

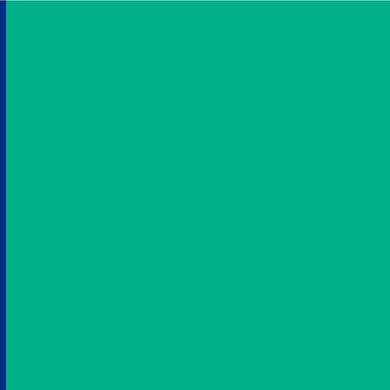
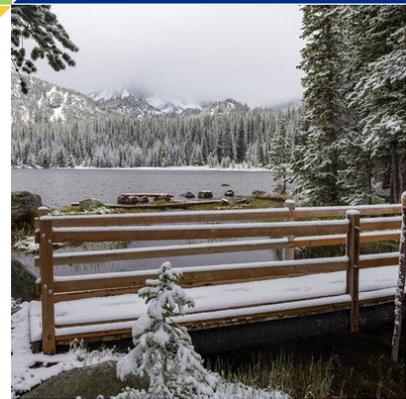
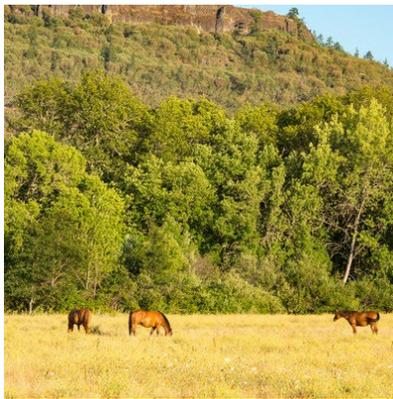
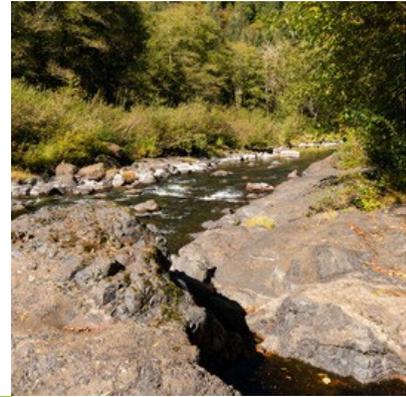
Oregon Climate Change Social Vulnerability Assessment

March 2026



DLCD

Department of
Land Conservation
& Development



Executive Summary

Climate change is disrupting the natural and built environment throughout Oregon. These changes affect Oregonians' health, livelihoods, and sense of place.

As directed by the Oregon Legislature, Oregon Department of Land Conservation and Development (DLCD) and University of Oregon staff conducted a statewide survey and twelve in-person workshops to learn more about how climate change impacts Oregonians, and how social factors can increase or decrease those impacts. The survey and workshops were based on regional profiles created by the Oregon Climate Change Research Institute (OCCRI). These profiles show the top six climate impacts for each region, summarized in the table below.

The first peoples of what is now called Oregon have stewarded this land since time immemorial. Each of the tribes in Oregon have their own priorities and concerns about how the rapidly changing environment will impact natural resources, cultural resources, and cultural practices. This assessment does not summarize that work. To learn more about the priorities of the nine federally-recognized tribes, please see the [Legislative Commission on Indian Services website](#) to contact each tribe individually.

Most Oregonians see an immediate need to act to adapt to a changing climate. They want effective climate change that is as varied and complex as the communities across Oregon. They want adaptation actions aligned with their local values and based on their unique physical, psychological, and social needs. Participants express their desire for a true partnership between state government, local governments, and communities. They want a voice in designing, implementing, and managing projects that receive state technical assistance and financial support.

Oregonians want state agencies to use existing programs and policies to create comprehensive climate change adaptation. They want the state to provide education and build community capacity to respond to climate change. Climate change does not impact everyone equally, and most Oregonians are concerned about people who do not have the resources to adapt to climate change, including the unhoused, low-income, elderly, and people with health conditions.

Some impacts of climate change directly affect people. Other impacts are indirect, when adaptation actions have their own impacts. For example, survey respondents and workshop participants described the importance of activities that support community cohesion including community events, festivals, farmers' markets, youth sports, and adult sports. These events may be cancelled because of wildfire smoke that reduces air quality to unhealthy levels or extreme heat that makes outdoor activities unsafe. That decision would have its own impacts, including weakening interpersonal bonds and creating community factions. Another example involves public lands. Oregonians have a strong desire to enjoy the outdoors and find sustenance there. They are concerned that climate adaptation policies could limit access to public lands without consulting local communities.

The Oregon Climate Change Research Institute summarized the most significant predicted impacts by region, as shown in the following table.

Most Significant Climate Impacts

Coastal Oregon



WILDFIRES



WATER SECURITY

Other Impacts:
Sea Level Rise,
Ocean Warming,
Ocean Acidification,
Population Growth

Northern Willamette Valley



WILDFIRES



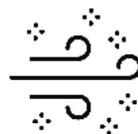
DROUGHT



EXTREME PRECIPITATION



HEAT WAVES



AIR QUALITY

Other Impacts:
Population Growth

Mid and South Willamette Valley



WILDFIRES



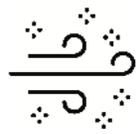
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HEAT WAVES



AIR QUALITY



MEAN TEMPERATURE

Southwest Oregon



WILDFIRES



DROUGHT



EXTREME PRECIPITATION



HEAT WAVES



MEAN TEMPERATURE



WARMER WINTERS

Mid-Columbia



WILDFIRES



DROUGHT



EXTREME PRECIPITATION



HEAT WAVES



AIR QUALITY



WARMER WINTERS

Central Oregon



WILDFIRES



DROUGHT



EXTREME PRECIPITATION



HEAT WAVES



AIR QUALITY



WARMER WINTERS

Northeast Oregon



WILDFIRES



DROUGHT



EXTREME PRECIPITATION



HEAT WAVES



MEAN TEMPERATURE



WARMER WINTERS

Southeast Oregon



WILDFIRES



DROUGHT



EXTREME PRECIPITATION



HEAT WAVES



MEAN TEMPERATURE



WARMER WINTERS

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About the Institute for Policy 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.



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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 social 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.

With this investment, the Oregon Department of Land Conservation and Development (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 predominant climate change effects by region. Regional chapters provide more detail.

Table 1: Summary of Predominant Effects of Climate Change by Region

Region	Predominant Effects of Climate Change
Coastal Oregon	Sea level rise, warming ocean water, ocean acidification & hypoxia, wildfires, water security, and population growth.
Northern Willamette Valley	Drought, heat waves, extreme precipitation, wildfires, air quality degradation, and population growth.
Mid and South Willamette Valley	Drought, heat waves, extreme precipitation, wildfires, air quality degradation, and increased mean temperature.
Southwest Oregon	Increased mean temperature, heat waves, drought, wildfires, warmer winters, and extreme precipitation.
Mid-Columbia	Drought, heat waves, degraded air quality, wildfires, warmer winters, and extreme precipitation.
Central Oregon	Heat waves, degraded air quality, wildfires, warmer winters, and extreme precipitation.
Northeastern Oregon	Drought, heat waves, degraded air quality, wildfires, warmer winters, and extreme precipitation.
Southeastern Oregon	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.”¹ 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.

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

¹ <https://www.ipcc.ch/report/sixth-assessment-report-working-group-ii/>

connected to one another.^{2,3} Tanner (2015) and Yi (2022) define livelihood as the ability to sustain oneself and family in the face of climate change.^{4,5} 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.⁶ 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 idea that resilience can be characterized by elasticity and springiness of a system.⁷ 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.^{8,9}

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.¹⁰

² White, S., & Abeyasekera, A. (Ed.) (2014). Wellbeing and Quality of Life Assessment: A practical guide. Practical Action Publishing.

³ 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

⁴ 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>

⁵ 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>

⁶ 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>

⁷ (Quah, Danny (2021) [Building back better with trampolines \(nus.edu.sg\)](https://nus.edu.sg), accessed 12/14/2022

⁸ 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

⁹ Alameldeen, A. (2021). What is a Resilient Community? *Academia Letters*. <https://doi.org/10.20935/AL3615>

¹⁰ 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

Discussions of how to reduce vulnerability or increase resilience to climate change include addressing equity: for whom and why climate change responses are pursued.¹¹ 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 communities.¹² In response, DLCD 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, DLCD conducted in depth 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 DLCD 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.

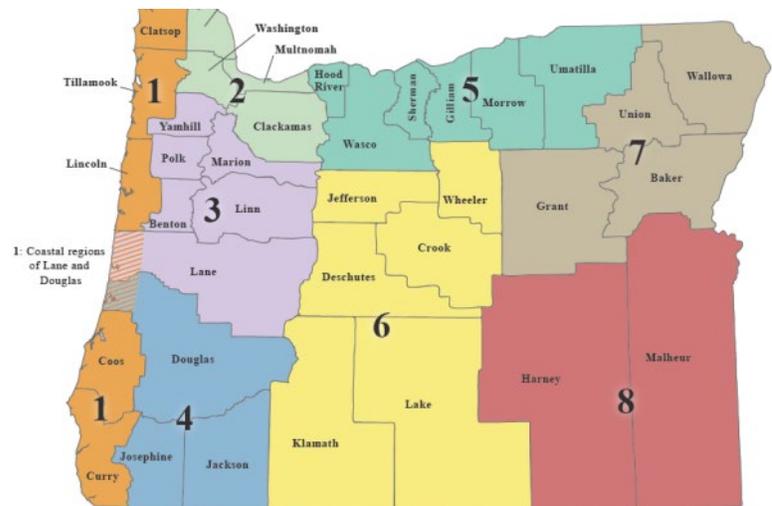
Prior to beginning fieldwork, DLCD staff examined existing national-scale GIS-based approaches to evaluating where investments might be made to equitably address harms caused by natural hazard events and climate change. Each approach yielded a different result and as a group did little to clarify who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

DLCD staff also examined climate change social vulnerability assessments conducted by other Oregon state agencies. Appendix B provides links to these assessments. DLCD 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.

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

Figure 2: Oregon Department of Emergency Management Hazard Mitigation Regions



¹¹ 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

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

collected and organized data using the eight Oregon Emergency Management (OEM) regions as a frame:

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

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

Details about field assessment results are in chapters 2 through 10.

Results

Research revealed common themes and unique differences 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 participants in more than one region.

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

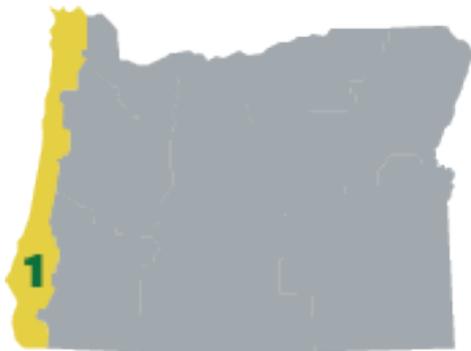
	Regions							
	1	2	3	4	5	6	7	8
Natural Systems and Environment								
Disruption to natural areas and systems	x		x		x	x	x	x
Disruption to hunting, fishing & foraging	x		x			x		
Water scarcity			x	x	x	x		x
Degraded air quality	x	x	x	x	x	x		x
Infrastructure and Buildings								
Water system damage		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							
Livelihoods and Economy								
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
Social Systems								
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	
Health								
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
Local Government Capacity								
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 region, with details in separate chapters.

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.

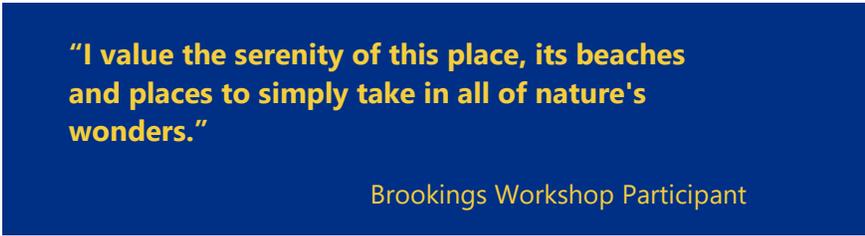


Figure 4: Top Values of Region 1 Survey Respondents

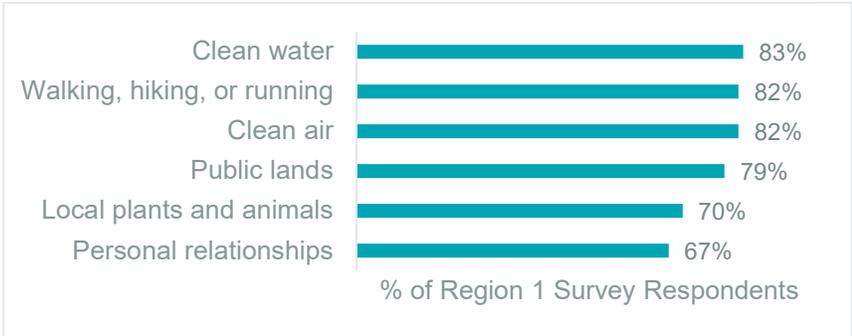


Figure 5: Region 1 Workshop Wordcloud



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 in Chapter 2.

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.

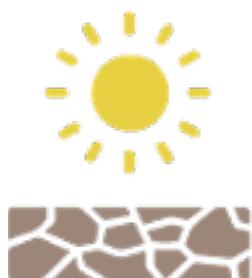
Community Solutions

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 in Chapter 3.

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 and 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 in Chapter 4.

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 in Chapter 6.

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 in Chapter 6.

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 selected. 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

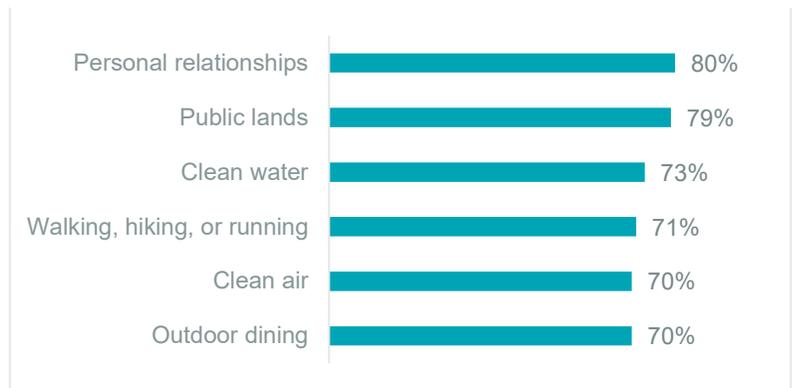


Figure 20: Region 5 Interviewee Wordcloud



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.

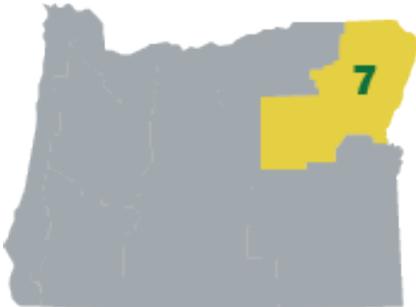
Community Solutions

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 in Chapter 7.

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 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 selected. 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

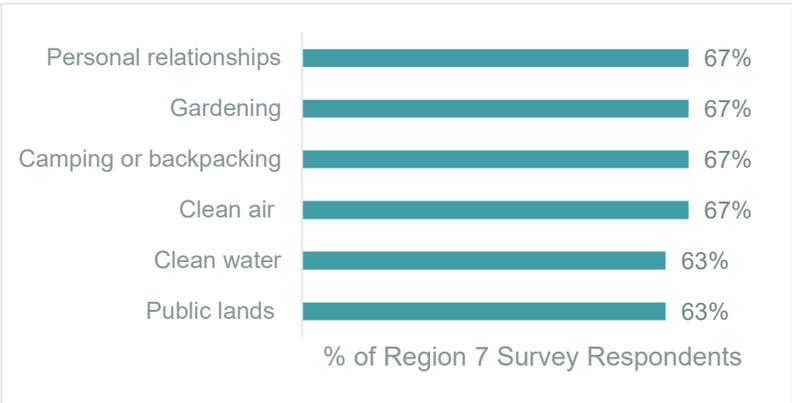


Figure 23: Region 7 Wordcloud



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

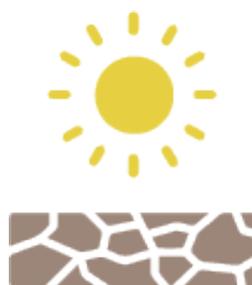
83% of survey respondents said wildfires have a negative impact on their lives.

“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 in Chapter 8.

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 selected. Figure 26 displays the most common words Region 8 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

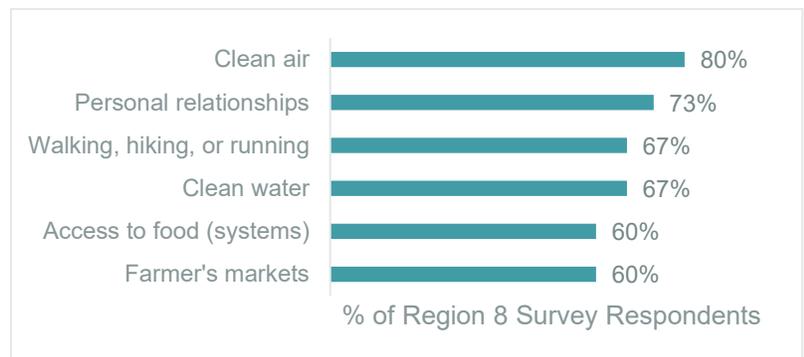


Figure 26 Region 8 Workshop Wordcloud



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 in Chapter 9.

Development Densities

Four themes emerged when evaluating survey results 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.

Details about community values and climate impacts by development density are in Chapter 10.

Recommendations

Upon review of the draft assessment, the state's multi-agency Climate Change Adaptation Framework Team made the following recommendations:

Integration

- Establish a statewide, coordinated, and locally focused program of climate change adaptation.
- Prioritize multi-agency climate change programs and projects.
- Fund state agencies to coordinate around climate change adaptation planning and implementation.
- Maintain the Oregon Climate Change Adaptation Framework.
- Participate in information sharing forums, such as the U.S. Climate Alliance and the Oregon Climate Action Commission.
- Expand the scope of Regional Solutions to include climate change mitigation and adaptation planning and actions.
- 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 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 take part 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

- Continue to 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.¹³
- Continue to fund over multiple biennial legislative sessions activities authorized under the Emergency Heat Relief Act (SB 1536), including the Healthy Homes Grant Program,¹⁴ 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 in case of power outages during heat, smoke, and cold events.¹⁵

¹³ <https://www.oregon.gov/oha/ph/healthyenvironments/climatechange/pages/index.aspx>

¹⁴

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

¹⁵ doi: <https://doi.org/10.1038/d41586-023-03934-2>

Chapter 1 – Coastal Oregon



Sources courtesy of Adobe Stock Photos. Debbie Ann Powell (left) and Alis

Background

This section provides a summary of existing community characteristics for Coastal Oregon. We drew from existing state planning documents, such as the Oregon Natural Hazards Mitigation Plan and other background research materials to provide a high-level overview of environmental, demographic, and economic conditions in the region. This section concludes with an overview of climate projections for Coastal Oregon and known social vulnerabilities to the communities within the Department of Emergency Management, Mitigation Region 1.

Environmental Characteristics

Geographically, the coastal region stretches between the Pacific Ocean and the major valleys (the Willamette, Umpqua, and Rogue) to the east. Low elevation and high precipitation characterize most of the region. A network of rivers, including the Siuslaw, Umpqua, Nehalem, Rogue, Yaquina, Siletz, Nestucca, Trask, Wilson, Coos, and Coquille flow through this region towards the Pacific Ocean. Figure 1.1 describes more environmental characteristics of the region.

Figure 1.1 Major Landmarks and Land Type of Coastal Oregon by County

<u>Major Natural Landmarks</u>	<u>Land Types</u>
Clatsop County: Haystack Rock	Clatsop County
Coos County: Oregon Dunes National Recreation Area	26% Public 6% Developed/Cultivated
Curry County: Rogue River-Siskiyou National Forest	Coos County
Lincoln County: Yaquina Bay State Recreation Site	28% Public 7% Developed/Cultivated
Tillamook County: Cape Meares National Wildlife Refuge	Curry County
Coastal Lane County: Sea Lion Caves	55% Public 3% Developed/Cultivated
Coastal Douglas County: Oregon Dunes National Recreation Area	Lincoln County
	29% Public 6% Developed/Cultivated

Source: Oregon by the Number, 2024

Community Characteristics

Coastal Oregon has a population of 170,813 across 17,000 square miles. The region's population is growing slower than the statewide rate.¹⁶ The Portland State University's Population Research Center predicts in-migration, rather than births, will be the main driver of

¹⁶ Shannon Caplan, David Keyes, and Elissa Schloesser, *Oregon by the Numbers*, vols. (The Ford Family Foundation and Oregon State University Extension Service, August 2022), Available: https://www.tfff.org/wp-content/uploads/OBTN_2022_101022-Digital.pdf.

regional population growth.¹⁷ Table 1.1 provides additional population characteristics by county. The cities of Florance in Lane County and Reedsport in Douglas County represent the coastal portions of those counties.

Table 1.1 Population Characteristics for Coastal Oregon by County

	Clatsop County	Coos County	Curry County	Tillamook County	Coastal Lane County	Coastal Douglas County
Total Population	41,190	64,908	23,404	27,345	9,598 ¹⁸	4,368 ³
Total land area (mi²)	1,084	1,806	1,989	1,332		
Population Density (people/mi²)	38	36	12	21		
Net migration, 2020-202 [2per 1,000 population]	30.5	21.7	51.3	30.9		

Source: Oregon by the Numbers, 2024

¹⁷ State Interagency Hazard Mitigation Team, *Oregon’s Natural Hazards Mitigation Plan*, vols. (State of Oregon, September 24, 2020), Available: https://www.oregon.gov/lcd/NH/Documents/Approved_2020ORNHMP_00_Complete.pdf.

¹⁸ Portland State University, Population Research Center, 2024 Certified Estimates.

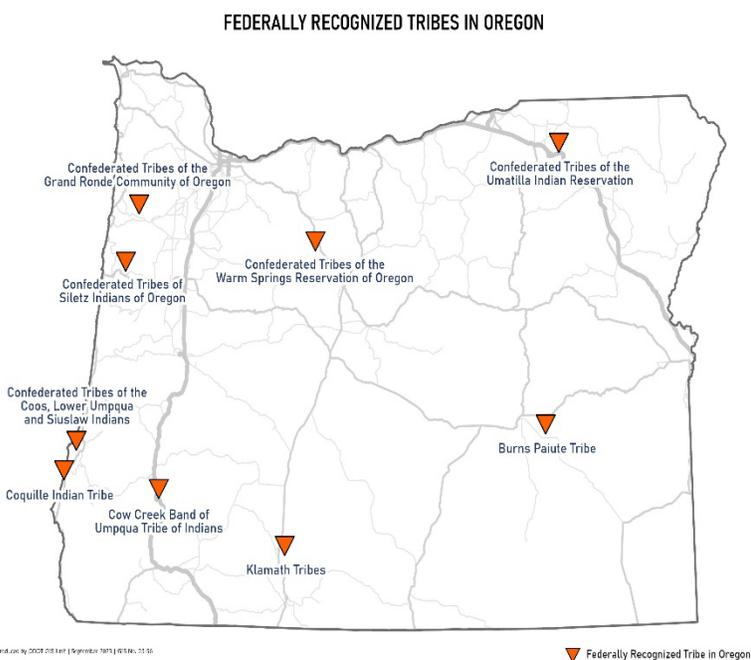
Federally Recognized Tribes

Figure 1.2 displays the locations of the nine federally recognized tribes in Oregon. Five of the nine tribes have tribal service areas that overlap with the Oregon Coast region. These include:

- Confederated Tribes of Coos, Lower Umpqua, and Siuslaw Indians
- Confederated Tribes of Grand Ronde
- Confederated Tribes of Siletz
- Cow Creek Band of Umpqua Tribe of Indians
- Coquille Indian Tribe

Additional information on Oregon Tribes can be found in Part II, Appendix A.

Figure 1.2 Oregon's Federally Recognized Tribes



Race and Ethnicity

Source: Oregon Department of Transportation

The Coastal Oregon region has a greater (~10%) white population as compared to the state average. There is a greater population of Hispanic/Latino identifying community members (10%) in Tillamook County as compared to the other counties in this region (8%).¹⁹

Social Vulnerability

The physical, mental, and financial well-being of specific population groups in Coastal Oregon are already vulnerable to unanticipated events and natural hazards. These groups are likely to experience disproportionate impacts from climate-related hazards and events. According to the CDC Social Vulnerability Index, coastal counties have a medium to high vulnerability index. Natural hazards would significantly impact coastal populations, especially in Coos County. Figure 1.3 provides a summary of Region 1's known social vulnerabilities.

Median incomes and education levels in the region are below the state average. The region also has the highest concentration of homeless families in Oregon.²⁰ The region has a higher percentage of residents with disabilities and residents over the age of 65 than the state average. Coos County is the 90th percentile in Oregon for share of these populations, which may account for its higher vulnerability index. Table 1.2 shows measures of social vulnerability.

Figure 1.3 Known Regional Vulnerabilities

- High percentage of tourists
- High percentage of individuals experiencing homelessness
- High percentage of seniors
- High percentage of people with disabilities
- Lack of vehicle access
- Median household income below state average
- Education levels below state averages

¹⁹ Caplan, Keyes, and Schloesser, *Oregon by the Numbers*.

²⁰ State Interagency Hazard Mitigation Team, *OR NHMP*.

Table 1.2 Social Vulnerability Measures for Coastal Oregon by County¹

	Clatsop	Tillamook	Lincoln	Coos	Curry	Lane (Coastal) ²	Douglas (Coastal) ²
Median household income	\$68,025	\$63,098	\$57,794	\$57,563	\$64,300	\$52,049	\$54,655
Households in financial hardship	41.9	46%	47.2%	45.8%	42.3%		
Child poverty	10.7%	17.0%	20.2%	24.6%	ID		
Unemployment	4.3%	4.4%	5.2%	5.3%	5.4%		
Food insecurity	10.9%	11.4%	12.5%	13.5%	12.2%		

Sources: 1. Oregon by the Numbers 2024; 2. Population research center for Florence and Reedsport; ID = insufficient data

Individual and community well-being can be influenced by various financial, social, and environmental factors. Table 1.3 details self-reported data from individuals in coastal counties.²¹ Research from The Ford Family Foundation in their annual Oregon by the Numbers Report shows that counties with lower rates of poverty, unemployment, disability, and mortality also report fewer (physically) unhealthy days. Their researchers also note that addressing mental health concerns requires access to care. Oregon’s coastal counties have a lower potential access to mental health care than the state average according to the Ford Family Foundation.

Table 1.3 Percent of Population Reporting Good Physical and Mental Well-Being in Coastal Oregon

	Good Physical Health ²	Good Mental Health ^{1, 2}
Oregon	60.1%	55.4%
Clatsop County	68.6%	53.8%
Tillamook County	60.8%	53.4%
Lincoln County	57.1%	54.6%
Coos County	54.3%	56.7%
Curry County	53.5%	61.6%
(Coastal) Lane County	57.9%	53.0%
(Coastal) Douglas County	58.0%	56.5%

Sources:

- https://visual-data.dhsoha.state.or.us/t/OHA/views/SHIPv2/dash35poormental-adultsSHIP?iframeSizedToWindow=true&%3Aembed=y&%3AshowAppBanner=false&%3Adisplay_count=no&%3AhowVizHome=no&%3Aorigin=viz_share_link&%3Atoolbar=no Workbook: SHIPv2
- 2022 Oregon by the Numbers Report, The Ford Family Foundation

²¹ Caplan, Keyes, and Schloesser, *Oregon by the Numbers*.

Economic and Livelihood Characteristics

Table 1.4 provides a high-level summary of the top employment industries in Coastal Oregon across the six counties. In 2018, the five major supersectors by share of employment in Region 1 were:

1. Leisure and Hospitality
2. Trade, Transportation, and Utilities
3. Local Government
4. Education and Health Services
5. Manufacturing²²

Compared to the United States as a whole, Region 1 is competitive in Fishing, Hunting and Trapping, Forestry and Logging, Wood Product Manufacturing, Accommodation, and Animal Production and Aquaculture.²³

²² State Interagency Hazard Mitigation Team, *OR NHMP*; U.S. Bureau of Labor Statistics, *Quarterly Census of Employment and Wages*, vols., December 20, 2019, Available: <https://www.bls.gov/cew/classifications/industry/industry-supersectors.htm>.

²³ State Interagency Hazard Mitigation Team, *OR NHMP*; U.S. Bureau of Labor Statistics, *QCEW*.

Table 1.4 Top Three Employment Industries for Coastal Oregon by County

	Clatsop	Tillamook	Lincoln	Coos	Curry	Lane (Coastal)	Douglas (Coastal)
1	Food services and drinking places	Food manufacturing	Food services and drinking places	Food services and drinking places	Food services and drinking places	Educational services	Wood product manufacturing
2	Accommodations	Food services and drinking places	Accommodations	Administrative and support services	Wood product manufacturing	Food services and drinking places	Food services and drinking places
3	Hospitals	Educational services	Educational services	Educational services	Ambulatory health care services	Ambulatory health care services	Educational services

Source: Oregon by the Numbers, 2024

Climate Projections

Oregon Climate Change Research Institute (OCCRI) projects that the six climate change impacts that will affect Coastal Oregon most are **ocean acidification, sea level rise, ocean warming, water security, wildfires, and population growth**. Data informing climate projections for the region are based on continuing current high-level emissions of greenhouse gases.²⁴

²⁴ Erica Fleishman and Oregon Climate Change Research Institute, *Sixth Oregon Climate Assessment*, vols. (Oregon State University, January 2023), Available: https://ir.library.oregonstate.edu/concern/technical_reports/gt54kw197.

POTENTIAL EFFECTS OF CLIMATE CHANGE ON OREGON'S COAST



SEA LEVEL RISE

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

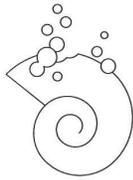
- Salt water intrusion
- Coastal flooding and erosion
- Less-efficient port operations
- Loss of cultural resources
- Changes in estuarine food web



WARMING OCEAN WATER

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



OCEAN ACIDIFICATION

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)



WILDFIRES

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



WATER SECURITY

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



POPULATION GROWTH

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.



blogs.oregonstate.edu/occri/

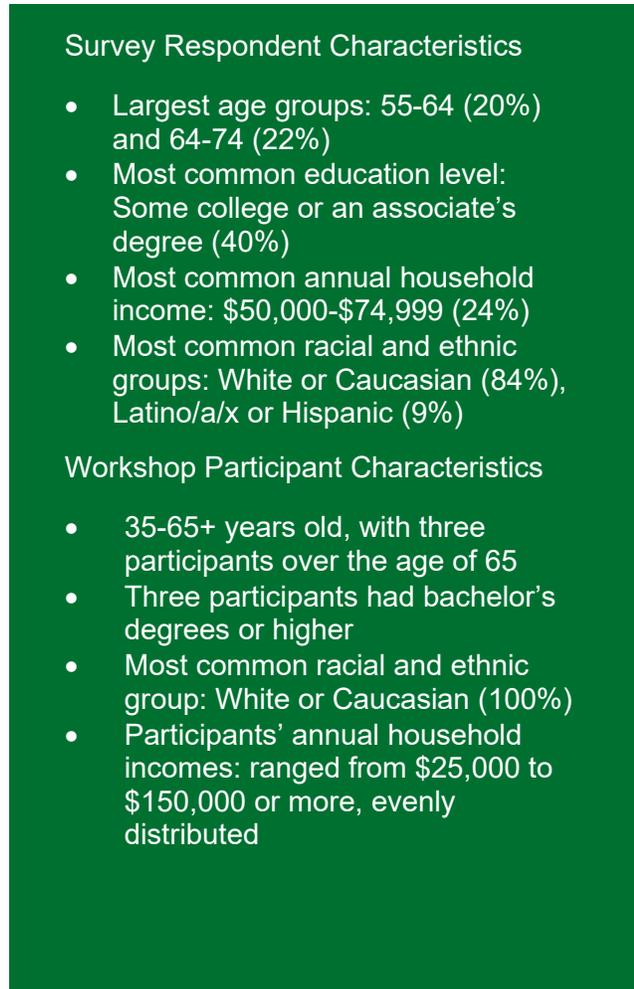
Findings

This section presents the key findings from review and synthesis of 105 survey responses from Coastal Oregon respondents and conversations with nine workshop participants who attended a regional workshop in Brookings, Oregon. These findings are supplemented by background research.

Figure 1.4 provides a detailed breakdown of respondent characteristics. Overall, survey respondent demographics were representative of the region in terms of age, race, income, and most education levels. Respondents who identified as White or Caucasian were underrepresented by about 10 percentage points, while multiracial survey respondents were underrepresented by about 5%. Respondents who have a professional or doctorate degree were overrepresented by about 15 percentage points ²⁵

Only five workshop participants provided demographic data. Overall, more workshop participants identified as older, White or Caucasian, and with higher educational attainment levels than the general population in Coastal Oregon. ²⁶

Figure 1.4 Coastal Oregon Respondent Characteristics



Community Values

Finding 1.1 Coastal residents value their unique access to the natural beauty of the Pacific Ocean coastline, especially the recreational activities it provides.

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

- Clatsop County Survey Respondent

Oregon public beaches provide ample opportunities for outdoor recreation. Workshop participants in Brookings, Oregon said access to beaches, trails, the ocean, and forests are important aspects of their community. Ten survey respondents wrote that they valued the

²⁵ Census Bureau and Social Explorer, "American Community Survey, 5-year (2017-2021)," Census, ACS 2021, Available: https://www.socialexplorer.com/tables/ACS2021_5yr.

²⁶ Ibid.

uniqueness of the ocean and beach in the region. Over 80% of survey respondents said they value the “Hiking, walking, or jogging” opportunities in the region. Nearly the same percentage value “Public land”, where, because of Oregon’s public beach law, residents and tourists alike can enjoy those activities.²⁷

Workshop participants and survey respondents also **value the opportunities right outside their doors to experience the unique regional nature**. Some participants noted how minimal human development and living in a small town means they can enjoy dark, clear skies at night and see wildlife from their windows. A survey respondent commented that “[o]ne thing I really value about my hometown is the peace and quiet. All I hear is crickets and frogs at night.” Seventy percent of Coastal Oregon survey respondents said they value “local plant and animal species”. Like workshop participants, three of these survey respondents wrote that they enjoyed watching birds and other wildlife. Workshop participants added that, in addition to wildlife watching, the coast’s biodiversity provides recreational opportunities for fishing, hunting, and outdoor photography.

Based on what participants and respondents reported related to the outdoors, they seem to **find inherent value in the natural environment around them**. They engage in recreational activities that allow them to simply witness the diversity and untamed beauty of the coastline.

²⁷ Tiffany Camhi, “How Oregonians came to own the state’s beaches” *OPB.*, 3 Jul. 2020, Available: <https://www.opb.org/news/article/history-oregon-tom-mccall-public-beaches/>.

Finding 1.2 The region relies on natural resources for key industries and subsistence activities.

