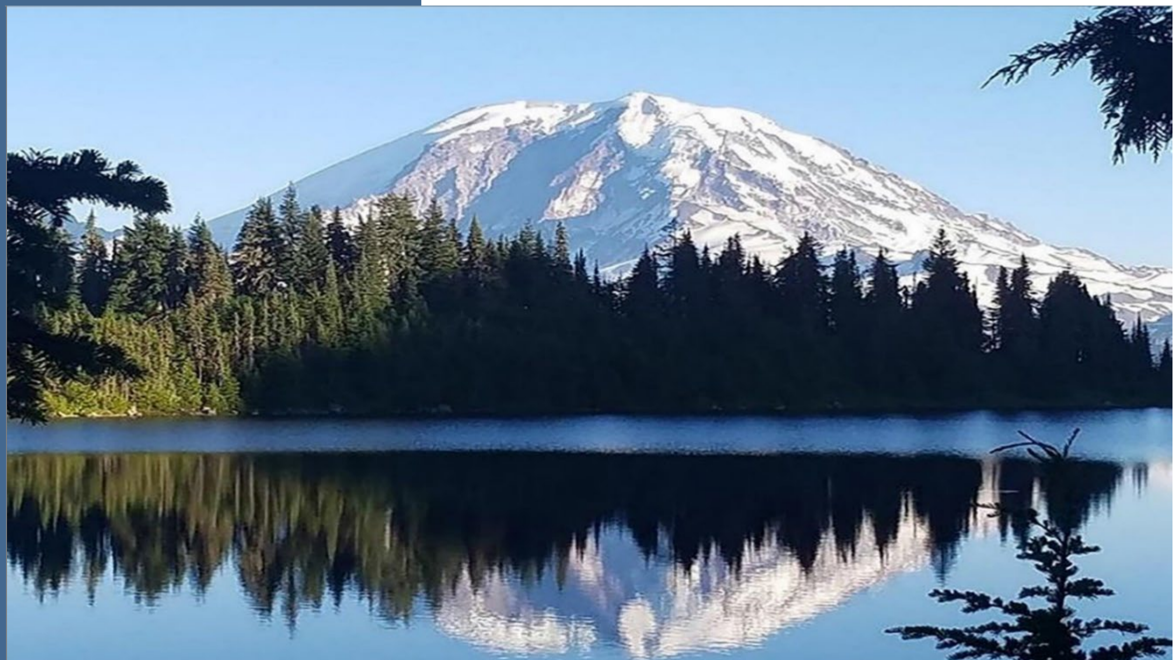

Supporting Information for the 2022 Water Quality Assessment

Supplemental methods, citations, TMDL prioritization, and data sources

Water Quality Program

Washington State Department of Ecology

Olympia, Washington

April 2025, 25-10-025

DEPARTMENT OF ECOLOGY
State of Washington

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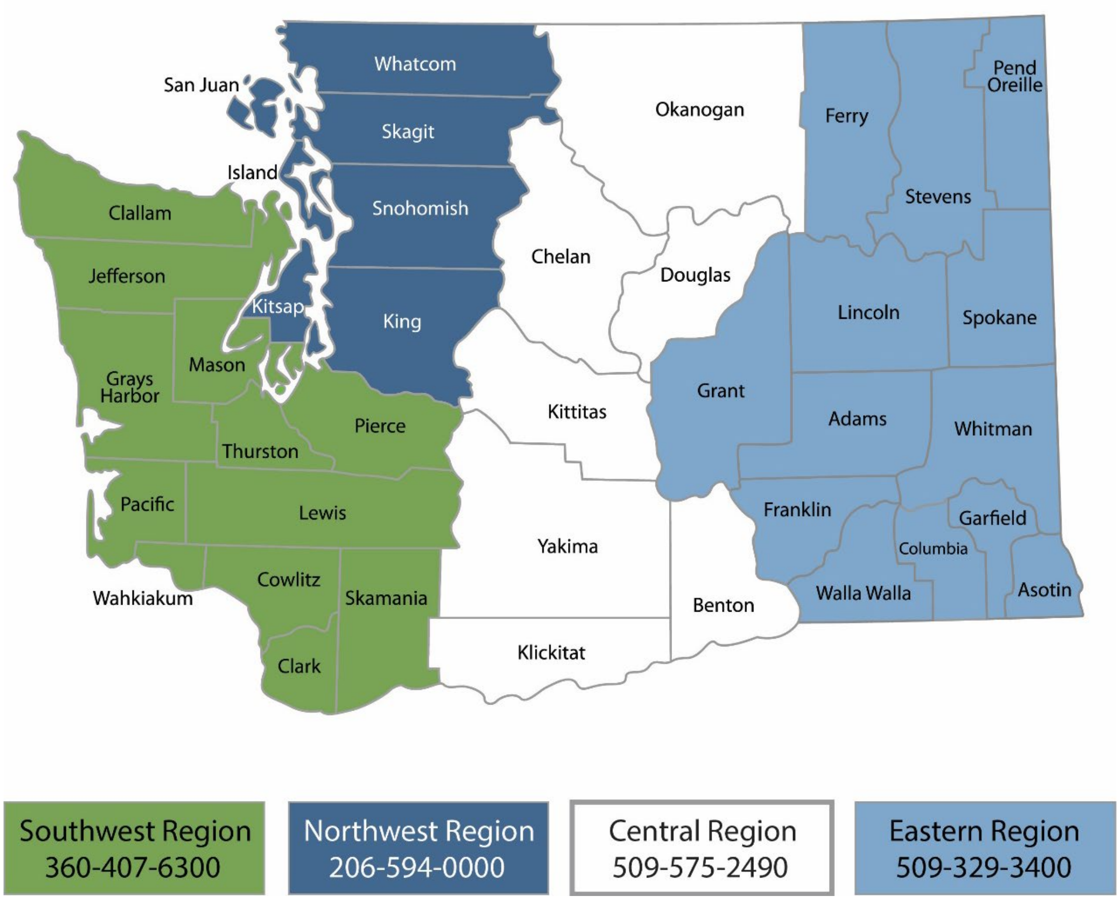
[1] www.ecology.wa.gov/contact

Department of Ecology's Regional Offices

Map of Counties Served



Region	Counties served	Mailing Address	Phone
Southwest	Clallam, Clark, Cowlitz, Grays Harbor, Jefferson, Mason, Lewis, Pacific, Pierce, Skamania, Thurston, Wahkiakum	PO Box 47775 Olympia, WA 98504	360-407-6300
Northwest	Island, King, Kitsap, San Juan, Skagit, Snohomish, Whatcom	PO Box 330316 Shoreline, WA 98133	206-594-0000
Central	Benton, Chelan, Douglas, Kittitas, Klickitat, Okanogan, Yakima	1250 W Alder St Union Gap, WA 98903	509-575-2490
Eastern	Adams, Asotin, Columbia, Ferry, Franklin, Garfield, Grant, Lincoln, Pend Oreille, Spokane, Stevens, Walla Walla, Whitman	4601 N Monroe Spokane, WA 99205	509-329-3400
Headquarters	Across Washington	PO Box 46700 Olympia, WA 98504	360-407-6000

Supporting Information for Candidate 2022 Water Quality Assessment

Supplemental methods, citations, TMDL prioritization, and data sources

Water Quality Program
Washington State Department of Ecology
Olympia, WA

April 2025

25-10-025

DEPARTMENT OF
ECOLOGY
State of Washington

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Document Purpose

The Washington State Department of Ecology (Ecology) prepared this document during completion of Washington's 2020/2022 Water Quality Assessment (further referred to as 2022 WQA) to meet requirements of the Clean Water Act. The primary purposes of this document are to:

- Provide numeric and narrative data sources that were considered for use in making water quality category determinations for the Water Quality Assessment.
- Provide citation information associated with Washington's 2022 WQA in order to satisfy the U.S. Environmental Protection Agency (EPA) submittal requirements and to meet the requirements of RCW 34.05.272.
- Document additional assessment methodologies and policy decisions used to support water quality determinations and further supplement Water Quality Program Policy 1-11.

This document was submitted to the EPA with the associated 2022 WQA category determinations, also known as the Integrated Report of the 305(b) report and 303(d) list, in April 2025. The full 2022 WQA can be accessed through Ecology's website[2].

This document is structured into several sections containing the following information:

- Supplemental Methodologies – additional assessment methods used to support 2022 WQA category determinations for parameters that may or may not have a defined methodology in Policy 1-11.
- Numeric Data Sources – citations of numeric-based datasets analyzed to support water quality determinations.
- Narrative Data and Information – narrative data and information submitted for consideration in the WQA and Ecology's use determinations.
- TMDL Prioritization – overview of Ecology's TMDL prioritization process and priority rankings.
- TMDL and Alternative Pollution Control Project Information – information and analyses supporting Category 4A and 4B determinations.
- Water Quality and Sediment 303(d) Priority Rankings – appendices of water quality, tissue, and sediment 303(d) listings ranked for development of a TMDL.

[2] https://ecology.wa.gov/water-shorelines/water-quality/water-improvement/assessment-of-state-waters-303d

Background Information on the WQA Process

The federal Clean Water Act at sections 303(d) and 305(b) require Washington State to assess the water quality status of Washington state waters and periodically report on the status to EPA Region 10. Ecology develops the Water Quality Assessment (WQA) to fulfill this requirement. The purpose of the WQA is to determine if readily available data demonstrates that the water quality for the given waterbody supports the designated uses described in the water quality standards and begin prioritizing clean-up. Ecology accomplishes this by applying methodologies to compare available data and information to water quality standards for surface waters and sediments, following credible data protocols and requirements.

Credible data laws and policies

Washington State law (Water Quality Data Act codified in RCW 90.48.570 through 90.48.590, also referred to as the "Credible Data Act") requires Ecology to use credible data to determine whether any water of the state is to be placed on or removed from the 303(d) list and whether any surface water of the state is supporting its designated use or other classification. Ecology's Credible Data Policy (Policy 1-11, Chapter 2[3]) describes the Quality Assurance (QA) measures, guidance, regulations, and existing policies that help ensure the credibility of data and other information used in agency actions relating to surface water quality. This policy applies when evaluating data and information for use in agency decisions when the quality of a surface water of the state is at issue. It is also intended as guidance for all parties interested in submitting data for consideration in decisions related to water quality.

Data are considered credible data if:

- Appropriate quality assurance and quality control procedures were followed and documented during collection and analysis of water quality samples;
- The samples or measurements are representative of water quality conditions at the time the data were collected;
- The data consist of an adequate number of samples based on the objectives of the sampling, the nature of the water in question, and the parameters being analyzed; and
- Sampling and laboratory analysis conform to methods and protocols generally acceptable in the scientific community as appropriate for use in assessing the condition of the water.

Ecology encourages any party considering submitting numeric or narrative data for consideration in the WQA to review both chapters of Policy 1-11 to understand submittal requirements.

Water Quality Assessment methodology

Washington's assessment protocols are described in "Washington's Water Quality Assessment Listing Methodology to Meet Clean Water Act Requirements" (Policy 1-11, Chapter 1[4]). This

[3] https://apps.ecology.wa.gov/publications/SummaryPages/2110032.html
[4] https://apps.ecology.wa.gov/publications/SummaryPages/1810035.html

policy describes the methodologies for how waterbody segments are assessed for determining the status of water quality, using the state's water quality standards as the basis. Ecology applies this policy when evaluating data and information for the Assessment to meet the federal Clean Water Act reporting requirements. The policy is also intended as guidance for all parties that submit data for the WQA process or are planning data collection efforts for use in future assessments. This policy provides guidance for both numeric data submittals and submittals based on narrative standards.

Data citations to meet RCW 34.05.272

Ecology's Water Quality Program (WQ) is required to identify the information sources relied upon in support of certain agency actions defined by RCW 34.05.272. One of the purposes of this document is to meet the requirements of RCW 34.05.272 by providing citation information associated with Washington's 2022 WQA.

RCW 34.05.272 describes eleven categories of information sources that need to be identified with citations used to support the WQA. They include:

1. Peer review overseen by an independent third party.
2. Review by staff internal to Ecology.
3. Review by persons that are external to and selected by Ecology.
4. Documented open public review process that is not limited to invited organizations or individuals.
5. Federal and state statutes.
6. Court and hearings board decisions.
7. Federal and state administrative rules and regulations.
8. Policy and regulatory documents adopted by local governments.
9. Data from primary research, monitoring activities, or other sources, but that has not been incorporated as part of documents reviewed under other processes.
10. Records of best professional judgment of Ecology employees or other individuals.
11. Sources of information that do not fit into one of the other categories listed.

This document contains the primary citation lists associated with the development of the 2022 WQA and the data sources used or examined as the basis for individual water quality listings. Citations noted in this document include numbers in brackets, following the citation, that identify which of the eleven citation categories relate to the specific citation. In cases where a group of source listings all have the same citation category, the category number is included within the descriptive text above the group of source listings.

State and federal guidance documents

The following are citations for state and federal laws and policies supporting Ecology's WQA determination process:

Washington Administrative Code. Chapter 173-201A WAC. Water Quality Standards for Surface Waters of the State of Washington.[5]

Washington State Department of Ecology. 2018. Water Quality Program Policy 1-11 Chapter 1: Washington's Water Quality Assessment Listing Methodology to Meet Clean Water Act Requirements. Revised March 2023.[6]

Washington State Department of Ecology. 2006. Water Quality Program Policy, WQP Policy 1-11 Chapter 2. Ensuring Credible Data for Water Quality Management. Washington State Department of Ecology. Revised July 2021.[7]

Washington State Department of Ecology. 2011. Waters Requiring Supplemental Spawning and Incubation Protection for Salmonid Species. Washington State Department of Ecology. Revised January 2011. Publication No. 06-10-038.[8]

Federal Water Pollution Control Act (the "Clean Water Act") 33 U.S.C. 1251 et seq.[9]

Revised Code of Washington. Chapter 90.48 RCW. Water Pollution Control.[10]

2022 WQA Process

Ecology followed several key steps to develop and submit the final 2022 WQA to EPA for approval, including:

- Updates to the listing methodologies in Policy 1-11, Chapter 1
- Updates to waterbody segments
- Gathering and assembling credible water quality data
- Technical assessment of data to make category determinations
- Tribal and public review of the WQA results
- Final WQA and Candidate 303(d) list submitted to EPA for approval

Individuals and organizations participated in developing the 2022 WQA by reviewing and commenting on Policy 1-11, submitting readily available data, and reviewing and commenting on the draft 2022 WQA.

Updates to Policy 1-11, Chapter 1

Policy 1-11, Chapter 1 was updated in March of 2023 for the 2022 WQA.

[5] https://apps.leg.wa.gov/WAC/default.aspx?cite=173-201A
[6] https://apps.ecology.wa.gov/publications/SummaryPages/1810035.html
[7] https://apps.ecology.wa.gov/publications/SummaryPages/2110032.html
[8] https://apps.ecology.wa.gov/publications/SummaryPages/0610038.html
[9] https://www.govinfo.gov/content/pkg/USCODE-2018-title33/pdf/USCODE-2018-title33-chap26.pdf
[10] https://app.leg.wa.gov/Rcw/default.aspx?cite=90.48

After EPA partially approved of the 2018 WQA in 2022, one of the first steps in the 2022 WQA was to conduct a comprehensive public process to update key parts of the listing methodology policy. Highlights of this update included:

- A new freshwater harmful algae blooms (HABs) methodology to evaluate HABs impact on recreational uses under our narrative criteria.
- A note on the disapproval of our natural conditions provision in our Surface Water Quality Standards, and temporary suspension of the natural conditions methodology.
- Clarifying information on application of narrative water quality standards in the WQA and data submittal requirements.
- Other minor updates.
- Transitioning the policy into an updated and accessible format.

Ecology held a public review period on the proposed revisions from September 2022 – January 2023. Revisions to Policy 1-11, Chapter 1 were finalized in March 2023. A response to comments[11] was prepared as part of the process.

Updating Waterbody Segments

Following EPA partial approval of the 2018 WQA, Ecology updated the assessment unit layer used in the WQA. Waterbodies are delineated into sections, termed assessment units, where data is evaluated to determine impairment status. In freshwater, Ecology uses the 1:24,000 scale National Hydrography Dataset (NHD) as our baseline for assessment units. The 2018 WQA assessment unit layer mapping used the 2012 NHD layer. This significant update brought in the 2021 NHD layer, ensuring we are more accurately mapping waterbodies across Washington state.

Call for Data

Each WQA begins with a "Call for Data", where Ecology invites tribes, governments, stakeholders, and any other interested parties to submit data and information for consideration in the upcoming WQA. Ecology issued the Call for Data in July 2022[12] to commence Washington's 2022 WQA. Ecology requested that submitters upload numeric data to either Ecology's Environmental Information Management[13] (EIM) database or databases associated with the federal Water Quality Portal[14] (Portal). Ecology also received data and narrative submittals outside of EIM to consider for use in the WQA that were evaluated against narrative water quality standards. The target data window for the 2022 WQA was data collected between January 1, 2012 and December 31, 2021.

Tribal Review

[11] Response to Comments, Water Quality Program Policy 1-11, Chapter 1, 2022 Revisions
[12] https://lawfilesext.leg.wa.gov/law/WSRPDF/2022/22/22-22-001.pdf
[13] https://apps.ecology.wa.gov/eim/search/default.aspx
[14] https://www.waterqualitydata.us/

Ecology offered all tribes within Washington an opportunity to review and provide input on updates to Policy 1-11 and the draft WQA prior to public review. These tribal reviews were in accordance with the 1997 agreement between Ecology, tribes and EPA, described in the *Cooperative Management of the Clean Water Act 303(d) Program for the Tribes in Washington State, the Washington State Department of Ecology, and the U.S. Environmental Protection Agency Region 10*. Washington does not have Clean Water Act authority on tribal reservation boundaries; the EPA or governing tribe implements Clean Water Act programs on tribal lands. However, Ecology does utilize readily available tribal data and makes water quality determinations on waterbodies draining into or out of tribal reservation boundaries.

Prior to public review of the draft WQA, Ecology worked directly with Washington tribes and EPA to address concerns regarding the draft WQA results and corrected any errors found. The 2022 WQA tribal review ran from September 30 – November 1, 2024.

Public Review

Ecology held a public comment period on the draft 2022 WQA from November 4, 2024 to January 10, 2025. Ecology held an online webinar on November 13, 2024 to provide an overview of the 2022 WQA, demo the tools available for public review, and answer any public questions. All comments received during the public comment period and Ecology's responses are provided in the Response to Comments 2022 Water Quality Assessment[15] document. The response to comments publication link was included in Ecology's submittal to EPA and is available on Ecology's website.

Candidate 2022 WQA Submitted to EPA

Ecology submitted the 2022 candidate WQA to EPA in April, 2025. The full submission to EPA's ATTAINS database included assessment unit information and geometry, water quality determinations, water quality actions, a transmittal letter, our Response to Comments 2022 Water Quality Assessment document, this Supporting Information document, and Policy 1-11, Chapter 1.

[15] https://apps.ecology.wa.gov/publications/SummaryPages/2510026.html

Supplemental Methodologies

Perfluorooctane sulfonate (PFOS): Use of fish consumption advisories

Ecology reviewed the Washington Department of Health (DOH) Fish Consumption Advisories website[16] for non-priority pollutant based advisories. Non-priority pollutants do not have numeric criteria in Washington's Water Quality Standards. As of July 2023, three lakes were issued a perfluorooctane sulfonate (PFOS) fish consumption advisory. This included the entire lake for Lake Meridian, Lake Sammamish and Lake Washington. PFOS fish tissue data were obtained from EIM for each lake. Data were evaluated and included if they met the three main data usability requirements outlined in Policy 1-11:

- Tissue data had to be collected within the assessment window, which was 1/1/2012 to 12/31/2021 for this assessment cycle.
- The tissue data had to be collected from edible species.
- The data needed to come from an assessable tissue type. For finfish, fillet samples were assessed because fillets are the most common edible portion of fish compared to the whole body.

If a sampling location had data that met the three assessment usability requirements, a Category 5 listing was created for the assessment unit that contained the location.

Non-native aquatic plants

Data were provided by Ecology's aquatic invasive plant staff in May 2024 to assess for the presence of non-native aquatic plants. The dataset included lake monitoring data from 1/1/2012 to 12/31/2021 on Class A and Class B weed lists of submersed and floating plants. Any waterbodies with a documented presence of non-native aquatic plants during the assessment window were placed in Category 4C. Waterbodies that were already categorized as 4C but did not have new data within the monitoring window maintained their 4C determination. Any waterbody that was previously in Category 4C for non-native aquatic plants but had information in the database indicating the listed plants have been "eradicated", were moved to Category 3. Ecology defines eradication as the absence of that plant for at least five years. Data collected in private ponds, mitigation ponds, and stormwater ponds were not assessed.

[16] https://doh.wa.gov/community-and-environment/food/fish/advisories

Natural Conditions

In 2021, EPA disapproved of Washington's natural conditions provisions in the Surface Water Quality Standards (WAC 173-201A). This disapproval removed the following components of our water quality standards:

- General natural conditions provision (WAC 173-201A-260(1)(a)
- Temperature human activity increase of 0.3°C (WAC 173-201A-200(1)(c)(i) and -210(1)(c)(i))
- Dissolved oxygen human activity increase of 0.2 mg/L (WAC 173-201A-200(1)(d)(i) and -210(1)(d)(i))

Due to this disapproval, during the 2022 update of Policy 1-11, Chapter 1, Ecology added a note to the natural conditions section stating the natural conditions methodology is no longer relevant and will not be utilized until a new natural conditions provision has been adopted into our standards and approved by EPA. For the 2022 WQA, all natural conditions determinations made in previous assessments were removed and relevant listings were placed in the appropriate category based on the methodology in Policy 1-11, Chapter 1.

When a new natural conditions provision has been adopted into our Surface Water Quality Standards and approved by EPA, we will update the natural conditions methodology in Policy 1-11, Chapter 1. Upon policy approval, we will utilize the updated methodology to make natural conditions determinations in future Water Quality Assessments.

Bacteria – Primary Contact Recreation Uses

In 2019 the Surface Water Quality Standards (WAC 173-201A) were revised changing the bacteria indicator for primary contact recreation uses in both freshwater and marine water. This revision changed the recreational uses bacteria indicator from fecal coliform to Escherichia coli (E. coli) in freshwater. This revision changed the recreational uses bacteria indicator from fecal coliform to enterococci in marine water. As stated in Policy 1-11, Chapter 1 and consistent with the updated water quality standards, the Assessment continued evaluating fecal coliform data collected through 2020 to allow data collectors and laboratories time to transition monitoring and laboratory protocols. The Assessment will no longer evaluate fecal coliform data collected in 2021 and beyond to evaluate attainment of primary contact recreation uses.

In the 2022 Assessment, we combined fecal coliform and E. coli listings on the same freshwater assessment units in the below scenarios. This only occurred when both the fecal coliform and E. coli listings were evaluating contact recreation uses and is consistent with the rule implementation plan[17]. No changes were made to listings in marine waters.

- E. coli data was collected in 2021 and the listing had a category determination that was equal to the fecal coliform category determination. In this scenario the fecal coliform

[17] https://apps.ecology.wa.gov/publications/documents/1810042.pdf

listing was transitioned to E. coli, and the category determination matches the 2022 category determinations for both E. coli and fecal coliform.

- E. coli data was collected in 2021 and the listing had a category determination for E. coli that was more substantial than the fecal coliform category determination. In this scenario the listing was transitioned to E. coli, and the category determination was based on evaluation of the E. coli data.
    - A more substantial E. coli determination results when newer E. coli data demonstrates whether uses are attained, or not (Category 1 or 5) when compared against the fecal coliform determination.
- Fecal coliform listings in Category 4A remained in Category 4A regardless of any E. coli listing. If E. coli data exists on the assessment unit, then a unique E. coli listing is generated based on the data.

By transitioning listings, we ensure that only E. coli data is used to demonstrate attainment of recreational uses in the future. Future assessments will continue to transition fecal coliform listings to E. coli listings where new E. coli data is available.

Numeric Data Sources

EIM

Ecology's EIM database[18] contains environmental monitoring data collected by Ecology and other parties. EIM includes data for groundwater, watershed habitat health, marine sediments, river and stream water quality, and more. The tables below list studies from Ecology's EIM database that Ecology considered and subsequently used in the development of the 2022 WQA. The first table details studies with surface water quality data. The second table contains studies with contaminated sediments data analyzed by Ecology's Toxics Cleanup Program.

The following EIM studies apply RCW 34.05.272 data source category #9: Data from primary research, monitoring activities, or other sources, but that has not been incorporated as part of documents reviewed under other processes.

Table 1. Studies from EIM with surface water data included in development of the 2022 WQA.

Study ID	Study Name
17274-01	Abandoned Mine Lands Initial Investigations
2020_CB/NT_Tissue	Commencement Bay Nearshore/Tideflats (CB N/T) Superfund Site supplemental testing
AAHM0003	Fecal Coliform Bacteria TMDL for Oakland Bay-Hammersley Inlet
AAHM0004	TMDL Analysis for Temperature in tribs to Oakland Bay-Hammer
AAHm001	Skookum Temperature TMDL
aalb0001	Colville River Tributaries - Fecal Coliform
AJOH0011	Walla Walla River Chlorinated Pesticide and PCB TMDL
AJOH0016	Similkameen River Arsenic
AJOH0021	Chinet Intake Toxicity Investigation
AJOH0026	Zinc, Copper, & Lead Concentrations in Quilceda/Allen Creeks
AJOH0028	Statewide Metals in Selected Rivers & Creeks
AJOH0029	Statewide Arsenic Sampling in Selected Rivers
AJOH0043	Sequim-Dungeness Pharmaceuticals Screening
AJOH0045	Effects of Gold Dredging in Similkameen River
AJOH0046	Palouse River - Total Maximum Daily Load Evaluation for Chlorinated Pesticides and PCBs
AJOH0048	PBT Monitoring: Measuring PBDE Levels in Washington Rivers and Lakes

[18] https://apps.ecology.wa.gov/eim/search/default.aspx

Study ID	Study Name
AJOH0050	Yakima River 2006 Fish Tissue Survey for Chlorinated Pesticides, PCBs, and Dioxins.
AJOH0051	Marina Copper Study
AJOH0053	Endosulfan and Dieldrin in Wide Hollow Creek
AJOH0055	Yakima River Pesticides and PCBs TMDL: Evaluation of Water Quality Study Findings
AJOH0057	Puget Sound Boatyard Receiving Water Study
AJOH0059	Mercury & Small-Scale Mining
AJOH0060	Mercury and Copper in Leach Creek
AJOH0061	Microcystins and Saxitoxin in Western Washington Lakes
AJOH0063	Background Assessment for Chemical Contaminants in Northeastern Washington Area Lakes.
AJOH0065	Analyzing Chlorinated Pesticide Residues in Fish from Washington Background Lakes and Emerging PBTs in Fish Tissue
AMB_WQ_Bothell	Annual Stream Water Quality Monitoring
Ambient Monitoring	King County Ambient Macroinvertebrate Monitoring Program
AMS001	Statewide River and Stream Ambient Monitoring-WY2010 to present (Transitional data that has not yet been QA'd will be found in 'Statewide River and Stream Ambient Monitoring-WY 2010 to present-2;' User Study ID AMS001-2)
AMS001E	Statewide River and Stream Ambient Monitoring-WY 2000 through WY 2009
AMS002	Statewide Lake Monitoring
AMS002B	Lake Mini-Monitoring TP and Secchi
AMS004	Continuous Stream Monitoring
AMS005	Continuous Stream Temperature Monitoring
AO6557	Heglar Kronquist Landfill RI/FS, Mead, WA
AODE11237	Port of Tacoma Parcel 15 RI/FS
AODE12803	Gig Harbor Sportman's Club RI/FS
AODE13959	Yakima Mill Site Remedial Investigation - Stage I
AODE15571	Agrium Kennewick and Finley Fertilizer Operation Facilities - Surface and Groundwater Monitoring
AODE5738	Marine Trades Area RIFS, Port Angeles, WA
AODE8258	Douglas Management Dock (Alaska Marine Lines), Seattle, WA
AODE8979	Weyerhaeuser Mill A Former, Everett, WA
AODE9000	Blaine Marina Inc Remedial Investigation, Blaine, WA
AODE9476	Kimberly-Clark Worldwide Site, Everett, WA
AQ_Kenmore2012	Kenmore Sediment and Water Investigation
AQCD092002472	Alcoa Vancouver - Sediment Cleanup Site
AsotCD-00105	Asotin County Water Quality Monitoring
ASTO0001	Upper Yakima Basin Temperature TMDL

Study ID	Study Name
ASTO0003	Walla Walla River Tributaries Temperature TMDL
ASTO0004	Willapa River Temperature TMDL
AVLSWQCON20	Avista Lake Spokane Continuous Monitoring
BBCWQ	Burnt Bridge Creek - 2016 Water Quality Monitoring
BBCWQ06	Burnt Bridge Creek - 2006 Water Quality Monitoring
BBCWQ07	Burnt Bridge Creek - 2007 Water Quality Monitoring
BBCWQ11	Burnt Bridge Creek - 2011 Water Quality Monitoring
BCAR0001	Groundwater/Surface Water Interactions in the Sammamish R.
BCAR006	Edison large on-site sewage system (LOSS) - Groundwater study
BCUS0005	Spokane River BOD TMDL
BEACH	See also EPABEACH: WA State BEACH (Beach Environmental Assessment, Communication, and Health) Program
BEDI0007	Water Quality Monitoring for Fecal Coliform Bacteria in Pierre Creek and Burns Creek
BEDI0008	Medicine Creek Fecal Coliform Investigation Summer 2009
BEDI0009	Medicine Creek Water Quality Monitoring for Fecal Coliform Bacteria and Nitrate+Nitrite-Nitrogen
BEDI0010	McAllister Creek Fecal Coliform Bacteria Monitoring Summer 2009
BEDI0011	Dobbs Creek Water Quality Monitoring for Fecal Coliform Bacteria
BEDI0012	Kennedy Creek Fecal Coliform Bacteria Water Quality Monitoring Study
BEDI0013	Upper Kennedy Fecal Coliform Bacteria Investigation, 2008-2009
BEDI0014	South Prairie Creek; Inglin Creek Drain Tile T4DT
BEDI0016	Black Creek Temperature Monitoring (06/24/2010 - 09/02/2010)
BEDI0017	Humptulips River Temperature Monitoring
BEDI0018	Dungeness Seep Study for Fecal Coliform Bacteria
BEDI0019	Bowman Creek Fecal Coliform Characterization
BEDI0020	Pussyfoot Creek Fecal Coliform Bacteria Characterization Monitoring
BEDI0021	Second Creek Fecal Coliform Characterization
BEDI0022	Lower Salmon Creek Watershed Fecal Coliform Bacteria Monitoring
BERA0001	Verification of 303(d) Listed Sites in NWRO, CRO and ERO
BERA0002	Skagit and Pend Oreille Rivers - 303(d) Fish Tissue Listings
BERA0003	South Puget Sound Fish and Shellfish Tissue Verification of 303(d) Listings
BERA0004	Similkameen River and Palmer Lake Investigation of Arsenic in Fish Tissue

Study ID	Study Name
BERA0005	Potholes Reservoir: Screening Survey for Dieldrin, other Chlorinated Pesticides, and PCBs in Fish, Water, and Sediments
BERA0007	Assessment of Toxicity in North Creek, Gig Harbor
BERA0008	Integrated Ambient Monitoring Pilot - Potential Causes for Impairment of Rainbow Trout Early Lifestages and Loss of Benthic Biodiversity in Indian Creek
BERA0009	Spokane River Toxics Preliminary Monitoring 2012 through 2013 - In Support of the Long-term Toxics Monitoring Strategy
BERA0010	Integrated Ambient Monitoring Follow-up Study in Indian Creek - Phase II Study
BERA0011	Lake Spokane PCBs in Carp
BERA0012	Spokane River PCBs and other Toxics: Long-Term Monitoring at the Spokane Tribal Boundary
BlackCr	Black Creek Temperature Monitoring (06/01/2006 - 10/01/2006)
Boise Ambient	King County Boise Creek Ambient Monitoring Project
Brwa0007	Squalicum Creek Stormwater Pilot Total Maximum Daily Load
BSAC0001	Continuous Nitrate Monitoring in the Deschutes River during the 2010 Water Year
BT9901	North Ranch Bio Recycling Water Quality Monitoring
BUDD07	Budd Inlet Sediment Characterization
BZAL0001	Woodland Creek Temperature TMDL
C0500017	Little Spokane River Bacteria, Phosphorus, and Temperature TMDL Surveys
C0500079	Hood Canal Salmon Enhancement Group Molluscan Study
C0800174	Fidalgo Bay Nearshore Non-Point Watershed Assesement
C0900063	Investigation of fecal coliform sources in Juanita Creek basin
C1100043	Burnt Bridge Creek Bacteria Source Reduction Project
C1200226	WDFW Puget Sound Ecosystem Monitoring Program (PSEMP) Toxics in Biota Study- Toxic Contaminants in Dungeness Crab and Spot Prawn from Puget Sound, Washington, USA
C1800150	Baseline Streamflow and Water Temperature Assessment for French Creek and Leland Creek (WRIA 45)
CamasBKGRM121	Camas WWTP Receiving Water Study
CAME001	Brominated Flame Retardants, Chlorinated Paraffins, and Hexabromocyclododecane in WA Rivers and Lakes
CAME002	Statewide Survey of Per- and Poly-fluoroalkyl Substances in Washington State Rivers and Lakes
CAME003	Flame Retardants in Ten Washington State Waterbodies
CAME004	Perfluoroalkyl Substances (PFAS) in Freshwater Fish
CAME005	Survey of Phthalates in Washington Rivers and Lakes

Study ID	Study Name
CampBRAU2C	US ARMY Camp Bonneville RAU-2C
CapitolLake-DES-EIS	Capitol Lake DES EIS Water Quality Sampling
CARR0002	Moses Lake Phosphorus TMDL
CBRO0001	Dungeness Watershed Fecal Coliform TMDL Effectiveness Monitoring
CBUR0001	Pesticides in Salmonid-Bearing Streams, Year 2
CBUR0002	Pesticides in Salmonid-Bearing Streams, Year 3
CBUR0003	Pesticides in Salmonid-Bearing Streams, Year 4
CBUR0004	Pesticides in Salmonid-Bearing Streams, Year 5
CBUR0006	Pesticides in Salmonid-Bearing Streams, Year 6
CBUR0007	A Study of Copper Discharge from Irrigation Canals
CCC1-06	Volunteer Water Quality Monitoring: Baseline Monitoring of the Upper Columbia River Shoreline
CCHL46954465	Cowlitz County Headquarters Landfill (aka Weyerhaeuser Regional Landfill) Groundwater Monitoring
CC-LISP	Long-term Index Site Project (LISP), Clark County
CCOF0003	Lower Okanogan River Basin DDT and PCB TMDL Effectiveness Monitoring, 2008
CCOF0004	2007 Lake Chelan Wapato Basin TMDL Effectiveness Monitoring for Total Phosphorus
CC-SCMP	Clark County NPDES Salmon Creek Monitoring Project
CC-SNAPBACT	Stormwater Needs Assessment Program; Focused Assessment
CC-SNAPCHAR	Stormwater Needs Assessment Program subwatershed characterization
CC-TEMP	Clark County Continuous Stream Temperature
CCTWLDM1079	Cowlitz County Tennant Way Landfill Detection Monitoring
CC-VOLMGIB	Clark County Volunteer Monitoring Ambient Stream Monitoring
CC-VOLMONAM	Clark County Volunteer Monitoring, Ambient Stream Monitoring
CCWR_002	City of Port Angeles (PA-fecal)
CCWR_003	Streamkeepers monitoring (SK_suite)
CCWR_004	SK_fecal
CCWR_009	Sequim_CRT
CCWR_031	McDonald Creek irrigation inflow study
CCWR_034	Clallam County Environmental Health
CCWR_035	Citizen-Initiated Monitoring
CCWR_049	Quileute Tribe monitoring
CCWR_053	Lincoln HS Monitoring
CCWR_055	Storm surface water EPA Grant 2008-2009
CCWR_058	Clean Water District monitoring
CCWR_061	Storm surface water EPA Grant 2010-2011

Study ID	Study Name
CCWR_062	WRIA 19 stormwater sediment study
CFA_WQ14	Chehalis Flood Authority Water Quality Monitoring
cfur0001	A Comparison of Two Analytical Methods for Measuring Mercury in Fish Tissue
cfur0003	PBT Monitoring: Measuring PFC Levels in Washington
CFUR0005	PBDE Flame Retardants in Spokane River Fish Tissues and Osprey Eggs.
CFUR0006	Speciated Mercury in the Lake Ozette Drainage.
cfur0008	Mercury Screening in Lake Ozette Sockeye
CHPI001	Moses Lake TMDL Groundwater Study
CHPI004	Waitsburg WWTP Groundwater Study - Evaluation of Nutrient Loading to the Touchet River
Clarks Creek DO	Clarks Creek Dissolved Oxygen Study
CNF WQ TMDL	Colville National Forest Water Quality TMDL Monitoring
COS_WQ	City of Shoreline Ambient Stream Monitoring 2007-2015
COVWetWeather19-20	Wet Weather Ambient Conditions Study of the Columbia River, 2019-2020
CRBHHRA12	Columbia River Component Risk Assessment: Baseline Human Health Risk Assessment
CRK-06	Volunteer Water Quality Monitoring: Baseline Monitoring of Columbia River Tributaries
DBAT0002	Totten and Eld Inlets National Monitoring Program
DBAT0004	Skokomish River Basin Fecal Coliform TMDL Attainment Monitoring
DBIL0001	Lower Skagit Tributaries Temperature TMDL
DCWA2018-CRMonit	Columbia River Water Quality Monitoring 2018
DCWA2019-CRMonit	Columbia River Water Quality Monitoring 2019
DCWA2019-ExtCRMonit	Extended Columbia River Water Quality Monitoring 2019
ddug0001	Nason Creek Oxbow Reconnection Monitoring
DDUG0002	Mid-Yakima River Tributaries Temperature Study (former study name Yakima Area Creeks Temperature Assessment)
DE20573	Boeing Everett Uplands & Powder Mill Gulch
DGRA0001	Walla Walla River Chlorinated Pesticides Source Characterization
DMMP_Dioxin_2005-07	DNR Dioxin Study
DNOR0006	Lake Whatcom Sediment Mercury
DOHLW05	Lake Washington fish tissue study
DryForkCreek	City of Pullman Fecal Coliform Bacteria Monitoring of Dry Fork Creek
DSAR0004	Pesticides in Salmonid-Bearing Streams, Year 7
DSAR0005	Pesticides in Salmonid-Bearing Streams, Skagit-Samish Intensive Sampling
DSAR0006	Pesticides in Salmonid-Bearing Streams, Year 8
DSAR0007	Pesticides in Salmonid-Bearing Streams, Year 9

Study ID	Study Name
DSAR0008	Pesticides in Salmonid-Bearing Streams, Comparison of Grab vs Depth Integration
DSAR0009	Pesticides in Salmonid-Bearing Streams, Year 10
DSAR0010	Pesticides in Salmonid-Bearing Streams, Year 11
DSAR0011	Pesticides in Salmonid-Bearing Streams, Copper Assessment
DSAR1	Nisqually TMDL Study
DSAR2	Henderson TMDL
DSER0009	Okanogan River DDT/PCB TMDL Assessment
DSER0010	Spokane River PCB TMDL
DSER0011	Mission Creek DDT TMDL Assessment
DSER0015	Persistent Organic Pollutants in Feed and Rainbow Trout from Selected Trout Hatcheries
DSER0016	PCBs, PBDEs, and Selected Metals in Spokane River Fish, 2005
EFF_LSRT	Lower Snohomish River Tributaries Effectiveness Monitoring
EFLewis_WQP	EF Lewis River Ambient Monitoring and Source Identification
EFLewisSA	East Fork Lewis Fecal Coliform Bacteria and Temperature Source Assessment
EFLRTMDL	East Fork Lewis River TMDL technical study for Temperature and Bacteria (WRIA27)
EG150077	Hood Canal Priority Basins
EG160640	Quilcene-Dabob Bay Pollution Identification and Correction
EG170155	Anderson Lake Management Plan
EG190168	Oak Bay - Mats Mats Pollution Identification and Correction
EG190169	Northern Hood Canal Pollution Identification and Correction
EKCDAmbientWQ	WRIA 31 TMDL
ENVVEST	Puget Sound Naval Shipyard and Intermediate Maintenance Facility Environmental Investment Project (ENVVEST)
EPABEACH	WA State BEACH (Beach Environmental Assessment, Communication, and Health) Program
EPALAKES	National Study of Chemical Residues in Lake Fish Tissue (EPA)
EPALR05B	USEPA 2005 Phase 1 Fish Tissue Sampling: RI/FS Upper Columbia River/ Lake Roosevelt
Ephrata Landfill_592	Ephrata Landfill, Ephrata, Grant County WA
ERST	Extensive Riparian Status and Trends Stream Temperature Monitoring
EURM0001	Tieton and Lower Naches Temperature Study
FBCPDX48	Supplementary Fidalgo Bay and Custom Plywood Mill Sediment Dioxin Study, Anacortes, WA: Data Report
FCCD 1_WQ	WRIA 44/50 stream monitoring

Study ID	Study Name
Fecal_TMDL_Bothell	North and Swamp Creeks TMDL Fecal Bacteria Results
FFCMP13	Freshwater Fish Contaminant Monitoring Program 2013
FFCMP14	Freshwater Fish Contaminant Monitoring Program 2014
FFCMP15	Freshwater Fish Contaminant Monitoring Program 2015
FFCMP16	Freshwater Fish Contaminant Monitoring Program 2016
FFCMP17	Freshwater Fish Contaminant Monitoring Program 2017
FFCMP18	Freshwater Fish Contaminant Monitoring Program 2018
FFCMP19	Freshwater Fish Contaminant Monitoring Program 2019
FIDALG08	Fidalgo Bay Sediment Investigation
FMUFLOW&WQ	Freshwater Monitoring Unit Flow and Water Quality
FS1203	B&L Wood Waste Landfill, Fife Way and Puget Power Rd, Tacoma, WA
FS1206878	Grit contamination in Blair Waterway.
FS1220	Arkema Inc. RI/FS, Tacoma, WA
FS12719	Receiving Water Study - Consolidated Diking Improvement Ditch No. 3, Longview WA
FS1554858	Van Stone Mine Site, CS461, Colville, WA
FS2018	The Boeing Company, Auburn Fabrication Division Plant
FS2699	Sisco Landfill Site
FS3	Kaiser Mead NPL Groundwater Monitoring
FS53481373	Kaiser Trentwood Remedial Investigation, Spokane, WA
FS787	Palouse Producers, Palouse, WA
FS84531356	USG Interiors Highway 99 Cleanup Site, Tacoma, WA
FS9	Kimberly-Clark Worldwide Site, Everett, WA
fwbenth1	Ecology's Freshwater Ambient Biological Assessment Program
G0000106	Baseline Assessment of Lower Hood Canal Streams
G0000116	Cooperative Water Quality Monitoring Project
G0000145	Kettle Tri-Watershed Project
G0000146	Henderson Inlet Watershed Implementation Program
G0000198	Little Spokane River Watershed Plan Development
G0000225	Okanogan Water Quality Monitoring Project
G0000233	Upper Crab Creek Watershed, Phase II Project
G0000258	Samish Basin Watershed Water Quality Monitoring Project
G0000276	Lake Sammamish Watershed Community Link
G0000291	Snohomish County Surface Water Management
G0000292	Colville River Watershed Health Project
G0100027	S.F. Nooksack River Water Quality Study
G0100038	Local Involvement in Resource Issues
G0100105	Riley Slough Habitat Enhancement Project
G0100116	Clarks Creek Watershed Pollutant Reduction Project

Study ID	Study Name
G0100121	Shellfish Watersheds Protection Project
G0100125	Nearshore Habitat Evaluation and Enhancement Project
G0100141	Pingston Creek Watershed Planning
G0100188	Recover Bertrand Creek, WRIA 1
G0100200	Upper Union River Restoration
G0100202	White River Water Quality Study
G0100205	Stabler Water Quality/Quantity Study project
G0200038	Leland Watershed Water Quality Monitoring
G0200071	Protecting Water for People and Fish
G0200112	TMDL Implementation Monitoring in WRIA 1 Project
G0200114	Water Quality Assessment Manson Lakes
G0200178	Whatcom Watershed TMDL (Total Maximum Daily Load) Study & Stormwater Mapping Project
G0200179	Upper Pend Oreille Sub-Watershed Ranking
G0200269	Port of Bellingham's Non-Point Pollution Solutions Monitoring
G0200280	Chehalis River Council Volunteer Monitoring Project
G0200281	Nisqually Reach Pollution Source Identification Project
G0200283	Crab Creek's Contribution to Moses Lake's TMDL
G0200294	Kittitas TMDL Support and Monitoring Project
G0200295	Cow Creek Implementation Project
G0200309	Water Quality/Flow Monitoring Program
G0200314	Mill Creek Watershed Implementation Plan
G0200318	Longview Ditches Lead Monitoring Study
G0200377	Fecal Coliform Baseline Study
G0300010	North Fork Palouse River Watershed Water Quality
G0300016	Chico Creek Watershed Planning Project
G0300020	Benthic Macroinvertebrate and Water Temperature Monitoring for Watershed Characterization in Clark County
G0300021	Water Quality Monitoring Implementation
G0300037	Lower Palouse River Scoping Project
G0300092	Agricultural BMP Implementation in Island County
G0300114	Garfield County Riparian Restoration
G0300117	Anderson Island Shellfish Project
G0300126	Baseline Assessment of Lower Hood Canal Streams
G0300181	Water Resources Protection Program (Burnt Bridge Creek)
G0300201	Newman Lake Watershed Monitoring & Education
G0300233	West Branch Hylebos Creek Restoration
G0400041	Snohomish River Pollutant Diagnosis and Implementation Project

Study ID	Study Name
G0400062	Quilceda-Allen Watershed Livestock Water Quality Improvements Grant
G0400133	Skagit County Monitoring Program (Grant: G0400133, 12/22/2003 - 12/31/2008)
G0400196	Hangman Creek TMDL Project
G0400199	Deschutes River/Budd Inlet TMDL
G0400200	Urban Streams Riparian Restoration, Cleanup and TMDL Action Plan
G0400264	French Creek BMP Monitoring and Implementation
G0400274	DDT Concentrations in Lake Chelan Water Measured Using Semipermeable Membrane Devices (SPMDs) and a Large-Volume Solid-Phase Extraction Device. Sediment Organochlorine Pesticide Concentrations near Tributary and Irrigation Drain Discharges to Lake Chelan
G0500025	Clallam County-Wide Monitoring CCWF Task 3
G0500033	Riparian Enhancement and Monitoring
G0500076	Ten Mile Creek Watershed Restoration Project- 4Mile Creek Focus Area Monitoring
G0500118	South Prairie Creek Restoration Project
G0500122	Colville River TMDL Implementation Project
G0500140	Bellingham Salmon Habitat Restoration and TMDL
G0500151	Bainbridge Island Water Quality Monitoring Program
G0500173	Dyes Inlet Restoration Project
G0500175	Snoqualmie Watershed Agricultural Assistance Team Project
G0600071	Cottage Lake Phosphorus Reduction Project
G0600178	Long Lake Integrated Management Plan
G0600241	Pend Oreille TMDL Data Gathering Project
G0600283	Little Klickitat TMDL Implementation Project, Task 2 Monitoring
G0600323	Stillaguamish Sub-Basin TMDL
G0600332	Skokomish Annas Bay Restoration Study
G0600345	Totten/Eld Inlet TMDL Response
G0600378	Mason County's Hood Canal Septic System Surveys and Database Enhancement
G0700093	Chimacum Creek Clean Water Project
G0700116	WRIA 22-23 Water Quality Monitoring
G0700126	Little Bear Pollution Identification/Correction
G0700145	Livestock Implementation Project
G0700165	Pine Creek Enhancement Phase 2, Task 5 Water Quality Monitoring
G0700167	Palouse River Implementation Project B
G0700243	Hansen Creek / Red Creek Restoration Project
G0700293	Grant County Ephrata Landfill, Ephrata, WA

Study ID	Study Name
G0700316	Swamp Creek Water Pollution Prevention
G0800014	Loon Lake Water Quality Monitoring Program
G0800055	Hood Canal Clean Water Project
G0800056	Discovery Bay Clean Water Project
G0800097	NF Palouse River TMDL Implementaiton Project
G0800099	Achieving Environmental Compliance- AEC
G0800113	Jump Off Joe Creek Restoration Project
G0800132a	Whatcom Creek Watershed Bacteria TMDL CCWF Grant No G0800132
G0800132b	Bellingham Water Quality and Habitat Improvement: Long-term Temperature and Shade Monitoring of Whatcom Creek
G0800327	Holmes Harbor Bacteria Source Identification/Remedy
G0800328	Lincoln County Implementation Project
G0800355	Little Pend Oreille River Watershed Water Quality Monitoring
G0800396	Little Klickitat Temperature TMDL Implementation Project
G0800398	WRIA 31 Water Quality Remediation and Evaluation, Task 4 Water Quality Monitoring
G0800469	South Fork Stillaguamish Tributaries Restoration
G0800516	Lake Steilacoom Calcium Hydroxide Treatment Routine Monitoring
G0800611	Lake Assessment and Toxic Cyanobacteria Monitoring Project
G0800616	Miller Creek Sub-basin Investigative Water Quality Monitoring; Grant G0800616 Miller-Pilchuck Creeks TMDL Improvement
G0800618	Juanita Creek Basin Stormwater Retrofitting Analysis Project
G0900050	Sinclair Inlet Restoration/Protection Project
G0900051	Kittitas Multi-TMDL Compliance Project
G0900067	Mats Mats Bay Water Quality Improvement Program
G0900073	Day Creek Habitat Restoration: temperature effectiveness monitoring for introduced large in-channel wood.
G0900074	Hansen Creek Alluvial fan
G0900076	Lone Lake Restoration and Implementation Project
G0900201	Hammonds Lake Nutrient Source Study
G1000099	WRIA 44/50 Long Term Monitoring Program
G1000122	Northshore Hood Canal Pollution Identification and Correction
G1000151	Water Quality Improvement Through Beaver Restoration in the Methow River Watershed
G1000282	Methow Subbasin Water Quality Restoration and Monitoring Program
G1000301	Liberty Bay Watershed Restoration Project

Study ID	Study Name
G1000342	Chamokane Creek Watershed Implementation Plan
G1000349	Stillaguamish Temperature TMDL Adaptive Assessment and Implementation Project
G1000530	South Sound GREEN Fecal Coliform Bacteria Monitoring in Dobbs Creek
G1000531	Washington State University Puyallup Research and Extension Center Clarks Creek Water Quality, Science, Restoration, and Implementation Program
G1100174	Clean Water District 2013-14
G1100177	Little Klickitat TMDL
G1100189	Hood Canal Watershed Clean Water Project
G1100202	pierce county shellfish project
G1100251	Jefferson County Lakes Toxic Algae Project
G1200001a	Lake Ketchum Algae Control Plan (Water Quality Data)
G1200017 B-IBI	B-IBI Monitoring, North Fork West Hylebos Creek
G1200127	Northeast Jefferson Clean Water Project
G1200280	Maxwelton Bacteria Source Identification
G1200337	Little Klickitat TMDL Implementation
G1200408	Bear Creek Livestock BMP Continuation
G1300059	Walla Walla Conservation District Water Monitoring, 2015-2016
G1300075	Ebey's Prairie Watershed Stormwater Remediation Project
G1300080	Squalicum Creek Water Quality and Biotic Integrity Improvements
G1300080 & G1400398	Squalicum Creek Water Quality and Biotic Integrity Improvements, Phase 2
G1300083	WDFW Puget Sound Ecosystem Monitoring Program (PSEMP) Toxics in Biota Study - Toxic contaminants in juvenile Chinook salmon (Oncorhynchus tshawytscha) migrating through estuary, nearshore and offshore habitats of Puget Sound
G1300102	White Salmon River Fecal Coliform Bacteria Monitoring
G1400003	Jefferson County Toxic Cyanobacteria Project
G1400004	Lake Ketchum Algae Control Implementation
G1400400	Squalicum Creek Watershed Monitoring and Social Marketing Clean Water Project
G1400424	Little Klickitat TMDL Implementation Project 6
G1400428	Swale Creek Implementation Project
G1400435	Drayton Harbor/Semiahmoo Bay Water Quality Enhancement Project
G1400458	Strait Water Quality Partnership Task 2 - Pillar Point Shellfish Downgrade Response
G1400475	Waughop Lake Management Plan
G1400501	Shade Monitoring for the Wenatchee Basin Water Quality Restoration Project

Study ID	Study Name
G1400520	WRIA 31 Implementation & Monitoring
G1400530	Hood Canal Clean Streams Initiative
G1400543	Skagit Flats South Water Quality Monitoring
G1400575	Spanaway Lake Management Plan
G1400587	2014 Pierce County Shellfish Project
G1500046	Penrose Point Nutrient Reduction Project
G9700218	Snohomish Watershed Water Quality Monitoring Project
G9900069	Jumpoff Joe Implementation Project
G9900096	Whatcom County Shellfish Protection Plan
G9900116	White Salmon River Watershed Restoration Project
G9900145	Swamp Creek Illicit Discharge Remediation Project
G9900233	Erosion Control Program
GMER0004	Union River FC TMDL Attainment Monitoring
GONW0001	Snoqualmie River TMDL Effectiveness Evaluation
GPEL0008	Old Stillaguamish River TMDL
GPEL0009	Stillaguamish River Temperature TMDL
GPEL0010	Lower White River pH TMDL
Green RivEquipBlank	Green River PCB Equipment Blank Study Data Report
Green RivSurfWater1	Lower Duwamish Waterway Source Control: Green River Watershed Surface Water Data Report
GRNRVLD13	Green River Loading Study - Phase 1
GRNRVLD14	Green River Loading Study - Phase 2
GRNRVLD16	Green River Loading Study - Phase 3
GTUT0001	Pesticides in Salmonid-Bearing Streams, Year 12
GTUT0002	Pesticides in Salmonid-Bearing Streams, Year 13
GTUT0003	Pesticides in Salmonid-Bearing Streams, Year 14
GTUT0004	Pesticides in Salmonid Bearing Streams, Year 15
GTUT0005	Pesticides in Salmonid-Bearing Streams, Year 16
GTUT0006	Pesticides in Salmonid-Bearing Streams, Year 17
GTUT0007	Pesticides in Salmonid-Bearing Streams, Year 18
HANSVLGS	Hansville General Store, Hansville, WA
HgFish05	Mercury Trends in Fresh Water Fish 2005
HgFish06	Mercury Trends in Freshwater Fish 2006
HgFish07	Mercury Trends in Freshwater Fish 2007
HgFish08	Mercury Trends in Freshwater Fish 2008
HgFish09	Mercury Trends in Freshwater Fish 2009
HgFish10	Mercury Trends in Freshwater Fish 2010
HgFish11	Measuring Mercury Trends in Freshwater Fish in Washington State, 2011 Sampling Results
HgFish12	Measuring Mercury Trends in Freshwater Fish in Washington State, 2012 Sampling Results

Study ID	Study Name
HgFish13	Measuring Mercury Trends in Freshwater Fish in Washington State, 2013 Sampling Results
HgFish14	Measuring Mercury Trends in Freshwater Fish in Washington State, 2014 Sampling Results
HgFish15	Measuring Mercury Trends in Freshwater Fish in Washington State, 2015 Sampling Results
HgFish16	Measuring Mercury Trends in Freshwater Fish in Washington State, 2016 Sampling Results
HgFish17	Measuring Mercury Trends in Freshwater Fish in Washington State, 2017 Sampling Results
HgFish18	Measuring Mercury Trends in Freshwater Fish in Washington State, 2018 Sampling Results
HgFish19	Measuring Mercury Trends in Freshwater Fish in Washington State, 2019 Sampling Results
HgFish20	Measuring Mercury Trends in Freshwater Fish in Washington State, 2020 Sampling Results
HoldMine	Holden Mine Remediation, Holden, WA
IAA_C1800180	Yakima Delta Restoration Project Temperature Monitoring
Island_County_AEC_WQ	Island County Water Quality Monitoring Program
IslandCountyPIC	Island County Pollution Identification and Correction Study
IslandCoWQ	Island County Water Quality Program
IWM	Intensive Watershed Monitoring
JCRE0001	Crystal Creek Multi-Parameter TMDL Effectiveness Monitoring
JDURK0001	Wilson Creek Sub-Basin Fecal Coliform Monitoring
JeldWen12	Jeld Wen Former Nord Door Site - Sediments
jfie0001	Padilla Bay Tributaries Fecal Coliform Bacteria Total Maximum Daily Load
JHSVII01	Salmon Recovery Index Watershed Program (SRIW)
JICA0000	South Fork Palouse River TMDL*please see Study Comment field below*
JICA0001	Palouse River TMDL
JICA0002	Wide Hollow Creek Water Quality Study for Aquatic Life Use
JICA0003	Okanogan River Tributaries 303(d) pH Listings Verification Study
JICA0005	Upper Yakima River Basin Water Quality Monitoring for Aquatic Life Parameters: Water Temperature, Dissolved Oxygen, and pH
JJOY0003	Walla Walla Bacteria and pH TMDL
JJOY0005	Hangman Creek Dissolved Oxygen and pH TMDL
jjoy0006	Upper Crab Creek TMDL Study
jjoy0007	Little Spokane River Dissolved Oxygen & pH TMDL
jjoy0009	Little Spokane Fish Hatchery Characterization

Study ID	Study Name
JKAR0001	Fecal coliform bacteria monitoring: South Prairie Creek tributaries assessment including Inglin Creek and Spiketon Ditch.
JKAR0002	Skagit Bay Fecal Coliform Bacteria Loading Assessment
JKAR0003	Cherry and Ames Creeks (Snoqualmie River Tributaries) Dissolved Oxygen Study
JKAR0004	Clover Creek multiple parameter TMDL
jkar0005	North River Temperature and Bacteria Verification Study
jros0001	Goosmus Creek
jros0003	Little Spokane River Fish Hatchery
JROS0009	Colfax Floodworks Fecal Coliform Study
jros0011	Crab Creek Alternate Feed Route Study
JROS0020	Lake Spokane Nutrient Monitoring
JROS0021	Asotin Creek FC Study
JROS0022	Inland Empire Paper Company Source Water Study
JROS0023	New Spokane WWTP Monitoring
JROS0024	Deep Lake Monitoring
JROS0025	Walla Walla Basin Bacteria, pH, and DO TMDL Effectiveness Monitoring
JROSL001	Rocky Ford Creek Monitoring 2006
JROSL003	SF Palouse FC Source Tracking 2004
JROSL004	Pataha Creek Effectiveness Monitoring 2005
JROSL005	Dragoon Creek Effectiveness Monitoring 2004
JROSL006	SF Palouse River Effectiveness Monitoring 2004
JROSL007	Garfield County Implementation Monitoring
JROSL008	Asotin County Implementation Monitoring
Kachess2018	Lake Kachess 2018 Water Quality Monitoring Study
KC_AmBug	King County Ambient Benthic Macroinvertebrate Monitoring
KC_Minor_Lakes	King County Minor Lakes Monitoring Program
KC_WQA_CECs	Water Quality Assessment and Monitoring Study: Contaminants of Emerging Concern
KC-FrshTiss_2015-21	King County Freshwater Tissue Monitoring_2015-21
KClake-1	King County Routine Major Lakes Ambient Monitoring
KCmar-1	King County Routine Marine Ambient Monitoring
KC-marine-tissue	King County MarineTissue Monitoring
KC-MarTiss_2017-21	King County Marine Tissue Monitoring_2017-21
KCPIC_Quartermaster	Quartermaster Harbor Pathogens Reduction Project - National Estuary Program Grant
KCsamm	Sammamish River Water and Sediment Quality Assessment
KCsb-1	King County Swimming Beach Monitoring Program
KCstrm-1	King County Routine Ambient and Wet Weather Streams Monitoring

Study ID	Study Name
KESE0002	Padden Creek Pesticide Monitoring Project
KITSAPWQ	Kitsap Public Health District Surface Water Trend Monitoring
KNRD TS Temperature	KNRD Time Series Temperature Monitoring Network
KSIN0004	SW/GW interactions - Muck Cr. watershed, Pierce Co
KSIN0009	Evaluation of groundwater conditions at the terminus of Deep and Coulee Creeks (Spokane County)
KTWQ	Kalispel Tribe Water Quality Monitoring Network
L0000023	Glendale Creek Restoration Project
L0200005	Stormwater Comprehensive Management Plan
LacamasSA	Lacamas Creek Bacteria, Temperature, and Nutrients Source Assessment
LDWAOC3	Lower Duwamish Waterway Administrative Order on Consent (third amendment)
LDWEnglishSole2007	2007 PSAMP Groundfish Contaminant Survey
LDWFishCrabClam2007	FISH, CRAB, AND CLAM TISSUE COLLECTION AND CHEMICAL ANALYSES FOR ADDITIONAL FISH, CRAB, AND CLAM SAMPLING IN THE LOWER DUWAMISH WATERWAY IN 2007
LDWGSW0717	Lower Duwamish Waterway, Groundwater Sampling for PCB Congeners and Aroclors
LDW-KC-Waters	King County Water sampling (Lower Duwamish River)
LDWRTHIC	Lower Duwamish River LDWRI-Benthic Invertebrate sampling. Data included Chemistry, Tissue and Bioaccumulation.
LKFenwick_WQ	Water Quality for Lake Fenwick
LKMeridian_WQ	Water Quality for Lake Meridian
LKSpokaneNutrient_WQ	Lake Spokane Nutrients Monitoring
LoonLake WQ	Loon Lake Water Quality Monitoring Program, Continuous
LS0001	Lake Stevens Fecal Coliform TMDL Monitoring
LSP3	Little Squalicum Park Remedial Investigation/Feasibility Study (data collected by Integral and the City of Bellingham during the LSP RI/FS phase)
LSUL0001	Puyallup River Fecal Coliform Bacteria TMDL
LVDITCH-2010	Fecal Coliform in Longview Ditches and Lake Sacajawea 2010
Lynnwood_TMDL	Swamp Creek Watershed, Fecal Coliform Bacteria TMDL, Lynnwood, WA
MakahTmp	Makah Continuous Temperature Monitoring Summaries, Forest and Fish Program, Makah Indian Tribe (WRIA 19-20)
MarineWater	Long-term marine water column monitoring 1999-present. (Transitional data that has not yet been through a documented Data Entry Review process can be found in EIM Study ID MarineWater).

Study ID	Study Name
MasonHCPIC_WQ	Mason County's Hood Canal Septic System Surveys and Database Enhancement stage 1
MBEL0002	Lake Ballinger Monitoring Project
MBEL001	Lakes Bacteria Sampling
mbell003	Lake Erie and Lake Campbell Effectiveness Monitoring Project
mifr0001	Status Monitoring for the Upper Yakima River Suspended Sediment and Organochlorine Pesticide TMDL
MIFR0002	Little Spokane River PCBs in Fish Tissue Verification Study
mifr0003	Spokane Fish Hatchery PCB Evaluation
MIKA0001	Giffin Lake, Yakima County Phosphorus Verification Monitoring
MIKA0002	Myron Lake, Yakima County Ammonia Verification Monitoring
MinesII	Water & Sediment Quality in Ten Metals Mining Districts II
MIT_SCWQ	Muckleshoot Indian Tribe Fisheries Department Lake Washington Ship Canal Water Quality Project
MONPG20	2020 Port Gardner Monitoring Pilot Study
MonroeWQ	City of Monroe TMDL water quality monitoring for fecal coliform bacteria
Monte Cristo	Monte Cristo Mining Area Remedial Investigation
MRED0002	Hangman Hills Sewage Treatment Plant Nutrient Loading and Groundwater Study
MROB0001	Deschutes River Watershed (WRIA 13), multi-parameter TMDL
MROB0004	South Puget Sound Dissolved Oxygen Study, Phase 2
MROB002	Bear Evans Temperature and DO TMDL
MROB003	Green River and Newaukum Creek Temperature and Dissolved Oxygen Study
MROOS003	Squalicum Creek Toxics Screening Study
MROS0001	Sammamish River Temperature and Dissolved Oxygen TMDL
MSVL_MUNSONCREEK2017	Munson Creek TMDL 2017
MSVL_MUNSONCREEK2018	TMDL, Munson Creek, Marysville, Snohomish County
MVON001	Stillaguamish River-Dissolved OxygenAdditional Study for Low Dissovled Oxygen Levels Below The City of Arlington.
MVP003	Additional Study of Low Dissolved Oxygen Levels In The Upper Stillaguamish River Main Stem
MVP004	Gibbons Creek Effectiveness Monitoring
NCRI0001	Snoqualmie River Temperature TMDL
NCRI0002	Whatcom Creek Temperature Total Maximum Daily Load
NEP_PovBay_GVL23371	NEP_Pathogens_King_County_Poverty_Bay_GVL23371
NFPR	North Fork Palouse River BMP effectiveness monitoring
NFTOUTLE	North Fork Toutle River Water Temperature Study
NMat0001	Drayton Harbor Watershed Fecal Coliform TMDL

Study ID	Study Name
NMat0002	Lower White River Nutrients and pH Study
NMat0003	Phase 2: High Summer Bacteria Concentrations in Streams
NMat0004	Salmon Creek Low DO and pH Study
NMat0005	Fecal Coliform MPN method comparison study
NMat0006	Chehalis River Tributaries Supplemental Temperature and Flow Monitoring 2017
NSEA_TerrellCr_WQ	NSEA Water Quality on Terrell Creek
OCCSED16	Occidental Chemical Corporation (OCC), Data Summary Report Hylebos Sediment and Porewater Sampling Program 2016
OGEO0001	Willapa River Fecal Coliform Bacteria Verification Study
PAND0001	Screening Survey of Mercury Levels in Fish Tissue
PAND0002	OP Pesticides in Grayland Ditch
PAND0004	Henderson Inlet Fecal Coliform Effectiveness Monitoring
PASED08	Port Angeles Harbor Sediment Investigation.
PbTrends09	PBT Trend Monitoring: Lead in Suspended Particulate Matter, 2009
PbTrends10	PBT Trend Monitoring: Lead in Suspended Particulate Matter 2010
PbTrends11	PBT Trend Monitoring: Lead in Suspended Particulate Matter 2011
PbTrends12	PBT Trend Monitoring: Measuring Lead in Suspended Particulate Matter from Washington State Rivers and Lakes, 2012 Results.
PbTrends13	PBT Trend Monitoring: Measuring Lead in Suspended Particulate Matter from Washington State Rivers and Lakes, 2013 Results.
PbTrends14	PBT Trend Monitoring: Measuring Lead in Suspended Particulate Matter from Washington State Rivers and Lakes, 2014 Results.
PbTrends15	PBT Trend Monitoring: Measuring Lead in Suspended Particulate Matter from Washington State Rivers and Lakes, 2015 Results.
PbTrends16	PBT Trend Monitoring: Measuring Lead in Suspended Particulate Matter from Washington State Rivers and Lakes, 2016 Results.
PCSWQD	Pierce County Surface Water Quality Upland Sampling
PeabodySID2012	Peabody Creek Stressor Identification Study 2012
PipersFC001	Piper's Creek Microbial Source Tracking Study
PlumcreekWQ	Lookout Creek Temperature monitoring
PortGamble09	Port Gamble Bay Remedial Investigation and Feasibility Study
PORTGAMBLE2011	Port Gamble Bay Supplemental Remedial Investigation 2011

Study ID	Study Name
PortGardner_08	Sediment Characterization Study in Port Gardner and Lower Snohomish Estuary, Port Gardner, WA. Reload 4/10/2010. Revised by Jonathan Newer of SAIC - Bothell WA
PPIC0005	Mid. Columbia and Snake Rivers TDG TMDL Field Monitoring
PPIC0006	Pend Oreille River Temperature TMDL
PPIC0008	Pend Oreille R. TDG TMDL
PSE Jackson Prairie	Puget Sound Energy Jackson Prairie
PSK-LUC-2019-21	Puget Soundkeeper Alliance Lost Urban Creeks Project - Springbrook Creek Monitoring
PSTox001	Toxics in Surface Runoff to Puget Sound
RCOO0002	COLVILLE RIVER BACTERIAL TMDL
RCOO0003	Grayland Area Pesticide Reduction Evaluation
RCOO0004	Lake Chelan DDT and PCBs in Fish TMDL
RCOO0006	Vancouver Lake PCBs, Chlorinated Pesticides, and Dioxins in Fish Tissue and Sediment Investigation
RCOO0008	West Medical Lake PCBs, Dioxins and Furans in Fish, Sediment, and Wastewater Treatment Plant Effluent
RCOO0009	Copper and Zinc Levels in Des Moines, Massey, and McSorley Creeks, King County
RCOO0010	Puget Sound Toxics Loading Analysis: Characterization of Toxic Chemicals in Puget Sound and Major Tributaries, 2009-10
RCOO0016	Puget Sound Basin Railroad Track PAH and Metals Baseline Study
RESources_LNKSK_WQ	TMDL fecal coliform monitoring in the lower Nooksack River.
Rivers	Rivers B-IBI sampling
RJAC001	Arsenic in fish, sediments, and waters from four lakes, 2002
RJAC0010	Pesticides in Salmonid-Bearing Streams, Year 1
RJAC002	Metals and PCBs in Long Lake Fish
RSM_EFS1	Redmond Paired Watershed Study _ Final
RSMP_PC_PMNM2015	Regional Stormwater Monitoring Program Puget Marine Nearshore Mussels (Pierce)
RSMP_PC_PMSB2015	Regional Stormwater Monitoring Program Puget Marine Shoreline Bacteria (Pierce)
S356THST_SAM_STUDY	Effectiveness Monitoring of the South 356th Street Retrofit and Expansion Project, Federal Way, WA
SAM_MNM	Stormwater Action Monitoring Program Puget Nearshore Mussels
SAM_PC_MNM2017	Stormwater Action Monitoring Program - Pierce County - Puget Nearshore Mussels
SAM_PLES	Stormwater Action Monitoring Program Puget Lowland Ecoregion Streams
SAM_PSS	Stormwater Action Monitoring for Puget Small Streams

Study ID	Study Name
SCBIDWQD	Routine monthly monitoring of water quality in canals and return flows of the South Columbia Basin Irrigation District
SCL_BWQS	Water Quality Monitoring Program, Boundary Hydroelectric Project (FERC No. 2144)
SCMP_WQ	Skagit County Monitoring Program (01/01/2009 -)
SCOL0001	Weaver Creek (Mason County) Fecal Coliform TMDL Attainment Monitoring
scol0002	White Salmon River Watershed Fecal Coliform Bacteria Attainment Monitoring Study
SCOL0003	Deschutes River Multi-parameter Total Maximum Daily Load
SCOL003	Deschutes River Multi-parameter Total Maximum Daily Load Effectiveness Monitoring Pilot Project Water Quality Study Design (Quality Assurance Project Plan)
scol4610001	Weaver Creek Fecal Coliform TMDL Attainment Monitoring
SCRIBER-TMDL-01	Fecal coliform monitoring in Scriber Creek for Swamp Creek TMDL
SCTA0001	Dayton and Waitsburg TMDL Fine-Tuning
SCTPWQCR	Columbia River Background Water Quality near the SCTP
SGOL008	Zinc and Copper Concentrations in an Industrial Area Creek during Storm Events.
SGOL009	Lead and Copper Concentrations in North Creek, Gig Harbor
Skok_Estuary_Monitor	Skokomish Estuary monitoring
SLIP4_RAC	Slip 4 Removal Action Construction 2012
SNOCO_TMDLMONITORING	Snohomish County Surface Water Management Fecal Coliform Bacteria TMDL Monitoring
SNOCOBUG	Freshwater Streams Benthic Macro Invertebrate Sampling
SNOCOPIC_LowerStilly	Lower Stillaguamish Pollution Identification and Correction Program
SnohomishSTRMWTR_WQ	City of Snohomish QAPP
SnoLakes	Snohomish County Lake Management Program
Solvay_RWS	Receiving Water Study for Solvay Chemicals Inc
SPC TMDL	South Prairie Creek TMDL
SPC_TMDL_WQ	South Prairie Creek Restoration Monitoring
SPILDW06	Sediment Profile Imaging Feasibility Study - Lower Duwamish Waterway
SPOKTDG1	Spokane River TDG TMDL
SPU_stream_bact	SPU Urban Stream Bacteria Study
SRK_HangmanC_WQ	Hangman Creek Water Temperature Monitoring
SRK_SpokaneR_WQ	Spokane River Temperature Monitoring
SRRTTF-2014	Spokane River Regional Toxics Task Force 2014 Synoptic Dry Weather Survey and Confidence Testing for PCBs in Surface Water
SRRTTF-2015	Spokane River Regional Toxics Task Force 2015 Synoptic Dry Weather Survey

Study ID	Study Name
SRRTTF-2016	Spokane River Regional Toxics task Force 2016 Monthly Monitoring
SRRTTF-2018	Spokane River Regional toxics task Force 2018 Contiunued ID of potential unmonitored dry weather sources
SRRTTF-GW2016	Spokane River Regional Toxics Task Force 2016 Groundwater Sampling for PCBs in the Spokane Valley-Rathdrum Prairie Aquifer
SSB_WQ	South Skagit Bay Sampling
STEB0001	Naches River Temperature TMDL
STEB0002	Burnt Bridge Creek Fecal Coliform Bacteria, Dissolved Oxygen, and Temperature Total Maximum Daily Load Technical Study
STILTMDL	Stillaguamish River Watershed Fecal Coliform, Dissolved Oxyg
SuqTribeStreamTemps	Water Temperatures in Selected Streams of Kitsap County
ThorntonMatthewsFC01	Thornton Creek and Matthews Beach Microbial Source Tracking Study
tist0000	West Medical Lake verification monitoring
tist0001	Deadman/Meadow/Alpowa FC, DO, pH, and Temp STI monitoring
tist0002	Hangman Creek dissolved oxygen, pH, and nutrients pollutant source assessment
TMDL2017SC	NPDES required monthly TMDL Swamp Creek monitoring
TMDL-WAR045515	Municipal Stormwater Permit TMDL Surface Water Monitoring, City of Everett
TMDL-WAR045515-2020	2020 Municipal Stormwater Permit TMDL Surface Water Monitoring, City of Everett
TNC 1_WQ	Groundwater level monitoring WRIA 44/50
TSWA0001	Samish Bay Fecal Coliform Bacteria TMDL
TSWA0002	Liberty Bay Fecal Coliform TMDL
TSWA0003	Lacamas Creek Fecal Coliform, Temperature, Dissolved Oxygen, and pH Total Maximum Daily Load
TSWA0004	French Creek and Pilchuck River Temperature, Dissolved Oxygen, and pH Total Maximum Daily Load
TSWA0005	North Ocean Beaches Fecal Coliform TMDL and Source ID Study
TUWS35TM	Tucannon River Watershed Temperature TMDL
UCR_FS05	Phase I Upper Columbia River Site CERCLA RI/FS - Fish Tissue Data
Upper GreenSurfWater	Lower Duwamish Waterway Source Control: Upper and Middle Green River Surface Water Data Report
USNKPLTM	Keyport Area 8 Biological Evaluation
USNKPLTM16	Keyport Area 8 Tissue/Sediment Evaluation
USNSILTM2003-07	US Navy Bremerton Naval Complex Operable Unit B Marine Monitoring, Bremerton, WA. Combined 3 years of data from 2003 2005 and 2007 into one study.

