2020 State of Salmon in Watersheds

EXECUTIVE SUMMARY

WASHINGTON STATE
RECREATION AND CONSERVATION OFFICE
Governor's Salmon Recovery Office

Contents

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Development of this report is not possible without data from many individuals. Especially significant are contributions from the Columbia River Inter-Tribal Fish Commission, salmon recovery lead entities, the Northwest Indian Fisheries Commission, the Office of the Washington State Climatologist, the Salmon Recovery Funding Board, salmon recovery regions, the Washington Department of Ecology, the Washington Department of Fish and Wildlife, and the Washington Stormwater Center.

This report also would not have been possible without funding from the National Oceanic and Atmospheric Administration's National Marine Fisheries Service and the U.S. Fish and Wildlife Service.

About the cover: The photograph, taken by Ryan Hagerty with the U.S. Fish and Wildlife Service, is of a sockeye salmon spawning in the Little Wenatchee River near Leavenworth.

ALL OTHER PHOTOGRAPHS ARE FROM THE RECREATION AND CONSERVATION OFFICE UNLESS NOTED OTHERWISE.

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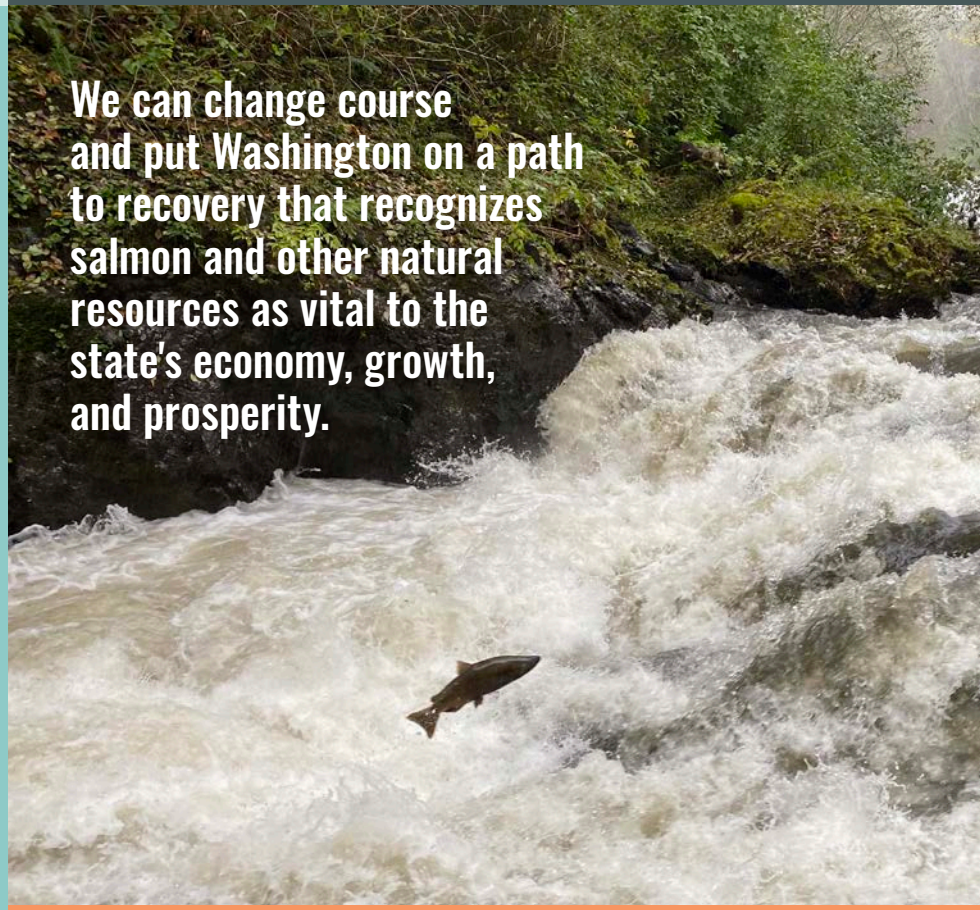
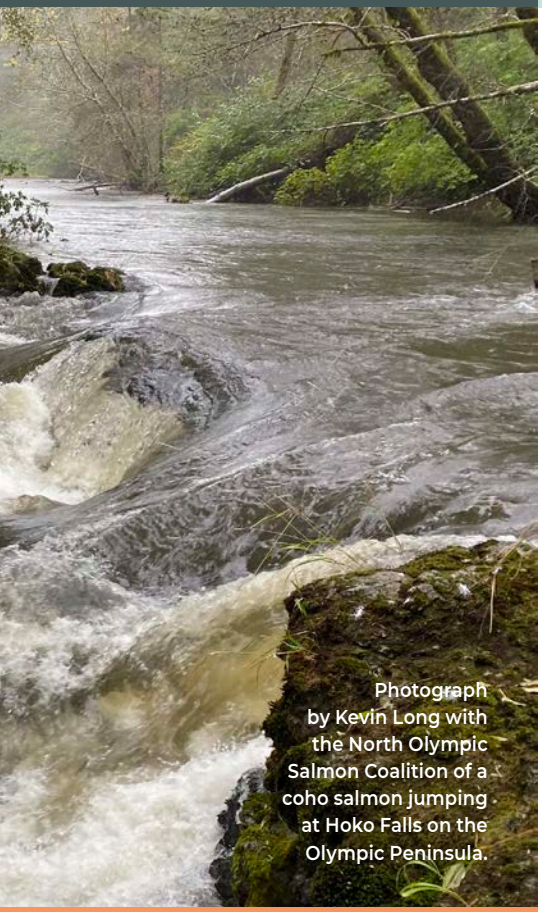


TRIBAL LANDS ACKNOWLEDGMENT

The Washington State Recreation and Conservation Office and the Governor's Salmon Recovery Office acknowledge the ancestral and contemporary lands called home by Indian tribes and nations[1] from time immemorial. We recognize tribal sovereignty and that this place and the region of the Pacific Northwest hold spiritual, cultural, and personal significance for Indian tribes and nations. This acknowledgment is an expression of gratitude for the historic and ongoing self-determination of the tribes to be stewards for these lands, waters, natural resources, and many creatures including salmon that we are so privileged to enjoy here. The salmon recovery community is committed to honoring the role of Indian tribes and nations as it works collectively to recover salmon.



Photograph by Kevin Long with the North Olympic Salmon Coalition of a coho salmon jumping at Hoko Falls on the Olympic Peninsula.

Washingtonians have a substantial role in ensuring that salmon remain to enrich the spirit of the Pacific Northwest.

Salmon at the Crossroads Time is Running Out

EXECUTIVE SUMMARY

Thirty years ago, the federal government determined Snake River sockeye were endangered, making it the first salmon population in the Pacific Northwest to be listed under the Endangered Species Act. Since then, 14 species[2] have been listed in Washington. Determined to save this treasured icon, thousands of people across Washington State have worked tirelessly to increase salmon populations. Their efforts have slowed the decline of many populations and even brought some close to recovery.

However, too many salmon remain on the brink of extinction. And time is running out. The climate is changing, rivers are warming, habitat is diminishing, and the natural systems that support salmon in the Pacific Northwest need help now more than ever.

Today, Washingtonians stand at a fork in the road with a clear choice: Continue with current practices and gradually lose salmon, orcas, and a way of life that has sustained the Pacific Northwest for eons. Or, change course and put Washington on a path to recovery that recognizes salmon and other natural resources as vital to the state's economy, growth, and prosperity.

It will not be an easy road; tough choices will require that Washingtonians embrace their individual responsibilities and work together. This is a cause that needs neighbors to bond with neighbors to find solutions. If Washingtonians can rise to this challenge, success for salmon and for people will ripple through the economy, environment, culture, traditions, and lifestyle, enhancing this state's proud heritage.

Washingtonians have faced unprecedented challenges during the COVID-19 pandemic and have demonstrated the courage and the fortitude to persevere. This crisis has brought fundamental changes to how Washingtonians live, work, and recreate. Some of these changes will continue and will shape Washington well into the future. In these unprecedented times, the recovery of salmon and southern resident orcas must remain a priority, one that also shapes the future of the region. Intentional choices will ensure salmon and people have the clean, cold water they need and that people can ply the waterways to earn a living, catch salmon to feed their families, venture to streams with classmates to see salmon returning home, or cast their first fishing lines in the ocean.

Salmon have an ancient and substantial role in the health of humans, forests, plants, and other animals. And Washingtonians have a substantial role in ensuring that salmon remain to enrich the spirit of the Pacific Northwest and the lives of those who call this place home.

Why Recover Salmon?

The Endangered Species Act requires the federal government to protect species that are in danger of extinction or likely to become so. Since 1991, the federal government has declared 14 species of salmon and steelhead in Washington as at-risk of extinction under the Act. Regional organizations throughout the state formed to develop and implement recovery plans.

Washington State is obligated to uphold treaty-reserved fishing rights for Indian tribes and has a duty to ensure salmon are present and available for harvest. Treaty Indian tribes co-manage the salmon resource with the State. Through treaties with the federal government, treaty Indian tribes gave up their lands in exchange for perpetual access to certain natural resources. Salmon are a sacred cultural, spiritual, and economic resource to tribes. The profound value of salmon to tribes fuels their deeply committed and strong leadership in salmon recovery.

Beyond legal and moral obligations, salmon are important to Washington's economy, environment, recreation opportunities, food supply, and culture.

Washington State is obligated to uphold treaty-reserved fishing rights for Indian tribes and has a duty to ensure salmon are present and available for harvest.

What's at Stake

Economy

Commercial and recreational fishing in Washington is estimated to support 16,000 jobs and $540 million in personal income.[3]

Environment

As a keystone species, salmon reflect the health of the environment from mountain rivers to the ocean. Scientists estimate 138 species of wildlife, everything from whales to insects, depend on salmon for their food.[4]

Recreation

An estimated $1.5 billion is spent annually on equipment and trip-related costs by people fishing and harvesting shellfish recreationally in Washington,[5] supporting many rural families and businesses.

Food Supply

The Washington Department of Ecology reported an estimated 32 percent of adults in the state ate salmon in 2010.[6]

Social Justice

Restoring salmon habitat improves environmental health and human well-being. Many low-income and marginalized residents, who are more likely to be subjected to pollution and poor living conditions, may benefit from having more salmon to eat. In addition, prioritizing salmon recovery prioritizes the livelihoods, experiences, and voices of diverse communities.

EAGLE PHOTOGRAPH BY KENNETH JOHN GILL AKA GILLFOTO. YOUNG GIRL WITH FISH AT CLEAR LAKE. COURTESY OF THE WASHINGTON DEPARTMENT OF FISH AND WILDLIFE

WHAT DOES RECOVERY MEAN?

"Congress passed the Endangered Species Act in 1973, recognizing that the natural heritage of the United States was of 'esthetic, ecological, educational, recreational, and scientific value to our nation and its people.' It was understood that, without protection, many of our nation's native plants and animals would become extinct. Recovery is the process of restoring listed species and their ecosystems to the point where they no longer require Endangered Species Act protections. Endangered and threatened species may have different needs and may require different conservation strategies to achieve recovery."

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

PHOTOGRAPH BY ERIKA NORTEMANN TAKEN ON THE BEACH OF THE QUINAULT INDIAN RESERVATION DURING THE CANOE JOURNEY OF 2013

Culture

From the earliest times, people of the Northwest have identified themselves with salmon. The state's first inhabitants—Indian tribes—defined themselves as the Salmon People.[7] Salmon are woven throughout tribal lives as a source of food, work, art and literature, heritage, and celebration. Washington Indian tribes remain committed to protecting and recovering salmon and have worked tirelessly to restore their habitat. To this day, government agencies rely on the knowledge, stories, and expertise tribes have when co-managing this treasured fish.

