

2025 State of Our Watersheds

A Report by the Treaty Tribes in Western Washington

Principal Findings



WRIAs 1-23

The State of Our Watersheds
2025
Principal Findings

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The State of Our Watersheds

2025

Principal Findings

Barriers – Culverts

REGION CHAPTERS

Pacific Coast Region –

- There are 3,919 fish passage barriers in the Pacific Coast region that have been identified by the Washington Fish and Wildlife Department to impact migrating salmonids. While many of these barriers are owned by the state and fall under the rulings of the Culvert Injunction Case, the majority are owned by other government agencies and private landowners. These culverts continue to restrict access to habitat for salmon while often having no timeline for replacement.

Puget Sound Region –

- There are 11,623 fish passage barriers in the Puget Sound region that have been identified by the Washington Fish and Wildlife Department to impact migrating salmonids. While many of these barriers are owned by the state and fall under the rulings of the Culvert Injunction Case, the majority are owned by other government agencies and private landowners. These culverts continue to restrict access to habitat for salmon while often having no timeline for replacement.

TRIBAL CHAPTERS

(Hoh) There are 51 state-owned culverts in the “Culverts Case” dataset in the Hoh Area of Interest. Of these, 31 (or 60.8%) are still barriers to fish. In another dataset of 316 barrier culverts, 154 (or 48.8%) are county-owned. Private ownership accounts for 64 (or 20.2%) while state ownership accounts for 52 (16.2%) of the culverts. In addition to action being taken to fix state-owned culverts, measures need to be taken to remove the impediments to fish passage caused by county-and-private-owned culverts.

(Lower Elwha) In the Lower Elwha Area of Interest, the State of Washington has about 81 barrier culverts of which 60 (or 74.1%) still need to be repaired. There are an additional 857 barrier culverts owned by the state and local governments as well as private corporations and individuals. Of these, there are 526 (or 61.4%) on county-owned roads while 257 (or 30%) are under private ownership.

(Makah) As of December 2024, there were a total of 293 fish barrier culverts in the Makah Area of Interest. Of these, the state owns 111 (or 38%), while private and county ownership accounts for 100 (34 %) and 65 (22%) culverts respectively. Small landowners and the county would need assistance in terms of funds and partnerships to repair these culverts before new ones emerge.

(Muckleshoot) There are 6,071 barrier culverts impeding fish passage that are owned by the state, cities and counties, as well as private corporations and individuals in the Muckleshoot Area of Interest. Most of the barriers are owned by cities (2,042 barriers), followed by those owned by the counties (1,547 barriers) and privately owned (1,487 barriers). A federal court injunction requires Washington State to correct high-priority fish-blocking culverts by 2030. However, many barriers fall outside this requirement, such as those owned by cities, counties, or private landowners, which are only replaced when a culvert fails or a road project triggers construction.

(Nisqually) There are 674 barrier culverts that are owned by the state, cities and counties, as well as private corporations and individuals in the Nisqually Watershed. Most of the barriers are owned by Pierce, Thurston or Lewis counties (296 barriers), or privately owned (201 barriers).

(Nooksack) A total of 902 anadromous fish barrier culverts have been identified in WRIA 1 (the Water Resource Inventory Area for Nooksack and independent watersheds) through 2023. There were 723 barrier culverts identified through 2019 and 179 additional barrier culverts documented from 2020 through 2023. Over that same time period, approximately 77 culverts that were surveyed as blocking fish in 2019 were no longer considered blocking. The additional 179 barrier culverts identified since 2019 are not thought to be newly constructed.

(Puyallup) There are 1,567 barrier culverts that are owned by the state, cities and counties, as well as private corporations and individuals in the Puyallup Area of Interest. Most of the barriers are privately owned (486 barriers) or owned by Pierce or King County (452 barriers).

(Quileute) Currently, there are 254 fish barrier culverts in the Quileute Area of Interest. Private ownership accounts for 77 (or 30.3%) while county ownership accounts for another 77 (30.3%). The state, federal and city governments own 65 (25.6 %), 23 (9.1%), and seven (2.7%) of these culverts.

(Quinault) There are 3,055 barrier culverts in the Quinault Area of Interest. Private ownership accounts for 1383 (or 45.3%) of the culverts while 952 (or 31.2 %) are owned by various counties. Washington state, cities, and the federal government, own 271 (8.9 %), 178 (5.8%), and 150 (4.9%) culverts respectively.

(Sauk-Suiattle) A recent comprehensive inventory of culverts on anadromous fish-bearing streams in the Skagit watershed documented 931 culverts. Of these, 556 culverts are fish-passage blockages and 91 culverts are unknown but may be fish-passage blockages. Over 74% of the blocking and unknown culverts are either privately owned (291 culverts, 45%) or county owned (194 culverts, 30%). The remaining 162 culverts (about 25%) are spread across other public ownerships.

(Skokomish) There are 1,105 barrier culverts owned by the state, cities and counties, as well as private corporations and individuals in the Skokomish Area of Interest. Most of the barriers are owned by Jefferson, Kitsap or Mason counties (455 barriers).

(Squaxin Island) There are 1,688 barrier culverts owned by the state, cities and counties, as well as private corporations and individuals in the Squaxin Island Area of Interest. Most of the barriers are owned by Kitsap, Mason, Pierce or Thurston counties (726 barriers).

(Suquamish) There are 1,083 known barrier culverts that are owned by the state, cities and counties, as well as private corporations and individuals in the East Kitsap area. Most of the barriers are privately owned (343 barriers) or owned by Kitsap County (326 barriers).

(Swinomish) A recent comprehensive inventory of culverts on anadromous fish-bearing streams in the Skagit watershed documented 931 culverts. Of these, 556 culverts are fish-passage blockages and 91 culverts are unknown but may be fish-passage blockages. Over 74% of the blocking and unknown culverts are either privately owned (291 culverts, 45%) or county owned (194 culverts, 30%). The remaining 162 culverts (about 25%) are spread across other public ownerships.

(Tulalip) In the Snohomish River watershed, an estimated 1,876 inventoried barriers are blocking or impeding fish from accessing more than 400 miles of upstream habitat. This is an increase of known barriers to 786 since 2019.

(Upper Skagit) A recent comprehensive inventory of culverts on anadromous fish-bearing streams in the Skagit watershed documented 931 culverts. Of these, 556 culverts are fish-passage blockages and 91 culverts are unknown but may be fish-passage blockages. Over 74% of the blocking and unknown culverts are either privately owned (291 culverts, 45%) or county owned (194 culverts, 30%). The remaining 162 culverts (about 25%) are spread across other public ownerships.

Climate Change

REGION CHAPTERS

Puget Sound Region – The watersheds of Puget Sound are exhibiting changes driven by the climate crisis that will likely accelerate in the future: more frequent extreme heat events; warmer stream temperatures; subsequent increases in fish disease; shrinking glaciers and snowpack; lower summer streamflows; more extreme winter floods; shifts in streamflow patterns and timing; more frequent wildfires; warmer ocean temperatures; changing ocean chemistry; and flooding and erosion from more intense winter storms and rising sea levels. These changes are compounded by the effects of habitat destruction and fragmentation described in this report. Efforts to restore habitat integrity and diversity contribute to the resilience of the species and ecosystems that are fundamental to tribal treaty rights and traditional ways of life.

Pacific Coast Region – The watersheds of the Pacific Coast are experiencing changes driven by the climate crisis that will likely accelerate in the future: more frequent extreme heat events; warmer stream temperatures; subsequent increases in fish disease; shrinking glaciers and snow pack; lower summer streamflows; more extreme winter floods; shifts in streamflow patterns and timing; more frequent wildfires; warmer ocean temperatures; changing ocean chemistry; and flooding and erosion from more intense winter storms and rising sea levels. These changes are compounded by the effects of habitat destruction and fragmentation described in this report. Efforts to restore habitat integrity and diversity contribute to the resilience of the species and ecosystems that are fundamental to tribal treaty rights and traditional ways of life.

TRIBAL CHAPTERS

(Hoh) Glaciers in the Olympic Mountains continue to thin and recede due to climate change. If carbon emissions are not abated, the Olympic Glaciers are predicted to be extinct by 2070. This will cause warmer and lower summer flows in the river.

(Jamestown) Climate modeling in the Jamestown S’Klallam Tribe’s area predicts that by mid-century, the main channel of the Dungeness is likely to regularly exceed critical temperature thresholds for cold-water fishes (e.g., 16°C 7DAD Max temperatures) and reduce summer flows. These changes will stress cold-water salmon throughout their life stages and be a barrier to migration. Lack of funding and capacity to prepare for these changes remain a challenge.

(Lower Elwha) The predicted loss from climate change of winter snowpack and associated late spring/early summer runoff will result in fundamental changes to the Elwha River ecosystem. Habitat loss in the river is expected at flows of less than 400 cubic feet per second (cfs), a situation exacerbated by water withdrawals. In 2024, the Elwha River reached a low flow of 214 cfs.

