METRICS Watershed Report

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UAPP411: Regional Watershed Management

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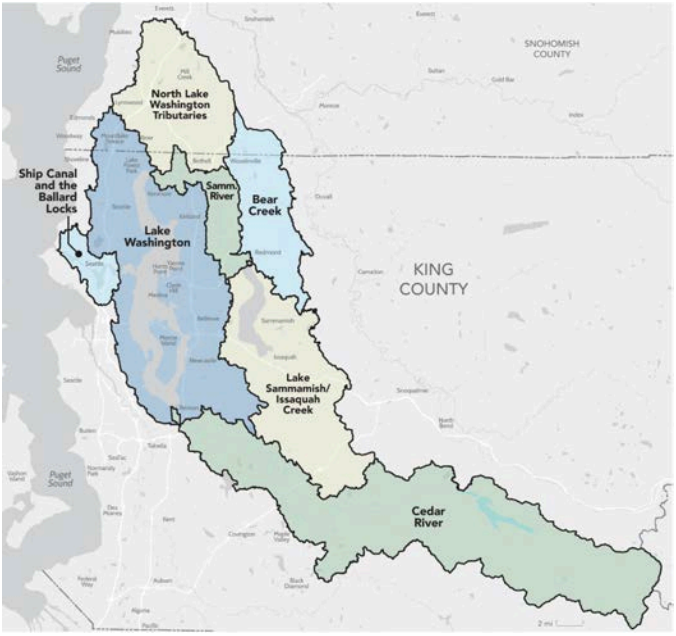
Mission statement

The WRIA 8 **METRICS** Initiative's mission is to reduce pollutant loads and restore ecological integrity within the Lake Washington-Cedar-Sammamish Watershed in Washington State by implementing coordinated regional stormwater upgrades, green infrastructure expansion, and habitat restoration projects to achieve measurable improvements in water quality, salmon recovery, and public health by 2045.

Background

The Lake Washington-Cedar-Sammamish Subbasin (WRIA 8) drains into the broader Central Basin of Puget Sound in western Washington State. This watershed includes the land area, streams, and tributaries drained by the Sammamish & Cedar River, both flowing into Lake Washington, connected to Puget Sound through the constructed urban waterway, the Lake Washington Ship Canal, built in 1916 (Washington State Department of Ecology, 2020; 2022).



Watersheds within WRIA8 Basin Created through ArcGIS

The Cedar River originates in the Cascade mountain range, with a mean annual flow of about 439 million gallons per day (mgd), whereas the Sammamish River, flowing from Lake

Sammamish, measured depositing about 196 mgd into Lake Washington. Seattle, the state's largest urban center, is located within WRIA 8, depending on the Cedar River and holistically the WRIA 8 watershed for its municipal drinking water supply (Washington State Department of Ecology, 2020; 2022). The Cedar-Sammamish watershed was anthropogenically manipulated in 1912 when the Cedar River, then also the city's source of hydroelectric power, was diverted from the Black River to flow into Lake Washington after a devastating 1911 Cedar River flood overwhelmed water pipelines and railroad infrastructure, leaving the urban center lacking electricity and drinking water (Casey, 2025; Stein et al., 2000).

The watershed spans approximately 692 square miles and includes dense urban centers and surrounding suburban communities (Washington State Department of Ecology, 2020). The region supports a large and growing population, contributing to both economic growth and environmental stress. In 2025, the estimated population within WRIA 8 specifically was around 1,932,056 people according to the Washington State Office of Financial Management Small Area Estimate Program. This makes the monetary fishing value at about $61 million, and utilizing average daily flow, the Cedar & Sammamish rivers freshwater value combined total to about $231 million dollars, so WRIA 8 is a very economically important watershed in Washington state. While over 50% of the watershed is urban or designated for urban growth, the water supply is strained with competing demands from nearby industry, agricultural lands, municipalities, and individual residences (Washington State Department of Ecology, 2020; 2022).

WRIA 8 is particularly important for regional biodiversity, as it provides critical spawning and rearing habitat for 8 salmonid species, including Chinook salmon, which are federally listed as threatened. Another threatened salmonid species, the Puget Sound steelhead are now considered "functionally extirpated" from the basin despite the watershed serving as its

critical habitat (Washington State Department of Ecology, 2020).

