Final Regulatory Analyses:

Including the:

- Final Cost-Benefit Analysis
- Least-Burdensome Alternative Analysis
- Administrative Procedure Act Determinations
- Regulatory Fairness Act Compliance

Chapter 173-201A WAC

Water Quality Standards for Surface Waters of the State of Washington. Salmon Spawning Habitat Protection

By

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For the

Water Quality Program

Washington State Department of Ecology

Olympia, Washington

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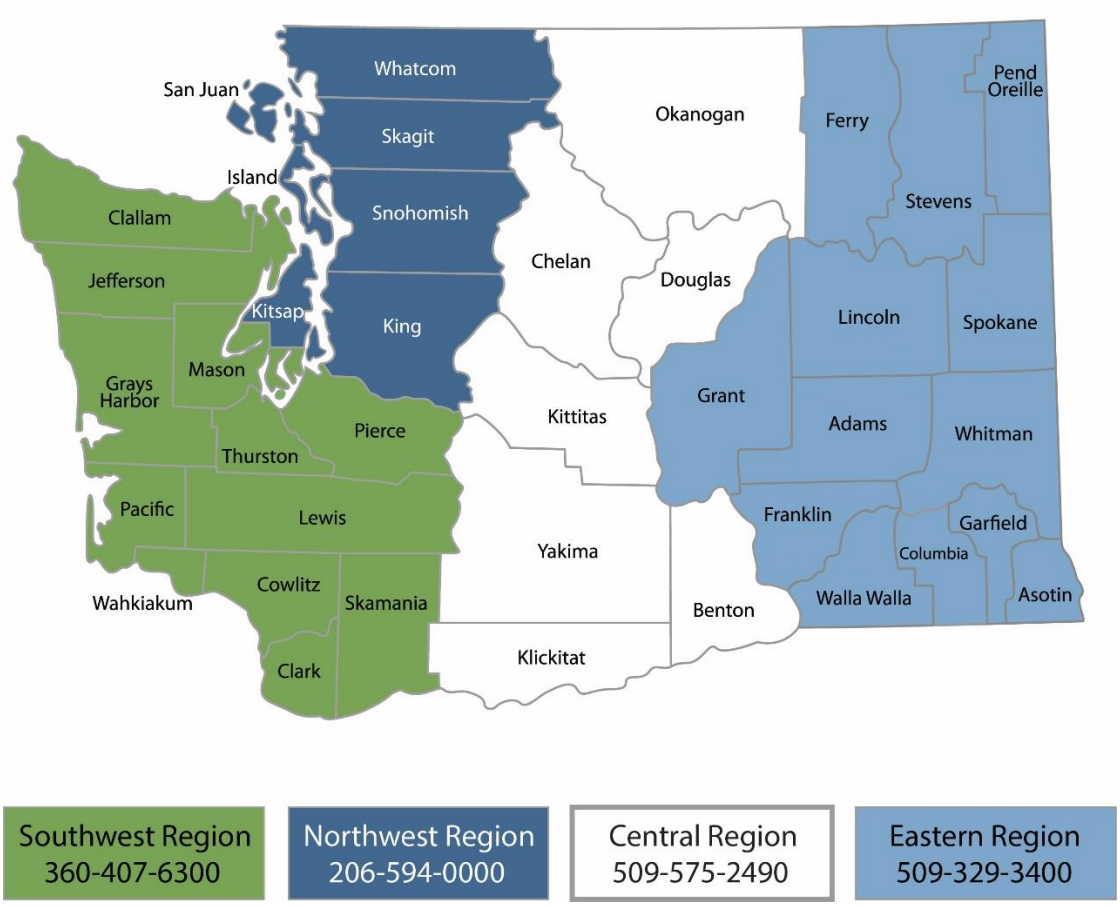

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DEPARTMENT OF
ECOLOGY
State of Washington

Table of Contents

Tables

Acronyms

AKART	All known available and reasonable technologies
APA	Administrative Procedure Act
BMP	Best management practices
BPJ	Best professional judgement
CBA	Cost-Benefit Analysis
DO	Dissolved oxygen
EPA	Environmental Protection Agency
LBA	Least-Burdensome Alternative Analysis
NOAA	National Oceanic and Atmospheric Association
NWEA	Northwest Environmental Advocates
PV	Present value
RCW	Revised Code of Washington
RFA	Regulatory Fairness Act
TMDL	Total maximum daily load
TSS	Total suspended solids

Executive Summary

- This report presents the determinations made by the Washington State Department of Ecology (Ecology), as required under chapters 34.05 RCW and 19.85 RCW, for the amendments to the Water Quality Standards for Surface Waters of the State of Washington (Chapter 173-201A WAC; the "rule"). This includes the:
- Final Cost-Benefit Analysis (CBA)
- Least-Burdensome Alternative Analysis (LBA)
- Administrative Procedure Act Determinations
- Regulatory Fairness Act Compliance

The Washington Administrative Procedure Act (APA; RCW 34.05.328(1)(d)) requires Ecology to evaluate significant legislative rules to "determine that the probable benefits of the rule are greater than its probable costs, taking into account both the qualitative and quantitative benefits and costs and the specific directives of the law being implemented." Chapters 1 – 5 of this document describe that determination.

The APA also requires Ecology to "determine, after considering alternative versions of the rule…that the rule being adopted is the least burdensome alternative for those required to comply with it that will achieve the general goals and specific objectives" of the governing and authorizing statutes. Chapter 6 of this document describes that determination.

The APA also requires Ecology to make several other determinations (RCW 34.05.328(1)(a) – (c) and (f) – (h)) about the rule, including authorization, need, context, and coordination. Appendix A of this document provides the documentation for these determinations.

The Washington Regulatory Fairness Act (RFA; chapter 19.85 RCW) requires Ecology to evaluate the relative impact of rules that impose costs on businesses in an industry. It compares the relative compliance costs for small businesses to those of the largest businesses affected. Chapter 7 documents that analysis, when applicable.

All determinations are based on the best available information at the time of publication. We encourage feedback (including specific data) that may improve the accuracy of this analysis.

This rulemaking revises "WAC 173-201A-200 Fresh water designated uses and criteria" to provide additional water quality and habitat protection for early life stages of salmonids—including salmon, steelhead, and trout—and their spawning gravel. Ecology considers two general revisions in this rule:

- Revising the freshwater dissolved oxygen criteria to increase protection of early life stages of salmonids in spawning gravels.

- Adding fine sediment criteria to provide additional protection for spawning gravel habitat.

The rule amendments will make the following changes:

- Revising the freshwater dissolved oxygen criteria.
    - Adding the definitions of "Intragravel dissolved oxygen" and "Spatial median".
    - Setting more stringent water column dissolved oxygen criteria for salmonid spawning based uses.
    - Adding an intragravel dissolved oxygen component to the dissolved oxygen criteria for salmonid spawning based uses.
    - Adding an oxygen saturation component to the dissolved oxygen criteria for the salmonid spawning based uses.
    - Clarifying the habitat type and spatial extent for sample collection when evaluating intragravel dissolved oxygen.
- Adding a narrative fine sediment criterion to all existing and designated aquatic life uses for fresh water.

Costs

Potential costs associated with adding a narrative fine sediment criterion to all existing and designated aquatic life uses for fresh water:

- **Costs for point source dischargers in TMDLs.** If a permittee is discharging sediment to a water body impaired for the narrative fine sediment criterion, that permittee could incur monitoring costs. We assume monitoring costs will be similar to monitoring costs for turbidity or total suspended solids (TSS). Ecology estimated these costs for sites with one to five acres at $1,650 per year, and at $2,721 per year for sites with more than five acres in the Small Business Economic Impact Analysis for the Construction Stormwater General Permit (2020).[2] The estimated 20-year present value (PV)[3] for fine sediments monitoring costs is between $20,271 and $33,429, depending on the size of a site.
- **Costs for nonpoint dischargers.** To address nonpoint sources of pollution, Ecology develops a list of best management practices (BMPs). Many of the BMPs address more than one of the water quality issues, such as temperature, bacteria, toxic chemicals, sediments, etc. Therefore, it is difficult to identify specific BMPs to address fine

[2] Small Business Economic Impact Analysis. Construction Stormwater General Permit. May, 2020. https://apps.ecology.wa.gov/publications/documents/2010022.pdf

[3] All Ecology analyses look at a 20-year time span from the time of rule adoption, which is typically enough time to reflect consequences of a rulemaking. This standard is consistent with principles in federal guidance and historic analytical practices. Present value is defined as the value of a consequence occurring at the present time that has the same effect on wellbeing as the future consequence, and calculated by discounting the monetary value of each future consequence by a factor that depends on the date it occurs. Ecology calculates present values based on the historic average real rate of return on US Treasury I-Bonds since 1998. US Treasury Department (2021). http://www.treasurydirect.gov/indiv/research/indepth/ibonds/res_ibonds_iratesandterms.htm

sediment and costs associated with implementation. However, we have some estimates for common BMPs used to address sediments.

One of the most common BMPs addressing nonpoint sediments costs about $15,500 per acre based on 33 previously funded grant agreements across the state from State Fiscal Years 2016 to 2019. Cost per acre varies based on specific site conditions and project scale. Costs range from about $3,500 to $35,000 depending on the:

- Extent of invasive species control.
- Ease of access.
- Plant stock quality.
- Maintenance budget.

Typically, larger scale projects have a lower cost per acre. These costs are associated with funding programs and include administrative costs, while costs tend to be higher than if landowners implement BMPs on their own.

Benefits

We identified the probable environmental, social, and economic benefits from the amendments. Chapter 4 discusses these further:

- **Streamlined process for identifying causes of dissolved oxygen impairment of waters.** The alternate criteria expressed in percent saturation will help refine the 303(d) list to identify those waters that are low in dissolved oxygen largely due to nutrients versus those where temperature precludes the attainment of the dissolved oxygen concentration criteria.
- **Increased protection of early life stages of salmonids.** Revising the freshwater dissolved oxygen criteria for certain aquatic life use categories and adding a narrative fine sediment criterion to all existing and designated aquatic life uses for fresh water provide increased protection for early life stages of salmonids, although we cannot quantify how many salmonids will directly benefit from this rule.
- **Additional protection for other species.** Environmental benefits include additional habitat protections for other aquatic life and wildlife, including those organisms that depend on salmonids for their food.
- **Increased non-use values.** Social benefits include the non-use value of salmonids. People who are not involved in commercial fish harvesting or recreational fishing see value in increased salmonid protections. The amendments also align with the values of indigenous cultures.
- **Determined economic benefits of use and non-use values.** For the economic analysis in this document, the total value of protecting salmonids is equal to the sum of use and

non-use values. Use values include the value of the commercial fish harvest (market priced) and the value of recreational fishing trips (nonmarket value).

We conclude, based on a reasonable understanding of the quantified and qualitative costs and the benefits likely to arise from the rule amendments as compared to the baseline, that the benefits of the rule amendments are greater than the costs.

Least-Burdensome Alternative Analysis

The authorizing statutes for this rule are:

- Clean Water Act 303(c)(2)(A)
- Water Pollution Control Act, Chapter 90.48 RCW
- Water Resources Act of 1971, Chapter 90.54 RCW

The goals and objectives of the authorizing statutes are to:

- Maintain the highest possible standards to insure the purity of all waters of the state consistent with:
    - Public health and public enjoyment thereof.
    - Propagation and protection of wild life, birds, game, fish and other aquatic life.
    - Industrial development of the state.
- Require the use of all known available and reasonable methods (AKART) by industries and others to prevent and control the pollution of the waters of the state of Washington.
- Retain and secure high quality for all waters of the state.
- Protect the public health or welfare, enhance the quality of the water, taking into consideration their use and value for public water supplies, propagation of fish and wildlife, recreational purposes, and agricultural, industrial and other purposes.
- Authorize compliance schedules lasting longer than ten years under certain circumstances.

After considering alternatives to the rule's contents, within the context of the goals and objectives of the authorizing statute, we determined that the rule represents the least-burdensome alternative of possible rule contents that meet the stated goals and objectives.

Regulatory Fairness Act Compliance

We conclude the rule amendments potentially have disproportionate impacts on small businesses, and therefore Ecology must include elements in the rule amendments to mitigate this disproportion, as far as is legal and feasible.

We cannot predict which existing dischargers will be included on updated 303(d) lists and future clean-up actions. We also cannot predict what combination of BMPs and other technology controls will be implemented by permittees discharging to a newly impaired water for fine sediment. Using the REMI E3+ model, we applied potential costs to various industries, based on current sediment monitoring data. We recognize that more industries may be affected. We randomly applied cost range to one business in every identified industry (because of the high degree of the uncertainty) and combined them in one model. The higher end of the costs range was applied to the "Forestry and logging" sector, which affected the results, showing the strongest impact on this industry. Modeling results did not indicate significant impacts to industries. However, output would decrease by $1.3 million in year 2022 over all industries in the state. These relative indicators of industries demonstrate the following decreases from the baseline:

- Forestry and logging: 0.018 percent.
- Support activities for agriculture and forestry: 0.004 percent.
- Other wood manufacturing" in 2022: 0.002 percent.

The reduction in output is due to the capital costs associated with BMP implementation that would occur in 2022. The monitoring costs did not show any effect on output in the model, and therefore, we do not expect impacts to industry revenue. These results are scalable based on the number of dischargers assumed to be impacted in each industry.

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Chapter 1: Background and Introduction

1.1 Introduction

- This report presents the determinations made by the Washington State Department of Ecology (Ecology), as required under chapters 34.05 RCW and 19.85 RCW, for the amendments to the Water Quality Standards for Surface Waters of the State of Washington (Chapter 173-201A WAC; the "rule"). This includes the:
- Final Cost-Benefit Analysis (CBA)
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- Administrative Procedure Act Determinations
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The Washington Administrative Procedure Act (APA; RCW 34.05.328(1)(d)) requires Ecology to evaluate significant legislative rules to "determine that the probable benefits of the rule are greater than its probable costs, taking into account both the qualitative and quantitative benefits and costs and the specific directives of the law being implemented." Chapters 1 – 5 of this document describe that determination.

