NORTH COAST

REGION 1

Observed & Projected Climate Changes

Air & Water Temperature

Observed	
Annual Air	• +1.2-1.5°C (2.2-2.7°F) from 1895-2019, with the most recent decade (2010-2019) the warmest on record. • Annual temperature has increased more in the southern part of the region.
Seasonal Air	• Most warming has been observed in summer, particularly for minimum temperatures.
Extreme Heat	• No change in the frequency of extreme daytime temperatures. • Increased frequency of extreme overnight temperatures in summer.
Streams	• Long-term monitoring sites in the region indicate historical warming rates of ~0.30°C/decade (0.54°F/decade) during summer months. • Many streams and rivers in the region do not currently meet water quality temperature criteria during summer months.
Projected by 2100	
Annual Air	• +2°C (3.6°F) to +3.9°C (7.0°F).
Seasonal Air	• Projected increases in all seasons, with the greatest amount of warming projected in summer (+4.3°C/7.7°F) and the least amount of warming in spring (+3.3°C/5.9°F). • A 4°C (7.2°F) increase at high elevations (e.g., Mary's Peak) would increase mountain temperatures to levels comparable with current temperatures in lowland areas (e.g., Willamette Valley).
Extreme Heat	• Longer, more frequent, and more intense heat waves. • Increase in the annual number of days >90°F (32°C) by mid-century (+4 to +14 days) compared to 1971-2000.
Streams	• Increased average surface-water temperatures during summer months. • +2.36°C (4.3°F) for mean August stream temperature.

Precipitation & Drought

Observed	
Annual	• No trend over the past 90 years. • Recent years have been dry compared to the 20th-century average; e.g., Newport received 12-15% less annual precipitation during the last 20 years.
Seasonal	• In recent decades, spring precipitation has been 5-10% above the 20th-century mean while summer, fall, and winter have had below-average precipitation. • Summer has been the most anomalously dry at 79% of normal 20th-century amounts.
Snowpack	• Number of days with snow cover has decreased by 10-12 days/decade.
Drought	• The 21st century has been anomalously dry across the region.

Projected by 2100

Annual	• +2%, although precipitation projections are more uncertain and variable.
Seasonal	• Winter, Summer: Increased winter precipitation (+8 to 10%) and decreased summer precipitation (-28%). • Fall, Spring: Most models project a small decrease or no change in precipitation.
Extreme Precipitation	• Increased intensity of atmospheric rivers. • Increased number of days with an atmospheric river present.
Snowpack	• Further reduced high-elevation snowpack.
Drought	• Increased frequency and duration of drought. • Increased probability of more extreme droughts than those observed in the past century. • Climatic water deficit (a measure of drought stress) is projected to at least double under a high-emissions scenario. • Increased soil drought in the inland, southern portions of the region.

Hydrology & Sea Level Rise

Observed

Sea Level Rise & Storm Surge	• Relative sea level in northern Oregon (Cannon Beach and north) is falling or slightly stable; relative sea level rise rates in central Oregon have been 1-3mm/year since at least the 1970s.

Projected by 2100

Sea Level Rise & Storm Surge	• Rising sea level and increased storm surges. • Increased frequency of major and moderate high-tide flood events. • Sea level at Astoria projected to increase by 2.6-17 inches from 2016-2050. • Sea level at Newport projected to rise by 9-19 cm (3.5-7.5 in) by 2040 and 25-187 cm (9.8-73.6 in) by 2100.
Streamflows	• Overall increase in late fall and winter streamflow. • Slight increases in the size of average peak flows, with some watersheds increasing as much as 24% in average peak flows relative to historical conditions. • Increased frequency of peak flows. • Earlier median center of timing of flow. • 5-25% decrease in spring, summer, and early fall streamflow. • Decreased summer streamflows, with some watersheds declining 20-28% from historical conditions. • Compared to other parts of the Pacific Northwest (e.g., inland mountain ranges), future reductions in average summer streamflows are modest for this region. • Increased duration of low-flow events.