(Lummi) The 2018 Washington Department of Ecology Water Quality Assessment and listings report to the U.S. EPA is the first update since 2012. Based on the 2018 assessment, stream temperature pollution listings increased in the Nooksack River watershed. Rising stream temperatures threaten the health of salmon in the river system.

(Nisqually) Muck Creek Basin is the largest prairie system in the Nisqually River Watershed whose unique hydrology has driven the local adaptation of the Nisqually Chum, steelhead, and coho, but due to changes in the prairie ecosystem, it has lost much of its resilience to climate change. The Muck Creek Watershed Restoration Strategy needs to be implemented to address habitat loss, low flow issues, and wetland protection.

(Port Gamble) The Port Gamble S’Klallam Tribe continues to monitor the impacts of changing climate on their reservation and throughout the region. Of particular concern is changes in forested areas, wetlands and groundwater recharge resiliency on their reservation.

(Quileute) The cherished way of life of the Quileute Tribe is threatened by the increased frequency of major coastal flooding exacerbated by human-caused climate change. By 2100 sea level is projected to rise by 4 to 56 inches along the Pacific Northwest coast and by almost 20 inches along the Quileute coastline. In the 22 years between 2003 and 2024, the Bogachiel river reached or exceeded the flood stage in 15 years, including three of the last five.

(Quinault) Higher temperatures from human-driven climate change are causing a rapid retreat of glaciers that feed many rivers in the Quinault Area of Interest. The Anderson Glacier, which fed the Quinault River, has disappeared. Other receding glaciers that feed the Quinault include the Linsleys, White and Christie while those that feed the Queets River include the Queets, Humes and Jeffers. The result is less fish habitat, higher stream temperatures, and greater sediment load.

(Sauk-Suiattle) Precipitation is shifting from snow to rain in the Sauk River watershed. The Sauk River watershed hydrology is historically 71% dominated by snow. Based on climate forecasts, the watershed will only be 42% snow dominated by the 2080, a loss of 29%. Climate change also is projected to increase the size of the river's 20-year, 50-year and 100-year floods by 63%, 57% and 51% respectively.

(Sauk-Suiattle) Since 1959, glacier area in the Skagit River watershed has decreased between 30 and 35 square kilometers (-19%). At current consumption rates, this loss of glacial cover in the watershed equals the elimination of an estimated 100 years of cold freshwater supply for Skagit County.

(Sauk-Suiattle) Over the last six decades, natural-origin Chinook salmon have been spawning later by up to 0.52 days per year. Meanwhile, egg take for hatchery propagation has moved earlier by 0.58 days per year. Mean August river temperatures have risen over the period of record as expected given climate predictions, suggesting that natural-origin Chinook salmon spawn timing trends may be expressing plastic or adaptive responses to warming water and/or related factors.

(Squaxin Island) A study completed by the Squaxin Island Tribe and the Climate Impacts Group found that sea level rise is projected to dramatically increase the frequency of inundation during storm surge events. Many of the sites surveyed by the Tribe are currently at risk of flooding or will be in the future due to sea level rise. These include culturally significant sites to the Tribe.

(Stillaguamish) Monitoring of mountain goat populations since 2012 has found sharply declining rates of survival in Washington state. The Darrington west area population is estimated to have declined from 235 goats in 2015 to 8 goats in 2024 . The Mount Baker population declined from 346 goats in 2019 to 164 goats in 2021. A recent study into environmental impacts on mountain goat survival looked at the 324 mountain goats spread across seven separate monitoring activities between 2002 and 2022. Of the 324 goats monitored, only 122 goats survived, and survival decline increased between 2012 and 2022.

(Suquamish) The Suquamish Tribe's water temperature data was used in a study to assess the impacts of climate change on salmonids in the Chico Creek watershed. Results show that stream temperatures will increase in the coming decades and solutions need to be implemented to protect salmon, such as riparian habitat restoration and beaver recolonization.

(Swinomish) Over the last six decades, natural-origin Chinook salmon have been spawning later by up to 0.52 days per year. Meanwhile, egg take for hatchery propagation has moved earlier by 0.58 days per year. Mean August river temperatures have risen over the period of record as expected given climate predictions, suggesting that natural-origin Chinook salmon spawn timing trends may be expressing plastic or adaptive responses to warming water and/or related factors.

(Tulalip) A comparison of mean daily mean streamflow in the Snohomish River between 1964-1993 and 1993-2023 shows a shift in streamflow timing over the course of the water year. Daily streamflow is becoming higher from October through January and lower from June through August (Figure 1).¹ This corresponds with the climate change impacts of rising air temperature, more annual precipitation as rain and less as snow in the winter, and less overall precipitation in the summer.

Floodplain – Development - Connectivity

TRIBAL CHAPTERS

(Muckleshoot) Floodplains along the Green/Duwamish, White/Puyallup, and Cedar rivers remain in poor health. In the Green River, about 80% of the historic ecological floodplain is no longer connected to the river. Approximately 28 miles of levee exist along a 21-mile stretch of the Green River. Reconnecting floodplains and restoring floodplain habitats is essential for increasing both the available rearing and refuge habitat and corresponding salmon productivity of the watershed.

(Nooksack) Between 2006 and 2016, agriculture and developed land increased in the mainstem Nooksack floodplain by 241 acres (163 acres in the lower mainstem and 78 acres in the upper mainstem). During that same time period, undeveloped land decreased by 374 acres (361 acres in the lower mainstem and 13 acres in the upper mainstem).

(Upper Skagit) As of 2015, 35% of floodplain is isolated or impaired, which reduces the quantity and quality of rearing habitat. Exacerbating the impairment caused by floodplain disconnection, the middle Skagit floodplain remains in a state of managed deforestation, under 50% of the floodplain currently has forest cover.

Floodplain - Land Cover

Puget Sound Region –

In the Puget Sound lowlands, approximately 1,285 square miles of floodplain habitat exist, with a land cover composition of 49% forest/shrub, 27% agriculture, 17% developed, and 7% other/natural areas. Preserving functional floodplains is crucial for Puget Sound’s watersheds and ensuring juvenile salmon retains essential shelter, refuge, and food sources.

Forest Cover

REGION CHAPTERS

Pacific Coast Region –

- It is estimated that 73.7% (2,450 square miles) of this region is forested as of 2021 with trees greater than 15 feet in height.

Puget Sound Region –

- Within the Puget Sound region (WRIA 1-19) there are approximately 8,000 square miles of land within the state’s jurisdiction. Using newly available data, it is estimated that 65.6% (5,250 square miles) of this region is forested as of 2021 with trees greater than 15 feet in height.

TRIBAL CHAPTERS

(Nooksack) The 50-year salmon recovery target for hydrologically mature forest cover was met in 2021 with 316,590 acres across the Nooksack watershed. All geographic areas except for the lower mainstem currently meet their 50-year goals and all areas except the lower mainstem have shown an increase in hydrologically mature forest since the adoption of the Salmon Recovery Plan.

(Port Gamble) Forest canopy cover in the Port Gamble S’Klallam Tribe’s Area of Interest (AOI) decreased by 5.02 square miles overall from 2016 to 2021. Of the 330 sub-watersheds, 125 had losses greater than 0.5%, including 17 sub-watersheds with losses between 10 and 30%, none of which were within urban growth areas. In 2021, 193 of the 330 sub-watersheds had less than 65% forest canopy cover and only 31 had forest canopy cover greater than 75%.

(Quinalt) The 2021 tree canopy cover data shows that only 54 watersheds (about 46% of the land area) are in healthy or good condition. Many of the watersheds in poor condition were around the high population areas of Aberdeen and twin cities of Chehalis and Centralia. Overall, between 2011 and 2021, there was a slight increase in forest cover. The highest increase of 11.3% was in the Middle Wynoochee River watershed, while the highest decrease of 10.2% was in the headwaters of the Chehalis River.

(Sauk-Suiattle) In 2021, Sauk River floodplain riparian areas were an estimated 88% forested. It is estimated that 104 acres of forest cover was lost in the Sauk River floodplain between 2011 and 2021. Almost 97%, or 101 acres, of loss is attributed to natural processes, considered a healthy function of the floodplain ecosystem.

(Skokomish) From 2011 to 2021, the Hood Canal watershed saw an increase of approximately 4,494 acres of forest cover, a 0.55% gain.^{1,2} Forest practice applications are still occurring, but the regrowth of forests is surpassing the amount of timber harvested.

(Squaxin Island) Forest cover decreased slightly by 0.84% from 2011-2021 in the Squaxin Area of Interest, a loss of approximately 5,173 acres.

(Suquamish) Forest cover in the East Kitsap area decreased by 2.22% between 2011-2021, a loss of approximately 4,230 acres.