The APA also requires Ecology to "determine, after considering alternative versions of the rule…that the rule being adopted is the least burdensome alternative for those required to comply with it that will achieve the general goals and specific objectives" of the governing and authorizing statutes. Chapter 6 of this document describes that determination.

The APA also requires Ecology to make several other determinations (RCW 34.05.328(1)(a) – (c) and (f) – (h)) about the rule, including authorization, need, context, and coordination. Appendix A of this document provides the documentation for these determinations.

The Washington Regulatory Fairness Act (RFA; chapter 19.85 RCW) requires Ecology to evaluate the relative impact of rules that impose costs on businesses in an industry. It compares the relative compliance costs for small businesses to those of the largest businesses affected. Chapter 7 documents that analysis, when applicable.

We base all determinations on the best available information at the time of publication.

1.1.1 Background

Salmon and steelhead populations have been declining in Washington State for more than a decade (State of the Salmon Report).[4] Since 1991, the federal government has declared 14 species of salmon and steelhead in Washington as at-risk of extinction

[4] State of salmon in watersheds 2020. Report. https://stateofsalmon.wa.gov/salmon-101/

under the Endangered Species Act. Salmonids play a pivotal role in the structure and health of our fresh and marine water ecosystems. Chinook salmon, for example, are the primary food for the endangered Southern Resident Orca, and the decline of Chinook is one of the main factors attributed to the decline of this orca population, according to the 2018 Southern Resident Orca Task Force Final Report.[5] Migrating salmon and steelhead bring essential nutrients from the ocean back to rivers, streams, and surrounding habitat. These nutrients are a significant part of the freshwater food web. Salmonids represent one of the most sensitive aquatic life species in Washington and therefore form the basis for protecting all aquatic life uses, as defined in the Water Quality Standards for Surface Waters of the State of Washington (WAC 173-201A).

This rulemaking will improve rules that protect salmonid spawning habitat in lakes, rivers, and streams. Both dissolved oxygen and the amount of fine sediment in substrate are key factors in ensuring early life stages of salmonids survive and properly develop. Dissolved oxygen and fine sediment are interrelated in that the delivery of oxygen to gravel is dependent on the size and permeability of the sediment. The changes provide additional protection to ensure that there are sufficient dissolved oxygen levels in spawning gravels and to ensure the physical structure of salmonid nests (called redds) are conductive to spawning success.

This rulemaking revises "WAC 173-201A-200 Fresh water designated uses and criteria" to provide additional water quality and habitat protection for early life stages of salmonids—including salmon, steelhead, and trout—and their spawning gravel. Ecology considers two general revisions in this rule:

- Revising the freshwater dissolved oxygen criteria to increase protection of early life stages of salmonids in spawning gravel.
- Adding fine sediment narrative criterion to provide additional protection for spawning gravel habitat.

1.2 Summary of the proposed rule amendments

The rule amendments will make the following changes:

- Revising the freshwater dissolved oxygen criteria.
    - Adding the definitions of "Intragravel dissolved oxygen" and "Spatial median".
    - Setting more stringent water column dissolved oxygen criteria for salmonid spawning based uses.

[5] Southern Resident Orca Task Force Final Report. Southern Resident Orca Task Force. https://www.governor.wa.gov/issues/issues/energy-environment/southern-resident-orca-recovery/task-force

    - Adding an intragravel dissolved oxygen component to the dissolved oxygen criteria for salmonid spawning based uses.
    - Adding an oxygen saturation component to the dissolved oxygen criteria for the salmonid spawning based uses.
    - Clarifying the habitat type and spatial extent for sample collection when evaluating intragravel dissolved oxygen.
- Adding a narrative fine sediment criterion to all existing and designated aquatic life uses for fresh water.

The rule amendments also make several changes that have no material impact, such as re-wording, clarifications and additional cross-references, updating references, and deleting obsolete and irrelevant language. In particular:

- 173-201A-020: Edits in definitions for “Intragravel dissolved oxygen” and “spatial median”
- 173-201A-200(1)(a)(v): Corrected spelling error
- 173-201A-200(1)(c): Corrected citation error in “note” to Table.
- 173-201A-200(1)(d): Edits for clarity in beginning narrative, revisions to Table (1)(d), edits to “note” for clarity and readability
- 173-201A-200(1)(d)(iv): Edits to revert back to original language, relevant language moved up to “note” in Table(1)(d)
- 173-201A-200(1)(e): Edits to correct formatting error that was pointed out by OTS
- 173-201A-200(1)(h): Edits to correct formatting error, language edits to clarify intent of sub-section.

1.3 Reasons for the rule amendments

The salmon spawning habitat protection rule aims to increase protection for early life stages of salmonids by revising the current dissolved oxygen criteria and creating a new fine sediment criterion. National Oceanic and Atmospheric Administration (NOAA) identified the following four key factors affecting the health of fish: habitat, hydropower, hatchery, and harvest impacts. To improve habitat conditions, NOAA provided comment to Ecology expressing concerns that Washington’s dissolved oxygen standards may not be fully protecting early life stages of salmonids. Specifically, NOAA focused on oxygen levels necessary to maintain healthy conditions for salmon spawning gravels. Another goal of this rulemaking is to account for impacts of barometric pressure and summertime temperatures on dissolved oxygen when salmonid spawning and rearing are not present. Early life stages of salmonids are not present year-round in all waterbodies, and therefore, oxygen levels protective of spawning and rearing of salmonids do not need to be assigned when these uses are not present. Furthermore, this rule seeks to acknowledge the limitations in the capacity of oxygen to dissolve in water at higher elevations.

In our 2011 triennial review, Ecology identified the development of fine sediment criteria as a priority for future water quality standards work. In a 2018 U.S. District Court Stipulated Order of Dismissal (Order) between Northwest Environmental Advocates (NWEA), EPA, and Ecology, Ecology agreed to adopt fine sediment criteria to protect early life stages of salmonids. In this rulemaking, we are addressing impacts of fine sediment on early life stages of aquatic life and developing methods to characterize a fine sediment impairment.

1.4 Document organization

The remainder of this document is organized in the following chapters:

- **Baseline and the rule amendments (Chapter 2):** Description and comparison of the baseline (what will occur in the absence of the rule amendments) and the rule requirements.
- **Likely costs of the rule amendments (Chapter 3):** Analysis of the types and sizes of costs we expect impacted entities to incur as a result of the rule amendments.
- **Likely benefits of the rule amendments (Chapter 4):** Analysis of the types and sizes of benefits we expect to result from the rule amendments.
- **Cost-benefit comparison and conclusions (Chapter 5):** Discussion of the complete implications of the CBA.
- **Least-Burdensome Alternative Analysis (Chapter 6):** Analysis of considered alternatives to the contents of the rule amendments.
- **Regulatory Fairness Act Compliance (Chapter 7):** When applicable, a comparison of compliance costs for small and large businesses, mitigation, and impact on jobs.
- **APA Determinations (Appendix A):** RCW 34.05.328 determinations not discussed in chapters 5 and 6.

Chapter 2: Baseline and Rule Amendments

2.1 Introduction

We analyzed the impacts of the rule amendments relative to the existing rule within the context of all existing requirements (federal and state laws and rules). This context for comparison is called the baseline, and reflects the most likely regulatory circumstances that entities would face if the proposed rule was not adopted. It is discussed in Section 2.2, below.

2.2 Baseline

The baseline for our analyses generally consists of existing rules and laws and their requirements. This is what allows us to make a consistent comparison between the state of the world with and without the rule amendments.

For this rulemaking, the baseline includes:

- The existing rule, WAC 173-201A.
- RCW 90.48 Water Pollution Control.
- 40 CFR 131.20 Water Quality Standards - State review and revision of water quality standards; requires states and tribes (with primacy for clean water actions) to periodically review and update the water quality standards.
- 2018 U.S. District Court Stipulated Order of Dismissal.[6]

2.3 Rule amendments

The rule amendments will make the following changes:

- Revising the freshwater dissolved oxygen criteria.
    - Adding the definitions of “Intragravel dissolved oxygen” and “Spatial median”.
    - Setting more stringent water column dissolved oxygen criteria for salmonid spawning based uses.
    - Adding an intragravel dissolved oxygen component to the dissolved oxygen criteria for salmonid spawning based uses.
    - Adding an oxygen saturation component to the dissolved oxygen criteria for the salmonid spawning based uses.
    - Clarifying the habitat type and spatial extent for sample collection when evaluating intragravel dissolved oxygen.

[6] 2018 U.S. District Court Stipulated Order of Dismissal: https://www.bdlaw.com/content/uploads/2018/10/NWEA-stip.pdf

- Adding a narrative fine sediment criterion to all existing and designated aquatic life uses for fresh water.

2.3.1 Revising the freshwater dissolved oxygen criteria.

2.3.1.1 Adding the definitions of "Intragravel dissolved oxygen" and "Spatial median".

Baseline

Currently, there are no definitions of "Intragravel dissolved oxygen" and "Spatial median" in the rule.

Adopted

"Intragravel dissolved oxygen" means the concentration of dissolved oxygen in the spaces between sediment particles in a streambed.

"Spatial median" is the middle value of multiple ranked measurements taken within the sampling area.

Expected impact

The definitions themselves cause no impact to entities. The intent of the definition is to clarify new components of the dissolved oxygen criteria (see sections below for proposed changes to criteria).

2.3.1.2 Setting more stringent water column dissolved oxygen criteria.

Baseline

Table 1 shows the current criteria for dissolved oxygen.

Table 1. Washington's water quality criteria for dissolved oxygen (WAC 173-201A-200).

Category	Dissolved oxygen level (mg/L; 1-day minimum)
Char Spawning and Rearing	9.5
Core Summer Salmonid Habitat	9.5
Salmonid Spawning, Rearing, and Migration	8.0
Salmonid Rearing and Migration Only	6.5
Non-anadromous Interior Redband Trout	8.0
Indigenous Warm Water Species	6.5

Adopted

The rule amendments will revise the water column based dissolved oxygen concentration criteria and add two additional components to the dissolved oxygen criteria, each with a set of associated criteria. Refer to Table 2 for the:

- Dissolved oxygen criteria for water column based dissolved oxygen concentration.
- Oxygen saturation.
- Intragravel dissolved oxygen.

Facilities can demonstrate compliance through one or more of the dissolved oxygen criteria.

Table 2. Water quality criteria for dissolved oxygen (WAC 173-201A-200).

Category	Water Column (1-Day Minimum)
Char Spawning and Rearing*	10 mg/L or 90% saturation
Core Summer Salmonid Habitat*	10 mg/L or 95% saturation
Salmonid Spawning, Rearing, and Migration*	10 mg/L or 90% saturation
Salmonid Rearing and Migration **Only**	6.5 mg/L
Nonanadromous Interior Redband Trout*	10 mg/L or 90% saturation
Indigenous Warm Water Species	6.5 mg/L

* Intragravel D.O. criteria for these aquatic life use categories may be used for compliance purposes. When intragravel D.O. is used for compliance, the intragravel D.O. (1-day minimum) concentration must be 8.0 mg/L or greater, and the D.O. water column (1-day minimum) concentration must be 9.0 mg/L or greater[7]. Intragravel D.O. must be measured as a spatial median within the same habitat area (see WAC 173-201A-020 Definitions).

Changes made between preliminary and final rule language

We changed percent saturation criteria for the Core Summer Salmonid Habitat use in the final rule, because EPA expressed concern regarding this criteria. We changed the Core Summer Salmonid Habitat use from 90 to 95 percent because early life stages are present during the summer months for water bodies assigned this use. The 90 percent saturation coupled with the maximum temperature criteria for this use (16 or 13 degrees Celsius) did not provide full protection for spawning or early life stages. The 95 percent saturation criterion provides equivalent protection compared with the concentration-based dissolved oxygen criterion of 10 mg/L.

Percent saturation criteria language added in the rule proposal was deleted from the Salmonid Rearing and Migration only and Indigenous Warm Water Species use categories; water column criteria reverted back to the water column dissolved oxygen of 6.5 mg/L that is currently in the standards.

Proposed language for percent saturation criteria was incorrectly added to the Salmonid Rearing and Migration only and Indigenous Warm Water Species use categories. Percent saturation is not appropriate for this use category because the use does not include salmonid spawning, which was the purpose of the rulemaking. Percent saturation criteria language added in the rule proposal was deleted from the Indigenous Warm Water Species use category; water column criteria reverted back to the water column dissolved oxygen of 6.5 mg/L that is currently in the standards.

We added a water column criteria that must be met when intragravel criteria is measured and is 8.0 mg/L or greater. The additional of an associated water column criteria component to the intragravel dissolved oxygen criteria is to ensure full protection for juvenile and adult life stages of salmonids. The intragravel dissolved oxygen criteria of 8.0 mg/L provides full protection for early life stages of salmonids in gravels but does not address protection of water column dwelling salmonids at other life stages. If there is adequate intragravel dissolved oxygen, then the criterion in the water column can reasonably be lower and the 2 mg/L assumption between the water column and gravels is no longer necessary.

These changes do not affect the conclusions of PRA.

Expected impact

The 1-day minimum water column concentrations of 10 mg/L dissolved oxygen for protection of salmonid-based designated uses will likely result in benefits, as there is scientific support that these values are fully protective of early life stages of salmonids.

We examined whether this amendment was likely to impact current dischargers and found that it is not likely to add any costs.

Anyone who owns or operates a facility discharging or proposing to discharge wastewater to the state waters must apply for a wastewater discharge permit. One of

the requirements of the permit application is that "[e]very applicant must submit data for Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Total Organic Carbon (TOC), Total Suspended Solids (TSS), Temperature (winter and summer), and pH."

While 375 (35.8 percent)[8] of facilities have BOD limits and dilution factors to ensure compliance with the dissolved oxygen water quality criteria, the majority of Water Quality permittees do not directly monitor dissolved oxygen in their permits. Of those that directly monitor dissolved oxygen (11.8 percent), no facilities report dissolved oxygen only because reductions in the water column are often attributed to the impact of excess nutrients and increased temperature. Excess nutrients lead to growth of algae and aquatic plants. When these blooms die or deteriorate, respiring microorganisms increase in abundance and consume oxygen in the water. Higher temperatures can be a factor in promoting excess growth of algae and plants in the presence of nutrients and is known to physically limit the capacity for oxygen to dissolve in water.

