

# Oregon Climate Change Vulnerability Assessment

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## Foreword

Indigenous tribes and bands have been with the lands we inhabit today throughout Oregon and the Northwest since time immemorial and continue to be a vibrant part of Oregon today. We would like to express our respect to the First Peoples of this land, the nine federally recognized tribes of Oregon: Burns Paiute Tribe, Confederated Tribes of Coos, Lower Umpqua & Siuslaw Indians, Confederated Tribes of Grand Ronde, Confederated Tribes of Siletz Indians, Confederated Tribes of the Umatilla Indian Reservation, Confederated Tribes of the Warm Springs Reservation, Coquille Indian Tribe, Cow Creek Band of the Umpqua Tribe of Indians, and The Klamath Tribes. It is important that we recognize and honor the ongoing legal and spiritual relationship between the land, plants, animals, and people indigenous to this place we now call Oregon. The interconnectedness of the people, the land, and the natural environment cannot be overstated; the health of one is necessary for the health of all. We recognize the pre-existing and continued sovereignty of the nine federally recognized tribes who have ties to this place and thank them for continuing to share their traditional ecological knowledge and perspective on how we might care for one another and the land, so it can take care of us. We commit to engaging in a respectful and successful partnership as stewards of these lands.

As we are obliged by state law and policy, we will uphold government-to-government relations to advance strong governance outcomes supportive of tribal self-determination and sovereignty. The Department of Land Conservation and Development (DLCD) recognizes that tribal engagement related to this project has been insufficient. DLCD will share this draft document with tribes in the Spring and Summer of 2024.

DLCD recognizes the contributions of the project advisory team, who helped refine the assessment approach.

## How to Read This Document

This document summarizes results from a statewide survey, interviews, and a series of workshops. These activities were carried out regionally using the Oregon Department of Emergency Management (ODEM) Natural Hazard Mitigation Planning Areas. Reports detailing results from each of the eight ODEM regions are found in the appendices accompanying this document. The appendices also provide detailed information about the methods employed to complete this assessment.

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## About the Institute for Policy Research and Engagement



**School of Planning, Public  
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Research and Engagement**

The Institute for Policy Research & Engagement (IPRE) is a research center affiliated with the School of Planning, Public Policy, and Management at the University of Oregon. It is an interdisciplinary organization that assists Oregon communities by providing planning and technical assistance to help solve local issues and improve the quality of life for Oregon residents. The role of IPRE is to link the skills, expertise, and innovation of higher education with the transportation, economic development, and environmental needs of communities and regions in the State of Oregon, thereby providing service to Oregon and learning opportunities to the students involved.

# Executive Summary

Climate change is disrupting our natural and built environments, our health, livelihoods, and sense of place. The Department of Land Conservation and Development (DLCD) conducted a survey and in-person workshops in the fall of 2022 and spring of 2023 to learn more about how the effects of climate change impact Oregonians. DLCD learned that people across the state value access to the outdoors, community gatherings, clean air and water, high-quality food, and local decision-making power. Many Oregonians are concerned about how climate change might impact their wellbeing, livelihoods, and sense of place. Workshop and survey participants want their state government and local governments to support and facilitate locally relevant climate change adaptation actions intended to strengthen the built and social environment.

Effective climate change adaptation actions are as varied and complex as the communities in which they are deployed. This project found that Oregonians are ready to begin climate change adaptation, and they want adaptation actions to be in sync with local values. One of the predominant themes is the request for true partnership — that state technical and financial support is welcome if local voices are included in project design, implementation, and management. Furthermore, Oregonians want state agencies to integrate what they are already doing into a comprehensive climate change adaptation program. Upon review of the draft assessment, the multi-agency Climate Change Adaptation Framework Team offered the following key recommendations:

- Establish a statewide, coordinated, and locally focused program of climate change adaptation.
- Permanently fund DLCD's climate change resilience coordinator position so that state agency staff can continue to engage with each other, track progress toward implementing Climate Change Adaptation Framework strategies, and update the Framework every five years.
- Ensure that Resilience Hubs and Networks grants authorized by HB-3409 (2023) receive ongoing funding for planning and projects.
- Expand the scope of regional solutions to include climate change mitigation and adaptation planning and action by making specialists available to local government, community-based organizations, and Resilience Hubs.
- Integrate the unique contributions of — and challenges faced — by tribal nations into plans and projects.
- Learn to use climate change, equity, environmental justice, social vulnerability indexes and maps wisely and transparently.
- Encourage federal land managers to include local voices as they plan for and react to climate change impacts and invite federal partners into state planning processes.
- Fully fund the Oregon Climate Change Research Institute at Oregon State University to provide pro-bono assistance to state agencies, cities, and counties as they develop climate change adaptation plans and projects.
- Provide training and networking opportunities to state employees and local planners on the practice of climate change adaptation.
- Enhance support for the public health system (tribes, local public health authorities, and community-based organizations) to engage in and contribute to decision-making processes related to reducing greenhouse gas emissions and climate change adaptation.



- Continue to fund — over multiple biennial legislative sessions — activities authorized under the Emergency Heat Relief Act (SB 1536), including the Healthy Homes Grant Program<sup>1</sup>, and Community Cooling Spaces grant.

Collectively, these measures will create strong, resilient communities capable of withstanding the impacts of an unpredictable climate future.

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# Introduction

## Project Background

In 2021, representatives from 24 state agencies collaborated to produce the [Oregon Climate Change Adaptation Framework](#). Together, they recommended that the state develop a climate change vulnerability assessment focused on how Oregonians are and will continue to be impacted by climate change. The Oregon legislature funded this assessment during the 2021 legislative session.

DLCD, the Oregon Climate Change Research Institute (OCCRI), and the Institute for Policy Research and Engagement at the University of Oregon (IPRE) collaborated to produce the vulnerability assessment. DLCD staff provided project guidance, context, and logistics for public and tribal engagement. OCCRI provided regional climate change projections that formed the foundation for discussions with residents at regional workshops. IPRE facilitated and summarized results from regional workshops.

## Purpose

This assessment is intended to inform how the state might serve the needs of Oregonians as the climate changes. Analysis provided by OCCRI shows that the physical effects of climate change will vary by region. Local demographics and social conditions also vary by region. As a result, vulnerability to the effects of climate change, and the state's response to these vulnerabilities also will vary by region. DLCD staff designed this assessment to better understand regional concerns related to climate change, particularly in relation to how climate change affects wellbeing, livelihoods, and sense of place.



## Climate Change Effects by Region

DLCD and IPRE staff conducted this assessment by region to capture differences in climate change effects and experiences across the state (Figure 1). The regions correspond to those used to analyze the effects of natural hazards in the Oregon Natural Hazard Mitigation Plan. Report findings are presented by Oregon Department of Emergency Management (OEM) region, and by development density.

Figure 1: Oregon Department of Emergency Management Natural Hazard Mitigation Regions

Table 1 summarizes predominance climate change effects by region. [Posters Showing Climate Change Effects](#), found later in this document, provide more detail.

Table 1: Summary of Predominant Climate Change Projections by Region

Region	Predominant Effects of Climate Change
1	Sea level rise, warming ocean water, ocean acidification & hypoxia, wildfires, water security, and population growth.
2	Drought, heat waves, extreme precipitation, wildfires, air quality degradation, and population growth.
3	Drought, heat waves, extreme precipitation, wildfires, air quality degradation, and increased mean temperature.
4	Increased mean temperature, heat waves, drought, wildfires, warmer winters, and extreme precipitation.
5	Drought, heat waves, degraded air quality, wildfires, warmer winters, and extreme precipitation.
6	Heat waves, degraded air quality, wildfires, warmer winters, and extreme precipitation.
7	Drought, heat waves, degraded air quality, wildfires, warmer winters, and extreme precipitation.
8	Increased mean temperature, heat waves, drought, wildfires, warmer winters, and extreme precipitation.

Source: Oregon Climate Change Research Institute (2021)

Although the effects of climate change may be the same or similar across regions, the vulnerabilities they create vary by region because of variations in local climate, ecology, economy, and demographics.

## Categories of Vulnerability

The Intergovernmental Panel on Climate Change (IPCC) Working Group II defines **vulnerability** as “the propensity or predisposition to be adversely affected and encompasses a variety of concepts and elements including sensitivity or susceptibility to harm and lack of capacity to cope and adapt.”<sup>2</sup> Vulnerabilities can be categorized as physical, health, and social.

**Physical vulnerability** relates to harm to buildings, infrastructure, and ecosystems. Several state agencies, including the departments of Transportation, Energy, Fish and Wildlife, Forestry, Water Resources, and Agriculture have explored these physical vulnerabilities related to climate change in published reports. The Oregon Health Authority’s Climate and Health Program has also described the health impacts of climate change. The vulnerabilities described in these reports are summarized in Appendix C of this assessment ([forthcoming](#)).

**Social vulnerability** relates to the propensity for climate change to adversely affect people’s wellbeing, livelihoods, or sense of place. White (2014) relates wellbeing to physical and mental health as well as a sense of security and happiness, including the degree to which people feel

<sup>2</sup> <https://www.ipcc.ch/report/sixth-assessment-report-working-group-ii/>

connected to one another.<sup>3, 4</sup> Tanner (2015) and Yi (2022) define livelihood as the ability to sustain oneself and family in the face of climate change.<sup>5, 6</sup> Sense of place relates to how well-connected people feel to where they live and their willingness to steward its character and function in the face of climate change. Praskievicz, (2022) describes how a sense of place imparts meaning and connects people not only to location but to each other as the climate changes.<sup>7</sup> Social vulnerability also includes economic harm.