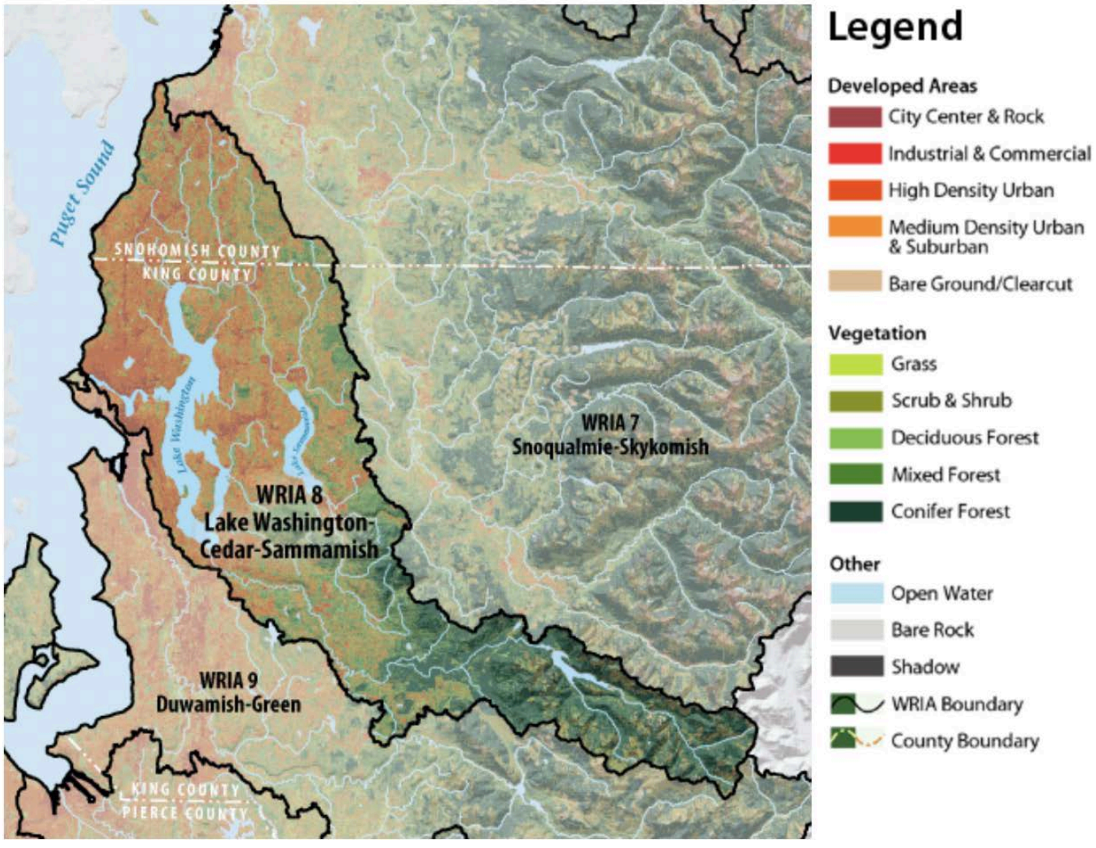
Common Name	Scientific Name	Evolutionary Significant Unit	Critical Habitat	Regulatory Agency Status
Chinook Salmon	Oncorhynchus tshawytscha	Puget Sound Chinook	Yes/2005	NMFS/ Threatened/ 1999
Coho Salmon	Oncorhynchus kisutch	Puget Sound/Strait of Georgia Coho	No	NMFS/Species of Concern/ 1997
Sockeye Salmon	Oncorhynchus nerka	No listing	No listing	No listing
Kokanee	Oncorhynchus nerka	No listing	No listing	No listing
Steelhead Trout	Oncorhynchus mykiss	Puget Sound steelhead	Yes/2016	NMFS/ Threatened/ 2007
Bull Trout	Salvelinus confluentus	Puget Sound Dolly Varden/Bull Trout	Yes/2010	USFWS/ Threatened/ 1999
Coastal Cutthroat Trout	Oncorhynchus clarkii clarkii	No listing	No listing	No listing
Rainbow Trout	Oncorhynchus mykiss	No listing	No listing	No listing

Source: Washington State Department of Ecology. (2020). Watershed Restoration and Enhancement Plan WRIA 8 - Cedar Sammamish Watershed [Table: Selected Salmonids Present within the Cedar-Sammamish Watershed].