We do not expect any changes in the dissolved oxygen sampling schedules for the dischargers, as the list of sampling parameters will remain the same.

All of Ecology's Water Quality permits already include the best methods of controlling the levels of those toxic pollutants.

Federal and state law require the implementation of technology-based controls. Moreover, the Clean Water Act and Chapter 90.48 RCW recognize that a manageable and equitable clean water program requires a technology-based program, even though the treatment might be greater than required to meet water quality standards. Requiring technology-based treatment may continually reduce the pollutant load and postpone the necessity of allocating the waste load from each discharge.

All water quality permits issued by Ecology include a reasonable potential determination of whether technology-based controls are sufficient to meet water quality standards. If not, water quality-based limits are developed.

Based on permit writing practices, we assume that all of the dischargers either do not have dissolved oxygen limits or are already required to use technology-based controls.

The water quality assessment adds new dissolved oxygen impairment (303(d)) listings when Ecology receives data that demonstrates a waterbody is impaired due to low dissolved oxygen measurements. New 303(d) listings may occur as new data are provided for this assessment effort. When more data is assessed, there is greater potential 303(d) listing will be identified. However, we do not expect an increase in

[8] Discharge Monitoring Reports. Water Quality Permitting and Reporting Information System (PARIS). https://apps.ecology.wa.gov/paris/DischargeMonitoringData.aspx.

dissolved oxygen listings attributable to this rulemaking. Rather, the updated dissolved oxygen criteria will enable the refinement of the list of impaired waters.

The current dissolved oxygen 303(d) listings include some water bodies in which temperature may be the cause or a large contributing factor of the low dissolved oxygen values. The oxygen saturation criteria is anticipated to refine the 303(d) list to identify those waters that are low in dissolved oxygen largely due to nutrients, potentially reducing the number of 303(d) listings for dissolved oxygen by identifying those that are solely attributed to temperature. Those changes are not likely to affect dischargers' behavior because waters will be assessed separately for compliance with temperature and dissolved oxygen criteria. Given that the updated 303(d) listings will better identify which waters are impaired due to nutrients (better detected by percent oxygen saturation) and those affected by human caused temperature increases (better identified by the temperature criteria), the actions necessary to bring the waterbody into compliance will be identified earlier in the water cleanup process. We do not anticipate more dissolved oxygen listings due to the additional compliance option of percent saturation, regardless of the dissolved oxygen concentration.

2.3.1.3 Adding intragravel dissolved oxygen criteria.

Baseline

The current criteria for dissolved oxygen can be found in Table 1. The current dissolved oxygen criteria does not include an intragravel dissolved oxygen component that could be used for compliance.

Adopted

See the adopted criteria for dissolved oxygen in Table 2. Intragravel dissolved oxygen must be measured as a spatial median within the same habitat area.

Expected impact

The intragravel dissolved oxygen criterion is 8.0 mg/L. When intragravel dissolved oxygen. is used for compliance, the intragravel dissolved oxygen (1-day minimum) concentration must be 8.0 mg/L or greater, and the dissolved oxygen water column (1-day minimum) concentration must be 9.0 mg/L or greater. This amendment will likely result in net benefits. The adopted criteria allows direct assessment of oxygen levels in gravels where early life stages of salmonids reside, leading to a more accurate assessment of habitat protections. The 10 mg/L water column criteria is based on the worst-case assumption that there is a 2.0 mg/L drop in dissolved oxygen levels from the water column to gravel. However, we may have overestimated the dissolved oxygen depression of 2.0 mg/L in some waterbodies, especially those with optimal substrate conditions.

We added a water column criteria that must be met when intragravel criteria is measured and is 8.0 mg/L or greater. Reason for Change: The additional of an associated water column criteria component to the intragravel dissolved oxygen criteria is to ensure full protection for juvenile and adult life stages of salmonids. The intragravel dissolved oxygen criteria of 8.0 mg/L provides full protection for early life stages of salmonids in gravels but does not address protection of water column dwelling salmonids at other life stages. If there is adequate intragravel dissolved oxygen, then the criterion in the water column can reasonably be lower and the 2 mg/L assumption between the water column and gravels is no longer necessary. This change does not affect the conclusions of PRA.

The intragravel dissolved oxygen criteria presents an alternate method to demonstrate that early life stages of salmonids are protected by directly measuring dissolved oxygen levels in the interstitial spaces of gravel. While direct intragravel dissolved oxygen levels may be more difficult to measure accurately, it may be the most relevant method to determine if early life stages of salmonids are protected.

The adopted rule adds an intragravel dissolved oxygen component to the dissolved oxygen criteria. Because the rule allows permittees to demonstrate compliance through one or more of the dissolved oxygen criteria, this provides flexibility and potential cost savings (benefits) for the dischargers.

It is important to stress that a discharger will choose to monitor and report the intragravel dissolved oxygen parameter only if it expects the potential costs of the sampling to be less than the potential benefits (or cost savings) of verifying their compliance using the alternative method.

2.3.1.4 Adding oxygen saturation criteria.

Baseline

Table 1 shows the current criteria for dissolved oxygen. The current dissolved oxygen criteria do not include an oxygen saturation component that permittees can use for compliance.

Adopted

See the adopted criteria for dissolved oxygen in Table 2.

Expected impact

The adopted oxygen saturation component in the dissolved oxygen criteria will likely result in benefits as it accounts for temperature- and elevation-related influences on dissolved oxygen, resulting in a more accurate measurement of the oxygen conditions of a water body. Furthermore, oxygen saturation provides needed flexibility to the

dissolved oxygen criteria during the summer months when water temperatures rise and, in many streams, early life stages of salmonids are not present.

During warmer seasons, the more stringent concentration based dissolved oxygen criteria protective of early life stages are not necessary and often not physically achievable due to effects of temperature on oxygen capacity in waters.

Washington's dissolved oxygen criteria applies year-round and is intended to support characteristic aquatic life uses. Although the criteria applies year-round, the aquatic life uses that define a use category may not apply year-round. The dissolved oxygen criteria needs to account for environmental factors that lower dissolved oxygen levels during times when aquatic life uses are not present. Setting a 95 percent oxygen saturation criteria for aquatic life uses defined by salmonid spawning and emergence during the cooler seasons (i.e., outside of summer) is not required for full protection, and at cooler temperatures, is often more stringent than the concentration based criteria of 10 mg/L.

The minimum allowable dissolved oxygen concentration at sea level when meeting temperature requirements (max 17.5°C) of the salmonid spawning, rearing, and migration use would be 9.1 mg/L with a 95 percent oxygen saturation criteria. EPA recommends a water column protection level of 8.0 mg/L for juvenile and adult salmonid life stages. A 95 percent oxygen saturation criterion would be overly stringent when early life stages are not present and would create an abnormally high amount of impairment listings.

The minimum allowable dissolved oxygen concentration at sea level when meeting temperature requirements (max 17.5°C) of the salmonid spawning, rearing, and migration use would be 8.6 mg/L with a 90 percent oxygen saturation criteria. The 8.6 mg/L minimum value associated with 90 percent oxygen saturation is more stringent than EPA recommendations for juvenile and adult salmonid life stages of 8.0 mg/L and therefore, should provide adequate protection during summer months when environmental conditions preclude attainment of the concentration based dissolved oxygen criteria and salmonid spawning is not occurring.

Nonetheless, we recognize that some aquatic life uses characterized by salmonid reproduction and rearing during summer months may be particularly susceptible to environmental conditions and may require additional protection. Therefore, we have changed the oxygen saturation criterion for the Core Summer Salmonid Habitat use from 90 percent to 95 percent oxygen saturation. This reflects the extra protection for early life stages needed during summer months when water temperatures are elevated, river flows are lower, and to account for other environmental factors that may be reducing oxygen levels.

2.3.1.5 Sampling considerations for intragravel dissolved oxygen.

Baseline

Currently there is no intragravel dissolved oxygen criterion or definition in the rule.

Adopted

The rule adopts the option of collecting intragravel dissolved oxygen measurements over a spatial area within the same habitat. Intragravel dissolved oxygen measures must be calculated as a median value for a given habitat area.

Expected impact

Defining the spatial extent for sample collection of intragravel dissolved oxygen data does not result in any impacts and therefore, does not have any costs.

2.3.2 Adding a narrative fine sediment criterion to all existing and designated aquatic life uses for fresh water.

Baseline

There is currently no narrative fine sediment criteria. Adding fine sediment criteria aligns with the agreement in the 2018 U.S. District Court Stipulated Order of Dismissal (Order) between Northwest Environmental Advocates (NWEA), EPA, and Ecology.[9] In the Order, Ecology agreed to adopt fine sediment criteria to protect salmonid redds.

Adopted

The rule adds a narrative fine sediment criterion to all existing and designated aquatic life uses for fresh water. The narrative criterion is as follows:

> "(h) **Aquatic life fine sediment criteria.** The following narrative criteria apply to all existing and designated uses for fresh water:
>
> > (i) Water bodies shall not contain excess fine sediment (<2 mm) from human-caused sources that impair designated uses.
> >
> > (ii) When reference values are used to demonstrate compliance with the fine sediment criteria, measured conditions shall be compared to those from reference sites or regional data that represent least disturbed site conditions of a comparable water body or ecoregion. Reference locations

[9] 2018 U.S. District Court Stipulated Order of Dismissal https://www.bdlaw.com/content/uploads/2018/10/NWEA-stip.pdf

should be comparable in hydrography, geology, ecology, and habitat to that of the water body evaluated."

Expected impact

The adopted rule will create costs and benefits by requiring an evaluation of excess fine sediment (<2 mm) from human-caused sources that impair designated uses.

We have revised the rule language to remove the reference to making a determination and correlation between sediment conditions and adverse effects on aquatic life. Scientific studies are not available that demonstrate a direct link between fine sediment based parameters and different protection levels for early life stages of salmonids. The new language clarifies that excess fine sediment from human derived sources shall not impair water uses. This aligns with the water quality assessment impairment listing methodologies we intend to finalize within 18 months of rule adoption.

The rule will affect point and nonpoint dischargers differently. Point dischargers are regulated through permits. If a current permittee discharges into a waterbody that is on the 303(d) impaired waterbody listing for the new narrative fine sediment criterion, that permittee could incur monitoring costs.

It is likely that permitted dischargers already have sediment discharge controls in place due to technology-based limits, or via another parameter of concern (bacteria, metals, toxics, etc.) that binds to sediment. Therefore, any discharger currently covered by the Industrial Stormwater or Construction Stormwater general permits will likely avoid investing into additional control technologies. The others, such as some with individual permits, may incur costs for sediment control actions.

If the pollutant comes from a set of diffuse sources, such as general urban, residential, farm runoff, or other land activities that generate pollution discharges, they are referred to as a nonpoint source. Ecology develops a list of best management practices (BMPs) for each of the water quality pollution sources identified. Nonpoint dischargers of fine sediments will incur capital and operational costs. Some will require very basic erosion and sediment control BMPs (mulch, silt fence, etc.), while others will need treatment technologies (sediment ponds, filters, etc.).

Chapter 3: Likely Costs of the Rule Amendments

3.1 Introduction

We analyzed the likely costs associated with the rule amendments, as compared to the baseline. The rule amendments and the baseline are discussed in detail in Chapter 2 of this document.

3.2 Cost analysis

The rule amendments will make the following changes:

- Revising the freshwater dissolved oxygen criteria.
    - Adding the definitions of "Intragravel dissolved oxygen" and "Spatial median".
    - Setting more stringent water column dissolved oxygen criteria for salmonid spawning based uses.
    - Adding an intragravel dissolved oxygen component to the dissolved oxygen criteria for salmonid spawning based uses.
    - Adding an oxygen saturation component to the dissolved oxygen criteria for the salmonid spawning based uses.
    - Clarifying the habitat type and spatial extent for sample collection when evaluating intragravel dissolved oxygen.
- Adding a narrative fine sediment criterion to all existing and designated aquatic life uses for fresh water.

3.2.1 Revising the freshwater dissolved oxygen criteria.

3.2.1.1 Adding the definitions of "Intragravel dissolved oxygen" and "Spatial median".

Adding the definition of "Intragravel dissolved oxygen" does not itself create any costs, as any costs come from its use in implementation of the new criteria, not from the definition itself. See 3.2.1.3.

3.2.1.2 Setting more stringent water column dissolved oxygen criteria

The adopted 1-day minimum water column concentrations of 10 mg/L dissolved oxygen for protection of salmonid-based designated uses[10] will not likely result in costs for any current permittees. Anyone who owns or operates a facility discharging or proposing to discharge wastewater to the state waters must apply for a wastewater discharge permit. One of the requirements of the permit application is that "[e]very applicant

[10] Please see subsection "Changes made between preliminary and final rule language" on p. 21 about the corrections made to PRA and their explanations.

must submit data for Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Total Organic Carbon (TOC), Total Suspended Solids (TSS), Temperature (winter and summer), and pH."

While 375 (35.8 percent)[11] of facilities have BOD limits and dilution factors to ensure compliance with the dissolved oxygen water quality criteria, the majority of Water Quality permittees do not directly monitor dissolved oxygen in their permits. Of those that directly monitor dissolved oxygen (11.8 percent), no facilities report dissolved oxygen only because reductions in the water column are often attributed to the impact of excess nutrients and increased temperature. Excess nutrients lead to growth of algae and aquatic plants. When these blooms die or deteriorate, respiring microorganisms increase in abundance and consume oxygen in the water. Higher temperatures can be a factor in:

- Promoting excess growth of algae and plants in the presence of nutrients.
- Limiting the capacity for oxygen to dissolve in water.

We do not expect any changes in the dissolved oxygen sampling schedules for the dischargers, as the list of sampling parameters will remain the same. All of Ecology's Water Quality permits also already include the best methods of controlling the levels of those toxic pollutants.