Study ID	Study Name
USNSILTM2014-15	US Navy NBK Bremertion Operable Unit B Marine 2014-15 Sinclair Inlet Marine Monitoring, Bremerton, WA
USNSILTM2018	US Navy NBK Bremerton Operable Unit B Marine 2018 Sinclair Inlet Marine Monitoring, Bremerton WA
UWI_EB07	Surface Sediment and Fish Tissue Chemistry in Greater Elliott Bay (Seattle) -Urban Waters Initiative
Vashon	King County Vashon Island Macroinvertebrate Monitoring Project
VCNW1264	Des Moines Creek Regional Retention/Detention Facility Arsenic Issues Investigation by Des Moines Creek Basin Committee
VCNW2260	Interfor Pacific Site - City of Marysville
VCNW3159	Sisco Landfill Site
VCSW0889	Pacific Northwest Salmon Center Brownfields Cleanup, Belfair, WA
VCSW1726	Highway 14 MP 23 Burlington Environmental
WA0001317	Pend Oreille Mine Ground & Surface water
WA0032182	Carnation Wastewater Treatment Plant - Temperature Monitoring Study for NPDES Permit #WA0032182
WADOH_Marine_Fecal	Shellfish Growing Area Program - Marine Water Quality Monitoring
WAR044001_S8B	Clark County Phase I Municipal Stormwater Permit (2013 - 2018)
WAR044001_S8D	Clark County Phase I Municipal Stormwater Permit
WAR044002_S8D	Pierce County Phase I Municipal Stormwater Permit
WB1577RIFS	Solid Wood Inc. (West Bay Park) RI/FS, Olympia, WA. Agreed Order # DE-08-TCP SR-5415
WDFW 11-1916	WDFW Mussel Watch Pilot Expansion project - toxic contaminants in Puget Sound nearshore biota: a large-scale synoptic survey using transplanted mussels (Mytilus trossulus)
WDFW_CBNT_Evaluation	One-time 2019 study conducted by WDFW in the Commencement Bay/Nearshore Tidelands Superfund Site
WDFW_TBiOS_Chinook	Contaminants Reveal Spatial Segregation of Sub-adult Chinook Salmon Residing and Feeding in Puget Sound
WDFW_TBiOS_EngSole	Contaminants in Puget Sound English Sole Muscle tissues
WEHI0000	Type N Experimental Buffer Treatment Study
WEHI0001	Type N Experimental Buffer Treatment Study--Competent Lithologies
WEHI0002	Extensive Riparian Status and Trends
WEHI0003	Type N Experimental Buffer Treatment Study--Incompetent Lithologies
WENRTMDL	Wenatchee River TMDL
WHATCOM	Lake Whatcom Total Daily Maximum Loading (TMDL) Study
WHM_COB0	City of Bothell Watershed Health Monitoring

Study ID	Study Name
WHM_EFF0	Watershed Health data for Monitoring the Effectiveness of Pollution Control Activities on Agricultural Lands, Bertrand Creek
WHM_EFF2	Watershed Health data for Henderson Inlet Fecal Coliform TMDL Effectiveness Monitoring
WHM_EFF3	Effectiveness Monitoring of TMDL and Salmon Recovery Activities on Newaukum River
WHM_EPA	Status and Trends Puget Sound Region Sentinel Site Monitoring
WHM_PCD0	Palouse Conservation District, Palouse River Watershed Health Assessments
WHM_WHB	Wide Hollow Creek Water Quality Study for Aquatic Life Use (Bioassessment and Habitat Component)
WHOB001	Pine Creek Toxaphene Source Assessment
WHOB002	Wenatchee River PCB Source Assessment
WHOB003	Assessment of Methods for Sampling Low-Level Toxics in Surface Waters
WHOB004	Copper, Zinc, and Lead in Select Marinas of Puget Sound
WHOB008	Prevalence and Persistence of Cyanotoxins in Lakes of the Puget Sound Basin
WillBacT	Riverdale Creek Verification Study
WJW00002	Puyallup and White Rivers Dissolved Oxygen and Temperature Data Summary Report
WPAH13	2013 Western Port Angeles Harbor RI/FS Sediment Sampling
WQALWAND	Lake Whatcom Tributary Monitoring Project
WQAMFNWT	City of Bellingham Nooksack River Middle Fork Water Temperature Monitoring Program
WQASCAMB	Snohomish County Surface Water Ambient Monitoring
WQC2015CwCoHH00129	Water Quality Testing & Improvement at Two Cowlitz County Lakes
WQC-2016-0014	Monitoring the Effectiveness of Riparian Buffers on the South Fork of the Palouse River
WQC-2016-00371	Douglas County Water Quality Improvement Program
WQC-2016-CHCoNR-0247	Lake Chelan Long Term Monitoring
WQC-2016-CKliCD00003	Little Klickitat & Swale Creek TMDL
WQC2016MCFEG00215	Yakima River Side Channels Project
WQC2016OkHiAl00126	Monitoring Program for the Triple Creek Wetland Restoration Project
WQC-2017-00166	Water temperature changes in response to beaver influenced watershed improvement
WQC-2017-00167	Strait Priority Areas Project
WQC-2017-00168	Central Hood Canal Pollution Identification and Correction
WQC-2017-UndeCD00095	Underwood Conservation District WRIA 29 Wind and White Salmon Stream Temperature and Water Level Monitoring

Study ID	Study Name
WQC-2018-0110	Water Quality Analysis of Tributaries to the North and South Fork Palouse River
WQC-2020-00036	Jefferson County Foundational Monitoring and PIC
WQC-2020-00164	Water Temperature Mapping in the Snoqualmie and Skykomish River Basins
WQC-2020-00165	Improving Water Quality in Yellowhawk Creek and W. Little Walla Walla River
WQC2020ClCHHS00011	Sequim-Dungeness Clean Water District (CWD) Pollution Identification & Correction (PIC), Trends and Project Monitoring (Section 319 match)
WQNEP-2016-00013	Kolodziej NEP Stormwater 2017-19
WQNEP-2020-0050	Chemicals of Emerging Concern in Marine and Freshwater Fish in King County
WROCR2018WaWWMP00001	Flow and Temperature monitoring for the Walla Walla Basin Instream Flow Enhancement Study
WROCR-VER1-00015	Icicle Creek Water Resource Management Strategy
WRSRP-2020-00006	Little Spokane - Bear Creek Managed Aquifer Recharge
WRYBIPBentCD00011	Lower Yakima River Thermal Refuge Temperature Monitoring
WSTMP01	Washington State Toxics Monitoring Program: Exploratory Monitoring 2001
WSTMP02	Washington State Toxics Monitoring Program: Exploratory Monitoring 2002
WSTMP03	Washington State Toxics Monitoring Program: Exploratory Monitoring 2003.
WSTMP03T	Washington State Toxics Monitoring Program: pre-QAPP Trend Monitoring
WSTMP04	Washington State Toxics Monitoring Program: Exploratory Monitoring 2004.
WSTMP05	Washington State Toxics Monitoring Program: Exploratory Monitoring 2005.
WSTMP06	Washington State Toxics Monitoring Program: Exploratory Monitoring 2006.
WSTMP07	Washington State Toxics Monitoring Program: Exploratory Monitoring 2007.
WSTMP08	Washington State Toxics Monitoring Program: Exploratory Monitoring 2008.
WSTMP09	Washington State Toxics Monitoring Program: Exploratory Monitoring 2009.
WSTMP10	Washington State Toxics Monitoring Program: Exploratory Monitoring 2010
WSTMP12	Washington State Toxics Monitoring Program: Exploratory Monitoring 2012
WWP1Y0	Whatcom Waterway Phase 1 Cleanup Year 0
WWP1Y1	Whatcom Waterway Phase 1 Compliance Monitoring Year 1
WWP1Y3	Whatcom Waterway Compliance Monitoring Year 3
WYEH Clam Background	Wyckoff/Eagle Harbor Horse Clam Background Sampling

Study ID	Study Name
YUTTMDL	Mid-Yakima River Basin Bacteria TMDL (former study name Yakima Urban Tributaries Fecal Coliform TMDL)

Table 2. Studies from EIM with contaminated sediment data included in development of the 2022 WQA.

Study ID	Study Name
09BNC	Bremerton Naval Station Pier 7, 8 and B. Sampled in 2008
2019HylebosOMMP	2019 Mouth of Hylebos OMMP
53ACSO96	King County's NPDES CSO Subtidal Sed
63ACSO97	NPDES 63rd Ave CSO Baseline Study, 1997
AGS_NPDES_2007	American Gold Seafoods 2007 NPDES Sampling at Puget Sound salmon net pens
AGS_NPDES_2010	NPDES Sampling during 2010: American Gold Seafoods Net-Pen Sites in Puget Sound
AJOH0005	Spokane River PCBs, 1993-1994
AJOH0018	Similkameen River Sediment Quality Data Review
AJOH0038	Metals Contamination in Lake Roosevelt (EIM Study ID ROOSVMET was removed from EIM on 08-16-2012 because it contained duplicate data)
AJOH0040	Occurrence and Significance of DDT Compounds and Other Contaminants in Fish, Water and Sediment from the Yakima River Basin
AJOH0049	Toxics in stormwater runoff from PS boatyards.
AJOH0063	Background Assessment for Chemical Contaminants in Northeastern Washington Area Lakes.
AJOH0066	Assessment for Chemical Contaminants in Northeastern Washington Area Lakes:Sampling Additional Lakes and Wetlands for Metals Contamination
AK_CSO97	NPDES Alaska CSO Baseline Study
ALCOA001	Alcoa Former Vancouver Works
ALCOA90	ALCOA Aluminum - Class 2 Inspection
ALCOAP2a	ALCOA-Phase 2a
ALCOAP2b	ALCOA-Phase 2b
ALDRWD04	Sediment Sampling Results, Walderwood Picnic Point Wastewater Treatment Facility. Original name: ALDRWD04
ALKI01	NPDES Alki Subtidal Monitoring 2001
ALKI9497	NPDES Alki Subtidal Monitoring 1994-1997
AMLPFM15	AML Underpier Sampling in Seattle, WA.
ANCTP20	City of Anacortes WWTP NPDES Sediment Study 2020
ANCTP21	City of Anacortes WWTP NPDES Sediment Study 2021
ANIC0001	Pesticides in Washington State Stream Sediments
AO7294	Chevron Pipeline Co Pasco Bulk Terminal, Pasco, WA
AODE10483	Columbia Gorge Aluminum
AODE11237	Port of Tacoma Parcel 15 RI/FS
AODE12803	Gig Harbor Sportman's Club RI/FS
AODE15806	Port of Vancouver Cadet/Swan, NuStar and Kinder Morgan

Study ID	Study Name
AODE16185	South Park Marina Site Investigation, Seattle, WA
AODE2008	Gas Works Park WA Natural GasAnalytical Data Information, Seattle, WA
AODE5095	Jeld Wen Inc., Former Nord Door Site Groundwater, Soil and 2009 Sediments, Everett, WA
AODE5271RI	Remedial Investigation Everett Shipyard Property soil, groundwater and sediment.
AODE5272	West Bay Marina Remedial Investigation, Olympia, WA
AODE5572	Port of Everett North Marina West End Site, Soil, Groundwater and Sediment Characterization, Everett, WA.
AODE6677	Port of Everett Ameron Hulbert Remedial Investigation and Feasibility Study, Agreed Order AODE6677
AODE6703	Port of Seattle - Lora Lake Apartments Site Agreed Order AODE6703, Remedial Investigation/Feasibility Study
AODE7088	Boeing Isaacson-Thompson Site Remedial Investigation
AODE7655	South State Street Manufactured Gas Plant Remedial Investigation
AODE8979	Weyerhaeuser Mill A Former, Everett, WA
AODE9001	Westman Marine Remedial Investigation, Blaine, WA
AODE983515	Alexander Avenue Petroleum Tank Facilities Site Investigation, Tacoma, WA
AQ_Kenmore2012	Kenmore Sediment and Water Investigation
AQCD092002472	Alcoa Vancouver - Sediment Cleanup Site
AQDSI2006	Duwamish Shipyard, Inc. Phase 1 Remedial Investigation 2006
AQDSI2011Sed	Duwamish Shipyard, Inc. Phase 1 Remedial Investigation, Sediments
AQKeyport2011	Keyport Lagoon Sediment Characterization - 2011
AQMauryIsland2008	Glacier Northwest, Inc., Maury Island Dock Reconstruction
AQPACCARPHASE1_2	Evaluation of sediment chemistry data, stormwater and stormwater solids data, and emergent groundwater data for discrete samples collected from the Lower Duwamish Waterway (LDW) adjacent to the 8801 East Marginal Way South Property. Phase I and II
AQSLWA082010	Washington DNR - South Lake Washington Shoreline Restoration Project
AR-94-02	NRDA Sed. Svy of Comm & Elliott Bays
ARCOCP00	Arco Cherry Point NPDES Characterization
ARCOCP01	BP ARCO Cherry Point NPDES Sed Rechar
BB_RB	Bellingham Bay Regional Background Characterization
BCECW11	Bay Center Marina Entrance Channel, DY12
BCWTAC95	Boise Cascades West Tacoma Mill Baseline
Bellinghambay08	Bellingham Bay Creosote Piling and Structure Removal Evaluation, Hart Crowser Sediment Investigation. Name submitted by Hart Crowser: Bellbay

Study ID	Study Name
BERA0001	Verification of 303(d) Listed Sites in NWRO, CRO and ERO
BERA0005	Potholes Reservoir: Screening Survey for Dieldrin, other Chlorinated Pesticides, and PCBs in Fish, Water, and Sediments
BERA0006	South Lake Washington PCBs in Sediments
BHPSED19	Blakely Harbor Park Sediment Investigation 2019
BLAKEISL	WSPRC BLAKE ISLAND MD DY89
BLGMMETL	Metals Results from Bellingham Bay
BLVDPARK	Boulevard Park, Bellingham Bay Creosote Piling and Structure Removal Evaluation, City of Bellingham Sediment Investigation
BN_SF_HV	BN_SF RR Harborview Park Investigation
BNC_RI_10	10 New BNC Remedy Improvements - Naval Base Kitsap. Storm Sewer Outfall Extension Sediment Sampling. Submitted by eric.strout@sealaska.com
BNC_SIR_11	BNC - Naval Base Kitsap Seawall Interim Repairs. Sediment sampling.
BNS_P7	Bremerton Naval Station, Pier 7 Pre and Post Construction Sediment Sampling. Original name: BNS_P7
BNSFSK02	BNSF Skykomish River Site
BOEI2004	Boeing Developmental Center 2004
BOEING94	Boeing Duwamish Waterway Sediment Sampls
BOEING97	Boeing Site Characterization Study
BOERENTON_SED	Boeing Renton Pre-DNR Lease Sampling
BOISECAS	Boise Cascade Mill - Class 2 Inspection
BOLD 2008	Puget Sound Sediment PCB and Dioxin 2008 Survey. Also known as BOLD STUDY
BONF0911	Columbia River - Bonneville Fish Ladder September 2011 (Washington side)
BONN0797	Bonneville Second Powerhouse
BP2ABS	Boeing Plant 2 Additional Backfill Sampling
BP2PCM15-25	Boeing Plant 2 RCRA Corrective Action Post-Construction Monitoring 2015-2025
BPCP06	RETEC BP Cherry Point 2006
BPCP16	BP Cherry Point 2016 NPDES Sampling
BremSed2015	City of Bremerton Sediment Monitoring 2015
BREMTP98	'98 Bremerton WTP NPDES Sed. Mon. Report
BRTCSO97	NPDES Barton CSO Baseline Study
Budd Inlet Hardel 07	C396_Hardel EIM Results. Original User Study ID was C396. Updated 10/21/08 per Sharon R. Brown.
BUDD07	Budd Inlet Sediment Characterization
BUDD98	BUDD INLET
BUDINLET	Budd Inlet Sediment Survey Project

Study ID	Study Name
CAME005	Survey of Phthalates in Washington Rivers and Lakes
CAP_NPDES_2020	Cooke Aquaculture Sediment Critical Summer Period Monitoring 2020
CAP_NPDES_2021	Cooke Aquaculture Sediment Critical Summer Period Monitoring 2021
CAPSM07	Cap Sante Boat Haven - West Basin Redevelopment Project, Recency Extension, DY08
CARKEK00	Carkeek Park Outfall Monitoring 2000
CBLOG87	Methylphenol in log rafting areas of CB
CBRIP11	Crescent Bar Recreational Improvement Project, DY11
CBSDSM17	Commencement Bay Dredged Material Disposal Site Monitoring, 2017
CBUR0007	A Study of Copper Discharge from Irrigation Canals
CCDAM21	Chambers Creek Dam Removal
CD122034301	Everett Shipyard Site Upland Cleanup Action Compliance Monitoring, Everett, EA
CDC Deadman Creek	Deadman Creek - City of Mead, Spokane County - Sediment Sampling
CENKIT10	Central Kitsap Wastewater Treatment Facility (NPDES Permit Renewal -2010). GeoEngineers original name: NPDES-WA-003052-0.
CENKIT99	Central Kitsap WWTP NPDES monitoring
cfur0002	History of Mercury in Selected Washington Lakes Determined from Age-Dated Sediment Cores: 2007 Sampling Results
CFUR0004	Determination of Persistent, Bioaccumulative and Toxic Chemical Trends in Selected Washington Lakes Using Age-Dated Sediment Cores: 2008 Sampling Results
CFUR0007	Determination of PBT Chemical Trends in Selected Washington Lakes Using Age-Dated Sediment Cores: 2009 Sampling Results.
CFUR0010	Determination of PBT Chemical Trends in Selected Washington Lakes Using Age-Dated Sediment Cores: 2010 Sampling Results.
CG36P05	US Coast Guard Pier 36 - Post Dredge Characterization, DY06
CGSTA98	US Coast Guard Station - East Waterway - Slip 36, DY00
CHAMBR95	Chambers Creek WWTP Marine Sediment Mon.
CHEVPW04	Chevron Point Wells Supplemental Study
CHEVPW94	Chevron Pt Wells NPDES Baseline
CHEVPW95	Chevron Point Wells Terminal 95
CHEVRN02	Chevron Whatcom Crk Bellingham
CHNC0606	Baker Bay - Chinook Channel Sediment June 2006
CHNK0787	Chinook Channel 1987
CIPA2003	Cypress Ediz Hook Smolt 2003 NPDES Monit

Study ID	Study Name
CITRAP88	Contaminant Flux to City Waterway 1990
CMLPP14	Chester Morse Lake Pump Plant dredging project, DY14
CoEvOutf17	2017 City of Everett Deep Water Outfall DNR Easement Sampling
COLALU94	Columbia Aluminum Baseline
COLM0900	Columbia River Mouth- O & M
COLMAN94	Colman Dock - South Area, Seattle, WA
COLON03A	Colony Wharf Sed Invest 7-24-03
COLON03B	Colony Wharf Sed Invest 11-6-03
COLR0697	Col.R. Channel Deepening July 1997
CONOCO04	ConocoPhillips NPDES Permit Support
COT_FossMon Sed	Thea Foss and Wheeler Osgood-Waterways Remediation Project OMMP and LTMP Sediment Monitoring
COWR0107	Cowlitz River - Channel Sediment January 2007
CPRESS02	Cypress Island 2002 NPDES
CPSD9497	Ambient Subtidal Monitoring 1994-1997
CS14604-PPCD	Time Oil Bulk Terminal, PPCD 20-2-15215-3 SEA, W. Commodore Way, Seattle, WA
CSFSED17	Cosmo Specialty Fibers Baseline Sediment Sampling
CUSPLY95	Custom Plywood Mill at Anacortes 1995
CVAug2010	Chinook Ventures Surficial Sediment Characterization
CWMFC19	Old Mouth Cowlitz Federal Navigation Side Channel
DAISPA99	Daishowa-Port Angeles NPDES Monitoring
DE10630_04	Anacortes Port Log Yard - Pier 2 Due Diligence
DE10630_08	Anacortes Port Log Yard - Log Haul out site Sediment Characterization-2008
DE10630_09	Anacortes Port Log Yard - Log Haul out site Sediment Characterization-2009
DE10630_15	Anacortes Port Log Yard_2015_Remedial Investigation
DENN9496	Denny Way Cap Monitoring 1994-96
DennyWay_sed	Denny Way / Lake Union CSO Control Project
DKC0605	Driftwood Key Community Club, DY06
DNOR0003	Elliot Bay Waterfront Recontamination Study
DNOR0006	Lake Whatcom Sediment Mercury
DNRBLDMRN	Ballard Marine 1121 NORTHWEST 45th STREET SEATTLE, WASHINGTON
DNRSED16	DNR Lease Area Sediment Sampling 2016
DSER0008	Lake Roosevelt Sediment Toxicity (duplicate study LKROOS01 deleted on 12-26-2012)
DSER0009	Okanogan River DDT/PCB TMDL Assessment
DSER0010	Spokane River PCB Source Assessment 2003-2007 (formerly Spokane River PCB TMDL)

Study ID	Study Name
DSER0011	Mission Creek DDT TMDL Assessment
DSER0014	Screening San Juan Harbor sediments for toxicants
DSIP2RI	Duwamish Shipyard, Inc. Supplemental (Phase 2) Remedial Investigation
DUDI0105	Duwamish Diagonal Jan-Feb 2005 post-dredge perimeter - before thin-layer cap placement
DUDI0304	Duwamish Diagonal - March 2004 post-dredging
DUDI0405	Duwamish Diagonal April 2005 baseline cap monitoring - year 1. Changed original LDWG's Sedqual survey name from DUWDIAGA to DUDI0405 to be consistent with previous naming convention.
DUDI0604	Duwamish Diagonal June 2004 baseline cap monitoring - year 0 (post-cap placement)
DUDI1003	Duwamish Diagonal 10-2003 pre-dredging
DUNATO96	Site Invest.Dunato's Marine Serv.&Supp.
DUSHIP93	Duwamish Shipyard, Elliot Bay, WA
DUW0908	USACE Duwamish River Navigation Channel Maintenance Dredging, DY10
DuwamishSediment08	Lower Duwamish Waterway Sediment Investigation
DUWRIV97	Duwamish River Water Quality Assessment
DUWSU12	Duwamish Waterway, East Waterway and West Waterway Subsurface Sediment Characterization
EDMDUNOC	City of Edmonds Unocal Study
EDMOND08	City of Edmonds NPDES Sediment Analysis
EDMOND95	Edmonds WWTP Baseline
EEWSed13	Everett East Waterway - Sediment Characterization
EEWSed15	Everett East Waterway - Sediment and Porewater Characterization
EHCHEM94	Eagle Harbor PreDesign Sediment Sampling
EHPMAR95	U.S. Navy Everett Rec. Marina Sed. Mon.
EHYR8M03	Eagle Harbor Year 8 Monitoring
EIGHTBAY	1985 Puget Sound Eight-Bay survey.
EPAGAS84	Lake Union Sediment Investigation
EPAGAS95	EPA WA Natural Gas - Seattle Plant
EVEOM11	Corps of Engineers Snohomish River Navigation Channel Maintenance Dredging, DY12
EVEOM17	Snohomish River Federal Navigation Channel Dredged Material Characterization DY2018
Everfuel	Evergreen Fuel Facility, Shelton, WA
EVRT12TH	Everett 12th St. barge channel dredging.
EVRTSM94	Everett Simpson Site Sediment Investigat

Study ID	Study Name
EVSLOW	Everett Smelter Site, Lowland Area Feasibility Study and Cleanup Strategy
EVTWE494	Weyerhauser Everett, WA
EWST298	USACE/Port of Seattle East Waterway Stage 2, DY00
EWW-KC2011	East Waterway, Port Gardner, WA. Kimberly-Clark Sediment Study 2011.
FIDALG08	Fidalgo Bay Sediment Investigation
FIDLGO97	Survey of Fidalgo Bay
FmrSpSlip1	Former Spopac Slip 1 Sediment and Porewater Sampling
FOSSMARS	Thea Foss Marina Project
FS1019	Former Pacific Wood Treating Site - Interim Action (Port of Ridgefield Lake River Industrial Site investigation/cleanup), Ridgefield, WA
FS1126	Grays Harbor Historical Seaport Landing, former Weyerhaeuser Sawmill site in Aberdeen
FS1206878	Grit contamination in Blair Waterway.
FS1217	USG Interiors Puyallup Cleanup Site
FS1220	Arkema Inc. RI/FS, Tacoma, WA
FS12847683	Vic Franck Boatyard Sediments
FS1385	Cascade Pole Long-term Groundwater Compliance Monitoring and Sediment Sampling, Olympia, WA
FS1523145	Snopac Property
FS1554858	Van Stone Mine Site, CS461, Colville, WA
FS1940187	Crowley Marine Services Inc 8th Ave S, Seattle, WA
FS23849623	Northlake Shipyard Sandblast Grit Removal, Seattle, WA
FS23881883-RI	Glacier Northwest - Reichhold, Inc. Remedial Investigation/Feasibility Study
FS2670	Port of Anacortes - Dakota Creek (RI/FS)
FS2899	Whatcom Waterway - Log Pond 5 Year Monitoring and 2004 Due Diligence Data
FS4438651	Port of Everett- Former Bay Wood Products Site, Everett, WA. Formerly AQBAYWOOD & AQBaywood2011
FS8122259	Former Scott Paper Mill - Ordered by Consent Decree, Anacortes, WA
FS84531356	USG Interiors Highway 99 Cleanup Site, Tacoma, WA
FS95275518	Former Irondale Iron and Steel Plant, Irondale, WA
FS96239	Northport Waterfront
FVO92	FVO Marine Ways Site Sampling Report
FWLKUN01	Lake Union Sediment Quality Study
FWSPOR00	Chemical Analysis and Toxicity Testing of Spokane River Sediments Collected in October 2000

Study ID	Study Name
FWUPCR05	USEPA Phase I Sediment Sampling Upper Columbia River/Lake Roosevelt Site CERCLA RI/FS
G0400274	DDT Concentrations in Lake Chelan Water Measured Using Semipermeable Membrane Devices (SPMDs) and a Large-Volume Solid-Phase Extraction Device. Sediment Organochlorine Pesticide Concentrations near Tributary and Irrigation Drain Discharges to Lake Chelan
G0800233	Stormwater sediment 2009
G0800557	Lower Duwamish Source Control, T117 Early Action Area Non-Time Critical Removal Action (NTCRA)
G1300053	Budd Inlet Sediment Site Surface and Subsurface Sediment Investigation
G1400032	Former Hambleton Brothers Log Yard
G1400353	Quiet Cove Property
G1400515	Geddes Marina
G1400575	Spanaway Lake Management Plan
G1400583	Pakonen Boatyard
GAMBLE06	Port Gamble Dredging 2006
GEI006	Ecology Tier 1 Site Investigation - Former Port Blakely Mill Bainbridge Island, Washington
GEI024	Ecology Tier 2 Site Investigation - Guemes Channel
GHSED18	Gig Harbor Sediment Study 2018
GHSI	Grays Harbor Sediment Screening Study. Duplicate study found in EIM GRAYH_99 was erased on 03-25-2013.
GMTNPDES	General Metals of Tacoma, Inc
GOOSLK04	Goose Lake Remedial Investigation
GPBASE93	GP Baseline Sed. Character., '93 NPDES
GPBASE99	GP Outfall Surface Sed Investigation
GPCAM17	Sediment Monitoring at Georgia-Pacific (Camas) for NPDES Permit No. WA0000256
GRAYS_08	Dredged Material Characterization for Grays Harbor Navigational Channel Maintenance Dredging, Grays Harbor, WA 2008-2009
GRAYS00	USACE Grays Harbor O&M, DY01
GRAYS04	USACE Grays Harbor O&M, DY05
GRAYS06	USACE Grays Harbor Navigation Channel Maintenance Dredging, DY08
GRAYS11	USACE Grays Harbor Navigation Channel O&M - DY 12
GRAYS177	USACE Grays Harbor O&M, DY02
GRAYS297	Army Corps of Engineers - Grays Harbor dredged material characterization - 2010
GRAYS98	USACE Grays Harbor O&M, DY99
GWPLKUN	Triad Approach...Gas Works Pk. Lk. Union

Study ID	Study Name
HANSEN12	Hansen Boat Company, 30Aug2012 Surface Sediment Sampling, NPDES Permit WA0031909
HARIS03A	Harris Ave Shipyard Supp Invest7-24-2003
HARIS03B	Harris Shipyard Sup Sed Inv 11/6/03
HARIS11	Harris Ave Shipyard Supplemental Site Investigation, Bellingham, WA
HARRIS00	Sediments at Harris Ave Shipyard
HgFish06	Mercury Trends in Freshwater Fish 2006
HgFish07	Mercury Trends in Freshwater Fish 2007
HgFish08	Mercury Trends in Freshwater Fish 2008
HgFish09	Mercury Trends in Freshwater Fish 2009
HIRIPH2	Harbor Island Phase II RI
HODR0808	Hood River - Hood River Delta Assessment August 2008
HoldMine	Holden Mine Remediation, Holden, WA
HWSDR2021	2021 Hylebos Sediment Data Report
HYLE9496	Hylebos Waterway PRD Event 1A, 1B & 1C
HYLEBOS_HHCG_2012a	Head of Hylebos Waterway of the Commencement Bay/Nearshore Tideflats Superfund Site. Original study id: HHCG001
HYPCB87	PCB Contamination in Hylebos Waterway.
I&J05	I&J Waterway RI/FS, 8-31-05
ICEHB19	DY2020 Ice Harbor Dam Upstream Navigation Guidewall Cable Replacement
IJ2012	I&J Waterway RI/FS - Supplemental Investigation
IJ2013	I&J Waterway RI/FS - Supplemental Investigation 2013
IJW05	RETEC I&J Waterway Surface Sampling 2005
ILWA0787	Ilwaco Channel 1987
ILWC0606	Baker Bay - West Ilwaco Channel Sediment June 2006
INTLCO15	2015 Alcoa Intalco NPDES Sediment Characterization
INTLCO88	DOE 88 Intalco C2 Monitoring Inspection
INTLCO93	1993 WDNR Impact Zone Study at Intalco
INTLCO99	Intalco Sediment Investigation
ITT_94	ITTRAYONIER,PLANTCLOSUREMONITORING
JBHW0706	Columbia River - Julia Butler Hansen Wildlife Refuge Assessment July 2006
JCKSON94	Jackson Park Housing Complex OU2
JeldWen12	Jeld Wen Former Nord Door Site - Sediments
JeldWen13	Jeld Wen Former Nord Door Site - 2013 Sediments
JMED0001	Columbia River Basin (Clark County, WA) Toxics Local Source Control Monitoring - Screening Study Phase I
JORG1819	Jorgensen 2018-2019 Sediment Characterization
JT-2015	Jacobson Terminal 2015

Study ID	Study Name
JTMarine2008	JT Marine 2008 Baseline Columbia River Sediment Data
JTMarine2014	JT Marine 2014 Columbia River Sediment Data
K0622000	Boeing Development Center
KALAMA88	Kalama Chemical Inc - Class 2 Inspection
KC_CSO_2011	King County CSO Sediment Quality Characterization 2011 - NPDES Permit No. WA-002918-1
KC_CSO_2013	King County CSO Sediment Quality Characterization 2013 - NPDES Permit No. WA-002918-1
KC_CSO_2018	King County CSO Sediment Characterization 2018 for NPDES Permit No. WA-002918-1
KC_old	Historic data required by NPDES data to be submitted to Ecology
KC-CSO-2016	King County CSO Sediment Characterization 2016 for NPDES Permit No. WA-002918-1
KCintertidal-sed	King County Ambient Intertidal Sediment sampling
KCm_kcr2049	Elliot West TF/Denny Way CSO
KCmar-1	King County Routine Marine Ambient Monitoring
KCOutf12	2012 Kimberly Clark Deep Water Outfall NPDES Sampling
KCST9802	KC Streams Sed data for 303D submission
KEYPORT	The Navy's Keyport RI Report
KEYPRT92	Navy/Keyport Final RI Report of 10/25/93
KEYST19	Keystone Federal Navigation Channel Dredged Material Characterization DY2020
KILIS20	2020 Kilisut Harbor Restoration confirmation sampling
KIMCLK04	Kimberly-Clark Outfall 100 Baseline Sediment Samp
KINGST02	Kitsap County Outfall
KINGST19	2019 Kingston Waste Water Treatment Plant, Surface Sediment Sampling, NPDES Permit WA0032077
KITCO13	Kittitas County Boat Ramp Recreational Improvement Project, DY14
KITSAP03	Kitsap Transit/Sidney Landing Investigat
KTSPMON2	Sinclair and Dyes Inlet monitoring 91-92
LAK99	Lakehaven Utility District NPDES 1999 Lakehaven
LAKEROOS	Review of L. Roosevelt Synoptic Data
LAKOTA05	Lakota Sediment Sampling
LAKOTA16	Lakota Wastewater Treatment Plant Sediment Monitoring Study
LAKROO92	SQ Assessment of Lk.Roosevelt & Colu. R.
LCBWRS93	Lower Columbia Backwater Recon. Survey
LDWAOC3	Lower Duwamish Waterway Administrative Order on Consent (third amendment)
LDWAOC4	Lower Duwamish Waterway Administrative Order on Consent (fourth amendment)

Study ID	Study Name
LDWFishCrabClam2007	FISH, CRAB, AND CLAM TISSUE COLLECTION AND CHEMICAL ANALYSES FOR ADDITIONAL FISH, CRAB, AND CLAM SAMPLING IN THE LOWER DUWAMISH WATERWAY IN 2007
LDWOFSS	Surface Sediment Sampling at Outfalls in the Lower Duwamish WaterwaySeattle, WA
LDWPilot14-20	Lower Duwamish Waterway ENR/AC Pilot Study, 2014-2020
LDWRTHIC	Lower Duwamish River LDWRI. Data include freshwater and marine sediment, clams and benthic invertebrates.
LDWSedDioxin2010	2009/2010 Lower Duwamish River surface sediment sampling results for dioxins and furans and other chemicals
LDWSPS	LDW South Park Slag
LDWT117OFPostConSed	Terminal 117 Outfall Post-construction Sediment Sampling
LDWT117OFPreConSed	Terminal 117 Outfall Pre-construction Sediment Sampling
LDWT117OFPreOpSed	Terminal 117 Outfall Pre-operational Sediment Sampling
LDWUPSED2010	Lower Duwamish River upstream sediment analysis.
LIPDS04	Lakeside Industries - Lake Washington Ship Canal, DY05
LKUNDRDK	Lake Union Drydock Sediment Monitoring
LKUNION	Survey of Contaminants in Lake Union
LKWA00	Lake Washington Baseline Sed Study 2000
LODRIV98	Lower Duwamish River -Site Inspection
LogPnd01	GP Log Pond Year 1
LogPnd02	GP Log Pond Year 2
LONEST89	Lonestar NW maintenance dredge Duwamish River
LONGVW90	Longview Fibre Co. - Class 2 Inspection
LOTT_96	Budd Inlet - LOTT 1996 NPDES Sed. Monitoring Report
LOTT2019	LOTT CWA 2019 Sediment Monitoring NPDES Permit No. WA0037061
LOVRIC17	Lovric's Sea-Craft Sediment Characterization 2017
LSAMM99	Lake Sammamish Baseline Sediment Stdy 99
LSP1	Little Squalicum Park Remedial Investigation/Feasibility Study (data collected by Oeser RI)
LSP2	Little Squalicum Creek Screening Level Assessment used for Little Squalicum Park initial investigation.
LSP3	Little Squalicum Park Remedial Investigation/Feasibility Study (data collected by Integral and the City of Bellingham during the LSP RI/FS phase)
Lucca's Landing	Lucca's Landing sediment sampling for DNR Lease
LUUCSO00	King County Lake Union University Regulator CSO
LVFIB01	Longview Fibre Maintenance Dredging DY02
LWRCOLUM	Contaminants in 5 Lower Columbia Ports
LWSCR92	USACE Lake Washington Ship Canal, DY92 Recon Study

Study ID	Study Name
LYNNWD09	City of Lynnwood WWTP Baseline Sediment Monitoring 2009
LYNNWD95	Lynnwood WWTP Baseline
MAGCSO96	NPDES Magnolia CSO Baseline Study, 1996
MALINS	1980 NOAA OMPA-19 survey of Elliott Bay.
MARTINAC2011	J.M. Martinac Sediment Sampling per the NPDES requirements.
MBTL12	2012 NPDES Sediment Characterization for Outfalls 001S and 002A - Millennium Bulk Terminals, Longview, WA. NPDES Permit WA0000086.
MBTL12_RIFS	Former Reynolds Reduction Plant Longview RI-FS
MCPLC_2012	McFarland Cascade 2012. NPDES Permit No. WA00379563.
MCRNH0917	Mouth of the Columbia River North Head Baseline Survey
MESHOU16	MHCC Outfall Sediment Sampling and Analysis
METAL18	Metaline Waterfront Improvement Project, DY18
MIDWAY02	Midway Sewer Outfall #1 Baseline
MIDWAY06	Midway Sewer District Sed Sampling
MIDWAY07	Midway WWTP 2007 Supplemental Sediment Sampling
MIDWAY95	MIDWAY BASELINE
MIDWWY09	Middle Waterway Action Committee (MWAC)--Middle Waterway Problem Area, Areas A and B Commencement Bay Nearshore/Tideflats Superfund Site; Remedial Action Long-term Monitoring Results Years 0, 3, 4, and 5; Commencement Bay
mifr0003	Spokane Fish Hatchery PCB Evaluation
MILLCRP2	Mill Creek Sediment Sampling & Analysis
MONAK05	Anderson/Ketron DMMP Dredged Material Disposal Site - 2005 Full Monitoring
MONCB03	2003 Tiered-Full Monitoring of the DMMP Commencement Bay Dredged Material Disposal Site
MONCB04	2004 Tiered-Full Monitoring at Commencement Bay
MONCB05	2005 Commencement Bay Site Physical Monitoring and Phenol Study
MONCB191	2003 Tiered-Full Monitoring in Com Bay
MONEB13	Elliott Bay DMMP Monitoring, Partial, 2013
MONPG20	2020 Port Gardner Monitoring Pilot Study
Monte Cristo	Monte Cristo Mining Area Remedial Investigation
MORTON92	Morton Marine maintenance dredging
MSHS0810	Mount Saint Helens Sediment Evaluation --Toutle River Sediment Retention Structure
MSNW00	Marine Services NW
MURCSO97	NPDES CSO Subtidal sediments, 1997
NB_CSO96	Magnolia, North Beach, 53rd Street CSO's
NBLA0001	Norfolk CSO Sediment Phase I

Study ID	Study Name
NBLA0002	Ostrich Bay Sediment Monitoring
NBLA0005	Post Point, Bellingham Bay Sediment Sulfide and Toxicity Assessment
NBLA0006	Evaluation of Candidate Freshwater Sediment Reference Sites
Nippon18	Sediment Monitoring NPDES Permit WA0000124, Nippon Dynawave Packaging Co., Longview, Washington
NLMAR-DNR	Northlake Marina Lease Renewal
NOAPMC94	Pacific Marine Center Sediment Survey
NOP_RB	North Olympic Peninsula Regional Background Characterization
Northlake18	Northlake Shipyard 2018 Sediment Sampling
NPI_PA_001_002_2010	Sediment Sampling for Nippon Paper Industries
NPI_PA_002_2010	National Parks Service Sediment Sampling for Nippon Paper Industries outfall 002 replacement.
NSESBL12	Naval Station Everett Small Boat Launch and Kimberly-Clark Derelicht Pier Sediment Study
Nutrien21	Nutrien NPDES and DNR Lease Baseline Sediment Characterization Sampling 2021
OAKHAR04	Crescent Harbor WWTP
OAKHBR06	Oak Harbor Sediment Sampling
OAKSED08	2008 Oakland Bay Sediment Characterization of intertidal and subtidal areas from Hammersley Inlet to upper Oakland Bay, Mason County, Washington.
OAKSED17	Oakland Bay Sediments - Shelton Harbor Unit RI/FS and Interim Actions
OAKSED20	Oakland Bay Sediments - Shelton Harbor Unit RI/FS and Interim Actions - 2020
OBCLAM97	Jackson Park/Erlands Point Clam and Sediment Samples near Ostrich Bay in Dyes Inlet (former Study Name Clam study, Ostrich Bay). Samples Analyzed Independently by Navy. See also Study AJOH0027.
OCCSED16	Occidental Chemical Corporation (OCC), Data Summary Report Hylebos Sediment and Porewater Sampling Program 2016
OHPSD06	Olympia Harbor - Supplemental Dioxin Study, DY07
OLAVNE00	Sediments at Olavine
OLYHAR88	USACE Olympia Harbor Navigation Improvement FC, DY 89
OLYNI88	USACE Olympia Harbor Navig. Improvement PC, DY 89
OTHELLO21	City of Othello WWTP NPDES WA0022357 Sediment Characterization Study 2021
OU2BND97	Boundary of OU 2, JPHC/NHB site
OU2CON97	Confirmatory Study OU 2, JPHC/NHB site
OU2SDM96	Sedimentology Study OU 2, JPHC/NHB site
OU2SRC97	Source Study OU 2, JPHC/NHB site

Study ID	Study Name
OVRA99	Olympic View Restoration in Commencement
P&T_MILL	Pope_and_Talbot_Mill_Site_Sediment
P53MON93	Metro QA Review of P53-55 Capping Data
P53MON96	Pier 53 Cap Monitoring 1996
P66CAP	PIER66 SEDIMENT CAP/CENTRAL WATERFRONT
PA_STP04	Port Angeles NPDES Sediment Analysis
PA_STP10	City of Port Angeles 2010 NPDES Permit WA-0023973 Sediment Characterization
PA_STP96	1996City of Port Angeles NPDES Report
PAINEFLD	Survey for Contaminants at Paine Field
PASED08	Port Angeles Harbor Sediment Investigation.
PCAWAL21	PCA Sediment Sampling for NPDES Permit Requirements 2021
PerCov09	Percival Cove Study
PGB-HERRING-SED2014	Port Gamble Bay Sediment Sampling in 2014 for Herring Embryo Mortality Study
PGHO&M96	USACE Grays Harbor O&M, DY96
PGHT294	Grays Harbor, Port of, Terminal 2, DY94
PGHT493	Grays Harbor, Port of, Terminal 4, DY94
PGHTE21	Port of Grays Harbor Terminals 1,2,3,4 - DY22
PGM1010	Port Gardner Dredged Material Disposal Site Monitoring, 2010
Phillips66_2015	Phillips 66 Ferndale NPDES Sediment Sampling 2015
Phillips66_2017	Phillips 66 Ferndale NPDES Sediment Sampling 2017
Phillips66_2019	Phillips 66 Ferndale Refinery Wharf Causeway Replacement Sediment Characterization
Pier_53-55_2002	Pier 53/55 Sediment Cap monitoring study
PIER_D93	U.S. Navy Pier D Supplemental Sampling
PIER_D95	U.S. Navy Pier D Long-Term Area Monitor
PIER2310	Army Reserve Pier 23 Replacement Project - FSID # 54221181
POEMA19	Port of Everett Marina - post-dredge sediment characterization
POEP3N19	Port of Everett Pier 3 N Baseline Surface Sediment Characterization
POGHT07-1	Port of Grays Harbor - Terminal 1, 2 and 4, DY08
POGHT07-2	Port of Grays Harbor - Terminal 3 Maintenance Dredging, DY09
POLARIS	Crowley Marine Services Base Sed Samp
PORT ANGELES DNR08	Environmental Baseline Investigation DNR Lease 22-077766. Original name submitted by Exponent Inc,: PAEBI08
PortGamble09	Port Gamble Bay Remedial Investigation and Feasibility Study
PORTGAMBLE2011	Port Gamble Bay Supplemental Remedial Investigation 2011
PortGardner_08	Sediment Characterization Study in Port Gardner and Lower Snohomish Estuary, Port Gardner, WA. Reload 4/10/2010. Revised by Jonathan Newer of SAIC - Bothell WA

Study ID	Study Name
PortGardner_RB	Port Gardner Regional Background Characterization
POS2R03	Port of Seattle - East Waterway Stage II Recency Testing, DY04
POS4604	Port of Seattle - T46, DY05
POS9108	Port of Seattle T91 Post-Dredge Evaluation, DY09
POSDMC16	Des Moines Creek Basin Outfall Surface Sediment Sampling
POSFT04	Port of Seattle - Fishermen's Terminal, DY05
POST5_96	Seattle, Port of, Terminal 5, DY97
POSTPT03	Post Point NPDES Sediment Sampling, 2003
POSTPT87	Post Point Treatm Plant, B'ham Cty, 1987
POSTPT96	Post Point Treatm Plant, B'ham Cty, 1996
PoT_Split_2020	2020 Port of Tacoma PCB Split Sediment Monitoring
POTBD98	USACE Blair Waterway Deepening, DY99
POTBLR91	Port of Tacoma, Blair Waterway project
POTP413	Port of Tacoma Pier 4 Reconfiguration Project, DY14
POVANC15	Port of Vancouver Maintenance Dredging Sediment Sampling
POVANC21	Berth 17 Sediment Sampling
PPTox07	Sediment toxicity study near Post Point wastewater treatment plant outfalls (Bellingham Bay, Washington)
PSAMP_HP	Puget Sound Assessment and Monitoring Programâ€™s historical sediment monitoring program 1989-1995
PSAMP_LT	The Puget Sound Assessment and Monitoring Programâ€™s Long-Term Temporal Monitoring
PSAMP_SP	The Puget Sound Assessment and Monitoring Program's (PSAMP) Spatial/Temporal Monitoring
PSAMPNOA	A Cooperative Agreement with the Puget Sound Assessment and Monitoring Program and the National Oceanic and Atmospheric Administration(NOAA) National Status and Trends (NS&T) Program to jointly examine measures of sediment quality throughout Puget Sound.
PSDDA_00	Elliott Bay Full Monitoring
PSDDA_01	Full monitoring of Commencement Bay
PSDDA_02	Tiered-Partial Monitoring of Elliott Bay
PSDDA_95	Commencement Bay Full Monitoring
PSDDA1	PSDDA Phase I Survey of Disposal Sites
PSDDA2	PSDDA Phase 2 Survey of Disposal Sites
PSEMP_LT	Puget Sound Ecosystem Monitoring Program Long Term Sediment Component
PSNS90	Puget Snd Naval Shipyard Site Inspec. 90
PSREF90	Puget Sound Reference Areas Survey
PST18_P2	Port of Seattle, T18 Phase 2, DY97
PST1809	Port of Seattle T18 post-dredge evaluation

Study ID	Study Name
PST9115	Port of Seattle Terminal 91, DY16
PST9116	Port of Seattle Terminal 91, DY17
PST9117	Port of Seattle T-91 Submerged Lands Preliminary Investigation Sediment Characterization Results Phase 1
PST9118	Port of Seattle T-91 Submerged Lands Preliminary Investigation Sediment Characterization Results Phase 2
PSYSEA98	Portland Shipyard Sed. Inv.
PT_2001	Pope & Talbot Landfill 2&3
PT_DRGVR	P&T Sediment Dredge Verification
PT_PG1	Pope and Talbot - Port Gamble 1
PTPC2014	Port Townsend Paper Corporation NPDES Sediment Data - 2014
PTWNPCC2	Pt. Townsend Paper Company Class 2
QUEBAX1	PAH's in L. Wash. at Quen/Baxter Phase 1
QUEBAX2	PAH's in L. Wash. at Quen/Baxter Phase 2
QUEBAX3	PAH's in L. Wash. at Quen/Baxter Phase 3
QUEDAL00	Quendall Terminals
QUILL17	Quillayute River Federal Navigation Channel and Boat Basin Dredged Material Characterization
QUILL301	Army Corps of Engineers - Quillayute dredged material characterization - 2010
RAYON98	Rayonier, DY98
RAYONR05	Former Rayonier Mill Site
RAYSED09	Former Rayonier WWTP Outfall Sediment Baseline Monitoring,Port Angeles, Washington
RCOO0004	Lake Chelan DDT and PCBs in Fish TMDL
RCOO0006	Vancouver Lake PCBs, Chlorinated Pesticides, and Dioxins in Fish Tissue and Sediment Investigation
RCOO0007	History of Mercury in Selected Washington Lakes Determined from Age-Dated Sediment Cores: 2006 Sampling Results.
RCOO0008	West Medical Lake PCBs, Dioxins and Furans in Fish, Sediment, and Wastewater Treatment Plant Effluent
RCOO0014	Burnt Bridge Creek PCB and Dieldrin Screening Study
RCOO0016	Puget Sound Basin Railroad Track PAH and Metals Baseline Study
RED99	Lakehaven Utility District NPDES 1999 Redondo
REDONDO	Redondo Sediment Sampling
REDONDO09	Redondo Poverty Bay - Lakehaven Utility District Wastewater Treatment Outfall -- DNR lease and NPDES requirements. Name changed from LUD09.
REDONDO16	Redondo Wastewater Treatment Plant Sediment Monitoring Study

Study ID	Study Name
RENT01	NPDES Renton (South Plant) Subtidal 2001
RENT9497	NPDES Renton Subtidal Monitoring 1994-97
RENT99	NPDES Renton Subtidal Monitoring 1999
RETEC_02	RETEC 2002
RETEC_99	RETEC 1999
REYNOLDS	Reynolds Aluminum - Class 2 Inspection
RGHALY04	Former Haley Wood Treatment Facility - Resubmitted data by GeoEngineers.
RGHALY15	Former Haley Wood Treatment Facility - Supplemental Sediment Investigation
RHONE495	Rhone-Poulenc RFI-3. RCRA facility investigation (RFI) report for the Marginal Way facility. Round 3 data and sewer sediment technical memorandum. Prepared for US Environmental Protection Agency Region 10.
RICH9496	Richmond Beach IT Monitoring 1994-96
RILEY001	South Puget Sound toxicants in sediments
RJAC003	B+L Wetland Landfill
RJAC005	Sediment Toxicity near Gas Works Park, Seattle
RJAC006	Dillenbaugh Creek contaminated sediments
ROSSIS99	Ross Island Facility Site Investigation
RPMESI97	Rayonier Pulp Mill Expanded Site Inspection 1997, TDD:97-06-0010
RSM_EFS1	Redmond Paired Watershed Study _ Final
RSMP_PC_MNS2016	Regional Stormwater Monitoring Program Puget Marine Nearshore Sediments (Pierce)
RTTAC14	RockTenn NPDES Sediment Analysis 2014
RUSTWY15	Marine Sediment Sampling along Ruston Way, Commencement Bay
SALMII96	Salmon Bay Phase II
SAM_PLES	Stormwater Action Monitoring Program Puget Lowland Ecoregion Streams
SAM_PSS	Stormwater Action Monitoring for Puget Small Streams
SCDMET03	Sinclair-Dyes Metals Verification Study
SCLAIR94	Sinclair Inlet monitoring, 1994
SCOTT95	Scott Paper Co. Baseline Sediment Survey
SCTPSedCR	Evaluation of Sediments in the Columbia River near the SCTP Outfall
SEACOM94	Seattle Commons Sediment Sampling Report
SEACRE97	Seacrest Preliminary Study '97
SEDCORE11	PBT Chemical Trends in Washington State Determined from Age-Dated Lake Sediment Cores, 2011 Sampling Results
SEDCORE12	PBT Chemical Trends in Washington State Determined from Age-Dated Lake Sediment Cores, 2012 Sampling Results

Study ID	Study Name
SEDCORE13	PBT Chemical Trends in Washington State Determined from Age-Dated Lake Sediment Cores, 2013 Sampling Results
SEDCORE14	PBT Chemical Trends in Washington State Determined from Age-Dated Lake Sediment Cores, 2014 Sampling Results
SEDCORE15	PBT Chemical Trends in Washington State Determined from Age-Dated Lake Sediment Cores, 2015 Sampling Results
SEDCORE16	PBT Chemical Trends in Washington State Determined from Age-Dated Lake Sediment Cores, 2016 Sampling Results
SEDCORE17	PBT Chemical Trends in Washington State Determined from Age-Dated Lake Sediment Cores, 2017 Sampling Results
SEDCORE19	PBT Chemical Trends in Washington State Determined from Age-Dated Lake Sediment Cores, 2019
SEQUIM97	City of Sequim Outfall Sampling
SHANPT95	Shannon Point Seafoods Phase I SAP
SHEBA20	Shelter Bay Marina sediment characterization DY20
SHELHARB	Shelton Harbor Sediment Study
SHELL04	Shell Puget Sound Refinery
SHELL20	Shell Oil Products US Puget Sound Sediment Data Report 2020
SHELL92	Shell Oil Sediment Baseline
SHELTON WWTP	Shelton WWTP Outfall Baseline Sediment Monitoring Study by City of Shelton
SIMILCON	Sinclair Inlet, Quay Wall and Drydock Sediment Sampling, Bremerton Naval Complex, Bremerton, WA
SIMILK00	Similkameen River Sediments
SIMPSN87	Baseline Monitoring Simpson Tacoma
SIMPSON	Simpson NPDES Sediment Analysis 2004
SINCLET	Lower Sinclair Inlet Sediment PCB Study
SITCM00	Port of Tacoma Sitcum Waterway Maintenance Dredging, DY00
SITCUMHA	Sitcum's Milwaukee Waterway Habitat Area
SITCUMP1	Sitcum W. Remed. Project Phase 1 Area
SITCUMP2	Sitcum W. Remed. Project Phase 2 Area
SKAGIT01	Skagit River Sediment at Mount Vernon
Slip4_LTMY1	Lower Duwamish Waterway Slip 4 Early Action Area Long-Term Monitoring Year 1
Slip4_LTMY3	Lower Duwamish Waterway Slip 4 Early Action Area Long-Term Monitoring Year 3 (2015)
Slip4_LTMY5	Lower Duwamish Waterway Slip 4 Early Action Area Long-Term Monitoring Year 5 (2017)
Slip4_LTMY7	Lower Duwamish Waterway Slip 4 Early Action Area Long-Term Monitoring Year 7 (2019)
SLIP4_RAC	Slip 4 Removal Action Construction 2012

Study ID	Study Name
SLUPRK90	So. Lake Union Park -Kurtzer Marine Park
SN080903	Woody Riparia Sediment Lower Snake River
SNCL0403	Snake-Clearwater Rivers Pre-dredging
SNCL0600	Sediment Sampling for Dredging
South_Plant_2011	2011 South WWTP Outfall Sediment Sampling Event
South_Plant_2017	2017 South Plant WWTP NPDES Outfall Study - Sediment Sampling Events
South_Plant_2018	2018 South Plant WWTP NPDES Outfall Study - Sediment Sampling Event
SPILDW06	Sediment Profile Imaging Feasibility Study - Lower Duwamish Waterway
SPOK2000	Spokane River Sediments October 2000
SPRM-2008-HARVARD	Spokane River Metals 2008-HARVARD
SPRM-2008-IC	Spokane River Metals 2008-IC
SPRM-2008-MURRAY	Spokane River Metals 2008-MURRAY
SPRM-2008-STARR	Spokane River Metals 2008- STARR
SPUCSO044WQ	Seattle Public Utilities CSO Outfall 44 Post Construction Monitoring
SPUCSO062WQ	CSO Outfall 62 Post Construction Compliance Report
SPUCSO095WQ	Seattle Public Utilities CSO Outfall 95 Post Construction Monitoring Compliance Report
SQMMON91	91 Pt. of Port Angeles Sediment Monitori
SQMMON92	92 Pt. of Port Angeles Sediment Monitori
SRRTTF-MR2021	Monitoring to Assist in Defining the Sources of PCB Contamination in the Spokane River Mission Reach
SST-SED	Schnitzer Steel of Tacoma 2010 Surface Sediment Sampling, NPDES WDP No. WA0040347, Head of Hylebos Waterway, Tacoma, WA
SST-SED21	NPDES Sediment Monitoring Schnitzer Steel of Tacoma 2021
STARR98	Starr Rock Surface Sed Investigation
STEILLK1	Copper in Steilacoom Lake - Phase 1
STEILLK2	Copper in Steilacoom Lake - Phase 2
STPAUL93	St. Paul Waterway Area Remedial Action
SWINC09	USACE Swinomish Channel O&M, DY10
SWINC17	Swinomish Channel Federal Navigation Channel Dredged Material Characterization DY2018
SWINR02	USACE Swinomish Channel O&M, DY03
SWON0001	Spokane River Biofilm PCB Screening Study
SWSSD10SEDS	SW Suburban Sewer District Salmon Creek Burien WTTP Sediment Monitoring by Michael A. Kyte, Nisqually Aquatic Technologies.
SWSSD96	Southwest Suburban Sewer District
T117CA14	T-117 Cleanup Removal Action 2013-2014

Study ID	Study Name
TAMU_02	TAMU 2002
TENLAK92	Chemical Contaminants in Ten Lakes WA
TESORO01	TESORO SEDIMENT CHEMISTRY 2001 Sampling
TESORO20	Tesoro Refining Facility - Fidalgo Bay Sediment Sampling 2020
TEXACO95	Texaco Class 2
TF89_92	EILS' Thea Foss Water Way Sampling
THFOSS94	Thea Foss & Wheeler-Osgood W'way Round 1
TNCBRSED	Tacoma Narrows Bridge Sediment
TODD05	Todd Shipyards Sediment Operable Unit
TODD05_Y5	Todd Shipyards Sediment Operable Unit Year 5
TOKPT98	USACE Willapa Harbor - Tokeland Marina Entrance Channel and Mooring Basin, DY98
TPETM06	USACE Willapa Bay, Toke Point Entrance Channel and Tokeland Marina, DY07
TPPS3AB	TPPS Phase III A & B
TXNPDS92	Texaco Anacortes NPDES Sediment Studies
UC_ESI	Upper Columbia River ESI
UCR-2007	Upper Columbia River Sediments 2007
UNIMAR2	UNIMAR Drydock (Yard 1) Sampling 1991
UPRVRDAM	Upriver Dam PCB Sediments Site
USGSLR03	Elements and Mercury in Lk Roosevelt
USNKPLTM	Keyport Area 8 Biological Evaluation
USNKPLTM12	Keyport Area 8 Cadmium Evaluation
USNKPLTM16	Keyport Area 8 Tissue/Sediment Evaluation
USNSILTM2003-07	US Navy Bremerton Naval Complex Operable Unit B Marine Monitoring, Bremerton, WA. Combined 3 years of data from 2003 2005 and 2007 into one study.
USNSILTM2010	US Navy Bremerton Naval Complex Operable Unit B Marine Monitoring, Bremerton, WA
USNSILTM2012	US Navy NBK Bremertion Operable Unit B Marine 2012 Sinclair Inlet Marine Monitoring, Bremerton, WA
USNSILTM2014-15	US Navy NBK Bremertion Operable Unit B Marine 2014-15 Sinclair Inlet Marine Monitoring, Bremerton, WA
USNSILTM2018	US Navy NBK Bremerton Operable Unit B Marine 2018 Sinclair Inlet Marine Monitoring, Bremerton WA
USOIL07	Sediment Monitoring near outfall in Blair Waterway
UWI	Urban Waters Initiative
UWI_EB07	Surface Sediment and Fish Tissue Chemistry in Greater Elliott Bay (Seattle) -Urban Waters Initiative
VALCOA93	Aluminum Company of America, Vancouver

Study ID	Study Name
VCNW1264	Des Moines Creek Regional Retention/Detention Facility Arsenic Issues Investigation by Des Moines Creek Basin Committee
VCNW2268	Chevron Seattle Terminal 4097 (T-108W, 108E, and 106W Source Control Data Evaluation), Seattle, WA
VCNW3159	Sisco Landfill Site
VCNW3298	Bear Creek Country Club
VCSW1705	Shadow Creek Residential Development, Hill Road Large Lot Subdivision, Olympia, WA
VIGOR18	Vigor Southwest Yard Habitat Project
VMPOSES20	Vancouver Marine Park WWTF Outfall Sediment Evaluation Study 2020
VWOSES18	Vancouver Westside WTP Outfall Sediment Evaluation Study 2018
WB1577RIFS	Solid Wood Inc. (West Bay Park) RI/FS, Olympia, WA. Agreed Order # DE-08-TCP SR-5415
WCNorthlake-DNR	Waterfront Construction
West_Point_2011	2011 West Point WWTP Outfall Study Sediment Sampling Event
West_Point_2017	2017 West Point Outfall Study Sediment Sampling Event
West_Point_2018	2018 West Point Outfall Study Sediment Sampling Event
West_Point_2019	2019 West Point Shelf Sediment Sampling Event
WEYLO15	Weyerhaeuser Longview DY2016 Maintenance Dredging
WHAPRD02	Whatcom WW Pre-Remedial Design Eval
WHATRI96	Whatcom Waterway 1996 RI Report
WHM_WHB	Wide Hollow Creek Water Quality Study for Aquatic Life Use (Bioassessment and Habitat Component)
WHOB004	Copper, Zinc, and Lead in Select Marinas of Puget Sound
WHOB008	Prevalence and Persistence of Cyanotoxins in Lakes of the Puget Sound Basin
WHTCKES13	Whatcom Creek Estuary Restoration Project
WICKSED	Sediment characterization for Wick Towing sediment lease parcels
WLDCFT01	WELDCRAFT SUPP. SEDIMENT INVESTIGATION
WLDCFT02	WELDCRAFT INTERIM ACTION
WLDCFT98	WELDCRAFT PHASE II SITE ASSESSMENT
WLPBR20	Willapa Landing Park Boat Ramp, DY21
WLRPT498	Terminal 4 Slip 3 Sediment Investigation
WP1&2_96	West Point EBO Baseline Study Phase 1
WPAH13	2013 Western Port Angeles Harbor RI/FS Sediment Sampling
WPNT00	NPDES West Pt Subtidal Monitoring 2000
WPNT06	West Point, King County, NPDES Sediment Monitoring
WPNT9497	West Point Subtidal NPDES Monit. 1994-97
WPNT98	1998 West Point Outfall Sediment Data

Study ID	Study Name
WSFSTB10	Washington State Ferries Seattle Terminal Building Replacement and Trestle Preservation
WSTRK20	DY2021 WestRock Longview Maintenance Dredging
WWP1Y0	Whatcom Waterway Phase 1 Cleanup Year 0
WWP1Y1	Whatcom Waterway Phase 1 Compliance Monitoring Year 1
WWP1Y3	Whatcom Waterway Compliance Monitoring Year 3
WWP1Y5	Whatcom Waterway Compliance Monitoring Year 5
WWP2_PRDI	Whatcom Waterway Phase 2 Pre-Remedial Design Investigation
WWPRDI08	Whatcom Waterway Pre-Remedial Design Investigation

Water Quality Portal

The Water Quality Portal[19] is a publicly accessible database supported by the U.S. Geological Survey (USGS), Environmental Protection Agency (EPA), and the National Water Quality Monitoring Council (NWQMC). The Portal houses data from the USGS National Water Information System (NWIS), EPA Storage and Retrieval (STORET) data warehouse, and U.S. Department of Agriculture Sustaining the Earth's Watersheds – Agricultural Research Database (STEWARDS). The following tables list studies and USGS monitoring locations from the Portal database that Ecology considered and subsequently used in the development of the 2022 WQA. Monitoring locations from USGS stations are not directly linked to Study IDs within the Portal. Therefore, USGS locations included in the 2022 WQA are listed in a separate table.

The following Water Quality Portal studies apply RCW 34.05.272 data source category #9: Data from primary research, monitoring activities, or other sources, but that has not been incorporated as part of documents reviewed under other processes.

[19] https://www.waterqualitydata.us/

Table 3. Studies from the Water Quality Portal included in development of the 2022 WQA.

