds of Adaptive Management, and the single unintentional exceedance was managed to reduce the likelihood of impacting fall Chinook Salmon. 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.

[1] If there are fewer than 15 redds above the 65 kcfs elevation, then the Critical Elevation will be the first 5 kcfs elevation above the elevation containing the 16th highest redd within the survey area on Vernita Bar.

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Disclaimer

This report is provided as an annual update on the implementation of the Hanford Reach Fall Chinook Protection Program Agreement. All data are provisional and subject to change as new data and analyses become available. Readers are cautioned to use data at their own risk and should consult the most current report to obtain the most current and accurate information.

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1.0 Introduction

The dams located upstream of the Hanford Reach of the Columbia River have the potential to influence the fall Chinook Salmon (*Oncorhynchus tshawytscha*) population that spawn in the Hanford Reach. The main mechanisms that could influence this population are management of flows associated with hydropower production. Priest Rapids Dam, at the upstream end of the Hanford Reach, is part of the seven-dam hydroelectric complex on the mid-Columbia River that includes Wanapum, Rock Island, Rocky Reach, Wells, Chief Joseph, and Grand Coulee dams. This seven-dam complex is operated under a load following strategy to meet electrical demand in the Pacific Northwest. Load following refers to a power production strategy that adjusts power output as demand for electricity fluctuates throughout the day. Hydropower generation through these projects largely governs stream flow in the Hanford Reach.

The mid-Columbia projects are part of the larger Columbia River hydropower system and are operated under the terms of an international treaty and other agreements that affect river flows and natural resources. These include the Columbia River Treaty between the United States and Canada, the Pacific Northwest Coordination Agreement, and the Hanford Reach Fall Chinook Protection Program Agreement (HRFCPPA). The HRFCPPA contains constraints on dam operations designed to provide protection for fall Chinook Salmon that spawn and rear in the Hanford Reach of the Columbia River. This report describes the implementation of the HRFCPPA for the 2024–2025 season.

The Hanford Reach is located on the Columbia River in southeast Washington State. The Reach extends from Priest Rapids Dam (river kilometer [Rkm] 639) to the head of McNary Pool (Rkm 557), approximately 82 km below the Priest Rapids Project Boundary near Richland, Washington (Figure 1). On June 9, 2000, Presidential Proclamation 7319 established the 78,900 hectare (195,000 acre) Hanford Reach National Monument, which includes the Columbia River. The monument boundary is about 3 miles downstream of Priest Rapids Dam. This designation continues the protection of the Hanford Site and Reach that began during World War II when the Hanford Nuclear Reservation was established to produce nuclear weapons. The U.S. Fish and Wildlife Service (USFWS) co-manages the monument under existing agreements with the Department of Energy.

The Hanford Reach is the most productive mainstem spawning area for fall Chinook Salmon in the entire Columbia River basin and supports the largest spawning population of fall Chinook Salmon in the Pacific Northwest (Huntington et al. 1996; Dauble and Watson 1997; Harnish et al. 2012; Langshaw et al. 2017; Harnish and Hoffarth 2022). This productivity is particularly significant considering most of the formerly large, naturally spawning anadromous fish populations of the Columbia River Basin have drastically declined.

Before the construction of major dams and water storage projects, Columbia River discharge at PRD was lowest during the winter (Niehus et al. 2012). Snowmelt increased flows in the spring and early summer, and peak flows normally occurred in June. Discharge then decreased through the fall and into the winter. Little daily or hourly fluctuation in discharge likely occurred under pre-dam conditions. Completion of the Columbia River hydropower and flood control system has altered the annual hydrograph by reducing peak spring flows, increasing average minimum flows, and shifting the period of lowest flow from winter to autumn (Niehus et al. 2012; Langshaw et al. 2017).

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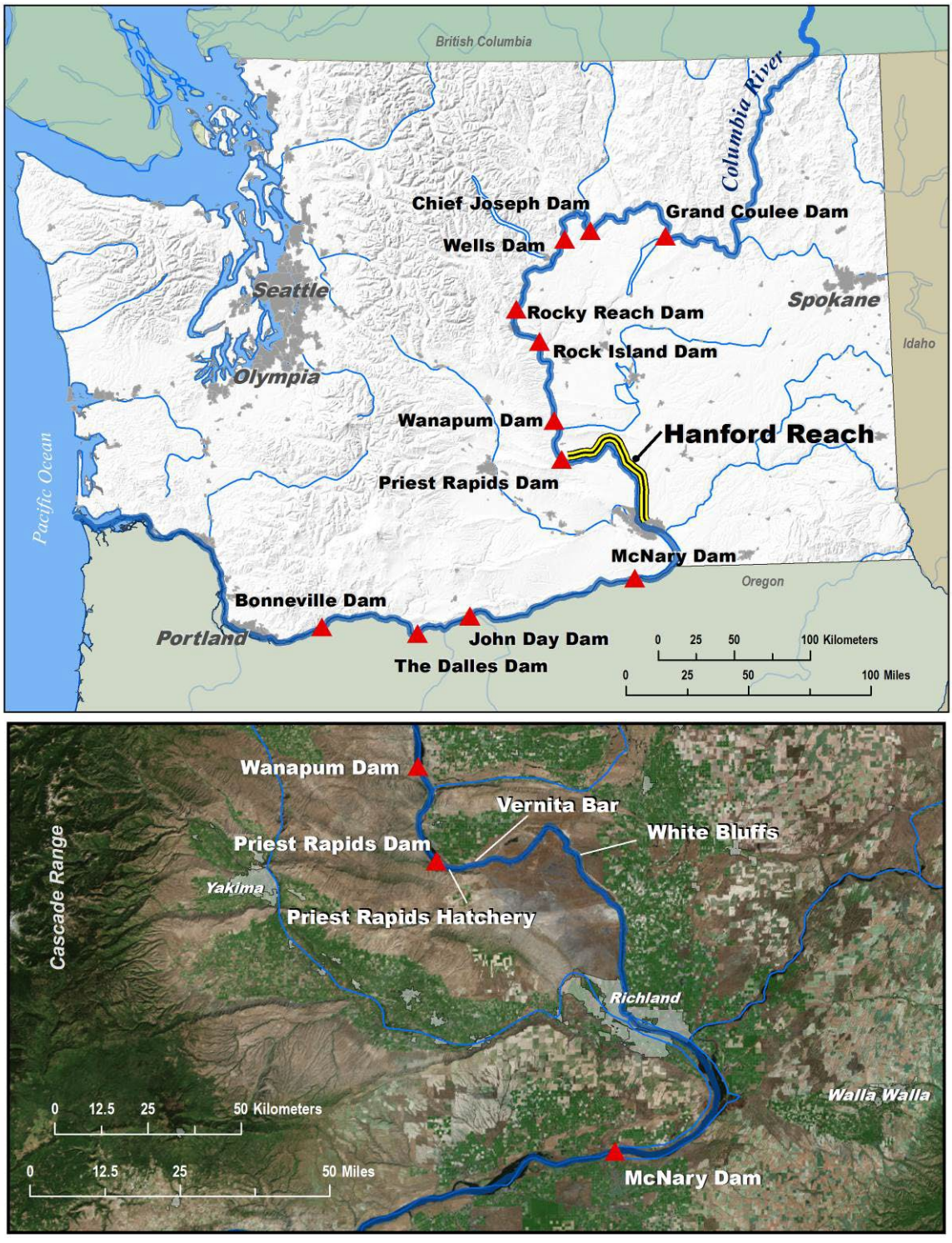

Figure 1 **The location and landmarks of the Hanford Reach within the Columbia River (Washington State, USA). The Hanford Reach is located between Priest Rapids Dam and the head of the McNary Dam pool near the city of Richland.**

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Operation of the mid-Columbia River projects to meet power demand (load following) results in large hourly and daily fluctuations in discharge, which can lead to dewatering of redds and stranding or entrapment of juvenile fall Chinook Salmon in the Hanford Reach. Observations of dewatered redds motivated efforts to develop an operating agreement to reduce the impacts of flow fluctuations on fall Chinook Salmon spawning and egg incubation. In 1988, the Vernita Bar Settlement Agreement (VBSA) was signed by the power-producing entities, fishery agencies (with the exception of the USFWS), and Native American tribes. The VBSA was the first major formal operation to "protect" fall Chinook Salmon that spawn in the Hanford Reach.

2.0 Hanford Reach Fall Chinook Protection Program

The Vernita Bar Settlement Agreement was approved by Federal Energy Regulatory Commission (FERC) Order issued December 9, 1988 and established obligations and procedures for the protection of fall Chinook Salmon at Vernita Bar. The primary objective was to minimize fall Chinook Salmon spawning above the water elevation occurring at a flow of 1,982 m^3/sec (70 kcfs) at Vernita Bar, which is the first major spawning area downstream of PRD (Figure 2). Discharge is manipulated by using reverse load factoring (RLF) at the Priest Rapids Project. Reverse load factoring flips the typical load following flow regime; rather than peak during the day when electrical demand is high, RLF requires that daytime discharge from Priest Rapids Dam remain at moderate levels and stable (i.e., 55–70 kcfs) while allowing for high flows, or peaking, at night.

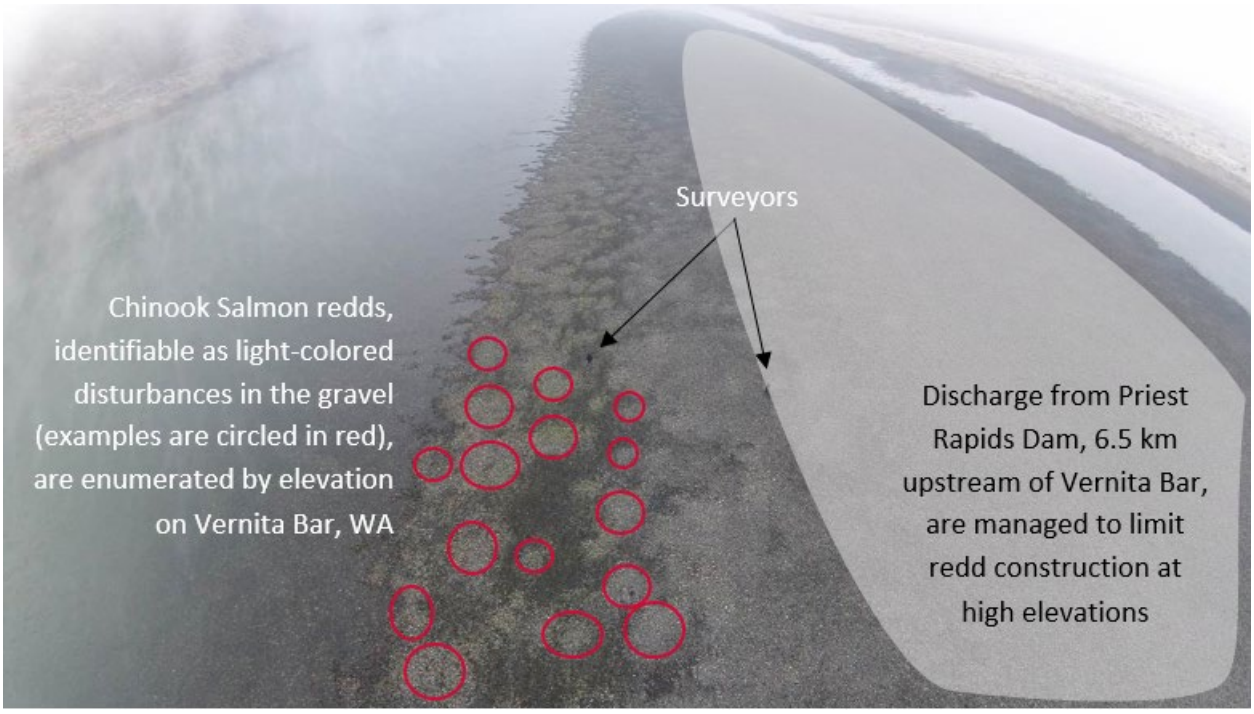

Figure 2 **Vernita Bar downstream of Priest Rapids Dam during a redd survey. Near the end of the spawning period, river flows are temporarily reduced to allow biologists to determine the elevation of redds. Using these data, flows are managed to ensure the vast majority of redds remain underwater until juveniles emerge from the gravel. Photograph by Aaron Nepean, Cutboard Studios.**

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The VBSA provided protection for incubating fall Chinook Salmon in the Hanford Reach by maintaining sufficient discharge from PRD to prevent desiccation of eggs and hatching fry, but it did not provide protection for, or enhance survival of, emergent and rearing fry. In 1998, the Washington Department of Fish and Wildlife (WDFW) and the joint fishery managers recommended that operations at PRD create no fluctuations, and/or, steadily increase flows on the Hanford Reach of the Columbia River throughout the juvenile fall Chinook Salmon emergence and rearing period. This recommendation was provided to the power managers, but analyses indicated that stable flows and ramping-rate constraints were not feasible. An interim protection program was proposed to meet the following criteria: 1) substantially more protection for juvenile fall Chinook Salmon fry than occurred before1998, 2) preservation of some opportunity for load-following/power peaking operations, 3) allow system-coordinated river operations, 4) provide ability to monitor and evaluate in-season and adaptively manage operations to reduce stranding and entrapment. This led to the development of the Interim Hanford Fall Chinook Protection Plan (IHFCPP) in 1999, which was implemented on a trial basis in an attempt to safeguard rearing juvenile fall Chinook Salmon in the Hanford Reach. The IHFCPP set operational constraints on flow fluctuations in the Hanford Reach during the fall Chinook Salmon Emergence and Rearing periods. Managing flow fluctuations in the Hanford Reach required the coordination of the seven dams upstream from Priest Rapids Dam to Grand Coulee Dam. From 1999 to 2003, the Hanford Reach Stranding Policy Group met annually to develop and refine an interim plan to protect emergent and rearing juvenile fall Chinook Salmon in the Hanford Reach.

Refinements to the IHFCPP led to development and implementation of the Hanford Reach Fall Chinook Protection Program Agreement (HRFCPPA; Appendix A). The HRFCPPA contains provisions for measures that meet or exceed all protection measures covered under the original VBSA and additional provisions to improve survival of juvenile fall Chinook Salmon after emergence. Parties to the Agreement include Grant PUD, Public Utility District No. 1 of Chelan County (Chelan PUD), Public Utility District No. 1 of Douglas County (Douglas PUD), Bonneville Power Association (BPA), NOAA Fisheries, WDFW, USFWS, Confederated Tribes and Bands of the Yakama Nation, and the Confederated Tribes of the Colville Indian Reservation.

The Department of Ecology 401 Certification associated with a new FERC license for the Priest Rapids Project required the Fall Chinook Working Group (FCWG) to evaluate the performance of the HRFCPPA (Sections 6.3(4), 6.3(5), and 6.3(7) of the 401 Certification). The FCWG had broad participation from federal, state, county, and tribal entities in assessing the program. After additional studies, analyses, and comprehensive review of the HRFCPPA, no changes to the program were recommended by the FCWG to the Department of Ecology (Langshaw et al. 2015).

Section C.6(c) of the HRFCPPA requires annual reporting of activities related to the HRFCCPA including 1) Vernita Bar redd counts, 2) dates on which the Hatching, Emergence, and End of Emergence and End of Rearing Periods occur, 3) a record of Columbia River flows through the Hanford Reach based on Priest Rapids discharges, and 4) a description of the actual flow regimes from Initiation of Spawning through the Rearing Period based on the availability of data. This requirement was incorporated in the Grant PUD's FERC license under section 401(a)(5) and Water Quality Certification under section 6.2(1). The following report is intended to meet these reporting requirements.

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2.1 Adaptive Management of the Hanford Reach Fall Chinook Protection Plan

The FCWG has considered and approved proposals from Grant PUD to adaptively manage operations of Priest Rapids Dam to minimize risks to fall Chinook Salmon that have resulted from changing conditions. In October 2021, Grant PUD proposed to reduce the daytime flow target during Reverse Load Factoring from 55-70 kcfs to 50-65 kcfs and in October 2023, proposed a further reduction in the daytime flow target to 40-55 kcfs. Grant PUD proposed the changes in response to low inflows to the Project in October, which caused challenges maintaining Reverse Load Factoring. By reducing the daytime flow target, Grant PUD was able to maintain low daytime flows, serving the purpose of the Agreement to prevent fish from spawning at higher flow elevations. Inflows to the Project increased in November when the BPA required additional flow to support Chum Salmon spawning below Bonneville Dam.