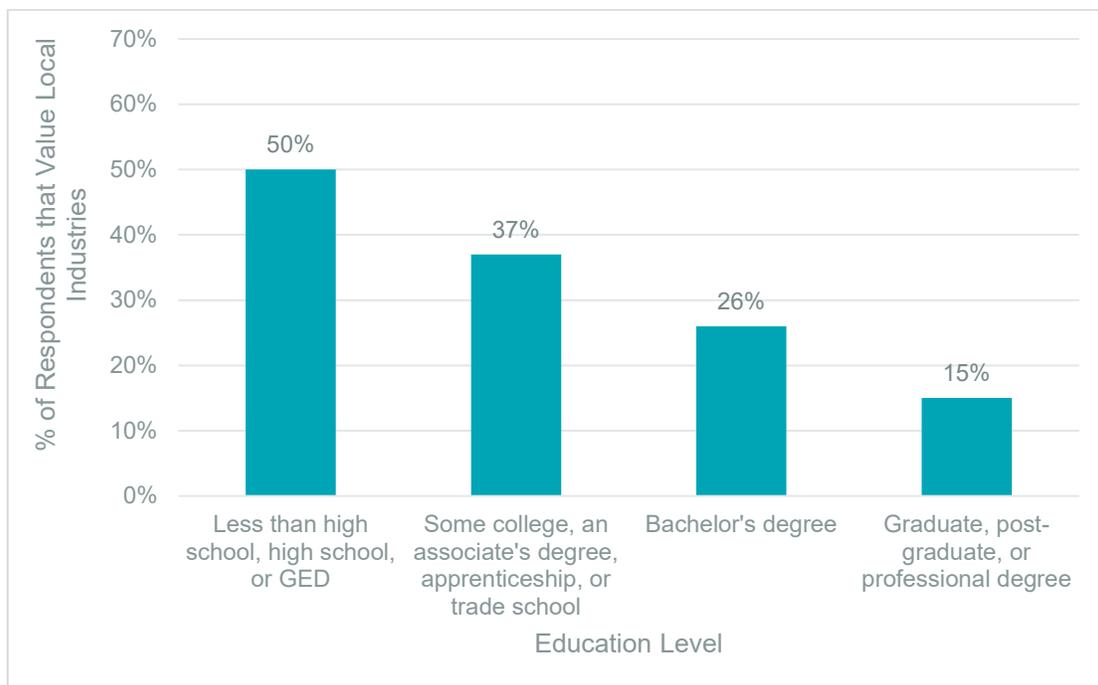
“Absolutely love the large tracts of undeveloped land. The estuaries and salt marshes are critical habitats that support commercially important species.”

- Lincoln County Survey Respondent

Workshop participants emphasized **how reliant the region is on natural resource-based industries**, such as fishing, timber, and tourism. Participants also identified the unique conditions in the “banana-belt” that makes agriculture in the area so productive. One survey respondent wrote that they love the abundance of locally owned farms in the area. Additionally, another respondent noted that healthy estuary and salt marshes support commercially important species. Survey respondents and workshop participants identified that fish in particular are critical to important local industries, like fishing and tourism. Fish also play an important cultural role, especially for Native communities. Both developed and undeveloped areas on the coast support an array of natural resource-based industries.

Although only 46% of survey respondents overall said that they valued “Local industries or markets”, Figure 1.5 shows the variation in this value based on educational attainment. At least 50% of respondents with high school degrees, GEDs, equivalents or lower value local industries or markets, but this rate steadily decrease in correlation with increasing education levels. These patterns suggest that **people with lower education levels may be more likely to work in or rely on regionally specific economies** and may be more likely to report a higher value for it.

Figure 1.5 Percentage of Survey Respondents Who Value Local Industries or Markets by Education Level



Coastal Oregon survey respondents also value access to a diverse range of food systems. About 60% of survey respondents valued “Hunting, fishing, or forging”, “Gardening”, “Farmers markets”, “Boat Marinas”, and “Access to food systems”. Boat marinas on the coast are an important part of fishing infrastructure. This common clustering suggests not only that respondents value diverse food sources and the infrastructure that supports them, but also that people’s livelihood may include sustenance activities on the coast.

Climate Change Impacts

Finding 1.3 Coastal communities worry about the impact of wildfire and air quality on recreation as well as the loss of property and heritage sites.

Coastal Oregonians worry about losing access to activities and culture from smoke and fire. Workshop participants viewed decreased air quality from wildfire smoke as a barrier to spending time outside in the natural areas without harming their physical health. They also expressed concern about potential wildfire damage or destruction of local historical sites, a local point of pride shared with the 54% of Coastal Oregon survey respondents who reported value for “Local history and heritage”.

Workshop participants talked about how **wildfires across the state could drive climate migration to Coastal Oregon.** They are concerned about the conflict between this **population growth in conjunction with property loss from coastal wildfires and an already strained housing market.** Although the fewest Coastal Oregon survey respondents indicated concern for population growth of all the region’s climate change projections, most are still concerned about this effect and possibly share workshop participants’ concerns over climate change limiting resources just as more people try to access them.

Both older and younger survey respondents appear more concerned about wildfire impacts than middle-aged respondents (Table 1.5). Workshop data did not provide insights into why or how age might affect these groups’ experiences with wildfires. However, people over the age of 65 are more vulnerable to health impacts from smoke.²⁸ Additionally, older coastal residents may rely more on or have more personal investment in the built environment likely to be impacted by wildfire, like transportation networks or property. Younger respondents (25-34 years) more commonly valued outdoor recreational activities than other age groups. While the correlation does not explain this connection, this age group could perceive wildfires as impacting their recreational choices more than other groups. Although concern about wildfire impacts is widespread, what drives those concerns may vary.

Table 1.5 Percentage of Survey Respondents Who Percieve Negative Impacts on Their Lives from Wildfire by Age

	Under 24	25-34	35-44	45-54	55-64	65-74	75 or older	Total % of Respondents
Strong or somewhat negative impact	70%	93%	88%	64%	68%	95%	75%	80%

²⁸ State Interagency Hazard Mitigation Team, *OR NHMP*.

Finding 1.4 Climate change impacts on the ocean and coastal river systems threaten Coastal Oregonians’ livelihoods and access to basic needs and resources.

“I’m retired now from the fishing business but still worry about sea warming and seems as though there are changes to our oceans which should be studied more.”

– Clatsop County Survey Respondent

Coastal Oregon faces unique climate projections, largely affecting the Pacific Ocean and other water sources. Most survey respondents (64% or more) are **concerned about impacts from all water-specific projections**. Over 70% are concerned about ocean acidification. Workshop participants stressed their concerns for clean water shortages.

Female-identifying survey respondents and respondents who identified as Latino/a/x demonstrated particular concern about water-specific climate projections. Forty percent more female-identifying respondents than male-identifying said that warming ocean water would have negative impact on their lives and values (Figure 1.6). Male-identifying respondents anticipated negative impacts from warming ocean water least commonly of any projection. In research on ocean acidification, gender, political ideology, and belief in climate change were the strongest predictors of concern. Study authors suggested this finding may be explained by gender differences in risk aversion.²⁹ Global researchers have also cautioned policy makers about a lack of recognition about women’s significant employment in fisheries, whether as fishermen or support staff, when considering impacts of climate change to fish and oceans.³⁰

Figure 1.6 Percentage of Survey Respondents Who Perceive Negative Impacts on Their Lives from Warming Ocean Water by Gender Identity

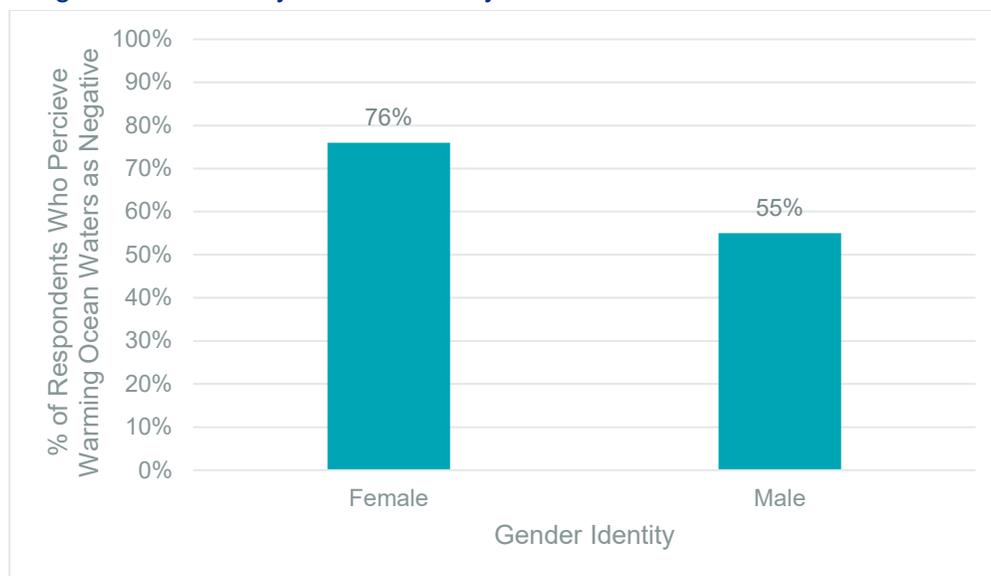


Table 1.6 shows that 67% of Latino/a/x respondents selected three water-specific climate change projections while only 56% selected wildfires. More conversations and research about

²⁹ Sandra L. Cooke and Sojung C. Kim, “Exploring the ‘Evil Twin of Global Warming’: Public Understanding of Ocean Acidification in the United States” *Science Communication*. 41.1 (2019): 66–89.

³⁰ Mayesha Alam et al., *Women and Climate Change. Impact and Agency in Human Rights, Security, and Economic Development*, vols. (Georgetown Institute for Women, Peace and Security, 2015).

how these groups may experience impacts from these climate projections could help inform appropriate support strategies.

Table 1.6 Percentage of Latino/a/x Respondents Who Perceive Negative Impacts on Their Lives by Climate Projections

	Sea Level Rise	Warming Ocean Water	Ocean Acidification	Wildfires	Water Security	Population Growth
Strong or somewhat negative impact	67%	67%	67%	56%	44%	67%

Finding 1.4.a Coastal Communities are concerned about the resilience of their livelihood systems.

“My people have been Hunters/Fishermen and harvesters for centuries. We rely on these things to put food in our stomachs. Negative changes in the environment will have a very negative impact on me.”

– Lincoln County Survey Respondent

Workshop participants expressed **concern about the effect temperature changes and warming water will have on natural resource-based industries**. Participants observed that rising water temperatures change the migration of fish and overall fish stock, causing cascading impacts on the movement of other wildlife (like seals and otters), the fishing industry, and the tourist economy.

Although drought is not included as a top six climate projection for this region, workshop participants expressed concern that drought would affect the timber industry and unique growing season of the banana-belt.

Survey respondents under 65 are 80% more concerned about impacts on jobs, sources of income, and access to services than respondents over 65. Coastal Oregon has higher unemployment rates than the statewide average³¹. Younger people are more likely actively seeking, or struggling to find, employment. These respondents, as well as the respondents with lower education levels as identified in Finding 1.1, may be more vulnerable to climate change impacts on jobs.

For some, **negative impacts on livelihood means disruptions to food sources, which carry cultural meaning**. These cultural impacts are especially significant for Coastal Tribes. Salmon is a sacred First Food, in particular to the Confederated Tribes of Coos, Lower Umpqua and Siuslaw, but is significant to many of the coastal Indigenous populations. The Confederated Tribes of Siletz Indians and the Confederated Tribes of Grand Ronde as well as the Confederated Tribes of Coos, Lower Umpqua and Siuslaw have continually worked to protect and restore waterways and fisheries threatened by U.S. infrastructure projects in the region.³²

Community Context:

³¹ State Interagency Hazard Mitigation Team, *Oregon’s Natural Hazards Mitigation Plan*, vols. (State of Oregon, September 24, 2020), Available: https://www.oregon.gov/lcd/NH/Documents/Approved_2020ORNHMP_00_Complete.pdf.

³² “A Brief History of the Coos, Lower Umpqua & Siuslaw Indians.”

Why are so many Coastal Oregonians worried about ocean acidification? Ocean acidification limits resources shellfish and other crustaceans use to build shells. In 2020, Oregon Live reported on a National Oceanic and Atmospheric Administration study that found for the first time that ocean acidification harms Dungeness crabs, Oregon's most commercially valuable shellfish. The article quotes Caren Braby, a marine program manager with the Oregon Department of Fish and Wildlife, saying, "almost all fisherman in Oregon have some connection to Dungeness crab. It's a powerhouse of economic value." Although our survey did not specifically capture why so many coastal respondents are concerned about ocean acidification, our findings support Braby's assertion that the livelihood ramifications may be widespread. Our data also reveals that around 20% more respondents with annual household incomes under \$25,000 are concerned about Ocean acidification than respondents in other income brackets.³³

Finding 1.4.b Water-specific climate change projections may threaten the built environment, including property and transportation networks that facilitate the flow of goods and services in the region.

"The working class and poor populations will need realistic options concerning how and where to live if climate change and sea level rise force us out of the coastal areas and cause us to lose assets."

– Clatsop County Survey Respondent

Workshop participants expressed concern that Brookings is **geographically isolated from aid in the case of disasters**. Seven Coastal Oregon survey respondents expressed concern over worsening flooding during storms from sea level rise and observed that increased wind intensity and flooding already brings down trees, threatening homes and **sometimes making Highway 101 impassible**. US-101 is one of the few transportation routes in and out of Brookings, and other coastal communities. The region also relies on freight and cargo rail lines to provide basic goods.³⁴ Workshop participants talked about the potential for food prices to increase because of these transit challenges and the potential need to rely on air or sea transport of goods. They fear clean water shortages without access to supply chains. Both workshop participants and survey respondents also **worry they will lose their homes to sea level rise**. One survey respondent wrote that they worry for family who lives very close to the ocean and wished for more defensive measures to protect homes.

Only 20% of survey respondents felt most concerned with the impacts on the built environment, but 35% prioritized the built environment for where they wanted to see climate change adaptation resource allocated (Figure 1.7). This difference may indicate that people believe even small impacts on the built environment could have large effects on their lives.

³³ Kale Williams | The Oregonian/OregonLive, "Ocean acidification is impacting Dungeness crabs, Oregon's most-valuable fishery, study shows" *oregonlive*. , 24 Jan. 2020, Available: <https://www.oregonlive.com/environment/2020/01/ocean-acidification-is-impacting-dungeness-crabs-oregons-most-valuable-fishery-study-shows.html>.

³⁴ State Interagency Hazard Mitigation Team, *OR NHMP*.

Figure 1.7 Percentage of Survey Respondents Who Feel Most Concerned for the Built Environment due to Climate Impacts vs. Who Want to Allocate Adaptation Resources

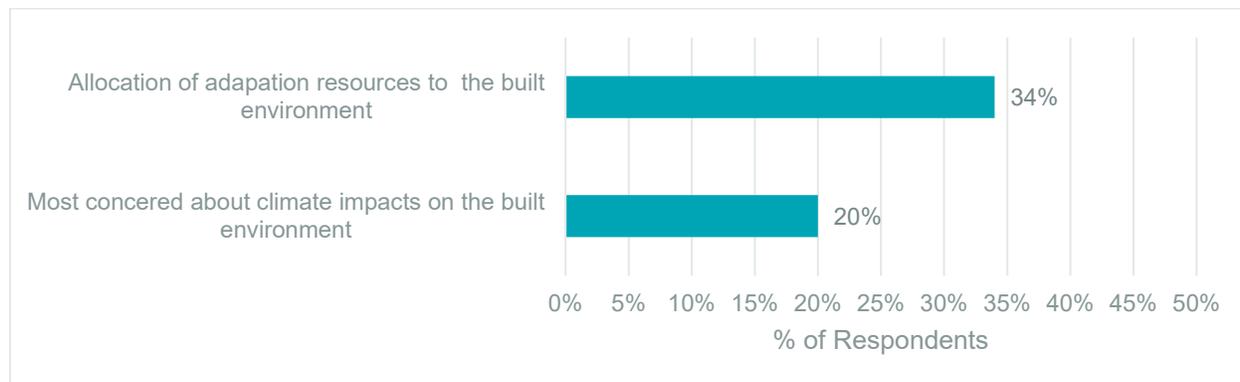


Table 1.7 shows Coastal Oregon survey respondents’ top three built environment values. Like workshop participants and survey respondents who provided write-in answers, Coastal Oregon survey respondents may want climate adaptation resources to protect their homes from sea level rise, flooding, and downed trees.

Table 1.7 Top “Built Environment” Values of Survey Respondents

Value	% of Respondents
Access and reliability of public utilities (power, water, sewer, trash, recycling, etc.)	62%
Residential areas or neighborhoods	54%
Boat launches or public marinas	52%

Community Solutions

In both the survey and workshop, Coastal Oregon residents discussed potential solutions to reduce climate change and its impact on their lives and communities. Since residents know their communities on a deeper level, we present the solutions they suggested to reduce vulnerabilities in their communities.

Figure 1.8 shows the categories of values that survey respondents were most concerned for in regard to climate change impacts versus the categories of values they thought should be prioritized for climate adaptation resources.

Figure 1.8 Percentage of Survey Respondents by Level of Concern Compared to Top Categories Respondents Prioritized for Allocation of Adaptation Resources

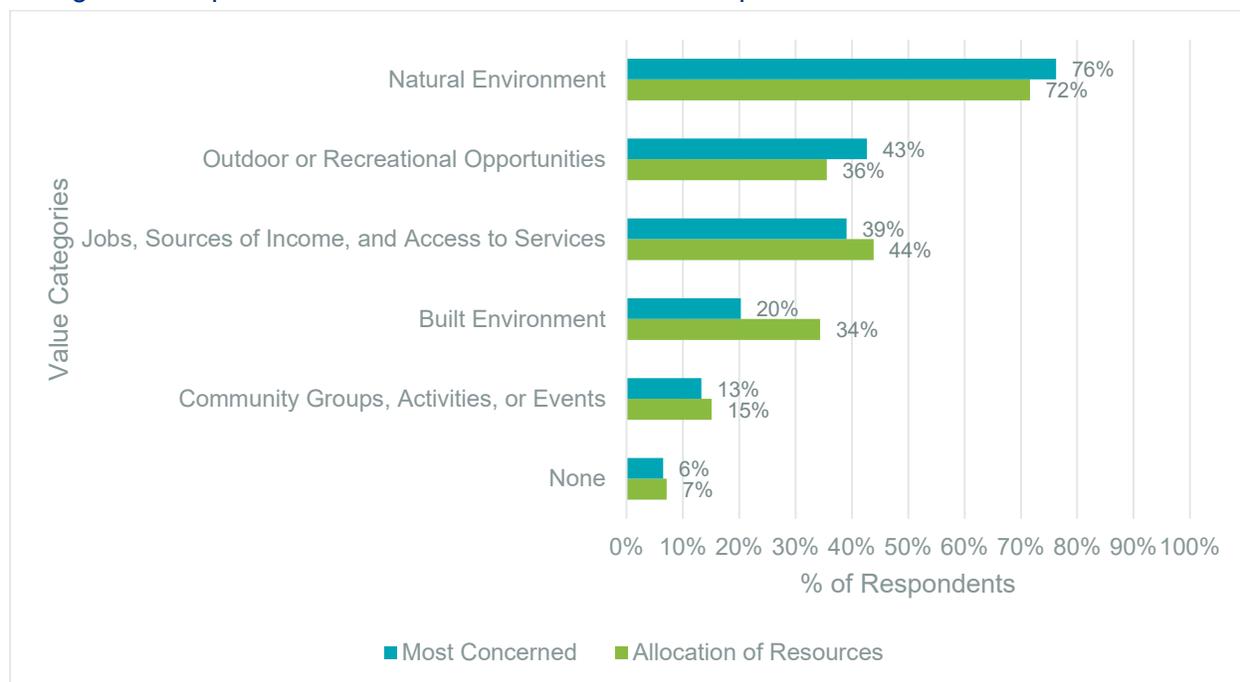


Table 1.8 shows that the top three categories of concern are Natural Environment, Outdoor or Recreational Opportunities, and Jobs, Sources of Income, and Access to Services.

Table 1.8 Frequently Chosen Values in Top Three Categories Survey Respondents Prioritized for Adaptation Resources

	% of Respondents
Natural Environment	
Clean Water	87%
Clean Air	86%
Public Lands	80%
Jobs, Sources of Income, Access to Services	
Access to Food Systems	62%
Small Business Support	45%
Local Industries and Markets	35%
Outdoor or Recreational Opportunities	
Walking, hiking, or running	82%
Hunting, fishing, or foraging	62%
Gardening	62%

Policy, Investment, and Leadership

Coastal Oregonians want the Oregon Legislature to **“take immediate actions”** to stop the causes and consequences of climate change and to **“think outside the box”**. Possible actions survey respondents and workshop participants suggested were:

- Funding more resources to address climate change (5 respondents).

- Making investments in new job-creating resource development in the area, like wind and solar energy (3 respondents).
- Providing local watersheds with greater management power (1 respondent).
- Enforcing taxes on wealthy households to fund social programs (1 respondent).
- Strong new laws that force companies to decrease their carbon (1 respondent).

Conversely, some Coastal Oregon residents do not want the government to act on climate change. Two respondents do not trust state government to effectively spend tax-payer money, while another four feel that we “**can’t control what the Earth does**”.

Education and Planning

Two survey respondents advocated for more **climate change research and public education**. Three survey respondents wanted more **conservation efforts that would limit development**.

Finally, several respondents are concerned about disaster planning and response. One asks for better ways to access information during a natural disaster. Another would like to see defensive measures to protect homes near the ocean. And a third wants “**realistic options**” for the **working class and low-income households** if sea level rise forces people to move or causes loss of financial assets.

Conclusion

This regional report concludes with a high-level summary of key findings related to Coastal Oregon community values and how they perceive they will be impacted by climate change. Each finding is broken down into how it relates to social aspects of vulnerability, including physical, emotional, social, and economic.

Coastal Oregonians derive joy as well as resources from the ocean, beaches, and wildlife, and forests around them (Table 1.9):

Table 1.9 Summary of Coastal Oregon Values

Finding 1.1 Coastal residents value their unique access to the natural beauty of the Pacific Ocean coastline, especially the recreational activities it provides.				
	Physical	Emotional	Social	Economic
Access to nature	Public land; Beaches, trails, ocean, forests; Minimal development allows for dark skies and wildlife viewing	Find inherent value in the natural environment		

Opportunities for outdoor recreation	Public land; Beaches, trails, ocean, forests; Ideal conditions for fishing, hunting, and outdoor photography		Important aspects of the community	
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Finding 1.2 The region relies on natural resources for key industries and subsistence activities.

	Physical	Emotional	Social	Economic
Reliant on natural resource-based industries	Healthy estuary and salt marshes support commercially important species		Fish have role in culture, especially for Native communities	Fishing, timber, tourism, agriculture (banana-belt)
Subsistence activities	Diverse range of food systems and the infrastructure that supports them (e.g. boat marinas)			People's livelihoods may include sustenance activities on the coast

They worry that climate change impacts, especially from wildfire and water-specific projections, will reduce their ability to live in this region. They feel that climate change will negatively affect them in the following ways (Table 1.10):

Table 1.10 Summary of Climate Impacts in Coastal Oregon

Finding 1.3 Coastal communities worry about the impact of wildfire and air quality on recreation as well as the loss of property and heritage sites.				
	Physical	Emotional	Social	Economic
Decreased air quality	Harms physical health	Indoor isolation harms mental health	Inability to gather outdoors	
Damage to heritage sites		Lose local points of pride	Lose local points of pride	Reduced tourism
Population growth			Tension over scarce resources	Scarcity of resources like housing
Property loss		Stress of loss		Cost of loss

Finding 1.4 Climate change impacts on the ocean and coastal river systems threaten Coastal Oregonian's livelihoods and access to basic needs and resources.

	Physical	Emotional	Social	Economic
Negative impacts on natural resource-based economy/jobs		Stress of job insecurity/loss	More people needing financial support	Warmer water hurts fishing, tourism; Drought hurts timber, agriculture
Disruption to cultural food sources		Stress of losing way of life	Loss of way of life	
Threat to emergency transportation infrastructure	Isolated from emergency aid if HWY 101 impassable	Stress of pending natural disasters	Inability to evacuate if HWY 101 impassable	
Threat to supply chains	Inability to access food and water			Increased food prices
Threat to homes	Possibility of losing shelter	Stress of losing shelter		Cost of losing shelter and defensive measures

Chapter 2 – Northern Willamette Valley



Sources courtesy of Adobe Stock Photos. Wasim (left) R Ressler (right)

Background

This section provides a summary of existing community characteristics for the Northern Willamette Valley / Portland Metro region. We drew from existing state planning documents, such as the Oregon Natural Hazards Mitigation Plan, and other background research materials to provide a high-level overview of environmental, demographic, and economic conditions in the region. This section concludes with an overview of climate projections for Southeastern Oregon and known social vulnerabilities to the communities within the Oregon Department of Emergency Management, Mitigation Region 2.

Environmental Characteristics

The Northern Willamette Valley Region begins at the Cascade Mountain Range in the east and extends west through the Willamette Valley and into the Coast Range and southward from the Columbia River in the north to the Mid-Willamette Valley. Two rivers shape the region's main watersheds, the Columbia River and the Willamette River. The region has a mild climate, long growing season, and abundant moisture. Precipitation occurs in the winter months, falling as rain in the valley but building snowpack in the mid-elevations of the Cascade foothills.³⁵

Geographically, the region is composed of three ecoregions: the Coast Range, the Willamette Valley and the Cascades. In the Cascades, the soil is volcanic and supports Douglas fir forests and cold-water salmonids. The key sources of water include streams, lakes, reservoirs, rivers, and glacial lakes. The Willamette Valley has terraces and floodplains dotted with scattered hills, buttes and foothills. The fertile soil and temperate climate make this ecoregion the most important for agricultural areas.³⁶ The valley has made urban and suburban development possible with the flat terraces. The Coastal range considered in this region includes the east slope the range. Figure 2.1 describes more environmental characteristics of the region.

³⁵ State Interagency Hazard Mitigation Team, *Oregon's Natural Hazards Mitigation Plan*, vols. (State of Oregon, September 24, 2020), Available: https://www.oregon.gov/lcd/NH/Documents/Approved_2020ORNHMP_00_Complete.pdf.

³⁶ Ibid.

Figure 2.9. Major Landmarks and Land Type of the Northern Willamette Valley by County

Source: Oregon by the Number, 2022



Community Characteristics

The Northern Willamette Valley area hosts a population of nearly two million people across 3,800 square miles.³⁷ The region experienced growth at a faster rate than the state as a whole between 2010 and 2018. Washington County grew the fastest through natural increase and net in-migration. Washington and Clackamas Counties are expected to experience more growth in the next decade. Table 2.1. provides more detail of population characteristics by county.

³⁷ Shannon Caplan, David Keyes, and Elissa Schloesser, *Oregon by the Numbers*, vols. (The Ford Family Foundation and Oregon State University Extension Service, August 2022), Available: https://www.tfff.org/wp-content/uploads/OBTN_2022_101022-Digital.pdf.

Table 2.11. Population Characteristics for Northern Willamette Valley / Portland Metro by County

	Clackamas County	Columbia County	Multnomah County	Washington County	Region 2
Total Population	420,925	52,865	808,098	599,541	1,881,429
Total land area (mi²)	1,883	689	465	727	3,764
Population Density (people/mi²)	224	77	1,737	825	500
Net migration, 2020-2022 per 1,000 population]	22.3	15.1	-8.3	7.3	9.1

Source: Oregon by the Numbers, 2024

Federally Recognized Tribes

Figure 2.2 displays the locations of the nine federally recognized tribes in Oregon. Five of the nine tribes have tribal service areas that overlap with the Northern Willamette Valley region. These include:

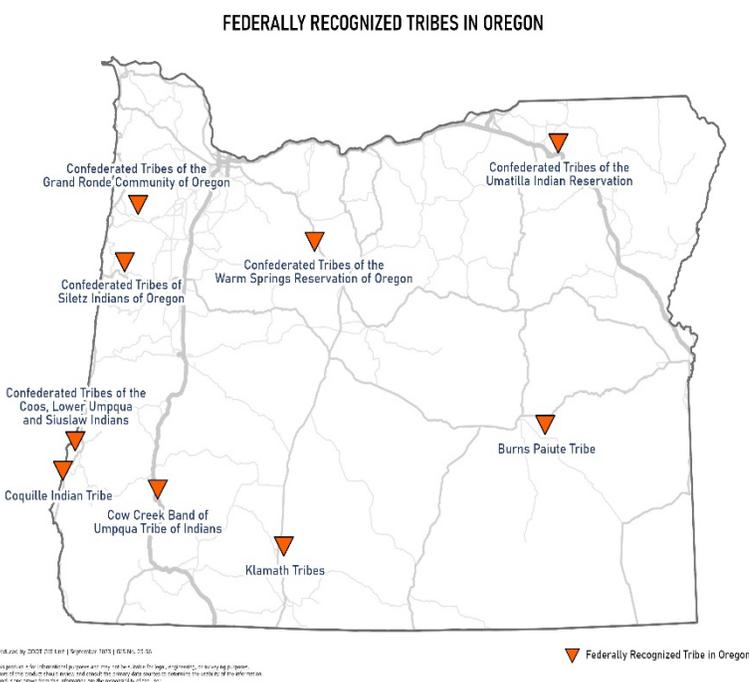
- Confederated Tribes of Siletz
- Confederated Tribes of Warm Springs
- Confederated Tribes of Grande Ronde

Additional information on Oregon Tribes can be found in Part II, Appendix A.

Race and Ethnicity

The Northern Willamette Valley has an above state average population of Asian, Hispanic/Latino, Black/African American, and two or more races identifying community members, especially in Washington and Multnomah Counties.³⁸

Figure 2.10 Oregon's Federally Recognized Tribes



Source: Oregon Department of Transportation

³⁸ Caplan, Keyes, and Schloesser, *Oregon by the Numbers*.

Social Vulnerability

The physical, mental, and financial well-being of specific population groups in the Northern Willamette Valley region are already vulnerable to unanticipated events and natural hazards. These groups are likely to experience disproportionate impacts from climate-related hazards and events. According to the CDC Social Vulnerability Index, Multnomah County is the most vulnerable county in the region, with a moderate social vulnerability score, compared to Washington and Columbia counties with a low score.³⁹ Figure 2.3 provides a high-level summary of Region 2's known social vulnerabilities.

Figure 2.11 Known Regional Vulnerabilities

- High percentage of tourists
- High percentage of people with disabilities
- High percentage of individuals experiencing homelessness
- High number of renters
- High percentage of individuals who do not speak English well

The social vulnerability of this region is driven by high numbers of disabled individuals in Multnomah County, a dramatic increase in the homeless population in Clackamas County, and higher numbers of renters and individuals who do not speak English very well in Multnomah and Washington Counties.⁴⁰ Low-income and high poverty rates in Columbia County make the area vulnerable to economic hardship that can follow a hazard event. The region hosts many tourists, making climate hazard communications challenging. Figure 2.3 shows a summary of known regional vulnerabilities. Other household vulnerabilities can be found in Table 2.2.

³⁹ State Interagency Hazard Mitigation Team, *OR NHMP*.

⁴⁰ *Ibid.*

Table 2.12. Social Vulnerability Measures for Northern Willamette Valley / Portland Metro by County

	Clackamas County	Columbia County	Multnomah County	Washington County
Median household income	\$95,740	\$83,265	\$83,668	\$100,121
Households in financial hardship	42%	45%	47%	41%
Child poverty	7.1%	10.3%	14.1%	9.3%
Unemployment	3.8%	4.8%	3.9%	3.5%
Food insecurity	7.4%	9.4%	10.1%	7.4%

Source: Oregon by the Numbers, 2024

Individual and community well-being can be influenced by various financial, social, and environmental factors. Table 2.3 details self-reported data from individuals in Northern Willamette Valley counties.⁴¹ Research from The Ford Family Foundation in their annual Oregon By the Numbers Report shows that counties with lower rates of poverty, unemployment, disability, and mortality also report fewer (physically) unhealthy days. Their researchers also note that addressing low mental health should consider access to care.

Table 2.13 Percent of Population Reporting Good Physical and Mental Well-Being in Northern Willamette Valley

	Good Physical Health	Good Mental Health
Oregon	60.1%	57.3%
Clackamas County	61.4%	58.8%
Columbia County	58.9%	56.9%
Multnomah County	58.4%	53.8%
Washington County	63.9%	62.2%

Source: 2022 Oregon by the Numbers Report, The Ford Family Foundation

⁴¹ Caplan, Keyes, Porter, and Schloesser, *Oregon by the Numbers*.

Economic and Livelihood Characteristics

The Northern Willamette Valley region has the Portland International Airport, which is key to the statewide economy.⁴² The region is vulnerable to disruptions in airport service that can impact the transport of people, goods, and emergency services.⁴³ The region has eight power-generating facilities and many dams — including Bonneville Power Administration’s main dam, the Bonneville Dam. Additionally, it is the site of Oregon’s Critical Energy Infrastructure Hub.⁴⁴

Table 2.2 provides a high-level summary of the top employment industries in the Northern Willamette Valley / Portland Metro Region across the four counties. In 2018, the five major supersectors by share of employment in Region 5 were:

1. Trade, Transportation, and Utilities
2. Professional and Business Services
3. Education and Health Services
4. Manufacturing
5. Leisure and Hospitality⁴⁵

Table 2.14. Top Three Employment Industries for Northern Willamette Valley / Portland Metro by County

	Clackamas County	Columbia County	Multnomah County	Washington County
1	Food services and drinking places	Food services and drinking places	Educational Services	Computer and electronic product manufacturing
2	Professional and technical services	Educational services	Professional and technical services	Administrative and support services
3	Administrative and support services	Social assistance	Food services and drinking places	Food services and drinking places

Source: Oregon by the Numbers, 2024

Climate Projections

Oregon Climate Change Research Institute (OCCRI) projects that the six climate change impacts that will affect the Northern Willamette Valley most are **drought, wildfire, flooding, landslides, and extreme heat**.⁴⁶ Data informing climate projections for the region are based on continuing current high-level emissions of greenhouse gases.⁴⁷

⁴² State Interagency Hazard Mitigation Team, *OR NHMP*.

⁴³ *Ibid.*

⁴⁴ *Ibid.*

⁴⁵ *Ibid.*; U.S. Bureau of Labor Statistics, *Quarterly Census of Employment and Wages*, vols., December 20, 2019, Available: <https://www.bls.gov/cew/classifications/industry/industry-supersectors.htm>.

⁴⁶ Erica Fleishman and Oregon Climate Change Research Institute, *Sixth Oregon Climate Assessment*, vols. (Oregon State University, January 2023), Available: https://ir.library.oregonstate.edu/concern/technical_reports/gt54kw197.

⁴⁷ Erica Fleishman and Oregon Climate Change Research Institute, *Sixth Oregon Climate Assessment*, vols. (Oregon State University, January 2023), Available: https://ir.library.oregonstate.edu/concern/technical_reports/gt54kw197.



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



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



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



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



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



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.



blogs.oregonstate.edu/occri/

Findings

This section presents the key findings that emerged from review and synthesis of 78 survey responses from the Northern Willamette Valley region of Oregon and four workshop participants who attended a regional workshop in Pendleton, Oregon. These findings are supplemented by background research where appropriate. Figure 2.4 provides a detailed background of respondent characteristics.

Overall, more survey respondents identified as older, White or Caucasian, having higher educational attainment, and lower household incomes than the general region overall. People under 18 were underrepresented by about 20 percentage points. Additionally, people with household income over \$150,000 were underrepresented by about 14 percentage points. All non-white identities were underrepresented, except for people who identified as American Indian and Alaska Native. Respondents who have a post-graduate or professional degree were overrepresented by about 10 percentage points.⁴⁸

Only four workshop participants provided demographic data. Overall, more workshop participants identified as older, White or Caucasian, and with higher annual household incomes and educational attainment levels than the general population in the region.⁴⁹

Community Values

Finding 2.1 The health of the natural environment reflects the health of the community.

More than 80% of survey respondents for this region were concerned about the natural environment (Figure 2.5). The following areas of concern including outdoor/recreational opportunities, jobs, sources of income, and access to service, and community fell at least 40 percentage points below concern for the natural environment. The survey respondents in this region most valued the natural environment. Workshop participants expressed that the natural environment supports other identified values.

