# Fourth Oregon Climate Assessment Report

## State of climate science: 2019

## Summary

**Oregon is already experiencing statewide impacts of a changing climate**. In August 2018, Portland and the Willamette Valley experienced some of the worst air quality on the planet owing to smoke from wildfires near and far. Ranchers in southern and eastern Oregon reported significant economic losses caused by lack of water from a low winter snowpack and a hot and dry summer. Climate change touches all corners of Oregon, but our frontline communities are most vulnerable. These include the economically disadvantaged and those who depend on natural resources for their livelihood: rural residents including Native Americans.

The state continues to warm as a result of the heat-trapping gases emitted into the atmosphere from global activity. This report represents a convergence of evidence of the risks that Oregon is facing, and will face in a changing climate, drawing from the past three Oregon Climate Assessment Reports, the 4th US National Climate Assessment, and other peer-reviewed literature, and other analyses performed by the Oregon Climate Change Research Institute (OCCRI) and research partners.

### Observed Climate

**Oregon continues to warm in all seasons, in part due to human activity.** The entire Pacific Northwest has warmed about 2˚F since 1900. The last three years (2016-2018) were all warmer than the 1970-1999 average, and 2015 still stands as Oregon's warmest year on record. Annual precipitation varies between wet and dry years, with no discernible trend. The year 2018 was much drier than normal, and 11 counties received an emergency drought declaration, even coastal Lincoln County, because of historically low flows in the Siletz River.

### Future Climate

**Warming is projected to continue in all seasons, dependent on global activity.** Oregon is projected to warm by about 4-9˚F by 2100, depending in part on whether global emissions follow a lower (RCP 4.5) or higher (RCP 8.5) path. The Paris Agreement, signed in 2016, is a non-binding international agreement meant to limit global temperature increase to 2˚C, which would require global emissions to be even lower than RCP4.5. Temperature projections using both RCP 4.5 and 8.5 are similar until about 2040. Warming is likely to be enhanced in mountainous areas in winter and spring, and muted on the coast in summer.

**Changes in rainfall will accentuate extremes.** Annual precipitation is not projected to change, but models generally suggest modest increases in winter precipitation and decreases in summer precipitation. Extreme precipitation may change more (~20%) in eastern Oregon than western Oregon (~10%) by mid-century. Heavy rainfall can lead to slope instability and landslides, and close important transportation corridors

**Sea level rise projections have not changed substantially through mid-century, though estimates of the maximum plausible sea level by the end of the century (2100) have increased to 8.2 feet.** However, even after global temperature stabilizes, ice sheets will continue melting irreversibly until they reach a new equilibrium which could take millennia. Warming beyond the global 2˚C target could lead to irreversible melting of Greenland, highlighting the importance of global policy meant to limit warming. Stabilizing global climate soon could limit sea level rise to less than 3.3 feet even in 2300.

**Hot days will become more frequent in Oregon in a changing climate.** Most locations, except the cooler mountains and the coast, will see an increase of about 30 days over 86˚F by mid-century compared with the recent past. Hot days and warm nights pose a human health risk. Farmworkers and other outdoor laborers are more vulnerable to heat related illness or death. In urban areas, economically disadvantaged communities are the most vulnerable.

## Changes in snow & future water supply

**Nearly every location in Oregon has seen a decline in spring snowpack, and it will continue to significantly decline through mid-century, especially at lower elevations.** Oregon's mountain snowpack serves myriad economic, ecological, and social functions, and the snowcapped volcanic peaks are part of the state's cultural identity. Mountain snowpack acts as a natural reservoir which enhances summertime surface and groundwater supply. Meager mountain snowpack creates water scarcity in the state, as evidenced by droughts in 2015 and 2018. Snowpack is crucial for Oregon's vibrant recreation industry. In 2015, low snowpack resulted in a multi-million dollar loss in ski resort revenues in the Northwest. Recent research shows that the observed declines in snowpack since 1985 were smaller than they would have been without natural climate variability, which is expected to reverse and produce much larger declines.

These changes in snowpack present a dual risk to the state. In winter, increases in average streamflow will be the result of precipitation falling as rain instead of snow and rapid runoff, increasing flood risk in some basins. Summer flows may be reduced by as much as 50% in some basins, presenting challenges to junior water rights holders, hydroelectric power generation, and those not served by reservoir or groundwater storage. Lower flows also impact important commercial and tribal fisheries.

## Fire risk

**Fire activity is strongly linked to summer climate, with the largest fires occurring exclusively in warm and dry summers.** The most obvious impact of climate change in the west in recent years has been fire. Recent catastrophic fires in California and major wildfires in Oregon highlight the vulnerability of the state to increasing wildfire in a warming climate. The Eagle Creek Fire September 2017 closed I-84, a crucial transportation corridor between western and eastern Oregon. Fire risk is projected to increase across the entire state by mid-century, with the largest increases in the Willamette Valley and eastern Oregon. The associated wildfire smoke creates a health hazard for vulnerable communities, especially outdoor laborers and children, who may be exposed to poor air quality.

## Agriculture and the natural resources economy

**Climate change may also present a potential opportunity for agriculture with a longer growing season, though producers may be limited by water availability and limited adaptive capacity**. Oregon's $48.5B agriculture industry (2015) is a cornerstone of the state's economy. By mid-century in the higher emissions scenario, parts of western Oregon will see a lengthening of the growing season by about two months, and the rest of the state would see an increase of about a month. Warmth will arrive earlier in the spring and last longer in fall. Though some crops may thrive in a longer growing season, concerns about the incidence of pests and weeds, reduced crop quality, and increased irrigation demand may hamper production. Forests may experience drought stress due to lower soil moisture in the summer, and timber production can be affected.

**The challenges are great, but there are opportunities to adapt to a rapidly changing Oregon.** Adaptive capacity is not equal across and within communities and sectors. However, careful management of natural resources can help reduce the climate risks that the natural resources economy faces. Such management includes creating resilient agro-ecosystems, building more robust water markets, and managing forests while considering natural resources and wildfire prevention. Reducing barriers for socioeconomic groups most affected by climate change can take the form of rules and policy meant to limit the exposure of these groups to fire and heat. There is a need to build community capacity and leadership in frontline communities to participate in the processes of climate-related decisions Additionally, modernizing crucial infrastructure (bridges, roads, buildings, and culverts) may mitigate climate risk and build resilience into systems.

*About this report. The Oregon Climate Change Research Institute (OCCRI) periodically assesses the state of knowledge of climate science as it pertains to Oregon, fulfilling the legislative mandate that created OCCRI. This summary was written by Kathie Dello and Philip Mote, January 2019.*