## Resilience

IPCC defines **resilience** as the “capacity of social, economic and ecosystems to cope with a hazardous event or trend or disturbance, [by] responding or reorganizing in ways that maintain their essential function... while also maintaining the capacity for adaptation, learning and transformation.” Resilience is not the opposite of vulnerability. A person or population can be vulnerable, but resilient, or lack resilience. Effective climate change adaptation responses will consider local degrees of vulnerability and resilience.

Economist Danny Quah uses the metaphor of a trampoline to capture the notion that resilience can be characterized by elasticity and springiness of a system.<sup>8</sup> If resilience is framed as the springiness of a **system**, then vulnerabilities are not personal or neighborhood characteristics but rather symptoms of a system that is unbalanced, inflexible, or weak.<sup>9, 10</sup>

## Equity in Climate Change Response Planning

As described in the [State of Oregon Climate Equity Blueprint](#),

Certain communities are bearing the brunt of climate change impacts due to years of historic inequities created and maintained by governments, including the State of Oregon. Historic redlining policies correlate to current-day heat islands in low-income neighborhoods of color. Increasingly extreme weather punishes farmworkers as they harvest our food. Native communities face the risk of further loss of cultural traditions and ways of life as climate change disrupts their deep relationships with the land and water. Most recently, long-standing racial and income inequalities are being exacerbated by the COVID-19 pandemic. At the same time, Oregon has also experienced the worst air pollution and loss of forests in its recorded history due to recent wildfire events. Overall, low-income communities across the state have more vulnerabilities and fewer resources to recover from these climate impacts.<sup>11</sup>

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<sup>3</sup> White, S., & Abeyasekera, A. (Ed.) (2014). Wellbeing and Quality of Life Assessment: A practical guide. Practical Action Publishing..

<sup>4</sup> Kyne, D. & Aldrich, D. P. (2020) Capturing bonding, bridging, and linking social capital through publicly available data. *Risk Hazards Crisis Public Policy* **11**, 61–86

<sup>5</sup> Tanner, T., Lewis, D., Wrathall, D. *et al.* (2015) Livelihood resilience in the face of climate change. *Nature Clim Change* **5**, 23–26. <https://doi.org/10.1038/nclimate2431>

<sup>6</sup> Yi Fan, Xingmin Shi, Xueping Li, Xiao Feng, (2022) Livelihood resilience of vulnerable groups in the face of climate change: A systematic review and meta-analysis, *Environmental Development*, Volume 44, <https://doi.org/10.1016/j.envdev.2022.100777>

<sup>7</sup> Praskievicz, S. (2022). Ground truth: Finding a “place” for climate change. *Progress in Environmental Geography*, 1(1-4), 137-162. <https://doi.org/10.1177/27539687221127035>

<sup>8</sup> (Quah, Danny (2021) [Building back better with trampolines \(nus.edu.sg\)](https://nus.edu.sg), accessed 12/14/2022

<sup>9</sup> Price, Leigh (2017) Wellbeing research and policy in the U.K.: questionable science likely to entrench inequality, *Journal of Critical Realism*, 16:5, 451-467, DOI: 10.1080/14767430.2017.1371985

<sup>10</sup> Alameldeen, A. (2021). What is a Resilient Community? *Academia Letters*. <https://doi.org/10.20935/AL3615>

<sup>11</sup> State of Oregon, Climate Equity Blueprint. (2020). (n.p.): Better World Group. Available at: [https://www.oregon.gov/lcd/CPU/Documents/2021\\_Jan\\_Climate-Equity-Blueprint.pdf](https://www.oregon.gov/lcd/CPU/Documents/2021_Jan_Climate-Equity-Blueprint.pdf)

Discussions of how to reduce vulnerability or increase resilience to climate change includes addressing equity: for whom and why climate change responses are pursued.<sup>12</sup> How does the social, political, and economic system in which people live and work determine who benefits and who is burdened?

Unfortunately, commonly used tools that focus on the economic benefit of pursuing an intervention are by nature inequitable because they focus on the monetary exchange value of goods over the wellbeing of people. The result has been more affluent communities receiving more resources than low income or very low-income communities.<sup>13</sup> In response, DLCDC sought to illuminate vulnerabilities that are hidden when decisionmakers consider only monetary or utilitarian values, but which are important indicators of all Oregonians' quality of life and identity.

## Assessment Approach

With these ideas in mind and in partnership with OCCRI and IPRE, DLCDC conducted targeted interviews, regional workshops, and a statewide survey to learn how climate change effects manifest in each of Oregon's natural hazard mitigation regions. A facilitated work group met six times prior to DLCDC initiating fieldwork to inform its approach. Work group facilitation was provided by JLA Associates. Interviews, the survey, and workshops were held in the fall of 2022 and spring of 2023. More information about methods used for this assessment is found in the [Methods](#) section of this document.

Prior to beginning fieldwork, DLCDC staff examined existing national-scale GIS-based approaches to evaluating where investments might be made to equitably address harms caused by natural hazard events and climate change. Each approach yielded a different result and as a group did little to clarify who and where is most at risk because of climate change. Results from this analysis are found in Appendix A.

DLCDC staff also examined climate change vulnerability assessments conducted by other Oregon state agencies. Appendix B provides links to these assessments. DLCDC staff concluded that while these assessments addressed specific agency needs, they would benefit from being part of a coordinated statewide program for climate change adaptation.

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<sup>12</sup> Sara Meerow, Pani Pajouhesh & Thaddeus R. Miller (2019) Social equity in urban resilience planning, *Local Environment*, 24:9, 793-808, DOI: 10.1080/13549839.2019.1645103

<sup>13</sup> Page, Emily & Kris Smith (2021) Improving benefit-cost analyses for rural areas <https://headwaterseconomics.org/equity/improving-benefit-cost-analyses/>, accessed 12/14/2022.



## Interviews, Regional Workshops and Statewide Survey

DLCD staff — with support from the University of Oregon Institute for Policy Research and Engagement (IPRE) — conducted interviews, workshops, and a survey to discover sources of vulnerability in Oregon. The project team collected and organized data using the eight Oregon Emergency Management (OEM) regions as a frame:

1. Oregon Coast
2. Mid to Northern Willamette Valley
3. Mid to Southern Willamette Valley
4. Southwestern Oregon
5. Mid-Columbia
6. Central Oregon
7. Northeastern Oregon
8. Southeastern Oregon

Figure 2: Oregon Department of Emergency Management Hazard Mitigation Regions



The project team also analyzed data by development densities: urban, rural, and frontier.

Readers can find details about field assessment results in Appendix C.

## Fieldwork Results

Fieldwork revealed common themes and unique differences emerged across the eight OEM regions and by development density. Despite the diversity of Oregon’s landscapes and the uniqueness of each community, respondents statewide reported similar impacts from climate change. They worried about impacts to the environment, their health, social structures, infrastructure, the built environment, livelihoods, affordability, and vulnerable populations. Each community, whether on the coast or in the eastern part of the state, urban or rural, also shared concerns specific to their unique characteristics. As a result, climate change adaptations in Oregon will require coordinated, statewide strategies supplemented by locally focused efforts.

## Concerns Across Oregon

Assessment participants from all regions expressed concern over the effects of climate change on mental health, social tensions, and costs of living. Negative effects on physical health, the ability to gather outdoors, agriculture, and cultural practices were commonly mentioned. Table 1 shows concerns mentioned by more than one OEM mitigation planning region.

Table 1: Climate Change-Related Concerns Voiced in Regional Surveys and Workshops

	Regions							
	1	2	3	4	5	6	7	8
<b>Natural Systems and Environment</b>								
Disruption to natural areas and systems	x		x		x	x	x	x
Disruption to hunting, fishing & foraging	x		x			x		
Water scarcity			x	x	x	x		x
Degraded air quality	x	x	x	x	x	x		x
<b>Infrastructure and Buildings</b>								
Water system damage		x	x			x		x
Energy system damage		x						x
Transportation system damage	x	x	x					x
Damage to infrastructure (unspecified)	x		x		x		x	x
Property loss	x	x	x	x				x
Damage to heritage sites	x							
<b>Livelihoods and Economy</b>								
Loss of natural resource jobs	x						x	x
Harm to industry	x	x					x	x
Effects on tourism	x	x			x		x	x
Effects on Supply Chains and Retail Trade, Food Security	x	x	x				x	
Harm to outdoor workers			x			x		x
Harm to agriculture, ranching and fishing	x	x	x	x	x	x	x	
Increased cost of living	x	x	x	x	x	x	x	x
<b>Social Systems</b>								
Population growth or human displacement	x		x					
Social tension/stress	x	x	x	x	x	x	x	x
Loss of community gathering opportunities/social isolation				x	x		x	x
Loss of “way of life”	x		x		x	x		
Limited access to nature & public Lands	x		x	x	x	x	x	x
Harm to Oregon Tribes	x		x		x		x	
<b>Health</b>								
Harm to physical and mental health	x	x	x	x	x	x	x	x
Inability to respond to excess heat		x	x		x	x		x
Harm to unhoused, underserved, and low-income people	x	x	x	x	x		x	
Harm to elderly population		x	x			x	x	
Harm to children		x	x	x			x	x
<b>Local Government Capacity</b>								
Increased costs to public works								x
Stress on emergency services and preparation	x	x	x		x		x	x

Source: Data compiled from statewide survey and workshops (Appendix C)

The following pages summarize results from each of the eight regions. Detailed reports for each region are available in Appendix C.