Figure 2.12 Northern Willamette Valley Respondent Characteristics

Survey Respondent Characteristics

- Largest age groups: 25-34 (21%) and 55-64 (19%)
- Most common education level: Graduate, post-graduate, or professional degree (27%), and some college or an associate's degree (27%)
- Most common annual household income: \$50,000-\$74,999 (25%)
- Most common racial and ethnic groups: White or Caucasian (80%) and Latino/a/x (9%)

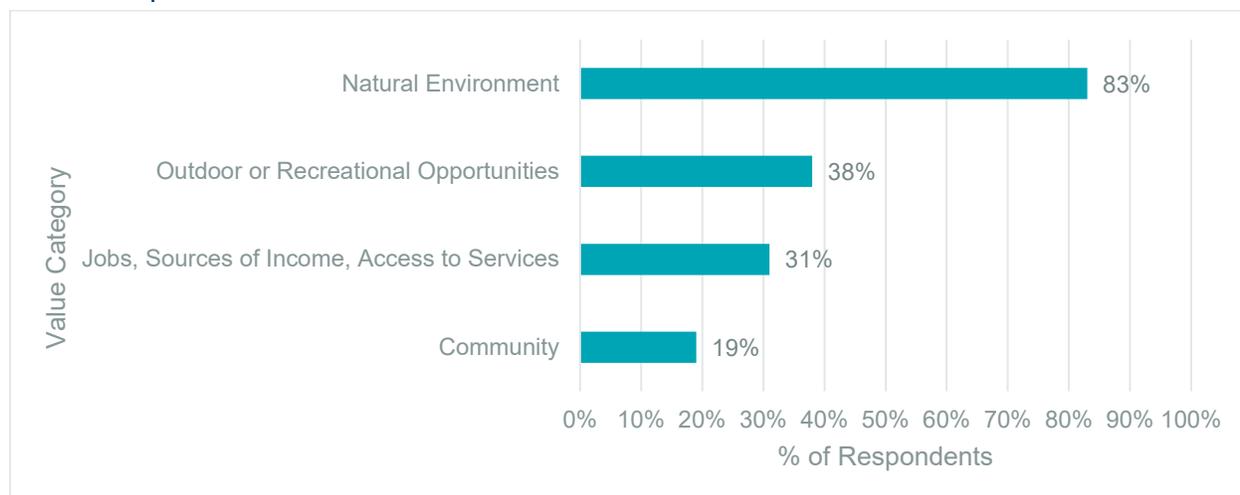
Workshop Participant Characteristics

- 45-64 years old
- Most common education level: bachelor's degree or higher (100%)
- Most common racial and ethnic group: White or Caucasian (100%)
- Annual household income levels were distributed between \$50,000 and

⁴⁸ Census Bureau and Social Explorer, "American Community Survey, 5-year (2017-2021)," Census, ACS 2021, Available: https://www.socialexplorer.com/tables/ACS2021_5yr.

⁴⁹ Ibid.

Figure 2.13 Top Value Categories Survey Respondents Feel Most Concerned for Due to Climate Impacts



Finding 2.1.a A healthy natural environment represents clean water and food, which participants identified as basic necessities.

“To have a healthy community we need to have a healthy environment. I feel fortunate that we have access to good water where I live at this time.”

-Multnomah County Survey Respondent

When asked specifically what survey respondents **value in the natural environment**, clean water, clean air, and public lands are the top three responses. Portland area workshop participants value how these elements of the natural environment, like “fresh food and clean water” help meet basic needs. The survey and workshop respondents of this region identify with the natural environment as an indicator of their health, wellbeing, and livelihood. The residents of this region **realize the importance of a healthy natural environment as it impacts the social and physical health** of the people who depend on its clean resources. A workshop participant wrote, “meeting basic needs is the first criteria to a healthy and secured community.”

Finding 2.1.b People in the Northern Willamette Valley greatly value the region’s outdoor opportunities.

The natural features of this region provide a great setting for outdoor recreation.

Participants identified access to nature and outdoors as a strong value. Survey respondents identified popular activities in this region, including:

- Walking, hiking or running (80%)
- Barbecues, picnics, or outdoor dining (70%)
- Gardening (65%)

One workshop participant noted, “fewer outdoor recreation opportunities might impose changes on urban lifestyle.” The natural environment provides a setting for outdoor activities where individuals and community members enjoy time together. **Loss of outdoor recreation will have a negative impact on the region’s wellbeing.** Workshop participants raised concern for youth in a future with less outdoor access.

Finding 2.1.c The natural environment provides jobs, sources of income, and access to services.

“We need to keep the natural environment clean and healthy for people to be able to work and take care of their families.” – Columbia County Survey Respondent

Survey respondents most commonly valued the following elements related to jobs, sources of income or access to services:

- Access to food or food systems (60%)
- Living wage jobs or job opportunities (50%)
- Small business support (50%)

Finding 2.1.c echoes Finding 2.1.a in the **importance of secure food systems** in this region. Workshop participants were concerned for outdoor workers who support these food systems, such as “farmers in America and all over the world [who] will be unable to provide the food we need to survive as a species.” Survey respondents commonly valued farmer’s markets and local fairs in this region as a source for local economy as well as a source for local services.

Finding 2.2 The community needs reliable physical, social, and economic infrastructure to thrive.

“[I value] living in a community that cares about local businesses and the town’s livability.” - Columbia County Survey Respondent

Survey respondents most commonly valued the following elements related to the built environment:

- Access and Reliability of Public Utilities (75%)
- Residential Areas or Neighborhoods (60%)
- Public or Community Gathering Spaces (55%)

The respondents in this region **rely on the built environment to access the natural environment, jobs, and recreational opportunities**. While Finding 2.1 shows that respondents in the region value the natural environment, respondents also value the region’s infrastructure and built environment.

Finding 2.2.a Physical infrastructure is necessary for public safety.

“[We should allocate resources to] infrastructures such as electricity and roads.” Portland-area Workshop Participants

Workshop participants and survey respondents consider infrastructure an essential community value. The basic necessities identified in Finding 2.1 such as **clean air and clean water will be less accessible with vulnerable water systems**. The region’s older centralized water infrastructure is vulnerable to flooding and pollution.⁵⁰ In case of emergencies, workshop participants want access public services (e.g., busses, trains) and physical infrastructure (e.g., road, tracks) to move around. Natural hazards and emergency events can further disrupt automobile traffic, create gridlock, and shut down local transit systems, making evacuations and other emergency operations difficult.⁵¹

⁵⁰ State Interagency Hazard Mitigation Team, *OR NHMP*.

⁵¹ *Ibid.*

Finding 2.2.b The community needs social infrastructure to thrive.

“Washington County has a large variety of demographic groups that creates a rich cultural environment.” – Washington County Survey Respondent

Workshop participants and survey respondents emphasized regional values of art, music, culture and history. The **social infrastructure** is not only bolstered by the natural environment (Finding 2.1.b), but also **created and enjoyed by community members themselves**. Survey respondents value social gathering places such as the Killin Wetlands Metro Park and Tillamook Forestry Center to visit with family and friends. They also value homes and neighborhoods. Workshop participants value the ability to build community trust within residential areas where people feel the most secure.

Community based organizations and nonprofit organizations are essential parts of the social infrastructure, as they provide access to resources. One survey respondent wanted locally based nonprofits on the frontline of the climate crisis to have more state resources to lead community climate adaptation work.

Finding 2.2.c The community relies on stable economic infrastructure.

“[I value] affordable energy & utilities.” – Washington County Survey Respondents

This region accounts for approximately half of all employment in the state.⁵² The infrastructure associated with power generation and transmission plays a critical role in supporting the regional economy.⁵³ Impacts to power generation infrastructure within the Northern Willamette Valley will have impacts not just statewide but across the Pacific Northwest. These disruptions would have cascading impacts to the well-being and livelihoods for communities in Oregon, Washington, Idaho, Western Montana, and parts of California, Nevada, Utah, and Wyoming. Nearly 3 million people and 1.2 million jobs depend on the Bonneville Power Administration, a hydropower energy producer in the Columbia River Basin.⁵⁴

Workshop respondents **valued affordability of various resources**, like food, water, housing, and energy, and **recognized the hardships of those who have little to no income**. Income loss and inaccessible public services will **compound vulnerability** following a disaster for low-income community members. As one workshop participant noted, “we need MORE efficient low-income housing with AC and good heating. I worry that Max trains won’t be able to run in extreme weather.” The disruption of the economic infrastructure will affect the community’s wellbeing and livelihoods.

Climate Change Impacts

Finding 2.3 Wildfires, Poor Air Quality, and Extreme Heat have a strong negative impact on the wellbeing of the community.

“We live in the forest near Oxbow Park. We feel very threatened by the fire risk in late summer when the red cedars are turning brown around us. Living in the forest is no longer a safe environment.” – Multnomah County Survey Respondent

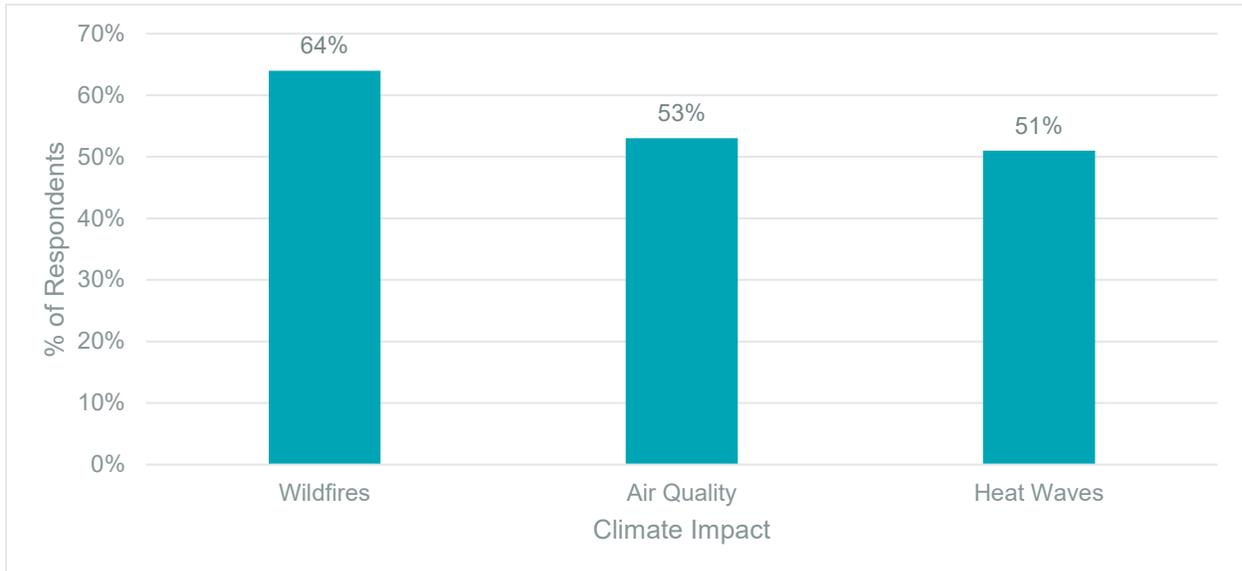
⁵² Ibid.

⁵³ Ibid.

⁵⁴ “About” *Bonneville Power Administration*. , 18 May 2023, Available: <https://www.bpa.gov/about>.

As shown in Figure 2.6, most survey respondents agree that wildfires would have a strong negative impact on their lives and values. Wildfires can have detrimental effects on the natural environment, and therefore on the community’s values as well (Finding 2.1). In this region, communities in the wildland-urban interface are highly vulnerable to wildfire.⁵⁵ The community’s access to the outdoors and public services is at risk by wildfires and the smoke produced by the fires.

Figure 2.14. Most Common Climate Impacts Survey Respondents Precieve to Have a Strong Negative Impact on Their Lives



Finding 2.3.a Community members are concerned about the risk that wildfires pose to housing.

“I value decent shelter for all and worry about the houseless.”

Multnomah County Survey respondent

Wildfire is defined as an uncontrolled burning of forest, brush, or grassland. Fire return intervals are long in this region, but due to the high amount of vegetation and wind, when a fire does go though, it can be very large and damaging. Areas in this region are experiencing more risk due to the current trend toward rural home site development.⁵⁶ **Housing is a strong value for this community. Homeowner and renters alike are at risk** of losing their homes to wildfires. The houseless will need emergency shelters to seek refuge from climate hazards. Disasters that result in damage to the built environment can stress temporary shelters, a vital service for many people experiencing homelessness.⁵⁷

Finding 2.3.b. Wildfire, poor air quality, and extreme heat affects the community’s health.

“Heat, fires, and poor air quality have significant mental and physical health concerns at the individual, household, and public levels.” - Pendleton Workshop Participant (Northern Willamette Resident)

⁵⁵ State Interagency Hazard Mitigation Team, *OR NHMP*.

⁵⁶ *Ibid.*

⁵⁷ *Ibid.*

The Oregon Climate Change Institute (OCCRI) projected higher concentrations of pollen and fine particulate matter from wildfire smoke in this region.⁵⁸ Wildfire smoke can cause adverse public health effects and impact the physical and mental health of the community. Workshop participants reflected on how **the health of air, water, and food are all tied together, especially during fire season.**

Increased particulate matter in the air will lower solar radiation and constrain crop growth, therefore, impacting the community's ability to grow food and have sustainable energy.⁵⁹ Wildfires directly impact the values mentioned in Key Findings 1 and 2. As mentioned in the Finding 3b., workshop participants were concerned for the houseless, echoing the **importance to plan for episodic natural hazards as well as chronic events.** For example, year-around access to shelter is becoming increasingly important as wildfire smoke becomes more common across the state.⁶⁰

Most young adults (25-34 years old) who took the survey perceived air quality as having a strong negative impact. Other survey respondents wrote-in their concern for the **"the kids stuck inside"**. Parents, in particular, may worry for their kids and their health as they imagine a future with more smoke and less recreation.

Portland has an average of around 10 days above 90° Fahrenheit, and the frequency of prolonged periods of high temperatures is expected to increase in this region.⁶¹ More than half of survey respondents perceive extreme heat to have a strong negative impact on their lives. Most older adults (45-74 years old) perceive heat waves will have a strong negative impact on their lives. An **older population requires special consideration** due to sensitivity to heat and cold, reliance upon transportation to obtain medication, and comparative difficulty in making home modifications that reduce risk to hazards.⁶²

Community Solutions

"I value prioritizing vulnerable populations and assets when creating adaptation measures but we need to ensure that these measures work in the long-term and don't put a band aid on the problem." – Multnomah County Survey Respondent

For both the survey and workshop, the residents of the Northern Willamette Valley and Portland Metro discussed some potential solutions to reduce the impact of climate change on their lives and communities. It is important to consider the type of solutions that respondents discussed, as residents of these communities are deeply connected to their own values and concerned by the ways in which climate change is affecting them.

Local Engagement

Respondents **would like to see reliable organizations lead climate adaptation efforts** (Finding 2.2.b). One workshop respondent wrote, "please support mutual aid organizations so that organizing and direct aid can mitigate and supplement the shortages and gaps brought on by climate catastrophe."

⁵⁸ Fleishman and Oregon Climate Change Research Institute, *Sixth Oregon Climate Assessment*.

⁵⁹ Oregon Climate Change Research Institute, *Oregon Climate Assessments*, vols., n.d., Available: <https://blogs.oregonstate.edu/occric/oregon-climate-assessments/>.

⁶⁰ State Interagency Hazard Mitigation Team, *OR NHMP*.

⁶¹ *Ibid.*

⁶² *Ibid.*

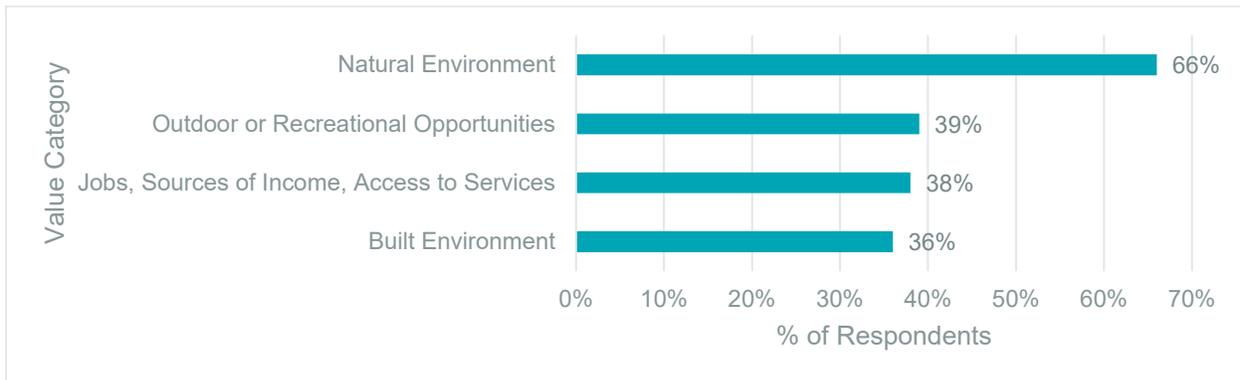
Vulnerable Populations

As seen in Finding 2.2.c, respondents understand the negative impact of climate change on all individuals and that there is **“greater negative impact on most vulnerable people: lower income, medically compromised, and poorly educated.”** As mentioned in Finding 2.3.a, housing and shelter are important values in this region. Respondents voiced concern for people in need of emergency shelters.

Natural Environment

Respondents of this region **recognize the need to protect the natural environment to protect the systems that sustain the community: air, water, and food systems** (Figure 2.7).

Figure 2.15 Top Value Categories Survey Respondents Want to Allocate Adaptation Resources To



Conclusion

The adaptation process will be better informed with a greater understanding of the impacts of climate change within the context of local values and vulnerabilities. Below the community values and climate impacts are described through physical, emotional, social, and/or economic harms to aid the State of Oregon with the allocation of resources.

Respondents from the North Willamette Valley region value their natural environment and the physical, social, and economic infrastructure that make their quality of life possible (Table 2.6):

Table 2.15 Summary of Northern Willamette Valley Values

Finding 2.1 The health of the natural environment reflects the health of the community.				
	Physical	Emotional	Social	Economic
Nature fulfills basic needs	Clean water, clean air, public lands, fresh food is good for health		Clean water, clean air, public lands, fresh food is good for social health	
Nature provides opportunities for outdoor recreation	Natural environment supports outdoor activities; Outdoor recreation is important for children's development		Setting for community members to enjoy time together	
Nature provides jobs, sources of income, access to services				Importance of secure food systems; Importance of farmer's markets and local fairs to economy

Finding 2.2 The community needs reliable physical, social, and economic infrastructure to thrive.

	Physical	Emotional	Social	Economic
Physical infrastructure	Provide access to basic needs, including clean air, clean water, and public services, especially in emergencies			
Social infrastructure			Art, music, culture, history; Outdoor gatherings with family and friends; Ability to build community trust in residential areas; Community based organizations	
Economic infrastructure				Power generation and transmission supports regional economy; Affordability of resources like food, water, housing, and energy

They worry that climate change impacts, especially from wildfire, poor air quality, and heat waves, will reduce their ability to live in this region. They feel that climate change will negatively affect them in the following ways (Table 2.7):

Table 2.16 Summary of Climate Impacts in Northern Willamette Valley

Finding 2.3. Wildfires, poor air quality, and extreme heat have a strong negative impact on the wellbeing of the community.				
	Physical	Emotional	Social	Economic
Property loss			Limited availability of emergency or temporary shelter	
Decreased air quality	Harms physical health	Indoor isolation harms mental health	Concern for houseless populations needing shelter	Constrains crop growth
Prolonged periods of high temperatures	Need for home modifications (A/C)		Older population sensitive to heat	

Respondents from this region emphasized a need for the state to protect the natural environment, help strengthen local social infrastructure, and protect members of vulnerable populations. Doing so will help protect the residents' communities, well-being, and livelihoods.

Chapter 3 – Mid and South Willamette Valley



Sources courtesy of Adobe Stock Photos. By Brandon (left) ; John (right)

Background

This section provides a summary of existing community characteristics for the Mid and-South Willamette Valley. We drew from existing state planning documents, such as the Oregon Natural Hazards Mitigation Plan, and other background research materials to provide a high-level overview of environmental, demographic, and economic conditions in the region. This section concludes with an overview of climate projections for the Mid and South Willamette Valley and known social vulnerabilities to the communities within the Department of Emergency Management, Mitigation Region 3.

Environmental Characteristics

The Mid and South Willamette Valley's climate is mild with abundant moisture that supports a long growing season. The region is agriculturally vital, with fertile soil and ample rainfall. Mountain ranges and watersheds shape the Mid and South Willamette Valley's topography. The region begins in the east at the Cascades crest and stretches west to the Coast Range. It begins in the south from the base of the Calapooya Mountains and extends north to the Portland suburbs. The major watershed is the Willamette River with smaller water bodies

Figure 3.16 Major Landmarks and Land Type of the Mid and South Willamette Valley by County

<u>Major Natural Landmarks</u>	<u>Land Types</u>
Benton County: Corvallis Watershed Wild Animal Refuge, Mary's Peak, Alsea Falls Recreational Site	Benton County 26% Public 35% Developed/Cultivated
Lane County: Row River Trail, Three Sisters	Lane County 58% Public 10% Developed/Cultivated
Linn County: Middle Santiam Wilderness, Willamette National Forest, Mt Washington	Linn County 40% Public 27% Developed/Cultivated
Marion County: Silver Falls State Park, Enchanted Forest	Marion County 35% Public 47% Developed/Cultivated
Polk County: Basket Slough National Wildlife Refuge, Valley of the Giants, Sarah Helmick State Recreation Site	Polk County 12% Public 43% Developed/Cultivated
Yamhill County: Bald Creek State Scenic Viewpoint, Pheasant Creek Falls, Mt Hebo	Yamhill County 17% Public 45% Developed/Cultivated

Source: Oregon by the Numbers, 2022

Region 3 is composed of three ecoregions: the Cascades, the Willamette Valley, and the Coast Range. The Cascades ecoregion is underlain by volcanic soils and has mainly Douglas fir

⁶³ State Interagency Hazard Mitigation Team, *Oregon's Natural Hazards Mitigation Plan*, vols. (State of Oregon, September 24, 2020), Available: https://www.oregon.gov/lcd/NH/Documents/Approved_2020ORNHMP_00_Complete.pdf.

forests that are managed for commercial logging. The Willamette Valley ecoregion is dominated by terraces and floodplains. Productive soils and temperate climate make this ecoregion one of the most important agricultural regions in Oregon. The Coast Range ecoregion has soils that are a mix of sedimentary and volcanic, and forests are made up mostly of Douglas fir.⁶⁴ Figure 3.1 provides more information on amounts of public lands, developed/cultivated lands, and major natural landmarks in the region.

Community Characteristics

The Mid and South Willamette Valley hosts a population of approximately one million people across 10,000 square miles. The region grew at a slower rate than the whole state. Between 2010 and 2018, Benton County experienced the greatest growth and Lane County had the least growth. Portland State University’s Population Research Center projected that Polk and Yamhill Counties will have the quickest growth attributed to in-migration.⁶⁵ Table 3.1 shows basic demographic information for each of the six counties.

Table 3.17 Population Characteristics for Mid and South Willamette Valley by County

	Benton County	Lane County	Linn County	Marion County	Polk County	Yamhill County	Region 3
Total Population	95,615	383,218	128,598	345,815	87,600	106,674	1,147,520
Total land area (mi²)	678	4,722	2,309	1,191	744	718	53,362
Population Density (people/mi²)	141	81	56	290	117	149	21
Net migration, 2020-2022 [per 1,000 population]	5.2	10.3	23.1	4.9	34.6	14.1	16.4

Source: Oregon by the Numbers, 2024

⁶⁴ Ibid.

⁶⁵ Shannon Caplan, David Keyes, Rachel Porter, and Elissa Schloesser, *Oregon by the Numbers*, vols. (The Ford Family Foundation and Oregon State University Extension Service, August 2024, Available: https://www.tfff.org/wp-content/uploads/OBTN_2024-091724-1.pdf)

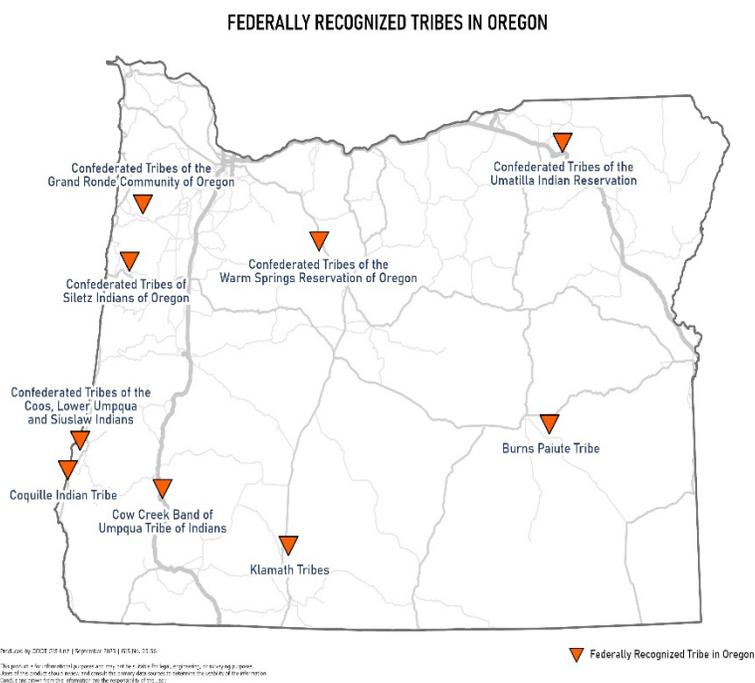
Federally Recognized Tribes

Figure 3.2 displays the locations of the nine federally recognized tribes. Six of the nine tribes have tribal service areas that overlap with the Mid and South Willamette Valley region. These include:

- Confederated Tribes of Siletz
- Confederated Tribes of Coos, Lower Umpqua and Siuslaw Indians
- Coquille Indian Tribe
- Cow Creek Band of Umpqua Tribe
- Confederated Tribes of Warm Springs
- Confederated Tribes of Grande Ronde

Additional information on Oregon Tribes can be found in Part II, Appendix A.

Figure 3.17 Oregon's Federally Recognized Tribes



Source: Oregon Department of Transportation

Race and Ethnicity

Marion, Yamhill and Polk Counties have a greater population of Hispanic/Latino identifying community members compared to the state as a whole. Polk County has a greater population of American Indian and Alaska Native Alone identifying community members compared to state. And Benton County has a greater population of Asian identifying community members compared to the state.⁶⁶

Social Vulnerability

The physical, mental, and financial wellbeing of specific population groups in the Mid and South Willamette Valley are already vulnerable to unanticipated events and natural hazards. These groups are likely to experience disproportionate impacts from climate-related hazards and events. According to the CDC Social Vulnerability Index, Benton County's vulnerability rating is "low-medium," Linn, Lane, Polk, and Yamhill County's vulnerability ratings are "medium-high," and Marion County's vulnerability rating is "high."⁶⁷ The variance in vulnerability ratings suggests that natural hazards will impact the populations of

Figure 3.18 Known Regional Vulnerabilities

- High percentage of individuals who speak English less than well
- High percentage of individuals aged 17 or younger
- High percentage of single-parent households
- High percentage of overcrowding in occupied

⁶⁶ Census Bureau and Social Explorer, "American Community Survey, 5-year (2017-2021)," Census, ACS 2021, Available: https://www.socialexplorer.com/tables/ACS2021_5yr.

⁶⁷ "CDC/ATSDR Social Vulnerability Index Map," Interactive Map (Agency for Toxic Substances and Disease Registry, 2020), Available: https://www.atsdr.cdc.gov/placeandhealth/svi/interactive_map.html.

more vulnerable counties more severely. Figure 3.3 provides a high-level summary of the region’s known social vulnerabilities.

Marion County falls in the 90th percentile for the portion of its residents that speak English less than ‘well’ and the 80th percentile for share of multi-unit structures and percent of people living in group quarters. Both Marion and Linn Counties have larger than average percentages of people aged 17 or younger, single-parent households, and occupied housing units with more people than rooms. Other than Benton County, this region’s wages are lower than elsewhere in the state.⁶⁸ Table 3.2 provides more social vulnerability measures.

Table 3.18 Social Vulnerability Measures for Mid and South Willamette Valley

	Benton County	Lane County	Linn County	Marion County	Polk County	Yamhill County
Median household income	\$72,882	\$65,157	\$69,523	\$70,926	\$77,353	\$80,125
Households in financial hardship	47%	47%	43%	43%	40%	52%
Child poverty	13.8%	16.6%	13.6%	16.1%	14.0%	15.1%
Unemployment	3.6%	4.6%	4.6%	4.3%	4.2%	3.9%
Food insecurity	9.3%	11.9%	10.7%	10.2%	9.4%	9.0%

Source: Oregon by the Numbers, 2024

Individual and community wellbeing can be influenced by various financial, social, and environmental factors. Table 3.3 details self-reported data from individuals.⁶⁹ Research from The Ford Family Foundation in their annual Oregon by the Numbers Report shows that counties with lower rates of poverty, unemployment, disability, and mortality also report fewer (physically) unhealthy days. Their researchers also note that addressing low mental health should consider access to care.

⁶⁸ State Interagency Hazard Mitigation Team, *OR NHMP*.

⁶⁹ Caplan, Keyes, Porter and Schloesser, *Oregon by the Numbers*.

Table 3.19 Percent of Population Reporting Good Physical and Mental Wellbeing in Coastal Oregon

	Good Physical Health	Good Mental Health
Oregon	60.1%	57.3%
Benton County	61.5%	59.7%
Lane County	57.9%	53.0%
Linn County	59.2%	58.7%
Marion County	59.9%	58.5%
Polk County	56.0%	56.4%
Yamhill County	59.8%	53.0%

Source: Oregon by the Numbers, 2022

Economic and Livelihood Characteristics

Table 3.4 provides a high-level summary of the top employment industries in the Mid and South Willamette Valley across the six counties. In 2018, the five major supersectors by share of employment in Region 3 were:

1. Trade, Transportation, and Utilities
2. Education and Health Services
3. Local Government
4. Manufacturing
5. Leisure and Hospitality⁷⁰

Compared to the United States as a whole, Region 3 is competitive in Forestry and Logging, Private Households, Crop Production, support activities for Agriculture and Forestry, and Wood Product Manufacturing. The Private Households industry “employs workers on or about the household premises...such as cooks, maids, butlers, gardeners, personal caretakers, and other maintenance workers.”⁷¹

Table 3.20 Top Three Employment Industries for Mid and South Willamette Valley by County

	Benton County	Lane County	Linn County	Marion County	Polk County	Yamhill County
1	Educational services	Educational services	Educational services	Food services and Drinking places	Educational services	Educational services
2	Food services and Drinking places	Food services and Drinking places	Food services and Drinking places	Educational services	Food services and Drinking places	Food services and Drinking places

⁷⁰ State Interagency Hazard Mitigation Team, *OR NHMP*; U.S. Bureau of Labor Statistics, *Quarterly Census of Employment and Wages*, vols., December 20, 2019, Available: <https://www.bls.gov/cew/classifications/industry/industry-supersectors.htm>.

⁷¹ State Interagency Hazard Mitigation Team, *OR NHMP*; U.S. Bureau of Labor Statistics, *QCEW*.

3	Professional and technical services	Ambulatory health care services	Social assistance	Ambulatory health care services	Nursing and residential care facilities	Crop production
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Source: Oregon by the Numbers, 2024

Climate Projections

Oregon Climate Change Research Institute (OCCRI) projects that the six climate change impacts that will affect the Mid and South Willamette Valley most are **drought, heat waves, extreme precipitation, wildfires, poor air quality, and increasing mean temperatures.**⁷²

Data informing climate projections for the region are based on continuing current high-level emissions of greenhouse gases.⁷³

⁷² Erica Fleishman and Oregon Climate Change Research Institute, *Sixth Oregon Climate Assessment*, vols. (Oregon State University, January 2023), Available: https://ir.library.oregonstate.edu/concern/technical_reports/gt54kw197.

⁷³ State Interagency Hazard Mitigation Team, *OR NHMP*.



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



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



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



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



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 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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Findings

This section presents the key findings from review and synthesis of 161 survey responses from Mid and South Willamette Valley respondents and conversations with 26 workshop participants who attended regional workshops in Cottage Grove and Woodburn, Oregon. These findings are supplemented by background research. Figure 3.4 provides respondent characteristics.

Overall, more survey respondents identified as older and as having higher levels of educational attainment than the general population in the region but were representative in terms of racial and income demographics. People under 24 were underrepresented by about 23 percentage points. Individuals 55- to 74-year-old were the most overrepresented aged group. Respondents who identified as White or Caucasian, multiracial and Hispanic or Latino/a/x were all slightly underrepresented by about 5 percentage points. Respondents who have a post-graduate or professional degree were overrepresented by about 10 percentage points.⁷⁴

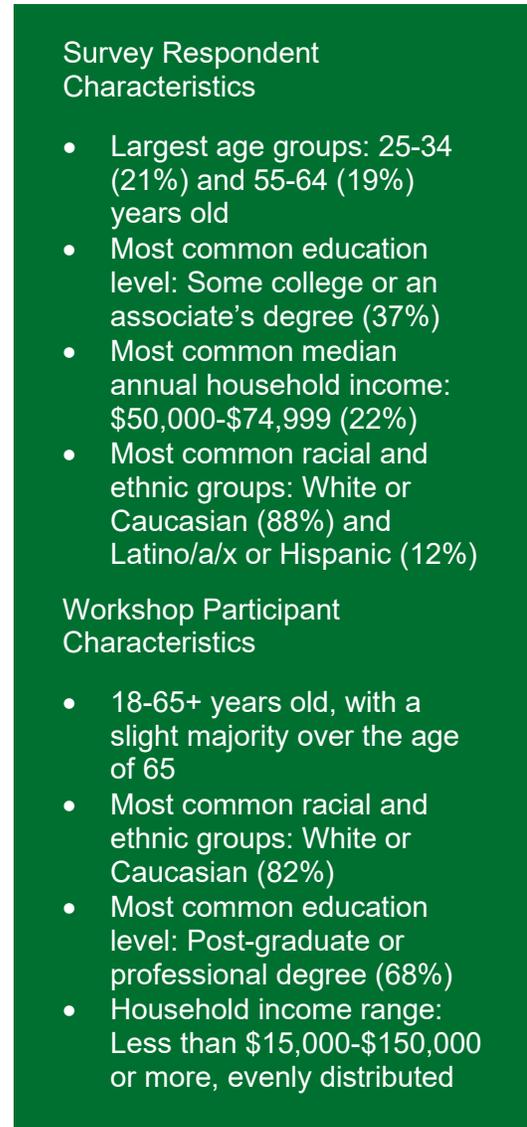
Twenty-two workshop participants provided demographic data. Overall, more workshop participants identified as older, White or Caucasian, and with higher educational attainment levels than the general population in the region.⁷⁵

Community Values

Finding 3.1 Respondents from the Mid and South Willamette Valley value the beauty and abundance of their natural environment.

When asked about what they value about the natural environment, survey respondents of the Mid and South Willamette Valley shared an appreciation for clean water, clean air, public lands, and local plant and animal species. They also valued farmer's markets, gardening, and access to food or food systems. These values are closely related to natural resources (Figure 3.5). Attendees at public workshops confirmed these values. They explained that they enjoy having access to the region's mountain ranges and water sources and that they appreciate that the land provides for their basic needs.

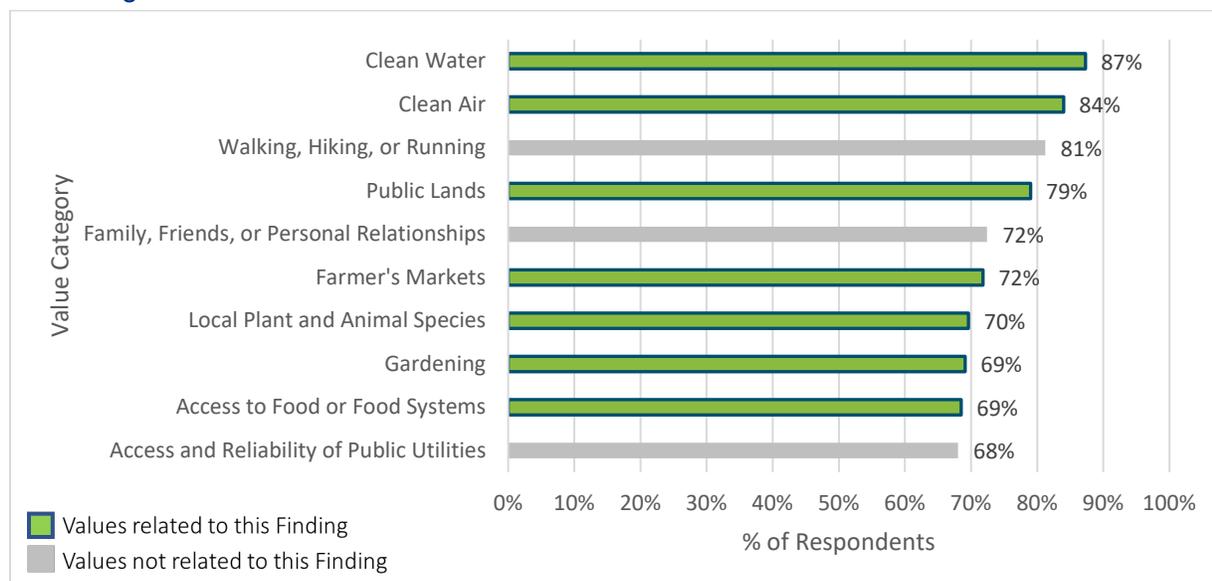
Figure 3.19 Mid and South Willamette Valley Respondent Characteristics



⁷⁴ Census Bureau and Social Explorer, "American Community Survey, 5-year (2017-2021)."

