The Nature Conservancy

CLIMATE IMPACTS GROUP
UNIVERSITY of WASHINGTON
College of the Environment

Adapting *to* Change

Climate Impacts and Innovation in Puget Sound

{ A Puget Sound Conservation Publication }

Impacts drive *Innovation.*

We are facing extraordinary challenges as a community. The ten warmest years on record have all occurred since 1998, and 2015 was the warmest year on record for Washington State since 1895. What we experienced in the Puget Sound region in 2015 was just a rehearsal of what we expect to come – warming temperatures and more extreme heat events, acidifying marine waters, rising seas, more heavy rain events, increasing flood risk, decreasing mountain snowpack, and declining water availability in summer. These shifts will all influence the health and economic well-being of our region.

American mathematician John Allen Paulos once said, "Uncertainty is the only certainty there is." This is increasingly poignant as we work to make our communities nimbler, more resilient, and able to adapt and even thrive with the coming changes. These changes come as the region's appeal draws thousands of new residents and job opportunities, placing new demands on land and water that are compounded by a changing climate and other environmental changes.

This report offers a brief introduction to the University of Washington Climate Impacts Group's 2015 State of Knowledge report about climate change and its effects in the Puget Sound region. Our shared goal is to use this science to improve understanding of the observed and projected changes in the region, and to catalyze actions and solutions. The time has come for integrated and comprehensive thinking about climate change impacts and how we will respond together. Our landscapes, our cities, our rivers and marine waters all need to be made more resilient and adaptable. Decision makers can integrate the wealth of information on climate impacts into long-term planning for facilities and infrastructure. Communities will also need to ensure that resilience efforts, and their outcomes, are equitable to those most affected by environmental degradation.

The ultimate impact of climate change in Puget Sound depends not only on greenhouse gas emissions, but also on the choices we make in dealing with the effects of climate change. This is not work that can be done in disconnected silos. It requires collaboration across sectors; government, businesses and communities must all work together, as water, land use, public health, economic development, transportation and supply chains will all be affected.

As the Puget Sound region continues to grow, there is no better time to come together and step up our commitment to ensuring that the region thrives long into the future.

Onward,

Jessie Israel
Director, Puget Sound Conservation
The Nature Conservancy

Amy Snover
Director, Climate Impacts Group
Assistant Dean, College of the Environment
University of Washington

April, 2016

IMAGE BY BENJ DRUMMOND

TRIANGLE COVE, CAMANO ISLAND. Communities such as this one located on a spit in Port Susan Bay are especially vulnerable to sea level rise and increasing storm events.

Puget Sound is a unique place to forge a new vision for facing climate change.

From the peaks of the Cascades and Olympics to the saltwater of the Sound, climate has shaped the physical landscape of the Puget Sound region and has influenced where and how people, plants and animals inhabit that landscape. While natural variability has always been (and always will be) part of our regional story, climate change is becoming a significant factor affecting our local environment, the nature and health of our ecosystems, and the risks and opportunities our communities will face.

Preparing for and managing these changes will take time, resources and collaboration. Puget Sound is a unique place to forge a new vision for facing climate change, with its diversity of lands, waters and wildlife. Rich in natural and social capital, the region is a global hub for business, trade, philanthropy, and innovation. It is innovation that drives both our economic engine and our approach to creative problem solving, and we have the ability to tap into a global reservoir of knowledge and experience, share and apply the latest, most accurate science, and work at multiple scales to find efficient and effective solutions.

As the century unfolds, we expect warming that is two to ten times larger than the change observed during the 20th century. By 2100, most Puget Sound watersheds are expected to be rain dominant (whereas currently they are snow dominant), which will have cascading effects on the hydrology and rivers of the region, salmon, and the availability of water for our communities and farms. Warming oceans could be detrimental to Puget Sound's shellfish industry, and rising sea levels could further exacerbate flood risks for many of our coastal communities.

This report highlights observed and projected changes in regional climate, as synthesized in the University of Washington Climate Impacts Group's 2015 State of Knowledge report. All citations and more information can be found in the full report: **cig.uw.edu/ps-sok**

Mauger, G.S., J.H. Casola, H.A. Morgan, R.L. Strauch, B. Jones, B. Curry, T.M. Busch Isaksen, L. Whitely Binder, M.B. Krosby, and A.K. Snover, 2015. State of Knowledge: Climate Change in Puget Sound. Report prepared for the Puget Sound Partnership and the National Oceanic and Atmospheric Administration. Climate Impacts Group, University of Washington, Seattle. Doi:10.7915/CIG93777D

IMAGE BY PHIL GREEN

Puget Sound is experiencing a suite of long-term changes, and these changes are expected to accelerate in the coming decades due to rising greenhouse gas emissions.

As we look to understand the impacts of climate change on cities, watersheds, and communities across Puget Sound, it is critical to try to understand what is driving this change. If we understand these drivers, we can identify and prioritize solutions that minimize the risk through adaptation, actions, and solutions.

Year-to-year variability has been and will remain an important feature of local climate. We will continue to see periods that are abnormally wet and others that are abnormally dry. Important patterns of natural variability for Puget Sound include the El Niño/Southern Oscillation (ENSO, otherwise known as El Niño and La Niña) and the Pacific Decadal Oscillation (PDO). Climate change impacts on ENSO and other natural climate variations are unknown at this time.

