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PUGET SOUND

Further Actions Could Improve Efforts to Address Impaired Water Quality That Threatens Salmon

Accessible Version

Highlights of [GAO-24-105687](#), a report to congressional requesters

Further Actions Could Improve Efforts to Address Impaired Water Quality That Threatens Salmon

Why GAO Did This Study

Salmon in Washington State's Puget Sound region provide food and jobs for many people and hold particular cultural significance for Tribes in the region. However, Puget Sound salmon populations have declined, in part due to the degradation of water quality.

GAO was asked to review efforts to improve water quality to help recover salmon populations in Puget Sound. This report examines (1) how impaired water quality affects the health of Puget Sound salmon; (2) the extent to which EPA has worked with Ecology to develop impaired waters lists for the Puget Sound region since 2012; and (3) the actions EPA and Ecology have taken under the Clean Water Act to address impaired water quality in the region, and the challenges they face.

GAO examined federal, state, and other documents; interviewed officials and representatives from federal and nonfederal entities; and analyzed data from Washington's most recent impaired waters list.

What GAO Recommends

GAO reiterates its recommendation from 2013 that Congress should consider revising the Clean Water Act's largely voluntary approach to restoring waters impaired by nonpoint source pollution. GAO also recommends that EPA work with Ecology to develop a plan documenting the actions the agencies will take to meet the required submission and approval deadlines for Washington's impaired waters lists. EPA agreed with this recommendation and Ecology expressed some concerns about it. GAO maintains that the recommendation is warranted, as discussed in the report.

View [GAO-24-105687](#). For more information, contact J. Alfredo Gómez or Cardell D. Johnson at (202) 512-3841, gomezj@gao.gov or johnsoncd1@gao.gov.

What GAO Found

Water quality impairments—such as elevated water temperatures and toxic chemicals—have a variety of harmful effects on Puget Sound salmon. For example, scientists have discovered that a chemical in tire dust that enters water bodies via stormwater runoff is extremely toxic to some salmon species (see fig.).

Puget Sound Coho Salmon That Died Following Exposure to Stormwater Runoff



A carcass of a female coho salmon affected by the toxic chemical 6PPD-quinone in stormwater runoff in Seattle's Longfellow Creek. This salmon died before spawning, retaining nearly 100 percent of its eggs.

Source: Tiffany Linbo, National Oceanic and Atmospheric Administration. | [GAO-24-105687](#)

The Environmental Protection Agency (EPA) oversees the Washington State Department of Ecology's efforts to develop statewide lists of water bodies that do not meet water quality standards. The Clean Water Act and EPA regulations require states to develop these lists—known as impaired waters lists—every 2 years. Ecology has developed two such lists since 2012, but it completed these lists several years after the deadlines for doing so and has missed subsequent deadlines. EPA also has not met deadlines for reviewing and approving the lists. Because of the agencies' missed deadlines, the most recent list covered the 2014, 2016, and 2018 assessment cycles but was not finalized until 2022.

Missed deadlines can hamper entities working to improve water quality in the Puget Sound region by preventing them from having updated information to support their decision-making. However, EPA and Ecology have not yet developed a written plan to prevent further missed deadlines. By working with Ecology to develop such a plan, EPA could better ensure that timely water quality information will be available to Congress, other decision makers, and the public.

EPA and Ecology have taken various actions to improve water quality in Puget Sound but face challenges. For example, nonpoint source pollution from diffuse sources such as agricultural runoff contributes to impaired water quality. However, under the Clean Water Act, EPA does not have direct authority to require landowners to take prescribed actions to reduce such pollution. Supported in part by EPA funding, Ecology primarily relies on voluntary actions to address nonpoint source pollution. However, officials said there are limits to the progress that can be made through voluntary actions alone. In 2013, GAO recommended that Congress consider revising the act's approach to restoring waters impaired by nonpoint source pollution, but Congress has not yet acted on this recommendation.

Contents

GAO Highlights	ii
Letter	1
Background	7
Impaired Water Quality Has a Variety of Harmful Effects on Puget Sound Salmon	14
EPA Has Overseen Ecology's Development of Two Impaired Waters Lists Since 2012, but the Agencies Have Faced Challenges Meeting Required Deadlines	18
EPA and Ecology Have Taken a Range of Actions to Address Impaired Water Quality in the Puget Sound Region but Face Challenges	27
Conclusions	39
Matter for Congressional Consideration	40
Recommendation for Executive Action	40
Agency Comments, Third-Party Views, and Our Evaluation	41
Appendix I: Comments from the Environmental Protection Agency	44
Appendix II: Comments from the Washington State Department of Ecology	48
Appendix III: GAO Contacts and Staff Acknowledgments	55
GAO Contacts	55
Staff Acknowledgments	55
Figures	
Figure 1: Area Comprising the Puget Sound Region	8
Figure 2: General Puget Sound Salmon Life Cycle	9
Figure 3: Sources of Water Quality Impairment in the Puget Sound Region	11
Figure 4: Key Steps under the Clean Water Act for Identifying and Restoring Impaired Waters	13
Figure 5: Remains of a Puget Sound Coho Salmon That Experienced Prespawn Mortality Following Exposure to 6PPD-quinone in Stormwater Runoff	17
Figure 6: Timeline of Washington State Department of Ecology's Development of Impaired Waters Lists Since 2012	23
Figure 7: Ohop Creek Stormwater Management Pilot Project	35

Abbreviations

EPA	Environmental Protection Agency
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
TMDL	total maximum daily load

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November 8, 2023

The Honorable Cathy McMorris Rodgers
Chair
Committee on Energy and Commerce
House of Representatives

The Honorable Cliff Bentz
Chairman
Subcommittee on Water, Wildlife, and Fisheries
Committee on Natural Resources
House of Representatives

The Honorable Dan Newhouse
House of Representatives

Washington State’s Puget Sound is the second-largest estuary in the United States and is home to a wide variety of fish and other marine life, including economically and culturally important species such as salmon.¹ The rivers, lakes, and marine waters of the Puget Sound region support the life cycle of several species of salmon, which hatch and begin to develop in freshwater, migrate to the Pacific Ocean for their adulthood, and return to Puget Sound to spawn in the streams where they hatched.² Washington State documentation describes salmon as keystone species that can significantly affect the health of the broader Puget Sound ecosystem and are critical to the survival of other species that consume salmon. Salmon also figure prominently in Washington State’s commercial and recreational fishing industries, which are a key source of food and jobs for many people and communities. Moreover, Puget Sound

¹Estuaries and their surrounding wetlands are bodies of water usually found where rivers meet the sea.

²For the purposes of our report, we collectively refer to the five Pacific salmon species (Chinook, chum, coho, pink, and sockeye) and two related salmonids (steelhead and cutthroat trout) that are found in Puget Sound as Puget Sound salmon.

salmon have particular cultural significance for Tribes in the region, many of which have treaty rights to the fish in Puget Sound waters.³

However, Puget Sound salmon populations have declined, in some cases substantially, as human population and development in the region have expanded. For example, three salmon species—Puget Sound Chinook, Hood Canal summer-run chum, and Puget Sound steelhead—are listed as threatened under the Endangered Species Act, and the 2007 Puget Sound Salmon Recovery Plan reported that Puget Sound Chinook were at only 10 percent of their historic numbers.⁴ The Department of Commerce’s National Oceanic and Atmospheric Administration (NOAA) has identified several factors contributing to the decline in Puget Sound salmon populations, including the degradation of water quality.⁵ For example, NOAA found that stormwater runoff contaminated with toxic chemicals and other pollutants has contributed to salmon mortality and population decline, and that climate change may further degrade water quality for salmon by increasing water temperatures.

The Clean Water Act was enacted more than 50 years ago to restore and maintain the chemical, physical, and biological integrity of the nation’s waters.⁶ To achieve this objective, the act established a national goal for water quality that provides for the protection and propagation of fish and other wildlife. The Environmental Protection Agency (EPA) serves as the primary federal agency responsible for implementing the act, and EPA

³For the purposes of this report, the term “Tribes” refers to federally recognized Indian Tribes. As of January 2023, when the Department of the Interior’s Bureau of Indian Affairs published its most recent list of federally recognized Indian Tribes, there were 19 federally recognized Indian Tribes in the Puget Sound region.

⁴Shared Strategy for Puget Sound, *Puget Sound Salmon Recovery Plan, Volume I*, adopted by NOAA’s National Marine Fisheries Service on January 19, 2007 (Seattle, WA). NOAA has determined that Puget Sound steelhead is a distinct population segment and that Puget Sound Chinook and Hood Canal summer-run chum are evolutionarily significant units, which are stocks of Pacific salmon considered to be distinct populations and, therefore, “species” under the Endangered Species Act. See Policy on Applying the Definition of Species Under the Endangered Species Act to Pacific Salmon, 56 Fed. Reg. 58,612, 58,618 (Nov. 20, 1991).

⁵NOAA is responsible for the protection, conservation, and recovery of endangered and threatened marine and anadromous species, such as salmon, under the Endangered Species Act. Other factors NOAA has identified as contributing to the decline in Puget Sound salmon include degradation of habitat, harvest (i.e., fishing), hydropower development, and predation.

⁶33 U.S.C. § 1251(a). The Federal Water Pollution Control Act Amendments of 1972 are commonly referred to as the Clean Water Act. Pub. L. No. 92-500, 86 Stat. 816 (codified as amended at 33 U.S.C. §§ 1251-1389).

provides oversight of state efforts to implement programs under the act. The act established a nationwide approach to improve and maintain the quality of rivers, streams, lakes, and other water bodies, which involves different programs aimed at reducing pollution in the nation's waters. Under this approach, states are required to adopt and submit water quality standards to EPA for review and approval or disapproval. States then monitor and assess water quality against the applicable EPA-approved standards. In addition, every 2 years states are required to develop a list of water bodies that do not meet the standards. This list is known as the impaired waters list, or the 303(d) list.⁷

To restore impaired water bodies, EPA and the states implement a variety of programs that address different sources of pollution. In Washington State, the Department of Ecology leads the state's implementation of the act, including assessing water quality, identifying impaired waters, and issuing water quality permits.⁸ Other state agencies, Tribes, local governments, and nongovernmental organizations are also involved in efforts to improve water quality in Puget Sound, including through conducting research and funding and implementing projects.

You asked us to review efforts to improve water quality to help recover salmon populations in Puget Sound. This report examines (1) how impaired water quality affects the health of Puget Sound salmon; (2) the extent to which EPA has worked with the Washington State Department of Ecology to develop impaired waters lists for the Puget Sound region since 2012; and (3) the actions EPA and Ecology have taken under the Clean Water Act to address impaired water quality in the Puget Sound region, and the challenges they face in doing so.

To examine how impaired water quality affects the health of Puget Sound salmon, we reviewed agency and tribal documentation, such as NOAA's reports evaluating the status of Puget Sound salmon listed under the Endangered Species Act, as well as relevant scientific studies identified

⁷States are required to monitor and assess waters under section 305(b) of the act and to identify impaired waters under section 303(d). Specifically, section 303(d) requires each state to "identify those waters within its boundaries for which the [required] effluent limitations... are not stringent enough to implement any water quality standard applicable to such waters." 33 U.S.C. § 1313(d)(1)(A). EPA has recommended that states submit "integrated reports" that include the information gathered under both section 303(d) and section 305(b).

⁸Other state agencies, such as the Governor's Salmon Recovery Office and the Puget Sound Partnership, coordinate salmon recovery programs.

by NOAA or cited in agency reports. We also interviewed officials from NOAA, EPA, and Washington State agencies that are involved in water quality and salmon recovery issues, as well as representatives from two selected tribal organizations, to obtain their perspectives on the effects of impaired water quality on salmon health.⁹

We selected four water quality parameters—water temperature, dissolved oxygen, sediment, and toxic contaminants—to serve as illustrative examples of the effects that impaired water quality can have on salmon. The selection of these parameters is not intended to reflect their importance to salmon health compared with other water quality parameters. Rather, we selected these parameters to demonstrate a variety of ways impaired water quality can affect salmon health, based on our review of agency and tribal documents and scientific studies, as well as our interviews with federal and state officials and representatives from tribal organizations.

To examine the extent to which EPA has worked with Ecology to develop impaired waters lists for the Puget Sound region since 2012 (the 10-year period prior to the start of our review), we reviewed EPA and Ecology documents related to water quality assessments and the associated identification of impaired waters. For example, we reviewed EPA documents related to the agency's oversight of the water quality assessments and associated impaired waters lists, such as guidance memorandums and decision documents that present the results of its review of the state's impaired waters list.¹⁰ We also reviewed Ecology documents related to its development of impaired waters lists, including the agency's water quality assessment policy and supporting documentation. We assessed Ecology and EPA's actions to develop and approve Washington State's impaired waters lists against relevant requirements established in the Clean Water Act and associated federal regulations.

⁹The Washington State agencies we interviewed were the Department of Ecology, Governor's Salmon Recovery Office, Puget Sound Partnership, and Washington State Conservation Commission. The two tribal organizations were the Northwest Indian Fisheries Commission and the Puget Sound Tribal Management Conference. Representatives from 10 Tribes and a tribal consortium participated in our interview with the Tribal Management Conference, and we held a separate follow-up interview with one Tribe from the Tribal Management Conference at the Tribe's request.

¹⁰EPA generally issues a memorandum for each assessment cycle with guidance on developing impaired waters lists, available at <https://www.epa.gov/tmdl/integrated-reporting-guidance-under-cwa-sections-303d-305b-and-314>.