⁷⁵ Ibid.

Figure 3.20 Top Ten Most Frequently Chosen Values by Survey Respondents as They Relate to Finding 3.1



Finding 3.1.a Respondents from the Mid and South Willamette Valley value their region for its natural beauty and for opportunities to access the outdoors.

“[The] clean watershed create[s] an exquisite ambience for visitors and residents.”

– Lane County Survey Respondent

Respondents from this region **appreciated opportunities to access nature and be one with it.** Survey respondents value the region’s “sheer beauty.” They praised its mountains, oceans, lush valleys, and diverse wildlife. Workshop participants agreed, describing the beauty of healthy forests, greenery, and local flowers, like roses and tulips. Workshop attendees also emphasized the importance of having access to large open natural spaces including forests, lakes, parks, and wilderness areas. One survey respondent explained how convenient it was to experience “raw nature” without having to drive a long distance.

Finding 3.1.b Respondents from this region value that the natural environment sustains them by fulfilling their basic needs for clean air, clean water, and healthy ecosystems.

“Plenty of good farm land for fresh fruit, vegetables, etc.”

– Marion County Survey Respondent

Respondents value the region’s **abundant natural resources that fulfill their basic needs** for clean air, clean water, healthy ecosystems, and good soil for producing nutritious food. Survey respondents noted that effective forest management practices maintain healthy plants and wildlife, which is crucial for maintaining fresh air and other resources. Similarly, workshop attendees also discussed the benefits of their region’s healthy, diverse, functioning ecosystems.

Mid and South Willamette Valley respondents **value of clean air, water, and healthy ecosystems relates to their desire for high-quality, nutritious food.** Access to food and food systems ranked as one of survey respondents’ top ten most frequently selected community values. The region’s mild climate, favorable precipitation patterns, and abundant, fertile

farmland allow for year-round farming and gardening.⁷⁶ These aspects of the natural environment ensure that people living in this region enjoy access to plenty of healthy, organic, locally grown food.

Finding 3.1.c Quality food is a result of the natural environment that supports culture and social connection in the region.

“Food brings us together.”

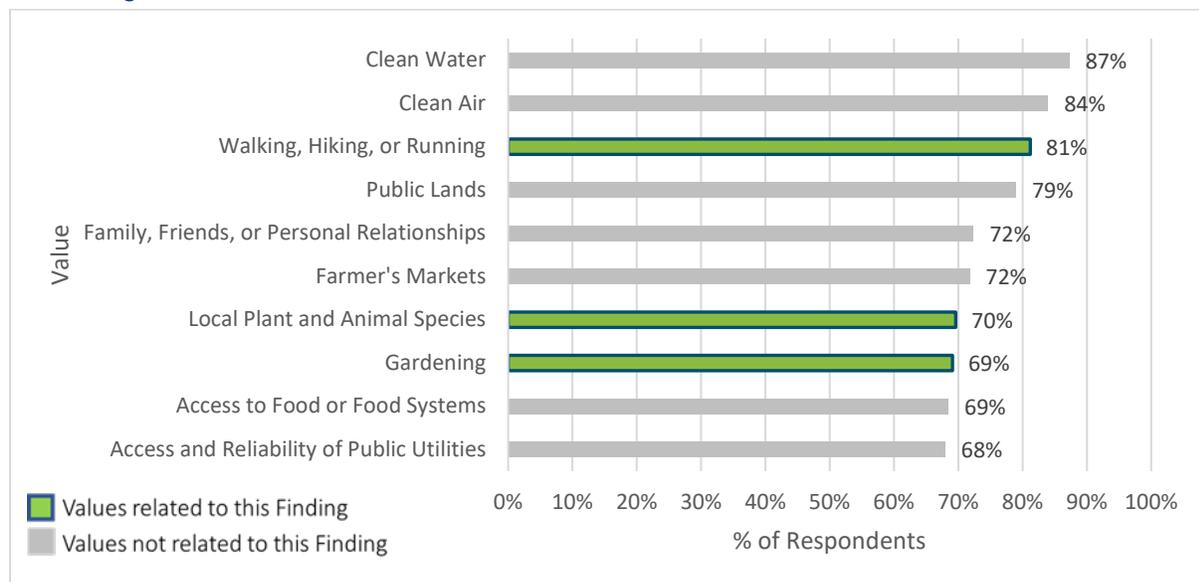
– Woodburn Workshop Attendee

The production and sharing of high-quality food are culturally and socially significant to respondents from the Mid and South Willamette Valley. Farmer’s markets ranked as one of survey respondents’ top ten selected community values, reinforcing the idea that reliable access to sustainably produced, quality food is something they identify with strongly. Farmer’s markets allow people to buy food from local sources and vendors, support their local farmers, and interact with other members of the community. Workshop attendees explained that they like the idea of growing and sharing food that is healthy and safe. They appreciated the diverse food options resulting from the vibrant local farm scene, like food trucks and authentic Mexican restaurants. Survey respondents liked that their natural resources and connection to the land also helps farmers and ranchers to “earn an honest living.”

Finding 3.2 Respondents from the Mid and South Willamette Valley greatly value outdoor and recreational opportunities.

When asked about what they value about outdoor and recreational opportunities in their area, survey respondents of the Mid and South Willamette Valley shared an appreciation for walking, hiking, or running, local plant and animal species, and gardening (Figure 3.6). Workshop attendees shared these values and frequently discussed their love of outdoor recreation as well.

Figure 3.21 Top Ten Most Frequently Chosen Values by Survey Respondents as They Relate to Finding 3.2



⁷⁶ State Interagency Hazard Mitigation Team, *OR NHMP*.

Finding 3.2.a This region's respondents see their enjoyment of outdoor and recreational opportunities as closely tied to their love of the natural environment.

Respondents from this region enjoy the **restorative aspects of getting into nature for recreation**. Their high ranking of local plant and animal species and gardening ties in with their appreciation of fulfilling their basic needs from an environment that supports and provides for them. Survey respondents explained that they value the ability to connect to nature through bird watching, star gazing, outdoor dining, and visiting natural areas like Mt. Pisgah and Fern Ridge Reservoir. Workshop attendees discussed this topic too, describing their appreciation for local parks, the ability to bike to work, and opportunities for boating and camping.

Finding 3.2.b This region's respondents value the opportunities that outdoor activities provide to connect with others and to stay physically and emotionally healthy.

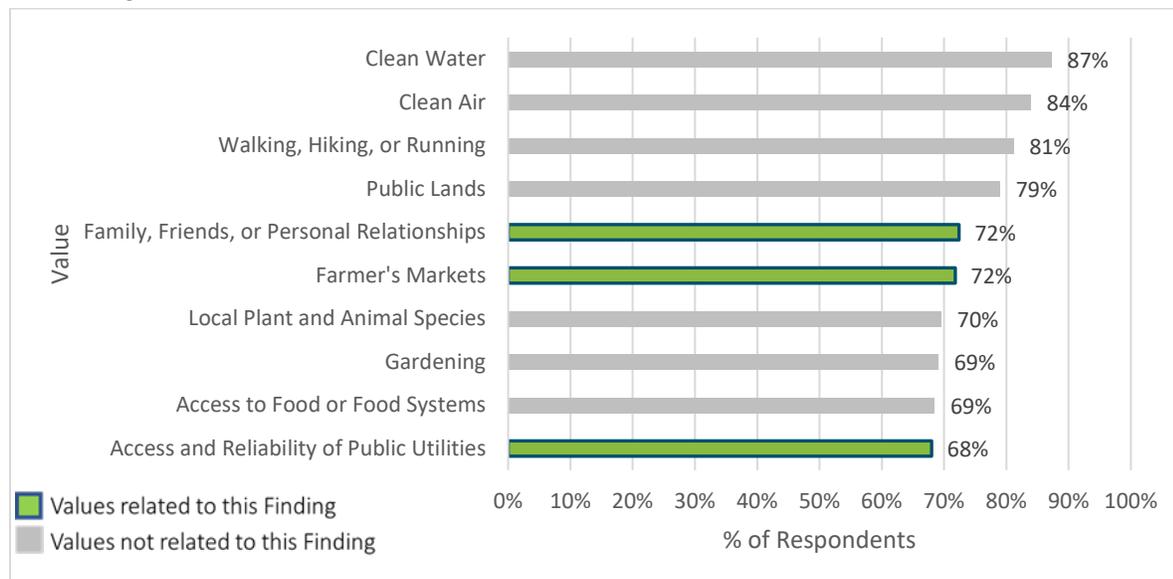
Mid and South Willamette Valley's respondents also **view outdoor recreation as an opportunity to connect socially** with members of their community who share similar interests in the outdoors. One survey respondent noted that visiting parks and community gardens is a great way to make friends. Workshop attendees said that they enjoyed seasonal traditions, like skiing on specific holidays, and the opportunities for human connection that outdoor traditions like fishing, hunting, and camping provide. Visiting parks, boating, and camping were other activities that workshop attendees use to connect with friends and family. Workshop attendees discussed the importance of access to places outside city boundaries as well, like lavender fields and blueberry picking spots. One attendee explained that having access to outdoor cultural places was important for his health and social life because it gave him a reason to go outside. Another participant shared that cultivating plants, especially vegetables, in her garden is an important way of maintaining intergenerational ties within her family.

Many outdoor activities also provide **opportunities for the region's respondents to maintain physical and emotional health by exercising socially**. Workshop participants enjoyed the opportunities to play sports together, like basketball. Biking and walking trails provide other opportunities for community members to exercise together.

Finding 3.3 Respondents from the Mid and South Willamette Valley value social ties and opportunities for community gathering.

When asked about what they value about community groups, activities, and events in their region, survey respondents shared an appreciation for family, friends, and personal relationships, farmer's markets, and access to and reliability of public utilities (Figure 3.5). Workshop attendees said that they also shared these values.

Figure 3.22 Top Ten Most Frequently Chosen Values by Survey Respondents as They Relate to Finding 3.3



Finding 3.3.a Strong social connections between people in the Mid and South Willamette Valley help create a safe, vibrant, and livable atmosphere.

“My community feels safe. I am not afraid to be in the parks, walking the streets, going to events in my area. I trust the people around me.”

– Marion County Survey Respondent

Survey respondents from the Mid and South Willamette Valley **value living in an area with a small-town vibe where people are friendly, welcoming, and involved.** They appreciate the laid-back atmosphere where there is little traffic. Respondents felt that people in their smaller communities are social and care about their neighbors. Workshop attendees reported similar feelings. They enjoy spending time with loved ones and value the caring, welcoming attitudes of the people in their communities. Cultural celebrations are important for bringing the community together.

Survey respondents from this region **appreciate interacting with like-minded people who share their progressive values.** They like, for example, that their fellow community members are environmentally minded. Workshop attendees noted that networking with other creative, open-minded people is an important aspect of their communities.

The **safety of the community** was another common theme associated with the value of social ties. Survey respondents referenced low crime and violence as positive aspects of the region. Workshop attendees expanded on this topic, explaining that their children feel safe in school and that life feels “calm.” They value the social safety nets that help make their communities safe for people from different backgrounds.

Finding 3.3.b Community groups and amenities support social connection.

A common theme among Mid and South Willamette Valley survey respondents and workshop attendees was that **community groups and amenities help to promote social connection.** People from this region described a wide array of groups and activities, including hobby groups, women’s groups, the dance community, potlucks, summer festivals, and other community

events. The region's respondents also appreciated the availability of public art, poetry events, art fairs, concerts, and opportunities for social exercise like outdoor Tai Chi classes.

The built environment supports access to community groups and activities. The region boasts a **healthy choice of public spaces** that allow for the forging and maintenance of community relationships and the exploration of new interests. Some of these spaces include libraries, spaces for community fitness and sports, green spaces like city parks and community gardens, coffee shops, and other small local business establishments. Respondents from this region explained that these spaces allow for healthy social routines within the community – people can shop, exercise, walk, and spend time with friends and family as they go about their normal days because these spaces exist.

Accessible transportation is another key component to the region's ability to support its communities' social interactions – being able to physically get to friends and family, or to an event, is critical. Survey respondents and workshop attendees noted that their communities' transportation systems provide affordable and reliable transportation options. They appreciate the available bike trails and having the option to bike or walk to fulfill their daily needs. A respondent from Corvallis specifically noted the city's free bus system. A major interstate (I-5) bisects the region from north to south, and the region is also home to the state's second largest airport. Respondents noted that these transportation options make access to both international and local travel another benefit of living in the Mid and South Willamette Valley.

Respondents emphasized that their **communities further strengthen social ties by offering support services to people in need.** Survey respondents shared that community collaboration and volunteer opportunities were important to their positive feelings towards their communities. People valued being able to help and support community members in need.

Climate Change Impacts

The highest percentage of survey respondents (85%) said drought would have either a strong or somewhat negative impact on their lives (Table 3.5). The second highest percentage of survey respondents (84%) were concerned about wildfire, with 71% believing it would have a strong negative impact. The third highest percentage of survey respondents (82%) were concerned about the effects of heat waves.

Table 3.21 Percentage of Survey Respondents Who Perceive Negative Impacts on Their Lives

	Drought	Wildfire	Heat Waves	Air Quality	Mean Temperature	Extreme Precipitation
Strong Negative Impact	50%	71%	44%	56%	29%	21%
Somewhat Negative Impact	35%	13%	38%	25%	35%	36%
Total Negative Impact	85%	84%	82%	81%	64%	57%

Finding 3.4 Drought threatens the Mid and South Willamette Valley’s agriculture-based livelihoods, connection to nature, and sense of strong community.

“Climate change is directly affecting my and my family's ability to live a healthy, satisfying, and prosperous life. Due to tree death and ground shrinkage, my house has increased cracks in the foundation...”

– Cottage Grove Workshop Attendee

Mid and South Willamette Valley survey respondents expect drought to negatively affect them more than any other impact. This finding connects with respondents’ values of access to clean water, healthy local food, and outdoor recreation opportunities. Drought could cause insufficient water for crops and a lack of available farmworkers when the growing season begins early. It could also lead to a higher frequency of toxic algal blooms in the region’s bodies of water⁷⁷.

Finding 3.4.a Drought threatens the region’s agricultural industry, which is central to respondents’ food security and farmers’ and agricultural workers’ livelihoods.

“I garden as a necessary supplement financially. That is becoming more uncertain...”

⁷⁷ Robyn White, “Why Flooding Can Happen After A Drought” *Newsweek*, 11 Jan. 2023, sec. Tech & Science, online, Internet, 6 May 2023. , Available: <https://www.newsweek.com/flooding-after-drought-california-explained-1773032>.

Historically, the region's mild climate, long growing season, and abundant moisture has supported the **most diversified agriculture in the state.**⁷⁸ As one of the most diverse agricultural regions in the country, the Mid and South Willamette Valley produces over 170 different crops including hay, grain, grass seed, and specialty seeds. The valley also produces a variety of vegetables, berries, tree fruits, hazelnuts, wine grapes, hops, nursery products, and Christmas trees.⁷⁹

Respondents from the Mid and South Willamette Valley worry that **drought will lead to higher water costs and food system insecurity.** Given the importance and value of agriculture and the accessibility of high-quality local food in this region, it was not surprising that both survey respondents and workshop attendees emphasized food system security. At one workshop, attendees prioritized food system stability as a top concern because they recognized its reliance on a highly complex system that is being impacted in different ways by all of these different effects. They noted, for example, that fruit orchards often require 40 or more years of tending to reach peak production, and that drought and other negative environmental impacts can wipe them out in the blink of an eye. This complex interaction of effects and changes means that it will be a difficult problem to solve and will require a coordinated, systems approach.

Drought introduces significant challenges to the agriculture industry. Respondents cited **soil degradation** as one major impact that could result in devastating crop failures and, consequently, instability in agricultural markets. Drought negatively affects soil health in several ways. For example, a lack of water prevents plants from absorbing the nutrients they need from the ground. Increased soil temperature due to less soil moisture also affects microbial activities and nutrient processing.⁸⁰ Drought also creates a “shift in production feasibility,” requiring farmers to change the types of crops they grow to more drought-tolerant varieties. Workshop participants explained that tree and vine crops (including fruit) would be especially vulnerable. Drought will exacerbate the loss of groundwater that results from water intensive agriculture such as cannabis.

Some populations are particularly vulnerable to the effects of drought on their livelihoods. Drought is likely to impact smaller farms and subsistence gardeners even more severely because they are less able to get the resources needed to adjust to changes. One survey respondent noted that indigenous communities will have less access to First Foods and will struggle to maintain their culture and way of life as a result. Low-income households will struggle to afford food as it becomes more expensive. Agricultural workers and their families may also experience income instability and loss of job opportunities as farm owners adjust the crops they plant to adapt to changing conditions.

⁷⁸ State Interagency Hazard Mitigation Team, *OR NHMP*.

⁷⁹ “Oregon Agriculture Regions” (Oregon Department of Agriculture, Sep. 2020), Available: <https://www.oregon.gov/oda/shared/Documents/Publications/Administration/ORGrowingRegions.pdf>.

⁸⁰ “How Drought Affects Soil Health” *Iowa State University Extension and Outreach*, 23 Aug. 2017, Available: <https://crops.extension.iastate.edu/cropnews/2017/08/how-drought-affects-soil-health>.

Finding 3.4.b Drought threatens Mid and South Willamette Valley respondents' connection to nature and their ability to build community, help each other in times of need, and maintain cohesiveness in the face of challenges.

“Water quality...ties back to forest health. If our forests die, they make our water, they draw the moisture out of the air, create rain, fog, precipitation...it’s a really complicated system...”

– Cottage Grove Workshop Attendee

Respondents from this region **feel a deep connection to the natural environment and worry that drought will impact their relationships to it and to each other.** Workshop attendees discussed how drought will likely lead to forest degradation and tree death. They voiced concern for the health of the area’s rivers, lakes, and wildlife and described how disruptions to delicate ecosystems will lead to loss of clean air and nutrient-rich soil.

Respondents worry that **drought will impact recreational activities, which are important for their connection to nature and for building community.** Workshop attendees worried that lack of water will turn parks brown in the summer and make ski season less predictable in the winter. They also noted the importance of outdoor activities for young people and worried that if kids are not able to participate in outdoor activities, they will miss out on important educational and developmental opportunities.

The connection between the natural environment and social ties is important when it comes to **emergency preparedness**, too. Extreme drought can set the conditions for wildfires and even flash flooding, which can happen during droughts because the ground is so dry that the water cannot saturate it and runs off instead.⁸¹ One workshop attendee explained that because roads tend to be based around rivers, landslides and flooding have the potential to cut people off from each other by making those routes unsafe and impassable. Disasters could cut off cell phone and internet service, impacting people’s ability to communicate and reconnect with loved ones. These points led workshop attendees to a discussion about the **importance of mutual aid and community organizing.**

Respondents from the Mid and South Willamette Valley worry that **drought will lead to tensions between neighbors and disrupt the cohesiveness of the community.** Workshop attendees voiced concerns that water shortages will lead to water wars between neighbors. In- and out-migration was another topic of concern. A workshop attendee noted that if climate disasters became too common in the area, people might move away. On the other hand, one survey respondent said she worried about an influx of climate refugees because, compared to other regions in the United States, this area’s climate is more hospitable.

Finding 3.4.c Drought leads to stress, isolation, and scarcity, which threaten Mid and South Willamette Valley respondents' mental and physical health.

“When I was nine years old, I tried to drown myself due to climate guilt. I felt there was no future to stay alive for. I felt powerless. I still do. I don’t know how I keep going.”

– Benton County Survey Respondent

⁸¹ White, “Why Flooding Can Happen After A Drought.”

When discussing the topic of drought, the topic of **climate anxiety and mental health** arose frequently. Respondents referred to it in a variety of ways, including anxiety, depression, hopelessness, and eco-grief. They talked about the prevalence of fear-based media, and the resulting need for more self-care resources. Respondents recognized that climate anxiety can add to stress within families, fights over scarce resources, and the anxiety of feeling the need to be constantly prepared for disaster.

Physical health was another concern related to drought in this region. As discussed in Finding 3.4.a, negative agricultural impacts will likely increase prices and reduce availability of fresh food, making it more difficult for people, especially those with less income, to access the nutrition they need. Workshop attendees feared that drought would reduce drinking water supplies and cause wells to dry up. They worried that poor water quality will cause more people to get sick. Disruptions to transportation routes, as discussed in Finding 3.4.b, could also prevent people in need of urgent physical care from reaching hospitals in a timely manner.

Finding 3.4.d Drought negatively impacts Mid and South Willamette Valley's built environment and support services by stressing storm water systems, increasing the likelihood of floods, and damaging property.

“What are the impacts of crumbling infrastructure? With the droughts, [you] instantly see the ground shrinkage. [You] have a part of house sinking because the trees are drinking more of the ground water, so things are drying up and the foundation is starting to settle in areas. Things are settling out in certain ways that they wouldn't if there had been enough water. Anything with foundations where the ground pulls away from foundations. When floods come, trees fall everywhere because the grounds are just hollow.”

– Cottage Grove Workshop Attendee

Respondents noted that **drought will stress infrastructure and the built environment in the region**. A higher chance for flash flooding means that storm water systems could be overwhelmed and fail, causing overflowing wastewater systems. Upgrading storm water systems could help but may be too expensive for local governments to manage. Flooding would also result in more erosion and loss of valuable soil resources. Workshop attendees discussed ground shrinkage as well. With less moisture available, hollow spaces form in the ground causing trees to fall and building foundations to sink and even collapse. Ground shrinkage could also affect roads. Workshop attendees explained that drought could result in more dam-controlled flooding in low-lying areas as communities work to stockpile water resources. The resulting loss of landmass could create a need for relocation services for those living in flood-prone areas. As discussed in Finding 3.4.b, floods and landslides can reduce mobility and result in dangerous transportation conditions because many roads run along the region's rivers.

Drought will affect support services in the region as well. Workshop attendees wondered whether evacuation plans currently in place will even work because disasters may make evacuation routes unsafe and compromise communications systems. Increased occurrence of **drought-related natural disasters will put more stress on emergency management** and lead to increased cost and time to access emergency services.

Finding 3.5 Wildfire threatens the Mid and South Willamette Valley's livelihoods, connection to nature, and sense of strong community.

Wildfire was the next highest ranked climate impact in the Mid and South Willamette Valley. Respondents' concern reflects their values of the natural environment and social connections.

Finding 3.5.a Wildfire threatens respondents' homes, towns, and jobs, all of which are central to their livelihoods.

"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

Respondents from the Mid and South Willamette Valley worried that increased risk of **wildfire will lead to financial loss**. Wildfire poses a significant threat to homes and businesses, which means that insurance costs for owning those buildings are likely to increase steeply. People living in wildfire prone areas will have to deal with expensive solutions to wildfire, like home-hardening.

Smoke from wildfire can also affect crop production. According to one workshop attendee, smoke taint in grape crops makes wine less palatable, and therefore less profitable. Dangerous conditions from poor air quality will also prevent outdoor workers from being able to work, meaning that they have a lower chance of earning the money they need to support themselves and their families. As discussed in Finding 3.4.a, farms, especially those with orchards, require years of tending to reach full productivity, but one wildfire can wipe them out within hours.

Finding 3.5.b Wildfire limits Mid and South Willamette Valley respondents' ability to access nature for recreational purposes and to maintain social connections in outdoor settings that they feel emotionally connected to.

"The communities along the west slopes of the Cascades were profoundly affected, and continue to feel the effects, of the 2020 fires. For my family, we lost access to recreation areas that we've been visiting since I was a little girl, and where we mushroom hunted every fall until 2019. It feels like losing a piece of our heritage and identity. And I know that the communities of the Santiam Canyon (and other areas) suffered far worse with financial, emotional, and infrastructure losses that still aren't resolved in many cases (particularly for those with the least resources to recover)."

- Woodburn Workshop Attendee

Respondents from this region felt that, like drought, **wildfire would significantly impact their connection to the natural environment and to their communities**. Workshop attendees expressed that it takes years to get a forest back after it burns. As in Finding 3.4.a, rapid changes to complex systems and tree and animal death were concerns associated with wildfire. Additionally, respondents expect wildfire to have negative impacts on native plants. Workshop attendees explained that wildfire was of particular concern for people near the Wildland-Urban Interface (WUI). One attendee living at the WUI stated that although it had been his long-term dream to live in the forest, now the risk of wildfire makes it much more expensive and makes him anxious.

Respondents **worry that wildfire will reduce opportunities for outdoor recreation** and the associated connection to nature and community. Workshop attendees cited the inability to gather outdoors, go camping, and exercise and play sports outside as significant challenges relating to wildfire smoke. One survey respondent who was a triathlete explained that when it is smoky outside, he cannot bike or train outside.

Natural areas that have experienced or are experiencing wildfire are also often no longer accessible to the public. Many of these natural areas hold special places in people's memories and traditions. One workshop attendee said that wildfire destroyed two of his favorite places – Mount Holy Lake and Mount Adams. He explained that these were places that people who grew up in the area had been visiting since they were kids.

Similar to Finding 3.4.b, **wildfire will impact Mid and South Willamette Valley communities' emergency preparedness**, further emphasizing the importance of mutual aid and community organizing. One workshop attendee talked about the importance of community members being able to support each other through a crisis.

Finding 3.5.c Wildfire threatens Mid and South Willamette Valley respondents' mental and physical health by keeping them “on edge” and by degrading air quality to the point that it exacerbates health concerns for sensitive populations and makes outdoor activity unsafe.

“How will climate change impact you? Continued wildfire and air quality will impact my daily life. I am afraid and stressed around how to be prepared...”

– Cottage Grove Workshop Attendee

As with drought, the threat of **wildfire stirred thoughts of climate anxiety and mental health** among respondents from this region. However, unique to wildfire was respondents' discussion of isolation and depression linked to having to stay indoors when smoke makes air quality unhealthy. The threat of wildfire puts people on edge, not knowing when they are going to have to grab their go-bags and flee their homes.

Like drought, **wildfire also threatens physical health.** In addition to the potential for the loss of human life, respondents also feared negative health effects from wildfire and smoke. Workshop attendees commented that poor air quality worsens respiratory issues like asthma. Sensitive populations, including the young and the elderly, are particularly at risk. Young people may also be developmentally affected, since smoke reduces their ability to play and exercise outdoors. Outdoor workers, including agricultural workers and firefighters, are also at increased risk while they do their jobs. Workshop attendees noted that air filters for homes, schools, and businesses will be important to protect against harmful smoke particulates.

Finding 3.5.d The heightened threat of wildfire negatively impacts the Mid and South Willamette Valley's built environment and support services by increasing the risk to property and the need for limited emergency response resources.

Respondents noted that **wildfire will stress the built environment and support services** in the region. The communities that are most vulnerable are those located at the WUI.⁸² Respondents seemed acutely aware of this fact, with one workshop attendee worrying about her safety because her house is in the forest. Workshop attendees discussed reduced housing stability, increased property insurance costs, and the need for increased disaster relief

⁸² State Interagency Hazard Mitigation Team, *OR NHMP*.

resources, which currently there are not enough of to support the increased risk and scale of wildfires. Workshop attendees worried about the increased cost and time to access emergency services due to increased demand and dangerous transportation conditions that arise during wildfire emergencies. Housing status was another important factor, with homeowners in this region tending to be more concerned about wildfire impacts than respondents in other housing categories. This may be the case because homeowners would bear greater financial responsibility than renters were they to lose property in a fire.

Finding 3.6 Heat Waves threaten the Mid and South Willamette Valley’s livelihoods, connection to nature, and sense of strong community.

Respondents from the Mid and South Willamette Valley ranked heat waves as the third most negative climate change impact for their region.

Finding 3.6.a Heat waves threaten the region’s agriculture industry, which is central to respondents’ food security and farmers’ and agricultural workers’ livelihoods. They will also increase respondents’ energy costs.

Similar to Finding 3.4.a, respondents from the Mid and South Willamette Valley worry that **heat waves will lead to food system insecurity and negatively impact the economic health** of the area. Heat waves can cause crop damage and failure for big farms, small farms, and subsistence gardeners alike. Heat waves will likely require farmers to adjust the types of crops they grow to more heat-tolerant varieties. Additionally, changes in the pests and pollinators populations may have negative outcomes from increased pest damage or lack of pollinators. These challenges are likely to increase food prices, decrease food availability, and reduce the amount of work available for agricultural workers.

Heat waves will also affect livelihoods. As extreme heat forces agricultural workers to work less for safety purposes, they will make less money to support themselves and their families. It is also possible that food will go to waste because it cannot be harvested. As with drought, heat waves will likely affect small farms more than large farms because they are less able to get the resources needed to adjust to change. As extreme heat becomes more common, people will need access to air conditioning. Many homes in Oregon do not have air conditioning, and even for those that do, energy costs may become exorbitant. One workshop attendee provided an example, saying that his wife now must work part-time to help pay for air conditioning because the house is too hot to live in comfortably without it.

Finding 3.6.b Heat waves harm Mid and South Willamette Valley respondents’ connection to nature and sense of community by threatening native plant and animal species and making it uncomfortable to spend time recreating and connecting with others outdoors.

“The hotter it gets outside, the harder it is to enjoy the summer, and as climate change takes place, it becomes increasingly more uncomfortable in the summer months”

– Lane County Survey Respondent

Respondents felt that **heat waves were another impact that would significantly affect their connection to the natural environment and to their communities.** Workshop attendees voiced concerns around impacts on native plants and animals. Specifically for plants, they are concerned about the arrival of invasive species and pests, especially new types of fungus, pine

beetles, and the ash borer, all of which can cause native tree death. When trees become infected, they must be cut down which results in lost shade and changes the landscape. Specifically for animals, respondents are concerned about temperature-based animal lifecycles being thrown off by unusual temperatures, which can cause big problems for native wildlife. For example, if heat waves cause a shift in insect life cycles, they may not be available as food for baby birds when they hatch. Their lifecycles will become mismatched, which could lead to gaps in nutrition that some species rely on. Fish die off was another concern that workshop attendees discussed.

Workshop attendees worried that **heat waves would reduce their ability to get outdoors and spend time with friends and family**, forcing them to stay at home and be isolated instead. They noted that research shows that violence is more likely to occur on hotter days, so respondents worry that there will be more violence in their communities as heat waves become more common.

Finding 3.6.c Heat waves contribute to stress, isolation, increased violence, and physical discomfort that disrupts routines and sleep, all of which threaten Mid and South Willamette Valley respondents' mental and physical health.

“Everyone’s health is and will continue to degrade because of the effects of climate change...Society will break down.”

– Cottage Grove Workshop Attendee

Heat waves contribute significantly to climate anxiety and mental health concerns among respondents from this region. Heat waves can make people feel isolated and depressed due to having to stay indoors to stay cool. Workshop attendees talked about how they will likely have to change patterns of life to avoid heat. For example, if it is too hot for school, kids may have to stay home. If it is too hot to shop during the day, people may have to shop at night. Heat waves can also affect human behavior by making it hard to focus and prompting aggression.⁸³ Heat waves could lead to more conflict within the community because higher temperatures correlate to more incidents of physical violence.

Heat waves threaten the physical health of people in this region. Workshop attendees noted that extreme temperatures create the opportunity for new diseases to come to the region, including cyanobacteria, Lyme Disease, mold, and respiratory fungi like cryptococcus, by creating ideal growing conditions for them or their vectors. Because extreme heat is not as common in this region as it has historically been in other parts of Oregon, people are likely not as prepared for extreme heat events as they could be.⁸⁴ Hyperthermia, or an abnormally high body temperature that can be caused by exposure to heat, is a concern, especially for sensitive populations like the elderly.⁸⁵ Over 80% of the roughly 12,000 people who die of heat-related causes each year in the United States are over the age of 60.⁸⁶ Workshop attendees also discussed the physical discomfort that heat waves cause, citing the “important health effects of

⁸³ Sujata Gupta, “How extreme heat from climate change distorts human behavior” *ScienceNews*, 18 Aug. 2021, sec. Science & Society, Available: <https://www.sciencenews.org/article/extreme-heat-climate-change-human-behavior-aggression-equity>.

⁸⁴ Rexford S. Ahima, “Global warming threatens human thermoregulation and survival” *The Journal of Clinical Investigation*. 130.2 (2020): 559–561.

⁸⁵ “Definition of hyperthermia” *NCI’s Dictionary of Cancer Terms*. (National Cancer Institute, 2 Feb. 2011), nci.global.ncienterprise, Available: <https://www.cancer.gov/publications/dictionaries/cancer-terms/def/hyperthermia>.

⁸⁶ Stephanie Dutchen, “The Effects of Heat on Older Adults” *Harvard Medicine*, 14 Oct. 2022, Available: <https://hms.harvard.edu/magazine/aging/effects-heat-older-adults>.

deep sleep” and noting how hotter weather makes it harder to get that deep sleep, especially without air conditioning.

Finding 3.6.d More frequent heat waves threaten the Mid and South Willamette Valley’s built environment and support services by damaging building and roadway materials, overloading the power grid, and increasing danger for unhoused populations.

“Climate changes will increase the usage of electrical power consumption on an energy grid that is outdated and insufficient to meet these demands.”

– Lane County Survey Respondent

Respondents noted that **heat waves will impact the built environment and support services** in the region. Workshop attendees described how high temperatures can affect materials, causing roads to buckle and paint to peel off of buildings. They also focused on how heat waves can overload the power grid because more people are using air conditioning more often. This behavior can lead to power shut offs, stress the energy grid, and make electricity more expensive. One workshop attendee explained that the loss of electricity is especially dangerous for people with health conditions requiring them to rely on electrical devices for survival.

Workshop attendees felt that **unhoused populations are particularly vulnerable to heat waves** because they do not have a way to escape. The respondents discussed the importance of finding ways to help unhoused persons by providing respite centers.

Community Solutions

“Dear Legislators: In regard to protecting our communities for the future, we need your help. Each community needs preparation, a plan, knowledge, community engagement, and resources to make it through the changes in the next five to twenty years or more.

We need to protect vulnerable populations with financial support in heat waves and higher temperatures—laws that enhance safety. We need technology to protect crops.

We need to protect infrastructures. We need mental health services. As you see, we cannot do this without your help, or the community's involvement.”

– Woodburn Workshop Attendee

In the statewide survey and both regional workshops, Mid and South Willamette Valley respondents discussed potential solutions to reduce climate change and its impact on their lives and communities. Since respondents know their communities on a deeper level, we present the solutions they suggested to reduce vulnerabilities in their communities.

One common theme among respondents was a **feeling of urgency and a need to act “before it is too late.”** Respondents emphasized that “we need to start now” to save the region’s natural resources because habits take a long time to change.

Local Engagement

Survey and workshop respondents expressed a desire for **community-centered solutions**. One survey respondent stated that the state legislature should prioritize input from individual communities because without it, policy changes are likely to not actually help the communities that they are targeting. Respondents explained that the legislature should allocate more

resources to community organizations so that local people who know the community's strengths and weaknesses can create more "place-based" and effective solutions.

Another common theme among respondents was the desire for more **research, awareness, and education** around climate change topics. They voiced a desire for information to help communities understand what resources are available, where they have agency, and how they can be more prepared for future climate disruptions. One survey respondent noted that the state should consider financial accessibility of proposed climate adaptations too, saying that "more research needs to be done on how to fix this in a...way that will not [drive-up] prices to where people cannot afford to participate." This points to climate adaptation strategies that anyone could participate in regardless of income. Investment in what makes communities thrive – housing, access to care, transportation – is what will make communities more climate resilient. Another respondent noted that the state should help communities find and implement climate adaptation success stories from around the world.

