Climate Change Influence on Natural Hazards in Eight Oregon Counties

Overview of County Reports

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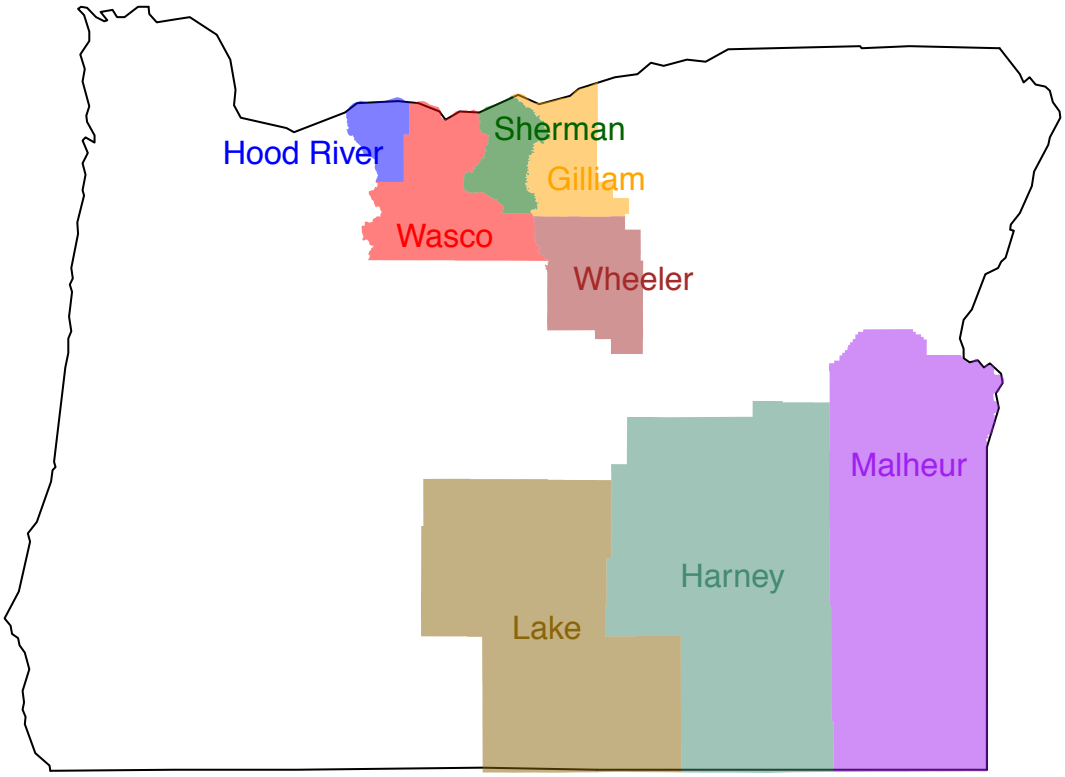
Prepared by
Oregon Climate Change Research Institute
www.occri.net



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Oregon Department of Land Conservation and Development

Introduction. The Earth's climate is warming largely due to increasing amounts of greenhouse gas emissions worldwide. Climate change is expected to influence the likelihood of occurrence of existing natural hazard events such as heavy rains, river flooding, drought, heat waves, cold waves, wildfire, and air quality. Supported by the Oregon Department of Land Conservation and Development's Pre-Disaster Mitigation grants, the Oregon Climate Change Research Institute provided analyses and summaries of how climate change is expected to influence natural hazards for eight counties in Oregon.

Hood River, Wasco, Sherman, Gilliam, Wheeler, Malheur, Harney, and Lake Counties each received a report, *Future Climate Projections*, describing county-specific projected changes in climate metrics related to selected natural hazards. The reports present future climate projections for the 2020s (2010–2039 average) and 2050s (2040–2069 average) compared to the 1971–2000 average historical baseline. This overview presents a summary of projected direction of changes in climate change-related risk of natural hazard occurrence based on projections only for the 2050s compared to the historical baseline (Table 1). Projections for the 2020s are similar to those for the 2050s, but of smaller magnitude, and can be found in the county reports.

Heat Waves. Across all eight counties, extreme heat events are expected to increase in frequency, duration, and intensity due to continued warming temperatures. Under the higher emissions scenario, projected increases in the number of days with temperature at or above 90°F range on average from 12 additional days in Hood River County to 38 additional days in Malheur County (Figure 1) by the 2050s compared to the historical baseline.