Federal and state law require the implementation of technology-based controls. Moreover, the Clean Water Act and Chapter 90.48 RCW recognize that a manageable and equitable clean water program requires a technology-based program, even though the treatment might be greater than required to meet water quality standards. Requiring technology-based treatment may continually reduce the pollutant load and postpone the necessity of allocating the waste load from each discharge.

All water quality permits issued by Ecology include a reasonable potential determination of whether technology-based controls are sufficient to meet water quality standards. If not, water quality-based limits are developed.

We will use the updated dissolved oxygen criteria for identifying impaired waters. Cleanup actions for impaired waters require the development of TMDLs, which will identify point sources of nutrient discharges. Based on permit writing practices, we assume that all current dischargers either do not have dissolved oxygen limits or already are required to use technology-based controls.

3.2.1.3 Adding intragravel dissolved oxygen criteria.

[11] Water Quality Permitting and Reporting Information System (PARIS). https://apps.ecology.wa.gov/paris/PermitLookup.aspx

The adopted rule adds an intragravel dissolved oxygen component to the dissolved oxygen criteria. The rule states that compliance may be demonstrated through one or more of the dissolved oxygen criteria, thereby providing flexibility and potential cost savings (benefits) for the dischargers.

It is important to stress that a discharger will choose to monitor and report the intragravel dissolved oxygen parameter only if it expects the potential costs of the sampling to be less than the potential benefits (or cost savings) of verifying their compliance using the alternative method.

3.2.1.4 Adding oxygen saturation to the dissolved oxygen criteria.

Dischargers typically measure oxygen saturation using a hydroprobe. Most hydroprobes can provide simultaneous information on oxygen saturation and water column dissolved oxygen concentrations. Measuring oxygen saturation is anticipated to take minimal time and compared with water column based dissolved oxygen concentrations. Thus, oxygen saturation should not add additional costs, because the discharger has existing requirements to measure water column dissolved oxygen concentrations.

3.2.1.5 Clarifying the habitat type and spatial extent of sampling when evaluating intragravel dissolved oxygen.

We do not expect any costs caused by this amendment. See 3.2.1.1 for the discussion.

3.2.2 Adding a narrative fine sediment criterion

The EPA considers fine sediment as the nation's most prevalent pollutant in surface waters, and Ecology has identified fine sediment as a common pollutant that can adversely affect aquatic life health.[12] Currently, the Water Quality Standards for Surface Waters of the State of Washington rely on general narrative criteria for limiting deleterious material, but do not have specific criteria to limit fine sediment. Ecology prioritized addressing the impacts of fine sediment on early life stages of aquatic life and developing methods to characterize a fine sediment impairment as part of this adopted rule.

The adopted narrative fine sediment criteria is part of a stipulated order of dismissal resulting from litigation. The settlement agreement requires Ecology to complete the final guidance regarding a listing methodology for fine sediment within 18 months of adopting this rule. The development or update of a listing methodology is a regular need whenever the state develops new water quality standards criteria.

One of the potential costs associated with the new adopted criterion is Ecology's need of FTEs to develop a new methodology in Policy 1-11 to assess fine sediments and then evaluate the

[12] Salmon Spawning Habitat Protection Rule. Preliminary Technical Support Document. Ecology. October, 2021.

available fine sediment data according to this methodology. We generally do not estimate costs for Ecology to comply with the adopted rules.

The new methodology is likely to lead to more 303(d) listings that will identify water bodies as impaired for fine sediment.

We discuss the following sets of likely costs qualitatively or with rough estimates, as they are multivariate in regards to sediment data collection, business, dischargers, location, and TMDL development. Many of these variables are unknown at this time, such that we are not able to forecast them quantitatively with sufficient confidence.

303(d) impaired waterbody listing policy

The federal Clean Water Act's section 303(d) established a process to identify and clean up polluted waters. Every two years, all states are required to perform a water quality assessment of surface waters in the state, including all the rivers, lakes, and marine waters where data are available. Ecology collects Washington state's water quality data, federal data, and invites other groups to submit water quality data they have collected. Anyone who collects data must use appropriate scientific methods. After assessing the data, we sort the water bodies into categories that describe the status of the water quality and create the draft list. We provide a public review and comment period and submit the final assessment to EPA for approval. The last time we submitted a revised 303(d) list to EPA was August 2021.

Federal laws, state water quality standards, and the Policy on the Washington State Water Quality Assessment (WQP Policy 1-11; revised July 2020) guide Ecology's assessments. Policy 1-11 describes how the standards are applied, requirements for the data used, and how to prioritize TMDLs, among other issues. Ecology periodically revises the Water Quality Assessment Policy based on new information and updates to EPA guidance. Each revision includes a public review process.

Waters with designated uses – such as for drinking, recreation, aquatic habitat, and industrial use – that are impaired by pollutants are placed in the polluted water category in the water quality assessment 303(d) list. These water bodies fall short of state surface water quality standards and are identified as polluted.

Waters placed on the 303(d) list require the preparation of a water cleanup plan (TMDL). The water cleanup plan identifies how much pollution needs to be reduced or eliminated to achieve water quality standards (clean water), and allocates that amount of required pollution reduction among the existing point (discrete) and nonpoint (diffuse) sources.

In addition, even before a TMDL is completed, the inclusion of a water body on the 303(d) list can reduce the amount of pollutants a permittee can release under permits issued by Ecology to specific impaired waters.

Point source dischargers in Total Maximum Daily Load process

If the pollutant comes from a discrete source (referred to as a point source), such as a municipal or industrial facility's discharge pipe, that facility's share of the loading capacity is called a wasteload allocation. General and individual permits regulate point source dischargers. If the receiving water body is impaired and point source dischargers are identified as contributors, restrictions to total suspended sediments (TSS) or turbidity in effluent may be an option to reduce fine sediment inputs into a receiving water body.

Washington currently has numeric criteria for turbidity that are based on a change above background turbidity conditions. This criteria structure is useful for limiting anthropogenic sources of turbidity, and therefore excess sediment, entering a waterbody. These criteria rely on the change in turbidity conditions related to a discharge to, or activity within, the waterbody to limit human impacts to the aquatic habitat. However, turbidity criteria do not provide information on bedded sediment nor does it differentiate naturally occurring sediment deposition from anthropogenic sources of sediment deposition.

TSS criteria are currently assigned to any facility discharging to a 303(d) listed waterbody impaired for sediment. TSS criteria target solids with size of <0.06 mm versus fine sediments, defined as particles < 2 mm.[13]

Industrial dischargers frequently monitor TSS because of activities that tend to generate more dust or small sediment that leave the site in stormwater or based on effluent guidelines in 40 CFR Subchapter N, Effluent Guidelines and Standards.

TSS is a required permit monitoring parameter for the following industry classes[14]:

- Hazardous Waste Treatment, Storage and Disposal Facilities
- Timber Product Industry
- Paper and Allied Products
- Wood Product Manufacturing
- Coal Mining
- Oil and Gas Extraction
- Nonmetallic Mining and Quarrying
- Petroleum and Coal Products Manufacturing
- Nonmetallic Mineral Product Manufacturing
- Steam Electric Power Generation

[13] Fine sediments will be defined at those sediments classified as fines or sands and are less than 2 mm in diameter.
[14] Industrial Stormwater General Permit. Ecology, 2019. https://apps.ecology.wa.gov/paris/DownloadDocument.aspx?Id=293972

- Marine Industrial Construction
- Non Hazardous Waste Landfills

We analyzed the Water Quality Permitting and Reporting Information System (PARIS) Discharge Monitoring Reports (DMR) data and found that in the most likely affected by the adopted rule categories of general permits; all dischargers have monitoring requirements for total suspended sediments, turbidity, or both. (See Table 4).

Table 3. Dischargers that have monitoring requirements for total suspended sediments, turbidity, or both.

Permit category	**Total number of dischargers**	**Turbidity**	**TSS**	**No sediment measurement**
Construction SW GP	313	313	0	0
Industrial Storm water GP	50	46	17	0
Industrial to ground State Wastewater Discharge Permit IP	19	2	13	5
Industrial NPDES IP	86	19	70	9
Total	468	380	100	14

If a waterbody with a current permittee discharging sediments is listed as impaired for the new narrative fine sediment criterion, that permittee could incur monitoring costs. We assume that monitoring costs will be similar to monitoring costs for turbidity. Ecology estimated these costs for sites with 1-5 acres at $1,650 per year, and at $2,721 per year for sites 5+ acres in the Small Business Economic Impact Analysis for Construction Stormwater General Permit (2020).[15] The estimated 20-year PV for fine sediments monitoring costs is between $20,271 and $33,429, depending on the size of a site.

It is likely that permitted dischargers already have sediment discharge controls in place due to technology-based limits, or via another parameter of concern (bacteria, metals, toxics, etc.) that binds to sediment. Therefore, any discharger currently covered by the Industrial Stormwater or Construction Stormwater general permits will likely avoid investing in additional control technologies. The others, such as some with individual permits mentioned above, may incur costs for sediment control actions (BMPs, settling, electrocoagulation, and filtration).

The estimate range for the filtration technologies is between $2,000 and $40,000. The most common technology control is swale (constructing 100 feet of which costs about $200). The

[15] Small Business Economic Impact Analysis Construction Stormwater General Permit. May, 2020. https://apps.ecology.wa.gov/publications/documents/2010022.pdf

manufactured devices are more expensive: canister filters cost around $7,000, and a Filtera filter costs around $20,000.

Nonpoint dischargers

If the pollutant comes from a set of diffuse sources (referred to as a nonpoint source), such as general urban, residential, farm runoff, or other land activities, that generate pollution discharges, the cumulative share is called a load allocation. The possible sources of nonpoint fine sediment pollution are:

- Soil erosion on cropland
- Soil erosion on pasture, rangelands, and animal confinement areas
- Soil erosion associated with timber harvesting
- Stormwater
- Roads: gravel roads, roadside ditches, traction sand
- Streambank erosion

To address these nonpoint sources, Ecology develops a list of best management practices (BMPs) for each of the water quality pollution sources we identify. Some sites will require very basic erosion and sediment control BMPs (mulch, silt fence, etc.), while others will need treatment technologies (sediment ponds, filters, etc.). We consider the BMPs described below reasonable and feasible, and funding assistance is available to incentivize implementation.

Many of the BMPs address more than one of the water quality issues, such as temperature, addressing bacteria and chemical sediments, etc. Therefore, it is difficult to identify specific BMPs to address fine sediment and costs associated with implementation. However, we have some estimates for common BMPs used to address sediments.

The BMPs for managing fine sediments at nonpoint sources include:

- Reducing erosion (vegetative buffers, conservation-based tillage).
- Reducing runoff-carrying sediment.
- Reducing livestock impacts.
- Informing and educating watershed residents about water quality issues.

To illustrate possible unit costs, we refer to the costs estimates for nonpoint BMPs made by the Lower White River TMDL Workgroup at Ecology (Table 4).[16]

Table 4. Nonpoint TMDL Implementation Cost Estimates

Nonpoint BMPs	**Cost per unit[17]**	**Type of Unit**
Manure Storage Structure	$17,500	Per parcel
Off-stream, Watering	$11,250	Per miles of fenced stream length
Nutrient Management Planning	$28.73	Per acre
Livestock Exclusion Fencing	$5.00	Per foot
Riparian Buffers	$3,779.56	Per acre

Another estimate made by Ecology's Water Quality Combined Funding Program is the average cost to complete riparian restoration, which is approximately $15,500 per acre based on 33 previously funded grant agreements across the state from State Fiscal Years 2016 to 2019[18]. Cost per acre varies based on specific site conditions and project scale. Costs range from approximately $3,500 to $35,000, depending on the extent of invasive species control, ease of access, plant stock quality, and if maintenance is included in the budget. Typically, larger scale projects have a lower cost per acre. These costs are associated with funding programs and include administrative costs, and costs tend to be higher than if landowners were implementing BMPs on their own.

We provide the ranges because the costs are likely to vary significantly from real costs of upgrading a particular site, depending on the site's specific conditions. Site-specific factors can have a dramatic impact on the ultimate cost of a nonpoint pollution mitigation project. For example:

- Background water characteristics.
- Site constraints.
- Geotechnical conditions.
- Condition and layout of the existing control technologies.

[16] Puyallup River basin TMDLs. Ecology, 2021. https://ecology.wa.gov/Water-Shorelines/Water-quality/Water-improvement/Total-Maximum-Daily-Load-process/Directory-of-improvement-projects/Puyallup
[17] The BMP costs are for work in Boise, Pussyfoot, and Second Creeks only.
[18] Ecology Grants and Loans. https://apps.ecology.wa.gov/eaglmap/

3.3 Costs summary

3.3.1 Revising the freshwater dissolved oxygen criteria.

Setting more stringent water column dissolved oxygen criteria

Those changes are not likely to affect dischargers' behavior, as their waters are commonly still assessed based on the temperature criteria and dissolved oxygen criteria, separately. Given that the updated 303(d) listings will better identify which waters are impaired due to nutrients (better detected by percent saturation) and those affected by human caused temperature increases (better identified by the temperature criteria), the actions necessary to bring the waterbody into compliance will be identified earlier in the water cleanup process.

Adding oxygen saturation and intragravel dissolved oxygen criteria

If a discharger is required to monitor, report, and use technology to control degradation of dissolved oxygen, we assume that any discharger with limits based on water column concentrations may want to take additional measurements of dissolved oxygen (oxygen saturation or intragravel dissolved oxygen) in the event of noncompliance with water quality standards.

It is important to stress that a discharger will choose to monitor and report the intragravel dissolved oxygen parameter only if it expects the potential costs of the sampling to be less than the potential benefits (or cost savings) of verifying their compliance using the alternative method.

Intragravel dissolved oxygen sampling can only be measured in the stream, and there are many environmental factors at play in a water body that will not be associated with the facility. We typically regulate dischargers' effluent before it goes to the stream and thus, it is not likely that a discharger will choose to take this sample frequently. We assume that a discharger will want to take the intragravel between never and quarterly. The 20-year PV costs for one discharger will be between $0 and $842. We mention these costs for illustration only.