Study ID	Study Name	Organization ID	Organization Name
4	Temperature Monitoring Program	CTUIR_WQX	Confederated Tribes of the Umatilla Indian Reservation (Tribal)
6	Handheld Monitoring Program (CTUIR)	CTUIR_WQX	Confederated Tribes of the Umatilla Indian Reservation (Tribal)
61	Storm surface water EPA Grant 2010-2011	CLALLAMCODCD	Clallam County-DCD
106 CWA	Sequim Bay Basin Fresh Water Stream Nutrient and Bacteria Sampling Program	JSKTRIBE_WQX	Jamestown Sklallam Tribe (Tribal)
2009_summer_stream_temp	Summer Stream Temperature	PGSTNATR_WQX	Port Gamble S'Klallam Tribe (Tribal)
2018 2019_Dobbs Flemming	TCEH_PC-01J18001-0_2018_Dobbs Flemming PIC	THURSTONCOUNTY	Thurston County Health Department
319 Testing	319 Testing	SNOQUALM_WQX	Snoqualmie Tribe (Tribal)
BBMONIT	Birch Bay FC Monitoring	WHATCOM_WQX	Whatcom County Public Works
BBMONIT;EPABEACH	Birch Bay FC Monitoring; Project EPABEACH (system generated)	WHATCOM_WQX	Whatcom County Public Works
CBWQM	Chehalis Basin Water Quality Monitoring	CHEHALIS_WQX	Confederated Tribes of the Chehalis Reservation (Tribal)
CDAWAT_Streams_2005	CDATstreams	CDATWATRES	Coeur D'Alene Tribe (Tribal)
CDAWAT_Streams_2006	CDATstreams	CDATWATRES	Coeur D'Alene Tribe (Tribal)
CDAWAT_Streams_2007	CDATstreams	CDATWATRES	Coeur D'Alene Tribe (Tribal)

Study ID	Study Name	Organization ID	Organization Name
ClallamBellPIC	Clallam Bell Creek PIC	JSKTRIBE_WQX	Jamestown S'Klallam Tribe (Tribal)
CENWWEDH	District Water Quality Sampling Program	CENWWEDH	U.S. Army Corps of Engineers Walla Walla District
ClallamLowerMatLotzPIC	Clallam Lower Matriotti and Lotzgesell PIC Project	JSKTRIBE_WQX	Jamestown Sklallam Tribe (Tribal)
ClallamMeadCASSPIC	Clallam Meadowbrook Creek and Slough and Cassalery PIC Project	JSKTRIBE_WQX	Jamestown S'Klallam Tribe (Tribal)
ClallamUpperMatPIC	Clallam Upper Matriotti and Lotzgesell PIC Project	JSKTRIBE_WQX	Jamestown S'Klallam Tribe (Tribal)
CONTAMB	Continuous Ambient Monitoring	PUYALLUP_WQX	Puyallup Tribe of Indians (Tribal)
CONTMON	Continuous Temperature Monitoring	PUYALLUP_WQX	Puyallup Tribe of Indians (Tribal)
CSLOPE22WQ	Columbia Slope Water Quality Monitoring 2021-2022	HERRERA_ENVIRONMENTAL	Herrera Environmental Consultants, Inc.
CWA_2562	Quileute Water Quality	QUILEUTE_WQX	Quileute Natural Resources (Washington)
CWDA	Clean Water District Activities	JCPH_WQX	Jefferson County Public Health
Cypress Island	Cypress Island	SAMISHINDIAN_WQX	Samish Indian Nation
DOH Contract No. N22580-1	Skagit County Pollution Identification and Correction Program	SKAGITCOUNTY_WQX	Skagit County
Drayton_Harbor_WQ	Drayton Harbor Watershed Water Quality Monitoring	NOOKSACK_WQX	Nooksack Indian Tribe (Tribal)

Study ID	Study Name	Organization ID	Organization Name
DWQMON	Discrete Water Quality Monitoring	PUYALLUP_WQX	Puyallup Tribe of Indians (Tribal)
ELDPICSAMPLES	ELD SHORELINE SAMPLING P.I.C. GRANT	THURSTONCOUNTY	Thurston County Health Department
EMAP/REMAP/CEMAP	EMAP/REMAP/CEMAP	OREGONDEQ	State of Oregon Dept. of Environmental Quality
EPA_REG_EFF	EPA Regulatory Effectiveness	KINGCOUNTY	King County (Washington)
EPABEACH	EPABEACH	SWINOMISH	Swinomish Indian Tribal Community (Tribal)
EPABEACH;SWQM	Project EPABEACH (system generated); Skokomish Surface Water Quality Monitoring Program	SKOKDATA_WQX	Skokomish Tribe
EPABEACH;SWQMP	EPABEACH; Swinomish Water Quality Monitoring Program	SWINOMISH	Swinomish Indian Tribal Community (Tribal)
EPABEACH;TRTUL_WQ_AMB	Project EPABEACH (system generated);Tulalip Ambient Water Quality Monitoring Project	TRTUL_WQX	Tulalip Tribes
ESD 253A	Hoh Tribe Instantaneous Water Quality Monitoring	R10OEA	EPA Region 10 Office of Environmental Assessment
Fidalgo Bay	Continuous Dissolved Oxygen Monitoring	SAMISHINDIAN_WQX	Samish Indian Nation
GLEON Lake Observer;NALMS_SECCHI_DIPIN	GLEON Lake Observer; Secchi Dip In	NALMS	North American Lake Management Society

Study ID	Study Name	Organization ID	Organization Name
GriffinCk	Continuous Dissolved Oxygen Monitoring	SNOQUALM_WQX	Snoqualmie Tribe (Tribal)
Hansen	Hansen Creek Restoration Project	UPPERSKAGIT	Upper Skagit Indian Tribe (Tribal)
HohRiverPrj1	Continuous Water Temperature Monitoring	HOHTRIBE_WQX	Hoh Tribe
HohRiverPrj2	Hoh Tribe Instantaneous Water Quality Monitoring	HOHTRIBE_WQX	Hoh Tribe
HohRiverPrj3	Continuous Dissolved Oxygen Monitoring	HOHTRIBE_WQX	Hoh Tribe
Hood Canal Regional Pollution	The Hood Canal Regional Pollution Identification and Correction (PIC) Program	KITSAPCHD_WQX	Kitsap County Health District
IDEQ LEW SW	IDEQ Lewiston Office Surface Water Program Sampling	IDEQ_WQX	Idaho Department Of Environmental Quality DEQ
JSKTRIBE	JAMESTOWN WQ PROGRAM	JSKTRIBE	Jamestown SKlallam Tribe
JSTNEPNutrientPhyto2021	Investigation of nutrients and phytoplankton in Admiralty Inlet and Hood Canal	JSKTRIBE_WQX	Jamestown S'Klallam Tribe (Tribal)
KC_QUARTERMASTER	Quartermaster Harbor Marine Water Quality	KINGCOUNTY	King County (Washington)
KimCkWQ	KimCkWQ	SNOQUALM_WQX	Snoqualmie Tribe (Tribal)
KINGCO_422027	King County 2014 Lake WA PCB/PBDE Loadings Study	KINGCOUNTY	King County (Washington)
KNRD	KNRD 2008 Watershed Assessment	KNRD_WQX	Kalispel Indian Community of the Kalispel Reservation

Study ID	Study Name	Organization ID	Organization Name
KNRD FT-2009	KNRD 2009 Fish Tissue Analysis	KNRD_WQX	Kalispel Indian Community of the Kalispel Reservation (Tribal)
KNRD FT-2011	KNRD 2011 Fish Tissue Analysis	KNRD_WQX	Kalispel Indian Community of the Kalispel Reservation (Tribal)
KNRD FT-2017	KNRD 2017 Fish Tissue Analysis	KNRD_WQX	Kalispel Indian Community of the Kalispel Reservation (Tribal)
KNRD FT-2021	KNRD 2021 Fish Tissue Analysis	KNRD_WQX	Kalispel Indian Community of the Kalispel Reservation (Tribal)
KNRD Inorganics and Metals	Inorganics and Metals Sampling Project	KNRD_WQX	Kalispel Indian Community of the Kalispel Reservation (Tribal)
KNRD Water Quality Monitoring	Water Quality Monitoring Project	KNRD_WQX	Kalispel Indian Community of the Kalispel Reservation (Tribal)
KNRD_WQX	KNRD	KNRD 2008 Watershed Assessment	Kalispel Indian Community of the Kalispel Reservation
KNRD-Timeseries Daily-Min Max Mean	KNRD Temperature Daily Summary Data Project (Min, Max, Mean, 7DADM)	KNRD_WQX	Kalispel Indian Community of the Kalispel Reservation (Tribal)
KPH_EPA_ShellfishProt_2010thru2014	Kitsap County Shellfish Restoration Protection	KITSAPCHD_WQX	Kitsap County Health District
Lake Campbell	Lake Campbell	SAMISHINDIAN_WQX	Samish Indian Nation
Lake Symington Nutrient Grant	Lake Symington Nutrient Reduction Project	KITSAPCHD_WQX	Kitsap County Health District

Study ID	Study Name	Organization ID	Organization Name
LC_WQ	Lake Campbell Water Quality Monitoring	SAMISHINDIAN_WQX	Samish Indian Nation
LUMMI001	Lummi Nation Water Quality Monitoring Program	LUMMINSN	LummiNation (Washington)
LUMMI002	Surface Water - Incident Response	LUMMINSN_WQX	Lummi Tribe of the Lummi Reservation (Tribal)
LUMMI004	Surface Water - DOH Support	LUMMINSN_WQX	Lummi Tribe of the Lummi Reservation (Tribal)
LUMMI006	Marietta Channel Study	LUMMINSN_WQX	Lummi Tribe of the Lummi Reservation (Tribal)
LUMMI017	Surface Water - Nutrient Monitoring	LUMMINSN_WQX	Lummi Tribe of the Lummi Reservation (Tribal)
LUMMI018	Surface Water - Regular Monitoring	LUMMINSN_WQX	Lummi Tribe of the Lummi Reservation (Tribal)
LUMMI019	Surface Water - First Flush WQ Monitoring	LUMMINSN_WQX	Lummi Tribe of the Lummi Reservation (Tribal)
LUMMI020	Surface Water - Metals and Hydrocarbons	LUMMINSN_WQX	Lummi Tribe of the Lummi Reservation (Tribal)
LUMMI021	Surface Water - Investigation	LUMMINSN_WQX	Lummi Tribe of the Lummi Reservation (Tribal)
LUMMI023	ZAPS	LUMMINSN_WQX	Lummi Tribe of the Lummi Reservation (Tribal)
LUMMINSN	LUMMI001	Lummi Nation Water Quality Monitoring Program	LummiNation (Washington)
MKWQ	makah water quality	MAKAH	Makah Tribe (Washington)

Study ID	Study Name	Organization ID	Organization Name
MM_PDDN	Midnite Mine Pre-Design Data Needs	MIDNITE_2	Midnite Mine Environmental Data
NALMS_SECCHI_DIPIN	Secchi Dip In	NALMS	North American Lake Management Society
NARS_NCCA2010	National Coastal Condition Assessment	NARS_WQX	EPA National Aquatic Resources Survey (NARS)
NARS_NCCA2015	National Coastal Condition Assessment 2015	NARS_WQX	EPA National Aquatic Resources Survey (NARS)
NARS_NLA2007;NARS_NLA2007_ECOREGION_WMT	EPA NARS National Lakes Assessment 2007;NARS_NLA2007_ECOREGION_WMT	NARS_WQX	EPA National Aquatic Resources Survey (NARS)
NARS_NLA2007;NARS_NLA2007_ECOREGION_XER	EPA NARS National Lakes Assessment 2007;EPA NARS NLA2007 EcoRegion - Xeric	NARS_WQX	EPA National Aquatic Resources Survey (NARS)
NARS_NLA2012	National Lakes Assessment 2012	NARS_WQX	EPA National Aquatic Resources Survey (NARS)
NARS_NLA2017	EPA NARS National Lakes Assessment 2017	NARS_WQX	EPA National Aquatic Resources Survey (NARS)
NARS_NRSA1819	National Rivers and Streams Assessment 2018-2019	NARS_WQX	EPA National Aquatic Resources Survey (NARS)

Study ID	Study Name	Organization ID	Organization Name
NARS_NRSA2008_2009	National Rivers and Streams Assessment	NARS_WQX	EPA National Aquatic Resources Survey (NARS)
NARS_NRSA2013_2014	National Rivers and Streams Assessment	NARS_WQX	EPA National Aquatic Resources Survey (NARS)
National Water Quality Assessment Program (NAWQA)	NA	USGS-OR	USGS Oregon Water Science Center
National Water Quality Assessment Program (NAWQA)	NA	USGS-WA	USGS Washington Water Science Center
NCCA_NCA199706;NCCA_WEMAP200506	National Coastal Assessment (NCA) 1997-2006 Overall;Western Environmental Monitoring and Assessment Program (WEMAP) Coastal 2005-2006	NARS_WQX	EPA National Aquatic Resources Survey (NARS)
NEP_2016_WSDA	NEP_2016_WSDA	WSDA_WQX	Washington State Department of Agriculture, Dairy Nutrient Management Program
NEP_2017_PHSKC	Expanded PIC Program and OSS Management	KINGCOUNTY	King County (Washington)
NEP_2018_SkagitCountyPW	Skagit County Pollution Identification and Correction Program	SKAGITCOUNTY_WQX	Skagit County
NEP_2019_PHSKC	NEP_2019_PHSKC	KINGCOUNTY	King County (Washington)

Study ID	Study Name	Organization ID	Organization Name
NEP_2019_WSDA	NEP_2019_WSDA	WSDA_WQX	Washington State Department of Agriculture, Dairy Nutrient Management Program
NLA06608	EPA National Aquatic Resources Survey	NARS_NLA2006	EPA NARS National Lakes Assessment 2006
Nooksack_Temp	Nooksack River Watershed Temperature Monitoring	NOOKSACK_WQX	Nooksack Indian Tribe (Tribal)
NooksackWaterQuality	Nooksack River Watershed Sampling	NOOKSACK_WQX	Nooksack Indian Tribe (Tribal)
North County PIC 2020	TCEH_PC-01J18001_2020_North County PIC	THURSTONCOUNTY	Thurston County Health Department
Nov08Waters	Shoalwater Tribe Water Monitoring	SBITENV_WQX	Shoaltwater Bay Tribe (Washington) (Tribal)
NRSA0809	USEPA National Aquatic Resource Assessment - National Rivers and Streams Assessment 2008-2009	OST_SHPD	USEPA, Office of Water, Office of Science and Technology, Standards and Health Protection Division
NRSA1314	USEPA National Aquatic Resource Assessment - National Rivers and Streams Assessment 2013-2014	OST_SHPD	USEPA, Office of Water, Office of Science and Technology, Standards and Health Protection Division
ODEQVolMonWQProgram	ODEQVolMonWQProgram	CRK_WQX	Columbia Riverkeeper

Study ID	Study Name	Organization ID	Organization Name
ODEQVolMonWQProgram	ODEQVolMonWQProgram	WALLAWALLA_WC	Walla Walla Basin Watershed Council
Off_Res	Off_Reservation	UPPERSKAGIT	Upper Skagit Indian Tribe (Tribal)
OZETTERIVER	OZETTE RIVER PROJECTS	MAKAH_WQX	Makah Indian Tribe of the Makah Indian Reservation (Tribal) (BEACH)
PC-00J326-01	Pierce County Pollution Identification and Correction Project	TPCHD_WQX	Tacoma-Pierce County Health Department (Washington)
PC-00J888-01	Tacoma-Pierce PIC Round 6 C17128	TPCHD_WQX	Tacoma-Pierce County Health Department (Washington)
PC-01J18001-0	NEP 2016_SouthSound Shellfish	TPCHD_WQX	Tacoma-Pierce County Health Department (Washington)
Pesticide Stewardship Partnerships	Pesticide Stewardship Partnerships	OREGONDEQ	State of Oregon Dept. of Environmental Quality
PGST_RESWQ	Port Gamble S'Klallam Tribe Reservation Monitoring	PGSTNATR_WQX	Port Gamble S'Klallam Tribe (Tribal)
PGST_WQ	Port Gamble SKlallam Tribe Water Quality	PGSTNATR_WQX	Port Gamble S'Klallam Tribe (Tribal)
PICPILOT2015	Pollution Identification and Correction Pilot Area 2015	CLALLAMCOUNTYEH_WQX	Clallam County Environmental Health Services

Study ID	Study Name	Organization ID	Organization Name
PICPILOT2016	Pollution Identification and Correction Pilot Area 2016	CLALLAMCOUNTYEH_WQX	Clallam County Environmental Health Services
PICPILOT2017	Pollution Identification and Correction Pilot Area 2017	CLALLAMCOUNTYEH_WQX	Clallam County Environmental Health Services
PO-00J12301	Pierce County Shellfish Watersheds Project	TPCHD_WQX	Tacoma-Pierce County Health Department (Washington)
PRWM	Puyallup River Watershed Monitoring	PUYALLUP_WQX	Puyallup Tribe of Indians (Tribal)
QINNRSA16	Quinault Rivers and Streams Assessment using EPA's NRSA Protocol	QIN_WQX	Quinault Indian Nation (Tribal)
QuendallTerminals	Quendall Terminals	ASPECT_WQX	Aspect Consulting - Bainbridge Island - Seattle - Wenatchee - Yakima
QWRIA21P3	Ambient Water Quality	QIN_WQX	Quinault Indian Nation (Tribal)
QWRIA21P5	2011 Queets River Watershed Peak Water Temperature	QIN_WQX	Quinault Indian Nation (Tribal)
QWRIA21P8	2011 Queets River Watershed Thermal Infrared Radiometry Flight	QIN_WQX	Quinault Indian Nation (Tribal)
ResWQ	106	SNOQUALM_WQX	Snoqualmie Tribe (Tribal)
SCMP	Skagit County Monitoring Program	SKAGITCOUNTY_WQX	Skagit County
SemiahmooWatershed	Semiahmoo Spit Water Quality Monitoring	NOOKSACK_WQX	Nooksack Indian Tribe (Tribal)

Study ID	Study Name	Organization ID	Organization Name
SFEW	Shellfish - Early Warning and intensive water quality monitoring	SQUAXIN	Squaxin Island Tribe (Tribal)
SFPS	Shellfish - Pathogens in marine sediment	SQUAXIN	Squaxin Island Tribe (Tribal)
SITRIPAQ	On-reservation - riparian and aquatic habitat	SQUAXIN	Squaxin Island Tribe (Tribal)
SNOWQ	Surface Water Quality Monitoring	SNOQUALM	Snoqualmie Tribe Environmental & Natural Res Dep(Washington)
SNOWQ	106 Water Quality Sampling	SNOQUALM_WQX	Snoqualmie Tribe (Tribal)
SoosCreek	2015_Soos Creek Stormwater Monitoring	MIT_WQX	Muckleshoot Indian Tribe (Tribal)
SRWWQM	Skagit River Watershed Water Quality Monitoring	SKAGITWG_WQX	Skagit River Watershed Grant (TNC, SRSC, WWAA) - Washington (Tribal)
SSIT_WQ	water quality	SAUKSUIATTLE	Sauk-Suiattle Indian Tribe (Tribal)
ST647986	SKA2	SWINOMISH	Swinomish Indian Tribal Community (Tribal)
ST683683	KIK3	SWINOMISH	Swinomish Indian Tribal Community (Tribal)
ST854657	SWN6	SWINOMISH	Swinomish Indian Tribal Community (Tribal)
Statewide Toxics	Statewide Toxics Monitoring	OREGONDEQ	State of Oregon Dept. of Environmental Quality

Study ID	Study Name	Organization ID	Organization Name
STOI	STOI	STOI	Spokane Tribe of the Spokane Reservation (Tribal)
SumasMountain200905	Sumas Mountain Asbestos Site - Soil, Sediment and Water Sampling, May 12-13, 2009	R10SUMASMOUNTAIN	EPA Region 10 Superfund Sumas Mountain Asbestos Site
SUQ_WQMD	Suquamish Tribe Monitoring	SUQUAMISH	Suquamish Tribe (Tribal)
Surface Water Ambient	Surface Water Ambient Monitoring	OREGONDEQ	State of Oregon Dept. of Environmental Quality
SW Network	USGS Project SW Network	BUNKER_USGS	Bunker Hill Mining and Metallurgical Complex (Region 10) USGS
SWMP Continuous	Surface Water Monitoring Program Continuous	WSDANRAS	Washington State Department of Agriculture
SWQM	Surface Water Quality Monitoring	ELWHAWQ1_WQX	Lower Elwha Klallam Tribe (Tribal)
SWQM	Water Quality Monitoring	SBITENV	Shoaltwater Bay Tribe (Washington)
SWQM	Water Quality Monitoring	SBITENV_WQX	Shoaltwater Bay Tribe (Washington) (Tribal)
SWQM	Skokomish Surface Water Quality Monitoring Program	SKOKDATA_WQX	Skokomish Indian Tribe of the Skokomish Reservation, Washington
SWQMP	Swinomish Water Quality Monitoring Program	SWINOMISH	Swinomish Indian Tribal Community (Tribal)

Study ID	Study Name	Organization ID	Organization Name
TCFCMP2012-2013	Terrell Creek Fecal Coliform Monitoring Project	NSEA	Nooksack Salmon Enhancement Association(Volunteer)*
TIAN_2020	Suspect and non-target screening for CEC in an urban estuary	UWT_CUW	University of Washington Tacoma at Center for Urban Waters
TMDL	Total Maximum Daily Load Sampling	OREGONDEQ	State of Oregon Dept. of Environmental Quality
TWG	Targeted Watershed Grant	JSKTRIBE_WQX	Jamestown Sklallam Tribe (Tribal)
USGS 100	USGS CDA Sampling Locations	R10BUNKER	EPA Region 10 Superfund Bunker Hill Mining and Metallurgical Complex
Water Quality Response	Water Quality Response Monitoring	OREGONDEQ	State of Oregon Dept. of Environmental Quality
WCOAST	EMAP-West 1999-2006 Coastal Monitoring	EMAP_CS_WQX	Environmental Monitoring and Assessment Program
WhiteandGreenRiver	White and Green River Water Quality Monitoring Project	MIT_WQX	Muckleshoot Indian Tribe (Tribal)
WhiteRiver	White River Water Quality Monitoring Project	MIT_WQX	Muckleshoot Indian Tribe (Tribal)
WhiteRiverCTemp	White River Continuous Temperature Monitoring	MIT_WQX	Muckleshoot Indian Tribe (Tribal)
WQNEP-2020-KCWLRD-00050	Chemicals of Emerging Concern in Marine and Freshwater Fish in King County	KINGCOUNTY	King County (Washington)

Study ID	Study Name	Organization ID	Organization Name
WS-96073601	Thurston County Targeted Watershed Project-Nisqually	THURSTONCOUNTY	Thurston County Health Department
WSDANRAS2013_SW_Discrete	Washington State Department of Agriculture Surface Water Monitoring Program 2013 Discrete Samples	WSDANRAS	Washington State Department of Agriculture
WSDANRAS2014_SW_Discrete	Washington State Department of Agriculture Surface Water Monitoring Program 2014 Discrete Samples	WSDANRAS	Washington State Department of Agriculture
WSDANRAS2015_SW_Discrete	Washington State Department of Agriculture Surface Water Monitoring Program 2015 Discrete Samples	WSDANRAS	Washington State Department of Agriculture
WSDANRAS2016_SW_Discrete	Washington State Department of Agriculture Surface Water Monitoring Program 2016 Discrete Samples	WSDANRAS	Washington State Department of Agriculture
WSDANRAS2017_SW_Discrete	Washington State Department of Agriculture Surface Water Monitoring Program 2017 Discrete Samples	WSDANRAS	Washington State Department of Agriculture
WSDANRAS2018_SW_Discrete	Washington State Department of Agriculture Surface Water Monitoring Program 2018 Discrete Samples	WSDANRAS	Washington State Department of Agriculture
WSDANRAS2019_SW_Discrete	Washington State Department of Agriculture Surface Water Monitoring Program 2019 Discrete Samples	WSDANRAS	Washington State Department of Agriculture

Study ID	Study Name	Organization ID	Organization Name
WSDANRAS2020_SW_Discrete	Washington State Department of Agriculture Surface Water Monitoring Program 2020 Discrete Samples	WSDANRAS	Washington State Department of Agriculture
WSDANRAS2021_SW_Discrete	Washington State Department of Agriculture Surface Water Monitoring Program 2021 Discrete Samples	WSDANRAS	Washington State Department of Agriculture
YAKAMA_NATION_WQD	Washington State Department of Agriculture Surface Water Monitoring Program 2020 Discrete Samples	YAKAMA_WQX	Confederated Tribes and Bands of the Yakama Nation (Tribal)

Table 4. USGS monitoring locations without study IDs from the Water Quality Portal included in development of the 2022 WQA.

USGS Station ID	Location Description
12040680	LAKE HOH NEAR FORKS, WA
12043454	LAPOEL CREEK NEAR FAIRHOLM, WA
12043467	SMITH CREEK NEAR FAIRHOLM, WA
12043530	BARNES CREEK NEAR PIEDMONT, WA
12043950	PIEDMONT CREEK AT PIEDMONT, WA
12044000	LYRE RIVER AT PIEDMONT, WA
12046506	ELWHA RIVER AT STRATTON RD, NR PORT ANGELES, WA
12046690	TUMWATER CREEK NEAR PORT ANGELES, WA
12047013	WHITE CREEK DS OF WABASH ST NR PORT ANGELES, WA
12047305	SURVEYOR CREEK NEAR LITTLE OKLAHOMA, WA
12047440	BAGLEY CREEK NEAR LITTLE OKLAHOMA, WA
12047660	HEATHER LAKE NEAR SEQUIM, WA
12048050	CANYON CREEK NEAR SEQUIM, WA
12050245	SNOW CREEK ABOVE NF-2814 ROAD NEAR MAYNARD, WA
12051995	UNNAMED TRIB TO LITTLE QUILCENE R NR QUILCENE, WA
12053810	MILK LAKE NEAR ELDON, WA
12056500	NF SKOKOMISH R BL STAIRCASE RPDS NR HOODSPORT, WA
12058495	DOW CREEK BLW N LAKE CUSHMAN RD NR HOODSPORT, WA
12058800	NF SKOKOMISH R BL LWR CUSHMAN DAM NR POTLATCH, WA
12059500	NORTH FORK SKOKOMISH RIVER NEAR POTLATCH, WA
12060500	SOUTH FORK SKOKOMISH RIVER NEAR UNION, WA

USGS Station ID	Location Description
12061500	SKOKOMISH RIVER NEAR POTLATCH, WA
12062508	UNNAMED CREEK ABV PURDY-CUTTOFF RD NR POTLATCH, WA
12062510	SKOKOMISH RIVER ABOVE HIGHWAY 106 NR POTLATCH, WA
12062515	SKOKOMISH RIVER BL HIGHWAY 106 NR POTLATCH, WA
12062550	UNNAMED CREEK AT FOREST BEACH NEAR BELFAIR, WA
12062560	LAKE DEVEREAUX OUTLET AT HIGHWAY 106 NR BELFAIR, WA
12062580	UNNAMED TRIBUTARY TO LYNCH COVE NEAR BELFAIR, WA
12063000	UNION RIVER NEAR BREMERTON, WA
12063050	TRIBUTARY TO UNION RIVER NEAR BELFAIR, WA
12063100	UNION RIVER ABOVE HAZEL CREEK NR BREMERTON, WA
12063200	UNION RIVER AT OLD NAVY YARD WAY NR BREMERTON, WA
12063280	BEAR CREEK NEAR SUNNYSLOPE, WA
12063300	UNION RIVER BELOW BEAR CREEK NEAR BELFAIR, WA
12063400	UNION RIVER AB OLD NAVY YARD WAY NR BELFAIR, WA
12063518	UNION RIVER AB NORTH SHORE ROAD NEAR BELFAIR, WA
12063520	UNION RIVER AT NORTH SHORE ROAD NEAR BELFAIR, WA
12065010	MISSION CREEK AT NORTH SHORE ROAD NEAR BELFAIR, WA
12065095	STIMSON CREEK NEAR BELFAIR, WA
12065100	STIMSON CREEK AT NORTH SHORE ROAD NEAR BELFAIR, WA
12065600	TIN MINE CREEK AT GOLD CREEK RD NR BREMERTON, WA
12065800	TAHUYA RIVER BELOW TAHUYA LAKE NR BREMERTON, WA
12067300	TAHUYA RIVER AB ELFENDAHL PASS RD NR BREMERTON, WA
12067600	TAHUYA RIVER AT CAMP SPILLMAN NEAR BREMERTON, WA
12067700	TAHUYA RIVER BELOW HAVEN WAY NEAR BELFAIR, WA
12067800	TAHUYA RIVER 1 MILE BELOW HAVEN WAY NR BELFAIR, WA
12067900	TAHUYA RIVER 3 MILES BL HAVEN WAY NR BELFAIR, WA
12068020	TAHUYA RIVER ABOVE MOUTH NEAR BELFAIR, WA
12069550	BIG BEEF CREEK NEAR SEABECK, WA
12070000	DOGFISH CREEK NEAR POULSBO, WA
12070220	STEEL CREEK NEAR GLUDS POND NEAR BROWNSVILLE, WA
12072160	GORST CREEK BELOW HEINS CREEK NEAR GORST, WA
12072370	GORST CREEK AT W BELFAIR VALLEY RD AT GORST, WA
12072380	GORST CREEK NEAR GORST, WA
12072430	ANDERSON CREEK NEAR ANDERSON ROAD NEAR GORST, WA
12072480	BLACKJACK CREEK DS OF HWY 16 NEAR FERNWOOD, WA
12072510	BLACKJACK CREEK AT MOUTH AT PORT ORCHARD, WA
12072520	ANNAPOLIS CREEK AT ARNOLD AVENUE AT ANNAPOLIS, WA
12072530	OLNEY CREEK NEAR MOUTH AT ANNAPOLIS, WA
12072660	OLALLA CREEK AT BURLEY OLALLA ROAD NEAR OLALLA, WA
12073520	MINTER CREEK NEAR MINTER, WA
12073895	COULTER CREEK NEAR ALLYN, WA
12073905	UNNAMED TRIBUTARY TO COULTER CREEK NEAR ALLYN, WA

USGS Station ID	Location Description
12076530	GOLDSBOROUGH CREEK NR GRAVEL PITS NR SHELTON, WA
12077565	MILL CREEK NEAR SE TRILLIUM LN NEAR SHELTON, WA
12078210	UNNAMED TRIBUTARY TO SKOOKUM CR NR KAMILCHE, WA
12078920	DESCHUTES RIVER NR SHELL ROCK RIDGE NEAR VAIL, WA
12078930	DESCHUTES RIVER NEAR VAIL, WA
12080750	WOODLAND CREEK AT DRAHAM ROAD NEAR OLYMPIA, WA
12080800	WOODLAND CREEK BELOW DRAHAM ROAD NEAR LACEY, WA
12081516	MCALLISTER CREEK ESTUARY NEAR OLYMPIA, WA
12088490	POWELL CREEK NEAR MCKENNA, WA
12089710	YELM CREEK DOWNSTREAM FM 123RD AVE SE NR YELM, WA
12089970	NISQUALLY RIVER NEAR YELM, WA
12090452	SPANAWAY CR AT SPANAWAY LK OUTLET NR SPANAWAY, WA
12091956	EUNICE LAKE NEAR CARBONADO, WA
12096700	HIDDEN LAKE NEAR GREENWATER, WA
12098700	WHITE RIVER AT HEADWORKS AB FLUME NR BUCKLEY, WA
12099060	WHITE RIVER CANAL ABV LAKE TAPPS NEAR BUCKLEY, WA
12101100	LAKE TAPPS DIVERSION AT DIERINGER, WA
12102000	CLARKS CREEK AT PUYALLUP, WA
12102212	SWAN CREEK AT PIONEER WAY TACOMA, WA
12103206	LAKOTA CREEK BELOW UNNAMED TRIB NEAR TACOMA, WA
12103218	MCSORLEY CREEK NEAR DESMOINES, WA
12103324	DES MOINES CREEK NEAR MOUTH AT DES MOINES, WA
12107850	STONEQUARRY CREEK NEAR ENUMCLAW, WA
12109960	LITTLE SOOS CREEK BLW HWY516 NEAR COVINGTON, WA
12112600	BIG SOOS CREEK ABOVE HATCHERY NEAR AUBURN, WA
12113390	DUWAMISH RIVER AT GOLF COURSE AT TUKWILA, WA
12113400	DUWAMISH RIVER AT TUKWILLA, WA
12113406	DUWAMISH R AT 42ND AVE BRIDGE AT DUWAMISH, WA
12113415	DUWAMISH R AT E MARGINAL WAY BR AT DUWAMISH, WA
12113425	DUWAMISH R AT 102ND ST BRIDGE AT DUWAMISH, WA
12113490	LONGFELLOW CREEK AB GENESEE ST NR WEST SEATTLE, WA
12113499	TAYLOR CREEK AT LAKERIDGE PARK NEAR RENTON, WA
12117000	TAYLOR CREEK NEAR SELLECK, WA
12119600	MAY CREEK AT MOUTH NEAR RENTON, WA
12119690	COAL CREEK BLW COAL CRK PKWY NEAR BELLEVUE, WA
12119705	COAL CREEK AT BELLEVUE, WA
12119815	YARROW CREEK NR NE 34TH ST NEAR BELLEVUE, WA
12119990	KELSEY CREEK NEAR BELLEVUE, WA
12120000	MERCER CREEK NEAR BELLEVUE, WA
12120500	JUANITA CREEK NEAR KIRKLAND, WA
12121600	ISSAQUAH CREEK NEAR MOUTH NEAR ISSAQUAH, WA
12125500	BEAR CREEK AT WOODINVILLE, WA

USGS Station ID	Location Description
12125880	NORTH CREEK NEAR WINTERMUTES CORNER, WA
12125900	NORTH CREEK BELOW PENNY CREEK NEAR BOTHELL, WA
12126110	NORTH CREEK NR 242ND ST SE NR BOTHELL, WA
12126200	NORTH CREEK AT NORTH CREEK PARKWAY NR BOTHELL, WA
12126800	SWAMP CREEK NEAR ALDERWOOD MANOR, WA
12126904	SCRIBER CREEK NEAR MOUTH NR MOUNTLAKE TERRACE, WA
12127100	SWAMP CREEK AT KENMORE, WA
12128000	THORNTON CREEK NEAR SEATTLE, WA
12128040	PIPERS CREEK AT CARKEEK PARK, AT SEATTLE, WA
12128075	BOEING CREEK AT SHORELINE, WA
12128100	PICNIC POINT CREEK BLW SOUTH RD NR EDMONDS, WA
12128450	JAPANESE GULCH CREEK NEAR MOUTH NEAR MUKILTEO, WA
12128485	POWDER MILL GULTCH CREEK NEAR MUKILTEO, WA
12150495	CHERRY CREEK BELOW MARGARET CREEK NEAR DUVALL, WA
12151400	FRENCH CREEK NR 124TH ST SE NEAR MONROE, WA
12154000	STEVENS CREEK AT LAKE STEVENS, WA
12155050	DUBUQUE CREEK BLW PANTHER CREEK NR LK STEVENS, WA
12156395	MUNSON CREEK NEAR 73RD DR NE NEAR MARYSVILLE, WA
12156950	UNNAMED TRIB TO MF QUILCEDA CR NR MARYSVILLE, WA
12162980	JIM CREEK BELOW LITTLE JIM CREEK NEAR OSO, WA
12163020	JIM CREEK ABOVE HATCHERY CREEK NEAR OSO, WA
12163270	REHAB CREEK NEAR OSO, WA
12163990	JIM CREEK BELOW NICKS ROAD NEAR ARLINGTON, WA
12164050	JIM CREEK AT JORDAN ROAD NEAR ARLINGTON, WA
12165000	SQUIRE CREEK NEAR DARRINGTON, WA
12166300	NF STILLAGUAMISH RIVER NEAR OSO, WA
12167500	ARMSTRONG CREEK NEAR ARLINGTON, WA
12167650	STILLAGUAMISH RIVER AT RM 12.2 NEAR ARLINGTON, WA
12168650	PILCHUCK CREEK NEAR MOUTH NEAR SILVANA, WA
12169990	CHURCH CREEK AT JENSEN ROAD NEAR STANWOOD, WA
12170050	STILLAGUAMISH RIVER NR THOMLE ROAD NR STANWOOD, WA
12170300	STILLAGUAMISH RIVER NEAR STANWOOD, WA
12178080	NEWHALEM CREEK ABOVE EAST FORK NEAR NEWHALEM, WA
12178700	LOWER THORNTON LAKE NEAR NEWHALEM, WA
12178730	THORNTON CREEK NEAR NEWHALEM, WA
12181090	SOUTH CASCADE MIDDLE TARN NEAR MARBLEMOUNT, WA
12181095	SOUTH CASCADE LAKE NEAR MARBLEMOUNT, WA
12181100	SF CASCADE R AT S CASCADE GL NR MARBLEMOUNT, WA
12181200	SALIX CREEK AT S CASCADE GL NEAR MARBLEMOUNT, WA
12181450	HIDDEN LAKE NEAR MARBLEMOUNT, WA
12203542	WHATCOM CREEK UPS OF MEADOR AVE AT BELLINGHAM, WA
12210700	NOOKSACK RIVER AT NORTH CEDARVILLE, WA

USGS Station ID	Location Description
12211100	NOOKSACK RIVER NEAR EVERSON, WA
12211390	KAMM CREEK AT KAMM ROAD NEAR LYNDEN, WA
12212050	FISHTRAP CREEK AT FRONT STREET AT LYNDEN, WA
12212448	BERTRAND CREEK TRIB AT BADGER RD NR LYNDEN, WA
12212898	FOURMILE CREEK AB GUIDE MERIDAN NR BELLINGHAM, WA
12213100	NOOKSACK RIVER AT FERNDALE, WA
12213505	CALIFORNIA CREEK NEAR PLEASANT VALLEY, WA
12214350	SUMAS RIVER AT SOUTH PASS ROAD AT NOOKSACK, WA
12215000	JOHNSON CREEK AT SUMAS, WA
12215650	COPPER LAKE NEAR GLACIER, WA
12419495	SPOKANE RIVER AT STATELINE BR NR GREENACRES, WA
12433000	SPOKANE RIVER AT LONG LAKE, WA
12436500	COLUMBIA RIVER AT GRAND COULEE, WA
12437940	EAST FOSTER CREEK AT BELL BUTTE ROAD NR LEAHY, WA
12437980	WEST FORK FOSTER CR AB EAST FORK NR BRIDGEPORT, WA
12447350	METHOW RIVER ABOVE ROBINSON CREEK NR MAZAMA, WA
12447370	LOST RIVER NEAR MAZAMA, WA
12447382	EARLY WINTERS CREEK NEAR MAZAMA, WA
12447384	GOAT CREEK NEAR MAZAMA, WA
12447386	METHOW RIVER ABOVE WOLF CREEK NEAR WINTHROP, WA
12447387	WOLF CREEK BELOW DIVERSION NEAR WINTHROP, WA
12447390	ANDREWS CREEK NEAR MAZAMA, WA
12447394	LAKE CREEK NEAR WINTHROP, WA
12447440	EIGHTMILE CREEK NEAR WINTHROP, WA
12447450	CHEWUCH RIVER AT EIGHTMILE RANCH NEAR WINTHROP, WA
12448000	CHEWUCH RIVER AT WINTHROP, WA
12448500	METHOW RIVER AT WINTHROP, WA
12448850	TWISP RIVER ABOVE BUTTERMILK CREEK NEAR TWISP, WA
12448998	TWISP RIVER NEAR TWISP, WA
12449500	METHOW RIVER AT TWISP, WA
12449710	BEAVER CREEK NEAR MOUTH NEAR TWISP, WA
12449780	LIBBY CREEK NEAR CARLTON, WA
12449795	GOLD CREEK NEAR CARLTON, WA
12449950	METHOW RIVER NEAR PATEROS, WA
12450880	STILLETO LAKE NEAR STEHEKIN, WA
12462640	COLOCKUM CREEK NEAR ROCK ISLAND, WA
12464606	SAND HOLLOW CREEK AT S RD SW NEAR VANTAGE, WA
12464607	SAND HOLLOW AT MOUTH NEAR VANTAGE, WA
12464770	CRAB CREEK AT ROCKY FORD ROAD NEAR RITZVILLE, WA
12464774	SOUTH FORK CRAB CREEK NEAR MOUTH NR RITZVILLE, WA
12464780	CRAB CREEK ABOVE SYLVAN LAKE NEAR LAMONA, WA
12465000	CRAB CREEK AT IRBY, WA

USGS Station ID	Location Description
12465400	WILSON CREEK BELOW CORBETT DRAW NEAR ALMIRA, WA
12466020	CRAB CREEK ABV BROOK LK AT HWY 28 NR STRATFORD, WA
12466150	CRAB CREEK BELOW BROOK LAKE NEAR STRATFORD, WA
12467000	CRAB CREEK NEAR MOSES LAKE, WA
12470600	ROCKY FORD CREEK AT SR 17 NEAR EPHRATA, WA
12471400	LIND COULEE WASTEWAY AT SR 17 NEAR WARDEN, WA
12472190	LOWER CRAB CREEK NEAR MCMANAMON RD NR OTHELLO, WA
12472380	CRAB CREEK LATERAL ABOVE ROYAL LAKE NR OTHELLO, WA
12472515	RED ROCK COULEE AT E ROAD SW NEAR SMYRNA, WA
12472520	RED ROCK COULEE NEAR SMYRNA, WA
12472600	CRAB CREEK NEAR BEVERLY, WA
12472900	COLUMBIA R AT VERNITA BR NR PRIEST RAPIDS DAM, WA
12472940	SCBID WAHATIS WASTEWAY NEAR MATTAWA, WA
12473520	COLUMBIA RIVER AT RICHLAND, WA
12483940	NANEUM CREEK ABOVE GAME FARM ROAD NR KITTITAS, WA
12483995	COLEMAN CREEK BELOW TOWN CANAL NEAR KITTITAS, WA
12484550	UMTANUM CREEK NEAR MOUTH AT UMTANUM, WA
12485940	WENAS CREEK AT FLETCHER LANE NEAR SELAH, WA
12487000	YAKIMA RIVER AT SELAH GAP NEAR NORTH YAKIMA, WA
12494450	NACHES RIVER AT RM 12.2 NEAR NACHES, WA
12498690	NACHES RIVER ABOVE DIVERSION DAM NEAR YAKIMA, WA
12498980	COWICHE CREEK AT WEIKEL, WA
12498990	NACHES RIVER AT 40TH AVENUE NEAR YAKIMA, WA
12500420	MOXEE DRAIN AT BIRCHFIELD ROAD NEAR UNION GAP, WA
12500445	WIDE HOLLOW CREEK NEAR MOUTH AT UNION GAP, WA
12500450	YAKIMA RIVER ABOVE AHTANUM CREEK AT UNION GAP, WA
12500900	SF AHTANUM CREEK AB CONRAD RANCH NR TAMPICO, WA
12504490	SUNNYSIDE CANAL AT DIVERSION NEAR PARKER, WA
12504508	SUNNYSIDE CANAL DIV AB N OUTLOOK RD NR SUNNYSIDE
12504509	JOINT DRAIN 32 AT OUTLOOK RD NEAR SUNNYSIDE, WA
12505040	YAKIMA RIVER AT RM 103 NEAR WAPATO, WA
12505045	YAKIMA RIVER AT RM 102.8 NEAR PARKER, WA
12505060	YAKIMA RIVER AT RM 102.6 NEAR PARKER, WA
12505085	YAKIMA RIVER AT RM 100.8 NEAR DONALD, WA
12505090	YAKIMA RIVER AT RM 100.7 NEAR DONALD, WA
12505150	ROZA CANAL WASTEWAY NUMBER 3 NEAR SAWYER, WA
12505180	ROZA CANAL WASTEWAY NO 3 BLW HWY 12 NR SAWYER, WA
12505270	YAKIMA RIVER AT RM 94.4 NEAR BUENA, WA
12505300	YAKIMA RIVER NEAR TOPPENISH, WA
12505310	YAKIMA RIVER BELOW HIGHWAY 22 NEAR TOPPENISH, WA
12505315	BUENA DRAIN AT WESTBOUND I-82 NEAR BUENA, WA
12505320	YAKIMA RIVER AT RM 91 AT ZILLAH, WA

USGS Station ID	Location Description
12505325	YAKIMA RIVER AT RM 88.1 NEAR TOPPENISH, WA
12505330	YAKIMA RIVER AB E TOPPENISH DRAIN NR GRANGER, WA
12505440	YAKIMA RIVER AT BRIDGE AVE AT GRANGER, WA
12505445	JOINT DRAIN AT YAKIMA VALLEY HWY AT GRANGER, WA
12505448	JOINT DRAIN 28 NEAR GRANGER, WA
12505450	GRANGER DRAIN AT GRANGER, WA
12507580	YAKIMA RIVER AB SATUS CR AT RM 73 NR SATUS, WA
12508670	DID 7 DRAIN NEAR MABTON, WA
12508680	YAKIMA R AB SULPHUR CR AT RM 61.3 NR MABTON, WA
12508785	JOINT DRAIN NEAR S 1ST STREET AT SUNNYSIDE, WA
12508788	SULPHUR CR WASTEWAY AT SHELLER RD AT SUNNYSIDE WA
12508790	DID 18 DRAIN AT SUNNYSIDE, WA
12508810	WASHOUT DRAIN AT SUNNYSIDE, WA
12508820	BLACK CANYON CREEK AT WANETA RD NEAR SUNNYSIDE, WA
12508825	JOINT DRAIN 40.2 NR TEAR RD NEAR SUNNYSIDE, WA
12508835	JOINT DRAIN FROM ROUGK LN NEAR SUNNYSIDE, WA
12508840	DID 3 DRAIN NEAR SUNNYSIDE, WA
12508850	SULPHUR CREEK WASTEWAY NEAR SUNNYSIDE, WA
12508988	DRAIN 31 AT WEST CHARVET RD AT MABTON, WA
12508997	GRANDVIEW DRAIN AT CHASE ROAD NEAR GRANDVIEW, WA
12509050	YAKIMA RIVER AT EUCLID BR NR GRANDVIEW, WA
12509057	JOINT DRAIN 1 AT BUS RD NEAR GRANDVIEW, WA
12509489	YAKIMA RIVER AT PROSSER, WA
12509499	CHANDLER CANAL AT BUNN RD AT PROSSER, WA
12509686	YAKIMA RIVER NEAR WHITSTRAN, WA
12509698	SPRING CREEK AT MCCREADIE RD NEAR PROSSER, WA
12509710	SPRING CREEK AT MOUTH AT WHITSTRAN, WA
12509900	YAKIMA RIVER AB CHANDLER PUMP NR WHITSTRAN, WA
12510200	CORRAL CANYON CREEK AT MOUTH NEAR BENTON CITY, WA
12510500	YAKIMA RIVER AT KIONA, WA
12511000	CID CANAL AT HORN RAPIDS DAM NR WEST RICHLAND, WA
12511210	HORN RAPIDS DITCH BL H.R. DAM NR WEST RICHLAND, WA
12511800	YAKIMA RIVER AT VAN GIESEN BR NEAR RICHLAND, WA
12511800	YAKIMA RIVER AT VAN GEISAN BR NEAR RICHLAND, WA
13334000	GRANDE RONDE RIVER AT ZINDEL, WA
13334300	SNAKE RIVER NEAR ANATONE, WA
13349700	ROCK CREEK BELOW COTTONWOOD CREEK NEAR REVERE, WA
13351000	PALOUSE RIVER AT HOOPER, WA
14012550	WALLA WALLA R AT PEPPER BR RD NR COLLEGE PLACE, WA
14012600	WALLA WALLA RIVER NEAR COLLEGE PLACE, WA
14012650	WALLA WALLA R AT OLD MILTON B NR COLLEGE PLACE, WA
14013000	MILL CREEK NEAR WALLA WALLA, WA

USGS Station ID	Location Description
14013100	MILL CREEK AT WICKERSHAM RD BR NR WALLA WALLA, WA
14013500	BLUE CREEK NEAR WALLA WALLA, WA
14013600	MILL CREEK BELOW BLUE CREEK NEAR WALLA WALLA, WA
14013700	MILL CREEK AT FIVE MILE RD BR NR WALLA WALLA, WA
14013995	YELLOWHAWK CREEK NEAR WALLA WALLA, WA
14014560	GARRISON CREEK AT MISSION RD NR COLLEGE PLACE, WA
14014600	WALLA WALLA R AT LST CHNCE RD NR COLLEGE PLACE, WA
14014650	WALLA WALLA R AT SWEGLE RD BR NR COLLEGE PLACE, WA
14015000	MILL CREEK AT WALLA WALLA, WA
14015002	MILL CREEK AT TAUSICK WAY AT WALLA WALLA, WA
14015100	MILL CREEK AT 9TH AVE BRIDGE AT WALLA WALLA, WA
14015200	MILL CREEK AT GOES ROAD BRIDGE NR WALLA WALLA, WA
14015300	MILL CREEK AT WALLULA AVE NEAR COLLEGE PLACE, WA
14015350	MILL CR AT LAST CHANCE RD BR NR COLLEGE PLACE, WA
14015400	MILL CREEK AT MISSION RD BR NEAR COLLEGE PLACE, WA
14015550	WALLA WALLA RIVER NEAR LOWDEN, WA
14015600	WALLA WALLA R AT LOWDEN RD BRIDGE AT LOWDEN, WA
14016050	DRY CREEK AT LOWDEN, WA
14016150	PINE CREEK AT SAND PIT RD NEAR TOUCHET, WA
14016375	WALLA WALLA R AT TOUCHET-GARDENA BR NR TOUCHET, WA
14016660	NF TOUCHET RIVER ABOVE CONFLUENCE AT DAYTON, WA
14016750	SF TOUCHET RIVER ABOVE CONFLUENCE AT DAYTON, WA
14016800	PATIT CREEK NEAR DAYTON, WA
14016810	TOUCHET RIVER NEAR DAYTON, WA
14016820	TOUCHET RIVER AT GALLAHER RD NEAR WAITSBURG, WA
14016935	TOUCHET RIVER US OF WWTP NEAR WAITSBURG, WA
14016955	COPPEI CREEK AT HWY124 BRIDGE NEAR WAITSBURG, WA
14016960	TOUCHET RIVER DS OF WWTP NEAR WAITSBURG, WA
14017020	TOUCHET RIVER AT BROWNS RD BR AT PRESCOTT, WA
14017110	TOUCHET RIVER AT PETTYJOHN RD NEAR PRESCOTT, WA
14017120	TOUCHET RIVER NEAR LAMAR, WA
14017350	TOUCHET RIVER AT LUCKENBILL RD BR NEAR TOUCHET, WA
14017400	TOUCHET RIVER NR TOUCHET NORTH RD NR TOUCHET, WA
14017450	TOUCHET RIVER AT SIMS RD BRIDGE NEAR TOUCHET, WA
14017500	TOUCHET RIVER NEAR TOUCHET, WA
14017600	TOUCHET RIVER AT TOUCHET, WA
14018500	WALLA WALLA RIVER NEAR TOUCHET, WA
14018600	WALLA WALLA RIVER BL WARM SPRNGS CR NR TOUCHET, WA
14018800	WALLA WALLA RIVER AT OASIS RD BR NEAR WALLULA, WA
14144700	COLUMBIA RIVER AT VANCOUVER, WA
14144805	FLUSHING CHANNEL AT VANCOUVER LK AT VANCOUVER, WA
14211920	BURNT BRIDGE CR AT VANCOUVER LK NR VANCOUVER, WA

USGS Station ID	Location Description
14211925	VANCOUVER LAKE SITE 2 NEAR VANCOUVER, WA
14211930	VANCOUVER LAKE SITE 3 NEAR VANCOUVER, WA
14211935	VANCOUVER LAKE SITE 4 NEAR VANCOUVER, WA
14211940	VANCOUVER LAKE SITE 1 NEAR VANCOUVER, WA
14211949	VANCOUVER LAKE SITE 5 NEAR VANCOUVER, WA
14211955	LAKE RIVER AT FELIDA, WA
14213050	SALMON CREEK AT LAKE RIVER NR VANCOUVER
14216000	LEWIS RIVER ABOVE MUDDY RIVER NEAR COUGAR, WA
14216500	MUDDY RIVER BELOW CLEAR CREEK NEAR COUGAR, WA
14224570	LAKE LOUISE OUTLET NEAR PARADISE, WA
14224590	SNOW LAKE NEAR PACKWOOD, WA
14240525	NF TOUTLE RIVER BELOW SRS NEAR KID VALLEY, WA
14241500	SOUTH FORK TOUTLE RIVER AT TOUTLE, WA
14242580	TOUTLE RIVER AT TOWER ROAD NEAR SILVER LAKE, WA
14243000	COWLITZ RIVER AT CASTLE ROCK, WA
121689962	PRAIRIE CREEK NEAR 74TH AVE NE NEAR ARLINGTON, WA
121689962	PRAIRIE CRREK NEAR 74TH AVE NE NEAR ARLINGTON, WA
1220070110	UNNAMED TRIB TO FISHER C NR MILLTOWN RD NR CONWAY
1250532100	YAKIMA RIVER BLW N MYERS RD BRIDGE RB NR ZILLAH
1250532110	YAKIMA RIVER BLW N MYERS RD BRIDGE LB NR ZILLAH
1250532200	YAKIMA RIVER AT RM 90.4 NEAR ZILLAH, WA
1250532210	YAKIMA RIVER AT RM 90.3 NEAR ZILLAH, WA
1250532400	YAKIMA RIVER 3 FT FROM RB AT RM 89 NR ZILLAH, WA
1250532410	YAKIMA RIVER 20 FT FROM RB AT RM 89 NR ZILLAH, WA
1401362020	TITUS CREEK AT FIVE MILE RD BR NR WALLA WALLA, WA
1401362090	TITUS CREEK AT MOUTH AT WALLA WALLA, WA
1401442890	E PRG LTL WW R AT SPRDALE RD NR COLLEGE PLACE, WA
1401542590	W PRONG LTL WW R AT SWEGLE RD NR COLLEGE PLACE, WA
453604122060000	FRANZ LAKE SLOUGH ENTRANCE, COLUMBIA RIVER, WA
454321122352300	CURTIN CREEK NEAR VANCOUVER, WA
454510122424900	WHIPPLE CREEK NEAR SALMON CREEK, WA
454549122295800	SALMON CREEK NEAR BATTLEGROUND, WA
454705122451400	CAMPBELL SLOUGH, RIDGEFIELD NWR, ROTH UNIT, WA
455122122310600	ROCK CREEK NEAR BATTLEGROUND, WA
460040118170200	COTTONWOOD CREEK AT HOOD RD NR BAKER-LANGDON, WA
460133118204700	COTTONWOOD CREEK AT PLAZA WAY, NR BAKER-LANGON, WA
460236118131100	RUSSELL CREEK AT FOSTER RD, NR WALLA WALLA, WA
460306118123300	UNNAMED TRIB TO RUSSELL CREEK, NR WALLA WALLA, WA
460335118090600	BLUE CREEK AT MILL CREEK RD, NR TRACY, OR
460939123201600	BIRNIE SLOUGH, WHITE'S ISLAND, COLUMBIA RIVER, WA
461315119452400	JD 55.1 AT BETTINSON ROAD
461517119402500	SNIPES CREEK AT MCCREADIE ROAD NR WHITSTRAN, WA

USGS Station ID	Location Description
461802124024400	COLUMBIA R AT PORT OF ILWACO MARINA AT ILWACO, WA
462023120075200	DR 2 AT YAKIMA VALLEY HIGHWAY NEAR GRANGER, WA
462023120075240	GWSW ACTSW1-1 AT DR2 NR GRANGER, WA
465647120265700	PARK CREEK AT S. FERGUSON ROAD NR ELLENSBURG, WA
465708120270500	CARIBOU CREEK AT S FERGUSON ROAD NR ELLENSBURG, WA
470012119410300	FRENCHMANN HILLS AT ROAD I
471142122094701	EPILIMNION-LAKE TAPPS NR BONNEY LAKE, WA SITE 2
471142122094702	HYPOLIMNION-LAKE TAPPS NR BONNEY LAKE, WA SITE 2
471223122091201	EPILIMNION-LAKE TAPPS NR BONNEY LAKE, WA SITE 6
471223122091202	HYPOLIMNION-LAKE TAPPS NR BONNEY LAKE, WA SITE 6
471241122084401	EPILIMNION-LAKE TAPPS NR BONNEY LAKE, WA SITE 7
471241122084402	HYPOLIMNION-LAKE TAPPS NR BONNEY LAKE, WA SITE 7
471324122093901	EPILIMNION-LAKE TAPPS NR SUMNER, WA SITE 5
471324122093902	HYPOLIMNION-LAKE TAPPS NR SUMNER, WA SITE 5
471358122085201	EPILIMNION-LAKE TAPPS NR SUMNER, WA SITE 3
471358122085202	HYPOLIMNION-LAKE TAPPS NR SUMNER, WA SITE 3
471405122093301	EPILIMNION-LAKE TAPPS NR SUMNER, WA SITE 4
471405122093302	HYPOLIMNION-LAKE TAPPS NR SUMNER, WA SITE 4
471418122121101	EPILIMNION-LAKE TAPPS NR SUMNER,WA SITE 1
471418122121102	HYPOLIMNION-LAKE TAPPS NR SUMNER, WA SITE 1
471423122115001	EPILIMNION-LAKE TAPPS NR SUMNER, WA SITE 8
471423122115002	HYPOLIMNION-LAKE TAPPS NR SUMNER, WA SITE 8
471456122110801	EPILIMNION-LAKE TAPPS NR SUMNER, WA SITE 9
471456122110802	HYPOLIMNION-LAKE TAPPS NR SUMNER, WA SITE 9
472518119221001	MAIN CANAL AT EAST LOW CANAL NR STRATFORD, WA
472556119160401	BROOK LAKE NEAR OUTLET NEAR STRATFORD, WA
473313122392701	SINCLAIR INLET NEARSHORE 10 NEAR MW206
473315122392301	SINCLAIR INLET NEARSHORE 7 NEAR MW241
473316122391401	SINCLAIR INLET NEARSHORE 5 NEAR MW721
473316122391801	SINCLAIR INLET NEARSHORE 6
473317122390801	SINCLAIR INLET NEARSHORE 3 NEAR MW715
474006122073601	SAMMAMISH RIVER BELOW BEAR CREEK
474243122083001	SAMMAMISH RIVER IRRIGATION RETURN AT 124TH STREET
474358122084001	SAMMAMISH RIVER IRRIGATION RETURN AT 145TH STREET
474736117340700	LK SPOKANE NR NINE MILE FALLS
474944117374400	LK SPOKANE NR NW SHORE RD
475004117453000	LK SPOKANE NR LK SPOKANE CAMPGROUND
480333123503210	LAKE CRESCENT STATION LS04
480508123455710	LAKE CRESCENT STATION LS02
481903122301001	SKAGIT DELTA (SITE 3)
481915122225501	WHILEY SLOUGH
481917122293901	SKAGIT DELTA (SITE 1)

USGS Station ID	Location Description
481958122294301	SKAGIT DELTA (SITE 2)
482027122262401	HALL SLOUGH
482106122283401	SKAGIT DELTA (SITE 5)
482109122282501	SKAGIT DELTA (CRAFT ISLAND)
482125122293501	SKAGIT DELTA (OLD DIST)
482132122283401	SKAGIT DELTA (NEW DIST MID)
482136122282601	SKAGIT DELTA (NF AT NEW DIST)
482510117393701	BAYLEY LAKE (LITTLE PEND OREILLE NWR) NR ADDY, WA
483807118045960	FRANKLIN D ROOSEVELT LAKE SW OF JESSEE MOUNTAIN WA
483829118054360	FRANKLIN D ROOSEVELT LAKE NW OF JESSEE MOUNTAIN WA
483939118063860	FRANKLIN D ROOSEVELT LAKE NEAR MATNEYS SPURS WA
483949118085160	FRANKLIN D ROOSEVELT LAKE WEST OF MARCUS WA
484029118052960	FRANKLIN D ROOSEVELT LAKE E OF KAMLOOPS ISLAND WA
484332118024960	FRANKLIN D ROOSEVELT LAKE NEAR EVANS WA
484619118011260	FRANKLIN D ROOSEVELT LAKE NR BOSSBURG MOUNTAIN WA
484842118001360	COLUMBIA RIVER NEAR OUTLET OF LODGEPOLE CREEK WA
485631117431010	FRANKLIN D ROOSEVELT LAKE DEADMANS EDDY RADB-DGT
485632117430810	FRANKLIN D ROOSEVELT LAKE DEADMANS EDDY RAD7-DGT
485646117430210	FRANKLIN D ROOSEVEL LAKE DEADMANS EDDY (UPSTRM-DGT
485802119383200	SIMILKAMEEN R-4.5
485955121042501	ROSS LAKE - NEAR CANADIAN BORDER

National Water Information System (NWIS)

The National Water Information System (NWIS)[20] is a publicly accessible database supported by the U.S. Geological Survey (USGS). It contains continuous water quality data from USGS monitoring locations throughout the country. Continuous NWIS data was not reported to the Water Quality Portal due to the large number of records. The following table lists USGS station and location descriptions for the USGS monitoring locations from the NWIS database that Ecology considered and subsequently used in the development of the 2022 WQA.

The following USGS stations from NWIS apply RCW 34.05.272 data source category #9: Data from primary research, monitoring activities, or other sources, but that has not been incorporated as part of documents reviewed under other processes.

[20] https://waterdata.usgs.gov/nwis

Table 5. USGS monitoring locations from NWIS that were included in development of the 2022 WQA.

USGS Station ID	Location Description
12042800	BOGACHIEL RIVER NEAR FORKS, WA
12043000	CALAWAH RIVER NEAR FORKS, WA
12056500	NF SKOKOMISH R BL STAIRCASE RPDS NR HOODSPORT, WA
12098700	WHITE RIVER AT HEADWORKS AB FLUME NR BUCKLEY, WA
12100490	WHITE RIVER AT R STREET NEAR AUBURN, WA
12101100	LAKE TAPPS DIVERSION AT DIERINGER, WA
12101102	WHITE RIVER AT 24TH ST E AT DIERINGER, WA
12102012	YSI 6920V2-2 AT WSU 2 AT PUYALLUP, WA
12113390	DUWAMISH RIVER AT GOLF COURSE AT TUKWILA, WA
12113415	DUWAMISH R AT E MARGINAL WAY BR AT DUWAMISH, WA
12114500	CEDAR RIVER BELOW BEAR CREEK NEAR CEDAR FALLS, WA
12115000	CEDAR RIVER NEAR CEDAR FALLS, WA
12115500	REX RIVER NEAR CEDAR FALLS, WA
12116100	CANYON CREEK NEAR CEDAR FALLS, WA
12116400	CEDAR RIVER AT POWERPLANT AT CEDAR FALLS, WA
12116500	CEDAR RIVER AT CEDAR FALLS, WA
12117000	TAYLOR CREEK NEAR SELLECK, WA
12117500	CEDAR RIVER NEAR LANDSBURG, WA
12117600	CEDAR RIVER BELOW DIVERSION NEAR LANDSBURG, WA
12119000	CEDAR RIVER AT RENTON, WA
12137290	SOUTH FORK SULTAN RIVER NEAR SULTAN, WA
12137800	SULTAN RIVER BELOW DIVERSION DAM NEAR SULTAN, WA
12138160	SULTAN RIVER BELOW POWERPLANT NEAR SULTAN, WA
12147470	NF TOLT RIVER ABOVE YELLOW CREEK NR CARNATION, WA
12147500	NORTH FORK TOLT RIVER NEAR CARNATION, WA
12147600	SOUTH FORK TOLT RIVER NEAR INDEX, WA
12148000	SOUTH FORK TOLT RIVER NEAR CARNATION, WA
12148300	SF TOLT RIVER BL REGULATING BASIN NR CARNATION, WA
12148500	TOLT RIVER NEAR CARNATION, WA
12165800	FRENCH CREEK NEAR DARRINGTON, WA
12166000	BOULDER RIVER NEAR OSO, WA
12168997	PORTAGE CREEK AT 61ST AVE NE NEAR ARLINGTION, WA
12169500	FISH CREEK NEAR ARLINGTON, WA
12170000	CHURCH CREEK NEAR STANWOOD, WA
12170300	STILLAGUAMISH RIVER NEAR STANWOOD, WA
12172000	BIG BEAVER CREEK NEAR NEWHALEM, WA
12173500	RUBY CREEK BELOW PANTHER CREEK NEAR NEWHALEM, WA
12178000	SKAGIT RIVER AT NEWHALEM, WA
12178100	NEWHALEM CREEK NEAR NEWHALEM, WA
12179900	BACON CREEK BELOW OAKES CREEK NEAR MARBLEMOUNT, WA

USGS Station ID	Location Description
12181000	SKAGIT RIVER AT MARBLEMOUNT, WA
12182500	CASCADE RIVER AT MARBLEMOUNT, WA
12186000	SAUK RIVER AB WHITE CHUCK RIVER NR DARRINGTON, WA
12187500	SAUK RIVER AT DARRINGTON, WA
12189500	SAUK RIVER NEAR SAUK, WA
12200500	SKAGIT RIVER NEAR MOUNT VERNON, WA
12205000	NF NOOKSACK RIVER BL CASCADE CREEK NR GLACIER, WA
12208000	MF NOOKSACK RIVER NEAR DEMING, WA
12209490	SKOOKUM CREEK ABOVE DIVERSION NEAR WICKERSHAM, WA
12210000	SF NOOKSACK RIVER AT SAXON BRIDGE, WA
12210700	NOOKSACK RIVER AT NORTH CEDARVILLE, WA
12210900	ANDERSON CREEK AT SMITH ROAD NEAR GOSHEN, WA
12212050	FISHTRAP CREEK AT FRONT STREET AT LYNDEN, WA
12212430	UNNAMED TRIB TO BERTRAND CR NR H ST NR LYNDEN, WA
12213100	NOOKSACK RIVER AT FERNDALE, WA
12398550	BOUNDARY RESERVOIR AT FOREBAY NR METALINE FALLS
12398600	PEND OREILLE RIVER AT INTERNATIONAL BOUNDARY
12438000	COLUMBIA RIVER AT BRIDGEPORT, WA
12438900	NINEMILE CREEK NEAR OROVILLE, WA
12439000	OSOYOOS LAKE NEAR OROVILLE, WA
12439500	OKANOGAN RIVER AT OROVILLE, WA
12442500	SIMILKAMEEN RIVER NEAR NIGHTHAWK, WA
12445000	OKANOGAN RIVER NEAR TONASKET, WA
12447200	OKANOGAN RIVER AT MALOTT, WA
12447302	OKANOGAN RIVER NR WAKEFIELD BR SOUTH OF MALOTT, WA
12447390	ANDREWS CREEK NEAR MAZAMA, WA
12448000	CHEWUCH RIVER AT WINTHROP, WA
12450480	METHOW RIVER NEAR MOUTH NEAR PATEROS, WA
12450650	WELLS POWERPLANT HEADWATER NEAR PATEROS, WA
12462500	WENATCHEE RIVER AT MONITOR, WA
12473503	SCBID WB 5 WASTEWAY NEAR MOUTH NEAR RINGOLD,WA
12509489	YAKIMA RIVER AT PROSSER, WA
12510500	YAKIMA RIVER AT KIONA, WA
12514400	COLUMBIA RIVER BELOW HWY 395 BRIDGE AT PASCO, WA
13334300	SNAKE RIVER NEAR ANATONE, WA
13343590	LOWER GRANITE LK FOREBAY AT LOWER GRANITE DAM, WA
13343595	SNAKE RIVER (RIGHT BANK) BL LOWER GRANITE DAM, WA
13343855	LAKE BRYAN FOREBAY AT LITTLE GOOSE DAM, WA
13343860	SNAKE RIVER BELOW LITTLE GOOSE DAM, WA
13352595	LAKE H G WEST FOREBAY AT LOWER MONUMENTAL DAM, WA
13352600	SNAKE RIVER BELOW LOWER MONUMENTAL DAM, WA
13352950	LAKE SACAJAWEA FOREBAY AT ICE HARBOR DAM, WA

USGS Station ID	Location Description
13353010	SNAKE RIVER BL GOOSE ISLAND BL ICE HARBOR DAM, WA
14019220	COLUMBIA RIVER AT MCNARY DAM LOCK NR UMATILLA, OR
14019240	COLUMBIA RIVER BELOW MCNARY DAM NEAR UMATILLA, OR
453439122223900	COLUMBIA RIVER, RIGHT BANK, AT WASHOUGAL, WA
453604122060000	FRANZ LAKE SLOUGH ENTRANCE, COLUMBIA RIVER, WA
453712121071200	COLUMBIA RIVER AT THE DALLES DAM FOREBAY, WA
453845121562000	COLUMBIA RIVER AT BONNEVILLE DAM FOREBAY, WA
453845121564001	COLUMBIA RIVER AT CASCADE ISLAND, WA
454249120423500	COLUMBIA RIVER, RIGHT BANK, NEAR CLIFFS, WA
454314120413701	COLUMBIA RIVER AT JOHN DAY DAM NAVIGATION LOCK, WA
454705122451400	CAMPBELL SLOUGH, RIDGEFIELD NWR, ROTH UNIT, WA
460939123201600	BIRNIE SLOUGH, WHITE'S ISLAND, COLUMBIA RIVER, WA

Other data sources

- Washington State Toxic Algae Database.[21] Accessed November 2023. [9]
- Washington Department of Health (DOH) Fish Consumption Advisories website.[22] Accessed August 2024. [9]

Narrative Data and Information

We reviewed all narrative data and information submitted during the Call for Data period of the 2022 WQA. Each narrative submittal was reviewed for relevance, quality, and completeness in consideration for use in the 2022 WQA, under the requirements detailed in our Water Quality Assessment Credible Data Policy (Water Quality Policy 1-11, Chapter 2). Washington State law (Water Quality Data Act codified in RCW 90.48.575 through 90.48.590, also referred to as "Credible Data Act") requires Ecology to use credible data to determine whether any water of the state is to be placed on or removed from the 303(d) list and whether any surface water of the state is supporting its designated use or other classification. Our Credible Data Policy describes the Quality Assurance (QA) measures, guidance, regulations, and existing policies that help ensure the credibility of data and other information used in agency actions relating to surface water quality. This policy applies when evaluating data and information for use in agency decisions when the quality of a surface water of the state is at issue. It is also intended as guidance for all parties interested in submitting data for consideration in decisions related to water quality.

[21] https://www.nwtoxicalgae.org/Data.aspx
[22] https://doh.wa.gov/community-and-environment/food/fish/advisories

Data are considered credible data if:

- Appropriate quality assurance and quality control procedures were followed and documented in collecting and analyzing water quality samples.
- The samples or measurements are representative of water quality conditions at the time the data were collected.
- The data consist of an adequate number of samples based on the objectives of the sampling, the nature of the water in question, and the parameters being analyzed; and
- Sampling and laboratory analysis conform to methods and protocols generally acceptable in the scientific community as appropriate for use in assessing the condition of the water.

For data and information related to water quality parameters for which we do not have numeric criteria in our State Water Quality Standards, we can evaluate the health of designated uses utilizing our narrative water quality standards (WAC 173-201A-260(2)[23]). Our Water Quality Assessment Listing Methodology Policy describes our narrative water quality assessment listing process (Water Quality Program Policy 1-11, Chapter 1, see Section IE. Data and Information Submittals – Information submittals based on narrative standards). To determine a designated use impairment based on narrative criteria in the WQA, data and information packages must demonstrate a direct link between the environmental alteration in the waterbody and the degradation of a designated use. Submittals should include the following information:

- documentation of persistent deleterious, chemical, or physical alterations of an AU, and
- documentation of degradation of a designated use in the same AU, and
- documentation or supporting scientific evidence that directly links the deleterious, chemical, or physical alterations as the cause of the designated use degradation in the same AU.

Any numeric water quality data associated with the specific study being considered that was already in EIM or the federal Water Quality Portal would have been accessed directly, regardless of whether or not the narrative submittal met the above conditions.

During the Call for Data, we received three narrative submittal packages related to turbidity on the Spokane River, 6PPD-quinone, and ocean acidification. The below sections contain our evaluation of the submittal packages and our use determinations.

Turbidity - Spokane River at Hangman Creek confluence

Background

The Spokane Riverkeeper submitted a data and information package relevant to turbidity in the Spokane River below the confluence with Hangman Creek. The data was submitted on September 22, 2022, during the Call for Data period for the 2022 Water Quality Assessment.

[23] https://app.leg.wa.gov/wac/default.aspx?cite=173-201A-260

The email package submitted by the Spokane Riverkeeper included;

- A letter notifying the WQA lead of the study including an overview, preliminary results, and Study ID for the data in EIM.
- Study report from 2020 (Schultz 2020)
- Study report from 2021 (Schultz 2021)
- Quality Assurance Project Plan (QAPP) for data collection
- QAPP signature page
- A letter detailing the anthropogenic sources of turbidity in Hangman Creek

Turbidity data

The Spokane Riverkeeper, in partnership with Spokane Falls Trout Unlimited and community scientists, conducted a study on turbidity inputs from Hangman Creek into the Spokane River (EIM Study ID: SRK_Turbidity). To analyze turbidity inputs, paired samples were collected at a minimum weekly during the wet seasons, from January 2020 – June 2021. Samples were collected following an Ecology approved QAPP (Schultz 2019) and analyzed for turbidity with a Hach 2100P mobile turbidimeter. Samples were collected from the following locations (Figure 1).

- Sandifur – Spokane River at Sandifur Bridge, approximately 0.25 miles upstream of Hangman Creek confluence.
- Memorial – Spokane River at Riverside Memorial Park, approximately 0.25 miles downstream of Hangman Creek confluence.
- TJ Meenach – Spokane River at TJ Meenach Bridge, approximately 2.5 miles downstream of Hangman Creek confluence.
- Hangman – Hangman Creek at 11th Street Bridge, approximately 1.5 miles upstream of confluence with Spokane River.

Ecology obtained all turbidity data from EIM for the submitted locations.

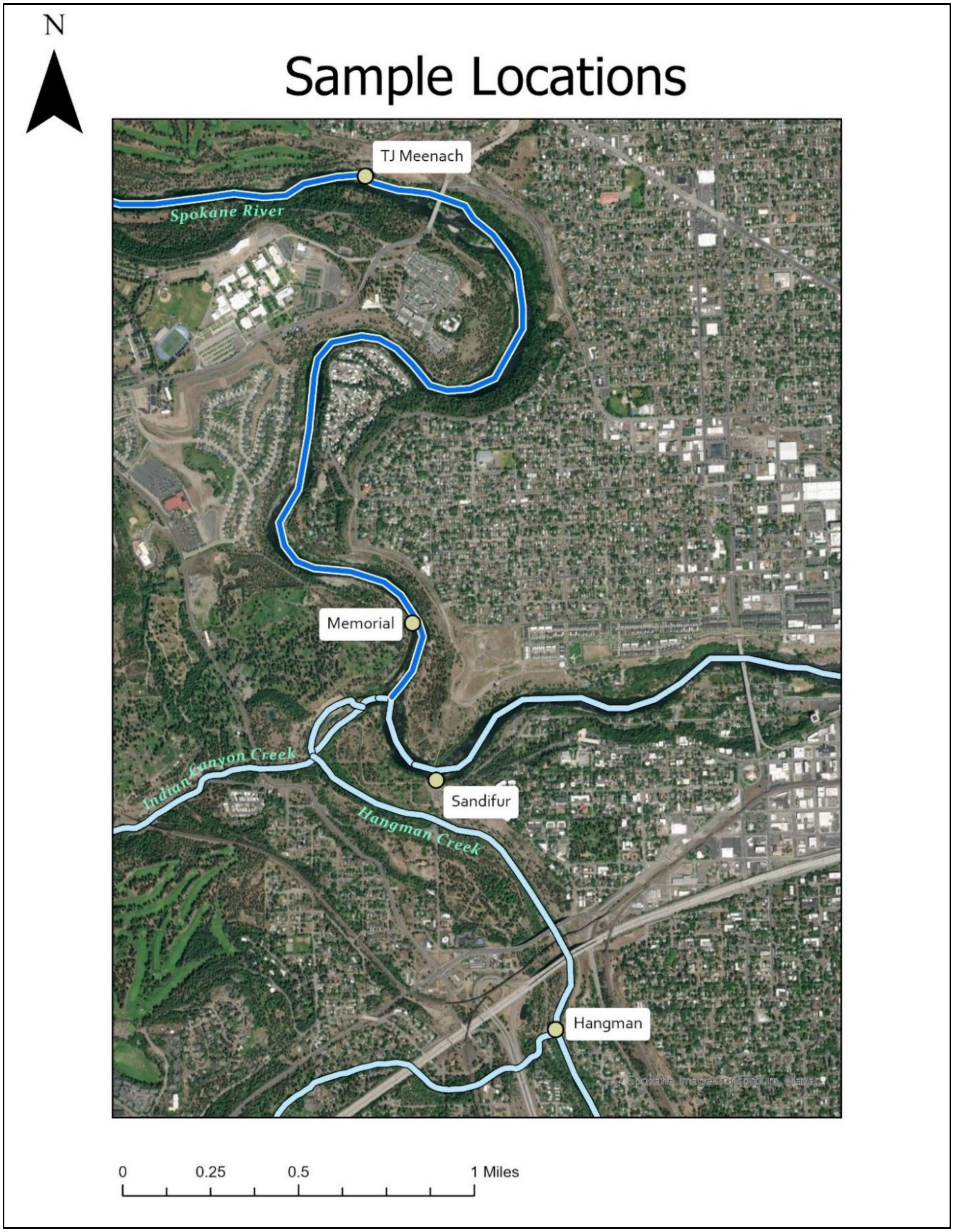

Figure 1. Map of sample locations along the Spokane River and Hangman Creek. Data was collected to document turbidity impairment on assessment unit 17010307010781_001_001, indicated in dark blue.