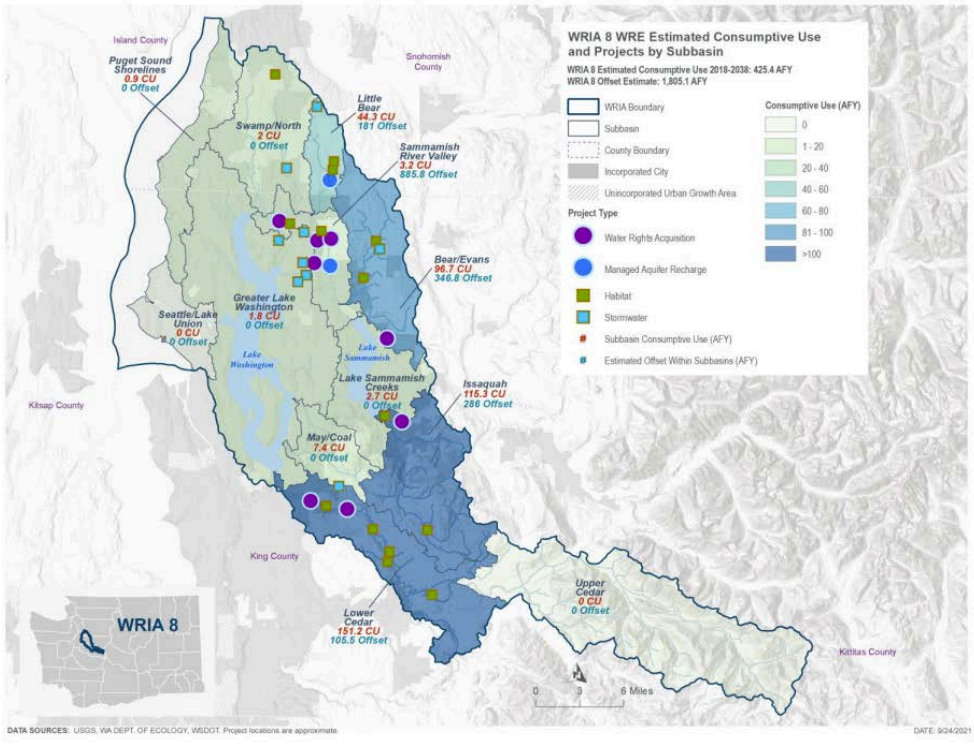
WRIA 8 is characterized by a mix of urban, suburban, and forested landscapes, with steep upland areas transitioning into lowland lakes and river systems. The watershed includes glacially formed lakes, river floodplains, and tributary streams that support diverse aquatic ecosystems. Hydrologically, the system is driven by seasonal precipitation patterns typical of the Pacific Northwest, with high flows during winter rainfall and lower flows in summer months. Urbanization has significantly altered natural flow regimes. Increased impervious surfaces have led to higher stormwater runoff, reduced groundwater recharge, and increased flooding and erosion.

Water quality in WRIA 8 has long been a concern, particularly due to pollution from urban runoff and human activity. Bacterial contamination, nutrients, heavy metals, and toxic chemicals are common pollutants. Human activity is the main driver of environmental change in WRIA 8. Urban development has replaced natural vegetation with impervious surfaces, increasing pollutant loads and altering hydrology. Contributing factors include stormwater runoff from residential, commercial, and transportation infrastructure, aging or failing septic systems in some areas, and pet waste and urban wildlife contributions to bacterial pollution. The watershed supports salmon populations that are culturally, economically, and ecologically important.

Land Use And Topography



Source: King County Department of Natural Resources and Parks. (2008). *Salmon Conservation and Restoration: Lake Washing/Cedar/Sammamish Watershed [Map: Watershed Map Showing Land Use]*.



Source: Washington State Department of Ecology. (2020). Watershed Restoration and Enhancement Plan WRIA8 - Cedar Sammamish Watershed [Map: WRIA 8 Estimated Consumptive Use and Projects by Subbasin].