# Coastal Oregon

Figure 3: OEM Region 1



Coastal Oregon corresponds to OEM Region 1 as shown in Figure 3. The regional area spans Clatsop, Tillamook, Lincoln, Coos, and Curry counties, as well as the coastal regions of Lane and Douglas counties. This region includes land under the jurisdiction of the sovereign nations of the Confederated Tribes of Coos, Lower Umpqua, and Siuslaw, Confederated Tribes of Grand Ronde, Confederated Tribes of Siletz Indians, Cow Creek Band of Umpqua Tribe of Indians, and Coquille Indian Tribe. IPRE collected data from 114 coastal Oregon residents on their community values and perceptions about climate change.

## Community Values

Coastal Oregon respondents value unique **access to the natural beauty** of the Pacific Ocean coastline, especially the **recreational activities** it provides. The region relies on natural resources for key industries and subsistence activities. Respondents expressed **that fishing, tourism, and timber** are particularly important industries. They also value the opportunity to engage in subsistence activities such as **hunting, fishing, foraging, and gardening**.

Figure 4 shows the top six values survey respondents in the region selected. Figure 5 shows the most common words workshop participants used to describe their values.

*"I value the serenity of this place, its beaches and places to simply take in all of nature's wonders."*  
 Brookings Workshop Participant

Figure 4: Top Values of Region 1 Survey Respondents

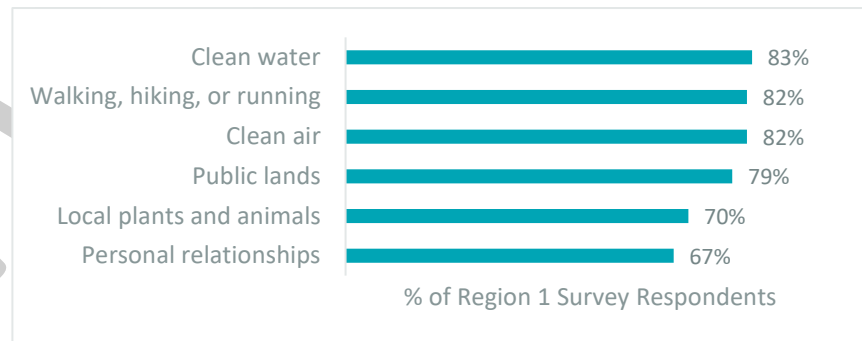


Figure 5: Region 1 Workshop Wordcloud



## Climate Impacts

Survey respondents in the coastal region expressed concern about the impacts of wildfires and ocean conditions on their lives. Workshop participants discussed how wildfire smoke limits access to outdoor activities and wildfires may damage culturally important heritage sites. Both groups expressed concerns that sea level rise and flooding threaten the built environment, particularly transportation networks that facilitate the flow of goods and services in the region. Concern was voiced over changes in ocean conditions, like warmer waters, hypoxia, and ocean acidification, which could have cascading effects on the fishing and tourism industry. For coastal tribes, first foods are not only a source of sustenance but also cultural identity.

### WILDFIRES



**80%** of survey respondents said wildfires have a negative impact on their lives.

**“My people have been hunters/fishermen and harvesters for centuries. We rely on these things to put food in our stomachs.”**

Lincoln County Survey Respondent

**“Heritage sites, camps, and river beaches may be lost.”**

Brookings Workshop Participant

### OCEAN ACIDIFICATION



**70%** of survey respondents said ocean acidification has a negative impact on their lives.

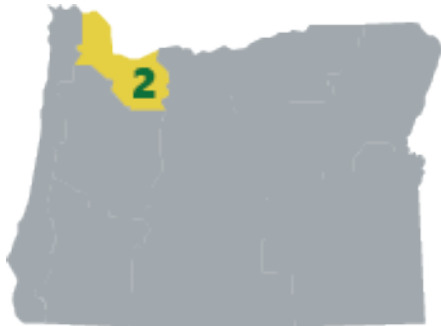
## Community Solutions

Survey and workshop participants want the State of Oregon to respond to climate change with immediate action and by thinking outside the box. For example, participants suggested conservation efforts, limiting commercial development, and using a wealth tax to fund social programs. Respondents also advocated for more climate change research, public education, and a focus on disaster planning and response.

Detailed descriptions of survey and workshop findings are found in Appendix C.

# Mid to Northern Willamette

Figure 6: OEM Region 2



OEM Region 2, as shown in Figure 6, spans Clackamas, Columbia, Multnomah, and Washington counties. This region includes land under the jurisdiction of the sovereign nations of the Confederated Tribes of Siletz, the Confederated Tribes of Warm Springs, and the Confederated Tribes of Grande Ronde. IPRE collected data from 82 residents on their community values and perceptions about climate change.

## Community Values

Northern Willamette Valley respondents **value the health of the natural environment**. Respondents feel the **environment provides the basic needs**, like air, water, and food, from which other needs are met, like **jobs and access to recreation**. The community needs reliable **physical, social, and economic infrastructure** to thrive. Water systems and public transit support **public health and safety**. Neighborhoods and parks provide **opportunities to gather**. **Affordability** ensures access to these resources.

Figure 7 shows the top six values survey respondents selected. Figure 8 displays the most common words workshop participants used to describe community values.

**"We value our health and the air we breathe, and the water we drink to be clean and free of contaminants. The food we grow is directly related to all."**

Columbia County Survey Respondent

Figure 7: Top Values of Region 2 Survey Respondents

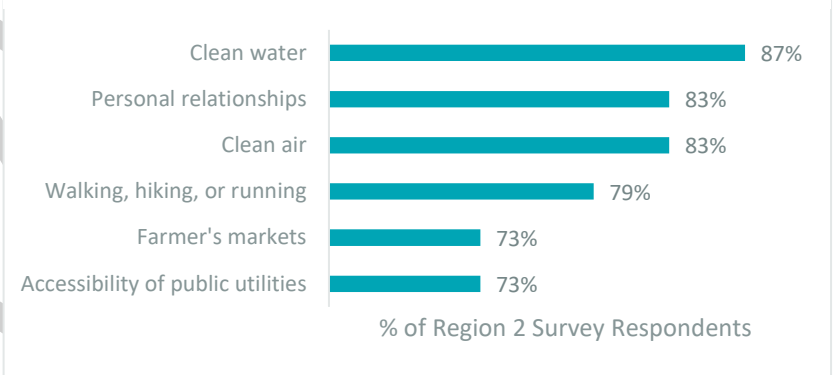


Figure 8: Region 2 Workshop Wordcloud



## Climate Impacts

Survey respondents in the region most frequently expressed concern about the current and potential impacts of wildfires, air quality, and extreme heat. Workshop participants discussed how housing and shelter are critical to protect community members from these elements. Children may also be impacted more significantly as they will have limited opportunities for outdoor activities.



### WILDFIRES

**87%** of survey respondents said wildfires have a negative impact on their lives.

**“Heat, fires, and poor air quality have significant mental and physical health concerns at the individual, household, and public levels.”**

Portland Metro Workshop Participant

**“I value decent shelter for all and worry about the houseless. Also, we need more efficient low-income housing with AC and good heating.”**

Portland Metro Survey Respondent



### HEAT WAVES

**87%** of survey respondents said heat waves have a negative impact on their lives.

## Community Solutions

Participants want the State of Oregon to protect air, water, and food systems. They would like to see reliable organizations lead climate adaptation efforts. Respondents also desire assistance for vulnerable populations, including low-income and medically compromised individuals. They voiced concern for people in need of emergency shelters. Respondents from this region emphasized a need for the state to help strengthen local social infrastructure and protect members of vulnerable populations. They believe doing so will help protect the residents’ communities, well-being, and livelihoods.

Detailed descriptions of survey and workshop findings are found in Appendix C.

# Mid to Southern Willamette

Figure 9: OEM Region 3



This region corresponds to OEM Region 3 as shown in Figure 9. The area includes Benton, Lane, Linn, Marion, Polk, and Yamhill counties and lands under the jurisdiction of the Confederated Tribes of Siletz, the Confederated Tribes of Coos, Lower Umpqua and Siuslaw Indians, Coquille Indian Tribe, Cow Creek Band of Umpqua Tribe, Confederated Tribes of Warm Springs, and Confederated Tribes of Grande Ronde. IPRE collected data from 187 residents through regional workshops and statewide survey.

## Community Values

Participants from the mid to south Willamette Valley **value access to the outdoors, a healthy environment** that meets basic needs, and quality food, and provides recreational opportunities. Participants discussed that **outdoor activities are an opportunity to connect with others and to stay physically and emotionally healthy.** Workshop participants value social ties and opportunities for community gathering. These **strong social connections**, formed through community groups and public spaces, help create a safe, vibrant, and livable atmosphere.

**“A lot of people like to get involved with the community. There is a strong sense of community for those who get involved. People like to be social.”**  
 Marion County Survey Respondent

Figure 10 shows the top six values survey respondents in the region selected. Figure 11 displays the most common words workshop participants used to describe community values.