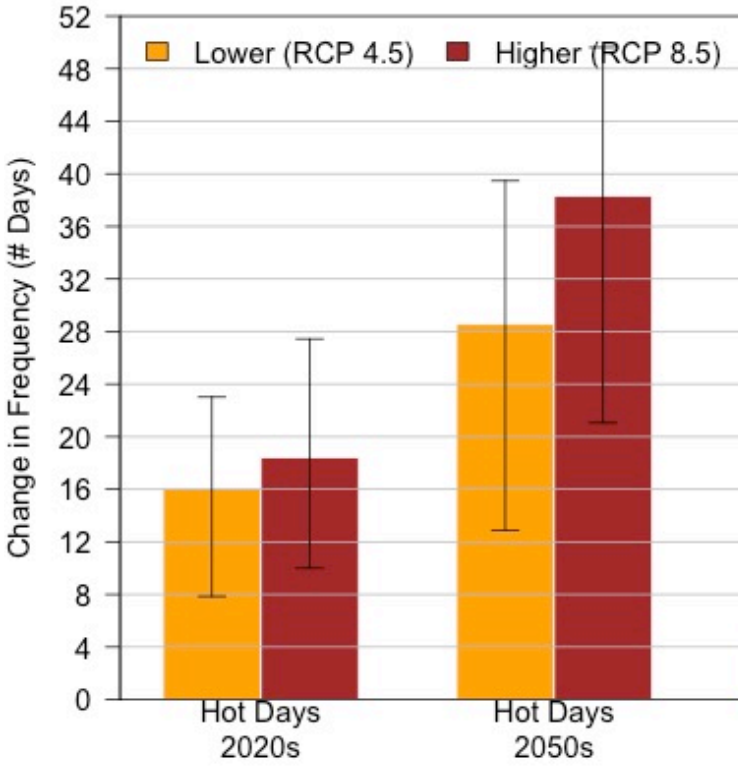

Figure 1 Projected future change in the number of hot days for Malheur County from the historical baseline for the 2020s and 2050s under a lower and higher emissions scenario. The bars and whiskers display the mean and range, respectively, of changes across 20 global climate models. Hot days are defined as days with maximum temperature of at least 90°F.

Cold Waves. Across all eight counties, cold extremes are still expected to occur from time to time, but with much less frequency and intensity as the climate warms. Under the higher emissions scenario, projected decreases in the number of days with temperature at or below freezing range on average from 7 fewer days in Sherman and Gilliam Counties to 14 fewer days in Hood River County by the 2050s compared to the historical baseline.

Heavy Rains. As the atmosphere warms and is able to hold more water vapor, the frequency and intensity of extreme precipitation events is expected to increase. Across all eight counties, the amount of precipitation on the wettest day of the year is expected to increase in the future. Under the higher emissions scenario, projected increases range on average from 14% more precipitation on the wettest day in Wheeler County to 20% more precipitation in Sherman County by the 2050s compared to the historical baseline.

River Flooding. Mid- to low-elevation tributaries, such as Hood River and John Day River, that are near freezing level in winter, receiving a mix of rain and snow, may experience an increase in winter flood risk due to warmer winter temperatures causing precipitation to fall more as rain and less as snow, as well as more intense precipitation events. The flood magnitude of the 10-year (10% exceedance probability) single-day food event is projected to increase on the Snake, John Day, and

Owyhee Rivers, but shows little change on the Columbia main stem by the 2050s compared to the historical baseline.

Drought. Counties reliant on spring and summer snowpack to supply summer water demands are projected to experience greater frequency of low spring snowpack years. Drought conditions represented by low summer soil moisture and low summer runoff are projected to become more frequent in Hood River (Figure 2), Wasco, and Wheeler Counties, but may become less frequent in the other five counties by the 2050s compared to the historical baseline.