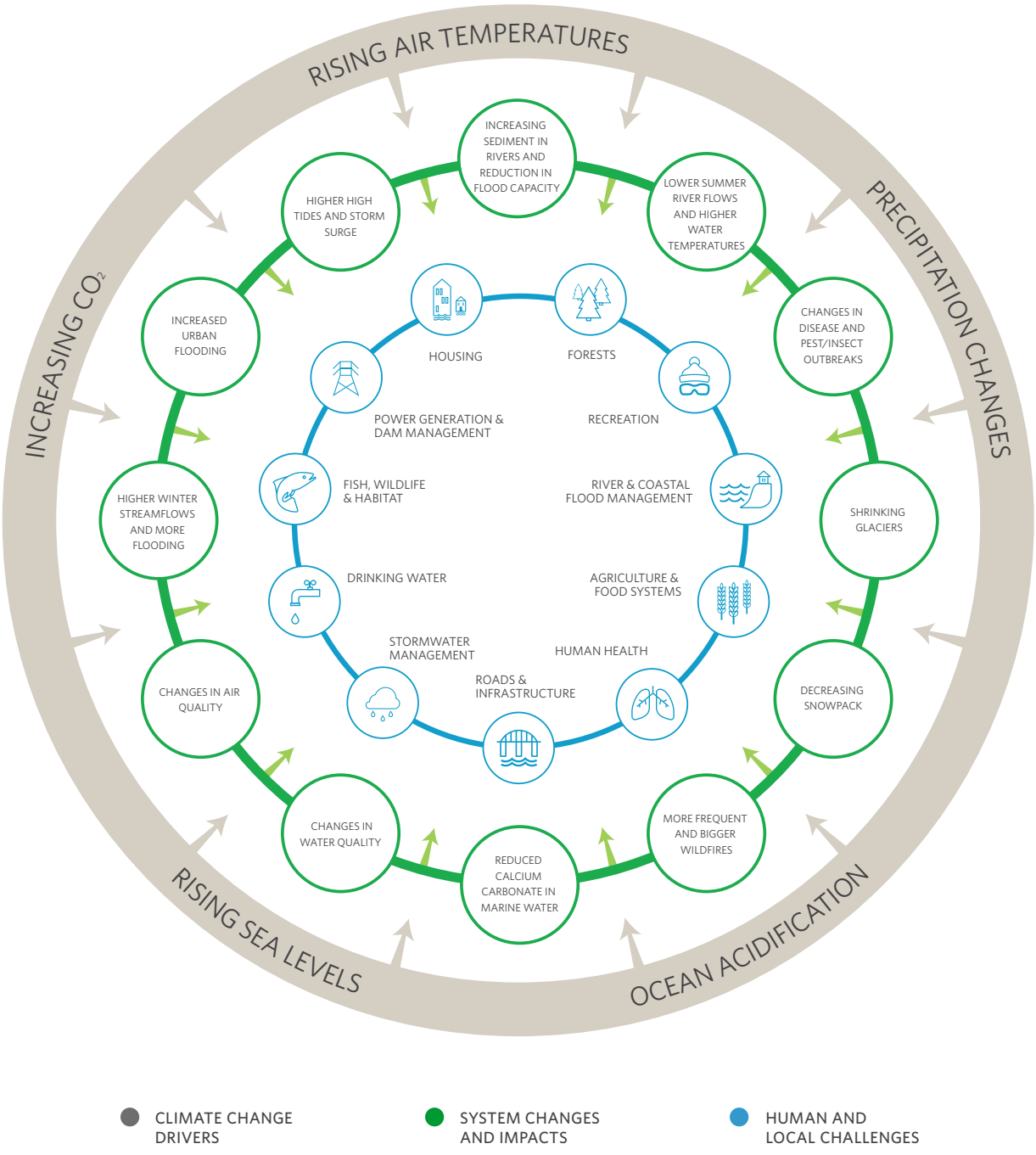


Figure adapted from primary source material provided by the Skagit Climate Science Consortium (SC^2). For more information, visit www.skagitclimatescience.org.

TEMPERATURE

The Puget Sound region has warmed, with the average annual temperature in lowland areas increasing 1.3°F over the last century. All but six years from 1980-2014 were above the century's average. Puget Sound's frost-free season has lengthened by 30 days (between 1920 and 2014), and nighttime temperatures have increased nearly 2°F.

The region is expected to see rising temperatures continue throughout the 21st century. Models project the change in average temperature to be at least double what was observed in the 20th century, and potentially ten times that amount by 2100. In the shorter term, average annual temperature is likely to increase 4° to 6°F by the 2050s, with extreme heat events becoming more common and extreme cold events less frequent.

PRECIPITATION

Summers in the Pacific Northwest will likely be drier, with climate models projecting an average of 22% less rain during summer months by the 2050s. Conversely, the majority of climate models project an increase in winter, spring and autumn precipitation. However, projected changes in seasonal and total annual rainfall are small relative to the large year-to-year and decade-to-decade variations in precipitation that already occur here as a result of natural variability.

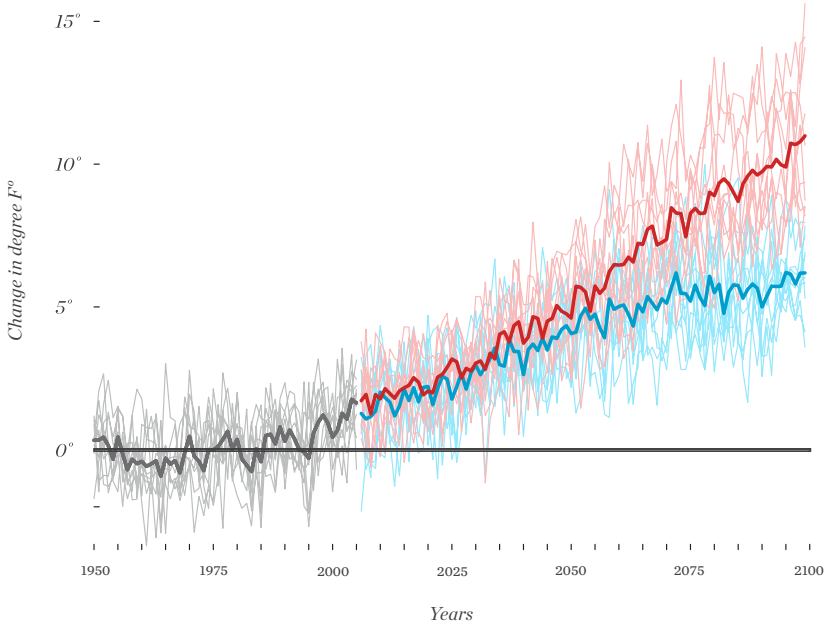
HEAVY RAINFALL

Heavy rainfall events (often caused by "atmospheric rivers") are expected to become more intense in future years. Climate models show that the heaviest 24-hour rain events in the Pacific Northwest will intensify by an average of 22% by the 2080s. The frequency of today's heaviest 24-hour rain events also increases, occurring seven days per year by the 2080s, on average, compared to two days per year historically (1970-1999). This increased frequency and intensity will escalate flood risks in many watersheds.

For more information on temperature and precipitation changes see Chapter 2 in the 2015 State of Knowledge report.

