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RECLAMATION

Willamette Basin Mercury TMDL Water Quality Implementation Plan Annual Report

**Tualatin Project, Oregon
Columbia-Pacific Northwest Region**



Mission Statements

The U.S. Department of the Interior protects and manages the Nation's natural resources and cultural heritage; provides scientific and other information about those resources; honors its trust responsibilities or special commitments to American Indians, Alaska Natives, Native Hawaiians, and affiliated Island Communities.

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

Willamette Basin Mercury TMDL Water Quality Implementation Plan Annual Report

**Tualatin Project, Oregon
Columbia-Pacific Northwest Region**

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Acronyms and Abbreviations

DMA	designated management agency
NWI	National Wetlands Inventory
ODEQ	Oregon Department of Environmental Quality
Reclamation	Bureau of Reclamation
TMDL	Total Daily Maximum Load
WQIP	Water Quality Implementation Plan

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Executive Summary

The Willamette River basin and its numerous tributaries do not currently meet Oregon's Water Quality Standards for mercury. These standards protect designated beneficial uses such as human health, recreation, fish and aquatic life, wildlife, hunting, and fishing (fish consumption and rearing). When water quality standards are not met, the Federal Clean Water Act requires a Total Maximum Daily Load (TMDL) to be established. A TMDL determines how much pollution can be added to the river without exceeding water quality standards.

The Bureau of Reclamation (Reclamation) received a letter from the Oregon Department of Environmental Quality (ODEQ) on February 17, 2022, designating Reclamation as a reservoir operator designated management agency (or DMA). Baseline water quality monitoring at Henry Hagg Lake is proposed through the first 5 years of TMDL implementation. Henry Hagg Lake is a feature of the Tualatin Project and is operated to provide irrigation water, recreation, and flood and water quality control under existing environmental compliance commitments. Accordingly, operations are tightly regulated and any changes to operations will require extensive study; water contract review, and compliance with applicable laws including the National Environmental Policy Act, the Endangered Species Act, and Section 106 of the National Historic Preservation Act. Such efforts likely would exceed the 5-year reporting cycle for this Water Quality Implementation Plan (WQIP) and are thus outside the scope and budget of the WQIP.

Reclamation submitted the Willamette Basin Mercury TMDL WQIP in August of 2023. ODEQ approved an updated version of the plan in January 2024. The first annual report per the approved WQIP schedule was submitted by April 1, 2024, and Reclamation completed a review of reservoir adjacent wetlands based on the National Wetlands Inventory (NWI). The first monitoring season for the WQIP was completed in 2024, but results are not yet available for this monitoring and there is no water quality data available to report.

Water Quality Implementation Plan

As a described in the 2024 Water Quality Implementation Plan (WQIP)¹, Reclamation will submit annual reports to Oregon Department of Environmental Quality (ODEQ) that include the information in the performance measures table of the 2024 WQIP (table 1).

Table 1.—2024 WQIP performance measures

Reclamation Mercury TMDL Implementation Tracking Matrix							
Source	Strategy	How	Fiscal Analysis	Measure	Timeline	Milestone	Status
Shoreline Erosion	Monitor reservoir level fluctuations	Via Hydromet monitoring	N/A	Daily max water elevation change	April 2024 - August 2028	Annual report for the previous calendar year's monitoring (April 1)	April 2025
Reservoir Chemistry	Maintain reservoir-adjacent wetlands	Existing surveys/delineations	N/A	Acreage of wetlands	April 2024 - August 2028		April 2025
	Monitor	Dissolved oxygen profiles	\$90,621 for August 2024 - August 2028	Percent of reservoir volume < 0.5 mg DO	August 2024 – August 2028		April 2025
		DO, 1 m interval, pH, EC, temperature		Percent saturation			
		Nutrient status: nutrients, ions, organic carbon, 3 times annually		Nutrient concentrations, increase/decrease in sulfate or carbon	August 2024 – August 2028		April 2025
		Water column Hg 3 times annually		THg concentrations	August 2024 – August 2028		April 2025
		Water column dissolved MeHg 3 times annually		Dissolved MeHg concentrations	August 2025 - August 2028		April 2025
	Continue existing protective reservoir operations	Refill is targeted for May 1; minimum storage occurs November – January.	N/A	Refill date, percent fill relative to previous year, date of minimum storage	N/A		N/A