Figure 10: Top Values of Region 3 Survey Respondents

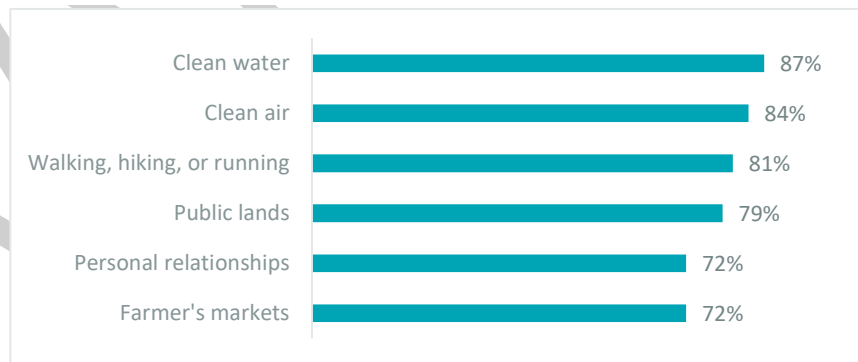
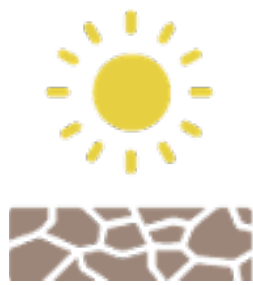


Figure 11: Region 3 Workshop Wordcloud



## Climate Impacts

Survey respondents in the region most frequently expressed concern about the current and potential impacts of drought and wildfire. Workshop participants discussed how drought threatens the agricultural industry and food security. Heat waves threaten residents' livelihoods, connection to nature, and sense of strong community. Wildfires threaten homes and businesses in the region.



### DROUGHT & HEAT

**86%** of survey

respondents said drought and heat have a negative impact on their lives.

**"Our town, Silverton, is built in a forest and is likely to suffer from wildfires. It is costly to recuperate homes, our towns and structures and to rebuild community."**

Marion County Survey Respondent

**"The way future climate change will [affect] me is the ability to work outside. The temperatures will make it impossible to spend any meaningful time outdoors."**

Cottage Grove Workshop Participant.



### WILDFIRES

**84%** of survey

respondents said wildfires have a negative impact on their lives.

## Community Solutions

Workshop participants from the mid to south Willamette Valley want the State of Oregon to act on climate change before it is too late. They desire more research and education on climate change, focus on community-centered solutions, and support for vulnerable populations. They want the state to focus on protecting complex systems, mitigating fire risks, and adapting the built environment and community services to meet emerging needs. They also noted a desire for the state to update policies to hold large corporations and industries more responsible for their negative impacts on the environment.

Detailed descriptions of survey and workshop findings are found in Appendix C.





## Climate Impacts

Survey respondents in the region most frequently expressed concern about the current and potential impacts of wildfires and drought on their lives. Workshop participants discussed the impacts and threats of wildfires, decreased air quality, droughts, and increased water scarcity. Smoke and drought can limit access to the outdoors, a source of social cohesion in the region. They expressed concern about a lack of resources to address wildfire risk to homes. These concerns lead to anxiety and social tension as the need to reallocate resources — particularly water — becomes apparent.



### WILDFIRES

**89%** of survey respondents said wildfires have a negative impact on their lives.

**“Climate change has increased the rate of water scarcity. Because I identify with the natural setting, I feel the hot and drying rivers, the desiccating trees, the declining aquifers.”**

Medford Workshop Participant

**“I debate leaving Ashland because of the wildfire smoke and threat. I worry about its effect on local businesses.”**

Jackson County Survey Respondent



### DROUGHT

**87%** of survey respondents said drought has a negative impact on their lives.

## Community Solutions

Participants want the State of Oregon to focus on the local level and provide support through community-based climate support centers. They expressed the importance of building relationships within communities, reducing wildfire risk through proactive forest management and state and federal partnerships, and updating water management practices to prioritize the needs of the public and the environment over those of private industries. Respondents highlighted the need to care for populations particularly at risk from climate change, including low-income households, the elderly, and people with preexisting health conditions.

Detailed descriptions of survey and workshop findings are found in Appendix C.





## Climate Impacts

Survey respondents in the region most frequently expressed concern about the current and potential impacts of wildfires, wildfire smoke, drought, and heat on their emotional, financial, and social lives. Areas of concern included a diminished ability to recreate outside, adverse effects on tourism, loss of agricultural productivity, and a diminished ability to come together as a community. Each of these areas contribute to stress and adverse effects on mental health. Concern was voiced over low-income residents' ability to cope and adapt to a changing climate.



### WILDFIRES

**93%** of survey respondents said wildfires have a negative impact on their lives.

**"There are times in the summer when it is too hot to be inside my house. The heat also affects agriculture production."**

Wasco County Survey Respondent

**"We suffer from wildfires a lot on this side of the state. It is not good for anyone."**

Umatilla County Survey Respondent



### DROUGHT

**84%** of survey respondents said drought has a negative impact on their lives.

## Community Solutions

Respondents from the Mid-Columbia region want the State of Oregon to support local capacity building, increase public education and research on climate change, and support vulnerable populations. Respondents desire actions that focus on the social, psychological, and emotional impacts of climate change. They proposed construction of green infrastructure, improvements to water systems, funding opportunities for affordable climate technology, and a focus on preserving the natural environment.

Detailed descriptions of survey and workshop findings are found in Appendix C.

# Central Oregon

Figure 18: OEM Region 6



Central Oregon corresponds to OEM Region 6 as shown in Figure 18. The regional area spans six counties including Crook, Deschutes, Jefferson, Klamath, Lake, and Wheeler counties and lands under the jurisdictions of the Cow Creek Band of Umpqua Tribe of Indians, Confederated Tribes of Warm Springs, and Klamath Tribes. IPRE collected data from 82 Central Oregon residents on their community values and perceptions about climate change.

## Community Values

Central Oregon workshop participants greatly value **social ties** and opportunities for community gathering. Residents value the **natural environment**, access to the outdoors, and the **recreational opportunities it provides**. The natural environment boosts the physical health of the community by providing beautiful landscapes and abundant hiking trails. Tribal communities in this region depend on the land and have emotional, social, and economic connections to it.

Figure 19 shows the top six values survey respondents in the Region 6. Figure 20 displays the most common words Region 6 interviewees used to describe their community values.

*"I live in a nice small community area, it has [a lot] of recreational stuff, camping, hiking, fishing, hunting, you name it."*

Deschutes County Survey Respondent

Figure 19: Top Values of Region 6 Survey Respondents

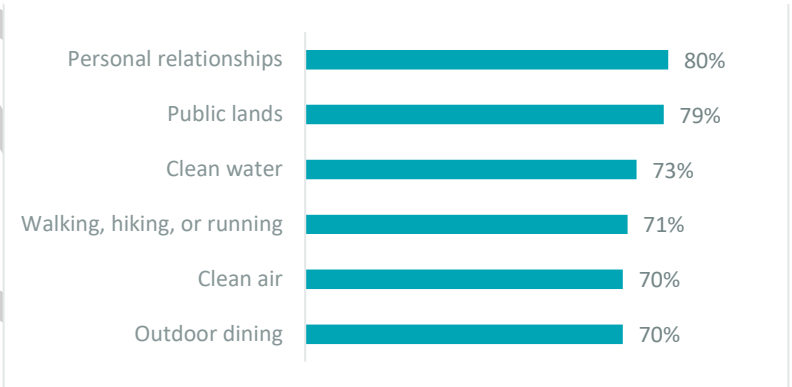


Figure 20: Region 5 Interviewee Wordcloud



## Climate Impacts

Survey respondents in the region most frequently expressed concern about the impacts of wildfires and drought on their lives. Survey respondents noted that wildfires are getting worse each year, negatively impacting their physical and mental health. Drought ranked as survey respondents' second highest climate impact concern because it threatens their livelihoods and quality of life by negatively impacting agriculture and recreation opportunities. Concern was voiced about heat waves and their potential to harm Central Oregon's infrastructure and residents' ability to spend time outdoors.



### WILDFIRES

**90%** of survey respondents said wildfires have a negative impact on their lives.

**"The wildfires are getting worse and it's getting harder to breathe because of the smoke in the summer."**

Deschutes County Survey Respondent

**"I live in a farming community, and we are highly affected by droughts and lack of water."**

Klamath County Survey Respondent



### DROUGHT

**89%** of survey respondents said drought has a negative impact on their lives.

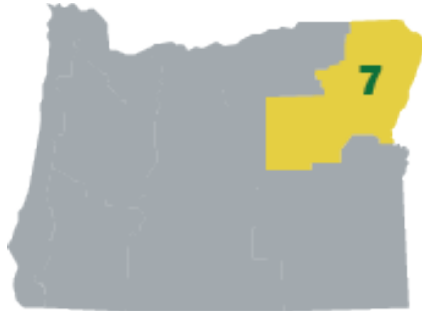
## Community Solutions

Central Oregonians want the State of Oregon to focus on preserving the natural environment. Examples include allocating more water storage areas and improving forest management practices. Respondents from this region are particularly interested in solutions to problems relating to water scarcity. Many respondents also voiced a desire for the state to "act now" before it is too late.

Detailed descriptions of survey and workshop findings are found in Appendix C.

# Northeastern Oregon

Figure 21: OEM Region 7



Northeastern Oregon corresponds to OEM Region 7 as shown in Figure 21. The region is bordered by the neighboring states of Washington and Idaho and spans across four Oregon counties including Grant, Baker, Union, and Wallowa County. This region includes lands under the jurisdiction of the Confederated Tribes of the Umatilla Indian Reservation. IPRE collected data from 35 Northeastern community members through a statewide survey and regional workshops.

