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United States Environmental Protection Agency

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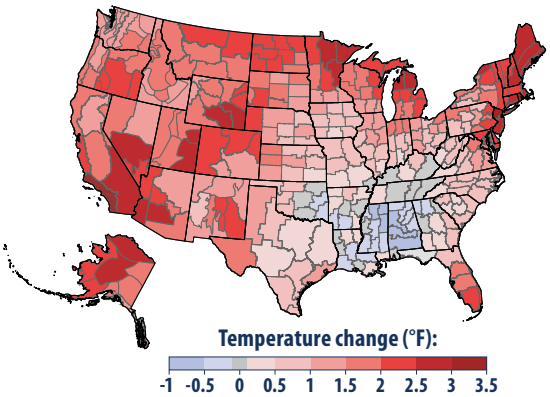
What Climate Change *Means for* Oregon

Oregon's climate is changing. Over the past century, most of the state has warmed about two degrees (F). Snowpack is melting earlier in the year, and the flow of meltwater into streams during summer is declining. In the coming decades, coastal waters will become more acidic, streams will be warmer, wildfires may be more common, and some rangelands may convert to desert.

Our climate is changing because the earth is warming. People have increased the amount of carbon dioxide in the air by 40 percent since the late 1700s. Other heat-trapping greenhouse gases are also increasing. These gases have warmed the surface and lower atmosphere of our planet about one degree during the last 50 years. Evaporation increases as the atmosphere warms, which increases humidity, average rainfall, and the frequency of heavy rainstorms in many places—but contributes to drought in others.

Greenhouse gases are also changing the world's oceans and ice cover. Carbon dioxide reacts with water to form carbonic acid, so the oceans are becoming more acidic. The surface of the ocean has warmed about one degree during the last 80 years. Warming is causing snow to melt earlier in spring, and mountain glaciers are retreating. Even the great ice sheets on Greenland and Antarctica are shrinking. Thus the sea is rising at an increasing rate.



Rising temperatures in the last century. The warming in Oregon has been similar to the average warming nationwide. Source: EPA, Climate Change Indicators in the United States.

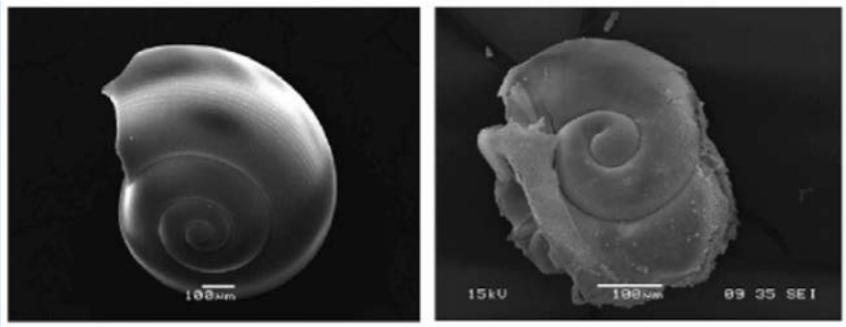
Marine and Coastal Ecosystems

Oregon's coastal waters are vulnerable to acidification. The ocean here is more acidic than most of the ocean, because nearby currents bring relatively acidic water from the deep ocean to the surface, especially during spring and summer. Increasing acidity impairs the ability of some types of shellfish to capture minerals in the water to build their shells, which can lead to thinner shells—or even prevent shells from forming. At the Whiskey Creek Hatchery in Netarts Bay, for example, acidic seawater during spawning has reduced the growth rates and survival of young oysters. Acidity also thins the exoskeletons of many species of plankton, which could reduce the population of those plankton and the fish that feed on them, and alter the entire marine food web. For example, young salmon eat some of the types of shellfish and plankton that are vulnerable to acidification.

Rising water temperatures, increasing ocean acidity, and changes in the marine ecosystem will amplify observed losses in commercially and recreationally important fish stocks in the region in the 21st century. Credit: NOAA.

Rising ocean temperatures may also harm marine ecosystems. Warming waters can increase the frequency of toxic algae blooms (such as "red tide") that cause shellfish poisoning and lead to closures of beaches and shellfish beds. Warmer waters also allow invasive species from southern waters to move northward.

Sea level rise will threaten coastal development and ecosystems. Erosion will threaten homes and public property along the shore. Mudflats, marshes, and other tidal wetlands provide habitat for birds and fish. As water levels rise, wetlands and beaches may be submerged or squeezed between the rising sea and structures erected to protect coastal development.



Pteropods, or "sea butterflies," are small free-swimming sea snails. They are an important source of food for North Pacific juvenile salmon, as well as whales and other marine species. The left panel shows a shell collected from a live pteropod from a region where acidity is not yet very high. The shell on the right is from a pteropod collected in a region where waters have acidified. Credit: Nina Bednaršek, NOAA.