¹ Willamette Basin Mercury TMDL Water Quality Implementation Plan, February 2024. U.S. Department of the Interior, Bureau of Reclamation. [Willamette Basin Mercury TMDL, CPN Region](#)

Reclamation Mercury TMDL Implementation Tracking Matrix							
Source	Strategy	How	Fiscal Analysis	Measure	Timeline	Milestone	Status
	Assess opportunities to reduce sediment runoff	Coordination with upstream land managers	N/A	Upstream land managers WQIP progress	April 2024-August 2028, establish data sharing		April 2025

Shoreline Erosion

Reservoir forebay elevation change day to day is provided in figure 1. 2023 is provided as a comparison. Maximum day to day fluctuations are less than 3 feet per day from January 2024 through December 2024.

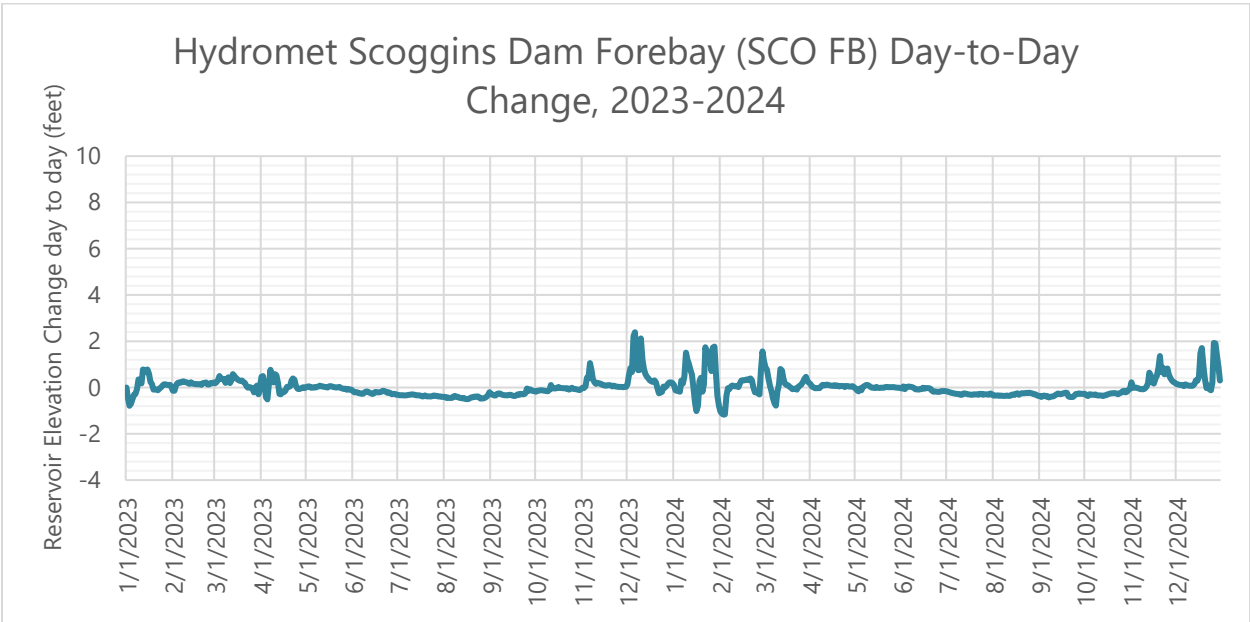


Figure 1.—Henry Hagg forebay elevation change day to day measured in feet by Hydromet forebay elevation sensor for 2023 and 2024.

Reservoir Chemistry

Area of Reservoir-Adjacent Wetlands

Reservoir adjacent wetlands surveyed via the NWI appears to show 6.58 acres of reservoir-adjacent wetlands (table 2).

Table 2.—Reservoir-adjacent wetlands per the NWI

Wetland Classification	Approximate Location	Area (acres)	Latitude	Longitude
PEM1Ch	Tanner Creek inflow	2.77	45.501	-123.209
PEM1Ch	Tanner Creek inflow	0.91	45.502	-123.209
PSSCh	Wall Creek inflow	0.68	45.502	-123.231
PSSAh	Scoggins Creek inflow	1.74	45.499	-123.227
PSSCh	West Shore near Lee Road	0.48	45.479	-123.222

2024 Monitoring Season

To efficiently use resources and promote cooperation between local agencies, Reclamation partnered with the Joint Water Commission (JWC) to utilize existing JWC water quality monitoring visits to collect water quality samples and submit them to the Reclamation water lab in Boise, ID. Once received, the Water Lab split samples to be analyzed locally for water quality constituents and submitted the remainder of each sample to the USGS, Upper Midwest Water Science Center, in Madison, WI for mercury analysis.