In April 2022, the FCWG agreed that Grant PUD would test operations to slow flow transitions between days and acknowledged that this could require exceeding daily flow band limitations described in the Agreement. This provided Grant PUD with flexibility to intentionally exceed daily flow bands when conditions were warranted. Slowing the flow transitions between days reduced the risk of stranding or entrapment of juvenile fall Chinook Salmon. Another example of a warranted intentional exceedance occurred when inflows, measured at Rock Island Dam, were much more variable than outflows measured at Priest Rapids Dam. This generally occurred in March and April, leading to challenges meeting the daily flow band limitations. Grant PUD consistently met the minimum flow constraints but to do so, exceeded daily flow band limitations on occasion, generally in an upwards direction. It was preferable to increase flows when it was not possible to stay within the daily flow band limitations. These occasional exceedances were consistent with the purpose of the Agreement to reduce risks of stranding and entrapment of juvenile fall Chinook Salmon.

3.0 Biological Monitoring of Hanford Reach Fall Chinook Salmon

Grant PUD produces and releases 5.4-5.6 million subyearling fall Chinook Salmon smolts from Priest Rapids Hatchery (PRH) as part of its mitigation for the construction and operation of Priest Rapids and Wanapum dams. The Washington Department of Fish & Wildlife operates PRH which is owned, maintained, and funded by the Grant PUD. In addition to the production and release of subyearling fall Chinook Salmon into the Hanford Reach, Grant PUD funds a hatchery monitoring and evaluation program (M&E program). The M&E program associated with PRH is intended to evaluate the performance of the program in meeting hatchery and natural production goals (Richards and Pearsons 2023; Pearsons 2022). A cooperative effort between Grant PUD, Douglas PUD, Chelan PUD, and WDFW has resulted in an updated Monitoring and Evaluation Plan for PUD Hatchery Programs (Hillman et al. 2019). This document provides guiding principles and approaches for the monitoring and evaluation (M&E) of PRH. Objectives, hypotheses, measured and derived variables, and field methods that will be used to collect data are listed in this document.

The PRH M&E program produces an annual report that reports on both monitoring within the hatchery as well as monitoring of the fall Chinook Salmon population in the Hanford Reach (Richards and Pearsons 2023). In addition, a comprehensive report is written every ten years (Pearsons 2022). Readers interested in either the PRH or biological monitoring of the fall

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Chinook Salmon population in the Hanford Reach should refer to the most recent PRH M&E program annual or comprehensive report.

4.0 Redd Surveys and Egg Development

4.1 Vernita Bar Surveys

The Hanford Reach Fall Chinook Protection Program establishes a Monitoring Team[2] to determine the Initiation of Spawning, End of Spawning, and Critical Elevation. Critical Elevation is the elevation on Vernita Bar (Figure 2) at which Protection Level Flows must be maintained during the Post Hatch and Emergence Periods. The Critical Elevation is determined annually as follows:

(a) The Monitoring Team will survey redds on Vernita Bar in the specified area (Exhibit A) for the purpose of determining the Initiation of Spawning, the location of redds, and the extent of spawning. The Monitoring Team will also provide a concurrent aerial survey of the Hanford Reach on the same weekend(s). The aerial survey(s) will be utilized to determine if Initiation of Spawning in areas of the Hanford Reach below the 36 kcfs level and/or outside the area specified occurs prior to Initiation of Spawning set on Vernita Bar. Once an Initiation of Spawning date has been determined, based upon the presence of 5 or more redds in an individual survey, the aerial surveys may be discontinued for that year. The surveys will be conducted on weekends beginning on the weekend prior to October 15 of each year.

(b) The Monitoring Team will perform a final redd survey the weekend prior to Thanksgiving to determine the Critical Elevation. The Monitoring Team may also make a supplemental redd survey the weekend after Thanksgiving to determine if additional redds are present above the 50 kcfs elevation. A preliminary estimate of the Critical Elevation will be made following the final redd survey and will be confirmed or adjusted based on the supplemental survey. The Critical Elevation will be set as follows: (Elevations must be in 5 kcfs increments beginning at the 40 kcfs elevation.)

> If 31 or more redds are located above the 65 kcfs elevation, the Critical Elevation will be the 70 kcfs elevation.
>
> If there are 15 to 30 redds above the 65 kcfs elevation, the Critical Elevation will be the 65 kcfs elevation.
>
> If there are fewer than 15 redds above the 65 kcfs elevation, then the Critical Elevation will be the first 5 kcfs elevation above the elevation containing the 16th highest redd within the survey area on Vernita Bar.

(c) Additional activities of the Monitoring Team will include calculation of temperature units, determination of the dates of Initiation of Spawning, Hatching, Emergence, the end of the Emergence Period, and the end of the Rearing Period. The Monitoring Team may also make non-binding recommendations to any of the Parties to this Agreement, including non-binding recommendations to protect redds above the Critical Elevation or to address special circumstances.

[2] Monitoring Team - a group of three individuals composed of one fishery biologist designated by each of the following: (1) Grant PUD; (2) Washington Department of Fish and Wildlife; and (3) a signatory fishery agency or tribe.

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Under the Vernita Bar Settlement Agreement, redd counts were limited to areas on Vernita Bar that could be surveyed from the ground. The HRFCCPA expanded the survey area for establishing the Initiation of Spawning and could include aerial surveys of the mainstem river adjacent to Vernita Bar. The Hanford Reach Working Group (HRWG) adopted SOA_2007_HR04, "Protocol for the setting the Initiation of Spawning" on August 17, 2007 (Appendix B). This Agreement stipulates that aerial or ground survey(s) may be utilized to set the Initiation of Spawning. If the presence of 5 or more redds is observed in an individual survey within Exhibit A by either ground surveys or aerial surveys, the Initiation of Spawning shall be established as the Wednesday immediately prior to that survey. The HRWG agreed that Exhibit A shall be understood to include those shoreline spawning areas both upstream and downstream of Vernita Bar, including both Vernita Bar and Columbia River shorelines, within the geographic area shown approximately in Exhibit A of the HRFCPPA.

In accordance with the HRFCPPA, the first spawning ground survey for redds on Vernita Bar was to be conducted the Sunday prior to October 15th. A modification was proposed (SOA_2010_HR01; Appendix B) and approved by the HRWG, which moved the start date to the first Sunday after October 15.

In 2024, redd surveys on Vernita Bar were conducted on October 20, October 27, November 3, and November 24 (Table 1). No redds were found on October 20 or October 27. On November 3, 25 completed redds were observed below the 50 kcfs elevation and 8 completed redds were observed above the 50 kcfs elevation. These results established the Initiation of Spawning Date for both the below and above 50 kcfs elevation as October 31, 2024.

On November 24, the fourth and final survey was conducted on Vernita Bar. A total of 140 redds were observed. The 16th highest elevation redd was in the 60-65 kcfs elevation zone, establishing the Critical Elevation for the 2024 – 2025 season at 65 kcfs. The Monitoring Team consisted of representatives from WDFW and Grant PUD. During the November 24 survey, flows from Priest Rapids Dam at Vernita Bar were approximately 44.5 kcfs. During the November 24 survey the Monitoring Team agreed that the spawning season had ended, and that November 24 be identified as the End of Spawning date.

Table 1 Summary of redd counts from ground surveys, 2024.

Date	Redd Count by Flow Level (kcfs)						Total
	36–50	50 – 55	55 – 60	60 – 65	65 – 70	Above 70	
Oct-20	0	0	0	0	0	0	0
Oct 27	0	0	0	0	0	0	0
Nov-3	25	4	3	0	0	0	32
Nov-24	--	77	39	16	5	3	140
Peak	**--**	**77**	**39**	**16**	**5**	**3**	**140**

A total of 140 redds were counted above 50 kcfs elevation on Vernita Bar during the final spawning ground survey which was less than the mean observed under the VBSA and HRFCPPA (i.e., 235; Figure 3)

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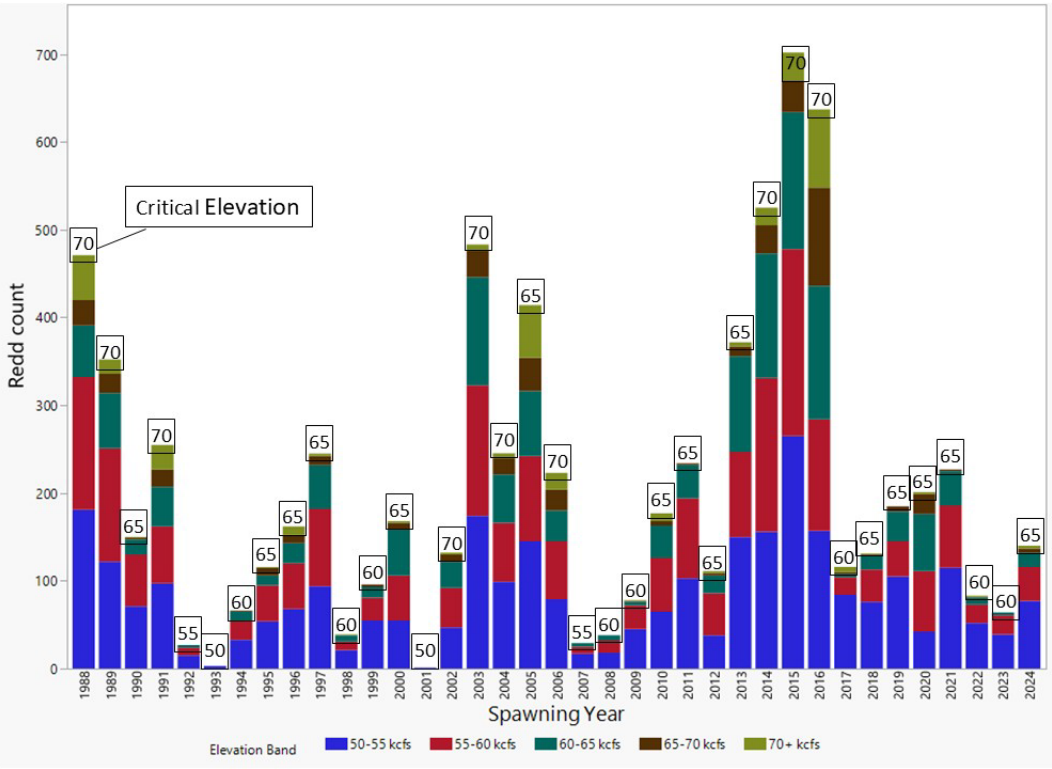

Figure 3 **Final redd abundance and distribution from ground surveys on Vernita Bar, 1988-2024. Final redd count are not consistently conducted in the 36-50 kcfs zone and are not included in this figure. The Critical Elevation for each year is listed above the bars.**

Since 1988, the abundance and distribution of redds within the ground survey area on Vernita Bar has been highly variable (Figure 3 and Appendix E). Redd abundance on Vernita Bar is correlated positively with Hanford Reach adult escapement (Figure 4). The 2013 – 2016 adult returns provided a unique opportunity to observe redd construction and site selection at unprecedented levels of escapement (Figure 4). Escapements of this size provided an opportunity to potentially identify the spatial capacity of redd construction within the survey area at Vernita Bar. In 2024, the relationship between adult escapement and redds counted on Vernita Bar was consistent with previous years (Figure 4).

Redd abundance and the elevational distribution of redds was correlated positively with escapement, particularly at the lower elevational bands (Figure 5). The relatively flat-sloped relationship between redd counts and escapement at the 65–70 kcfs and 70+ kcfs elevational bands suggest that reverse load factoring has been effective at limiting redd construction above the 65k elevation, even at the highest escapements (Figure 5).

The annual Critical Elevation, which is set by the elevational distribution of redds on Vernita Bar, was correlated positively with both escapement and discharge during peak spawning (Figure 6).

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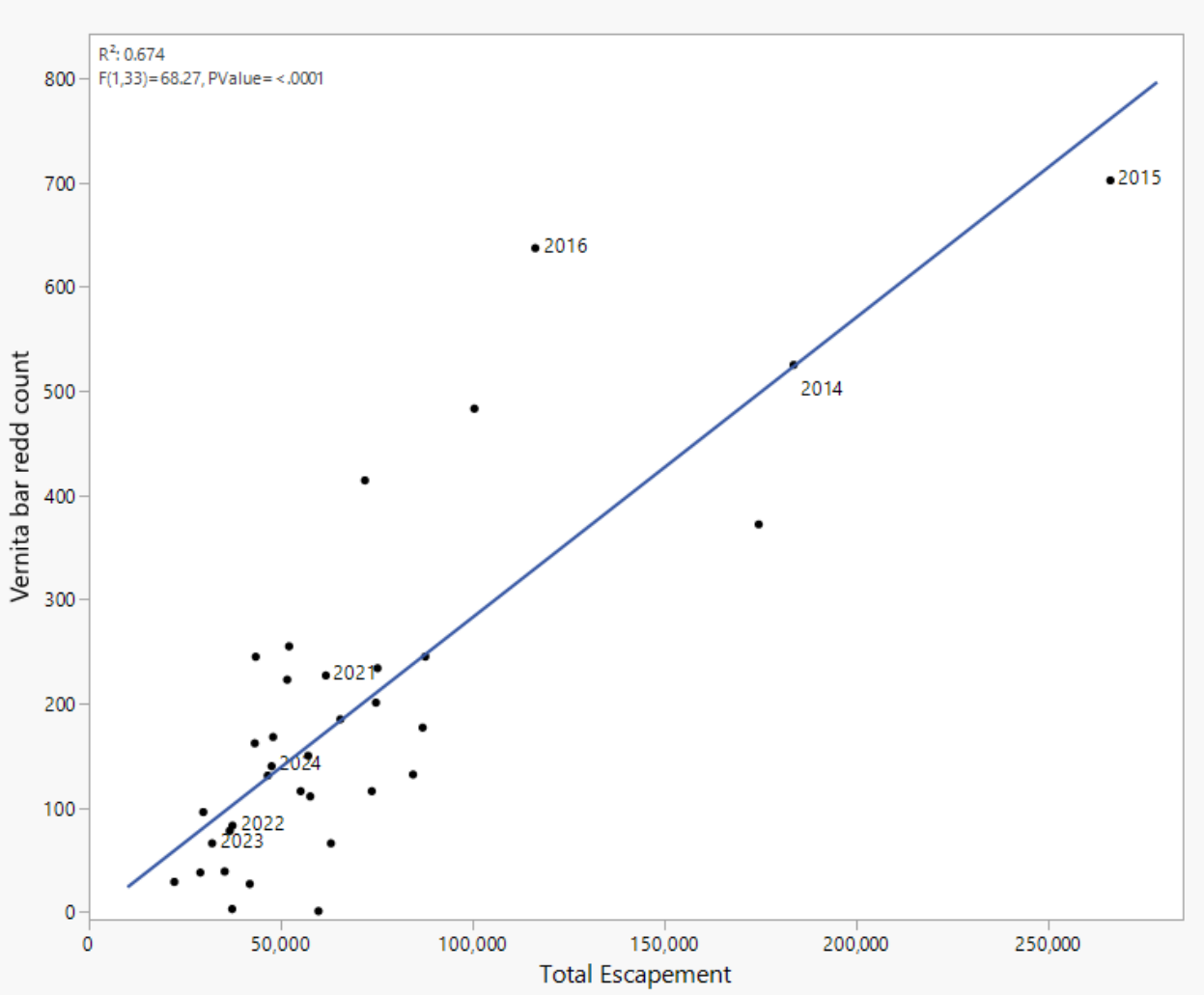

Figure 4 **Relationship between Hanford Reach adult escapement and redds above the 50 kcfs elevation observed during the Vernita Bar spawning surveys (1988–2024).**