(Tulalip) From 2011 to 2021, there was an estimated 1,989 acres net loss of forest cover in the lowlands of the Snohomish River basin. Over 90% of that loss occurred in areas zoned for Rural Residential land use, while in areas zoned for Agricultural land use there was a 247-acre increase in forest cover.

Forest Cover – Riparian

REGION CHAPTERS

Pacific Coast Region –

- In the Pacific Coast region, there is roughly 1,455 square miles of riparian habitat within the state’s jurisdiction. As of 2021, 80.74% of this riparian area was forested by trees taller than 15 feet in height.

Puget Sound Region –

- In the Puget Sound region there are roughly 1,925 square miles of riparian habitat within the state’s jurisdiction. This habitat is vital for water quality, salmon health, and many other critical ecosystem functions. As of 2021, 71.47% of this riparian area was forested by trees taller than 15 feet in height.

TRIBAL CHAPTERS

(Jamestown) The Jamestown S’Klallam Tribe plays a critical role in protecting and restoring riparian health in their area. Healthy riparian and channel migration zones are vital for salmon survival. However, throughout their area of interest, much of the land within riparian zones has been developed or degraded.

(Nooksack) Between 2011 and 2021, the Nooksack River riparian zone lost 309 acres of its forest cover; 154 acres (about 50%) to natural channel migration and bank erosion and 155 acres (about 50%) to human land use.

Forest Practices – Timber Harvesting

TRIBAL CHAPTERS

(Hoh) Between 2000 and 2023, about 170 square miles of forestlands have either been or will soon be harvested, with about 145 square miles (or 86%) in private ownership. The private forestland harvest operations were predominantly conducted between 2006 and 2017.

(Quileute) Forest practice applications filed for the purpose of harvesting timber within the Quileute Area of Interest show that between 2000 and 2023, about 131 square miles (or 27.5%) of forestlands have either been or will soon be harvested, with about 107 square miles (or 82%) in private forestlands. Activities were highest in the 2012-2017 period and lowest in the 2018-2023 period, although there is no clear trend in both public and private forestlands.

Forestland Conversion

TRIBAL CHAPTERS

(Stillaguamish) As of 2022, approximately 1,787 acres of land had been converted from forest practices to non-forest practices through the WADNR Class IV-General permit. Most of the conversion, 1,411 acres, occurred between 1997 and 2007. Snohomish County’s current 20-year Future Land Use plan proposed an estimated 7,221 acres of land currently zoned in forestland to be rezoned and converted out of forest practice activities and into rural residential and Urban Growth Area land uses.

Impervious Surface / Population Increase

REGION CHAPTERS

Pacific Coast Region –

- While the coastal regions of Washington State have not seen the drastic rise in impervious surface that the Puget Sound region has seen, its rate has still seen an increase over the last 20 years. Between 2001 and 2021 the percentage of impervious surface increased from 1.30% to 1.45%. The majority of this increase has occurred near the cities of Aberdeen and Centralia.

Puget Sound Region –

- Between 2001 and 2021, the percentage of impervious surfaces increased from 4.72% to 5.23%. The majority of this increase has occurred in Pierce, King, and Snohomish County watersheds.

TRIBAL CHAPTERS

(Muckleshoot) Impervious surface land cover has led to severely degraded water conditions in the Lake Washington, Green/Duwamish and Puyallup/White basins. Population growth in traditionally rural areas continues to increase impervious surface cover. In 2023, Black Diamond was the fastest growing city in King County with a 40.6% growth rate.

(Nisqually) Between 2011 and 2021, impervious surfaces increased by approximately 1,249 acres (0.18%) within the Nisqually Areas of Interest and Concern (this does not include JBLM land).

(Port Gamble) Within the Area of Study, the total impervious surface area increased by 1.63% from 2016 to 2021 (compared to 0.8% from 2011 to 2016). Fifty-eight of the 328 sub-watersheds had impacted habitat conditions from impervious surfaces in 2021, and 167 increased in impervious surface area from 2016 to 2021. The areas with the highest population densities had the most impervious surface areas.

(Puyallup) The Puyallup River basin continued to see an increase in impervious surface (0.32%) from 2011 through 2021. Portions of the Clarks Creek basin fell from degraded to severely degraded, while portions of the South Prairie basin fell from impacted to degraded, with the remaining areas still experiencing little to no impact. Recent population growth near the city of Orting may lead to more development and increased impervious surface in and around the Clarks Creek and South Prairie basins.

(Skokomish) Impervious surfaces in the Hood Canal watershed increased slightly by 0.05% from 2011-2021, and there was a slight increase in population between 2020-2023. Although there has not been significant change, continued population growth in the watershed could lead to a more rapid increase in development and impervious surfaces in the future.

(Squaxin Island) Between 2011 and 2021, impervious surfaces increased by approximately 1,082 acres (0.18%) outside of cities and Urban Growth Areas in the Squaxin Area of Interest.

(Stillaguamish) The population within the Stillaguamish watershed has increased by nearly 20,000 people, a 46% increase, since 2000. Over 60% of new residents moved into Arlington, Stanwood, Granite Falls and their associated Urban Growth Areas. But the watershed's population remains rurally dispersed, with over 60% of residents still living outside of cities, towns and Urban Growth Areas.

(Suquamish) From 2020-2023 population growth in East Kitsap was mostly confined to Urban Growth Areas within Kitsap County, however the county is still not in compliance with its adopted urban/rural growth target. From 2011-2021 impervious surfaces increased slightly (0.52%) with 982 acres added to roughly the same areas, concentrated mainly within the Blackjack Creek, Gorst Creek, and Clear Creek watersheds.

Invasive Species – Plants & Green Crab

TRIBAL CHAPTERS

Plants

(Hoh) Invasive plant species continue to be a problem in the riparian zones of the Hoh River watershed. Control measures have significantly reduced knotweed numbers, but other species like Scotch Broom, Herb Robert, Himalayan Blackberry, and Tansy Ragwort are now more widespread. Between 2020 and 2024, there has been a general increase in the number of acres occupied by these species.

(Quileute) The Quileute Tribe and its partners have continued the survey and treatment of knotweed species in the Quileute Area of Interest which have resulted in reducing knotweed infestation in the area. Other species like Himalayan blackberry, Scotch broom, and spotted jewelweed remain a problem in the area. Also, European green crab species were recently captured for the first time in the area.

(Sauk-Suiattle) Knotweed has been significantly reduced through treatment in the Sauk River watershed since 2014.

European Green Crab

(Jamestown) European Green Crab (EGC) are a highly invasive species that were first discovered in the Salish Sea in 2012. They feed on many subsistence species critical for the Tribe, negatively impact valuable eelgrass beds necessary for salmon to thrive, and pose a displacement risk for the native Dungeness Crab.² EGC catch numbers have increased over time with the addition of more traps set.

(Lummi) The invasive European green crab (EGC), *Carcinus maenas*, threatens to disrupt nearshore habitats and balanced ecosystems wherever it is introduced. The Lummi Nation has considerable tidelands and marshlands on its reservation, providing ample suitable habitat for the invasive species. In the fall of 2019, EGC were detected in Lummi Bay for the first time since the species colonized the NW Pacific coast. Since then, the Lummi Natural Resources Department has responded nonstop to this environmental threat.

(Makah) The European green crab (*Carcinus maenas*) has continued to expand its range and abundance within the Makah Area of Interest. More than 45,000 crabs were caught between 2020 and 2024, totaling more than 47,600 green crabs removed from Makah waterways since first detecting them in 2017. While the majority of catch continues to be in the coastal estuaries, new hotspots have been identified in the rocky intertidal habitats within Makah Bay and near the Ozette Reservation. In 2023, green crabs were detected for the first time inside Neah Bay. Additional monitoring and research show both promise and alarm for the future of managing this invasive species.

(Port Gamble) European Green Crab (EGC) are a highly invasive species that were first discovered in the Salish Sea in 2012. The Port Gamble S'Klallam Tribe is deeply concerned because these invasive crabs negatively impact eelgrass beds necessary for salmon to thrive; they feed on clams, oysters, and other critical species used for tribal subsistence; and they pose a displacement risk for the native Dungeness Crab. EGC catch numbers increase with the number of traps set.

(Quileute) The Quileute Tribe and its partners have continued the survey and treatment of knotweed species in the Quileute Area of Interest which have resulted in reducing knotweed infestation in the area. Other species like Himalayan blackberry, Scotch broom, and spotted jewelweed remain a problem in the area. Also, European green crab species were recently captured for the first time in the area.

(Quinalt) The proliferation of European green crab (*Carcinus maenas*) is fast becoming an urgent threat to the coastal ecosystem in the Quinalt Area of Interest. Between 2022 and 2024, almost 240,000 European green crabs were caught in Grays Harbor by various stakeholders, with numbers increasing from about 24,000 in 2022 to almost 130,000 in 2024.

