

Chapter 1: Introduction

Oregon is warming and the consequences are, and will be, notable.

Three years have past since the previous Oregon Climate Assessment Report (Dalton *et al.*, 2013). These years have been the three warmest years globally (NOAA, 2016), and the last three decades have been the warmest three decades (IPCC, 2013). The Earth's climate undoubtedly is warming. The warming observed since the mid-20th century is largely due to an increase in greenhouse gas concentrations caused by human activities (IPCC, 2013).

Oregon is warming, too. Consequences of this warming are already being felt by Oregonians. Snowpack is declining, summer streamflow is lowering, wildfire activity is increasing, sea level is rising, and coastal waters are acidifying. Such consequences and others are expected to continue into the decades to come. Indeed, the year 2015, in which global and Oregon temperatures were the warmest on record, foreshadows what typical conditions may look like by the middle of this century.

A majority of Oregonians thinks that global warming is happening and is worried.

The scientific evidence is overwhelming that human-caused climate change is happening (IPCC, 2013), a conclusion affirmed by 97% of climate scientists (Cook *et al.*, 2016). Despite such a consensus, only two-thirds (67%) of Oregonians believe that climate change is happening, and only about half (51%) believe that it is caused by human activities (Howe *et al.*, 2015). Just under half (47%) of Oregonians believe that most scientists think global warming is happening. However, a majority (57%) of Oregonians is indeed worried about global warming. Although only about a third (36%) think that global warming will harm themselves personally, two-thirds (67%) think that global warming will harm future generations (Howe *et al.*, 2015).

Adaptation is necessary, as mitigation alone will not prevent serious impacts.

In order to avoid negative impacts, now and in the future, we must both mitigate climate change and adapt to climate change. That is, we must try to reduce or even eliminate greenhouse gas emissions, and we must make preparations and adjustments that will be needed to meet new environmental conditions, doing so at all levels of government and society, from the highest international agreements down to our own personal actions (Bierbaum *et al.*, 2014). International and local mitigation efforts are already underway, but these are not yet sufficient to limit global warming to 2°C (3.6°F) above pre-industrial levels and to avoid the serious impacts of climate change. Accounting for the future emissions reduction pledges by countries participating in the 2015 Paris Agreement, the globe would still likely warm by 3°C (5.4°F) above pre-industrial levels by 2100 (Le Quéré *et al.*, 2016).

Oregon is making an effort to reduce greenhouse gas emissions.

In Oregon, greenhouse gas emissions peaked in 1999 and declined about 12% between 2005 and 2012 (Oregon Global Warming Commission, 2015). However, because Oregon's emissions by the year 2020 are projected to be higher than the target set by the

state legislature, additional actions to reduce greenhouse gas emissions may be needed (Oregon Global Warming Commission, 2015). Oregon is a leader in renewable energy policies; its government, by passing Senate Bill 1547, set a goal to become the first state to be coal-free by 2030 (Oregon Congress Senate, 2016). The city of Portland also is a leader in community mitigation efforts; it has set an ambitious goal of an 80% reduction in greenhouse gas emissions by 2050 compared to 1990 levels (Geiling, 2015; *World Wildlife Fund*, 2015).

Oregon must do more to adapt to climate changes already underway.

Climate change is happening here, now. The climate in our dear state is already changing and will continue to change. We know much about the expected effects of climate change that Oregon is likely to see. We must strive, in our governments and in our communities, to build resilience to climate change, and we must do so now. Although building resilience could be costly, it could be even more costly to suffer the losses and the damage that come from not being prepared for new conditions. A few state agencies, such as the Oregon Health Authority and the Oregon Department of Transportation, have already begun planning; and there are opportunities to build preparedness for climate change into existing planning efforts such as the Oregon Water Resources Strategy and the Natural Hazards Mitigation Plan. Furthermore, implementing climate adaptation actions can be compatible with other societal goals, such as sustainable development and disaster risk reduction (Bierbaum *et al.*, 2014).

What this report covers

In this third Oregon Climate Assessment Report (OCAR3), we build on the previous two assessment reports (Dalton *et al.*, 2013; Dello and Mote, 2010) by summarizing recent published literature between 2013 and 2016 on climate change science and impacts as it relates to the state of Oregon. The breadth of published literature from the past few years generally covers the breadth of topics discussed in previous assessments; however, the depth of the current assessment is intentionally less than in previous assessments as the previous assessments provide rich content that is still pertinent and useful. As such, the reader is encouraged to read the relevant sections of the previous reports for greater background and depth.

Key findings from previous assessments are largely confirmed, but more regionally specific details are included. The bulk of this third assessment covers the three key climate change risks facing Oregon and the Pacific Northwest, namely water resources, forest ecosystems, and coastal issues (Dalton *et al.*, 2013). Shorter chapters summarize recent literature about climate changes in Oregon and impacts on agriculture and human health. Where a comprehensive chapter was devoted to tribal issues in the second assessment (Lynn *et al.*, 2013), here updated information relevant to tribes is incorporated within the other chapters of OCAR3. Economic analyses that exist are included within various relevant chapters. In addition to the topical-based chapters, there is a short chapter summarizing the key climate-related risks facing different regions within Oregon including the Oregon Coast, the Willamette Valley, the Cascade Range, and eastern Oregon.

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