Federal Policies

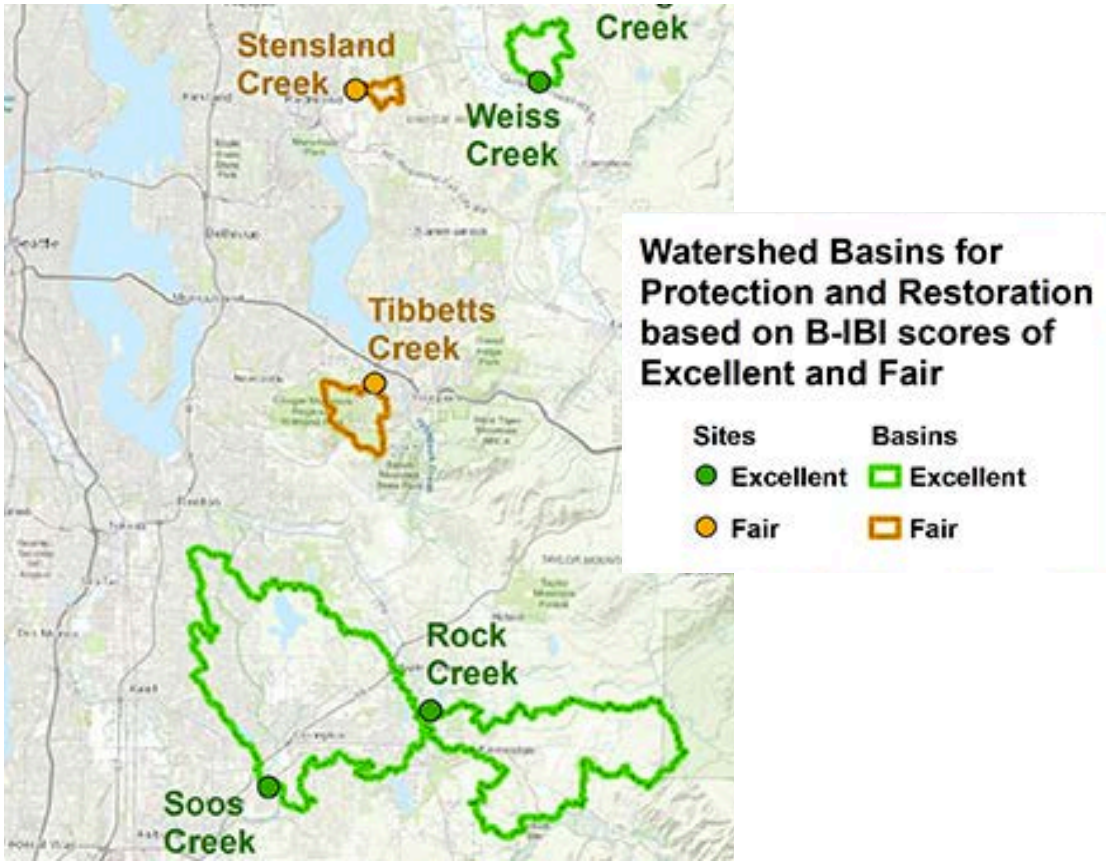
The 1972 Clean Water Act helps to protect waters of the US (WOTUS), including Washington state waters, via partnerships with the U.S. Army Corps of Engineers and the U.S. Environmental Protection Agency (Washington State Department of Ecology, n.d.-a). Due to the federal Supreme Court Decision in Sackett v. Environmental Protection Agency, the protections afforded by this Act only extend to wetlands that fit into the formal definition of WOTUS, leaving some waters considered non-WOTUS only protected by Washington State regulations through the state's Water Pollution Control Act (Washington State Department of Ecology, n.d.-a; Washington State Legislature, 2025).

Washington State Policies

The WA Water Pollution Control Act (Chapter 90.48 RCW), passed in 1971, is just one of many water-focused law components within Chapter 90 ‘Water Rights - Environment’ of the Revised Code of Washington to set and maintain particular water quality standards (Washington State Legislature, 2025) . A newer state policy specifically pushing for statewide watershed restoration is the 2018 Streamflow Restoration Act, which directs the WA Department of Ecology (Ecology) to create and adopt ‘Watershed Restoration and Enhancement Plans’ for the 8 specified local water resource inventory areas, motivated to balance rural water use and salmon recovery (Washington State Legislature, 2025). This law directs Ecology to collaborate with a committee consisting of at least the required local representatives (for counties, municipalities, native tribes, fish & wildlife, construction/ag./environment interests) as stated in RCW 90.94.030 in the formulation of the plan, with the adoption of the draft plan requiring unanimous approval of committee members–although issues with a divided committee decision could be overridden by WA Ecology (Washington State Legislature, 2025; Washington State Department of Ecology, 2022). The state agency produced the restoration and enhancement plan for the Cedar-Sammamish Watershed (WRIA 8) and overrode the WRIA 8 Committee's failed approval vote (15 for, 1 against) in early 2022, revising the 20-year plan (2018-2038) a little over 2 years later (Washington State Department of Ecology, 2022). An important, though in the case of the committee, nonvoting, WRIA 8 watershed stakeholder is the WRIA 8 Salmon Recovery Council, which works to establish legislative priorities to support salmon recovery in the region (King County Department of Natural Resources and Parks, 2026).