AVERAGE ANNUAL TEMPERATURES IN THE PUGET SOUND REGION ARE PROJECTED TO INCREASE RAPIDLY IN THE COMING DECADES

{ *Temperature difference relative to 1950-1999 average* }



The graph shows average annual air temperatures projected by climate models, relative to the average for 1950-1999 (horizontal gray line; the average annual temperature for the Puget Sound region is 44°F). Thin colored lines show individual climate model projections; thick colored lines show the averages of the models. Data source: Downscaled climate projections

HISTORICAL

LOW EMISSIONS (RCP 4.5)

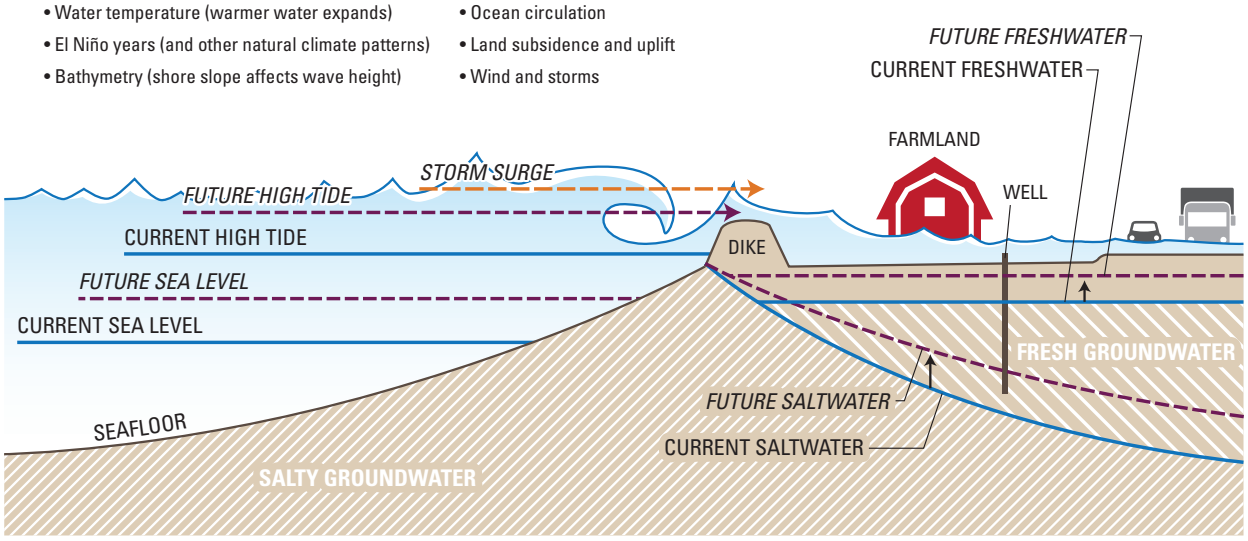
HIGH EMISSIONS (RCP 8.5)

GRAPH BY UW CLIMATE IMPACTS GROUP

RISING SEA LEVEL & STORM SURGE

Factors that Affect Local Sea Level

- Amount of water in ocean basin (includes ice)
- Water temperature (warmer water expands)
- El Niño years (and other natural climate patterns)
- Bathymetry (shore slope affects wave height)
- Atmospheric pressure
- Ocean circulation
- Land subsidence and uplift
- Wind and storms



NOTE: Sea, tide, and storm surge levels, depth of groundwater, and location of saltwater lens are for illustrative purposes only and do not depict actual or projected levels.

Graphic developed by the Skagit Climate Science Consortium (SC²). For more information, visit www.skagitclimatescience.org.

SEA LEVEL

Over the last century, sea level rose at most locations in Puget Sound; at the Seattle tide gauge, one of the longest-running gauges in the region, sea level rose about eight inches between 1900 and 2008. This trend is projected to continue over the coming century, with sea level projected to increase by an average of 24 inches by 2100 in the Puget Sound region (range: 4-56 inches). Changes in local land motion, weather patterns, and ocean currents can amplify or mask regional trends in sea level.

As sea levels rise, low-lying coastal areas will experience increased flooding, and higher seas will combine with river flows to increase flood risk in floodplains. Rising seas have the potential to damage coastal infrastructure, inundate commercial and industrial areas, and impact fisheries and shellfish operations.

OCEAN ACIDIFICATION

As a result of accumulating carbon dioxide (CO_2) in the atmosphere, the pH of the waters of the North Pacific Ocean and Puget Sound is declining, a process known as acidification. As atmospheric CO_2 levels climb, this situation will worsen; based on current CO_2 emission scenarios, ocean acidity is projected to increase by 150-200% by the end of this century. Other factors that influence the pH of marine waters locally include coastal upwelling, freshwater inputs, and nutrient runoff.

For more information on sea level rise and ocean acidification changes see Chapters 4 and 7 in the 2015 State of Knowledge report.

A CHANGING LANDSCAPE

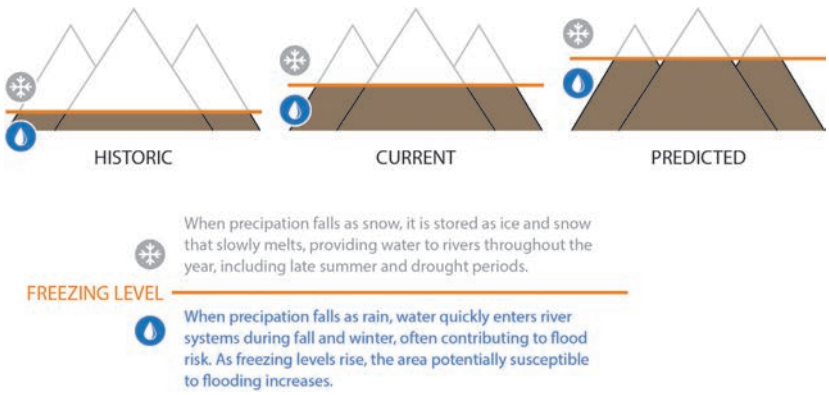
Changes in these important climate drivers will have far-reaching impacts in Puget Sound, affecting the region's water cycle, natural resources, cities and communities. Understanding how warming affects the hydrology of the region is crucial for developing solutions and adapting to climate change.

Flooding and drought will be major impacts of climate change in the Puget Sound region. Most models indicate wetter winters in the Pacific Northwest, and communities that already experience winter flooding can anticipate more frequent and intense floods. Meanwhile, low summer streamflow conditions are projected to become more acute in 12 Puget Sound watersheds due to the combined effects of lower mountain snowpack, lower summer precipitation, and warmer summer air temperatures.