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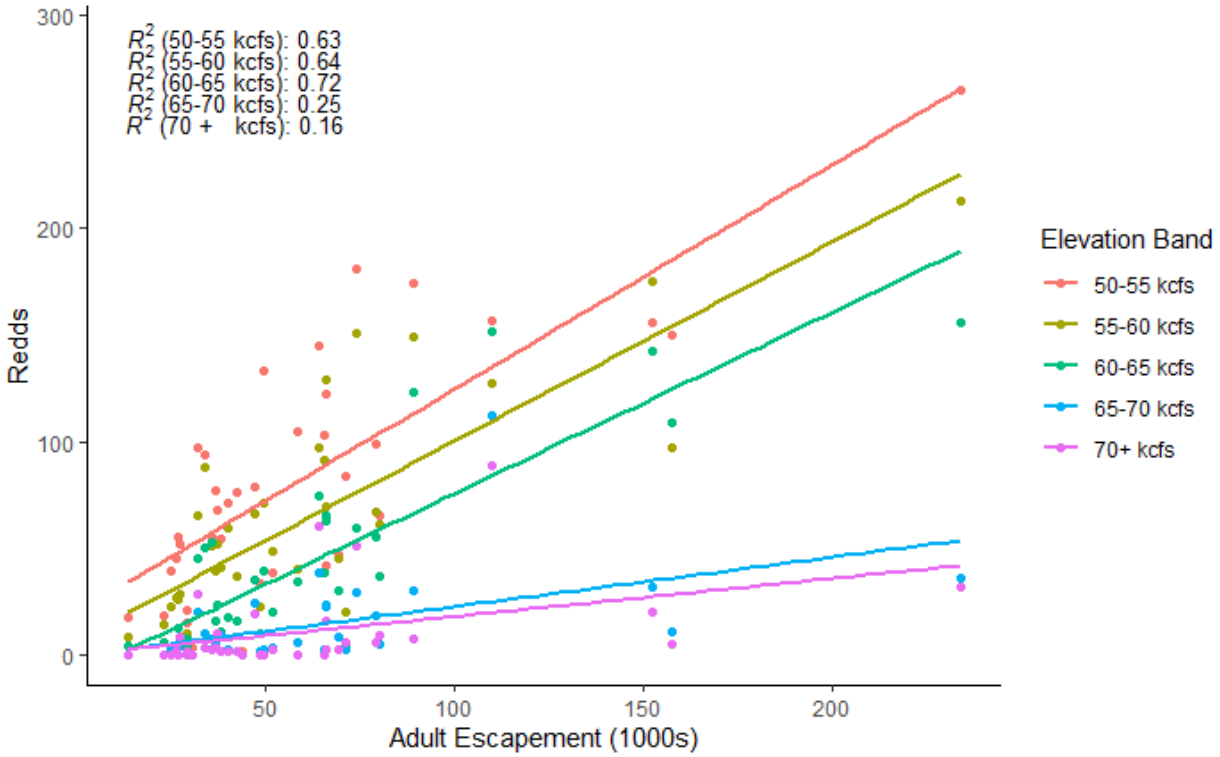

Figure 5 **Relationship between Hanford Reach escapement and redd counts on Vernita Bar by kcfs elevation bands (1988–2024).**

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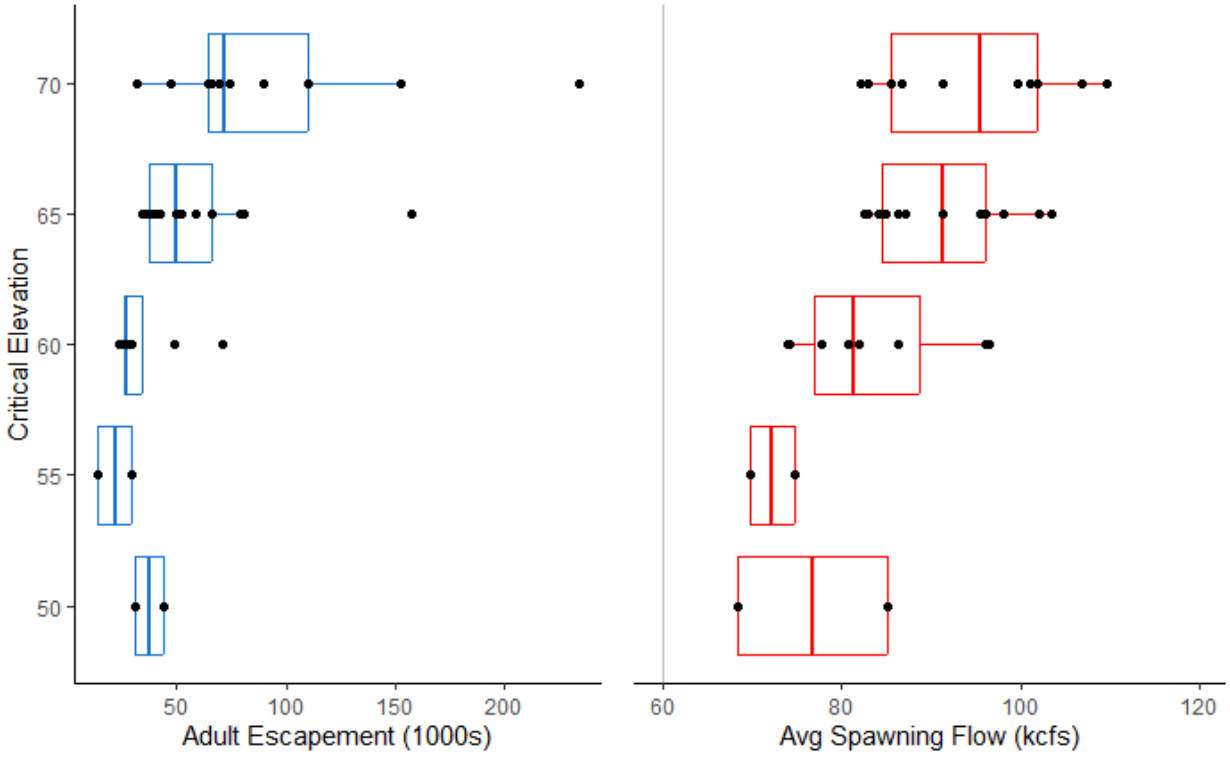

Figure 6 **Relationship between Hanford Reach adult escapement and the Critical Elevation (left) and Priest Rapids Dam average discharge during peak spawning and Critical Elevation (right) (1988–2024).**

4.2 Implementation Timing and Operations

Embryonic development and growth of fall Chinook Salmon is highly dependent on water temperature. Accumulated temperature units (ATU) can be used to predict the rate of development (i.e., hatching and emergence timing) of fall Chinook Salmon in the Hanford Reach. Fall Chinook Salmon reach eyed stage at approximately 250 ATU after spawning, hatch at approximately 500 ATU, and emerge at approximately 1,000 ATU. The VBSA used these ATU milestones to determine when Emergence Period protections would end. In addition to emergence timing, ATUs can be used to predict susceptibility of fall Chinook Salmon to stranding and entrapment. The HRFCPPA extended the ATU milestones beyond emergence to include protections during the Rearing Period. Based on data from the eight years of evaluation and monitoring, juvenile fall Chinook Salmon susceptibility to stranding and entrapment appears to decrease substantially by 1400 ATU after the end of spawning (Hoffarth 2006).

Under the Interim Hanford Fall Chinook Protection Plan, Rearing Period protections would begin when more than 50 fall Chinook Salmon fry were collected by beach seine from six designated shoreline locations in the Hanford Reach. This proved to be an unreliable and unpredictable indicator for the start of protections because hourly changes in discharge from Priest Rapids Dam can greatly alter the abundance and location of fall Chinook Salmon fry in near-shore areas of the Hanford Reach. Monitoring ATU to estimate emergence timing proved to be reliable and accurate. Fall Chinook Salmon fry were captured prior to the estimated start of emergence during more than five years of monitoring, but abundance was relatively low at

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roughly one percent of the total production (range 0–2.0%; Hoffarth 2003, Hoffarth et al. 2012). In addition to reliability and accuracy, the ATU milestones in the HRFCPPA provide predictable dates that can be used to coordinate activities between agencies and hydroelectric projects.

For brood year 2024, river temperatures were above average throughout much of the Protection Program. Temperatures briefly dipped below average in February, during the Hatch Period, but otherwise tracked near or above average for the duration of the Protection Program. Together, the temperatures from 2024 - 2025 resulted in a later than average start for the Initiation of Spawning and End of Spawning, later than normal timing of the beginning of Hatch, and earlier than average dates for Emergence and the end of the Protection period (Figure 7, Figure 8, Figure 9, and Appendix F). Project operational constraints intended to reduce mortality during the Emergence and Rearing periods were in effect for 84 days in 2025 (March 10 – June 2). Project operational constraints established by the IHFCPP and HRFCPPA to reduce mortality during the Emergence and Rearing periods have been in effect for a period of 71 to 115 days annually since the inception of the IHFCPP in 1999.

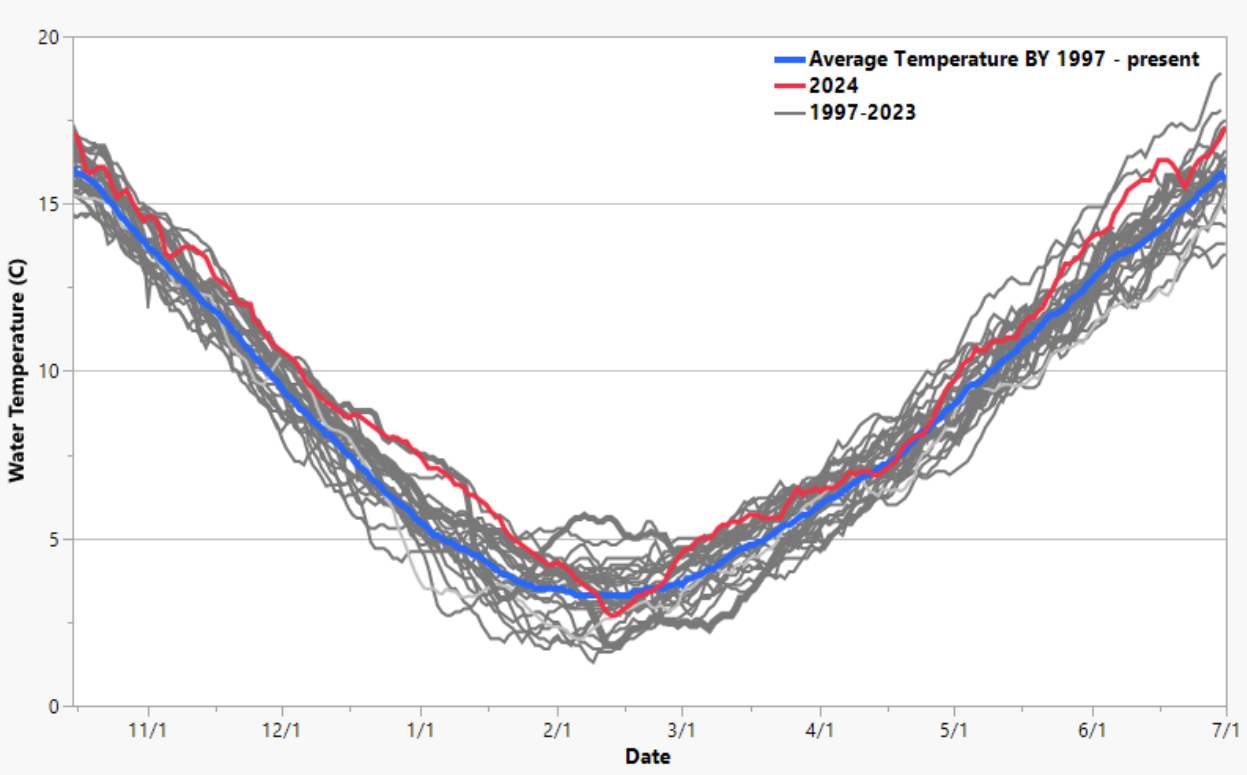

Figure 7 **Daily river temperatures on the Hanford Reach of the Columbia River during the protection season for brood years 1997–2023 (grey lines), the 2024 brood year (red line), and the daily mean temperature for brood years 1997–2023 (blue line).**

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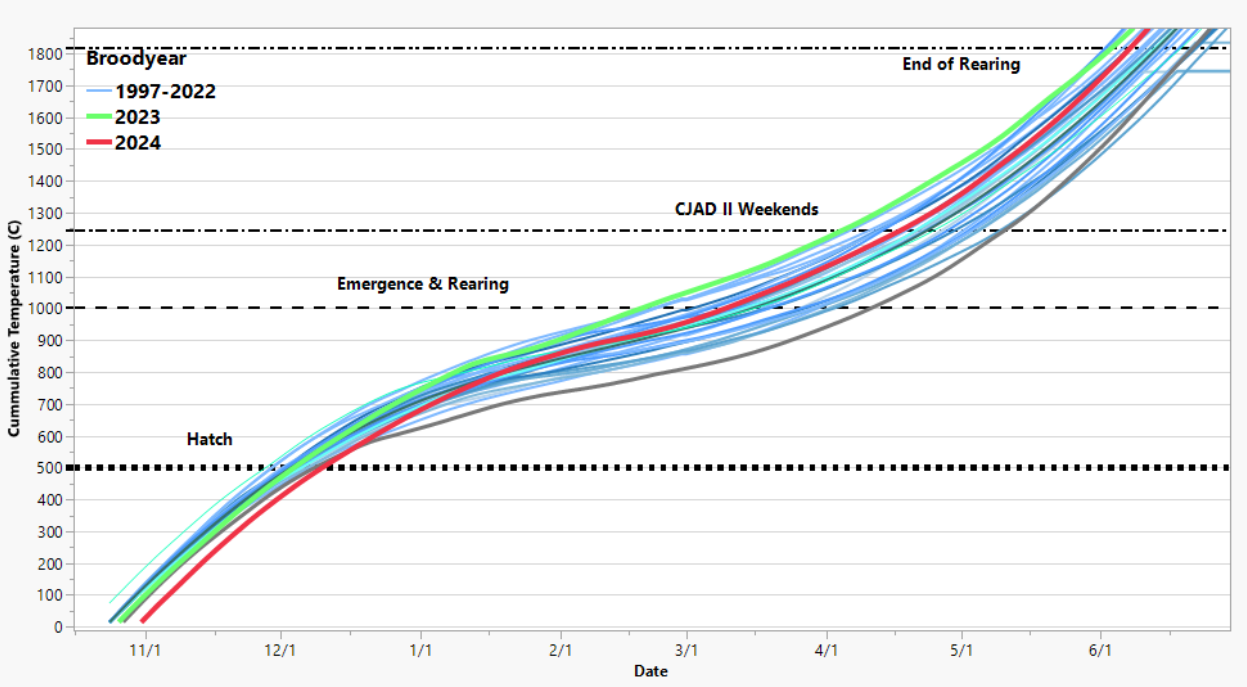

Figure 8 **The accumulation of temperature units in the Hanford Reach and Protection Periods during the protection season for brood years 1997–2022 (blue lines), brood year 2023 (green line) and brood year 2024 (red line).**