Large Woody Debris

TRIBAL CHAPTERS

(Muckleshoot) Surveys show that the Lower Cedar and Green rivers contain less than 5% of the large wood pieces expected for healthy streams. This shortage of wood is a strong indicator that habitat complexity is severely lacking, not only in these rivers, but likely across other rivers in this region.

Ocean Conditions

REGION CHAPTERS

Pacific Coast Region –

- The marine Areas of Interest for the tribes on the Washington outer coast have been heavily impacted by ocean warming, including marine heatwaves (MHW), hypoxia, and harmful algal blooms (HABs). In 2024/25, tribal fishers reported encountering anomalously warm waters on their fishing grounds well into the winter. In response to the changing marine conditions and their impacts on fisheries, tribes on the outer coast have been actively leading research and monitoring efforts to document and better understand what is happening in the marine environment.

TRIBAL CHAPTERS

(Hoh) The ocean area off the Hoh Area of Interest continues to be heavily impacted by ocean warming, including marine heatwaves, hypoxia, and harmful algal blooms. In 2021 a severe fish kill occurred off the Hoh reservation, with hundreds of dead fish washing up on the beach near the village. Also, tribal members have noted that they have been finding smaller razor clams with thinner shells than they have in the past.

(Makah) The Makah Tribe's Area of Interest has been impacted by changing ocean conditions, including warming oceans, marine heat waves, ocean acidification and hypoxia, harmful algal blooms and invasive European green crabs.

(Quileute) The coastal waters off the Quileute Tribe's Area of Interest continue to face many threats like ocean warming, including marine heatwaves (MHW), hypoxia, and harmful algal blooms (HABs), conditions that are exacerbated by human-caused climate change. In 2024, hypoxic conditions started earlier than normal and continued into October even in shallower inner-shelf waters.

(Quinault) The marine areas of interest for the Quinault Indian Nation have been heavily impacted by ocean warming, including marine heatwaves (MHW), hypoxia, and harmful algal blooms (HABs). Domoic acid concentrations from the HABs were high enough to close fisheries in 2021 and 2023. Summertime hypoxia has caused fish kills with hundreds of dead fish washing up on the beaches.

(Squaxin Island) Effects of warm ocean temperatures, high nitrogen levels, and low dissolved oxygen levels are noticeable, particularly in the shallow waters of the Squaxin Island Tribe’s traditional fishing waters in South Puget Sound.

Puget Sound Conditions

TRIBAL CHAPTERS

(Squaxin Island) Chronic stressors such as water quality degradation, rising ocean temperatures, competition with invasive species and grazing are causing rapid declines in kelp in Puget Sound. The Squaxin Island Tribe and partners are working to restore bull kelp beds before they disappear altogether.

Recreational Impacts

REGION CHAPTERS

Pacific Coast & Puget Sound Regions –

- The economic, societal and individual benefits of outdoor recreation in western Washington, come at a cost to Tribal treaty resources and to the ecological health of these watersheds. Tribes are currently working with state and federal land managers to ensure recreation management policy is based on best available science, tribal knowledge, cross-jurisdictional coordination, and ecological sustainability.

Restoration – Protection Measures

TRIBAL CHAPTERS

(Jamestown) The Jamestown S’Klallam Tribe has partnered with The Hood Canal Salmon Enhancement Group for the Big Quilcene Lower One Mile Construction Project. This project will restore habitat critical for salmon in the lower one mile of the Big Quilcene River and the surrounding floodplain. Construction is expected to begin in late 2025 and be completed by the end of 2026.

(Jamestown) Floodplains play an important ecological role in salmon recovery and create healthy functioning habitat for freshwater species. The Jamestown S’Klallam Tribe has been actively working on projects to restore the Dungeness River and its floodplains for more than 30 years.

(Lower Elwha) In 2017, the U.S. Navy installed a large transit protection pier on the U.S. Coast Guard Base on the south shore of Ediz Hook to accommodate moorage of the twin blocker vessels used to escort Naval submarines through the Strait of Juan de Fuca. Following discussions with the Tribe regarding mitigation options, the Navy agreed to complete mitigation projects to address treaty and compensatory mitigation.

(Lower Elwha) To address the lack of wood in streams, the Lower Elwha Klallam Tribe and its partners have, over the years, placed wood in stream channels. Such long-term projects have taken place in the Pysht River, Little River, East Twin River and Deep Creek watersheds, among others. These projects have resulted in positive habitat responses including rapid pool development, accumulation of gravels, side-channel development and increased floodplain connectivity.

(Lower Elwha) As part of the Elwha Dam removal project, extensive and rigorous monitoring and adaptive management plans were developed by the co-managers and federal partners. While the monitoring funds have sunset, it is important to secure more funding for monitoring to know whether habitat or fish goals needed for recovery are being met and to adaptively manage the hatchery and future harvests.

(Lower Elwha) The Lower Elwha Klallam Tribe’s habitat protection and restoration program of the South Fork Pysht River has been ongoing for three decades. Recent survey results showed a mix of recovering habitat from both restoration and natural recovery with habitats that showed no sign of recovery. The upper seven kilometers of the river are on a recovery trajectory while the lower seven kilometers contains significant reaches that require further restoration.

(Lummi) Recent mapping found that Nooksack delta tidal wetland habitat increased between 2008 and 2013, from 2,209 acres to 2,273 acres. As habitat area has increased through restoration, natural processes in the delta have changed and improved habitat type. Since 2008, a 13-acre log jam on a large distributary delta channel has formed, increasing blind channel habitat area in the delta by 14 acres (+70%) and decreasing distributary channel area by 34 acres (-15%). The increase in habitat area and change in habitat type has resulted in more area for the fish to occupy, increasing carrying capacity in the delta for Chinook salmon.

(Lummi) There has been little change in floodplain wetland area since the late 1990s. There was an estimated 1.5% loss of wetland area in the floodplain between 1996 and 2006, no further loss between 2006 and 2011, and a 1.5% gain of wetland area between 2011 and 2016.^{1,2} The fluctuation over the last 20 years is thought to be within the range of error of the data, and there has been overall no change in wetland area since 1996.

(Lummi) Since 2001, Lummi Nation and the Nooksack Indian Tribe have constructed 758 engineered logjams (ELJs) and habitat structures in the Nooksack River watershed. While 29 projects have been completed, four more projects are in a conceptual design phase, six are in a preliminary design phase and four are actively progressing.

(Makah) The Makah Tribe has devoted significant efforts to protecting and improving Neah Bay, including building the Makah Marina and Port of Neah Bay facilities (1995-1997) and replacing the commercial fishing dock (2014), along with removing derelict legacy marine debris including dilapidated marine structures, abandoned and derelict vessels (ADV) and sunken vessels (2024). Future work will be to remove the remaining ADV and the derelict T-dock, as well as restoring benthic substrate that has been covered for decades and exposed by the 2024 derelict structure removals.

(Nisqually) Fish passage barrier locations along rail which runs adjacent to the shoreline have been prioritized for removal by BNSF rail near the Nisqually River Delta. The highest priority project is the Sequelitchew Creek Estuary and would include culvert removal and construction of a bridge or trestle-like structure to restore the fluvial processes of Sequelitchew Creek.

(Nisqually) The purchase of key properties by the Nisqually Indian Tribe will protect and restore habitat and help counter failures in the Growth Management Act (GMA), Shoreline Management Act (SMA), and others.

(Nisqually) The Nisqually Indian Tribe and partners are changing the forest management paradigm to align with ecosystem recovery and management for culturally important forest resources. They are actively purchasing land rather than relying on regulatory processes to affect management and access. Tribal ownership guarantees access to hunting and gathering, and management can enhance those resources.

(Nooksack) Between 2020 and 2024, there were eight instream restoration projects in the Nooksack River forks that involved construction of 193 engineered logjams (ELJs) and 23 other types of structures. The Nooksack Indian Tribe and the Lummi Nation each sponsored four of the projects. The Nooksack projects resulted in 123 ELJs and three other structures, and the Lummi projects resulted in 70 ELJs and 20 other structures.

(Port Gamble) The Port Gamble Upland Cleanup is expected to be completed in the summer of 2025. This project will restore contaminated soils, remove hardscapes, and return the land and intertidal habitats to natural and healthy functioning processes at the former mill site in Port Gamble Bay.

(Puyallup) Strategies to reconnect floodplains through levee setbacks, side channel reconstruction and habitat restoration are being implemented in Pierce County, with approximately 9.4 miles of setback levees completed along more than 96 miles of levee. However, as sites are assessed for future projects, development in the floodplain could halt levee setback and restoration opportunities.

(Puyallup) Strategies to reconnect floodplains through levee setbacks, side channel reconstruction and habitat restoration are being implemented in Pierce County, with approximately 9.4 miles of setback levees completed along more than 96 miles of levee. However, as sites are assessed for future projects, development in the floodplain could halt levee setback and restoration opportunities.