Salmon are special to other Washingtonians as well. Considered an icon of the Pacific Northwest, salmon grace the back of the state's commemorative quarter. Residents gather by the thousands annually at festivals throughout the state to celebrate the wild fish's journey home from the ocean. Salmon have long been a part of many family fishing traditions and fishing businesses. Salmon remain significant to the people of Washington today.

Tribal knowledge, expertise, experience, and understanding is critical for salmon recovery.

Indian Tribes and Salmon Recovery

Indian tribes in Washington always have been leaders in salmon recovery. Tribes are committed to restoring salmon populations for the benefit of all and to ensure that a way of life and cultural heritage are sustained.

Tribal governments are responsible for hundreds of successful salmon habitat restoration projects. In partnership with the Washington Department of Fish and Wildlife, treaty Indian tribes co-manage the state's salmon and produce about 40 million salmon annually. In addition, working with federal agencies and other states, tribes set the fishing seasons each year.

Tribal knowledge, expertise, experience, and understanding is critical for salmon recovery. Along with co-managing salmon, many treaty Indian tribes and tribal organizations produce reports such as *The State of Our Watersheds* by the Northwest Indian Fisheries Commission,[8] that provide an ongoing scientific foundation for recovery. The tribal perspective and vision of keeping salmon strong and harvestable for future generations is a model that has maintained salmon in the rivers and can help propel successful recovery across the state.

Salmon Status in Washington

Today, 14 species of salmon and steelhead are listed as at-risk of extinction under the Endangered Species Act.

Among these species there is a wide range of progress towards recovery. Some species are moving in the right direction and are approaching their goals, such as Hood Canal summer chum and Snake River fall Chinook. While others, such as Puget Sound Chinook and upper Columbia River spring Chinook, continue to fall further behind and are in crisis.

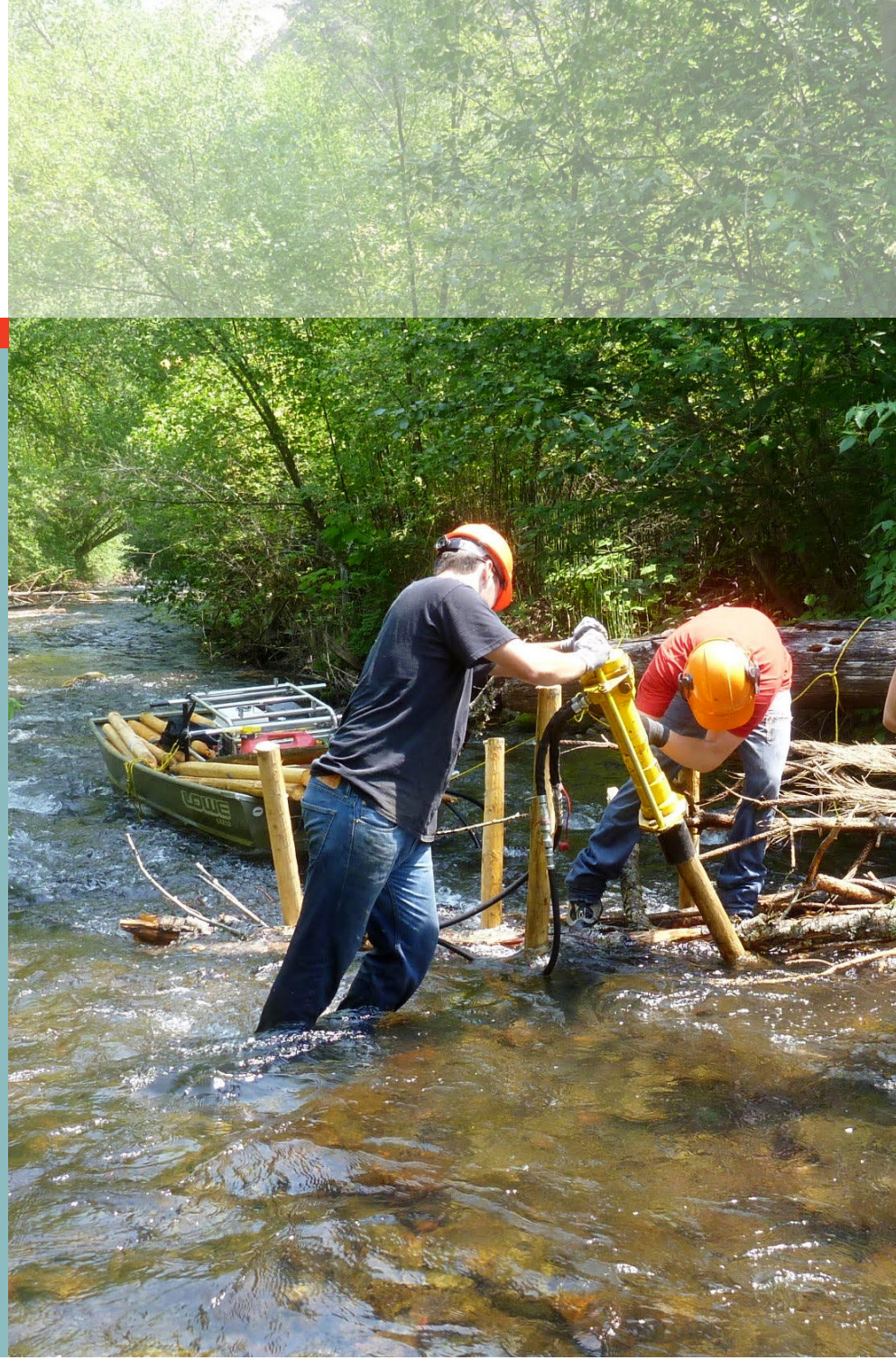
The chart below provides a general statewide snapshot of the relative progress towards recovery for at-risk salmon and steelhead in Washington. The chart relies on local knowledge and expertise combined with statistical measures that estimate the number of adult fish returning to their home rivers to spawn.

The National Oceanic and Atmospheric Administration (NOAA) evaluates attributes that are not shown in this report such as productivity, life history, genetic diversity, and the spatial structure (geographical spread) of the populations. NOAA also considers

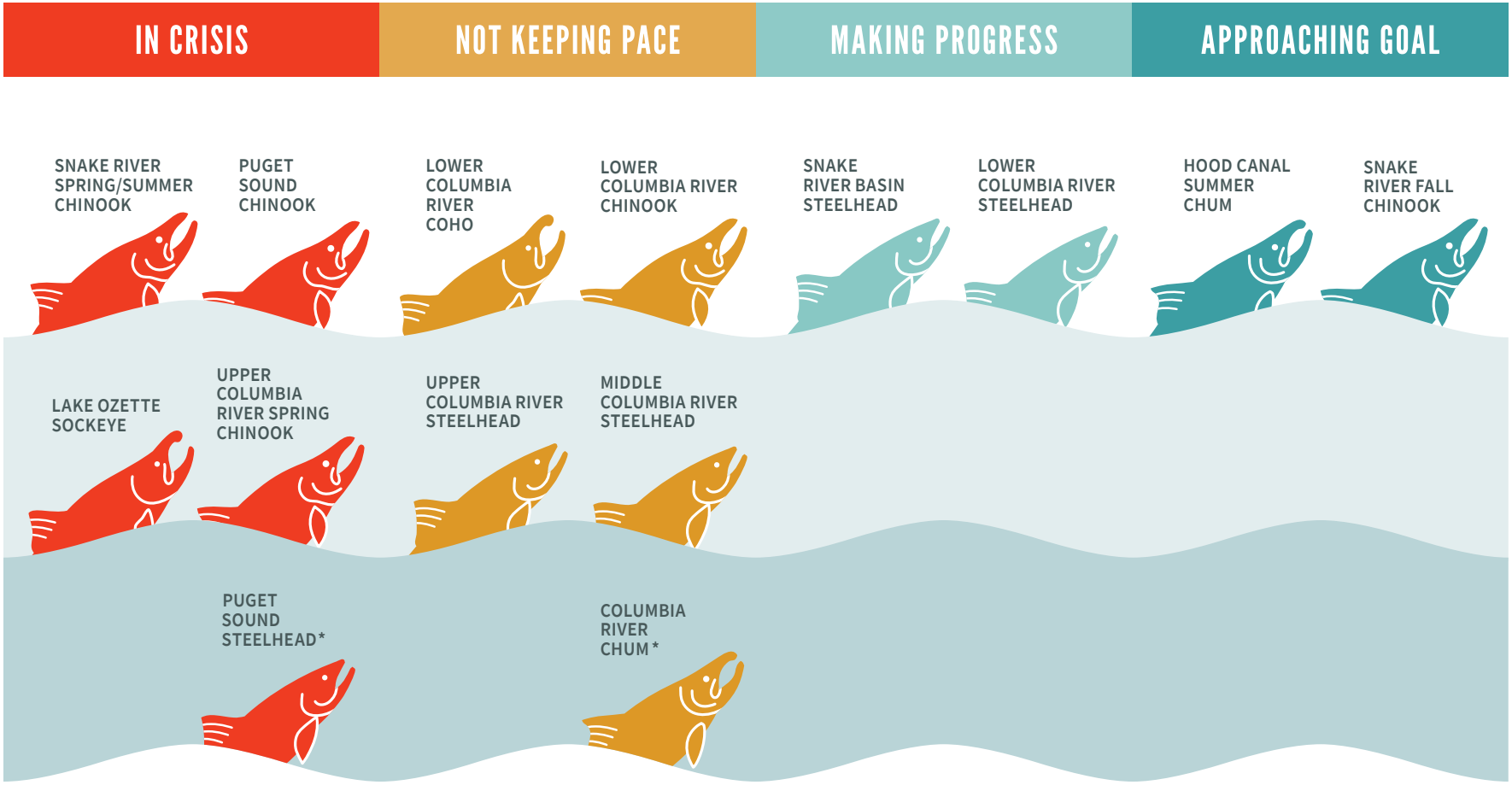
Salmon in Washington show a wide range of progress towards recovery.

threats and factors affecting the health of fish including habitat, hydropower, hatchery, and harvest impacts. NOAA's analysis, called the 5-year biological status review, is the method by which NOAA determines progress towards federal de-listing and recovery. The chart below does not replace NOAA's status review.

This report does not address salmon and steelhead species that are not listed under the federal Endangered Species Act, such as salmon on the Washington Coast. Keeping these species off the Endangered Species Act list requires continued attention and due diligence. Salmon recovery is a statewide investment.



Salmon Abundance



* Lacks complete data
Data Source: Washington Department of Fish and Wildlife

Funding

Salmon recovery brings jobs to local businesses.

A study[9] showed that 80 percent of funding for watershed restoration projects stays in the local counties, which often are more rural areas and have fewer jobs and revenue-generation opportunities.

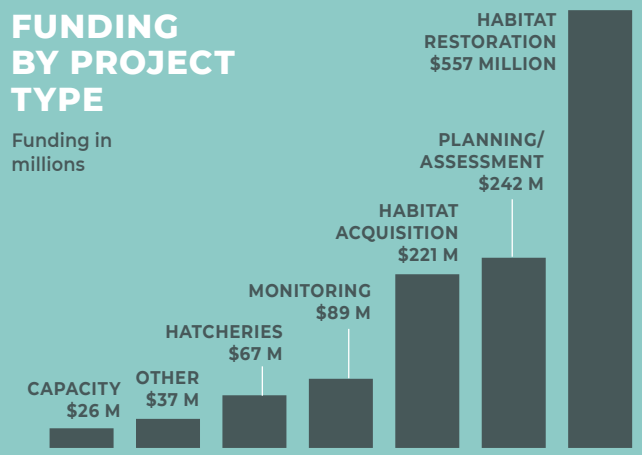
While progress in recovering salmon is being made in some areas of the state, far too many species still are precariously close to extinction. One fundamental reason is that funding for salmon recovery has not met the need.