In addition, we interviewed EPA and Ecology officials about the actions their agencies have taken to identify impaired waters in the Puget Sound region. We also interviewed a nongeneralizable sample of representatives from two tribal organizations and seven external stakeholder groups to obtain their perspectives on the water quality assessments and impaired waters lists. We selected these groups to represent a range of interests and perspectives, including academic, business, conservation, and wastewater treatment entities.¹¹ While the results of these interviews cannot be generalized to all tribal entities and external stakeholder groups in the region, they do provide illustrative examples of different entities' experiences with the impaired waters lists and their perspectives on the strengths and shortcomings of the lists.

We also analyzed publicly available data from Ecology's water quality assessment database for the most current impaired waters list, which covered the 2014, 2016, and 2018 assessment cycles.¹² We focused our analysis on data from freshwater bodies and marine waters located in the Puget Sound region, using the water resource inventory areas established by Washington State.¹³ We limited the scope of our analysis to water bodies that Washington State has designated for aquatic life uses pertinent to the health of salmon.¹⁴ Consequently, the information we report from our data analysis does not include waters with other types of designated uses, such as shellfish harvesting and water supply. In total, we analyzed approximately 10,000 unique data records (which

¹¹The external stakeholder groups we interviewed were the Association of Washington Business; King County Department of Natural Resources and Parks; Lacey, Olympia, Tumwater, and Thurston County (LOTT) Clean Water Alliance; Northwest Environmental Advocates; Puget Soundkeeper; University of Washington Puget Sound Institute; and the Washington Association of Sewer and Water Districts.

¹²Ecology's water quality assessment database is available at <https://apps.ecology.wa.gov/ApprovedWQA/ApprovedPages/ApprovedSearch.aspx>.

¹³Washington State has divided the watersheds in the state into 62 water resource inventory areas. Ecology officials stated that areas 1–19 are located in the Puget Sound region, so we limited our analysis to data from those areas.

¹⁴Specifically, we analyzed data for waters with the following aquatic life designated uses: char spawning and rearing; core summer salmonid habitat; excellent quality; extraordinary quality; fair quality; general; good quality; salmonid rearing and migration only; salmonid spawning, rearing, and migration; and toxics. Ecology officials confirmed that these aquatic life designated uses are relevant to the health of Puget Sound salmon. Given our focus on surface water quality, we also limited our analysis to data records with "water" listed in the Medium Name field.

Ecology refers to as “listings”) from Washington State’s most current water quality assessment and associated impaired waters list.

We assessed the reliability of these data by reviewing Ecology and EPA documentation and interviewing and obtaining written responses from Ecology officials. In addition, we conducted electronic and manual testing to look for discrepancies in the data, such as missing values or values that were outside of the expected range. On the basis of the results of these steps, we determined that the data were sufficiently reliable for the purpose of describing the results of Ecology’s most current water quality assessment in the Puget Sound region.

To examine the actions EPA and Ecology have taken to address impaired water quality in the Puget Sound region and the challenges they face, we reviewed documents from EPA and state agencies involved in undertaking different types of actions under the Clean Water Act. For example, we reviewed Ecology documents related to the state’s water quality permitting program, as well as EPA documents related to its oversight of Ecology’s implementation of various programs under the act.

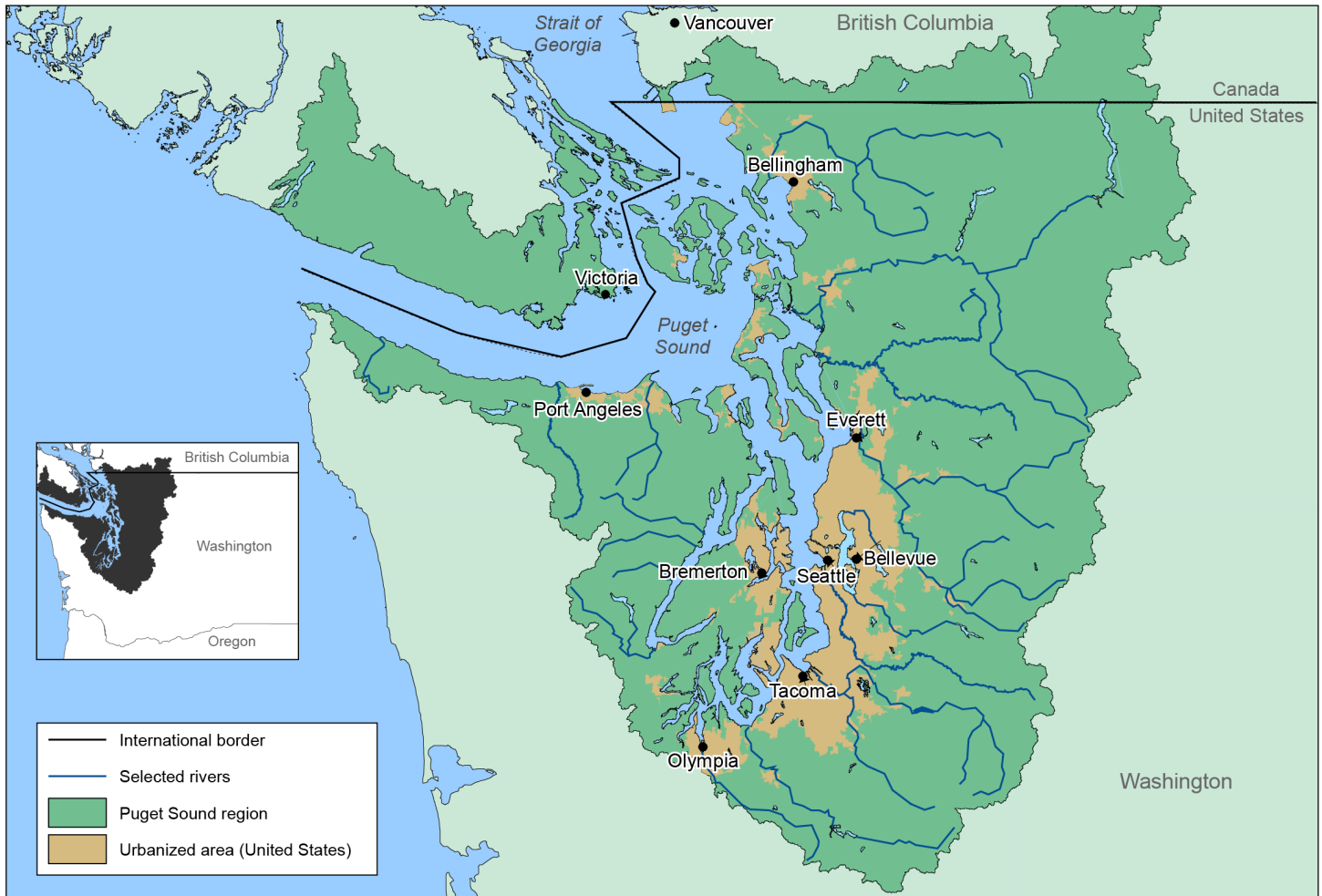
We also interviewed EPA and state agency officials about the different actions their agencies have taken to address impaired water quality in the Puget Sound region and the challenges they face in doing so. In addition, we obtained perspectives on these topics from our interviews with representatives from Puget Sound tribal organizations and external stakeholder groups described above. Because this was a nongeneralizable sample, the results of these interviews do not represent the views of all tribal entities and stakeholders involved in Puget Sound water quality and salmon recovery issues. However, they illustrate a range of perspectives on these topics. We also conducted a site visit to observe a project designed to improve water quality for salmon, led by a Tribe and two local entities with the support of funding from EPA and nonfederal sources.

We conducted this performance audit from February 2022 to November 2023 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Background

The Puget Sound region—also known as the Puget Sound basin—encompasses the southern half of the transboundary Salish Sea and spans much of western Washington State and portions of British Columbia, Canada, as shown in figure 1. The region covers more than 10,000 square miles, including about 2,800 square miles of inland marine waters and thousands of rivers and streams. The Puget Sound region features a wide variety of land uses, including highly urbanized areas, agricultural lands, commercial forests, and areas that are largely protected from development, such as national parks and wildlife refuges. As of 2022, approximately 5.3 million people lived in the Puget Sound region, and the population is expected to continue to grow in the future, according to state documentation.

Figure 1: Area Comprising the Puget Sound Region

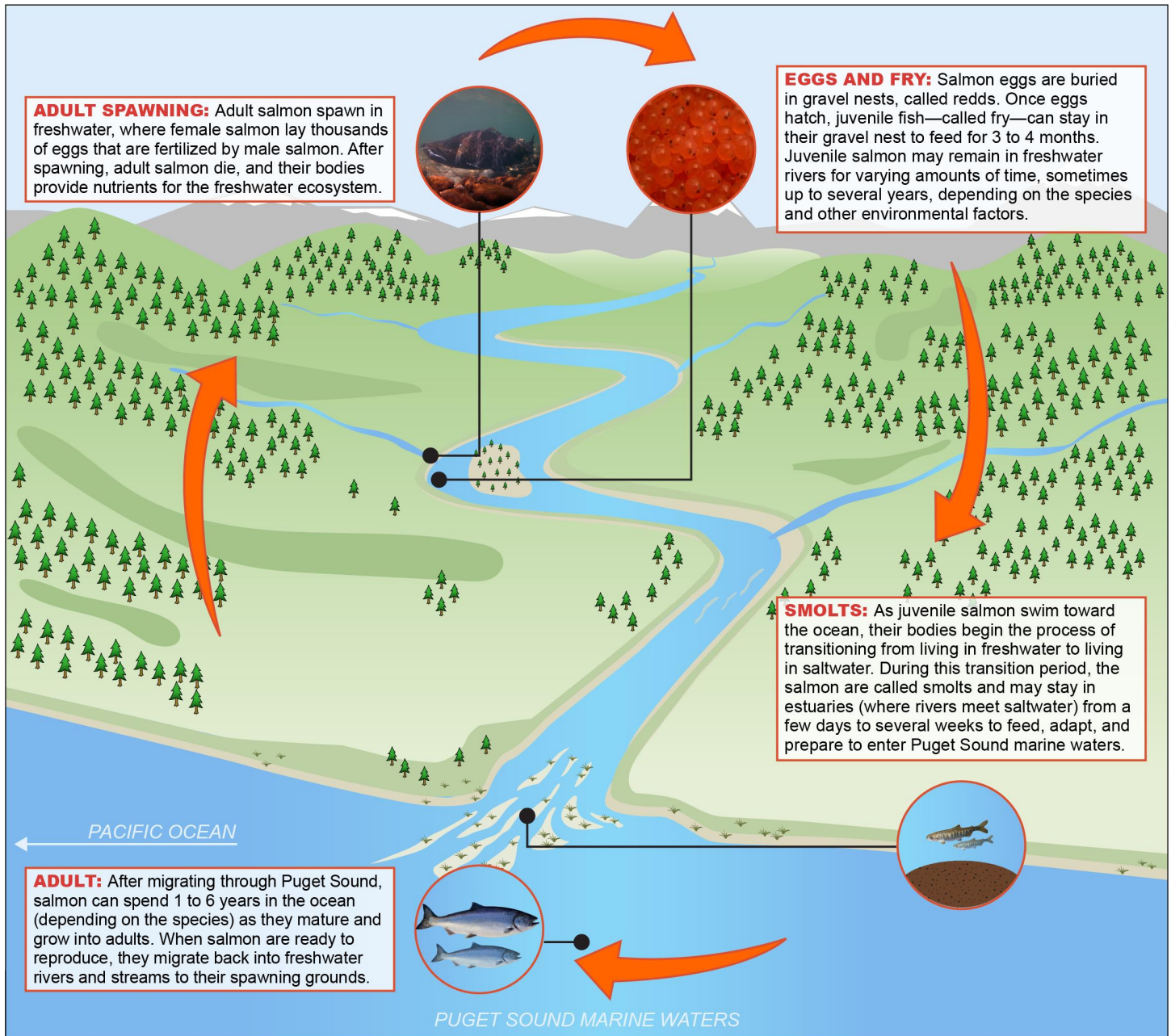


Sources: GAO analysis of data from the Department of Homeland Security, Puget Sound Partnership, U.S. Census Bureau, and U.S. Geological Survey, MapInfo. | GAO-24-105687

Note: The marine waters of Puget Sound and the Strait of Georgia are collectively known as the Salish Sea.

The Puget Sound region’s mix of fresh and marine water bodies supports salmon at different stages of their life cycle. Salmon are anadromous fish, which means that they begin their lives in freshwater bodies before migrating to the ocean to grow into adults and then return to freshwater to spawn. Figure 2 presents an overview of the salmon life cycle in Puget Sound.

Figure 2: General Puget Sound Salmon Life Cycle



Sources: GAO, National Oceanic and Atmospheric Administration (NOAA); Photos (clockwise from top left): John R. McMillan, NOAA; NOAA; Roger Tabor, U.S. Fish and Wildlife Service; and Betty Duncan, used by permission. | GAO-24-105687

Note: The different species of Puget Sound salmon generally follow a similar life cycle, as depicted above. This figure is intended to be illustrative and does not reflect all variations that exist between salmon species.