Vulnerable Communities

Respondents emphasized the need to **make resources available to vulnerable communities**. They noted that low-income, marginalized people will suffer most, and that it can be difficult for these people to ask or apply for resources that could help when they already have so many other needs to address. For this reason, one survey respondent stated that the legislature should allocate resources to provide social and health services, building upgrades, and better transit. Respondents also discussed the need to protect the livelihoods of people in jobs that climate change is affecting most immediately, such as those working in agriculture, water management, energy, and infrastructure maintenance. Survey respondents and workshop attendees also emphasized that rural and urban communities have different needs and barriers based on social, economic, cultural, and linguistic differences. For example, smaller communities often have difficulty applying for grants that could help them buy protective crop technologies like crop covers.

Natural Environment

Respondents expressed a desire to **focus on and protect complex systems**. One survey respondent explained that the systems being impacted are complex, and that they need immediate and long-term resources to remain viable. A workshop attendee noted that solutions need to address the systems thoroughly. Action must include immediate disaster relief to impacted communities and policy changes at the landscape level to ensure that economic, social, and natural systems adapt successfully. The region's food system is one example of the complex systems the region should consider.

Respondents also focused on the need to **mitigate fire risks**. Recommended actions included implementing controlled fire projects (prescribed fire) and focusing on home hardening and protecting communities. One workshop attendee from the Western Cascades expressed the importance of investments in research on "westside fires ecology, behavior, and management."

Public Services

Another common theme was the desire to **adapt the built environment and community services** in response to climate change. Survey respondents and workshop participants would like to see resources allocated to emergency shelters, robust public transportation systems, walkable neighborhoods, renewable energy systems, and energy efficient buildings. Healthcare was another topic relating to this theme, with one workshop attendee explaining that counselors and therapists offering "climate specific services" could help with climate anxiety concerns. Tree planting programs, green spaces, and soil protection were other improvements that respondents noted as important.

Industry

Changing the behavior of large corporations and industries was another common solution that respondents proposed. They discussed the need to stop blaming individuals and to focus more on the idea that corporations and big industries need to change too, instead of protecting them for financial reasons. One workshop attendee stated that “water belongs with the people,” not with corporations, golf courses, or big business, and that we need to “legislate this larger” to ensure a fair distribution of resources. The timber industry received attention, with one survey respondent believing that the legislature could reduce the loss of forest biodiversity caused by the timber industry by incentivizing ecological forest management in private woodlands. The fossil fuel industry was another area that respondents noted as requiring change, stating that a combination of greenhouse gas emission mitigation and climate adaptation are necessary for success.

Conclusion

This regional report concludes with a high-level summary of key findings related to Mid and South Willamette Valley community values and how they perceive they will be impacted by climate change. Each finding is broken down into how it relates to social aspects of vulnerability, including physical, emotional, social, and economic.

According to survey and workshop data, the people of Oregon’s Mid and South Willamette Valley deeply value their interpersonal relationships, outdoor and recreational activities, and natural environment (Table 3.6):

Table 3.22 Summary of Mid and South Willamette Valley Values

Finding 3.1 Respondents from the Mid and South Willamette Valley value the beauty and abundance of their natural environment.				
	Physical	Emotional	Social	Economic
Nature is beautiful	Beautiful mountains, healthy forests, lush valleys, and diverse wildlife			
Nature provides opportunities for outdoor recreation	Access to open natural spaces nearby			
Nature fulfills basic needs	Clean air, clean water, healthy ecosystems, good soil for nutritious food		Production and sharing of high-quality food are culturally and socially significant	Agriculture an important part of access to food and food systems; Connection to the land helps farmers and ranchers earn a living

Finding 3.2 Respondents from the Mid and South Willamette Valley greatly value outdoor and recreational opportunities

	Physical	Emotional	Social	Economic
Outdoor activities are restorative		Ability to connect to nature through bird watching, star gazing, outdoor dining, visiting natural areas		
Outdoor activities allow connection with others	Ability to maintain physical health by exercising outdoors	Ability to maintain mental health by exercising socially outdoors	Opportunities to connect socially through similar outdoor interests; Seasonal traditions; Can be a way of maintaining intergenerational ties	

Finding 3.3 Respondents from the Mid and South Willamette Valley value social ties and opportunities for community gathering.

	Physical	Emotional	Social	Economic
Small town vibe	Little traffic and scarcity of resources not much of a concern	Laid back atmosphere	People are friendly, welcoming, and involved; Cultural celebrations that bring community together	
Like-minded people			Communities share progressive values; Enjoy creative and open-minded people	
Safe communities			Low crime and violence; Social safety nets	

Finding 3.3 (con't) Respondents from the Mid and South Willamette Valley value social ties and opportunities for community gathering.

	Physical	Emotional	Social	Economic
Community groups and amenities			Wide array of groups and activities to bring people together; Volunteer opportunities and support services for people in need	
Built environment	Healthy selection of public spaces like libraries, green spaces, and coffee shops		Allows for forging and maintenance of community relationships and exploration of new interests; Allows for healthy social routines	
Accessible transportation	Walking and bike trails and transit systems; International and local travel supported by convenient interstates and airports		Able to get to friends and family and events;	Affordable and reliable transportation options

They worry that climate change impacts, especially from drought, wildfire, and heat waves, will reduce their ability to enjoy these aspects of their lives. They feel that climate change will negatively affect them in the following ways (Table 3.7):

Table 3.23 Summary of Climate Impacts in Mid and South Willamette Valley

Finding 3.4 Drought threatens the Mid and South Willamette Valley's agriculture-based livelihoods, connection to nature, and sense of strong community				
	Physical	Emotional	Social	Economic
Water scarcity	Ecosystem degradation, plant and animal death; Lack of safe drinking water harms physical health	Anxiety harms mental health	Particularly impacts small farmers, agricultural workers, low-income families; Reduced opportunities for recreation; Tensions between neighbors for scarce water	Crop damage, higher water and food costs
Soil degradation				Food system insecurity
Disruption to cultural food sources		Stress of losing way of life	Loss of way of life	
Threat to transportation infrastructure	Isolated from emergency aid if roads impassable; Ground shrinkage		Inability to evacuate if roads impassable, importance of mutual aid and community organizing; More time needed to access emergency services	
Threat to water infrastructure	More flash flooding may overwhelm stormwater systems, soil erosion		Relocation services needed for people in flood-prone areas	Expensive to upgrade stormwater systems
Population growth			Tension over scarce resources	

Finding 3.5 Wildfire threatens the Mid and South Willamette Valley's livelihoods, connection to nature, and sense of strong community

	Physical	Emotional	Social	Economic
Property loss	High threat at Wildland-Urban Interface		Reduced housing stability	Higher insurance costs and expensive home-hardening
Decreased air quality	Dangerous outdoor working conditions; Harms physical health	Indoor isolation harms mental health		Constrains crop growth
Destruction of natural areas	Damage to delicate, complex ecosystems	Lose access to favorite outdoor places	Fewer opportunities to build community through outdoor recreation	
Emergency preparedness		Fear of wildfire harms mental health	Importance of mutual aid and community organizing; Need for disaster relief resources to meet increased demand	
Threat to transportation infrastructure	Increased time to access emergency services may harm health			

Finding 3.6 Heat waves threaten the Mid and South Willamette Valley's livelihoods, connection to nature and sense of strong community.

	Physical	Emotional	Social	Economic
Prolonged periods of high temperatures	Need for A/C; Ecosystem degradation, plant and animal death; Heat and reduced sleep threaten physical health; Need for home modifications (A/C)	Indoor isolation harms mental health	Impacts small farmers, agricultural workers, low-income families, houseless; Reduced opportunities to socialize through recreation; Increased violence	Crop damage and higher food costs

New climate shifts species	Changes in pest and pollinator populations; New diseases			Crop damage and higher food costs
Threat to infrastructure	Heat damages infrastructure and overloads power grid			Expensive energy for A/C

Respondents from this region emphasized a desire for the legislature to act swiftly to address these impacts, with a focus on specific local needs. Members of this region, both survey respondents and workshop attendees, are calling for the legislature to prioritize the natural environment when allocating resources. Doing so will help protect the Mid and South Willamette Valley’s communities, wellbeing, and livelihoods.

Chapter 4 – Southwest Oregon



Background

The following chapter presents the findings from the Climate Change Vulnerability Assessment (CCVA) public engagement in Southwest Oregon. The study area includes three counties: Douglas (non-coastal), Jackson, and Josephine Counties. The CCVA engaged with Southwest Oregon community members through a statewide survey and a regional workshop. The survey and workshops combined reached participants from 26 different cities in the region. All cities represented in this region, excluding Medford, are rural areas.

Environmental Characteristics

Southwest Oregon’s climate is characterized by warm summers – generally the warmest in the state – and cool winters – generally cooler than the rest of western Oregon. Precipitation occurs in the winter months accumulating a substantial snowpack in the higher elevations while the lowland valleys receive less precipitation. The region is shaped by mountain ranges and watersheds, beginning with the Cascades in the east and extending to the Klamath Mountains and Coast Range in the west. There are three rivers that shape the region’s main watersheds: the Umpqua River, Rogue River, and Illinois River. The Oregon Regional Risk Assessment found that drought can have wide-ranging impacts in this region and all three counties are very vulnerable to drought-induced wildfire⁸⁷.

Region 4 is composed of three ecoregions: the Cascades, the Klamath Mountains, and the Coast Range. The Cascades ecoregion is underlain by volcanic soils and has mainly Douglas fir forests that are managed for commercial logging. The Klamath Mountains ecoregion is a mixture of conifer and hardwood forests, and it has sedimentary, granitic, metamorphic, and extrusive rocks underlying it. The Coast Range ecoregion has sedimentary soils that are prone to failure following clear cuts and is forested mostly by Douglas fir forests for commercial logging⁸⁸. Figure 4.1 describes more environmental characteristics of the region.

Figure 4.1. Major Landmarks and Land Type of Southwest Oregon by County

<u>Major Natural Landmarks</u>	<u>Land Types</u>
Douglas County (non-coastal): Umpqua National Forest	Douglas County (non-coastal) 51% Public 9% Developed/Cultivated
Jackson County: Oregon Vortex, Bear Creek Greenway, Cascade-Siskiyou National Monument	Jackson County 52% Public 11% Developed/Cultivated
Josephine County: Indian Mary Park, Rogue River-Siskiyou National Forest, Oregon Caves National Monument and Preserve	Josephine County 68% Public 9% Developed/Cultivated

⁸⁷ State Interagency Hazard Mitigation Team, *Oregon’s Natural Hazards Mitigation Plan*, vols. (State of Oregon, September 24, 2020), Available:

https://www.oregon.gov/lcd/NH/Documents/Approved_2020ORNHMP_00_Complete.pdf.

⁸⁸ *Ibid.*

Community Characteristics

Southwest Oregon hosts a population of nearly 420,000 people across over 9,500 square miles (Table 4.1). All counties in this region experienced population growth (or net migration) between 2010 and 2018. The average growth rate between the three counties of the region was greater than Oregon as a whole.⁸⁹ Jackson County experienced the greatest growth during this period in the region and the sixth greatest growth compared to all the counties in Oregon.⁹⁰

Table 4.24. Population Characteristics for Southwest Oregon by County

	Douglas County	Jackson County	Josephine County	Region 4
Total Population	111,322	222,604	87,994	421,920
Total land area (mi²)	5,133	2,801	1,641	9,575
Population Density (people/mi²)	22	79	54	44
Net migration, 2020-2022 (per 1,000 population)	23.0	10.4	23.6	19.0

Source: Oregon by the Numbers, 2024

⁸⁹ Shannon Caplan, David Keyes, Rachel Porter, and Elissa Schloesser, *Oregon by the Numbers*, vols. (The Ford Family Foundation and Oregon State University Extension Service, August 2024, Available: https://www.tfff.org/wp-content/uploads/OBTN_2024-091724-1.pdf)

⁹⁰ Ibid.

Federally Recognized Tribes

Figure 4.2 displays the locations of the nine federally recognized tribes. Three of the nine tribes have tribal service areas that overlap with the Southwest Oregon region. These include:

- Coquille Indian Tribe
- Confederated Tribes of Coos, Lower Umpqua, and Siuslaw Indians
- Cow Creek Band of Umpqua Tribe

Additional information on Oregon Tribes can be found in Part II, Appendix A.

Race and Ethnicity

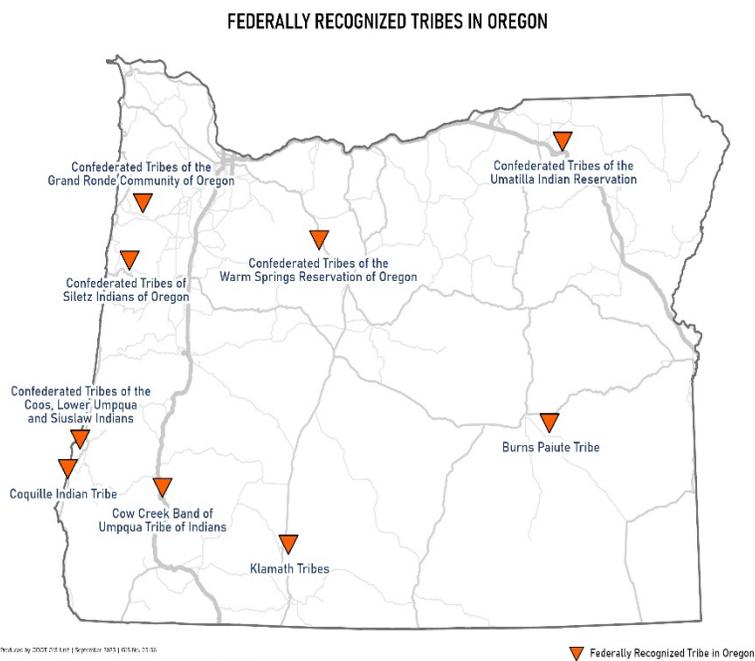
Similar to the state average, Jackson County has a greater population of Hispanic/Latino community members (13%) compared to Douglas (6%) and Josephine (8%) counties. Southwest Oregon has an above state average population of White and American Indian/Alaska Native identifying community members.⁹¹

Social Vulnerability

The physical, mental, and financial well-being of specific population groups in Central Oregon are already vulnerable to unanticipated events and natural hazards. These groups are likely to experience disproportionate impacts from climate-related hazards and events. According to the CDC Social Vulnerability Index, vulnerability in this region is similarly high across all three counties, meaning that any natural hazard would significantly impact their populations.⁹² Figure 4.3 provides a high-level summary of Region 4's known social vulnerabilities.

Social vulnerability in this region is driven by various factors. Jackson County experiences higher share of single-parent households and of residents that speak English less than “well”. Josephine County has a high number of residents

Figure 4.24 Oregon's Federally Recognized Tribes



Source: Oregon Department of Transportation

Figure 4.25 Known Regional Vulnerabilities

- **Low median household income**
- **High proportion of seniors**
- **High number of seniors with disabilities**
- **High number of tourists**
- **Rising rates of homelessness**
- **Lower educational attainment**
- **High number of single parent households**

⁹¹ Caplan, Keyes, and Schloesser, *Oregon by the Numbers*.

⁹² “CDC/ATSDR Social Vulnerability Index Map,” Interactive Map (Agency for Toxic Substances and Disease Registry, 2020), Available: https://www.atsdr.cdc.gov/placeandhealth/svi/interactive_map.html.

65 and older, a high unemployment rate and a higher share of people living in poverty.⁹³ See Table 4.3 for specific measures of social vulnerability in Southwest Oregon.

Table 4.25. Social Vulnerability Measures for Southwest Oregon by County

	Douglas County	Jackson County	Josephine County
Median household income	\$55,440	\$67,690	\$56,068
Households in financial hardship	51.4%	43.1%	51.2%
Child poverty	19.2%	15.3%	20.2%
Unemployment	5.3%	4.7%	5.6%
Food insecurity	12.0%	10.5%	12.7%

Source: Oregon by the Numbers, 2024

Individual and community well-being can be influenced by various financial, social, and environmental factors. Table 4.3 details self-reported data from individuals.⁹⁴ Research from The Ford Family Foundation in their annual Oregon by the Numbers Report shows that counties with lower rates of poverty, unemployment, disability, and mortality also report fewer (physically) unhealthy days. Their researchers also note that addressing low mental health should consider access to care.

Table 4.26 Percent of Population Reporting Good Physical and Mental Well-Being in Coastal Oregon

	Good Physical Health	Good Mental Health
Oregon	60.1%	57.3%
Douglas County	58.0%	56.5%
Jackson County	60.6%	55.4%
Josephine County	58.5%	58.2%

Source: 2022 Oregon by the Numbers Report, The Ford Family Foundation

Economic and Livelihood Characteristics

Table 4.4 provides a high-level summary of the top employment industries in Southwest Oregon across the six counties. In 2018, the five major supersectors by share of employment in Region 4 were:

1. Trade, Transportation, and Utilities
2. Education and Health Services
3. Leisure and Hospitality
4. Manufacturing

⁹³ State Interagency Hazard Mitigation Team, *OR NHMP*.

⁹⁴ Caplan, Keyes, and Schloesser, *Oregon by the Numbers*.

5. Local Government⁹⁵

Compared to the United States as a whole, Region 4 is relatively competitive in Forestry and Logging, Wood Product Manufacturing, Nonstore Retailers, Support Activities for Agriculture and Forestry, and Private Households.⁹⁶

Table 4.27 Top Three Employment Industries for Southwest Oregon by County

	Douglas County	Jackson County	Josephine County
1	Food services and drinking places	Food services and drinking places	Social assistance
2	Wood product manufacturing	Ambulatory health care services	Food services and drinking places
3	Educational services	Educational services	Ambulatory health care services

Source: Oregon by the Numbers, 2024

Climate Projections

Oregon Climate Change Research Institute (OCCRI) projects that the six climate change impacts that will affect Southwest Oregon most are increasing **mean temperatures, heat waves, drought, wildfire, warmer winters, and extreme precipitation**. Data informing climate projections for the region are based on continuing current high-level emissions of greenhouse gases.⁹⁷

⁹⁵ State Interagency Hazard Mitigation Team, *OR NHMP*; U.S. Bureau of Labor Statistics, *Quarterly Census of Employment and Wages*, vols., December 20, 2019, Available:

<https://www.bls.gov/cew/classifications/industry/industry-supersectors.htm>.

⁹⁶ State Interagency Hazard Mitigation Team, *OR NHMP*; U.S. Bureau of Labor Statistics, *QCEW*.

⁹⁷ Erica Fleishman and Oregon Climate Change Research Institute, *Sixth Oregon Climate Assessment*, vols. (Oregon State University, January 2023), Available: https://ir.library.oregonstate.edu/concern/technical_reports/gt54kw197.



MEAN TEMPERATURE

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

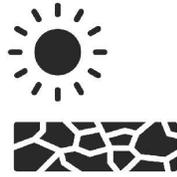
- Warmer nights
- Longer fire seasons
- Unmet chilling requirements
- Expansion of some pests, diseases, invasive species



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.



blogs.oregonstate.edu/occri/

Findings

This section presents the key findings from review and synthesis of 87 survey responses from Southwest Oregon residents and conversations with eight workshop participants who attended a regional workshop in Medford, Oregon. These findings are supplemented by background research. Figure 4.4 provides a detailed background of respondent characteristics.

Survey respondents identified as older but were representative of the region in terms of race, income, and most education levels. People under 18 were underrepresented by about 19 percentage points. Respondents aged 25-34 and 65-74 were the most overrepresented age groups. Respondents with graduate or professional degrees were also slightly overrepresented by about six percentage points.⁹⁸

Seven workshop participants provided demographic data. Overall, more workshop participants identified as older, White or Caucasian, and with higher educational attainment levels than the general population in the region.⁹⁹

Community Values

Finding 4.1 Southwest Oregon values strong relationships and access to community activities and amenities.

“The people are amazing in my community, very welcoming and loving. Everyone watches out for each other.”

-Josephine County Survey Respondent

When asked what they value about their communities, survey respondents and workshop participants shared that they enjoy the opportunities to connect with friends, family, and the broader feel of the community, and appreciate the built infrastructure that allows them to easily do so. Figure 4.5 highlights the top survey values related to Finding 4.1.

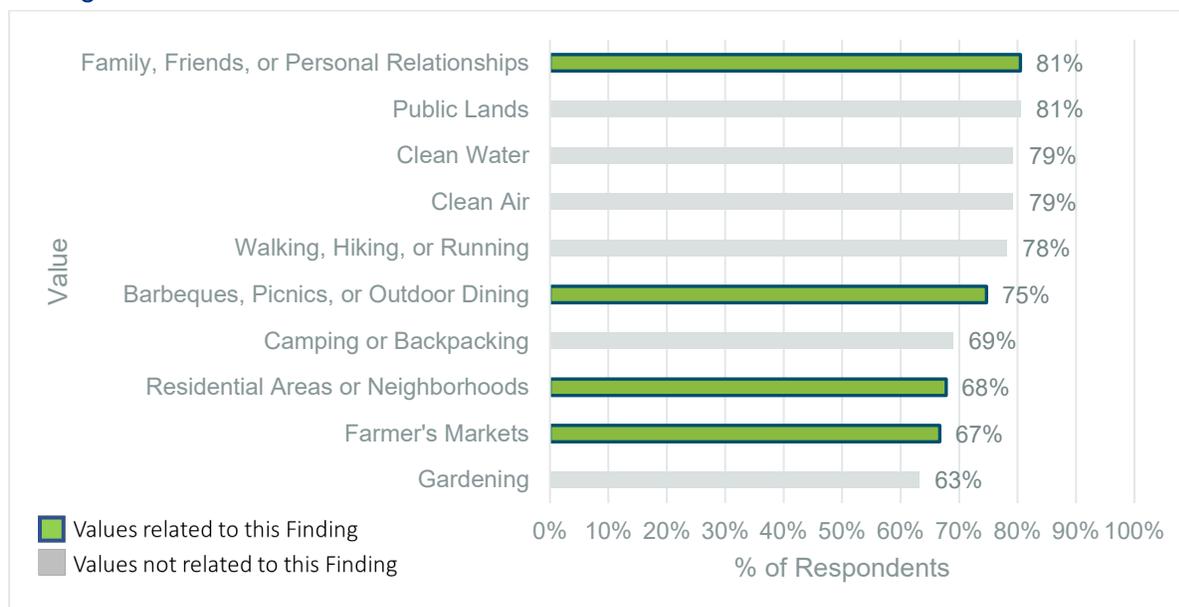
Figure 4.26 Southwest Oregon Respondent Characteristics



⁹⁸ Census Bureau and Social Explorer, “American Community Survey, 5-year (2017-2021),” Census, ACS 2021, Available: https://www.socialexplorer.com/tables/ACS2021_5yr.

⁹⁹ Ibid.

Figure 4.5 Top Ten Most Frequently Chosen Values by Survey Respondents as They Relate to Finding 4.1



Finding 4.1.a Residents of Southwest Oregon value opportunities to connect with friends, family, and their broader community through casual gatherings, local events, and community organizing.

“I need access to a diverse array of ideas that are new to me [...] I need the ability [build] community with others.” -Medford Workshop Participant

In Southwest Oregon, “Friends, Family, or Personal Relationships” tied as one of survey respondents’ two most often selected values (Figure 4.5). Workshop attendees reinforced this idea. They discussed the **importance of personal relationships**, saying that “friends and neighbors help me feel connected,” that they “[come] together in times of need,” and that they valued the “ability to connect with friends and family” and build “community with others.” For example, two participants shared that they had been friends for many years and enjoy the opportunity to see each other now at school sporting events their children are involved in.

Another common thread was the **abundance of cultural opportunities** like farmer’s markets, music, dancing, art, and history. A survey respondent expressed the importance of the area’s “cherished cultural history,” and workshop attendees noted their appreciation for local festivals (like the Oregon Shakespeare Festival and the Pear Blossom Festival) and parades. Survey respondents also highly valued “Barbeques, Picnics, and Outdoor Dining” (Figure 4.5), which tends to be an activity that people participate in for social purposes.

When asked to describe positive attributes of the region in their own words, both survey-takers and workshop attendees conveyed **appreciation for safe, small, welcoming communities** whose members support each other. Workshop participants explained that “common shared values,” “community members’ willingness to come together to solve problems,” and “access to diverse and new ideas” were valuable elements of their social fabric.

Finding 4.1.b Southwest Oregon’s community amenities and built environment reinforce the strength of the community.

In Southwest Oregon, the “Residential Areas or Neighborhoods” category ranked highest within “The Built Environment” value category (Figure 4.3). In free responses, survey respondents

expressed appreciation for “walkable streets,” “attractive housing/gardens,” and “vibrant downtowns” in the region. These observations, along with workshop discussion about residents having grown up in the area and being “here by desire,” suggest a **feeling of pride and ownership** within Southwest Oregon’s communities. A survey respondent further reinforced this idea of pride, saying “We are trying to form neighborhood groups to help folks transition toward sustainability, and build relationships with their neighbors. There is a lot that just citizens can do to help each other.”

Respondents with annual household incomes of less than \$25,000 make up just over 20% of Southwest Oregon survey respondents. Table 4.2 shows values differences between respondents in different income groups. Lower income respondents value access to food systems, services, and transportation to resources over higher income respondents.

Table 4.28 Top Values of Low Income Survey Respondents Compared to Other Household Income

Value	Household Income Less than \$25,000	Household Income Over \$25,000
Commercial Areas for Goods or Services	53%	41%
Transportation Infrastructure	63%	43%
Access and Reliability of Public Utilities	68%	54%
Access to Food or Food Systems	89%	57%

Community Context:

The Rogue Valley Food Systems Network (RVFSN) is coalition of farmers, businesses, organizations, and the Oregon Food Bank working towards connecting “food makers to food takers” in the specific context of the Rogue Valley’s robust agricultural economy. RVFSV promotes local farm businesses, hosts community events and celebrations of Rogue Valley agriculture, and coordinates food security resources. This comprehensive approach has streamlined resources from across the region into a cohesive mission that serves many types of food makers.

Finding 4.2 Respondents from Southwest Oregon value and identify with their natural resources.

“Climate change has increased the rate of water scarcity and since I am the closest to water that I’ll ever get, I feel myself slipping away. [...] I am also the closest to nature I’ll

¹⁰⁰ “Connecting food makers with food takers at Rogue Valley Food System Network” *The Jefferson Exchange*. (Jefferson Public Radio, 11 Apr. 2023), Available: <https://www.ijpr.org/show/the-jefferson-exchange/2023-04-11/wed-9-25-connecting-food-makers-with-food-takers-at-rogue-valley-food-system-network>; “What is a Food System?” *Rogue Valley Food System Network*. , 1 Apr. 2019, Available: <https://rvfoodsystem.org/about/whatisafoodsystem>.

*ever get & as the effects of climate change become more prevalent, I feel them.” -
Medford Workshop Participant*

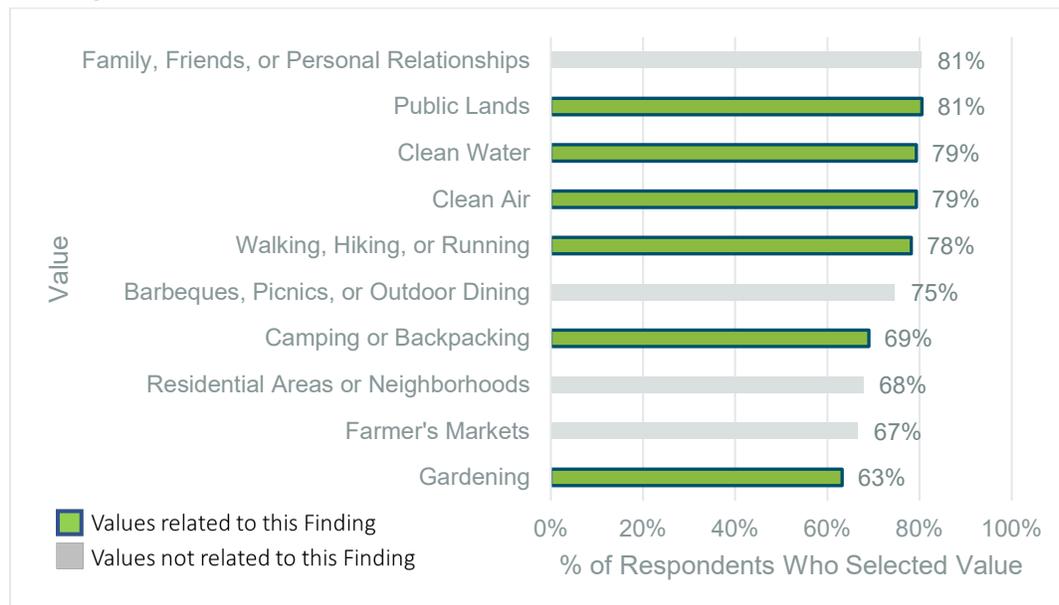
When asked about what they value about the natural environment, survey respondents of the Southwest Oregon shared an appreciation for public lands, clean water, and clean air. These resources, especially water, support the region’s economic and recreation opportunities.

Finding 4.2.a The natural environment is a source of identity and culture.

Survey respondents value “Public Lands”, “Clean Air”, “Clean Water”, and “Developed Parks” are in the natural environment (Figure 4.6). Additionally, “Walking, Hiking, or Running”, “Barbeques, Picnics, and Outdoor Dining” and “Camping or Backpacking” are outdoor recreational opportunities valued in this community.

The natural environment is **important to how people understand their experiences of living in this region**. Southwest Oregon is made up of **over 50% public land**.¹⁰¹ Over 80% of survey respondents said they value these public lands. Workshop attendees explained how they value the **wide variety of recreational opportunities** in the region and the ability to access public land to partake in outdoor recreation like hiking or just being in nature. Over 75% of survey respondents value “Walking, Hiking, or Running”. Just under 70% of respondents value “Camping and Backpacking”. Access to public land is important for survey respondents, not only to recreate also but to take “respite from the built environment.” One survey respondent wrote, “I value the proximity of downtown Ashland to open, undeveloped space in the Ashland watershed. I value music venues.” Another respondent reflects on the regions’ natural landscape and spaces for public use, “I’m grateful to be surrounded by natural beauty; mountains, lakes, rivers, and outdoor spaces for public use.” One workshop participant seemed to summarize community sentiment by remarking that **if the fish and river are not healthy, neither is the community**.

Figure 4.6 Top Ten Most Frequently Chosen Values by Survey Respondents as They Relate to Finding 4.2



¹⁰¹ Caplan, Keyes, and Schloesser, *Oregon by the Numbers*.

Finding 4.2.b The health of the natural environment reflects the health of the community.

Workshop participants talked about their **personal relationships with the Rogue River Basin** and how it **supports the region's people, economy, and cultural practices**. One participant said, "Southern Oregon is a community that takes pride in its extensive outdoor treasures. The members of our community rely on these assets not only to secure their everyday jobs, but also to engage in an outlet that is critical to their emotional well-being. Paying particular attention to caring for our natural resources is of utmost importance."

Eighty percent of survey respondents value clean water as part of the natural environment. Workshop participants reflected on how many people in the region depend on water for their livelihoods. Many people work on farms or in locally owned tourism businesses and the tourism industry in Southwest Oregon depends on water-based recreation opportunities, such as boating, rafting, fishing, and even hiking or camping by rivers.

Climate Change Impacts

Finding 4.3 Southwest Oregon residents worry about the primary and secondary effects of wildfires.

“How is climate change affecting me personally? For me, it would be forest fires. I live less than a mile from where the Alameda fire burned. [...] I did not receive an Emergency Call from any local agency about the situation [...] This situation creates some anxiety in me.” -Medford Workshop Participant

Southwest Oregon survey respondents and workshop participants both worry about the impacts of wildfire. Most survey respondents (70%) stated wildfires would have a strong negative impact on their lives. **Nearly 90% of respondents said that wildfire would have a somewhat or strong negative impact.**

While survey respondents provide a sense of the magnitude of wildfire impact, workshop participants articulated four main ways wildfires, or the risk of wildfires, impose primary and secondary impacts on their lives—through air quality, impacts on outdoor activities, climate anxiety and mental health, and impacts on resources and infrastructure.

Finding 4.3.a Wildfire smoke decreases the air quality for residents and can affect their health.

“I debate leaving Ashland because of the wildfire smoke and threat. I worry about its effect on local businesses. Mostly, I fear that we are not leaving a livable planet for our children.” -Jackson County Survey Respondent

Workshop participants and survey **respondents fear inhalation of smoke from wildfires**. One workshop participant said they wear N95 masks to reduce the risk of wildfire smoke inhalation and its impacts on their health. Another participant discussed how indoor air quality also could be affected by wildfire smoke due to limited or bad air filtration in buildings. Since indoor air quality can also be affected by wildfire, some residents feel like they cannot escape or find places without smoke affecting their ability to breathe. Multiple participants brought up the fact that “children and medically fragile people” will be the most affected physically by smoke.

Survey participants were also concerned about **vulnerable populations**, such as outdoor workers’ exposure to poor air quality from smoke. One survey respondent wrote, “I work outside a lot, and if we don’t protect our planet, jobs and the things we do outdoors will become much harder to do.” However, the survey and workshop did not capture significant additional first-hand data about outdoor workers’ values or potential vulnerabilities.

Finding 4.3.b Due to wildfires and smoke, residents cannot partake in outdoor activities or access public lands.

“I like being able to go to Bureau of Land Management land with my family to camp. Fire hazards prevent that.” -Josephine County Survey Respondent

Not only do wildfires affect air quality, but they **affect residents’ ability to participate in outdoor activities** in two main ways—smoke and reduced access to public lands. Since smoke decreases the air quality every year during fire season, wildfires already impact Southwest Oregon residents. Because of the health risk of smoke inhalations, workshop participants talked

about **not wanting to go outside on high smoke days**. Additionally, some have kids who are unable to play outside in the late summer or fall. School and club sports also can get canceled due to smoke.

Wildfires also reduce access to public lands. As workshop participants explained, if a wildfire burns through an area, sometimes it can no longer be legally accessed by the public until safety concerns are addressed. Additionally, sometimes wildfires destroy roads, physically blocking public access. With reduced access to public lands, Southwest Oregon residents can no longer participate in the outdoor activities they enjoy, and sometimes rely on for sustenance (like hunting and foraging).

Finding 4.3.c Climate anxiety and other mental health issues are affecting Southwest Oregon residents due to wildfire impacts and isolation from staying indoors.

“I feel like I have to escape in the summer.” -Medford Workshop Participant

Southwest Oregon survey respondents and workshop participants are very aware of the anxiety that comes with wildfires. One workshop participant talked about how “fire danger threatens me and my house”. Another said “**we’re all Bambi**” in reference to the fire scene in Disney’s 1942 Bambi where all the forest creatures and Bambi are trying to escape the forest fire. Southwest Oregon workshop participants said they experienced similar **feelings of anxiety and helplessness** when fires burn near their homes and in their communities.

OCCRI projected the wildfire risk in the area will continue to increase. One resident talked about how they were mostly able to keep wildfires out of town in the past, but as wildfires burn with more intensity, and create their own type of weather, they are harder to fight and they cause more damage overall. Workshop participants discussed how this increased risk, reduced ability to contain them, and increased damage will cause **more stress over wildfires** and other mental health impacts from isolation during high smoke days.

Isolation was brought up as workshop participants discussed the connection between staying indoors due to smoke and mental health issues. According to one participant, staying indoors equals less time to connect socially with others. As wildfires and smoke becomes more common along with heat waves and higher mean temperatures, more Southwest Oregonians may spend more time indoors. Workshop participants felt especially **isolated in the 2020 fire season** when they had to stay indoors not only due to the wildfires but also the pandemic. The isolation greatly affected their mental health because they were **cut off from their social ties**.

Finding 4.3.d Wildfires impact the infrastructure of Southwest Oregon and people who might lack the necessary resources to protect their homes.

Residents worry about **wildfires damaging infrastructure in the area**. Burning, falling trees can make **driving unsafe and roads impassable**. One survey respondent expressed concern for the “disruption of the supply chain” when wildfires cause roads to close for many days, weeks, or months. Another big impact of wildfires is the risk to people’s houses and property. To keep their homes safe, residents “need to fortify” them. Furthermore, one survey respondent stated there needs to be “more attention to hardening the urban interface area”.

However, some residents might not have the resources to help protect their homes from wildfires. Respondents highlighted that **some households are unable to pay for the hardening of their homes**. Additionally, one workshop participant talked about how they were unable to find home insurance because they live in a fire zone. If one can get home insurance, the price could be higher than a home not in a fire zone.