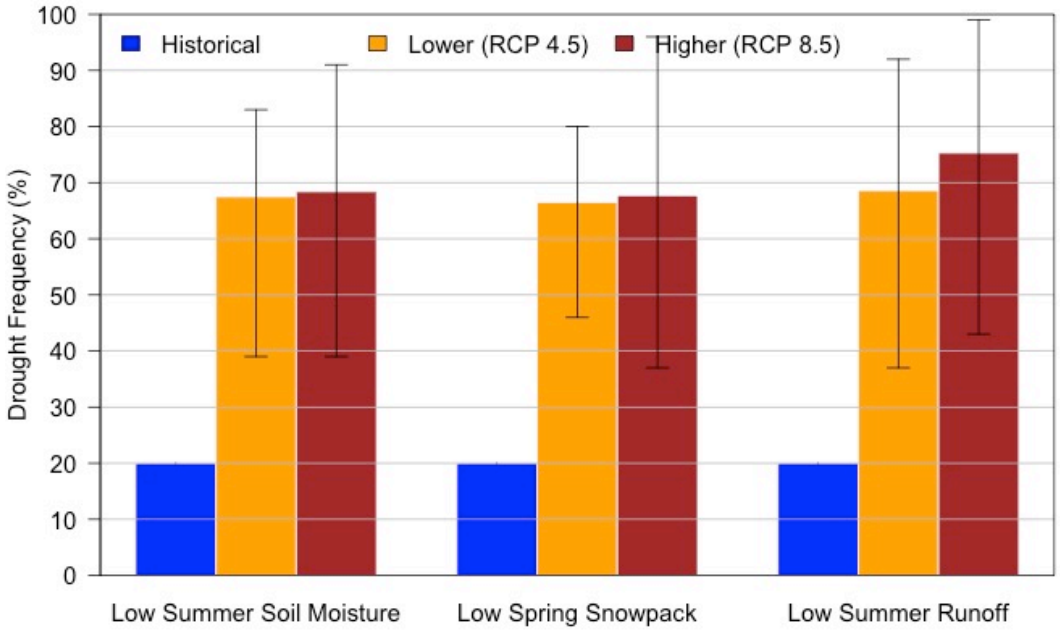

Figure 2 Frequency of the historical baseline 1-in-5 year event (by definition 20% frequency) of low summer soil moisture, low spring snowpack, and low summer runoff projected for the 2050s for Hood River County under lower and higher emissions scenarios. The bar and whiskers depict the mean and range across ten global climate models.

Wildfire. Across all eight counties, wildfire risk, as expressed through the frequency of very high fire danger days, is projected to increase under future climate change. Under the higher emissions scenario, projected increases in the frequency of very high fire danger days range on average from 38% greater frequency in Lake and Wasco Counties to 41% greater frequency in Gilliam County by the 2050s compared to the historical baseline.

Poor Air Quality. Under future climate change, the risk of wildfire smoke exposure is projected to increase across nearly all eight counties. Under a medium emissions scenario, projected increases in the frequency of days with high concentrations of wildfire-specific particulate matter between 2004–2009 and 2046–2051 range on average from 0% greater frequency in Sherman County to 122% greater frequency in Malheur County.

Windstorms. Limited research suggests very little, if any, change in the frequency and intensity of windstorms in the Pacific Northwest as a result of climate change.

Dust Storms. Limited research suggests that the risk of dust storms in summer would decrease under climate change in parts of eastern Oregon that experience an increase in vegetation cover from the carbon dioxide fertilization effect.

Increased Invasive Species. Warming temperatures, altered precipitation patterns, and increasing atmospheric carbon dioxide levels increase the risk for invasive species, insect and plant pests for forest and rangeland vegetation, and cropping systems.

Loss of Wetland Ecosystems. Freshwater wetland ecosystems are sensitive to warming temperatures and altered hydrological patterns, such as changes in precipitation seasonality and snowpack reduction.

Table 1 Summary of projected direction of changes in climate change-related risk of natural hazard occurrence across eight Oregon counties. Within each box, symbols denote the direction of expected change in risk: increasing, decreasing, or unchanging; and shading denotes the level of confidence in the projected direction of change. High confidence means nearly all models agree on the direction of change and there is strong evidence in the published literature. Medium confidence means a majority of models agree on the direction of change and there is strong to medium evidence in the published literature. Low confidence means the direction of change is small compared to the range of model responses or there is limited evidence in the published literature.

	Hood River	Wasco	Sherman	Gilliam	Wheeler	Malheur	Harney	Lake
Heat Waves	↑	↑	↑	↑	↑	↑	↑	↑
Cold Waves	↓	↓	↓	↓	↓	↓	↓	↓
Heavy Rains	↑	↑	↑	↑	↑	↑	↑	↑
River Flooding	↑	↑	↑	↑	↑	↑	↑	↑
Drought	↑	↑	=	=	↑	↑	↑	↑
Wildfire	↑	↑	↑	↑	↑	↑	↑	↑
Poor Air Quality	↑	↑	=	↑	↑	↑	↑	↑
Windstorms	=	=	=	=	=	=	=	=
Dust Storms	↓	↓	↓	↓	↓	↓	↓	↓
Increased Invasive Species	↑	↑	↑	↑	↑	↑	↑	↑
Loss of Wetland Ecosystems	↑	↑	↑	↑	↑	↑	↑	↑

Level of Confidence in Direction of Change	
	High Confidence
	Medium Confidence
	Low Confidence

Expected Direction of Change	
↑	**Risk Increasing**
↓	**Risk Decreasing**
=	**Risk Unchanging**