Another critical statewide policy impacting statewide watershed investment is the 2021 Climate Commitment Act helping to fund Puget Sound restoration projects through an emissions

cap and trade model (Puget Sound Partnership, 2026 -b). This policy invests over $200 million in healthy forests, riparian areas and floodplains, climate adaptation and resilience, and fish passage barriers, prioritizing projects focused on salmon recovery, reforestation to improve riparian health, and promoting sustainable, watershed-friendly farming practices (Puget Sound Partnership, 2026 -b). A recipient of $60.5 million of this funding in 2025 was the Puget Sound Partnership (PSP), a state agency focused on the regional restoration of Puget Sound, for the Puget Sound Acquisition & Restoration Fund (Puget Sound Partnership, 2026 -a). PSP heads projects directly impacting streams within WRIA 8, like the 'Restore and Protect Project' through King County to project healthy sites like Rock Creek, and restore degraded sites like Stensland Creek & Tibbetts Creek (King County Government, n.d.-b).



Source: King County Government. (n.d. -b). *Environmental Projects: The Restore and Protect Project [Map of study basins].*

Local/County Policies & Governance

After inadequate administration through municipal flood control zone districts, the King County Council passed Ordinance 15728 to create the King County Flood Control District, a separate government entity to reduce flood risk through the county, as flooding issues spanned beyond jurisdictional boundaries (Schauer, 2026). The District has an elected Board of Supervisors (County Council), a locally-composed Advisory Committee and Basin Technical Committee, providing holistic flood-related watershed management through funding and policy for programs across 40 different jurisdictions (Schauer, 2026).

Problems

Problem	Description	Causes
Salmon Recovery	The watershed is home to endangered Chinook salmon and Lake Sammamish Kokanee salmon, whose populations are dwindling with fewer returns in their migration patterns. Salmon are a keystone species, supporting the surrounding habitat, particularly as a food source to maintain the local orca population.	Development and man-made blockages on streams and rivers that limit salmon migration infrastructure are old and dangerous for migrating salmon, or just made with water in mind, not migrating fish. Pollution and contamination of waters, poor quality waters. Stormwater runoff due to lost vegetation, forests, wetlands, and increased impervious surfaces causes stronger flows and more erosion. Water temperature.
Flooding (Combined Sewer Overflows: CSOs)	One of the most pressing problems in the Lake Washington-Cedar-Sammamish Watershed is flooding associated with combined sewer overflows (CSOs). During periods of heavy rainfall, older sewer systems can exceed their capacity, causing untreated sewage mixed with stormwater to be discharged directly into nearby waterways and ultimately into Puget Sound.	This issue is largely a result of legacy infrastructure since many cities in the region still rely on combined sewer systems that were designed to carry both wastewater and stormwater through the same pipes. These systems include relief points, or outfalls, which are intended to prevent system backups by diverting excess flow during storms, but in doing so release polluted water into the environment. The problem is intensified by urbanization and climate change.
Reduce Toxic & Bacterial Pollution (Fecal coliform bacteria & Cyanobacteria are a major water quality issue)	High bacteria levels, particularly E. coli and fecal coliform, occasionally force swimming beach closures in the Lake Washington-Cedar-Sammamish watershed, especially after heavy rain. King County conducts weekly testing at public beaches for safety. Common contamination sources include wildlife, pets, and sewage overflows.	Sources of contamination include aging wastewater infrastructure, failing septic systems, agricultural runoff, and sewage discharge from boats and vessels. The excessive nutrient loading from sewage discharge, agricultural runoff, and rainfall events spikes the populations of cyanobacteria and E. coli.

Problem 1

The Cedar-Sammamish watershed is home to ecologically and culturally important salmon species, including Chinook salmon, which are listed as threatened. Salmon returns in the watershed have been slowly declining, with fewer fish migrating each year. This decline is concerning as salmon function as a keystone species supporting ecosystem health and serve as a necessary food source (Puget Sound Partnership, n.d.). Multiple factors contribute to this decline, such as urban development, pollution, and water quality. Urban development has created numerous man-made barriers like dams, culverts, and outdated infrastructure that block or hinder salmon migration routes. In many cases, these structures were built without consideration for fish passage, making them dangerous or impassable (King County Department of Natural Resources and Parks, 2003). Additionally, water quality degradation from pollution and contamination, including toxic chemicals and bacterial inputs, further stresses salmon populations. Increased stormwater runoff leads to higher flow volumes and streambank erosion, which degrade spawning habitats (King County Government, n.d.; Puget Sound Regional Council, n.d.).