A 2011 study[10] pegged the statewide cost of implementing habitat-related elements in regional salmon recovery plans for 2010-2019 at $4.7 billion in capital costs. As of today, $1 billion has been invested or just under 22 percent of the need–a funding rate that will not achieve recovery.

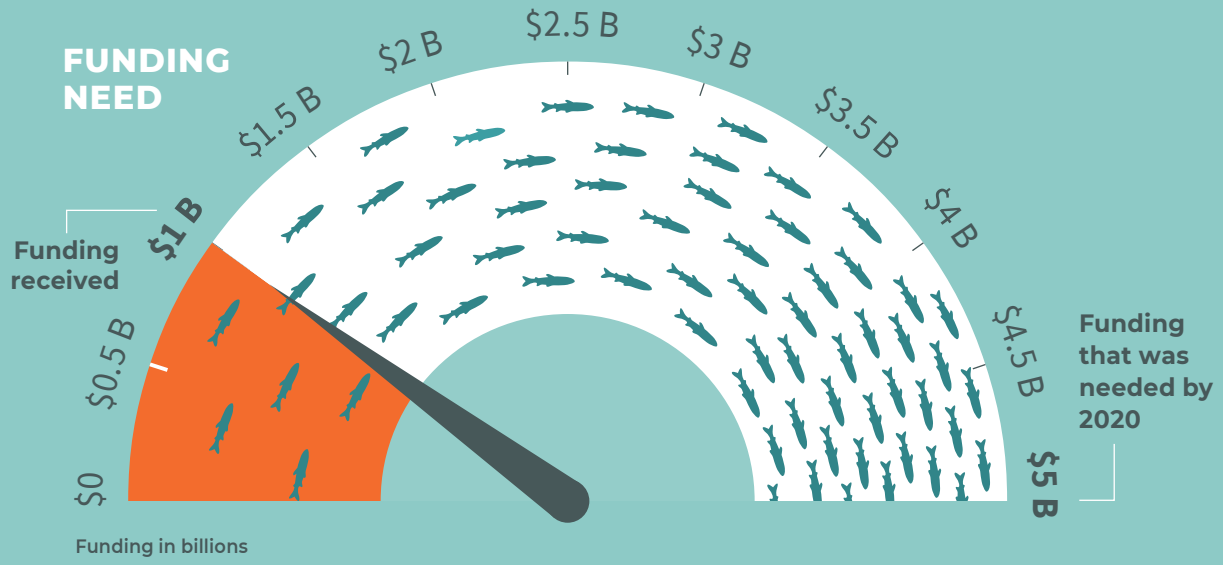
Recovering salmon habitat requires both restoration and protection measures. Restoration helps watersheds that are damaged by past human activity, while land-use and regulatory programs provide the necessary backstop for habitat loss. Unfortunately, without increased funding, restoration projects are unable to keep pace with ongoing habitat losses in the more urbanized parts of the state where land-use and regulatory programs are not adequately protecting habitat in the face of population growth and development.

In addition, with the funding to-date, many of the smaller, easier projects have been completed. What remains are the larger projects that affect bigger landscapes, the harder projects to change people's behavior, and the more complex projects that require fundamental changes in how a growing population is accommodated. The current funding programs do not fully encompass these larger investments.

The Salmon Recovery Funding Board has started to address this issue by setting aside some of its funding for targeted investments aimed at larger projects or additional priorities; however, this set-aside only will begin when funding reaches higher levels. In addition, some of these projects will require extensive work, partnerships, and potential changes to how work traditionally has been done.



Every $1 million spent on watershed restoration generates about $2.5 million in economic activity.[11]

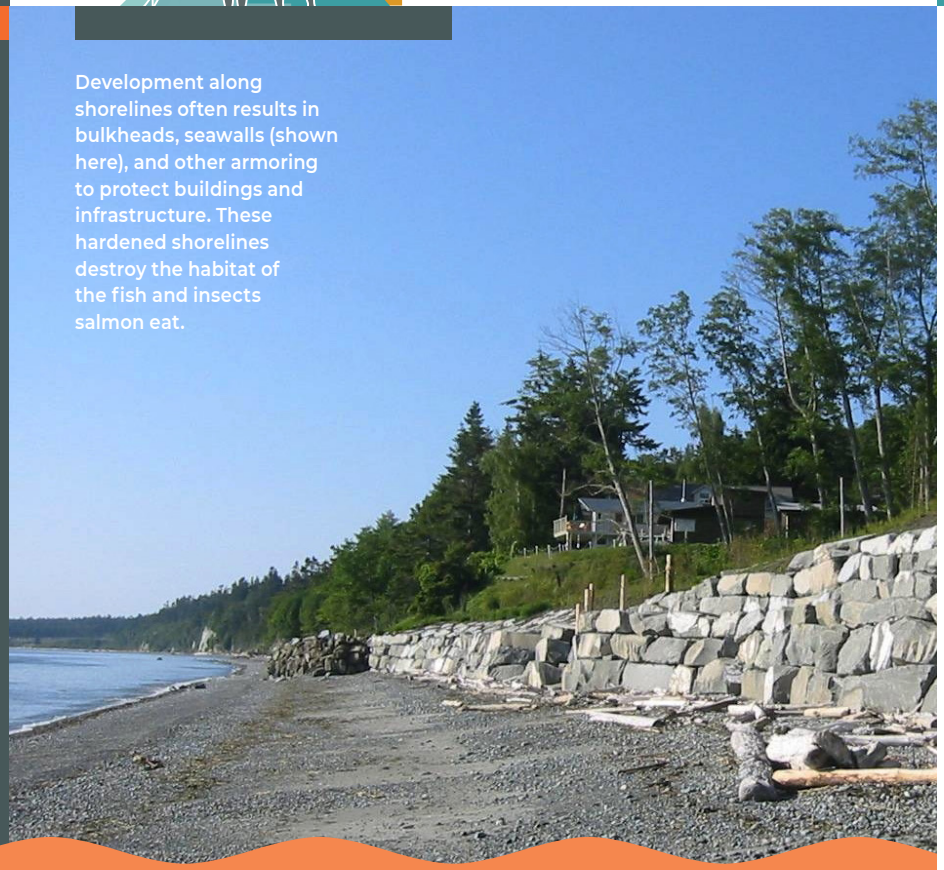


The Salmon Struggle

Salmon have complicated lives, which helps make them resilient to change, but also makes them vulnerable to human activities. Six species of salmon and steelhead (depending on how they are counted) live in Washington State. Salmon are born in freshwater, rear in streams, then head downstream to spend time in the estuaries where they can grow large enough to survive in the ocean. They return home to spawn, beginning the cycle all over again. It is estimated that less than 1 percent of salmon survive long enough to return home to spawn.[12]

Salmon recovery in Washington focuses on the key factors that led to their declines: habitat, harvest, hydropower, and hatcheries. Since federal listings, several other factors have increased pressures on salmon including climate change and predation by seals and other pinnipeds, birds, and other fish.

Salmon have complicated lives, which helps make them resilient to change, but also makes them vulnerable to human activities.



Development along shorelines often results in bulkheads, seawalls (shown here), and other armoring to protect buildings and infrastructure. These hardened shorelines destroy the habitat of the fish and insects salmon eat.

RISK FACTORS IN SALMON RECOVERY

HABITAT DEGRADATION

CLIMATE CHANGE

FISH PASSAGE BARRIERS

PREDATION

HARVEST

HYDROPOWER

HATCHERIES

Habitat Degradation

Salmon need healthy places to live. This means rivers with cool, clean water and a variety of habitats that allow them to rest, hide from predators, and spawn. It means intact estuaries where salmon can grow and transition to and from saltwater. And it means rivers and shorelines with ample food.

Keeping these areas functioning for salmon often conflicts with where people want to live and work and the resulting land development. As the number of people in the state continues to increase, more land and water are needed for houses, roads, crops, and other uses that compete with the needs salmon have for varied and intact habitat.

Washington's population has grown by 55 percent since 1990 and is expected to grow to 9 million by 2040.[13] This is equal to adding more than three cities the size of Seattle during the next 20 years. With this population growth, more habitat will be lost.

Ensuring that salmon have places to grow, feed, and spawn will challenge land-use planners, local governments, businesses, and residents to rethink how Washington plans for salmon and how Washington accommodates more people on the landscape with less impact.

Washingtonians must look long-term to plan for salmon. Planning for roads and other infrastructure begins 20 years or more before actions are taken. Salmon and other natural resources need similar planning horizons and considerations.

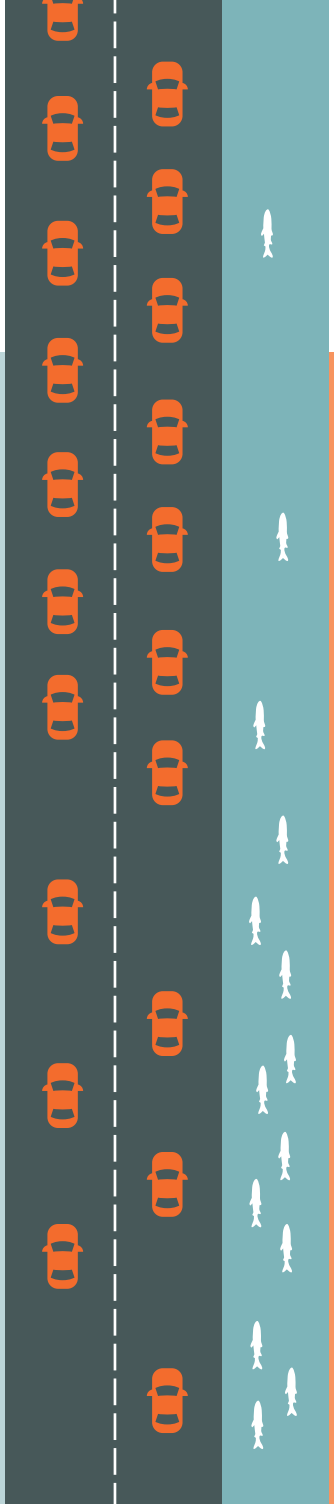
Shoreline Armoring

Development along shorelines often results in bulkheads, seawalls, and other armoring to protect buildings and infrastructure. These hardened shorelines destroy salmon habitat. The armor prevents waves from eroding the sediment and sand to create beaches, where salmon find the insects and other fish they eat. About one-third of Puget Sound's 2,500 miles of shoreline are armored.[14] The good news is that removal of armoring is increasing and permitting of new armor is slowing.[15] Between 2015 and 2018, there was a net reduction of about 1 mile of armoring[16] in the Puget Sound region. In addition, new methods of soft armoring are proving beneficial for people and salmon.