3.3.2 Adding a narrative fine sediment criterion to all existing and designated aquatic life uses for fresh water.

Point source dischargers in Total Maximum Daily Load process

If the pollutant comes from a discrete source (referred to as a point source), such as a municipal or industrial facility's discharge pipe, that facility's share of the loading capacity is called a wasteload allocation. General and individual permits regulate point source dischargers. If the receiving water body is impaired and point source dischargers are identified as contributors, restrictions to total suspended sediments (TSS) or turbidity in effluent may be an option to reduce fine sediment inputs into a receiving water body.

If a waterbody with a current permittee discharging sediments is listed as impaired for the new narrative fine sediment criterion, that permittee could incur monitoring costs. We assume that monitoring costs will be similar to monitoring costs for turbidity. Ecology estimated these costs for sites with 1-5 acres at $1,650 per year, and at $2,721 per year for sites 5+ acres in the Small Business Economic Impact Analysis for Construction Stormwater General Permit (2020). The estimated 20-year PV for fine sediments monitoring costs is between $20,271 and $33,429, depending on the size of a site.

It is very likely that a discharger with permit limits for TSS or turbidity already has sediment technology controls in place that are suitable for the fine sediment pollution prevention. For example, TSS criteria target solids with size of <0.06 mm versus fine sediments, defined as particles < 2 mm. Sites that will not need to take additional action will not incur these additional costs as a result of the rule amendments.

Nonpoint dischargers

If the pollutant comes from a set of diffuse sources (referred to as a nonpoint source), such as general urban, residential, farm runoff, or other land activities, that generate pollution discharges, the cumulative share is called a load allocation.

To address these nonpoint sources, Ecology develops a list of best management practices (BMPs) for each of the water quality pollution sources identified. Some sites will require very basic erosion and sediment control BMPs (mulch, silt fence, etc.), while others will need treatment technologies (sediment ponds, filters, etc.). Many of the BMPs address more than one of the water quality issues, such as temperature, addressing bacteria and chemical sediments, etc. Therefore, it is hard to identify which of the BMPs and costs associated with them will address the fine sediments uniquely.

Ecology's Water Quality Combined Funding Program estimated the average cost to complete riparian restoration – one of the most common BMPs addressing nonpoint sediments – is approximately $15,500 per acre based on 33 previously funded grant agreements across the state from State Fiscal Years 2016 to 2019[19]. Cost per acre varies based on specific site conditions and project scale. Costs range from approximately $3,500 to $35,000, depending on the extent of invasive species control, ease of access, plant stock quality, and if maintenance is included in the budget. Typically, larger scale projects have a lower cost per acre. These costs are associated with funding programs and include administrative costs, and costs tend to be higher than if landowners were implementing BMPs on their own.

[19] Ecology Grants and Loans. https://apps.ecology.wa.gov/eaglmap/

Chapter 4: Likely Benefits of the Rule Amendments

4.1 Introduction

We analyzed the likely benefits associated with the rule amendments, as compared to the baseline. The rule amendments and the baseline are discussed in detail in Chapter 2 of this document.

4.2 Benefits analysis

The rule amendments will make the following changes:

- Revising the freshwater dissolved oxygen criteria.
    - Adding the definitions of "Intragravel dissolved oxygen" and "Spatial median".
    - Setting more stringent water column dissolved oxygen criteria for salmonid spawning based uses.
    - Adding an intragravel dissolved oxygen component to the dissolved oxygen criteria for salmonid spawning based uses.
    - Adding an oxygen saturation component to the dissolved oxygen criteria for the salmonid spawning based uses.
    - Clarifying the habitat type and spatial extent for sample collection when evaluating intragravel dissolved oxygen.
- Adding a narrative fine sediment criterion to all existing and designated aquatic life uses for fresh water.

4.2.1 Revising the freshwater dissolved oxygen criteria.

4.2.1.1 Adding the definitions of "Intragravel dissolved oxygen" and "Spatial median".

The definitions themselves cause no impact, as they are an inherent part of adding parameters used to measure dissolved oxygen. This addition expands dischargers' compliance options.

4.2.1.2 Setting more stringent water column dissolved oxygen criteria.

The rule adopts revisions to the biologically-based water column dissolved oxygen criteria to provide benefits of increased protection of early life stages of salmonids.

The 10 mg/L protective values are based on EPA's recommendation of 11 mg/L as a mean value for full protection and 9 mg/L as a minima value. [20] Before EPA's 1986

[20] U.S. Environmental Protection Agency, 1986. Gold Book, Pub. No. EPA 440/5-86- 001, Quality Criteria for Water.

recommendations, the National Academy of Sciences (1972)[21] suggested that dissolved oxygen criteria for salmonid eggs be between maximum protection (11 mg/L) and high level of protection (9 mg/L). Given that Washington is continuing to use a 1-day minimum duration value for dissolved oxygen, the 10 mg/L value aligns with federal recommendations for dissolved oxygen.

The water quality assessment adds new dissolved oxygen impairment (303(d)) listings when Ecology receives data that demonstrates a waterbody is impaired due to low dissolved oxygen measurements. New 303(d) listings may occur as Ecology receives new data for this assessment effort. When more data is assessed, there is greater potential 303(d) listing will be identified. However, we do not expect an increase in dissolved oxygen listings attributable to this rulemaking. Rather, the updated dissolved oxygen criteria will enable the refinement of the list of impaired waters.

The current dissolved oxygen 303(d) listings include some listings in which temperature may be the cause or a large contributing factor of the low dissolved oxygen values. The oxygen saturation criteria is anticipated to refine the 303(d) list to identify those waters that are low in dissolved oxygen largely due to nutrients, potentially reducing the number of 303(d) listings by removing those that are solely attributed to temperature. Those changes are not likely to affect dischargers' behavior because waters will be assessed separately for compliance with temperature and dissolved oxygen criteria.

Given that the updated 303(d) listings will better identify which waters are impaired due to nutrients (better detected by percent oxygen saturation) and those affected by human caused temperature increases (better identified by the temperature criteria), the actions necessary to bring the waterbody into compliance will be identified earlier in the water cleanup process. We do not anticipate more dissolved oxygen listings due to the additional compliance option of percent saturation, regardless of the dissolved oxygen concentration.

Moreover, we anticipate to streamline the process for identifying causes of dissolved oxygen impairment of waters. This will result in less expenses associated with time and labor costs, and avoiding implementation of actions that are not addressing the real problem.

4.2.1.3 Adding intragravel dissolved oxygen criteria.

The rule adopts biologically-based intragravel dissolved oxygen criteria to provide benefits of increased protection of early life stages of salmonids.

Intragravel dissolved oxygen criteria is a direct measurement of dissolved oxygen levels where early life stages of salmonids reside, whereas the water column dissolved oxygen

[21] National Academy of Sciences (US). Committee on Water Quality Criteria. Water quality criteria, 1972. US Environmental Protection Agency, 1974.

levels are dependent on an assumption of dissolved oxygen depression from the water column to the interstitial spaces of gravels.

An extensive scientific literature review[22] validates the decision to set a 10 mg/L water column based dissolved oxygen value for early life stages of salmonids. The majority of qualified studies found that dissolved oxygen depression may be much less than 2.0 mg/L in moderate to high quality spawning gravels and in the absence of variables that influence oxygen demand. Ecology supports analyzing dissolved oxygen depression with minimal outlying variables because other water quality criteria address variables that may influence freshwater dissolved oxygen reductions in gravels (fine sediment, nutrients, turbidity, temperature, etc.). This would allow Ecology to focus on factual causes of water pollution.

4.2.1.4 Adding oxygen saturation criteria.

The purpose of the oxygen saturation component is to account for temperature and elevation impacts on dissolved oxygen levels. Furthermore, oxygen saturation provides needed flexibility to the dissolved oxygen criteria during the summer months when water temperatures rise and, in many streams, early life stages of salmonids are not present.

The adopted oxygen saturation value is based on monitoring data from several waterbodies in Washington considered relatively pristine or undisturbed by human influences. The adopted oxygen saturation values are more protective than the current biologically-based criteria at sea level at the maximum allowable temperature for all salmonid related aquatic life uses.[23] Washington also has supplemental spawning criteria that has identified water bodies that have early life stages of salmonids present during the summer months and, thus, require more stringent temperature criteria.

The addition of oxygen saturation and intragravel measurement compliance options for the dissolved oxygen criteria would also potentially result in cost savings for the current and future dischargers, if the more accurate assessment allows them to be delisted from the 303(d) list (see 3.2.1.4). This flexibility may also assist entities in monitoring and assessing protection of aquatic life.

4.2.1.5 Clarifying the habitat type and spatial extent of sampling when evaluating intragravel dissolved oxygen.

Ecology supports multiple intragravel measurements for determining compliance with the dissolved oxygen criteria and states that a single intragravel dissolved oxygen measurement may not be representative of a site-specific location or a water body. Intragravel dissolved oxygen conditions can vary spatially and temporally depending on

[22] Salmon Spawning Habitat Protection Rule. Preliminary Technical Support Document. Ecology. October, 2021.
[23] Please see Table 2 for clarifications.

the substrate conditions of a water body. Therefore, the rule provides that intragravel dissolved oxygen measures be collected over a spatial area and a median value be calculated for a given spawning area. This clarification would contribute to the provision of benefits of increased protection of early life stages of salmonids.

4.2.2 Adding a narrative fine sediment criterion

EPA does not currently have recommended criteria for fine sediment criterion. In 2003, EPA summarized the biological effects of suspended and bedded sediments in aquatic systems and reviewed all states' criteria that addressed fine sediment.[24] In the 2003 review, EPA concluded that generalizing protective criteria for fine sediment is difficult because biological responses vary with species and sediment characteristics. EPA also noted that many states have standards set to address suspended and bedded sediments, but that there is little consistency among the criteria.

The adopted rule would create benefits by including the evaluation and limitation of human-caused sources of fine sediment that may impair designated uses and result in a water body impairment.

4.3 Benefits of salmonid protection

The goal of the rule is to provide additional water quality and habitat protection for early life stages of salmonids—including salmon, steelhead, and trout—and their spawning gravel. Although we cannot quantify how increased protections in this rule would benefit salmonids populations, we can list which areas of Washington's environmental, social, and economic life that would benefit.

Use benefits

In the context of economic analysis, the total value is equal to the sum of the use and nonuse value. Use values include value of commercial fish harvest (market priced) and value of recreational fishing trips (nonmarket value). Nonuse value is discussed in social benefits below.

According to the report "State of salmon in watershed 2020",[25] commercial and recreational fishing in Washington is estimated to support 16,000 jobs and $540 million in personal income. People fishing and harvesting shellfish recreationally in Washington spend an estimated $1.5 billion annually on equipment and trip-related costs, supporting many rural families and businesses.

[24] Ecological and toxicological effects of suspended and bedded sediments on aquatic habitats-A concise review for developing water quality criteria for suspended and bedded sediments (SABS). US EPA, Office of Water draft report. Berry, W., Rubinstein, N., Melzian, B. and Hill, B., 2003.
[25] State of salmon in watershed 2020. Report. https://stateofsalmon.wa.gov/salmon-101/.

The amendments will also likely benefit tribal harvest of salmonids. Tribes hold long-standing cultural values for the environment and, as part of that, for fish catch.

Salmon are among local tribes' "first foods", which include water, salmon, deer, cous root, huckleberry, and lamprey.[26] The culture and lifeways of tribal communities are tied to fisheries resources, and a number of tribes hold treaty rights to the harvest of fisheries. In terms of use value, tribes, holding the right to half of the additional salmon likely to result from the amendments, will be able to sell or consume additional fish and have increased resources for traditional cultural uses. Also, some individuals are subsistence fishers, harvesting fish for cultural, spiritual, and economic reasons. Additional fish survival and availability in stream will improve the ability of subsistence fishers to receive nutrition, reduce food costs, and participate in cultural harvest their own food.

Non-use benefits

Non-use value of natural resources, among which is the "value of knowledge that species are protected",[27] captures individuals' preferences for a public good or resource that are not derived from their use.

Salmon and steelhead populations have been declining in Washington State for more than a decade.[28] Since 1991, the federal government has declared 14 species of salmon and steelhead in Washington as at-risk of extinction under the Endangered Species Act.

Based on the economic concept, even if individuals are not involved in commercial fish harvesting or recreational fishing, they value salmonid protection. Although this concept contributes to the total economic value of environmental resources, we define it as a social benefit because individuals' motives are to provide opportunities for their children or others in society to use or enjoy the resource in the future.

Cultural and existence value in stream

Salmonids are important to Tribes in Washington for economic and cultural reasons. Protecting salmonids provides indigenous populations with the nutritional benefits, economic savings and revenues, and supports recovery and maintenance of tribal lifeways.

The public can also hold values for fish in stream even if they never consume fish, fish recreationally, or spend money on whale watching. These values may intersect with cultural, ecosystem contribution, and avoided extinction values, but they extend to a difficult-to-capture

[26] Columbia River Inter-Tribal Fish Commission, 2011. https://critfc.org
[27] Klamath river basin restoration nonuse value survey. https://kbifrm.psmfc.org/wp-content/uploads/2016/12/Graham_2012_0010_Klamath-River-Basin-Restoration-Nonuse-Value-Survey-Final-Report.pdf
[28] State of the Salmon Report 2020. https://stateofsalmon.wa.gov/wp-content/uploads/2020/12/StateofSalmonExecSummary2020.pdf.

conceptual value for abundant native species functioning in a high-quality environment. Cultural and existence values can incorporate egalitarian values for others to use or encounter fish species, currently or intergenerationally.

Environmental benefits

Many other animals rely on salmon. Scientists estimate 138 species of wildlife, from whales to insects, depend on salmon for their food.[29] Migrating salmon and steelhead bring essential nutrients from the ocean back to rivers, streams, and surrounding habitat. These nutrients are a significant part of the freshwater food web.

Salmonids represent one of the most sensitive aquatic life species in Washington and, therefore, form the basis for protecting all aquatic life uses.