Declines in Puget Sound salmon populations over time led NOAA to list Puget Sound Chinook salmon and Hood Canal summer-run chum as threatened under the Endangered Species Act in 1999, followed by Puget Sound steelhead in 2007. In subsequent reviews, NOAA has continued to find that these species should remain listed as threatened. NOAA reported in 2022 that all three species are at moderate risk of extinction.¹⁵

NOAA and Washington State have identified impaired water quality as a key factor that has contributed to the decline in Puget Sound salmon and presents an ongoing challenge to efforts to recover salmon populations in the region. Salmon are vulnerable to impaired water quality in both freshwater and marine environments. A variety of pollution sources contribute to the impaired water quality in the Puget Sound region, including point sources that discharge pollutants from pipes or other discrete points, and nonpoint sources such as agricultural and stormwater runoff not covered by a permit (see fig. 3).¹⁶ In addition, several other factors that are beyond the scope of this report have played important roles in the decline of Puget Sound salmon, including habitat degradation (such as the loss of riparian areas along water bodies to development and agriculture), harvest by people, hydropower development, and predation (such as by seals).

¹⁵U.S. Department of Commerce, *Biological Viability Assessment Update for Pacific Salmon and Steelhead Listed Under the Endangered Species Act: Pacific Northwest*, Michael J. Ford, ed., NOAA Technical Memorandum NMFS-NWFSC-171 (January 2022).

¹⁶Permits under federal and state laws, including the federal Clean Water Act, are issued for some stormwater runoff. For example, the Department of Ecology issues stormwater permits for Washington State's most-populated cities and counties, as well as some industrial sites, construction sites, and businesses, to control surface and groundwater pollution from runoff.

Figure 3: Sources of Water Quality Impairment in the Puget Sound Region



Sources of water quality impairment include pollution by point sources, such as factories and wastewater treatment plants that discharge wastewater from pipes or other discrete points, and nonpoint sources, such as agricultural runoff from fields and livestock, septic systems, timber harvest operations, vessel pollution, and stormwater runoff not covered by a permit.

Source: GAO analysis of state agency documentation; GAO (icons). | GAO-24-105687

Under the Clean Water Act, states are required to establish water quality standards and to review and update, as appropriate, these standards every 3 years. Water quality standards include designated uses for

waters covered by the act and water quality criteria based on such uses.¹⁷ Designated uses take into consideration the use and value of a water body, such as for a public drinking water supply or the protection and propagation of fish, shellfish, and other wildlife. Water quality criteria generally describe the chemical, physical, and biological conditions—such as the dissolved oxygen levels and water temperatures—necessary to achieve and protect the designated uses.¹⁸

States adopt and submit water quality standards to EPA for review and approval or disapproval.¹⁹ Once standards are approved, states are to monitor and assess their water bodies to determine the degree to which the standards are being met. States are required to report biennially to EPA on the quality of their waters, and states generally fulfill this requirement by submitting integrated reports to EPA that include, among other things, the state's impaired waters list.

To improve the condition of water bodies identified as impaired, the act requires states to develop pollutant budgets, known as “total maximum daily loads” (TMDL), generally for each pollutant impairing a water body. The goal of developing a TMDL is to inform the actions needed to address point and nonpoint sources of pollution to meet water quality standards and restore impaired water bodies. A TMDL does this by establishing a numeric target for a specific pollutant reflecting the maximum amount of the pollutant that can be present in a water body and still meet water quality standards. A TMDL also assigns pollutant allocations to all point and nonpoint sources of pollution that discharge into waters covered by the TMDL, identifying the allowable amount of the

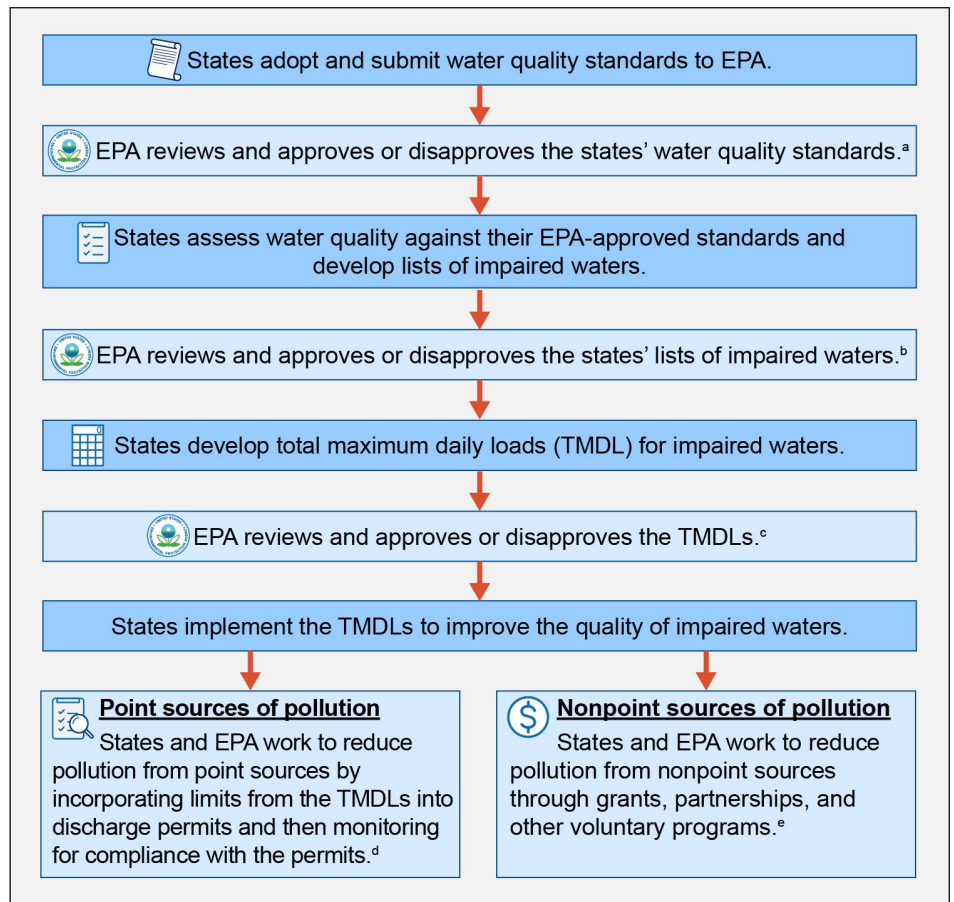
¹⁷EPA regulations provide that state water quality standards are also to include an antidegradation policy to, among other things, maintain and protect the existing uses and the level of water quality necessary to protect those uses. 40 C.F.R. §§ 131.6(d), 131.12(a).

¹⁸Water quality criteria are constituent concentrations, levels, or narrative statements representing a quality of water that supports a particular designated use for a given water body. The act requires EPA to establish and revise recommended national water quality criteria, which states can adopt. States can also develop their own criteria, subject to EPA approval. EPA-recommended criteria are to reflect the latest scientific knowledge on the kind and extent of all identifiable effects of the pollutants on health and welfare, including fish, among other things.

¹⁹EPA reviews state water quality standards based on whether they are consistent with requirements of the Clean Water Act and EPA regulations. If EPA determines that a standard is not consistent with the applicable requirements, EPA is to notify the state and specify the changes to meet such requirements. If the state does not adopt such changes, EPA is to promulgate standards for the state. 33 U.S.C. § 1313(c)(3); 40 C.F.R. §§ 131.21(a), 131.22(a).

pollutant among pollutant sources in quantities low enough to meet the numeric target. These allocations are known as wasteload allocations for point sources, and load allocations for nonpoint sources. Figure 4 provides an overview of key steps under the act for identifying and restoring impaired waters.

Figure 4: Key Steps under the Clean Water Act for Identifying and Restoring Impaired Waters



Source: GAO analysis of the Clean Water Act and Environmental Protection Agency (EPA) regulations and information; GAO (icons), EPA (seal). | GAO-24-105687

Note: This figure presents a general overview of key steps under the act and does not include all requirements or additional actions that states may take to help implement these key steps.

^aIf EPA disapproves a state's water quality standards, EPA is to notify the state and specify the changes needed to meet the requirements of the Clean Water Act and EPA regulations. If the state does not adopt such changes, EPA is to promulgate water quality standards for the state.

^bIf EPA disapproves a state's list of impaired waters, EPA is to identify any additional impaired waters in the state.

^cIf EPA disapproves a state's TMDL, EPA is to establish a TMDL for the impaired waters.

^dPoint sources of pollution—such as wastewater treatment plants and industrial facilities—discharge pollutants from pipes or other discrete points.

^eNonpoint sources of pollution include pollution from diffuse sources, such as agricultural and stormwater runoff not covered by a permit.

Tribal treaty rights play an important role in efforts to improve water quality and recover salmon in the Puget Sound region. In particular, 17 of the 19 federally recognized Tribes in the region have treaty rights to the fish in Puget Sound waters, according to documentation from a tribal organization.²⁰ These Tribes and Washington State co-manage Puget Sound salmon fisheries. In addition, as part of Washington State's government-to-government relationship with Tribes in the state, Ecology shares its water quality assessment results, including the impaired waters list, with the Tribes for review and comment before holding a public comment period and submitting the assessment results to EPA.²¹

Impaired Water Quality Has a Variety of Harmful Effects on Puget Sound Salmon

Impaired water quality has a variety of harmful effects on the health and survival of Puget Sound salmon in both marine and freshwater environments at different stages of their life cycle, according to NOAA documents. The effects of impaired water quality on salmon health are multifaceted, including direct effects, such as changes to salmon physiology, and indirect effects caused by reductions in food sources. Impaired water quality can result in both lethal and nonlethal effects on salmon, and the interaction of different types of impairments may exacerbate the risks that salmon face.

Salmon require cool, clean, and well-oxygenated water for their health and survival and are vulnerable to a range of water quality impairments.

²⁰In 1974, a federal court held that the treaty Tribes had the right to take up to 50 percent of the harvestable fish in areas where fishing rights had been reserved, an allocation upheld by the Supreme Court in 1979. *Washington v. Washington State Commercial Passenger Fishing Vessel Association*, 443 U.S. 658 (1979); *United States v. Washington*, 384 F. Supp. 312 (W.D. Wash. 1974).

²¹Washington State does not have Clean Water Act authority on tribal lands. Instead, EPA or the governing Tribe implements the act's programs on tribal lands. Therefore, Washington State's impaired waters list does not address waters located on such lands. Ecology officials said that the agency also shares updates to its water quality assessment policy—which, among other things, describes the methodologies and data requirements established for the assessment—with the Tribes for review and comment as part of the state's assessment process.

Water quality impairment threats include parameters such as water temperature, dissolved oxygen, sediment, and toxic contaminants (including some emerging contaminants, about which less is known). For example:

- **Water temperature.** Salmon require a specific range of water temperature for their metabolism to adequately support activity, growth, and reproduction. Water temperatures below the optimal range result in salmon moving more slowly and struggling to catch food or avoid predation, while temperatures exceeding the optimal range deplete oxygen and energy supplies and increase stress hormones. Research has found that warm stream temperatures can delay or prevent salmon migration, increase susceptibility to certain diseases, and be lethal when exceeding certain thresholds at different life stages.²² For example, the Lummi Nation reported that elevated water temperatures in the Nooksack River in 2021 contributed to the spread of pathogens that killed an estimated 2,500 Chinook salmon before the salmon could spawn.
- **Dissolved oxygen.** Research has shown that low levels of dissolved oxygen can affect salmon growth and development at different life stages.²³ For example, low levels of dissolved oxygen can alter embryo incubation periods, decrease the size of fry, increase the likelihood of predation, decrease feeding activity, and negatively affect swimming performance during migration. Under extreme conditions, low dissolved oxygen concentrations can be lethal to salmon.
- **Sediment.** Freshwater sediment accumulation from human activities such as agriculture, development, and timber harvest can cover salmon egg nests—called redds—and suffocate the eggs, according to NOAA documentation. Sediment can also increase turbidity, which can pose a threat to salmon health by hindering visibility and making it more difficult to find prey.²⁴

²²For example, see University of Washington Climate Impacts Group, “*State of Knowledge: Climate Change in Puget Sound*,” Report prepared for the Puget Sound Partnership and NOAA (Seattle, WA: November 2015).

²³For example, see Washington State Department of Ecology, *Evaluating Criteria for the Protection of Freshwater Aquatic Life in Washington’s Surface Water Quality Standards Dissolved Oxygen Draft Discussion Paper and Literature Summary*, 00-10-071 (Olympia, WA: December 2002).

²⁴Turbidity is a measure of water clarity. High turbidity makes water appear cloudy or muddy.

- **Toxic contaminants.** Salmon are exposed to potential harm from a wide range of toxic contaminants that enter marine and freshwater bodies through different human activities, according to EPA. Some toxic contaminants—such as mercury and copper—are long known, while others have only recently been identified. For example, researchers recently discovered that 6PPD-quinone—a chemical found in tire dust that enters water bodies via stormwater runoff—is extremely toxic to some salmon species and threatens the survival of populations of coho salmon in the Puget Sound region.²⁵ A 2022 study found 6PPD-quinone in stormwater runoff to be lethal within hours of exposure for juvenile coho, and within 2 days of exposure for juvenile steelhead and Chinook salmon.²⁶ Prior studies found similar effects for adult coho, with nearly all affected adult female coho dying before spawning (see fig. 5).²⁷ NOAA officials told us that the effects of many other toxic contaminants—including some contaminants found in stormwater runoff—on salmon health are unknown.

²⁵6PPD-quinone derives from 6PPD, a tire compound used to reduce the breakdown of rubber in tires. In 2020, researchers identified 6PPD-quinone as the chemical causing the severe mortality in coho salmon in urban streams in the Puget Sound region that had been studied for 20 years. See Zhenyu Tian et al., “A Ubiquitous Tire Rubber-derived Chemical Induces Acute Mortality in Coho Salmon,” *Science*, vol. 371, no. 6525 (2020): 185-189.