Methods

Designated uses

This section of the Spokane River has a designated aquatic life use of salmonid spawning, rearing, and migration (WAC 173-201A-602).

Turbidity criteria

Washington's Water Quality Standards state that turbidity shall not exceed 10 NTU over background when the background is 50 NTU or less, or a 20 percent increase in turbidity when the background turbidity is more than 50 NTU (WAC 173-201A-200 (1)(e)).

Background turbidity was determined by analyzing turbidity values at location Sandifur, upstream of the Hangman Creek confluence. Turbidity at Sandifur did not exceed 10 NTU for any sample in 2020 or 2021, with an average of 1.6 NTU (Figure 2). Therefore, the background was determined to be less than 50 NTU and the criteria not to exceed 10 NTU over background was used for the evaluation.

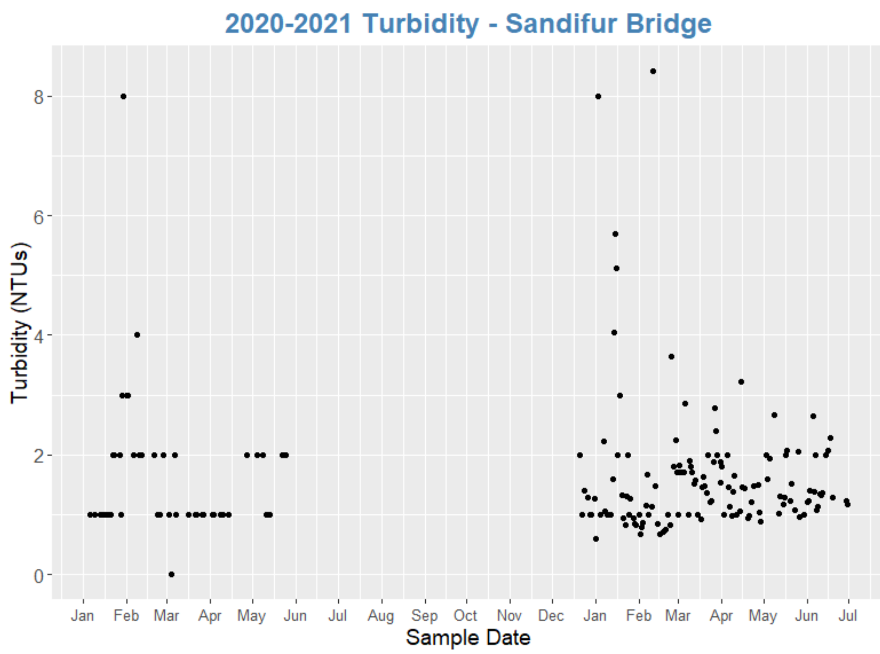

Figure 2. 2020 and 2021 turbidity levels at Sandifur Bridge upstream of the Hangman Creek confluence. Sandifur location used as background turbidity levels for this analysis.

Policy 1-11 methodology

The methodology to evaluate turbidity is outlined on Policy 1-11 – Chapter 1, Section 2K. Policy 1-11 states "Ecology will place an AU in Category 5 if ten percent or more sample values in the latest ten years exceed the applicable criterion. A minimum of three exceedances is required for an impairment determination."

In accordance with the turbidity methodology outlined in Policy 1-11, Ecology evaluated paired turbidity samples from the background levels collected at Sandifur with the downstream levels at Memorial and TJ Meenach to determine if turbidity inputs from Hangman Creek were exceeding the applicable criteria. Both Memorial and TJ Meenach are located on Assessment Unit (AU) 17010307010781_001_001 (dark blue in Figure 1). The turbidity data collected at Hangman was used, in tandem with the information submitted on anthropogenic sources of turbidity in Hangman Creek, to determine if Hangman Creek is a significant source of turbidity to the Spokane River.

Results

Comparison of background turbidity at Sandifur to location Memorial approximately 0.25 miles downstream of the Hangman Creek confluence showed 22 of 55 samples (40%) exceeding 10 NTU above background in 2020 (Figure 3). In 2021, 56 of 121 samples (46%) exceeded 10 NTU above background (Figure 4). In total, 78 of 176 samples (44%) exceeded 10 NTU above background across both years.

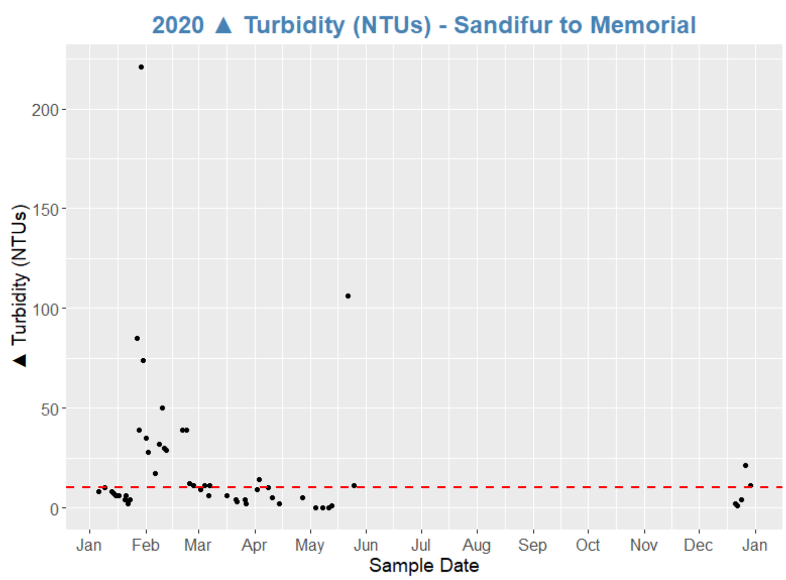

Figure 3. 2020 change in turbidity from Sandifur to Memorial based on paired sampling. Red dash indicates the not to exceed 10 NTU criteria.

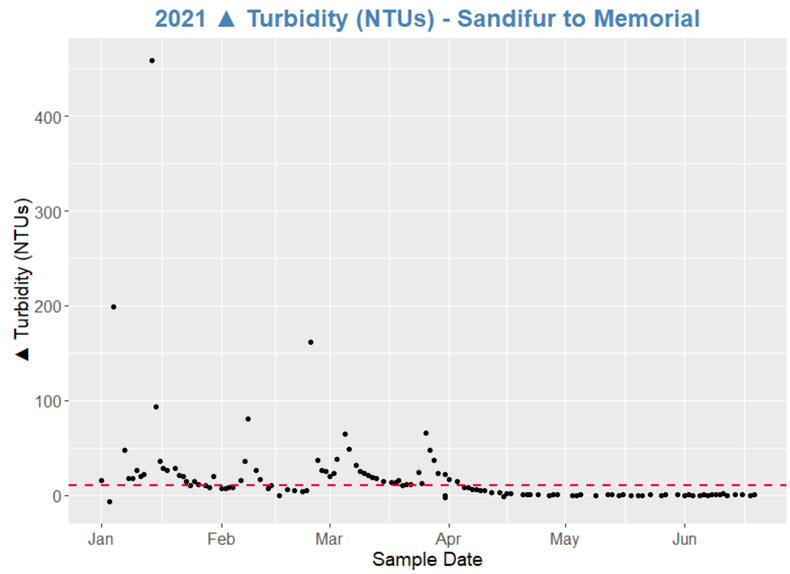

Figure 4. 2021 change in turbidity from Sandifur to Memorial based on paired sampling. Red dash indicates the not to exceed 10 NTU criteria.

Comparison of background turbidity at Sandifur to location TJ Meenach approximately 2.5 miles downstream of the Hangman Creek confluence showed 4 of 53 samples (8%) exceeding 10 NTU above background in 2020 (Figure 5). In 2021, 5 of 122 samples (4%) exceeded 10 NTU above background (Figure 6). In total, 9 of 175 samples (5%) exceeded 10 NTU above background across both years.

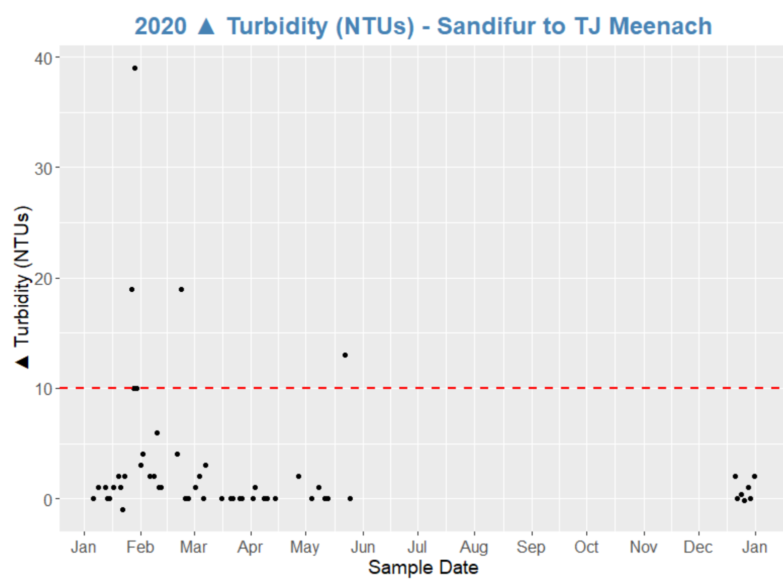

Figure 5. 2020 change in turbidity from Sandifur to TJ Meenach based on paired sampling. Red dash indicates the not to exceed 10 NTU criteria.

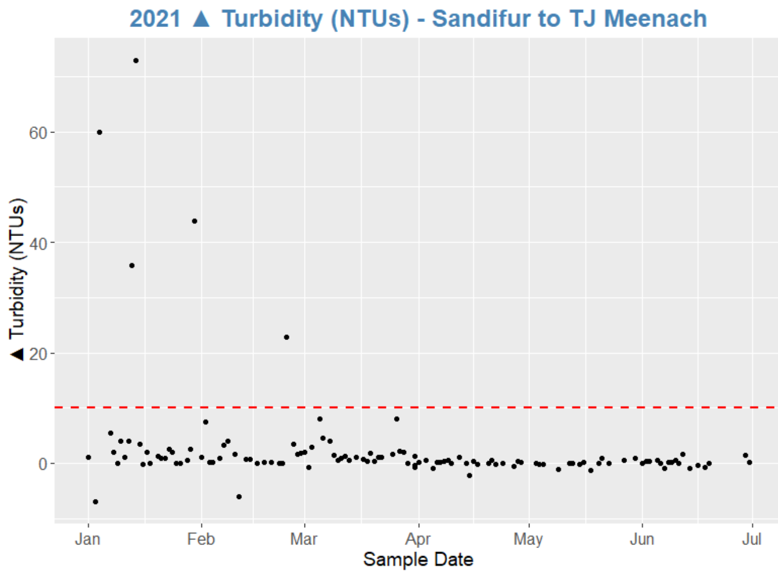

Figure 6. 2021 change in turbidity from Sandifur to TJ Meenach based on paired sampling. Red dash indicates the not to exceed 10 NTU criteria.

Narrative information

Sediment and erosion have long been studied in the Hangman Creek watershed. Studies on sediment inputs from Hangman Creek to the Spokane River date back to the 1990s with estimated sediment loads exceeding 50,000 tons in 1998 and 1999 (SCD 2000). Hangman Creek is characterized by easily erodible sediments but was once a meandering stream through vegetation dominated by bunchgrass prairie, ponderosa pine forest and a dense riparian vegetation of shrubs and trees (Ecology 2009). The creek has since been degraded by vegetation clearing for agriculture, rerouting, and straightening that has created an unstable bank with increasing stream velocity further eroding the bank (Ecology 2009).

These sediment impacts have degraded the fish and benthic macroinvertebrate communities within the Hangman Creek watershed and threaten the biotic community in the Spokane River (McLellan 2005). Habitat for the interior redband trout, identified as a Species of Greatest Conservation Need under the Washington State Wildlife Action Plan (WDFW 2021), once extended the Spokane River downstream of Spokane Falls (Behnke 1994). The primary populations of interior red band trout are now isolated in the headwaters of Hangman Creek tributaries (WDFW 2012). Continued turbidity impairments could reduce or eliminate potential spawning grounds on the interior redband trout in Hangman Creek and the Spokane River.

Ecology has established a TMDL on Hangman Creek to address fecal coliform, temperature, and turbidity issues in the watershed (Ecology 2009).

Ecology’s determination

In accordance with the Policy 1-11 turbidity methodology, a waterbody will be placed in Category 5 if ten percent or more sample values in the latest ten years exceed the applicable criterion. In addition, a minimum of three exceedances are required to make an impairment determination (Policy 1-11, Chapter 1 - Section 2K). Data from location Memorial, immediately downstream of the Hangman Creek confluence, shows violation of the turbidity criteria in 44% of samples across 2020 and 2021, with 78 exceedances. This data indicates that turbidity inputs from Hangman Creek are resulting in an aquatic life use impairment in the downstream AU 17010307010781_001_001. When considering data from Memorial with the downstream location at TJ Meenach, 87 of 351 samples (25%) exceed the turbidity criteria. This demonstrates the turbidity impairments are not only present in the immediate downstream portion of the AU but throughout much of the AU.

In addition to the numeric data, the narrative information supports the conclusion that anthropogenic sources of sediment in the Hangman Creek watershed are leading to a turbidity impairment in the immediate downstream AU of the Spokane River. For this reason, we are placing AU 17010307010781_001_001 in Category 5 for turbidity.

References

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6PPD-quinone

Background

6PPD is a chemical compound present in tires that helps to slow their degradation. As the tires breakdown due to use, 6PPD is exposed to air, reacting with ozone, and transforming into 6PPD-quinone (N-(1,3-Dimethylbutyl)-N′-phenyl-p-phenylenediamine quinone). Research indicates that when untreated stormwater containing 6PPD-quinone washes into waterbodies, it can have lethal effects on migrating salmon. These lethal effects are most commonly seen in coho salmon. This phenomenon, commonly referred to as coho prespawn mortality and urban runoff mortality syndrome, has been observed in some Puget Sound streams since the 1990s (Scholtz et al. 2011).

On September 28, 2022, during the Call for Data, The Puget Soundkeeper submitted a letter requesting Ecology consider 6PPD-quinone data in the 2022 Water Quality Assessment. The submittal package included:

- A call to compile 6PPD-quinone data
- A request to add 6PPD-quinone data to the Water Quality Atlas
- A citation for modeling data related to prespawn mortality in coho salmon in the Puget Sound basin
- A link to a StoryMap that includes a map of predicted mean annual coho salmon prespawn mortality rates
- A request for an interagency conversation with the Environmental Protection Agency (EPA) and National Oceanic and Atmospheric Administration (NOAA) to share 6PPD-quinone data

We evaluated this informational letter submittal against Washington’s narrative water quality criteria in accordance with the narrative submittal methodology in Policy 1-11, Chapter 1: Washington’s Water Quality Assessment Listing Methodology. This evaluation included all known and relevant information within Washington’s surface waters regarding 6PPD-quinone as of March 2023.

Coordination with EPA and NOAA

In December 2022, Ecology gathered relevant prespawn mortality field data and 6PPD-quinone surface water data. At that time, the relevant field data within Washington consisted of data collected in the following studies:

- Fiest et al. 2017. Roads to ruin: Conservation threats to a sentinel species across an urban gradient.

- French et al. 2022. Urban roadway runoff is lethal to juvenile coho, steelhead, and Chinook salmon, but not congeneric sockeye.
- King County prespawn mortality data for Miller Creek and Walker Creek.
- Peter et al. 2018. Using high-resolution mass spectrometry to identify organic contaminants linked to urban stormwater mortality syndrome in coho salmon.
- Peter et al. 2022. Characterizing the chemical profile of biological decline in stormwater-impacted urban watersheds.
- Scholz et al. 2011. Recurrent die-offs of adult coho salmon returning to spawn in Puget Sound lowland urban streams.
- Tian et al. 2021. A ubiquitous tire rubber–derived chemical induces acute mortality in coho salmon.
- Tian et al. 2022. 6PPD-quinone: Revised toxicity assessment and quantification with a commercial standard.

While we are aware of additional studies related to lab-based 6PPD and 6PPD-quinone measurements, and ongoing prespawn mortality field studies, the above list includes completed studies, that likely meet credible data requirements, that are relevant to 6PPD-quinone concentrations in Washington's surface waters as of March 2023.

We met with EPA in February 2023 to determine if there was additional relevant data related to 6PPD-quinone that could be used to assess the health of Washington's surface waters. EPA confirmed that while they were aware of ongoing research, and ongoing collaboration with Ecology to accredit a method for 6PPD-quinone, they were not aware of any additional data or information that could be evaluated through the WQA.

We communicated with NOAA Fisheries in the West Coast Regional Office via multiple emails from December 2022 to March 2023. NOAA provided the following information through email communication:

- NOAA previously collaborated with Ecology scientists to provide all relevant 6PPD-quinone data and information.
- NOAA recommended we communicate with the EPA Region 10 staff that have been extensively involved in cross agency planning around 6PPD-quinone.
- Prespawn mortality data collected in the Fiest et al. 2017 modeling paper was confirmed to follow a NOAA standard operating procedure (SOP).

Evaluation of data and information submitted

Modeling data from Feist et al. 2017

Summary

Feist et al. (2017) conducted coho salmon prespawn mortality surveys across an urban gradient to develop a relationship between land use, population density, roadways, climate patterns, and observed coho prespawn mortality. Coho salmon surveys were conducted by trained fisheries biologists at NOAA Fisheries, U.S. Fish and Wildlife Service, Stillaguamish Tribe, Suquamish Tribe and the Wild Fish Conservancy across 51 spawning reaches from 2000 to 2011. Coho salmon prespawn mortality was defined through an existing protocol (Scholtz et al. 2011) where female coho salmon carcasses with >50% egg retention and no obvious signs of predation were counted as prespawn mortality observations. Prespawn mortality surveys conducted in Scholtz et al. (2011) are also included in this dataset.

Prespawn mortality data was combined with geospatial layers of precipitation, land use, land cover, imperviousness, roadways, population density, and documented habitat restoration. A structural equation model was used to relate observed rates of coho prespawn mortality with landscape attributes and climate patterns. The modeling results indicated that high population density, traffic volume, density of highways and major arterials, and high impervious surfaces were strongly correlated to observed coho salmon prespawn mortality. The best supported structural equation model was used to create a predicted coho salmon prespawn mortality risk map throughout the Puget Sound basin.

At the time of this study, it was known that stormwater was a factor in coho salmon prespawn mortality, but the component of the stormwater that was causing adverse effects had yet to be identified.

Determination

We considered the prespawn mortality field surveys used for the modeling in Feist et al. (2017) as a potential indicator for evaluating aquatic life uses (Table 6). The prespawn mortality surveys were collected under an established NOAA SOP and therefore meet Ecology's data credibility requirements.

We did not include the predicted prespawn mortality map presented in Feist et al. (2017) in this determination decision. The model links the occurrence of prespawn mortality field observation to landscape variables and climate patterns. The model itself was not intended to capture specific water quality conditions and includes no measurement of water quality itself. Policy 1-11 states "Ecology will use modeled outputs that meet credible data requirements when the status of water quality is being determined relative to natural or reference conditions". The model was not used in our evaluation because it does not rely on water body specific data to predict prespawn mortality, does not provide any indication of natural or reference conditions, and is not reflective of actual aquatic life conditions.

Table 6. All 51 spawning sites sampled for prespawn mortality in Feist et al. (2017). The column Years Prespawn Mortality Observed indicates years where at least one sampled fish met the NOAA SOP definition of prespawn mortality. The Total Fish Sampled column represents the number of coho salmon female carcasses sampled.

Site	Years Surveyed	Years Prespawn Mortality Observed	Total Fish Sampled	Total Prespawn Mortality Observations
Barker Creek	2004, 2008	2004	13	5
Big Scandia Creek	2004, 2006, 2008, 2009	All Years	11	4
Blackjack Creek	2004-2010	2004, 2005, 2007	183	61
Bosworth Creek	2003	Not Observed	7	0
Canyon Creek	2003	All Years	25	2
Catherine Creek	2003	All Years	36	1
Cherry Creek	2005	All Years	10	4
Chico Creek	2004-2008, 2010	All Years	51	36
Church Creek	2011	All Years	5	1
Clear Creek WF	2004	All Years	4	1
Cool Creek	2004-2006, 2008-2010	2006	156	1
Curley Creek	2004-2008	2004, 2005, 2007	147	41
Curley Creek Trib	2004-2009	2004, 2005, 2007	32	8
Des Moines Creek	2004	All Years	30	19
Dickerson Creek	2005-2009	2007-2009	53	4
Dogfish Creek	2004-2009	2004, 2005, 2007, 2009	47	9
Dogfish Creek NF	2004-2009	2005, 2007	51	2
Dry Creek	2003	All Years	70	2
Dubuque Creek	2003	Not Observed	7	0
E.F. Griffin	2003	All Years	28	4
Eager Beaver	2003	All Years	132	5
Fauntleroy Creek	2000-2002, 2005, 2007	2000, 2001, 2005, 2007	30	11

Site	Years Surveyed	Years Prespawn Mortality Observed	Total Fish Sampled	Total Prespawn Mortality Observations
Fish Creek	2011	All Years	153	7
Fortson Creek	2002	All Years	114	1
Gorst Creek	2004-2010	2004, 2007-2010	42	13
Gorst Creek Trib	2004, 2009	Not Observed	7	0
Grizzly Creek	2003	All Years	161	7
Happy Hollow Creek	2011	Not Observed	7	0
Harris Creek	2003	Not Observed	5	0
Harris Tr. B	2003	Not Observed	4	0
Harris Tr. C	2003	All Years	10	1
Harris Tr. D	2003	All Years	5	2
Index Creek (E.F Stosse Cr)	2003	All Years	125	4
Jarstad Creek	2006, 2007	Not Observed	11	0
Johnson Creek	2004-2007, 2009	2004, 2006, 2007	11	5
Lake Creek	2003	All Years	44	2
Lewis Creek	2003	All Years	7	1
Longfellow Creek	2000-2009	All Years	498	364
Lost Creek	2004-2009	2007	27	2
M.F. Quilceda	2003	Not Observed	109	0
Parish Creek	2007-2010	Not Observed	13	0
People's Creek	2003	All Years	114	1
Pipers Creek	2000-2007	2000-2002, 2004-2007	86	49
Pond Creek	2003	Not Observed	58	0
Ross Creek	2003	Not Observed	5	0
Son of Deer	2003	Not Observed	5	0
Thornton Creek	2000-2008	All Years	71	59
Valhalla Creek	2011	Not Observed	6	0
Weiss Creek	2003	Not Observed	48	0
Wildcat Creek	2004-2010	2004, 2006-2008, 2010	101	24
Wildcat Creek Trib	2006, 2009	Not Observed	8	0

Coho urban runoff mortality syndrome in Puget Sound

Summary

The letter submitted indicated additional coho salmon prespawn mortality data is located on the Coho Urban Runoff Mortality Syndrome in Puget Sound StoryMap (PSST 2022) hosted by the Puget Sound Stormwater Science Team. The StoryMap provides an introduction and overview of coho salmon, their cultural significance, what prespawn mortality is (referred to as urban runoff mortality), what individuals can do to help, and an outline of ongoing research. The StoryMap hosts an online GIS version of the predicted prespawn mortality map in Feist et al. (2017). The StoryMap also provides a brief guide on identifying coho salmon and identifying salmon that have experienced prespawn mortality. Lastly, the StoryMap allows individuals to report observations of prespawn mortality through an iNaturalist project.

Determination

We reviewed the prespawn mortality observations reported through iNaturalist. The observations reported through iNaturalist vary in nature and include floating salmon carcasses in streams, live salmon in hatcheries showing irregular swimming, streamside salmon carcasses, and photos showing egg retention in salmon carcasses. Many observations lack complete information, such as the date of the observation and photos documenting the observation. There is no indication that a QAPP or SOP is in place for the data or that an established quality assurance procedure was followed for documenting prespawn mortality. There is no training required to report data on iNaturalist and there is no indication that observation reporters are trained. For these reasons, we determined that the data presented on iNaturalist does not meet our credible data requirements and is therefore not used in this determination.

Additional data and information considered

In addition to the information submitted by the Puget Soundkeeper, WQA staff coordinated with Ecology staff scientists, EPA and NOAA to gather additional 6PPD-quinone and prespawn mortality data to consider for the WQA. Below is a summary of the additional data we reviewed and used to make a determination.

6PPD-quinone surface water data

Summary

In January 2021, Tian et al. (2021) published the scientific paper “A ubiquitous tire rubber–derived chemical induces acute mortality in coho salmon” in the journal of Science Vol. 371, Issue 6525. This study performed multiple chemical fractionations of tire wear particles and exposed coho salmon to each fraction in a laboratory study. When coho salmon experienced prespawn mortality symptoms in particular fractions of stormwater, similar to direct exposure to stormwater, water samples were further fractionated until the compound in stormwater responsible for coho prespawn mortality could be pinpointed. The compound identified as responsible for coho salmon prespawn mortality was a transformation product of N-(1,3-dimethylbutyl)-N’-phenyl-p-phenylenediamine (6PPD), what is now commonly refer to as 6PPD-quinone.

Furthermore, the researchers synthesized tire derived 6PPD-quinone to estimate a LC50 (median lethal concentration) concentration. Two independent exposures of the synthetic 6PPD-quinone to 160 fish resulted in an initial estimated LC50 value of 0.79 ug/L.

To assess the environmental relevance of 6PPD-quinone the researchers retrospectively analyzed samples from roadway runoff and streams with high rates of coho salmon prespawn mortality using Ultra-High-Performance Liquid Chromatography–High-Resolution Mass Spectrometry (UPLC-HRMS). This retrospective analysis detected 6PPD-quinone concentrations at <0.3 to 3.2 ug/L in six of seven storm samples. These values were reported as estimates because at the time of the study there was not a commercially available 6PPD-quinone standard. The researchers concluded that 6PPD-quinone is the primary causal toxicant for coho prespawn mortality and is consistently present in laboratory studies demonstrating toxic effects to coho and absent in studies resulting in no toxicity.

Following the publication of Tian et al. (2021) a commercial standard became available for 6PPD-quinone. Follow up research was conducted to confirm the previously determined LC50 value. The results with the commercial standard updated the LC50 value to 95 ng/L (0.095 ug/L), an approximate 8.3-fold lower value than previously report (Tian et al. 2022) indicating 6PPD-quinone is more toxic than first reported. The researchers reported that the new LC50 value shows a systematic high bias in previously reported concentrations by approximately one order of magnitude (Tian et al. 2022). New estimates for retrospective receiving water samples are presented in Table 7.

We also reviewed the surface water samples used in the retrospective analysis of 6PPD-quinone presented in Tian et al. (2021). Retrospective samples were collected in 2018 and 2019 (Peter et al. 2018, Peter et al. 2020) from three urbanized waterways with historic observations of prespawn mortality. The samples collected were part of a project funded by the National Estuary Program (NEP) and collected under an Ecology approved QAPP (NTA 2016-0289). Retrospective samples were quantified using UPLC-HRMS with samples from receiving waters sites Seattle Site 3, Seattle Site 4 and Seattle Site 5 (Table 7). The results were initially reported as estimates due to the lack of a commercial standard.

Table 7. Estimated concentrations based on retrospective analysis of 6PPD-quinone in archived sample extracts in 2021 (Tian et al. 2021) and corrected values based on an evaluation with the commercial standard in 2022 (Tian et al. 2022).

Site ID	Date Collected	Sampling Location	Waterbody	Estimate Mean Concentration 2021 (µg/L)	Corrected Mean Concentration 2022 (µg/L)
Seattle Site 3	10/26/2018	47.4441, -122.3559	Miller Creek	0.60	0.06
Seattle Site 3	11/02/2018	47.4441, -122.3559	Miller Creek	0.45	0.045
Seattle Site 3	11/26/2018	47.4441, -122.3559	Miller Creek	0.28	0.028
Seattle Site 3	10/17/2019	47.4441, -122.3559	Miller Creek	3.2	0.32
Seattle Site 4	11/26/2018	47.5536, -122.3666	Longfellow Creek	0.39	0.039
Seattle Site 5	11/26/2018	47.7064, -122.2962	Thornton Creek	0.76	0.076

Determination

We considered the research presented in Tian et al. (2021) and Tian et al. (2022). This research was partially funded by the Department of Ecology under a National Estuary Program (NEP) grant and conducted under an Ecology approved QAPP and laboratory accreditation waiver. Therefore, we have determined that the research meets our credible data requirements and can be used in the determination.

Pre-spawn mortality data in King County

Summary

Conversations with Ecology scientists identified ongoing, seasonal, prespawn mortality surveys led by the Miller Walker Basin Steward within King County Department of Natural Resources and Parks. As part of the "Miller Walker Basin Stewardship Program Community Salmon Investigation (CSI)" the Basin Steward has trained, organized, and managed a group of volunteers to collect coho and chum salmon spawning data on lower Miller and Walker Creek (Figure 7). The CSI group has collected coho and chum salmon spawning data each fall/winter from 2010 – present, documenting the live count of fish observed, carcass data and fish identification, estimate number of eggs retained in the carcass, and any signs of predation.

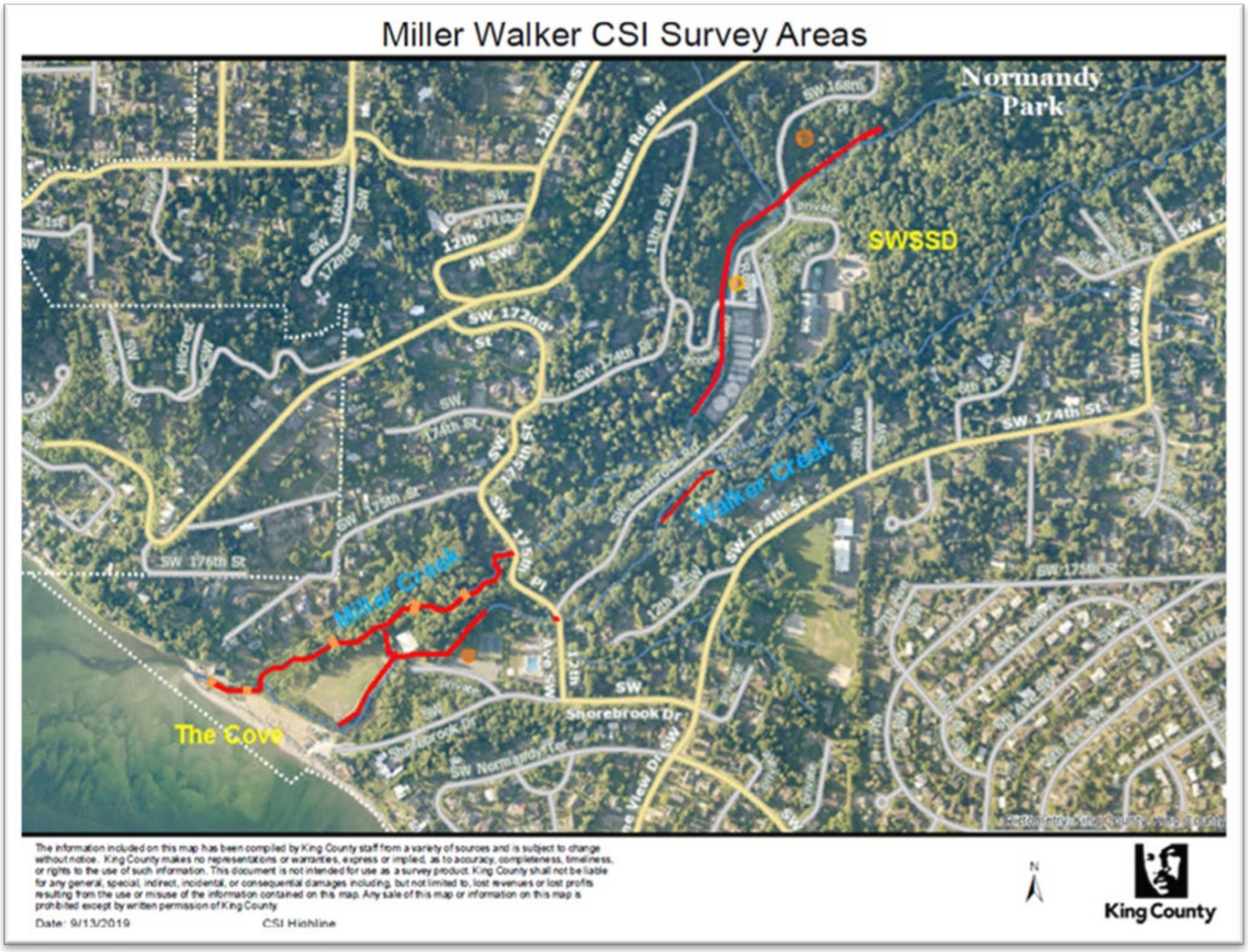

Figure 7. Map of sampling locations on Walker Creek and Miller Creek. Sampling reaches are identified in red. Map was provided to Ecology by King County. Received March 2023.

We contacted King County via email in February of 2023. In March of 2023, we met with King County to discuss SOP and quality assurance procedures for the CSI group and discussed data collected from the group from 2010-2022. The meeting resulted in confirmation of the following items:

- Each year King County leads a required volunteer training day for CSI volunteers. This training outlines survey routes, safety protocols, data collection procedures, fish identification, redd identification, and carcass processing procedures. The training documents for each year were provided by King County for review.
- King County confirmed that their SOP for identifying prespawn mortality matches the SOP used by NOAA, defined as >50% egg retention with no signs of predation (Scholz et al. 2011).
- King County acknowledged that volunteer survey data is reviewed for quality assurance by King County biologists prior to use in status reports.

- King County provided all the raw data for spawning surveys on Miller and Walker Creek from 2010-2022.

Determination

We reviewed the data and information provided by King County. We concluded that the spawner data collected by CSI volunteers meets our credible data requirements because 1) the volunteers were trained by King County biologists following an accepted SOP for identifying prespawn mortality, and 2) data collected by volunteers was reviewed for quality assurance by King County biologists following its collection. Therefore, we considered the prespawn mortality data on coho salmon collected by CSI in this evaluation. Data collected on chum salmon was not considered as research indicates 6PPD-quinone does not have the same lethal effects (McIntyre et al. 2021). Species recorded as unknown were not evaluated for this determination.

Data collected at Miller Creek shows at least three or more occurrences of prespawn mortality in 12 of the 13 years sampled. The average rate of prespawn mortality across the years was 64% with the highest number of prespawn mortality females in 2012 (n=88) (Table 8).

Table 8. Pre-spawn mortality data for coho salmon collected at Miller Creek. Number of PSM represents number of female coho sampled with egg retention greater than 50% and no signs of predation. Total number of females sampled, total number of PSM, and average.

Waterbody	**Year**	**Number of Females**	**Number of PSM**	**Rate**
Miller Creek	2010	6	4	67%
Miller Creek	2011	35	14	40%
Miller Creek	2012	120	88	73%
Miller Creek	2013	23	10	43%
Miller Creek	2014	33	26	79%
Miller Creek	2015	6	3	50%
Miller Creek	2016	17	8	47%
Miller Creek	2017	10	7	70%
Miller Creek	2018	15	10	67%
Miller Creek	2019	8	8	100%
Miller Creek	2020	4	0	0%
Miller Creek	2021	24	15	63%
Miller Creek	2022	41	25	61%
Miller Creek	*Total*	*342*	*218*	*64%*

Data collected at Walker Creek shows at least one observation of prespawn mortality in 5 of the 13 years sampled (note that no female coho salmon were sampled in 4 of the 13 years.) The average rate of prespawn mortality across the years was 37% with the highest number of prespawn mortality females in 2012 (n=12) (Table 9).

Table 9. Pre-spawn mortality data for coho salmon collected at Walker Creek. Number of PSM represents number of female coho sampled with egg retention greater than 50% and no signs of predation. Total number of females sampled, total number of PSM, and average rate are present in bold.

Waterbody	Year	Number of Females	Number of PSM	Rate
Walker Creek	2010	0	0	NA
Walker Creek	2011	6	0	0%
Walker Creek	2012	27	12	44%
Walker Creek	2013	3	0	0%
Walker Creek	2014	8	4	50%
Walker Creek	2015	0	0	NA
Walker Creek	2016	5	1	20%
Walker Creek	2017	2	0	0%
Walker Creek	2018	1	0	0%
Walker Creek	2019	0	0	NA
Walker Creek	2020	0	0	NA
Walker Creek	2021	4	3	75%
Walker Creek	2022	19	8	42%
Walker Creek	*Total*	*75*	*28*	*37%*

Additional studies reviewed

In response to the submitted letter, the below studies were identified through coordination with Ecology scientists, EPA and NOAA. We considered this additional data and information for the submittal but did not use it in our final determination for the reasons stated below.

Urban Runoff is Lethal to Juvenile Coho, Steelhead, and Chinook Salmonids but not Congeneric Sockeye

Summary

French et al. (2022) collected direct roadway stormwater runoff from downspouts connected to State Route 520 from Montlake Boulevard in Seattle to evaluate salmonid response to direct exposure. Stormwater runoff was collected six times in 2018 and two times in 2019. Fish were exposed to 100% stormwater runoff in a lab environment within 24 hours of stormwater collection. This study evaluated the mortality of hatchery provided sub-yearling coho, sockeye and Chinook salmon, as well as 1+ year coho salmon and steelhead, within 24 hours of stormwater exposure. In addition, the researchers evaluated juvenile coho salmon survival during a 24-hour exposure period to diluted stormwater runoff to better simulate receiving water conditions. Coho salmon were exposed to concentrations ranging from 1% to 25% stormwater.

Results indicated that coho salmon, both sub-yearling and 1+ year, were the most susceptible to stormwater exposure with mortality rates ranging from 92-100%. Exposure of stormwater to 1+ year steelhead resulted in 4-42% mortality, 0-13% to sub-yearling Chinook salmon, and 0% mortality to sub-yearling sockeye salmon. Diluted stormwater exposure studies showed juvenile coho salmon experienced mortality (at least one mortality in the exposure) at mixtures with >5% stormwater, with significant mortality (>80%) at mixtures with 25% stormwater.

Determination

While this research shows that stormwater containing 6PPD-quinone is toxic to coho salmon and potentially toxic to other salmonid species, we did not utilize this information for the WQA. The stormwater used in this research was collected directly from a downspout connected to State Route 520 and therefore is not representative of ambient surface water conditions. In addition, there is no information to determine what percentage of the stormwater is entering surface waters, at what location it is entering surface waters, its relative impact on the aquatic life in the ambient water it is draining to, and what percentage it would make up of the receiving waters to understand its toxicity. For these reasons, we did not further evaluate this information in its determination decision.

Characterizing the chemical profile of biological decline in stormwater-impacted urban watersheds

Summary

Peter et al. (2022) used non-targeted high-resolution mass spectrometry (HRMS) to evaluate the chemical composition of surface waters within 15 creeks across an urbanization gradient in the Puget Sound basin. We reviewed the surface water analysis in Peters et al. (2022) in relation to urban runoff mortality syndrome (URMS) (e.g. prespawn mortality). Baseflow samples were collected in September and October of 2017 from 10 of the 15 creeks sampled. Eight storm events were sampled in late 2017 and early 2018 ranging from one to five samples in each of the 15 creeks. Collected samples were processed at the Center for Urban Waters using an established method that extracts polar, non/semi volatile organic compounds (Du et al. 2017) and analyzed using Ultra-High-Performance Liquid Chromatography and Quadrupole Time-of-Flight HRMS. To evaluate chemical composition of surface waters, mixed effects modeling was used to associate compound detection through HRMS to predicted risk of coho prespawn mortality presented in Feist et al. (2017). The researchers also created a non-target compound prioritization based on the occurrence and relative abundances of HRMS detections.

There were 7,068 unique chemicals detected in 65 waters samples across the 15 creeks within the Puget Sound basin. These detections included both naturally occurring chemicals and anthropogenic contaminants. The chemical composition of surface waters within highly urbanized areas had a significant association with the increased risk of prespawn mortality. For compound prioritization the researchers identified 226 chemicals that represented degraded conditions in receiving waters of highly urbanized areas. Of these 226 chemicals, 32 represented "well established chemical families and sources associated with human development, including plasticizers, organophosphates, surfactants, tire rubber- and vehicle fluid-derived chemicals and the ubiquitous caffeine."

Determination

This research highlights the many organic compounds present in surface waters that are unregulated and may pose a threat to water quality and aquatic life. However, there is no information within the present study to link any of the identified compounds to degradation of aquatic life uses. It is important to note that the study does not include any analysis of 6PPD or 6PPD-quinone, nor is there any direct measure of prespawn mortality. Therefore, we determined that the data and information presented in this paper was not directly related to the evaluation of 6PPD-quinone and was not factored into the final determination.

Ecology’s determination

When a parameter has no numeric criteria (e.g. 6PPD-quinone), we can use the narrative assessment process to evaluate impairment of designated uses. To demonstrate designated use impairment based on narrative criteria, data and information must demonstrate a direct link between the environmental alteration in the waterbody and the degradation of a designated use. As stated in Policy 1-11, Chapter 1 submittals should include the following information:

- documentation of persistent deleterious, chemical, or physical alterations of an AU, and
- documentation of degradation of a designated use in the same AU, and
- documentation or supporting scientific evidence that directly links the deleterious, chemical, or physical alterations as the cause of the designated use degradation in the same AU.

Documentation of persistent deleterious, chemical, or physical alterations of an AU

The retrospective analysis of surface waters samples in Miller Creek, Longfellow Creek and Thornton Creek detected quantifiable concentrations of 6PPD-quinone. Sampling and retrospective analysis quantified 6PPD-quinone in four samples within two years, 2018 and 2019, in Miller Creek. In Longfellow Creek and Thornton Creek only one surface water sample was analyzed, detecting 6PPD-quinone in 2018. The documentation of 6PPD-quinone in four samples across two years indicates a persistent deleterious alteration in the AU in Miller Creek. One sample detecting 6PPD-quinone in Longfellow Creek and Thornton Creek indicates there was a deleterious chemical present, but there are not enough samples to determine if the chemical is persistent within those AUs.

Documentation of degradation of a designated use in the same AU

Coho prespawn mortality surveys document coho salmon spawners that died before spawning. Some level of coho prespawn mortality is a natural process. Without historic prespawn mortality data in these systems, it is difficult to determine the degree of impact attributed to anthropogenic sources. Therefore, the presence of prespawn mortality indicates there may be an impact on aquatic life uses but is not enough information alone to make an impairment determination.

Data collected by the CSI in King County have documented the presence of coho prespawn mortality in Miller Creek in their surveys over a 13-year period evaluated from 2010-2022. The only year prespawn mortality was not identified was 2020, when only four female coho salmon were sampled (King County 2022,Table 8). We determined that this data demonstrates a concern for the aquatic life uses in Miller Creek.

Data collected by NOAA document the presence of coho prespawn mortality in Longfellow Creek in each of the 10 years from 2000-2009 (Table 6). The sample size across the 10 years ranged from 4 to 135 female coho salmon (Feist et al. 2017 supporting information). We determined that this data demonstrates a concern for the aquatic life uses in Longfellow Creek.

Data collected by NOAA document the presence of prespawn mortality in Thornton Creek in each of the 9 years from 2000-2008 (Table 6). The yearly sample size at Thornton Creek was much lower, ranging from 1-33 female coho salmon (Feist et al. 2017 supporting information). We determined that this data demonstrates a concern for the aquatic life uses in Thornton Creek.

Documentation or supporting scientific evidence that directly links the deleterious, chemical, or physical alterations as the cause of the designated use degradation in the same AU.

The research presented in Tian et al. (2021) identified 6PPD-quninone as the causal toxicant of coho prespawn mortality by exposing coho salmon to a series of chemical fractionizations in a lab environment. When 6PPD-quinone was synthesized and exposed to coho salmon, the fish exhibited the symptoms of prespawn mortality (surface swimming, gaping, loss of orientation and equilibrium) within 90 minutes and were deceased within five hours. The timing of mortality matched positive controls within the study, and the behavioral symptoms matched those from field observations leading the researchers to conclude that 6PPD-quninone is the primary causal toxicant of coho prespawn mortality.

In response to the growing concerns attributed to 6PPD-quinone, the Washington Legislature passed a proviso to Engrossed Substitute Senate Bill 5092, Section 302 (32) providing funding for Ecology to identify priority areas affected by 6PPD-quinone and other runoff related toxics, as well as develop a standard laboratory method (Ecology 2022). Follow-up work has also been conducted by Ecology to explore safer alternatives to replace 6PPD in tires (Ecology 2024a). Ecology has also proposed a draft freshwater acute numeric criterion for 6PPD-quinone in its Aquatic Life Toxics Criteria (173-201A WAC) update (Ecology 2024b).

Considering the research, and follow-up response by EPA and Washington State and the Department of Ecology, the WQA team has determined that there is supporting scientific evidence that suggests the deleterious chemical (i.e., 6PPD-quinone) as a potential contributor to the designated use impact.

Determination

Miller Creek

The information above related to Miller Creek demonstrates 1) documentation of a persistent deleterious chemical alteration of an AU; 2) documentation of degradation of a designated use in the same AU; and 3) supporting scientific evidence that directly links the deleterious chemical alteration to the cause of the designated use degradation. In addition, the surface water samples containing 6PPD-quinone were collected in the same year and season as documented coho prespawn mortality in Miller Creek. Therefore, we have determined that there is sufficient information to list a section of Miller Creek as impaired (Category 5) for aquatic life use from 6PPD-quinone (Table 10)

Longfellow Creek and Thornton Creek

6PPD-quinone was only detected in one surface water sample in both Longfellow Creek and Thornton Creek. Only one surface water sample is not enough data to characterize ambient conditions of the waterbody. Without additional surface water samples containing 6PPD-quinone, there is not enough data to document persistent impairment due to the chemical. This decision is consistent with toxic parameter evaluations for aquatic life in Policy 1-11 – Chapter 1 where at least two samples are needed to qualify for a Category 5 determination. For these reasons we have determined to list sections of Longfellow Creek and Thornton Creek as Category 2 (water of concern) for aquatic life from 6PPD-quinone (Table 10).

Table 10. Summary table of data and information considered for the impairment determination. Sampling location, samples analyzed and estimate concentration of 6PPD-quinone from Tian et al. 2021 and Tian et al. 2022. Observed prespawn mortality rate from King County and Feist et al. 2017. Assessment unit notes the assessment unit for the category determination

Waterbody	Sampling Location	Samples Analyzed	Average Est. 6PPD-q (ug/L)	Observed PSM Rate	Assessment Unit	Category Determination
Miller Creek	47.4441, -122.3559	4	0.113	64%	17110019013108_001_001	5
Longfellow Creek	47.5536, -122.3666	1	0.039	77%	17110019019025_001_001	2
Thornton Creek	47.7064, -122.2962	1	0.076	87%	17110012000175_001_002	2

Additional information

The submitted letter also requested we add 6PPD-quinone data to the Water Quality Atlas. Adding a specific data layer associated with an individual parameter is outside the scope of the WQA and the Water Quality Atlas. Consistent with previous assessments, listing determinations will be displayed on the Water Quality Atlas, including the above 6PPD-quinone determinations.

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Ocean acidification

The Center for Biological Diversity submitted a data and information package relevant to ocean acidification for consideration in the 2022 Water Quality Assessment on September 24, 2022, during our defined Call for Data period. The submittal contained three primary data and information components:

- Datasets relevant to ocean acidification
- A list of monitoring stations with data relevant to ocean acidification
- A list of published scientific research studies related to ocean acidification

We reviewed these data and information for relevance, quality, and completeness in consideration for use in the 2022 WQA, under the requirements detailed in Policy 1-11 - Chapter 1. The following sections of this document detail the data and information provided in CBD's submittal, how we evaluated the data and information for use in the 2022 Water Quality Assessment under our Credible Data Policy and our narrative listing process, and our decision on whether to use these data to make category determinations based on the ocean acidification submission.

Numeric data

CBD provided raw environmental monitoring datasets for 12 distinct monitoring sites. Table 11 summarizes the contents of the datasets submitted. We considered these data for use under both our numeric and narrative assessment processes, but ultimately did not utilize these data in the 2022 WQA for the reasons detailed below.

There was no clear documentation provided with the datasets detailing the organization responsible for collecting the data. However, based on the location information, we were able to infer the lead agency for each dataset. None of the datasets provided were collected by the data submitter. While we will consider third party datasets for the WQA, our WQA Policy 1-11 – Chapter 1 details data and information submitted by third parties must include documentation addressing the accuracy and completeness of the submitted information, and documentation from the original data submitter confirming the quality assurance objectives were met. No quality assurance documentation was provided with any of the datasets.

Even without quality assurance documents, much of the data reflected concerns of core quality assurance principles. All datasets contained multiple of the following data quality concerns:

- Blank parameter name
- Missing or invalid data qualifiers
- Missing parameter units
- Missing sample method
- Missing sampling instrument

None of the six Ocean Observatories Initiative monitoring locations are located within Washington State waters. Ecology's authority to make water quality determinations for purposes of the Water Quality Assessment is limited to Waters of the State, which extends three miles off the Pacific Coast shoreline, as consistent with the provisions in the federal Clean Water Act Section 502. The submitted monitoring locations ranged from 4 to 40 miles off the Pacific Coast shoreline, outside Washington's jurisdiction for Clean Water Act actions. Our Credible Data Act requires that data used for the WQA is representative of the conditions of the waterbody where we are making a water quality determination. This is to ensure that we are accurately characterizing ambient water quality conditions when we are making regulatory determinations under the Clean Water Act. For Ecology to use these data, we would need to have data or information to support that aquatic life conditions 4 miles or more offshore are representative to those nearshore Waters of the State. In this case, we do not have the information to accurately apply these data within Waters of the State. Utilizing data collected well offshore to represent near shore conditions would not accurately represent water conditions, as it would not account for local point and non-point source pollution sources or coastal currents/upwelling. As a result, none of these data could be used for purposes of the WQA.

For data on parameters where we do not have a numeric criteria (air temperature, alkalinity, barometric pressure, carbon dioxide, salinity), we follow our narrative listing process to evaluate impairment status of designated uses. To demonstrate designated use impairment based on narrative criteria, data and information must demonstrate a direct link between the environmental alteration in the waterbody and the degradation of a designated use. Submittals should include the following information:

- documentation of persistent deleterious, chemical, or physical alterations of an AU, and
- documentation of degradation of a designated use in the same AU, and

- documentation or supporting scientific evidence that directly links the deleterious, chemical, or physical alterations as the cause of the designated use degradation in the same AU.

While the data submitter requests Ecology to “analyze the enclosed and all other readily available data to identify and list ocean acidification-impaired waters under section 303(d) of the Clean Water Act”, no information was provided with the raw data to evaluate the degradation status of a designated use or connect how the levels of the data provided are related to any designated use degradation. The lack of clear context for the purpose of these data are an additional reason they were not utilized in the WQA.

Table 11. Summary of data submitted by Center of Biological Diversity.

Location ID	Latitude	Longitude	Parameters	Date Range	Original Data Collector	Data Concerns
ooi-ce06issm-rid16-06-phsend000	47.1345	-124.2709	pH, salinity	10/7/14 – 12/30/21	Ocean Observatories Initiative	Missing sample methods Missing units Missing data qualifiers
ooi-ce06issm-mfd35-06-phsend000	47.1345	-124.2709	pH, salinity	10/4/14 – 12/2/21	Ocean Observatories Initiative	Missing sample methods Missing sampling instrument Missing units Missing data qualifiers
ooi-ce09ossm-rid26-06-phsend000	46.8537	-124.9594	pH, salinity	4/9/15 – 12/30/21	Ocean Observatories Initiative	Missing sample methods Missing units Missing data qualifiers
ooi-ce09ossm-mfd35-06-phsend000	46.8537	-124.9594	pH, salinity	4/9/15 – 9/14/21	Ocean Observatories Initiative	Missing sample methods Missing sampling instrument Missing units Missing data qualifiers
ooi-ce07shsm-rid26-06-phsend000	46.9865	-124.5692	pH, salinity	4/5/15 – 12/30/21	Ocean Observatories Initiative	Missing sample methods Missing units Missing data qualifiers
ooi-ce07shsm-mfd35-06-phsend000	46.9865	-124.5692	pH, salinity	4/5/15 – 12/30/21	Ocean Observatories Initiative	Missing sample methods Missing sampling instrument Missing units Missing data qualifiers
PSI_Baycenter	46.629	-123.9516	alkalinity, carbon dioxide	6/13/19	Pacific Coast Shellfish Growers Association	Missing parameter names Missing units

Location ID	Latitude	Longitude	Parameters	Date Range	Original Data Collector	Data Concerns
TAF_Dabobbay	47.8199	-122.8215	alkalinity, carbon dioxide, pH, salinity, water temperature	10/24/19	Pacific Coast Shellfish Growers Association	Missing parameter names Missing units
DOCKTON	47.37611	-122.45722	Air temperature, barometric pressure, dissolved oxygen concentration, dissolved oxygen saturation, pH, salinity, water temperature	1/1/12 – 1/1/22	King County	Missing sample methods Missing units Missing data qualifiers
POINT_WILLIAMS	47.53716	-122.40612	Air temperature, dissolved oxygen concentration, dissolved oxygen saturation, pH, salinity, water temperature	7/30/12 – 1/1/22	King County	Missing sample methods Missing units Missing data qualifiers
QUARTER_MASTER_YC	47.39394	-122.4635	dissolved oxygen concentration, dissolved oxygen saturation, pH, salinity, water temperature	1/1/12 – 1/1/22	King County	Missing sample methods Missing units Missing data qualifiers

Location ID	Latitude	Longitude	Parameters	Date Range	Original Data Collector	Data Concerns
SEATTLE_AQUARIUM	47.60786	-122.3436	dissolved oxygen concentration, dissolved oxygen saturation, pH, salinity, water temperature	1/1/12 – 1/1/22	King County	Missing sample methods Missing units Missing data qualifiers

List of monitoring stations

CBD provided a list of 20 monitoring stations with ocean-acidification related data for consideration in the water quality assessment and information on where to find quality assurance information associated with the data. We considered and evaluated any relevant data, and related quality assurance documentation, at these stations for consideration in the WQA under both our numeric and narrative assessment pathways.

For data to be considered, the data must meet our data credibility policy requirements and must have been collected within Washington's Waters of the State or contain information to support the location is representative of Washington's Waters of the State.

Without any information related to designated use impairment within these datasets, we were unable to utilize our narrative criteria assessment process. Therefore, we were only able to evaluate any ocean acidification related parameters for which we have numeric water quality standards. The only parameter in our water quality standards with numeric criteria related to ocean acidification is pH. As a result, any information in the following sub-sections describing data at the locations refers to pH data. For each monitoring location and dataset, we attempted to retrieve and review all related readily available quality assurance documentation.

The subsections below summarize all monitoring stations provided within the letter by the database the data reside in, as well as our evaluation of the data. We've provided the specific stations at the beginning of each subsection and our response immediately below the location information.

Integrated Ocean Observing System (IOOS)[24]

- **Coastal Endurance: Washington Inshore Surface Mooring: Near Surface Instrument Frame: Seawater pH, Ocean Observatories Initiative (OOI)**
  a. 47.1345, -124.2709
  b. 46.8537, -124.9594
  c. 46.9865, -124.5692
- **Coastal Endurance: Washington Inshore Surface Mooring: Seafloor Multi-Function Node (MFN): Seawater pH, Ocean Observatories Initiative (OOI)**
  d. 47.1345, -124.2709
  e. 46.8537, -124.9594
  f. 46.9865, -124.5692

No action. None of the six monitoring locations are located within Washington State waters. Ecology's authority to make water quality determinations for purposes of the Water Quality Assessment is limited to Waters of the State, which extends three miles off the Pacific Coast shoreline, as consistent with the provisions in the federal Clean Water Act Section 502. The submitted monitoring locations ranged from 4 to 40 miles off the Pacific Coast shoreline, outside Washington's jurisdiction for Clean Water Act actions. Our Credible Data Act requires that data used for the WQA is representative of the conditions of the waterbody where we are

[24] https://ioos.noaa.gov/

making a water quality determination. This is to ensure that we are accurately characterizing ambient water quality conditions when we are making regulatory determinations under the Clean Water Act. For Ecology to use these data, we would need to have data or information to support that aquatic life conditions 4 miles or more offshore are representative to those nearshore Waters of the State.

National Estuary Research Reserve System[25]

- **Ploeg Channel (pdbbpwq), Padilla Bay Reserve, NERRS, 48.5563, -122.5309**
- **Bayview Channel (pdbbywq), Padilla Bay Reserve, NERRS, 48.4961, -122.5021**

No action. We have concerns that these data do not meet our Credible Data Act requirements. The metadata associated with both sites detailed that the monitoring stations consistently collect large mats of kelp and algae around the sonde housing structures and that pH measurements may be affected. While the metadata documents that erroneous data associated with these occurrences is noted within the datasets, it also notes that all data associated with the same probe deployments as these erroneous data should be interpreted with caution. We also found instances in the metadata indicating that some subsets of the data may not be rejected or marked suspect due to fouling or drift but that only the "obviously impacted" results were marked. This makes it hard for the data consumer to decipher which records may be subject to sensor fouling and drift. Additionally, we found pH records with data qualifiers indicating that metadata documents should be referenced for more information on the data quality level, but we were not able to find information regarding these data points within the metadata document. In some cases, the metadata denoted that specific records should be qualified due to a data quality concern; however, the noted records were not qualified. For these reasons, we did not have confidence that these datasets meet our data credibility policy.

IOOS Partners Across Coasts Ocean Acidification (IPACOA)[26]

- **UW/NANOOS Moored Buoy near La Push, APL-UW, IPACOA, 47.9627, -124.958 (La Push)**
- **NCDC Optimum Interpolation SST, NOAA-NCDC, IPACOA, 46.1, -129.5 (NCDC)**
- **NDBC 46041 - Cape Elizabeth - 45NM NW of Aberdeen, NDBC, IPACOA, 47.353, -124.731 (Cape Elizabeth)**

No action. All monitoring locations are well outside Washington State waters. The La Push monitoring location is 13 miles offshore of the Pacific Coast. The NCDC monitoring location is over 260 miles offshore. The Cape Elizabeth monitoring location is 19 miles offshore. See response to IOOS monitoring locations for more information on Washington's jurisdictional authority for the Water Quality Assessment.

- **Profiling Buoy at Dabob Bay - Hood Canal, ORCA-UW, IPACOA, 47.8034, -122.8029**
- **Profiling Buoy at Twanoh - Hood Canal, ORCA-UW, IPACOA, 47.375, -123.0083**

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[25] https://coast.noaa.gov/nerrs/
[26] http://www.ipacoa.org/

No action. These monitoring locations contained no surface water quality pH data in the IPACOA database.

- **PCSGA - Bay Center Port mooring, Willapa Bay, PSI, IPACOA,46.629, -123.9516**
- **Penn Cove Shellfish, Coupeville - Whidbey Island, PennCoveShellfish, IPACOA, 48.2191, -122.7048**

No action. The data exports from the IPACOA database as of December 15, 2023 contained no pH data within them.

- **PCSGA - Taylor Shellfish Hatchery intakes, Dabob Bay, TaylorShellfish, IPACOA, 47.8199, -122.8215**

No action. This monitoring station contained 24 pH records collected on October 24, 2019. However, none of the records were accompanied with quality control flags, which is a core component of IOOS Quality Assurance Quality Control Real Time Oceanic Data (QARTOD) manual for quality control and assurance of real-time pH data observations[27]. Without this information, the level of data quality is unclear.

King County Puget Sound Marine Monitoring[28]

- **Dockton Park, King County, 47.37611, -122.45722**
- **Point Williams, King County, 47.53716, -122.40612**
- **Quarter Master Yacht Club, King County, 47.39394, -122.4635**
- **Seattle Aquarium Mooring - Elliott Bay, King County, 47.60786, -122.3436**

No action. The data at these marine mooring stations were not collected under a quality assurance project plan, standard operating procedure, sampling and analysis plan, or equivalent monitoring plan document. Our Water Quality Assessment Credible Data Policy requires that all data must be collected under such a project plan, in order to comply with our Credible Data Act and to ensure collection of credible data through standardized quality assurance procedures.

List of studies and publications

CBD provided a list of nine research studies, publications, and data packages for consideration in the WQA. We considered and evaluated the studies and publications under the narrative assessment pathway and the data packages for the numeric assessment pathway. Below we have provided a citation of the study, a general overview of the study objective and findings, as well as the determination of our narrative assessment.

[27] https://cdn.ioos.noaa.gov/media/2019/08/pHfinal_8_15_19b.pdf
[28] https://green2.kingcounty.gov/marine/

A compiled data product of profile, discrete biogeochemical measurements from 35 individual cruise data sets collected from a variety of ships in the southern Salish Sea and northern California Current System (Washington state marine waters) from 2008-02-04 to 2018-10-19.[29]

Summary

This data package contains data from 35 cruises in Salish Sea waters collected between 2008 to 2018 in partnership between the University of Washington and National Ocean and Atmospheric Administration. The parameters collected include hydrostatic pressure, water temperature, salinity, potential density anomaly, variations of dissolved oxygen measurements, total alkalinity, dissolved inorganic carbon, nitrate, nitrite, ammonium, phosphate, and silicate.

Determination

No action. Without any information related to designated use impairment related to these datasets, we were unable to utilize our narrative criteria assessment process to evaluate this data. Therefore, we were only able to evaluate any ocean acidification related parameters for which we have numeric water quality standards. The only parameter in our water quality standards with numeric criteria related to ocean acidification is pH. This dataset contains no pH records.

Pelagic calcifiers face increased mortality and habitat loss with warming and ocean acidification.[30]

Summary

This study evaluates how temperature and aragonite saturation impact *Limacina helicina,* a calcifier pteropod which is an indicator species for ocean change in the California Current Ecosystem (CCE). The study found that mortality of these pteropods in the CCE is expected to increase under ocean warming and acidification conditions, pteropods in the CCE are currently living close to their thermal maximum, and additional warming and acidification is expected to reduce their habitat suitability.

Determination

No action. The data supporting the study findings were all collected outside of Washington's jurisdiction for Clean Water Act actions. Data were collected either in other states or well-off Washington's Pacific Coast shoreline. There is no information to suggest these findings are relevant to marine or estuarine waters in Washington state, which are physically, chemically, hydrologically, and biologically distinct from the California Current Ecosystem.

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[29] https://www.ncei.noaa.gov/access/ocean-carbon-data-system/oceans/SalishCruise_DataPackage.html
[30] https://esajournals.onlinelibrary.wiley.com/doi/10.1002/eap.2674

Severe biological effects under present-day estuarine acidification in the seasonally variable Salish Sea. [31]

Summary

This study evaluates using physical, biogeochemical, and biological data collected in Puget Sound to evaluate pteropod *Limacina helicina*'s response to ocean acidification with other stressors. The study found that low aragonite saturation state influenced shell dissolution in Puget Sound from 2014-2016 and that seasonally variable estuaries may have more acidified conditions than coastal or open-ocean environments. But the study authors note that ocean acidification sensitive organisms, such as pteropods, still persist potentially due to offsets in other environmental factors and survival mechanisms.

Determination

No action. Ecology recognizes the relationships between aragonite saturation and pteropod shell dissolution as documented in this study and the broader scientific community. However, there are no reference conditions or sites with which to compare the pteropod dissolution results from this study. Without reference conditions, it is unclear whether or not these pteropod conditions represent the natural conditions of pteropods in Washington's waters. These types of data could likely be utilized in future WQAs, if paired with a robust statistical analysis including reference sites, which could then be used to document clear impacts to aquatic life uses in Washington waters.

Integrated Assessment of Ocean Acidification Risks to Pteropods in the Northern High Latitudes: Regional Comparison of Exposure, Sensitivity and Adaptive Capacity [32]

Summary

This study evaluates pteropod risk, exposure, and sensitivity to ocean acidification in the Gulf of Alaska, Bering Sea, and Amundsen Gulf using a combination of physical, chemical, and biological field data and model outputs. The study found shell morphometric characteristics are related to omega saturation state, and pteropod populations are at a high risk under ocean acidification conditions in the higher latitude North Pacific.

Determination

No action. The data supporting the study findings were all collected outside of Washington's jurisdiction for Clean Water Act actions. Data were collected either in the Bering Strait or offshore of Alaska and northern Canada. Additionally, the findings within the study are framed as relevant to high-latitude, polar/subpolar waters. There is no information to suggest these findings are relevant to marine or estuarine waters in Washington state, which are physically, chemically, hydrologically, and biologically distinct from these subpolar systems.

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[31] https://linkinghub.elsevier.com/retrieve/pii/S0048969720362185
[32] https://ftp.sccwrp.org/pub/download/DOCUMENTS/JournalArticles/1230_AcidificationRisksPteropods.pdf

Synthesis of Thresholds of Ocean Acidification Impacts on Echinoderms [33]

Summary

This study analyzed environmental monitoring data and previously published literature to develop pH thresholds at which echinoderms demonstrate negative behavioral, physiological, or growth responses. The study focused primarily on the California Current Ecosystem (CCE). The authors propose these thresholds provide a foundation for consistent interpretation of OA monitoring data or numerical model simulations.

Determination

No action. The study aggregates data and research findings from the CCE, which extends well outside of Washington's jurisdictional waters. The study also includes several species outside of the CCE. It is unclear how the broader findings of this study can be used to determine health of aquatic life uses within Washington Waters of the State. Additionally, the study focused on developing pH thresholds for echinoderm responses. Ecology currently utilizes our EPA approved pH criteria in our WQA for evaluating aquatic life uses, which was approved as protective of aquatic life uses in Washington's waters.

Synthesis of Thresholds of Ocean Acidification Impacts on Decapods [34]

Summary

This study analyzed environmental monitoring data and previously published literature to develop pH thresholds at which decapods demonstrate negative behavioral, physiological, or growth responses. The study utilized data from a variety of geographic regions, including tropics, polar, and upwelling, and of different depths, from intertidal. The authors propose these thresholds provide a foundation for consistent interpretation of OA monitoring data or numerical model simulations.

Determination

No action. The study aggregates data and research findings from several waterbodies and taxa outside of Washington Waters of the State. It is unclear how the broader findings of this study can be used to determine health of aquatic life uses within Washington Waters of the State. Additionally, the study focused on developing pH thresholds based on decapod responses. Ecology currently utilizes our EPA approved pH criteria in our WQA for evaluating aquatic life uses, which was approved as protective of aquatic life uses in Washington's waters.

[33] https://ftp.sccwrp.org/pub/download/DOCUMENTS/JournalArticles/1201_EchinodermsSynthesis.pdf
[34] https://ftp.sccwrp.org/pub/download/DOCUMENTS/JournalArticles/1235_DecapodsThresholds.pdf

Puget Sound Marine Waters: 2020 Overview [35]

Summary

The objective of this report is to collate and distribute the valuable physical, chemical, and biological information obtained from various marine monitoring and observing programs in Puget Sound. The report provides an overview of water quality data to summarize the general conditions of Puget Sound in 2020.

Determination

No action. The report provides a comprehensive overview of all the data collected in Puget Sound and provides high-level status and trends of some environmental parameters, but it is unclear what information within the report is relevant to determining the health of designated uses within specific Washington Waters of the State.

Pteropods make thinner shells in the upwelling region of the California Current Ecosystem[36]

Summary

This study evaluates *Limacina helicina* pteropod shell calcification within the California Current Ecosystem in relation to carbonate chemistry, dissolved oxygen and water temperature. The study found that shell thickness declined in pteropods along the upwelling gradient from offshore to near-shore waters. The authors propose that pteropods resort to building thinner shells, rather than shell dissolution, in the colder and more acidified upwelling waters.

Determination

No action. The data supporting the study findings were all collected outside of Washington's jurisdiction for Clean Water Act actions. All data collected under this study and its findings are relevant to the California Current Ecosystem. There is no information to suggest these findings are relevant to marine or estuarine waters in Washington state, which are physically, chemically, hydrologically, and biologically distinct from the California Current Ecosystem.

Integrating High-Resolution Coastal Acidification Monitoring Data Across Seven United States Estuaries[37]

Summary

This study characterized high-frequency coastal acidification monitoring data across Barnegat Bay, Casco Bay, Santa Monica Bay, San Francisco Bay, Tampa Bay, and Mission-Aransas Estuary in the United States. The study found extreme variability in pCO2 across the United States and

[35] https://www.pmel.noaa.gov/public/pmel/publications-search/search_abstract.php?fmContributionNum=5267
[36] https://www.nature.com/articles/s41598-021-81131-9
[37] https://www.frontiersin.org/articles/10.3389/fmars.2021.679913/full

an inverse relationship between pCO2 and water temperature across all waterbodies. The study also had several regional/waterbody specific findings.

Determination

No action. The data supporting the study findings were all collected outside of Washington's jurisdiction for Clean Water Act actions. There is no information to suggest these findings are relevant to marine or estuarine waters in Washington state, which are physically, chemically, hydrologically, and biologically distinct from Oregon, California, and other state waters. Additionally, the study presented no information on how the results of the ocean acidification related parameters (particularly pH or pCO_2) related to designated uses within the waters they were collected.

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TMDL and Advance Restoration Plan (ARP) Projects

303(d) List TMDL Prioritization

Water Quality Assessment Policy 1-11, Chapter 1[38] identifies the criteria Ecology uses to prioritize TMDL work. Those criteria are:

- Severity of the pollution problem
- Risks to public health
- Risks to threatened and endangered species
- Vulnerability of waterbodies to degradation
- Waterbodies where a new or more stringent permit limit is needed for point sources
- Local support and interest in a watershed
- Environmental Justice considerations

Prioritization of TMDLs is led by Ecology's regional offices. Each regional office looks at the Category 5 listings in their region, groups them into potential projects, and identifies priorities. Ecology uses several different processes to prioritize our water clean-up work, receive input on our priorities and allocate resources:

- **Annual Public Prioritization Webinar** - Regular opportunity for the public to provide feedback on TMDL priorities. Ecology shares any new potential projects that we are considering starting in the next 1-2 years.
- **Workload Assessment** - Ecology completes a TMDL workload assessment each time a 303(d) list is completed. This provides an opportunity for Ecology to look at all the new and existing Category 5 listings in the state and estimate potential future water cleanup projects.
- **Priority Ranking for TMDL Development (33 U.S.C. 1313(d)(1)(A); 40 CFR 130.7(b)(4))** - Required as part of a CWA 303(d) list, must include all listed water quality-limited segments still requiring TMDLs, and identify the impaired waters targeted for TMDL development in the next two years.

Annual Public Prioritization Webinar and Comment Period

Each year in the fall, Ecology holds a public TMDL prioritization webinar to solicit feedback from the public on our proposed water cleanup work. At the public webinar Ecology shares where we are currently developing water cleanup plans, provides updates on ongoing work, and presents information on and receives feedback on any new potential TMDL projects that we are considering starting in the next 1-2 years. This provides opportunities for communities and partners to help us as we establish and carry out our water cleanup priorities. A public comment period for TMDL priorities is then held after the webinar. Ecology uses the feedback received to make decisions on future TMDL work.

[38] https://apps.ecology.wa.gov/publications/SummaryPages/1810035.html

After the public webinar and comment period any proposals to start new water cleanup projects goes to Ecology's Water Quality Program management team who decide whether or not these priorities will move forward during the next year. Once approval to start a new TMDL is given by the Water Quality Program management team, Ecology's Environmental Assessment Program then looks at their available science resources and determines whether or not they have the capacity to proceed with proposed new TMDL projects. Once we have scientific resources dedicated and assigned to a TMDL project then that project becomes a high or medium priority.

