

NATURAL SYSTEMS

VULNERABILITY TO CLIMATE CHANGE



Warmer temperatures, wetter winters, and drier summers may impact the health and functioning of Shoreline's natural systems. These changes may increase stress on plants and animals that live in our most sensitive ecosystems.

Shoreline communities are likely to face the following impacts of a changing climate:

Sensitive Ecosystems



HIGH VULNERABILITY

Wetter winters and hotter, drier summers may further stress wetlands, water bodies, and other ecosystems and the threatened and endangered fish and wildlife that inhabit these areas.

Parks and Open Spaces



MODERATE VULNERABILITY

Warmer temperatures and more flooding may stress parks and open spaces, especially in places with paved surfaces and frequent use.

Urban Trees



MODERATE VULNERABILITY

Hotter summer temperatures and drought, as well as pests and diseases, may harm trees. Tree canopy may be lost in some areas from development.



Richmond Beach Salt Water Park



SENSITIVE ECOSYSTEMS

High vulnerability due to existing stress from human activities and the complex challenge of restoring natural systems.

Shoreline's natural systems include forested, shrub, and meadow plant and animal communities. They also include marine environments, freshwater streams, and freshwater wetlands and ponds. These natural systems provide many ecological functions and provide habitat for protected species (protected from harm under federal or state policy), including threatened and endangered species and species of concern.

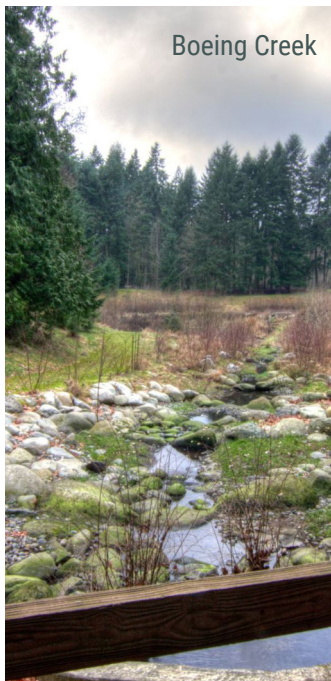
FRESHWATER STREAMS

Freshwater streams in Shoreline are vital to numerous species, for example:

- **McAleer Creek** is the only stream in the city with threatened Chinook salmon and steelhead trout.
- **Boeing Creek and Storm Creek** discharge directly to Puget Sound, a critical habitat for Southern Resident Killer Whales.
- **The marine shoreline and the Boeing Creek delta** (where the creek flows into Puget Sound) are an important migration route for salmon. Coho salmon (a species of concern) are present in lower reaches of Boeing Creek and in the tributaries to McAleer and Lyon creeks.

Freshwater streams are important to all life stages of salmon and Pacific lamprey. In the future, increased winter rainfall may cause higher water levels in streams, more flooding, and more erosion. Higher and faster streamflows can scour spawning beds and flush out juvenile salmon and other species. Flooding may also bring more pollutants into the streams, which may worsen as the city's population grows.

During the summers, less rainfall is likely to reduce water levels in streams, contributing to warmer water temperatures and reduced water quality. Since salmon need cold, clean water, poor water quality is likely to make it harder for salmon to survive in freshwater streams.



FRESHWATER WETLANDS AND WATERBODIES

Wetlands and ponds are important to species of concern, such as the western pond turtle. These natural systems are already stressed by disturbances from human activity, making them very sensitive to climate change impacts.

- Freshwater wetlands and other waterbodies in Shoreline, including Echo Lake, Ronald Bog, and Twin Ponds, will be **wetter in the winter and drier in the summer** due to climate change.
- **Changes in the movement, availability, distribution, and quality of freshwater** will likely make survival more difficult for wetland-adapted species, notably amphibians and certain bird species. These species depend on reliable water levels to survive. While these species may be negatively impacted by climate change, some **invasive species** (species that are not native to an ecosystem and cause harm) have adapted to changing conditions and as a result, are more likely to thrive and compete for habitat and resources with our native species.
- Warmer temperatures, combined with pollution from pet waste, fertilizers, leaf litter, and other nutrient-dense sources, may **worsen algal blooms** (groups of algae that grow out of control and produce toxic or harmful effects) in lakes, such as Echo Lake.



MARINE AND ESTUARINE ENVIRONMENTS

Marine and estuarine (mix of saltwater and freshwater) wetlands are present along the city’s entire shoreline. This habitat is vital to several life stages of forage fish (surf smelt, herring, and sand lance), salmon, and Pacific lamprey. Climate change is expected to impact Richmond Beach Saltwater Park and the coastal portions of the Richmond Beach neighborhood (west of the BNSF railroad track). Projected impacts include:

- Beaches, tidal wetlands, mudflats, and eelgrass beds are likely to be degraded by **rising temperatures and higher tides**.
- **Rising sea levels** will likely cause **more frequent flooding** of coastal areas, which may **change characteristics of the landscape**. Sea level rise and flooding may cause habitats near the shore to change into different habitats over time.
- **Species relying on disappearing habitat types may be forced to move** or their populations may decline. For instance, estuarine beaches provide spawning habitat for forage fish, which may be diminished with sea level rise.
- When the ocean absorbs increased levels of carbon dioxide from the atmosphere, waters become more acidic. **Ocean acidification can corrode the shells of oysters and other shellfish, slowing growth and increasing mortality**.
- More rainfall may wash more sediment and pollutants into streams, leading to **lower water quality** and altering coastal water characteristics.
- Warmer temperatures may **increase the frequency of harmful algal blooms**.