## Community Values

Northeastern Oregon participants value their **shared sense of community that is closely tied with rural identity** and access to the outdoors. They talked about being about being able to **access public lands** and engage in activities such as hunting, fishing, foraging, hiking, and camping. Northeastern Oregon participants also valued their **social connections and shared goals**. Participants noted that **community events** that showcase their rural character, including arts and cultural events, support their social bonds.

Figure 22 shows the top six values survey respondents in the Region 6. Figure 23 displays the most common words Region 7 workshop participants used to describe their community values.

**“I value the connection between the people of my community [,] and if there is anyone with an emergency the community surrounds and supports them.”**  
 Wallowa County Survey Respondent

Figure 22: Top Values of Region 7 Survey Respondents

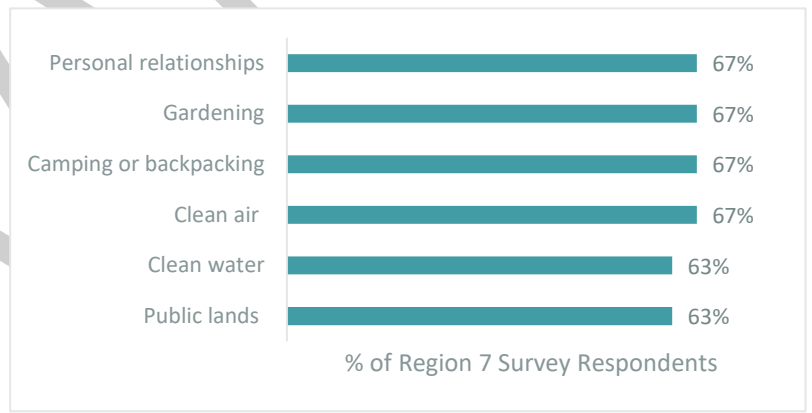


Figure 23: Region 7 Wordcloud



## Climate Impacts

Survey respondents in the region most frequently expressed concern about the current and potential impacts of wildfires and drought on their lives. Respondents discussed the negative impacts and threats of wildfires, droughts, and increased heat on the community. Community members expressed concern about climate impacts to physical safety and infrastructure. Participants saw climate change and related policymaking as potential stressors to their values of community connections and locally led efforts.



### WILDFIRES

**83%** of survey respondents said wildfires have a negative impact on their lives.

**“Wildfires are becoming more and more of a threat. Transportation of goods and services are impacted yearly because of adverse weather conditions.”**

Baker County Survey Respondent

**“[Changing climate conditions] impacts lives due to the issues of possible drought and fires. Ruined crops make for more expensive foods.”**

Union County Survey Respondent



### DROUGHT

**79%** of survey respondents said drought has a negative impact on their lives.

## Community Solutions

Respondents from Region 7 emphasized a desire for the legislature to prioritize local engagement and locally led efforts that can incorporate local knowledge and experience of the places they feel deeply connected to. Members of this region, both survey respondents and workshop attendees, are also calling for the legislature to support agriculture and local industry through actions such as education, research, providing access to resources, and mitigating impacts to transportation.

Detailed descriptions of survey and workshop findings are found in Appendix C.

# Southeastern Oregon

Figure 24: OEM Region 8



Southeastern Oregon corresponds OEM Region 8 as shown in Figure 24. Southeast Oregon is bordered by the neighboring states of Idaho, Nevada, and California. The region spans across Harney and Malheur counties and land under the jurisdiction of the Burns Paiute Tribe. IPRE collected data from 21 Southeastern Oregon residents through a statewide survey and regional workshops.

## Community Values

Southeastern Oregon respondents value being part of a rural community. Workshop participants discussed strong values for the **landscape, open space, remoteness, and dry climate**. Respondents also value the **social relationships, shared goals, and community events** that bring the community together. Workshop participants talked about how **shared goals and hobbies** connect community members to each other while giving members a sense of belonging.

Figure 25 shows the top six values survey respondents in the Region 6. Figure 26 displays the most common words Region 7 workshop participants used to describe their community values.

**"Our community is defined by the open space of a vast landscape. This informs the rural culture and underlies the cherished independence of community members."**

Burns Workshop Participant

Figure 25: Top Values of Region 8 Survey Respondents

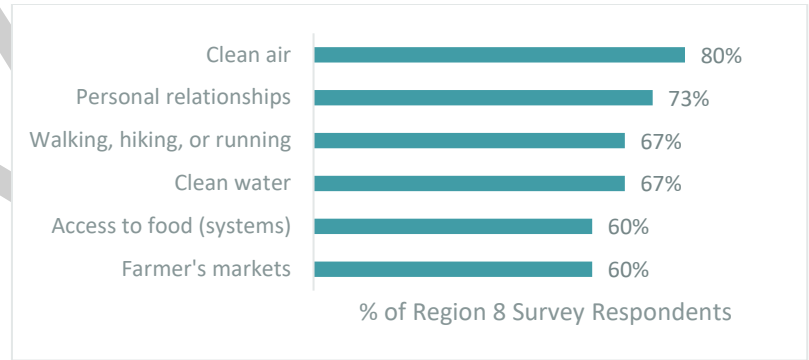


Figure 26 Region 8 Workshop Wordcloud





## Climate Impacts

Survey respondents in the region most frequently expressed concern about the current and potential impacts of wildfires and drought on their lives. Workshop participants discussed the impacts and threats of wildfires, decreased air quality, droughts, and increased water scarcity. Changing climate conditions impact community events that represent the uniqueness of the region, support community cohesion, and contribute to the local economy. Southeastern Oregonians are concerned about climate impacts to physical safety, community services, and infrastructure. Southeastern Oregon participants perceive that climate change will amplify existing vulnerabilities within their communities.



### WILDFIRES

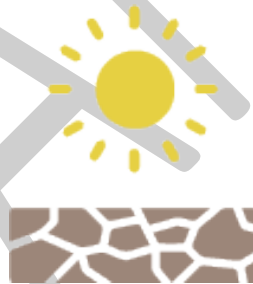
**87%** of survey respondents said wildfires have a negative impact on their lives.

**“Wildfire reduces access to public lands, recreation, commercial opportunities, and creates more forest fires.”**

Burns Workshop Participant

**“Drought affects wildlife and wildlife recreation, like the bird habitats and bird festivals.”**

Burns Workshop Participant



### DROUGHT

**67%** of survey respondents said drought has a negative impact on their lives.

## Community Solutions

Many workshop participants and survey respondents from Southeastern Oregon called for an increased voice in statewide policy and programming related to climate vulnerability and potential adaptation strategies. Local-, regional-, and state-level policymakers can work to build trust and long-term relationships in Southeastern Oregon with community organizations and municipalities.

Detailed descriptions of survey and workshop findings are found in Appendix C.



# Themes Across Development Densities

Four themes emerged when evaluating data based on development density (urban, rural, and frontier):

- Environment
- Social structures
- Infrastructure and built environment
- Livelihood and affordability

## Environment

Survey respondents and workshop participants across development densities have deep, personal connections to their unique natural surroundings. Respondents expressed a specific value for accessing public lands. Both urban and rural workshop participants emphasized how wildfires and smoke affect everyone's ability to spend time outside.

## Social Structures

Urban, rural, and frontier survey respondents and workshop participants alike valued opportunities to build connections within their communities. Frontier and rural workshop participants specifically talked about the importance of a small-town feel. Urban and rural workshop participants worried about how smoke and heat will lead to greater social isolation. Rural participants expressed the intense anxiety they feel during wildfire season.

Most significantly, development densities differed in their perceptions of government. The urban-rural divide in Oregon is acknowledged as a barrier to policy development and implementation. Rural and frontier workshop participants and survey respondents were more likely to value locally-based policy decisions. Many feel that statewide policies are too heavily influenced by urban populations, who do not share their same values or fully understand their local circumstances. Urban workshop participants and survey respondents seem to have higher levels of trust in government and expect governments to be leaders in addressing climate change mitigation and adaptation strategies.

## Infrastructure and Built Environment

Urban survey respondents and workshop participants were more likely to see development and built environment solutions as positive compared to rural and frontier respondents and participants. Rural workshop participants, however, said that they experience the economic costs of property adaptation and damage due to their frontline exposure to impacts like wildfires and sea level rise. They worry natural disasters may also limit transportation to their remote communities and have rippling economic costs to their regional and local industries.

## Livelihood and Affordability

Workshop participants and survey respondents from all density categories worried about the state's agriculture and food systems. Urban populations value locally grown food, while frontier and rural workshop participants depend economically on ranching and agriculture. Heat and drought will affect the continued economic viability of farming for these participants' communities. However, urban respondents were more likely to say climate adaptation resources should go to jobs and access to services.

Detailed descriptions of survey and workshop findings are found in Appendix C.

# Climate Change Response Strategies

Surveys and workshops demonstrated that social vulnerabilities to climate change exist within complex place-based webs of relationships, livelihoods, and connections to place. Workshop participants and survey respondents both emphasized the need to deploy community-specific climate change adaptation measures, developed with community engagement. DLCD heard that community members want a voice in how resources are managed in their regions as the climate changes.