A 2011 NOAA Fisheries and Canadian Department of Fisheries and Oceans study found that an increase in the availability of salmon may be related to improved killer whale birth and survival rates, although their results did not take into account other factors like increased salmon predation by other species.[30]

The southern resident killer whales (SRKWs) are a geographically distinct population of killer whales that travels in and around the Salish Sea during the summer and fall months and along the Pacific West Coast during the winter and spring months. These apex predators[31] have significant economic and cultural values for Washingtonians. The population of SRKWs has historically reached a high of 200 individuals. In recent years, the number has fallen to 74 due in large part to a reduction in Chinook salmon populations, which is the Southern Resident's primary prey.[32] Recovering and enhancing the population of SRKWs provides numerous benefits to the ecosystems they frequent, to the state's economy, and to the cultural identity of the state.

The Southern Resident Killer Whale Chinook Salmon Initiative[33] reports that:

- Wildlife watchers spend nearly $1 billion per year in Washington, primarily in rural areas.
- In 2001, 47 percent of Washington's residents participated in wildlife watching, compared to 16 percent in fishing and five percent in hunting.

[29] State of salmon in watershed 2020. Report. https://stateofsalmon.wa.gov/salmon-101/.
[30] Salmon Fisheries and Killer Whales – Final Report of the Science Panel, 2012. https://www.raincoast.org/wp-content/uploads/2009/07/kw-effects_of_salmon_fisheries_on_srkw-final-rpt.pdf
[31] A predator at the top of a food chain that is not preyed upon by any other animal.
[32] For more information, see the website for the Governor's Orca Task Force https://www.governor.wa.gov/issues/issues/energy-environment/southern-resident-orca-recovery
[33] Southern Resident Orca Task Force Final Report. Economic Value. https://srkwcsi.org/theeconomic-value-of-southern-resident-killer-whales/

- Wildlife watching activities support more than 21,000 jobs in Washington State, yield $426.9 million in job income, and generate $56.9 million in state and $67.4 million in federal tax revenues each year, based on 2001 data.
- The value of the overall whale watching industry in Washington State is worth at least $65-$70 million per year, with an average annual growth rate of three percent.
- An estimated 42 whale watch companies operate in Washington State, 22 of which are listed in Dun & Bradstreet's Million Dollar Database. The 22 listed companies generated $64 million in sales.
- On San Juan Island, there are 17 whale-watching and kayak-touring businesses. Countywide, tourism is a $127 million industry. "This is an orca-based economy," says Jason Gunter, manager of Discovery Sea Kayak. He estimates that 75 percent of his clients sign up to see killer whales.

We note that there are animals other than the SRKW that will benefit from increased food supply if higher fish survival rates result in more plentiful food sources for them. These include Northern Resident Killer Whale (NRKW) pods (about 264 individuals). These orcas, also a geographically distinct population, live off the coast of British Columbia, from Vancouver Island up to Alaska. NRKWs specialize in eating Chinook and Chum salmon. Other animals consuming salmon (various species) will also benefit, such as other fish and marine mammals.

Reduced likelihood of extinction

While the public places value on fish for use or non-use, they may hold additional values associated with avoiding extinction of a species (or passing a point from which there is not likely population recovery). Values may be for full recovery of a specific population or for downlisting from endangered to threatened. These extinction values (or threatened status values) may be based on potential future use or non-use values (such as bequest values for future generations or contribution to the food chain), and, like general values, may be species-specific. An available value for recovery of a similar population is for Puget Sound Chinook salmon. To invest in a ten-year program of chinook recovery, households were estimated to be willing to pay an average of $40.49 (2011- dollars) per household.[34] This survey was based on a nationwide sample of U.S. households, taken from 2006 through 2009. As an illustrative example, if this average value were held by all 2.8 million households in Washington, this would be a total value of over $112 million. Population proximity to the location of a species, and related knowledge about the species and its environmental context, can affect these valuations, so a state-specific population may have a higher value per household.[35]

[34] Wallmo, K., & Lew, D. K. (2012). Public Willingness to Pay for Recovering and Downlisting Threatened and Endangered Marine Species. Conservation Biology, 26(5), 830–839. http://www.jstor.org/stable/23255336

[35] Note that this may not be true for populations limited to a close geographic area, however. As demonstrated in a survey related to water allocation to aid fish in the Klamath River basin, local populations may have competing demands for resources that may be displaced to aid fish (such as irrigation). This could result in lower local willingness to pay for species aid or recovery. Source: Klamath river basin restoration nonuse value survey, 2012.

Another study (Layton et al.[36]) uses the Stated Preference (SP) method and the willingness to pay (WTP) function to estimate benefit functions for different types of fish. The study used two status quo levels, a "high" and a "low", of future fish populations in the absence of any new programs as the baseline from which improvements can be valued. Under the high status quo, the populations would remain stable over the next 20 years (no more declines); under the low status quo, the populations would continue to decline over the next 20 years at the same rate they declined during the previous 20 years.

To find out the value of fish for the adopted rule through the benefit function, we would need to know the initial number of fish within the assessed units. We cannot predict the number or location of the future TMDLs because of the uncertainty. Tables 5 and 6 consider a 50 percent increase in every type of fish, and then for an approximate 2,000,000 Washington state households, computes the average WTP per fish for each fish type.

Table 5. WTP for 50 percent increase in each fish type, High status quo

Fish type	WTP per month, per household for 50 percent increase, (In 1999 dollars)	WTP per month, per household for 50 percent increase, (In 2022 dollars)	Increase in fish (million)	WTP per year, per fish, for 2M households, (In 1999 dollars)	WTP per year, per fish, for 2M households, (In 2022 dollars)
Columbia freshwater fish	14.27	24.21	60	5.71	9.77
Columbia migratory fish	9.92	16.83	1	238.08	407.04
Puget sound Freshwater fish	15.52	26.34	35	10.64	18.21
Puget sound Migratory fish	20.83	35.35	2.5	199.97	342.19
Puget sound Saltwater fish	21.07	35.75	107.5	4.7	8.04

https://kbifrm.psmfc.org/wp-content/uploads/2016/12/Graham_2012_0010_Klamath-River-Basin-Restoration-Nonuse-Value-Survey-Final-Report.pdf

[36] Valuing multiple programs to improve fish populations. Layton D., Brown G., Plummer M., 1999.

Table 6. WTP for 50 percent increase in each fish type, Low status quo

Fish type	WTP per month, per household for 50 percent increase, (In 1999 dollars)	WTP per month, per household for 50 percent increase, (In 2022 dollars)	Increase in fish (million)	WTP per year, per fish, for 2M households, (In 1999 dollars)	WTP per year, per fish, for 2M households, (In 2022 dollars)	WTP per month, per household for 50 percent increase, (In 1999 dollars)
Columbia freshwater fish	14.55	24.69	296.28	37.5	9.31	15.93
Columbia migratory fish	18.97	32.19	386.28	0.25	1812.12	3100.88
Puget sound freshwater fish	28.84	48.94	587.28	26.5	26.12	44.7
Puget sound migratory fish	28.63	48.58	582.96	1.25	549.7	940.64
Puget sound saltwater fish	31.28	53.08	636.96	27	27.8	47.57

These tables have limitations for our analysis: they do not account for current number of fish and do not reflect possible number of fish saved, but they do show that the WTP are positive values. We do not know what and how many of water bodies would be affected by a future 303(d). Whitout the location we cannot determine the affected species, their life history, watershed characteristics, and stock-specific adaptations to local environmental features - all of these factors are influencing salmon population.

Chapter 5: Cost-Benefit Comparison and Conclusions

5.1 Summary of costs and benefits of the rule amendments

Costs

Potential costs associated with adding a narrative fine sediment criterion to all existing and designated aquatic life uses for fresh water:

- **Costs for point source dischargers in TMDLs.** If a permittee is discharging sediment to a water body impaired for the narrative fine sediment criterion, that permittee could incur monitoring costs. We assume monitoring costs will be similar to monitoring costs for turbidity or total suspended solids (TSS). Ecology estimated these costs for sites with one to five acres at $1,650 per year, and at $2,721 per year for sites with more than five acres in the Small Business Economic Impact Analysis for the Construction Stormwater General Permit (2020).[37] The estimated 20-year present value (PV)[38] for fine sediments monitoring costs is between $20,271 and $33,429, depending on the size of a site.
- **Costs for nonpoint dischargers.** To address nonpoint sources of pollution, Ecology develops a list of best management practices (BMPs). Many of the BMPs address more than one of the water quality issues, such as temperature, bacteria, toxic chemicals, sediments, etc. Therefore, it is difficult to identify specific BMPs to address fine sediment and costs associated with implementation. However, we have some estimates for common BMPs used to address sediments.

  One of the most common BMPs addressing nonpoint sediments costs about $15,500 per acre based on 33 previously funded grant agreements across the state from State Fiscal Years 2016 to 2019. Cost per acre varies based on specific site conditions and project scale. Costs range from about $3,500 to $35,000 depending on the:

  - Extent of invasive species control.
  - Ease of access.
  - Plant stock quality.
  - Maintenance budget.

[37] Small Business Economic Impact Analysis. Construction Stormwater General Permit. May, 2020. https://apps.ecology.wa.gov/publications/documents/2010022.pdf

[38] All Ecology analyses look at a 20-year time span from the time of rule adoption, which is typically enough time to reflect consequences of a rulemaking. This standard is consistent with principles in federal guidance and historic analytical practices. Present value is defined as the value of a consequence occurring at the present time that has the same effect on wellbeing as the future consequence, and calculated by discounting the monetary value of each future consequence by a factor that depends on the date it occurs. Ecology calculates present values based on the historic average real rate of return on US Treasury I-Bonds since 1998. US Treasury Department (2021). http://www.treasurydirect.gov/indiv/research/indepth/ibonds/res_ibonds_iratesandterms.htm

Typically, larger scale projects have a lower cost per acre. These costs are associated with funding programs and include administrative costs, while costs tend to be higher than if landowners implement BMPs on their own.

Benefits

We identified the probable environmental, social, and economic benefits from the amendments. Chapter 4 discusses these further:

- **Streamlined process for identifying causes of dissolved oxygen impairment of waters.** The alternate criteria expressed in percent saturation will help refine the 303(d) list to identify those waters that are low in dissolved oxygen largely due to nutrients versus those where temperature precludes the attainment of the dissolved oxygen concentration criteria.
- **Increased protection of early life stages of salmonids.** Revising the freshwater dissolved oxygen criteria for certain aquatic life use categories and adding a narrative fine sediment criterion to all existing and designated aquatic life uses for fresh water provide increased protection for early life stages of salmonids, although we cannot quantify how many salmonids will directly benefit from this rule.
- **Additional protection for other species.** Environmental benefits include additional habitat protections for other aquatic life and wildlife, including those organisms that depend on salmonids for their food.
- **Increased non-use values.** Social benefits include the non-use value of salmonids. People who are not involved in commercial fish harvesting or recreational fishing see value in increased salmonid protections. The amendments also align with the values of indigenous cultures.
- **Determined economic benefits of use and non-use values.** For the economic analysis in this document, the total value of protecting salmonids is equal to the sum of use and non-use values. Use values include the value of the commercial fish harvest (market priced) and the value of recreational fishing trips (nonmarket value).

We conclude, based on a reasonable understanding of the quantified and qualitative costs and the benefits likely to arise from the rule amendments as compared to the baseline, that the benefits of the rule amendments are greater than the costs.

5.2 Conclusion

We conclude, based on a reasonable understanding of the quantified and qualitative costs and benefits likely to arise from the rule amendments, as compared to the baseline, that the benefits of the rule amendments are greater than the costs.

Chapter 6: Least-Burdensome Alternative Analysis

6.1 Introduction

RCW 34.05.328(1)(e) requires Ecology to "…[d]etermine, after considering alternative versions of the rule and the analysis required under (b), (c), and (d) of this subsection, that the rule being adopted is the least burdensome alternative for those required to comply with it that will achieve the general goals and specific objectives stated under (a) of this subsection." The referenced subsections are:

(a) Clearly state in detail the general goals and specific objectives of the statute that the rule implements;

(b) Determine that the rule is needed to achieve the general goals and specific objectives stated under (a) of this subsection, and analyze alternatives to rule making and the consequences of not adopting the rule;

(c) Provide notification in the notice of proposed rulemaking under RCW 34.05.320 that a preliminary cost-benefit analysis is available. The preliminary cost-benefit analysis must fulfill the requirements of the cost-benefit analysis under (d) of this subsection. If the agency files a supplemental notice under RCW 34.05.340, the supplemental notice must include notification that a revised preliminary cost-benefit analysis is available. A final cost-benefit analysis must be available when the rule is adopted under RCW 34.05.360;

(d) Determine that the probable benefits of the rule are greater than its probable costs, taking into account both the qualitative and quantitative benefits and costs and the specific directives of the statute being implemented.

In other words, to be able to adopt the rule, we are required to determine that the contents of the rule are the least burdensome set of requirements that achieve the goals and objectives of the authorizing statute(s).

We assessed alternative rule content and determined whether they met the goals and objectives of the authorizing statute(s). Of those that would meet the goals and objectives, we determined whether those chosen for inclusion in the adopted rule amendments were the least burdensome to those required to comply with them.

For additional alternatives that were suggested during the public comment period, and Ecology's response, see the associated Concise Explanatory Statement for this rulemaking.

6.2 Goals and objectives of the authorizing statute

The authorizing statutes for this rule are

- Clean Water Act 303(c)(2)(A)

- Water Pollution Control Act, Chapter 90.48 RCW
- Water Resources Act of 1971, Chapter 90.54 RCW

We summarize the goals and objectives of the authorizing statutes as:

- To retain and secure high quality for all waters of the state.
- Insure the purity of all waters of the state consistent with:
    - Public health and public enjoyment thereof.
    - Propagation and protection of wild life, birds, game, fish and other aquatic life.
    - Industrial development of the state.
- Require the use of all known available and reasonable methods (AKART) by industries and others to prevent and control the pollution of the waters of the state of Washington.
- To protect the public health or welfare, enhance the quality of the water, taking into consideration their use and value for public water supplies, propagation of fish and wildlife, recreational purposes, and agricultural, industrial and other purposes.