A distinguishing feature of the Puget Sound region is that much of the area's water supply is currently stored in snowpack, rather than reservoirs, so changes in the region's hydrology can have significant implications for municipal and agricultural users that are dependent on snowmelt for their summer water supply. Several watersheds in Puget Sound are managed with dams and reservoirs that control the timing and amount of river flows. In some cases, changes in reservoir operations are expected to mitigate the impacts of climate change by reducing peak flows or retaining water for release during low flow periods. However, changes in reservoir operations are not always sufficient to offset climate change impacts, and can often result in significant trade-offs, with implications for fish habitat and agricultural water supply.

SNOWPACK AND STREAMFLOW

Warming will cause a greater proportion of winter precipitation to fall as rain rather than snow. Snowpack is projected to decline as winter and spring temperatures increase, causing the spring peak in streamflow to occur earlier in the year. By the 2080s, winter streamflow is projected to increase in snow-influenced watersheds by an average of about 30%, while summer streamflow is projected to decline by about 25-30%, on average. Even assuming moderate 21st century greenhouse gas emissions, the streamflow volume of the 100-year flood is projected to increase by an average of 18-55% in 12 Puget Sound watersheds.



Graphic developed by the Skagit Climate Science Consortium (SC²). For more information, visit www.skagitclimatescience.org.

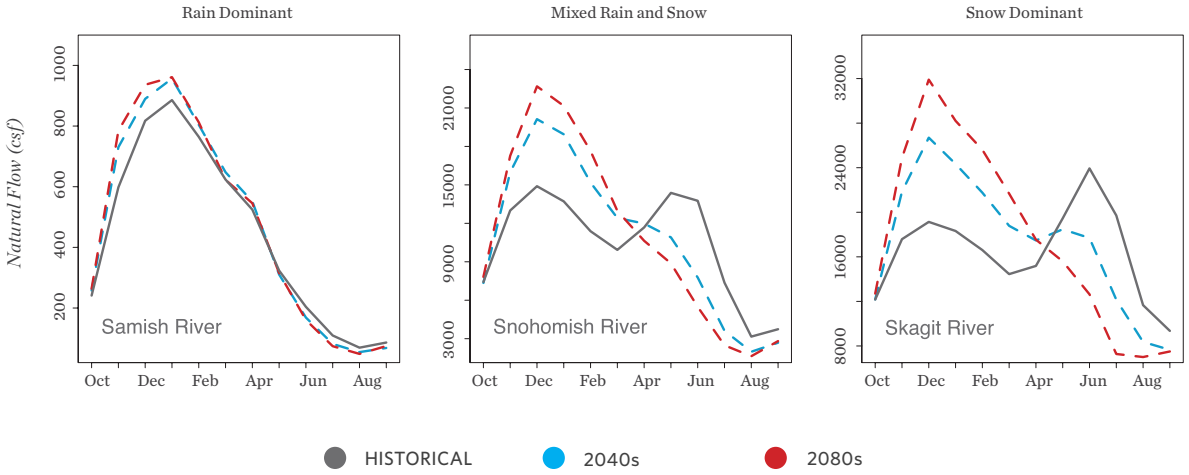
IMAGE BY JULIE MORSE

COLEMAN GLACIER, MOUNT BAKER
Most Puget Sound glaciers are visibly in decline; observed decreases range from 34% in the Olympic Mountains to 56% in the North Cascades.

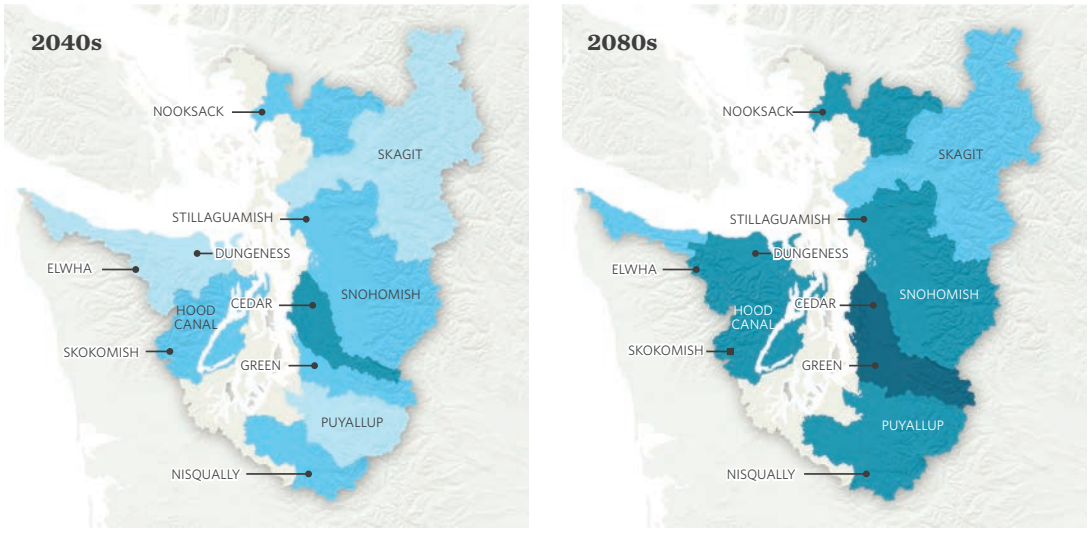
CHANGING HYDROLOGY

TIMING OF STREAMFLOW

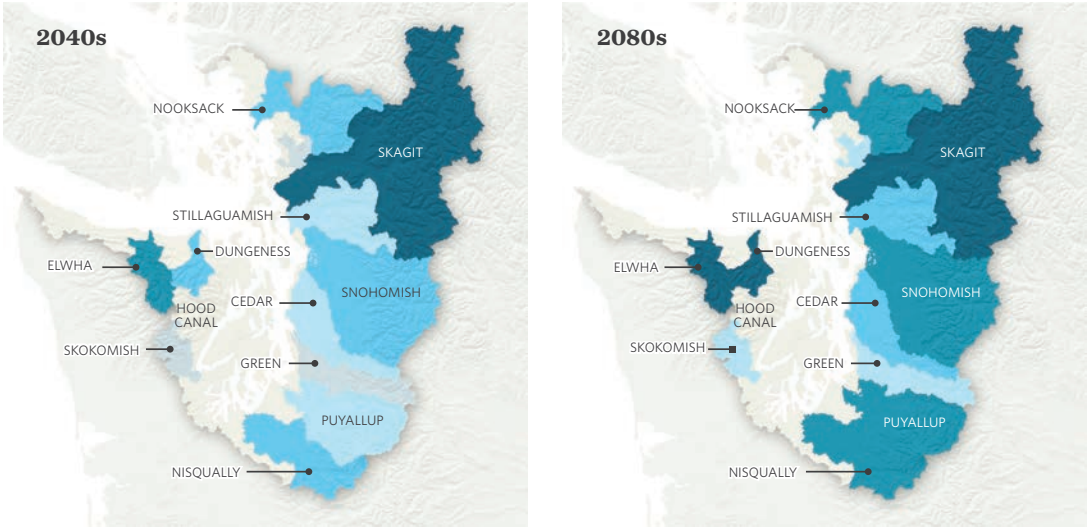
Most Puget Sound watersheds will be rain dominant by the end of the 21st century