DLCD heard that Oregonians want the state to initiate educational and capacity-building programs so that communities can better respond to their unique physical, psychological, and social needs as the climate changes. Respondents in all regions showed concern for people who may not have the resources to handle climate change effects, including the unhoused, low-income, elderly, and people with health conditions. Many people spoke of the need for immediate action.

Survey respondents and workshop participants relayed how important participation in community events, festivals, farmers markets, and youth and adult sports were to maintaining community cohesion. They also conveyed that shelter-in-place responses to wildfire smoke, extreme heat, and COVID-19 weaken interpersonal bonds, leading to community factions.

Finally, DLCD heard that Oregonians have a strong desire to enjoy and find sustenance in the outdoors as the climate changes. DLCD heard concerns about implementing policies that limit access to public lands without consulting local populations.

The assessment found that while Oregonians are ready to address climate change adaptation, they want adaptation actions in sync with local values. One of the predominant themes is the request for true partnership — that state technical and financial support is welcome if local voices are included in project design, implementation, and management. The assessment also found that Oregonians want state agencies to integrate what they are already doing into a comprehensive climate change adaptation program. Upon review of the draft Assessment, the multi-agency Climate Change Adaptation Framework Team offered the following key recommendations:

## Integration

- Establish a statewide, coordinated, and locally focused program of climate change adaptation.
- Prioritize funding to multi-agency climate change programs and projects.
- Permanently fund DLCD's climate change resilience coordinator position to:
  - Allow for continued interagency coordination around climate change adaptation.
  - Maintain the Oregon Climate Change Adaptation Framework.
  - Continue to build a state agency climate change adaptation community of practice.
  - Participate in regional information sharing forums, such as the U.S. Climate Alliance, and the Northwest Climate Resilience Collaborative.
  - Serve as a resource for the Regional Solutions Program offices and for local land use and hazards planners.

- Ensure that Resilience Hubs and Networks grants authorized by HB-3409 (2023) receive ongoing funding for planning and projects:
  - Expand the scope of Resilience Hubs and Networks to include climate change adaptation.
  - Provide educational materials and training to community-based organizations and the public.
  - Make Regional Solutions climate change specialists available to the Resilience Hubs and Networks.
- Expand the scope of Regional Solutions to include climate change mitigation and adaptation planning and action:
  - Assign a local climate change specialist to each Regional Solutions team who reviews workplans and projects with an eye toward finding multi-benefit opportunities for climate change mitigation, adaptation that align with local aspirations and culture.
- Integrate the unique contributions of and challenges faced by tribal nations into plans and projects.

## Equity

- Learn to use climate change, environmental justice, social vulnerability indices, and maps judiciously and transparently:
  - Apply map and index results with an understanding of the purposes for which they were developed and their data and spatial limitations.
  - Consult with host communities before relying on maps or index values to make decisions or deploy resources.
- Ensure fair and equitable access to climate change adaptation tools, funding, and programs:
  - Provide technical support to vulnerable communities as they co-develop — with state agencies — adaptation projects that serve their needs.
  - Allow stipends for individual community members to participate in the creation of policies and programs.
  - Provide multi-year technical and financial support to communities and community-based organizations that face challenges accessing climate change adaptation programs and funding.
  - Encourage state agencies to partner with community-based organizations by streamlining small organizational contracts.
- Foster inclusive climate change resilience, response, and recovery capacity:
  - Support activities that build community cohesion and shared purpose, such as festivals, farmers markets, athletic events, and citizen science.
  - Build awareness and provide technical assistance on how to respond to local emerging issues related to climate change such as excess heat management, caring for vulnerable neighbors, developing neighborhood response plans, etc.

- Engage underserved, elderly, and disabled communities in planning for their needs.
- Encourage federal land managers to include local voices as they plan for and react to climate change impacts and invite federal partners into state planning processes.

## Science

- Fully fund the Oregon Climate Change Research Institute at Oregon State University to provide pro-bono assistance to state agencies, cities, and counties as they develop climate change adaptation plans and projects.

## Education

- Provide training and networking opportunities to state employees and local planners on the practice of climate change adaptation:
  - Encourage participation in U.S. Climate Alliance work groups.
  - Support staff membership in organizations such as the American Society of Adaptation Professionals.
  - Fund the production of an annual climate change conference for state agency staff and local officials.
- Invest in early warning systems and train communities in how to interpret messages.

## Health and Wellbeing

- Enhance support for the public health system (tribes, local public health authorities, and community-based organizations) to engage in and contribute to planning and decision-making processes related to reducing greenhouse gas emissions and climate change adaptation.<sup>14</sup>
- Continue to fund over multiple biennial legislative sessions activities authorized under Emergency Heat Relief Act (SB 1536), including the Healthy Homes Grant Program,<sup>15</sup> and Community Cooling Spaces grant.
- Adopt building codes that focus not only on energy efficiency but also on passive survivability, allowing people to stay safe in their homes during heat, smoke, and cold events.<sup>16</sup>

<sup>14</sup> <https://www.oregon.gov/oha/ph/healthyenvironments/climatechange/pages/index.aspx>

<sup>15</sup>

<https://www.oregon.gov/oha/ph/healthyenvironments/healthyneighborhoods/healthyhomesgrantprogram/pages/index.aspx>

<sup>16</sup> doi: <https://doi.org/10.1038/d41586-023-03934-2>

# Methods

This section describes the research team’s methods for carrying out the Oregon Climate Change Social Vulnerability Assessment (CCVA).

## Advisory Group

The research team worked with an advisory group throughout the project. DLCD solicited interest in serving on the work group and selected 15 people from 24 applicants who represented a diverse range of interests. They guided the assessment process and informed the outreach approach. The advisory group provided input to DLCD and the research team as they planned and hosted regional workshops across the state. The advisory group met six times virtually from April 2022 to May 2023, and meetings were open for public viewing and comment.

## Posters Showing Climate Change Effects

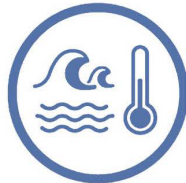
DLCD contracted with the Oregon Climate Change Research Institute to produce a set of posters to be used to stimulate conversation at in-person workshops. Electronic versions of the posters were also included in the survey instrument. Posters were made available in English and Spanish. Figures A1 through A8 show the posters. These posters are also available in Spanish on DLCD’s website.

POTENTIAL EFFECTS OF CLIMATE CHANGE ON OREGON'S COAST



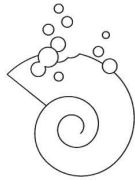
Sea level at Astoria projected to increase by 2.6-17 inches from 2016-2050

- Salt water intrusion
- Coastal flooding and erosion
- Less-efficient port operations
- Loss of cultural resources
- Changes in estuarine food web



Northwest open-ocean surface temperature +1.2±0.5°F since 1900, +5.0±1.1°F by 2080

- Altered marine food webs
- Reduced growth and survival of some marine species
- Lower estuarine water quality
- Increased probability of dead zones



pH at Newport currently 8.1, projected to be 7.8-7.9 by 2100

- Negative effects on reproduction of some shellfish (oysters, crabs, pink shrimp)
- Declines of some populations of cold water fishes (salmon, halibut)



Number of high fire danger days in summer and fall in Tillamook: 7 in 2020s, 14 by 2050s

- More days with smoke
- Higher concentrations of fine particulate matter
- Higher risk of landslides
- Increased sedimentation



Increase in late fall and winter streamflow; 5-25% decrease in spring, summer, and early fall streamflow

- Greater number of harmful algal blooms
- Higher fecal coliform loads
- Salt water intrusion
- Winter flooding and erosion in estuaries



Tillamook County population projected to increase by 24% from 2010-2050

- Pressure on existing resources and services
- Increase in volume of freshwater withdrawals
- Increased risk of fire ignitions

Projected changes in climate variables are from similar global climate models and reflect continued emissions of relatively high levels of greenhouse gases (RCP 8.5). Projected changes in natural hazards are derived from multiple sources that extended projections to different dates.



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DROUGHT

Annual number of dry days in Portland: 135 in 1990s, 141 by 2050

- Reduction in quality and quantity of water for domestic and agricultural use
- Dry vegetation increases wildfire risk
- Water stress in ecosystems



HEAT WAVES

Annual number of days >90°F in Portland: 14 in 2020s, 31 by 2050s

- Adverse effects on health of urban residents, outdoor workers
- Negative effects on some crops, dairy cows
- Higher seedling mortality
- Plants become heat-scorched



EXTREME PRECIPITATION

Increase in frequency and magnitude of floods due to more-intense rainfall and shift from snow to rain

- Higher risk of landslides, mudslides
- Disruption of transportation infrastructure, such as roads, bridges, and railroads
- Flooded airport runways



WILDFIRES

Number of high fire danger days in summer and fall in Portland: 15 in 2020s, 20 by 2050s

- More ignitions at the wildland-urban interface
- Adverse public health effects
- Lower wine quality
- Damaged homes, infrastructure



AIR QUALITY

Higher concentrations of pollen and fine particulate matter from wildfire smoke

- Adverse public health effects
- Lower solar radiation constrains crop growth, generation of solar power
- Economic losses from tainted wines, reduction in tourism



POPULATION GROWTH

Portland metropolitan area population projected to increase by 50% from 2015-2060

- Larger unhoused population
- Increasing food needs
- Increasing demand for water
- Strain on healthcare system

Projected changes in climate variables are from similar global climate models and reflect continued emissions of relatively high levels of greenhouse gases (RCP 8.5). Projected changes in natural hazards are derived from multiple sources that extended projections to different dates.