(Quileute) The Quillayute River watershed has been impacted by anthropogenic activities which have contributed to the decline in salmonid habitat quality and quantity. The Quileute Tribe developed a multi-phase implementation plan to restore salmon habitat, reduce flood risks to the tribal village of La Push, and support tribal fisheries. The Tribe has completed the restoration of the lower Quillayute River and plans to undertake restoration efforts in the upper three reaches of the Quillayute River in the future.

(Sauk-Suiattle) Between 2001 and 2019, a total of 24 floodplain structures or channel crossings were removed from the floodplain, natural processes were restored in 59 hectares of non-channel floodplain and floodplain channel area, and 2.7 kilometers of floodplain road/levee and channel-lining riprap was removed.

(Skokomish) Skokomish River channel and floodplain restoration efforts continue through riparian habitat restoration and watershed planning.

(Skokomish) In 2023 the Skokomish Tribe, in collaboration with Mason Conservation District, conducted an in-stream and floodplain reconnection project at the Skokomish River Mile 5. The project included engineered log jams and constructing a channel connecting the Skokomish River with Purdy Creek.

(Stillaguamish) The Stillaguamish Salmon Recovery Plan's 10-year target for estuary habitat restoration is 548 acres. From 2014 through 2019, 330 acres of estuary habitat were restored, bringing the total restored to 480 acres. In addition, 250 estuary acres were acquired during this time for future restoration. Since 2020, the tribe has secured a contract to restore 230 acres by 2026, purchased an additional 400 acres for future restoration, and is in an ongoing negotiation to see an additional 50 acres of tidal wetland restoration.

(Stillaguamish) Restoration toward salmon recovery continues in the Stillaguamish River floodplain. 22.66 of a targeted 30 acres of floodplain area have been restored, 0.24 miles of a targeted 4.1 miles of bank armoring has been removed, 367 acres of a targeted 400 acres of riparian forest has been planted. At the same time, 0.43 miles of additional bank armoring has been discovered and based on a 2021 high-resolution mapping of tree canopy by NOAA-CCAP, the percent riparian forest cover in the Stillaguamish River floodplain is at 28%.

(Suquamish) Eelgrass has declined in many areas and bull kelp has disappeared where it once flourished, but recent restoration projects show promise for improving nearshore habitat. Bull kelp was planted at Jefferson Head near the Suquamish Tribe's Doe Kag Wats estuary, and in 2020, the kelp reached the surface for the first time in almost three decades.

(Suquamish) Multiple culvert removal and habitat restoration projects have been completed or are near completion in East Kitsap. Additional habitat and restoration projects have been completed in Chico, Curley, Blackjack and Gorst watersheds. Of the culvert projects completed, the State Route 3 project (completed in 2024) that replaced two eight-foot square culverts with a 240 foot bridge (200 foot hydraulic opening) was most notable.

(Suquamish) The Suquamish Tribe is an active participant in salmon forums. Tribal representatives participate in the Puget Sound Partnership Salmon Recovery Council as well as participate in the West Sound Partners for Ecosystem Recovery (WSPER). WSPER serves as both the salmon recovery lead entity and the Local Integrating Organization for ecosystem recovery in the North Central Action Area. Participants include Kitsap County, Pierce County, City of Bremerton, City of Poulsbo, City of Port Orchard, City of Bainbridge Island, City of Gig Harbor, the Suquamish Tribe, the Port Gamble S'klallam Tribe, the Squaxin Island Tribe, Department of Fish and Wildlife and various enhancement groups, conservation districts and environmental groups. WSPER has a Salmon Recovery and Conservation Plan that was completed in 2005 and is currently going through an update scheduled to be released in 2025.

(Swinomish) From 1999 to 2019, net tidal footprint gain—naturally and through restoration—was only 44 hectares. Since 2020, two restoration projects have resulted in approximately 10-13 acres of habitat. These small habitat gains fall far short of the 1,114.6 hectares of new habitat outlined as a goal in the 2005 Skagit Chinook Recovery Plan.

(Swinomish) Between 2001 and 2019, a total of 24 structures or channel crossings were removed from the floodplain, natural processes were restored in 59 hectares of non-channel and channel area, and 2.7 kilometers of road/levee and channel-lining riprap was removed. However, this progress is too small to keep pace with recovery plan targets.

(Swinomish) According to the Skagit Chinook Recovery Plan, successful habitat protection depends upon public recognition of its importance, an unambiguous regulatory framework that ensures that the habitat needs of the fisheries resource are fully protected, and consistent enforcement of regulations.¹ Unfortunately, many exemptions exist for ongoing and new land uses, and counties and state agencies are largely unwilling or unable to enforce habitat protection laws.

(Tulalip) The Snohomish River Basin Salmon Conservation Plan had a 10-year goal to restore 1,237 acres of tidal marsh and blind channel habitat by 2015. Projects and planned work, including the 400-acre Spencer Island Project completed in 2009, the Tulalip Tribe's 354-acre Qwuloot Restoration Project completed in August of 2015, the 326-acre Smith Island project completed in the Spring of 2016, and the 353-acre Blue Heron Slough project completed in 2022, have the Snohomish estuary exceeding the 10-year restoration targets set in the Snohomish River Salmon Recovery Plan.

(Upper Skagit) A recent study found that half of 60 rivers researched in the Pacific Northwest have experienced increased variability in October – January (winter) streamflows since 1950. The same study found that the increased variability in winter freshwater flows had a more negative effect on Chinook productivity than any of the other climate signals researched.

(Upper Skagit) According to the Skagit Watershed Council Riparian Database, 472 acres of riparian trees were planted throughout the Skagit River watershed between 2020 and 2023. Of that, 83-acres were planted in the middle Skagit floodplain. This brings the total of riparian planting in the middle Skagit floodplain since 2006 to 687 acres.

(Upper Skagit) From 2000 to 2019, net tidal marsh habitat gain, naturally and through restoration, was only 44 hectares. Since 2020, no restoration efforts have resulted in a measurable increase in habitat, and negative progradation rates, erosion and sea level rise likely caused further reductions in habitat. This outcome falls far short of the 1,114.6 hectares of new habitat outlined as a recovery goal in the Skagit Chinook Recovery Plan.

RMAP

TRIBAL CHAPTERS

(Lummi) The state's Road Maintenance and Abandonment Plan (RMAP) has resulted in the repair or abandonment of 1,426 miles of private and state-owned forest roads in the upper Nooksack River watershed. The RMAP has also resulted in the repair or removal of 132 culverts on private and state-owned forest roads.¹ Work on Sierra Pacific-owned lands that was uncompleted at the last update of this report in 2020 has now been completed. This accomplishment is important because no alteration of the human landscape has a greater and more far-reaching effect on aquatic habitat than roads.

(Sauk-Suiattle) Efforts to upgrade and decommission forest roads and new regulations designed to reduce logging on unstable slopes above streams have greatly reduced forestry-related landsliding in the Skagit River watershed. Because excess sediment supply from forestry activities has been a leading cause of habitat degradation in the Pacific Northwest, these results are good news for salmon recovery. Increased winter precipitation and summer wildfire activity due to climate change, however, may lead to future increases in landslides despite past regulatory successes, suggesting an uncertain future for sediment supply impacts to salmon streams.

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Road Densities & Stream Crossings

TRIBAL CHAPTERS

(Hoh) A total of seven watersheds, representing about 80% of the land area, may not be properly functioning because of high road density values that exceed 3 miles per square mile. Similarly, all watersheds outside the Olympic National Park had road crossings of over three per mile of stream.

(Quinault) Road density values were over 3 miles/square mile in virtually all watersheds outside the Olympic National Park, where the values were generally less than 1 mile/square mile. Between 2016 and 2024, about 36% of the watersheds in the area had increases of over 1 mile/square mile, showing that the road density conditions may be getting worse. The density of stream crossings over roads were generally highest with values of over 3 per mile of river in the upper reaches of the Chehalis River, Skookumchuck River, and Stillman Creek.

Shoreline Armoring / Tidal Obstructions / Forage Fish / Pacific Herring

REGION CHAPTERS

Puget Sound Region –

- Washington State has roughly 2,460 miles of shoreline in the Puget Sound and the Strait of Juan de Fuca alone. Of the total miles of shoreline, 26.39% (598.9 miles) are armored to some degree. From 2020 to October 2024, there have been a total of 202 HPAs approved for shoreline armoring work. Repairs, replacements, and modifications to existing armor account for 85% of these HPAs. Only nine (4%) HPAs were for the removal of armoring.

TRIBAL CHAPTERS

(Jamestown) Tidal obstructions including tide gates, beach berms, dikes, and culverts are major barriers to historically accessible salmonid habitat. In the Jamestown S’Klallam Area of Concern, Cassalery Creek, Graysmarsh and Cline Spit are especially vulnerable. The tribe would like to restore these areas to pre-disturbance conditions with high quality habitat to sustain healthy populations of salmon.