Workload Assessment

After every Water Quality Assessment is completed, Ecology does a workload assessment. This is a formal way for Ecology to evaluate 303(d) list trends, document TMDL program process improvements, and estimate potential future water cleanup projects. See past workload assessment reports below:

- 2001 Final Statewide 303(d) Workload Assessment[39]
- 2006 TMDL Workload Assessment[40]
- 2016 TMDL Workload Assessment[41]
- 2021 TMDL Workload Assessment[42]

For the last workload assessment each region developed workload projection estimates for the new Category 5 list of impaired waters. Regions went through a process that included:

1. Grouping Category 5 listings by watershed and/or waterbody and pollutants or pollutant group,
2. Determining the relative priority by considering existing resources and the Policy 1-11 factors,
3. Assigning watershed/pollutant groups an appropriate type of water cleanup plan to most effectively and efficiently work towards clean water (e.g., TMDL, STI/Advance Restoration Project or other), as well as a hypothetical project name.
4. Assigning identified projects a priority (high, medium, or low) or ranking order, for starting the water cleanup plan.

Ecology will complete a workload assessment after the 2022 Water Quality Assessment is approved by EPA.

[39] https://apps.ecology.wa.gov/publications/documents/0103018.pdf
[40] https://apps.ecology.wa.gov/publications/documents/0610092.pdf
[41] https://apps.ecology.wa.gov/publications/documents/1710021.pdf
[42] https://apps.ecology.wa.gov/publications/documents/2310026.pdf

Priority Ranking for TMDL Development (33 U.S.C. 1313(d)(1)(A); 40 CFR 130.7(b)(4))

Category 5 waters are assigned either a “high”, “medium”, or “low” ranking, based on their TMDL prioritization status.

The Department of Ecology has identified the following TMDLs as **high priority** because we have committed resources to their development, and anticipate they will be completed in the next two years:

- Drayton Harbor Bacteria TMDL
- Soos Creek Fine Sediment TMDL
- Wide Hollow Creek Temperature TMDL

The Department of Ecology has identified the following TMDLs as **medium priority** because we have committed resources to their development but expect completion beyond the first TMDL Vision Metric Period (Reporting Period 1: 10/1/24-9/30/26):

- Soos Creek Multiparameter (Temperature, Dissolved Oxygen, Bacteria) TMDL
- Pataha Creek Multiparameter (Temperature, Dissolved Oxygen, Bacteria, pH) TMDL
- French Creek Temperature and Dissolved Oxygen TMDL

All other Category 5 listings are identified as **low priority**.

For some of the listings assigned as low priority for TMDL development the agency has prioritized and is committing resources to develop advance restoration plans (ARPs) including straight to implementation (STI) projects. These projects include:

- Puget Sound Nutrient Source Reduction Project
- Burnt Bridge Creek Advance Restoration Plan (ARP)
- Lacamas Creek Advance Restoration Plan (ARP)
- Hangman Creek Watershed DO/pH Advance Restoration Plan (ARP)
- White Salmon Bacteria Advance Restoration Plan (ARP)
- Hawk Creek STI
- Upper Colville STI
- Alkali Flat Creek STI
- Almota and Little Almota Creek STI
- Bonaparte Creek STI
- Spring Flat Creek STI

In addition, the Department of Ecology relies on the work of the State Forest and Fish Program for implementing best management practices on forest land. For that reason, waterbodies covered under the State Forest and Fish program are prioritized as low for the development of TMDLs.

Under state law, landowners must conduct forest practice activities in a manner that supports the attainment of water quality standards. In 2000, Washington adopted revised forest practices rules that identify stream buffers and other management prescriptions expected to meet water quality standards. The state Forest Practices Board tests the forestry rules through a formal adaptive management program, which has the goal of identifying and expediently revising any forestry rules that do not support the attainment of water quality standards. Washington established the Clean Water Act Assurances as a formal agreement in the 1999 Forests and Fish Report in recognition of the improvements to the rules and commitments made. Under the Clean Water Act Assurances, TMDL development is a low priority in watersheds where forestry is the primary land use, although Ecology may assign a higher TMDL development priority to forested watersheds with a broader mixture of land uses. Ecology's agreement to rely on the forest practices rules in lieu of developing separate TMDL load allocations or implementation requirements is conditioned upon maintaining an effective adaptive management program.

Ecology actively participates in the adaptive management program and monitors its effectiveness by evaluating progress towards achieving a series of water quality related milestones. Additionally, Ecology periodically evaluates compliance with individual stipulations contained within the Clean Water Act Assurances, in order to determine if a continuation of the Assurances remains warranted. In addition to participation in the Adaptive Management Program, Ecology conducts field reviews of Forest Practices activities.

TMDL Projects

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Alternative Pollution Control Projects 4B Analyses

The following 4B analyses apply RCW 34.05.272 data source categories 2 and 9.

Kitsap County 4B Analysis – June 2024

The Washington State Department of Ecology (Ecology) Integrated Report (IR) proposes to exclude the following listings for fecal coliform from the 303(d) list and place these water bodies in Category 4B. Ecology's basis for excluding these waterbodies from the 303(d) list is outlined in this evaluation.

- Listings moving from Category 5 to 4B: 36192, 38520, 38722, 38783, 40012, 40015, 40107, 40133, 45271, 74211, 74668, 74719, 88278
- Listings moving from Category 1 to 4B: 7637, 7651, 10389, 38460
- Listings staying in 4B: 7636, 7640, 7641, 7643, 7645, 7646, 7647,10370, 10371,10375, 10376, 23695, 36197, 38524, 38667, 38816, 38833, 38863, 43034, 52902, 53091, 53094, 53095, 53097, 53101, 53108, 53109, 53116, 53117, 60190, 74656, 74665, 74678, 74792, 86861

Kitsap County segments proposed for Category 1 that were previously in Category 4B include:

- 7633 - East Fork Dogfish Creek
- 7652 - Martha-John Creek
- 38432 - Big Anderson Creek
- 38528 - Dewatto River
- 53096 - Royal Valley Creek
- 53106 - Cowling Creek
- 74639 - Steele (Crouch) Creek

Kitsap County segments proposed for Category 1 that were previously in Category 5 but are covered by the 4B plan:

- 38814 - Stavis Creek
- 45119 - Dyes Inlet and Port Washington Narrow

The following segments that were previously moved to Category 1 under this program have continued to meet standards and will stay in Category 1:

- 38616 - Gorst Creek

Identification of Segment and Statement of Problem Causing Impairment

These creeks are located in various parts of Kitsap County. The fecal coliform pollution in these streams was identified by Kitsap County through its on-going monitoring program. The primary sources of bacteria pollution in Kitsap County are:

- Failing septic and sewer systems
- Faulty stormwater systems
- Pet and livestock waste
- Runoff from farms

Description of Pollution Controls and How They Will Achieve Water Quality Standards

In the early 1990s, Kitsap County agencies faced several difficult issues:

- The Public Health District sought more permanent funding to deal with shellfish closures, failing septic systems, and other water quality problems.
- The Department of Public Works needed to develop a stormwater management program in response to the U.S. Environmental Protection Agency's National Pollutant Discharge Elimination System Permit Program.
- The conservation district needed to respond to 1989 legislative approval to seek a fee to fund programs for landowner assistance.
- The Department of Community Development sought more permanent funding for state mandated watershed planning efforts.

A group of County Managers and Commissioners with a long-range vision for water quality began working together to design a coordinated interagency partnership to meet multiple needs in the county. In October 1993, after two years of planning and public process, the Kitsap County Board of Commissioners adopted Ordinance 156-1993, establishing the Kitsap County Surface and Stormwater Management Program (KCSSWM), now renamed Clean Water Kitsap (CWK). The goals of the program are to:

- Protect public health and natural resources.
- Minimize institutional costs.
- Meet state and federal regulatory requirements.
- Provide a permanent funding source to address nonpoint source pollution.

Kitsap Public Health is the primary agency responsible for monitoring, identifying, and prioritizing nonpoint fecal pollution correction programs in Kitsap County. In response to the fecal pollution problem, Kitsap Public Health developed a Pollution Identification and Correction (PIC) program and an Onsite Sewage System (OSS) Monitoring and Maintenance program. The PIC program receives a significant portion of its funding from the Clean Water Kitsap Program. CWK fees are assessed on properties in the unincorporated area of Kitsap County. Fees appear on annual property tax billings.

Kitsap Public Health's PIC program and OSS Monitoring and Maintenance program utilize existing local regulations and authority to address bacterial pollution sources and enforce corrections when necessary. These programs incorporate a strong educational element to prevent future fecal pollution.

The Kitsap Public Health District has monitored major streams and marine waters for fecal coliform on a routine basis since 1996. This extensive monitoring program has resulted in the listing of many Kitsap County marine and freshwater bodies for fecal coliform pollution on Washington State's 303(d) List of impaired or threatened waters. During the 2023 water year, 66 streams were monitored for pollution and 3,159 water samples were collected at least monthly.

Fewer samples may be collected at a monitoring station due to lack of flow during the dry season, hazardous weather conditions, equipment failures, or other circumstances.

The PIC Program uses water quality monitoring data to identify priority water bodies for clean-up. The primary focus of the monitoring program is to assess long-term pollution trends associated with human sewage and animal waste from nonpoint sources. Health District staff continue sampling water quality monthly on 66 streams. E. coli samples are analyzed by an Ecology accredited laboratory. Data are used to identify areas in need of pollution control and to evaluate the effectiveness of the correction program.

Clean up projects are designed to address the causes and sources of bacterial water pollution in specific geographic areas that the trend monitoring program has identified. CWK provides funding for PIC projects. The goal of each PIC project is to:

- Protect public health.
- Protect shellfish resources.
- Preserve, protect, and restore surface water quality.

The best management practices (BMPs) being used to improve water quality include a requirement to properly operate and maintain on-site systems in the watershed. Kitsap Public Health District is actively engaged in on-site system education, dye testing of suspect systems, and enforcement of the Kitsap County Board of Health Ordinance 2008A-01, On-Site Sewage System and General Sewage Sanitation Regulations, which requires proper design, installation, repair, operation and maintenance of on-site septic systems. In addition, the Kitsap Conservation District assists small farm owners and owners of livestock to implement BMPs for animal waste management and farm pollution control. The conservation district's role is as a non-regulatory agency. When a regulatory approach is needed, the Health District enforces the Solid Waste Regulations (KCBOH 2010-1).

Several enforceable pollution controls will assure that compliance with water quality standards is achieved.

- Kitsap County Ordinance 156-1993, establishing the Surface and Stormwater Management Program, which created an on-going, stable source of funding.
- Kitsap County Board of Health Ordinance 2008A-01, On-Site Sewage System and General Sewage Sanitation Regulations, which requires proper design, installation, repair, operation and maintenance of on-site septic systems.
- Kitsap County Board of Health Ordinance 2010-1, Solid Waste Regulations, which regulate handling and disposal of animal manure and pet waste; animal waste violations are enforced by the Health District under this ordinance.
- RCW 90.72, Shellfish Protection Districts.

Recent implementation activities include the following:

- From 2020-present Ecology's Water Quality Combined Funding program has funded 145 OSS repair/replacement projects in Kitsap County through the OSS Regional Loan Program.
- From 2020-mid 2024, the Health District's PIC program has performed the following activities: Conducted 1379 property surveys (educational visits and survey for bacteria sources), responded to 733 deficient septic pumping reports, and responded to 673 complaints about sewage or agricultural waste.
- From 2020-mid 2024, conducted 14 public workshops regarding septic maintenance and water quality issues.

Estimate or Projection of Time When Water Quality Standards Will be Met

All waters in Kitsap County are subject to one of the following standards for bacteria. The county-wide monitoring program compares monitoring data with the appropriate standard to determine whether the water body is on an improving trend and whether it has achieved compliance with standards.

Primary Contact Recreation Bacteria Criteria in Fresh Water

In 2021, the new E. coli freshwater standard was adopted for freshwater standards. The criteria are explained below.

Table 12. E. coli criteria for primary contact recreation bacteria criteria in fresh water

Bacterial Indicator	Criteria
E. Coli	E. coli organism levels within an averaging period must not exceed a geometric mean value of 100 CFU or MPN per 100 mL, with not more than 10 percent of all samples (or any single sample when less than ten sample points exist) obtained within the averaging period exceeding 320 CFU or MPN per 100 mL.

Marine

Table 13. Fecal coliform criteria for shellfish harvesting

Bacterial Indicator	Criteria
Fecal Coliform bacteria	Fecal coliform organism levels are used to protect shellfish harvesting. Criteria are ex-pressed as colony forming units (CFU) or most probable number (MPN). Fecal coliform must not exceed a geometric mean value of 14 CFU or MPN per 100 mL, and not have more than 10 percent of all samples (or any single sample when less than ten sample points exist) obtained for calculating the geometric mean value exceeding 43 CFU or MPN per 100 mL.

Many listings addressed by the Kitsap County PIC Program have changed over time. While many have remained in Category 4B, several have transitioned to Category 1 (meets tested standards for clean water). Last assessment cycle, five 4B listings moved into Category 1. This cycle, four of those listings returned to Category 4B, while the remaining listing (38616) is still demonstrating it is meeting tested standards for bacteria impairment and will remain in Category 1 for this assessment cycle. Seven 4B listings from the 2018 assessment are now demonstrating that they are meeting tested standards and therefore are being proposed for Category 1 this assessment cycle. Two Category 5 listings from the previous assessment are proposed for Category 1 this assessment cycle for a total of nine listings being proposed to move to Category 1. As stated above, bacteria pollution by nature is variable and so we expect a potential for some listings to return to Category 4B but the increasing number of listings proposed for Category 1 is a testament to the ongoing work in the watershed.

Ecology expects that most of the water bodies covered by Kitsap County’s PIC program will achieve compliance with bacteria standards by 2030. However, it should be noted that bacteria problems are likely to re-occur as septic systems age and properties change hands, so it should not be considered a failing of the PIC program if some waters move into Category 1, and then occasionally move back into Category 4B. In fact, an issue to remember with nonpoint pollution is that it is not the kind of thing that can be fixed just once. Instead, it requires continual vigilance, which is just what the PIC program provides.

Schedule for Implementing Pollution Controls

As described earlier in this report, Kitsap County continues to implement its PIC program and is continuing periodic monitoring, identifying problems, and fixing them. This is an on-going program, exactly what's needed to solve nonpoint pollution problems and to keep them from happening again. As of 2024, the Kitsap County PIC Program has continued stable funding to keep the program active and effective in identifying and addressing bacteria pollution sources.

Monitoring Plan to Track Effectiveness of Pollution Controls

Kitsap County has a countywide monitoring program. Samples are taken monthly and compared to the bacteria standard. WQA results are reported to the public and EPA through Kitsap County's website and through Ecology's IR report development process.

Stream Advisories

The Health District issues public health advisories for streams that have consistent problems with high bacteria levels. Advisories are posted to protect the health of people who might come in contact with stream water. Below is a graphic from Kitsap Public Health showing stream advisories over time.

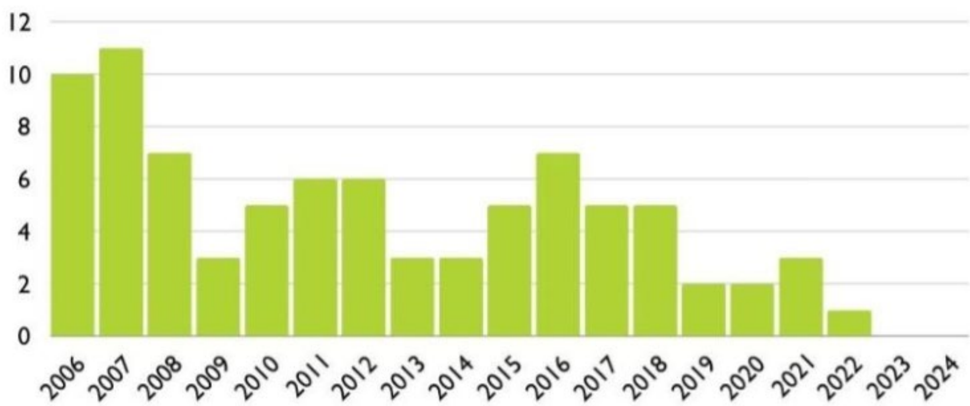

Figure 8. Stream advisories issued by Kitsap Public Health.

The number of stream advisories issued by Kitsap Public Health has gradually declined since 2006. No streams exceeded the advisory threshold based on sampling results for water year 2023 and no public health advisories are in effect for streams in 2024.

Shellfish harvesting

All creek systems in Kitsap County eventually drain into Puget Sound and many flow into shellfish growing areas. By reducing pollution in surface waters, the Kitsap County PIC Program improves water quality in shellfish growing areas. Since the inception of the PIC Program in the mid-1990's, there has been a net increase of more than 5,000 acres of shellfish beds approved for harvest around Kitsap County.

Commitment to Revise Pollution Controls as Necessary

Ecology will continue to work with Kitsap County to ensure that the PIC program continues. We fully expect the program to achieve compliance with bacteria water quality standards throughout the county. However, if it does not, Ecology will work with Kitsap County to determine other controls that could be used to achieve compliance.

Yellowjacket Creek 4B Analysis – June 2024

The Washington Department of Ecology (Ecology) Integrated Report (IR) proposes to keep three listings (19866, 19868, 19869) for temperature on Yellowjacket Creek in Category 4B of the IR. All 3 listings were in Category 4B of the 2018 IR. Ecology's basis for excluding these water bodies from the 303(d) list is outlined in this evaluation.

Identification of Segment and Statement of Problem Causing Impairment

Yellowjacket Creek is one of eight subwatersheds within the Lower Cispus River watershed. The 15.5 mile creek flows northerly from its headwaters at 4,276 feet above mean sea level to its confluence (1,259 feet above mean seal level) with the Cispus River at river mile 17.2. The mean stream gradient is 3.7%, calculated from digitized 7.5 - minute topographic maps.

The below table summarizes the monitoring network for the watershed. Since 2016, several sites were added to the temperature monitoring network:

- Resumed monitoring in Pumice Creek in 2017,
- Resumed monitoring at Pinto Creek at the mouth of Yellowjacket Creek in 2017,
- New site added at Badger Creek at the 2810-041 Road in 2019,
- New site added at Yellowjacket Creek at RM 11 in 2019,
- New site added at Veta Creek at the Yellowjacket confluence at the 28 road in 2019,
- New site added at High Bridge Creek at the 29 road in 2019,
- New site added at Galena Creek in 2019, and
- New site added at Lambert Creek in 2019
- Resumed monitoring and added new sites at Woods Creek tributaries in 2022 and 2023
- New sites added at Yellowjacket Creek Excavated Side Channels East and West in 2021

The Forest Service has continued monitoring at each of the above sites as part of the ongoing commitment to monitor and improve water quality in the Yellowjacket Creek subwatershed. Recent monitoring data was provided to Ecology to demonstrate this commitment has been fulfilled. A Yellowjacket and Camp Creek-Cispus River Subwatershed restoration action plan[43] was signed in March 2022, further demonstrating the commitment to ongoing restoration work in the watershed. The action plan, also known as a WRAP (watershed restoration action plan), identifies and prioritizes 'essential projects' to restore watershed processes to enhance water quality and fish habitat in the Gifford Pichot National Forest, specifically the Yellowjacket and Camp Creek - Cispus River subwatersheds. Restoration efforts will occur through implementation of essential projects including culvert replacements and removals, road

[43]https://fortress.wa.gov/ecy/ezshare/wq/WaterQualityImprovement/Yellowjacket%20Creek_CampCreekCispus_SubwatershedRestorationActionPlan_signed.pdf

hydrologic stabilization or decommissioning, large wood placement, stream restoration and other essential projects. Project types are presented later in this analysis.

Most monitored tributaries of Yellowjacket Creek did not exceed 16°C in the years monitored. Veta Creek had exceedances in 2020, 2021 and 2022 but not in 2023. Pumice Creek exceeded 16°C in two of the thirteen years it was monitored, and McCoy Creek had two exceedances in fourteen years of monitoring. Exceedances in lower Yellowjacket Creek were measured at the confluence of the Cispus River (fifteen of twenty years monitored), and upstream of the McCoy Creek confluence (four of twenty years monitored, none of which occurred in the last five years). Exceedances were not observed in Yellowjacket at river mile 11, although this site has only two years of monitoring data. Two new monitoring locations on Yellowjacket Creek were added in 2021, Yellowjacket Creek Excavated Side Channels East and West. No exceedances were observed in the 3 years of monitoring at both new locations. All sites on the Cispus River continue to have numerous exceedances, likely due to stream morphology. Yellowjacket Creek at the Cispus River confluence had numerous exceedances in the 23 sampled years, this is likely due to the wider stream channels from past land use practices. Monitoring data show that exceedances are most common in broad alluvial channels that have been incised and widened from past and continuing land use practices.

Table 14. Temperature summaries at monitoring sites in Yellowjacket Creek, tributaries, and the Cispus River.

Stream Name	Monitoring Location	Maximum 7-day average temperature in 2020,2023 (°C)	Years monitored	Years temperature exceeded maximum 7-day average of 16 °C (# and years)	Highest maximum 7-day average temperature (°C)
Pumice Creek	At confluence with Pinto Creek	14.0,13.8	13; 2001-2005, 2007, 2009-2010, 2017-2020, 2023	2; 2001, 2009	16.6 (2009)
Pinto Creek	At confluence with Yellowjacket Creek	13.5	5; 2001-2003, 2019-2020	0	15.2 (2001)
Pinto Creek	At 2800-144 Road	n/a	1; 2001	0	12.1 (2001)
Badger Creek	At mouth	n/a	1; 2001	0	12.0 (2001)
Badger Creek	At 2810-041 Road	11.8	1; 2020	0	11.8 (2020)

Stream Name	Monitoring Location	Maximum 7-day average temperature in 2020,2023 (˚C)	Years monitored	Years temperature exceeded maximum 7-day average of 16 ˚C (# and years)	Highest maximum 7-day average temperature (˚C)
Veta Creek	At confluence with Yellowjacket Creek	16.4	5; 2019-2023	3; 2020, 2021, 2022	17.5 (2022)
Galena Creek	Near Yellowjacket Confluence	13.7	2; 2019-2020	0	13.7 (2020)
Lambert Creek	At 29 Road	10.8	2; 2019-2020	0	10.9 (2019)
High Bridge Creek	At 29 Road	12.8	2; 2019-2020	0	12.8 (2020)
McCoy Creek	At Confluence with Yellowjacket Creek	15.1	10; 2001, 2009-2014, 2017-2020	1; 2009	16.6 (2009)
Yellowjacket Creek	Above McCoy Creek	15.3	21; 2001, 2003-2010, 2012-2023	6; 2004, 2006, 2009, 2015, 2022, 2023	17.3 (2015)
Yellowjacket Creek	At confluence with Cispus River	18.3	21; 1996, 1999-2017, 2020-2023	15; 2000-2003, 2005-2007, 2009, 2012-2017, 2020-2023	20.9 (2015)
Yellowjacket Creek	River Mile 11	11.2	2; 2019, 2020	0	11.6 (2019)
Cispus River	Above North Fork Cispus River	13.9	18; 1994, 2000, 2003-2011, 2013-2016, 2018-2020	3; 2005, 2009, 2015	17.1 (2015)
Cispus River	Above Yellowjacket Creek	16.2	9; 2000, 2011-2015, 2017-2018, 2020	6; 2013-2015, 2017-2018, 2020	18.4 (2015)

Stream Name	Monitoring Location	Maximum 7-day average temperature in 2020,2023 (˚C)	Years monitored	Years temperature exceeded maximum 7-day average of 16 ˚C (# and years)	Highest maximum 7-day average temperature (˚C)
Cispus River	Below Greenhorn Creek	17.5	18; 2000, 2003-2005, 2007, 2009-2022	14; 2003- 2005, 2007, 2009-2010, 2012-2015, 2017-2022	20.0 (2015)
Cispus River	Below Iron Creek (at Forest boundary)	17.5	22; 1999-2021	20; 2000-2007, 2009-2010, 2012-2021	19.9 (2015)

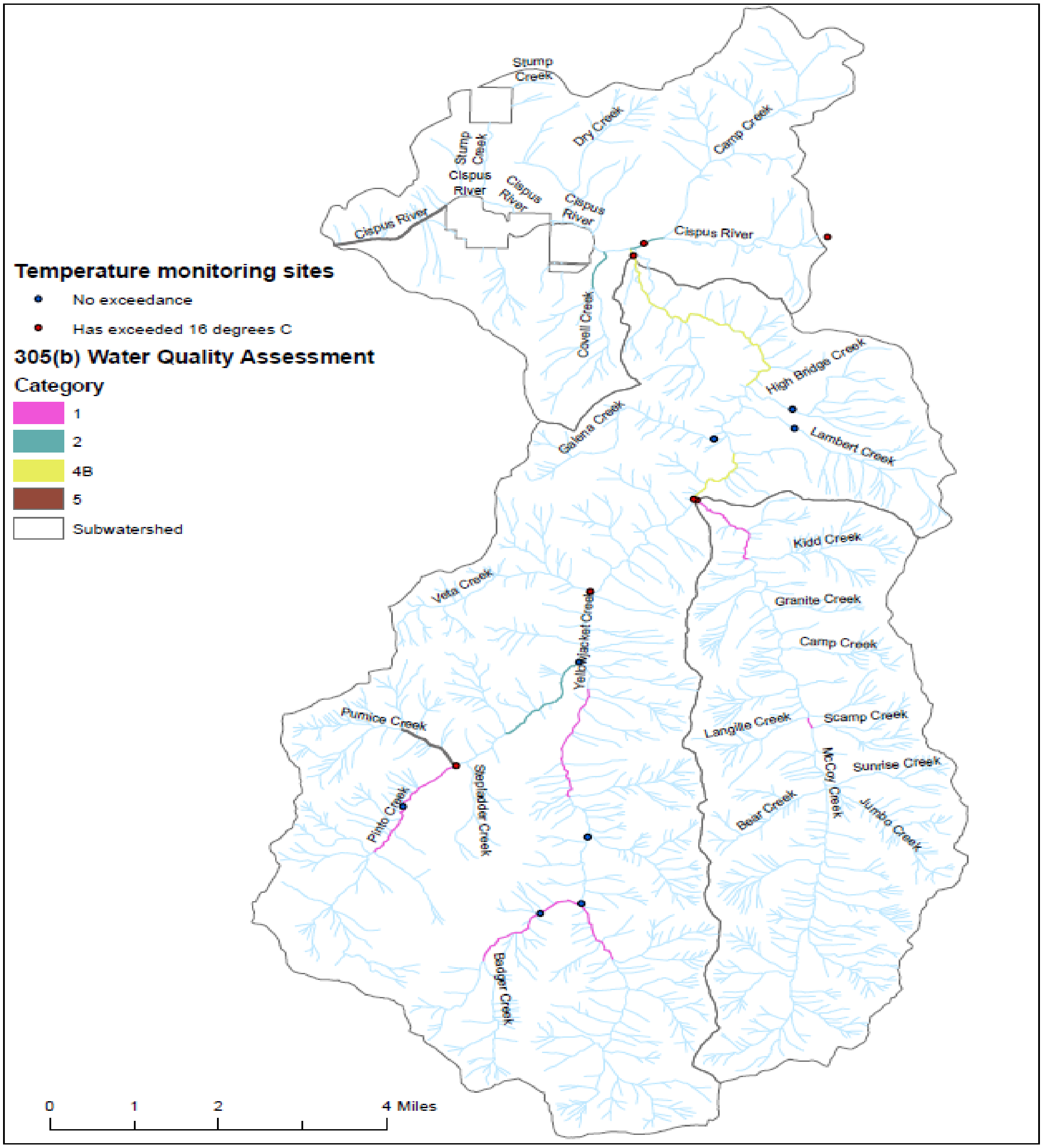

Figure 9. Map of Yellowjacket Creek, McCoy Creek, and Camp Creek-Cispus River subwatersheds, temperature monitoring sites, and 305(b) status.

Description of Pollution Controls and How They Will Achieve Water Quality Standards

The designated use for the temperature impaired segments of Yellowjacket Creek is core summer salmonid habitat, and the temperature criterion is 16 degrees centigrade, year-round. In addition, the segments have a supplemental spawning criterion of 13 degrees centigrade from February 15 to June 15.

Most riparian areas in the watershed will be restored by passive restoration, which means letting the areas recover on their own. This process can take 100 years or more. Currently, there is an active environmental assessment underway for broader forest landscape restoration work that includes a variety of actions including large wood placement and road decommissioning that should benefit the watershed. In addition, the Forest Service has implemented some active riparian restoration projects, which generally involve thinning riparian stands to encourage the remaining trees to grow faster and therefore provide more shade sooner. Stream temperatures in the smaller tributaries in the upper watershed should improve within the next five to ten years as vegetation grows and streambank stability increases (barring any additional natural disturbances or extreme climatic trends). Stream temperatures in the lowest reaches of the Yellowjacket Creek watershed will take longer to show improvement because the stream has widened and shallowed from excessive sediment inputs. In this area, lowered stream temperatures will depend as much on the stream recovering its natural geometry and stability as on restoring riparian shade.

Work that the Forest Service has done and plans to do to address road related sediment problems will also help to solve the temperature impairments in Yellowjacket Creek. The stream has widened and shallowed because of human caused sedimentation, and as roads are repaired, decommissioned, and routinely maintained, the sediment load to streams will decrease.

However, stream recovery takes time even when sediment delivery is decreased. Streams may take a decade or more to move past excessive sediment loads, and the amount of time this takes depends on the magnitude of flow events that occur. Consequently, stream widths may narrow temporarily and then widen again after a flow event that is large enough to move some of the excessive sediment load stored within the streams. As channel stability improves through time, other restoration treatments, such as placement of large wood in the channel, will become more viable.

It is anticipated that with the completion of identified high priority work, episodic inputs of accelerated sediment from roads, undersized or aging culverts, and bank instability will be decreased from the channel condition imprints observed historically. The overall effectiveness of these treatments should become evident by increased watershed stability in response to future flood events. Monitoring of BMP effectiveness and periodic aerial photo interpretation would help define recovery trends and timeframes.

Again, implementation of projects to improve temperature on the Forest fall into three primary categories: 1) Road treatments, 2) Riparian Reserve enhancement, and 3) stream restoration. Treatment types, and the objectives these projects fulfil to restore watershed processes to improve temperature are shown in Table 15.

Table 15.Treatment types, and objectives and definitions of treatments.

Treatment Type - Road	Definition and objectives
Decommission	Road decommissioning includes activities that stabilize and restore unneeded roads to a more natural state to mitigate hydrologic risk and reduce erosion and sedimentation. Decommissioning treatments can include all of the following techniques: revegetation, installation of waterbars, removal of culverts and road fill, removal of unstable road shoulders, full road prism obliteration and restoration of natural slope. Type and scale of treatment is dependent on site-specific considerations. Decommissioned roads will not be used in the future and are left in a state where erosion and sedimentation risk are eliminated.
Culvert upgrades/replacements	Replacement of culvert crossings to facilitate aquatic organism passage and improve hydraulic function to restore processes that improve temperature. Culvert replacements reduce the risk of crossing failure and the episodic input of sediment associated with these failures.
Reconstruction/maintenance	Road reconstruction and maintenance involves the improvement of existing roads to improve safety, service and environmental standards. Practices include refurbishing ditches and other drainage structures, rebuilding inlets and outlets, shaping road surface to drain properly, slope and fill stabilization, and improvement of surfacing.
Close/hydrologic stabilization	Hydrologic stabilization is a technique to store and stabilize roads to avoid, minimize, or mitigate adverse effects to water quality, aquatic habitat, and riparian resources. Hydrologically stabilized roads minimize erosion and hydrologic connectivity between the road and stream system. Practices include, but are not limited to, removal of culverts and fill presenting an unacceptable risk of failure or flow diversion, and suitable measures to ensure the road surface will intercept, collect, and remove water from the road surface in a manner that reduces concentrated flow in ditches, culverts, and over fill slopes and road surfaces without frequent maintenance. Roads that are hydrologically stabilized would remain as part of the FS road system; therefore, the intent is to retain the integrity of the roadway to the extent practicable, and measures would be implemented to reduce sediment delivery from the road surface road fills to reduce the risk of crossing failure and stream diversion.

Treatment Type - Road	Definition and objectives
Riparian Reserve Enhancement	Vegetation treatment objectives for Riparian Reserves as defined in the Northwest Forest Plan are to accelerate the development of late successional stand characteristics which in the long-term, will provide shade to perennial streams. Actions include thinning densely stocked young stands to reduce competition during the early stages of growth and addressing stands that were identified in a shade model as lacking effective shade to perennial streams.
Stream Restoration	Restoration of hydrologic, floodplain, and riparian function through placement of in-stream large wood structures to scour pools, sort gravels, support floodplain forest succession, re-engage relict side channels, and provide shade. Large wood structures are generally positioned to encourage development of a multi-thread channel network, providing side channel and off-channel habitat throughout a range of flows to encourage sustenance of summer low-flows and encourage Riparian Reserve development. Projects also include planting of adapted native trees and shrubs to accelerate riparian restoration. Wood for projects is generally acquired through harvest of upland stands, and trees from the adjacent Riparian Reserve.

Projects completed in the Yellowjacket subwatershed that contribute toward improving the functions that will eventually lower stream temperature are shown in Table 16. There were no projects completed in the McCoy Creek subwatershed in this timeframe.

Table 16. Projects completed in the Yellowjacket subwatershed since 2014.

Project Type	Total	Location and year
Culvert upgrades	5 crossings	Forest Road (FR) 2800-000 at MP 9.1, 2017 FR 2809-000 at MP 0.1, 2017 FR 2800-000 at MP 7.8, 2018 FR 2810-000 at MP 1.3, 2019 FR 2810-000 at MP 1.9, 2019
Road Decommission	0.5 miles	FR 7700-239, 2016
Road reconstruction and maintenance	31.7 miles	FR 7700-000 23 miles, 2019 FR 7605-000 9.7 miles, 2019
Riparian Reserve Enhancement	2015 9.8 acres 2016 18.6 2017 18.5 acres 2019 5 acres 2020 13.3 acres	Pinto Creek-2015, 2016 Veta Creek-2015 Yellowjacket Creek 2017, 2019, 2020
Yellowjacket Stream Restoration	6 large wood installed at the mouth of Yellowjacket Creek	2020
Installation of large woody debris	54 log jams	Yellowjacket Creek, first 1.3 miles, 2020, 2021, 2022, 2023, 2024
Streamside riparian planting	1.3 miles	Yellowjacket Creek 2020, 2021, 2022, 2023, 2024

Watershed Condition Framework

The Forest Service developed and began implementing the Watershed Condition Framework (WCF) in 2011 to provide a consistent, comparable, and credible process for improving the health of watersheds on national forests and grasslands. The WCF forms the basis for the management of aquatic resources on the Forest and includes 6-steps: a) classification of watershed condition at the subwatershed scale; b) prioritization of watersheds for restoration; c) development of Watershed Restoration Action Plans (WRAP) for Priority Watersheds; d) implementation of the integrated restoration projects defined in those plans; e) tracking of restoration accomplishments; and f) monitoring and verification

The Forest designated the Yellowjacket subwatershed as a priority watershed under step c of the WCF, based on water quality concerns, and the strong focus of ongoing and planned aquatic and riparian restoration in the Yellowjacket subwatershed. As of the last assessment cycle, the WRAP for the Yellowjacket subwatershed was under development. In 2022, the WRAP was finalized and the formal Action Plan was signed. The WRAP for the Yellowjacket subwatershed classifies watershed condition and presents essential projects the Forest and partners will complete over the next five years. Upon completion of these essential projects, the FS anticipates that overall watershed condition will be improved in the Yellowjacket subwatershed, and that the functional processes that will eventually improve temperatures in Yellowjacket Creek have been restored or are on a trajectory toward restoration.

Designation of the Yellowjacket subwatershed as a priority is in alignment with the Yellowjacket Restoration project and will position the Forest to leverage funds from multiple sources to ensure aquatic restoration projects are implemented.

Vegetation Management Project Planning

The Gifford-Pinchot National Forest has developed a 10-year vegetation management plan that identifies planning areas across the Forest where vegetation restoration projects will be planned and implemented. The Yellowjacket subwatershed is within the current planning area for the Yellowjacket Restoration project. According to the final WRAP, upcoming investment through the Yellowjacket Vegetation Management project is expected to leverage funds for aquatic restoration. Most planned projects in the Yellowjacket subwatershed are identified in this report are part of this larger planning effort. Including these aquatic restoration projects as part of the larger Yellowjacket project planning process will open funding opportunities and ensure that projects are completed in a timely fashion.

Roads Analysis

The Forest completed a Forest-wide Travel Analysis Report in 2015 (USDA Forest Service. 2015. Travel analysis report Gifford Pinchot National Forest. Vancouver, WA. 47 p.) under the Travel Management Rule (36 CFR 212) resulting in a prioritization of roads on national forest lands that addresses access and environmental risk, including water quality, setting the stage for further reductions in road miles and targeted improvement in the remaining road system. This report provides a recommendation for management for all roads under the Forest's jurisdiction.

This broad-scale Forest-level analysis will be applied at the project scale to inform road treatments in the Yellowjacket project. Additional analysis tools are useful to along with the Geomorphic Analysis and Inventory Project_Lite (GRAIP_Lite) (Nelson, N. Luce, C. and T Black. 2019. GRAIP_Lite: A system for road impact assessment. USDA Forest Service Rocky Mountain Research Station, Boise Aquatic Sciences Lab. 145 p) GRAIP_Lite is a system of spatial analysis tools developed by the Forest Service Rocky Mountain Research Station that models road-related sediment impacts to stream habitats. This model in combination with field reconnaissance will be used in the Yellowjacket project planning process to determine areas where roads present a higher risk to the stream system, and prioritizing roads for restoration or remediation efforts.

Climate Vulnerability Analysis and Climate Resiliency

The Gifford Pinchot National Forest completed a climate change vulnerability assessment in October 2019 (Hudec, J.L. Halofsky, J.E., Peterson, D.L., and Ho, J.J., eds. 2019. Climate change vulnerability and adaptation in southwest Washington. Gen. Tech. Rep. PNW-GTR-977. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 249 p.). With respect to maintenance and enhancement of the functions that improve temperature, this analysis focused on potential thermal impacts to anadromous fish species, emphasizing the need to build aquatic habitat resiliency and connectivity. Key themes include:

- Strategic prioritization or restoration of natural thermal, hydrologic, and wood regimes
- Management of fluvial connectivity and assisted migration
- Maintain and diversify aquatic monitoring programs

The Forest is working toward these goals and focusing efforts to build resiliency in watersheds where aquatic function has been compromised through past land use practices. Essential projects in the Yellowjacket Creek WRAP focus on building resiliency, particularly in reaches of Yellowjacket Creek that have been incised and widened where temperature is elevated.

Estimate or Projection of Time When Water Quality Standards Will be Met

Waters in Yellowjacket Creek will continue to violate temperature standards until excess sediment has worked its way out of the system and streams have recovered their natural geometry and the riparian areas have recovered. Given the time it takes for natural systems to recover, Ecology estimates that it will take 40 years for Yellowjacket Creek to meet the temperature standard.

Schedule for Implementing Pollution Controls

Projects planned in the Yellowjacket subwatershed over the next several years are shown in Table 17.

Table 17. Projects planned in the Yellowjacket subwatershed through 2035.

Project Name	Description
Streamside Riparian Planting	Improve stream temperature by providing riparian habitat in Yellowjacket Creek in phases, phases 1-3 are complete with phase 4 planned for 2026-2027 and phase 5 planned for 2027-2029.
Cispus-Yellowjacket Restoration Phase III	Starting in 2020 and having an expected completion of 2025, the Cispus-Yellowjacket Restoration Phase III project was proposed by the Cowlitz Indian Tribe, in partnership with the Forest Service, to restore salmon and steelhead habitat by building instream structures in 1,900 lineal feet of the mainstem Cispus River and Yellowjacket Creek to scour pools, sort gravels, support floodplain forest succession, and provide cover for adult and juvenile fish. Additionally, crews will plant locally adapted native trees and shrubs to accelerate riparian restoration.
Road Reconstruction	40-50 miles of treatment anticipated
Motorized trail reconstruction	Approximately 10 miles of motorized trails treated
Culvert Replacements	3 fish aquatic organism passage improvement projects: Veta Creek (FR 7713-000), High Bridge Creek (FR 2900-000) , Badger Creek (FR 2810-041),1 culvert replacement for hydraulic upgrade on Yellowjacket Creek at FR 2810-041
Road Hydrologic stabilization	Approximately 15 miles of road treated
Unauthorized road closures	Full removal of unauthorized roads in the Pumice and Pinto Creeks headwaters
Riparian Reserve Enhancement	Approximately 50 acres of Riparian Reserve enhancement throughout riparian areas in the Yellowjacket subwatershed
*Yellowjacket Creek Stream Restoration RM 1-6	Installation of large woody debris, side channel reconnection, and riparian enhancement in Yellowjacket Creek from the 28 Road to the McCoy Creek confluence Improve hydrologic function in Yellowjacket Creek and promote deep pool formation, side channel and floodplain connectivity, and old forest characteristics in Riparian Reserves adjacent to Yellowjacket Creek.
Pinto Creek Stream Restoration	Improve hydrologic function in Pinto Creek through installation of large woody debris to promote deep pool formation, side channel and floodplain connectivity, and promote old forest characteristics in Riparian Reserves adjacent to Pinto Creek.
Forest Road 28 Improvement	Part of the larger Yellowjacket Creek Stream Restoration Project, the Forest Road 28 Improvement project is now planned to begin in 2030.

Table notes:
*Yellowjacket Creek Stream Restoration-The Yellowjacket Stream Restoration is the largest planned active restoration project, with the potential to deliver direct benefits to stream temperature in Yellowjacket Creek. The Forest is partnering with is Cowlitz Tribe and multiple funding agencies to complete the project over the next several years. Temperature exceedances in lower Yellowjacket Creek are a direct effect of diminished aquatic function. Past land use practices have resulted in an incised and widened channel with areas of channel instability, few stable wood accumulations, rapid bank erosion and lateral channel adjustment, and isolated floodplain terraces. The channel habitat is dominated by low gradient riffle and pool sequence with abundant cobble (mean D50 ranging from 137-232 mm). Large wood is sparse throughout the first 1.7 miles of Yellowjacket Creek, averaging 11 pieces of large wood>24 in diameter per mile. The Yellowjacket Restoration project includes restoration of instream and off channel habitats to enhance natural geomorphic and hydrologic processes through installation of large wood. Since 2020, 54 log jams have been placed in the first 1.3 miles of Yellowjacket Creek, completing the first 3 planned phases and costing approximately $2.6 million. The Forest has also planted those same miles with trees and riparian plants. Most of the restoration reach will result in no less than two active channels, more than doubling the channel length and available edge habitat to improve riparian function and decrease stream temperature. The placement of large wood in Yellowjacket will be such that they enhance flow deflection into side and distributary channels, with some minor excavation at the inlets to introduce perennial flow. Log jams will also encourage pool formation and enhance water storage and hyporheic exchange, which will improve stream temperatures. Approximately 36 large, engineered log jams will be installed in Yellowjacket Creek on approximately six miles of stream. Project implementation began in 2020, and as stated above, restoration phases 1 through 3 have been completed with Phase 4 planned to occur in 2026/2027 and Phase 5 planned for 2027/2028/2029.

Monitoring Plan to Track Effectiveness of Pollution Controls

As detailed above the Forest Service monitor temperatures at multiple locations. They plan to continue monitoring at all current sites as part of the ongoing commitment to monitor and improve water quality in the Yellowjacket Creek subwatershed.

Commitment to Revise Pollution Controls as Necessary

The Gifford Pinchot National Forest is required under the Forest Plan for the forest, as amended by the Northwest Forest Plan (NWFP), to adjust and adapt activities if monitoring demonstrates that goals and objectives of the plan are not being met. In addition, an interagency aquatic monitoring effort, Aquatic-Riparian Effectiveness Monitoring Protocol (AREMP) has been in place since the inception of the NWFP with requirements to evaluate the effectiveness of the NWFP aquatic conservation strategy, and address watershed condition trends across the NWFP area. The outcomes of AREMP will be critical in determining whether implementation is working and if additional management practices will be needed.

Ecology expects that implementation activities completed and planned in the Yellowjacket watershed will achieve compliance with state water quality standards. However, if they do not, Ecology will work with the Forest Service to determine other controls that could be used to achieve compliance.

Entiat River 4B Analysis – June 2024

The Washington Department of Ecology (Ecology) Integrated Report (IR) proposes to exclude one temperature listings (3731), from the 303(d) list and keep this waterbody in Category 4B of the IR. Ecology's basis for excluding this waterbody from the 303(d) list is outlined in this analysis.

Identification of segment and statement of problem causing impairment

This segment is located just above the mouth of the Entiat River, which empties into the Columbia River. The most likely causes of the temperature impairment are the loss of riparian vegetation and changes to the channel width-to-depth ratio caused by sedimentation from roads, timber harvest, and agricultural practices.

Description of pollution controls and how they will achieve water quality standards

The Entiat Watershed Planning Group produced the Coordinated Resource Management Plan in 1999. This plan evaluated the watershed's condition and made recommendations designed to protect water quality and threatened and endangered fish. The sources of temperature impairment in the Entiat River are identified in the plan as:

- Reduced riparian shade resulting from removal of riparian vegetation and stream widening.
- Timber harvest and roads on Forest Service land in the upper basin also contribute to loss of riparian shade and degraded channel conditions.

The plan made several recommendations to help cool the water.

- Work with landowners to maintain and enhance riparian vegetation and wetlands, and implement streambank planting.
- Continue to work with NRCS on conserving water used for irrigation.
- Continue compliance with the forest practices rules, which protect riparian areas and allow for their re-establishment.
- Promote incentives for landowners to restrict unlimited access to streams by livestock.

The plan also included a recommendation to further plan under the Watershed Planning Act to evaluate base flow needs and establish minimum in-stream flows. The subsequent WRIA 46 Entiat Watershed Management Plan, which incorporated the findings of the Coordinated Resource Management Plan and recommended establishment of instream flows, was adopted unanimously by the Chelan County Board of Commissioners on September 13, 2004. The instream flow recommendations were codified as Chapter 173-546 of the Washington Administrative Code.

Land ownership in the basin is approximately 85% federal, which is primarily in the upper basin, 6% state, and 9% private. The upper watershed is in Wenatchee National Forest. Between the forest boundary, at river mile 26 and river mile 11.7, the land use is primarily rural residential, either year-round or seasonal, with a few dispersed pasture areas. Below river mile 11.5, the use is predominantly pear and apple orchards with some rural residential use.

The watershed planning committee performed an aerial remote sensing survey and used the Stream Network Temperature Model (SNTEMP) to identify problem areas in the river and to test different scenarios of best management practices implementation. The model was used to evaluate the effects of three alternative actions, singly and in combination. The three are:

- Increase in stream flow,
- System wide increase in riparian shade, and
- Reduction in channel width in the lower river.

Increases to streamflow were evaluated because a larger mass of water would take longer to warm. Increased shade was evaluated because it would reduce the amount and intensity of solar radiation reaching the water, thus reducing the water temperature. In the Entiat River watershed, numerous forest fires, combined with flood control measures in the lower 15 river miles, have significantly reduced the overall amount and quality of riparian vegetation along the river. The Entiat Watershed Planning Unit has recommended actions that would increase the riparian vegetation within the watershed, as well as reduce the threat of future forest fires that would threaten both the existing and proposed improved riparian vegetation. Decreased channel width was evaluated because it is expected that the channel will return to a more normal geomorphology once functioning riparian areas are re-established.

Based on the results of the model simulations performed with SNTEMP, the following recommendations were made:

- SNTEMP predicted reductions in water temperatures for all three alternative actions, suggesting that implementation of any of the three actions would help reduce water temperatures to some extent.
- Of the feasible alternatives, SNTEMP predicted the largest reductions in water temperatures when riparian shade was increased by 50% (Alternative Action 3). Therefore, an aggressive approach to increasing the current riparian shade conditions throughout the watershed should be undertaken to address high water temperatures.
- In addition, if Entiat Watershed Planning Unit resources are available, decreases to channel width in the lower 10 RMs in conjunction with changes in shade should also be considered (Alternative Action 4).
- A 10% change in streamflow is not likely to significantly affect water temperature.

As identified in the watershed plan and in the SNTEMP analysis of the Entiat River, the most effective best management practices to address the temperature listing are revegetating riparian areas, preventing further riparian vegetation removal, and restoring channel geomorphology and width-to-depth ratios.

Wenatchee National Forest has an approved TMDL, prepared by the Department of Ecology, which specifies areas throughout the forest where riparian shade must be maintained or re-established. The Forest Service is also required to comply with state water quality standards. Implementation of the TMDL should restore 85% of the watershed to a fully functioning riparian condition and help re-establish the original channel geomorphology. Management of state and privately owned lands in the watershed must comply with the state forest practices rules, which are designed to achieve compliance with the state water quality standards and the

Clean Water Act. For the remainder of the watershed, the 9% that is privately owned and not used for forestry, the watershed plan recommends re-establishing and maintaining riparian vegetation along at least 50% of the stream. The area is subject to wildfires, which make it unlikely that a higher percentage of riparian vegetation could be continuously maintained. This percentage is similar to that prescribed in the eastside section of the state forest practices rules. Implementation of the Wenatchee National Forest TMDL, combined with required compliance with the state forest rules and the riparian restoration strategy for the remainder of the land in the watershed is expected to restore riparian areas in the watershed to a fully functioning condition. This will result in compliance with the state water quality standards either by cooling the river to or below the numeric criterion or by achieving the Entiat River's natural condition.

Several enforceable pollution controls will assure implementation of the watershed plan.

- The Forest Service land is subject to the Wenatchee National Forest TMDL.
- The remainder of the watershed is subject to the state forest practices rules for forestry land uses.
- The agricultural and residential uses in the lower watershed are subject to the Chelan County Shoreline Master Program and critical areas ordinance, both of which are designed to minimize or eliminate impacts to riparian vegetation due to development activities on private lands.
- The Entiat Water Resources Management Program has been codified as Chapter 173-546 of the Washington Administrative Code. This rule establishes enforceable minimum in-stream flow requirements for the upper and lower Entiat River and the Mad River, a tributary of the Entiat.

State and local agencies are working together to restore Entiat riparian areas. The following projects were completed prior to 2008.

- The Department of Fish and Wildlife completed the Wilson side channel reconnection project in 2004. This project consisted of placing a diversion pipe in the Entiat River that provides an estimated 10 cubic feet per second of flow through 1,000 feet of rehabilitated side channel. The side channel was restored using large woody debris, boulders, and riparian plantings. The project is located at river mile 6.7.
- The Department of Fish and Wildlife completed an off-channel habitat project in 2004. This project deepened a .3 acre spring-fed pond and installed rootwads to provide habitat and cover for juvenile fish. The pond's outlet stream was cleared and deepened, and several large woody debris structures were installed along the Entiat River just upstream and downstream of the stream outlet. The project is located at river mile 6.2.
- Chelan County Public Works, with the cooperation of several other agencies, replaced the Stormy Creek culvert in 2004 with a pre-cast concrete bridge. The slope in the area was regarded from 6% to 4%, spawning gravel was placed in the creek, and riparian vegetation was planted. Approximately ½ mile of fish habitat was reopened.
- The Cascadia Conservation District re-vegetated an estimated 1.3 acres of riparian vegetation between river mile 3.2 and 3.8 in 2005 and 2006. In 2007, an additional 1.1 acres were re-vegetated at several locations in the drainage.

- Three surface water diversions were converted to groundwater wells for four irrigators in the basin. Wells were installed at river miles 4.0 and 6.3.
- The Bridge-to-Bridge, Phase 1 project consisted of the installation of a rock crossvane, side-channel habitat improvements, irrigation intake and outfall improvements, and riparian restoration. A rock crossvane was constructed to convey water into the Chelan County PUD irrigation side-channel, canal and intake pipe. The rock crossvane and the eleven rootwads were constructed to increase pool habitat and instream complexity. The rehabilitated side-channel had three boulder clusters and two log structures (constructed from 4 logs) installed to increase complexity and off-channel habitat. The slide-gate to the irrigation intake was replaced to allow year-round watering of the 1000 feet of irrigation canal. The irrigation outfall structure had an additional flashboard installed and two rock step-pools installed to assist in fish passage. This project was designed by the NRCS and installed by the Cascadia Conservation District in fall of 2006 at river mile 3.2.
- The Milne Project, located between river mile 2.8 and river mile 3.2, consisted of the installation of 13 logs with rootwads, six boulder barbs, six boulder clusters, and an irrigation diversion barb with sluice gate. Riparian planting along the access areas was also completed. The structures were installed in September 2007 with funds from the Salmon Recovery Funding Board and US Bureau of Reclamation.
- The Hanan-Detwiler rock crossvane and large woody debris were installed at rivermile 5.1 with funding from the Salmon Recovery Funding Board and US Bureau of Reclamation. The rock crossvane will serve to convey water into the HananDetwiler irrigation system and provide pool habitat. The two log structures each consisted of two logs with rootwads installed into the banks to provide fish habitat and a source of gravel through scouring. The project was completed in October 2007.

The following projects were completed after 2008.

- The Roaring Creek Flow Enhancement and Barrier Removal project removed two surface water diversions from Roaring Creek between RM 0.85 and RM 1.3. This project was completed in 2010.
- The 2010 Lower Entiat Riparian Restoration Project restored 4.3 acres (.65 miles) of riparian habitat directly adjacent the Entiat River.
- The 2011 Entiat Riparian Project restored 4.2 acres of riparian habitat directly adjacent the Entiat River, by installing native riparian trees, shrubs, and native grasses (5 of 5 sites), livestock exclusion fencing (1 of 5 sites) and temporary irrigation systems (3 of 5 sites), and controlling of noxious weeds at all five sites. The Roaring Creek Flow Enhancement and Barrier Removal project removed two surface water diversions from Roaring Creek between RM 0.85 and RM 1.3. This project was completed in 2010.
- The 2010 Lower Entiat Riparian Restoration Project restored 4.3 acres (.65 miles) of riparian habitat directly adjacent the Entiat River.
- The 2011 Entiat Riparian Project restored 4.2 acres of riparian habitat directly adjacent the Entiat River, by installing native riparian trees, shrubs, and native grasses (5 of 5 sites), livestock exclusion fencing (1 of 5 sites) and temporary irrigation systems (3 of 5 sites), and controlling of noxious weeds at all five sites. 2014 WQA—4B Analysis for Entiat River Page 5

- The Entiat RM 21.5 large woody debris (LWD) and Riparian Restoration project established woody riparian vegetation at the site by combining the installation of 14 LWD structures along 645 feet of existing bank with an accompanying 100-foot wide, approximately 1.9 acre, riparian planting area behind it. This project was completed in 2010.
- The 2010 Surface Water to Wells Conversion project replaced a 1.5 cfs surface water diversion for the Gaines Ditch in the lower Entiat River with four irrigation wells. Replacing the surface water diversion avoids fish entrainment and mortality, as well as providing water savings through higher delivery efficiencies. The conversion also keeps surface water in stream during low flow, peak irrigation use periods in late summer and fall.
- The 2012 Tyee Ranch project installed 4.5 acres of riparian plantings, placement of engineered log jams and other LWD structures, an excavated re-connection to floodplain and abandoned side channels.
- In 2014 five salmon habitat restoration projects were completed in the lower seven miles of the Entiat River. Three project sponsors were involved in the 2014 Entiat River habitat project implementation; Yakama Nation (YN) with a project at (RM 2.3-3.3), Chelan County Natural Resource Department (CCNRD) with two projects (RM 1.65 and RM 4.0-4.3), and Cascadia Conservation District (CCD) with two projects (RM 0.8-2.3 and RM 6.7-7.8). Project elements include habitat logs and boulder clusters placed along the channel margins, improvements to existing side channel areas, two engineered log jams near the upstream end of two side channels to provide habitat and help direct flow into the side channels, and the creation of two new off channel alcoves, for high flow refuge.

The following projects were completed after 2015.

- In 2017 several habitat projects were completed. The Yakama Nation, in collaboration with the US Forest Service Entiat Ranger District, enhanced side-channel connections and added engineered log structures along two areas of the Upper Middle Entiat. These projects offer more habitat for endangered salmon species. The Chelan Douglas Land Trust (CDLT) purchased 26 acres of property for protection which included approximately 4,425 feet of critical riverbank. The Cascade Columbia Fisheries Enhancement Group (CCFEG), a local non-profit organization which works to restore native fish habitat, removed two fish passage barriers along Stormy Creek, opening up about three miles of salmon habitat. The Fisheries Enhancement Group partnered with the US Fish and Wildlife Service to complete the work.
- In 2018, Trout Unlimited's Washington Water Project (TU-WWP) permanently increased instream flow and fish passage in Roaring Creek, a critical salmon-bearing tributary to the Entiat River, WRIA 46. The project removed irrigation diversions, which are also fish passage barriers, from flow-limited Roaring Creek further downstream to a groundwater well. These actions will eliminate two fish passage barriers and enhance aquatic habitat through increased water quantity of 1.5 cubic feet per second (cfs). The Roaring Creek project directly addresses documented limiting factors in the Entiat watershed.
- In 2018, the Cottonwood Flats Entiat Floodplain Restoration project began. CCNRD removed a bridge that was impeding flow and floodplain connectivity. Removal of

approximately 2,000 cubic yards of bridge abutment allowed for stream migration and access to side channel and backwater habitat.

- Beginning in 2018 and completed in 2021, the Entiat Tributary Baseflow & Habitat Restoration project is part of a larger solution to address low summer base flows and rising stream temperature with the ongoing impacts of climate change. The most important outcome is to provide significant biological benefits for salmonids through implementing 190 beaver dam analogs (BDAs) and post-assisted log structures (PALS) along seven kilometers of priority reaches of the Potato, Mud, and Stormy Creek tributaries to the Entiat River. The Coordinated Resource Management (CRM) team comprised of CCD, Cascade Fisheries, and Trout Unlimited, will implement BDAs to reconnect floodplains, retain and slow water from peak flows, increase shade through increasing riparian vegetation and cool water habitat, increase pools, and others to significantly increase biological benefits for steelhead, spring chinook, and other salmonids. This proposal builds upon the previous 33 BDAs installed on Potato Creek in 2020 by adding 190 BDAs/PALS in this same section of tributaries within the middle Entiat River. Upon completion the Potato Creek site that is publicly owned (USFS) will provide ample opportunities for the public to see how BDAs and PALS benefit the salmon recovery process, accelerate the growth of native plants, enhance birdwatching, and even create a "green fuel break" barrier to limit the spread of wildfires such as the Cougar Creek fire in 2018.
- Completed in 2021, this partnership between CCD, CCNRD, Chelan/Douglas Land Trust (CDLT) is the lowest downstream in the suite of Middle Entiat projects in the Stormy-Grey reach. Project Area F is located between RM 16.7 and RM 16.15. CCD would implement the work at Project Area F on both privately-owned land and land owned by CDLT. Nine primary and 30 secondary Large Woody Material (LWM) structures were installed throughout the reach to enhance habitat complexity. Of the 30 secondary LWM structures, 12 side channel LWM structures and an additional nine side channel logs would be installed within the proposed side channel elements. At the upstream end of the project area, two inlets would be excavated on river right to improve floodplain connectivity to an existing complex of side channels, to provide high-flow refuge habitat for juvenile salmon and steelhead. An existing outlet would be excavated to allow surface water that has entered in the upstream inlets to return to the river. Farther downstream, on river right, a side channel excavation would establish a perennial side channel, which is a side channel that would have water flowing through it year-round. At the downstream end on river left, a parcel of land (Enlow) recently purchased by CDLT were converted from a property that was once a private residence with a lawn, into an excavated network of side channels and alcoves that would provide acres of low-velocity, year-round, rearing habitat for juvenile salmon and steelhead.
- In 2023, CCD began planning for riparian restoration and placement of engineered logjams (ELJ)to decrease temperatures in the Mills 05 Reach. Lower instream temperatures will result from increased quality and quantity of riparian vegetation along the banks and placement of ELJ structures will aid in lower total suspended solids and sediment through reduction of bank erosion.

- Starting in 2024, the CCNRD is continuing work to improve water quality through the Entiat River Floodplain Riparian Enhancement Project. It is a Riparian Restoration project that will rehabilitate 3.23 acres of degraded riparian area along high priority restoration reaches of the Entiat River. The project will build off previous instream restoration efforts. The overall goal is to develop and implement a comprehensive Riparian Enhancement Plan that will include invasive treatment, native tree and shrub planting, and monitoring and adaptive management in order to achieve lasting riparian health. This action will restore associated ecological services such as: groundwater retention, shade and lowered stream temperature, long-term source of large wood, sediment and pollutant capture, and supporting aquatic food webs through enhanced leaf litter. Therefore, this action will also address reach-specific limiting factors (temperature, baseflow, cover, riparian disturbance) and support recovery of ESA-listed spring Chinook and Steelhead.
- There is also a future plan for CDLT to acquire and permanently protect 16.5 acres of land along the mainstem Entiat River. A primary goal is to protect valuable spawning and rearing habitat for Spring Chinook and Steelhead, but this protection will also benefit stream temperatures.

Estimate or Projection of Time When Water Quality Standards Will be Met

Because it will take time to complete restoration projects and for new vegetation to grow, we estimate that compliance with the temperature standard will be achieved in 2028. To determine if standards are being met in 2028, Ecology will need to review and analyze data.

Schedule for Implementing Pollution Controls

As described earlier in this report, the Entiat River Planning Unit has been consistently implementing restoration projects, and continues to work with other agencies to design projects, obtain funding, and complete the actual restoration work. There is a good record of on-going implementation, and we expect this to continue.

Monitoring Plan to Track Effectiveness of Pollution Controls

The Entiat River is monitored by one of Ecology's long term monitoring stations so there will be direct information available to determine whether implementation activities are making a difference.

Commitment to Revise Pollution Controls as Necessary

Ecology will continue to work with the Entiat River Planning Unit to ensure that implementation continues and that water quality in the Entiat River continues to improve. We fully expect the program to achieve compliance with water quality standards. However, if it does not, Ecology will work with the planning unit to determine other controls that could be used to achieve compliance.

Asotin Creek Watershed Straight to Implementation Project – October 2024

The Washington Department of Ecology (Ecology) Integrated Report (IR) proposes to exclude nineteen temperature listings from the 2022 303(d) list and place these segments into Category 4B. Table 18 and Figure 10 identify the specific listings addressed by this plan.

Table 18. Temperature listings addressed by Asotin Creek STI Project.

Listing ID	Assessment Unit	Stream – General location
13851	17060103000007_001_001	Asotin – mouth at Asotin City Park
13852	17060103000012_001_001	Asotin – above confluence with George Creek
13854	17060103000017_001_001	Asotin – at Head Gate Park
104000	17060103000955_001_001	Asotin – 8 miles above confluence with George Creek
13860	17060103000025_001_001	Asotin – below confluence with Charley Creek
13863	17060103000035_001_001	Asotin – downstream confluence north and south forks
22425	17060103000045_001_002	Asotin North Fork – upstream confluence with Lick Creek
13985	17060103000847_001_001	Asotin North Fork – at end of Asotin Rd.
13986	17060103000050_001_001	Asotin North Fork – at Forest Service fence line
13858	17060103000058_001_001	Asotin South Fork – upstream confluence with north fork
22426	17060103000064_001_001	Asotin South Fork – at Umatilla National Forest boundary
29321	17060103000071_001_001	George – below Rockpile Gulch
73615	17060103000069_001_001	George – at George Creek Rd. bridge
20352	17060103000967_002_002	George – at Trent Grade culvert
22429	17060103000089_001_001	George – upstream of Umatilla National Forest boundary
13862	17060103000026_001_001	Charley – at mouth
22427	17060103000030_001_001	Charley – upstream NF 4206
22430	17060103000042_001_001	Lick – near Umatilla National Forest boundary
20354	17060103000099_001_001	Pintler – 0.9 mi. below Nims Gulch

All waterbodies, except Listings 73615 and 10400, were first identified as impaired for temperature and placed in Category 5 in the 2004 WQA. They were later approved for Category

4B in the 2012 WQA and have remained in 4B since. Listing ID 73615 was first identified as impaired for temperature in the 2012 WQA and was placed directly into 4B. Listing ID 104000 was first identified as impaired in the 2022 WQA and Ecology requests moving into Category 4B in the 2022 WQA as the implementation of this plan will address this temperature across the entire watershed.

Ecology’s basis for continuing to exclude these waterbodies from the 303(d) list is outlined in this evaluation.

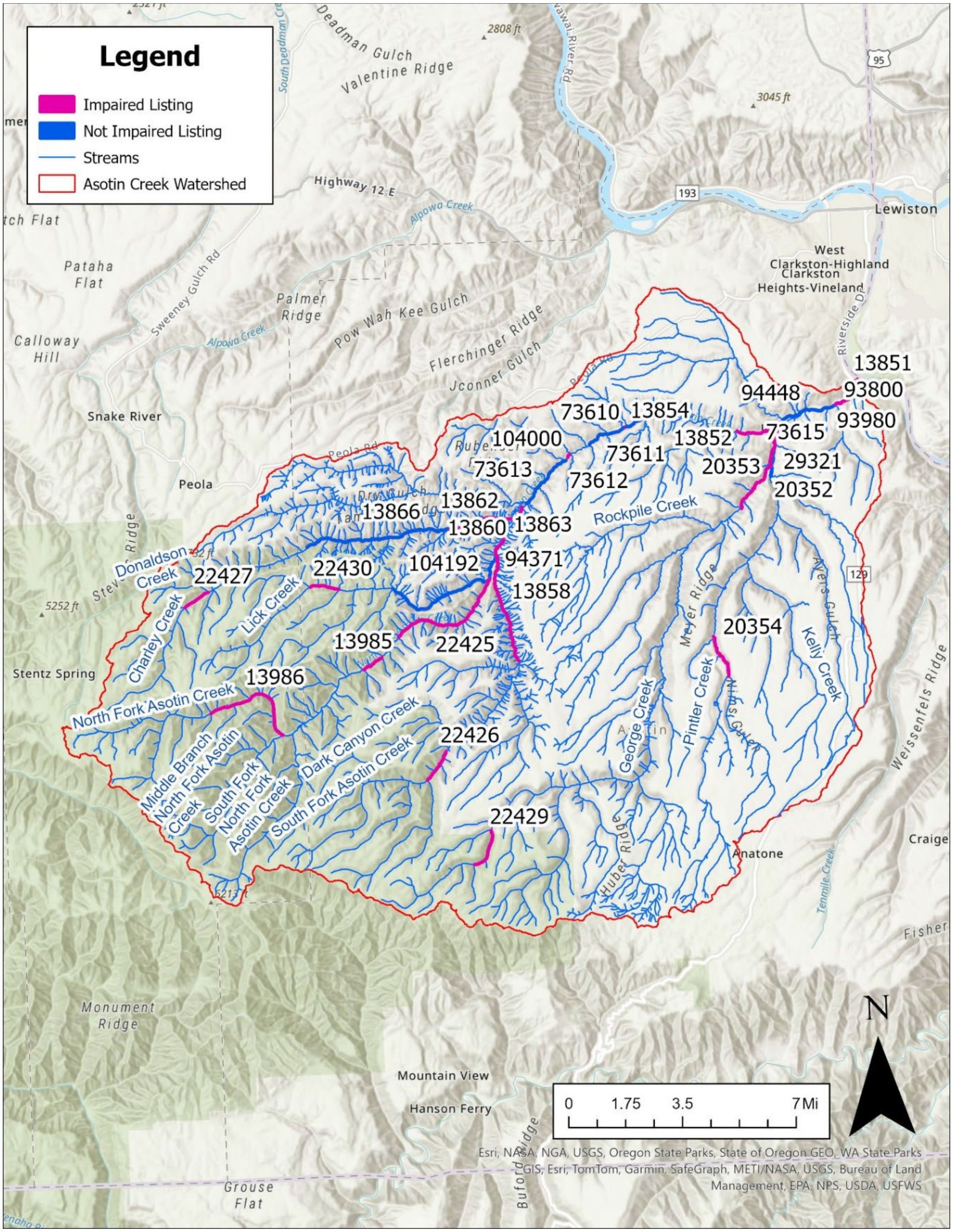

Figure 10. Asotin Creek watershed with temperature impaired and not impaired stream segments. Not impaired listings are included in map for reference in other sections of document.

Identification of Segment and Statement of Problem Causing Impairment

The Asotin Creek watershed is located in the southeast corner of Washington State. The majority of the watershed occurs within Asotin County. Some headwater streams get their start in Garfield County. Asotin Creek drains approximately 208,000 acres. The creek originates in the mixed conifer forests of the Blue Mountains. It cuts through layers of basalt rock and flows through narrow canyons before emptying into the Snake River at the town of Asotin, Washington.

The name “Asotin” is derived from the Nez Perce word, Heesut’iin, “Eel Creek” (Hitchman 1985). The Asotin Creek watershed was the center of a fishing village for collecting Pacific lamprey (*Entosphenus tridentatus*), now rarely found in the creek. The watershed is still home to threatened species of fish including Snake River Steelhead as well as Bull Trout and Spring Chinook Salmon.

Asotin Creek has several tributaries, the largest is George Creek. Asotin creek is divided between the North and South Forks in the upper watershed. Other tributaries include Charley Creek, and Lick Creek. The George Creek watershed is approximately 89,000 acres and its major tributaries include Pintler Creek, Kelly Creek, and Rockpile Creek.

The geology of Asotin Creek region is of interest given it results in specific land-use patterns. The watershed consists of layers of basaltic rocks, formed by multiple ancient lava flows. The bedrock has been covered by fine-grained soils that are highly erodible. Folding of the underlying bedrock has resulted in a plateau increased in elevation and tilted to the north and east. The uplifting of the bedrock has caused streams to cut down and form steep and narrow v-shaped canyons.

The Asotin Creek watershed climate varies dramatically between the upper and lower portions of the watershed. Rainfall ranges from more than 45 inches in the higher elevations of the Blue Mountains to 12 inches near the confluence with the Snake River. This substantial variation occurs over approximately 20 miles, a relatively short distance. Ninety percent of the precipitation occurs between September and May with thirty percent of the winter’s precipitation falling as snow. Snowfall at elevations less than 1,500 feet seldom lingers beyond three or four weeks, occasionally melting quickly enough to produce severe erosion.

Because of the differences in precipitation and elevation, vegetation also varies greatly in the watershed. Upland vegetation is dominated by mixed conifer forests in the upper watershed. The arid region near the Snake River is a shrub-steppe ecosystem dominated by sage and bunch grass. The stream corridor vegetation occurs in varying successional stages and consists mainly of alder and black cottonwood stands with mixed understory of shrubs. Ponderosa Pine is a dominant evergreen in much of the watershed. In the lower watershed, it typically occurs only in the transition zone between the riparian and upland areas. In the forested areas of the Blue Mountains, it is found throughout the uplands.

Multiple planning efforts have been completed in the Asotin Creek watershed. Most of these have been focused on salmon and steelhead recovery. The plans that have resulted all recognize stream temperature as a critical component of salmonid habitat and identify specific actions necessary to address temperature problems in the watershed. The Asotin Creek Model Watershed Plan proposed three implementation strategies to address the temperature problem:

- Streambank & Shoreline Protection
- Stream Channel Vegetation
- Fencing (Riparian)

The Bonneville Power Administration Sub-Basin Plan's strategies included management practices such as:

- Installing riparian buffers including livestock exclusion and planting
- Upholding existing land-use regulations
- Implementing conservation easements
- Decommissioning/paving roads

The Snake River Salmon Recovery plan identified riparian buffers and planting as primary tools to address temperature problems. The Middle Snake (WRIA 35) Watershed Plan identified stream temperature as a water quality problem and revegetation of stream corridors as a strategy to address it.

Much of the riparian vegetation in the Asotin Creek watershed is healthy compared to many eastern Washington watersheds. This is due to the rural location of the stream, the canyon geography that has prevented crop production along its banks, the public ownership of a significant portion of riparian area, and the extensive work by landowners to improve the riparian condition over the last several years.