Disturbances

Projected by 2100

Wildfire	• Slight increases in suitability for large wildfires for the Coast Range. • +5% increase in suitability for large forest fires, with suitability highest in inland, southern portion of region. • Increased fire frequency. • Uncertainty regarding fire severity; some studies suggest an increase in burn severity while others project either no change or potential reductions in fire severity.

	• Increased number of high fire danger days in summer and fall (e.g., Tillamook: 7 days in 2020s, 14 days by 2050s).
Insects & Pathogens	• Increased pathogen activity in areas where they typically infect drought-stressed host species. • Increase in Swiss needle cast in response to warmer, wetter conditions; increase in drought may inhibit spread of disease. • Altitudinal and latitudinal range expansion of some forest pathogens. • Warmer winters and hotter droughts may enable some insects to increase reproductive rates and move into previously unsuitable habitat. • Increased tree mortality from insects and pathogens as trees are exposed to more stress associated with growing-season drought.
Invasive Plants	• Altered distribution and spread of non-native plant species. • Warm, dry sites with increased topographic exposure may be particularly susceptible to nonnative species.

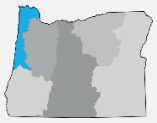
Information from the following references and the citations therein:

1. Halofsky, J.E., D.L. Peterson, and R.A. Gravenmier, eds. 2023. Climate change vulnerability and adaptation in Coastal Oregon. Gen. Tech. Rep. PNW-GTR-XXX. U.S. Dept of Ag., Forest Service, Pacific Northwest Research Station. XXX p.

2. Dalton, M. and E. Fleishman, eds. 2021. Fifth Oregon Climate Assessment. Oregon Climate Change Research Institute, Oregon State University. 183 p.

3. Fleishman, E., ed. 2023. Sixth Oregon Climate Assessment. Oregon Climate Change Research Institute, Oregon State University. 248 p.

4. Department of Land Conservation and Development. 2023. Climate Change Vulnerability Assessment Workshops, Regional Climate Change Projections Fact Sheets. https://www.oregon.gov/lcd/CL/Pages/Vulnerability-Assessment.aspx



NORTH COAST

REGION 1 Observed & Projected Changes for Habitats & Fish Species

Habitats

Mixed Conifer Forest

credit: Linda Repplinger

- Projected shifts in species dominance from moist temperate needleleaf forest to a mix of sub-tropical and temperate rain forest (similar to the northern California coast).
- Drier conditions could decrease growth and increase mortality in areas where Douglas-fir relies on groundwater in shallow soils.
- With temperature increases, western hemlock abundance may decrease.

Coastal Sitka Spruce Forest

credit: Jeremy Erickson

- Projected expansion of coastal mixed forest and an increase in hardwoods.
- Decreased fog would increase stress on Sitka spruce.

Oak Savanna Woodlands

credit: Sue Sierralupe

- Projected increases in woodland area along Willamette Valley margins.
- Increased oak mortality due to increased susceptibility to sudden oak death, increased frequency and severity of summer droughts, and increased fire frequency.

Montane Forests and Meadows

credit: Jeff Gunn

- Increased winter flooding, reduced snowpack duration, and increased drought stress in summer could result in further restriction or elimination of remnant noble fir patches, increased susceptibility of noble fir to disease, impacts on high-elevation forbs and shrubs (including extirpation), and forest encroachment into meadows.

Coastal Meadows and Grasslands

credit: Sean Clawson

- Potential conversion of meadows and grasslands to other vegetation; for example, if moisture increases, forest encroachment is likely.
- If fog is reduced, some native grasses and forbs may be lost.
- Possible loss of habitat due to sea level rise.