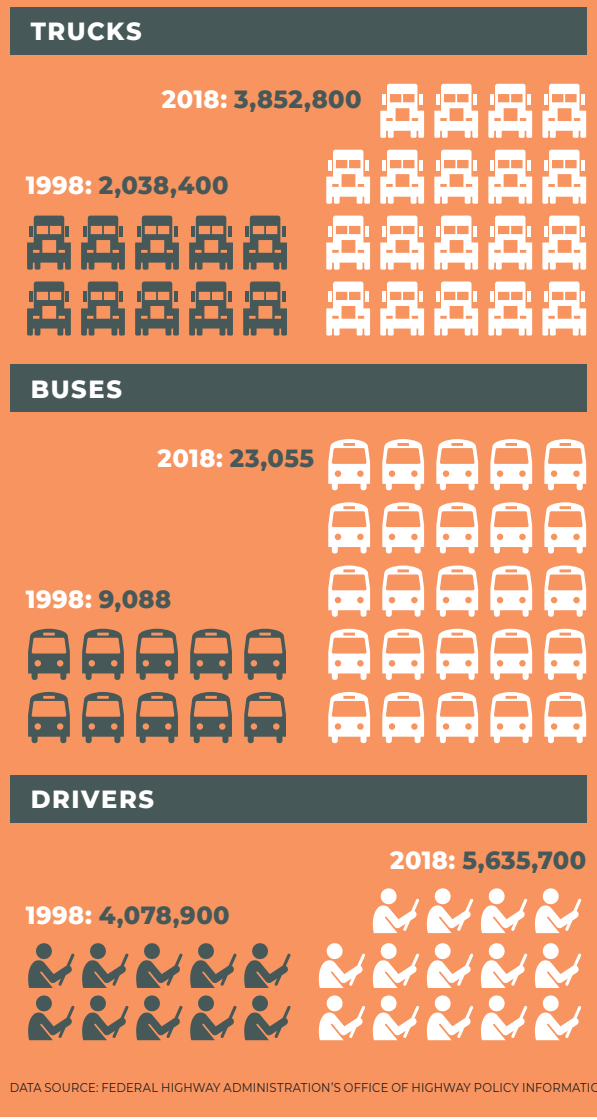
Stormwater Runoff

Salmon need clean water to survive. As cities have developed, the amount of paving and hard surfaces has increased. Today, stormwater running off those hard surfaces is the top pollution source impacting water bodies in and around Puget Sound.[17]

As rain runs off impervious surfaces such as roofs, roads, and pavement, it collects pollution from oil, fertilizers, pesticides,



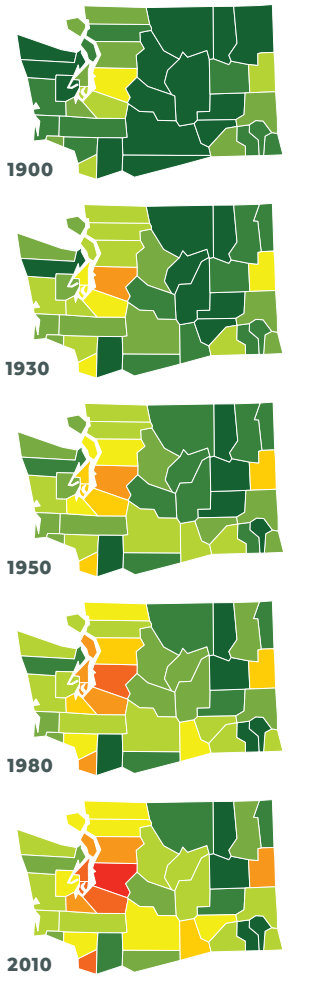
46% Increase in all vehicles from 1998 to 2018.



DATA SOURCE: FEDERAL HIGHWAY ADMINISTRATION'S OFFICE OF HIGHWAY POLICY INFORMATION

POPULATION DENSITY BY COUNTY

Planning for roads and other infrastructure begins 20 years or more before actions are taken. Salmon and other natural resources need similar planning horizons and considerations.



DATA SOURCE: WASHINGTON STATE OFFICE OF FINANCIAL MANAGEMENT

55% Washington's population has grown by 55 percent since 1990 and is expected to grow to 9 million by 2040.[13]

garbage, and animal manure before heading, usually untreated, into street drains and then directly into streams and bays and then the ocean.[18] This soup of toxins in untreated stormwater can decrease the oxygen levels in the water,[19] limit the ability of some salmon species to find food and avoid predators, and sometimes lead to large fish die-offs in urban streams.[20]

As Washington's population continues to grow, threats to water quality are likely to increase, creating more challenges for salmon recovery. Solutions to treating stormwater exist and have been found to make the difference between life and death for salmon. For example, running stormwater through systems like rain gardens removes pollutants and reduces harm to coho salmon.[21]

Riparian Areas and Floodplains

In Washington, 50-90 percent of land along waterways (riparian areas) has been lost or extensively modified by humans.[22] Riparian areas and floodplains are critical for salmon and will increase in importance as environmental conditions become more extreme due to climate change. Forested riparian areas provide shade and cool the water. They also hold trees that drop branches and leaves into the water, increasing the amount and quality of habitat in streams. Floodplains slow and store water during all times of the year, provide shelter and food for young fish, and buffer communities against floods.

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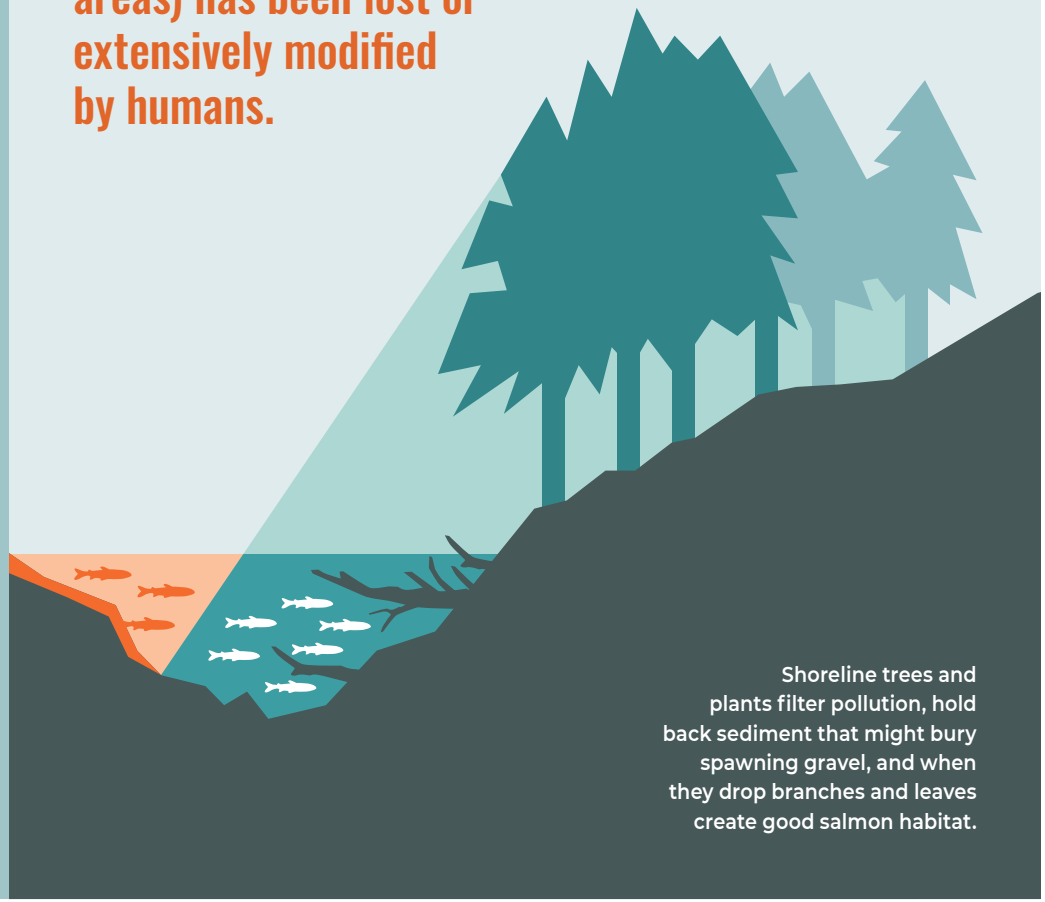


Shoreline trees and plants filter pollution, hold back sediment that might bury spawning gravel, and when they drop branches and leaves create good salmon habitat.

Climate

Warming Temperatures Are Impacting Salmon Streams

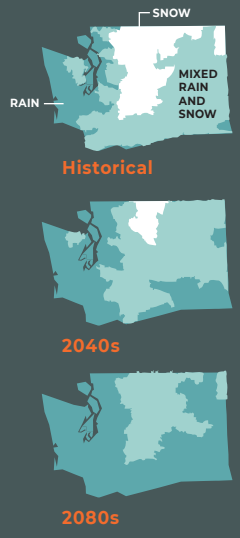
Climate change is threatening the clean, cold, and plentiful water in rivers that salmon need to survive.

Climate change has warmed the air across Washington by 0.15 degree Fahrenheit every decade during the past 100 years,[23] a trend that is projected to continue but at an even faster rate, reaching increases of up to 5.3 degrees Fahrenheit every decade by 2090.[24]

As the air warms, glaciers, which store much of the freshwater in the Pacific Northwest, melt and have less cold water to feed streams in the summer when salmon need it the most. Scientists already are seeing less water in summer streams,[25] and for longer periods of time. Scientists estimate that the amount of water that was released from melted snow declined by 21 percent in the western United States from 1955 to 2016.[26] Compounding the problem during low-flow periods is when more water is removed from rivers to irrigate farmland and accommodate demands of an increasing human population.

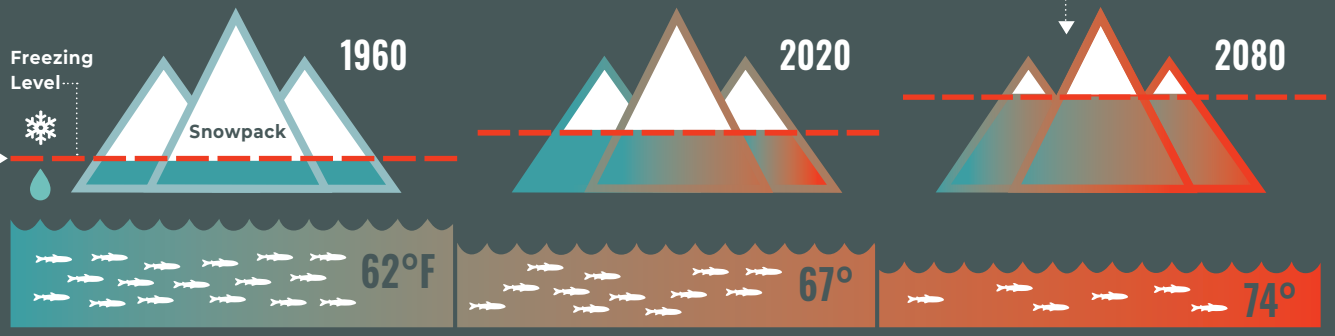
As the amount of cold water from glacier-fed rivers declines, the water temperature in rivers will continue to increase. For example, the temperature in the Snake River, through which many salmon species migrate, rose 1.4 degrees Fahrenheit from 1960 to 2015.[27] Streams with temperatures greater than 64 degrees Fahrenheit can stress salmon, and when rivers

Winter Precipitation Captured In Snowpack



CLIMATE AFFECTS WATER IN STREAMS

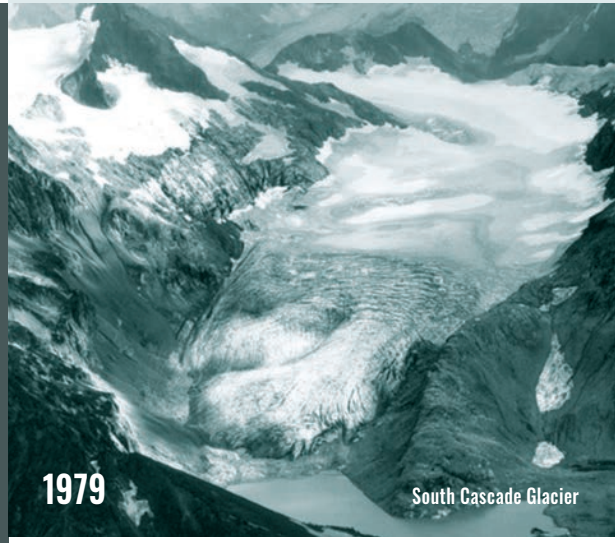
The amount of snow in the mountains is decreasing. Scientists project that the average spring snowpack in Washington will decline by 56-70 percent by the 2080s.[28] Some Washington streams are getting hotter, stressing salmon. Scientists estimate that 1,016 Puget Sound river miles will exceed 64 degrees Fahrenheit for up to 7.5 weeks.[29]



As temperatures warm, the point that rain turns to snow moves higher up the mountain, decreasing the snowpack. Salmon count on plentiful snowpack to melt and deliver cool, clean water in the summer and during droughts. Less snowpack means less water. Less water means warmer water. Both threaten salmon and salmon recovery.