However, there are five primary land-uses that cause nonpoint pollution and temperature problems in the Asotin watershed. Ecology's land use evaluation of the watershed has resulted in ranking the impacts causing the violations of temperature standards.

- Livestock Feeding
- Livestock Grazing
- Urbanization
- Forestry
- Crop Production

Livestock Feeding—Winter feeding is a major source of impacts to riparian areas and vegetation on private lands. While many of the feeding areas have been fenced from surface water, much of that fence is too close to the creek to adequately protect surface water. Winter feeding areas continue to damage woody vegetation and prevent sapling recruitment and regeneration.

Livestock Grazing—Grazing activities also impact riparian vegetation, particularly in the upper portions of the watershed. Areas along the streams not ideal for winter feeding are often grazed from spring to fall. This includes some of the private forested areas.

Urbanization—Areas near Asotin also likely contribute to temperature problems in the creek. Although the area is relatively small compared to the other land uses, the impacts to riparian vegetation are significant. Some homeowners have removed trees and shrubs and have lawns or pasture down to the water's edge. There are properties that own horses on small lots which access surface water and damage riparian vegetation. The city park and the Asotin Elementary school sports fields lack sufficient riparian vegetation.

Forestry—Historic timber harvesting on both public and private lands has removed many of the trees from the riparian zone. This has been particularly true on the Forest Service managed lands. Much of the shade in the upper watershed was lost due to historic logging activities. But, in recent years little logging has occurred in the riparian areas of the watershed. There has also been significant natural vegetation recovery and planting within the Umatilla National Forest.

Crop Production—Only a small portion of the riparian areas in the Asotin watershed are impacted by wheat and barley production. Most areas impacted by crop production occur in the upper Pintler Creek watershed where the streams are intermittent or ephemeral. In those areas, it is common for farming to occur up to streambanks or even through the stream channel.

Table 19 summarizes historic temperature data at multiple segments of Asotin Creek's mainstem, the north and south forks of Asotin Creek, and major tributaries George Creek, Charley Creek, and Pintler Creek. While continuous monitoring datasets are limited in the watershed, the available continuous temperature data collected by Washington Department of Fish and Wildlife (WDFW) between 2000 and 2002 found the 7-day average of the daily maximum (7DADMax) values well above the numeric criteria at nearly all sites sampled. In Asotin Creek, temperature values appear to increase from the headwaters to the mouth of the creek. Immediately downstream of the confluence with the north and south forks, Asotin Creek's mainstem reached 20.6°C 7DADMax in 2000. The mouth of Asotin Creek had 7DADMax values reached as high as 24.5 °C in 2001. The same trend was identified in George Creek, Asotin's largest tributary, with the highest 7DADMax value of 25.5 °C in 2001. Discrete monthly sampling across the watershed in 2005 and 2006 consistently had temperature values above the respective 7DADMax numeric criteria. Samples collected during the supplemental spawning periods exceeded the supplemental spawning criteria in Asotin Creek, Asotin Creek's south fork, and George Creek.

Table 19. Historic temperature data in Asotin Creek watershed. Bolded 7-day average daily maximum (7DADMax) represent exceedances of the temperature criteria.

Listing ID	Assessment Unit	Creek – General location	Year – Highest temperature value (°C)	Year – Highest 7DADMax value (°C)
13851	17060103000007_001_001	Asotin – mouth at Asotin City Park	1976 – 11.4 1977 – 23.9 1992 – 10.6 1993 – 16.6 1996 – 12.1 1997 – 21.4 2001 – 11.9 2002 – 23.8 2005 – 18.1 2006 – 17.5 2007 – 4.4 2011 – 18.4 2012 – 13.0 2013 – 21.7	**2001 – 24.5**
93800[a]	17060103000008_001_001	Asotin – at Morgan Rd.	2011 – 17.73	None available
13852	17060103000012_001_001	Asotin – above confluence with George Creek	2000 – NA[b] 2011 – 17.09	**2000 – 24.1**
73610[a]	17060103000016_001_001	Asotin – at river mile 8.3	2005 – 17.7 2006 – 18.9 2007 – 15.8	None available
13854	17060103000017_001_001	Asotin – at Head Gate Park	2000 – NA[b]	**2000 – 23.6**
73611[a]	17060103000018_001_001	Asotin – above Head Gate Park	2005 – 18.7 2006 – 19.3 2007 – 5.4	None available
73612[a]	17060103000022_001_001	Asotin – at KM post 18	2005 – 19.0 2006 – 19.3 2007 – 5.6	None available
73613[a]	17060103000023_001_001	Asotin – below Blankinship's	2005 – 18.8 2006 – 19.2 2007 – 5.6	None available

Listing ID	Assessment Unit	Creek – General location	Year – Highest temperature value (°C)	Year – Highest 7DADMax value (°C)
13860	17060103000025_001_001	Asotin – below confluence with Charley Creek	2000 – NA[b] 2005 – 19.0 2006 – 18.1 2007 – 5.7	**2000 – 21.7**
13863	17060103000035_001_001	Asotin – downstream confluence north and south forks	2000 – NA[b] 2005 – 19.2 2006 – 18.9 2007 – 5.5	**2000 – 20.6**
94371[a]	17060103000036_001_001	Asotin North Fork – upstream confluence with south fork	2011 – 6.7 2012 – 15.5 2013 – 18.5 2014 – 15.6 2015 – 17.0 2016 – 15.4 2017 – 6.0	None available
22425	17060103000045_001_002	Asotin North Fork – upstream confluence with Lick Creek	2001 – 20.0 2002 – 20.0	**2001 – 19.4** **2002 – 19.4**
13985	17060103000847_001_001	Asotin North Fork – at end of Asotin Rd.	2002 – NA[b]	**2002 – 18.3**
13986	17060103000050_001_001	Asotin North Fork – at Forest Service fenceline	2000 – NA[b]	**2000 – 17.3**
13858	17060103000058_001_001	Asotin South Fork – upstream confluence with north fork	2000 – NA[b] 2005 – 20.9 2006 – 19.6 2007 – 4.2	**2000 – 22.5**
22426	17060103000064_001_001	Asotin South Fork – at Umatilla National Forest boundary	2001 – 16.1	**2001 – 16.1**

Listing ID	Assessment Unit	Creek – General location	Year – Highest temperature value (°C)	Year – Highest 7DADMax value (°C)
29321	17060103000071_001_001	George – below Rockpile Gulch	2000 – 22.3 2001 – 25.9 2002 – 24.5	**2000 – 21.7** **2001 – 25.5** **2002 – 23.6**
73615	17060103000069_001_001	George – at George Creek Rd. bridge	2005 – 18.3 2006 – 20.3 2007 – 4.0	None available
20352	17060103000967_002_002	George – at Trent Grade culvert	2000 – 18.8 2001 – 18.0 2002 – 23.1	2000 – 17.5 2001 – 17.3 **2002 – 20.9**
22429	17060103000089_001_001	George – upstream of Umatilla National Forest boundary	2001 – 17.8 2002 – 17.8	2001 – 17.2 2002 – 15.0
13862	17060103000026_001_001	Charley – at mouth	2000 – NA[b]	**2000 – 21.6**
22427	17060103000030_001_001	Charley – upstream NF 4206	2000 – 15.0 2001 – 16.1 2002 – 17.2	**2000 – 14.4** **2001 – 15.0**
22430	17060103000042_001_001	Lick – near Umatilla National Forest boundary	2000 – 17.8	**2000 – 16.7**
20354	17060103000099_001_001	Pintler – 0.9 mi. below Nims Gulch	2000 – 24.4	**2000 – 23.4**

Table notes:

[a]Ecology is not currently requesting coverage of this listing because it has not been determined impaired. These data are presented for reference purposes.

[b]Daily max not reported.

Description of Pollution Controls and How They Will Achieve Water Quality Standards

Water quality target

Figure 11 details the aquatic life uses categories and extents which supplemental spawning uses apply in the Asotin Creek watershed. Table 20 defines the aquatic life use categories, supplemental spawning uses, and respective temperature numeric criteria for the ListingIDs covered under this project.

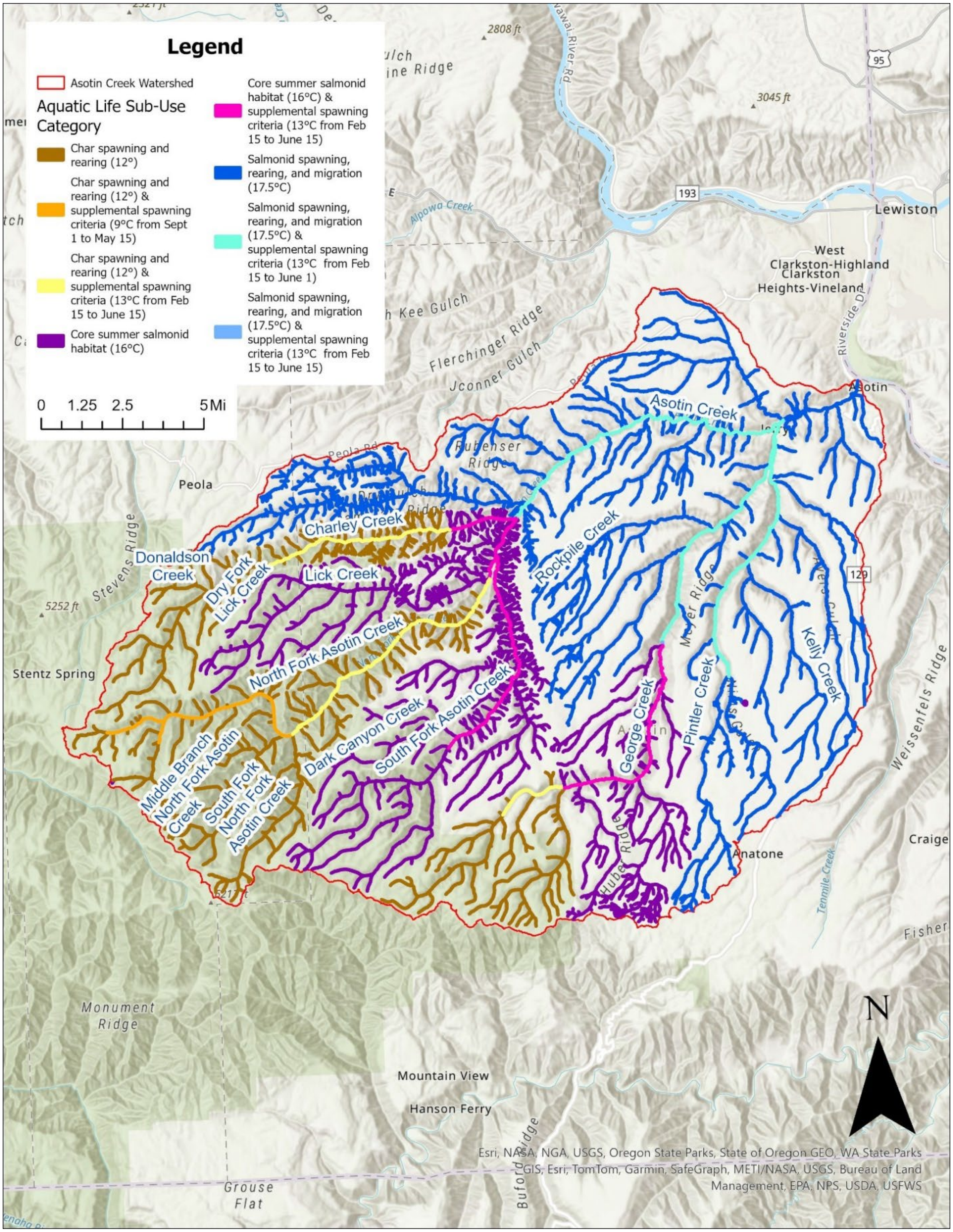

Figure 11. Asotin Creek watershed aquatic life uses and applicable temperature numeric criteria.

Table 20. Aquatic life and supplemental spawning uses and applicable temperature criteria for impaired waters in Asotin Creek watershed.

Listing ID(s)	Aquatic Life Use Category	Aquatic Life Criterion	Supplemental Spawning Criterion
13851, 13852	Salmonid spawning, rearing, and migration	17.5°C 7DADMax	none
13854, 13860, 29321, 73615, 20352, 20354	Salmonid spawning, rearing, and migration	17.5°C 7DADMax	13°C 7DADMax from February 15 – June 1
22426, 22430	Core summer salmonid habitat	16.0°C 7DADMax	none
13863, 94371, 13858, 13862	Core summer salmonid habitat	16.0°C 7DADMax	13°C 7DADMax from February 15 – June 15
22429, 22427	Char spawning and rearing	12.0°C 7DADMax	none
22425, 13985	Char spawning and rearing	12.0°C 7DADMax	13°C 7DADMax from February 15 – June 15
13986	Char spawning and rearing	12.0°C 7DADMax	9°C 7DADMax from September 1 – May 15

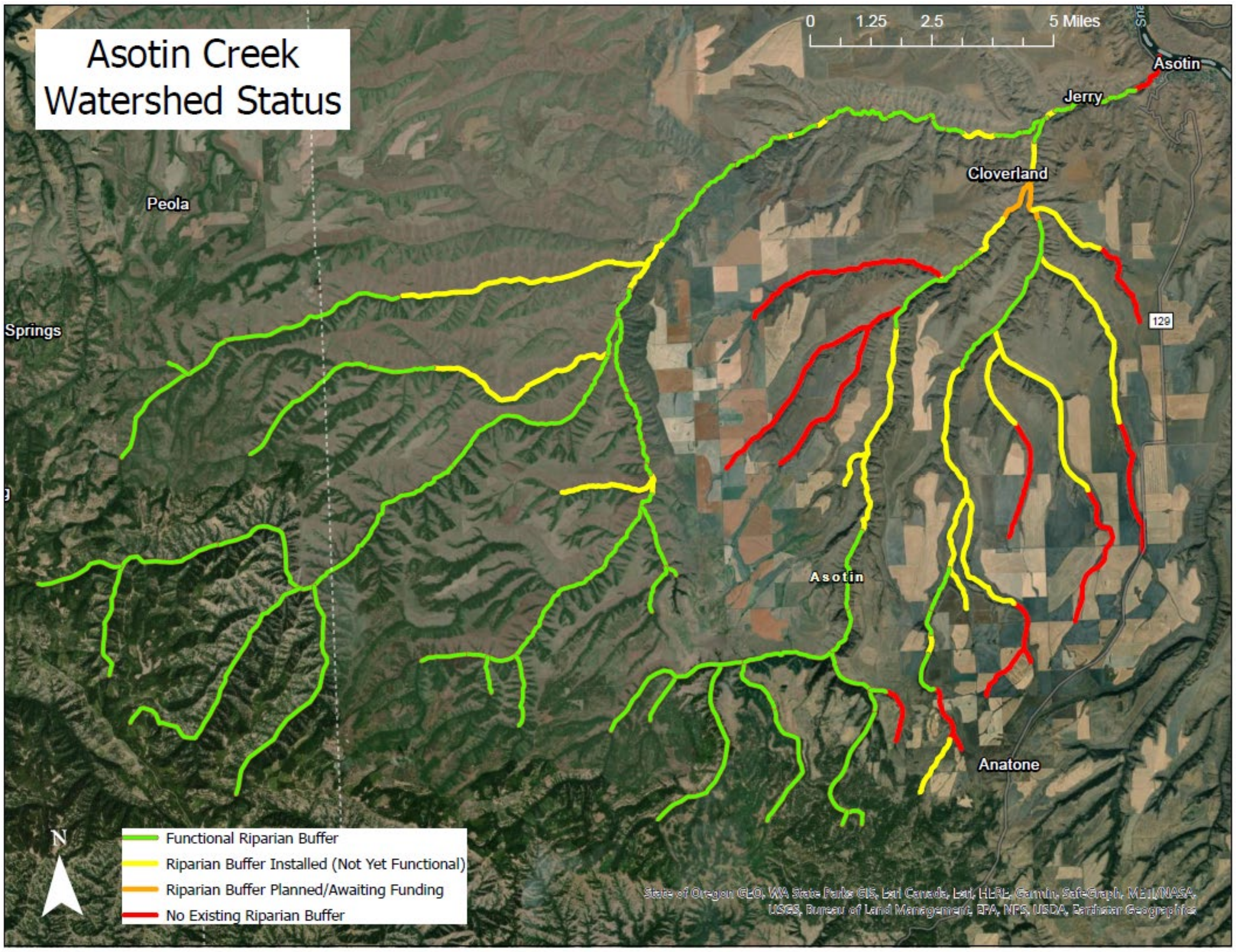

Figure 12. Asotin Creek Watershed riparian buffer status.

Controls that will achieve water quality standards

Asotin Creek is a relatively small stream. The bankfull width of the Asotin mainstem is approximately 13 meters (37 feet). The bankfull widths of lower reaches of the North Fork Asotin Creek, the South Fork Asotin Creek, and George Creek vary, but are generally half that width (Stuart, 2012). As would be expected, stream width diminishes significantly in the upper portions of the watershed. Buffer widths must be adequate to shade the stream and protect against other factors influencing temperature.

In order to meet water quality standards, Ecology will work with partners to create 75-foot-wide well-vegetated buffers on both sides of the stream (150 feet total) within the Asotin watershed for all areas used for livestock feeding, livestock grazing, and crop production. Ecology will focus on perennial reaches where stream flow occurs during the critical temperature period (late spring – early fall). Areas of the upper watershed where streams are intermittent or ephemeral are important for other water quality parameters but will be a lower priority. They will be planted and/or fenced as additional funding allows.

Ecology will implement an additional set of BMPs for properties with livestock. These BMPs use the construction specifications of the Natural Resource Conservation Service Field Office Technical Guide (FOTG). They are:

Livestock Exclusion Fence—A constructed barrier to animals that protects the riparian buffer. The fencing materials and the type and design of fence installed shall be of a high quality and durability. The type and design of fence installed must meet the management objective of excluding cattle from the riparian area. (FOTG Practice Code 382)

Watering Facility—A device to provide an adequate amount and quality of drinking water for livestock. Stock tanks should be installed as far from surface water as possible to protect against contamination of surface water via run-off or ground water connections. (FOTG Practice Code 361)

Stream Crossing—A stabilized area or structure constructed across a stream to provide a travel way for livestock. Stream crossings should be located in areas where the streambed is stable or where grade control can be provided to create a stable condition. (FOTG Practice Code 578)

For forest lands, the Washington State Forest Practices Rules (WAC 222-30) were developed with the expectation that the stream buffers and harvest management prescriptions were stringent enough to meet state water quality standards for temperature. These rules apply to all timber harvest on private lands within Washington. The program has some deficiencies, but provides a framework for bringing the forest practices rules and activities into full compliance with the water quality standards. Some additional discussions with the Department of Natural Resources (DNR) will occur to ensure water quality in Asotin Creek is adequately protected.

Currently, a no-cut buffer is required for fish bearing streams by the Forest Practices Rules. The rules establish a core zone of 30 feet from the stream where no harvest or construction is allowed. An additional 45-foot zone is also protected and no harvest is allowed except when:

- The basal area in the inner zone is greater than 110 square feet per acre and greater than 6 inches diameter. The harvest must leave at least 50 trees per acre including trees that shade the water.
- Thinning, and there are more than 100 trees per acre and the basal area is less than 60 square feet per acre. Still, 100 of the largest trees per acre must be left, including those that shade the stream.

Within the Umatilla National Forest, the Forest Service requires protected areas of 150 or 300 feet for perennial streams depending on the presence or absence of fish, but with exceptions. In addition, they require at least a 50 foot no-cut zone for non-fish-bearing intermittent streams. Some areas in the Umatilla National Forest will require additional planting based on historic harvest practices or natural events. Ecology will work with the Umatilla National Forest to ensure at least 75 feet of protection is required on all fish-bearing streams. In addition, some forest areas are subject to seasonal grazing. In these areas, a minimum of 35 feet of riparian corridor will be fenced to protect understory vegetation and prevent polluted run-off.

As outlined in the Straight to Implementation Plan, in the urbanized portion of the watershed there are small areas where 75-100ft vegetated buffers are not practical. This exception occurs primarily in lower Asotin Creek. Major roads or home locations do not allow for wider buffers. In these locations, Ecology will work to create 35 foot minimum vegetated buffers. Small buffers will be installed in a very small portion of the watershed (less than 2%) and should not affect the ability to meet water quality standards.

A significant amount of riparian planting has been completed in the Asotin watershed. Since 1998, more than 209,000 trees and shrubs have been planted, although more implementation is needed to achieve compliance with Washington's temperature standards.

Best management practice (BMP) implementation can be broken into two broad categories, riparian protection fencing and riparian planting. When fencing is installed to protect the riparian area from livestock, associated BMP, such as off-stream watering and stream crossings may also be necessary. In many cases, stream reaches will need both kinds of implementation. There are also stream reaches in the watershed where no livestock are present but additional planting is needed to adequately shade the stream.

In more recent years, an additional six miles of Asotin Creek was protected, with another five miles of buffer enhanced with plantings of over 13,000 trees in the riparian area. This watershed can be increasingly complex to establish robust buffers due to its arid and rocky conditions. The Asotin County CD continues to focus efforts on enhancement and maintenance in the watershed. Ecology has partnered with the CD on grants in the watershed to promote overbank flow and floodplain connection to improve temperature and sedimentation concerns. This has resulted in 116 Beaver Dam Analogs (BDAs) being installed throughout the watershed. The CD received a FY22 state 319 water quality grant from Ecology, which is providing funding to protect and enhance 40.4 acres of riparian buffers through planting an additional 9,060 trees in Asotin Creek. This grant also funded an addition 8,380 feet of exclusion fencing in addition to other livestock BMPs including a well, pump, storage tank, livestock pipe, trough and heavy use area. This grant would also provide enhanced technical assistance in the watershed to continue to see increased participation in water quality improvement projects.

In addition, farmers in the watershed are adopting direct seed technology, which is the practice of seeding a new crop into the standing stubble of a recently harvested crop without the traditional tillage of the ground. By doing so, soil erosion can be reduced by as much as 95 percent. This significantly reduces the volume of sediment washing into Asotin Creek. All of these efforts will help address the temperature impairments. From approximately 2015-2020, the Asotin County CD has assisted in converting an additional 3400 acres to direct seed or conservation tillage in the watershed. This increase in acres converted to conservation tillage has not continued because it's estimated that over 90% of the watershed is now using conservation tillage techniques. Most farmers in the watershed have already adopted, and are now using, direct seed technology due to the CD's incredible efforts.

Ecology uses our regulatory authority as a backstop when collaborative efforts fail. The Water Pollution Control Act (RCW 90.48) gives Ecology the authority to take enforcement actions against nonpoint polluters.

RCW 90.48 makes it unlawful for any person to "cause, permit or suffer to be thrown, run, drained, allowed to seep or otherwise discharged … any organic or inorganic matter that shall cause or tend to cause pollution of" waters of the state. Any person who violates or creates a substantial potential to violate the provisions of Chapter 90.48 RCW is subject to an enforcement order from Ecology pursuant to RCW 90.48.120. Ecology is authorized to "issue such order or directive as it deems appropriate under the circumstances[.]" In addition to administrative orders, violating Chapter 90.48 RCW may result in injunctions, civil penalties, and notices of violations.

It is worth noting that RCW 90.48.120 gives Ecology the authority to take action in response to nonpoint source pollution, the statute also gives Ecology the authority to take action based on a "substantial potential" to pollute state waters via either a point or nonpoint pollution source. Consequently, Ecology not only has authority to take action following a NPS pollution occurrence (i.e. there was a discharge), but has specific statutory authority to act proactively to prevent NPS pollution from occurring in the first place. Ecology's authority includes the authority to require a nonpoint source polluter to implement specific best management practices (BMPs). Ecology's authority can be used to prevent nonpoint pollution and require BMPs, as necessary.

Ecology has used this regulatory backstop several times since 2016.

Estimate or Projection of Time When Water Quality Standards Will be Met

It will take time for the riparian corridor to fully recover and for the stream to re-establish its natural geometry. Ecology originally estimated that the riparian buffers will have grown enough to be fully effective in 10-15 years, or by the year 2025. While much progress has been made planting and enhancing buffers, the vegetation has not yet reached the maturity necessary to protect the stream and meet temperature standards. While Asotin Creek continues to see projects implemented, additional time is necessary to allow for the growth required to adequately shade the Creek and meet the temperature standard throughout the entire watershed by 2040.

Schedule for Implementing Pollution Controls

As described earlier in this report, Ecology has worked with the conservation district, local governments, and landowners to implement a variety of best management practices in the Asotin Creek watershed, and landowners are continuing to implement best management practices that protect the stream corridor and improve water quality. It is our best professional judgment that this work will remedy the pollution problems in the impaired segments. Because it is our intention to restore the entire watershed and to prevent future pollution problems, we will be using monitoring data to track water quality improvements and to identify any new problem areas so they can be addressed. It will be an on-going process to get water bodies into compliance and to keep them in compliance.

Ecology's Livestock and Water Quality Program will continue to have an on-going presence in the watershed, and will continue working to achieve compliance with state water quality standards.

Monitoring Plan to Track effectiveness of Pollution Controls

Ecology initiated an effectiveness monitoring program in Asotin Creek watershed in May 2023. The goal of the monitoring program is to determine compliance with existing water quality standards for temperature, following years of nonpoint pollution control best management practice implementation under this STI project. These monitoring data will inform the effectiveness of our STI approach to pollution cleanup and provide the information feedback necessary for adaptive management purposes.

To make best use of limited resources for data collection, Ecology is focusing monitoring at the mouths of Asotin Creek, Asotin Creek North Fork, Asotin Creek South Fork, and George Creek. These monitoring locations represent ListingIDs 13851, 94371, 13858, and 103575, respectively. In the event the data demonstrates improving stream temperatures or attainment of numeric criteria, Ecology will consider expanding our monitoring efforts upstream to other sections of the creek and tributaries.

In-situ temperature loggers collecting surface water temperature measurements at 15-minute intervals were deployed in late May 2023. All temperature loggers were removed in October 2023 (while it was understood stream temperatures were below the criteria) to download data and complete quality control checks, and were then re-deployed later in the month. The loggers at Asotin Creek's north fork and south fork and George creek were deployed later in the month to capture stream temperatures during these location's relevant supplemental spawning criteria period from February to June. The Asotin Creek temperature logger was re-deployed in April 2024, as stream temperatures were beginning to approach the numeric criteria.

Recent Monitoring Results

Figure 13 displays the 7-DADMax temperature values in Asotin Creek from late May to early October 2023. Stream temperatures exceeded water quality standards 89 out of 135 days sampled, with a highest 7DADMax value of 21.67°C and highest daily max of 22.48°C. This 7-DADMax value is around 3 degrees cooler than the highest 7DADMax value reported at this site in 2001, despite much warmer air temperatures in 2023 (Table 21).

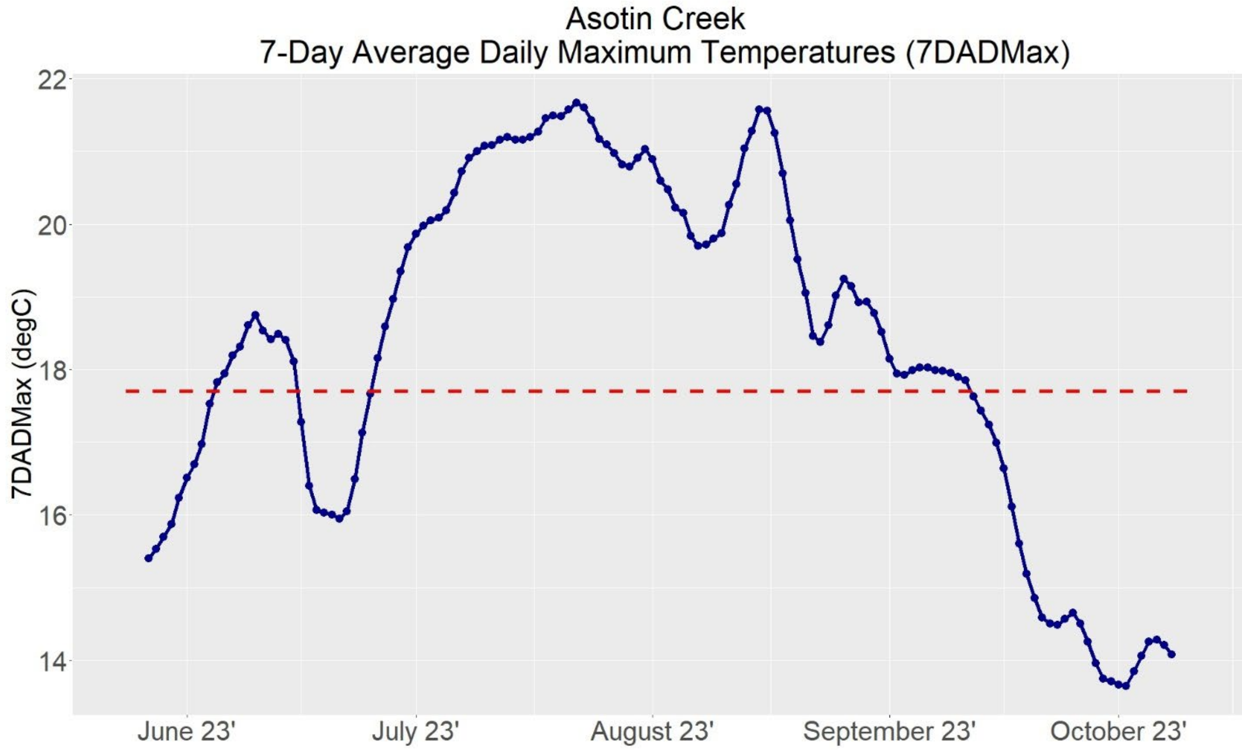

Figure 13. Asotin Creek 7-day average daily maximum temperature values (blue dotted line) and applicable temperature numeric criteria (red dashed line).

Table 21. Summary of surface water temperature data collected at mouth of George Creek. The number of "Days" refers to days with available 7-day average daily maximum temperature values.

Year	Highest 7DADMax (°C)	Highest Daily Max (°C)	Highest monthly average air temperature (°C)[44]
2000	21.7	22.3	31.6
2001	25.5	25.9	33.6
2002	23.6	24.5	33.5
2023	18.19	19.08	35.2

While not part of Ecology’s effectiveness monitoring efforts, Asotin Conservation District (CD) also collected continuous temperature monitoring data in Asotin Creek immediately upstream of the confluence with George Creek from late July through November 2019, with the goal of determining compliance with water quality standards. The highest reported 7DADMax from these data was 20.5°C, 4°C cooler than 7DADMax values reported in 2000 and only 7 out of 127

[44] National Ocean and Atmospheric Administration Online Weather Data (NOWData) at Lewiston-Nez Perce County Airport. Downloaded on June 6, 2024 from: https://www.weather.gov/wrh/climate?wfo=otx

days exceeded the numeric criteria. Note, air temperatures were warmer in 2019 than 2001. Lower stream temperature values in 2019 and 2023 compared to 2001, despite warmer air temperatures, suggest that temperature is recovering in the lower reach of Asotin Creek.

Additionally, Asotin CD collected continuous temperature data on Asotin Creek immediately downstream of the confluence of the north and south forks of Asotin Creek from late July through November 2019. The highest recorded 7DADMax value in 2019 was 18.4, with 6 out of 127 days exceeding standards. This 7DADMax is 2.1°C colder than the highest 7DADMax value reported in 2000 (20.6°C).

Figure 14 displays the 7DADMax temperature values in George Creek from late May 2023 to April 2024. Stream temperatures exceeded water quality standards 19 out of 298 days sampled, with a highest 7DADMax value of 18.19°C and highest daily max of 19.08°C. During the supplemental spawning period (February 15 to June 1), 6 out of 58 samples exceeded the 13°C criteria.

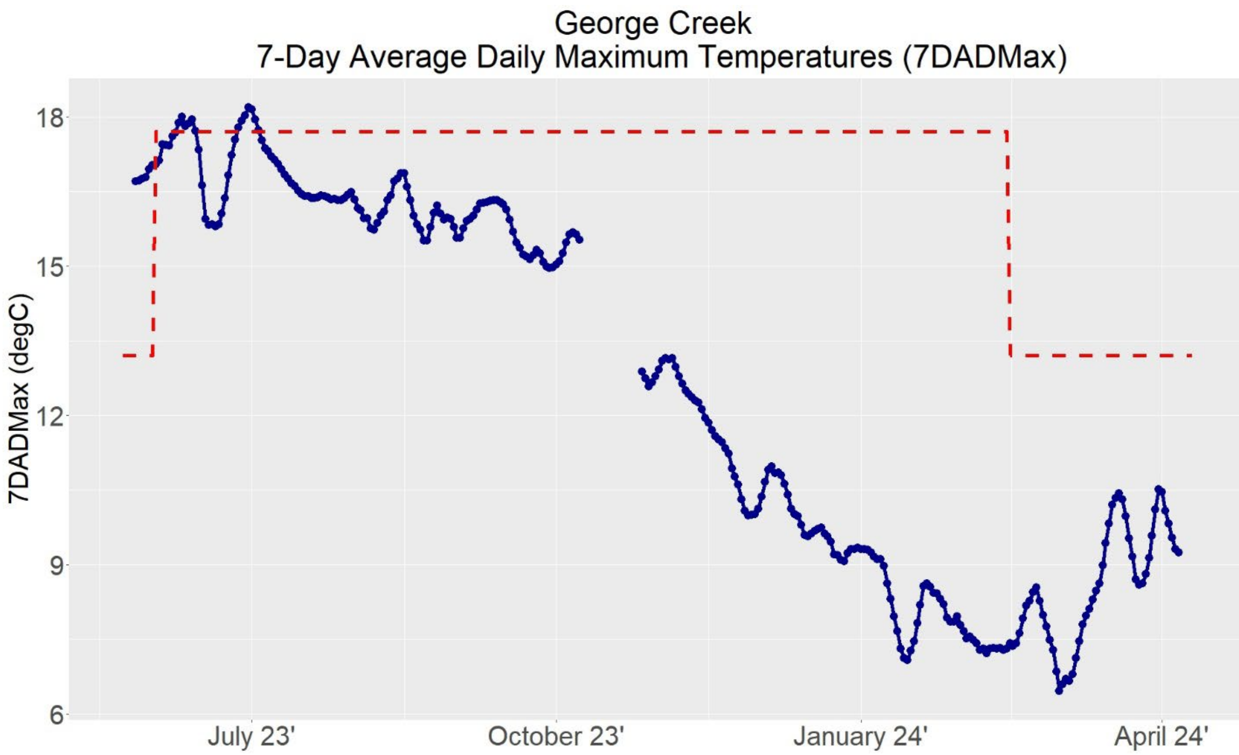

Figure 14 George Creek 7-day average daily maximum temperature values (blue dotted line) and applicable temperature numeric criteria (red dashed line).

While not part of Ecology’s effectiveness monitoring efforts, Asotin Conservation District (CD) also collected continuous temperature monitoring data during the 2019 and 2020 summer seasons in the immediately upstream George Creek segment, with the goal of determining compliance with water quality standards. In 2019, only 48 out of 159 days exceeded the numeric criteria, with 7DADMax values peaking at 20.9°C. In 2020, 82 out of 264 days exceeded the numeric criteria and summer 7DADMaxes reached 20.1°C. Unfortunately, there are no historic continuous data available at this monitoring location. However, these summer

7DADMax values range from 0.8 to 4.4°C cooler than those reported from 2000 to 2002 in the immediately downstream segment described above. Both our data at George Creek's mouth and Asotin CD's data collected upstream strongly suggest stream temperatures have decreased in the creek over the past two decades.

Figure 15 displays the 7-DADMax temperature values in Asotin Creek North Fork and South Fork from late May 2023 to early April 2024. Stream temperatures in Asotin Creek North Fork exceeded water quality standards 100 out of 298 days sampled, with a highest 7DADMax value of 19.87°C and highest daily max of 20.39°C. During the supplemental spawning period (February 15 – June 15), 20 out of 72 samples exceeded the criteria of 13 °C, reaching as high as 18.29°C. No historic continuous, summer-season temperature datasets exist on the lower-most reach of Asotin Creek North Fork for direct comparison to these data. Ecology's ambient monitoring program has been collecting monthly discrete temperature samples at this site since 2011. The highest reported daily temperature value reported since the 2018 WQA was 17.0°C in August 2022, however, these are not likely to capture the highest daily value or warmest day of the summer season. Additionally, immediately upstream of this monitoring location, 7DADMax values as high as 19.4°C were reported in 2001 and 2002.

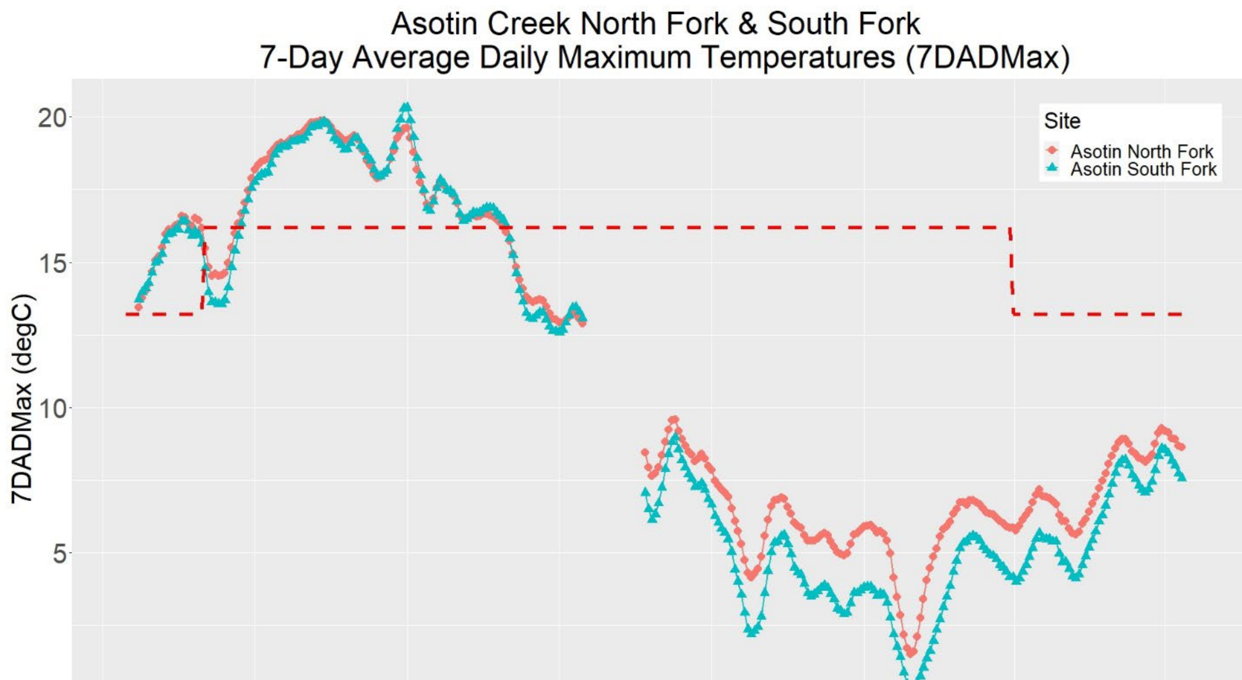

Figure 15. Asotin Creek North Fork and South Fork 7-day average daily maximum temperature values (orange and blue lines) and applicable temperature numeric criteria (red dashed line).

In Asotin Creek South Fork, stream temperatures exceeded water quality standards 101 out of 298 days sampled, with a highest 7DADMax value of 20.31°C and highest daily max of 21.35°C. During the supplemental spawning period (February 15 – June 15), 20 out of 72 samples exceeded the criteria of 13 °C, reaching as high as 16.41°C 7DADMax. The highest 7DADMax value in 2023 was 2.2°C cooler than the highest 7DADMax value in 2020, despite much warmer air temperatures in 2023.

At all sites with historic 7DADMax values and more current continuous data collected, the 7DADMax values collected in 2019 or 2023 were lower than the historic (Figure 16). The highest 7DADMax values across the watershed in 2019 and 2023 ranged between 2.2 to 6.6°C cooler than data collected between 2000 and 2002 at the same location. Collectively, these findings suggest that implementation efforts are improving stream temperatures through the watershed. Though additional stream temperature data are needed to provide additional assurances.

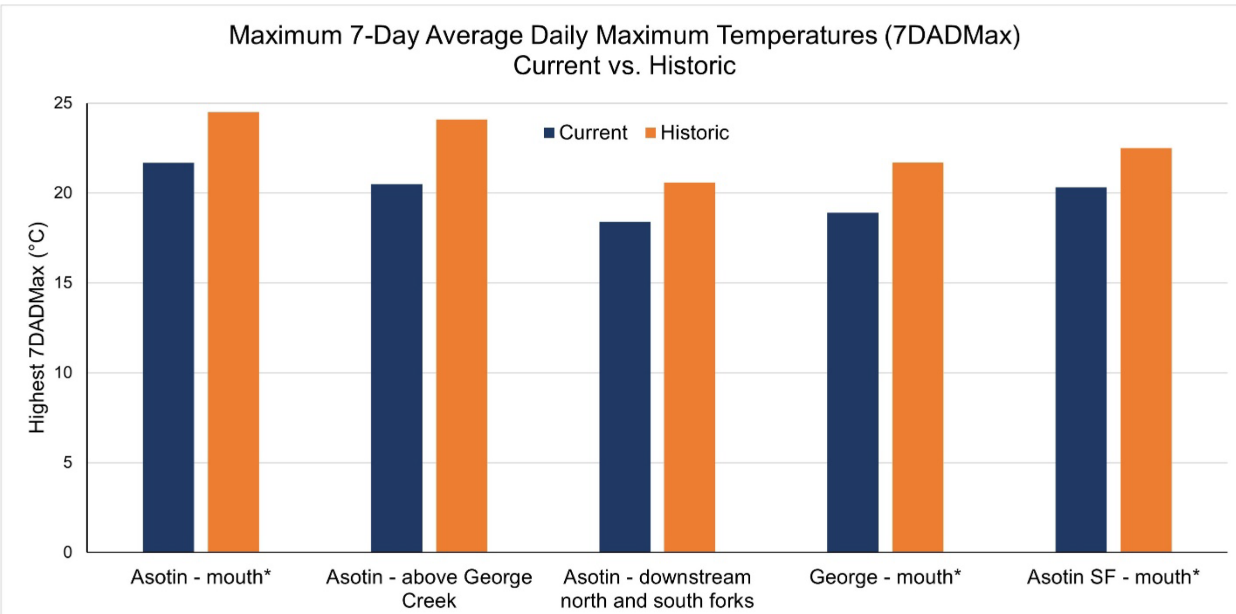

Figure 16. Current (2023 or 2019) and historic (2000-2002) annual maximum 7-day average daily maximum temperatures (7DADMax) in Asotin Creek watershed. For sites names with "*", current data were collected in 2023. For sites with the multiple years of historic data, the lowest 7DADMax value is displayed.

Commitment to Revise Pollution Controls as Necessary

Ecology will maintain a presence in the Asotin Creek watershed to ensure that water quality continues to improve. We fully expect the BMPs being implemented will achieve compliance with water quality standards. However, if they do not, Ecology will work with its local partners to determine other controls that could be used to achieve compliance.

Couse Creek Straight to Implementation Project – October 2024

The Washington Department of Ecology (Ecology) Integrated Report (IR) proposes to exclude three temperature listings from the 2022 303(d) list and place these segments into Category 4B. The specific listings are 29318, 29320, and 103958 (Figure 17,Table 22).

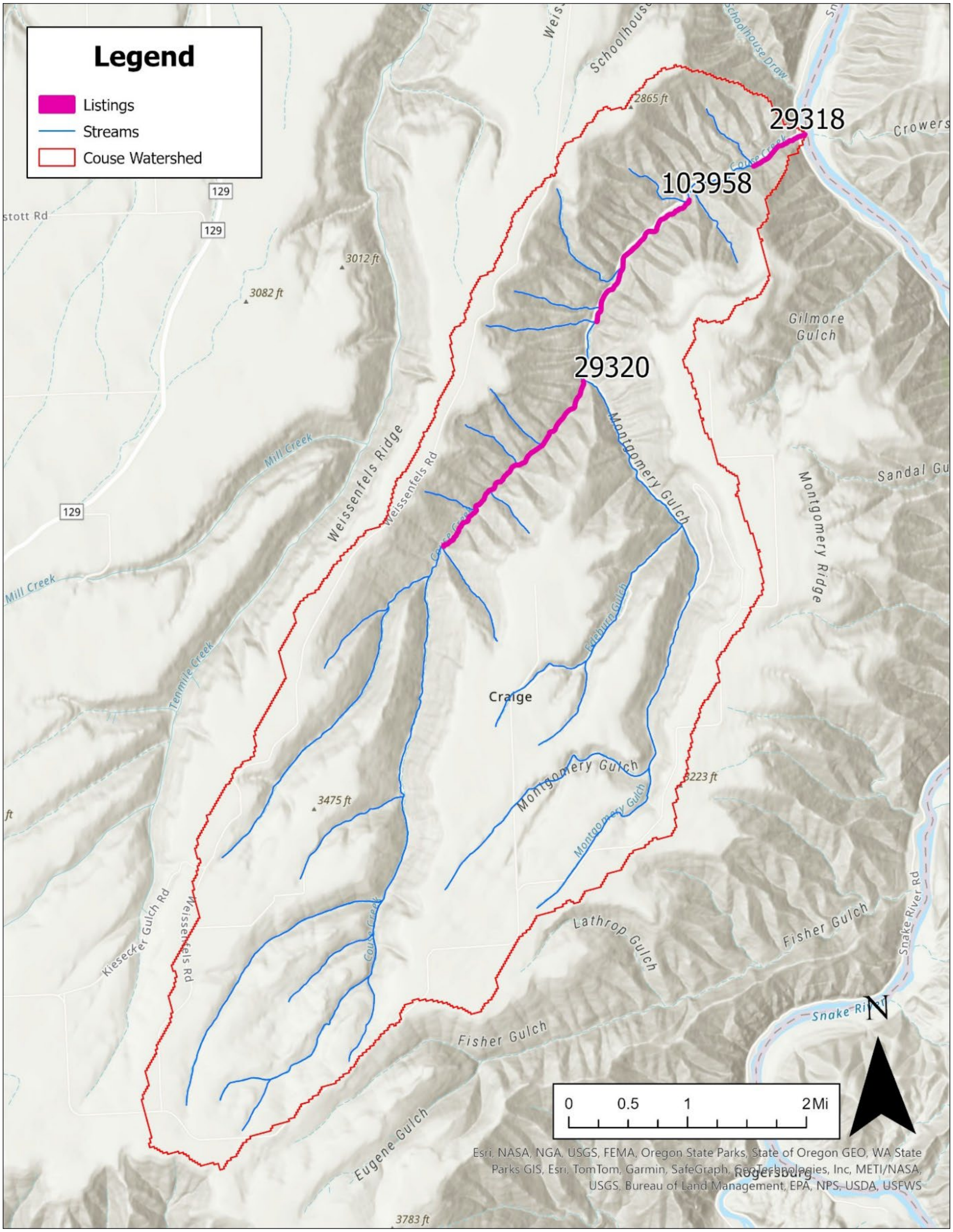

Figure 17. Couse Creek watershed and temperature impaired stream segments (listings) addressed by this plan.

Listings 29318 and 29320 were first identified as impaired for temperature and placed in Category 5 in the 2004 WQA. Both were later approved for Category 4B in the 2008 WQA and have remained in 4B since. Listing ID 103958 was first identified as impaired in the 2022 WQA and Ecology requests moving into Category 4B in the 2022 WQA as the implementation of this plan will address this temperature across the entire watershed.

Ecology's basis for continuing to exclude these waterbodies from the 303(d) list is outlined in this evaluation.

Table 22. Temperature listings addressed by Couse Creek STI Project.

ListingID	Assessment Unit	Stream – General location
29318	17060103001185_001_001	Couse – mouth at Snake River Rd. bridge
103958	17060103001159_001_001	Couse – 1.5 miles upstream of mouth
29320	17060103000141_001_002	Couse – upstream confluence with Mongomery Gulch

Identification of Segment and Statement of Problem Causing Impairment

Couse Creek is located in Asotin County in southeastern Washington. The creek cuts through a deep canyon on its way to the Snake River. The plateaus above Couse Creek are farmed for wheat and barley, and the canyon is used for range and feeding livestock. Threatened Snake River Steelhead trout still return to Couse Creek each autumn.

Prior to 2001, livestock in the watershed had uncontrolled access to the creek, and were fed at several easy to reach locations along the stream. The riparian corridor was degraded. Trampling and overgrazing had damaged or removed many of the trees and shrubs along the stream corridor. This degraded riparian area could not provide shade to the stream, resulting in high water temperatures. This is a sparsely populated area. There are no towns in the watershed and no point sources of pollution.

The most downstream segment of Course Creek, ListingID 29318, was first determined impaired based on data collected from 2000 to 2002 by the Washington Department of Fish and Wildlife (WDFW). Between 2000-2002, stream temperatures reached as high as 23.4°C, while the highest 7-day mean of maximum daily temperatures reported was 21.6°C. More recent WQAs included discrete temperature measurements collected from October 2005 to February 2007 by the Asotin Conservation District. These data only showed 1 of 21 samples exceeding water quality standards, where stream temperatures reached 18.8°C in May 2006 during the supplemental spawning season (criteria of 13.0°C).

The upstream segment of Couse Creek, ListingID 29320, was first determined impaired based data collected in 2000 to 2001 by the WDFW. Between 2000-2001, stream temperatures reached as high as 24.8°C, while the highest 7-day mean of maximum daily temperatures reported was 23.3°C. More recent WQAs included discrete temperature measurements collected from October 2005 to February 2007 by the Asotin Conservation District. These data only showed 1 of 15 samples exceeding water quality standards, where stream temperatures reached 18.2°C in May 2006 during the supplemental spawning season (criteria of 13.0 degrees Centigrade).

Description of Pollution Controls and How They Will Achieve Water Quality Standards

Water quality target

The designated use Aquatic Life Use category for the three impaired segments is “Salmonid Spawning, Rearing and Migration”, which equates to a 7-day average of the daily maximum (7DADMax) temperature criterion value of 17.5 degrees centigrade. In addition, all segments have a supplemental spawning criterion to protect the early life stages of salmonids of 13.0 degrees centigrade 7DADMax from February 15 to June 1 (Figure 18).

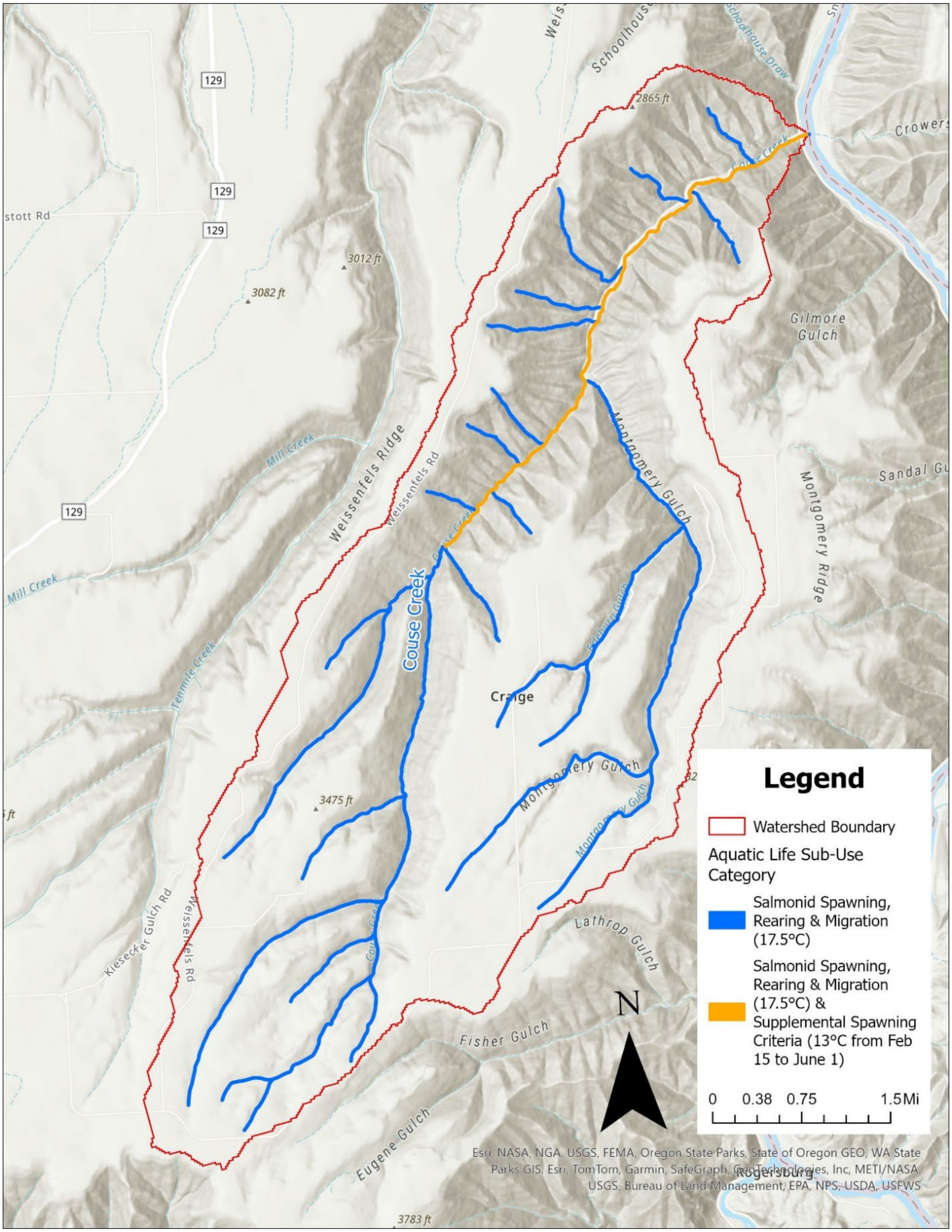

Figure 18. Couse Creek watershed aquatic life uses and applicable temperature numeric criteria.

Controls that will achieve water quality standards

The Department of Ecology's Eastern Regional Office has established a Livestock and Water Quality Program that uses a unique collaborative approach to address livestock-related problems. Instead of using the standard process that starts with a Category 5 listing, establishing a TMDL for the stream, writing an implementation plan, and finally getting to actual implementation, this strategy goes straight to implementation. The strategy is applied in watersheds in which the cause of a water quality impairment is clear.

Ecology encourages implementation of a wide variety of best management practices, however, a primary focus of the program has been to restore degraded riparian corridors and eliminate unlimited animal access to streams. Healthy riparian areas can improve water quality and stream health in multiple ways, which make them a particularly valuable and cost-effective management practice. Healthy riparian areas:

- Slow bank erosion by holding soil in place during periods of high water.
- Reduce flood damage and sedimentation by slowing runoff and capturing the sediment that would otherwise be carried downstream.
- Help keep water cool in summer by shading the stream.
- Improve water quality by capturing sediment, nutrients, pesticides, pathogens, and other pollutants before they reach the stream.
- Enhance summer stream flow by improving water infiltration and storage.
- Create fish and wildlife habitat.
- Limit livestock manure inputs to the creek and riparian areas.

Ecology has a three-step riparian restoration strategy, which allows the department to efficiently apply resources to priority problem areas. The first step is to address the source of degradation – unlimited livestock access to streams and winterfeeding operations in close proximity to the riparian corridor. Ecology relies primarily on livestock exclusion, and off-stream water supply to restrict livestock access to the riparian area. In implementing this BMP, Ecology was using NRCS riparian buffer standards, which required a minimum 35-foot buffer between the livestock fence and the mean ordinary high-water mark. In many cases, the buffer width was larger depending on the stream and site conditions. In 2022, Ecology updated its riparian buffer guidelines and is now implementing buffer widths according to the Voluntary Clean Water Guidance for Agriculture. These new guidelines require a minimum 75, 60 or 50-foot core buffer between the livestock fence and the mean ordinary high-water mark of the nearest stream bank, depending on the stream characteristics. Additional protection encompassing the total riparian management zone of 150 feet may be necessary depending on the stream, site conditions and adjacent land uses.

By first addressing livestock access, Ecology seeks to abate the primary pollution sources—livestock in the stream, eroded stream banks, increased runoff, increased sedimentation, and subsequent transport of fecal matter. As vegetation naturally returns in the riparian area, site conditions become stabilized, and the pollution sources are dramatically reduced. Also, this approach works to arrest morphological changes to the entire stream that are induced by erosion and sedimentation.

Ecology has spent much of its efforts and resources implementing this first step, in large part, because we have taken a holistic, watershed approach to protecting streams. By first addressing the primary sources of pollution and geomorphic change, Ecology can establish the necessary site conditions for successful restoration. Moreover, Ecology ensures that, first and foremost, the root problems are addressed for *the entire stream*, before resources are focused on site or segment specific restoration.

The second step occurs after a majority of site conditions have been stabilized, and the stream's entire geomorphic integrity is no longer jeopardized by the adjacent management practices. Ecology then conducts a reach by reach assessment to determine the appropriate trees and shrubs to be used for restoration. In some cases, federal programs require revegetation as part of the cost-share program, and so restoration work occurs simultaneously with livestock exclusion.

The third step is to work with local landowners to promote continuous and proper management of upland grazing lands.

In addition to the Livestock and Water Quality Program, Ecology's Eastern Regional Office has established a similar collaborative approach to address crop production-related problems. Ecology encourages implementation of a wide variety of best management practices, however, a primary focus of effort has been establishing minimum land use setbacks, restoring degraded riparian corridors, and converting conventionally farmed land to conservation tillage practices.

Ecology teams with conservation districts, local governments, and landowners to provide technical assistance and funding for implementation of best management practices. Ecology uses our regulatory authority as a backstop when collaborative efforts fail. The Water Pollution Control Act (RCW 90.48) gives Ecology the authority to take enforcement actions against nonpoint polluters.

RCW 90.48 makes it unlawful for any person to "cause, permit or suffer to be thrown, run, drained, allowed to seep or otherwise discharged … any organic or inorganic matter that shall cause or tend to cause pollution of" waters of the state. Any person who violates or creates a substantial potential to violate the provisions of Chapter 90.48 RCW is subject to an enforcement order from Ecology pursuant to RCW 90.48.120. Ecology is authorized to "issue such order or directive as it deems appropriate under the circumstances[.]" In addition to administrative orders, violating Chapter 90.48 RCW may result in injunctions, civil penalties, and notices of violations.

It is worth noting that RCW 90.48.120 gives Ecology the authority to take action in response to nonpoint source pollution, the statute also gives Ecology the authority to take action based on a "substantial potential" to pollute state waters via either a point or nonpoint pollution source. Consequently, Ecology not only has authority to take action following a NPS pollution occurrence (i.e. there was a discharge), but has specific statutory authority to act proactively to prevent NPS pollution from occurring in the first place.

Ecology's authority includes the authority to require a nonpoint source polluter to implement specific best management practices (BMPs). Ecology's authority can be used to prevent nonpoint pollution and require BMPs, as necessary.

Ecology has used this regulatory backstop several times since 2016.

The result of these partnerships has been the implementation of best management practices at hundreds of sites across several watersheds where water quality and fish habitat issues exist. By using a collaborative strategy, backed up by enforcement when necessary, Ecology has been able to create relationships and build trust with rural residents while improving water quality.

In the Couse Creek watershed, work with landowners began in 2002. Eight miles of riparian buffers were installed. The creek was fenced to protect it from livestock, and off-stream water was provided at several key points. Thousands of native trees and shrubs were planted in the stream corridor. Buffers were constructed using Natural Resource Conservation Service standards, which required a minimum width of 35 feet. For buffers installed with state or federal financial assistance, we require an agreement with the landowner stipulating that the buffer and fence will be maintained for at least 10 years. Looking forward, newly installed buffers funded with state financial assistance will be implemented according to the updated Voluntary Clean Water Guidance for Agriculture requirements.

In addition, farmers in the watershed are adopting direct seed technology, which is the practice of seeding a new crop into the standing stubble of a recently harvested crop without the traditional tillage of the ground. By doing so, soil erosion can be reduced by as much as 95 percent. This significantly reduces the volume of sediment washing into Couse Creek. All of these efforts will help address the temperature impairments. From approximately 2015 to 2020, the Asotin County CD assisted in converting an additional 652 acres to direct seed or conservation tillage in the watershed. This increase in acres converted to conservation tillage has not continued because it is estimated that over 90% of the watershed is now using conservation tillage techniques. Most farmers in the watershed have already adopted, and are now using, direct seed technology due to the CD's incredible efforts.

All of these efforts will help address the temperature impairments. Initial cattle exclusion fencing was generally installed adjacent to or upstream of the impaired segments. However, we have also fenced portions of the stream and tributaries where there are presently no Category 5 listings, but where there was unrestricted cattle access to the stream.

Riparian buffers are left to revegetate naturally in those areas in which there is enough live native vegetation left to recover. In all other areas we are installing buffers by planting native plants. Enhancement plantings and maintenance will continue to ensure all buffers are adequate and healthy. As of 2006, all cattle in the watershed have been fenced out of the stream.

In more recent years (2015-2020), an additional thirteen miles of riparian buffer was enhanced with plantings of over 9,000 trees in the riparian area, and the installation of an additional 0.4 miles of livestock exclusion fencing. This watershed can be increasingly complex to establish robust buffers due to its arid and rocky conditions. The Asotin County CD continues to focus efforts on enhancement and maintenance in the watershed. Ecology partnered with the CD on a grant to promote overbank flow and floodplain connection to improve temperature and sedimentation concerns. This effort installed 46 Beaver Dam Analogs (BDAs) throughout the watershed prior to 2020. The CD also received a FY22 state 319 water quality grant from

Ecology, which is currently providing funding to protect and enhance an additional 35,368 stream feet and plant 11,870 trees in Couse Creek. Under this grant, another 246 BDAs will be installed in Couse Creek in 2024 to further support temperature and sedimentation concerns in the watershed.

The Couse Creek watershed continues to recover. Since 2006, many riparian areas have been placed into the Conservation Reserve Enhancement Program, which requires maintenance of riparian plantings. Ecology has completed additional planting to increase riparian vegetation. In addition, Ecology has been encouraging landowners to implement direct seed technology through the use of state Centennial and federal 319 grant funds; and Bonneville Power Administration Direct Seed Cost-share.

Changes to the watershed are obvious. Trees and shrubs are now growing in the riparian area, and the channel is more defined and stable, with more consistent surface flow. There are Steelhead trout in the creek. Landowners are noticing the changes, too. One Couse Creek landowner told Ecology, “Since we implemented these projects we have stands of grass I have never seen before. The stream corridor looks healthier than it did three years ago.”

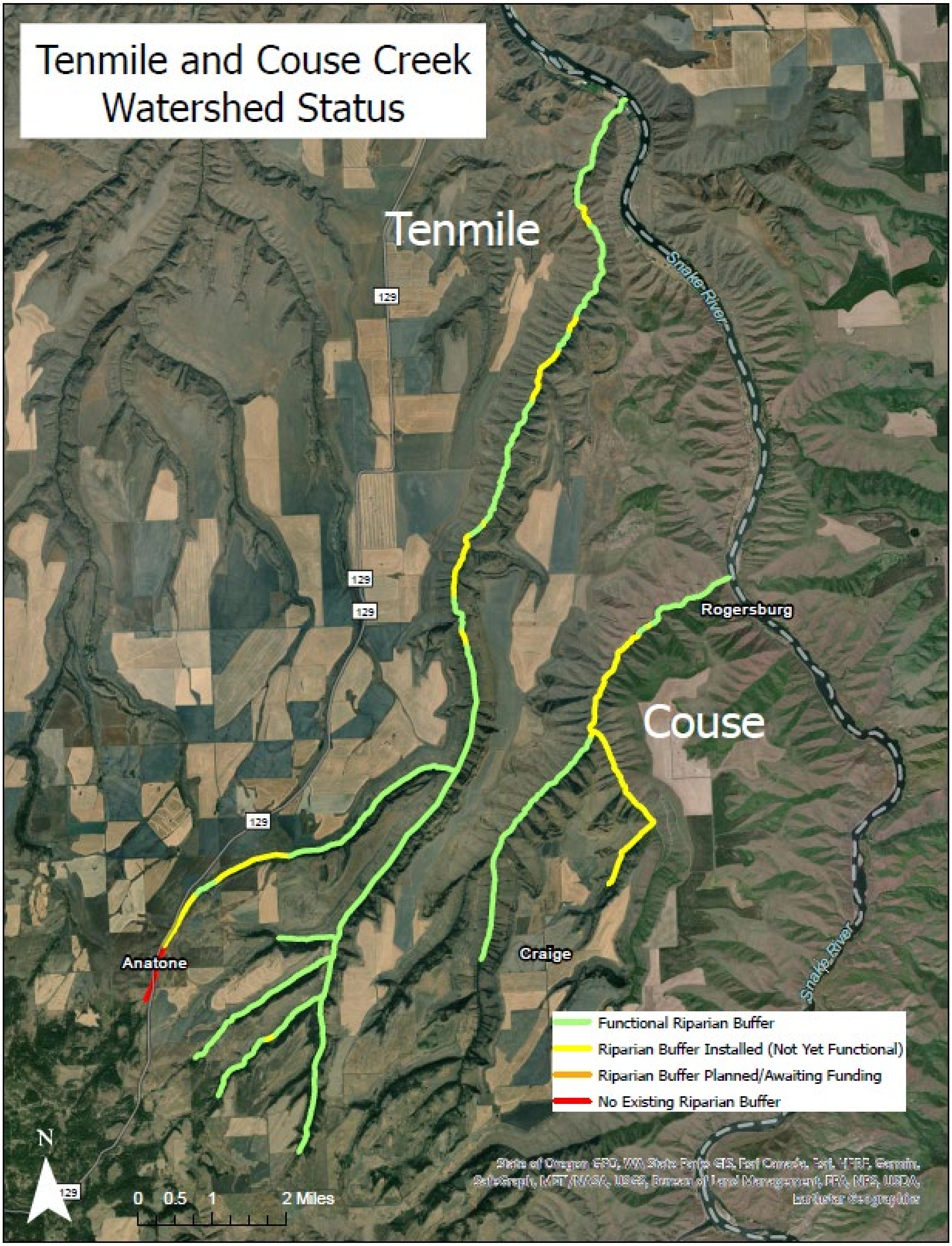

Figure 19. Tenmile and Couse Creek Watershed riparian status.

Description of requirements under which pollution controls will be implemented

It is Ecology's best professional judgment that the pollution controls that have been installed will result in the water quality standards being met. Maintenance of these controls has been ensured through 10-year landowner agreements that were established as part of the funding agreements for these projects. Additionally, Ecology staff will continue to perform watershed evaluations in this watershed to ensure that BMPs stay in place.

Estimate or Projection of Time When Water Quality Standards Will be Met

It will take time for the riparian corridor to fully recover and for the stream to re-establish its natural geometry. Ecology originally estimated that the riparian buffers will have grown enough to be fully effective in 10-15 years, or by the year 2025. While much progress has been made planting and enhancing buffers, the vegetation has not yet reached the maturity necessary to protect the stream and meet temperature standards. While Couse Creek continues to see projects implemented, additional time is necessary to allow for the riparian vegetation growth required to adequately shade the Creek and meet the temperature standard throughout the entire watershed by 2040.

Schedule for Implementing Pollution Controls

As described earlier in this report, Ecology has worked with the conservation district, local governments, and landowners to implement a variety of best management practices in the Couse Creek watershed. It is our best professional judgment that this work will remedy the pollution problems in the impaired segments. Because it is our intention to restore the entire watershed and to prevent future pollution problems, we will be using monitoring data to track water quality improvements and to identify any new problem areas so they can be addressed. It will be an on-going process to get water bodies into compliance and to keep them in compliance.

Ecology's Livestock and Water Quality Program will continue to have an on-going presence in the watershed, and will continue working to achieve compliance with state water quality standards.

Monitoring Plan to Track Effectiveness of Pollution Controls

Ecology initiated an effectiveness monitoring program in Couse Creek watershed in May 2023. The goal of the monitoring program is to determine compliance with existing water quality standards for temperature, following years of nonpoint pollution control best management practice implementation under this STI project. These monitoring data will inform the effectiveness of our STI approach to pollution cleanup and provide the information feedback necessary for adaptive management purposes.

To make best use of limited resources for data collection, Ecology is collecting continuous temperature data at 15-minute intervals via an in-situ data logger at one site located at the mouth of Couse Creek. This monitoring location represents ListingID 29318. In the event the data demonstrates improving stream temperatures or attainment of numeric criteria, Ecology will consider expanding our temperature monitoring efforts upstream to other sections of the stream (including listings 29320 and 103958) and tributaries.

Recent Monitoring Results

Figure 20 displays the 7-DADMax temperature in the lower-most segment of Couse Creek from late May 2023 to early April 2024, along with the applicable numeric criteria. Stream temperatures exceeded water quality standards on 109 of 298 days sampled[45] and reached 21.83°C 7DADMax in August 2023. During the supplemental spawning season (February 15 – June 1), 8 out of 58 days exceeded the 13°C criteria, reaching as high as 17.54°C 7DADMax. The logger was removed in October 2023 (while it was understood stream temperatures were below the criteria) to download data, complete quality control checks, and was re-deployed later in the month.

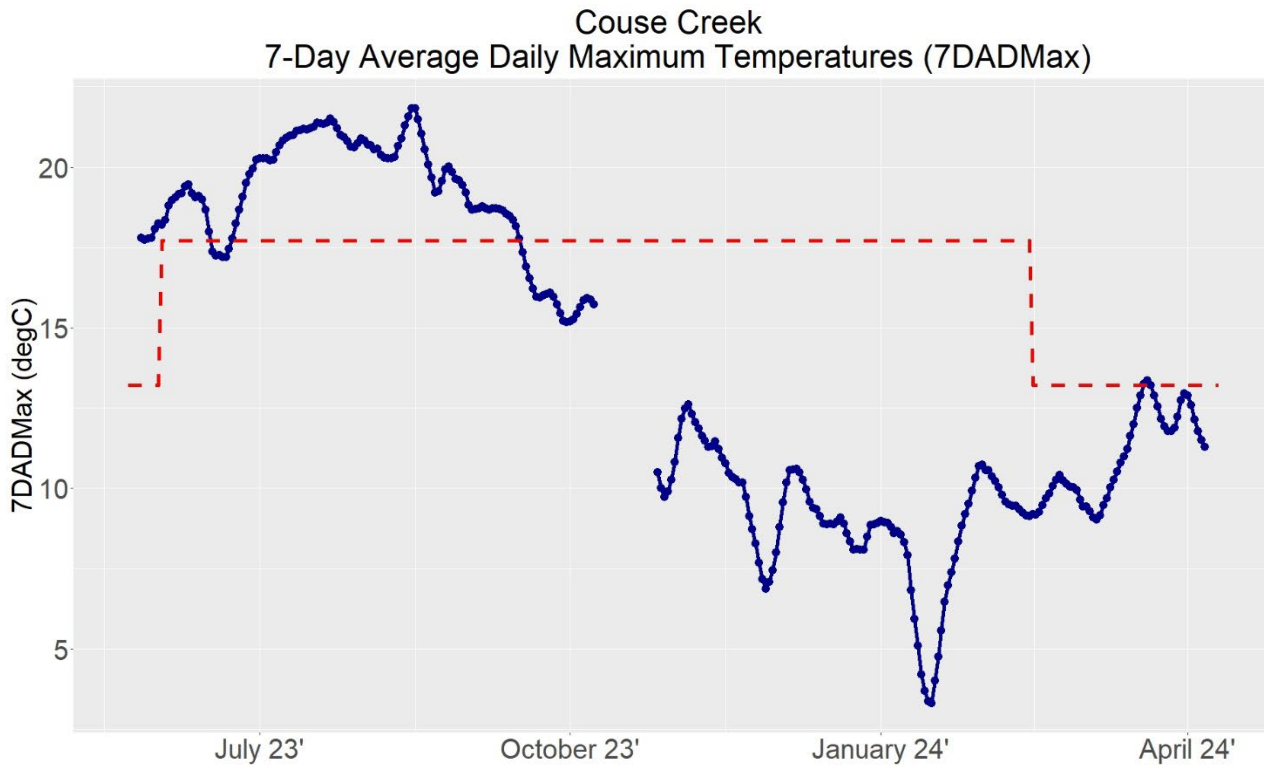

Figure 20. Couse Creek 7-day average maximum daily temperature values (blue dotted line) and applicable temperature numeric criteria (red dashed line).