6.3 Alternatives considered and why they were excluded

We considered the following alternative rule content and did not include it in the rule amendments for the reasons discussed in each subsection below.

- Develop numeric fine sediment criteria
- Do not include intragravel dissolved oxygen criteria
- Set a 95 percent oxygen saturation value for all applicable aquatic life use categories.
- Set a 11 mg/L water column dissolved oxygen level
- Develop chronic criteria for water column based dissolved oxygen criteria

6.3.1 Develop numeric fine sediment criteria

A single fine sediment threshold cannot be generalized statewide as each water body's sediment characteristics are unique. Furthermore, the science surrounding relationships between fine sediment based parameters and biological responses are not fully developed. The current state of the science suggests that a single parameter to measure fine sediment will not adequately capture sediment dynamics, changes within a water body, or harmful effects on aquatic life. A multi-parameter approach is necessary to understand sediment quality from a biological, chemical, geological, and physical perspective.

This alternative would not have met stated goals and objectives, as RCW 90.48.010 requires Ecology to "exercise its powers, as fully and as effectively as possible, to retain and secure high quality for all waters of the state."

6.3.2 Do not include intragravel dissolved oxygen criteria

Intragravel dissolved oxygen criteria are included to provide additional flexibility in the dissolved oxygen criteria and provide a means to directly measure the water condition needed to fully protect early life stages of salmonids. Rather than relying on a worst-case assumption of dissolved oxygen depression, direct measurements of intragravel dissolved oxygen eliminate the need to assume a reduction in oxygen from the water column to the spaces between gravels. The elimination of this assumption allows for a more accurate measurement of protection levels.

This alternative does not meet stated goals and objectives, as RCW 90.48.010 requires Ecology to "exercise its powers, as fully and as effectively as possible, to retain and secure high quality for all waters of the state."

6.3.3 Set a 95 percent oxygen saturation value for all applicable aquatic life use categories

The intention of the oxygen saturation criteria is to provide alternative dissolved oxygen criteria at warmer water temperatures, higher elevations, and in the absence of early life stages of salmonids. Ecology considered a 95 percent oxygen saturation value for all applicable aquatic life use categories, but found this alternative more burdensome compared to the same level of protection. Ecology ultimately landed on a 90 percent oxygen saturation value for aquatic life uses of (1) Char Spawning and Rearing, (2) Salmonid Spawning, Rearing, and Migration, and (3) Nonanadromous Interior Redband Trout; and a 95 percent oxygen saturation value for Core Summer Salmonid Habitat. Setting a 95 percent oxygen saturation value for all applicable aquatic life uses does not provide adequate flexibility during summer months when water temperatures can become elevated and early life stages of salmonids are not present. A 95percent oxygen saturation value at sea level and at the maximum allowable water temperatures is considered more stringent than the current water column based dissolved oxygen criteria and, therefore, does meet the stated goals of providing flexibility when water temperatures and elevations are high and early life stages are not present.

6.3.4 Set a 11 mg/L water column dissolved oxygen level

EPA recommends a more stringent 11 mg/L water column based DO level based on the assumption that there is a 3 mg/L drop in dissolved oxygen from the water column to gravels. In gravels, 8 mg/L is considered fully protective of early life stages of salmonids. EPA's assumption of 3 mg/L is based on two field studies that do not meet the minimum qualifications needed to evaluate dissolved oxygen depression. Ecology evaluated

literature since EPA's 1986 recommendations and found several new published field studies that met the minimum qualifications of little or no fine sediment in streams. These studies indicated a maximum dissolved oxygen reduction of 2 mg/L from the water column to the gravels.[39] Using the assumption of a 2 mg/L dissolved oxygen depression and protective intragravel dissolved oxygen levels of 8 mg/L, we conclude that water column levels should be set at 10 mg/L. EPA's recommendation of 11 mg/L in the water column is found to be excessively high (and, therefore, more burdensome) based on the current literature available.

6.3.5 Do not add a fine sediment criteria

Ecology, as a rule-making authority (RCW 90.48.035), has obligations in a 2018 settlement agreement[40] that Ecology would develop a fine sediment criterion.

6.3.6 Do not revise freshwater dissolved oxygen criteria

The current dissolved oxygen criteria includes protection levels for the water column only and does not account for influences of temperature or elevation on dissolved oxygen. We would continue to have dissolved oxygen criteria that applies to higher elevations (e.g., alpine, subalpine areas) that cannot physically meet oxygen requirements. Furthermore, early life stages of salmonids would not be fully protected, given that the current criteria are based on water column protection levels and not intragravel oxygen conditions.

This alternative does not meet stated goals and objectives, as RCW 90.48.010 requires Ecology to "exercise its powers, as fully and as effectively as possible, to retain and secure high quality for all waters of the state."

6.3.7 Implement seasonal dissolved oxygen criteria to protect early life stages

This rule includes protection for all salmonids, including salmon, steelhead, trout, whitefish, and grayling. This level of detail is beyond the scope of this rulemaking. Spawning and rearing time can vary significantly based on the water body and the species present. Thus, seasonal site-specific criteria would require information on salmonid spawning and rearing across water bodies in Washington State.

We considered setting a generic seasonal criterion from fall to spring months. However, it is well known that spawning and rearing occurs almost year-round in some streams in

[39] Salmon Spawning Habitat Protection Rule. Preliminary Technical Support Document. October, 2021.
[40] 2018 U.S. District Court Stipulated Order of Dismissal.
https://www.bdlaw.com/content/uploads/2018/10/NWEA-stip.pdf

Washington State. These streams would not be protected by a seasonal dissolved oxygen criterion.

6.3.8 Develop chronic criteria for water column based dissolved oxygen criteria

We considered setting acute and chronic based dissolved oxygen criteria. However, the current rule amendments only include an acute based dissolved oxygen criterion. One reason for this decision is the advice provided by the Science Advisory Group (SAG) that was assembled during this rulemaking. The SAG noted that salmonids are most fragile during early life stages, and using the highest level of protection should be considered due to uncertainty and variability in environmental conditions. Given environmental conditions and the high sensitivity of early life stages of salmonids, we adopted an acute criterion protective of both acute and chronic effects. This amendment aligns with the current dissolved oxygen criteria for Washington State that includes only an acute criterion. Further support for this decision was based on previous comments by the National Oceanic and Atmospheric Administration (NOAA).

Our recent review of scientific literature indicates support for a 10 mg/L dissolved oxygen level for the protection of sub-lethal effects and 9 mg/L dissolved oxygen level for the protection of lethal effects (see technical support document for this rulemaking). In a previous rulemaking, NOAA noted concerns with the acute protective level of 9.5 mg/L for the Core Summer Salmonid Habitat designated use during an Endangered Species Act (ESA) review. NOAA based their analysis on EPA recommendations of 11.0 mg/L (chronic value) and a 3 mg/L dissolved oxygen depression between the water column and gravels. NOAA concerns revolved around chronic exposures during incubation.

While an acute criterion 9.0 mg/L dissolved oxygen may be justified based on current literature, it does not protect against sub-lethal effects and is not supported by NOAA when considering acute criteria only. Furthermore, a 9.0 mg/L acute criterion would represent a less stringent acute criterion than the current 9.5 mg/L dissolved oxygen criterion for the Core Summer Salmonid Habitat and Char Spawning uses. While a 10 mg/L chronic criterion and a 9 mg/L acute criterion was considered, there are concerns that setting a 9.0 mg/L acute criterion would not be accepted during ESA review based on previous comments by NOAA.

We have decided to set a more stringent 10 mg/L dissolved oxygen level protective of both sub-lethal (chronic) and lethal (acute) effects. The adopted 10 mg/L value is based on the high sensitivity of early life stages of salmonids to fluctuations in oxygen conditions, new science demonstrating a 2 mg/L dissolved oxygen depression value from the water column to gravels, and NOAA's previous comments that 9.5 mg/L acute criterion alone may not be fully protective.

6.4 Conclusion

After considering alternatives to the adopted rule's contents, within the context of the goals and objectives of the authorizing statute, we determined that the adopted rule represents the least-burdensome alternative of possible rule contents that meet the stated goals and objectives.

Chapter 7: Regulatory Fairness Act Compliance

7.1 Introduction

The Regulatory Fairness Act (RFA; RCW 19.85.070) requires Ecology to perform a set of analyses and make certain determinations regarding the rule amendments. This chapter presents the:

- Analysis of relative compliance cost burden.
- Consideration of lost sales or revenue.
- Cost-mitigating elements of the rule, if required.
- Small business and local government consultation.
- Industries likely impacted by the proposed rule.
- Expected impact on jobs.

A small business is defined by the RFA as having 50 or fewer employees, at the highest ownership and operator level. Estimated compliance costs are determined as compared to the baseline (the regulatory environment in the absence of the rule amendments, limited to existing federal and state requirements). Analyses under the RFA only apply to costs to "businesses in an industry" in Washington State. This means the impacts, for this part of our analyses, are not evaluated for government agencies.

7.2 Analysis of relative compliance cost burden

We calculated the estimated per-business costs to comply with the rule amendments, based on the costs estimated in Chapter 3 of this document. In this section, we estimate compliance costs per employee. As we do not know what industries will be affected by the rule, we used the list of industries currently reporting the TSS and turbidity measurements. We recognize that less, more, or other industries may be affected.

We used current Employment Security Department (ESD)[41] data to estimate the average number of employees through all identified industries. Note that ESD data is collected at the facility level, not the business level of highest owner or operator. This means:

- The small business number may be underestimated.
- The largest businesses number is likely significantly underestimated.
- Any identified disparity may be larger than presented from the available data.

[41] Employment Security Department/Labor Market and Economic Analysis (LMEA), March 2020. https://esd.wa.gov/labormarketinfo/report-library

The average affected small business likely to be covered by the rule amendments employs approximately 9 people. The largest ten percent of affected businesses employ an average of 855 people. Based on cost estimates in Chapter 3, we estimated the following compliance costs per employee in Table 7.

We cannot make an assumption that small sites have less employees or that a riparian buffer project (or other BMP) will be less complex. Therefore, we compare small and large business with small and large sites; simple and complex projects.

Table 7: Compliance costs per employee

Action	$ per employee, small business, small site	$ per employee, small business, large site	$ per employee, large business, small site	$ per employee, large business, large site
Monitoring	2252	3714	24	39
Livestock Exclusion Fencing	464	4639	5	49
Riparian buffer (simple)	389	3889	4	41
Riparian buffer (complex)	3889	38889	41	409

We conclude the rule amendments potentially have disproportionate impacts on small businesses, and therefore Ecology must include elements in the rule amendments to mitigate this disproportion, as far as is legal and feasible.

7.3 Loss of sales or revenue

Businesses that will incur costs could experience reduced sales or revenues if the rule amendments significantly affect the prices of the goods they sell. The degree to which this could happen is strongly related to each business's production and pricing model (whether additional lump-sum costs will significantly affect marginal costs), as well as the specific attributes of the markets in which they sell goods, including the degree of influence each firm has on market prices, as well as the relative responsiveness of market demand to price changes.

We used the REMI E3+ model for Washington State to estimate the impact of the rule amendments on directly affected markets, accounting for dynamic adjustments throughout the

economy. The model accounts for: inter-industry impacts; price, wage, and population changes; and dynamic adjustment of all economic variables over time.

We cannot predict which existing dischargers will be included on updated 303(d) lists and future clean-up actions. We also cannot predict what combination of BMPs and other technology controls will be implemented by permittees discharging to a newly impaired water for fine sediment. Using the REMI E3+ model, we applied potential costs to various industries, based on current sediment monitoring data. We randomly applied cost range to one business in every identified industry (because of the high degree of the uncertainty), and combined them in one model. The higher end of the costs range where applied to "Forestry and logging" sector, which affected the results, showing the strongest impact on this industry. Modeling results did not indicate significant impacts to industries. However, output would decrease by $1.3 million in year 2022 over all industries in the state. These relative indicators of industries demonstrate the following:

- Forestry and logging: 0.018 percent.
- Support activities for agriculture and forestry: 0.004 percent.
- Other wood manufacturing" in 2022: 0.002 percent.

This is due to the capital costs associated with BPMs implementation that will occur in 2022. The monitoring costs did not show any effect on output, and therefore, revenue of the industries. These results are scalable based on the number of dischargers assumed to be impacted in each industry.

7.3.1 Other economic impact predictions for "Forestry and logging" industry.

As forestry alone is forecast to be more highly impacted than other industries, we have added information about the REMI forecast specific to the industry.

For "Forestry and Logging" industry economic impact forecast shows:

- Employment decrease of (jobs count): 2022 – 1.7; 2023 - 0.03; 2030 – 0.01; and no impact in 2040.
- Output decrease of: 2022 - $355,920; 2023 - $9,090; 2030 - $3.160; 2040 - $1,790.

For "Support activities for forestry and agriculture" industry economic impact forecast shows:

- Employment decrease of (jobs count): in 2022 – 1.39; in 2023 - 0.02; in 2030 – 0.01; and in 2040 – 0.001.
- Output decrease of: in 2022 - $28,890; in 2023 - $740; 2030 - $260; and in 2040 - $160.

7.4 Action taken to reduce small business impacts

The RFA (19.85.030(2) RCW) states that:

> "Based upon the extent of disproportionate impact on small business identified in the statement prepared under RCW 19.85.040, the agency shall, where legal and feasible in meeting the stated objectives of the statutes upon which the rule is based, reduce the costs imposed by the rule on small businesses. The agency must consider, without limitation, each of the following methods of reducing the impact of the amended rule on small businesses:
>
> a) Reducing, modifying, or eliminating substantive regulatory requirements;
>
> b) Simplifying, reducing, or eliminating recordkeeping and reporting requirements;
>
> c) Reducing the frequency of inspections;
>
> d) Delaying compliance timetables;
>
> e) Reducing or modifying fine schedules for noncompliance; or
>
> f) Any other mitigation techniques including those suggested by small businesses or small business advocates."

We considered all of the above options, the goals and objectives of the authorizing statutes (see Chapter 6), and the scope of this rulemaking. We limited compliance cost-reduction methods to those that:

- Are legal and feasible.
- Meet the goals and objectives of the authorizing statute.
- Are within the scope of this rulemaking.