Goal 1

To address these issues, METRICS aims to restore and protect salmon habitat through targeted, policy-driven actions. A key strategy is the removal of fish passage barriers by offering tax incentives to private landowners (Puget Sound Regional Council, n.d.). In addition, restoring riparian zones and floodplain habitats is essential for improving water quality, stabilizing streambanks, and enhancing ecological resilience. This could be financed through public funding directed toward high-priority restoration areas, with partial funding generated through mechanisms such as salmon-themed license plate programs. Another component involves reducing elevated stream temperatures by implementing stricter limits on water withdrawals

from affected stream areas and updating stormwater management policies to promote infiltration and cooling (King County Government, n.d.; Washington State Department of Ecology, n.d.). These policies would ultimately support the recovery of salmon populations and the broader ecosystem they sustain.

Problem 2

Flooding driven by combined sewer overflows (CSOs) represents a major challenge for the Puget Sound watershed, particularly in highly urbanized areas with aging infrastructure (King County Government, n.d.-c; King County Government, n.d.-a). During heavy rainfall events, older combined sewer systems, which are designed to carry both stormwater and wastewater through the same pipes, can exceed their capacity. When this happens, untreated sewage is discharged directly into nearby waterways, including the Puget Sound, posing serious risks to water quality, ecosystem health, and public safety.

A contributor to this issue is legacy infrastructure. Many cities in the Puget Sound region, including Seattle, rely on combined sewer systems that were originally constructed decades ago (King County Government, n.d.-a). These systems include designated overflow points, or outfalls, that intentionally release excess flow into surrounding water bodies during storms. While these systems were once considered effective, they are now increasingly inadequate in the face of modern environmental pressures.

Urbanization has also intensified the problem by increasing stormwater runoff volumes. The expansion of impervious surfaces such as roads, rooftops, and parking lots prevents water from naturally infiltrating into the ground, instead directing large volumes of runoff into storm drains and sewer systems. This increases the likelihood of system overflow during rainstorms.

Climate change is also increasing flooding and CSO occurrences across the watershed. The Puget Sound region is experiencing more frequent and intense rainfall events, particularly during winter months (King County Government, n.d.-c). These changing precipitation patterns place additional strain on already aging infrastructure, increasing both the frequency and severity of overflow. As a result, flooding and untreated sewage discharges are expected to become more common without intervention.