While not part of Ecology's effectiveness monitoring efforts, Asotin Conservation District (CD) also collected continuous temperature monitoring data at the mouth of Couse Creek in from July 2019 through September 2020 with the goal of determining compliance with water quality standards. Their data found similar temperature values. Streams temperatures reached 17.5°C 7DADMax in the supplemental spawning period and 21.7°C 7DADMax in the summer.

[45] To account for instrument accuracy, only measurements exceeding the applicable criteria by more than 0.2°C were counted as exceedances. This approach is consistent with our Water Quality Assessment methodology for evaluating temperature time-series data (Water Quality Program Policy 1-11, Chapter 1).

Table 23 below summarizes these recent effectiveness temperature monitoring data with the continuous monitoring collected by WDFW from 2000 to 2002. The highest reported annual 7DADMax values from 2000 to 2023 range from 21.1 to 21.8°C, suggesting that the stream temperature has not cooled in recent years. However, air temperatures were much warmer in 2023 compared to 2000-2002, suggesting that implementation efforts may be offsetting the impacts of highest air temperatures.

Table 23. Summary of surface water temperature data collected at mouth of Couse Creek. The number of "Days" refers to days with available 7-day average daily maximum temperature values.

Year	Highest 7DADMax (°C)	Highest Daily Max (°C)	Highest monthly average air temperature (°C)[46]
2000	21.6	22.2	31.6
2001	21.1	23.4	33.6
2002	21.4	22.1	33.5
2019	21.3	21.8	32.9
2020	21.7	23.0	32.5
2023	21.83	22.67	35.2

Asotin Conservation District also collected data in Couse Creek upstream from the confluence with Montgomery Gulch (representing Listing 29320) from July 2019 through September 2020. Table 24 below summarizes these data along with WDFW's historic data from 2000 and 2001. Summer 7DADMax values in 2019 and 2020 were between 0.7 to 2.2°C cooler than nearly twenty years ago, despite similar air temperature values. These data suggest that implementation efforts may be cooling creek summer temperatures in the upper reaches of the watershed.

[46] National Ocean and Atmospheric Administration Online Weather Data (NOWData) at Lewiston-Nez Perce County Airport. Downloaded on June 6, 2024 from: https://www.weather.gov/wrh/climate?wfo=otx

Table 24. Summary of surface water temperature data collected in Couse Creek, upstream from confluence with Montgomery Gulch. The number of "Days" refers to days with available 7-day average daily maximum temperature values.

Year	Highest 7DADMax (°C)	Highest Daily Max (°C)	Highest monthly avg air temperature (°C)[47]
2000	23.3	24.8	31.6
2001	21.3	22.6	33.6
2019	20.1	20.5	32.9
2020	20.6	22.1	32.5

The implementation and stream temperature data collectively suggest that implementation efforts are slowly working in Couse Creek watershed. Recent stream temperatures in the upper portion of the watershed are cooler than 20 years ago, despite similar air temperatures. Continued implementation and data collection will be needed to track the effectiveness of these efforts.

Commitment to Revise Pollution Controls as Necessary

Ecology will maintain a presence in the Couse Creek watershed to ensure that water quality continues to improve. We fully expect the Eastern Regional Office livestock and water quality program to achieve compliance with water quality standards. However, if it does not, Ecology will work with the conservation district, local governments, and landowners to determine other controls that could be used to achieve compliance.

Deadman and Meadow Creek Straight to Implementation Project – October 2024

The Washington Department of Ecology (Ecology) Integrated Report (IR) proposes to exclude twenty-four impairments (listings) within Deadman and Meadow Creek watersheds from the 2022 303(d) list and place these segments into Category 4B. Table 25 and Figure 21. summarize the listings addressed by this project, along with the Water Quality Assessment cycle each listing was first identified as impaired and the cycle the listing was first moved into Category 4B.

Ecology's basis for excluding these water bodies from the 303(d) list is outlined in this evaluation.

[47] National Ocean and Atmospheric Administration Online Weather Data (NOWData) at Lewiston-Nez Perce County Airport. Downloaded on June 6, 2024 from: https://www.weather.gov/wrh/climate?wfo=otx

Table 25. Listings Ecology requests placing into Category 4B, with the WQA cycle each listing was first identified as impaired and the cycle the listing was first moved into Category 4B.

Listing ID	Assessment Unit	Parameter	WQA Impaired	WQA moved to 4B
47172	17060107000224_001_001	Dissolved Oxygen	2008	2012
47173	17060107000240_001_001	Dissolved Oxygen	2008	2012
47174	17060107000250_001_001	Dissolved Oxygen	2008	2012
40553	17060107000250_001_001	Fecal coliform	2004	2012
40554	17060107000263_001_001	Fecal coliform	2004	2008
40555	17060107000274_001_001	Fecal coliform	2004	2008
45999	17060107000240_001_001	Fecal coliform	2012	2012
46000	17060107000224_001_001	Fecal coliform	2008	2012
72282	17060107003590_001_001	Fecal coliform	2018	2022
72286	17060107000235_001_001	Fecal coliform	2012	2012
72287	17060107000262_001_001	Fecal coliform	2018	2022
89107	17060107000279_001_001	Fecal coliform	2018	2022
50438	17060107000274_001_001	pH	2008	2012
50473	17060107000224_001_001	pH	2008	2012
50474	17060107000240_001_001	pH	2008	2012
50475	17060107000250_001_001	pH	2008	2012
18827	17060107000249_001_001	Temperature	2004	2008
18828	17060107000258_001_001	Temperature	2004	2008
18829	17060107000250_001_001	Temperature	2004	2012
18830	17060107000224_001_001	Temperature	2004	2012
18831	17060107000227_001_001	Temperature	2004	2012
18832	17060107000240_001_001	Temperature	2012	2012
40534	17060107000263_001_001	Temperature	2004	2012
93567	17060107000279_001_001	Temperature	2018	2022

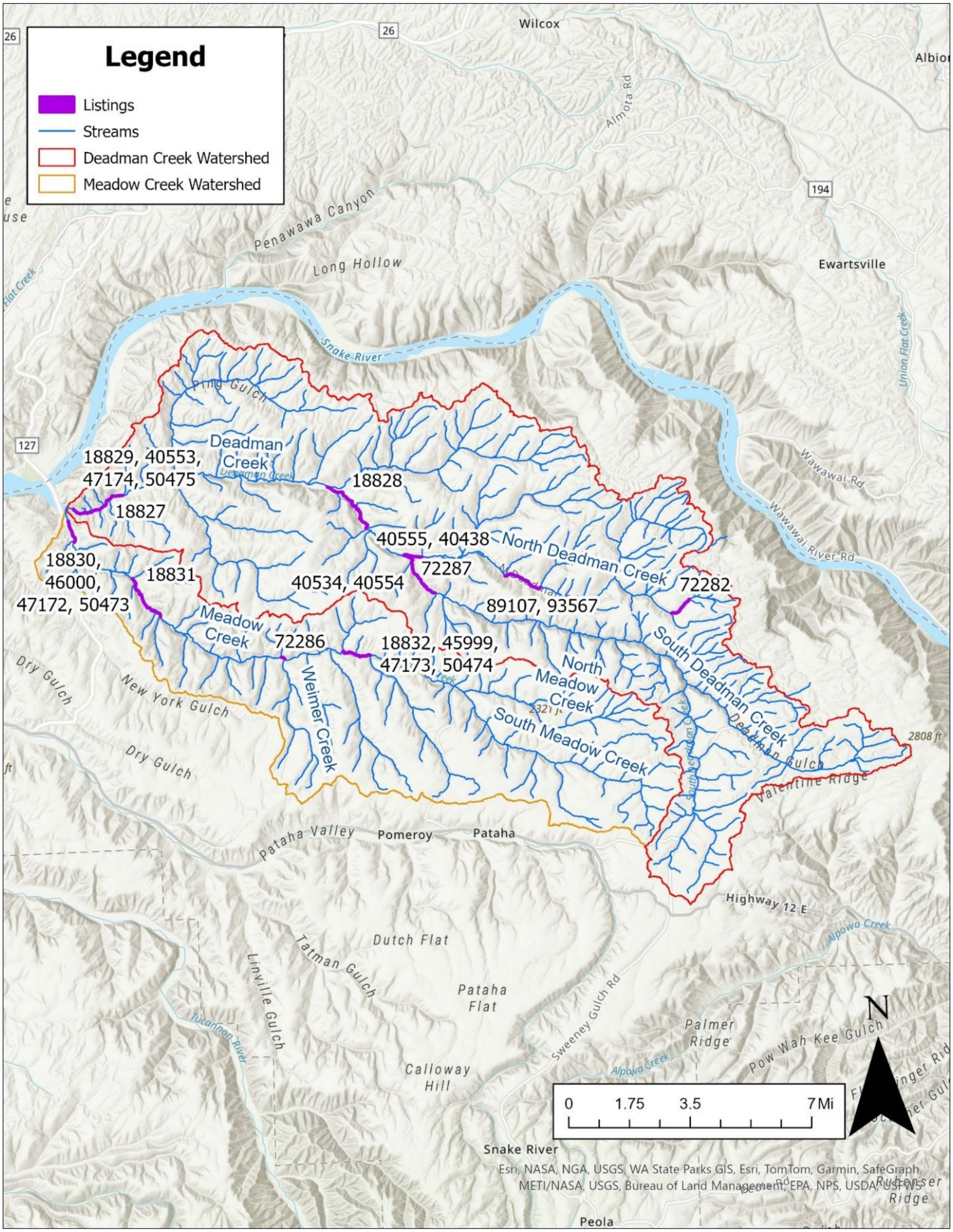

Figure 21 Deadman and Meadow Creek watersheds and impaired creek segments addressed by this plan.

Identification of Segment and Statement of Problem Causing Impairment

Deadman and Meadow Creek are located in Garfield County in southeastern Washington. Both flow roughly east to west through rolling hills before their confluences meet at the Snake River. This is arid country, with rainfall in some areas averaging as little as 11 inches annually.

Historically, the surrounding hills were covered in bunchgrass and sage, and the meandering creek provided habitat for Steelhead trout. Approximately half the watershed today is used for non-irrigated crops such as wheat and barley, primarily in the high areas of the watershed. The other half, primarily the bottomlands near streams, provides range for livestock. From November through March, cattle are typically fed along the valley floor, which serves as a refuge from the region's harsh winter weather.

This is a sparsely populated area. There are no towns in the watershed and no point sources of pollution. The few farmhouses are widely dispersed in the watershed, and there is no evidence that septic systems are contributing pollution to streams.

Table 26 summarizes historic dissolved oxygen data at three impaired segments and three segments of concern (Category 2) segments in Deadman and Meadow Creeks. Data collection ranges from 2003 to 2013. All data were collected by either Ecology or Pomeroy Conservation District. All measurements, with the exception of data collected in 2012 at Deadman and Meadow Creek's most downstream sampling sites, represent discrete measurements. At all sampling locations, the majority of sampling years demonstrated at least one, many times multiple, exceedances of the criterion.

In Deadman Creek, multiple exceedances of the criterion occurred at the most downstream sampling site, where the upstream site general had only one to no exceedances most sampling years. This suggests that dissolved oxygen may not be as limited in the upper reaches of the watershed.

At Meadow Creek's mouth, the continuous monitoring data in 2012 found 113 of 115 days exceeded the criterion, where bi-weekly discrete monitoring at the same location found 0-18% of samples in a year exceeding the criterion. This discrepancy suggests that discrete monitoring is likely no capturing the diurnal variability of oxygen levels in Meadow Creek, which is typical in many smaller-order streams.

Table 26. Historic dissolved oxygen data in Deadman and Meadow Creeks. Bolded counts represent exceedances of the applicable dissolved oxygen criterion of 8.0 mg/L.

Listing ID	Stream – General location	Year – samples exceeding criterion/total samples (lowest DO value (mg/L))
47174	Deadman – at Willow Gulch Rd. bridge	**2003 – 4/22 (5.38)** **2004 – 2/24 (0.82)** **2005 – 3/23 (5.26)** **2006 – 2/23 (6.48)** 2007 – 0/1 (11.47) **2012 – 6/70 (7.7)** 2013 – 0/3 (11.03)
47137[a]	Deadman North Fork – upstream confluence South Fork	**2003 – 1/22 (5.12)** **2004 – 1/24 (7.6)** 2005 – 0/23 (8.39) **2006 – 1/22 (7.71)** 2007 – 0/2 (12.31)
82259[a]	Deadman North Fork – River mile 4.7	**2012 – 1/8 (7.22)** 2013 – 0/3 (11.04)
47172	Meadow – at mouth	**2003 – 3/18 (5.45)** 2004 – 0/24 (8.02) **2005 – 3/23 (7.37)** **2006 – 4/22 (7.37)** 2007 – 0/2 (11.03) **2012 – 113/115 (5.26)** 2013 – 0/3 (10.36)
77712[a]	Meadow –at Weimer Gulch Rd. bridge	**2006 – 2/3 (7.5)**
47173	Meadow – at Ben Day Gulch Rd. bridge	**2003 – 6/22 (5.28)** **2004 – 2/23 (7.8)** **2005 – 5/23 (6.39)** **2006 – 4/22 (7.01)** 2007 – 0/2 (11.77) **2012 – 3/8 (7.68)** 2013 – 0/3 (10.36)

Table notes:

[a]Ecology is not currently requesting coverage of this listing because it has not been determined impaired. These data are presented for reference purposes.

Table 27 summarizes historic fecal coliform data supporting the impaired status of multiple segments of Deadman and Meadow Creeks. Data collection ranges from 1999 to 2013, with fecal coliform data collected by Ecology, Pomeroy Conservation District, and Washington State

University. That data demonstrates non-attainment of both the 10% and geometric mean criteria in both creeks in nearly every year sampled. In the lower reach of both creeks, the highest reported fecal coliform sampling events in 2012 and 2013 tended to be lower than those reported 1999-2007. In Deadman Creek, fecal coliform values and the number of exceedances of the 10% criterion tended to decrease from the headwaters to the mouth of the creek, suggesting fecal coliform pollution is targeted in the upper reaches of the watershed.

Table 27. Historic fecal coliform (FC) data in Deadman and Meadow Creeks. Years below represent "water-year" (October – September). Bolded sample and geometric mean values in the table represent exceedances of the applicable fecal coliform criteria.

Listing ID	Stream – General location	Year – samples exceeding 10% criterion[a]/total samples (highest value (CFU/100mL))	Year – highest FC geometric mean (CFU/100mL)[b]
40553	Deadman – at Willow Gulch Rd. bridge	**2003 – 3/23 (660)** **2004 – 3/24 (8000)** **2005 – 3/23 (251)** **2006 – 1/25 (280)** 2007 – 0/10 (170) 2012 – 0/7 (160) **2013 – 1/7 (290)**	**1999 – >100[c]** **2000 – >100[c]** **2003 – 196** 2004 – 73 2005 – 36 **2006 – 131** 2007 – 17 **2012 – 105** 2013 – 100
40555	Deadman North Fork – upstream confluence South Fork	**2003 – 6/19 (490)** **2004 – 6/24 (760)** **2005 – 9/22 (2000)** **2006 – 2/24 (1640)** 2007 – 0/10 (100)	**2000 – >100[c]** **2001 – >100[c]** **2003 – 168** 2004 – 96 2005 – 87 **2006 – 140** 2007 – 20
89107	Deadman North Fork – River mile 4.7	**2012 – 3/4 (770)** **2013 – 1/7 (400)**	**2012 – 536** **2013 – 226**
72282	Deadman North Fork – at Bell Plain Rd.	**2006 – 2/3 (710)** 2007 – 0/1 (6) **2012 – 5/7 (5100)** **2013 – 7/7 (330)**	**2006 – 369** **2012 – 1806** **2013 – 1996**
72287	Deadman South Fork – upstream confluence North Fork	**2006 – 2/2 (1000)** 2007 – 0/1 (2)	None available
40554	Deadman South Fork – at Gould City Mayview Rd.	None available	**2000 – >100[c]**

Listing ID	Stream – General location	Year – samples exceeding 10% criterion[a]/total samples (highest value (CFU/100mL))	Year – highest FC geometric mean (CFU/100mL)[b]
46000	Meadow – at mouth	**2003 – 7/12 (540)** **2004 – 19/24 (10000)** **2005 – 10/23 (1560)** **2006 – 18/24 (3700)** **2007 – 3/10 (480)** **2012 – 2/4 (510)** **2013 – 1/7 (290)**	**2003 – 317** **2004 – 446** **2005 – 195** **2006 – 772** **2007 – 155** **2012 – 284** 2013 – 81
72286	Meadow –at Weimer Gulch Rd. bridge	**2006 – 2/3 (790)**	**2006 – 346**
45999	Meadow – at Ben Day Gulch Rd. bridge	**2003 – 11/16 (2640)** **2004 – 11/23 (900)** **2005 – 8/23 (1240)** **2006 – 2/24 (4000)** 2007 – 0/9 (164) **2012 – 1/7 (1000)** **2013 – 3/7 (1000)**	**2003 – 285** **2004 – 145** **2005 – 122** **2006 – 328** 2007 – 11 **2012 – 202** **2013 – 285**

Table notes:

[a]200 CFU/100mL. See WAC 173-201A200 Table 200 (2)(b) for full criterion reference.

[b]Geometric mean values from 2005 and prior were calculated on a 12-month period and were evaluated using the pre-2019 recreational use criteria. Values from 2006 to present were calculated on a 3-month period and were evaluated using the current recreational use criteria.

[c]No values reported. Reported as above geometric mean criterion.

Table 28 below summarizes historic pH data on four pH impaired segments and one segment of concern in Deadman and Meadow Creek watersheds. Data collection ranges from 2003 to 2013. Data were collected by Ecology and Pomeroy Conservation District. Data collected in 2012 in the most downstream sites at Deadman and Meadow Creek represent continuous measurements during the summer season. Both the upper and lower limits of the pH criterion were exceeded at least once at four out of five segments. At all locations exceedances of the criterion only occurred from 2003 to 2007. Additionally, continuous data collected in 2012 found no exceedances of the criterion during 81 days of measurements in Deadman Creek and 115 days of measurements in Meadow Creek. These data suggest pH levels may be recovering in both creeks.

Table 28. Historic pH data in Deadman and Meadow Creeks. Bolded pH range values represent exceedances of the pH criteria (6.5 – 8.5 pH).

Listing ID	Stream – General location	Year - samples exceeding criterion/total samples	pH Range
50475	Deadman – at Willow Gulch Rd. bridge	2003 – 4/22 2004 – 2/24 2005 – 8/23 2006 – 0/21 2007 – 1/2 2012 – 0/81 2013 – 0/2	**5.69 – 9.67**
50438	Deadman North Fork – upstream confluence South Fork	2003 – 0/22 2004 – 1/24 2005 – 6/23 2006 – 0/20 2007 – 1/3	**6.17 – 8.89**
70669[a]	Deadman North Fork – at Bell Plain Rd.	2006 – 1/3 2007 – 0/1 2012 – 0/9 2013 – 0/2	7.79 – **8.54**
50473	Meadow – at mouth	2003 – 2/18 2004 – 0/24 2005 – 5/22 2006 – 1/21 2007 – 1/3 2012 – 0/115 2013 – 0/2	**6.08 – 8.82**
50474	Meadow – at Ben Day Gulch Rd. bridge	2003 – 0/22 2004 – 0/23 2005 – 5/22 2006 – 0/20 2007 – 1/2 2012 – 0/9 2013 – 0/2	**6.14 – 8.98**

Table notes:

[a]Ecology is not currently requesting coverage of this listing because it has not been determined impaired. These data are presented for reference purposes.

Table 29 summarizes historic temperature data at eight impaired segments and one segment of concern in Deadman and Meadow Creeks. Data collection ranges from 1999 to 2013. Data were collected by Ecology, Pomeroy Conservation District, Washington State University, and Washington State Department of Fish and Wildlife.

In Deadman Creek, every site and every year with 7DADMax available max values exceeded the criterion. In the lower reaches of the creek, 7DADMax values reached as high as 24°C in 2001 and 2002, with daily maxes ranged from 25-26°C. Continuous data in 2012 demonstrated 7DADMax values peaking at 20.9°C during the summer season and 16.65°C during the applicable supplemental spawning season.

Less temperature data are available for Meadow Creek. Continuous data collected 5.6 miles from the mouth of the creek reported a maximum 7DADMax value of 21.5°C and highest temperature value of 21.5°C. Temperature 7DADMax values in 2012 peaked at 20°C in the upper and lower reaches of the watershed.

Table 29. Historic temperature data in Deadman and Meadow Creeks. Bolded 7-day average daily maximum (7DADax) represent exceedances of the temperature criteria.

Listing ID	Stream – General location	Year – Highest temperature value (°C)	Year – Highest 7DADMax temperature value (°C)
18827	Deadman – at mouth	2001 – 25.6	**2001 – 24.3**
18829	Deadman – at Willow Gulch Rd. bridge	2002 – 26.3 2006 – 24.4 2007 – 4.9 2012 – 21.4 2013 – 10.0	**2002 – 24.5** **2006 – 22.8** **2012 – 20.9**
18828	Deadman – at Wild Horse Hill Rd. bridge	2001 – 21.8 2002 – 21.6	**2001 – 20.7** **2002 – 20.1**
40535[a]	Deadman North Fork – upstream confluence South Fork	1999 – NA[b] 2001 – NA[b] 2003 – 17.6 2004 – 17.8 2005 – 21.3 2006 – 20.6 2007 – 7.8	None available
93567	Deadman North Fork – River mile 4.7	2012 – 21.38 2013 – 7.9	**2012 – 20.75**
40534	Deadman South Fork – upstream confluence North Fork	1999 – NA[b] 2000 – NA[b] 2001 – NA[b]	None available
18830	Meadow – at mouth	2006 – 20.4 2007 – 6.5 2012 – 20.67 2013 – 10.91	**2012 – 20.2**

Listing ID	Stream – General location	Year – Highest temperature value (°C)	Year – Highest 7DADMax temperature value (°C)
73623[a]	Meadow –at Weimer Gulch Rd. bridge	2006 – 16.7	None available
18831	Meadow – river mile 5.6	2001 – 21.5	**2001 – 21.2**
18832	Meadow – at Ben Day Gulch Rd. bridge	2001 – 16.9 2002 – 14.9 2003 – 18.7 2004 – 19.3 2005 – 19.4 2006 – 20.4 2007 – 4.1 2012 – 20.53 2013 – 10.81	2001 – 16.2 2002 – 14.7 **2012 – 20.1**
22434[a]	Meadow – above confluence Panjab Creek	2001 – 15.6 2002 – 15.6	2001 – 15.0 2002 – 13.9

Table notes:

[a]Ecology is not currently requesting coverage of this listing because it has not been determined impaired. These data are presented for reference purposes.

[b]No values reported. Reported as above criterion.

The impairments are the result of a combination of factors. Winter feeding and uncontrolled livestock access to the stream had eliminated much of the vegetation within the stream corridor. This degraded riparian area could not provide shade to the stream, resulting in high water temperatures. It also allowed manure to run directly into streams. In addition, the uncontrolled stream access allowed cattle to deposit manure directly into the water and to trample stream banks. The creek was shallow, wide, and muddy in many areas due to cattle trampling, and provided little habitat for Steelhead trout.

Description of Pollution Controls and How They Will Achieve Water Quality Standards

Water Quality Target

All waterbodies in Deadman and Meadow Creek watersheds have a designated use of primary contact recreation. This designated use pertains to all fecal coliform listings in the watershed. While the listing addressed by this plan are based on fecal coliform data, in 2019 Ecology updated its water quality standards to adopt Escherichia coli (E. coli) as the primary indicator for evaluating recreational uses, replacing the fecal coliform criteria. E. coli levels must not exceed a 90-day[48] geometric mean value of 100 CFU or MPN per 100 mL, with not more than 10 percent of all samples (or a single sample when less than ten sample points exist) exceeding 320 CFU or MPN per 100 mL within the averaging period[49].

The designated uses aquatic life use category for all surface waters is “salmonid spawning, rearing and migration”. For the dissolved oxygen impaired segments, the standards require dissolved oxygen levels above 8.0 mg/L.

For the pH impaired segments, the standards require pH to be within the range of 6.5 to 8.5, with a human-caused variation within this range of less than 0.5 units.

For temperature, this salmon spawning, rearing, and migration equates to a 7-day average of the daily maximum (7DADMax) temperature criterion value of 17.5 °C. In addition, ListingIDs 18827 and 18828 have criterion to protect the early life stages of salmonids of 13.0 °C 7DADMax from February 15 to June 1 (Figure 22).

[48] WAC 173-201A(2)(b)(B) requires the averaging period for bacteria as no more than 90 days. Ecology’s standard procedures for implementing this requirement uses a 3-month averaging period. A shorter averaging period may be used if site specific information suggests a shorter period is necessary for determining compliance with criteria.
[49] Uses the same averaging period as used to evaluate the geometric mean criteria at the site.

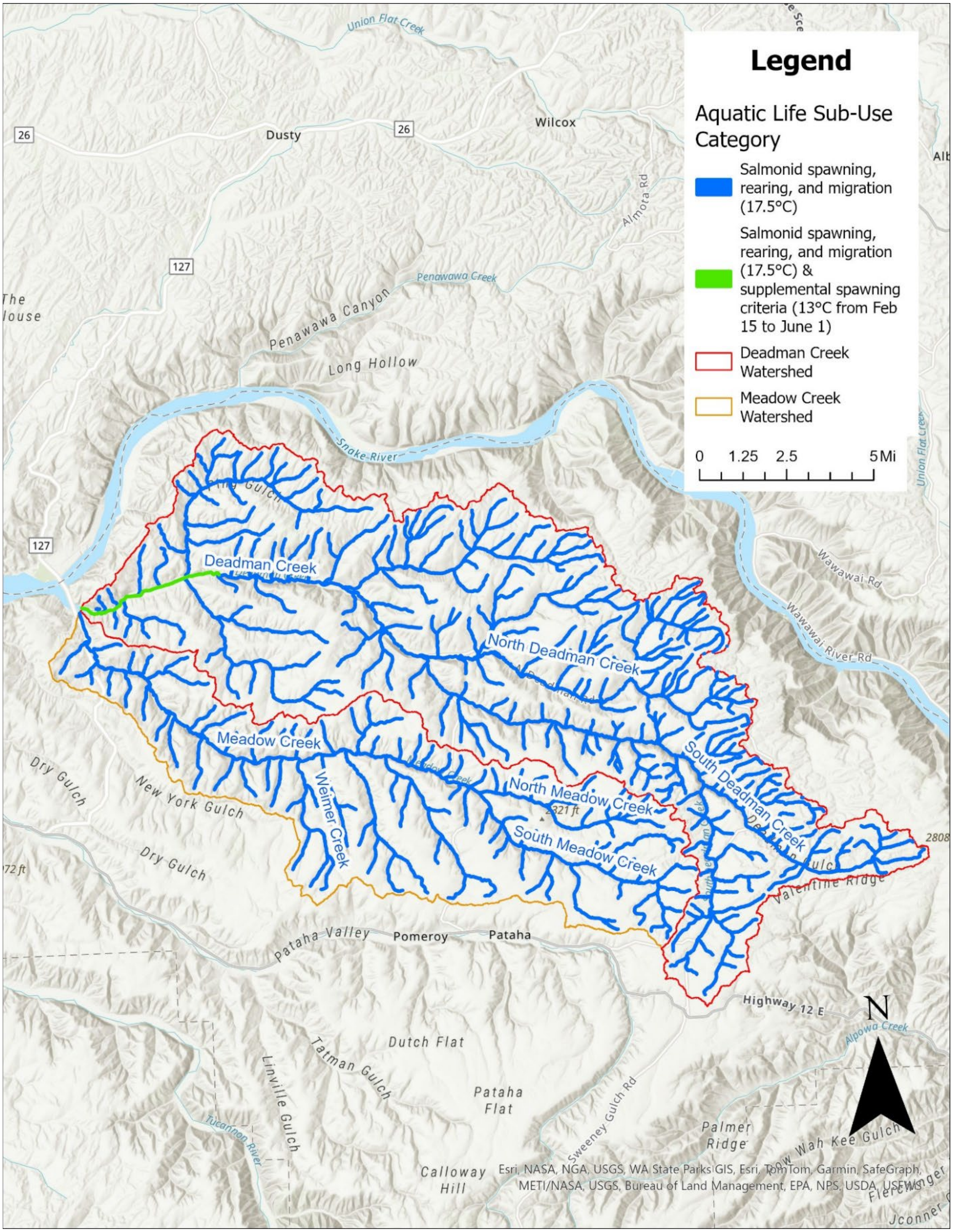

Figure 22. Deadman and Meadow Creek watersheds aquatic life uses and applicable temperature numeric criteria.

Controls that will achieve water quality standards

The Department of Ecology's Eastern Regional Office has established a Livestock and Water Quality Program that uses a unique collaborative approach to address livestock-related problems. Instead of using the standard process that starts with a Category 5 listing, establishing a TMDL for the stream, writing an implementation plan, and finally getting to actual implementation, this strategy goes straight to implementation. The strategy is applied in watersheds in which the cause of a water quality impairment is clear.

Ecology encourages implementation of a wide variety of best management practices, however, a primary focus of the program has been to restore degraded riparian corridors and eliminate unlimited animal access to streams. Healthy riparian areas can improve water quality and stream health in multiple ways, which make them a particularly valuable and cost-effective management practice. Healthy riparian areas:

- Slow bank erosion by holding soil in place during periods of high water.
- Reduce flood damage and sedimentation by slowing runoff and capturing the sediment that would otherwise be carried downstream.
- Help keep water cool in summer by shading the stream.
- Improve water quality by capturing sediment, nutrients, pesticides, pathogens, and other pollutants before they reach the stream.
- Enhance summer stream flow by improving water infiltration and storage.
- Create fish and wildlife habitat.
- Limit livestock manure inputs to the creek and riparian areas.

Ecology has a three-step riparian restoration strategy, which allows the department to efficiently apply resources to priority problem areas. The first step is to address the source of degradation – unlimited livestock access to streams and winterfeeding operations in close proximity to the riparian corridor. Ecology relies primarily on livestock exclusion, and off-stream water supply to restrict livestock access to the riparian area. In implementing this BMP, Ecology was using NRCS riparian buffer standards, which required a minimum 35-foot buffer between the livestock fence and the mean ordinary high water mark of the nearest stream bank. In many cases, the buffer width was larger depending on the stream and site conditions. In 2022, Ecology updated its riparian buffer guidelines and is now implementing buffer widths according to the Voluntary Clean Water Guidance for Agriculture. These new guidelines require a minimum 75, 60 or 50-foot core buffer between the livestock fence and the mean ordinary high water mark of the nearest stream bank depending on the stream characteristics. Additional protection encompassing the total riparian management zone of 150 feet may be necessary depending on the stream, site conditions and adjacent land uses.

By first addressing livestock access, Ecology seeks to abate the primary pollution sources—livestock in the stream, eroded streambanks, increased runoff, increased sedimentation, and subsequent transport of fecal matter. As vegetation naturally returns in the riparian area, site conditions become stabilized and the pollution sources are dramatically reduced. Also, this approach works to arrest morphological changes to the entire stream that are induced by erosion and sedimentation.

Ecology has spent much of its efforts and resources implementing this first step, in large part, because we have taken a holistic, watershed approach to protecting streams. By first addressing the primary sources of pollution and geomorphic change, Ecology can establish the necessary site conditions for successful restoration. Moreover, Ecology ensures that, first and foremost, the root problems are addressed for *the entire stream*, before resources are focused on site or segment specific restoration.

The second step occurs after a majority of site conditions have been stabilized, and the stream's entire geomorphic integrity is no longer jeopardized by the adjacent management practices. Ecology then conducts a reach by reach assessment to determine the appropriate trees and shrubs to be used for restoration. In some cases, federal programs require revegetation as part of the cost-share program, and so restoration work occurs simultaneously with livestock exclusion.

The third step is to work with local landowners to promote continuous and proper management of upland grazing lands.

In addition to the Livestock and Water Quality Program, Ecology's Eastern Regional Office has established a similar collaborative approach to address crop production-related problems. Ecology encourages implementation of a wide variety of best management practices, however, a primary focus of effort has been establishing minimum land use setbacks, restoring degraded riparian corridors, and converting conventionally farmed land to conservation tillage practices.

Ecology teams with conservation districts, local governments, and landowners to provide technical assistance and funding for implementation of best management practices. Ecology uses our regulatory authority as a backstop when collaborative efforts fail. The Water Pollution Control Act (RCW 90.48) gives Ecology the authority to take enforcement actions against nonpoint polluters.

RCW 90.48 makes it unlawful for any person to "cause, permit or suffer to be thrown, run, drained, allowed to seep or otherwise discharged … any organic or inorganic matter that shall cause or tend to cause pollution of" waters of the state. Any person who violates or creates a substantial potential to violate the provisions of Chapter 90.48 RCW is subject to an enforcement order from Ecology pursuant to RCW 90.48.120. Ecology is authorized to "issue such order or directive as it deems appropriate under the circumstances[.]" In addition to administrative orders, violating Chapter 90.48 RCW may result in injunctions, civil penalties, and notices of violations.

It is worth noting that RCW 90.48.120 gives Ecology the authority to take action in response to nonpoint source pollution, the statute also gives Ecology the authority to take action based on a "substantial potential" to pollute state waters via either a point or nonpoint pollution source. Consequently, Ecology not only has authority to take action following a NPS pollution occurrence (i.e. there was a discharge), but has specific statutory authority to act proactively to prevent NPS pollution from occurring in the first place. Ecology's authority includes the authority to require a nonpoint source polluter to implement specific best management practices (BMPs). Ecology's authority can be used to prevent nonpoint pollution and require BMPs, as necessary.

Ecology has used this regulatory backstop several times since 2016.

The result of these partnerships has been the implementation of best management practices at hundreds of sites across several watersheds where water quality and fish habitat issues exist. By using a collaborative strategy, backed up by enforcement when necessary, Ecology has been able to create relationships and build trust with rural residents while improving water quality.

In the Deadman Creek watershed, work with landowners began in 2002. Twenty-nine miles of riparian buffers were installed prior to 2014. In spring of 2014, ¾ mile of new cattle exclusion fence was installed in Meadow Creek and ¼ mile in Deadman Creek. The creek was fenced to protect it from livestock, and several off-stream watering facilities were installed. Feeding locations were moved away from the stream to prevent polluted runoff. Trees and shrubs were planted to stabilize banks, shade the stream, and provide wildlife habitat. Buffers were constructed using Natural Resource Conservation Service standards, which required a minimum width of 35 feet. For buffers installed with state or federal financial assistance, we require an agreement with the landowner stipulating that the buffer and fence will be maintained for at least 10 years.

Fencing was generally installed adjacent to or upstream of the impaired segments. However, we are also fencing portions of the stream where there are presently no Category 5 listings, but where there is unrestricted cattle access to the stream. Riparian buffers are left to revegetate naturally in those areas in which there is enough live native vegetation left to recover. In all other areas we are installing buffers by planting native plants. By 2008, 80 percent of the cattle had been fenced out of the stream.

More recently, the Pomeroy CD installed 1.6 miles of livestock exclusion fencing on lower Deadman Creek with planting to help with revegetation. Between 2020 and 2024, an additional 0.8 mi of exclusion fencing was completed throughout the Deadman watershed to further protect riparian function. Pomeroy CD worked with a landowner near the conjunction of the North and South Fork Deadman to install a supplemental off-stream watering system to support the removal of livestock access to surface water. In partnership with Ecology, the CD also installed another off-stream watering for a heavily polluted site on North Deadman Creek which is under a CREP contract that added another 2.5 miles of livestock exclusion fencing in 2021.

In the upland areas of the Deadman Creek watershed, there has been an impressive effort to improve soil health and reduce agricultural chemical inputs in the watershed through efforts to decrease soil erosion; and reduce excess fertilizers and pesticides from reaching the waterways. Over 350 acres have been planted with cover crops in the upland reaches of the watershed to help improve soil health and stabilize the soil during runoff events. Local Voluntary Stewardship Programs (VSP) and Washington State Conservation Commission Natural Resource Investment (NRI) funding has contributed over $110, 500 to producers in the watershed that are employing precision guidance systems which decrease fertilizers and pesticide use, and reduce over application that may contaminate water sources. In addition to these efforts, almost 4,000 acres have been treated to reduce overall weed presence, including the work completed for false indigo removal in riparian areas.

Between 2020 and 2024, the Pomeroy CD has worked in Meadow Creek with two separate landowners to install open bottom culverts to access winter feeding grounds and prevent livestock crossing through surface water. In partnership with Ecology, the CD installed another mile of livestock exclusion fencing along Meadow Creek as well as a small spring-fed tributary. A major recent effort seen in this watershed has been the addition of both Beaver Dam Analogs (BDAs) as well as beaver re-location to assist with increasing annual water flows and promote floodplain storage for water temperatures and sedimentation. Across the riparian and upland areas, 985 acres of herbaceous weed control was performed. And to further improve agricultural practices in the upland watershed, $47,438 was spent by local VSP and NRI sources to encourage precision agricultural practices which reduce nutrient and pesticide application rates and protect water quality. In addition to the push for precision agriculture, both Deadman and Meadow Creek watersheds have seen a large increase of cropland shifting into direct seed or conservation tillage practices with increased technical assistance from the Pomeroy CD.

Most BMPs remain in good shape, although there was some backsliding prior to Ecology's 2013 re-assessment of the watershed. There had been gates and stream crossings left open and a few sections of fence that had not been completed. Ecology will continue using tools as needed to ensure BMPs implemented and maintained.

Ecology's Livestock and Water Quality Program has focused efforts back into Deadman and Meadow Creeks with recent watershed evaluations in 2023 and 2024. As a result, the program identified an additional forty-eight sites with active water quality concerns. Once prioritization was completed five landowners were sent technical and financial assistance letters from Ecology, and communication will continue to get drafts planned with the Pomeroy CD. These efforts will be ongoing to identify and document sites of concern to further implement new projects in the watershed.

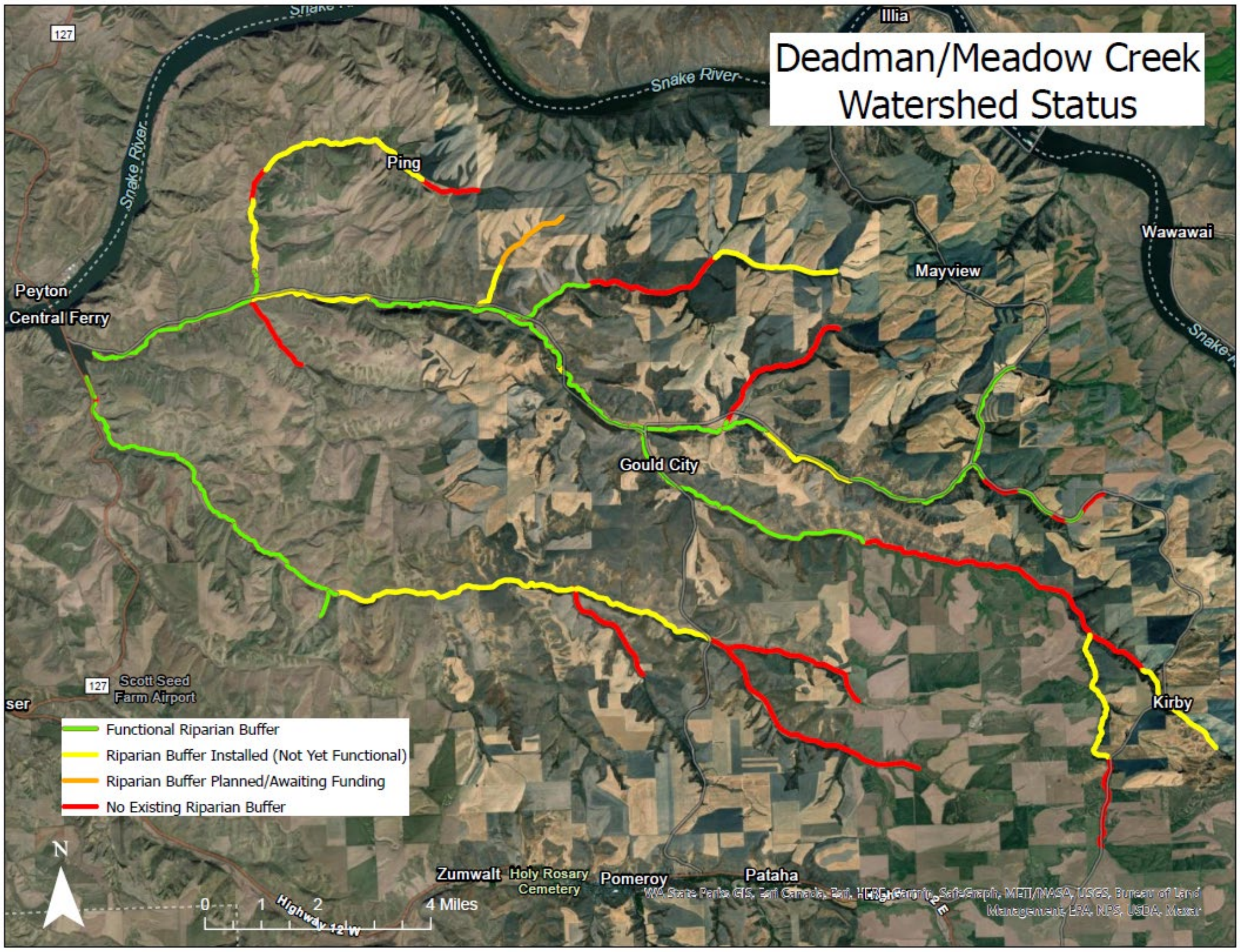

Figure 23. Deadman/Meadow Creek riparian buffer status.

Description of requirements under which pollution controls will be implemented

It is Ecology's best professional judgment that the pollution controls that have been installed will result in the water quality standards being met. Maintenance of these controls has been ensured through 10-year landowner agreements that were established as part of the funding agreements for these projects. Additionally, Ecology staff will continue to perform watershed evaluations in this watershed to ensure that BMPs stay in place.

Estimate or Projection of Time When Water Quality Standards Will be Met

It will take time for the riparian corridor to fully recover and for the stream to re-establish its natural geometry. Ecology estimates that the riparian buffers will have grown enough to be fully effective in 10-15 years. While Deadman and Meadow Creek continue to see projects implemented, increased focus in the watershed will help to meet temperature, fecal coliform, dissolved oxygen, and pH standards by 2035.

Schedule for Implementing Pollution Controls

As described earlier in this report, Ecology has worked with the conservation district, local governments, and landowners to implement a variety of best management practices in the

Deadman and Meadow Creeks watershed. It is our best professional judgment that this work will remedy the pollution problems in the impaired segments. Because it is our intention to restore the entire watershed and to prevent future pollution problems, we will be using monitoring data to track water quality improvements and to identify any new problem areas so they can be addressed. It will be an on-going process to get water bodies into compliance and to keep them in compliance.

A few sites where cattle are adversely affecting water quality remain in the watershed, and Ecology's Livestock and Water Quality Program will continue working with landowners to address these problem areas.

In addition, farmers throughout the watershed are adopting conservation tillage practices that reduce soil erosion and keep sediment out of the stream. These practices also improve rain and snowmelt infiltration and reduce the change of damaging spring floods. A new challenge in the watershed is a noxious weed called False Indigo. As cattle are excluded from the stream corridor, this aggressive invader moves in. The Pomeroy Conservation District had a grant from the Department of Ecology to remove the weed and plant native trees and shrubs in its place. They are continuing this work. Ecology's livestock and water quality program will continue to have an on-going presence in the watershed and will continue working to achieve compliance with state water quality standards.

Monitoring Plan to Track Effectiveness of Pollution Controls

Ecology initiated an effectiveness monitoring program in Deadman and Meadow Creek watersheds in May 2023. The goal of the monitoring program is to determine compliance with existing water quality standards for bacteria, dissolved oxygen, pH, and temperature, following years of nonpoint pollution control best management practice implementation under this STI project. These monitoring data will inform the effectiveness of our STI approach to pollution cleanup and provide the information feedback necessary for adaptive management purposes.

To make best use of limited resources for data collection, Ecology is focusing monitoring to one site in the lower reaches of both Deadman and Meadow Creeks. The Deadman Creek site is located at Willow Gulch Road, representing ListingIDs 40553, 47174, 50475, and 18829. The Meadow Creek monitoring location is located upstream of ListingIDs 46000, 47172, 50473, and 18830, as we were unable to gain landowner access to monitor in the most downstream segment of the creek. In the event the data demonstrates improving water quality or attainment of numeric criteria, Ecology will consider expanding our monitoring efforts upstream to other sections of the creek and tributaries.

Temperature data were collected at 15-minute intervals via an in-situ logger from May through early October 2023. At Deadman Creek, the temperature logger was removed in October 2023 because temperature values had fallen below numeric criteria and this site is not likely to exceed numeric criteria until the following spring. This logger will be re-deployed in the spring of 2024. In Meadow Creek, we are recording stream temperatures year-round to capture temperatures during the supplemental spawning criteria period from February to June.

We are currently collecting dissolved oxygen, pH, and E. coli samples every two weeks at this location. Though the existing recreational use impairments in the watershed are based on fecal coliform data, in 2019 Ecology updated its water quality standards to adopt Escherichia coli (E. Coli) as the primary indicator for evaluating recreational uses, replacing the fecal coliform criteria. Therefore, E. coli data will be used to evaluate the health of recreational uses.

Recent Monitoring Results

Figure 24 displays the 7-DADMax temperature in Deadman Creek from late May 2023 to early April 2024. Stream temperatures exceeded water quality standards of 90 out of 298 days sampled[50], reaching 20.64°C 7DADMax and peaking at 21.91°C. During the supplemental spawning season (February 15 – June 1), 8 out of 58 days exceeded the 13°C criteria, reaching as high as 17.54°C 7DADMax. The highest 7DADMax was 3.9°C cooler than the highest 7DADMax reported in 2002, 2.1°C cooler than that reported in 2006, and only 0.3°C cooler than 2012, despite 2023 air temperatures reaching higher or similar levels to those in the past (Table 30).

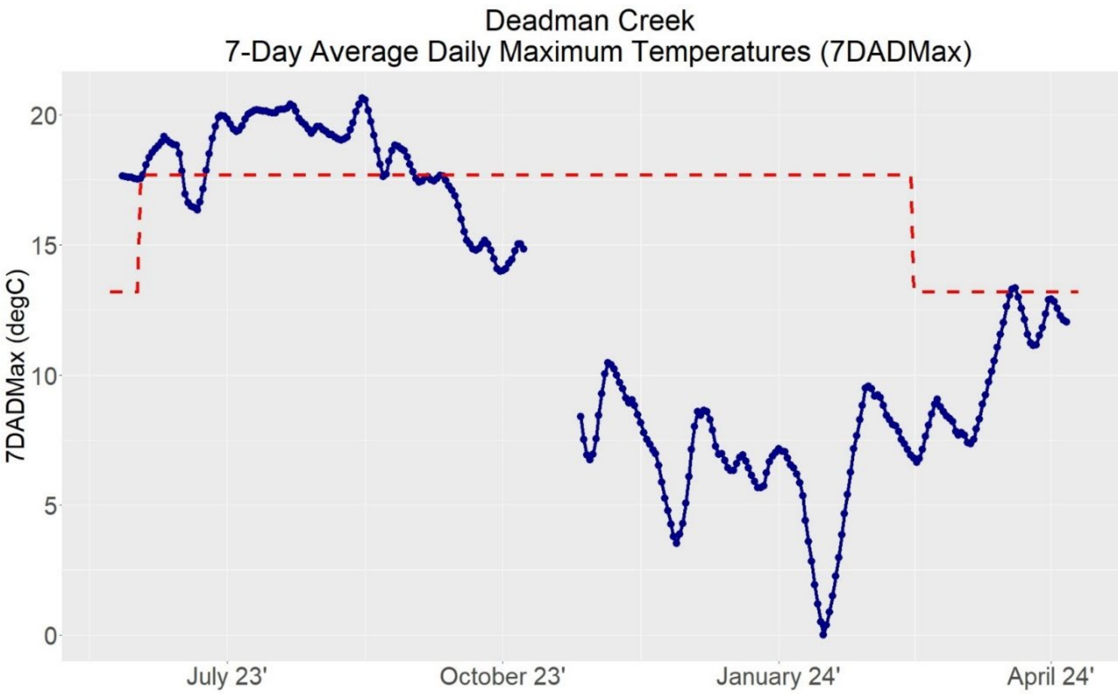

Figure 24. Deadman Creek 7-day average daily maximum temperature values (blue dotted line) and applicable temperature numeric criteria (red dashed line).

[50] To account for instrument accuracy, only measurements exceeding the applicable criteria by more than 0.2°C were counted as exceedances. This approach is consistent with our Water Quality Assessment methodology for evaluating temperature time-series data (Water Quality Program Policy 1-11, Chapter 1).

Table 30. Summary of surface water temperature data collected at Deadman Creek at Willow Gulch Road and air temperatures.

Year	Highest 7DADMax (°C)	Highest Daily Max (°C)	Highest monthly average air temperature (°C)
2002	24.5	26.3	33.5
2006	22.8	24.4	35.3
2012	20.9	21.4	34.4
2023	20.6	21.9	35.2

Figure 25 displays the 7-DADMax temperature in Meadow Creek from late May to early October 2023. Stream temperatures exceeded water quality standards of 76 out of 135 days sampled. The highest 7DADMax recorded in 2023 was 19.4 °C, with stream temperatures reaching as high as 20.28°C.

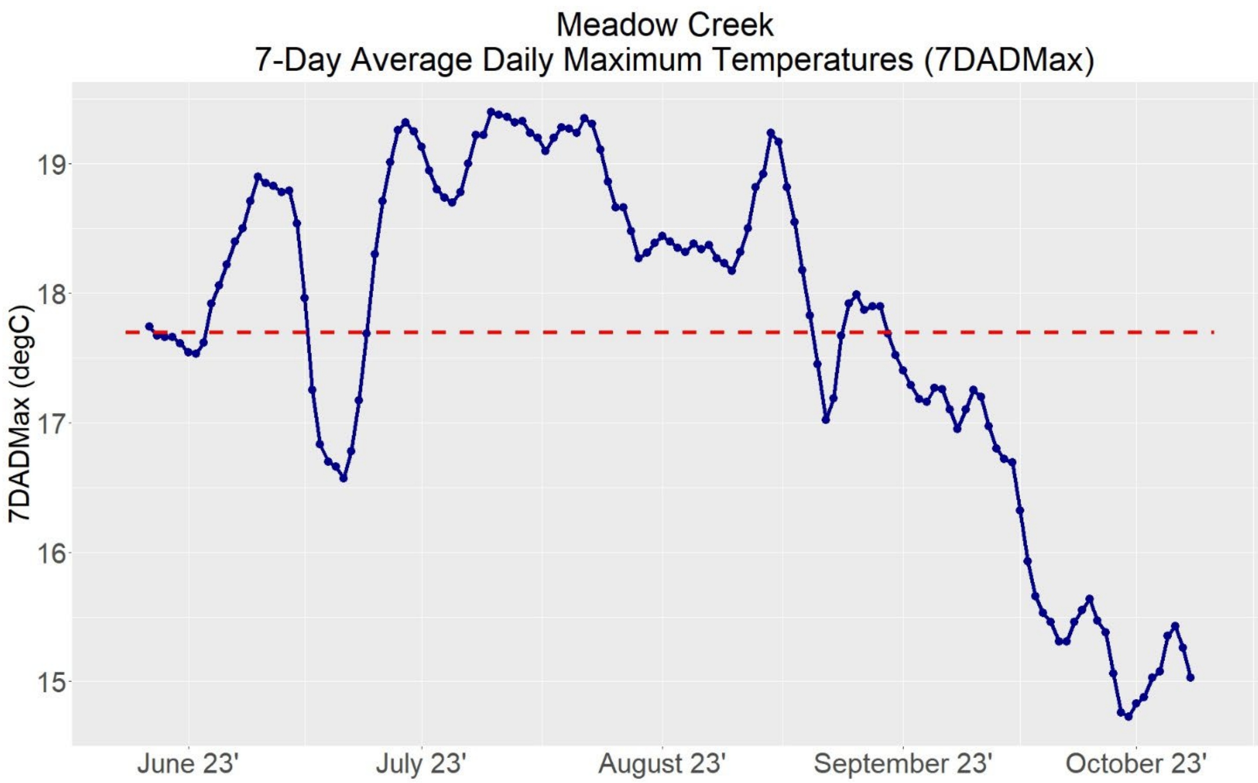

Figure 25. Meadow Creek 7-day average daily maximum temperature values (blue dotted line) and applicable temperature numeric criteria (red dashed line).

Figure 26 and Table 31 compare recently collected E. coli values in Deadman and Meadow Creek's against the E. coli water quality standards. In both creeks, both the ten percent and geometric mean criteria were exceeded several times. In Deadman Creek, E. coli values ranged from 23.1 to 1498.8 MPN/100mL, with 13 out of 24 samples exceeding the ten percent criteria of 320 MPN/100mL. E. coli were regularly above criteria levels in summer and spring months but had occasional spikes in the winter. Ten out of eleven geometric mean values exceeded the geometric mean criteria, with values ranging from 89.6 to 908.5 MPN/100mL.

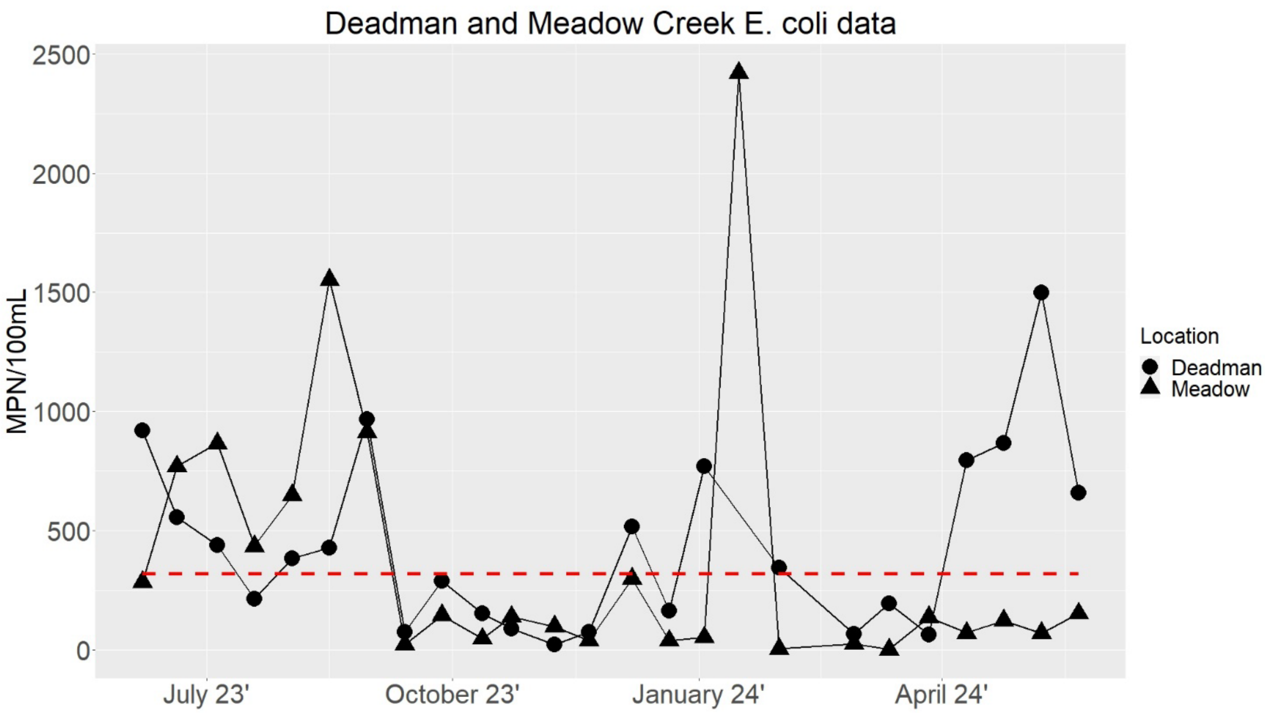

Figure 26. Deadman and Meadow Creek E. coli values (black circles and triangles, respectively) with Washington's E. coli 10 percent criteria (red dashed line).

In Meadow Creek, E. coli values ranged from 2.0 to 2419.6 MPN/100mL, with 7 out of 25 samples exceeding the ten percent criteria of 320 MPN/100mL. E. coli were regularly above criteria levels in summer months and only exceeded the criteria once throughout the winter months. Three out of eleven geometric mean values exceeded the geometric mean criteria, with values ranging from 36.1 to 692.5 MPN/100mL.

Table 31. Deadman and Meadow Creek E. coli three-month geometric mean values. The "Month and Year" field represents the middle month and year in the three-month averaging period. Bolded geometric mean values represent exceedances of the E. coli geometric mean criteria.

Month and Year	Deadman Samples	Deadman three-month geometric mean (MPN/100mL)	Meadow Samples	Meadow three-month geometric mean (MPN/100mL)
July 23'	7	**498.7**	7	**692.5**
August 23'	7	**317.5**	7	**380.9**
September 23'	7	**240.5**	7	**213.6**
October 23'	6	89.6	6	66.3
November 23'	6	**112.5**	6	81.6
December 23'	6	**184.9**	7	84.1
January 24'	5	**272.2**	6	75.9
February 24'	5	**185.3**	6	40.7
March 24'	5	**224.4**	5	36.1
April 24'	6	**451.5**	6	54.7
May 24'	4	**908.5**	4	99.2

pH in Deadman Creek ranged from 7.75 to 8.34 from July 2023 through May 2024. pH in Meadow Creek ranged from 7.46 to 8.36 over the same timeframe. All bi-weekly measurements in Deadman and Meadow Creek fell within the pH criteria range. pH data was not collected in June 2023 due to fouling on the pH probe. A new probe was promptly ordered and deployed in July.

Due to persistent quality control issues with our DO membrane, we could not use the collected DO data to evaluate attainment of DO criteria.

The recent water quality monitoring data and implementation information suggest our efforts are making progress in these watersheds. Current stream temperatures were lower than historic levels and all pH measurement fell within the numeric criteria. While we still see exceedances of the bacteria water quality standards, bacteria levels in Meadow Creek are less frequently exceeding the criteria in years past. Continued implementation and water quality data collection will be needed to track the effectiveness of these efforts.

Commitment to Revise Pollution Controls as Necessary

Ecology will maintain a presence in the Deadman Creek watershed to ensure that water quality continues to improve. We fully expect the Eastern Regional Office Livestock and Water Quality Program to achieve compliance with water quality standards. However, if it does not, Ecology will work with the conservation district, local governments, and landowners to determine other controls that could be used to achieve compliance.

Tenmile and Mill Creek Straight to Implementation Project – October 2024

The Washington Department of Ecology (Ecology) Integrated Report (IR) proposes to exclude two fecal coliform listings and six temperature listings from the 2022 303(d) list and place these segments into Category 4B. Table 32 and Figure 27 summarize the impaired segments (listings) addressed by this plan.

Table 32. Listings addressed by Tenmile and Mill Creek STI Project.

Listing ID	Assessment Unit	Stream – General location	Parameter
72313	17060103000114_001_001	Tenmile – mouth at Snake River Rd. bridge	Fecal coliform
72311	17060103000115_001_001	Tenmile – Weissenfels Ridge Rd. bridge	Fecal coliform
18835	17060103000114_001_001	Tenmile – mouth at Snake River Rd. bridge	Temperature
20355	17060103000115_001_001	Tenmile – Weissenfels Ridge Rd. bridge	Temperature
103959	17060103000116_001_001	Tenmile – 1.5 miles upstream of mouth	Temperature
18836	17060103000117_001_001	Tenmile – Rivermile 6	Temperature
20356	17060103000119_001_001	Tenmile – 1.5 miles below Mill Creek mouth	Temperature
29317	17060103000120_001_001	Mill – mouth at Mill Creek Rd. culvert	Temperature

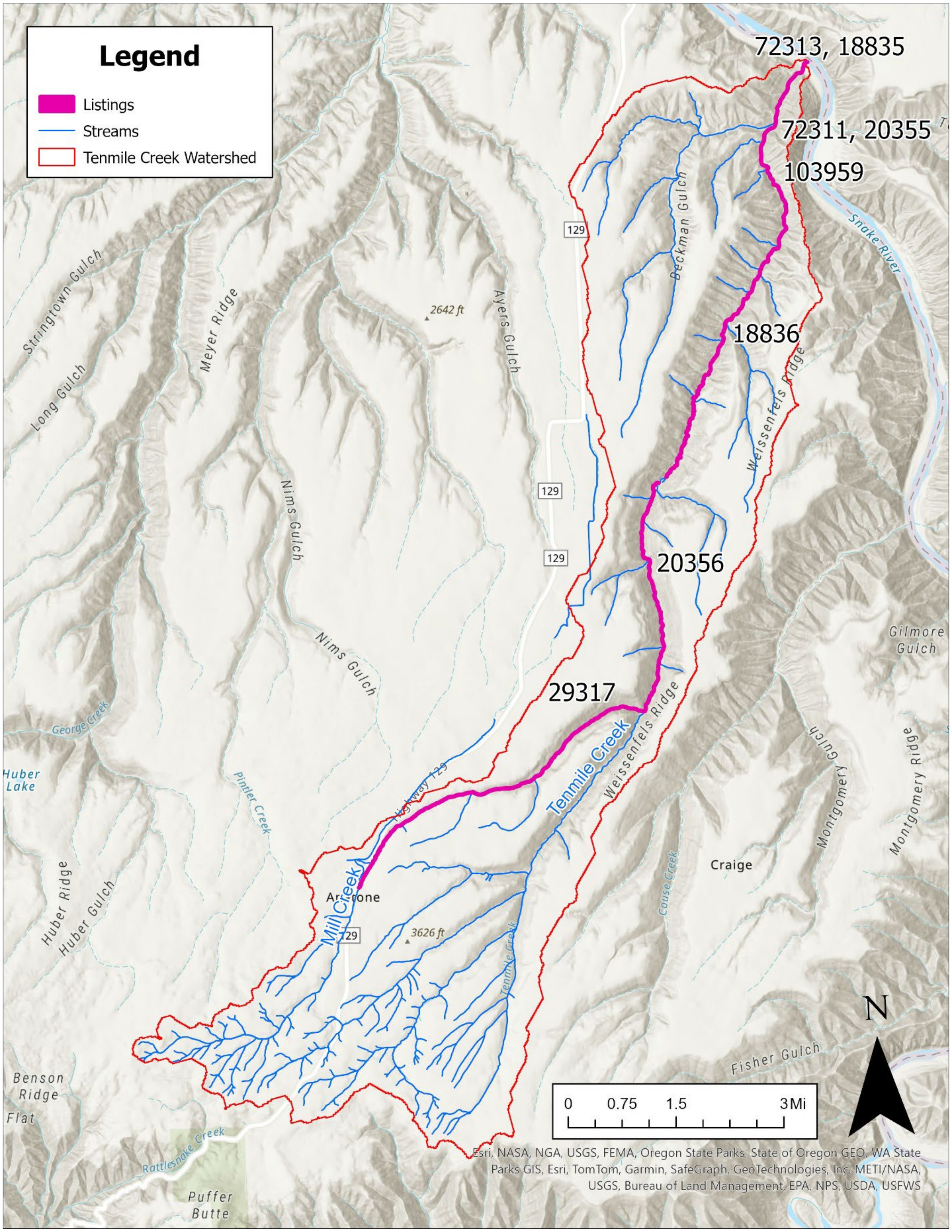

Figure 27. Tenmile Creek watershed and impaired creek segments addressed by this plan.

All temperature impaired water bodies, except listing 103959, were first identified as impaired and placed in Category 5 in the 2004 WQA. These impairments were later approved for Category 4B in the 2008 WQA and have remained in 4B since. Listing 103959 was first identified as temperature impaired in the 2022 WQA and Ecology requests moving into Category 4B in the 2022 WQA as the implementation of this plan will address this temperature across the entire watershed.

The lower-most section of Tenmile Creek was identified as impaired for fecal coliform in the 2012 WQA and moved into Category 4B in the same assessment cycle (Listing 72313). Listing 72311, further upstream on Tenmile Creek, was first identified as impaired in the 2018 WQA and Ecology requests moving into Category 4B in the 2022 IR as the implementation of this plan will address this pollutant across the entire watershed.

Ecology's basis for excluding all waterbodies above the 303(d) list is outlined in this evaluation.

Identification of Segment and Statement of Problem Causing Impairment

Tenmile Creek is located in Asotin County in southeastern Washington. Mill Creek is a tributary of Tenmile Creek. Tenmile Creek drops 2000 feet from the fringes of the Blue Mountains to the Snake River. The canyon created by the creek provides habitat for a variety of wildlife including deer, elk, coyote, and many species of birds. Even cougar are known to frequent the area. Tenmile Creek is also home to threatened Snake River Steelhead trout.

The Tenmile Creek canyon is important range for cattle. It also provides an excellent location for winter feeding. Feeding at the canyon's base protects livestock from harsh winter weather. However, a century of these activities left the stream corridor in poor condition. Many of the trees were damaged or removed, and stream banks were trampled and overgrazed. Winter feeding and uncontrolled livestock access to the stream had eliminated much of the vegetation within the stream corridor. This degraded riparian area could not provide shade to the stream, resulting in high water temperatures.

This is a sparsely populated area. There are no towns in the watershed and no point sources of pollution.

Table 33 summarizes the historic temperature monitoring data for temperature impaired segments within the watershed. All impaired segments were first determined impaired based on continuous monitoring data collected by the Washington Department of Fish and Wildlife (WDFW), between 2000 and 2002. The highest annual 7DADMax values WDFW reported in Tenmile Creek ranged from 17.9 °C around rivermile 6, to 25.5 °C in the uppermost reaches of the creek. Subsequent monthly discrete temperature measurements between March 2005 and February 2007 at two sites in the lower reaches of Tenmile Creek by the Asotin Conservation District found summer temperature values reaching as high as 21.0 °C in the mouth of the creek. The only data available for Mill Creek were collected by WDFW in 2000, which recorded a maximum 7DADMax value of 20.4 °C at the creek mouth.

Table 33. Summary of historic temperature data in Tenmile and Mill Creek watershed. Bolded 7DADMax values represent exceedances of the temperature criteria.

Listing ID	Assessment Unit	Stream – General location	Year – Highest temperature value (°C)	Year – Highest 7DADMax value (°C)
18835	17060103000114_001_001	Tenmile – mouth at Snake River Rd. bridge	2001 – 23.8 2002 – 24.5 2005 – 19.1 2006 – 20.3 2007 – 5.7	**2001 – 22.8** **2002 – 23.5**
20355	17060103000115_001_001	Tenmile – Weissenfels Ridge Rd. bridge	2000 – 25.3 2005 – 21.0 2006 – 18.9 2007 – 4.3	**2000 – 24.2**
18836	17060103000117_001_001	Tenmile – Rivermile 6	2001 – 19.1 2002 – 20.1	**2001 – 18.7** **2002 – 17.9**
20356	17060103000119_001_001	Tenmile – 1.5 miles below Mill Creek mouth	2000 – 26.2	**2000 – 25.5**
29317	17060103000120_001_001	Mill – mouth at Mill Creek Rd. culvert	2000 – 21.6	**2000 – 20.4**

Table 34 summarizes the historic fecal coliform data supporting impaired status of the two lower-most sections of Tenmile Creek. These data represent monthly discrete fecal coliform samples collected between March 2005 and February 2007 at two sites by the Asotin Conservation District. At the mouth of Tenmile Creek (ListingID 72313), both the fecal coliform ten-percent criterion and geometric mean criterion were exceeded in every sampling year. For the segment at Weissenfels Ridge Rd bridge (ListingID 72311), data exceeded fecal coliform criteria in 2005 and 2006, but not in 2007. However, the data from 2007 only covered the first half of the water year, which was when fecal coliform levels in 2005-2006 were lowest.

Table 34. Summary of historic fecal coliform data in Tenmile Creek. Years below represent "water-year" (October – September). Bolded sample and geometric mean values in the table represent exceedances of the applicable fecal coliform criteria.

Listing ID	Assessment Unit	Stream – General location	Year – samples exceeding 10% criterion[1]/total samples	Year – highest FC value (CFU/100mL)[b]	Water year – highest 3-month geometric mean (CFU/100mL)
72313	17060103000114_001_001	Tenmile – mouth at Snake River Rd. bridge	2005 – 3/6 2006 – 2/14 2007 – 1/7	**2005 – 450** **2006 – 470** **2007 – 460**	**2006 – 114** **2007 - 183**
72311	17060103000115_001_001	Tenmile – Weissenfels Ridge Rd. bridge	2005 – 2/7 2006 – 1/13 2007 – 0/7	**2005 – 730** **2006 – 570** 2007 – 47	**2006 – 188** 2007 – 9

Table notes:

[1]200 CFU/100mL. See WAC 173-201A200 Table 200 (2)(b) for full criterion reference.

[b]Geometric mean values from 2005 and prior were calculated on a 12-month period and were evaluated using the pre-2019 recreational use criteria. Values from 2006 to present were calculated on a 3-month period and were evaluated using the current recreational use criteria.

Description of Pollution Controls and How They Will Achieve Water Quality Standards

Water Quality Target

The designated use relevant to ListingIDs 72311 and 72313 is primary contact recreation. While this ListingID is based on fecal coliform data, in 2019 Ecology updated its water quality standards to adopt Escherichia coli (E. Coli) as the primary indicator for evaluating recreational uses, replacing the fecal coliform criteria. E. Coli levels must not exceed a 90-day[51] geometric mean value of 100 CFU or MPN per 100 mL, with not more than 10 percent of all samples (or a single sample when less than ten sample points exist) exceeding 320 CFU or MPN per 100 mL within the averaging period[52].

Figure 28 details the aquatic life use categories and extents which supplemental spawning uses apply in Tenmile Creek watershed. Table 35 defines the aquatic life use categories, supplemental spawning uses, and respective temperature numeric criteria for the ListingIDs covered under this project.

[51] WAC 173-201A(2)(b)(B) requires the averaging period for bacteria as no more than 90 days. Ecology's standard procedures for implementing this requirement uses a 3-month averaging period. A shorter averaging period may be used if site specific information suggests a shorter period is necessary for determining compliance with criteria.

[52] Uses the same averaging period as used to evaluate the geometric mean criteria at the site.