APRIL 1ST SNOWPACK CHANGES



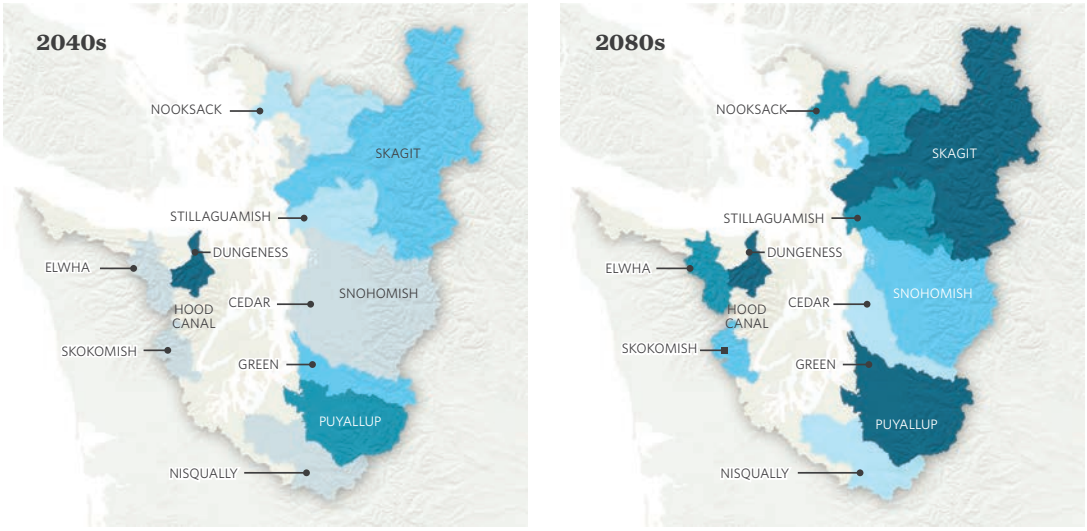
MINIMUM STREAMFLOW CHANGES



% change in annual minimum 7-day streamflow volume with a 2-year return interval

10 TO -15% | -16 TO -20% | -21 TO -25% | -26 TO -30% | GREATER THAN -30%

PEAK STREAMFLOW CHANGES



% change in peak daily streamflow volume with a 100-year return interval

5 TO 15% | 16 TO 20% | 21 TO 25% | 26 TO 30% | GREATER THAN 30%

DATA SOURCE: UW Climate Impacts Group. Maps show the projected change with moderate greenhouse gas scenario (A1B) for two time periods: the 2040's (2030-2059) and the 2080's (2070-2099), relative to 1970-1999. Results are only shown for watersheds that have historically accumulated at least 10 mm (0.4 in.) of April 1st snowpack. Flow projections do not account for reservoir operations which can have a large impact in the Skagit, Cedar, Green, White, and Skokomish watersheds. Peak flow projections only account for reduced snowpack; models do not include changes due to intensifying heavy precipitation.

FLOODING

Both the size and the frequency of floods are projected to increase as the combined result of warmer temperatures, intensifying heavy rain events, and rising seas. In snow-accumulating watersheds, winter flood risk will increase as warmer temperatures cause more winter precipitation to fall as rain rather than snow. Intensifying heavy rain events are projected to increase the flood risk in all Puget Sound watersheds. Continued sea level rise will extend the reach of storm surge, putting coastal areas at greater risk of inundation.

The movement of sediment in rivers – already a significant issue in many Puget Sound rivers – is also expected to increase and exacerbate flood risk. Receding snow and ice will expose new soil, and intensifying heavy rains could accelerate erosion, moving more sediment downstream. At the same time, sea level rise could affect sediment transport in coastal floodplains by slowing streamflow velocity. This could cause more sediment to accumulate in river channels, reducing a river's capacity to hold flood waters and exacerbating flooding.

Floodplains

Puget Sound floodplains are critical areas for salmon habitat, provide the most productive agricultural lands, and are prime areas for commercial, industrial, and residential development. Climate change is expected to affect floodplains and the natural services they provide, requiring shifts in the way communities think about and manage winter flooding.