²⁶B. F. French et al., “Urban Roadway Runoff Is Lethal to Juvenile Coho, Steelhead, and Chinook Salmonids, But Not Congeneric Sockeye,” *Environmental Science & Technology Letters*, vol. 9 (2022): 733–738.

²⁷For example, see N. L. Scholz et al., “Recurrent Die-Offs of Adult Coho Salmon Returning to Spawn in Puget Sound Lowland Urban Streams,” *PLoS One*, vol. 6, no. 12 (2011).

Figure 5: Remains of a Puget Sound Coho Salmon That Experienced Prespawn Mortality Following Exposure to 6PPD-quinone in Stormwater Runoff



A carcass of a female coho salmon affected by the toxic chemical 6PPD-quinone in stormwater runoff in Seattle's Longfellow Creek. This salmon died before spawning, retaining nearly 100 percent of its eggs.

Source: Tiffany Linbo, National Oceanic and Atmospheric Administration. | GAO-24-105687

Fish stressed by any single water quality parameter—such as high water temperature—are less able to handle other stressors, such as toxic contaminants or pathogens. Multiple water quality impairments often affect salmon simultaneously, and impairment by some parameters can exacerbate the effects of impairment from other parameters. For example, increasing water temperature decreases dissolved oxygen levels and can significantly increase the toxicity of some organic chemicals and metals.²⁸ NOAA officials stated that much remains unknown about the cumulative effects of multiple water quality impairments on salmon.

In addition, NOAA officials stated that the effects of climate change may further exacerbate the water quality challenges facing Puget Sound salmon. For example, salmon require a specific range of water volume in freshwater rivers and streams at different life stages, but climate change

²⁸Ann Richter and Steven A. Kolmes, "Maximum Temperature Limits for Chinook, Coho, and Chum Salmon, and Steelhead Trout in the Pacific Northwest," *Reviews in Fisheries Science*, vol. 13, no. 1 (2005): 23-49.

is expected to reduce summertime stream flows, which can lead to increased water temperatures. Research has shown that warming stream temperatures and changes to seasonal stream flows are expected to hamper salmon spawning, migration, habitat suitability, and survival.²⁹

EPA Has Overseen Ecology’s Development of Two Impaired Waters Lists Since 2012, but the Agencies Have Faced Challenges Meeting Required Deadlines

EPA has overseen the Washington State Department of Ecology’s efforts to develop two statewide impaired waters lists since 2012—which collectively covered four assessment cycles—that included the Puget Sound region. However, Ecology has faced challenges in meeting the biennial deadline for developing the lists and has instead completed the lists several years late.³⁰ EPA has similarly faced challenges in completing its review of the impaired waters lists in a timely fashion. Ecology is now behind most other states in developing impaired waters lists and has missed the deadlines for developing the lists that were due in 2020 and 2022. EPA and Ecology have held discussions about how to submit more timely impaired waters lists, but they have not yet developed a written plan to prevent additional missed deadlines from occurring in the future.

EPA Has Overseen Ecology’s Development of Two Impaired Waters Lists Since 2012

Ecology has conducted two water quality assessments since 2012 that, among other things, identified lists of impaired waters throughout the state, including in the Puget Sound region. The first impaired waters list during this period covered the 2012 assessment cycle, and the second was a combined list that covered the 2014, 2016, and 2018 assessment

²⁹University of Washington Climate Impacts Group, “*State of Knowledge: Climate Change in Puget Sound*.”

³⁰Under the Clean Water Act and EPA regulations, states are to assess water quality and develop impaired waters lists on a biennial basis in every even-numbered year. See 33 U.S.C. §§ 1313(d), 1315(b); 40 C.F.R. § 130.7(d)(1).

cycles.³¹ In its oversight role, EPA is responsible for reviewing the draft assessments and impaired waters lists to determine whether Ecology has complied with applicable statutory and regulatory requirements. In doing so, EPA is to approve or disapprove the impaired waters lists prepared by Ecology. If EPA disapproves Ecology's list, EPA is to identify any additional impaired waters in the state. For example, as a result of its review of the 2018 draft water quality assessment, EPA determined that additional water bodies should be included on Washington State's impaired waters list.

To conduct the assessments and develop the lists of impaired waters, Ecology collects water quality monitoring data through its own data gathering efforts and from external sources, including federal, state, and local agencies, as well as Tribes and nongovernmental groups. Ecology then evaluates the data and assigns the water bodies to one of five assessment categories, which Ecology defines as follows:

- Category 1 – water bodies that meet the state's water quality standards.
- Category 2 – water bodies that have some evidence of a water quality problem but not enough to show persistent impairment; Ecology refers to these water bodies as "waters of concern."
- Category 3 – water bodies with insufficient data to determine their status.
- Category 4 – impaired water bodies that do not require a TMDL.³²
- Category 5 – impaired water bodies that require a TMDL; this category represents the impaired waters list.

³¹For the purposes of our report, we refer to the combined 2014 through 2018 list as the 2018 impaired waters list, and we refer to the assessment that Ecology conducted to develop this combined list as the 2018 water quality assessment. Whereas the 2012 impaired waters list only covered freshwater bodies, the 2018 impaired waters list included both fresh and marine water bodies.

³²As discussed above, TMDLs are pollutant budgets that, among other things, establish numeric targets reflecting the maximum amount of a pollutant that can be present in a water body and still meet water quality standards. Ecology may assign an impaired water body to Category 4 for three reasons, which Ecology defines as: Category 4a if the water body already has an EPA-approved TMDL in place and implemented; Category 4b if the water body has a pollution control program, similar to a TMDL, in place that is expected to solve the pollution problems; and Category 4c if the water body is impaired by causes that cannot be addressed through a TMDL, such as low water flow or invasive exotic species.

After Ecology completes its analysis, the agency shares the preliminary draft water quality assessment results with Tribes in the state for review and comment, as well as with EPA for an early review. Ecology revises the assessment results, as needed, following these reviews and then holds a public comment period on the draft assessment and impaired waters list. Following the public comment period, Ecology submits the final draft assessment and impaired waters list to EPA for formal review and approval or disapproval.³³

We analyzed data from the final 2018 water quality assessment for records in the Puget Sound region, each of which represents a unique combination of a water body segment and a specific pollutant parameter that Ecology assessed.³⁴ We found that Ecology identified nearly 1,900 records of impaired surface waters in the region from fresh and marine water bodies designated for aquatic life uses pertinent to the health of salmon.³⁵ Nearly 1,500 of these records were rated as Category 5 and were, therefore, included on the state's impaired waters list. We found that temperature and dissolved oxygen were the most common types of impairment Ecology identified for these water bodies, accounting for approximately 80 percent of the Category 5 records in the data we examined. As described above, such impairments may pose risks to the health of salmon in the Puget Sound region.

³³As part of this submission, Ecology also provides EPA with a description of the methodology used to develop the impaired waters list and a priority ranking of impaired waters for TMDL development, among other things.

³⁴Water body segments vary in size. Some smaller water bodies may be analyzed as a single water body segment, whereas larger water bodies may be divided into multiple segments for the purpose of the assessments. If Ecology assessed a water body segment for multiple parameters, there would be multiple records for that segment in the assessment data, and these records could receive different ratings for different pollutant parameters. For example, a water body segment could have one record rated as Category 5 for one parameter and another record rated as Category 1 for a different parameter. Each record is also unique to a specific sample type (such as water, fish tissue, or sediment), which is referred to as the "medium" in the assessment data. As described above, we limited our analysis to records with "water" listed in the Medium Name field.

³⁵As part of Washington's water quality standards, the state assigns designated uses for water bodies and then develops water quality criteria designed to protect the designated uses. For freshwater bodies, Washington State has established four broad groups of designated uses, one of which—aquatic life uses—includes several uses (such as "core summer salmonid habitat") that are pertinent to the health of salmon. For marine water bodies, Washington State has also established four broad groups of designated uses, including aquatic life uses that are pertinent to the health of salmon. See Wash. Admin. Code §§ 173-201A-200(1), 173-201A-210(1).

EPA regulations require states to assemble and evaluate all existing and readily available water quality-related data and information to develop their impaired waters lists.³⁶ As part of its review of Washington State's 2012 and 2018 water quality assessments and impaired waters lists, EPA reported that the state had complied with this requirement. Nonetheless, the water quality assessments only covered a portion of the state's water bodies because of limitations in the availability of monitoring data, according to Ecology documentation and officials. For example, Ecology has reported that the 2018 assessment covered approximately 15 percent of the state's total water bodies, and Ecology officials said that the 2012 assessment covered approximately 13 percent of the state's water bodies.³⁷ Consequently, the impairment status of many water bodies in Washington State is unknown, and the state's impaired waters list likely does not include all impaired water bodies in the state, including in the Puget Sound region.

Even for the waters that were assessed, the available data were often insufficient to determine their impairment status. We found that more than half of the nearly 10,000 records in the Puget Sound region that we reviewed from the 2018 assessment were rated as Category 3. As noted above, this means that the available data were insufficient to determine the impairment status for the specific parameter being assessed.³⁸ This situation was common for water body segments that Ecology had assessed for toxics, such as copper and mercury, as nearly 85 percent of these records in the data we reviewed were rated as Category 3. Moreover, some emerging toxics, such as 6PPD-quinone, that had limited or no monitoring data available at the time of the assessment, were not

³⁶40 C.F.R. § 130.7(b)(5). EPA regulations further specify that, at a minimum, "all existing and readily available water quality-related data and information" includes, but is not limited to, all of the existing and readily available data and information about certain specified categories of waters, including waters identified by the state in its most recent section 305(b) report as "partially meeting" or "not meeting" designated uses or as "threatened." *Id.* § 130.7(b)(5)(i).

³⁷Ecology officials stated that the percentage of water bodies assessed in the Puget Sound region was likely higher than the statewide average, but they were unable to quantify how much higher. Ecology determined the percentage of total water bodies assessed in the state by calculating the percentage of stream miles assessed; the percentage of marine square miles assessed; and the percentage of unique lake water bodies assessed, according to agency officials.

³⁸As described above, multiple records can cover the same water body segment if the segment was assessed for multiple pollutant parameters. Consequently, it is possible for a water body segment to be rated as Category 3 for one parameter and to receive different ratings for other parameters.

included at all.³⁹ As described above, toxics pose risks to salmon health. However, the results of the 2018 assessment show that only limited information is available on the extent to which toxics have impaired surface waters in the Puget Sound region that are designated for aquatic life uses pertinent to the health of salmon.⁴⁰

EPA officials said that there are not enough resources to collect all of the data needed to make impairment determinations for all pollutant parameters in all of Washington State's waters. Ecology officials similarly stated that it is not possible to biennially assess all of the state's water bodies and that the assessments are limited to water bodies where monitoring data exist. Washington State is not unique among states in being unable to assess all of its water bodies. According to EPA's website, many states target their limited monitoring resources to waters of interest and assess only a small percentage of their total waters.

EPA and Ecology Have Faced Challenges Meeting Required Deadlines for the Impaired Waters Lists

EPA regulations implementing the Clean Water Act require states to develop impaired waters lists on a biennial basis and to submit those lists to EPA by April 1 of every even-numbered year.⁴¹ However, since 2012, Ecology has consistently not met this deadline and has submitted its lists for Washington State several years late (see fig. 6). For example, Ecology did not submit the state's 2012 impaired waters list to EPA until 2015. Additionally, Ecology did not submit separate impaired waters lists for the 2014 and 2016 assessment cycles, but rather for its 2018 impaired waters list, the agency submitted a combined list that also covered the

³⁹Water quality standards have not yet been established for 6PPD-quinone, but Ecology officials said that monitoring of 6PPD-quinone in the Puget Sound region has increased following the discovery in 2020 of the link between this chemical and threats to salmon health. The officials said that future water quality assessments could include information on 6PPD-quinone as long as the monitoring data meet the state's data quality requirements. The officials further stated that in the absence of applicable water quality standards and criteria, Ecology would evaluate data on 6PPD-quinone under the agency's narrative standards and data requirements described in its water quality assessment policy.

⁴⁰Ecology also assesses the level of toxics in fish tissue and in sediment as part of its water quality assessments, according to agency officials. Given our focus on surface water quality, we did not include data on toxics in fish tissue and sediment as part of our data analysis.

⁴¹40 C.F.R. § 130.7(d)(1).

previous two assessment cycles.⁴² Ecology did not submit the 2018 combined list of impaired waters to EPA until August 2021, more than 3 years after the deadline for doing so.

Figure 6: Timeline of Washington State Department of Ecology’s Development of Impaired Waters Lists Since 2012

Action	Required deadline	Date when the action was taken
Submit the 2012 impaired waters list to EPA	April 2012	September 2015 ^a
Submit the 2014 impaired waters list to EPA	April 2014	August 2021 (Ecology submitted a combined 2014-2018 list)
Submit the 2016 impaired waters list to EPA	April 2016	
Submit the 2018 impaired waters list to EPA	April 2018	
Submit the 2020 impaired waters list to EPA	April 2020	2024 (expected) ^b
Submit the 2022 impaired waters list to EPA	April 2022	

Source: GAO analysis of Environmental Protection Agency (EPA) and Washington State Department of Ecology documentation. | GAO-24-105687

⁴²EPA allows states to submit combined impaired waters lists that cover multiple assessment cycles when a state falls behind on its submissions. For example, in a March 2021 guidance memo, EPA stated that if a state is significantly behind in submitting an integrated report (which includes the impaired waters list), one option to catch up with a late submission while also meeting the reporting deadline for the current cycle is to combine the integrated report submissions. The guidance states that the strategy of combining integrated report submissions is not intended to obviate the requirement to submit an integrated report every 2 years. Rather, according to the guidance, the strategy has been employed for states to catch up on their past impaired waters lists; submit their current integrated report on time; and subsequently maintain the biennial reporting cycle.