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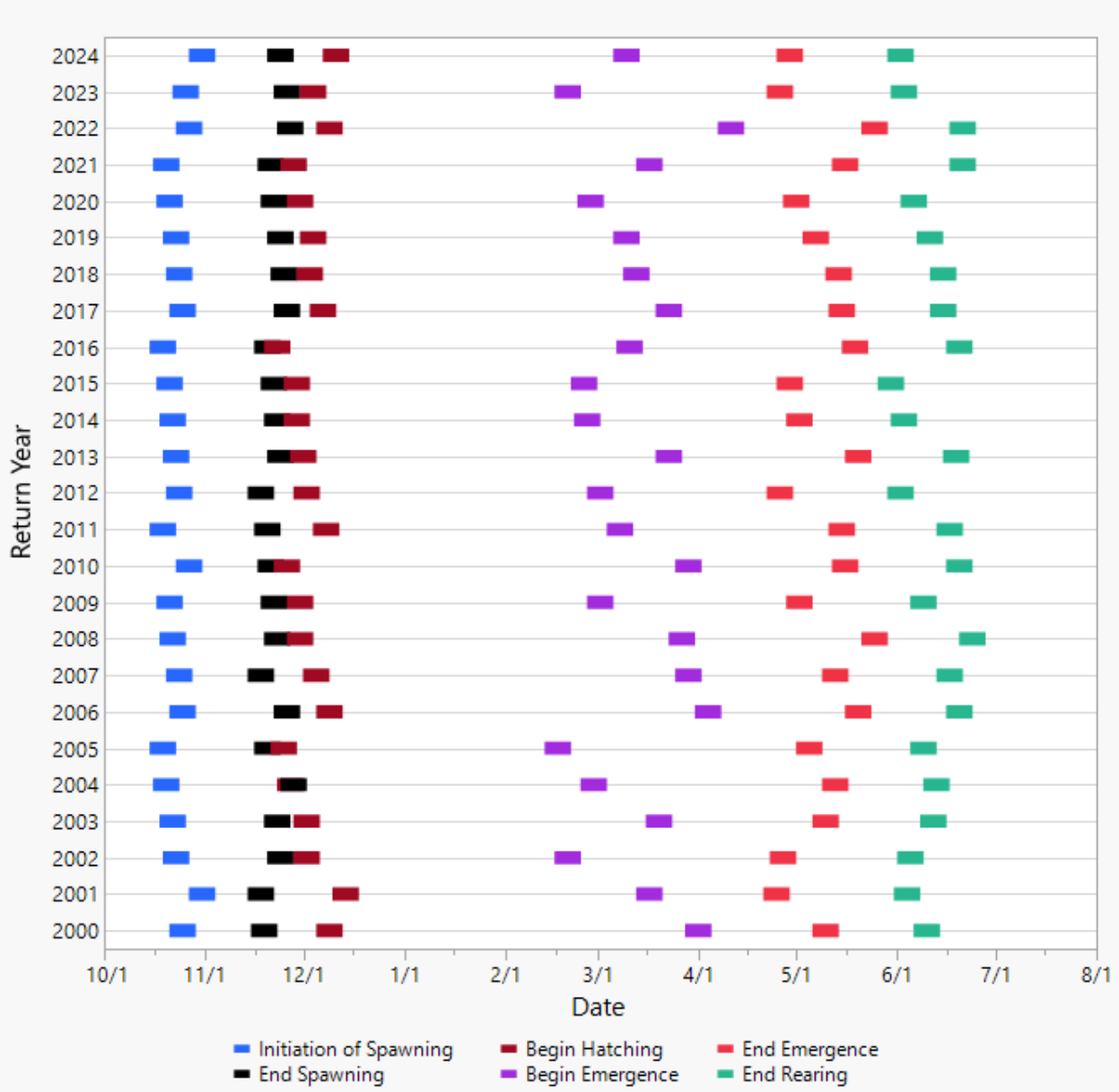

Figure 9 **Timing and duration of protection periods under the Vernita Bar Settlement Agreement and the HRFCPPA, 2000–2024 return year.**

5.0 Flow Protections from Hatch to Rearing

5.1 Critical Elevation and Discharge Minimums

Minimum discharge constraints (Protection Level Flow) are implemented at Priest Rapids Dam to prevent desiccation of fall Chinook Salmon prior to emergence. The Protection Level Flow varies during the protection season based on (1) the Hatch date in the 36–50 kcfs elevation zone (e.g., 50 kcfs) and the above 50 kcfs zone (e.g., the Critical Elevation) and (2) the Post-Hatch Period and the Emergence Period. During the Post-Hatch Period, the minimum discharge requirement is based on inter-gravel water levels and is required to be no less than 15 cm below 50 kcfs (for the 36–50 kcfs elevation zone) or the Critical Elevation (for the above 50 kcfs

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elevation zone). Within the relevant flow range (50–70 kcfs) 15 cm of stage equates to approximately 4 kcfs of discharge (https://waterdata.usgs.gov/wa/nwis/current?type=ratings). During the Emergence Period the Protection Level Flow is 50 kcfs (for the 36–50 kcfs elevation zone) and the Critical Elevation (for the above 50 kcfs elevation zone). When requirements overlap due to a staggered Initiation of Spawning date, the higher of the two requirements is defined as the minimum discharge constraint.

For return year 2024, Hatch in the 36–50 kcfs zone and the above 50 kcfs zone occurred on December 11, 2024. Emergence in the 36–50 kcfs elevation zone and above 50 kcfs zone occurred on March 10, 2025 (Table 2). Flows at the USGS Gage were maintained above the required Protection Level Flow (Table 2 and Figure 10) throughout the Protection Periods.

Table 2 Protection Level Flow requirements during the 2023 – 2024 protection season.

Period	Start Date	End Date	Protection Level Flow
Post-Hatch 36–50 kcfs zone	12/11/2024	3/9/2025	No less than 15 cm below the 50 kcfs elevation
Post-Hatch >50 kcfs zone	12/11/2024	3/9/2025	No less than 15 cm below the Critical Elevation (60 kcfs)
Emergence 36–50 kcfs zone	3/10/2025	4/29/2025	50 kcfs
Emergence >50 kcfs zone	3/10/2025	4/29/2025	Critical Elevation (65 kcfs)

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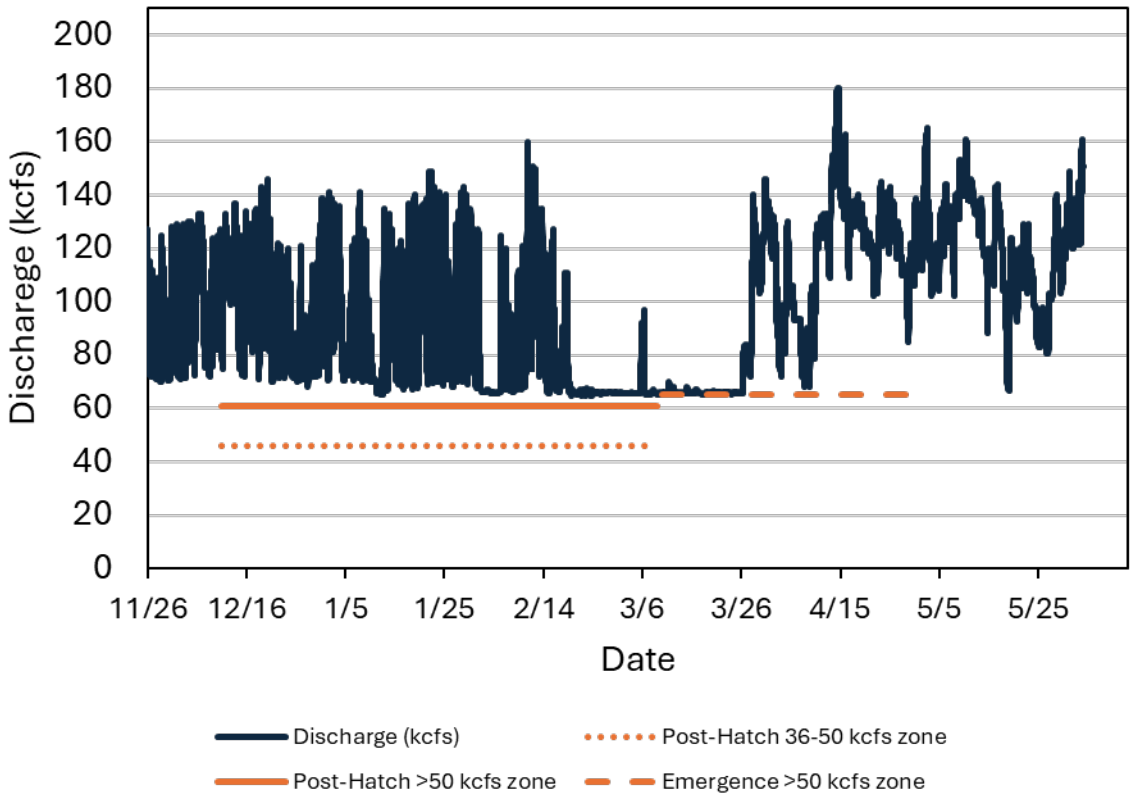

Figure 10 Discharge during the 2024–2025 Post Hatch and Emergence Periods measured at USGS Gage 12472800 below Priest Rapids Dam and the Protection Level Flow.

5.2 Protections for Emergent and Rearing Fall Chinook Salmon

During the Emergence and Rearing periods, the HRFCCPA establishes criteria for determining the acceptable magnitude of daily fluctuations in discharge from Priest Rapids Dam (i.e., discharge delta or minimum discharge; Table 3). Variability in power demand, water withdrawal (irrigation and urban), and weather events prevent precise prediction of daily average discharge at Priest Rapids Dam. Therefore, flow constraints are based on prior daily inflow[3] to Wanapum Dam or BPA forecasted weekend flows for Chief Joseph Dam, including side flows (i.e., tributary inflows). Criteria in the HRFCPPA requires that protections for emergent fry begin at the estimated start of emergence and continue until 400 ATU (°C) from the end of emergence. In 2025, discharge was variable, sometimes below average and sometimes above average, in March and April for the Emergence and Rearing Periods (Figure 11). During this time flows were maintained above the Protection Level Flow. In May flows remained below average for the remainder of the Emergence and Rearing Periods.

[3] "Previous Day's Average Weekday Wanapum Inflow" – the total volume of water discharged into the Wanapum project area measured as a daily average discharge from Rock Island Dam. This measure is used from Monday to Friday to determine the allowable flow fluctuation during the Rearing Period and will be calculated based on data reported on the Corps of Engineers website [http://nwd-wc.usace.army.mil/report/projdata.htm].

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Table 3 **Daily operational constraints established for the Hanford Reach Fall Chinook Protection Program.**

Wanapum Weekday Inflow or Chief Joseph Weekend Forecast (kcfs)	Discharge Constraint [A]
36 – 80	Delta < 20 kcfs
80 – 110	Delta < 30 kcfs
110 – 140	Delta < 40 kcfs
140 – 170	Delta < 60 kcfs
> 170	Minimum Discharge > 150 kcfs

[A] Discharge Delta (max-min) and minimums are calculated during the 24-hour period from hour ending 1:00 AM to midnight.

The mean Outflow Delta from PRD (when Outflow constraints were in effect) was 21.9 kcfs, which was less than the overall mean under the HRFCPPA (34.1 kcfs; Appendix G). Daily fluctuations as a percentage of mean daily discharge were less than the mean from previous years with Rearing Period protections (20.1% vs. 25.8%). The distribution of daily discharge fluctuations in 2025 skewed towards smaller daily fluctuations compared to previous years (Figure 12).

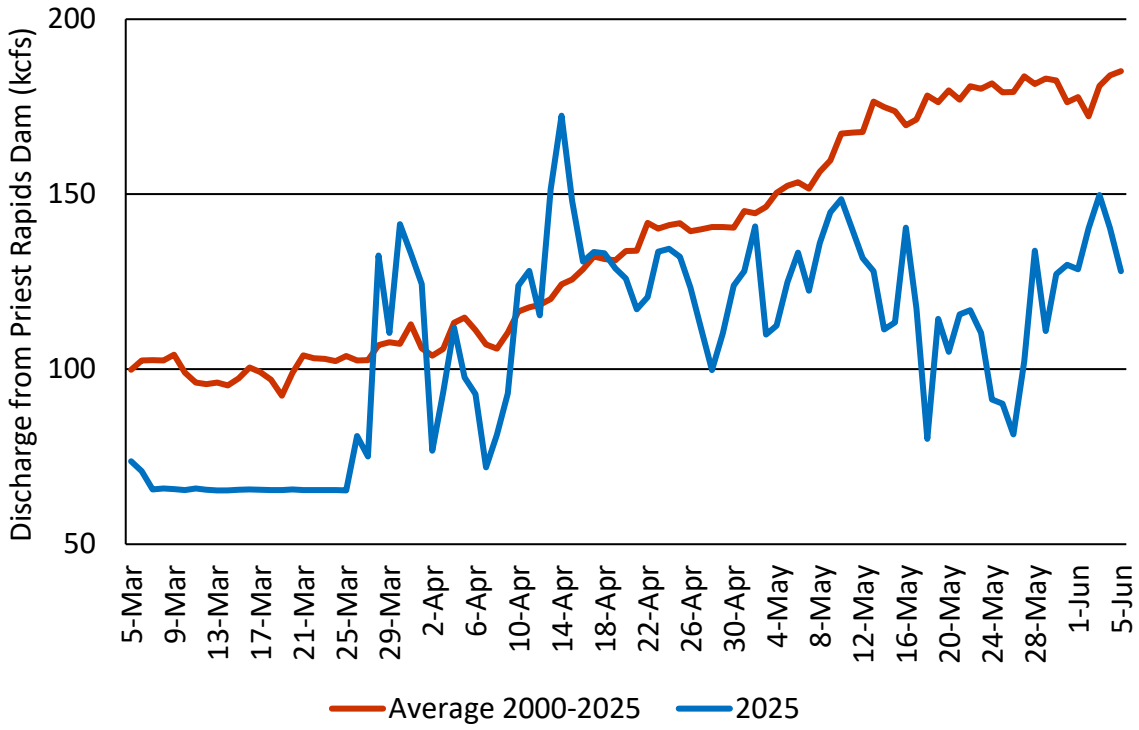

Figure 11 **Mean daily discharge from Priest Rapids Dam during the Emergence and Rearing Periods in 2025 and the mean from 2000–2024 under the VBSA and HRFCPPA.**

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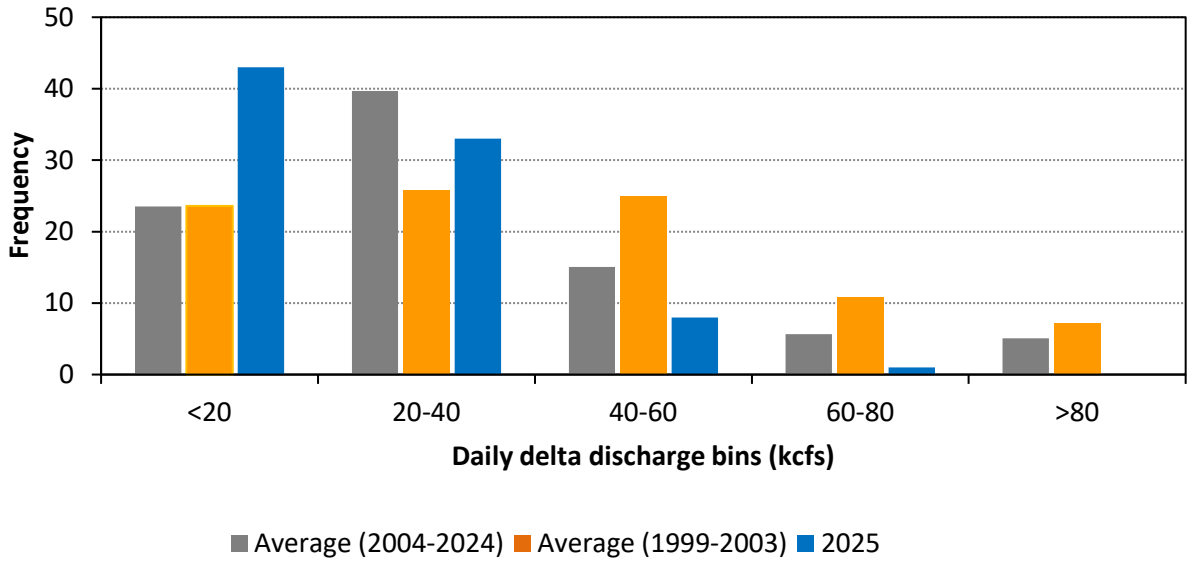

Figure 12 **Histogram of daily Outflow Deltas from Priest Rapids Dam. Some constraints restricting discharge fluctuations were initially implemented for brood year 1998. Rearing Period protections under the HRFCPPA were fully implemented for brood year 2004.**

6.0 Assessment of Flow Fluctuations and Targets

The Hanford Reach Fall Chinook Protection Program establishes operational criteria to minimize daily fluctuations in PRD discharge during fall Chinook Salmon Emergence and Rearing periods. During the 84 days of the 2025 Emergence and Rearing periods, Grant PUD exceeded the flow constraints on only one instance that was unintentional and outside the conditions considered under Adaptive Management (Section 2.1). On Sunday, May 18, during the Rearing Period, the flow from Priest Rapids Dam decreased from the daily lower target of 103 kcfs to 67 kcfs at average rate of 2.3 kcfs per hour starting around 08:00 until 02:00 on Monday, May 19. Flows then increased to normal in the early morning hours of May 19 (Figure 16). This flow exceedance was a result of lower than expected discharge from Rock Island Dam. Grant PUD managed the rate of reduction in flow on May 18 to reduce the likelihood of impacting juvenile fall Chinook Salmon.