Glaciers are Melting

In Washington, nearly a quarter of Mount Rainier's and more than half of the north Cascade and Olympic Mountain ranges' glaciers have melted,[30] and the rate of melting is only expected to increase.[31] Scientists estimate 80 percent of western North America's glacier ice volume will be lost by 2100.[32]



The changing climate also is bringing rain instead of snow to some areas, increasing the likelihood of severe flooding in the winter.

reach 70 degrees Fahrenheit, salmon begin to die.[33] Without actions to address impacts from climate change there will be fewer salmon and fewer rivers where they can survive.

The changing climate also is bringing rain instead of snow to some areas. With more rain, scientists predict winter streamflow will increase by 25-34 percent by the 2080s,[34] increasing the likelihood of severe flooding in the winter.[35] This issue is compounded when floodplains, which are natural storage areas for excess water, are developed for other purposes.

Not only is the amount of water in streams predicted to change but so is the timing. Scientists already are seeing annual peak flows occurring 1 to 4 weeks earlier in the West.[36]

As peak flows change in volume and season, the delicate life cycle of salmon will be disrupted. Glaciers and snowpack are melting earlier in the season. Faster and stronger running rivers can destroy redds (salmon nests) and flush young salmon out of their calm-water habitat, reducing their chance for survival.[37] While some juveniles may survive this premature transition from freshwater to saltwater, many won't be large enough to catch prey or avoid being eaten.[38]

Changes in Climate Impacting the Ocean

Human activities have resulted in record-breaking levels of carbon dioxide in the atmosphere and in the oceans.[39] Excess carbon dioxide is absorbed by the ocean, forming carbonic acid, which has driven up the average ocean acidity level by 30 percent since the Industrial Revolution.[40] Increased acidity damages the phytoplankton, zooplankton, and crustaceans salmon eat. Excess carbon dioxide also can change the way salmon use their sense of smell to find food, avoid being eaten, and find their natal streams.[41]

The climate also impacts ocean temperatures. During the past 50 years, the near-surface waters off Washington's coast have warmed by roughly 1.8 degrees Fahrenheit.[42] Warmer water has fewer nutrients and less oxygen than colder water and creates conditions less beneficial for salmon. For example, warmer water favors sub-tropical zooplankton, which are poor food for juvenile salmon and the fish they eat.

Salmon have demonstrated during the past 10,000 years that they can adapt to a changing environment. For example, salmon have coped with low streamflows and high temperatures by waiting in cold water pools until they are able to continue their journey. Climate change has exacerbated these problems. When combined with fewer natural buffers, degraded habitats, and lost genetic diversity within the salmon themselves, salmon are challenged to change quickly enough and their survival is at stake.[43]

PHOTOGRAPH OF ELK MOUNTAIN FIRE BY JOHN McCOLGAN, U.S. FOREST SERVICE

Climate scientists predict wildfires will increase in number and intensity, burning up to 1.1 million acres a year in the Northwest by the 2040s.[44]

Fish Passage Barriers

Washington has been making steady progress on fixing barriers, but the pace needs to increase.

The Washington Department of Fish and Wildlife estimates there are 20,000 known barriers either partially or fully blocking salmon and steelhead from reaching their spawning grounds in Washington.

Washington has been making steady progress on fixing these barriers. Since 2005, more than 3,300 barriers have been corrected. The changes made to date have opened at least 3,000 miles of habitat to salmon and steelhead.

Despite the gains, far too many salmon are blocked from reaching their destinations by a variety of human-made structures, such as dams, roads, water storage, and other structures.

Most of the barriers are created when roads intersect with streams and the streams are diverted into culverts, which are large pipes or other structures that carry the water under the roads. Most historic culverts were designed to move water not salmon. Many are aging and need to be replaced for safety as well as fish passage. Others are clogged with branches or sit too high for salmon to reach. Fixing fish passage barriers clears the path to more habitat in the watershed, especially higher quality areas upstream.

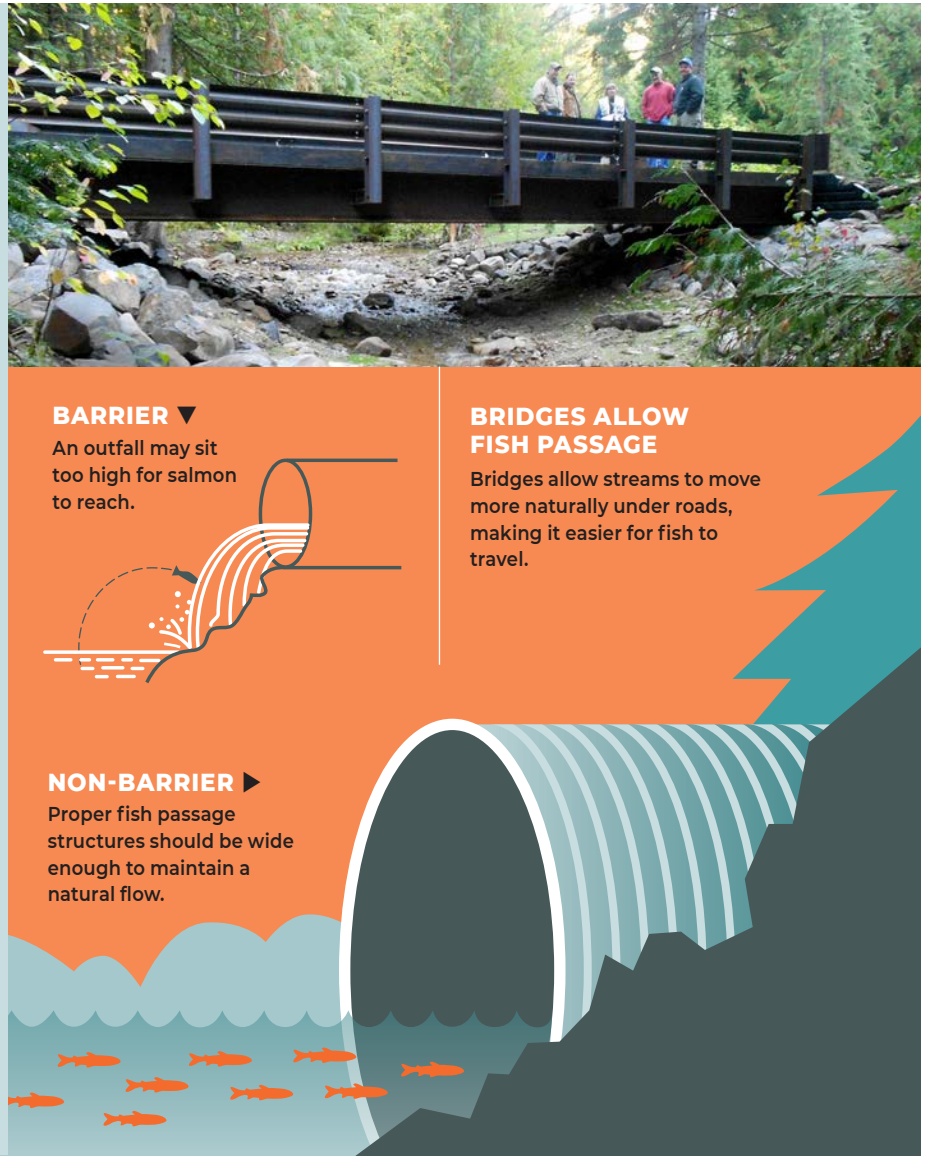
Washington State has recognized the need to correct fish passage barriers and has several efforts underway including work funded by and through the Salmon Recovery Funding Board, Brian Abbott Fish Barrier Removal Board, and Family Forest Fish Passage Program. In addition, the Washington Department of Transportation and other state agencies are correcting barriers.

Under the 1999 Forests and Fish Law, private landowners and state forestland managers in Washington have corrected more than 8,100 barriers. Large private and state forest landowners are 86 percent done with their goal and are on track to correct the fish barriers they are responsible for by 2021.

In 2001, treaty Indian tribes in western Washington sued Washington State for its failure to correct fish-blocking culverts, saying it damaged their treaty rights to fish. The U.S. Supreme Court affirmed a lower court's ruling requiring four state agencies[45] to correct barriers at an estimated cost exceeding $3.6 billion. This legal obligation requires full funding by the state Legislature.

In 2014, the Washington State Legislature created the Brian Abbott Fish Barrier Removal Board to coordinate the removal of barriers that block salmon access to prime spawning and rearing habitat on state, local, tribal, and private lands to ensure the corrections are strategic and better coordinated.

While progress has been made, an increased rate of barrier corrections is needed.



Predation and the Salmon Food Web

Healthy rivers and oceans are supported by complex food webs that represent a network of individual relationships between plants, animals, the foods they eat, and their environments. Like a balancing act, food webs continually shift to adjust to changes in the environment. Too big of a shift in the food web and individual relationships or food chains may be broken. When this occurs animals must adjust or perish.

Salmon are a keystone species and play a critical role in a food chain that stretches from the upper basins of the highest mountains to the open waters of the Pacific Ocean. Salmon are food for other animals at every stage of their lives from when they are eggs in the gravel to when they return back to the streams as adults. Salmon are critical for the survival or livelihood of other fish, small mammals, birds, marine mammals, and humans. At the end of their lives, when they have spawned and died in streams, their final contribution is to return an abundance of nutrients from the deepest oceans back to the riverbanks to nurture old-growth forests. As humans have modified the land, they have upset the food webs and have made it more accommodating to predators and more hostile to salmon.