Data Table for Figure 6: Timeline of Washington State Department of Ecology’s Development of Impaired Waters Lists Since 2012

Action	Required deadline	Date when the action was taken
Submit the 2012 impaired waters list to EPA	April 2012	September 2015(a)
Submit the 2014 impaired waters list to EPA	April 2014	August 2021 (Ecology submitted a combined 2014-2018 list)
Submit the 2016 impaired waters list to EPA	April 2016	
Submit the 2018 impaired waters list to EPA	April 2018	
Submit the 2020 impaired waters list to EPA	April 2020	2024 (expected)(b)
Submit the 2022 impaired waters list to EPA	April 2022	

Source: GAO analysis of Environmental Protection Agency (EPA) and Washington State Department of Ecology documentation.. | GAO-24-105687

^aEcology originally submitted the 2012 impaired waters list to EPA in September 2015, followed by several amendments containing corrections and additional documentation, with a final submission to EPA in June 2016.

^bEcology expects to submit a combined 2020 and 2022 impaired waters list to EPA in 2024, according to officials.

Ecology officials said that several factors have contributed to the agency’s challenges in meeting the required deadlines for developing Washington State’s impaired waters lists. For example:

- Ecology officials said that the agency assesses a larger amount and wider variety of water quality data for Washington State than is assessed by other states, which takes additional time to complete. The officials also said that the amount of data that Ecology assesses has increased over time, with the agency analyzing approximately 66 million data points statewide (most of which were related to water temperature) for the 2018 water quality assessment. As a result, the officials stated that the size and complexity of the work required to develop impaired waters lists has grown, while the time frames for developing those lists have remained the same.
- Ecology experienced delays in developing the impaired waters lists while it was implementing technical changes to help analyze and manage the larger amount of water quality data that the agency is required to assess, according to the officials. For example, Ecology completed a multiyear effort to develop a new information technology application to automate much of the data collection and analysis process. Ecology officials said this new application is intended to

improve the future efficiency of the assessment process, though the time needed to develop the system contributed to delays.

- Washington State has more extensive tribal and public outreach processes than other states, according to the officials. For example, Ecology allows time for public review at multiple points in the process of developing the impaired waters lists. In addition, as discussed above, as part of the state's government-to-government relationship with Tribes, Ecology provides Tribes with a separate review and comment period for the draft assessment results and impaired waters lists prior to the broader public comment period.
- Ecology made changes to its water quality assessment policy to reflect updates to the state's water quality standards. Ecology officials said that the agency updates its assessment policy between every assessment cycle. Moreover, the officials said that changes to this policy require additional review and comment periods for Tribes and the public, as well as a response from the agency to any comments received, all of which take time and must be completed before Ecology can assess the data.

In addition, EPA has faced challenges in completing its review of Washington State's impaired waters list in a timely fashion. The Clean Water Act and EPA regulations require EPA to approve or disapprove impaired waters lists not later than 30 days after their submission.⁴³ However, EPA took approximately 9 months to complete its initial review of the 2018 list, further contributing to the delay in finalizing the state's impaired waters list.⁴⁴ EPA officials stated that a variety of factors contributed to the review taking longer than 30 days, including the large scope of the submission since it covered three assessment cycles. The officials said that EPA also needed to spend additional time reviewing the legal implications of its decisions, given the potential for stakeholder litigation related to EPA's role in approving Ecology's impaired waters lists. Ecology officials stated that delays in EPA's approval of the impaired waters list make it more difficult for Ecology to meet its deadlines for the

⁴³33 U.S.C. § 1313(d)(2); 40 C.F.R. § 130.7(d)(2).

⁴⁴On June 8, 2022, EPA completed its initial review in which it partially approved and partially disapproved Washington State's impaired waters list and identified additional water bodies that should be included on the list. EPA then held a public comment period on the proposed additions before completing its final review on August 26, 2022, nearly one year after Ecology had originally submitted the draft assessment results and impaired waters list.

next assessment cycle, as Ecology is limited in the progress it can make on a new list until the previous one is approved.

Timely impaired waters lists serve many important purposes, including providing Congress, federal and state agencies, Tribes, other entities, and the public with current information on the quality of assessed water bodies that can be used in various ways. For example, Ecology has reported that the information in the water quality assessment and associated impaired waters list helps the agency focus its limited resources on the most impaired water bodies. In addition, one tribal organization and one state agency we interviewed said they use the lists to help inform funding decisions, such as the awarding of grants for projects to improve water quality.

The lists also play an important role in improving water quality by identifying waters that require TMDLs and helping to inform the subsequent pollution control efforts called for in the TMDLs, including setting pollutant discharge limits in water quality permits. Consequently, missed deadlines in developing the biennial impaired waters lists may prevent federal and state agencies, Tribes, and other entities from having updated information to support their decision-making. In addition, EPA and Ecology officials said that the missed deadlines can hamper the state's efforts to create new TMDLs and update water quality permits.

EPA headquarters has highlighted the importance of meeting deadlines for developing impaired waters lists, stating in a 2021 memo to the agency's regional offices that the timely submission and review of these lists is "critical to meet states' and EPA's responsibilities under the Clean Water Act."⁴⁵ The memo encouraged EPA regional offices to work with each state to facilitate the development of tailored plans for state submittal of timely impaired waters lists and timely EPA action on those lists. EPA Region 10 officials said they have held discussions with Ecology about how to submit timely impaired waters lists.⁴⁶ However, the officials said they have not yet developed a written plan with Ecology to ensure that the agency submits timely impaired waters lists in the future,

⁴⁵Environmental Protection Agency, Director of the Office of Wetlands, Oceans, and Watersheds, *Information Concerning 2022 Clean Water Act Section 303(d), 305(b), and 314 Integrated Reporting and Listing Decisions*, Memorandum to the Water Division Directors of Regions 1–10 (Mar. 31, 2021).

⁴⁶EPA Region 10 includes the states of Alaska, Idaho, Oregon, and Washington.

in part because of the complexities associated with the state's assessment process and the potential for litigation, as described above.

Without having a plan that documents how EPA and Ecology will achieve more timely development and approval of Washington State's impaired waters lists, the missed deadlines that have occurred since 2012 are at risk of continuing. For example, the deadlines for developing the impaired waters lists that were due in 2020 and 2022 have already passed, and Ecology has announced that it does not expect to complete its next list (which will cover the 2020 and 2022 assessment cycles) until 2024. EPA officials said that Washington State is an outlier compared with other states in this regard, and EPA's data show that Washington was one of only three states that had not submitted either its 2020 or 2022 impaired waters lists as of August 2023. By working with Ecology to develop a plan documenting the actions the agencies will take to meet the required submission and approval deadlines for Washington's impaired waters lists, EPA could better ensure that timely water quality information will be available to Congress, other decision makers, and the public.

EPA and Ecology Have Taken a Range of Actions to Address Impaired Water Quality in the Puget Sound Region but Face Challenges

Under the Clean Water Act, EPA and the Washington State Department of Ecology have developed TMDLs for some impaired water bodies in the Puget Sound region and have taken regulatory and nonregulatory actions intended to improve water quality. However, EPA and Ecology face a variety of challenges in addressing impaired water quality in Puget Sound, including limits on authority under the act to address nonpoint source pollution and the complexity of current water quality threats.

EPA and Ecology Have Developed TMDLs and Taken Regulatory and Nonregulatory Actions to Address Impaired Water Quality in Puget Sound

EPA and the Washington State Department of Ecology have developed TMDLs for some impaired water bodies in the Puget Sound region and taken regulatory and nonregulatory actions through a variety of programs to improve water quality. Ecology implements most of the state's Clean

Water Act programs, and EPA provides support for and oversight of Ecology's actions.⁴⁷

Development of TMDLs. As discussed above, under section 303(d) of the Clean Water Act, EPA is responsible for approving or disapproving Ecology's TMDL submissions for impaired water bodies.⁴⁸ If EPA disapproves a TMDL, EPA is to establish a TMDL for the impaired waters. Ecology officials said the agency develops implementation plans for each TMDL. These implementation plans describe the specific actions necessary to improve water quality for the parameters covered by the TMDL and identify the entities responsible for taking such actions.⁴⁹ For example, the TMDL implementation plans highlight best management practices—such as riparian buffers and livestock management practices—that should be implemented to address nonpoint sources of pollution, according to Ecology documentation.

Ecology has a backlog of TMDLs to develop for impaired waters throughout the state. For example, our analysis of data from the 2018 water quality assessment found nearly 500 Category 5 records for temperature and more than 700 Category 5 records for dissolved oxygen in the Puget Sound region. As described above, water bodies rated as Category 5 require a TMDL.⁵⁰ However, it is unclear how many TMDLs Ecology will need to develop to address these impaired waters, since

⁴⁷An environmental performance partnership agreement between EPA Region 10 and Ecology, which addresses a number of environmental programs, including the water quality program, defines the specific roles and responsibilities for each agency. The agreement identifies performance measures, evaluations, and plans that Ecology is to develop and submit to EPA and specifies EPA's oversight efforts.

⁴⁸33 U.S.C. § 1313(d)(2).

⁴⁹EPA recommends that states develop implementation plans for TMDLs, but such plans are not required under the act.

⁵⁰As part of our analysis, we also examined records for other impaired water body segments that were already covered by an approved TMDL and were rated as Category 4. Specifically, we found approximately 270 such records for temperature and approximately 90 such records for dissolved oxygen in the Puget Sound region.

each TMDL can cover multiple water body segments and pollutant parameters.⁵¹

According to Ecology documentation, the agency's development of TMDLs has become more complicated over time, which has contributed to delays. For example, Ecology has expanded the geographic area covered by TMDLs it develops to reflect entire watersheds, instead of small portions of water bodies, and has broadened the scope of some TMDLs to focus on multiple pollutants, instead of individual pollutants. This approach has resulted in some efficiencies, such as using the same set of actions to address an array of related pollutants. However, the expanded scope has required more data, analyses, and time to complete, according to Ecology documentation. Ecology continues to work on developing new TMDLs and has ranked impaired waters for TMDL development based on a set of criteria to help prioritize its future work.⁵²

Regulatory actions. Under section 402 of the Clean Water Act, EPA oversees Ecology's implementation of National Pollutant Discharge Elimination System (NPDES) permitting and enforcement activities to address point sources of pollution.⁵³ Ecology has NPDES permitting authority, as delegated by EPA under the act, for all point sources in the state, with the exception of those on tribal lands and federally owned facilities, for which EPA issues permits. Any discharge of pollutants into waters covered by the act requires an NPDES permit, which contains limits on the amount of each pollutant that permittees can discharge, as well as monitoring and reporting requirements for permittees. Ecology staff refer to the state's water quality assessment to determine which water bodies are impaired, according to Ecology officials. TMDLs provide

⁵¹In some cases, Ecology has not developed a TMDL but has taken other actions to address water quality impairments. For example, Ecology officials said that the agency is developing a nutrient reduction plan and has taken other actions to address low dissolved oxygen levels in Puget Sound marine waters as part of its Puget Sound Nutrient Reduction Project.

⁵²Such priority setting for TMDL development is required by the act and EPA regulation. 33 U.S.C. § 1313(d)(1)(A); 40 C.F.R. § 130.7(a), (b). Specifically, the act provides that states shall establish a priority ranking for impaired waters, taking into account the severity of the pollution and the uses to be made of such waters. Ecology's TMDL prioritization criteria include the severity of the pollution problem and risks to threatened and endangered species, among other things. EPA's action or inaction related to approval of Ecology's TMDL list and prioritization schedule has been the subject of litigation, including a lawsuit filed in 2019 regarding EPA's inaction on Ecology's failure to submit lists and priority rankings.

⁵³See 33 U.S.C. § 1342.

information on the sources of such impairment and the wasteload allocations that need to be incorporated into permit limits.

Ecology issues two types of NPDES permits—general and individual permits. General permits regulate specific categories of discharge—such as stormwater and wastewater treatment—for multiple dischargers with similar operations and types of discharges.⁵⁴ For example, one of Ecology’s municipal stormwater general permits regulates discharges specifically from storm sewer systems owned or operated by the state’s largest cities and counties.

For wastewater treatment, in December 2021, Ecology issued a new NPDES general permit—the Puget Sound Nutrient General Permit—that regulates nitrogen pollution from approximately 60 wastewater treatment plants in the Puget Sound region.⁵⁵ During the initial 5-year permit cycle, wastewater treatment plants are required to optimize their existing treatment processes to remove as much nitrogen as possible, monitor wastewater for nutrient reductions, and plan for future facility upgrades to control nutrients. Ecology issued the general permit in support of its broader Puget Sound Nutrient Reduction Project, which aims to address the low dissolved oxygen levels from point and nonpoint sources of pollution that have contributed to fish mortality and led to some Puget Sound marine waters being listed as impaired.

Ecology issues NPDES individual permits to reflect site-specific conditions of individual entities with discharges that do not fit a general permit category. For example, in addition to general permits, certain

⁵⁴Ecology issues NPDES general permits for periods of 5 years, after which the agency develops new permits.