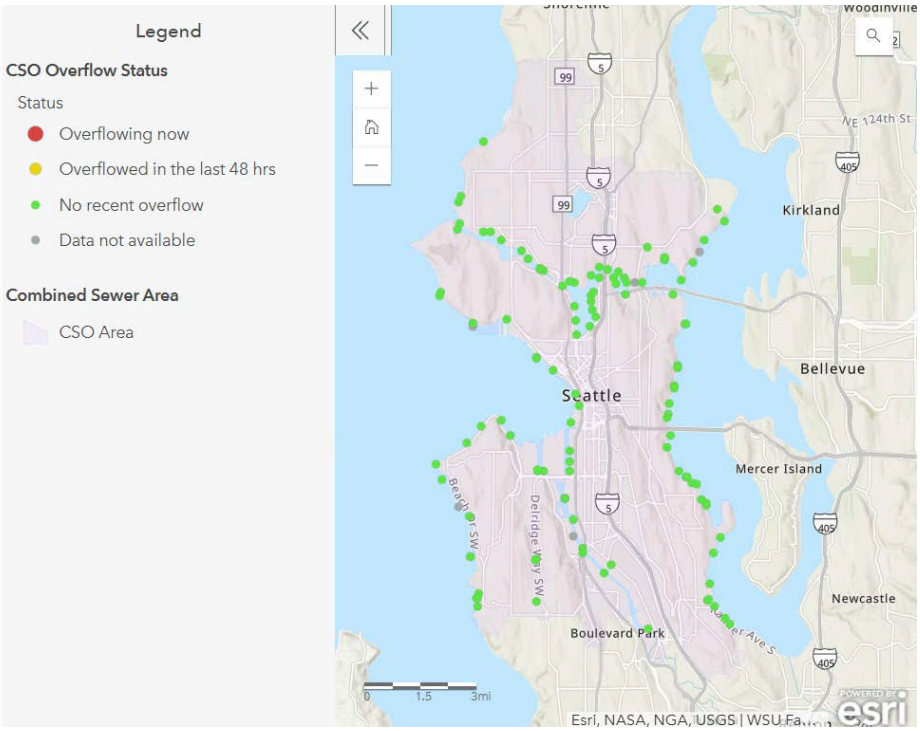
Goal 2

To address the growing challenges associated with flooding and combined sewer overflows, a primary goal for the watershed is to modernize stormwater and sewer infrastructure. The objective is to reduce untreated stormwater and sewage discharge, thereby improving water quality and decreasing flood risk throughout the region.

One target is to reduce CSO events to fewer than one untreated discharge per outfall per year by 2035. Achieving this would significantly limit the frequency of raw sewage entering local waterways and align with broader water quality protection efforts. In addition, retrofitting 50% of high-priority urban drainage basins with green infrastructure by 2040 would help manage stormwater at its source. Practices such as bioswales, permeable pavement, and rain gardens increase infiltration, slow runoff, and reduce the volume of water entering sewer systems during storms.

A further target is to reduce total stormwater runoff entering waterways by 30% by 2045. This reduction would not only decrease the likelihood of sewer system overload but also improve overall watershed health by limiting pollutant transport associated with runoff. Together, these targets provide a structured and measurable framework for addressing both the causes and the impacts of flooding within the Puget Sound watershed.

To achieve these targets, several policy strategies can be implemented. First, directing King County Flood Control District funding toward upgrading and monitoring aging sewer infrastructure would improve system capacity and allow for more proactive management of overflow risks. Current mapping of outflows only publicly reports CSOs within the last 48 hours, but utilizing and reporting this real-time data over longer time periods can help to properly prioritize system upgrades. Investments in pipe replacement, storage expansion, and real-time monitoring technologies would be effective in reducing system failures.



Source: King County Government. (n.d.-a). *Sewer System Services: Combined Sewer Overflow Status [Map: CSO status map].*

Second, grant programs through the County Flood Control District could be expanded to incentivize the installation of permeable surfaces and other green infrastructure in urban areas. By supporting municipal and community-level stormwater management projects, these programs would reduce runoff at the source while also providing benefits such as improved urban aesthetics, increased groundwater recharge, and enhanced habitats.

Finally, implementing an additional stormwater fee calculated based on overflow monitoring data across the flood control district could provide a sustainable funding source for long-term infrastructure improvements. Currently, annual surface water management fees are collected independently by different municipalities, with the County only raising funds from unincorporated areas (King County Government, n.d.-c). The King County 2026 annual fee ranges are based on the percentage of impervious surface present on land parcels, with residences being charged around $379 per year (King County Government, n.d.-c). Due to the King County Flood Control District's interjurisdictional strategy concerning collaboration and investment (King County Government, n.d.-b), an additional fee across all jurisdictions appropriated specifically for flood control district funding ensures a widespread, equitable, cost-burden, and improvement priority list correlating with combined sewer overflow event frequency. A small increase in these fees across the heavily populated county would greatly benefit multijurisdictional system-maintenance funding without adding a significant burden on individual households/property owners. A data-driven fee structure would ensure that funding is aligned with system usage and risk levels, while also encouraging municipalities and property owners to adopt practices that reduce runoff contributions.

Problem 3

Bacterial and toxic pollution represent another significant challenge for the watershed and have serious implications for both environmental and human health. Major sources of contamination include aging wastewater infrastructure, failing septic systems, agricultural runoff, and sewage discharge from boats and vessels. Excessive nutrient loading from sewage discharge, agricultural runoff, and heavy rainfall events can lead to spikes in cyanobacteria and E. coli populations, which negatively affect water quality and aquatic ecosystems. Bacteria may enter

Puget Sound directly through wastewater discharges or indirectly through rivers and streams that flow into the Sound. In addition, stormwater runoff transports bacteria from urban and agricultural areas into nearby waterways. Improper disposal of both human and animal waste further contributes to bacterial contamination and increases nutrient pollution throughout the watershed.