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DROUGHT

Annual number of dry days in Eugene: 133 in 1990s, 140 by 2050

- Reduction in quality and quantity of water for domestic and agricultural use
- Dry vegetation increases wildfire risk
- Water stress in ecosystems



HEAT WAVES

Annual number of days >90°F in Eugene: 19 in 2020s, 38 by 2050s

- Adverse effects on health of urban residents, outdoor workers
- Negative effects on some crops, dairy cows
- Higher seedling mortality
- Plants become heat-scorched



EXTREME PRECIPITATION

Increase in frequency and magnitude of floods due to more-intense rainfall and shift from snow to rain

- Higher risk of landslides, mudslides
- Disruption of transportation infrastructure, such as roads, bridges, and railroads
- Flooded airport runways



WILDFIRES

Number of high fire danger days in summer and fall in Eugene: 12 in 2020s, 16 by 2050s

- More ignitions at the wildland-urban interface
- Lower wine quality
- Damaged homes, infrastructure
- Displacement of residents



AIR QUALITY

Higher concentrations of pollen and fine particulate matter from wildfire smoke

- Adverse public health effects
- Lower solar radiation constrains crop growth, generation of solar power
- Economic losses from tainted wines



MEAN TEMPERATURE

Mean maximum daily temperature in Eugene: 82°F summer, 50°F winter in 2020s, +6°F summer, +4°F winter by 2050s

- Warmer nights
- Longer fire seasons
- Unmet chilling requirements
- Expansion of some pests, diseases, invasive species

Projected changes in climate variables are from similar global climate models and reflect continued emissions of relatively high levels of greenhouse gases (RCP 8.5). Projected changes in natural hazards are derived from multiple sources that extended projections to different dates.



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MEAN TEMPERATURE

Mean maximum daily temperature in Medford: 89°F summer, 51°F winter in 2020s, +3°F summer, +2°F winter by 2050s

- Warmer nights
- Longer fire seasons
- Unmet chilling requirements
- Expansion of some pests, diseases, invasive species



HEAT WAVES

Annual number of days >90°F in Medford: 43 in 2020s, 65 by 2050s

- Adverse effects on health of urban residents, outdoor workers
- Negative effects on some crops, dairy cows
- Higher seedling mortality
- Plants become heat-scorched



DROUGHT

Annual number of dry days in Medford: 181 in 1990s, 188 by 2050

- Reduction in quantity and quality of water for domestic and agricultural use
- Drier natural vegetation increases wildfire risk
- Loss of topsoil



WILDFIRES

Number of high fire danger days in summer and fall in Medford: 12 in 2020s, 16 by 2050s

- More ignitions at the wildland-urban interface
- Adverse public health effects of wildfire smoke
- Lower wine quality and associated economic losses
- Damaged homes, infrastructure



WARMER WINTERS

Annual mean snowfall in Jackson County: 3.81' from 1981-2010, 2.08' from 2025-2049

- Earlier springs
- Earlier peak streamflow
- Longer wildfire season
- Expansion of some pests, diseases, invasive species
- Unmet chilling requirements



EXTREME PRECIPITATION

Increase in frequency and intensity of floods due to stronger storms and a shift from snow to rain

- Higher risk of landslides, mudslides, and hillside and streambank erosion
- Disruption of transportation infrastructure, such as roads, railroads, and airport runways

Projected changes in climate variables are from similar global climate models and reflect continued emissions of relatively high levels of greenhouse gases (RCP 8.5). Projected changes in natural hazards are derived from multiple sources that extended projections to different dates.



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Annual number of dry days in Pendleton: 174 in 1990s, 179 by 2050

- Reduction in quantity and quality of water for domestic and agricultural use
- Drier natural vegetation increases wildfire risk
- Loss of topsoil



Annual number of days >90°F in Pendleton: 37 in 2020s, 56 by 2050s

- Adverse effects on health of urban residents, outdoor workers
- Negative effects on some crops, dairy cows
- Higher seedling mortality
- Plants become heat-scorched



Higher concentrations of pollen and fine particulate matter from wildfire smoke

- Adverse public health effects
- Lower solar radiation constrains crop growth, generation of solar power
- Economic losses from tainted wines, reduction in tourism



Number of high fire danger days in summer and fall in Pendleton: 15 in 2020s, 21 by 2050s

- More ignitions at the wildland-urban interface
- Adverse public health effects of wildfire smoke
- Lower wine quality
- Damaged homes, infrastructure



Annual mean snowfall in Umatilla County: 1.77' from 1981-2010, 0.84' from 2025-2049

- Earlier springs
- Earlier peak streamflow
- Unmet chilling requirements
- Longer wildfire season
- Expansion of some pests, diseases, invasive species



Increase in frequency and intensity of floods due to stronger storms and a shift from snow to rain

- Higher risk of landslides, mudslides, and hillside erosion
- Disruption of transportation infrastructure, such as roads, bridges, and railroads
- Flooded airport runways

Projected changes in climate variables are from similar global climate models and reflect continued emissions of relatively high levels of greenhouse gases (RCP 8.5). Projected changes in natural hazards are derived from multiple sources that extended projections to different dates.



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Annual number of dry days in Pendleton: 174 in 1990s, 179 by 2050

- Reduction in quantity and quality of water for domestic and agricultural use
- Drier natural vegetation increases wildfire risk
- Loss of topsoil



Annual number of days >90°F in Pendleton: 37 in 2020s, 56 by 2050s

- Adverse effects on health of urban residents, outdoor workers
- Negative effects on some crops, dairy cows
- Higher seedling mortality
- Plants become heat-scorched



Higher concentrations of pollen and fine particulate matter from wildfire smoke

- Adverse public health effects
- Lower solar radiation constrains crop growth, generation of solar power
- Economic losses from tainted wines, reduction in tourism



Number of high fire danger days in summer and fall in Pendleton: 15 in 2020s, 21 by 2050s

- More ignitions at the wildland-urban interface
- Adverse public health effects of wildfire smoke
- Lower wine quality
- Damaged homes, infrastructure



Annual mean snowfall in Umatilla County: 1.77' from 1981-2010, 0.84' from 2025-2049

- Earlier springs
- Earlier peak streamflow
- Unmet chilling requirements
- Longer wildfire season
- Expansion of some pests, diseases, invasive species



Increase in frequency and intensity of floods due to stronger storms and a shift from snow to rain

- Higher risk of landslides, mudslides, and hillside erosion
- Disruption of transportation infrastructure, such as roads, bridges, and railroads
- Flooded airport runways

Projected changes in climate variables are from similar global climate models and reflect continued emissions of relatively high levels of greenhouse gases (RCP 8.5). Projected changes in natural hazards are derived from multiple sources that extended projections to different dates.



[blogs.oregonstate.edu/occri/](https://blogs.oregonstate.edu/occri/)



DROUGHT

Annual number of dry days in Bend: 186 in 1990s, 192 by 2050

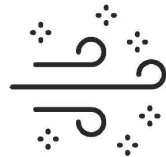
- Reduction in quantity and quality of water for domestic and agricultural use
- Drier natural vegetation increases wildfire risk
- Loss or lower abundance of some plant species



HEAT WAVES

Annual number of days >90°F in Bend: 12 in 2020s, 26 by 2050s

- Adverse effects on health of urban residents, outdoor workers
- Negative effects on some crops, dairy cows
- Higher seedling mortality
- Plants become heat-scorched



AIR QUALITY

Higher concentrations of pollen and fine particulate matter from wildfire smoke

- Adverse public health effects
- Lower solar radiation constrains crop growth, generation of solar power



WILDFIRES

Number of high fire danger days in summer and fall in Bend: 11 in 2020s, 15 by 2050s

- More ignitions at the wildland-urban interface
- Adverse public health effects of wildfire smoke
- Loss of timber, livestock forage
- Damaged homes, infrastructure



WARMER WINTERS

Annual mean snowfall in Deschutes County: 7.4' from 1981-2010, 5.4' from 2025-2049

- Earlier springs
- Earlier peak streamflow
- Longer wildfire season
- Expansion of some pests, diseases, invasive species



EXTREME PRECIPITATION

Increase in frequency and intensity of floods due to stronger storms and a shift from snow to rain

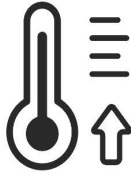
- Higher risk of landslides, mudslides
- Disruption of transportation infrastructure, such as roads, bridges, and railroads
- Increased risk of erosion

Projected changes in climate variables are from similar global climate models and reflect continued emissions of relatively high levels of greenhouse gases (RCP 8.5). Projected changes in natural hazards are derived from multiple sources that extended projections to different dates.