⁵⁵Several parties have appealed some aspects of this permit and, in January 2022, the parties agreed to a stipulated stay, meaning that some permit requirements are on hold until the state Pollution Control Hearings Board resolves the issues. Ecology has reported that despite some permit conditions being on hold, the majority of the permit remains in effect.

municipal wastewater treatment facilities have individual permits to cover pollutant discharges and combined sewer overflows.⁵⁶

After issuing permits, Ecology is to monitor permittees' discharges and take actions to ensure that permittees comply with permit limits. Ecology's compliance strategy includes informal and formal compliance monitoring activities including emails, phone calls, technical assistance, and warning letters. Ecology typically tries to resolve issues with permittees informally, such as by providing technical assistance, and can escalate if needed with formal enforcement actions, such as issuing fines, according to Ecology officials.

As part of its oversight role, EPA Region 10 periodically inspects NPDES-permitted facilities to complement the state's inspection efforts and meets with Ecology on a quarterly basis to discuss Ecology's plans to address permit noncompliance, according to EPA officials. In addition, EPA Region 10 conducts formal reviews of Ecology's NPDES permitting and enforcement programs every 5 years.⁵⁷ For example, in a 2022 oversight report, EPA Region 10 made several recommendations to improve Ecology's implementation of its NPDES programs. One of these recommendations was that Ecology address long-standing data issues by improving the flow of its data to EPA's national NPDES database.⁵⁸ In 2021, we reported that EPA and Ecology had been working to address data flow issues since 2017 and that EPA had initially set a goal to resolve data completeness issues for Washington State by the end of

⁵⁶Combined sewer overflows discharge untreated sewage mixed with stormwater to water bodies during heavy rain events. This occurs with certain old collection systems designed to overflow when rainfall or snowmelt exceeds the capacity of treatment facilities. For example, the city of Seattle is responsible for more than 80 combined sewer overflow outfalls, and King County is responsible for nearly 40 outfalls. Under separate consent decrees approved in 2013, both jurisdictions are required to implement projects to implement combined sewer overflow control measures by 2030. However, the city of Seattle and King County have requested to modify their consent decrees, and negotiations to do so are ongoing with EPA and Ecology, according to EPA officials. For more information on EPA's oversight of efforts to control combined sewer overflows nationwide, see GAO, *Clean Water Act: EPA Should Track Control of Combined Sewer Overflows and Water Quality Improvements*, [GAO-23-105285](#) (Washington, D.C.: Jan. 25, 2023).

⁵⁷Evaluating EPA's oversight of Ecology's NPDES program is outside the scope of this report.

⁵⁸Environmental Protection Agency, *State Review Framework Final Report for Washington Department of Ecology, Spokane Regional Clean Air Agency, and Yakima Regional Clean Air Agency* (Aug. 9, 2022).

fiscal year 2020.⁵⁹ In August 2023, EPA officials stated that Ecology had made substantial progress resolving the data flow issues and that EPA would continue to monitor the situation.

Representatives we interviewed from tribal organizations and external stakeholder groups shared varied perspectives about EPA and Ecology's implementation of the NPDES program. Some stated that Ecology's permit requirements were complex and challenging to achieve. However, several others stated that EPA and Ecology's regulatory actions were not strong enough, citing a need to strengthen permit limits and increase formal enforcement actions to meet water quality standards and tribal treaty responsibilities.⁶⁰

Nonregulatory actions. EPA provides funding to, and oversight of, some state efforts to implement nonregulatory actions intended to improve Puget Sound water quality through various programs under the Clean Water Act, including

- **Voluntary programs to address nonpoint source pollution.** Ecology primarily addresses nonpoint source pollution—such as agricultural and stormwater runoff not covered by a permit—through voluntary means, such as providing financial incentives and technical assistance to landowners. Under the Clean Water Act, EPA does not have direct authority to require landowners to take prescribed actions to reduce nonpoint source pollution.⁶¹ As a result, EPA relies on other

⁵⁹GAO, *Clean Water Act: EPA Needs to Better Assess and Disclose Quality of Compliance and Enforcement Data*, [GAO-21-290](#) (Washington, D.C.: July 12, 2021).

⁶⁰To characterize views of representatives from tribal and external stakeholder entities throughout this report, we defined modifiers (e.g., “many”) to quantify entities' views, as follows: “many” represents six to eight entities, “several” represents four to five entities, and “some” represents two to three entities.

⁶¹Separate from the Clean Water Act, the Coastal Zone Management Act, as amended by the Coastal Zone Act Reauthorization Amendments, requires coastal states with approved coastal zone management programs to develop nonpoint pollution control programs. See 16 U.S.C. § 1455b. The Coastal Nonpoint Pollution Control Program, which is jointly administered by NOAA and EPA, is outside the scope of this report.

tools, such as providing funding, to support Ecology's actions to reduce such pollution.⁶²

EPA provides funding for many of these voluntary efforts through the act's Section 319 Grant Program, which provides grants to states for assistance in implementing approved nonpoint source management programs.⁶³ Under the act, states are to develop a proposed nonpoint source management program. If EPA approves a state's proposed program, the state is eligible to receive grant funding to assist with program implementation.⁶⁴

According to Washington State's Section 319 nonpoint program plan, Ecology's approach to addressing nonpoint source pollution uses a combination of education, technical assistance, and financial assistance (e.g., grants and low-interest loan programs).⁶⁵ The plan also notes that Ecology prioritizes nonpoint projects that implement eligible best management practices, such as livestock exclusion fencing, agricultural waste management, and riparian vegetation restoration. Ecology officials said that if efforts to address nonpoint source pollution are unsuccessful, additional pollution reductions from

⁶²Other federal agencies also administer voluntary programs that help to address nonpoint source pollution. For example, the U.S. Department of Agriculture's Environmental Quality Incentives Program provides technical and financial assistance to agricultural producers and forest landowners to address natural resource concerns, including to improve water quality and reduce soil erosion and sedimentation.

⁶³See 33 U.S.C. § 1329(h).

⁶⁴33 U.S.C. § 1329(b). In 2016, an environmental stakeholder group sued EPA regarding its approval of Washington State's 2015 Water Quality Management Plan to Control Nonpoint Sources of Pollution. After a second amended complaint was filed in 2018, the parties in 2021 agreed to a stipulated order of dismissal, under which Washington State and EPA agreed to take certain actions regarding Washington's nonpoint source management plan on a specified timeline. Among other things, Washington State agreed to complete the development of agricultural best management practices guidance consistent with EPA regulations and submit an updated nonpoint source management plan that included those best management practices on or before December 31, 2022. Ecology submitted a revised plan to EPA in December 2022, which EPA approved in August 2023.

⁶⁵Washington State Department of Ecology, *Washington's Water Quality Management Plan to Control Nonpoint Sources of Pollution* (Olympia, WA: December 2022). The plan explains that separate from the federal Clean Water Act, the state has authority under state law, as well as its own regulatory tools, that it can also use to address nonpoint source pollution. However, the state's use of its state authority and regulatory tools is outside the scope of this report.

point sources may be required to meet the targets set in TMDLs and achieve water quality standards.

- **National Estuary Program and Puget Sound Geographic Program.** Under section 320 of the Clean Water Act, EPA oversees and manages the National Estuary Program. This program has developed and is implementing a long-term comprehensive conservation and management plan for the Puget Sound estuary.⁶⁶ The program also provides funding for efforts to restore and protect Puget Sound, including efforts to improve water quality.⁶⁷ The National Estuary Program for Puget Sound has three strategic initiatives that guide its work. One initiative, for stormwater, provides funding to support research and implement projects to improve Puget Sound water quality and reduce toxics in fish.⁶⁸

EPA's Puget Sound Geographic Program complements the National Estuary Program by providing funding to tribal, state, and local governments to implement projects identified in the comprehensive conservation and management plan.⁶⁹ For example, funding from these two programs supported a pilot project to treat stormwater runoff near Eatonville, Washington. This project tested the effectiveness of a mobile biofiltration unit to remove 6PPD-quinone and other pollutants from the runoff (see fig. 7). National Estuary

⁶⁶See 33 U.S.C. § 1330.

⁶⁷In 2018, we reported on efforts to restore Puget Sound, including those under the National Estuary Program. See GAO, *Puget Sound Restoration: Additional Actions Could Improve Assessments of Progress*, [GAO-18-453](#) (Washington, D.C.: July 19, 2018).

⁶⁸The National Estuary Program's other two strategic initiatives for Puget Sound are focused on shellfish and habitat and aim to restore and protect harvestable shellfish beds as well as improve the health of the Puget Sound region's rivers, forests, shorelines, and estuaries.

⁶⁹The Puget Sound Geographic Program has received an increase in funding in recent years. For example, in November 2021, the Infrastructure Investment and Jobs Act provided \$89 million for the program. Pub. L. No. 117-58, 135 Stat. 429, 1396 (2021). In addition, EPA's appropriation for fiscal year 2023 included \$54 million in funding for the Puget Sound Geographic Program—more than a \$19 million increase over the previous fiscal year. EPA officials stated that the additional funding will support increased efforts related to water quality, watershed health, salmon recovery plans, and treaty rights, through EPA's existing programs and initiatives. Further, the National Defense Authorization Act for Fiscal Year 2023 amended the Clean Water Act to, among other things, establish a Puget Sound Recovery National Program Office within EPA and establish the Puget Sound Federal Leadership Task Force to provide a venue for coordination across federal agency members to carry out requirements related to the restoration and protection of Puget Sound. Pub. L. No. 117-263, § 8501(b), 136 Stat. 2395, 3847 (2022) (codified at 33 U.S.C. § 1276b).

Program funding has also supported projects to study toxic chemicals in freshwater salmon spawning and rearing habitat and to help local governments plan to retrofit roads to better manage stormwater, among other projects.

Figure 7: Ohop Creek Stormwater Management Pilot Project



This project collected highway stormwater runoff (left) and used a biofiltration unit (right) to clean the stormwater of pollutants, such as 6PPD-quinone (a chemical found in tire dust that can be lethal to salmon), before reaching Ohop Creek. EPA provided some funding for the project through the National Estuary Program and Puget Sound Geographic Program.

Sources: Long Live the Kings, and the Environmental Protection Agency (EPA); Photos: GAO. | GAO-24-105687

Note: According to project officials, the pilot project's spring 2022 testing resulted in a 92 percent reduction in 6PPD-quinone levels compared with untreated runoff—a reduction sufficient to prevent harm to salmon.

- **Clean Water State Revolving Fund.** EPA provides grant funding under the Clean Water Act to Washington State for its Clean Water State Revolving Fund loan program.⁷⁰ The state contributes matching funds to the program and issues low-interest and forgivable principal loans to local governments and other entities for a variety of water infrastructure projects, such as for wastewater treatment construction and nonpoint source pollution control. As money is paid back into the

⁷⁰The Clean Water State Revolving Fund program, established under the Clean Water Act, as amended, is implemented at the state level, with each state administering its own state revolving fund program. See 33 U.S.C. §§ 1381-1389. EPA provides Clean Water State Revolving Fund financial assistance to states based on a statutory allotment formula. See 33 U.S.C. §§ 1285, 1384.

state's revolving loan fund, Ecology makes new loans to other recipients.

EPA and Ecology Face a Variety of Challenges in Addressing Impaired Water Quality in the Puget Sound Region

Federal and state agency officials and representatives from tribal organizations and external stakeholder groups that we interviewed identified several challenges that EPA and Ecology face in addressing water quality impairments in Puget Sound.

Limited authority under the Clean Water Act to address nonpoint source pollution. EPA and Ecology officials and representatives from many tribal organizations and stakeholder groups we interviewed stated that the act's lack of federal regulatory authority for addressing nonpoint source pollution is a challenge.⁷¹ They noted that there are limits to the progress that can be made through voluntary programs alone. For example, Ecology officials said the fact that nonpoint source pollution is not directly regulated under the act affects the agency's ability to enforce actions identified in TMDL implementation plans for nonpoint sources. In addition, representatives from one tribal organization stated that TMDLs for nonpoint sources have not been effective tools for achieving the conditions necessary to meet water quality standards and protect tribal treaty resources because of their reliance on landowners' willingness to voluntarily take action.

In 2013, we reported on the challenges of addressing nonpoint source pollution through voluntary programs and recommended that Congress consider revising the Clean Water Act's largely voluntary approach to restoring waters impaired by such pollution.⁷² As of October 2023, Congress had not taken action on this recommendation. We continue to

⁷¹Under Washington state law, Ecology has some authority, as affirmed by the Washington State Supreme Court, to regulate nonpoint source pollutant discharges into state waters. *Lemire v. Dep't of Ecology*, 309 P.3d 395, 400, 402 (Wash. 2013) (citing WASH. REV. CODE §§ 90.48.020, 90.48.080, 90.48.120). Ecology's use of its authority under Washington state law is outside the scope of this report.

⁷²As part of this recommendation, we said that Congress could consider ways to address factors, such as limited authority, which impede attainment of water quality standards, particularly the designated uses of fishing, swimming, and drinking. GAO, *Clean Water Act: Changes Needed if Key EPA Program Is to Help Fulfill the Nation's Water Quality Goals*, [GAO-14-80](#) (Washington, D.C.: Dec. 5, 2013).

believe that such a revision would help achieve the act's goals, including water quality that provides for the protection and propagation of fish and other wildlife.