Southwest Oregon has more people living in poverty than the statewide average and a larger share of households in the bottom income brackets.¹⁰² The City of Medford's *Climate Adaptation and Resiliency Plan: Vulnerabilities* report states, reduced financial flexibility to respond to external changes increases a households' overall vulnerability.¹⁰³ Medford workshop participants and survey respondents in free response sections noted that **climate change imposes financial costs that low-income populations** may struggle to afford. In addition to the high cost of home hardening, workshop participants said they know of people in the community who struggle to afford A/C in the summer. A survey respondent wrote that sometimes even energy adaptations like solar panels can be too expensive for everyone to implement.

Finding 4.4 Drought threatens Southwest Oregon respondents' resource-based livelihoods and sense of strong community.

"We need to improve the ability of water resources to continue to provide for communities and still protect and value natural ecosystems and prepare for the scarcity which will continue to impact both."

-Medford Workshop Participants

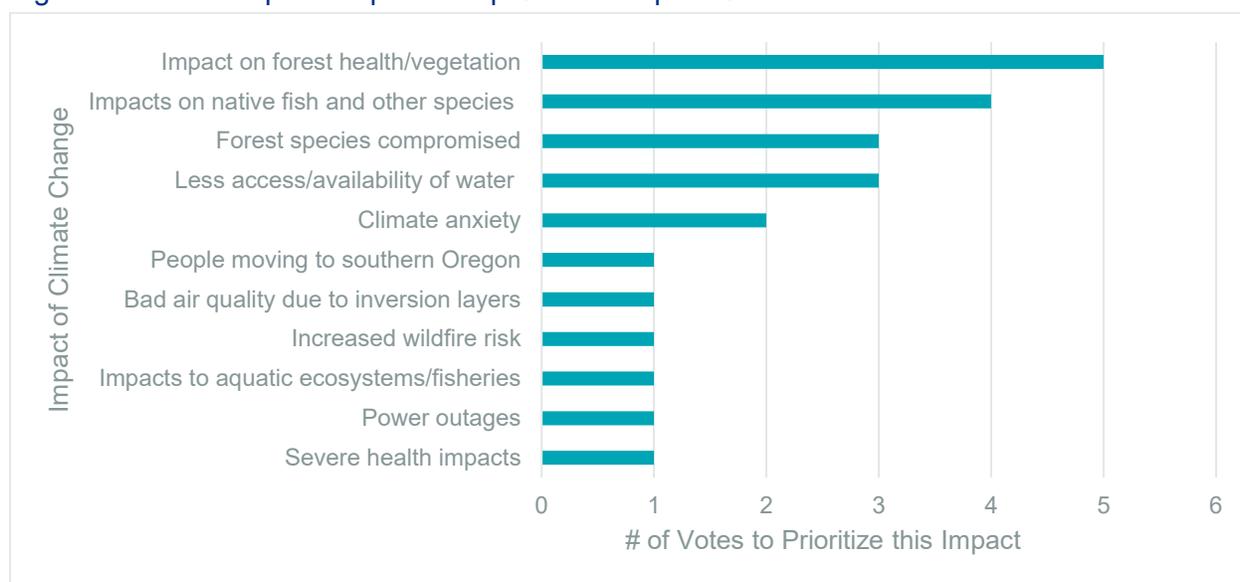
Drought is a widespread concern in Southwest Oregon. Over 80% of survey respondents in Southwest Oregon said drought would have at least a somewhat negative on their lives. Workshop participants reported already experiencing drought impacts such as wells going dry and low reservoirs.

During the Medford workshop, participants brainstormed 68 total climate impacts. Of these brainstormed impacts, Figure 4.5 shows the 11 impacts at least one participant voted to prioritize. Impacts directly related to water received eight votes out of twenty-three total, or almost 35%.

¹⁰² State Interagency Hazard Mitigation Team, *OR NHMP*.

¹⁰³ Medford Planning Department, *Climate Adaptation and Resiliency Plan: Vulnerabilities (Draft)*, vols. (City of Medford, 2022), Available: https://www.medfordoregon.gov/files/assets/public/planning/documents/long-range/carp_background-3-3-22.pdf.

Figure 4.7 Workshop Participants' Top Climate Impact Concerns



Workshop participants articulated that drought would escalate existing community tensions around water allocation because so many people’s livelihoods depend on water access, and simultaneously reduce amenities and activities that the community currently relies on for positive relationship building.

Finding 4.4.a Drought will increase community tensions around how to fairly allocate water to support the region’s water-intensive economy.

Workshop participants reported that **local livelihoods depend on access to water sources. They felt that agriculture, in particular, puts a huge demand on the water in the region.** Some participants explained that illegal marijuana farms make water management in the area even more complicated because their water usage cannot be monitored or regulated. One participant expressed frustration that out-of-state corporations also compete for local water uses. In addition to agriculture, participants worried that changes to river conditions may impact the small businesses that run recreational water activities for tourists. **Participants felt a sense of responsibility for sustainable management of the Rogue River and other water sources but worried about how water will be fairly allocated if drought worsens.**

Community Context

UNETE is an advocacy group for farm workers and immigrant communities in the Rogue River Valley. In a 2021 interview with OPB, Program Coordinator Kathy Keesee talked about the very poor and sometimes dangerous working conditions migrant workers face on illegal cannabis farms in the area. Keesee says that legal agricultural jobs dwindled in 2020 because of drought and the extreme wildfire season, forcing migrant workers into work on illegal grows. Keesee says exact numbers are difficult to estimate but the problem is likely to continue escalating.¹⁰⁴

Finding 4.4.b Changes to current water allocation could affect the reasons that residents have to gather together.

Impacts on agriculture may have cultural as well as economic consequences. Residents in the region have a shared sense of identity based on regionally foundational crops. Medford

¹⁰⁴ “Immigrant workers on illegal marijuana farms struggle with working conditions” *Think Out Loud*. (Oregon Public Broadcasting, 17 Nov. 2021), Available: <https://www.opb.org/article/2021/11/17/immigrant-workers-on-illegal-marijuana-farms-struggle-with-working-conditions/>.

workshop participants brought up the annual Pear Blossom Parade & Festival as an example. The Rogue River basin is known for its production of Royal Riviera pears, a staple of the Harry & David company since the 1930s. The Pear Blossom Parade & Festival celebrates spring through the opening of the pear blossoms.¹⁰⁵ But participants perceive pears as a water intensive crop. Workshop participants reported conversations in the community about whether the Rogue Valley should (and can) continue its traditional pear production due to water concerns. Workshop participants also predicted that drought could impact built infrastructure like green space, another source of opportunity for community gathering and bonding, as outlined in Finding 4.1.b. The City of Medford's *Climate Adaptation and Resiliency Plan: Vulnerabilities* affirms participants' concerns, noting that drought could affect the quality of public parks and relandscaping with weather-adapted plants is costly.¹⁰⁶ Changes to current water allocation, either for significant crops or landscaping, could **affect opportunities for socializing that Southern Oregon residents value.**

Community Solutions

"I believe we need to take actions to reduce warming and adverse weather now. Waiting another 20 years could be way too late."

-Douglas Survey Respondent

Workshop participants and survey respondents want more local-based approaches to help solve climate change and reduce their vulnerabilities. For both the survey and workshop, the residents of Southwest Oregon discussed some potential solutions which could help reduce climate change and its impact on their lives and communities. Respondents urged taking "aggressive action" on climate change as an overall approach. Since residents know their communities on a deeper level and how climate change is affecting them, it is important to also look at what type of solutions they present to help reduce the vulnerabilities of their communities. Below is a summary of some solutions discussed in the workshops and survey.

Local Engagement

The State of Oregon could **give communities "the tools, the educations, for doing what we can do adapt to a changing climate"**. "Climate support center" can be used to give these vital resources to address the causes and impacts of climate change. According to workshop participants, there is no centralized place for these resources. Instead, they are scattered across the state government, nonprofits, universities, and other organizations. Residents of Southwest Oregon, especially ones living in smaller communities, should not have to struggle to find important climate change adaptation and mitigation resources from multiple different organizations. Rather, it should be localized into one centralized organization, program, or center for each community.

Similar to a community climate support center, **community support can help combat the impacts of climate change.** In one survey respondent's community, they are forming neighborhood groups focused on building relationships through helping others transition towards a more sustainable lifestyle. They go on to discuss how "there is a lot that just citizens can do to help each other." One workshop participant believes that climate change impacts everyone more if communities don't help each other out. Therefore, everyone should hold

¹⁰⁵ "History & Board" *Pear Blossom Parade & Festival*. , n.d., Available: <http://pearblossomparade.org/history-board/>.

¹⁰⁶ Medford Planning Department, *Climate Adaptation and Resiliency Plan: Vulnerabilities (Draft)*.

people accountable for their actions to make sure everyone continues to do what is best for themselves, the community, and the planet in regard to climate change.

Vulnerable Communities

Southwest Oregon participants and respondents worry about the impacts of climate change on vulnerable communities, like low-income populations, as discussed above. Specifically for low-income populations, they discussed solutions to make climate change mitigation and adaptation strategies more affordable. One example is creating more affordable housing and helping communities afford expensive sustainable technology, like solar panels. Some areas in Oregon might not receive enough sunlight to solar panels, so rebate programs or tax breaks are not a good option and make some people **“feel left out of policy making”**. Additionally, vulnerable populations, like the elderly and people who are dependent on medical equipment, could be more affected by power outages. To reduce the risk of power outages and protect vulnerable populations like elders and people dependent on medical equipment, powerlines should be buried to protect them from extreme weather like wind, snow, or wildfires that will become more common due to climate change.

Natural Environment

Wildfires

As discussed previously, survey respondents said wildfires are the one climate change effect that impacts their lives the most. One survey respondent highlighted how effects of wildfires are extremely costly for the state, and, if nothing is done, expenses could increase to look more like California’s expenses after wildfires. The state could **reduce the risk of wildfires and “hedge against the fire season”** in the area through better and “more proactive” forest management. For example, there needs to be programs in Bureau of Land Management lands to manage and decrease the level of fuels (e.g., dry brush, dead trees) to help curb the overall wildfire risk and the intensity of future wildfires. This type of forestry maintenance could also give jobs to the local communities. Furthermore, the federal government needs to step in to help with forest management. There could be a potential partnership between the federal and state governments to help manage forests in public lands and forests around the State of Oregon the lower the risk of wildfires in Southwest Oregon.

Water Systems

Similarly, survey respondents and workshop participants want the **management of the water** in Southwest Oregon to improve and believe the current system will continue to be destructive. “The antiquated 19th century policies that shape water use are no longer a solution to water management problems. Rather, they are now significant problems in and of themselves.” According to participants, there is a clash between public water uses, agricultural uses, industrial uses, and environmental uses. **The public should be the priority when discussing water resources management** and preparing for future water scarcity. There needs to be “strict curtailment of non-beneficial uses of water” to sustain the water resources long-term and during times of drought. The water needs of the natural environment should not be forgotten in water management strategies. Strategies need to ensure enough water is available to keep a healthy water table, maintain surface water, keep water “connections to the sea and the atmosphere”, and allow for flora and fauna to thrive.

Conclusion

This regional report concludes with a high-level summary of key findings related to Southwest Oregon community values and how they perceive they will be impacted by climate change. Each finding is broken down into how it relates to social aspects of vulnerability, including physical, emotional, social, and economic.

Southwest Oregon respondents deeply value their interpersonal relationships and natural environment (Table 4.6):

Table 4.29 Summary of Southwest Oregon Values

Finding 4.1. Southwest Oregon values strong relationships and access to community activities and amenities.				
	Physical	Emotional	Social	Economic
Personal relationships			Friends, family, and neighbors are important	
Cultural opportunities			Farmer's markets, music, dancing, art, history, and festivals	
Safe, small-town vibe			Safe, small, welcoming communities whose members support each other	
Like-minded people			Common shared values and willingness to come together to solve problems	
Built environment	Walkable streets, vibrant downtowns, attractive neighborhoods		Feeling of pride and ownership within communities	

Finding 4.2. Respondents from Southwest Oregon greatly value and identify with their natural resources.

	Physical	Emotional	Social	Economic
Nature provides opportunities for outdoor recreation	Over 50% of the region is public land; Wide variety of recreational opportunities	Critical for emotional well-being		
Nature is restorative		Provides respite from the built environment		
Nature is beautiful	Beautiful mountains, lakes, and rivers			
Nature fulfills basic needs				Rely on natural assets like water, water-based recreation, farms, and tourism for livelihoods

They worry that climate change impacts, especially from drought and wildfire, will reduce their ability to enjoy these aspects of their lives. They feel that climate change will negatively affect them in the following ways (Table 4.6):

Table 4.30. Summary of Climate Impacts in Southwest Oregon

Finding 4.3. Southwest Oregon residents worry about the primary and secondary effects of wildfires.				
	Physical	Emotional	Social	Economic
Decreased air quality	Dangerous outdoor working conditions; Harms physical health			
Restricted outdoor and public lands access		Lose access to favorite outdoor places	Fewer opportunities to build community through outdoor recreation	

	Physical	Emotional	Social	Economic
Increased anxiety and isolation		Fear of wildfire harms mental health; indoor isolation harms mental health	Fewer opportunities to build community through outdoor recreation	
Damage to infrastructure	Isolated from emergency aid if roads impassable			Disruption to transportation could sever connection between retail markets and customers; Higher insurance costs and expensive home-hardening
Finding 4.4. Drought threatens Southwest Oregon respondents' resource-based livelihoods and sense of strong community.				
	Physical	Emotional	Social	Economic
Tensions around water allocation			Feel sense of responsibility to fairly allocate water	Agriculture and out-of-state corporations use a lot of water; Tourism depends on water resources
Loss of community gathering opportunities			Drought and adaptations to it require respondents to change socializing habits	

Many respondents from this region emphasized a desire for the legislature to act swiftly to address these impacts, with a focus on specific local needs through policies and centralized climate change resource centers. Members of this region, both survey respondents and workshop attendees, are calling for the legislature to prioritize the natural environment when allocating resources. Doing so will help maintain the viability and productivity of the Rogue River Basin, which is central to their communities, well-being, and livelihoods.

Chapter 5 – Mid-Columbia



Sources via Adobe Stock Photos. (left) Hanjo Hellmann,

Background

This section provides a summary of existing community characteristics for the Mid-Columbia region. We drew from existing state planning documents, such as the Oregon Natural Hazards Mitigation Plan, and other background research materials to provide a high-level overview of environmental, demographic, and economic conditions in the region. This section concludes with an overview of climate projections for the Mid-Columbia region and known social vulnerabilities.

Environmental Characteristics

The Mid-Columbia region borders Washington State along the Columbia River. The Columbia River and the eastern slope of the Cascades shape the region's topography. Region 5 begins at the Cascades crest in the west and extends east to the Idaho border. The region's major watershed is the Columbia River with all smaller water bodies feeding it as it flows west. The Mid-Columbia region is characterized by a semi-arid climate, in which summers and winters can be extreme.¹⁰⁷

The region is composed of four ecoregions: the Cascades, the Eastern Cascade Slope and Foothills, the Blue Mountains, and the Columbia Plateau. The Cascades ecoregion is underlain by volcanic soils and has forests of Douglas firs that are managed for commercial logging. The Eastern Cascade Slope and Foothills ecoregion is dominated by grand fir mixed forests in the uplands and mixed oak/conifer forests in the foothills. It often experiences dramatic temperature extremes. The Blue Mountains ecoregion is underlain by volcanic rock and has forests of spruce fir, grand fir, Douglas fir and ponderosa pine. The Columbia Plateau is underlain by basaltic bedrock up to two miles deep. Higher elevation areas support Douglas fir and ponderosa pine forests while narrow canyons provide habitat for riparian species¹⁰⁸. In some areas of the region, public lands dominate while other areas of the region have more developed and cultivated lands¹⁰⁹. Figure 5.1 describes more environmental characteristics of the region.

¹⁰⁷ State Interagency Hazard Mitigation Team, *Oregon's Natural Hazards Mitigation Plan*, vols. (State of Oregon, September 24, 2020), Available:

https://www.oregon.gov/lcd/NH/Documents/Approved_2020ORNHMP_00_Complete.pdf.

¹⁰⁸ Ibid.

¹⁰⁹ Shannon Caplan, David Keyes, and Elissa Schloesser, *Oregon by the Numbers*, vols. (The Ford Family Foundation and Oregon State University Extension Service, August 2022), Available: https://www.tfff.org/wp-content/uploads/OBTN_2022_101022-Digital.pdf.

Figure 5.8 Major Landmarks and Land Type in the Mid-Columbia River Region by County

Source: Oregon by the Numbers, 2022

<u>Major Natural Landmarks</u>	<u>Land Types</u>
Gilliam County: Cottonwood Canyon Recreational Area, JS Burres State Park, Earl Snell Memorial Park	Gilliam County 8% Public 29% Developed/Cultivated
Hood River County: Mt Hood National Forest, Mt hood Meadows Ski Area, Eagle Creek	Hood River County 73% Public 9% Developed/Cultivated
Morrow County: Willow Creek Dam, Umatilla National Forest, Umatilla National Wildlife Refuge	Morrow County 17% Public 30% Developed/Cultivated
Sherman County: Deschutes River State Park, John Day Dam, Cottonwood Canyon State Park	Sherman County 12% Public 44% Developed/Cultivated
Umatilla County: Hat Rock State Park, Umatilla National Forest, Bridge Creek Wildlife Area	Umatilla County 27% Public 33% Developed/Cultivated
Wasco County: Mt Hood National Forest, Deschutes River Recreation Site, Celilo Falls	Wasco County 44% Public 11% Developed/Cultivated

Community Characteristics

The Mid-Columbia region hosts a population of nearly 146,531 people across over 10,000 square miles. Around 55% of the region's total population is in Umatilla County. All counties across the region are growing in population size.¹¹⁰ Table 5.1 provides additional details of population characteristics by county.

¹¹⁰ Ibid.

Table 5.31 Population Characteristics of the Mid-Columbia Region by County

	Gilliam	Hood River	Morrow	Sherman	Umatilla	Wasco	Region 5
Total Population	1,983	23,965	12,140	1,900	79,904	26,639	146, 531
Total land area (mi²)	1,223	533	2,048	831	3,232	2,395	10,262
Population Density (people/mi²)	2	45	6	2	25	11	14
Net migration, 2020-2022 [per 1,000 population]	45.4	99	66	21	23	85	56.6

Source: Oregon by the Numbers, 2024

Federally Recognized Tribes

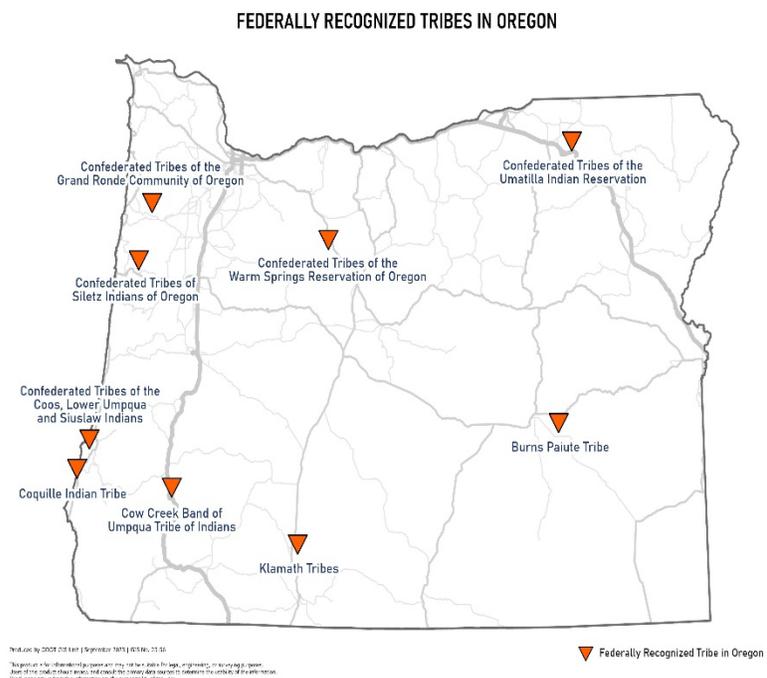
Figure 5.2 displays the locations of the nine federally recognized tribes. Two of the nine federally recognized tribes have tribal service areas in this region. These include:

- Confederated Tribes of Umatilla Indian Reservation
- Confederated Tribes of Warm Springs¹¹¹

Race and Ethnicity

Race and ethnicity demographics of the Mid-Columbia Region diverge from the state average. Gilliam, Sherman, and Wasco

Figure 1.31 Oregon's Federally Recognized Tribes



Source: Oregon Department of Transportation

¹¹¹ Shannon Caplan, David Keyes, Rachel Porter, and Elissa Schloesser, *Oregon by the Numbers*, vols. (The Ford Family Foundation and Oregon State University Extension Service, August 2024, Available: https://www.tfff.org/wp-content/uploads/OBTN_2024-091724-1.pdf)

Counties have above the state average of individuals identifying as White, while the other counties are below the state average. All six counties have below the state average of individuals identifying as Black and Asian. Gilliam, Umatilla, and Wasco Counties have above the state average of individuals identifying as American Indian and Alaska Native, while the other counties have below the state average. Gilliam, Sherman, and Wasco Counties have above the state average of individuals identifying as Native Hawaiian or Pacific Islander, while the other counties have below the state average. Hood River, Morrow, and Wasco Counties have above the state average of individuals identifying as Hispanic or Latino, while the other counties have below the state average.¹¹²

Social Vulnerability

The physical, mental, and financial wellbeing of specific population groups in the Mid-Columbia region are already vulnerable to unanticipated events and natural hazards. These groups are likely to experience disproportionate impacts from climate-related hazards and events. Additionally, the CDC's Social Vulnerability Index identifies Gilliam and Sherman Counties as a 'low' level of vulnerability, Hood River and Morrow Counties as a 'medium-high' level of vulnerability, and Umatilla and Wasco Counties as a 'high' level of vulnerability.¹¹³ Figure 5.3 provides a summary of Region 5's known social vulnerabilities.

Between 2015 and 2019, Region 5 reported a 65% increase in the number of people experiencing homelessness.¹¹⁴ Sherman and Morrow Counties both reported significant percent increases but started with a count of zero. Older adults (65 and older) make up a smaller portion of Region 5 than they do of the state overall. The share of children in the region is higher than the share in the state overall. In Region 5, the share of people who do not speak English "Very Well" is higher than the statewide estimate, especially for Morrow, Hood River, and Umatilla Counties.¹¹⁵ Other household vulnerabilities can be found in Table 5.3.

Figure 5.32 Known Regional Vulnerabilities

- **High number of people experiencing homelessness**
- **Fewer college degrees**
- **Higher number of housing rentals and vacancies**
- Higher percent of children, as compared with the state
- Higher percent of older adults, as compared with state
- **Higher percent of people who speak English less than very well**
- **High percentage of people with a disability**

¹¹²

Caplan, Keyes, and Schloesser, *Oregon by the Numbers*; Census Bureau and Social Explorer, "American Community Survey, 5-year (2017-2021)," Census, ACS 2021, Available: https://www.socialexplorer.com/tables/ACS2021_5yr.

¹¹³ "CDC/ATSDR Social Vulnerability Index Map," Interactive Map (Agency for Toxic Substances and Disease Registry, 2020), Available: https://www.atsdr.cdc.gov/placeandhealth/svi/interactive_map.html.

¹¹⁴ State Interagency Hazard Mitigation Team, *OR NHMP*.

¹¹⁵ Ibid.

Table 5.32 Social Vulnerability Measures for the Mid-Columbia Region by County

	Gilliam County	Hood River County	Morrow County	Sherman County	Umatilla County	Wasco County
Median household income	\$58,409	\$80,254	\$64,975	\$57,171	\$57,973	\$570,322
Households in financial hardship	47.4%	38.9%	48.5%	48.1%	44.1%	50.4%
Child poverty	ID	ID	26.7%	17.5%	13.7%	11.5%
Unemployment	4.6%	3.6%	4.1%	3.3%	4.6%	4.3%
Food insecurity	9.8%	5.6%	9.4%	11.6%	10.0%	9.6%

Source: Oregon by the Numbers, 2024; ID = insufficient data

Individual and community wellbeing can be influenced by various financial, social, and environmental factors. Table 5.3 details self-reported data from individuals in Mid-Columbia counties.¹¹⁶ Research from The Ford Family Foundation in their annual Oregon by the Numbers Report shows that counties with lower rates of poverty, unemployment, disability, and mortality also report fewer (physically) unhealthy days. Their researchers also note that addressing low mental health should consider access to care. Notably, Region 5 counties are within the top 15 highest ranked counties for good mental health, with Morrow County as the county with the highest reported mental health.

Table 5.33 Percent of Population Reporting Good Physical and Mental Wellbeing in the Mid-Columbia

	Good Physical Health	Good Mental Health
Oregon	60.1%	57.3%
Gilliam County*	68.7%	59.8%
Hood River County	57.0%	59.0%
Morrow County	47.9%	70.9%
Sherman County*	68.7%	59.8%
Umatilla County	63.1%	64.5%
Wasco County*	68.7%	59.8%

Source: 2022 Oregon by the Numbers Report, The Ford Family Foundation, *Gilliam, Sherman, and Wasco counties are reported together as the North Central Public Health District, so each county reflects the same value, though there is likely variation.

Economic and Livelihood Characteristics

Table 5.4 provides a high-level summary of the top employment industries in the Mid-Columbia Region across the six counties. In 2018, the five major supersectors by share of employment in Region 5 were:

¹¹⁶ Caplan, Keyes, and Schloesser, *Oregon by the Numbers*.

1. Trade, Transportation, and Utilities
2. Natural Resources and Mining
3. Local Government
4. Education and Health Services
5. Manufacturing¹¹⁷

Compared to the United States as a whole, Region 5 is relatively competitive in Crop Production, Support Activities for Agriculture and Forestry, Animal Production and Aquaculture, Forestry and Logging, and Food Manufacturing.¹¹⁸

Table 5.34. Top Three Employment Industries for the Mid-Columbia Region by County

	Gilliam County	Hood River County	Morrow County	Sherman County	Umatilla County	Wasco County
1	Educational services	Crop production	Food manufacturing	Professional and technical services	Food services and drinking places	Crop production
2	Executive, legislative and general government	Food services and drinking places	Crop production	Gasoline stations	Educational services	Food services and drinking places
3	Social assistance	Professional and technical services	Animal production	Heavy and civil engineering construction	Agriculture and forestry support activity	Educational services

Source: Oregon by Numbers, 2024

Climate Projections

Oregon Climate Change Research Institute (OCCRI) projects that the six climate change impacts that will affect the Mid-Columbia Region most are increased instances and/or severity of **drought, heat waves, poor air quality, wildfires, warmer winters, and extreme precipitation**. Data informing climate projections for the region are based on continuing current high-level emissions of greenhouse gases.¹¹⁹

¹¹⁷ State Interagency Hazard Mitigation Team, *OR NHMP*; U.S. Bureau of Labor Statistics, *Quarterly Census of Employment and Wages*, vols., December 20, 2019, Available: <https://www.bls.gov/cew/classifications/industry/industry-supersectors.htm>.

¹¹⁸ State Interagency Hazard Mitigation Team, *OR NHMP*; U.S. Bureau of Labor Statistics, *QCEW*.

¹¹⁹ State Interagency Hazard Mitigation Team, *OR NHMP*.



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/

Findings

This section presents the key findings that emerged from review and synthesis of 44 survey responses from Mid-Columbia respondents and conversations with 19 workshop participants who attended regional workshops in Pendleton and Hood River. These findings are supplemented by background research. Figure 5.4 provides a detailed background of respondent characteristics.

Overall, 25% of Region 5's population is comprised of 25- to 54-year-old individuals. However, 35- to 54-year-olds were overrepresented within the survey. Thirty-four percent of residents in the region have a college degree, which reflects survey respondent characteristics. Survey respondents with higher median household incomes are overrepresented by nine percentage points. Latino/a/x or Hispanic respondents were underrepresented (9%) as compared to the region (27%).¹²⁰

Sixteen workshop participants provided demographic data. Overall, a higher percentage of workshop participants identified as 65+ and 35 to 54 years old than the regional average. The percentage of participants with graduate, post-graduate, or professional degree is also overrepresented; Only 8% of residents have a Master's, Professional School, or Doctorate Degree compared to the almost 70% of workshop participants. Both income levels of \$150,000 or more and \$35,000-\$49,999 were overrepresented in the data. Workshop participants accurately represented white or Caucasian demographics of the region.¹²¹

Community Values

Finding 5.1 Residents value their community, what makes it unique, and affordability.

Figure 5.5 shows Region 5 survey respondents' top 10 most frequently selected community values. Survey respondents' values that relate to community-oriented resources of Finding 1 are highlighted in green. Using workshop data, we identified find three main ways residents value

Figure 5.33 Mid-Columbia Respondent Characteristics

Survey Respondent Characteristics

- Nearly half of respondents were between 35 and 54
- Most common education level: Some college or an associate's degree (34%)
- Most common median annual household income: \$50,000-\$74,999 (27%)
- Most common racial and ethnic groups: White or Caucasian (77%) and Latino/a/x or Hispanic (9%)

Workshop Participant Characteristics

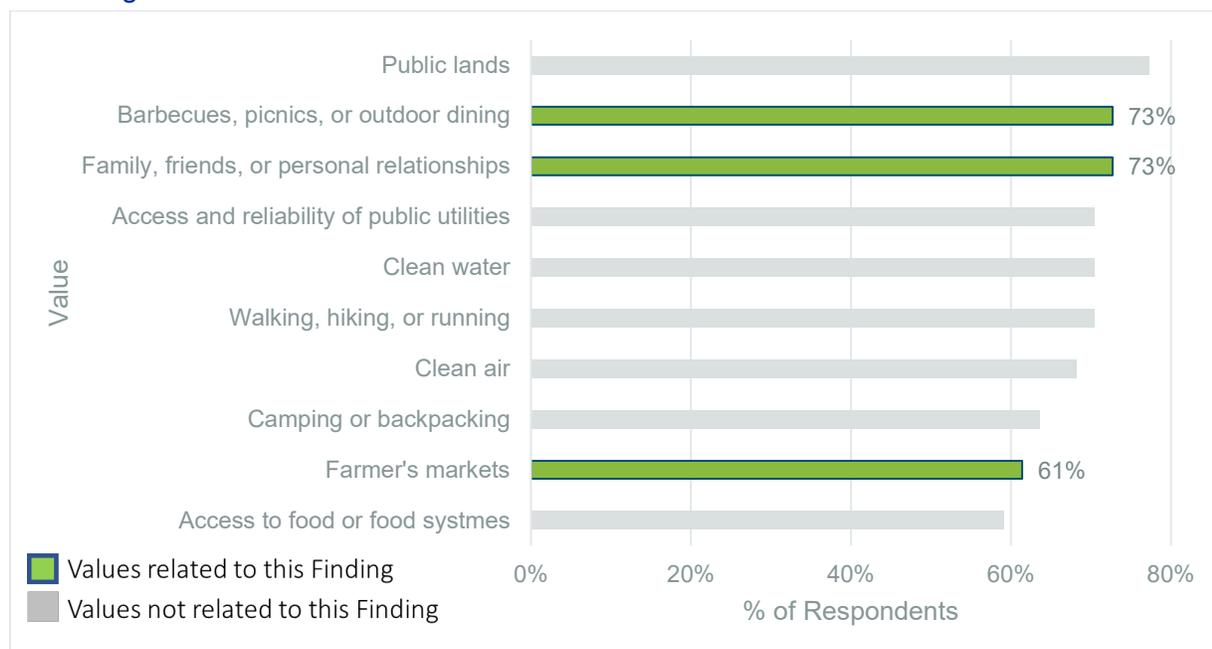
- Largest age groups: 65+ (31%) and 35-44 (25%) years old
- Most common education level: Graduate, post-graduate, or professional degree (69%)
- Most common median annual household income: \$150,000 or more (25%) and \$35,000-\$49,999 (19%)
- Most common racial and ethnic groups: White or Caucasian (83%)

¹²⁰ Census Bureau and Social Explorer, "American Community Survey, 5-year (2017-2021)."

¹²¹ Ibid.

community—through their interpersonal relationships, aspects important to their livelihood, and the unique community events.

Figure 5.12 Top Ten Most Frequently Chosen Values by Survey Respondents as They Relate to Finding 5.1



Finding 5.1.a Residents of the Mid-Columbia region value their interpersonal relationships and the sense of belonging they feel within their small, tight knit communities.

*“I live in The Dalles. One of the best things about living here is the sense of community.”
-Wasco County Survey Respondent*

Survey respondents and workshop participants **value personal connections and a sense of community**. Most survey respondents (73%) valued “Family, friends, or personal relationships”. Respondents also discussed how they appreciate the sense of community when given the opportunity to expand on their values. The sense of community is strengthened through residents “looking out for each other.” One respondent talked about how they “can count on anybody and everybody for help if and when need be.” Workshop participants appreciate how the “**small town vibe**” of their communities where every knows each other and has “familiar faces”. Participants discussed how there is a “certainty” and “stability” that comes with a “true small town”. They can always **depend on their community** to look out for them and help out when needed. Additionally, some workshop participants wanted to set down roots in a “tight knit community” where “like-minded” people lived. They put an emphasis on the importance of “personal connections” throughout their “diverse communities”

Workshop and survey respondents discussed the value of shared places and **opportunities to bolster personal connections** with each other and within the community. These included activities like sports, outdoor activities, community fitness, camps, music, cultural programs, or community events. Survey respondents reported a value for “Barbeques, picnics, and outdoor dining” (73%), “Farmer’s markets” (61%), and “Public or community gathering spaces” (55%). Within group discussions, workshop participants emphasized the importance of opportunities to connect and how the physical places where they can “gather to visit, play, eat, and grow” allow for building and strengthening relationships. These public places and community events act as a space to connect and build relationships within the Mid-Columbia region’s social infrastructure.

Negative impacts to community spaces may have rippling impacts beyond just social bonds to economic repercussions from event cancellations and supporting service industries.

Finding 5.1.b Mid-Columbia residents value access to affordable housing, living wages, health care, and other services which increases their and their community's livelihood.

"[We need] living wages that allow us to contribute to the community."

-Hood River Workshop Participant

The Mid-Columbia Region is a great place to live in Oregon, but is lacking in ability to support residents livelihood, according to workshop participants. One participant moved to Hood River for the opportunities for public service and environment-related jobs. However, while participants **value affordable housing**, it is lacking in their community. Some participants shared their concern over whether they'd be able to stay in the community they love because of the rising cost of living and housing availability. In 2022, 64% of the average wage was spent on the average monthly mortgage in Hood River, 25% higher than the Oregon average.¹²² According to one participant, some people must cross into Washington to find more affordable housing.

In addition to affordable housing, residents discussed the **need for living wages**. Just under 50% of survey respondents reported a value for "Living wages, jobs, or job opportunities". While workshop participants expressed their desire to pursue satisfying, fast-paced jobs, they also feel the need to find jobs that can offer a more livable wage. All counties in the Mid-Columbia region have more than 40% of households in financial hardship. Five of the six counties in the region have a median household income less than the State of Oregon's of \$65,667. Gilliam County has a median income more than \$20,000 below the state average.¹²³ Participants highly value education and job opportunities in their community which would allow for fulfilling jobs with a livable wage.

Survey respondents and workshop participants value **access to services** that support their quality of life and their community's livelihood, even if they do not currently have access to them. Just over 70% of respondents stated they value "Access and reliability of public utilities". Participants discussed how a strong community stems from several factors needed to provide **basic needs to sustain them**, such as access to "excellent medical care", "quality child and elder care", and utilities, like clean water.

Finding 5.1.c The Mid-Columbia region has a plethora of cultural events that provide a unique community for the residents.