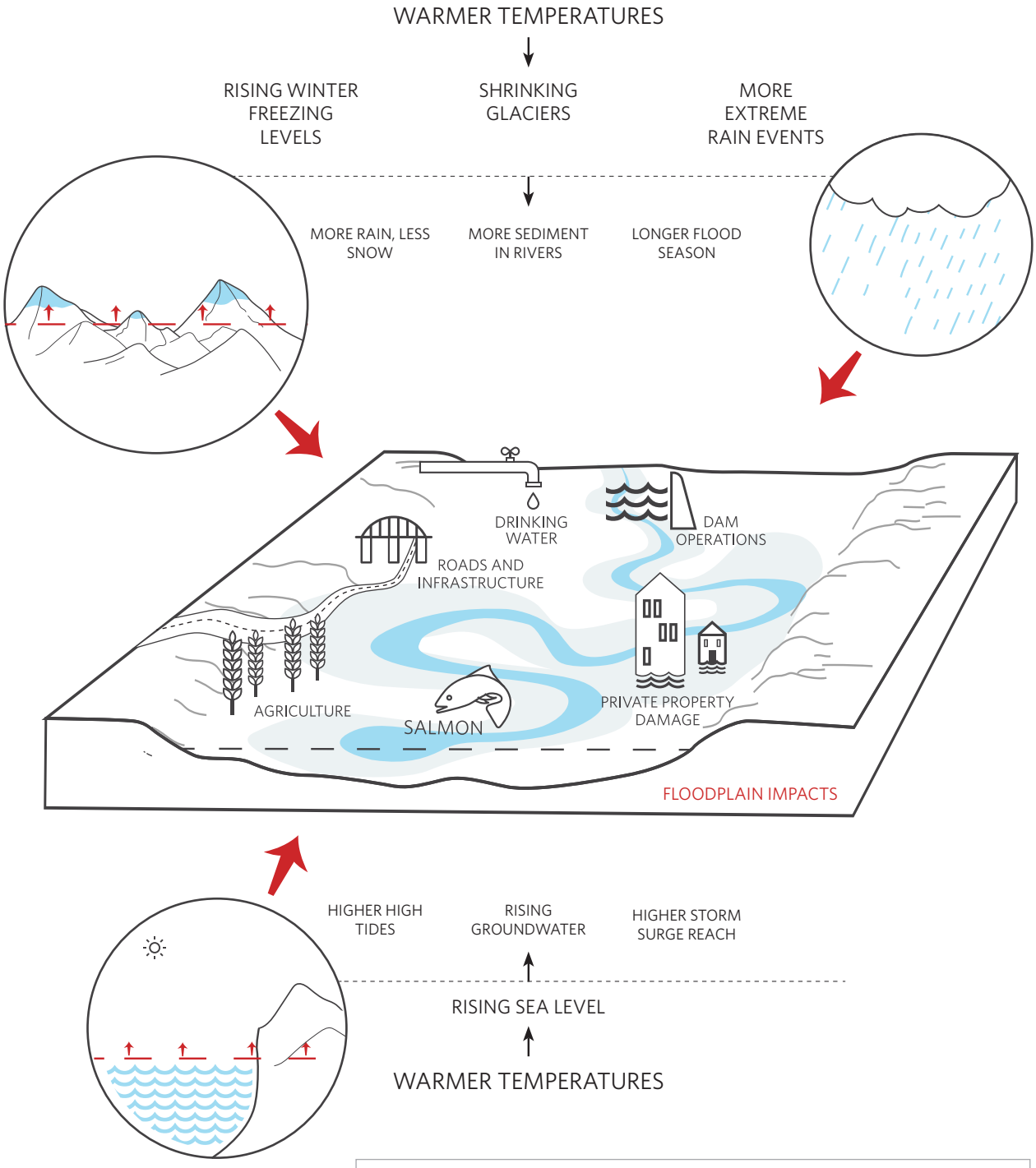
Understanding the changing nature of flood frequency is critical for floodplain management and planning. A fundamental aspect of floodplain management and policies is the definition of the "100-year flood," which will be dramatically affected by climate change impacts on Puget Sound rivers. For example, models project that by the 2040s, the flows associated with the 100-year flood in the Skagit River will become a 22-year event on average, while the 30-year flows will become a 7-year event. Similarly, 100-year flows in the Snohomish River are projected to become a 30-year event on average by the 2040s.

Urban Stormwater

Increases in the intensity of heavy rainfall events can create drainage problems and exacerbate localized flooding in developed areas that are dense with impervious surfaces (i.e. pavement and other materials that prevent the ground from absorbing rain). As rainwater runs over the landscape, it picks up pollutants such as bacteria, pesticides, metals, and toxic hydrocarbons from oil and fossil fuels, carrying them into habitats and aquatic systems. Increased frequency and intensity of heavy rain events may increase the cost of operating, maintaining, and upgrading critical stormwater infrastructure, and affect water quality due to increased flows, sediment, and nutrient loads. With the addition of rising sea levels, stormwater and wastewater systems are likely to experience problems with saltwater intrusion, corrosion, and flooding.

For more information on changes to the region's water cycle see Chapter 3 in the 2015 State of Knowledge report.

INCREASING FLOOD RISK



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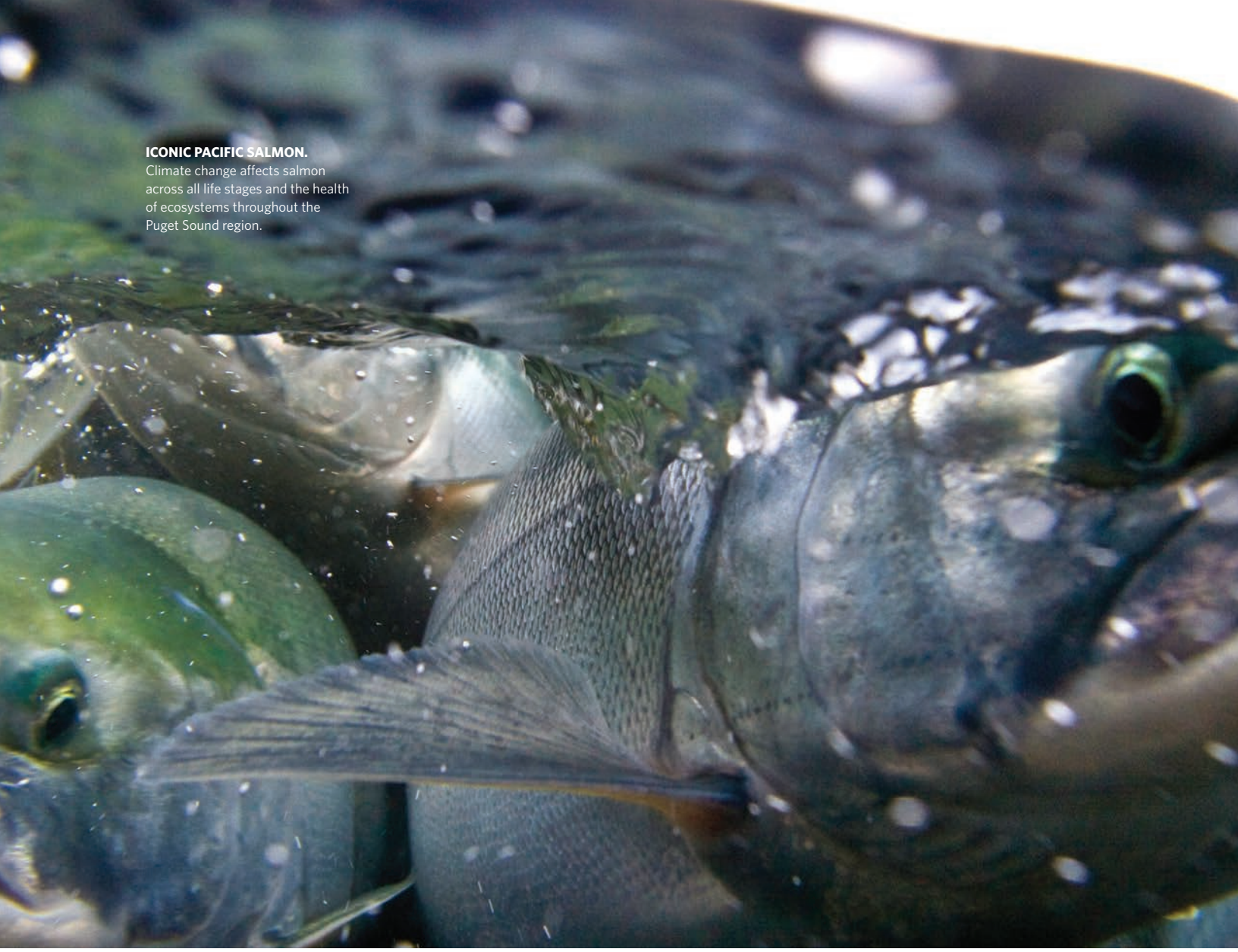

ICONIC PACIFIC SALMON.
Climate change affects salmon across all life stages and the health of ecosystems throughout the Puget Sound region.