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MEAN TEMPERATURE

Mean maximum daily temperature in LaGrande: 85°F summer, 42°F winter in 2020s, +4°F summer, +2°F winter by 2050s

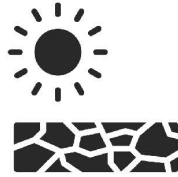
- Warmer nights
- Longer fire seasons
- Unmet chilling requirements
- Expansion of some pests, diseases, invasive species



HEAT WAVES

Annual number of days >90°F in LaGrande: 20 in 2020s, 39 by 2050s

- Adverse effects on health of urban residents, outdoor workers
- Negative effects on some crops, dairy cows
- Higher seedling mortality
- Plants become heat-scorched



DROUGHT

Annual number of dry days in Union County: 157 in 1990s, 163 by 2050

- Reduction in quantity and quality of water for domestic and agricultural use
- Drier natural vegetation increases wildfire risk
- Mortality of crop plants, trees



WILDFIRES

Number of high fire danger days in summer and fall in LaGrande: 14 in 2020s, 20 by 2050s

- Adverse public health effects of wildfire smoke
- Damaged homes, infrastructure
- Lower solar radiation constrains generation of solar power



WARMER WINTERS

Annual mean snowfall in Union County: 5.0' from 1981-2010, 3.0' from 2025-2049

- Earlier springs
- Earlier peak streamflow
- Longer wildfire season
- Expansion of some pests, diseases, invasive species



EXTREME PRECIPITATION

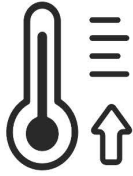
Increase in frequency and intensity of floods due to stronger storms and a shift from snow to rain

- Higher risk of landslides, mudslides, and hillside and streambank erosion
- Disruption of transportation infrastructure
- Risk of dam failure

Projected changes in climate variables are from similar global climate models and reflect continued emissions of relatively high levels of greenhouse gases (RCP 8.5). Projected changes in natural hazards are derived from multiple sources that extended projections to different dates.



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MEAN TEMPERATURE

Mean maximum daily temperature in Burns: 85°F summer, 50°F winter in 2020s, +2°F in summer and winter by 2050s

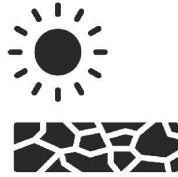
- Warmer nights
- Longer fire seasons
- Unmet chilling requirements
- Expansion of some pests, diseases, invasive species



HEAT WAVES

Warmest summer day in Burns: 100°F in 2020s, 104°F by 2050s

- Adverse effects on health of urban residents, outdoor workers
- Negative effects on some crops, dairy cows
- Higher seedling mortality
- Plants become heat-scorched



DROUGHT

Annual number of dry days in Burns: 133 in 1990s, 140 by 2050

- Reduction in quantity and quality of water for domestic and agricultural use
- Drier natural vegetation increases wildfire risk
- Loss or lower abundance of some plant species



WILDFIRES

Number of high fire danger days in summer and fall in Burns: 13 in 2020s, 19 by 2050s

- Adverse public health effects of wildfire smoke
- Damaged homes, infrastructure
- Loss of crops, timber, housing
- Lower solar radiation affects generation of solar power



WARMER WINTERS

Annual number of frost-free days in Burns: 179 in 2000s, 224 by 2050s

- More rain, less snow
- Earlier peak spring streamflow
- Higher probability of late frost
- Intensified summer drought
- Longer wildfire season



EXTREME PRECIPITATION

60% increase in number of extreme rainfall events in Burns from the 1990s to the 2050s

- Increased risk of flash floods
- Disruption of transportation infrastructure, such as roads, bridges, and railroads
- Increased soil erosion

Projected changes in climate variables are from similar global climate models and reflect continued emissions of relatively high levels of greenhouse gases (RCP 8.5). Projected changes in natural hazards are derived from multiple sources that extended projections to different dates.



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## Literature Review

DLCD and the IPRE team conducted a literature review on the effects of climate change in Oregon, vulnerable populations, and plans and policies currently in place in the state. The review focused on Oregon-specific research into climate change vulnerability. These documents included, but were not limited to, Oregon's 2010 and 2021 Climate Adaptation Frameworks, the 2021 Climate Equity Blueprint, the sixth Oregon Climate Assessment, and the 2020 Oregon Health Authority Climate Change and Social Resilience Report. DLCD and IPRE used findings, poster data, and input from the advisory group to develop engagement strategies.

The literature review included examination of GIS-based indices, used by federal and state agencies, non-governmental organizations, and others to examine vulnerabilities to environmental stressors, including natural hazards. These indices are described in more detail in Appendix B.

## Interviews

IPRE conducted 12 interviews with advisory group members and 11 interviews with stakeholders. Stakeholder interviews focused on Eastern Oregon communities to inform regional workshop approaches and to supplement lower attendance rates. Stakeholders were identified with input from DLCD and the advisory group and included individuals with professional and leadership roles related to climate change, community and economic development, community health, and professional trades, amongst others. Interviewers queried the respondents about their roles in their organizations and communities and what they most valued about their communities. Interviewees shared thoughts on the social impacts of climate change in their communities and the groups they saw as being particularly vulnerable to climate change. Interviewees also provided definitions of wellbeing, livelihood, and community, which the research team used to help frame and inform public-facing engagements around these concepts.

## Statewide Survey

The research team designed a statewide survey to capture input from two groups: people living in locations where in-person workshops were not feasible and people who could not attend an in-person session in their local area. The survey opened in December 2022 and closed at the end of April 2023. It was available online in both English and Spanish. Additional responses were collected past April 30, 2023 to provide to DLCD, but are not included within this report. The research team contracted with Centiment, a survey and research service, to build an audience panel that was representative of rural and frontier ZIP codes based on gender, race, ethnicity, and income.<sup>17</sup> The research team then used a snowball sampling technique to collect additional responses, asking the advisory group members and workshop participants to spread the word about the survey. Finally, the team used a convenience sampling technique for the rest of its distribution efforts, utilizing social media platforms. The survey received a total of 607

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<sup>17</sup> An audience panel of representative racial and ethnic respondents in the state of Oregon translates into smaller numbers of responses from Black/African American, American Indian or Alaska Native, Asian/Asian American, Native Hawaiian/Other Pacific Islander, Latino/a/x or Hispanic, and Multi-racial demographic groups. CCVA Part III expands on these implications and provides recommendations for future public engagement efforts.



verified responses, which the research team aggregated by geography (OEM Region) and development density (urban, rural, and frontier) and summarized in this report.

## Regional Workshops

The research team conducted 12 in-person regional workshops and one virtual workshop across the state from October 2022 to March 2023, as shown in Table 0-2. The Research team led workshop participants through a series of interactive activities and group discussions to identify community values, discuss their perspective of the impact of climate change on those values, and identify values or climate projections that were most concerning to them.

**Table 2. Workshop locations and dates**

Workshop location	Date
Burns, OR - Region 8	10/13/2022
John Day, OR – Region 7	10/14/2022
Madras, OR – Region 6	10/15/2022
Baker City, OR – Region 7	10/24/2022
Ontario, OR – Region 8	10/25/2022
Pendleton, OR – Region 5	10/26/2022
Virtual Youth Workshop – All Regions	2/4/2023
Cottage Grove, OR – Region 3	3/1/2023
Hood River, OR – Region 5	3/3/2023
Brookings, OR – Region 1	3/11/2023
Woodburn, OR – Region 3	3/15/2023
Medford, OR – Region 4	3/17/2023
Klamath Falls, OR – Region 6	3/18/2023

Although some Spanish-language promotional material was distributed, most outreach was conducted in English by English-only speakers. Tribes were informed of the workshops and invited to attend, although few tribal members did so.

## Workshop Design

The workshops had four main goals:

- Build awareness of regional climate impacts throughout Oregon.
- Gather feedback from community members on how climate change impacts their lives.
- Collect written feedback through worksheets and questionnaires.
- Convene a space that is interactive and inclusive for all community members.

The research team used three overarching themes to frame and guide discussions with interviewees, regional workshop designs, and the statewide survey. Definitions were drafted and shaped with input from our advisory group. The following definitions were provided throughout each engagement method:

- **Well-being** – a person’s physical and mental health. *Keywords: safety, security, joy, happiness, satisfaction, lifestyle, sense of purpose, and quality of life.*
- **Livelihood** – a person’s ability to make a living and/or to provide basic needs for herself and her household. *Keywords: job, income, access to services, access to care, transportation, and housing.*

- **Community** – a person’s sense of belonging within a group of people and/or within a place. *Keywords: shared values, shared beliefs, hobbies, clubs, sports, culture, identity, institutions, landscapes, and intergenerational connections.*

## Workshop Outreach

The research team conducted outreach for workshops through:

- Promotion on the project website.
- Personalized letters to local councils and commissions.
- Sharing workshop dates and information with regional DLCD staff.
- Emailing government listservs and climate-related organizations.
- Calling and emailing media centers, schools, libraries, government agencies, and local organizations within the region.
- Outreach through Facebook and Twitter posts.

## Limitations and Lessons Learned

The similarities and differences highlighted in this assessment reflect the input of participants. If respondents from one region did not mention a theme that may have been common among other regions it does not mean that people in that region do not share the same concern; it simply means that respondents did not mention it during engagement activities. In some cases, this pattern may reveal where additional public engagement activities would provide a more representative or more nuanced perspective on community values and perception of climate impacts within different regions.

While the approach to learning about how Oregonians are experiencing the effects of climate change focused on conversations with individuals, it is not intended to imply that the people experiencing adverse effects from climate change are individually responsible for ameliorating its effects on them. Building resilience to the effects of climate change demands that we strengthen the social and economic systems in which people live and work.

The demographic profile of workshop participants does not reflect that of the locations in which workshops were held. The project team reached out to community-based organizations who serve the Spanish-speaking community. Materials were translated into Spanish and translators were provided in Woodburn and Ontario. These actions, however, did not attract a representative number of Spanish-speaking individuals.

Likewise, project team outreach to tribal nations did not result in sufficient tribal engagement. In 2024, DLCD staff will conduct staff-to-staff consultation with representatives of Oregon tribes.