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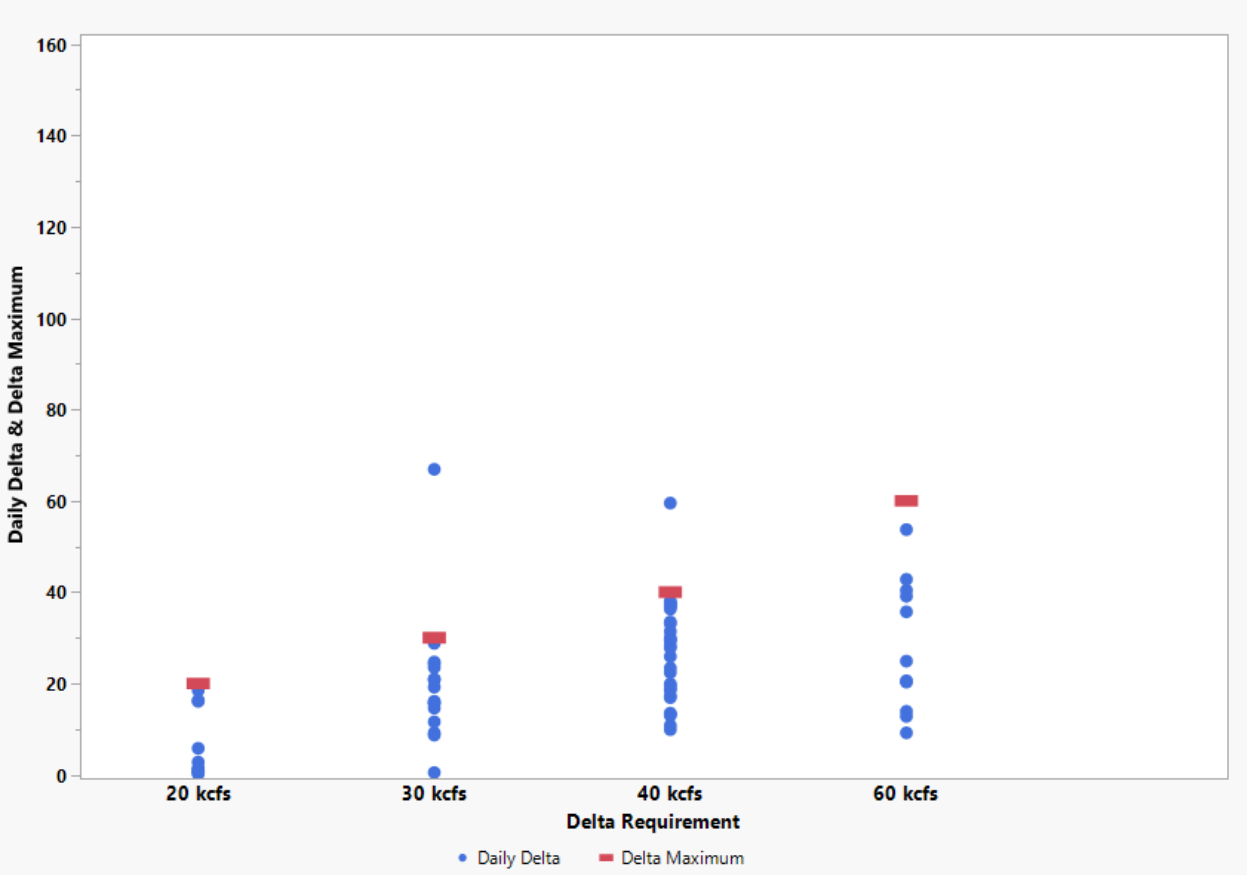

Figure 13 **Summary of 2025 Priest Rapids Dam daily discharge deltas and delta maximum by constraint category.**

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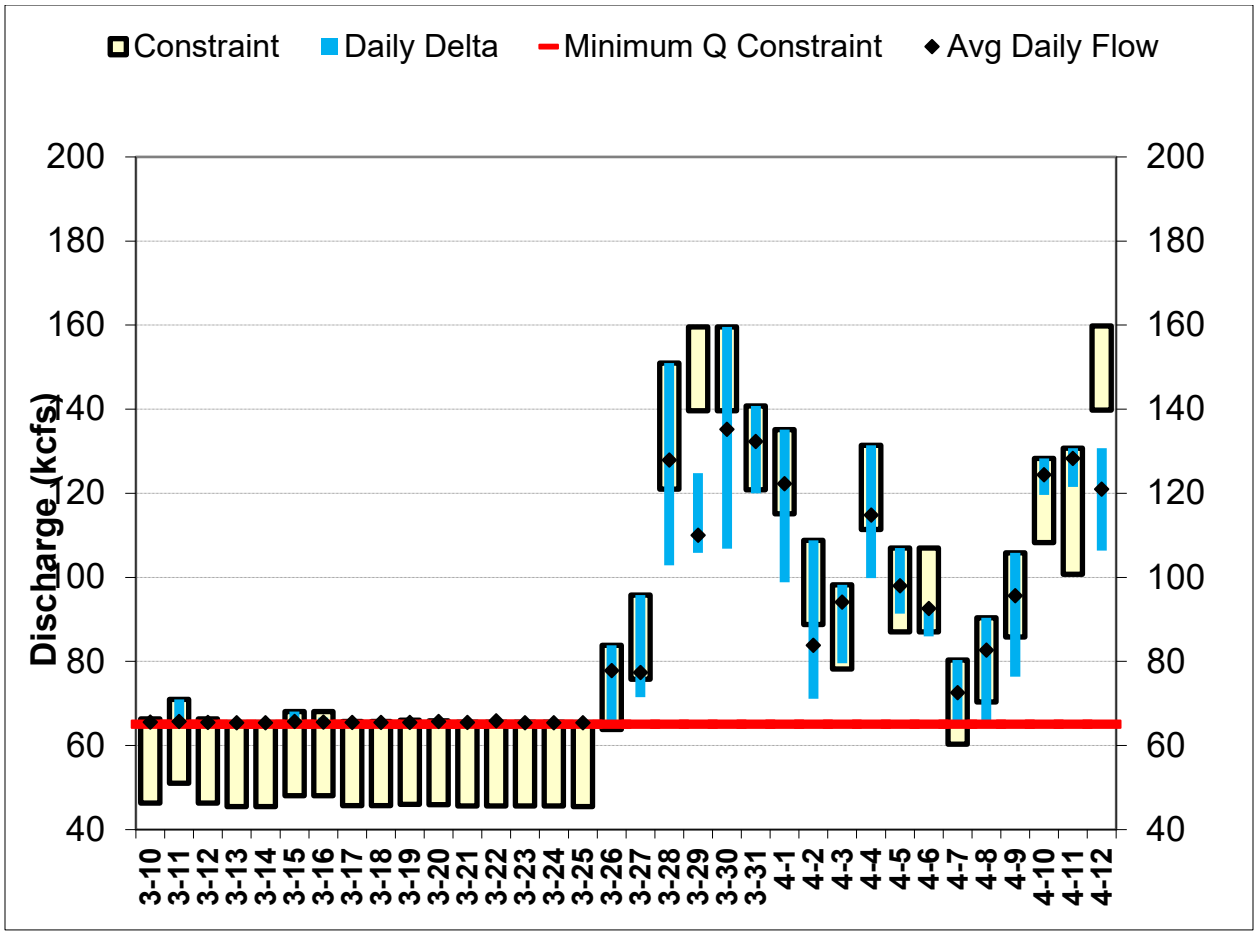

Figure 14 **Mean, minimum, maximum hourly discharge and daily fluctuation from Priest Rapids Dam, March 10 – April 12, 2025.**

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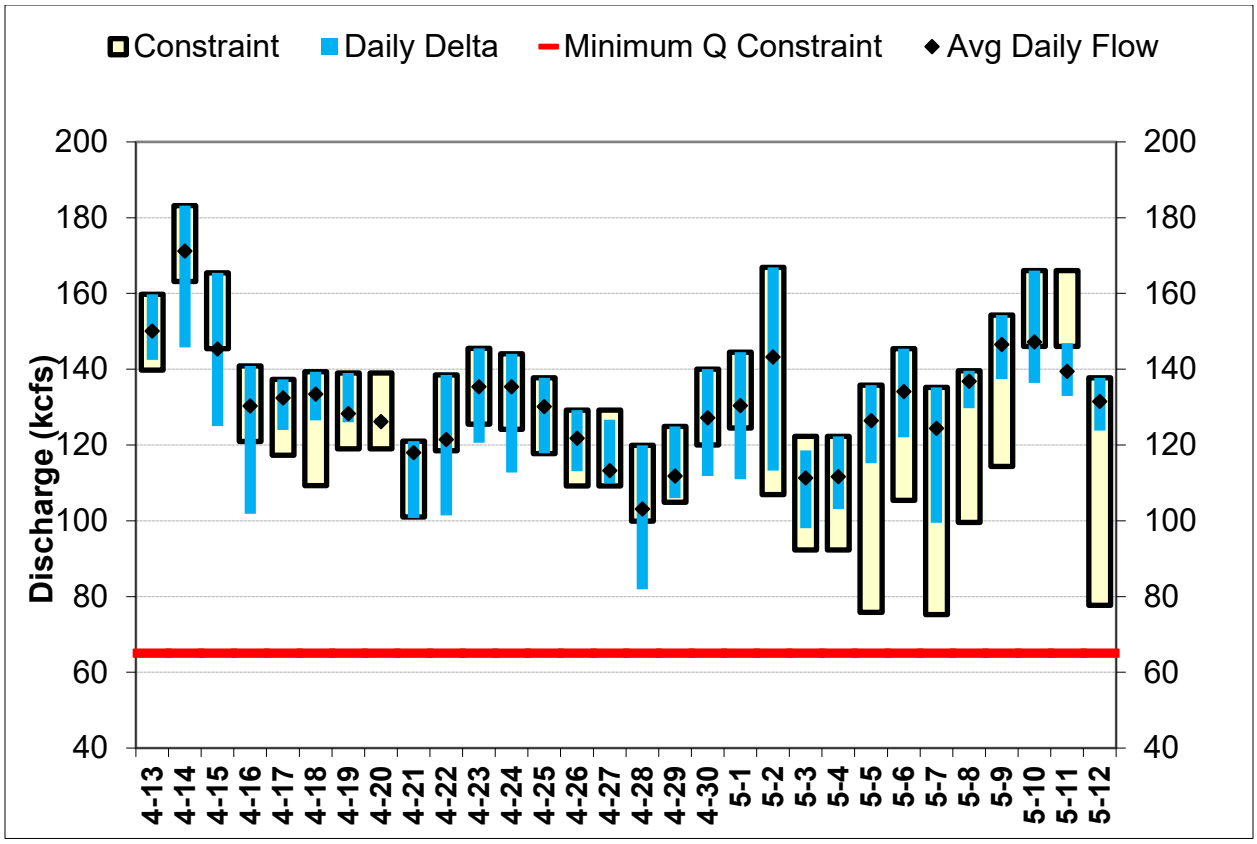

Figure 15 **Mean, minimum, maximum hourly discharge and daily fluctuation from Priest Rapids Dam, April 13 – May 12, 2025.**

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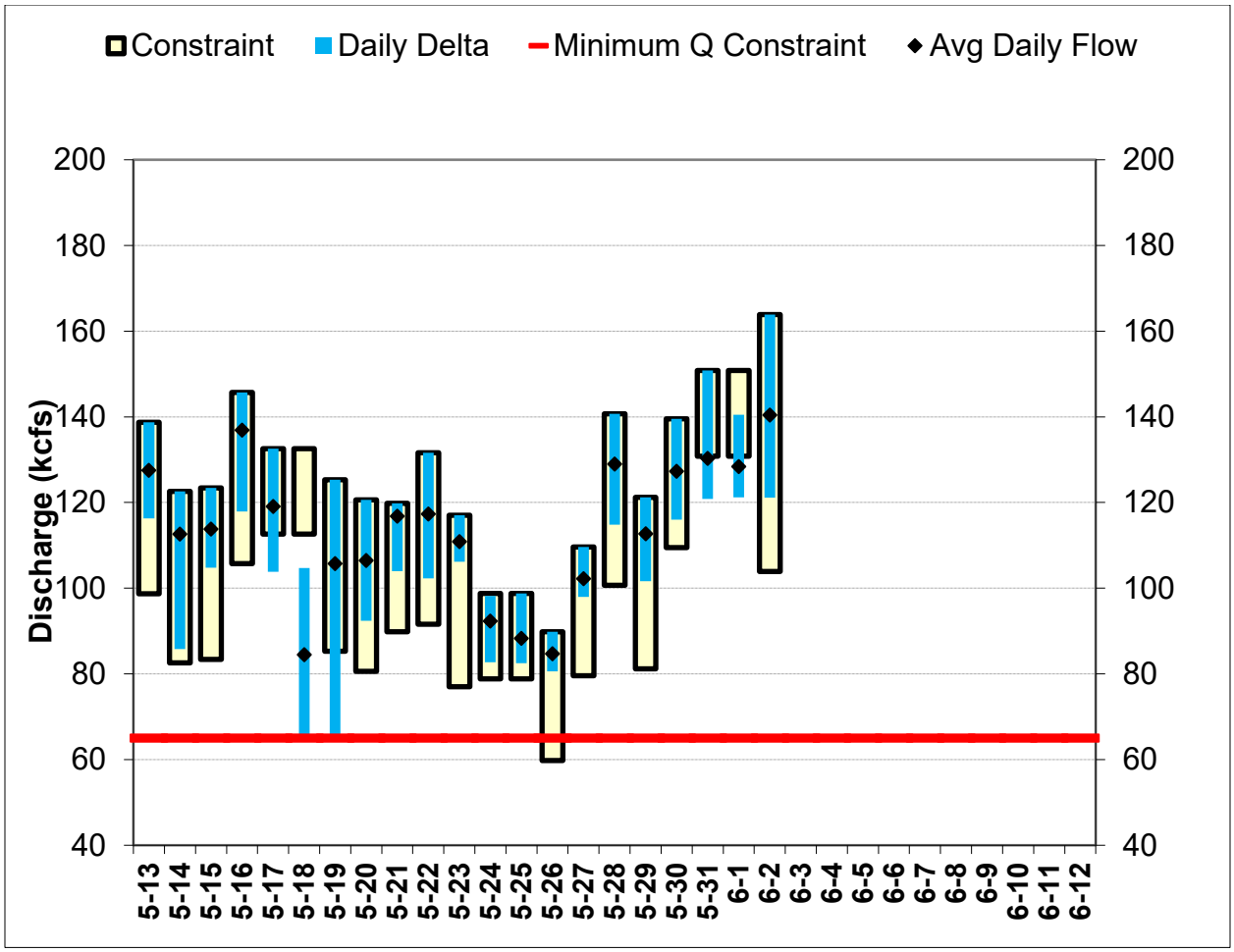

Figure 16 Mean, minimum, maximum hourly discharge and daily fluctuation from Priest Rapids Dam, May 13 – June 2, 2025.

Power demands are typically lower on weekends than on weekdays. The reduced demand for power typically leads to large reductions in discharge at hydroelectric projects. Large decreases in discharge and the resulting drop of river levels have the potential to strand and/or entrap large numbers of juvenile fall Chinook Salmon. River levels can remain low throughout the weekend (48 to 56 hours) leading to an increased likelihood of mortality from entrapments reaching lethal water temperatures or draining and drying out. Additional provisions were included in the HRFCPPA to reduce fall Chinook Salmon mortality on weekends during peak susceptibility (Section C.5(b)(6), aka CJAD II protections). On four consecutive weekends that occur after 800 ATU from the end of the Spawning Period, Priest Rapids Outflow are to be maintained to at least a minimum discharge calculated as the average of the daily hourly minimum discharge from Monday through Thursday of the current week.

The 2025 weekend-minimum discharge constraints began on the weekend of April 5 and continued through the weekend of April 26. The minimum constraint was met on all four of the CJAD II weekends (Table 4).

In recent years, unusually low inflows to the Project have created challenges for maintaining the Critical Elevation during the Emergence and Rearing periods. Since 2019, the District has maintained outflows above the Critical Elevation during March and April even when inflows

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were below the minimum flow constraint (Figure 17). The District will continue to strive to meet minimum flow constraints.