IMAGE BY AMI VITALE

SALMON

Pacific salmon are an iconic species of the Puget Sound region and the Pacific Northwest; they are critical to the cultural identity of many Coast Salish tribes and local economies. They are also inextricably linked to the health of freshwater ecosystems. Warmer streams, ocean acidification, lower summer streamflows, and higher winter streamflows are all projected to affect the spawning and survival of Pacific salmon populations.

Declines in summer minimum streamflows are expected to increasingly disconnect floodplains from rivers, preventing some migrating salmon populations from accessing off-channel spawning and rearing habitat. Lower flows also result in physical barriers to migration when there is not enough water to migrate back to spawning grounds.

The effects of lower summer streamflow will be exacerbated by increasing stream temperatures. Streams with temperatures that are currently favorable for salmon could see temperatures increase to levels considered stressful for salmon (i.e., stream temperatures >67°F) while streams that already reach stressful temperatures in today's climate are more likely to see temperatures warm enough to create thermal migration barriers for salmon (i.e., temperatures >70°F). As river and stream temperatures rise, the persistence of cold water "refugia" within rivers – areas that are colder than adjacent areas – and diversity among salmon populations will be critical to helping salmon populations survive and adapt to future climate conditions.

LANDSLIDES AND SEDIMENT TRANSPORT

Landslide risk, erosion, and sediment transport are directly affected by the frequency and intensity of rainfall, snow cover extent, and the magnitude of peak flows. Climate change is expected to increase the frequency of landslides and the rate of erosion and sediment transport in winter and spring. In summer, these processes are expected to decrease. Indirectly, landslide risk may be altered due to an increase in the frequency and severity of wildfires. Research on the effects of climate change on landslides and sediment processes is limited, in part because it is challenging to distinguish climate change effects from non-climatic factors such as development patterns and forest management.

TIMING OF BIOLOGICAL EVENTS

The timing of many biological events, such as leaf emergence in spring, plankton blooms in lakes, and spawning runs for salmon, can be altered by warming. Because each species will respond differently, climate change may cause important biological interactions to become unsynchronized.

SPECIES DISTRIBUTIONS

Many species will exhibit changes in their geographic ranges, with some species ranges experiencing expansion while others experience contraction or migration. For example, declining snowpack is expected to lead to a decline in montane meadows as forests expand to higher elevations. Range shifts will vary among species, and will also be affected by non-climatic factors such as development and management practices.

FORESTS

Warmer temperatures and drier conditions are expected to increase forest fire risk in Puget Sound even though the area has not historically been fire prone. Increases in the risk of large wildfires, along with altered ranges and timing of insects and fungal pathogens, will affect the vigor, growth, and distribution of forest tree species throughout the Puget Sound region.

Over time, scientists expect the distribution and abundance of some tree species in the Puget Sound region to be altered. Growth of Douglas-fir and other species in warm lower-elevation forests may decrease where growth is currently limited by summer water availability. In contrast, growth of cold-climate, high-elevation species such as mountain hemlock may increase where growth is currently limited by mountain snowpack.

AGRICULTURE

Agriculture in the Puget Sound region may benefit from warmer temperatures lengthening the growing season, and increases in atmospheric CO_2 concentrations which could increase the production of some crops. However, increased heat stress, decreased summer water availability, increased flood risk, and changes in the range and timing of pests may negatively affect crops and livestock. Additionally, rising sea levels may render some existing coastal dikes insufficient to prevent flooding of agricultural lands in Puget Sound deltas, and affect the ability to drain farmland in the coastal floodplains.

For more information on changes to the region's water cycle see Chapter 3 in the 2015 State of Knowledge report.

A CHANGING SEASCAPE

Puget Sound supports a stunning diversity of marine life, including the region's best-known species – orca and Pacific salmon. Climate change will shape the marine environment through changes in sea level, sea surface temperatures, and sea surface salinity. Ocean acidification is projected to increase from carbon emissions. These processes will have significant impacts on marine species via changes in coastal habitat, shifts in species distributions, changes in community composition and food web structure, population abundances, and the timing of biological events.

Changes in the local marine environment may dramatically affect coastal communities that depend on marine species, including fishermen and shellfish farmers in the region. All seven species of Pacific salmon spend part of their life cycle in the marine waters of Puget Sound, and will be affected directly by changes in their habitat, or indirectly by changes in food availability due to warmer temperatures. Ocean acidification will likely harm shellfish and other organisms that form shells.

COASTAL HABITATS

Sea level rise is projected to expand the area of some tidal wetlands in Puget Sound, but reduce the area of others as water depths increase and coastal areas become submerged. For example, the area covered by salt marsh is projected to increase, while tidal freshwater marsh area decreases. Rising seas will also accelerate the eroding effect of waves and storm surge, causing unprotected beaches and bluffs to recede more rapidly.

HARMFUL ALGAL BLOOMS

Ocean acidification may increase the toxicity of some harmful algal blooms. Warmer water temperatures in the North Pacific Ocean and Puget Sound are also likely to make harmful algal blooms more frequent and severe, and extend the season in which they occur.

MARINE ECOSYSTEMS

A combination of climate-related stressors will affect marine organisms and habitats, including warmer water temperatures, loss of coastal habitat due to sea level rise, ocean acidification, and changes in water quality and freshwater inputs. Some species, like salmon and shellfish, are likely to be negatively affected by these changes; other species, such as eelgrass, may benefit.

CIRCULATION IN THE OCEAN AND IN PUGET SOUND

It is still unclear how the circulation in Puget Sound and nearshore Pacific Ocean might change. For example, changes in the timing and amount of river flows may affect the ability of Puget Sound's surface and deep waters to mix. Ocean upwelling may change, but projections are not conclusive. Short-term variability in upwelling (ranging from seasons to decades) will likely be more important than long-term changes related to global warming throughout the 21st century.