This first year did not collect all water quality parameters to be used for the mercury translator. Monitoring in 2024 was developed to train staff on monitoring techniques, test logistics for monitoring, and allow time to set up laboratory analysis agreements. Results are not yet available for 2024 monitoring and will be available in the 2026 annual report. Table 3 describes the monitoring completed in 2024.

Table 3.—2024 Water Quality Monitoring at Henry Hagg

Date	Depths (meters)	Quality Control	Analytes
8/19/2024	1/5/10/15/21/25	Equipment Blank, Field Replicate, Laboratory Blank	UTHg, UMHg, Ca, K, Mg, SiO ₂ , Cl, F, SO ₄ , OP, TDS, dNH ₃ , NO ₃ +NO ₂ , TKN, TP, TSS, TDS, TOC, DOC, pH/Temp/DO profile
9/18/2024	1/5/11/15/21	Field Replicate, Laboratory Blank	UTHg, UMHg, Ca, K, Mg, SiO ₂ , Cl, F, SO ₄ , OP, TDS, dNH ₃ , NO ₃ +NO ₂ , TKN, TP, TSS, TDS, TOC, DOC, pH/Temp/DO profile
10/16/2024	1/5/11/15/19	Field Replicate, Laboratory Blank	UTHg, UMHg, Ca, K, Mg, SiO ₂ , Cl, F, SO ₄ , OP, TDS, dNH ₃ , NO ₃ +NO ₂ , TKN, TP, TSS, TOC, DOC, pH/Temp/DO profile (TDS not completed)

Continue Existing Protective Reservoir Operations

Figure 2 shows the maximum and minimum forebay elevations for Henry Hagg Lake for 2023 and 2024. 2023 is presented as a comparison. In 2024, refill to forebay elevation 303.5' was completed on April 30, and the lowest reservoir level was measured at 265' on November 10.