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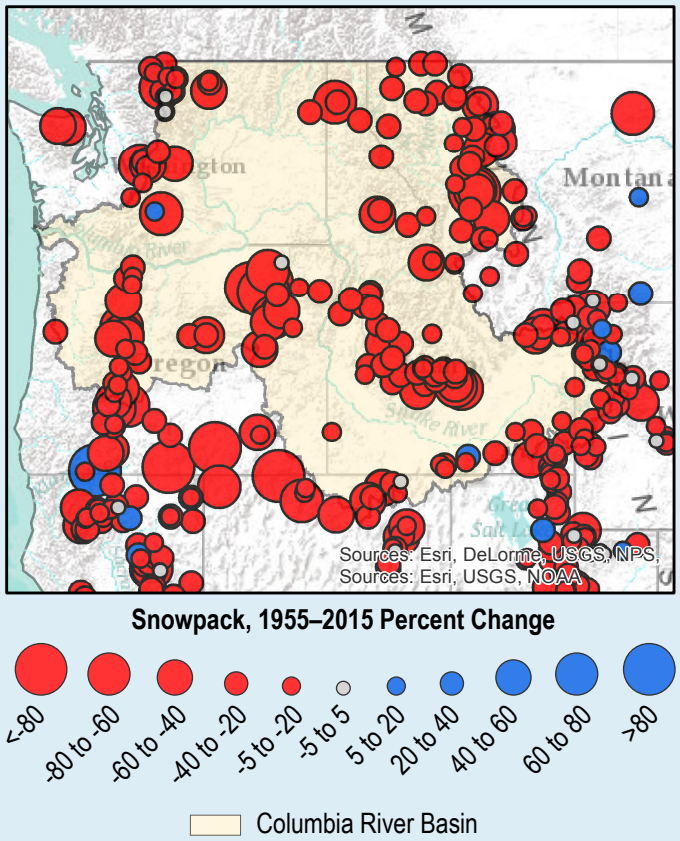
Snowpack, Streamflows, and Water Availability

The flows of water in rivers and streams are increasing during late winter and early spring but decreasing during summer. Warmer winters have reduced average snowpack in the Cascades by 20 percent since 1950. The snowpack is now melting a few weeks earlier than during the 20th century, and, by 2050, it is likely to melt three to four weeks earlier. Decreasing snowpack means there will be less water flowing through streams during summer. Moreover, rising temperatures increase the rate at which water evaporates (or transpires) into the air from soils and plants. More evaporation means that less water will drain from the ground into rivers and streams.

Declining snow and streamflow would harm some economic sectors and aquatic ecosystems. Less snow means a shorter season for skiing and other winter recreation. Water temperatures will rise, which would hurt Chinook and sockeye salmon in the interior Columbia River Basin. The combination of warmer water and lower flows would threaten salmon, steelhead, and trout. Lower flows would also mean less hydroelectric power.



Trends in April snowpack in Oregon and the U.S. portion of the Columbia River Basin, 1955–2013. Snowpack has decreased at most monitoring sites in Oregon and the basin. Source: EPA.

Wildfires and Landscape Change

Climate change can increase the frequency and severity of fires that burn forests, grasslands, and desert vegetation. Since 1984, about 4 percent of the land in Oregon has burned per decade. The changing climate is likely to more than double the area in the Northwest burned by forest fires during an average year by the end of the 21st century. Although drier soils alone increase the risk of wildfire, many other factors contribute to fires, and forests in the Western Cascades may be less vulnerable to climate change than those in the Eastern Cascades.

Higher temperatures and a lack of water can also make trees more susceptible to pests and disease, and trees damaged or killed burn more readily than living trees. For example, climate change is likely to increase the area of pine forests in the Northwest infested with mountain pine beetles in the next few decades. Pine beetles and wildfires are each likely to decrease timber harvests. Increasing wildfires also threaten homes and pollute the air.

The combination of more fires and drier conditions may expand deserts and otherwise change the landscape in the dry eastern portion of the state. Many plants and animals living in arid lands are already near the limits of what they can tolerate. Warmer temperatures and a drier climate would generally extend the geographic range of the Great Basin desert. In some cases, native vegetation may persist and delay or prevent expansion of the desert. In other cases, fires or livestock grazing may accelerate the conversion of grassland to desert in response to the changing climate. For similar reasons, some forests may change to desert or grassland.

Agriculture

Climate change may also pose challenges for livestock and crops. Higher temperatures cause cows to eat less, grow more slowly, and produce less milk, and in extreme cases may threaten their health. Some farms may be harmed if more hot days reduce crop yields, or if the decline in summer streamflow reduces the water available for irrigation. Other farms may benefit from a longer growing season and the fertilizing effect of carbon dioxide.

Health and Vulnerable People

Climate change is likely to amplify some threats to health in Oregon. Certain people are especially vulnerable, including children, the elderly, the sick, and the poor.

The sources of information about climate and the impacts of climate change in this publication are: the national climate assessments by the U.S. Global Change Research Program, synthesis and assessment products by the U.S. Climate Change Science Program, assessment reports by the Intergovernmental Panel on Climate Change, and EPA's *Climate Change Indicators in the United States*. Mention of a particular season, location, species, or any other aspect of an impact does not imply anything about the likelihood or importance of aspects that are not mentioned. For more information about climate change science, impacts, responses, and what you can do, visit EPA's Climate Change website at www.epa.gov/climatechange.

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