The scope of this rulemaking was limited to revising the freshwater dissolved oxygen criteria and adding a fine sediment criteria to all existing and designated aquatic life uses for fresh water. We could not meet legally stated goals and objectives if the rule amendments included reduced or variable water quality standards, recordkeeping, or reporting.

We included the following elements in the rule amendments to reduce costs to small businesses. This rulemaking is reducing, modifying, or eliminating substantive regulatory requirements by providing alternative compliance options to the existing dissolved oxygen criteria. Because the rule provides that compliance may be demonstrated through one or more of the dissolved oxygen criteria, this provides flexibility and potential cost savings (benefits) for the dischargers. A discharger will choose to monitor and report the intragravel dissolved oxygen parameter only if it expects the potential costs of the sampling to be less than the potential benefits (or cost savings) of verifying their compliance using the alternative method.

Updated dissolved oxygen criteria will enable the refinement of the list of impaired waters. The current DO 303(d) listings include some listings in which temperature may be the cause or a large contributing factor of the low dissolved oxygen values. The alternate criteria expressed in percent saturation will help to refine the list to identify those waters that are low in dissolved oxygen largely due to nutrients, potentially reducing the number of 303(d) listings by removing those that are solely attributed to temperature.

7.5 Small business and government involvement

We involved small businesses and local governments in its development of the rule amendments, using:

- Water Quality Information Listserv:
    - Voluntary membership to stay informed on the salmon spawning habitat protection rulemaking.
- Public webinars:
    - **Small business involvement:**
    - Clark Regional wastewater district, Sunnyside Valley Irrigation District, Trout Unlimited, Clean Water ATS, Puget Sound Keeper Alliance, South Columbia Basin Irrigation District, The National Council for Air and Stream Improvement (NCASI), Northwest Environmental Advocates, Washington State Water Resources Association, RE Sources, Port of Longview, Parametrix, WSP, Port of Tacoma, Dell, Chelan PUD, Avista Corp, NW Fishletter, Tupper Mack Wells PLLC, Skagit River System Cooperative, Skagit Fishereies Enhancement Group.
    - **Local government involvement:**
    - NWIFC, Confederated Tribes of Coos, Lower Umpqua and Siuslaw Indians, City of Tacoma, WA Department of Natural Resources, City of Kirkland, Idaho department of environmental quality, Quileute Nation, Pierce County, , City of Spokane, City of Seattle, Lower Columbia Fish Enhancement Group, US Bureau of Reclamation, City of Federal Way, Snohomish Conservation District, Pierce Conservation District, Snohomish County, US Department of Agriculture, City of Vancouver, Tacoma-Pierce County Health Department, King County, Tulalip Tribe, Spokane Tribe, Port Gamble S'Klallam Tribe, Suquamish Tribe, Environmental Protection Agency, City of Bainbridge, City of Vancouver, Chehalis Tribe, City of Bellingham, US Corp of Engineers, Skokomish Tribe, Lewis Conservation District, Thurston County, CRITFC, City of Vancouver, Quileute Tribe, Washington Department of Fish and Wildlife, Alaska Department of Environmental Conservation, Hoh Tribe, Klickitat County, Stillaguamish Tribe.
- Science Advisory Team:
    - **Small business involvement:**
    - Ashley Coble (NCASI), Chris Frissell (Salish Kootenai College), Brian Mattax (WSP)
    - **Local government involvement:**

- Joy Archuleta (US Forest Service), Jennifer Arthur (Seattle Public Utilities), Jordan Bauer (Ecology), Seth Book (Skokomish Tribe), Joanna Crowe Curran (US Corp of Engineers), Lindsay Guzzo (EPA), Tim Hagen (Pierce County), Kirk Krueger (WA Fish and Wildlife), Patrick Lizon (Ecology), Glen Merritt (Ecology), Cleo Nuculae (Ecology), Ted Parker (Snohomish County), Cole Provence (Ecology), Rainy Rau (City of Vancouver), Keunyea Song (Ecology), Leanne Weiss (Ecology), Angela Zeigenfuse (Ecology).

7.6 North American Industry Classification System (NAICS) codes of impacted industries

The rule amendments likely impacts the following industries, with associated NAICS codes. NAICS definitions and industry hierarchies are discussed at https://www.census.gov/cgi-bin/sssd/naics/naicsrch?chart=2017.

113310	Forestry and Logging
321912, 321918	Wood Product Manufacturing
332323	Fabricated Metal Product Manufacturing
423310, 423930	Merchant Wholesalers, Durable Goods
452319	General Merchandise Stores
488210	Support Activities for Transportation
561990	Administrative and Support Services
811122	Repair and Maintenance

7.7 Impact on jobs

We used the REMI E3+ model for Washington State to estimate the impact of the rule amendments on jobs in the state, accounting for dynamic adjustments throughout the economy.

The rule amendments will result in transfers of money within and between industries, as compared to the baseline. The modeled impacts on employment are the result of multiple small increases and decreases in employment, prices, and other economic variables across all industries in the state.

We cannot predict which existing dischargers will be included on updated 303(d) lists and future clean-up actions. We also cannot predict what combination of BMPs and other

technology controls will be implemented by permittees discharging to a newly impaired water for fine sediment. Using the REMI E3+ model, we applied potential costs to various industries, based on current sediment monitoring data. We randomly applied cost range to one business in every identified industry (because of the high degree of the uncertainty), and combined them in one model. The higher end of the costs range where applied to "Forestry and logging" sector, which also affected the results of impact on jobs on the particular industry.

Table 9: Impacts on jobs

Industry	Initial Jobs Impact	Jobs Impact in 20 years
Whole state	8	0.25
Forestry and Logging	1.7	0
Support activities for agriculture and forestry	1.4	0.001
Construction	0.8	0.007
Manufacturing	0.5	0.025
Wholesale trade	0.222	0.008
Retail trade	0.66	0.023
Transportation and warehousing	0.228	0.012

References

RCW 34.05.272 requires Ecology to categorize sources of information used in significant agency actions made in the Water Quality Program.

Independent peer review: Review is overseen by an independent third party.

Klamath river basin restoration nonuse value survey. https://kbifrm.psmfc.org/wp-content/uploads/2016/12/Graham_2012_0010_Klamath-River-Basin-Restoration-Nonuse-Value-Survey-Final-Report.pdf

National Academy of Sciences (US). Committee on Water Quality Criteria. Water quality criteria, 1972. US Environmental Protection Agency, 1974.

Salmon Fisheries and Killer Whales – Final Report of the Science Panel, 2012. https://www.raincoast.org/wp-content/uploads/2009/07/kw-effects_of_salmon_fisheries_on_srkw-final-rpt.pdf

Southern Resident Orca Task Force Final Report. Southern Resident Orca Task Force. https://www.governor.wa.gov/issues/issues/energy-environment/southern-resident-orca-recovery/task-force

State of salmon in watersheds 2020. Report. https://stateofsalmon.wa.gov/salmon-101/

U.S. Environmental Protection Agency, 1986. Gold Book, Pub. No. EPA 440/5-86- 001, Quality Criteria for Water.

Internal peer review: Review by staff internal to Ecology.

Industrial Stormwater General Permit. Ecology, 2019. https://apps.ecology.wa.gov/paris/DownloadDocument.aspx?Id=293972

Small Business Economic Impact Analysis. Construction Stormwater General Permit. May, 2020. https://apps.ecology.wa.gov/publications/documents/2010022.pdf

Salmon Spawning Habitat Protection Rule. Preliminary Technical Support Document. October, 2021.

Wallmo, K., & Lew, D. K. (2012). Public Willingness to Pay for Recovering and Downlisting Threatened and Endangered Marine Species. Conservation Biology, 26(5), 830–839. http://www.jstor.org/stable/23255336

Water Quality Program Permit Writer's Manual, 2018. https://fortress.wa.gov/ecy/publications/SummaryPages/92109.html

Water quality assessment Policy 1-11. Assessment policy 1-11 - Washington State Department of Ecology, 2020. https://apps.ecology.wa.gov/publications/documents/1810035.pdf

External peer review: Review by persons that are external to and selected by Ecology.

N/A

Open review: Documented open public review process that is not limited to invited organizations or individuals.

N/A

Legal and policy documents: Documents related to the legal framework for the significant agency action, including but not limited to: federal and state statutes, court and hearings board decisions, federal and state administrative rules and regulations, and policy and regulatory documents adopted by local governments.

2018 U.S. District Court Stipulated Order of Dismissal
https://www.bdlaw.com/content/uploads/2018/10/NWEA-stip.pdf

40 CFR 131.20 Water Quality Standards - State review and revision of water quality standards; requires states and tribes (with primacy for clean water actions) to periodically review and update the water quality standards.

Chapter 173-201A WAC, Water Quality Standards for Surface Waters of the State of Washington.

Chapter 90.48 RCW, Water Pollution Control.

Chapter 90.54 RCW, Water Resources Act of 1971.

Federal Water Pollution Control Act of 1972.

Washington Administrative Procedure Act (APA; RCW 34.05.328(1)(d))

Washington Regulatory Fairness Act (RFA; chapter 19.85 RCW)

Data from primary research, monitoring activities, or other sources, but that has not been incorporated as part of documents reviewed under independent, internal, or external peer review.

Discharge monitoring data. Ecology. 2021
https://apps.ecology.wa.gov/paris/DischargeMonitoringData.aspx

Ecology Grants and Loans. https://apps.ecology.wa.gov/eaglmap/

Employment Security Department/Labor Market and Economic Analysis (LMEA), March 2020.
https://esd.wa.gov/labormarketinfo/report-library

Puyallup River basin TMDLs. https://ecology.wa.gov/Water-Shorelines/Water-quality/Water-improvement/Total-Maximum-Daily-Load-process/Directory-of-improvement-projects/Puyallup

Records of the best professional judgment of Ecology employees or other individuals.

Conversation and email from Travis Porter 9/10/21, Industrial Stormwater General Permit, Ecology.

Other: Sources of information that do not fit into other categories.

N/A

Appendix A: Administrative Procedure Act (RCW 34.05.328) Determinations

A. RCW 34.05.328(1)(a) – Clearly state in detail the general goals and specific objectives of the statute that this rule implements.

See Chapter 6.

B. RCW 34.05.328(1)(b) –

1. Determine that the rule is needed to achieve the general goals and specific objectives of the statute.

See Chapters 1 and 2.

2. Analyze alternatives to rulemaking and the consequences of not adopting this rule.

Fine Sediment

Meeting legal obligations made in a 2018 U.S. District Court Stipulated Order of Dismissal between NWEA, EPA, and Ecology to do the following:

i. Propose fine sediment criteria to protect salmonid redds. If the rule is a narrative criterion, ECY will concurrently issue draft guidance on how it will interpret and apply the criterion, including its use in 303(d) listing.

The only alternative we considered for the adopted fine sediment criterion was to not move forward with rulemaking. The consequence of not revising sections of the rule that we agreed to in the Stipulated Order of Dismissal between NWEA, EPA, and Ecology is that we would be in violation of a legally binding agreement. Not meeting this agreement may also negatively affect our working relationship with EPA and negatively impact our relationship with NWEA.

Dissolved Oxygen

Do not revise freshwater DO criteria. The current dissolved oxygen criteria includes protection levels for the water column only and does not account for influences of temperature or elevation on dissolved oxygen. We would continue to have DO criteria that applies to alpine and subalpine areas that cannot physically meet oxygen requirements. Furthermore, early life stages of salmonids would not be fully protected.

Please see the Least Burdensome Alternative Analysis, Chapter 6 of this document, for discussion of alternative rule content considered.

C. RCW 34.05.328(1)(c) - A preliminary cost-benefit analysis was made available.

When filing a rule proposal (CR-102) under RCW 34.05.320, Ecology provides notice that a preliminary cost-benefit analysis is available. At adoption (CR-103 filing) under RCW 34.05.360, Ecology provides notice of the availability of the final cost-benefit analysis.

D. RCW 34.05.328(1)(d) – Determine that probable benefits of this rule are greater than its probable costs, taking into account both the qualitative and quantitative benefits and costs and the specific directives of the statute being implemented.

See Chapters 1 – 5.

E. RCW 34.05.328 (1)(e) - Determine, after considering alternative versions of the analysis required under RCW 34.05.328 (b), (c) and (d) that the rule being adopted is the least burdensome alternative for those required to comply with it that will achieve the general goals and specific objectives stated in Chapter 6.

Please see Chapter 6.

F. RCW 34.05.328(1)(f) - Determine that the rule does not require those to whom it applies to take an action that violates requirements of another federal or state law.

40 CFR 131.20 requires states and tribes (with primacy for clean water actions) to periodically review and update the Water Quality Standards. The adopted updates are reviewed and approved by the EPA before becoming effective for Clean Water Act actions.

G. RCW 34.05.328 (1)(g) - Determine that the rule does not impose more stringent performance requirements on private entities than on public entities unless required to do so by federal or state law.

The rule revisions do not impose more stringent performance requirements on private entities than on public entities as the rule applies to surface waters of the state. Any entity, whether public or private, must adhere to the rules protecting water quality in the state of Washington.

H. RCW 34.05.328 (1)(h) Determine if the rule differs from any federal regulation or statute applicable to the same activity or subject matter.

No.

If **yes**, the difference is justified because of the following:

☐ (i) A state statute explicitly allows Ecology to differ from federal standards. [If checked, provide the citation included quote of the language.]

☐ (ii) Substantial evidence that the difference is necessary to achieve the general goals and specific objectives stated in Chapter 6.

[If checked, explain.]

I. RCW 34.05.328 (1)(i) – Coordinate the rule, to the maximum extent practicable, with other federal, state, and local laws applicable to the same subject matter.

We will work with EPA to ensure that this rule is approvable and meets Clean Water Act requirements. We will also meet with tribes to help understand how the potential rule could impact water quality regulations in the Chelan River.

We worked with EPA during the litigation discussions, and they are supportive of us moving forward with a rulemaking that included the addition of a fine sediment criterion. The revisions will help EPA with their obligations in this lawsuit.