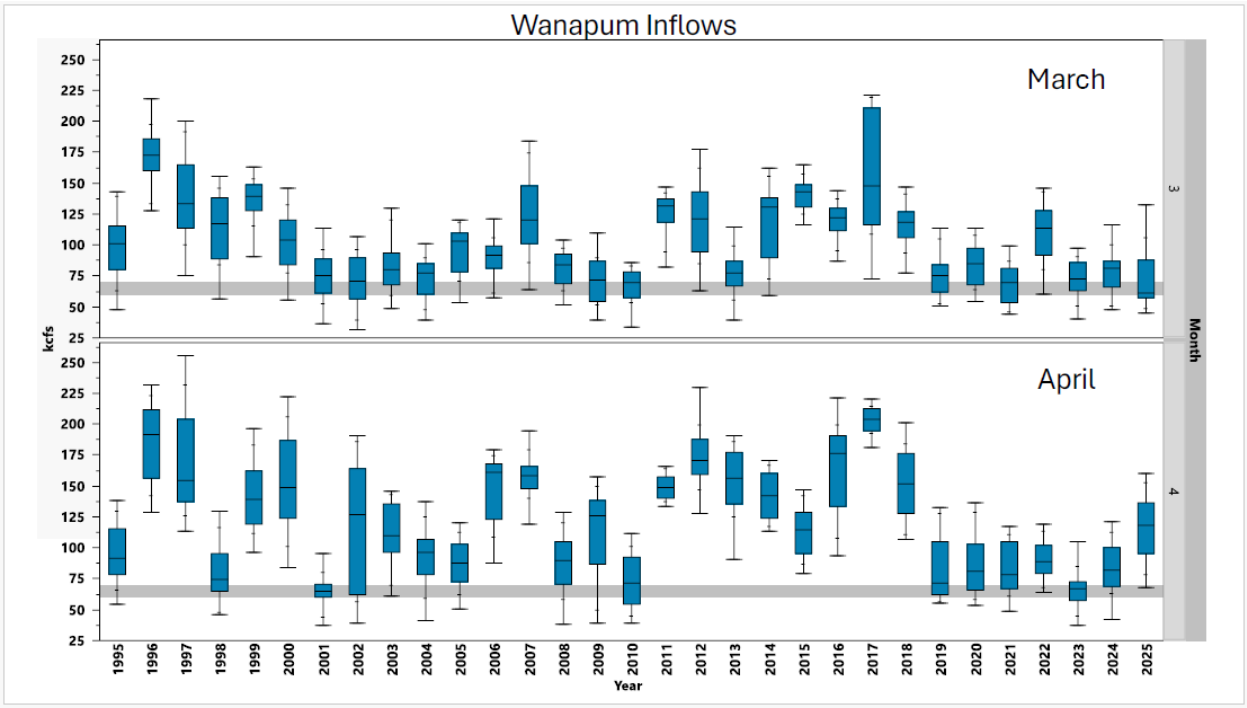

Figure 17 **Inflows to Wanapum Reservoir during March and April from 1995-2025. The reference line at 60 kcfs represents the typical minimum flow constraint during the Emergence and Rearing periods. Boxes cover 25-75th percentiles, middle line is the median value, and whiskers extend 1.5x past the interquartile range.**

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Table 4 Weekend constraints and minimum discharges from Priest Rapids Dam.

Weekend of CJAD II Minimum Flow Constraint	Weekend Minimum Constraint (kcfs)	Minimum Weekend Outflow from Priest Rapids Dam (kcfs)	Difference between constraint and Priest Rapids Dam outflow (kcfs)
April 5-6	92.4	92.4	0.0
April 12-13	81.9	106.4	+24.5
April 19-20	124.2	125.5	+1.3
April 26-27	108.9	109.9	+1.0

6.1 Assessment of River Conditions During the Protection Program in Relation to Egg-to-Presmolt Survival

In an analysis of the freshwater productivity of Hanford Reach fall Chinook Salmon, Harnish et al. (2014) identified two river environmental variables correlated with Hanford Reach egg-to-presmolt survival (Figure 18). First, the ratio of the minimum post-hatch incubation discharge to the minimum spawning discharge (PHMinQ:SpMinQ) explained the greatest variability and was correlated positively to egg-to-presmolt survival. Second, the difference between the mean spawning discharge and the minimum post-hatch incubation discharge (SpAvgQ-PHMinQ) was strongly negatively correlated with egg-to-presmolt survival. For the 2024 – 2025 flow protection season the PHMinQ:SpMinQ was 1.57 and the SpAvgQ-PHMinQ was 798.1. Using the two relationships developed by Harnish et al. (2014), the estimated egg-to-presmolt survival for the 2024 brood year was 0.50 and 0.50, respectively.

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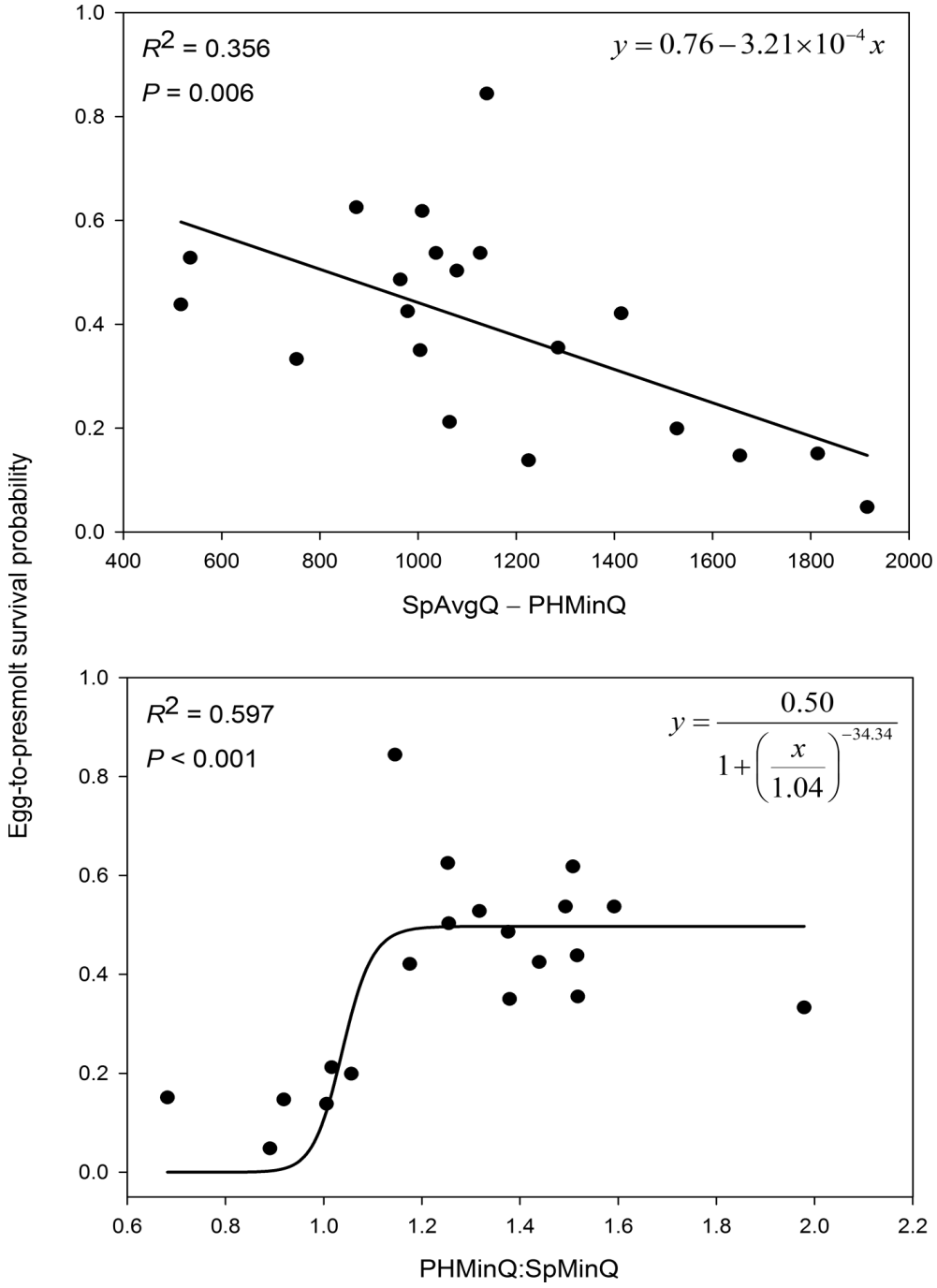

Figure 18 **Figure 8 from Harnish et al. (2014). Bivariate regression relationships of river environment variables that were found to be correlated with Hanford Reach fall Chinook Salmon egg-to-presmolt survival estimates. Variables included the difference between mean spawning discharge and minimum posthatch incubation discharge (SpAvgQ – PHMinQ) and the ratio between the minimum posthatch incubation discharge and the minimum spawning discharge (PHMinQ:SpMinQ).**

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7.0 Summary

Operations to protect the 2024 brood year of fall Chinook Salmon in the Hanford Reach were highly successful (Appendix G). Discharge from Priest Rapids Dam was maintained above the Protection Level Flow throughout the Emergence and Rearing periods. Eighty-three of 84 (99%) daily fluctuation constraints were met or intentionally exceeded within the scope of Adaptive Management, and the single unintentional exceedance was managed to reduce risks to fall Chinook Salmon. 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 (96% constraints met or minor exceedances 2006 – 2024; Figure 19 and Appendix G). Low inflows resulted in challenges in achieving daily flow constraints in 2025 and continued the trend of low inflows observed since 2019. The overall high success rate is particularly noteworthy given that the signatories to the HRFCPPA did not anticipate, nor does the agreement require perfect compliance with constraints at all times. Section C.5(c) clearly reflects this important consideration:

(c) All Parties agree that perfect compliance with the flow constraints of C.5(b) is not possible. Conditions related to inflow, reservoir elevation, accuracy of BPA estimates, emergencies and human error can contribute to exceeding the Priest Rapids Outflow Delta or Priest Rapids Outflow dropping below minimums specified. Grant will make every effort to meet the operating constraints.

While perfect compliance is not required, it is important to recognize the performance of the operators, dispatch personnel, and river coordinator. Continued high performance was achieved as a direct result of their efforts and dedication.

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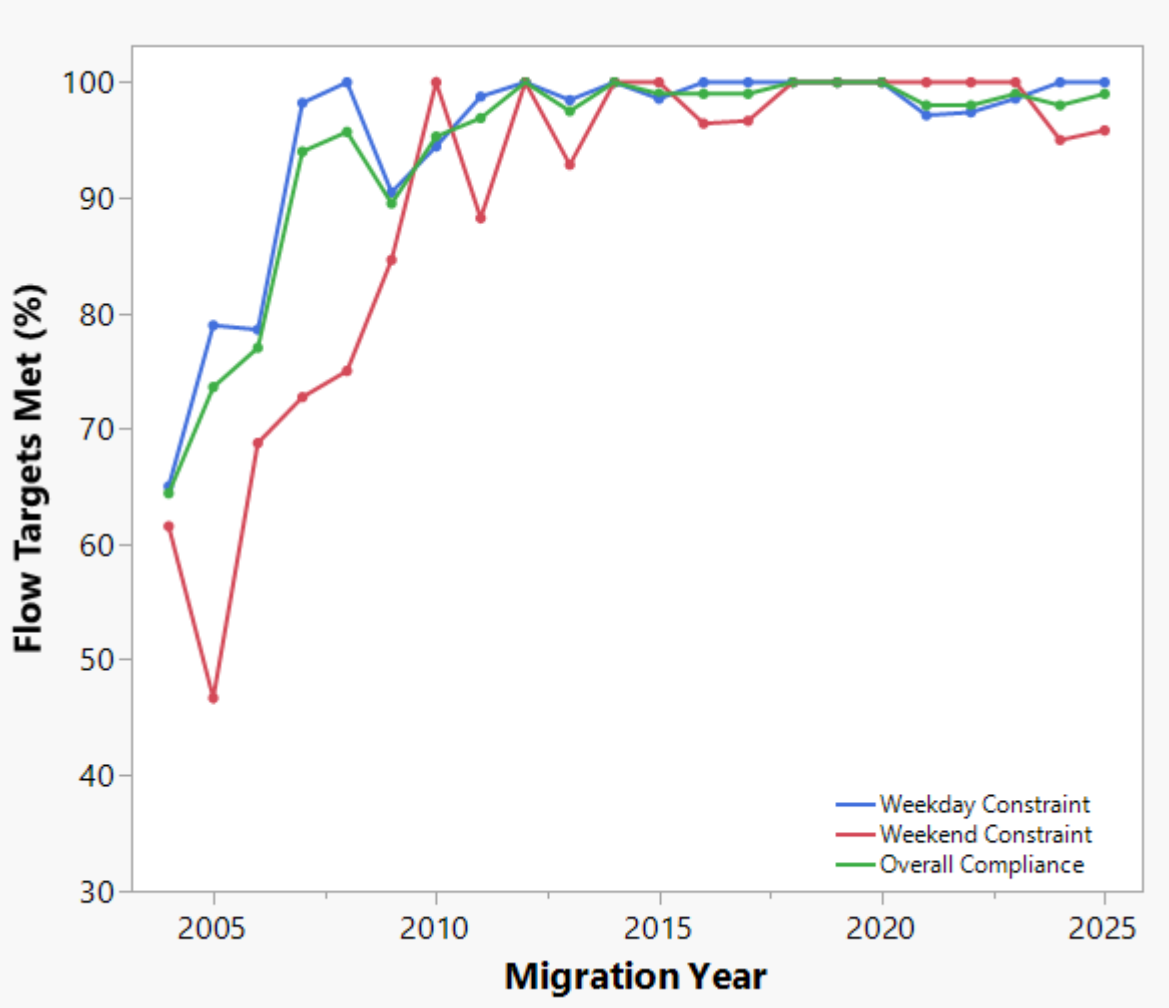

Figure 19 **Compliance with HRFCFPP flow targets at Priest Rapids Dam on weekdays, weekends, and overall, during the period of 2004-2025.**

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Appendix A
Hanford Reach Fall Chinook Protection Agreement
Excerpt of protection measures outline in Section C

C. HANFORD REACH FALL CHINOOK PROTECTION

Subject to the limitations and conditions set out in this Agreement, Grant, Chelan, Douglas and BPA shall provide the following flow regimes for the Spawning through Rearing Period for Hanford Reach fall Chinook salmon in the Hanford Reach of the Columbia River.

1. Spawning Period

(a) All Parties agree that flows maintained during the Spawning Period and escapement levels are factors influencing the placement of Redds. The flow manipulation under this subsection C.1 is directed to minimize formation of Redds above the 70 kcfs elevation. Minimizing formation of Redds above the 70 kcfs elevation in turn is a key factor influencing the success of the flow regime under subsection C.4 during the Emergence Period.

(b) During the Spawning Period(s) of 2005 and 2006, Grant will experiment with alternative operations for flow manipulation. The requirement of the alternative operations will be to ensure that Priest Rapids Outflows are not higher than 70 kcfs and not lower than 55 kcfs for a continuous period of at least 12 hours out of each day during the Spawning Period. Grant will provide continuous monitoring of Redd formation during these tests and report the results weekly. These experiments may continue as long as no more than 31 Redds are located above the 65 kcfs elevation on Vernita Bar. If Redd counts reveal that more than 31 Redds are located above the 65 kcfs elevation, Spawning Period operations will default to the procedures of C.1(c) below. If Redd counts show that alternative Spawning Period operations can limit the formation of Redds above 70 kcfs, then Grant shall be allowed to choose between use of C.1(b) or C.1(c) as guidelines for operational parameters during the Spawning Period of future years.

(c) If the experimental operations testing during C.1(b) above are unsuccessful in minimizing formation of Redds above the 70 kcfs elevation, Grant's operations will revert to the default operation specified in this paragraph. During the Spawning Period, Grant will operate Priest Rapids Project No. 2114 to the extent feasible through use of the Mid-Columbia Hourly Coordination and Reverse Load Factoring to produce a Priest Rapids Outflow during Daylight Hours that can range from 55 to 70 kcfs. The goal during the Spawning Period is to limit spawning to the area below the 70 kcfs elevation on Vernita Bar. In the event physical changes are made at the Priest Rapids Project which affect Grant's ability to provide Reverse Load Factoring, Grant agrees to meet with the Parties to this Agreement to determine what adjustments to Grant's obligation under this subsection C.1(c) shall be made, notwithstanding the provisions of subsections B.4 and B.5.