Geohazards

Geologically hazardous areas or “geohazards” are areas more likely to experience erosion, landslides, earthquakes, or other geological events that threaten human health and safety. As such, these areas are not well suited for development.

In Shoreline, known landslide areas are present along the downstream end of Boeing Creek, along the shoreline, and in steep areas along the eastern edge of the city. Steep slopes and landslide hazard areas could experience changes in stability as seasonal rainfall patterns change over time, particularly during the winter when rainfall totals increase.



PARKS AND OPEN SPACE

Moderate vulnerability because higher temperatures will stress natural systems in parks and open spaces, but many City parks are irrigated, making them better able to withstand the increased stress.

What are urban heat islands?

Areas where roofs, pavement, and other dark-colored hard surfaces absorb heat, causing some areas of a city to be warmer compared to shaded or vegetated areas (like forested parks) or surrounding rural landscapes. Urban heat islands already exist in Shoreline and many other cities. As temperatures rise with climate change, people, plants, animals, and infrastructure in urban heat islands may become more vulnerable.

Parks provide opportunities for climate change resilience by soaking up rainwater and providing shade. However, park facilities and natural features will face pressure from rising temperatures and changes in rainfall, combined with a growing population. Rising temperatures and longer summer droughts may also stress plants in open spaces, potentially leading to plant die-offs and increased fire risk.

Recreational parks with hard surfaces—parking lots, tennis courts, and playfields—already contribute to localized urban heat islands that may increase risk of heat exposure for park users, especially more vulnerable groups like children and older residents. However, the plants and green spaces in parks can help offset some of the heat impacts.



URBAN TREES

Moderate vulnerability because warmer temperatures and emerging pests pose risks to tree health, but irrigation makes them more resilient to these impacts.

Vulnerable Tree Species

Shoreline is home to many valued native tree species, including madrone, bigleaf maple, western red cedar, Douglas-fir, and cascara. Some tree species will be more vulnerable to climate change impacts, while other trees will adapt to a wider range of environmental conditions. The City is in the process of reviewing and updating its Tree List to encourage planting of resilient, long-lived tree species to support climate change resilience. The City can update this list as conditions change.

Urban trees provide many important services that will strengthen Shoreline communities against the negative impacts of climate change. For example:

- Tree canopy provides **shade** and reduces **urban heat island** effects.
- Trees **soak up rainwater runoff** during intense storms, reducing the burden on stormwater pipes. A typical street tree can soak up to 760 gallons of rainwater in a year.
- Trees and other green spaces can **reduce stress levels**, providing mental health benefits to residents.

While large patches of forest are still present in Shoreline, large stretches of paved area within the city contribute to urban heat islands. As the city continues to grow, trees may be removed in some areas to make way for development, potentially worsening the urban heat island effect as well as surface water management challenges in those areas. However, current City regulations help to protect the existing tree canopy by requiring retention of larger trees, as well as replacement for trees that are removed.

Pests and diseases that weaken trees may become more prevalent with warmer temperatures. Trees weakened by pests and diseases are more likely to struggle in hotter, drier summers.

WHAT IS SHORELINE DOING?

- **Green Cities Partnership:** this coalition of cities and counties in Puget Sound is committed to preserving urban forests. As a member of this partnership since 2019, Shoreline has already restored almost two acres of degraded urban forest and installed over 2,500 native shrubs and trees.
- **Ballinger Open Space Restoration:** the City partnered with the Mountains-to-Sound Greenway Trust to use urban carbon credits to fund forest restoration at the Ballinger Open Space, replacing three acres of invasive plants with 2,000 native trees.
- **Urban Forest Strategic Plan:** the City's 2014 plan includes a priority of achieving a "climate appropriate degree of tree cover, community-wide." Current tree canopy is protected through City code regulating tree removal.

Additional strategies that Shoreline is planning or could pursue to build climate resilience include:

- **Increasing connectivity between open spaces** to improve species resilience, plant regeneration opportunities, and enhanced recreational opportunities.
- **Planting native species** in parks, lawns, and the right-of-way to upgrade these underutilized spaces, help reduce flooding and erosion, expand urban habitat, and enhance natural spaces for Shoreline residents. Planting trees in open spaces and portions of parking lots can also expand tree canopy cover, and combat heat island effects.
- Modifying the City's plant palettes to **use more drought-tolerant plants** that can withstand increased heat and less rainfall during the summer.
- Using the City's **Parks, Recreation, and Open Spaces Plan** to identify additional ways to build climate resilience.