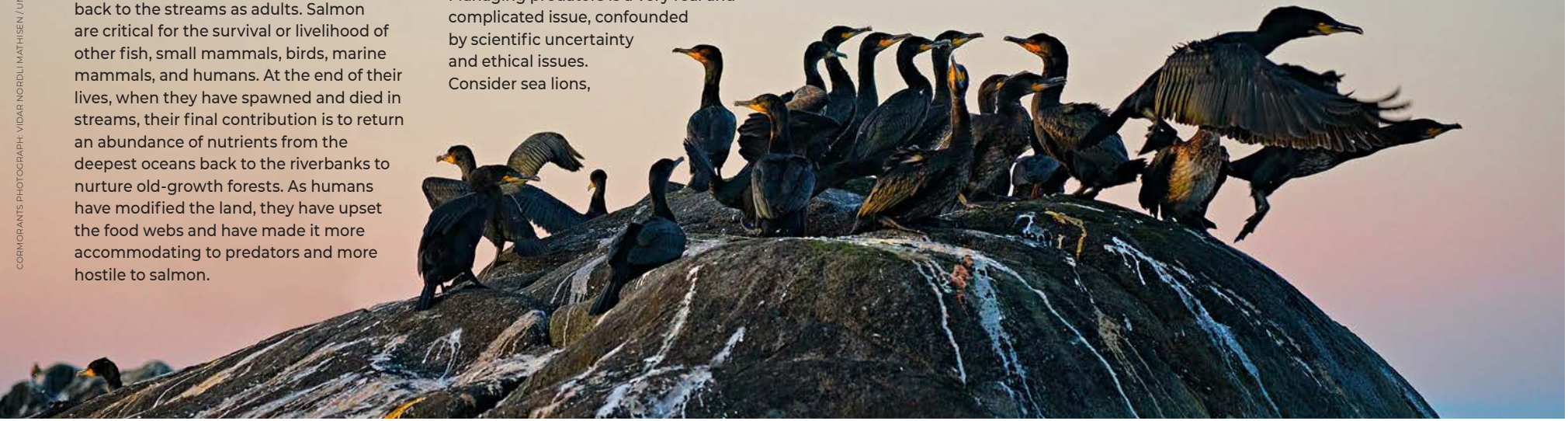
This is seen in two ways. First, native species (sea lions, cormorants) that eat salmon can benefit from a changing food web and grow in numbers. Scientists estimate that birds eat 35 percent of the juvenile spring Chinook salmon in the upper Columbia River as the salmon head to the ocean.[46] Northern pikeminnows also eat millions of young salmon and steelhead in the reservoirs behind dams on the Columbia and Snake Rivers.[47]

Second, a changing food web may benefit non-native, invading species. Northern pike, which is a non-native species introduced illegally, has established populations in eastern Washington. They are concerning because of their ability to eat large numbers of young salmon.

Managing predators is a very real and complicated issue, confounded by scientific uncertainty and ethical issues. Consider sea lions, which are protected under federal law and have grown in large numbers under that protection. Now, they are eating endangered salmon by the tons. This issue is exacerbated by decreased habitat for salmon and potentially could nullify the ongoing work to recover salmon.

How salmon, steelhead, and the habitats upon which they rely are managed must be addressed. Care must be taken not to upset this delicate balance.

Between 1970 and 2015, scientists estimate that seals and other pinnipeds increased the amount of Chinook salmon they ate from 75 tons to 718 tons- double that of resident killer whales and six times more than the combined commercial and recreational catches.[48]



CORMORANTS PHOTOGRAPH: VIDAR NORDLI MATHISEN / UNSPLASH.COM. SEAL PHOTOGRAPH BY THE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION.

Harvest

Salmon fishing in Washington has decreased dramatically since the early 1970s, affecting tribal fishing, tribal treaty obligations, recreational anglers, and commercial fishing businesses.

While important during the initial federal listings, today harvest in Washington has been curtailed significantly and is not a primary factor limiting salmon recovery. Fishing in Washington State is highly managed and relies primarily on hatcheries. More than 80 percent of the salmon caught in the ocean and rivers come from hatcheries.

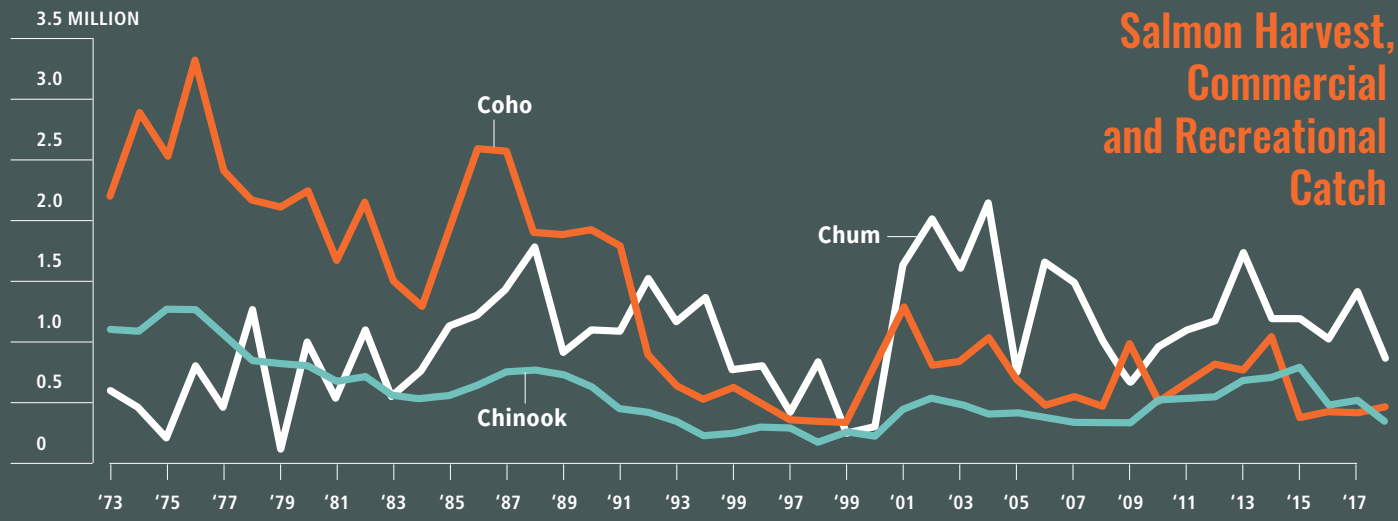
In addition, a significant portion of the overall harvest of salmon originating from Washington occurs in Canada and Alaska.

Protection and restoration of habitat, addressing predation, and mitigating the impacts from climate change must be pursued to fully benefit from the restrictions that have been applied to fishing for recovery.

Chart Data Source:
Washington Department of Fish and Wildlife. Data is for hatchery and wild coho, chum, and Chinook salmon caught (tribal and non-tribal) in the state's rivers and the ocean as reflected on sport catch record cards and commercial landings.

Fishing in Washington has declined since the early 1970s by about 50 percent for Chinook and 80 percent for coho salmon, both wild and hatchery.

Salmon Harvest, Commercial and Recreational Catch



Hydropower and Dams

Salmon and steelhead travel between spawning and rearing habitats in rivers to areas where they grow and develop, and eventually to the ocean. When hydropower dams and other barriers block their migration, salmon populations decline.

General impacts from dams can include blocked fish passage and delayed migration. One study showed that dams block more than 55 percent of the spawning and rearing habitat once available to salmon and steelhead in the Columbia River basin.[49]

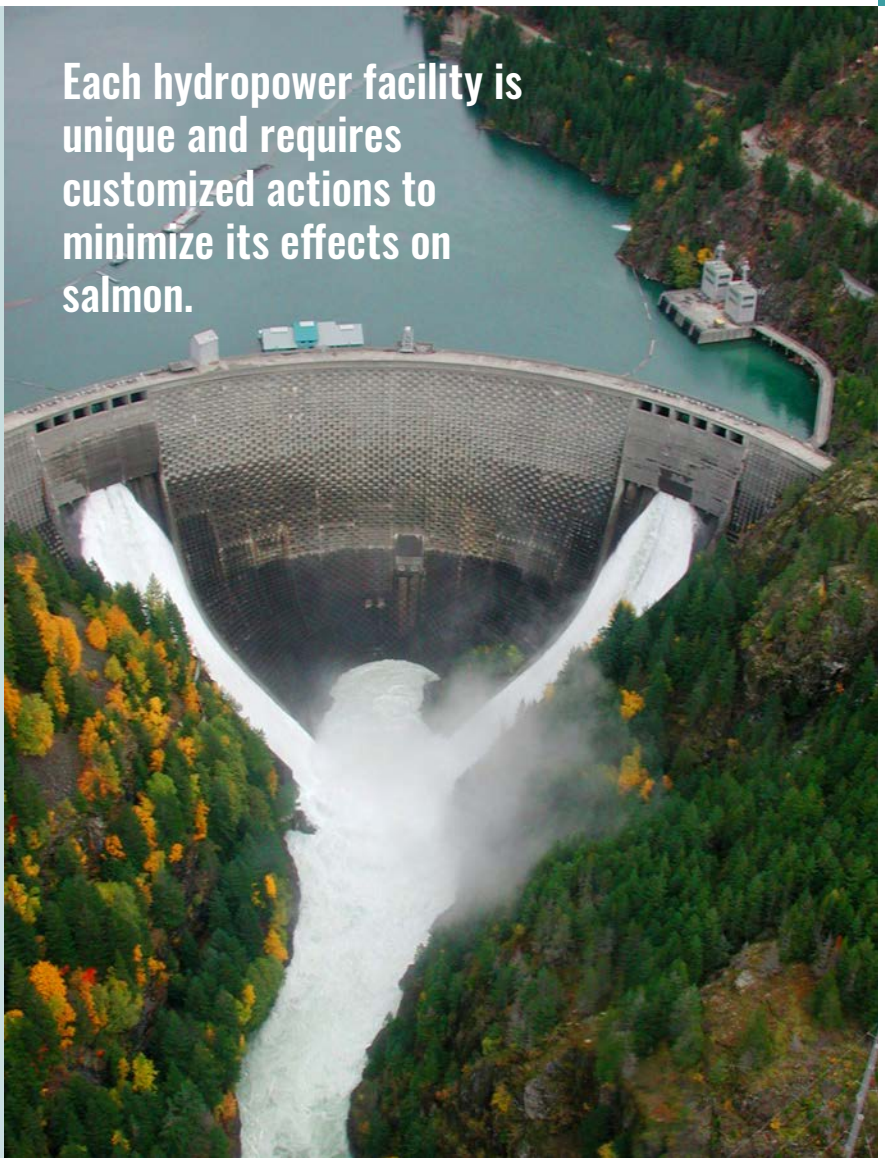
In addition, dams can create places where salmon become easy prey as they wait to pass through the dams. Seals and other animals feed on the congregating salmon at the entrances to fish ladders. Dams also can kill salmon, cause temperature and water quality issues, slow downstream migration, and alter environmental processes, which impact salmon habitat.

As a result, hydropower systems are highly regulated and highly mitigated in an attempt to offset impacts to salmon. Government agencies, industry, treaty Indian tribes, and nonprofits have worked diligently to address the impacts of dams, while attempting to preserve the benefits dams provide for people, such as flood control, relatively green and on-demand power, shipping assistance, and irrigation of farmland.

Each hydropower facility is unique and requires customized actions to minimize its effects on salmon. In addition, the cumulative impacts of all dams must be considered for salmon that migrate through hundreds of miles of rivers to and from the ocean.

There have been significant changes to increase salmon's survival through the dams across the state. Indian tribes have led efforts to remove dams on the Elwha, Middle Fork Nooksack, and Pilchuck Rivers. There are additional efforts underway to improve passage such as at Mud Mountain Dam near Enumclaw or to place salmon above dams where they have not been for nearly 100 years such as at Chief Joseph Dam near Bridgeport and Grand Coulee Dam near the town of Grand Coulee. Efforts also are underway to adjust spill schedules at large dams to increase the amount of water available for salmon during critical migration periods. The State and tribes also have secured a federal permit to reduce the number of sea lions feeding on migrating salmon below dams in the lower Columbia River.

Continued cooperation, diligence, advocacy, and robust science is required to ensure dams and hydropower systems continue to improve operations and passage survival for salmon and steelhead.