(d) The Parties agree that BPA has no obligation under this Agreement to limit fall flows to influence Redd location. This is, however, without prejudice to the rights of any Party to assert, except before the FERC prior to ten years from the effective date of this Agreement, that BPA may have an obligation apart from this Agreement to limit such flows and the rights of any Party to request cooperation of BPA, the Bureau of Reclamation and the Corps of Engineers to limit such flows. The Parties agree to work together to obtain the cooperation of BPA, the Bureau of Reclamation and the Corps of Engineers to achieve the desired flow regime.

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2. Pre-Hatch Period

During the Pre-Hatch Period the Priest Rapids Outflow may be reduced to 36 kcfs for up to 8 hours on weekdays and 12 hours on weekends (with no two consecutive minimum periods). All Parties recognize that utilization of the 36 kcfs minimum may have to be limited to achieve the Priest Rapids Outflow goal during the Spawning Period.

3. Post-Hatch Period

(a) After Hatching has occurred at Redds located in the 36 to 50 kcfs zone, the Protection Level Flow shall be maintained over Vernita Bar so that the intergravel water level is no less than 15 cm below the 50 kcfs elevation.

(b) After Hatching has occurred at Redds located in the zone above the 50 kcfs elevation, the Protection Level Flow shall be maintained over Vernita Bar through the Post Hatch Period so that the intergravel water level is no less than 15 cm below the Critical Elevation.

4. Emergence Period

(a) During the Emergence Period, after Emergence has occurred in the 36 to 50 kcfs zone, the Protection Level Flow shall not be less than necessary to maintain water over Vernita Bar at the 50 kcfs elevation.

(b) During the Emergence Period, after Emergence has occurred above the 50 kcfs elevation, the Protection Level Flow shall be maintained at or above the Critical Elevation.

5. Rearing Period

(a) All Parties recognize that flow fluctuations during the Rearing Period may impact juvenile Hanford Reach fall Chinook. The Parties also recognize that elimination of all flow fluctuations is not physically possible without severely impacting the ability of Mid-Columbia Operators to produce a reliable supply of electricity. The goal during the Rearing Period is to provide a high level of protection for juvenile Hanford Reach fall Chinook rearing in the Hanford Reach by limiting flow fluctuations while retaining operational flexibility at each of the seven dams on the Mid-Columbia River.

(b) During the Rearing Period, Grant will operate Priest Rapids Project No. 2114 to the extent feasible through use of the Mid-Columbia Hourly Coordination to produce a Priest Rapids Outflow that limits flow fluctuations according to the following criteria:

(1) When the Previous Day's Average Weekday Wanapum Inflow is between 36 and 80 kcfs limit Priest Rapids Weekday Outflow Delta to no more than 20 kcfs. When the average of BPA's Friday Chief Joseph Outflow Estimates plus side flow estimates for Saturday and Sunday is between 36 and 80 kcfs limit the Priest Rapids Weekend Outflow Delta to no more than 20 kcfs.

(2) When Previous Day's Average Weekday Wanapum Inflow is between 80 and 110 kcfs limit Priest Rapids Weekday Outflow Delta to no more than 30 kcfs. When the average of BPA's Friday Chief Joseph Outflow Estimates plus side flow estimates for Saturday and Sunday is between 80 and 110 kcfs limit the Priest Rapids Weekend Outflow Delta to no more than 30 kcfs.

(3) When Previous Day's Average Weekday Wanapum Inflow is between 110 and 140 kcfs limit Priest Rapids Weekday Outflow Delta to no more than 40 kcfs. When the

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average of BPA's Friday Chief Joseph Outflow Estimates plus side flow estimates for Saturday and Sunday is between 110 and 140 kcfs limit the Priest Rapids Weekend Outflow Delta to no more than 40 kcfs.

(4) When Previous Day's Average Weekday Wanapum Inflow is between 140 and 170 kcfs limit Priest Rapids Weekday Outflow Delta to no more than 60 kcfs. When the average of BPA's Friday Chief Joseph Outflow Estimates plus side flow estimates for Saturday and Sunday is between 140 and 170 kcfs limit the Priest Rapids Weekend Outflow Delta to no more than 60 kcfs.

(5) When Previous Day's Average Weekday Wanapum Inflow is greater than 170 kcfs Priest Rapids Outflow for the following weekday will be at least 150 kcfs. When the average of BPA's Friday Chief Joseph Outflow Estimates plus side flow estimates for Saturday and Sunday is greater than 170 kcfs, Priest Rapids Outflow for Saturday and Sunday will be at least 150 kcfs.

(6) On four consecutive Saturdays and Sundays that occur after 800 TUs have accumulated after the end of the Spawning Period, Priest Rapids Outflow will be maintained to at least a minimum flow calculated as the average of the daily hourly minimum flow from Monday through Thursday of the current week.

(c) All Parties agree that perfect compliance with the flow constraints of C.5(b) is not possible. Conditions related to inflow, reservoir elevation, accuracy of BPA estimates, emergencies and human error can contribute to exceeding the Priest Rapids Outflow Delta or Priest Rapids Outflow dropping below minimums specified. Grant will make every effort to meet the operating constraints.

(d) On Monday, following lower flows from the weekend it is not considered a violation of the provisions in C.5(b) when Monday inflows require increasing the Priest Rapids discharge above the upper limit established at midnight on Sunday. If the upper limit is raised on Monday, the lower limit must be raised to allow the difference between the maximum and new minimum flow to remain within the applicable Priest Rapids Weekday Outflow Delta limit.

(e) Problems can be expected from time to time. Grant will detail the circumstances associated with its inability to meet these constraints in the annual report described under C.6(c). In addition to annual reporting, the Parties agree to use the dispute resolution process described under E.9 whenever any Party claims excessive non-compliance.

6. Monitoring Team

For purposes of determining the Protection Level Flow during the Post Hatch and Emergence Periods, a Critical Elevation shall be determined each year as follows:

(a) The Monitoring Team will survey Redds on Vernita Bar in the area specified on Exhibit A for the purpose of determining the Initiation of Spawning, the location of Redds and the extent of spawning. The Monitoring Team will also provide a concurrent aerial survey of the Hanford Reach on the same weekend(s). The aerial survey(s) will be utilized to determine if Initiation of Spawning in areas of the Hanford Reach below the 36 kcfs level and/or outside the area specified on Exhibit A occurs prior to Initiation of Spawning within the Exhibit A area above the 36 kcfs level. Once an initiation of Spawning date has been determined, based upon the presence of 5 or more redds in an individual survey, the aerial surveys maybe discontinued for that year. The

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surveys will be conducted on weekends beginning on the weekend prior to October 15 of each year.

(b) The Monitoring Team will make a final Redd survey the weekend prior to Thanksgiving to determine the Critical Elevation. The Monitoring Team may also make a supplemental Redd survey the weekend after Thanksgiving to determine if additional Redds are present above the 50 kcfs elevation. A preliminary estimate of the Critical Elevation will be made following the final Redd survey and will be confirmed or adjusted based on the supplemental survey. The Critical Elevation will be set as follows: (Elevations must be in 5 kcfs increments beginning at the 40 kcfs elevation.)

(1) If 31 or more Redds are located above the 65 kcfs elevation, the Critical Elevation will be the 70 kcfs elevation.

(2) If there are 15 to 30 Redds above the 65 kcfs elevation, the Critical Elevation will be the 65 kcfs elevation.

(3) If there are fewer than 15 Redds above the 65 kcfs elevation, then the Critical Elevation will be the first 5 kcfs elevation above the elevation containing the 16th highest Redd within the survey area on Vernita Bar (see Table 1 below for examples of the application of these counts).

Table 1. Examples illustrating theoretical final Vernita Bar Redd counts and the resulting Critical Elevations, elevations are provided in kcfs ranges.

	36-50 kcfs	50-55 kcfs	55-60 kcfs	60-65 kcfs	65-70 kcfs	70+ kcfs	Resulting Critical Elevation
Example 1	836	418	148	71	48	34	70
Example 2	283	94	65	28	16	4	65
Example 3	105	35	10	3	1	0	55

(c) Additional activities of the Monitoring Team will include calculation of Temperature Units, determination of the dates of Initiation of Spawning, Hatching, Emergence, the end of the Emergence Period and the end of the Rearing Period. The Monitoring Team may also make non-binding recommendations to any of the Parties to this Agreement, including non-binding recommendations to protect Redds above the Critical Elevation or to address special circumstances. By September 1 of the following year, Grant will submit an annual report to the Monitoring Team and BPA. The annual report will include, but not be limited to: 1) Vernita Bar Redd Counts, 2) dates on which the Hatching, Emergence, End of Emergence and End of Rearing Periods occurred, 3) a record of Columbia River flows through the Hanford Reach based on Priest Rapids discharges, and 4) a description of the actual flow regimes from the Initiation of Spawning through the Rearing Period based on available data. During the rearing period, Grant will provide a weekly operations report to the Parties. After review by the Monitoring Team, the

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final report will be sent to all Parties. During the Rearing Periods of 2011, 2012 and 2013, the Parties will also meet to develop a follow-up monitoring program to estimate fry losses. This monitoring program will be designed according to protocols developed from 1999 to 2003 or alternatively with different methods developed by the Parties.

(d) If from time to time, disputes arise regarding activities of the Monitoring Team, the Parties agree to use the dispute resolution process described under E.9 below.

7. Redds Above Critical Elevation

This Agreement is not intended either to preclude or require protection of Redds above the Critical Elevation. The Parties shall meet annually to determine if there are measures that, in the joint discretion of Grant, Chelan, Douglas and BPA, can be taken to protect any Redds located above the Critical Elevation.

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Appendix B
Statement of Agreement for the HRFCPPA developed by the Hanford Reach Work Group

SOA 2007-HR01: Hanford Reach Working Group Statement of Agreement on Documentation of Hanford Reach Working Group Agreements

Submitted to Hanford Reach Working Group: July 11, 2007 Approved: September 6, 2007
Statement:

"The Hanford Reach Working Group (HRWG) agrees that the process of documenting agreements reached by consensus of the HRWG will consist of the distribution of a draft Statement of Agreement at least 10 days prior to a request for a vote by all Parties 1. Modifications to the draft Statement of Agreement may occur at any time prior to a vote on the Statement of Agreement. Statements of Agreement shall be as brief as possible. Relevant background information should be included below the Statement of Agreement as warranted."

SOA 2007-HR03: Hanford Reach Working Group Statement of Agreement on Development of a Single Hanford Reach Fall Chinook Protection Program Annual Report

Submitted to Hanford Reach Working Group: July 11, 2007 Approved: September 6, 2007
Statement:

"The Hanford Reach Working Group (HRWG) agrees a single Hanford Reach Fall Chinook Protection Program Annual Report jointly developed, coordinated between the Public Utility District No. 2 of Grant County and the Washington Department of Fish & Wildlife, and submitted to the Hanford Reach Monitoring Team and the Bonneville Power Administration (BPA) by September 1 of each year."

SOA 2007-HR04: Protocol for the setting the Initiation of Spawning

Submitted to Hanford Reach Working Group: July 11, 2007 Approved: August 17, 2007
Statement:

“The Hanford Reach Working Group (HRWG) agrees that for the purposes of the Hanford Reach Fall Chinook Protection Program, Exhibit A shall be understood to include those shoreline spawning areas both upstream and downstream of Vernita Bar, including both Vernita Bar and Columbia River shorelines, within the geographic area shown approximately in Exhibit A of the Hanford Reach Fall Chinook Protection Program (HRFCPP).

Furthermore, the HRWG agrees that pursuant to subsection C.6 of the HRFCPP, aerial survey(s) may be utilized to determine if the presence of 5 or more redds in an individual survey in areas of the Hanford Reach below the 36 kcfs level, within Exhibit A and/or outside the area specified on Exhibit A, occurs prior to the identification of the presence of 5 or more redds in an individual survey within the Exhibit A area above the 36 kcfs level. If the presence of 5 or more redds is established in an individual survey by either ground surveys or aerial surveys, Initiation of Spawning shall be established as per the definition of Initiation of Spawning in Section A of the HRFCPP. Aerial redd count surveys that occur on weekdays rather than on weekends shall be valid redd count surveys. If the presence of 5 or more redds is established in an individual,

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weekday, aerial and/or ground survey, the Initiation of Spawning shall be established as that Wednesday immediately prior to that survey."

SOA 2007-HR06: Hanford Reach Working Group Statement of Agreement on Protocol for Requesting an Additional Weekend of Protection Flows

Submitted to Hanford Reach Working Group: July 11, 2007 Approved: September 6, 2007

"The Hanford Reach Working Group (HRWG) agrees that, on a case-by-case basis, an additional weekend of protection flows in the Hanford Reach will be considered, provided four (4) days' notice is provided to Grant PUD Operators in writing. If conditions warrant an additional weekend of protection flows, Grant PUD will coordinate with other operators and make every effort to meet the weekend minimum operating constraints."

SOA 2010-HR01: Hanford Reach Working Group Statement of Agreement on Protocol for Conducting the First Vernita Bar Ground Survey and Concurrent Aerial Redd Count

Submitted to Hanford Reach Working Group: September 3, 2010 Approved: November 2, 2010

"The Hanford Reach Working Group (HRWG) agrees that the first Vernita Bar ground survey and the first aerial redd counts will commence on the first Sunday following October 15 annually."

SOA 2011-HR01: Hanford Reach Working Group Statement of Agreement on Water temperature data that will be used to calculate Temperature Units for the Hanford Reach Fall Chinook Protection Program

Submitted to Hanford Reach Working Group: February 25, 2011 Approved: April 5, 2011

"The Hanford Reach Working Group (HRWG) agrees that data collected at the Priest Rapids Dam (PRD) tailrace Fixed Site Monitoring station will be used to calculate Temperature Unit accumulations for the Hanford Reach Fall Chinook Protection Program."

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Appendix C
Summary of Priest Rapids Dam discharge, fluctuations, and constraints (kcfs) associated with the Hanford Reach Fall Chinook Protection Program, March 10 – June 2, 2025.