Aquatic & Wetland Ecosystems


credit: OWEB

- Increased frequency, duration, & intensity of drought & higher rates of evapotranspiration.
- Decreased groundwater recharge.
- Increased water temperatures.
- Increased winter flooding and erosion.
- Increased scour events and transport of large wood and sediments out of headwater areas into lower-gradient floodplains.
- Saltwater intrusion.

Estuarine


credit: OWEB

- Higher sea level, stronger winter storms, and warmer and drier summer conditions will affect the spatial extent of estuarine habitats as well as interactions with coastal terrestrial habitats.
- Saltwater intrusion.
- Coastal flooding and erosion.
- Large mainstem rivers close to estuaries may experience greater tidal inundation and flooding in the winter in response to higher sea levels coupled with high flows from intense winter storms.
- Increased tidal inundation time on lowland marshes, altering vegetation composition and leading to a transition to mudflat or open water.

Fish Species

Winter Steelhead Trout


credit: Greg Shields, cc

- Warming temperatures could lead to a change in life history expression, with a loss of steelhead life history forms and an increase in inland rainbow trout forms because of a faster growth rate.
- Rearing juvenile steelhead are vulnerable to low flows and higher stream temperatures in summer.
- Adults likely face barriers to migration due to warming water temperatures (i.e., steelhead populations stop moving when water temperature exceeds 21°C (69.8°F)).
- Headwater rearing locations are susceptible to debris flows and scour.

Coastal Cutthroat Trout


credit: Bureau of Environmental Services.

- Returning adults (of sea-run form) and juveniles located farther down the river network may be subject to increased river temperatures.
- Potential increased susceptibility to wildfire and lower summer flows for freshwater forms using stream reaches further up.
- Downstream displacement of headwater-rearing fish, with increased exposure to warmer stream temperatures and potential for intensified biological interactions with native and nonnative species found lower in the watershed.

Pacific Lamprey

credit: USFWS

- Increased risk of mortality for embryonic and newly-hatched Pacific lamprey due to water temperatures exceeding 20°C (68°F) in summer.
- Increases in water temperature can also affect survival of larval rearing fishes, timing or number of individuals as they metamorphose into ocean-going life stage, pr lead to premature migration of juvenile lamprey (which could expose them to salt water before they have made necessary physiological changes).
- Like Pacific lamprey, Western Brook Lamprey are vulnerable to water temperatures above 20°C (68°F).

Coho Salmon

credit: USGS

- Warming water temperatures can accelerate egg incubation rates in winter or spring, accelerate growth in spring, and potentially desynchronize the developmental phenology of juveniles from the temporal availability of seasonal habitats.
- Increased habitat degradation due to warming temperatures.

Chinook Salmon

credit: Greg Morgan, BLM

- Tillamook, Nestucca, and Alsea River populations may be more at risk due to warming summer stream temperatures as their abundance is already low.
- Highly variable flow and temperature regimes in April and May can affect smolt migration (e.g., high flows and water temperatures can narrow migration window while cool temperatures and minimal flows can delay migration).
- Holding adults are vulnerable to higher summer water temperatures.
- Holding and migrating adults may become increasingly stressed and susceptible to disease, diminishing reproductive potential and increasing pre-spawn mortality.
- Reduced availability of coldwater refuges.
- Altered behavior, physiology, and growth due to warmer water temperatures.
- Spring Chinook salmon may have more vulnerability to freshwater conditions than fall Chinook, while fall-migrating fish may be more vulnerable to changes in ocean conditions

Chum Salmon

credit: K King, USFW

- Sensitive to degraded estuarine conditions as they depend on tidally influenced and estuarine habitats for rearing.
- Increased exposure to warmer water temperatures in freshwater habitats.

Information from the following references and the citations therein:

1. Halofsky, J.E., D.L. Peterson, and R.A. Gravenmier, eds. 2023. Climate change vulnerability and adaptation in Coastal Oregon. Gen. Tech. Rep. PNW-GTR-XXX. U.S. Dept of Ag., Forest Service, Pacific Northwest Research Station. XXX p.