PHOTOGRAPH OF ROSS DAM IN WHATCOM COUNTY COURTESY OF THE U.S. ARMY CORPS OF ENGINEERS

Hatcheries

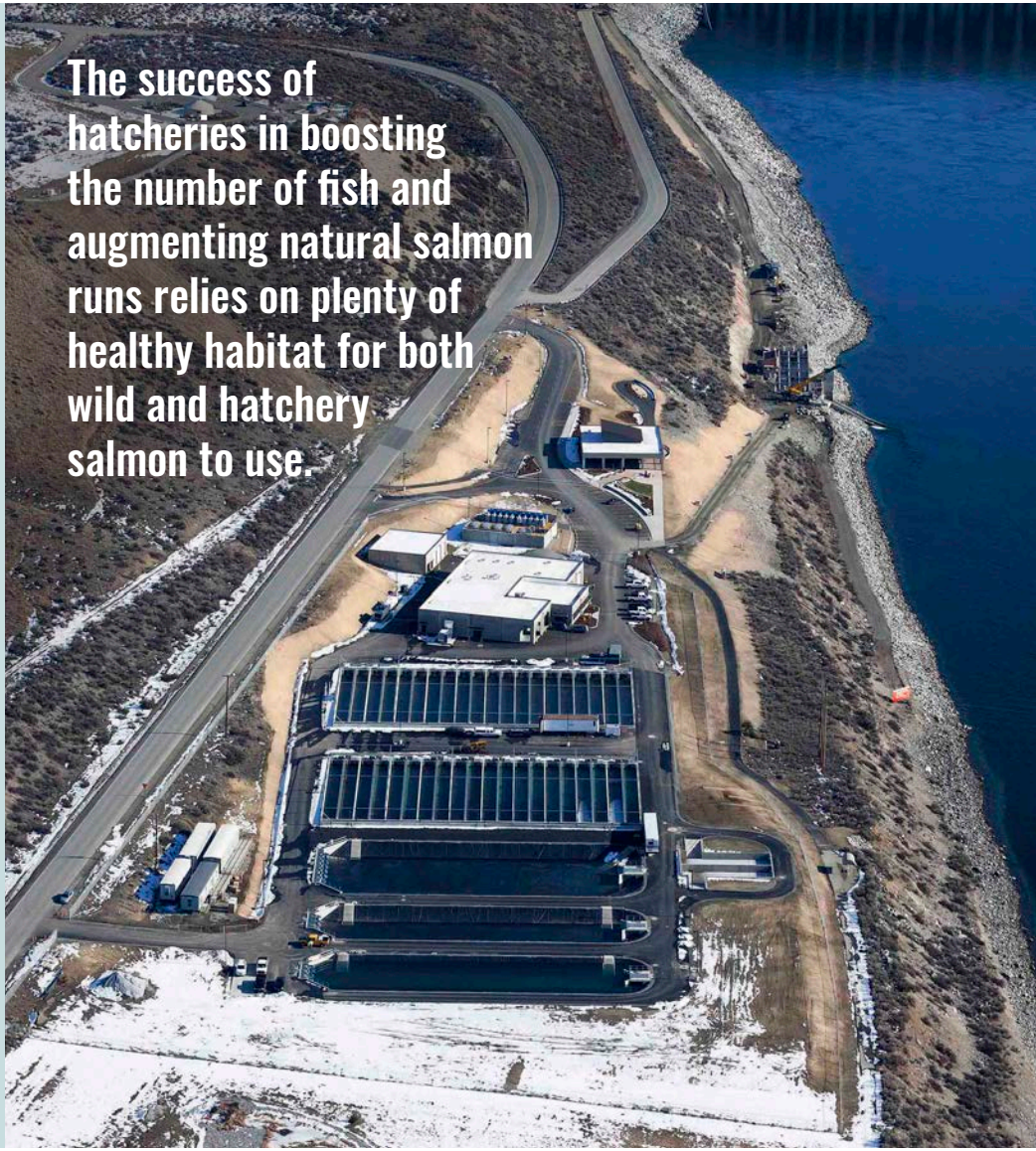
Hatcheries serve two purposes in recovery. First, hatcheries are used selectively around the state to augment natural salmon runs. This critical work is necessary to rebuild salmon runs that have been reduced to just a handful of fish in some rivers because of a loss of habitat.

Second, hatcheries boost the number of fish statewide, reducing the impact of fishing on wild salmon. More than 80 percent of the salmon caught are born in hatcheries. Until habitat conditions improve, hatcheries are needed to meet tribal fishing and treaty obligations, support local and regional businesses reliant on fishing and outdoor recreation, and provide critical food for orcas, other wildlife, and humans.

Hatchery programs may hinder salmon recovery if they are not monitored, evaluated, and adaptively managed to limit risks to wild populations. Hatchery-raised fish can interbreed with wild salmon and weaken the fitness of wild stocks and they also can compete with wild salmon for food and other resources. These factors contributed to salmon declines in the past, but wide recognition of these impacts has improved management of hatcheries statewide. Continued efforts to monitor, evaluate, and adaptively manage hatchery programs will ensure hatcheries can achieve their intended benefits without impeding recovery of wild salmon.

The success of hatcheries in boosting the number of fish and augmenting natural salmon runs relies heavily on robust and healthy habitat for both wild and hatchery salmon. Along with efforts to monitor hatcheries, an equal amount of effort must be invested in protecting and restoring habitat. Agencies and Indian tribes have operational plans, such as the Hatchery Genetic Management Plans, to ensure compliance with the federal Endangered Species Act and broader recovery efforts. For example, 55 percent of the Washington Department of Fish and Wildlife hatcheries have Hatchery Genetic Management Plans approved by the federal government. Many non-state hatcheries also have genetic management plans. These plans do not achieve recovery, but act to limit the potential impacts from hatcheries.

The State and treaty Indian tribes work together to co-manage hatcheries so they align with the goals and objectives in the federally approved recovery plans that are the foundation for Washington's recovery efforts.



PHOTOGRAPH OF THE CHIEF JOSEPH DAM HATCHERY COURTESY OF THE CONFEDERATED TRIBES OF THE COLVILLE RESERVATION.

STORMY A RESTORATION PROJECT

Project Restores Important Side-Channel Habitat

It might look like a large pile of tree debris but to fish, it's a glorious place for resting and hiding from predators in the Entiat River. Located in Chelan County, the Entiat River joins the Columbia River near the town of Entiat. In the past, the land along the river was logged extensively and the river was cleared of its large tree root wads and logs, a common practice historically. The result was a river channel that didn't contain the variety of habitats (fast moving water, slow water to rest, deep ponds with cool water for the summer) that salmon need to survive and thrive. In addition, the river was disconnected from its adjacent floodplain, where young spring Chinook salmon and steelhead often feed as they grow in preparation for their ocean journeys.

To restore the river, the Confederated Tribes and Bands of the Yakama Nation used a complex "inside-out" construction method to rebuild side channels while leaving most of the floodplain undisturbed.

The Yakama Nation increased floodplain access, created perennial side channels, and built engineered log structures at the head of two side-channel inlets to increase the types of habitat in the river. The Stormy A project restored thousands of feet of side-channel habitat in this important spawning and rearing area of the Entiat River.

Priorities for Action

Salmon have lived in the Pacific Northwest for more than 10,000 years and have demonstrated an amazing ability to adapt and survive. Salmon have proven they will prevail if given the chance. Twenty years ago, Washingtonians made the choice to give salmon that chance and have saved salmon from the brink of extinction. However, now is the time for a renewed commitment. The salmon are ready. Here are the priorities for action if recovery is to be successful.

In 2019, Governor Jay Inslee committed to work with the tribes to improve protections for riparian habitat to build climate resiliency and achieve salmon recovery.

PROTECT AND RESTORE HABITAT FOR SALMON, PEOPLE, AND CLIMATE RESILIENCY

Adapt land-use and other regulations to accommodate salmon and other natural resources

- Integrate and give priority to the needs of salmon and other natural resources in land-use plans, long-term infrastructure planning processes, and related regulatory programs.
- Increase compliance and enforcement of existing land-use laws.
- Implement Net Ecological Gain standards to buffer against growing development pressures.
- Adopt policies and incentive programs to reduce carbon emissions and support programs to reduce nutrients and organic carbon from entering waterways.
- Adopt incentives for businesses and private landowners willing to make ecosystem improvements on their land.
- Support Governor Jay Inslee's commitment to work with Indian tribes in Washington to establish a statewide standard for protecting fully functioning, healthy, riparian habitat for salmon.
- Increase investments in innovative solutions to mitigate impacts of stormwater, pollution, and related development. Implement modern standards to address point and non-point pollution sources and to clean up stormwater running from roads into waterways.
- Increase community and industry awareness and understanding of climate change, ocean acidification, and stormwater impacts on salmon and both local and larger ecosystems.

Ensure clean, cold water in streams and improve fish passages

- Reconnect fish habitat by removing artificial barriers and reconnecting floodplains, and work to avoid future floodplain encroachment. This will increase the resiliency to climate change for salmon and people.
- Identify and protect cold sources of groundwater and springs to cool summer streams and increase water in streams during the late summer when streams are vulnerable to droughts.
- Pursue fish passage projects and re-introduction efforts to place salmon above dams where they've been blocked.
- Ensure that recovery actions are coordinated across all the factors affecting salmon, especially those that most closely influence one another such as habitat, harvest, hydropower, hatcheries, and predation. When implementing recovery plans, all factors must be considered together so that their collective benefits can be fully realized. Management of each individual factor should be informed by recovery plans to ensure this coordination is planned, prioritized, and carried out.

RECREATION AND CONSERVATION OFFICE HABITAT RESTORATION ACCOMPLISHMENTS 2005-2020

3,019
FISH PASSAGE BARRIERS CORRECTED

20,013
ACRES OF RIPARIAN AREAS TREATED

3,386
MILES OF STREAM MADE ACCESSIBLE TO SALMON

12,008
ACRES OF ESTUARIES AND NEAR-SHORE AREAS TREATED

Although restoration has improved habitat in many areas, much work remains and will be complicated by the enormous impacts of climate change and anticipated population growth. Without significant changes to how Washington accommodates human population growth, salmon populations will continue to decline. The fundamental question is whether Washington State has the fortitude to place the needs of salmon on par with other societal needs. Restoring habitat that already has been damaged will not be enough to recover salmon. How Washington manages the landscape, which is determined by local, state, and federal land-use decisions, will determine whether salmon can be saved from the brink of extinction.

REDUCE PREDATION

- Pursue activities to manage native and non-native predators in the Columbia River, and secure additional funding and research to pursue solutions in Puget Sound and other parts of the state.

FULLY FUND SALMON RECOVERY

- Increase funding and create stable funding for operating the organizations that implement and coordinate on-the-ground efforts.
- Increase funding for grant programs that target priority capital projects (e.g. Salmon Recovery Funding Board's Targeted Investments, Puget Sound Acquisition and Restoration Program).
- Increase private sector investments in salmon recovery.
- Fund the science necessary to evaluate salmon and habitat status and progress toward recovery. The lack of funding for monitoring is hampering the State's ability to evaluate trends and effectiveness of actions.

BUILD THE NEXT GENERATION OF LEADERS

- Salmon recovery has a long list of past leaders, including Billy Frank Jr. and William Ruckelshaus. These leaders laid the foundation for success, and now is the time to engage the next generation of salmon recovery leaders. Efforts need to be made to educate and inspire these critical leaders.

KILISUT HARBOR

A Road Between Them

The views across Kilisut Harbor, which lies between Marrowstone and Indian Islands on the Olympic Peninsula, are beautiful. Until recently though, when a closer look was taken, visitors could see dead fish and algae-filled water.

The problem was an earthen berm and two, 1950s-era pipes under State Route 116 that were too small and restricted the flow of water between Oak Bay and the 2,285-acre Kilisut Harbor. The berm and highway above couldn't simply be removed because they provided the only route to the islands by car.

To remedy the situation, the North Olympic Salmon Coalition and Port Gamble S'Klallam Tribe teamed up to replace the road. Gathering more than $15 million in funding and multiple partners, they removed the earthen berm and the two pipes and replaced them with a 440-foot-long, four-lane bridge over Kilisut Harbor. The Washington Department of Transportation administered the construction contract and Cascade Bridge LLC crews built the new bridge.