Limited ability to address current water quality threats under the Clean Water Act. NOAA and state agency officials and representatives from several tribal organizations and external stakeholder groups said that the water quality threats facing Puget Sound now are more complex than they were when the act was enacted more than 50 years ago. The officials and representatives stated that the act is not well equipped to address modern challenges, such as climate change and the increasing number of chemical contaminants that now impair water quality in the Puget Sound region. For example, NOAA officials said that the act's processes to identify and address water quality impairments largely call for a chemical-by-chemical approach and generally do not account for the ways that water quality parameters interact. Ecology officials said that such a chemical-by-chemical approach is costly and inefficient, especially given how many chemicals are now in use.⁷³ Moreover, representatives from some stakeholder groups said that this approach hampers EPA and Ecology's ability to respond to emerging threats to water quality in the Puget Sound region.

Resource constraints. EPA and state agency officials and representatives from several tribal organizations and stakeholder groups said that resource constraints, such as insufficient funding and staffing, can limit EPA and Ecology's ability to implement water quality programs under the act. For example, EPA officials cited staff resource constraints as contributing to delays in reviewing Ecology's water quality standards.⁷⁴ In addition, Ecology officials said that staff shortages have hampered their agency's enforcement activities under the act. Further, officials from the Puget Sound Partnership stated that the federal funding Ecology receives

⁷³Under the Toxic Substances Control Act, EPA is required to compile, keep current, and publish a list of each chemical substance that is manufactured or processed, including imports, in the United States for uses under the act. See 15 U.S.C. § 2607(b). EPA's August 2023 Toxic Substances Control Act Inventory identified approximately 42,000 active chemical substances in commerce. EPA reports receiving applications to review approximately 500 new chemical substances annually.

⁷⁴Specifically, EPA officials said that attrition, personnel changes, and the workload associated with meeting Endangered Species Act requirements—including consultations with the U.S. Fish and Wildlife Service and National Marine Fisheries Service—have contributed to delays in reviewing Ecology's water quality standards.

from EPA to address water quality impairments and meet water quality standards is a small portion of what is needed to complete this work.

Ecology officials and representatives from several stakeholder groups also acknowledged the challenge of funding constraints among regulated entities—such as wastewater treatment facilities—to replace aging infrastructure and upgrade technology to meet new permit requirements and regulations. Some of the representatives of stakeholder groups stated that such entities' reliance on utility fees by ratepayers to fund costly upgrades is not sustainable and that diversifying the sources of funding for such large-scale projects would be helpful.

Litigation regarding EPA and Ecology's authority and actions. EPA and Ecology officials said litigation challenging the agencies' authority and actions to address water quality under the act has affected their agencies' approach to their work.⁷⁵ Specifically, Ecology officials said litigation takes time and staff resources to address, and the risk of litigation can raise uncertainty among agency officials about how EPA and Ecology should proceed with their water quality management efforts. In addition, EPA officials said that litigation can affect how EPA and Ecology prioritize their work, including potentially forcing the agencies to focus resources on lower priority work. EPA officials attributed the volume of litigation to the many engaged entities in Washington State with varied and sometimes competing priorities and perspectives on water quality management and said that the extensive litigation in Washington State is not as common in other states.

Representatives from some stakeholder groups also identified the litigation faced by EPA and Ecology as a challenge to the agencies' water quality management efforts. For example, a representative from one stakeholder group cited the considerable time the agencies dedicate to responding to lawsuits and managing conflict related to competing priorities as a strain on agency resources. A state agency official and representatives from a stakeholder group stated that Ecology faces a difficult task in its water quality work, as the agency's decisions affect the livelihoods of a growing population, and it is not possible to satisfy all of their competing priorities.

⁷⁵For example, EPA and Ecology have faced litigation in recent years concerning Washington State's water quality standards, 303(d) list, TMDLs, and nonpoint source management program.

Other challenges. Federal and state agency officials said factors such as population growth and climate change also pose challenges to efforts to improve Puget Sound water quality. The population of the Puget Sound region is predicted to grow approximately 45 percent between 2018 and 2050.⁷⁶ In addition to increasing demand on land and water resources, such population growth could increase nutrient inputs to Puget Sound that lead to oxygen loss.⁷⁷ Moreover, climate change is projected to increase air temperatures in the region, which will cause more precipitation to fall as rain instead of snow and result in decreased summer water availability and warmer freshwater temperatures that can harm salmon.⁷⁸ An official from the Washington State Governor’s Salmon Recovery Office stated that water quality management and salmon recovery efforts must account for a growing population in the region. However, the official said that determining how to do so while minimizing ecological impacts is a significant challenge, especially when preparing for a future with less water because of climate change.

Conclusions

Puget Sound salmon are iconic species that have experienced severe consequences as human use and development in the region have expanded. Along with factors such as habitat degradation, fishing, hydropower development, and predation, impaired water quality has played an important role in the decline in Puget Sound salmon populations. However, efforts to improve water quality in the region have been hampered by missed deadlines in the development and approval of impaired waters lists. Since 2012, the Washington State Department of Ecology has consistently not met the biennial deadline for assessing the quality of the state’s waters and developing impaired waters lists, which, among other things, can hamper efforts to create new TMDLs and update water quality permits. EPA has highlighted the importance of producing timely impaired waters lists but has missed its own deadlines for reviewing and approving the lists. EPA has not worked with Ecology to develop a plan that documents the actions the agencies will take to prevent these missed deadlines from continuing to occur. By working with

⁷⁶Puget Sound Regional Council, *Draft 2050 Forecast of People and Jobs* (Seattle, WA: Mar. 1, 2018).

⁷⁷University of Washington Climate Impacts Group, *State of Knowledge: Climate Change in Puget Sound*.

Ecology to develop such a plan, EPA could better ensure that timely water quality information will be available to Congress, other decision makers, and the public.

EPA and Ecology have taken a variety of actions intended to improve water quality in the Puget Sound region, but they face challenges that hinder their progress. One challenge is the limited authority under the Clean Water Act to address nonpoint source pollution. In 2013, we recommended that Congress consider revising the act's largely voluntary approach to restoring waters impaired by such pollution, but this action has not yet been taken.

Matter for Congressional Consideration

We reiterate our 2013 recommendation that Congress should consider revising the Clean Water Act's largely voluntary approach to restoring waters impaired by nonpoint source pollution.

Recommendation for Executive Action

The Administrator of EPA should work with the Washington State Department of Ecology to develop a plan documenting the actions the agencies will take to meet the required submission and approval deadlines for the state's impaired waters lists. (Recommendation 1)

Agency Comments, Third-Party Views, and Our Evaluation

We provided a draft of this report for review and comment to the Department of Commerce, EPA, and the Washington State Department of Ecology. EPA and Ecology provided written comments, which are reproduced in appendixes I and II, respectively, and are summarized below. Commerce's NOAA responded by email that it did not have comments on the draft report. EPA and Ecology also provided technical comments, which we incorporated as appropriate.

In its written comments, EPA agreed with our recommendation and noted that it has held discussions with Ecology on a plan for the timely submittal of future impaired waters lists. EPA stated that it will work with Ecology to establish commitments from both agencies, including target dates, to catch up on the listing cycles.

In its written comments, Ecology stated that it had concerns about the focus of our report and the recommendation. Specifically, Ecology stated that it disagreed with the report's focus on the timeliness of the state's impaired waters list. Ecology acknowledged the importance of regularly assessing water quality data for the state and noted that the water quality assessments are a critical part of its clean water work. However, the agency stated that meeting the Clean Water Act's deadlines for the assessments is not integral to the success of the state's salmon recovery efforts, and that our recommendation overlooks important solutions for salmon recovery.

We recognize that salmon recovery in Puget Sound is complex and will require multi-faceted solutions addressing water quality as well as a wide range of other issues, such as the degradation of habitat, fishing, hydropower development, and predation. We acknowledge the importance of these factors in our report, but examining them was outside the scope of our work. Rather, our report focused more narrowly on examining specific issues related to impaired water quality in Puget Sound, with a particular focus on EPA and Ecology's implementation of the federal Clean Water Act.

EPA headquarters has highlighted the timely submission and review of impaired waters lists as critical to meeting states' and EPA's responsibilities under the act. In addition, as we describe in the report,

developing timely impaired waters lists helps to ensure that agencies, Tribes, and other entities have updated information to support their decision-making, including funding decisions and where to target limited resources. As a result, we continue to believe that it is important for EPA to work with Ecology to develop a plan documenting the actions the agencies will take to meet the required submission and approval deadlines for the state's impaired waters lists. In its written comments, Ecology stated that it will continue to work closely with EPA on its water quality assessments and impaired waters lists, and that it is committed to issuing more regular assessments now that it has an automated process in place to help with analyzing data.

Ecology also expressed concern that our report did not adequately acknowledge how its assessment work has changed since the act's deadlines were established, stating that our report disregarded the large amount of data Ecology now assesses and the need for meaningful tribal consultation and public involvement. We agree that tribal consultation and public involvement in the assessment process are important, and our report describes Ecology's perspectives on these topics and other factors that have affected the agency's ability to meet the deadlines for the impaired waters lists. Ecology also expressed concern that the report and recommendation did not focus on the quality of its water quality assessments. However, performing a scientific review of the quality of the assessments was beyond the scope of our work.

We are sending copies of this report to the appropriate congressional committees, the Secretary of Commerce, the Administrator of EPA, the Director of the Washington State Department of Ecology, and other interested parties. In addition, the report is available at no charge on the GAO website at <https://www.gao.gov>.

If you or your staff have any questions about this report, please contact us at (202) 512-3841 or gomezj@gao.gov or johnsoncd1@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made key contributions to this report are listed in appendix III.



J. Alfredo Gómez
Director, Natural Resources and Environment



Cardell D. Johnson
Director, Natural Resources and Environment

Appendix I: Comments from the Environmental Protection Agency



REGION 10 ADMINISTRATOR

SEATTLE, WA 98101

October 16, 2023

Mr. J. Alfredo Gomez
Director
Natural Resources and Environment
U.S. Government and Accountability Office
Washington, D.C. 20548

Dear Mr. Gomez:

Thank you for the opportunity to review and comment on the U.S. Government Accountability Office's draft report titled, *Puget Sound: Further Actions Could Improve Efforts to Address Impaired Water Quality That Threatens Salmon* (GAO-24-105687). The purpose of this letter is to provide the U.S. Environmental Protection Agency's response to the draft report.

The report examined (1) how impaired water quality affects the health of Puget Sound salmon, (2) the extent to which the EPA has worked with the Washington State Department of Ecology to develop impaired waters lists for the Puget Sound region since 2012, and (3) the actions the EPA and Ecology have taken under the Clean Water Act to address impaired water quality in the region and the challenges they face. GAO reviewed federal, state, tribal and nongovernmental documents; interviewed officials and representatives from federal and nonfederal entities (such as tribal organizations); and analyzed data from Washington's most recent impaired waters list.

GAO Recommendation:

The Administrator of the EPA should work with the Washington State Department of Ecology to develop a plan documenting the actions the agencies will take to meet the required submission and approval deadlines for the state's impaired waters lists.

The EPA Response:

The EPA agrees with this recommendation and as noted in the enclosed comments, has been in discussion with Ecology on a plan for the timely submittal of future impaired waters lists. The EPA will engage with Ecology through our performance partnership agreement to establish commitments from both agencies and include target dates to catch up on the listing cycles. The enclosure includes a number of additional comments and clarifications on the draft report.

The EPA appreciates the opportunity to review the draft report. The EPA is committed to addressing your recommendation and continues to invest agency resources to improve the water quality of Puget Sound. Please contact Hanh Shaw, Manager of the Standards, Assessment and Watershed

Appendix I: Comments from the Environmental Protection Agency

Management Branch, at (206) 553-0171 or shaw.hanh@epa.gov should you have any questions or need further information.

Sincerely,

CASEY
SIXKILLER

Digitally signed by
CASEY SIXKILLER
Date: 2023.10.16
10:48:17 -0700

Casey Sixkiller
Regional Administrator

ENCLOSURES

1. EPA Technical Comments
2. Letter from Laura Watson, Director of the Washington Department of Ecology, to Amy Trainer, Environmental Policy Director of the Swinomish Tribe, dated August 13, 2020
3. Memorandum from Ronald L. Lavigne, Senior Counsel of the Office of the Attorney General, to Ben Rau, Watershed Planning Unit Supervisor of the Washington Department of Ecology, dated July 12, 2019

cc: Ms. Laura Watson
Director, Washington Department of Ecology

Accessible Text for Appendix I: Comments from the Environmental Protection Agency

October 16, 2023

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Director
Natural Resources and Environment
U.S. Government and Accountability Office
Washington, D.C. 20548

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GAO Recommendation:

The Administrator of the EPA should work with the Washington State Department of Ecology to develop a plan documenting the actions the agencies will take to meet the required submission and approval deadlines for the state's impaired waters lists.

The EPA Response:

The EPA agrees with this recommendation and as noted in the enclosed comments, has been in discussion with Ecology on a plan for the timely submittal of future impaired waters lists. The EPA will engage with Ecology through our performance partnership agreement to establish commitments from both agencies and include

target dates to catch up on the listing cycles. The enclosure includes a number of additional comments and clarifications on the draft report.

The EPA appreciates the opportunity to review the draft report. The EPA is committed to addressing your recommendation and continues to invest agency resources to improve the water quality of Puget Sound. Please contact Hanh Shaw, Manager of the Standards, Assessment and Watershed

Management Branch, at (206) 553-0171 or shaw.hanh@epa.gov should you have any questions or need further information.