Agriculture is a large part of the culture of the Mid-Columbia region. The Columbia River Gorge bordering the northern edge of the region has a diverse agricultural industry that supports jobs, identity, and local tourism. According to workshop participants, many of the agricultural industries have current and historic ties to different cultural and identity groups. **Agriculture supports the local tourism industry** through wine tours, breweries, and fruit picking. Some cities have local harvest festivals every year to celebrate the connection between the residents and agriculture. In addition to harvest festivals, the Mid-Columbia region hosts several other cultural events and local festivals throughout the year. These events and festivals range from local music festivals or art events to more spiritual events from the local tribes. Participants

¹²² Nigel Jaquiss, "New Numbers Show Oregon Homes at Their Least Affordable in 15 Years" *Willamette Week*, 25 May 2022, Available: <https://www.wweek.com/news/2022/05/25/new-numbers-show-oregon-homes-at-their-least-affordable-in-15-years/>.

¹²³ Caplan, Keyes, and Schloesser, *Oregon by the Numbers*.

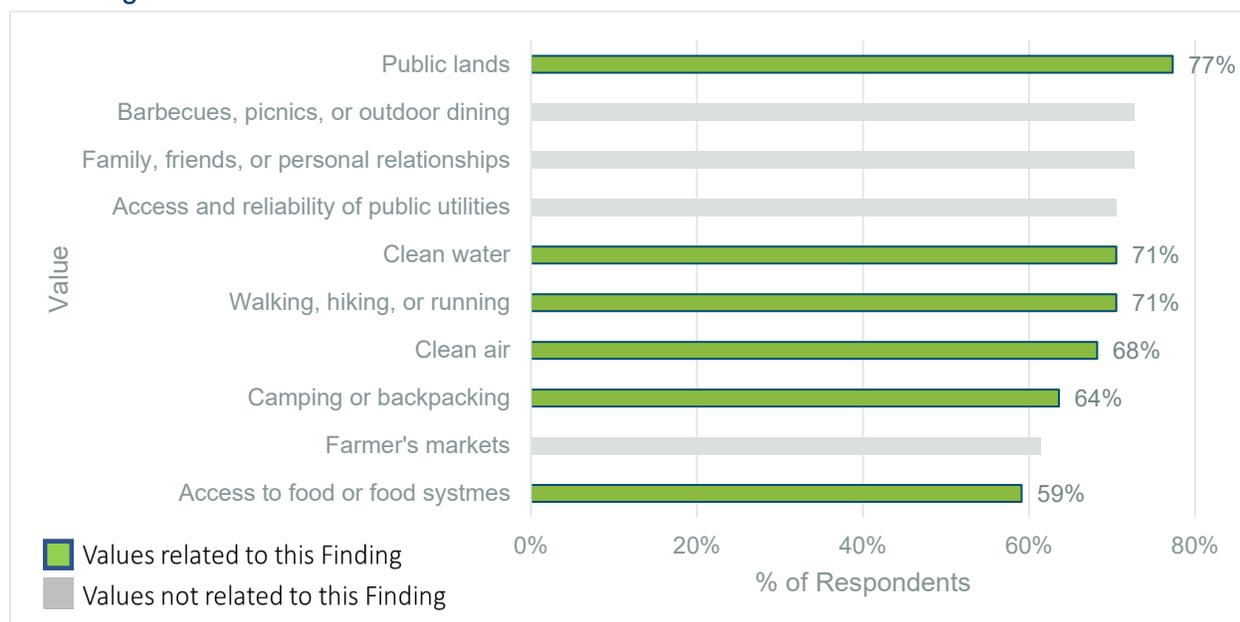
value how the **events and festivals showcase the diversity of the people and cultures of the region**. They also appreciate the opportunity it gives to bring people together, particularly with people of cultural backgrounds different from theirs, which aligns with Finding 5.1.a. discussed above.

Survey respondents and workshop participants valued their **connection to history**. Half of survey respondents valued “Local histories and heritage”. The indigenous way of life is important to some workshop participants who identified as indigenous. They talked about their value for the “rich culture and traditions” of the local tribes which includes two federally recognized tribes, the Confederated Tribes of Umatilla Indian Reservation and the Confederated Tribes of Warm Spring¹²⁴. Other survey participants mentioned that the tribes have used the region for “millennia” for living, trading, and traveling through. Access to and availability of First Foods, including “salmon, deer, roots, berries”, are important for local tribal communities.

Finding 5.2 Mid-Columbia residents value the natural environment in their community, the opportunities for activities it provides, and its resources.

Survey respondents overwhelmingly valued categories relating to the natural environment. As shown in Figure 5.6, six out of the top ten community values stem from the natural environment, as highlighted in green. Some workshop participants discussed various motivations for moving to the Mid-Columbia Region such as having access to nature, being a part of the windsurfing community, the beauty of the gorge, and fishing. Using workshop data, we identified find four main ways residents value the natural environment—through the ability to access public lands, the opportunities for recreation and outdoor activities, the ecosystem services it provided, and its connection to the regional economy.

Figure 5.13 Top Ten Most Frequently Chosen Values by Survey Respondents as They Relate to Finding 5.2



¹²⁴ Ibid.

Finding 5.2.a Community members value the ability to access the natural environment through public lands.

Survey respondents and workshop participants **value their ability to access public lands and the closeness of natural spaces** to their communities. Seventy-three percent of survey respondents value public lands. Furthermore, workshop participants enjoy public parks, city parks, trails, and mixed-use areas. One participant discussed how proximity to natural spaces increases connection with others, another important value as discussed above. Public lands are important to supporting other community values like interpersonal relationships and outdoor recreational activities which will be discussed more in depth in Finding 5.2.b. Public lands, like parks, can be used for these events or activities as community gathering spaces. In the case of outdoor activities and recreation, public lands can host a multitude of outdoor opportunities including barbecuing, fishing, hiking, and water sports, among other things.

Finding 5.2.b Recreation and other outdoor activities are important aspects for the Mid-Columbia region.

Survey respondents and workshop participants enjoy partaking in many outdoor activities, including recreational activities, outdoor events, or just enjoying the outdoors. Survey respondents' top three values categorized as "Outdoor or Recreational Opportunities" were:

- "Barbecues, picnics, or outdoor dining" (73%)
- "Walking, hiking, or running" (71%)
- "Camping or backpacking" (64%).

Workshop participants appreciate how **outdoor activities increase their physical and mental health** and how easily accessible the activities are in the region. Region 5 counties are within the top 15 counties of the state reporting the highest rates of good mental health, with Morrow County ranked as number one.¹²⁵

There are many recreational activities participants enjoy and value, a big one being water sports like water skiing or wind surfing. The Columbia River Gorge provides a great location for water sports. Workshop participants value **recreational activities they can do alone or in groups** (Ex: hiking, biking, skiing, fishing, swimming) and things they can do together or on a team (Ex: tennis, basketball).

Workshop participants also value **outdoor events**. Outside of the community and cultural events discussed above, one participant valued listening to music outdoors and appreciated outdoor music venues. Others enjoy just being in nature, like enjoying the outdoors through motorcycling. Overall, city, state, and federal lands allow residents to enjoy many of these outdoor and recreational activities, which explains why they value access to nature and public lands.

Finding 5.2.c The natural environment provides many different ecosystems services valued by the residents of the Mid-Columbia region, including clean air and water, food, and natural beauty.

Most survey respondents valued "Clean water" (71%) and "Clean air" (68%). Workshop participants valued clean air and water too. With the threat of wildfire increasing in the area and many wildfires in the past, workshop participants worry about their **access to clean air**. The Columbia River, its tributaries, and groundwater sources provide **clean drinking water** to the

¹²⁵ Ibid.

residents. Additionally, the lack of clean water could reduce residents' ability to partake in water sports.

Survey respondents and workshop participants discussed how **the health of the environment and the community are intertwined**, in relation to food. One respondent said, "to have a healthy community, we need a healthy environment." Overall, participants value the fresh, local food harvested from the area, including the "delicious" pears, apples, and cherries as well as sustainable agriculture. One participant pointed out how clean water is essential to grow food. In general, as discussed by one participant, the geography of the region makes way for a thriving agriculture system.

Outside of basic needs air, water, and food, workshop participants value **the natural beauty of the region**. One participant described the environment of the region as "the awesome beauty of where we live". Another value is the "gorgeous gorge". Some brought up how much they value the rain and how green it makes everything. Participants appreciate the positive feelings and emotions they get when being in nature. For one participant, natural areas give them a "safe place to walk".

Finding 5.2.d The natural environment supports the economy of the Mid-Columbia region through recreational tourism and agritourism.

Many **small businesses thrive due to the proximity to nature**, according to workshop participants. For example, many people flock to the Columbia River Gorge for wind surfing and water skiing which helps local sports shops through the renting of gear and guide services. Additionally, people come to the region for sight-seeing of the beautiful scenery, the public lands, and the natural features including Mt Hood. Another form of tourism participants value is "agritourism". Many people come into the region for the opportunities for wine tasting, visiting breweries, and going to small farms to pick fresh fruit. **Tourism and agritourism support the livelihoods and economy of local communities**, outside of the activities. According to Travel Oregon, visitors spent over \$400 million in the Mt. Hood and the Columbia River Gorge in 2021 which led to the employment of over 4,500 locals.¹²⁶

¹²⁶ "Mt. Hood & The Columbia River Gorge," Travel Website *Travel Oregon*. , n.d., Available: <https://industry.traveloregon.com/regions/mt-hood-the-columbia-river-gorge/>.

Climate Impacts

Finding 5.3 Wildfires and smoke negatively impact residents, their communities, and their homes.

“We suffer from wildfires a lot on this side of the state. It is not good for anyone.” - Umatilla County Survey Respondent

Over 90% of respondents said wildfires would have a negative impact on their lives (Table 5.5). With wildfires comes more smoke that impacts the air quality of the region. Over 80% of respondents said air quality would have a negative impact on their lives.

Table 5.35 Percentage of Survey Respondents Who Perceive Negative Impacts on Their Lives

	Wildfires	Drought	Air Quality	Heat Waves	Extreme Precipitation	Warmer Winters
Strong Negative Impact	64%	54%	46%	57%	30%	27%
Somewhat Negative Impact	29%	30%	36%	25%	36%	30%
Total Negative Impact	93%	84%	82%	82%	66%	57%

Using workshop data, we found four ways wildfires and air quality impact resident’s lives including lifestyle and livelihood, the environment, vulnerable groups, and health.

Finding 5.3.a Wildfires and smoke will affect residents’ lifestyles and livelihoods.

“Wildfire smoke means no outdoor fun.” -Hood River Workshop Participant

Wildfires and air quality affect the lifestyles of workshop participants by reducing their ability to partake in daily activities, community events, and recreation. Participants are unable to go outside due to the smoke during the wildfire season which impacts their ability to do daily activities like running errands and visiting friends. Others discussed how communities have to cancel events, including sporting events and outdoor festivals, due to poor air quality. Participants are also **unable to recreate freely** because of the wildfires closing public lands and smoke affecting their ability to breathe properly.

Wildfires and air quality will also impact workshop participants’ livelihoods through **decreasing tourism and affecting the food system**. As discussed in Finding 5.2.d, many people engage in tourism because of the great recreational activities and beautiful scenery the natural environment and public land in the Mid-Columbia region provides. Wildfires and air quality make it more difficult to access public lands due to closures, lowers visibility for sight-seeing, and can make it unhealthy to recreate outdoors due to smoke. Participants worry about how impacts in the tourism industry could lead to **jobs and economic losses**. One participant summed up this worry—“Recreation losses in the early spring equals economic losses.”

Workshop participants also worry about their **food being contaminated** when smoke and ashes from wildfires pollute their soil and water sources and therefore increasing food insecurity. According to one participant, the fumes of smoke could compound with other chemical contaminants like pesticides and other industry related air pollution further impacting the region's food and agriculture. Since agritourism is also important for the region's economy, as discussed above in Finding 5.2.d, impacts on food and agriculture could impact wineries, breweries, small farms, and other small businesses that rely on agritourism.

Finding 5.3.b Residents worry about the potential impacts of wildfires on the built and natural environment of the Mid-Columbia region.

"I am concerned about the number of fires that come so close to my town."

-Wasco County Survey Respondent

Workshop participants discussed the **destruction of wildfires** to the built environment. One participant referenced the destructive force of wildfires on the community of Paradise, California as an example and worried it could happen to their own community. As the wildfire risk increases in the region, participants **fear potential housing and property loss or structural damage**.

Participants are concerned about the effects of wildfires on the natural environment, mainly on their ability to access public lands and flora and fauna. As fires **decrease access to open spaces and public lands**, participants discussed the effect on outdoor activities and recreation. One resident mentioned the loss of trees in both the cities and forests due to wildfires. Additionally, fires displace and hurt many animals. Animals may be forced into urban areas due to the impacts of wildfires on their normal habitats. If an animal, one participant gave a cougar as an example, shows up in a residential area due to fire and loss of its habitat, there is a potential "threat to humans".

Finding 5.3.c Low-income populations will be more affected by wildfire.

"I am afraid of rising home insurance from the wildfire policies." -Wasco County Survey Respondent

The **cost of wildfire preparation** can be a barrier to low-income residents' ability to protect their homes and property. Many workshop participants discussed home hardening as the most important way to protect their homes and property, which can include using ignition resistance materials for siding and roofs, fire-resistant windows, and attic ventilation¹²⁷. However, as one participant pointed out, there is a **lack of access to affordable resources for home hardening**. One 2017 study found the average cost of retrofitting one's house to become wildfire resistance is \$24,600¹²⁸. Renters and people in informal living arrangements are particularly vulnerable to wildfire impacts since they do not often have control over making home updates.

In addition to the expense of home hardening, some workshop participants worry about the **increased cost of home insurance**. As wildfires become more common in the region, fire insurance for the homes located in areas where wildfires are becoming increasingly common

¹²⁷ Building Codes Division, "What homeowners need to know about home hardening" (Department of Consumer and Business Services, n.d.), Available: <https://www.oregon.gov/bcd/codes-stand/Documents/5785-howfirehardeningworks.pdf>.

¹²⁸ Trent D Penman et al., "Retrofitting for wildfire resilience: What is the cost?" *International journal of disaster risk reduction*. 21 (2017): 1–10.

will increase. Some residents might not be able to afford the increasing cost of insurance. While not mentioned by participants, residents might not be able to get fire insurance at all in the future. Insurers, like State Farm, have already begun to refuse insurance to homeowners in California because of increasing catastrophic conditions caused by wildfire¹²⁹.

Overall, workshop participants believe **low-income communities will be most affected** by wildfires and other climate change impacts due to the compounding effect of the increased cost of living and the lack of living wages in the region. Participants discussed how they will be unable to afford food and healthcare or find housing if they lose their home due to the absence of affordable housing. All of these **burdens exacerbate** the already apparent impacts of wildfires on low-income communities.

Finding 5.3.d Wildfires and smoke negatively affect the physical and mental health of residents.

“Climate change will deeply, dramatically, and irreversibly impact the health and wellbeing of our local communities. People will lose years of their lives due to new and worsened chronic conditions, depression, mental health, anxiety, and grief.” -Hood River Workshop Participant

The potential **short- and long-term health effects** from wildfire smoke are “deeply concerning” to workshop participants. With decreased air quality due to wildfire smoke, participants worry about the potential risk of asthma presenting in new individuals, to individuals who already have asthma, and to individuals who are more susceptible to decreased air quality. Some other negative effects discussed by participants include chronic diseases like heart, lung, and circulatory diseases, respiratory infections, diabetes, and lung or brain cancer. With lots of potential for many health effects, one participant brought up the **increased cost of medical bills**.

Workshop participants are most concerned by the potential health impacts of smoke to **children, elders, and the medically vulnerable**. Because these groups are **more susceptible to poor air quality**, they could be more likely to have negative health impacts than the average resident. One participant mentioned how poor air quality could negatively affect babies in the womb and lead to a decrease of healthy babies born in the region.

Wildfires and smoke will also negatively impact **residents’ mental health**. Many workshop participants fear wildfires and their impacts due to the uncertainty and unpredictability. One participant said they “**feel disoriented, sad, and uncertain**” when thinking about wildfires and their impacts. Wildfire threats bring upon anxiety and climate grief” to participants. One participant revealed how they feel like there is “nowhere to escape” from wildfires.

Furthermore, smoke and heat prevent residents from recreating outside in the summer including activities like camping, hiking, or other outdoor activities.

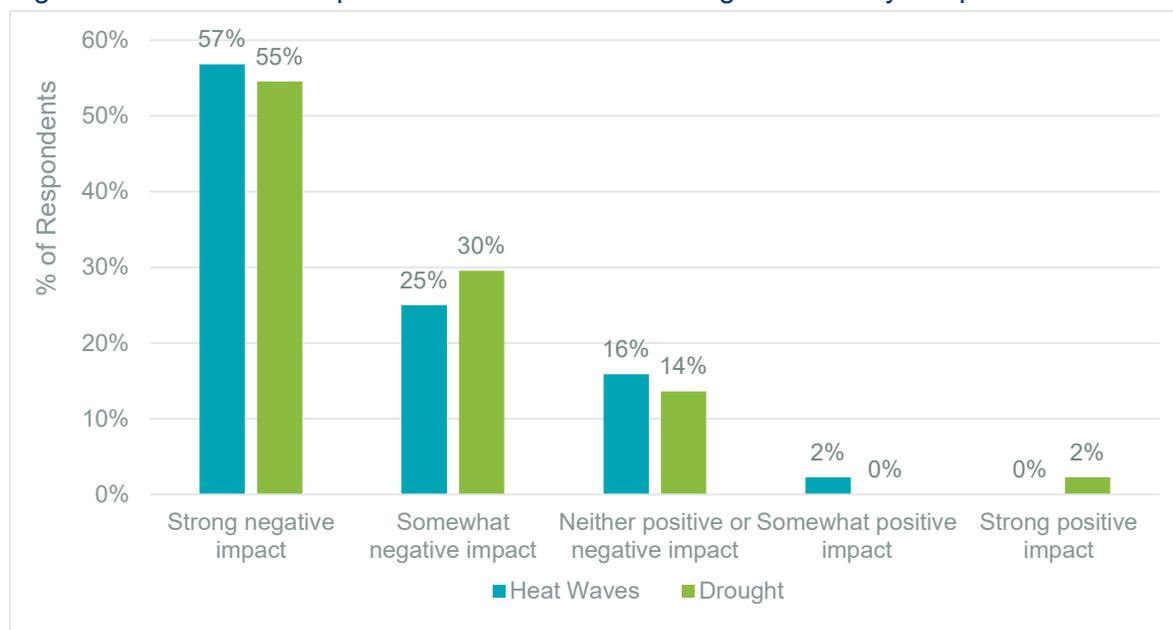
Participants also discussed spending more time indoors. For some, being indoors is not a reprieve from outdoor conditions, one participant reporting, “There are times in the summer when it is too hot to be inside my house.” Other participants discussed how **being stuck indoors can bring feelings of isolation**, mainly due to the inability to actively participate in relationships outside of their home. The decreased ability to access relationships not only affects the individual’s mental health, but also the interpersonal relationships of communities.

¹²⁹ Christopher Flavelle, Jill Cowan, and Ivan Penn, “Climate Shocks Are Making Parts of America Uninsurable. It Just Got Worse.” *The New York Times*. , 31 May 2023, sec. Climate, Available: <https://www.nytimes.com/2023/05/31/climate/climate-change-insurance-wildfires-california.html>.

Finding 5.4 Mid-Columbia residents are concerned about the impact of heat waves and drought will have on the natural and built environment.

Eighty-two percent and eighty-four percent of respondents said heat wave and drought, respectively, have a negative impact on their lives (Figure 5.7). Evaluating workshop data, we identified six main ways that participants perceive that heat waves and drought impact would impact their lives including impacts on the water system, food systems, flora and fauna, recreation, vulnerable populations, and infrastructure.

Figure 5.14 Perceived Impact of Heat Waves and Drought on Survey Respondents' Lives



Finding 5.4.a Mid-Columbia residents are concerned about how drought and warmer temperatures will impact the water system.

Workshop participants discussed how **drought will decrease the availability and increase the demand for water** in the Mid-Columbia region, which may be further strained by potential population growth in the region. Some participants mentioned the **potential for migration** into the area in the future due to its desirability as a place to live. One resident said that “people move here for the access to nature.” As the population of the area increases, the demand for water also increases. Drought will decrease the supply of water and affect the **water security** of the region. One participant mentioned the potential for conflict due to resource scarcity.

Participants are also worried about drought reducing streamflow in the region affecting the overall **stream health and ecosystem health** due to the limited precipitation and the loss of snowpack in the winter. Decreased stream health is only exacerbated due to heat waves. One participant mentioned how less water and higher temperatures can **increase fish mortality**, which led participants to talk about the negative impacts it could have on salmon. Participants discussed potential impacts to salmon that included the alteration of migration patterns from warmer water, disruption to spawning and life cycles, and ability for salmon to digest food properly. Another participant brought up how any impacts on fish impair their ability to catch and eat them. Overall, reduced streamflow and impacts on salmon and the fish populations will

affect residents' ability to access some outdoor areas and limit their ability to recreate, which is something workshop participants highly value as discussed above.

Community Context:

Indigenous people, and other populations who rely on Oregon’s water system, will be greatly impacted by decreased streamflow which is determined by the amount of rain and snowfall in the watershed. Jeremy FiveCrows, a spokesman for the Columbia River Inter-Tribal Fish Commission, discussed how Indigenous people have relied on fishing for millennia. They are worried about the potential impacts of reduced streamflow on the salmon population. If the flow is too low, salmon swimming from the ocean may be unable to return to their natural spawning grounds, water temperature could increase and create fatal conditions for the fish, and offspring might not survive. Fish like trout and freshwater whitefish could also be kept from their spawning grounds due to high temperatures. Fish mortality drastically increases when river temperatures stay over 72 degrees for more than 24 hours¹³⁰

Less water from drought and higher temperatures can also give way to worse contamination. Drought, dams, and warmer water slow down the water stream, which encourages the **growth of blue algae**. Workshop participants discussed how the blue algae in the Columbia River has “adverse impacts on communities”, such as water becoming “unsuitable for drinking and swimming”. One participant mentioned pollution from industry also increases the levels of blue algae.

Finding 5.4.b Residents worry about what the heat waves and drought will do to the food system.

“Water resources dramatically affect personal and community gardens just as much as professional crops.” -Wasco County Survey Respondent

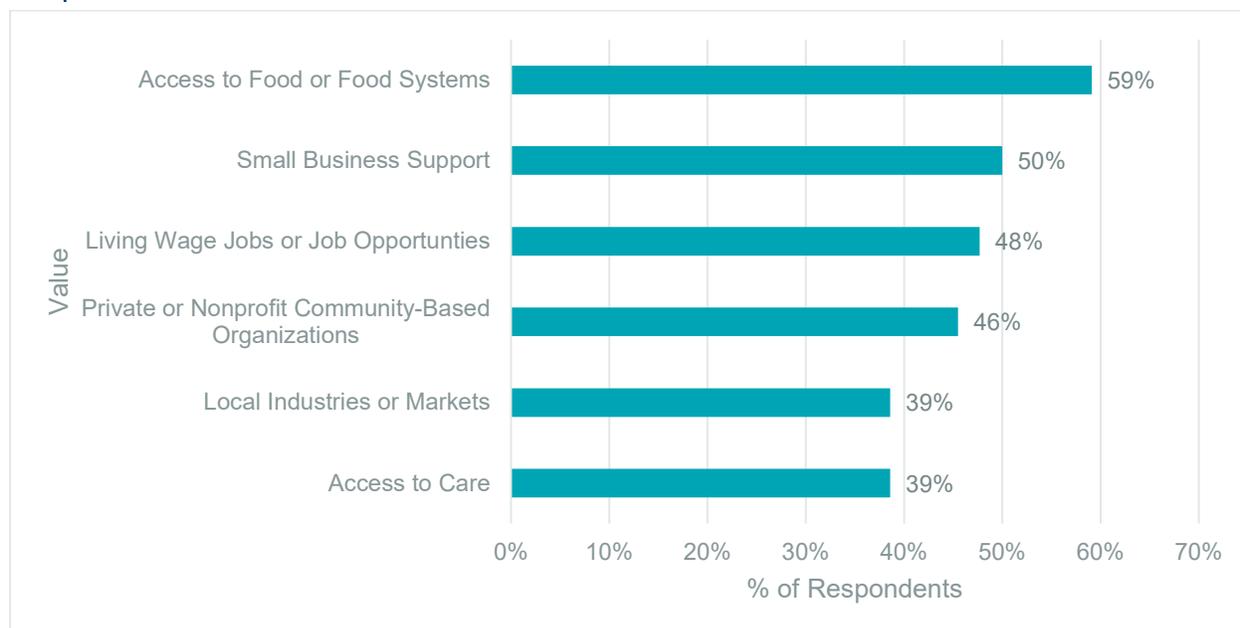
Workshop participants worry about the **loss of crops or “poorer harvest”** due to increased drought and reduced irrigation to water crops. For example, due to the hot and dry weather in 2021, the quantity and yields of wheat across the Pacific Northwest were significantly lower than usual. Only 10% of the wheat crop was in excellent or good condition. Additionally, drought increases protein content in wheat which affects farmers' ability to sell it to flour millers for a fair price.¹³¹ Other workshop participants discussed how **pests may become more prevalent** with the increasing heat and how crops can die due to reduced snowfall since snow acts as protective insulation from the cold during the winter months.

Crop death, crop harvest, and changes in crop type will affect the agricultural system and the food system. Over half of survey respondents value “Access to food or food systems”, the highest in the “Jobs, Sources of Income, or Access to Services” category (Figure 5.8). Workshop participants are **concerned about the “food growing capacity”** of the region, not only on a large scale but also in smaller household gardens. Participants worry that crop death and decreased harvest may eventually lead to **food shortages and decreased food security**, which could increase the risk of resource-based conflicts. One workshop participant discussed the importance of First Foods in their lives and how it might be impacted by drought.

¹³⁰ Kale Williams, “‘We’re just trying to survive at the moment’: Oregon agricultural sector hit hard by severe drought” *The Oregonian (oregonlive)*. , 18 Jun. 2021, sec. Environment, Available: <https://www.oregonlive.com/environment/2021/06/were-just-trying-to-survive-at-the-moment-oregon-agricultural-sector-hit-hard-by-severe-drought.html>.

¹³¹ Alana Lackner, “Wheat harvest impacted by heat, drought” *Columbia Gorge News*. , 11 Aug. 2021, Available: https://www.columbiagorgenews.com/news/wheat-harvest-impacted-by-heat-drought/article_bdec4a80-fa0c-11eb-b4b7-b7826d17c97b.html.

Figure 5.15 Top “Jobs, Sources, of Income, or Access to Services” Values of Survey Respondents



Impacts on the agriculture system may in turn affect the agritourism. One participant was worried about the wine industry and impacts on wine grapes. Another talked about the grain harvest which is important to breweries. Others were concerned about the fruit crops including cherries, pears, and apples.

Finding 5.4.c Drought and heat waves will decrease the productivity of the flora and fauna of the region.

Drought and heat waves also impact flora and fauna. With less water and increased temperatures, workshop participants worry about **natural vegetations and forests decreasing in natural areas** either by dying off, not growing as much, or no new plants growing. The reduction of vegetation could lead to a **loss of habitat for animals**. Participants also concerned about animals dying or a “mass extinction” occurring due to drought and increased temperatures. Some are especially worried about insect and pollinator populations because of their importance to the food system. Others discuss the possibility of increasing invasive species populations due to their ability to “handle heat” better than native species and how it would affect the natural system. Additionally, drought will affect the natural system by **increasing the likelihood of floods** during extreme precipitation events because dry soils are unable to absorb large amounts of water quickly. One participant discussed how flooding washes away topsoil and increase erosion in the region. Overall, drought and increased temperatures will negatively affect the natural systems.

Finding 5.4.d Extreme heat, similar to poor air quality, reduces residents' ability to recreate.

“Our summers have changed so much. They've been so hot that we can't enjoy Oregon summers like we used to.” -Hood River Survey Respondent

Similar to smoke, the heat has made it **harder for residents to recreate**. Many workshop participants feel the “loss of recreation” either due to their inability to camp in the summer or

because they cannot partake in any of their usual outdoor activities. **Participants have to stay indoors in order to feel comfortable in the summer.** However, many households do not have air conditioning to make it more comfortable during extremely hot days. One participant said, “There are times in the summer when it is too hot to be inside my house.” Retrofitting air conditioning into homes could make summers and heat waves more bearable, but some households might be unable to afford it.

Finding 5.4.e Residents expressed concern for the disproportional health impact on vulnerable populations.

Workshop participants of the Mid-Columbia region discussed how heat waves and warmer temperatures affect outdoor workers’ health. According to them, Latinos and tribal members make up a large portion of the outdoor workers. One participant mentioned that some agriculture workers sometimes must work in over 100-degree temperatures and start feeling the effects of the heat at 80 degrees when moving at a face pace. Overall, **outdoor workers have a greater risk of dehydration and heat strokes** since they are working long hours in the heat while exerting copious amounts of energy.

Participants worry about the impacts of heat waves on people who are more susceptible to heat, including elders and other medically vulnerable individuals. These populations might have “medical devices powered by electricity” or meds that need to stay cold in a refrigerator or freezer. The **power grid has the potential to fail and cause disruption to essential medical devices.**

According to workshop participants, **“unsheltered people” have an increased risk** of higher temperatures since they are sometimes unable to escape the heat. They, along with other low-income communities, might have an **inability to find shelter during heat waves** to help them stay cool. According to one workshop participant, there is a “lack of infrastructure for cooling shelters” in the region.

Finding 5.4.f The Mid-Columbia region needs improvement to their infrastructure in order to reduce impacts of extreme heat.

Mid-Columbia workshop participants are concerned about the effects of heat waves on infrastructure. Participants discussed the **increasing risk of grid failures due to the amount electricity used** during high temperatures days. Public safety power shutoffs to reduce demand and reduce the risk of power grid failures are common in the region, according to participants. Some participants discussed the importance of air conditioning in order to stay cool during extreme heat. However, like home hardening and other wildfire protection, some individuals might not be able to afford to retrofit an air condition unit into their home. Additionally, **more air conditioning units will increase the demand and strain on the power grid.** One participant believes homes do not need air conditioning but should be built with materials, like “strawbale only more conventional,” to help cool the house down without putting a strain on the power grid.

Community Solutions

“Change needs to happen if we are to sustain future generations.” -Wasco County Survey Respondent

Workshop participants and survey respondents across the Mid-Columbia regions suggested potential strategies for how the state and local government can help to reduce climate vulnerability in their communities.

Overall, workshop participants and survey respondents believed that policies should increase the standard of living for Oregonians. Respondents believe that the state government needs to “think holistically” and “supplement the shortages and gaps brought on by the climate catastrophe.” They also see the importance of balance amongst competing interests and across diverse communities when evaluating potential solutions. One respondent shared, “Policy makers [need] to **strive for a balance to protect both the environment and people's livelihoods.**” Respondents identified continued education, research, and cross-sector training as solutions that would support an overall approach to address climate.

Local Engagement

Respondents also urged their representatives to “**support local thinking**”, “local capacity building”, and making a “commitment to first exploring options within communities” to address the divide between urban and rural communities and the one-size-fits-all approach. Respondents view local level “exploratory work” as important piece of the process that “bring[s] people together across differences” to imagine different possibilities. Respondents saw this as particularly important for communities of color who are typically underrepresented in policy making. One possible solution that respondents posed was to increase funding for engagement.

Additional examples of local engagement that respondents include:

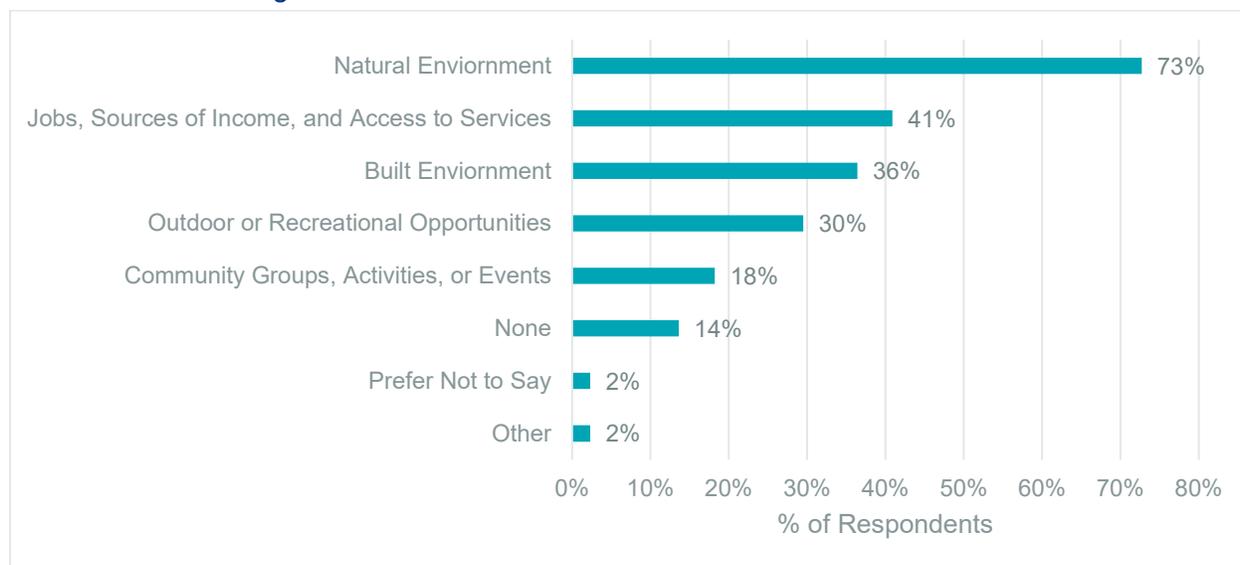
- **Educating the public** about climate change
- Educating people on hard issues and discussing them to produce a plan
- Supporting “mutual aid organizations”
- Supporting “those most affected by climate”
- **Funding projects or actions focusing on “our most vulnerable groups”**
- Focusing on “the social, psychological, and emotional impacts of climate change in our communities”

Natural Environment

Helping the natural environment is important when thinking about solutions. Seventy-three percent of survey respondents said resources need to be allocated to the “Natural Environment” (Figure 5.7). Overall, the state government should “**create and preserve more open spaces.**” It is important to create and fund restorations projects to **help the ecosystem “bounce back.”** Examples of restoring the ecosystem of the region include:

- Restoring the “floodplain connection”
- Replanting native plants
- Helping native bees thrive after fires
- Returning land to local tribes who have vast knowledge and are able to restore the land.

Figure 5.16 Percentage of Survey Respondents Who Want to Allocate Adaptation Resources to Different Value Categories



Water Systems

There are many solutions to **improve the water systems of the region**. Salmon are important to workshop participants and they do not want to lose them in the Columbia River. To increase their recovery, the state government could **look into dam removal** along the river. Dams could be removed to increase salmon recovery. Additionally, they could create more opportunities for **“water capture and reprioritization”** and “more creative ways to capture water” to help reduce the strain on the water system during droughts. An example is green stormwater infrastructure which “saves water, provides habitats, and promotes human and plant health.” State and local governments could **require green stormwater infrastructure** and codify it. Other creative ways to reduce the strain of the water system are modernizing irrigation and creating “permeable streets to recharge run-off.”

Infrastructure

The state government should focus on **“public infrastructure that promotes climate resilience”** or “green infrastructure.” This could be done by adapting infrastructure to decrease water usage or create “cleaner ways for power and other resources we rely on.” However, some clean energy can be expensive to some residents. To help increase affordability of clean energy, the government could help **fund opportunities for residents to acquire clean energy technology** or fund research to make more affordable technology. Other green infrastructure ideas include:

- Creating smart building codes to transition from flammable materials to more heat-, cold-, and fire-resistance materials
- “Codify[ing] building types that don’t need air conditioning”
- Adding air filtration in buildings to combat the poor air quality from smoke

Economy

To help **stabilize the economy** in the future, it is important to diversify it “so if one industry fails, we won’t too.” Additionally, the government could create “financial incentives that promote economic development targeted on reducing inequality.” To help the agriculture system, a big part of the region’s economy, the government could help **“change to crop types and management”** to help fit and adapt to future changes. They could also support agricultural

workers by **providing safe working conditions through policies and regulations** and creating funds to support their health.