For more information on changes to the region's marine environments see Chapters 4, 6, and 11 in the 2015 State of Knowledge report.

IMAGE BY HANNAH LETINICH

BAYWATER SHELLFISH FARM, HOOD CANAL.
Communities in Puget Sound may be directly affected by climate threats to our local food supply, especially shellfish. Warmer marine waters may lead to proliferations of toxic blooms and the expansion of toxic bloom season, increasing the risk of diseases from pathogens such as Vibrio.

"As climate impacts mount, so does the urgency of resolving the equity challenge. Those least responsible for climate change are often the most vulnerable to changes in weather patterns, sea level rise, and other impacts, further exacerbating existing inequities. Meanwhile, actions – both to address climate impacts and to reduce emissions – are intertwined with broader equity issues involving livelihoods, health, food security, and energy access."

-World Resources Institute

IMPLICATIONS FOR OUR COMMUNITIES

The Puget Sound region is home to a growing population and a rich diversity of cultural, institutional, and economic resources. As changes in our climate will affect everyone, the best solutions will be inspired and informed by diverse coalitions of people, including local communities, tribes, resource users, businesses, and elected leaders.

People residing in places affected by climate change due to events such as flooding or sea level rise may not have the assets to adapt or move to a new location. Equity issues can arise in the adaptation choices we make. It will be critical to ensure that the people who are most impacted by environmental degradation and a changing climate, who have been under-represented in the past and who bring new perspectives to tackling this challenge, are engaged in climate planning efforts and decision making.

IMAGE BY DAVID FOX

NORTH BEND, WA.
A winter storm in January 2015 flooded many homes in the Snoqualmie Valley. Communities throughout Puget Sound will need to work together to address the impacts of increasing frequency and intensity of flooding.

TRIBES

Rooted in place, tribes are particularly vulnerable to climate change. Tribal communities in the Puget Sound region face a wide range of climate-related risks, including sea level rise, more frequent and larger floods, impacts on culturally-important species such as salmon and shellfish, a greater risk of wildfires, and changes in the forest, coastal, and marine ecosystems on which they rely.

BUILT ENVIRONMENT

The developed areas of Puget Sound and the transportation, drinking water, wastewater, and energy systems that serve the region's population will face an increasing risk of various extreme weather events (e.g. heat waves, flooding, wildfire). Consequences include flooding of low-lying infrastructure, increased corrosion of and damage to waterfront assets, reduced energy transmission capacity during heat events, and higher maintenance costs for many transportation assets and other elements of the built environment.

HUMAN HEALTH

More frequent heat waves and more frequent and intense flooding could harm human health directly. Warming may also intensify health risks from poor air quality and allergens. Climate change can also indirectly affect human health through its impacts on water supplies, wildfire risk, and the ways in which diseases are spread. Risks are often greatest for the elderly, children, those with existing chronic health conditions, individuals with greater exposure to outside conditions, and those with limited access to health resources.

For more information on impacts to communities see Chapters 12 and 13 in the 2015 State of Knowledge report.

CLIMATE RISK REDUCTION

Many Puget Sound communities, agencies, and organizations are already preparing for the impacts of a changing climate. Most are in the initial planning stages of assessing impacts, while some are implementing adaptation actions. Taking action today is critical for reducing climate risks, and will play an important role in determining the future consequences of climate change for people and nature around Puget Sound. Here are some of the actions currently underway in the Puget Sound region.

ASSESSING VULNERABILITIES

Several Puget Sound communities and organizations are assessing their individual vulnerabilities to climate change. For example:

- The Jamestown S'Klallam tribe recently completed a vulnerability assessment. The tribe found that even moderate sea level rise will increase the flood risks for Highway 101 near Discovery Bay, potentially limiting the tribe's access to the highway during those flood events.

- The University of Washington Climate Impacts Group has worked with the City of Seattle, City of Tacoma, Sound Transit, the Swinomish Indian Tribal Community, and others to identify climate vulnerabilities in their natural and built environments.

PARTNERSHIP BUILDING

Agencies, organizations, and communities are working collaboratively with stakeholders to identify options for responding to climate change in the Puget Sound region. For example:

- Local and county governments in the central Puget Sound region are working to establish a Central Puget Sound Climate Preparedness Partnership. The goal of the partnership is to enhance opportunities for collaboration and coordination of climate resilience activities in the central Puget Sound region.

CLIMATE-INFORMED PLANNING

Based on vulnerabilities identified, communities and practitioners are incorporating climate change impacts into planning and decisions. For example:

- The Nature Conservancy has worked with Pacific County and other partners to map coastal vulnerability and sea level rise, and is helping to incorporate these assessments into their Shoreline Master Program updates.

- King County is using sea level rise and streamflow projections from the Climate Impacts Group to inform decision making regarding maintenance and capital upgrades of low-lying facilities.

TAKING ACTION

A number of Puget Sound communities have begun to enact changes in policies, practices, and infrastructure that are designed to increase climate resilience. For example:

- The City of Anacortes designed and constructed a new $65 million water treatment plant that will account for projected increases in flooding and sediment loading in the Skagit River.

- A new 8-mile reclaimed water pipeline built by King County provides additional water for agriculture and industrial customers in the Sammamish River Valley, increasing water supply flexibility during times of drought.

IMAGE BY DEVAN KING

Looking Forward—

Understanding the local effects of climate variability and change is the first step towards characterizing, and ultimately reducing, climate risks. This report is a brief summary of the Climate Impacts Group's 2015 Puget Sound State of Knowledge report, and is intended to inform discussions within the Puget Sound region about the risks associated with climate change, and our choices for managing those risks. It is important to recognize that this report does not serve as a crystal ball for predicting our future; the consequences of a changing climate will arise from the complex interactions between climate, our critical natural and human systems, and a multitude of non-climate factors such as development choices, patterns of energy and water consumption, land use decisions, and other economic and social factors.

The region's best future will be achieved if innovations that address climate risk can be connected and enhanced, and novel collaborations developed to build resilience to the changes underway. Decisions that consider climate risks, the interactions among these risks, and the connection between these risks and non-climate stressors offer the opportunity to maintain the integrity of the ecosystems that we treasure, the reliability of the infrastructure on which we depend, and the well-being of this generation and future generations in the Puget Sound region.

Conserving the lands and waters on which all life depends.

The Nature Conservancy

www.washingtonnature.org/climatechange

Building climate resilience for people and nature.

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