(Nisqually) In and around The Nisqually Reach, forage fish spawning locations have been documented, with 45% of sand lance and 55% of surf smelt spawning locations occurring along shorelines with significant armoring (50-100%).

(Nooksack) Around 37.5 miles (24%) of the marine shoreline is armored in WRIA 1 (the Water Resource Inventory Area for Nooksack and independent watersheds). Over the past 10 years there has been very little new armoring added, but there have been an estimated 68 hydraulic permits accepted by the Washington Department of Fish and Wildlife (WDFW) that either replace or repair existing armoring. Most of this permitting is centered around the urban shorelines of Bellingham and Blaine, WA, and the industrial shoreline of the Cherry Point refinery area.

(Skokomish) Since 2019 there have been an estimated 44 hydraulic permits accepted by WDFW to either replace or repair existing shoreline armoring in Hood Canal. In 2017, a bulkhead was replaced without the proper permits, causing permanent environmental damage and killing endangered Chinook salmon. In 2024, property owners were ordered to pay a \$250,000 fine for the illegal bulkhead replacement.

(Stillaguamish) More than 13.75 miles of nearshore marine shoreline is armored in Port Susan Bay. Over the past 10 years there has been very little new armoring added to previously unarmored shoreline, but there have been an estimated 50 hydraulic permits accepted by WDFW that either replace or repair existing armoring and very little existing armoring has been removed.

(Suquamish) Shorelines with significant armoring (50-100%) account for 97% of armoring in East Kitsap County. Forage fish spawning locations have been documented, with 71% of sand lance and 90% of surf smelt spawning locations occurring along shorelines with significant armoring.

(Swinomish) The Washington Department of Fish and Wildlife's (WDFW) Beach Strategies project shoreline data and Skagit County's dike and levee data shows 136 miles of modified shoreline, including nearshore tidal barriers, in Skagit and Samish river intertidal areas. Based on these data, over 106 miles of the modified shoreline is entirely armored. In 2008, published data for that same region showed 113 miles of modified shoreline.^{1,2} It is assumed that most of the increase is due to improved data, including for areas not previously surveyed.

(Upper Skagit) The Washington Department of Fish and Wildlife's (WDFW) Beach Strategies project shoreline data and Skagit County's dike and levee data shows 136 miles of modified shoreline, including nearshore tidal barriers, in Skagit and Samish river intertidal areas. Based on these data, over 106 miles of the modified shoreline is entirely armored. In 2008, published data for that same region showed 113 miles of modified shoreline.^{1,2} It is assumed that most of the increase is due to improved data, including for areas not previously surveyed.

Shoreline Armoring / Modifications / Overwater Structures – Freshwater

TRIBAL CHAPTERS

(Muckleshoot) Elliott Bay and the Duwamish River are heavily modified with extensive shoreline armoring and levees. Approximately 91% (28 out of 31 miles) of Elliott Bay and the Lower Duwamish River shoreline are heavily armored (50-100%). Shoreline armoring and levees continue upstream along the Duwamish River, with only small and fragmented areas of natural habitat suitable for juvenile salmon.

(Muckleshoot) In Lake Sammamish, Lake Washington, and the Lake Washington Ship Canal, approximately 4,000 docks impact lakeshore habitat by creating prime accommodations for salmon predators and significantly increasing the distance juvenile salmon must travel around docks to reach marine waters.

(Nooksack) Between 2005 and 2024, an estimated 9,700 feet of bank armoring hydromodifications (riprap or levees) was added to the mainstem and forks of the Nooksack River, with over 2,200 feet added since 2020. Since 2005, roughly 5,000 feet of bank armoring has either eroded or been removed, with over 750 feet of erosion/removal since 2020. Roughly 65 miles of bank armoring remain in the Nooksack River and its three forks.

Water Quality – Shellfish

TRIBAL CHAPTERS

(Jamestown) Biotoxin monitoring in the Jamestown S’Klallam Tribe’s Area of Interest ensures that only shellfish safe for human consumption are harvested. Long-term data will help us understand what factors increase harmful algal blooms in the Salish Sea.

(Lummi) In 2024, the commercial shellfish growing area in Portage Bay experienced two changes: The Washington Department of Health (DOH) and Lummi Nation upgraded 360 acres from conditionally approved to approved and reduced long-standing seasonal closures to September 1st – November 30th. (Nisqually) Impacts to the nearshore however can be seen even without climate events. Physical parameters such as temperature, salinity and pH have a large impact on the ecology and health of shellfish in the nearshore.

(Nooksack) Since 2019, Drayton Harbor has seen a 47% decline in fully approved commercial shellfish area, while Birch Bay has seen no change in prohibited and/or unclassified acreage.

(Skokomish) The Skokomish Indian Tribe has been working with partners to reestablish the native Olympia oyster near the mouth of the Skokomish River. Efforts by the tribe and others to improve water quality near Hoodspoint has also led to a mile of shellfish beach to be declared safe for harvesting for the first time in 45 years.

(Squaxin Island) The Squaxin Island Tribe has been working with partners to reestablish the native Olympia oyster with the goal of having a robust, self-sustaining bed on Squaxin Island. These efforts are encouraging. However, elsewhere within the tribe's area of interest, poor water quality, rising water temperatures, and sea level rise threaten shellfish habitat.

(Stillaguamish) In 2024, over 1,600 acres of commercial shellfish area at the mouth of the Stillaguamish was "Unclassified" for shellfish harvesting due to lack of commercial or tribal interest in harvesting there. The 302 acres prohibited in Port Susan and South Skagit Bays in 2016 remain prohibited in 2024.

(Suquamish) Poor water quality threatens bivalve shellfish harvests and efforts to restore cockle populations have slowed after the discovery of cockle cancer was found in samples.

(Upper Skagit) Since 2011, there has been no change in the conditionally approved status of over 4,000 acres of commercial shellfish growing area in Samish Bay, which continues to be periodically closed for harvest due to pollution. Between 2015 and 2020, additional testing led to an increase of approved commercial growing area to the north of Samish Bay of 526 acres and in Padilla Bay of 151 acres, but there has been no additional progress since.

Water Quality – Stormwater_PSM_6PPD-Q

TRIBAL CHAPTERS

(Lower Elwha) The Lower Elwha Klallam Tribe's treaty right to harvest coho salmon may be threatened by the presence of 6PPD in streams. Compared to other watersheds in Puget Sound, watersheds in the Lower Elwha Area of Interest have relatively low 6PPD vulnerability scores of less than 1. The highest risk of tire contaminant exposure in the area is in the Lower Dungeness River watershed, followed by the Pysht River watershed.

(Muckleshoot) A compound derived from tire wear, 6PPD-quinone, causes pre-spawning mortality in coho salmon and acute toxicity in rainbow trout/steelhead. In the Muckleshoot area of interest, predictions have been made for areas where 6PPD will contribute to high pre-spawning mortality rates in coho salmon.

(Nisqually) A compound derived from tire wear, 6PPD-quinone (6PPD-Q), has been found to cause pre-spawning mortality in coho salmon. Near Ohop Creek, the Nisqually Indian Tribe and partners have installed a pilot biofiltration system to capture and filter stormwater run-off from Highway 7. Preliminary results found that the system appears to be effective in removing over 90% of 6PPD-Q from untreated stormwater.

(Puyallup) Coho salmon are an important resource to the Puyallup Tribe, and with the discovery that 6PPD-Q in small concentrations can kill Coho in about 90 minutes, demand has grown for mitigation techniques and policies to be put in place to reduce or eliminate the chemical in streams.

(Quinalt) A preservative in car tires known as 6PPD has been identified as the toxic chemical responsible for the mortality of coho salmon returning to spawn in streams and rivers. Watersheds around Aberdeen and in the Upper Black River just south of the greater Olympia area had the highest risk vulnerability scores for 6PPD exposure and are most likely to be impacted by these tire contaminants.

(Suquamish) A compound derived from tire wear, 6PPD-quinone, has been shown in studies to cause mortality in 100% of adult coho salmon. In East Kitsap County, there are 655 stormwater discharge locations on state-maintained highways, and predictions have been made for areas where heavy traffic will contribute to high pre-spawning mortality rates in coho salmon.

Water Quality – Streamflow

REGION CHAPTERS

Pacific Coast Region –

- Recent streamflow data reveal significant seasonal deviations from historic baselines (1948-1998), with increasing days of below-normal flows in summer (July-October) and spring (April-June) and heightened variability in late fall and winter (November-March). These altered hydrological patterns signal critical climate change impacts on freshwater ecosystems, threatening habitat integrity and diverse aquatic communities.

Puget Sound Region –

- Recent streamflow data from 14 USGS stream gages across the Puget Sound region reveal significant seasonal deviations from historic baselines (1948-1998), with increasing days of below-average flows in summer (July-October) and spring (April-June) and changing patterns in late fall and winter flows (November-March). These alterations indicate potential climate change impacts on critical freshwater ecosystem conditions.