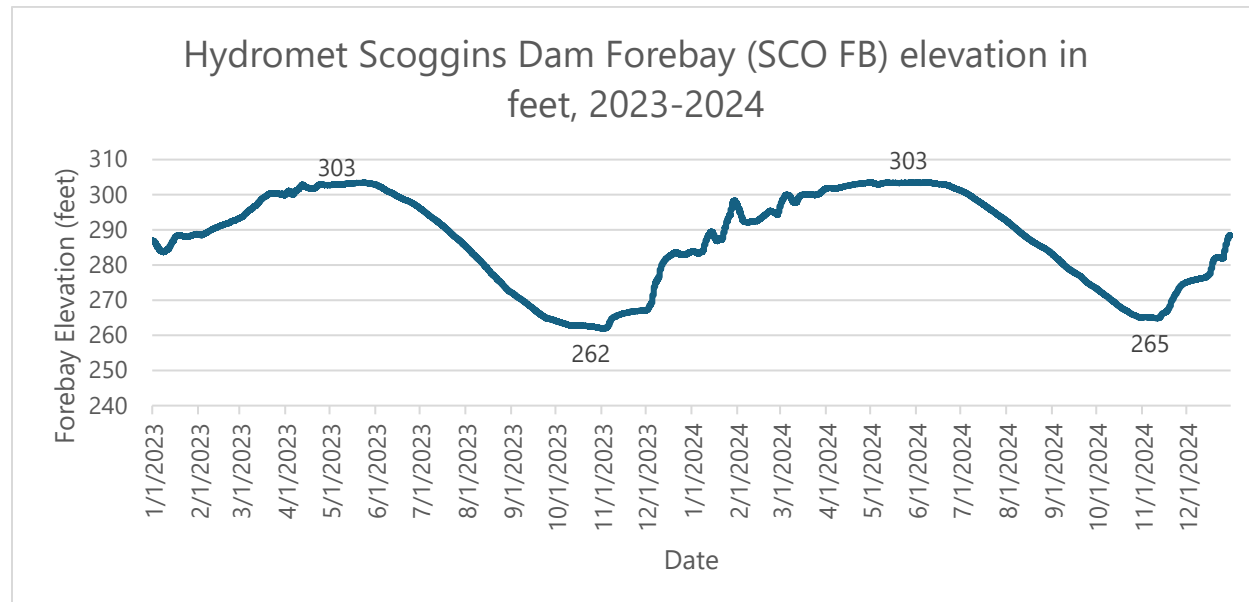


Figure 2.—Henry Hagg forebay elevation measured in feet by Hydromet forebay elevation sensor for 2023 and 2024.

Reclamation continued existing reservoir operations which are protective versus mercury risk factors described in table 4.

Table 4.—Mercury risk factors and reservoir operations

Mercury Risk Factor	2023/2024 Henry Hagg Lake Operations
Reservoirs can be sites where the rate of methylation of Hg is enhanced by conditions of low DO and elevated organic carbon and sulfate in bottom waters and sediment (ODEQ 2019a).	No water quality results to report yet for 2024 monitoring season. No monitoring in 2023.
Water management was particularly important in influencing fish THg concentrations, which were up to 11-times higher in reservoirs with minimum water storage occurring in May, June, or July (Willacker et al. 2016). For northwestern forested mountain reservoirs, minimum water storage occurring in January was associated with the lowest fish THg levels.	Minimum water storage occurred in the period from November to January in 2023 and 2024.
Between-year changes in maximum water storage strongly influenced fish THg concentrations, but within-year fluctuations in water levels did not influence fish THg concentrations (Willacker et al. 2016).	The reservoir filled to forebay elevation 303.5' (full pool) in 2023 and 2024.

Assess Opportunities to Reduce Sediment Runoff

No opportunities were presented to reduce upstream sediment runoff in 2024, though upstream land management agencies are required to have their own water quality implementation plans in place.

2025 Monitoring Plan

Reclamation partnered with the Joint Water Commission (JWC) to utilize existing JWC water quality monitoring visits to collect water quality samples and submit them to the Reclamation water lab in Boise, ID. Once received, the Water Lab will split samples to be analyzed locally for water quality constituents and submit the remainder of each sample to the United States Geological Survey (USGS), Upper Midwest Water Science Center, in Madison, WI for mercury analysis. In 2025, the Reclamation Water Lab will filter samples when they arrive per USGS sampling procedure and provided USGS equipment prior to shipping samples to the USGS laboratory for mercury analysis.

Water quality monitoring is scheduled to occur per the approved WQIP beginning in August 2025. Monitoring will occur in August, September, and October. During each event in August, September, and October, samplers will fill a 2 liter bottle at 5x reservoir depths, including the surface, mid epilimnion (about 5 m), just below the thermocline (about 15 m) and then mid hypolimnion and deep hypolimnion samples, along with 1x field blank per sampling event, 1x field duplicate every other sampling event, and 2x deionized water blanks (laboratory), and 2x equipment rinse blanks per monitoring season (calendar year).

In 2025 and beyond, these samples will be analyzed for unfiltered total mercury (UTHg), unfiltered methylmercury (UMHg), filtered total mercury (FTHg), and filtered methylmercury (FMHg) along with other analytes to aid in developing the mercury translator. These include dissolved ammonia, dissolved nitrate + nitrite, dissolved ortho-phosphorus, total Kjeldahl nitrogen, total phosphorus, total organic carbon, dissolved organic carbon, total suspended sediment, dissolved chloride, dissolved fluoride, dissolved sulfate, dissolved calcium, dissolved magnesium, dissolved potassium, dissolved silica, and dissolved sodium, and pH/temperature/conductivity and dissolved oxygen profile taken during the sampling event.

References

- ODEQ. 2019. *Monitoring Strategy to Support Implementation of the Willamette Mercury Total Maximum Daily Load*. October 2019, Oregon Department of Environmental Quality.
- Willacker, J.J., C.A. Eagles-Smith, M.A. Lutz, M.T. Tate, J.M. Lepak, and J.T. Ackerman. 2016. “Reservoirs and water management influence fish mercury concentrations in the western United States and Canada.” *Science of the Total Environment*, pp. 739–748.