Oregon Climate Assessment Report

Legislative Summary

Earth's climate has changed in the past, though the recent magnitude and pace of changes are unprecedented in human existence. Recent decades have been warmer than at any time in roughly 120,000 years. Most of this warming can be attributed to human activity, primarily burning fossil fuels (coal, oil and natural gas) for energy. Burning fossil fuels releases carbon dioxide and other heat trapping gases, also known as greenhouse gases, into the atmosphere. This warming cannot be ascribed to natural causes (volcanic and solar) alone. It can be said that human activities are primarily responsible for the observed 1.5 ˚F increase in 20th century temperatures in the Pacific Northwest. A warmer climate will affect this state substantially.

Future regional climate changes in Oregon include:

Increases in temperature around 0.2-1˚F per decade

Average annual air temperatures will increase through the 21st century. The amount of warming depends partly on the rate of greenhouse gas emissions.

Warmer and drier summers

Seasonal changes of climate are typically more relevant for decision makers and for studying impacts. The most consistent changes in global climate models show a regional warming and drying in the summer. The multi-model average decrease for summer precipitation is 14% by the 2080s.

There is some evidence that extreme precipitation will increase in the future

Though trends in extreme daily precipitation over the 20th century have been ambiguous in Oregon, there is some indication that such events will increase in the 21st century.

Sea level rise

It is near certain that global mean sea level will increase, possibly by 2-4 feet by 2100. By the mid 21st century, the rate of sea level rise will exceed vertical land movement on the Oregon Coast. Submerged areas will experience erosion and flooding impacts.

Key findings:

Summer water supply will decrease as a result of reduced snowpack and summer precipitation. The presence of a winter snowpack is crucial for summertime water supply in much of Oregon. A viable water supply is needed for irrigation, residential and commercial water use, fish propagation and survival and overall ecosystem health. Snowpack in the Pacific Northwest is particularly sensitive to warming. By mid-century, Cascade snowpacks are projected to be less than half of what they were in the 20th century, with lower elevation snowpacks being the most vulnerable. Water demands are projected to increase throughout the 21st century, particularly in urban areas, posing an additional stressor to water availability.

Availability, quality and cost of water will likely be the most limiting factor for agricultural production systems under a warmer climate. Many Oregon irrigation systems are fed by snowmelt and stored in reservoirs. With an increase in temperature irrigation demands will be greater. There may be new opportunities for agriculture in a warmer climate: the growing season may be extended and yields may be more plentiful. A potential opportunity exists for a longer growing season and yields may be greater. Oregon's wine regions have seen the length of the frost-free period increase from 17 to 35 days. However, more research is needed on irrigation technologies and new crop adapta-

tions. Associated management of new invasive plant pathogens, insects and weeds is needed.

Wildfire is projected to increase in all Oregon forest types in the coming decades. Warmer and drier summers leave forests more vulnerable to the stresses from fire danger west of the Cascades. Wildfire in forests east of the Cascades is mainly influenced by vegetation growth in the winters that provides fuel for future fires. An increase in fire activity is expected for all major forest types in the state under climate change. Large fires could become more common in western Oregon forests.

Frequency and magnitude of coastal flooding events may continue to increase. Storminess and extreme storm events have been increasing, leaving coastal areas vulnerable to flooding and erosion. North Pacific winter storm track is projected to shift northward in the 21st century, meaning slightly fewer, but more intense storms.

Many plant and animal species on land, in freshwater, and in the sea have and will shift their distributions and become less or more abundant. In a warmer climate, plant and animal species may have to shift upward or northward on land, and deeper or northward at sea. Rare or endangered species may become less abundant or extinct; insect pests, invasive species and harmful algal blooms may become more abundant.

Changes to the marine environment including increasing water temperatures. Substantial increases in water temperatures in the ocean are likely and will exceed natural variability. The ocean also absorbs carbon dioxide (CO_2) from the atmosphere, which forms carbonic acid and is making waters corrosive to certain species.

Oregon's economy, like many other states, is likely to be affected by a changing climate and by policies addressing projected changes. There is still much work to be done in developing a complete assessment on the economic impacts of climate change in Oregon. However, the work to date suggests that climate change poses economic risks to the state. The magnitude of the impact will depend on the rate of physical change, the willingness of humans to alter their behaviors, and the resilience of our ecosystems.

The important drivers of greenhouse gas emissions are population, consumption, and the emission intensity of the economy (e.g. tons of equivalent carbon dioxide per unit of economic output).

We are already experiencing the impacts of climate change in Oregon. Given these observed and anticipated impacts, prudent measures to adapt should be taken now. Resilience needs to be built into human communities and fostered in natural communities to deal with the adverse impacts on of climate change. The State of Oregon has undertaken a substantial adaptation planning effort drawing heavily from the conclusions regarding the state of climate science found in this report.

The full report can be obtained by calling Julie Cope at the Oregon Climate Change Research Institute at 541-737-5705 and is available for download at www.occri.net/ocar.

The Oregon Climate Change Research Insititute is a network of over 100 researchers across the Oregon University System and affiliated state and federal labs. OCCRI is housed in the College of Oceanic and Atmospheric Science at Oregon State University.