TRIBAL CHAPTERS

(Hoh) Since 1960, flows in the Hoh River have become more extreme, largely as a result of climate change. With less precipitation and warmer air temperatures during summer months, flows in rivers and streams are declining. In contrast, winter storms are becoming more severe, resulting in greater peak flood events.

(Jamestown) Shallow riffles in the Dungeness River challenge salmon migrating during low summer flows. The Jamestown S’Klallam Tribe (JST) has been testing short-term fixes to make them passable and will be conducting a suitability study to install Large Woody Debris (LWD) as a long-term fix.

(Makah) Peak flow values have increased in winter while flows in summer have decreased at precisely the time when streamflow is needed the most and when water temperatures are at their highest. Major storm events are becoming more frequent and changes in the distribution of precipitation have become more common. Four of the highest peak flow values and three of the lowest peak flow values have been recorded in the last 25 years. These changes alter the availability and type of instream fish habitat.

(Muckleshoot) Population increases in the Muckleshoot area of interest have been significant over the last 5 years. Land development activities associated with this population growth are closely correlated with factors that can decrease groundwater recharge and decrease summer streamflow, particularly groundwater extraction for public water supply and exportation of wastewater to treatment plants. There are more than 500 public groundwater sources (wells or springs) in selected watersheds in the Muckleshoot area of interest in King County alone. These wells are relatively shallow and are often in hydrologic connection with streams.

(Nooksack) A comparison of mean daily streamflow in the Nooksack River between 1967-1996 and 1997-2023 shows a shift in streamflow timing over the course of the water year. Daily streamflow is becoming higher from October through January and lower from June through August (Figure 1). This corresponds with the climate change impacts of rising air temperature and more annual precipitation as rain, less winter precipitation as snow, and less summer precipitation overall.

(Quinalt) The variation and timing of mean streamflows in the Queets River near Clearwater and the Chehalis River at Porter show a similar pattern of peak flows in the winter months and low flows in the summer months. However, while the winter peak flow values were similar for both rivers, the summer low flows were consistently lower for the Chehalis, which can negatively impact fish habitat.

(Squaxin Island) Between 1980-2019 there were 9,520 water wells installed in the southern Kitsap Watershed and the Kennedy-Goldsborough Watershed near Shelton, WA. Between 2020-2024, an additional 508 water wells were installed—a 5.3% increase. In the Deschutes Watershed 4,353 water wells were installed between 1980-2019, and 158 water wells were added between 2020-2023—a 3.6% increase.

Water Quality – TMDL, Temp., pH, Dissolved Oxygen

REGION CHAPTERS

Pacific Coast Region –

- According to the Washington Department of Ecology’s 2018 305(b) & 303(d) report to EPA, 54% of the assessed waters in the Pacific Coast region were determined to be impaired for one or more parameters. Notably, 90% of these impaired waters are identified as salmonid-bearing, raising significant concerns about the long-term viability of salmon populations in the region.

Puget Sound Region –

- In the Puget Sound region, 60% of assessed waters were determined to be impaired for one or more parameters according to the 2018 data, with temperature and bacteria being the most prevalent issues. Of the water quality assessed streams that are salmonid bearing, 88% are impaired for one or more parameters, potentially impacting the viability of salmonid populations.

TRIBAL CHAPTERS

(Hoh) Warm water temperatures continue to degrade salmonid habitat in the Hoh Tribe’s Area of Interest. Eight of nine creeks monitored for water quality by the Hoh Tribe since 2007 have had summer water temperatures that exceed state water quality standards for core summer salmonid habitat or char spawning, rearing and migration in monitoring years. Of the 96 river miles monitored by the Tribe in 2023, 60.4 river miles (62.9%) had water quality conditions (water temperature, dissolved oxygen, or pH) that did not fully support salmonid or char life uses.

(Lower Elwha) There were 151 polluted water listings (about 204 miles) in 2018 compared to the 127 listings (about 184 miles) in 2012 for the most common pollutants—water temperature, dissolved oxygen, pH, bacteria and turbidity. This represents a 15.9% increase in listings and a 9.8% increase in miles between the two time periods. Water temperature was the most common pollutant with 74 listings, followed by bacteria with 40.

(Lummi) During 2024 water quality monitoring conducted by Lummi Natural Resources (LNR), copper was found in 98% of marine water and 23% of freshwater samples. The effects on aquatic organisms from chronic and acute exposures to copper is a grave concern to the Lummi Nation.

(Makah) In 2022, EPA approved the 2018 Washington State water quality assessment and 303d list of polluted waters. There were 120 polluted water listings in 2018 compared to the 89 listings in 2012 for the most common pollutants – water temperature, dissolved oxygen, and pH, representing a 25.8% increase. Water temperature remains the most common pollutant with 74 listings, followed by dissolved oxygen with 30. The stream length impaired by water temperature increased from 107.9 miles in 2012 to 113.5 miles in 2018, (a 4.9 % increase) while the length impaired for dissolved oxygen increased from 22.3 miles in 2012 to 48.1 miles in 2018 (a 53.6 % increase).

(Muckleshoot) Washington State Department of Ecology’s current Water Quality Assessment lists approximately 167 waterbody segments as impaired for temperature and 298 waterbody segments as impaired for dissolved oxygen in the Cedar/Sammamish, Duwamish/Green, and Puyallup/White river areas. In these Muckleshoot areas of interest, waterbody segments currently listed as impaired for water temperature and dissolved oxygen increased by 51 and 79, respectively, since the last assessment approved by EPA in 2012.

(Nooksack) From 2012 to 2018, the water quality has decreased in the Nooksack River Watershed.

(Puyallup) The Washington State Department of Ecology 2018 Water Quality Assessment and listings report to the U.S. EPA is the first update released since 2012. In the Puyallup-White watershed, temperature impaired streams that need a water improvement plan increased from 35.31 listed miles to 45.31 listed miles, and dissolved oxygen impaired streams increased from 9.39 listed miles to 18.39 listed miles. Additionally, none of the temperature or dissolved oxygen impaired streams improved from the 2012 assessment to the 2018 assessment.

(Quileute) There were 109 listings (190.2 miles) of polluted streams in 2018 compared to the 58 listings (106.3 miles) in 2012 for the most common pollutants—water temperature, dissolved oxygen, pH, and bacteria. This increase is likely the result of increased water quality monitoring in recent years rather than an accurate assessment of the rate of increase.

(Quinalt) There are 270 current water quality impairment listings across 609.4 miles for waters whose beneficial uses are impaired by four of the most common pollutants—water temperature, dissolved oxygen, pH and fecal coliform bacteria. The number of listings represents a 15.9% decrease from the 2012 assessment. Water temperature, the most common pollutant, has 138 listings, representing a 17.9% decrease from the 2012 assessment.

(Sauk-Suiattle) From 2012 to 2018, the water quality has decreased in the Skagit River watershed.

(Sauk-Suiattle) Stream temperature monitoring in the Sauk River watershed shows that waters are often too warm for juvenile salmonids. Of 30 streams with at least three years of monitoring data, only three streams had no days of temperatures harmful to salmon, while 11 streams had temperatures exceeding water quality standards between 30 and 60 days annually on average, and 11 streams had temperatures exceeding water quality standards between 60 and 90 days annually on average.

(Squaxin Island) The Washington State Department of Ecology 2018 Water Quality Assessment and listings report to the US EPA is the first update released since 2012. In the Kennedy-Goldsborough watershed, temperature impaired streams that need a water improvement plan increased slightly from 21.25 listed miles to 21.85 listed miles, and dissolved oxygen impaired streams remained the same at 8.46 listed miles. None of the temperature or dissolved oxygen impaired streams improved from the 2012 assessment to the 2018 assessment.

(Stillaguamish) The 2018 Washington Department of Ecology Water Quality Assessment and listings report to the U.S. EPA is the first update since 2012. In it, temperature-impaired streams that need a water improvement plan increased from 4.85 listed miles to 50.78 listed miles, and dissolved oxygen-impaired streams increased from 6.59 listed miles to 23.62 listed miles. Additionally, only 0.28 miles of previous temperature-impaired streams improved from impairment, and none of the previous dissolved oxygen-impaired streams improved.

(Swinomish) The Washington Department of Ecology failed to meet its goal of 100% riparian planting by 2020, and the agency has taken no steps since then to redress this significant adverse impact to Skagit basin water quality and salmon health and recovery. Since 2020, less than 3% of temperature impaired salmon streams have been planted with riparian habitat.

(Tulalip) From 2012 to 2018, water quality has decreased in the Snohomish River watershed.

(Upper Skagit) From 2012 to 2018, water quality decreased in the Skagit River watershed.

Water Quantity – Wells

REGION CHAPTERS

Pacific Coast Region –

- Since 1980, over 13,600 permit-exempt wells have been developed in the Pacific Coast region (WRIAs 20-23). Between 2019 and 2024, 825 new permit-exempt wells were constructed, representing a 16% decrease from the previous five-year period (2014-2019). The Chehalis watershed (WRIAs 22-23) hosts the majority of these wells, posing significant threats to groundwater availability and ecosystem health, particularly impacting salmon habitats.