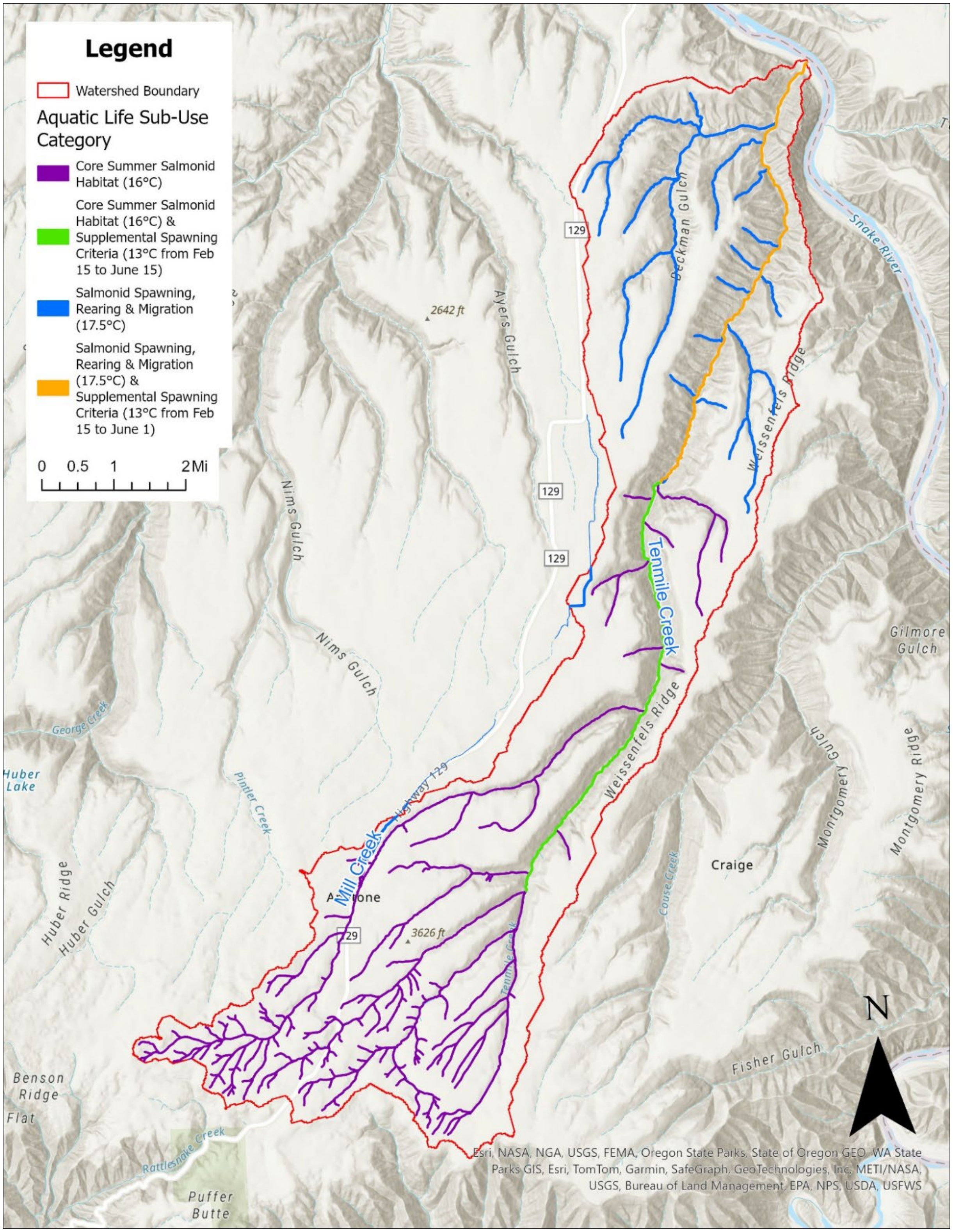

Figure 28. Tenmile Creek watershed aquatic life uses and applicable temperature numeric criteria.

Table 35. Aquatic life and supplemental spawning uses and applicable temperature criteria for impaired waters in Tenmile Creek watershed.

Listing ID(s)	Aquatic Life Use Category	Aquatic Life Criterion	Supplemental Spawning Criterion
18835, 18836, 20355	Salmonid spawning, rearing, and migration	17.5°C 7DADMax	13°C 7DADMax from February 15 – June 1
20356	Core summer salmonid habitat	16.0°C 7DADMax	13°C 7DADMax from February 15 – June 15
29317	Core summer salmonid habitat	16.0°C 7DADMax	none

Controls that will achieve water quality standards

The Department of Ecology's Eastern Regional Office has established a Livestock and Water Quality Program that uses a unique collaborative approach to address livestock-related problems. Instead of using the standard process that starts with a Category 5 listing, establishing a TMDL for the stream, writing an implementation plan, and finally getting to actual implementation, this strategy goes straight to implementation. The strategy is applied in watersheds in which the cause of a water quality impairment is clear.

Ecology encourages implementation of a wide variety of best management practices, however, a primary focus of the program has been to restore degraded riparian corridors and eliminate unlimited animal access to streams. Healthy riparian areas can improve water quality and stream health in multiple ways, which make them a particularly valuable and cost-effective management practice. Healthy riparian areas:

- Slow bank erosion by holding soil in place during periods of high water.
- Reduce flood damage and sedimentation by slowing runoff and capturing the sediment that would otherwise be carried downstream.
- Help keep water cool in summer by shading the stream.
- Improve water quality by capturing sediment, nutrients, pesticides, pathogens, and other pollutants before they reach the stream.
- Enhance summer stream flow by improving water infiltration and storage.
- Create fish and wildlife habitat.
- Limit livestock manure inputs to the creek and riparian areas.

Ecology has a three-step riparian restoration strategy, which allows the department to efficiently apply resources to priority problem areas. The first step is to address the source of degradation – unlimited livestock access to streams and winterfeeding operations in close proximity to the riparian corridor. Ecology relies primarily on livestock exclusion, and off-stream water supply to restrict livestock access to the riparian area. In implementing this BMP, Ecology was using NRCS riparian buffer standards, which required a minimum 35-foot buffer between the livestock fence and the mean ordinary high-water mark of the nearest stream bank. In many cases, the buffer width was larger depending on the stream and site conditions. In 2022, Ecology updated its riparian buffer guidelines and is now implementing buffer widths according to the Voluntary Clean Water Guidance for Agriculture. These new guidelines require a minimum 75, 60 or 50-foot core buffer between the livestock fence and the mean ordinary high water mark of the nearest stream bank depending on the stream characteristics. Additional protection encompassing the total riparian management zone of 150 feet may be necessary depending on the stream, site conditions and adjacent land uses.

By first addressing livestock access, Ecology seeks to abate the primary pollution sources—livestock in the stream, eroded streambanks, increased runoff, increased sedimentation, and subsequent transport of fecal matter. As vegetation naturally returns in the riparian area, site conditions become stabilized and the pollution sources are dramatically reduced. Also, this approach works to arrest morphological changes to the entire stream that are induced by erosion and sedimentation.

Ecology has spent much of its efforts and resources implementing this first step, in large part, because we have taken a holistic, watershed approach to protecting streams. By first addressing the primary sources of pollution and geomorphic change, Ecology can establish the necessary site conditions for successful restoration. Moreover, Ecology ensures that, first and foremost, the root problems are addressed for *the entire stream*, before resources are focused on site or segment specific restoration.

The second step occurs after a majority of site conditions have been stabilized, and the stream's entire geomorphic integrity is no longer jeopardized by the adjacent management practices. Ecology then conducts a reach by reach assessment to determine the appropriate trees and shrubs to be used for restoration. In some cases, federal programs require revegetation as part of the cost-share program, and so restoration work occurs simultaneously with livestock exclusion.

The third step is to work with local landowners to promote continuous and proper management of upland grazing lands.

In addition to the Livestock and Water Quality Program, Ecology's Eastern Regional Office has established a similar collaborative approach to address crop production-related problems. Ecology encourages implementation of a wide variety of best management practices, however, a primary focus of effort has been establishing minimum land use setbacks, restoring degraded riparian corridors, and converting conventionally farmed land to conservation tillage practices.

Ecology teams with conservation districts, local governments, and landowners to provide technical assistance and funding for implementation of best management practices. Ecology uses our regulatory authority as a backstop when collaborative efforts fail. The Water Pollution Control Act (RCW 90.48) gives Ecology the authority to take enforcement actions against nonpoint polluters.

RCW 90.48 makes it unlawful for any person to "cause, permit or suffer to be thrown, run, drained, allowed to seep or otherwise discharged … any organic or inorganic matter that shall cause or tend to cause pollution of" waters of the state. Any person who violates or creates a substantial potential to violate the provisions of Chapter 90.48 RCW is subject to an enforcement order from Ecology pursuant to RCW 90.48.120. Ecology is authorized to "issue such order or directive as it deems appropriate under the circumstances[.]" In addition to administrative orders, violating Chapter 90.48 RCW may result in injunctions, civil penalties, and notices of violations.

It is worth noting that RCW 90.48.120 gives Ecology the authority to take action in response to nonpoint source pollution, the statute also gives Ecology the authority to take action based on a "substantial potential" to pollute state waters via either a point or nonpoint pollution source. Consequently, Ecology not only has authority to take action following a NPS pollution occurrence (i.e. there was a discharge) but has specific statutory authority to act proactively to prevent NPS pollution from occurring in the first place. Ecology's authority includes the authority to require a nonpoint source polluter to implement specific best management practices (BMPs). Ecology's authority can be used to prevent nonpoint pollution and require BMPs, as necessary.

Ecology has used this regulatory backstop several times since 2016.

The result of these partnerships has been the implementation of best management practices at hundreds of sites across several watersheds where water quality and fish habitat issues exist. By using a collaborative strategy, backed up by enforcement when necessary, Ecology has been able to create relationships and build trust with rural residents while improving water quality.

In the Tenmile Creek watershed, work with landowners began in 2002. As of 2014, twelve miles of riparian buffers were installed. The creek was fenced to protect it from livestock, and thousands of native trees and shrubs were planted in the stream corridor. Buffers were constructed using Natural Resource Conservation Service standards, which required a minimum width of 35 feet. For buffers installed with state or federal financial assistance, we require an agreement with the landowner stipulating that the buffer and fence will be maintained for at least 10 years. Looking forward, newly installed buffers funded with state financial assistance will be implemented according to the updated Voluntary Clean Water Guidance for Agriculture requirements, and still require a 10 year landowner agreement.

Initial cattle exclusion fencing was generally installed adjacent to or upstream of the impaired segments. However, we have also fenced portions of the stream where there are presently no Category 5 listings, but where there was unrestricted cattle access to the stream. Riparian buffers are left to revegetate naturally in those areas in which there is enough live native vegetation left to recover. In all other areas we are installing buffers by planting native plants. At this time, most of the upstream riparian areas have been restored. Planting is continuing where buffers need additional plants.

In addition, farmers in the watershed are adopting direct seed technology, which is the practice of seeding a new crop into the standing stubble of a recently harvested crop without the traditional tillage of the ground. By doing so, soil erosion can be reduced by as much as 95 percent. This significantly reduces the volume of sediment washing into Tenmile Creek. All of these efforts will help address the temperature impairments. From approximately 2015 to 2020, the Asotin County CD assisted in converting an additional 500 acres to direct seed or conservation tillage in the watershed. This increase in acres converted to conservation tillage has not continued because it's estimated that over 90% of the watershed is now using conservation tillage techniques. Most farmers in the watershed have already adopted, and are now using, direct seed technology due to the CD's incredible efforts.

Since 2008, Ecology has completed a large project that includes installation of a Conservation Reserve Enhancement Program buffer and moving a feeding operation further upland with a 75-foot setback. A large proportion of the riparian work in the watershed was funded with federal cost-share funds, which require landowner maintenance. Projects funded with state dollars have 10-year landowner agreements requiring maintenance.

In more recent years (2015-2020), an additional mile of Tenmile Creek was protected, with another thirteen miles of buffer enhanced with plantings of over 8,000 trees in the riparian area. This watershed can be increasingly complex to establish robust buffers due to its arid and rocky conditions. The Asotin County CD continues to focus efforts on enhancement and maintenance in the watershed. Ecology has partnered with the CD on a grant in the watershed to promote overbank flow and floodplain connection to improve temperature and sedimentation concerns. This resulted in installing 53 Beaver Dam Analogs (BDAs) throughout the watershed prior to 2020. The CD then received a FY22 state 319 water quality grant from Ecology, which is currently providing funding to protect and enhance an additional 20.2 acres through planting another 8,250 trees and shrubs in Tenmile Creek's watershed. These enhanced buffers were already protected by livestock exclusion fencing, but due to the difficult conditions, needed maintenance plantings to ensure robust and functioning riparian areas. Also under this grant, another 40 BDAs were installed in Tenmile Creek to further support temperature and sedimentation concerns in the watershed.

The Tenmile and Mill Creek watershed continues to recover. Each year, the benefits to water quality and fish habitat are more dramatic. Native cottonwood, alder, and willow trees are quickly returning to the stream banks. Grasses along the stream are healthier and more deeply rooted. Additionally, manure and exposed soil are no longer visible near the creek. Steelhead trout are returning to the creek to spawn in greater numbers than have been recorded in several decades.

Description of requirements under which pollution controls will be implemented

It is Ecology's best professional judgement that the pollution controls that have been installed will result in the water quality standards being met. Maintenance of these controls has been ensured through 10-year landowner agreements that were established as part of the funding agreements for these projects. Additionally, Ecology staff will continue to perform watershed evaluations in this watershed to ensure that BMPs stay in place

Estimate or Projection of Time When Water Quality Standards Will be Met

It will take time for the riparian corridor to fully recover and for the stream to re-establish its natural geometry. Ecology originally estimated that the riparian buffers will have grown enough to be fully effective in 10-15 years, or by the year 2025. While much progress has been made planting and enhancing buffers, the vegetation has not yet reached the maturity necessary to protect the stream and meet temperature standards. While Tenmile Creek continues to see projects implemented, additional time is necessary to allow for the growth required to adequately shade the stream and meet the temperature standard throughout the entire watershed by 2040.

Schedule for Implementing Pollution Controls

As described earlier in this report, Ecology has worked with the conservation district, local governments, and landowners to implement a variety of best management practices in the Tenmile Creek watershed, and landowners are continuing to implement best management practices that protect the stream corridor and improve water quality. It is our best professional judgment that this work will remedy the pollution problems in the impaired segments. Because it is our intention to restore the entire watershed and to prevent future pollution problems, we will be using monitoring data to track water quality improvements and to identify any new problem areas so they can be addressed. It will be an on-going process to get water bodies into compliance and to keep them in compliance.

Ecology's Livestock and Water Quality Program will continue to have an on-going presence in the watershed, and will continue working to achieve compliance with state water quality standards.

Monitoring Plan to Track Effectiveness of Pollution Controls

Ecology initiated an effectiveness monitoring program in Tenmile Creek watershed in May 2023. The goal of the monitoring program is to determine compliance with existing water quality standards for temperature and E. coli, following years of nonpoint pollution control best management practice implementation under this STI project. These monitoring data will inform the effectiveness of our STI approach to pollution cleanup and provide the information feedback necessary for adaptive management purposes.

To make best use of limited resources for data collection, Ecology is collecting data at one site located at the mouth of Tenmile Creek. This monitoring location represents Assessment Unit 17060103000114_001_001, or ListingIDs 18835 and 72313. In the event the data demonstrates improving water quality or attainment of numeric criteria, Ecology will consider expanding our monitoring efforts to additional upstream impaired segments.

Data collection includes continuous stream temperature measurements at 15-minute intervals via an in-situ data logger and bi-weekly grab samples E. coli analysis.

Recent Monitoring Results

Figure 29 displays the 7-DADMax temperature in Tenmile Creek from late May 2023 to late March 2024. Stream temperatures exceeded water quality standards on 107 out of 282 days sampled, with a highest 7DADMax value of 21.8 °C. During the supplemental spawning period (February 15 – June 1), 6 out of 42 samples exceeded the criteria of 13 °C, reaching as high as 18.29°C. However, we have not yet collected data through the end of the 2024 supplemental spawning season, when we expect temperatures are more likely to exceed the supplemental spawning criteria. The logger was removed in October 2023 (while it was understood stream temperatures were below the criteria) to download data, complete quality control checks, and was re-deployed later in the month.

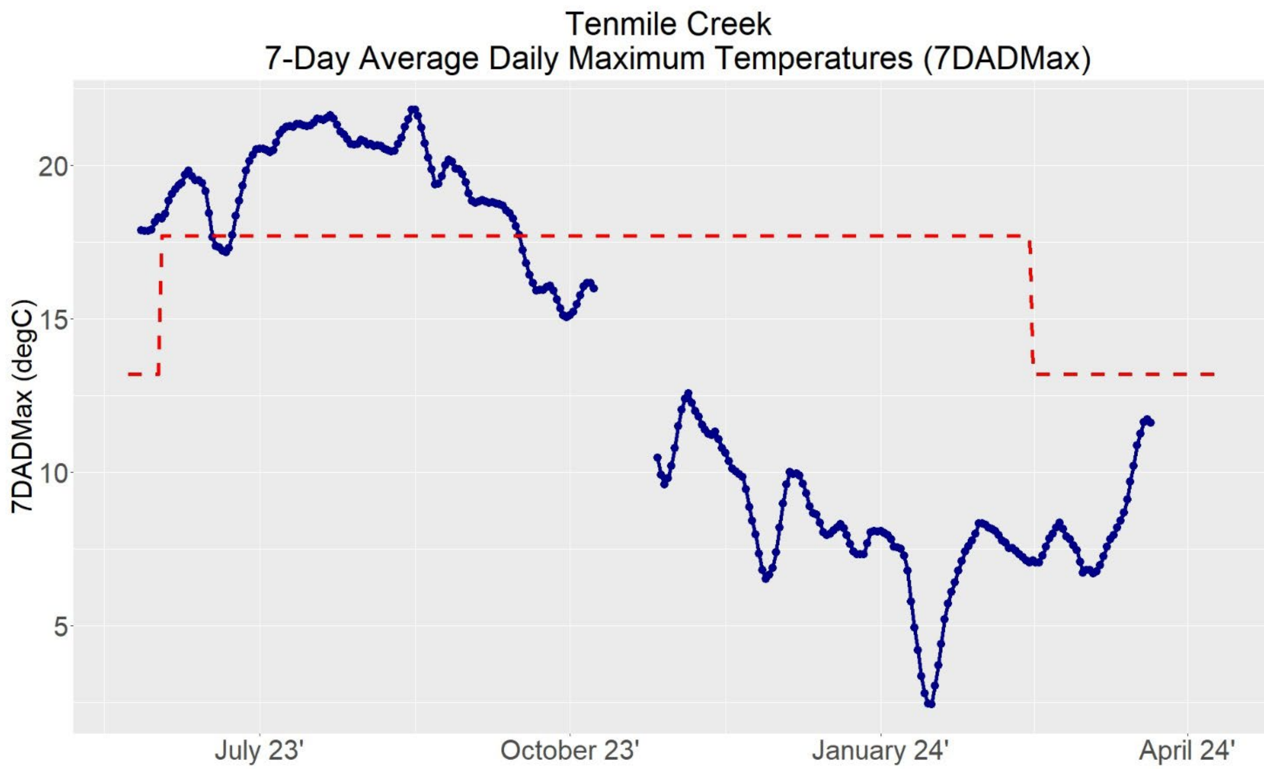

Figure 29. Tenmile Creek 7-day average maximum daily temperature values (blue dotted line) and applicable temperature numeric criteria (red dashed line).

While not part of Ecology's effectiveness monitoring efforts, Asotin Conservation District (CD) also collected continuous temperature monitoring data at the mouth of Couse Creek from July to December 2019, with the goal of determining compliance with water quality standards. Their data found stream temperatures above the 17.5 °C criterion on 54 out of 130 days, with a highest 7DADMax value of 22.1 °C.

Table 36 summarizes recent effectiveness monitoring temperature data with historic continuous monitoring data collected by WDFW in 2001 and 2002. While the recent data demonstrate standards are yet not being met, the 2024 highest reported summer 7DADMax and daily max values were between 1-2 °C cooler than those previously reported in 2001-2002. This may be an indication of improving stream temperatures in the lowermost reach of Tenmile Creek, especially considering air temperatures were much warmer in 2023 compared to 2000-2002. However, additional monitoring data will provide more insight into this hypothesis.

Table 36. Summary of surface water temperature data collected at mouth of Tenmile Creek. The number of "Days" refers to days with available 7-day average daily maximum temperature values.

Year	Highest 7DADMax (°C)	Highest Daily Max (°C)	Highest monthly average air temperature (°C)
2001	22.8	23.8	31.6
2002	23.5	24.5	33.6
2019	22.1	22.6	32.9
2023	21.80	22.87	35.2

Figure 30 and Table 37 compare recently collected E. coli values in Tenmile Creek against the E. coli water quality standards. No exceedances of the 10% criteria or geometric mean criteria occurred during our sampling period. E. coli values ranged from 2 to 172.5 MPN/100mL, all well below the 320 MPN/100mL water quality standards. Geometric mean values ranged from 19.2 MPN/100mL in the winter and 58.6 MPN/100mL in summer.

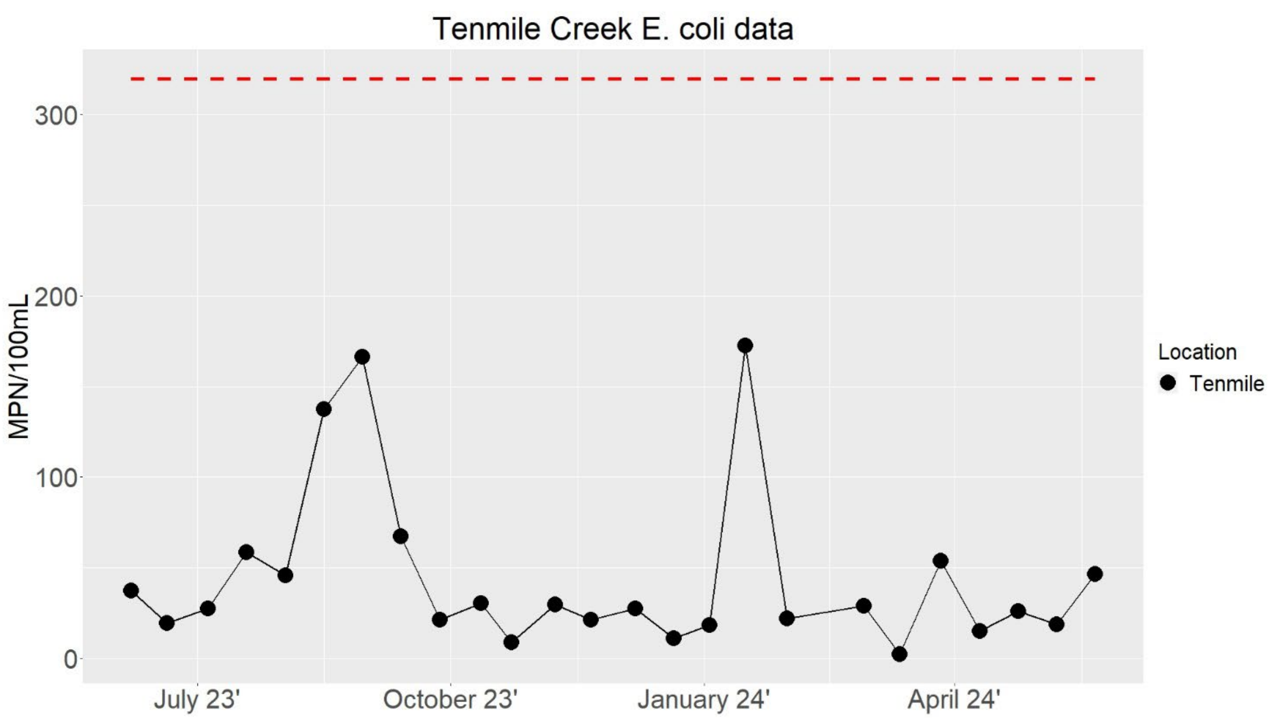

Figure 30. Tenmile Creek E. coli values (black dotted line) with Washington's E. coli 10 percent criteria (red dashed line).

Table 37. Tenmile Creek E. coli three-month geometric mean values. The “Month and Year” field represents the middle month and year in the three-month averaging period.

Month and Year	Samples	Three-month geometric mean (MPN/100mL)
July 23’	7	53.3
August 23’	7	58.6
September 23’	7	45.2
October 23’	6	24.8
November 23’	6	19.2
December 23’	7	27.9
January 24’	6	29.1
February 24’	6	24.5
March 24’	6	16.4
April 24’	6	18.1
May 24’	4	24.0

The recent water quality monitoring data and implementation information suggest our efforts are making progress in Mill Creek. Recent stream temperature values are slightly lower than those in the past and bacteria levels are well below the applicable numeric criteria. Continued implementation and water quality data collection will be needed to track the effectiveness of these efforts.

Commitment to Revise Pollution Controls as Necessary

Ecology will maintain a presence in the Tenmile Creek watershed to ensure that water quality continues to improve. We fully expect the Eastern Regional Office livestock and water quality program to achieve compliance with water quality standards. However, if it does not, Ecology will work with the conservation district, local governments, and landowners to determine other controls that could be used to achieve compliance.

Upper Alpowa Creek Straight to Implementation Project – October 2024

The Washington Department of Ecology (Ecology) Integrated Report (IR) proposes to exclude seventeen listings from the 2022 303(d) list and place these segments into Category 4B. Table 38 and Figure 31 summarize the listings addressed by this project, along with the Water Quality Assessment cycle each listing was first identified as impaired and the cycle the listing was first moved into Category 4B. Note Ecology requests excluding one additional fecal coliform listing (72289) and one additional dissolved oxygen listing (77714) from the 303(d) list in the 2022 WQA, as the implementation of this plan will address this pollutant across the entire watershed.

Ecology’s basis for excluding these seventeen listings from the 303(d) list is outlined in this evaluation.

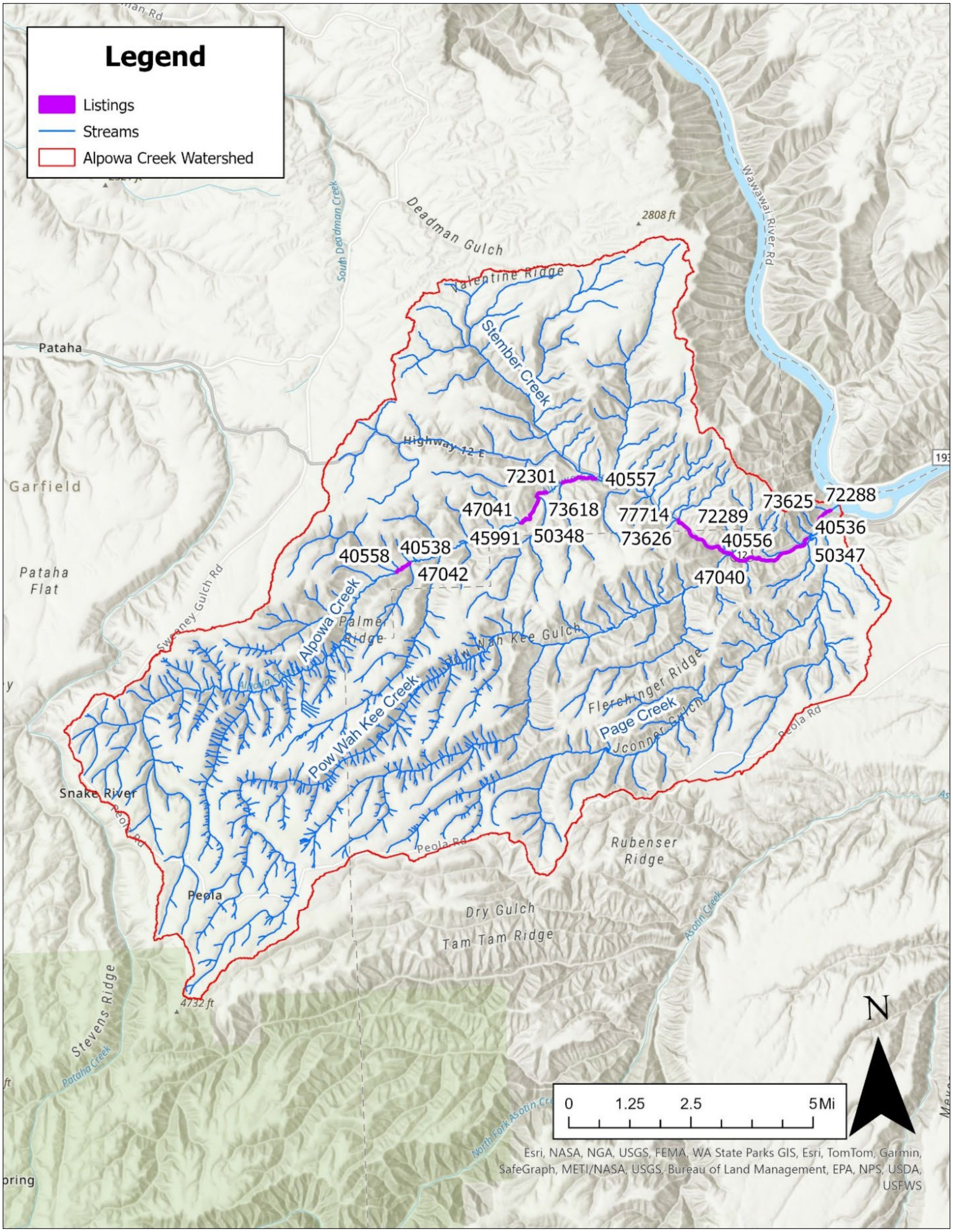

Figure 31. Listings in Alpowa Creek watershed Ecology requests placing into Category 4B.

Table 38. Listing's in Alpowa Creek watershed Ecology requests placing into Category 4B, with the WQA cycle each listing was first identified as impaired and the cycle the listing was first moved into Category 4B.

Listing ID	Assessment Unit	Parameter	WQA impaired	WQA moved to 4B
47040	17060107000353_001_001	Dissolved oxygen	2008	2012
47041	17060107000366_002_002	Dissolved oxygen	2008	2008
47042	17060107000373_001_001	Dissolved oxygen	2008	2008
77714	17060107000355_001_001	Dissolved oxygen	2012	2022
40556	17060107000353_001_001	Fecal coliform	2004	2012
45991	17060107000366_002_002	Fecal coliform	2008	2008
40557	17060107000365_001_001	Fecal coliform	2004	2008
40558	17060107000373_001_001	Fecal coliform	2004	2008
72288	17060107000350_001_001	Fecal coliform	2012	2012
72289	17060107000355_001_001	Fecal coliform	2018	2022
50347	17060107000353_001_001	pH	2008	2012
50348	17060107000366_002_002	pH	2008	2008
40536	17060107000353_001_001	Temperature	2012	2012
73618	17060107000366_002_002	Temperature	2012	2012
40538	17060107000373_001_001	Temperature	2012	2012
73625	17060107000350_001_001	Temperature	2012	2012
73626	17060107000355_001_001	Temperature	2012	2012

Identification of Segment and Statement of Problem Causing Impairment

Alpowa Creek is located in Garfield and Asotin Counties in southeastern Washington. It originates from several springs in the forested foothills of the Blue Mountains, travels through a desert canyon, and meets the Snake River near Clarkston, Washington. For generations the Alpowa Creek canyon has been used to range and feed livestock. Wheat and barley are also grown in the watershed. The creek provides significant habitat for the threatened Snake River Steelhead trout.

After years of uncontrolled livestock access to the creek, a large portion of the riparian corridor was in poor condition, and the stream was consistently in violation of the state fecal coliform standard.

Table 39 summarizes the historic dissolved oxygen data at the four impaired segments and two non-impaired in Alpowa Creek. Data collection ranges from 2005 to 2013, with primarily seasonally-limited discrete data collected by Ecology, Pomeroy Conservation District, and Asotin Conservation District. The data demonstrate dissolved oxygen levels below the 8.0 mg/L criterion in most sections of Alpowa Creek from 2005 to 2007. However, the majority of these samples were within 0.5 mg/L of the criterion. More recent continuous data at the mouth of Alpowa Creek collected during the 2013 summer season found only 1 out of 84 days exceeding the criterion. Data collected further upstream from 2012 to 2013 were more limited but found no exceedances of the criterion.

Table 39. Historic dissolved oxygen data in Alpowa Creek. Bolded counts represent exceedances of the applicable dissolved oxygen criterion of 8.0 mg/L.

Listing ID	Assessment Unit	Stream – General location	Year – samples exceeding criterion/total samples (lowest DO value (mg/L))
77713[a]	17060107000350_001_001	Alpowa – mouth at Chief Timoth Bridge	**2005 – 1/8 (7.93)** **2006 – 1/11 (7.94)** 2007 – 0/2 (11.08) **2012 – 1/84 (7.78)** 2013 – 0/3 (10.69
47040	17060107000353_001_001	Alpowa – River Mile 0.8	**2003 – 4/23 (4.75)** **2004 – 3/24 (7.68)** **2005 – 2/23 (7.96)** **2006 – 1/21 (7.81)** 2007 – 0/3 (10.81)
77714	17060107000355_001_001	Alpowa – Upstream confluence with Pow Wah Kee Gulch	2005 – 0/8 (8.04) **2006 – 2/11 (3.26)** 2007 – 0/2 (10.65)
47041	17060107000366_002_002	Alpowa – Alpowa Creek Road Bridge	**2003 – 6/23 (4.95)** **2004 – 5/23 (7.3)** **2005 – 2/22 (7.82)** **2006 – 1/24 (7.97)** 2007 – 0/2 (11.9) 2012 – 0/8 (8.54) 2013 – 0/3 (10.49)
47042	17060107000373_001_001	Alpowa – River Mile 10.7	**2003 – 7/23 (4.4)** **2004 – 5/23 (7.28)** **2005 – 2/22 (7.16)** **2006 – 3/21 (7.52)** 2007 – 0/1 (10.73)

Table notes:

[a]Ecology is not currently requesting coverage of this listing because it has not been determined impaired. These data are presented for reference purposes.

Table 40 summarizes historic fecal coliform data supporting the impaired status for the six segments along Alpowa Creek. Data collection ranges from 1999 to 2013, with fecal coliform data collected by Ecology, Pomeroy Conservation District, Asotin Conservation District, and Washington State University. The data demonstrate persistent non-attainment of both the 10% and geometric mean fecal coliform criteria along multiple segments of Alpowa Creek. In stream segments, the 10% criteria was more likely to be violated in a water year than the geometric mean criteria demonstrating the “flashy” nature of elevated bacteria levels in the watershed.

Table 40. Historic fecal coliform (FC) data in Alpowa Creek. Years below represent “water-year” (October – September). Bolded sample and geometric mean values in the table represent exceedances of the applicable fecal coliform criteria.

Listing ID	Assessment Unit	Stream – General location	Year – samples exceeding 10% criterion[a]/total samples (highest value (CFU/100mL))	Year – highest FC geometric mean (CFU/100mL)[b]
72288	17060107000350_001_001	Alpowa – mouth at Chief Timothy Bridge	**2005 – 3/6 (1010)** **2006 – 6/12 (8500)** 2007 – 0/7 (160) **2012 – 4/7 (2100)** **2013 – 4/7 (400)**	**2005 – 711.5** **2006 – 1049** 2007 – 78 **2012 – 1299** **2013 – 264[c]**
40556	17060107000353_001_001	Alpowa – River Mile 0.83	**2003 – 5/7 (268)** **2004 – 2/24 (413)** **2005 – 5/23 (520)** **2006 – 4/25 (630)** **2007 – 1/11 (630)**	**1999 - >100[c]** **2000 - >100[c]** **2003 – 106.6** 2004 – 54 2005 – 80 **2006 – 100** 2007 – 47
72289	17060107000355_001_001	Alpowa – Upstream confluence with Pow Wah Kee Gulch	**2005 – 2/6 (400)** **2006 – 1/12 (400)** 2007 – 0/5 (116)	**2005 – 122** **2006 – 115** 2007 – 14
40557	17060107000365_001_001	Alpowa – Upstream confluence with Stember Creek	Not reported	**1999 - >100[c]** **2000 - >100[c]**

Listing ID	Assessment Unit	Stream – General location	Year – samples exceeding 10% criterion[a]/total samples (highest value (CFU/100mL))	Year – highest FC geometric mean (CFU/100mL)[b]
45991	17060107000366_002_002	Alpowa – Alpowa Creek Road Bridge	**2003 – 4/14 (1840)** **2004 – 3/23 (700)** **2005 – 8/23 (1700)** **2006 – 9/27 (1000)** **2007 – 0/11 (105)** **2012 – 2/7 (465)** **2013 – 1/7 (495)**	**2003 – 121.5** 2004 – 45.8 2005 – 97.7 **2006 – 598** 2007 – 43 **2012 – 301** **2013 – 2010**
40558	17060107000373_001_001	Alpowa – River Mile 10.7	**2003 – 6/17 (1770)** **2004 – 1/24 (500)** **2005 – 7/23 (590)** **2006 – 6/24 (310)** **2007 – 2/9 (270)**	**2003 – 172.9** 2004 – 45.5 **2005 – 112.9** **2006 – 168** 2007 – 88

Table notes:

[a]200 CFU/100mL. See WAC 173-201A200 Table 200 (2)(b) for full criterion reference.

[b]Geometric mean values from 2005 and prior were calculated on a 12-month period and were evaluated using the pre-2019 recreational use criteria. Values from 2006 to present were calculated on a 3-month period and were evaluated using the current recreational use criteria.

[c] No values reported. Reported as above geometric mean criterion.

Table 41 summarizes historic temperature data at five impaired segments and one waterbody of concern (Category 2) along Alpowa Creek. Two segments had one year of continuous temperature data to calculate 7DADMax values, both of which documented 7DADMax values 21 °C or higher. All other datasets consisted of discrete samples, which cannot be used to calculate a 7-day average daily maximum (7DADMax) value for direct comparison against the criterion (17.5 °C 7DADMax). However, all segments had discrete data with values above the criterion magnitude. Additionally, listing 73618 found 7DADMax values as high as 16.6 in 2012 during the supplemental spawning period of February 15 – June 1, when a temperature criterion of 13.0 °C applies. On listing 40538 in 2006, discrete surface water temperatures were reported as high as 22.3 °C during the supplemental spawning season.

Table 41. Historic temperature data in Alpowa Creek. Bolded 7-day average daily maximum (7DADMax) represent exceedances of the temperature criteria.

Listing ID	Assessment Unit	Stream – General location	Year – Highest temperature value (°C)	Year – Highest 7DADMax temperature value (°C)
73625	17060107000350_001_001	Alpowa – mouth at Chief Timoth Bridge	2005 – 19.8 2006 – 19.3 2007 – 7.9 2012 – 22.66 2013 – 9.17	**2012 – 22.17**
40536	17060107000353_001_001	Alpowa – River Mile 0.8	1999 – NA[a] 2000 – NA[a] 2003 – 21.2 2004 – 20.4 2005 – 20.1 2006 – 21.4 2007 – 8.2	None available
73626	17060107000355_001_001	Alpowa – Upstream confluence with Pow Wah Kee Gulch	2005 – 19.9 2006 – 18.5 2007 – 8.2	None available
40537[b]	17060107000365_001_001	Alpowa – Upstream confluence with Stember Creek	1999 – NA[a] 2000 – NA[a]	None available
73618	17060107000366_002_002	Alpowa – Alpowa Creek Road Bridge	2003 – 21.9 2004 – 19.7 2005 – 20.1 2006 – 21.6 2007 – 8.3 2012 – 21.34 2013 – 9.29	**2012 – 21.01**
40538	17060107000373_001_001	Alpowa – River Mile 10.7	1999 2000 2003 – 23.0 2004 – 20.2 2005 – 21.4 2006 – 22.3 2007 – 9.0	None available

Table notes:

[a] No values reported. Reported as above criterion.

[b]Ecology is not currently requesting coverage of this listing because it has not been determined impaired. These data are presented for reference purposes.

Table 42 below summarizes historic pH data on the two pH impaired segments and two additional segments of Alpowa Creek. Exceedances of the upper range of the pH criteria (6.5 to 8.5) occurred infrequently in multiple sections of the creek from 2004 to 2006. A more recent and comprehensive timeseries dataset at the mouth of Alpowa Creek in 2012 found no exceedances of the criteria.

Table 42. Historic pH data in Alpowa Creek. Bolded pH range values represent exceedances of the pH criteria.

Listing ID	Assessment Unit	Stream – General location	Year - samples exceeding criterion/total samples	pH Range
70666[a]	17060107000350_001_001	Alpowa – mouth at Chief Timoth Bridge	2006 – 2/3 2007 – 0/1 2012 – 0/94 2013 – 0/2	7.7 – **8.71**
50347	17060107000353_001_001	Alpowa – River Mile 0.83	2003 – 0/23 2004 – 0/24 2005 – 3/21 2006 – 0/20 2007 – 0/2	7.01 – **8.72**
50348	17060107000366_002_002	Alpowa – Alpowa Creek Road Bridge	2003 – 0/23 2004 – 1/23 2005 – 3/21 2006 – 2/23 2007 – 0/3 2012 – 0/9 2013 – 0/2	6.59 – **8.8**
50349[a]	17060107000373_001_001	Alpowa – River Mile 10.7	2003 – 0/23 2004 – 1/23 2005 – 1/21 2006 – 0/20 2007 – 0/2	6.8 – **8.9**

[a]Ecology is not currently requesting coverage of this listing because it has not been determined impaired. These data are presented for reference purposes.

The impairments are the result of a combination of factors. Winter feeding and uncontrolled livestock access to the stream had eliminated much of the vegetation within the stream corridor. This degraded riparian area could not provide shade to the stream, resulting in high water temperatures. It also allowed manure to run directly into streams. In addition, the uncontrolled stream access allowed cattle to deposit manure directly into the water and to trample stream banks. There is also some evidence that failing septic systems may be contributing to the problem.

Livestock manure is a likely cause of the low dissolved oxygen and pH violations. Manure uses oxygen and lowers pH during decomposition by in-stream bacteria. Nutrients in the manure and from fertilizers stimulate excessive plant growth in the creek. This problem is exacerbated by high stream temperatures and an overabundance of sunlight exposure. Aquatic plants use oxygen for respiration at night and can raise the pH of the water during photosynthesis during the day. Controlling the excessive growth is key to meeting pH and dissolved oxygen criteria and improving the health of the aquatic community.

Description of Pollution Controls and How They Will Achieve Water Quality Standards

Water quality target

All waterbodies in Alpowa Creek watershed have a designated use of primary contact recreation. This designated use pertains to all fecal coliform listings in the watershed. While these listings are based on fecal coliform data, in 2019 Ecology updated its water quality standards to adopt Escherichia coli (E. coli) as the primary indicator for evaluating recreational uses, replacing the fecal coliform criteria. E. coli levels must not exceed a 90-day[53] geometric mean value of 100 CFU or MPN per 100 mL, with not more than 10 percent of all samples (or a single sample when less than ten sample points exist) exceeding 320 CFU or MPN per 100 mL within the averaging period[54].

The designated uses aquatic life use category for all surface waters in Alpowa Creek watershed is “salmonid spawning, rearing and migration”. For the dissolved oxygen impaired segments, the standards require dissolved oxygen levels above 8.0 mg/L.

For the pH impaired segments, the standards require pH within the range of 6.5 to 8.5, with a human-caused variation within this range of less than 0.5 units.

For temperature, the salmon spawning, rearing, and migration use category equates to a 7-day average of the daily maximum (7DADMax) temperature criterion value of 17.5 °C. In addition, ListingIDs 73618 and 40538 have criterion to protect the early life stages of salmonids of 13.0 °C 7DADMax from February 15 to June 1 (Figure 32).

[53] WAC 173-201A(2)(b)(B) requires the averaging period for bacteria as no more than 90 days. Ecology’s standard procedures for implementing this requirement uses a 3-month averaging period. A shorter averaging period may be used if site specific information suggests a shorter period is necessary for determining compliance with criteria.
[54] Uses the same averaging period as used to evaluate the geometric mean criteria at the site.

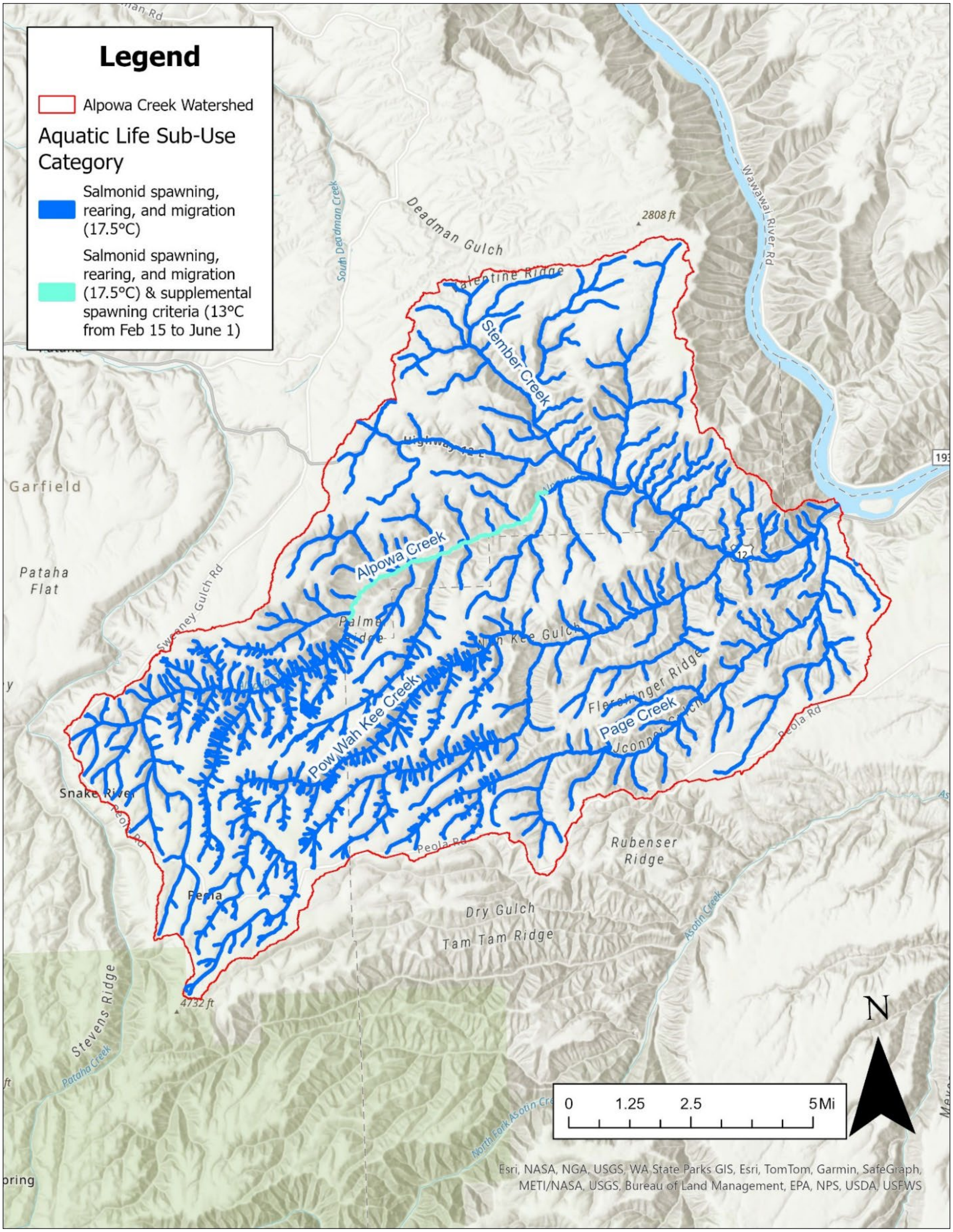

Figure 32. Alpowa Creek watershed aquatic life uses and applicable temperature numeric criteria.

Controls that will achieve water quality standards

The Department of Ecology's Eastern Regional Office has established a Livestock and Water Quality program that uses a unique collaborative approach to address livestock-related problems. Instead of using the standard process that starts with a Category 5 listing, establishing a TMDL for the stream, writing an implementation plan, and finally getting to actual implementation, this strategy goes straight to implementation. The strategy is applied in watersheds in which the cause of a water quality impairment is clear.

Ecology encourages implementation of a wide variety of best management practices, however, a primary focus of the program has been to restore degraded riparian corridors and eliminate unlimited animal access to streams. Healthy riparian areas can improve water quality and stream health in multiple ways, which make them a particularly valuable and cost-effective management practice. Healthy riparian areas:

- Slow bank erosion by holding soil in place during periods of high water.
- Reduce flood damage and sedimentation by slowing runoff and capturing the sediment that would otherwise be carried downstream.
- Help keep water cool and reduce light exposure in summer by shading the stream.
- Improve water quality by capturing sediment, nutrients, pesticides, pathogens, and other pollutants before they reach the stream.
- Enhance summer stream flow by improving water infiltration and storage.
- Create fish and wildlife habitat.
- Limit livestock manure inputs to the creek and riparian areas.

Ecology has a three-step riparian restoration strategy, which allows the department to efficiently apply resources to priority problem areas. The first step is to address the source of degradation – unlimited livestock access to streams and winterfeeding operations in close proximity to the riparian corridor. Ecology relies primarily on livestock exclusion, and off-stream water supply to restrict livestock access to the riparian area. In implementing this BMP, Ecology was using NRCS riparian buffer standards, which required a minimum 35-foot buffer between the livestock fence and the mean ordinary high water mark of the nearest stream bank. In many cases, the buffer width was larger depending on the stream and site conditions. In 2022, Ecology updated its riparian buffer guidelines and is now implementing buffer widths according to the Voluntary Clean Water Guidance for Agriculture. These new guidelines require a minimum 75, 60 or 50-foot core buffer between the livestock fence and the mean ordinary high water mark of the nearest stream bank depending on the stream characteristics. Additional protection encompassing the total riparian management zone of 150 feet may be necessary depending on the stream, site conditions and adjacent land uses.

By first addressing livestock access, Ecology seeks to abate the primary pollution sources—livestock in the stream, eroded stream banks, increased runoff, increased sedimentation, and subsequent transport of fecal matter. As vegetation naturally returns in the riparian area, site conditions become stabilized and the pollution sources are dramatically reduced. Also, this approach works to arrest morphological changes to the entire stream that are induced by erosion and sedimentation.

Ecology has spent much of its efforts and resources implementing this first step, in large part, because we have taken a holistic, watershed approach to protecting streams. By first addressing the primary sources of pollution and geomorphic change, Ecology can establish the necessary site conditions for successful restoration. Moreover, Ecology ensures that, first and foremost, the root problems are addressed for *the entire stream*, before resources are focused on site or segment specific restoration.

The second step occurs after a majority of site conditions have been stabilized, and the stream's entire geomorphic integrity is no longer jeopardized by the adjacent management practices. Ecology then conducts a reach by reach assessment to determine the appropriate trees and shrubs to be used for restoration. In some cases, federal programs require revegetation as part of the cost-share program, and so restoration work occurs simultaneously with livestock exclusion.

The third step is to work with local landowners to promote continuous and proper management of upland grazing lands.

In addition to the Livestock and Water Quality Program, Ecology's Eastern Regional Office has established a similar collaborative approach to address crop production-related problems. Ecology encourages implementation of a wide variety of best management practices, however, a primary focus of effort has been establishing minimum land use setbacks, restoring degraded riparian corridors, and converting conventionally farmed land to conservation tillage practices.

Ecology teams with conservation districts, local governments, and landowners to provide technical assistance and funding for implementation of best management practices.

Ecology uses our regulatory authority as a backstop when collaborative efforts fail. The Water Pollution Control Act (RCW 90.48) gives Ecology the authority to take enforcement actions against nonpoint polluters.

RCW 90.48 makes it unlawful for any person to "cause, permit or suffer to be thrown, run, drained, allowed to seep or otherwise discharged … any organic or inorganic matter that shall cause or tend to cause pollution of" waters of the state. Any person who violates or creates a substantial potential to violate the provisions of Chapter 90.48 RCW is subject to an enforcement order from Ecology pursuant to RCW 90.48.120. Ecology is authorized to "issue such order or directive as it deems appropriate under the circumstances[.]" In addition to administrative orders, violating Chapter 90.48 RCW may result in injunctions, civil penalties, and notices of violations.

It is worth noting that RCW 90.48.120 gives Ecology the authority to take action in response to nonpoint source pollution, the statute also gives Ecology the authority to take action based on a "substantial potential" to pollute state waters via either a point or nonpoint pollution source. Consequently, Ecology not only has authority to take action following a NPS pollution occurrence (i.e. there was a discharge) but has specific statutory authority to act proactively to prevent NPS pollution from occurring in the first place. Ecology's authority includes the authority to require a nonpoint source polluter to implement specific best management practices (BMPs). Ecology's authority can be used to prevent nonpoint pollution and require BMPs, as necessary.

Ecology has used this regulatory backstop several times since 2016.

The result of these partnerships has been the implementation of best management practices at hundreds of sites across several watersheds where water quality and fish habitat issues exist. By using a collaborative strategy, backed up by enforcement when necessary, Ecology has been able to create relationships and build trust with rural residents while improving water quality.

In the upper Alpowa Creek watershed, work with landowners began in 2003. Thirteen miles of riparian buffers were installed. The creek was fenced to protect it from livestock, and off-stream water sources were developed. Thousands of native trees and shrubs were planted in the stream corridor to help stabilize banks and shade the stream. These buffers were constructed using Natural Resource Conservation Service standards, which required a minimum width of 35 feet. Many of these buffers were wider than the minimum. For buffers installed with state or federal financial assistance, we require an agreement with the landowner stipulating that the buffer and fence will be maintained for at least 10 years. Ecology has also planted additional native trees and shrubs in the riparian area of the creek in cooperation with the Public Utility district.

Fencing was generally installed adjacent to or upstream of the impaired segments. However, we have also fenced portions of the stream where there are presently no Category 5 listings, but where there was unrestricted cattle access to the stream. Riparian buffers are left to revegetate naturally in those areas in which there is enough live native vegetation left to recover. In all other areas we are installing buffers by planting native plants.

More recently, the Pomeroy CD has worked in collaboration with the Palouse CD and utilized salmon recovery funds to establish over almost 1,400 Post Assisted Log Structures (PALS) on Alpowa Creek resulting in increased pooling and floodplain storage to improve temperature and sedimentation concerns on over three miles of Alpowa Creek. This collaborative project continues in several iterations throughout the footprint to maintain improvements. Since 2020, about 300 PALS have been installed. An off-stream watering facility for livestock was also installed during this timeframe that included 500’ of pipeline and a 1,600 gallon storage tank. Across the riparian and upland areas, 1,440 acres of herbaceous weed control was performed in the watershed to improve plant communities and supporting beneficial and native species. In the upland areas, agricultural practices supporting improved management include around $67,000 was spent to support guidance precision agriculture which decreases the amount of nutrients and pesticides that are applied which have the potential to runoff and impact water quality. To date, several thousand acres of cropland have been converted to direct seed or conservation tillage practices throughout the watershed.

Ecology’s Eastern Regional Office expanded its implementation work to the entire watershed instead of focusing on just upper Alpowa Creek. As of 2018, a significant portion of the upper watershed had riparian buffers that have been established through use of funds from the Conservation Reserve Enhancement Program, but some of that has since been removed and grazed which will continue to receive focus in the coming years.

Ecology’s recent watershed evaluations in 2024 resulted in the program identifying an additional six sites with active water quality concerns. Once prioritization was completed one landowner was sent a letter from Ecology. These efforts will continue in 2025 to work with this landowner to protect water quality, and to identify and document ongoing sites of concern that implement new projects in the watershed.

Since the riparian buffers were installed, native vegetation is returning, and water quality monitoring data from the early 2010s indicate that the stream bacteria levels are improving (See Recent monitoring results section below for more information). In addition, many landowners have been pleasantly surprised with the on-the-ground results. While they point out that water quality and fish habitat projects create some new management challenges, they have also observed some exciting economic benefits to their operations. By providing off-stream water in strategic locations, livestock are now better dispersed throughout their range. This has resulted in healthier grasses and better forage. In turn, animals are typically more robust and healthy, and the amount of supplemental feed needed during the year is reduced.

As the amount of fecal coliform delivered to the stream is reduced with healthy riparian corridors providing shade, we expect minimum dissolved oxygen concentrations and pH levels to meet water quality criteria.

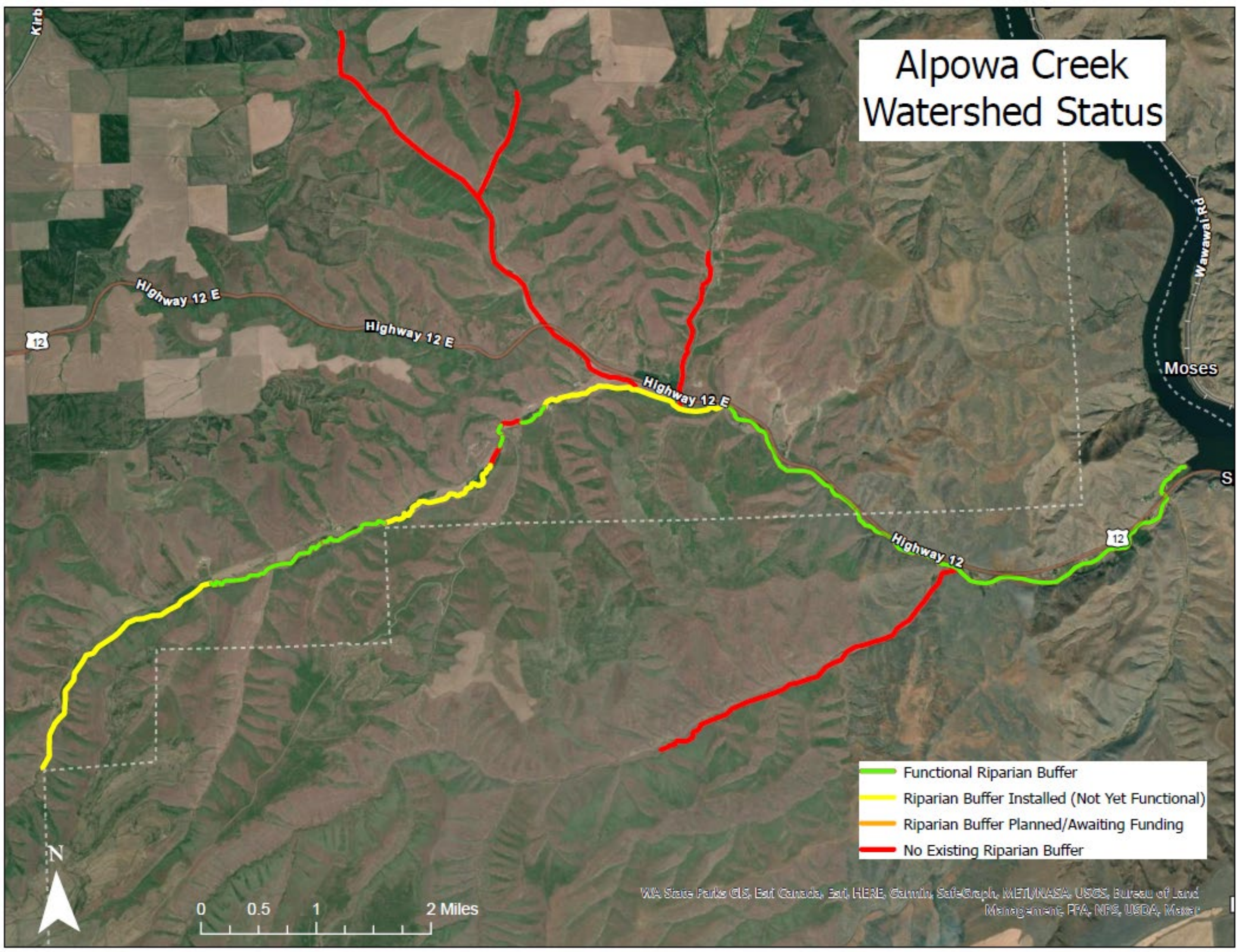

Figure 33. Alpowa Creek riparian buffer status.

Description of requirements under which pollution controls will be implemented.

It is Ecology's best professional judgement that the pollution controls which have been installed will result in the water quality standards being met. Maintenance of these controls has been ensured through 10-year landowner agreements that were established as part of the funding agreements for these projects. Additionally, Ecology staff will continue to perform watershed evaluations in this watershed to ensure that BMPs stay in place.

Estimate or Projection of Time When Water Quality Standards Will be Met

It will take time for the riparian corridor to fully recover and for the stream to re-establish its natural geometry. Ecology estimates that the riparian buffers will have grown enough to be fully effective in 10-15 years. With continued project implementation in the upper Alpowa Creek, increased focus in the watershed will help to meet the standards for fecal coliform, dissolved oxygen and pH by 2030. Standards in the lower watershed and the temperature standards for the entire watershed should be met by 2035.

Schedule for Implementing Pollution Controls

As described earlier in this report, Ecology has worked with the conservation district, local governments, and landowners to implement a variety of best management practices in the upper Alpowa Creek watershed. It is our best professional judgment that this work will remedy the pollution problems in the impaired segments. Because it is our intention to restore the entire watershed and to prevent future pollution problems, we will be using monitoring data to track water quality improvements and to identify any new problem areas so they can be addressed. It will be an on-going process to get water bodies into compliance and to keep them in compliance.

Some work remains to be completed in the watershed. Landowners will now focus project implementation in the small tributaries to Alpowa Creek, where livestock still have uncontrolled access. Ecology's Livestock and Water Quality Program will continue to have an on-going presence in the watershed, and will continue working to achieve compliance with state water quality standards.

We will use monitoring data and evidence of additional work completed in this watershed to determine whether these listings will stay in Category 4B in the next Water Quality Assessment.

Monitoring Plan to Track Effectiveness of Pollution Controls

Ecology initiated an effectiveness monitoring program in Alpowa Creek watershed in May 2023. The goal of the monitoring program is to determine compliance with existing water quality standards for bacteria, dissolved oxygen, pH, and temperature, following years of nonpoint pollution control best management practice implementation under this STI project. These monitoring data will inform the effectiveness of our STI approach to pollution cleanup and provide the information feedback necessary for adaptive management purposes.

To make best use of limited resources for data collection, Ecology is focusing monitoring to one site located near the mouth of Alpowa Creek at Chief Joseph Bridge. This monitoring location represents ListingIDs 72288, 77713, 73625, and 70666. In the event the data demonstrates improving water quality or attainment of numeric criteria, Ecology will consider expanding our monitoring efforts upstream to other sections of the creek and tributaries.

Temperature data were collected at 15-minute intervals via an in-situ logger from May through early October 2023. The logger was redeployed in April 2024 as water temperatures begin to rise in spring 2024. We collected dissolved oxygen, pH, and E. coli samples every two weeks at this location from June 2023 to May 2024. Though the existing recreational use impairments in the watershed are based on fecal coliform data, in 2019 Ecology updated its water quality standards to adopt Escherichia coli (E. Coli) as the primary indicator for evaluating recreational uses, replacing the fecal coliform criteria. Therefore, E. coli data will be used to evaluate the health of recreational uses.

Recent Monitoring Results

Figure 34 displays the 7DADMax temperature in Alpowa Creek from late May to early October 2023. Stream temperatures exceeded water quality standards of 100 out of 135 days sampled. The highest 7DADMax recorded in 2024 was 21.08 °C, approximately 1 °C cooler than the highest 7DADMax reported with the only historical time-series dataset at this location (collected in 2012). This 1°C temperature difference is promising, considering that the highest monthly mean of daily maximum air temperatures in 2023 was 0.8°C warmer[55]. However, further data collection is needed to further support improving stream temperatures in Alpowa Creek.

[55] National Ocean and Atmospheric Administration Online Weather Data (NOWData) at Lewiston-Nez Perce County Airport. Downloaded on June 6, 2024 from: https://www.weather.gov/wrh/climate?wfo=otx

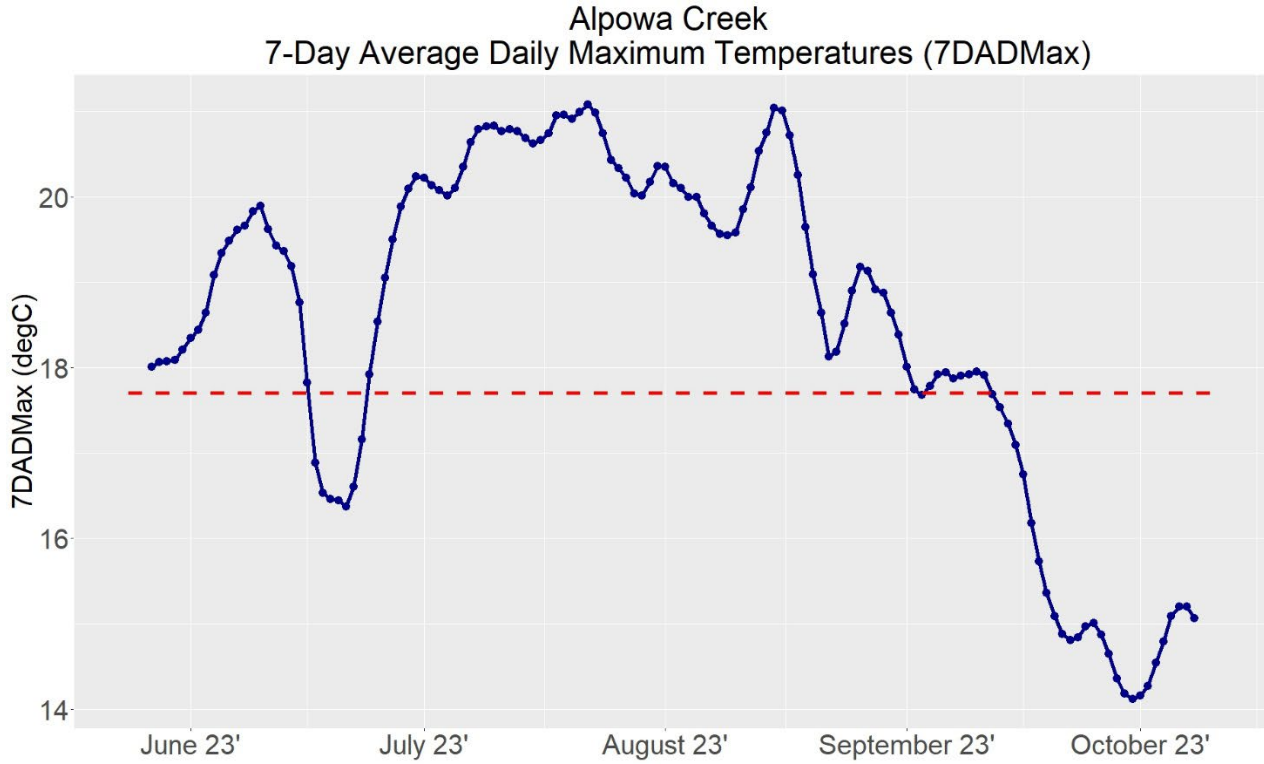

Figure 34. Alpowa Creek 7-day average maximum daily temperature values (blue dotted line) and application temperature numeric criteria (red dashed line).

Figure 35 and Table 43 compare recently collected E. coli values in Tenmile Creek against the E. coli water quality standards. Both the ten percent and geometric mean criteria were exceeded several times during the sampling period. E. coli values ranged from 27.4 to 2419,6 MPN/100mL, with 12 out of 25 samples exceeding the ten percent criteria of 320 MPN/100mL. E. coli values tended to be drastically higher in spring and summer months. In March 2024, livestock were moved onto pasture adjacent to the stream, which correlated with significant increases in E. coli levels. Ten out of 11 geometric mean values exceeded the geometric mean criteria, with values ranging from 95.2 to 746.4 MPN/100mL.

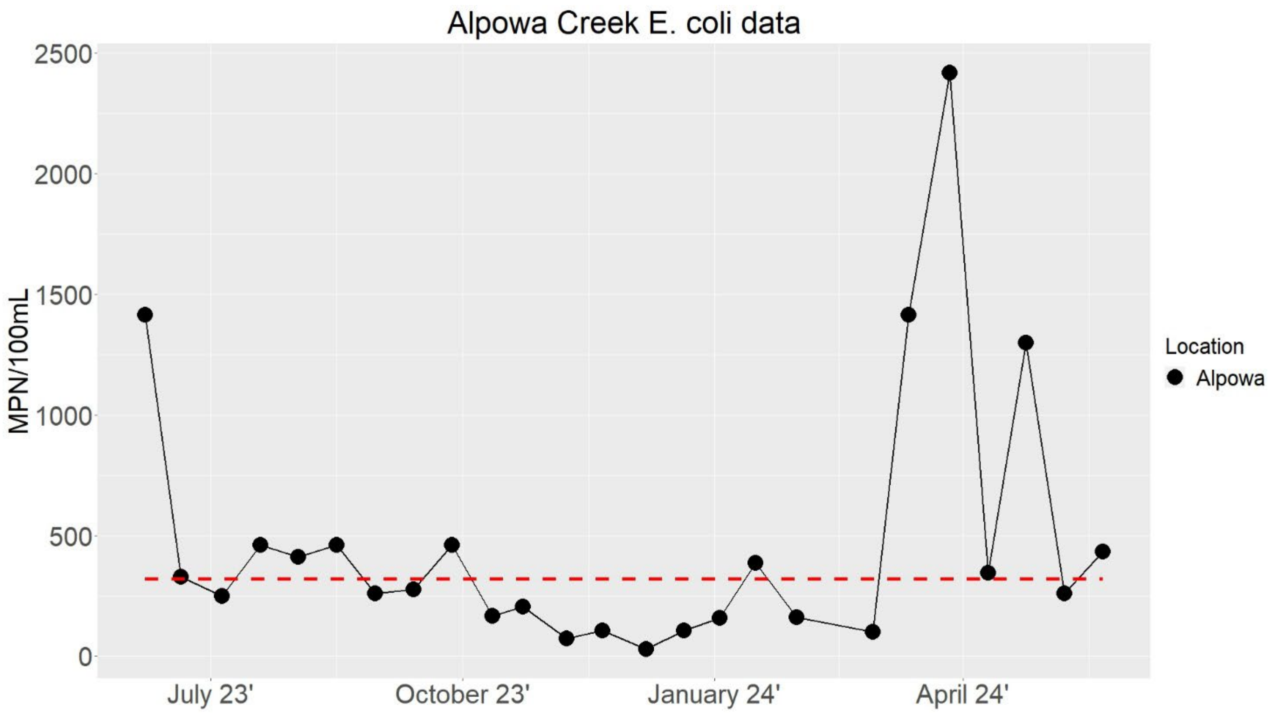

Figure 35. Alpowa Creek E. coli values (black dotted line) with Washington's E. coli 10 percent criteria (red dashed line).

Table 43. Alpowa Creek E. coli three-month geometric mean values. The "Month and Year" field represents the middle month and year in the three-month averaging period. Bolded geometric mean values represent exceedances of the E. coli geometric mean criteria.

Month and Year	Samples	Three-month geometric mean (MPN/100mL)
July 23'	7	**427.6**
August 23'	7	**355.4**
September 23'	7	**298.7**
October 23'	6	**178.9**
November 23'	6	95.2
December 23'	7	**111.7**
January 24'	6	**119.3**
February 24'	6	**388**
March 24'	5	**688.9**
April 24'	6	**746.4**
May 24'	4	**474.2**

pH in Alpowa Creek ranged from 7.62 to 8.67 from July 2023 through May 2024. Only one out of twenty-two bi-weekly pH samples exceeded the upper range of the criteria. pH data was not collected in June 2023 due to fouling on the pH probe. A new probe was promptly ordered and deployed in July.

Due to persistent quality control issues with our DO membrane, we could not use the collected DO data to evaluate attainment of DO criteria.

The recent water quality monitoring data and implementation information suggest our efforts are making progress in these watersheds. Current stream temperatures were lower than historic levels and all except one pH measurement fell within the numeric criteria. Though bacteria continue to be a problem likely due to livestock access issues. Continued implementation and water quality data collection will be needed to track the effectiveness of these efforts.

Commitment to Revise Pollution Controls as Necessary

Ecology will maintain a presence in the Alpowa Creek watershed to ensure that water quality continues to improve. We fully expect the Eastern Regional Office livestock program to achieve compliance with water quality standards. However, if it does not, Ecology will work with the conservation district, local governments, and landowners to determine other controls that could be used to achieve compliance.

Appendix A: Water Quality 303(d) List Priority Rankings

Appendix A contains a table of water quality and tissue listings on the 303(d) list that have been ranked for development of a clean-up plan. The table can be accessed with the following link: Appendix A - Water Quality 303(d) List Priority Rankings.[56]

[56] https://apps.ecology.wa.gov/publications/parts/2510025part1.pdf

Appendix B: Sediment 303(d) List Priority Rankings

Appendix B contains a table of sediment listings on the 303(d) list that have been ranked for development of a clean-up plan. The table can be accessed with the following link: Appendix B - Sediment 303(d) List Priority Rankings[57].

[57] https://apps.ecology.wa.gov/publications/parts/2510025part2.pdf

Appendix C: Sediment 4B Clean Up Sites

Appendix C contains a table of sediment listings covered by a 4B clean-up plan. The table can be accessed with the following link: Sediment 4B Clean Up Sites.[58]

[58] https://apps.ecology.wa.gov/publications/parts/2510025part3.pdf