Unlike many other water pollutants, bacteria concentrations can fluctuate significantly from day to day depending on environmental conditions. Factors such as stormwater runoff, tides, wind patterns, temperature, sunlight exposure, and predation all influence bacteria survival and movement within the environment. Because of these constantly changing conditions, identifying and tracking the exact sources of bacterial contamination can be extremely difficult. This variability makes long-term monitoring and management especially important for maintaining water quality in the Puget Sound.

Goal 3

One of the primary goals for reducing bacterial pollution is decreasing toxic chemical concentrations through stronger industrial discharge regulations and improved monitoring programs. Washington State's Department of Ecology currently operates the BEACH Program, which monitors saltwater in the Puget Sound for illness-causing bacteria from Memorial Day to Labor Day. This program issues permits to wastewater treatment plants that allow treated wastewater discharges while establishing pollution limits and technical requirements to ensure facilities operate at standards designed to protect Puget Sound ecosystems. Expanding this program to provide year-round testing through increased permit fees could greatly improve monitoring efforts and lead to healthier and more stable waterways throughout the year.

Continuous testing would provide more accurate data regarding seasonal pollution trends and allow agencies to respond more effectively to contamination events.

Another important strategy for addressing bacterial pollution involves improving septic system management. The Craft3 Clean Water Loan currently provides affordable loans to homeowners for repairing or replacing failing septic systems. Working in partnership with the Washington Department of Ecology, the program offers lower interest rates for low-income households and offers special rates for lower-income households and allows repayment periods of up to 30 years or until the property is sold. This program provides an effective option for homeowners who may otherwise struggle to afford costly septic system upgrades. In addition to the existing loan program, a new grant initiative could be created to assist property owners with maintaining, repairing, or replacing failing septic systems. Funding for this grant could come from a small diversion of property tax revenue, which would ultimately benefit both local residents and the surrounding ecosystem through improved water quality and reduced contamination risks.

Agricultural runoff also remains a significant source of bacterial pollution throughout the watershed. One challenge associated with addressing agricultural pollution is that many studies are limited to locations where landowners voluntarily allow access or where pollution discharges can be directly documented from public areas. To improve management efforts, greater public education and outreach programs could be implemented throughout King County. In residential communities, encouraging homeowners to plant native vegetation instead of maintaining traditional lawns could reduce the need for fertilizers, herbicides, and pesticides while also decreasing water consumption and stormwater runoff. Native plant species are generally better adapted to local climate conditions and help improve infiltration while stabilizing soils.

For rural and agricultural areas, implementing no-till farming practices and planting cover crops could significantly improve soil health, reduce erosion, and increase water infiltration by minimizing soil disturbance and keeping land covered throughout the year. Additionally, proper manure management practices are critical for reducing bacterial contamination from livestock operations. Farms could utilize designated manure storage facilities designed to prevent runoff into nearby waterways while also avoiding manure or fertilizer application during rainfall events or periods when crops cannot effectively absorb nutrients. These management strategies would help reduce nutrient loading and bacterial pollution entering rivers and streams connected to the Puget Sound.

Recommendation Summary And Conclusion

To address pollution and ecological decline in the Cedar-Sammamish Watershed, the METRICS will implement a set of policies designed to address aging infrastructure, habitat degradation, and ongoing pollution sources. First, to reduce stormwater surges and CSOs, the plan will prioritize upgrading outdated sewer systems, expanding green stormwater infrastructure, and retrofitting high-risk urban areas to better manage runoff. Second, to restore and protect salmon habitats, the initiative will fund the removal of fish passage barriers through tax incentives for private landowners, expand riparian and floodplain restoration projects in critical areas, and support long-term habitat recovery. Third, the plan will strengthen regulations on toxic chemical runoff, implement stricter controls on bacterial contamination, and update stormwater policies. These recommendations will help improve water quality, restore ecosystem health, enhance salmon populations, and protect public health to sustain the watershed overall.

The Lake Washington-Cedar-Sammamish watershed faces complex environmental challenges driven by urban growth, climate change, and aging infrastructure systems. The WRIA

8 METRICS Initiative provides a comprehensive and forward-looking framework for addressing these challenges through coordinated policies and measurable targets. By focusing on infrastructure modernization, habitat restoration, and pollution reduction, the initiative aims to improve water quality, support salmon recovery, and protect public health. Long-term success will depend on continued collaboration among government agencies, stakeholders, and local communities, as well as the effective use of tools such as GIS to guide decision-making and track progress. Ultimately, achieving sustainable watershed management will require an integrated approach that balances environmental protection with the needs of a growing population.

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