Puget Sound Region –

- *Since 1980, over 87,000 permit-exempt wells have been developed in the Puget Sound region (WRIAs 1-19). Between 2019 and 2024, 3,000 wells were constructed, representing a 30% decrease compared to the previous five years. While the rate of permit-exempt well construction has decreased in the last five years, the growing number of new water well installations poses a threat to groundwater availability and stream ecosystem health across the region.*

TRIBAL CHAPTERS

(Lummi) Between 2020 and 2024, an estimated 331 new water wells were drilled in Water Resource Inventory Area 1 (WRIA 1), and 85% of those are estimated to be permitted exempt water wells.¹ Approximately 80% of all permitted exempt water wells in WRIA 1 are in basins closed either seasonally or year-round to water withdrawal due to instream flow levels that are less than the minimum flows established in 1985.

(Nisqually) In the Nisqually Watershed, 7,726 water wells were installed between 1980-2019. Between 2020-2024, 355 water wells were added, a 4.6% increase. Most of the new wells are located between Yelm and Eatonville, along fish bearing streams that flow into the Nisqually River.

(Port Gamble) From 1980 to 2019, 6,987 wells were installed in the Port Gamble S’Klallam Tribe’s study area. From 2020 to 2024, 342 new wells were added. This is a 2% increase from the new well installations reported in 2020 (335 new wells installed from 2015-2019).¹ Of the 342 new wells added from 2020 to 2023, 112 were installed in WRIAs 15 and 17, which are closed to new water withdrawals for at least part of the year.

(Puyallup) In the Puyallup Area of Interest 3,040 water wells were installed between 1980-2019. Between 2020-2024, 85 water wells were added, a 2.8% increase. Most of the new wells are located near the Carbon River and South Prairie Creek, one of the most productive salmon-bearing streams in the Puyallup River Watershed.

(Quileute) Development pressures continue to impact the Quileute’s watersheds, including such activities as unpermitted buildings and the continued development of water wells. Currently, there are 383 water wells in the Quileute’s Area of Interest.

(Quinault) Currently, there are 13,677 water wells which may affect groundwater supply and instream flows in the Quinault Area of Interest. Between 1980 and 2019, 12,588 wells were completed in the area at a rate of about 323 wells per year. Since 2020, 1089 wells were added at a rate of about 218 new wells per year. This represents a lower rate of new wells in the last five years. Also, in each year, there was a slightly lower number of wells than in the previous one. It remains critical to look at the cumulative impacts of both total volume consumption and timing of flows to determine impacts of permit-exempt wells.

(Skokomish) Along Hood Canal 5,874 water wells were installed between 1980-2019. Between 2020-2024 an additional 283 water wells were added, a 4.8% increase.

(Stillaguamish) Between 2005 and 2022, there have been 1,086 wells added to the groundwater reserve watersheds established through the Instream Resources Protection and Water Resources Program. Washington Department of Ecology estimated that the 1,086 wells were withdrawing 190,575 gallons of water per day from the groundwater reserve watersheds.

(Suquamish) In East Kitsap 5,011 water wells were installed between 1980-2019. Between 2020-2024, an additional 183 water wells were added, a 3.7% increase.

Special Topics

TRIBAL CHAPTERS

(Lower Elwha) The six urban creeks in Port Angeles have been severely altered because of the urbanization. The Lower Elwha Klallam Tribe is working with partners to correct fish passage barriers and improve floodplain and estuary habitat of these urban watersheds. Of the seven streams in the Port Angeles Urbanized Area, only Morse Creek has a stream gage which monitors flow and temperature. Deep Creek and Morse Creek, a gauged stream farther west, have similar trajectories of increasing peak flows. It is therefore likely all streams in Port Angeles are experiencing increased peak flows. Several of the streams are known to be contaminated with fecal coliforms and have low fish populations.

(Lummi) Monitoring of juvenile salmon abundance over the past 15 years shows unchanged outmigration trends, suggesting a resilience to further decline but a lack of progress toward meeting recovery goals.

(Lummi) Over 35 years of efforts to maintain and improve water flows in the Nooksack River basin have proven unsuccessful. The only measure left to use is adjudication, the legal determination of water rights for every water user in the Nooksack River basin.

(Makah) Because they were in danger of going extinct, the Lake Ozette Sockeye population was listed as threatened under the Endangered Species Act in 1999. This listing status was upheld in 2005, 2014, and 2022 following 5-year reviews. Results from the 2022 Lake Ozette Sockeye Status Review shows the population is still unstable with the number of adult spawners ranging from 439 to 12,829 and none of the four population viability criteria being met.

(Muckleshoot) The Hiram M. Chittenden Locks do not meet current fish passage standards. Juvenile and adult salmon are delayed, injured, trapped, and killed by the infrastructure and operation of the Locks and the Lake Washington Ship Canal. Marine mammal predation in and around the facility is a serious and ongoing concern since the 1980s.

(Nisqually) As restoration and monitoring continues in the Nisqually River Delta, updates to infrastructure are needed to facilitate long-term recovery. New roadway and bridge structures on I-5 where it crosses the delta would reconnect historic channels to combat coastal squeeze, reduce flooding, and increase resiliency.

(Nisqually) Along the West Coast of the United States, the number of California sea lions has risen as high as 300,000 individuals. A dramatic increase in California and Stellar sea lion utilization of the Nisqually River Delta has been observed between late November and early January, the same time as the Nisqually winter Chum salmon run.

(Port Gamble) Up to 50% of migrating juvenile steelhead that encounter the Hood Canal Bridge (HCB) do not survive migration past the bridge. New mitigation strategies to decrease predation at the HCB are currently being tested and preliminary results are promising.

(Port Gamble) The Kitsap Natural Resource Asset Management Program (KNRAMP) is a new approach for managing natural resources by treating them as assets. KNRAMP's goal is to employ a systematic process for making strategic decisions about these critical natural resources assets. The Port Gamble S'Klallam Tribe was instrumental in developing this program with its partners.

(Puyallup) The Puyallup Tribe and partners developed a thermal concept design with the goals of restoring, protecting or enhancing cold water refuges for salmonids during hot summer months. Two out of seven reaches along South Prairie and Wilkeson Creeks were selected for implementation of the thermal concept design. All data will be used to improve the design of future projects to protect and enhance cold water refuges for salmonids throughout the watershed.

(Puyallup) Electron Hydro, LLC, was sentenced to pay over \$1 million in penalties and ordered to partially remove a rock dam and sheet pile wall on the Puyallup River. This was completed during the 2024 summer work window, providing volitional fish passage past the project for the first time in 120 years.

(Quileute) Over the past several decades, habitat loss and degradation have been explicitly identified as contributing to the steady decline in fish abundance. Habitat limiting factors include the lack of water in critical areas, a significantly altered estuary, road development, fish passage issues, logging, poor riparian vegetation, incised river channels and reduced levels of large woody debris.

(Quileute) The large number of visitors to beaches in the Quileute Area of Interest may be causing significant habitat and water quality problems. There has been an increase in human fecal matter from outdoor recreationists and harmful bacteria from such fecal deposits may biocontaminate shellfish the tribe uses for subsistence and other traditional practices.

(Skokomish) Monitoring of the Skokomish estuary shows that native vegetation and salmon are utilizing restored habitat.

(Squaxin Island) Dramatic increases in harbor seal and sea lion populations have led to increased predation on salmon at juvenile and adult life stages. The Squaxin Island Tribe is concerned with low survival rates of juvenile Coho salmon and contributes to ongoing research with the Salish Sea Marine Survival Project.

(Squaxin Island) Cumulative losses of stream and wetland buffers through the allowances of reasonable use exemptions threaten salmon recovery.

(Swinomish) The U.S. Army Corps of Engineer's McGlinn Island Jetty substantially blocks access for juvenile Chinook and other salmon species to rearing habitats along and north of the Swinomish Channel, and in the spring of 2023 was discovered to be injuring and killing these fish. The 2005 Skagit Chinook Recovery Plan identifies the McGlinn Island Jetty as a limiting factor, impeding juvenile Chinook salmon access to Swinomish Channel and Padilla Bay. Conceptual approaches for restoring fish passage across the jetty include one or more breaches about 350 feet wide.

(Upper Skagit) Seattle City Light is currently undergoing FERC relicensing for its Skagit Hydroelectric Project. Since construction in 1915, the dams have severely altered the Skagit River watershed, including blocking ecological functions and isolating over 140 miles of pristine cold-water tributary habitat. It is imperative that upstream and downstream fish passage be restored at all three of the Skagit Project dams. At the time of publishing, it remains uncertain whether Seattle will achieve timely and successful fish passage at its three Skagit dams.