Sincerely,

Casey Sixkiller
Regional Administrator

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cc: Ms. Laura Watson
Director, Washington Department of Ecology

Appendix II: Comments from the Washington State Department of Ecology



STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

PO Box 47600, Olympia, WA 98504-7600 • 360-407-6000

October 13, 2023

J. Alfredo Gómez, Director, Natural Resources and Environment
Cardell D. Johnson, Director, Natural Resources and Environment
Government Accountability Office
441 G Street NW
Washington, DC 20548

Re: Puget Sound: Further Actions Could Improve Efforts to Address Impaired Water Quality that Threatens Salmon (GAO-24-105687)

Dear Director Gomez and Director Johnson:

Thank you for the GAO's engagement in developing the report, *Puget Sound: Further Actions Could Improve Efforts to Address Impaired Water Quality That Threatens Salmon*. As you note, the water quality challenges facing Puget Sound are complex and plentiful. Your report provides an opportunity to highlight the challenging work we do and suggests where actions at the national level can make improvements on this local issue. However, we do have concerns with the focus of the report and the recommendations and hope you will consider them before finalizing your report.

Salmon recovery is a top priority for Washington State. For decades, state leaders have partnered with Tribes, federal agencies, local governments, environmental non-profits, industry, and elected leaders to recover the Puget Sound and save our salmon. It is imperative and intrinsic to our way of life in the Pacific Northwest. The Department of Ecology is one of many agencies working to improve the health of salmon runs. This includes working for cool, clean water, and healthy salmon habitat.

The Governor's Office, in the [2021 Governor's salmon strategy update](#)¹, outlines our state's priorities for tackling the many challenges faced by salmon population.

"Salmon are important to the Pacific Northwest. They support the economy, provide food for orcas and other wildlife, and are intricately linked to the health and well-being of the region. Their fate is determined by society's decisions about how to accommodate an increasing human population and its use of land and water."

"Salmon face many challenges: warming waters, streams drying up, vanishing floodplains, polluted water, and a gauntlet of predators. Yet, they persist. While remarkably resilient, salmon cannot adapt quickly enough to the changing world without bold intervention. If

¹ <https://rc0.wa.gov/wp-content/uploads/2021/12/GSRO-GovSalmonStrategy-2021.pdf>

**Appendix II: Comments from the Washington
State Department of Ecology**

Director J. Alfredo Gómez
Director Cardell D. Johnson
October 13, 2023
Page 2

climate projections prove accurate and are not slowed, extinction, not recovery, is the likely outcome.”

The road to salmon recovery spans decades. To reach the destination will require increased investments, a renewed dedication to environmental stewardship, and everyone working together. With so much expertise in Washington, we anticipated the GAO report to incorporate some of the recommendations from the State of the Salmon report for improving the health of Puget Sound and the rivers and streams that flow into it, to improve water quality and better support salmon. Unfortunately, this is not the case.

Ecology disagrees with the report’s focus on the timeliness of the state’s impaired waters list as a key component of salmon recovery in Washington. As we previously shared with the GAO, we recognize the importance of regularly assessing water quality data for the state. We perform one of the largest and most thorough water quality assessments in the nation, including millions of data points. Given the size and complexity of our assessment, combined with the important Tribal and public review of this data, and related policy work, each assessment takes time.

We will continue to work closely with EPA on our Water Quality Assessment and impaired waters list. We are committed to issuing more regular Assessments now that we have a new automated process to help with analyzing data. However, GAO’s recommendation to focus on meeting the Clean Water Act deadlines for the impaired waters list is disappointing and overlooks the truly important solutions for salmon recovery. While the Water Quality Assessment is a critical part of our clean water work in Washington, meeting the Clean Water Act deadlines for the Assessment is not integral to the success of our state’s salmon recovery efforts. The purpose of the Assessment is to identify and help us prioritize our work in impaired waterways. We already know the Puget Sound is impaired with several sources of pollution including excess nutrients from wastewater treatment plants, and from nonpoint sources in the watersheds.

We are also concerned that the report and recommendation focuses primarily on the timeliness of Washington’s water quality assessment and not the quality of the assessment. We pride ourselves on producing a high quality, useful Assessment and have taken steps to issue the Assessment more regularly, while preserving opportunities for feedback.

Tribal review and consultation, and public review can take up to a year. Tribal consultation is a key component of our obligation to work in a government-to-government capacity with Tribes to restore natural resources. Shortchanging tribal engagement and failing to incorporate deep tribal expertise into salmon recovery efforts would be counterproductive and damaging to our ultimate goals. And meaningful public engagement is critical to producing just and equitable outcomes. Additionally, the quantity of data we access and the number of pollutants we review will continue to grow and become more complex as more contaminants of concern are incorporated into this work. By not acknowledging the mismatch between the 1972 Clean Water Act two-year schedule and the way this work has changed over the past five decades, the GAO disregards the large amount of data Washington assesses and disregards the need for meaningful Tribal consultation

**Appendix II: Comments from the Washington
State Department of Ecology**

Director J. Alfredo Gómez
Director Cardell D. Johnson
October 13, 2023
Page 3

and an inclusive public process. As a result, the GAO report so narrowly focuses on a process issue that the report cannot be viewed as meaningfully contributing to salmon recovery solutions.

In addition to these broader concerns, we have two specific comments for your consideration:

1. Footnote 39. It is important to note that since there is no water quality standard for 6PPD-q, we have no criteria and subsequent methodology in Policy 1-11 to evaluate this data. All data that may be evaluated prior to a criteria being developed would need to be evaluated under our narrative standards and data requirements in Policy 1-11.
2. Reference to assessment policy on page 22 should state that between every assessment cycle, we update the policy which goes through a public review process and must be completed before we assess any data.

We appreciate the report recommendation for a national solution to address nonpoint pollution. Nonpoint pollution is an important challenge we are facing in Puget Sound, and across the state and the nation, especially as it relates to temperature and unpermitted land use activities that cause pollution. Identifying nonpoint as a national priority will send a clear message that to meet the goals of the Clean Water Act, all pollution must be addressed.

Given our experience in water quality and salmon recovery, we would find great value in the GAO providing recommendations that remove barriers and increase coordination across all partner agencies. This includes all federal and state agencies working together to improve salmon habitat, along with working closely with Tribal governments across Washington State.

We would welcome support from federal agencies in terms of providing additional funding and resources to develop total maximum daily loads and to implement actions that meet state water quality standards versus just improving water quality, protecting waters that are not yet impaired, and restoring habitat to be more resilient against climate change.

Thank you for considering our feedback. Please do not hesitate to reach out to Vince McGowan, Water Quality Program Manager, if you have any questions. He can be reached at 360-407-6405 or Vincent.mcgowan@ecy.wa.gov

Yours Truly,



Laura Watson
Director

Accessible Text for Appendix II: Comments from the Washington State Department of Ecology

October 13, 2023

J. Alfredo Gómez, Director, Natural Resources and Environment
Cardell D. Johnson, Director, Natural Resources and Environment
Government Accountability Office
441 G Street NW
Washington, DC 20548

Re: Puget Sound: Further Actions Could Improve Efforts to Address Impaired
Water Quality that Threatens Salmon (GAO-24-105687)

Dear Director Gomez and Director Johnson:

Thank you for the GAO's engagement in developing the report, Puget Sound: Further Actions Could Improve Efforts to Address Impaired Water Quality That Threatens Salmon. As you note, the water quality challenges facing Puget Sound are complex and plentiful. Your report provides an opportunity to highlight the challenging work we do and suggests where actions at the national level can make improvements on this local issue. However, we do have concerns with the focus of the report and the recommendations and hope you will consider them before finalizing your report.

Salmon recovery is a top priority for Washington State. For decades, state leaders have partnered with Tribes, federal agencies, local governments, environmental non-profits, industry, and elected leaders to recover the Puget Sound and save our salmon. It is imperative and intrinsic to our way of life in the Pacific Northwest. The Department of Ecology is one of many agencies working to improve the health of salmon runs. This includes working for cool, clean water, and healthy salmon habitat.

The Governor's Office, in the 2021 Governor's salmon strategy update¹, outlines our state's priorities for tackling the many challenges faced by salmon population.

"Salmon are important to the Pacific Northwest. They support the economy, provide food for orcas and other wildlife, and are intricately linked to the health and well-being of the region. Their fate is determined by society's decisions about how to accommodate an increasing human population and its use of land and water."

“Salmon face many challenges: warming waters, streams drying up, vanishing floodplains, polluted water, and a gauntlet of predators. Yet, they persist. While remarkably resilient, salmon cannot adapt quickly enough to the changing world without bold intervention. If climate projections prove accurate and are not slowed, extinction, not recovery, is the likely outcome.”

The road to salmon recovery spans decades. To reach the destination will require increased investments, a renewed dedication to environmental stewardship, and everyone working together. With so much expertise in Washington, we anticipated the GAO report to incorporate some of the recommendations from the State of the Salmon report for improving the health of Puget Sound and the rivers and streams that flow into it, to improve water quality and better support salmon.

Unfortunately, this is not the case.

Ecology disagrees with the report’s focus on the timeliness of the state’s impaired waters list as a key component of salmon recovery in Washington. As we previously shared with the GAO, we recognize the importance of regularly assessing water quality data for the state. We perform one of the largest and most thorough water quality assessments in the nation, including millions of data points. Given the size and complexity of our assessment, combined with the important Tribal and public review of this data, and related policy work, each assessment takes time.

We will continue to work closely with EPA on our Water Quality Assessment and impaired waters list. We are committed to issuing more regular Assessments now that we have a new automated process to help with analyzing data. However, GAO’s recommendation to focus on meeting the Clean Water Act deadlines for the impaired waters list is disappointing and overlooks the truly important solutions for salmon recovery. While the Water Quality Assessment is a critical part of our clean water work in Washington, meeting the Clean Water Act deadlines for the Assessment is not integral to the success of our state’s salmon recovery efforts. The purpose of the Assessment is to identify and help us prioritize our work in impaired waterways. We already know the Puget Sound is impaired with several sources of pollution including excess nutrients from wastewater treatment plants, and from nonpoint sources in the watersheds.

We are also concerned that the report and recommendation focuses primarily on the timeliness of Washington’s water quality assessment and not the quality of the assessment. We pride ourselves on producing a high quality, useful Assessment and have taken steps to issue the Assessment more regularly, while preserving opportunities for feedback.

Tribal review and consultation, and public review can take up to a year. Tribal consultation is a key component of our obligation to work in a government-to-government capacity with Tribes to restore natural resources. Shortchanging tribal engagement and failing to incorporate deep tribal expertise into salmon recovery efforts would be counterproductive and damaging to our ultimate goals. And meaningful public engagement is critical to producing just and equitable outcomes.

Additionally, the quantity of data we access and the number of pollutants we review will continue to grow and become more complex as more contaminants of concern are incorporated into this work. By not acknowledging the mismatch between the 1972 Clean Water Act two-year schedule and the way this work has changed over the past five decades, the GAO disregards the large amount of data Washington assesses and disregards the need for meaningful Tribal consultation and an inclusive public process. As a result, the GAO report so narrowly focuses on a process issue that the report cannot be viewed as meaningfully contributing to salmon recovery solutions.

In addition to these broader concerns, we have two specific comments for your consideration:

Footnote 39. It is important to note that since there is no water quality standard for 6PPD-q, we have no criteria and subsequent methodology in Policy 1-11 to evaluate this data. All data that may be evaluated prior to a criteria being developed would need to be evaluated under our narrative standards and data requirements in Policy 1-11.

Reference to assessment policy on page 22 should state that between every assessment cycle, we update the policy which goes through a public review process and must be completed before we assess any data.

We appreciate the report recommendation for a national solution to address nonpoint pollution. Nonpoint pollution is an important challenge we are facing in Puget Sound, and across the state and the nation, especially as it relates to temperature and unpermitted land use activities that cause pollution. Identifying nonpoint as a national priority will send a clear message that to meet the goals of the Clean Water Act, all pollution must be addressed.

Given our experience in water quality and salmon recovery, we would find great value in the GAO providing recommendations that remove barriers and increase coordination across all partner agencies. This includes all federal and state agencies working together to improve salmon habitat, along with working closely with Tribal governments across Washington State.

We would welcome support from federal agencies in terms of providing additional funding and resources to develop total maximum daily loads and to implement actions that meet state water quality standards versus just improving water quality, protecting waters that are not yet impaired, and restoring habitat to be more resilient against climate change.

Thank you for considering our feedback. Please do not hesitate to reach out to Vince McGowan, Water Quality Program Manager, if you have any questions. He can be reached at 360-407-6405 or Vincent.mcgowan@ecy.wa.gov

Yours Truly,

Laura Watson
Director

1 <https://rco.wa.gov/wp-content/uploads/2021/12/GSRO-GovSalmonStrategy-2021.pdf>

Appendix III: GAO Contacts and Staff Acknowledgments

GAO Contacts

J. Alfredo Gómez at (202) 512-3841 or gomezj@gao.gov, or Cardell D. Johnson at (202) 512-3841 or johnsoncd1@gao.gov.

Staff Acknowledgments

In addition to the contacts named above, Jonathan Dent (Assistant Director), Joshua Wiener (Analyst in Charge), Jack Granberg, and Erin T. Murphy made key contributions to this report. Also contributing to the report were Adrian Apodaca, Elizabeth Dretsch, Susan Iott, Matt McLaughlin, John Mingus, Patricia Moye, Leslie Pollock, and Craig Starger.

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