Date	Average Discharge	Minimum Discharge	Maximum Discharge	Daily Delta	Delta Constraint
10-Mar-25	65.6	64.8	66.3	1.5	20
11-Mar-25	65.7	65.2	71	5.8	20
12-Mar-25	65.5	65.2	66.3	1.1	20
13-Mar-25	65.4	65.3	65.5	0.2	20
14-Mar-25	65.4	65.3	65.5	0.2	20
15-Mar-25	65.7	65.3	68.1	2.8	20
16-Mar-25	65.6	65.2	66.6	2.9	20
17-Mar-25	65.5	65.2	65.7	0.5	20
18-Mar-25	65.5	65.2	65.7	0.5	20
19-Mar-25	65.5	65.2	66	0.8	20
20-Mar-25	65.7	65.4	65.9	0.5	30
21-Mar-25	65.5	65.3	65.6	0.3	20
22-Mar-25	65.9	65.3	65.6	0.3	20
23-Mar-25	65.4	65.3	65.5	0.3	20
24-Mar-25	65.4	65.3	65.6	0.3	20
25-Mar-25	65.4	65.2	65.5	0.3	20
26-Mar-25	77.8	65.3	83.8	18.5	20
27-Mar-25	77.4	71.5	95.8	24.3	30
28-Mar-25	127.9	102.9	151	48.1	30
29-Mar-25	110	105.8	124.8	53.8	30
30-Mar-25	135.2	106.8	159.6	52.8	30
31-Mar-25	132.3	120	140.8	20.8	30
1-Apr-25	122.3	98.8	135.1	36.3	40
2-Apr-25	83.8	71.1	108.8	37.7	40
3-Apr-25	94.1	79.6	98.2	18.6	20
4-Apr-25	114.8	99.8	131.4	31.6	30
5-Apr-25	98	91.4	107	15.6	30
6-Apr-25	92.6	86	93.2	21	30
7-Apr-25	72.6	65.7	80.3	14.6	30
8-Apr-25	82.7	65.7	90.4	24.7	30
9-Apr-25	95.6	76.4	105.8	29.4	30
10-Apr-25	124.4	119.6	128.3	8.7	30
11-Apr-25	128.3	121.5	130.7	9.2	60
12-Apr-25	121	106.4	130.7	53.4	40

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13-Apr-25	150.1	142.5	159.8	17.3	40
14-Apr-25	171.2	145.8	183.2	37.4	40
15-Apr-25	145.3	125	165.4	40.4	60
16-Apr-25	130.3	101.8	140.9	39.1	60
17-Apr-25	132.4	124	137.3	13.3	40
18-Apr-25	133.4	126.5	139.3	12.8	60
19-Apr-25	128.3	126	139	13	40
20-Apr-25	126.2	125.5	127.2	13.5	40
21-Apr-25	118	100.7	121	20.3	60
22-Apr-25	121.4	101.4	138.5	37.1	40
23-Apr-25	135.4	120.6	145.5	24.9	60
24-Apr-25	135.4	112.7	144.1	31.4	40
25-Apr-25	130.1	117.8	137.7	19.9	40
26-Apr-25	121.8	113.1	129.2	16.1	30
27-Apr-25	113.2	109.9	126.7	19.3	30
28-Apr-25	103.1	81.9	119.9	38	40
29-Apr-25	111.8	106	124.9	18.9	40
30-Apr-25	127.2	111.8	140	28.2	40
1-May-25	130.4	111	144.5	33.5	40
2-May-25	143.2	113.2	166.9	53.7	60
3-May-25	111.3	98	118.6	24.3	30
4-May-25	111.6	103.1	122.3	19.2	30
5-May-25	126.4	115.2	135.8	20.6	60
6-May-25	134.1	122	145.4	23.4	40
7-May-25	124.4	99.5	135.2	35.7	60
8-May-25	136.8	129.7	139.6	9.9	40
9-May-25	146.5	137.4	154.3	16.9	40
10-May-25	147.2	136.4	166	29.6	40
11-May-25	139.4	132.9	146.9	33.1	40
12-May-25	131.5	123.8	137.7	13.9	60
13-May-25	127.5	116.3	138.7	22.4	40
14-May-25	112.6	85.8	122.6	36.8	40
15-May-25	113.8	104.8	123.4	18.6	40
16-May-25	136.9	117.9	145.7	27.8	40
17-May-25	119.1	103.8	132.6	28.8	30
18-May-25	84.5	65.7	104.7	66.9	30
19-May-25	105.7	65.8	125.3	59.5	40
20-May-25	106.5	92.4	120.6	28.2	40

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21-May-25	116.8	104	119.8	15.8	30
22-May-25	117.3	102.3	131.6	29.3	40
23-May-25	110.9	106.2	117	10.8	40
24-May-25	92.3	82.7	98.2	16.1	20
25-May-25	88.3	82.5	98.8	16.3	20
26-May-25	84.7	80.6	89.8	9.2	30
27-May-25	102.2	98	109.6	11.6	30
28-May-25	129	114.8	140.7	25.9	40
29-May-25	112.7	101.6	121.2	19.6	40
30-May-25	127.3	116	139.5	23.5	30
31-May-25	130.3	120.8	150.8	30	40
1-Jun-25	128.4	121.2	140.5	29.6	40
2-Jun-25	140.4	121.1	163.9	42.8	60

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Appendix D
Summary of Vernita Bar ground survey, 1998-present.

Brood Year	Final count by spawning elevation (kcfs)						Total
	36-50	50-55	55-60	60-65	65-70	70+	
2024	--	77	39	16	5	3	140
2023	--	39	22	3	2	0	66
2022	--	52	21	8	1	1	83
2021	--	115	71	39	2	0	227
2020	--	42	69	65	23	2	201
2019	--	105	40	34	6	0	185
2018	--	76	37	16	1	0	130
2017	--	84	20	4	2	6	116
2016	--	157	127	152	112	89	637
2015	--	265	213	156	36	32	702
2014	--	156	175	142	32	20	525
2013	--	150	97	109	11	5	372
2012	--	38	48	20	3	2	111
2011	--	103	91	38	2	0	234
2010	--	65	61	37	5	9	177
2009	---	45	27	4	1	1	78
2008	---	18	14	6	0	0	38
2007	---	17	8	4	0	0	29
2006[a]	---	79	66	35	24	19	223
2005	---	145[B]	97[B]	74	38	60	172
2004	---	99[B]	67[B]	55	18	6	79
2003	---	174	149	123	30	7	483
2002	152	47	45	30	8	2	284
2001	41	1	0	0	0	0	42
2000	231	55	51	53	7	2	399
1999	49[B]	55	26	12	3	0	96
1998	162[B]	21	10	7	0	1	39
1997	342	94	88	50	10	3	587
1996	299	68	52	23	9	10	461
1995	---	54	41	11	9	1	116
1994	142	33	22	10	1	0	208
1993	95	3	0	0	0	0	98
1992	99	15	9	3	0	0	126
1991	---	97	65	45	20	28	255
1990	---	71	59	17	2	1	150
1989	---	122	129	63	22	16	352
1988	---	181	151	59	29	51	471

- - - data not collected, [A] Data from November 19 survey, only 2 of 5 transects surveyed on final survey (11/26), [B] Counts from previous week because area not counted on final survey

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Appendix E

Critical life stage milestones and periods of protection for fall Chinook salmon fry rearing in the Hanford Reach of the Columbia River

Dates for life-stage milestones are estimated with ATUs. Beginning in 1999, early rearing protections were extended beyond the Emergence Period. The dates for protections under the HRFCPPA (2004-present) are based on ATU and dates under the IHFCPP (1999 – 2003) are based on fall Chinook salmon fry presence in near-shore areas and encountered in random sampling by WDFW.

Brood Year	Initiation of Spawning			End of Spawning	Beginning Hatch	Start of Emergence	End of Emergence	End of Rearing Period	Duration of Emergence (days)	Duration Emergence and Rearing protections (days)
	<36 kcfs	36-50 kcfs	>50 kcfs							
2024	10/31/2024	10/31/2024	10/31/2024	11/24/2024	12/11/2024	3/10/2025	4/29/2025	6/2/2025	51	84
2023	10/26/2023	10/26/2023	11/9/2023	11/26/2023	12/4/2023	2/20/2024	4/24/2024	6/3/2024	66	104
2022	10/27/2022	10/27/2022	11/3/2022	11/27/2022	12/9/2022	4/11/2023	5/25/2023	6/21/2023	45	71
2021	10/20/2021	10/20/2021	10/27/2021	11/21/2021	11/28/2021	3/17/2022	5/16/2022	6/21/2022	60	97
2020	10/21/2020	10/21/2020	10/28/2020	11/22/2020	11/30/2020	2/27/2021	5/1/2021	6/6/2021	64	100
2019	10/23/2019	10/23/2019	10/23/2019	11/24/2019	12/4/2019	3/10/2020	5/7/2020	6/11/2020	58	93
2018	10/24/2018	10/24/2018	10/31/2018	11/25/2018	12/3/2018	3/13/2019	5/14/2019	6/15/2019	63	95
2017	10/25/2017	10/25/2017	11/8/2017	11/26/2017	12/7/2017	3/23/2018	5/15/2018	6/15/2018	54	85
2016	10/19/2016	10/19/2016	10/19/2016	11/20/2016	11/23/2016	3/11/2017	5/19/2017	6/20/2017	70	102
2015	10/21/2015	10/21/2015	10/21/2015	11/22/2015	11/29/2015	2/25/2016	4/29/2016	5/30/2016	65	96
2014	10/22/2014	10/28/2014	10/28/2014	11/23/2014	11/29/2014	2/26/2015	5/2/2015	6/3/2015	66	98
2013	10/23/13	10/23/13	10/23/13	11/24/13	12/1/13	3/23/14	5/20/14	6/19/14	58	88
2012	10/24/12	10/24/12	10/31/12	11/18/12	12/2/12	3/2/13	4/26/13	6/2/13	56	93
2011	10/19/11	10/26/11	10/26/11	11/20/11	12/8/11	3/8/12	5/15/12	6/17/12	69	102
2010	10/27/10	10/27/10	11/3/10	11/21/10	11/26/10	2/27/11	5/16/11	6/20/11	79	114
2009	10/21/09	10/28/09	11/4/09	11/22/09	11/30/09	3/2/10	5/2/10	6/9/10	62	100
2008	10/22/08	10/29/08	10/29/08	11/23/08	11/30/08	3/27/09	5/25/09	6/24/09	60	90
2007	10/24/07	10/31/07	11/7/07	11/18/07	12/5/07	3/29/08	5/13/08	6/17/08	46	81
2006	10/25/06	10/25/06	11/1/06	11/26/06	12/9/06	4/4/07	5/20/07	6/20/07	47	78
2005		10/19/05	10/19/05	11/20/05	11/25/05	2/17/06	5/5/06	6/9/06	78	113
2004		10/20/04	10/27/04	11/28/04	11/27/04	2/28/05	5/13/05	6/13/05	75	106
2003		---	10/22/03	11/23/03	12/2/03	3/20/04	5/10/04	6/12/04	52	85
2002		10/23/02	10/30/02	11/24/02	12/2/02	2/20/03	4/27/03	6/5/03	67	106
2001		10/31/01	---	11/18/01	12/14/01	3/17/02	4/25/02	6/4/02	40	80
2000		10/25/00	10/25/00	11/19/00	12/9/00	4/1/01	5/10/01	6/10/01	40	71
1999		10/27/99	10/27/99	11/21/99	12/10/99	3/20/00	5/2/00	6/26/00	44	99
1998		10/28/98	11/11/98	11/29/98	12/5/98	3/8/99	5/11/99	6/30/99	65	115
1997		10/22/97	10/22/97	11/23/97	12/3/97	3/12/98	5/4/98		54	
1996		10/23/96	10/23/96	11/24/96	12/12/96	4/30/97	6/4/97		36	
1995		10/18/95	10/25/95	11/19/95	12/7/95	5/17/96	6/22/96		37	
1994		10/26/94	11/2/94	11/20/94	12/13/94	4/23/95	5/28/95		36	
1993		10/27/93	---	11/21/93	12/11/93	3/27/94	5/8/94		43	
1992		10/21/92	10/28/92	11/22/92	11/28/92	4/2/93	5/24/93		53	
1991		10/23/91	10/23/91	11/24/91	12/2/91	2/20/92	4/21/92		62	
1990		10/24/90	10/24/90	11/18/90	12/4/90	4/13/91	5/23/91		41	

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1989		10/18/89	10/25/89	11/19/89	11/23/89	2/4/90	4/29/90		85	
1988		10/19/88	10/26/88	11/20/88	11/24/88	3/5/89	5/14/89		71	

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Appendix F

Summary of discharge from Priest Rapids Dam, during the fall Chinook salmon Emergence and Rearing periods under the IHFCPP and HRFCPPA, 1999-present.

Brood Year	Emergence and Rearing Period Dates	Total Days	Mean Daily Discharge (when delta constraints) (kcfs)	Mean Daily Discharge Delta (kcfs)	Daily Delta/ Daily Discharge (%)	Daily Discharge Delta (kcfs)				
						<20	20-40	40-60	60-80	>80
2024	March 10-June 2, 2025	84	108.8	21.9	20.1%	43	33	8	1	0
2023	February 20-June 3, 2024	104	86.6	19.8	22.9%	59	44	2	0	0
2022	April 11-June 21, 2023	71	128.2	32.5	25.4%	31	20	9	4	7
2021	March 17-June 21, 2022	97	142.9	35.7	25.0%	20	50	13	11	3
2020	Feb 27-Jun 6, 2021	100	102.9	20.4	19.8	53	41	3	3	0
2019	Mar 10-Jun 11, 2020	93	137	38.1	27.8	35	26	13	9	11
2018	Mar 13-Jun 15, 2019	95	108.6	20.8	19.2	42	47	5	1	0
2017	Mar 23-Jun 15, 2018	85	134.3	30.3	22.5	4	23	4	0	0
2016	Mar 11-Jun 20, 2017	102	130.8	34.82	26.6	1	6	3	0	0
2015	Feb 25-May 30, 2016	96	145.8	31.9	21.9	24	52	16	4	0
2014	Feb 26-Jun 3, 2015	98	128.9	29.3	22.7	18	72	8	0	0
2013	Mar 23-Jun 19, 2014	88	173.3	42.4	24.4	5	42	31	7	4
2012	Mar 2-Jun 2, 2013	93	147.2	34.7	23.6	23	30	22	10	2
2011	Mar 8-Jun 17, 2012	102	194.6	68.0	34.9	5	21	31	12	33
2010	Feb 27-Jun 20, 2011	114	196.7	31.9	16.2	5	50	31	17	11
2009	Mar 2-Jun 9, 2010	100	93.6	22.1	23.6	37	45	4	0	0
2008	Mar 28-Jun 25, 2009	89	132.0	40.2	30.4	11	37	17	4	7
2007	Mar 29-Jun17, 2008	81	148.1	38.1	25.7	18	37	11	9	6
2006	Apr 4-Jun 20, 2007	78	171.7	34.8	20.3	15	34	23	6	0
2005	Feb 13-Jun 9, 2006	117	146.2	41.3	28.2	21	48	26	10	12
2004	Feb 28-Jun 13, 2005	106	109.0	27.2	25.0	34	59	8	2	3
2003	Mar 21-Jun 12, 2004	84	110.4	28.0	25.4	32	30	20	0	2
2002	Feb 20-Jun 5, 2003	98	117.0	33.3	28.5	32	28	26	10	2
2001	Mar 21- Jun 4, 2002	76	131.2	47.1	35.9	19	9	26	11	11
2000	Mar 26-Jun 10, 2001	77	70.6	23.2	32.9	45	11	12	8	1
1999	Mar 21-Jun 26, 2000	98	148.2	50.0[A]	33.7	9	30	34	13	12

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1998	Mar 10-Jun 30, 1999	113	161.4	42.1	26.1	13	51	27	12	10
mean		**95.3**	**139.9**	**36.8**	**26.6**	**19.3**	**36.4**	**19.8**	**7.1**	**6.1**
[A] Interim protection plan called for rewetting of dewatered areas during eight days. Mean Daily Discharge Delta was 39.5 kcfs without the rewetting operations										

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Appendix G

Summary of constraints and performance during the Emergence and Rearing Periods under the HRFCPPA, 2004-present.

Migration year	Weekday Constraint		Weekend Constraint		Combined			CJAD II weekends – difference between minimum discharge and constraints (kcfs)			
	Targets	Met	Targets	Met	Targets	Met	%	1	2	3	4
2025	61	61	24	23	84	83	99%	0	24.5	1.3	1.0
2024	74	70	30	27	104	97	93%	-0.1	6.8	3.2	1.2
2023	71	70	20	20	91	90	99%	53.2	18.6	2.3	1.4
2022	77	75	20	20	97	95	98%	3.5	2.9	26.6	20.4
2021	70	68	30	30	100	98	98%	0.3	2.6	24.9	3.4
2020	68	68	26	26	94	94	100.0	13.1	1.0	1.7	24.1
2019	69	69	27	27	95	95	100.0	19.4	1.4	32.6	17.2
2018	61	61	24	24	85	85	100.0	5.4	27.1	128.6	3.6
2017	72	72	30	29	102	101	99.0	28.2	25.3	1.1	6.5
2016	68	68	28	27	96	97	99.0	1.1	49.8	-4.0	3.0
2015	70	69	28	28	98	97	99.0	1.1	3.2	7.6	10.3
2014	64	64	25	25	89	89	100.0	4.6	6.0	20.1	21.9
2013	65	64	14	13	79	77	97.5	10.9	36.4	4.5	-27.0
2012	72	72	15	15	87	87	100.0				
2011	81	80	17	15	98	95	96.9				
2010	72	68	14	14	86	82	95.3				
2009	63	57	13	11	76	68	89.5				
2008	57	57	12	9	69	66	95.7				
2007	56	55	11	8	67	63	94.0				
2006	84	66	16	11	100	77	77.0				
2005	76	60	15	7	91	67	73.6				
2004	60	39	13	8	73	47	64.4				
Mean	**68.3**	**62.6**	**16.0**	**13.6**	**84.4**	**76.2**	**90.2**				

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