The work restored 27 acres of tidal channel, increasing feeding opportunities for migrating salmon, including Hood Canal summer chum salmon, Puget Sound Chinook salmon, and Puget Sound steelhead, all of which are species listed as threatened with extinction under the federal Endangered Species Act. Not only is tidal flow restored, but the estuary is returned to a more natural state and fish will be able to more easily travel between the harbor and bay.

The road was opened to both human traffic and fish traffic in October 2020.

FUNDING: $15.2 MILLION

- Estuary and Salmon Restoration Program grant: $2.4 million
- Puget Sound Acquisition and Restoration grant: $7.2 million
- Fish Passage Barrier Removal Program (Washington Department of Transportation): $2 million
- U.S. Navy: $1 million
- Coastal Resiliency Grant (National Oceanic and Atmospheric Administration): $1.5 million
- National Coastal Wetlands Grant (Washington Department of Ecology): $1 million
- Donations: $41,237

PROJECT SPONSOR:
North Olympic Salmon Coalition

Salmon habitat restoration projects like this are happening around the state to return rivers and bays to more natural states, while still accommodating people.

William D. Ruckelshaus

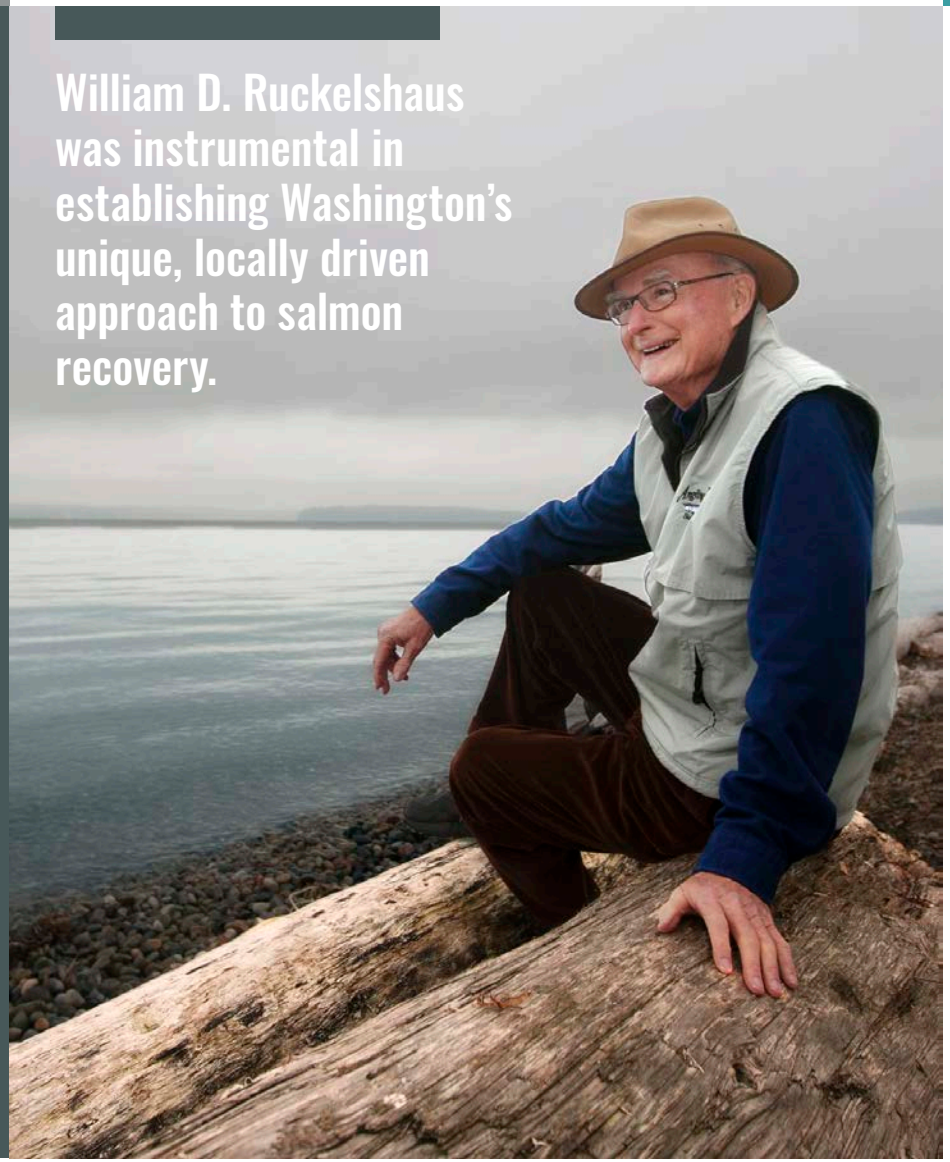
Salmon recovery work would not have progressed as it has without the leadership of William D. Ruckelshaus, who passed away in 2019. When awarding the Presidential Medal of Freedom in 2015 to Mr. Ruckelshaus, President Barack Obama cited his "tireless work to protect public health and combat global challenges like climate change."

His distinguished career in environmentalism began when he was appointed as the first administrator of the Environmental Protection Agency. He is credited with shaping its guiding principles, including banning the pesticide DDT and striking an agreement with the automobile industry to require catalytic converters, which reduce air pollution. Mr. Ruckelshaus exhibited the same leadership when his efforts turned to the regional salmon recovery issue. He was a founding member of the Washington State Salmon Recovery Funding Board and served as its first chairman from 1999 to 2007. He was instrumental in establishing Washington's unique, locally driven approach to salmon recovery. He led the board as it struggled with how to develop a salmon recovery grant program, which continues today and forms the backbone of salmon recovery efforts in Washington.

Much of his life was dedicated to protecting the planet. He served as a member of the U.S. Commission on Ocean Policy, which brings attention to the importance of restoring saltwater areas needed for salmon recovery, and was co-founder of Washington's Shared Strategy process, the framework within which Puget Sound watersheds prepared groundbreaking plans for recovering salmon. Mr. Ruckelshaus also chaired the Leadership Council of the Puget Sound Partnership to organize the cleanup and restoration of Puget Sound, the second largest estuary in the United States. He was an inspiration and mentor to many young environmentalists and should be thanked for the cleaner air and water enjoyed today.

Read more about Mr. Ruckelshaus in the Legacy Washington profile.[50]

PHOTOGRAPH BY LAURA MOTT



William D. Ruckelshaus was instrumental in establishing Washington's unique, locally driven approach to salmon recovery.

Engaging Communities and Implementing Recovery

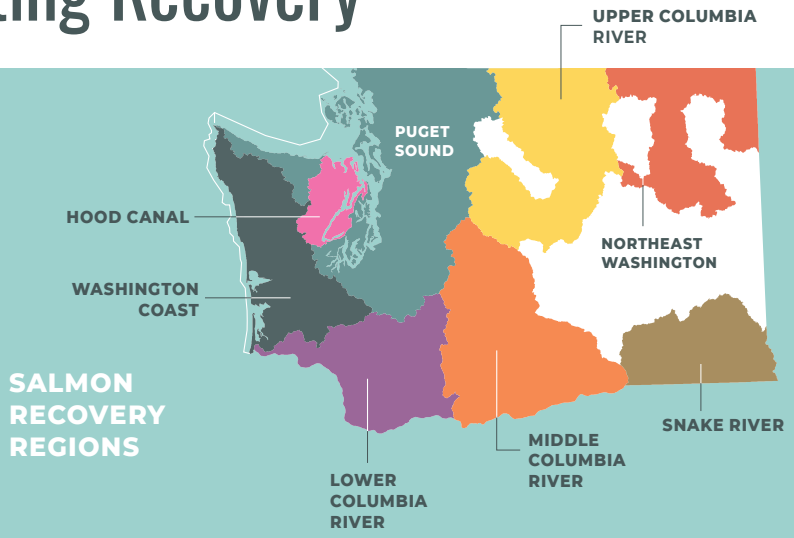
Washington's network of organizations is committed to recovering salmon. Today, collaboration and partnerships are necessities, and regional recovery organizations are the glue binding the network together and ensuring coordination. The challenge of recovering salmon spans jurisdictional boundaries and requires everyone working together to put salmon and nature first.

INDIAN TRIBES

Indian tribes are foundational for salmon recovery in Washington. In addition to being sovereign nations with thousands of years of knowledge, expertise, and insight, tribes have led many of the largest restoration and recovery efforts in the state. Tribes serve on the local and regional recovery boards and work closely with partners and state agencies to advance recovery priorities. In addition, treaty Indian tribes co-manage fisheries and other natural resources with state agencies.

REGIONAL SALMON RECOVERY ORGANIZATIONS

Regional recovery organizations lead implementation of the federally approved salmon recovery plans. Located across the state, these seven organizations are governed by local boards and work with salmon recovery partners, Indian tribes, and state and federal agencies to coordinate activities and ensure progress towards recovery.



WASHINGTON SALMON COALITION AND LEAD ENTITY WATERSHEDS GROUPS

The Washington Salmon Coalition and lead entity watershed groups are critical for developing local salmon habitat recovery strategies and ensuring projects get completed. They do this by soliciting restoration projects and by ranking and vetting those projects using local advisory groups. The lead entities work closely with others who do the projects, including cities, counties, Indian tribes, nonprofits, fisheries enhancement groups, conservation and irrigation districts, state and federal agencies, and colleges and universities.

GOVERNMENT ORGANIZATIONS AND PARTNERS

Cities, counties, state and federal agencies, and partners play a pivotal role in salmon recovery. They control much of the land where actions occur, help secure funding, provide scientific expertise, and help establish policies necessary for salmon recovery.

INDIVIDUALS

Individuals make decisions every day that can either benefit or burden the natural environment. People can contribute to salmon recovery by making good land-use decisions, using products that don't harm salmon, and keeping pollution out of waterways. Landowners also play vital roles because many of the restoration projects occur on their land.

Looking Forward

WORKING TOGETHER

It is going to take working together and expanding those who are at the table to recover salmon. Washingtonians want salmon as part of the Northwest way of life. They want clean water and food security. They want their children to be able to go to a local river and watch the wonder of salmon returning home. They want to share these stories and the excitement and beauty of the natural world with their children and grandchildren. They want to look out at the water and know that someday they may witness the grandeur of jumping orcas. Not any one group can do this alone. Washingtonians must work together to protect the Northwest culture. Every person can bring his or her own uniqueness to this movement, and together salmon can be saved.

STATEWIDE SALMON RECOVERY STRATEGY

Twenty years ago, Governor Gary Locke adopted the *Statewide Salmon Strategy–Extinction is not an Option*, and Governor Christine Gregoire added to it in 2006. This strategy was put in place to address a growing crisis: the listing of salmon under the federal Endangered Species Act. The development of this strategy was unique and the first of its kind in the nation, a collaborative initiative to restore and protect salmon runs across Washington State anchored in local expertise, experience, partnerships, and on-the-ground leadership. During the past 20 years, there have been significant advances in salmon recovery through regionally specific, scientifically rigorous, and locally produced recovery plans. In 2021, an updated Governor's salmon strategic plan will be released. The goal of this update is to set a strategic path forward for salmon and Washington, while honoring and furthering the achievements and investments made to date.

Citations

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"60-day summer low flow" refers to the lowest 60-day average flow value recorded each day from July 1 through October 31. The recorded flow value on each day corresponds to the average flow over the previous 60 days. For example, the flow value recorded for July 1 denotes the average daily flow from May 3 through July 1. The flow value recorded July 2 refers to the average flow from May 4 through July 2; and so on through October 31. It should be noted the Ecology analysis of streamflow trends focused on summer minimum flows only. The study did not look at annual flow trends or other seasonal flows.

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