Conclusion

This regional report concludes with a high-level summary of key findings related to Mid-Columbia community values (Table 5.6) and how they perceive they will be impacted by climate change (Table 5.7):

Table 5.36 Summary of Mid-Columbia Region Residents' Values

Finding 5.1 Residents value their community, what makes it unique, and the ability to afford to live in their community.				
	Physical	Emotional	Social	Economic
Personal relationships			Friends, family, and neighbors are important	
Small town vibe		Feelings of stability and certainty	Communities where everyone knows and looks out for each other	
Like-minded people			Tight knit community	
Built environment	Shared gathering places; Need for access to services like quality utilities and medical care		Opportunities to gather socially and strengthen relationships	
Cultural opportunities			Music, cultural programs, community events that showcase diversity of the people and cultures of the region and bring people together	
Livelihood				Need for affordability of housing; Need for living wages and job opportunities

	Physical	Emotional	Social	Economic
Agriculture			Culturally and historically significant; Supports identity; Harvest festivals	Supports jobs and local tourism through wine tours, breweries, and fruit picking
Native culture			Rich culture, history, and traditions of local tribes	Access to First Foods are important for tribal communities

Finding 5.2 Mid-Columbia residents value the natural environment in their community, the opportunities for activities it provides, and its resources.

	Physical	Emotional	Social	Economic
Nature is beautiful	Awesome beauty of the region and its landmarks	Being in nature generates positive emotions		
Nature provides opportunities for outdoor recreation	Public lands and natural spaces are accessible; Parks, trails, and mixed-use areas are important: Water sports; Outdoor activities increase physical health	Outdoor activities increase mental health	Proximity to natural spaces increases connection with others; Opportunities for gathering outdoors	
Nature fulfills basic needs	Clean air and clean water are important; Health of community and the environment are intertwined, especially through food			Sustainable agriculture depends on clean water
Nature is important for industry				Tourism and agritourism, both related to sight-seeing and recreational opportunities, support livelihoods and economy

The people of the Mid-Columbia region deeply value their unique community and natural environment. They worry that climate change impacts, especially from wildfire, poor air quality, heat waves, and drought will reduce their ability to enjoy these aspects of their lives (Table 5.7):

Table 5.37 Summary of Climate Impacts in the Mid-Columbia Region

Finding 5.3 Wildfires and smoke negatively impact residents, their communities, and their homes.				
	Physical	Emotional	Social	Economic
Decreased air quality	Harms physical health, especially of vulnerable populations	Indoor isolation harms mental health	Fewer opportunities to build community through outdoor recreation	Disrupts tourism; Constrains crop growth; Higher medical bills
Destruction of natural areas	High threat at Wildland-Urban Interface; Damage to delicate, complex ecosystems; Shift in ability to engage in physical outdoor activity	Lose access to favorite outdoor places	Fewer opportunities to build community through outdoor recreation	Disrupts tourism
Access to public lands	Increased interaction with displaced wildlife;		Fewer opportunities to build community through outdoor recreation	Disrupts tourism; outdoor recreation industry
Emergency preparedness	Renters unable to make home alterations		Low-income communities most affected	Higher insurance costs and expensive home-hardening
Health	New or increased instances of asthma and chronic health conditions	Fear of wildfire harms mental health; increased feelings of uncertainty	Fewer opportunities to build community through outdoor recreation	Increased cost of medical bills

Finding 5.4 Mid-Columbia residents are concerned about the impact of heat waves and drought will have on the natural and built environment.

	Physical	Emotional	Social	Economic
Water scarcity	Ecosystem degradation, plant and animal death; Lack of safe drinking water (blue algae) harms physical health; Loss of animal habitat		Tensions between neighbors for scarce water;	Crop damage and food system insecurity; Disrupts tourism, agritourism
Impacts to food systems	Potential food shortages; food insecurity	Stress of losing way of life (First Foods)	Loss of way of life (First Foods); impact to community heritage for related to agriculture	Decreased yield or quality of agricultural crops; increased pests, diseases; negative impact to agritourism
Vulnerable populations	Higher risk of health impacts on outdoor workers; Negative health impacts on elders and the medically vulnerable		Fewer opportunities to build community through outdoor recreation; decreased access to personal relationships; lack of public cooling shelters;	
Threat to infrastructure	Power shutoffs due to heat dangerous for people with medical conditions that require electricity; lack of energy efficient housing stock; inability to retrofit homes		Public safety power shutoffs	Heat may cause power grid failure; cost of air conditioning

Many respondents from this region emphasized a need for the state to focus on the local level and increase research and education efforts. Members of this region are calling for the state to improve water systems, public infrastructure, support agriculture, and prioritize the natural environment when allocating resources. Doing so will help protect the residents' communities, wellbeing, and livelihoods.

Chapter 6 – Central Oregon



Source via Adobe Stock Photos, (left) RG (right) Victoria Nefedova

Background

This section provides a summary of existing community characteristics for Central Oregon. We drew from existing state planning documents, such as the Oregon Natural Hazards Mitigation Plan, and other background research materials to provide a high-level overview of environmental, demographic, and economic conditions in the region. This section concludes with an overview of climate projections for Central Oregon and known social vulnerabilities to the communities within OEM Region 6.

Environmental Characteristics

Central Oregon's climate is semi-arid, and it is prone to droughts and wildfires, especially during dry summers and years with low snowpack. Cascades crest to the west, the Blue Mountains in the north and the California border to the south define the region. Region 6 has a diverse variety of ecological zones and is not shaped by any particular watershed, although the Deschutes, John Day, and Crooked Rivers are major watersheds to the north. Large lakes are common in the southern portions of Region 6.¹³²

Four ecoregions compose the region: the Blue Mountains, the Cascades, the Eastern Cascades Slope and Foothills, and the Northern Basin and Range. The Blue Mountains ecoregion is mostly flat with arid climates, but with a few areas of more abundant water near the John Day and Crooked Rivers. Sagebrush grasslands and forests of spruce fir, ponderosa, and Douglas fir are common. The Cascades ecoregion is underlain by volcanic soil and has mostly forests of Douglas fir managed for commercial logging. The Eastern Cascades Slope and Foothills ecoregion is forested by ponderosa pines and mixed fir canopies. It also has rangelands with sagebrush, bitterbrush, and bunchgrasses. Located in the Cascades' rain shadow, this ecoregion can experience temperature extremes. The Northern Basin and Range ecoregion has seasonally wet lake basins, high desert wetlands, high shrub- and grass-covered plains, scattered hills, mountains, and buttes, playas, and dunes.¹³³ Central Oregon is largely public land with small, dispersed areas of development.¹³⁴ Figure 6.1 provides more information on amounts of public lands, developed/cultivated lands, and major natural landmarks in the region.

¹³² State Interagency Hazard Mitigation Team, *Oregon's Natural Hazards Mitigation Plan*, vols. (State of Oregon, September 24, 2020), Available:

https://www.oregon.gov/lcd/NH/Documents/Approved_2020ORNHMP_00_Complete.pdf.

¹³³ Ibid.

¹³⁴ Shannon Caplan, David Keyes, and Elissa Schloesser, *Oregon by the Numbers*, vols. (The Ford Family Foundation and Oregon State University Extension Service, August 2022), Available: https://www.tfff.org/wp-content/uploads/OBTN_2022_101022-Digital.pdf.

Figure 6.17 Major Landmarks and Land Types of Central Oregon by County

<u>Major Natural Landmarks</u>	<u>Land Types</u>
Crook County: Ochoco Wayside State Park, Ochoco National Forest, Prineville Reservoir and Wildlife Area	Crook County 50% Public 4% Developed/Cultivated
Deschutes County: Smith Rock State Park, Mt. Bachelor Ski Area, Lava River Cave	Deschutes County 78% Public 5% Developed/Cultivated
Jefferson County: Lake Billy Chinook, The Cove Palisades State Park, Black Butte	Jefferson County 51% Public 8% Developed/Cultivated
Klamath County: Winema National Forest, Crater Lake National Park, Lake of the Woods	Klamath County 60% Public 8% Developed/Cultivated
Lake County: Derrick Cave, Fremont National Forest, Hart Mountain National Antelope Refuge	Lake County 75% Public 3% Developed/Cultivated
Wheeler County: Umatilla National Forest, Painted Hills, Ochoco National Forest	Wheeler County 29% Public 1% Developed/Cultivated

Source: Oregon by the Number, 2022

Community Characteristics

Central Oregon hosts a population of approximately 327,112 people across 24,000 square miles¹³⁵. Approximately 50% of the region’s total population is in Wheeler County. All counties in this region experienced population growth (or net migration) between 2010 and 2018. The average growth rate between the six counties of the region was greater than Oregon as a whole. Table 6.1 provides additional detail of population characteristics by county.¹³⁶

¹³⁵ Ibid.

¹³⁶ Ibid.

state average of individuals identifying as Hispanic or Latino, while the other counties are below the state average.¹³⁸

Social Vulnerability

The physical, mental, and financial well-being of specific population groups in Central Oregon are already vulnerable to unanticipated events and natural hazards. These groups are likely to experience disproportionate impacts from climate-related hazards and events. Additionally, the CDC’s Social Vulnerability Index identifies vulnerability as similarly high across all six counties meaning that any natural hazard would significantly impact their populations.¹³⁹ Figure 6.3 provides a summary of Region 6’s known social vulnerabilities.

Region 6 has a slightly higher percentage of people with a disability than the state. Within Region 6, Deschutes County has the highest number of people experiencing homelessness; the region experienced a 22% increase overall from 2015 to 2019. Older adults (65 and older) make up a larger portion of Region 6 than they do of the state overall. The share of children in the region is about the same as the share in the state overall. The portion of Region 6 residents who do not speak English “very well” is significantly smaller compared to the rest of the state.¹⁴⁰ See Table 6.2 for specific measures of social vulnerability in Central Oregon.

Figure 6.40 Known Regional Vulnerabilities

- High percentage of individuals with disabilities
- Low median household incomes
- High share of senior citizens in Crook, Lake, and Wheeler counties
- Increases in child poverty in Douglas and Deschutes counties
- Increasing number of vacant homes (Deschutes County)
- Increasing number of single-parent households (Klamath County)

Table 6.39 Social Vulnerability Measures for Central Oregon by County

	Crook County	Deschutes County	Jefferson County	Klamath County	Lake County	Wheeler County
Median household income	\$74,969	\$82,042	\$69,345	\$57,219	\$54,663	\$50,774
Households in financial hardship	46.1%	35.6%	45.4%	51.0%	49.5%	55.6%
Child poverty	ID	10.9%	12.8%	22.1%	ID	ID
Unemployment	9%	8%	8%	9%	6%	4%

¹³⁸ Census Bureau and Social Explorer, “American Community Survey, 5-year (2017-2021),” Census, ACS 2021, Available: https://www.socialexplorer.com/tables/ACS2021_5yr; Caplan, Keyes, and Schloesser, *Oregon by the Numbers*.

¹³⁹ “CDC/ATSDR Social Vulnerability Index Map,” Interactive Map (Agency for Toxic Substances and Disease Registry, 2020), Available: https://www.atsdr.cdc.gov/placeandhealth/svi/interactive_map.html.

¹⁴⁰ State Interagency Hazard Mitigation Team, *OR NHMP*.

Food insecurity	13%	10%	14%	15%	16%	14%
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Source: Oregon by the Numbers, 2024; ID = insufficient data

Individual and community well-being can be influenced by various financial, social, and environmental factors. Table 6.3 details self-reported data from individuals in Central Oregon counties.¹⁴¹ Research from The Ford Family Foundation in their annual Oregon By the Numbers Report shows that counties with lower rates of poverty, unemployment, disability, and mortality also report fewer (physically) unhealthy days. Their researchers also note that addressing low mental health should consider access to care.

Notably, Region 6 is home to the counties with the highest and lowest rating for good physical health statewide (Crook County and Wheeler County respectively). Region 6 is also home to the counties with the second highest and lowest rating for good mental health statewide (Lake County and Jefferson County).

Table 6.40 Percent of Population Reporting Good Physical and Mental Well-Being in Central Oregon

	Good Physical Health	Good Mental Health
Oregon	60.1%	57.3%
Crook County	73.1%	65.5%
Deschutes County	64.1%	59.9%
Jefferson County	50.3%	49.1%
Klamath County	62.8%	59.6%
Lake County	59.5%	69.4%
Wheeler County	29.7%	55.7%

Source: 2022 Oregon by the Numbers Report, The Ford Family Foundation

Economic and Livelihood Characteristics

Table 6.4 provides a high-level summary of the top employment industries in Central Oregon across the six counties. In 2018, the five major supersectors by share of employment in Region 6 were:

- Trade, Transportation, and Utilities
- Education and Health Services
- Leisure and Hospitality
- Local Government
- Professional and Business Services¹⁴²

Compared to the United States as a whole, Region 6 is relatively competitive in Forestry and Logging, Wood Product Manufacturing, National Security and International Affairs, Beverage and Tobacco Product Manufacturing, Administration of Housing Programs, Urban Planning, and Community Development.¹⁴³

¹⁴¹ Caplan, Keyes, and Schloesser, *Oregon by the Numbers*.

¹⁴² State Interagency Hazard Mitigation Team, *OR NHMP*; U.S. Bureau of Labor Statistics, *Quarterly Census of Employment and Wages*, vols., December 20, 2019, Available: <https://www.bls.gov/cew/classifications/industry/industry-supersectors.htm>.

¹⁴³ State Interagency Hazard Mitigation Team, *OR NHMP*; U.S. Bureau of Labor Statistics, *QCEW*.

Table 6.41. Top Three Employment Industries for Central Oregon by County

	Crook County	Deschutes County	Jefferson County	Klamath County	Lake County	Wheeler County
1	Specialty trade contractors	Food services and drinking places	Educational services	Educational services	Hospitals	Educational services
2	Educational services	Ambulatory health care services	Food services and drinking places	Food services and drinking places	Educational services	Executive, legislative, and general government
3	Wood product manufacturing	Professional and technical services	Social assistance	Wood product manufacturing	Wood product manufacturing	Gasoline stations

Source: Oregon by the Numbers, 2024

Climate Projections

Oregon Climate Change Research Institute (OCCRI) projects that the six climate change impacts that will affect Central Oregon most are increased instances and/or severity of **drought, heat waves, poor air quality, wildfires, warmer winters, and extreme precipitation**.¹⁴⁴ Data informing climate projections for the region are based on continuing current high-level emissions of greenhouse gases.¹⁴⁵

¹⁴⁴ Erica Fleishman and Oregon Climate Change Research Institute, *Sixth Oregon Climate Assessment*, vols. (Oregon State University, January 2023), Available: https://ir.library.oregonstate.edu/concern/technical_reports/gt54kw197.

¹⁴⁵ State Interagency Hazard Mitigation Team, *OR NHMP*.

POTENTIAL EFFECTS OF CLIMATE CHANGE ON CENTRAL OREGON



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



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



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



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



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



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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Findings

This section presents the key findings from Central Oregon survey and workshop data. The CCVA engaged with community members through a statewide survey and regional workshops. The survey and workshops combined reached participants from different cities in each county including Bend, Crater Lake, Klamath Falls, Redmond, and Lakeview.

We based the climate vulnerability findings in this chapter on 80 Central Oregon residents' survey responses and a conversation with the one person who attended the workshop in Klamath Falls, Oregon. The research team also held a workshop in Madras, Oregon, but no one attended.

Table 6.4 provides a detailed overview of survey respondent characteristics. Overall, in the CCVA survey, adults ages 35-55 were overrepresented by about 20 percentage points, while mid-income households and respondents with some college or a bachelor's degree were overrepresented by closer to 10-15 percentage points. No Region 6 residents under 18 responded to the survey, although this population makes up about 20% of the region. People from households with annual incomes over \$125,000 were most underrepresented, making up four percent of survey respondents, but 20% of regional residents. Survey respondents with high school educations or less were underrepresented as well, by about 13%. Respondents with post-bachelor's education were underrepresented by closer to 5%. Survey respondents were representative of the region's racial and ethnic demographics.

The person who attended the Klamath Falls workshop was a member of the Klamath Tribe. Due to the workshop's limited attendance, the research team was able to focus on and delve deeper into the attendee's perspective than would have been possible in a workshop with higher attendance. Because this participant's perspective was distinct from the perspectives of those in the region's survey respondents, the team recorded her input in this chapter as an interview. Their responses are reflected in yellow callout boxes throughout the chapter. Although the team highlighted their input separately, it is important to note that this attendee is only representing their own perspective, and that their views do not necessarily reflect the views of all tribal communities in the region.

Figure 6.41 Region 6 Survey Respondent Characteristics

Survey Respondent Characteristics

- Largest age groups were 35-44 (25%) and 45-54 (21%) years old.
- Most common education level: Some college or an associate's degree (43%)
- Most common median annual household income: \$50,000-\$74,999 (28%)
- Most common racial and ethnic groups: White or Caucasian (86%), Latino/a/x or Hispanic (11%)

Community Values

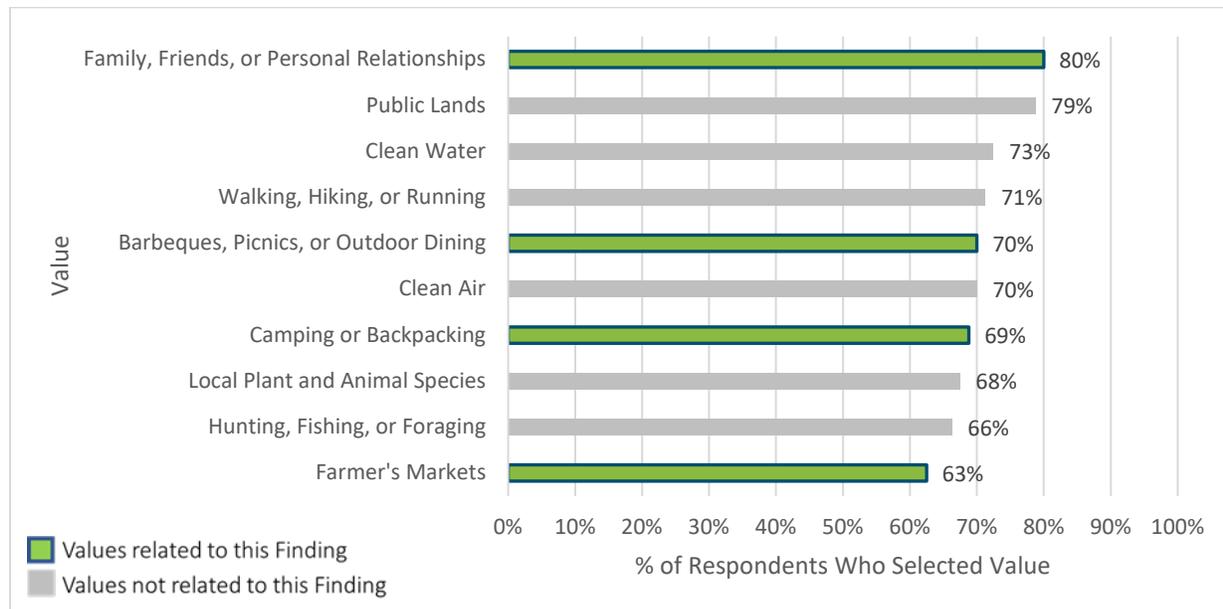
Finding 6.1 Residents of Central Oregon greatly value social ties and opportunities for community gathering.

When asked what they value about community groups, activities, and events in their region, survey respondents shared strong appreciation for family, friends, and personal relationships, farmer's markets, barbecues, picnics, and outdoor dining, and camping and backpacking (Figure 6.5). The importance of these values in the region supports the idea that **social ties and**

community are central to life in the region. The workshop attendee also highlighted the importance of community relationships, especially within the tribal community.

The Oregon Values and Beliefs Center reported similar findings in its 2022 Survey of Central Oregon Communities, saying that “supporting [the] community” was among survey respondents’ most frequently selected values.¹⁴⁶

Figure 6.20 Ten Most Frequently Chosen by Survey Respondents as They Relate to Finding 6.1



Finding 6.1.a Survey respondents from the region feel that they are part of a strong, welcoming, family-oriented community.

“Everyone in my neighborhood is very friendly and will go out of their way to say hello when they see you out and about.”

- Deschutes County Survey Respondent

Survey respondents felt that there is a **strong sense of community throughout Central Oregon**. They noted that their communities are family-oriented and friendly environments that welcome both visitors and new residents. Respondents reported that their neighbors go out of their way to say hello, show hospitality to each other, and come together during hard times.

Community Context

One survey respondent gave a specific example of the community working to help each other, citing a local nonprofit organization called Bonanza Cares. The organization started in 2013 as a group of people trying to invest in their community and encourage neighbors to care for each other, especially in challenging times. Since 2013, the organization has grown and is not only meeting the needs that come in but also trying to plan ahead to fill gaps in services that

¹⁴⁶ *Central Oregon: State of the Region*, vols. (Oregon Values and Beliefs Center, November 2022), Available: https://www.ci.madras.or.us/sites/default/files/fileattachments/community/page/12687/ovbc_coic_central_oregon_state_of_the_region_2022_summary_report.pdf.

community members are likely to need in the future.¹⁴⁷ The survey respondent noted that the organization has been “a huge help” to families in the region.

Finding 6.1.b Community amenities and the built environment support the strength of community.

“It’s clean, simple, easy to get around.”

– Deschutes County Survey Respondent

Survey respondents expressed that **access to amenities helps keep their community bonds strong**. They valued community gathering locations like green spaces, playgrounds, basketball courts, skate parks, and outdoor amphitheaters that enable them to interact with other members of the community. One survey respondent highlighted the availability of live music opportunities. Another liked how easy it is to access amenities by walking, although it is important to note that some areas of Central Oregon, especially larger cities like Bend, are likely more walkable than others. The region’s communities feel that they could be even more connected if they were part of a transit district. The Oregon Values and Beliefs Center 2022 survey revealed that “a majority [of Central Oregonians] would like to see a new transit district in their area of Oregon”.¹⁴⁸

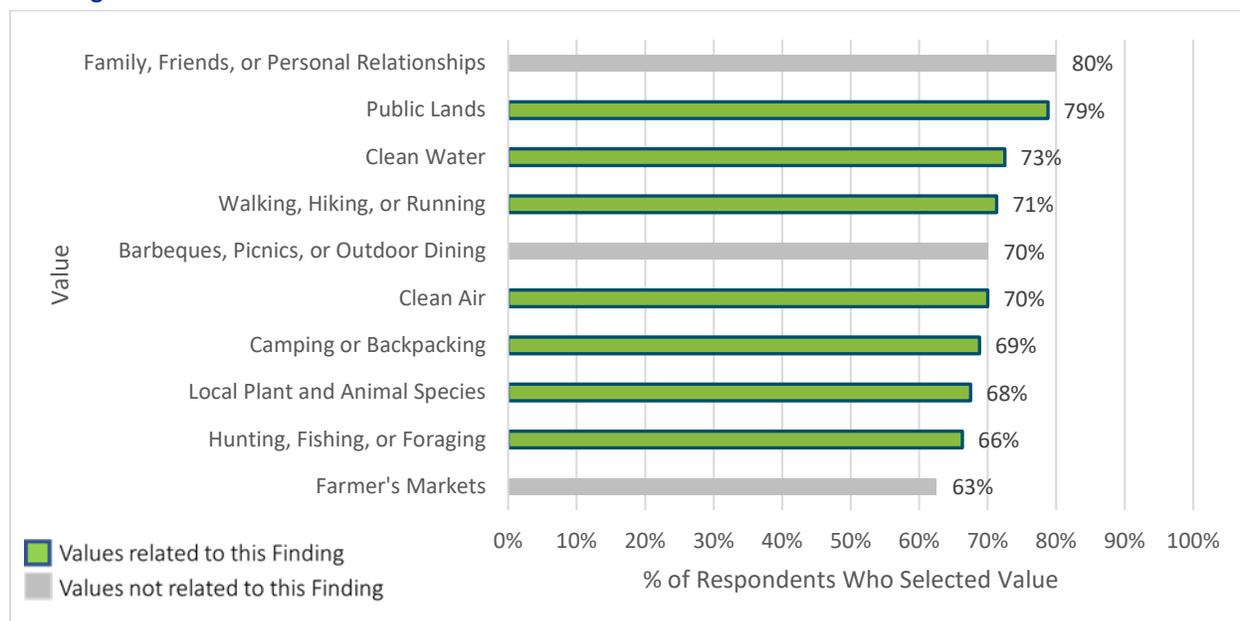
Finding 6.2 Residents of Central Oregon greatly value the natural environment and access to the outdoors.

When asked what they value about the natural environment, Central Oregon respondents shared an appreciation for their public lands, clean water and air, and local plant and animal species. They also valued outdoor activities like walking, hiking, running, camping, backpacking, hunting, fishing, and foraging (Figure 6.6).

¹⁴⁷ Holly Dillemoth, “Caring for neighbors: Bonanza nonprofit offers resources during pandemic” *Herald and News*. (Klamath, 21 Apr. 2020), sec. Featured, Available: https://www.heraldandnews.com/klamath/caring-for-neighbors-bonanza-nonprofit-offers-resources-during-pandemic/article_ef0ea361-cdc6-562a-bea5-c3a5628f8c00.html.

¹⁴⁸ *Central Oregon: State of the Region*.

Figure 6.21 Ten Most Frequently Chosen Values by Survey Respondents as They Relate to Finding 6.2



These values align with data gathered through other research efforts for Central Oregon. The Bend Community Climate Action Plan research team found that survey respondents prioritized the natural environment above other quality of life elements (community health and safety, affordability, economic vitality, social equity, and security and resilience) when considering the reduced use of fossil fuels.¹⁴⁹ The Oregon Values and Beliefs Center reported similar findings in its 2022 Survey of Central Oregon Communities, saying that “Central Oregonians share an appreciation for the natural environment and a concern for the protection and stewardship of natural resources and environmental quality in the area.”¹⁵⁰ These data support the idea that the **beauty and accessibility of nature is important to residents of Central Oregon.**

Finding 6.2.a Residents of Central Oregon value the beauty of the natural environment.

Survey respondents indicated **appreciation for the beauty of their region** and its mild weather. One respondent remarked that the region is “filled with natural beauty and wonder” while another appreciated the state’s amazing lush, green forests.

Community Member Interview, on Community Values:

*The community member discussed their value for the mutual support within their tribal community. They spoke of shared history and traditions. They described the wisdom of the elders, who play an important role in passing knowledge on to younger members of the tribe, like where and how to harvest and prepare traditional foods. They appreciated that people within the tribe support each other in the face of challenges and to help fight for the tribe’s interests. **Shared knowledge, experiences, and beliefs**, such as a common creation story, and shared emotional pain from cultural erasure, are important factors that unite their tribal community.*

*The community member also spoke of their **value for spiritual connection to the land** and the land’s ability to impact their wellbeing and identity. They spoke at length about their connection with the natural environment, explaining the spiritual bond to the land where their ancestors*

¹⁴⁹ Casey Bergh et al., *Bend Community Climate Action Plan*, vols., n.d.

¹⁵⁰ *Central Oregon: State of the Region*.

have spent thousands of years learning about the place and how to care for it. They described their relationship with the land as “reciprocal” one that is expressed as a respect for its plants and animals, and a desire for the land to thrive. They noted that being within nature can significantly impact her emotional wellbeing. They also highlighted the importance of having **access to traditional sacred places**, explaining that there is history behind particular plants, and that it is important to have access to “food that is loved, cared for, and protected.”

The community member frequently referenced **the importance of the nearby Upper Klamath Lake**, the largest body of freshwater in the state, which has been a source of food and place of ceremonial practices for the Klamath Tribes for generations. They reflected on **the importance of the lake’s fish populations**. The fish, specifically *c’waam* and *koptu*, are an important part of the tribe’s diet and heritage, and legends explain that the Creator gifted the fish to the tribe to provide a stable food source.¹⁵¹ Saying prayers by the lake and being able to touch the water was another important part of life the community member highlighted. Touching the lake has become more dangerous in recent years as cyanobacteria blooms and cyanotoxins in the water become more common.¹⁵² These bacteria and toxins, some of which are toxic, prefer warm waters in lakes and reservoirs. They are becoming more common as climate change worsens and can cause a range of health issues, including liver damage, rashes, and gastrointestinal illness. The toxins are not destroyed by boiling, making them unique from other biological drinking water contaminants.¹⁵³

Finding 6.2.b Residents of Central Oregon appreciate the land for the recreational opportunities it provides.

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

– Deschutes County Survey Respondent

Survey respondents **liked that their region provides easy access to outdoor recreation**. Specifically, they enjoyed its abundant hiking trails, recreational bodies of water, mineral resources, and hunting and fishing opportunities. One survey respondent noted that the area’s weather is often sunny, which makes outdoor activities more appealing. The Oregon Values and Beliefs Center found similar results. It reported that when asked about 15 different services in their region, Central Oregonians were “most satisfied [by] outdoor parks and recreation.”¹⁵⁴

Climate Change Impacts

The highest percentage of survey respondents (90%) said wildfire would have either a strong or somewhat negative impact on their lives (Table 6.5), with 69% believing it would have a strong negative impact. The second highest percentage of survey respondents (89%) were concerned about drought. The third highest percentage of survey respondents (68%) were concerned about the effects of heat waves.

¹⁵¹ Kay Kingsman, “Oregon Tribal Spotlight: Klamath Tribes” *Travel Oregon*, 8 Oct. 2021, Available: <https://traveloregon.com/things-to-do/culture-history/oregon-tribal-spotlight-klamath-tribes/>.

¹⁵² Oregon State University, “Toxic algal blooms behind Klamath River dams create health risks far downstream” *PhysOrg*, 16 Jun. 2015, sec. Environment, Available: <https://phys.org/news/2015-06-toxic-algal-blooms-klamath-river.html>.

¹⁵³ Ibid.

¹⁵⁴ *Central Oregon: State of the Region*.

Table 6.42 Percentage of Survey Respondents Who Perceived Negative Impacts on Their Lives

	Wildfire	Drought	Heat Waves	Air Quality	Warmer Winters	Extreme Precipitation
Strong Negative Impact	69%	54%	31%	30%	30%	18%
Somewhat Negative Impact	21%	35%	37%	43%	32%	26%
Total Negative Impact	90%	89%	68%	73%	62%	44%

Finding 6.3 Wildfire and poor air quality will negatively impact the region by threatening its residents’ physical and mental health.

Wildfire, and its secondary effect of poor air quality, ranked among respondents’ highest climate change concerns. Survey respondents noted that **wildfires are getting worse each year and that this progression is negatively impacting their physical and mental health.** In the summer, poor air quality makes it harder to breathe, which is physically uncomfortable and potentially dangerous for sensitive populations. Poor air quality also makes it less pleasant to relax and decompress by engaging in outdoor activities, which many people enjoy as a way of maintaining good mental health. Not knowing when or where the next wildfire will spark was a source of stress, with one survey respondent explaining that “I’ve already had to evacuate...from a wildfire.”

Finding 6.4 Drought threatens Central Oregonian’s livelihoods and quality of life by negatively impacting agriculture and recreation opportunities.

“I live in a farming community, and we are highly affected by droughts and lack of water. Some farmers have lost their way of life due to this issue. It’s something that really needs to be addressed.”

– Klamath County Survey Respondent

Drought ranked as survey respondents’ second highest climate impact concern. Survey respondents focused on **drought’s effects on local agriculture and recreation.** They expressed concern about losing jobs and crops, food shortages, and increasing food prices. One respondent noted that farmers raising cattle have encountered difficulties getting enough water to raise them. He also explained that the scarcity of water is causing the prices of feed to increase quickly. Another respondent raised a quality-of-life concern, saying that drought is making it harder to participate in recreational activities in and on the water.

Finding 6.5 Heat Waves threaten Central Oregon’s infrastructure and residents’ ability to spend time outdoors.

“In Region 3, I evacuated due to a severe heat wave...”

– Deschutes County Survey Respondent

Heat waves also concerned respondents from Central Oregon. Survey respondents worried that their **built environment, including roads and indoor climate technology, is not ready to withstand more extreme climate** conditions. They also noted that people who do not have air-conditioning will suffer as extreme temperatures become more frequent, and that even people who do have air conditioning will suffer because energy prices will soar as demand increases. Heat waves will disproportionately impact people with pre-existing health conditions, like the elderly. Both survey respondents and the workshop attendee also recognized that **heat waves would keep them from being able to spend as much time outside.**

Community Member Interview, on Climate Change Impacts:

*The community member explained that climate change will contribute to a “loss of way of life” for tribal communities, including **the loss of history, stories, culture, wisdom, and the way to protect the land.***

*The community member explained **that intensifying wildfires**, which some would argue result from poor forest management, can cause **psychological pain for members of tribal communities.** The Klamath Tribe managed its forests with care for centuries, using fire to enhance growth of important resources like huckleberries, camas, and hazel, maintain foraging areas for deer and elk and create clearance around campsites. In the late 1800s, **Indian Agency initiatives undermined the tribe’s tradition of prescribed burning by actively preventing fires** to preserve the Cascade Range’s supply of economically valuable timber and game animals.¹⁵⁵ As a result, the tribe now has little input into forest management and can only watch as uncontrolled fires destroy the land they love. The community member expressed that this can cause generational trauma, and that it is especially challenging to explain to children.*

*The community member also worried about the impact drought would have on tribal communities. She explained that **drought can threaten communities’ access to first foods and reduces the crops they are able to grow in their gardens.** Community members may also be forced to create new wells when their current wells run dry. They noted the potential for **negative effects on wildlife and trees, and consequently, tribal community members’ spirituality, which is so closely tied to the natural environment.** They also highlighted that drought can also increase the likelihood of landslides and flash flooding.*

Community Solutions

Survey respondents indicated that the top three areas they would like to see the legislature allocate resources to are the “Natural Environment,” “Jobs, Sources of Income, and Access to Services,” and “Outdoor or Recreational Opportunities.”

¹⁵⁵ Douglas Deur, “‘A Caretaker Responsibility’: Revisiting Klamath and Modoc Traditions of Plant Community Management” *Journal of Ethnobiology*. 29.2 (2009): 296–322.

Natural Environment

A common theme among respondents was the **desire for more focus on nature in general**. They proposed better forest management and maintenance in recreational areas. One respondent asked the legislature to allocate more money to natural resources, such as animals and their habitats, to guard against the changing climate.

Water Systems

Another common theme among respondents was a desire for the legislature to **focus on water resources**. One respondent said that drought's effects on his farming community "really need to be addressed," while another recommended that the legislature should allocate more water storage areas. Another respondent believed that the legislature should consider policy changes to water reuse regulations, such as using class A water from wastewater treatment plants for refuge replenishment. Focusing money on restoring in-stream flow rather than on restoring in-stream habitats was another recommendation, with the survey respondent believing that restoring flow would help fish, agriculture, and drinking water resources. According to the Oregon Values and Beliefs Center's Survey of Central Oregon Communities, residents are worried enough about drought that majority of them are willing to pay higher taxes to address the issue.¹⁵⁶

Government Role

There was conflicting input from study participants on the role of the government in enacting policy around climate change. Some respondents wanted to compel the government to act now. They made comments like "climate change is real," "I want our elected representatives to take climate change seriously," and we "need legislature to draw a hard line on major drivers of climate change." Other respondents displayed a lack of trust in the government. One respondent believed that the legislature "should butt out" and allow locals to manage the situation. Another respondent expressed a belief that officials do not actually want to make changes that will have a profound impact.

A small minority of respondents who provided open-ended comment (4 out of 46 responses) in Region 6 did not view climate change as a priority or had various views on the legitimacy of climate change as either human-caused or existing altogether.

¹⁵⁶ *Central Oregon: State of the Region.*

Conclusion

This regional report concludes with a high-level summary of key findings related to Central Oregon community values and how they perceive they will be impacted by climate change. According to survey and workshop data, the people of Central Oregon greatly value their interpersonal relationships, outdoor and recreational activities, and the natural environment (Table 6.6):

Table 6.43 Summary of Central Oregon Values

Finding 6.1 Residents of Central Oregon greatly value social ties and opportunities for community gathering.				
	Physical	Emotional	Social	Economic
Strong sense of community			Family-oriented, friendly, welcoming environments who come together during hard times	
Community amenities	Gathering locations like green spaces, playgrounds, basketball courts, skate parks, and outdoor amphitheaters		Enable them to interact with other members of the community; Live music opportunities	
Built environment	Walkable areas; Need for more transit		Enable them to access community-building events and situations	
Tribal community			Mutual support within Tribal community due to shared history and traditions; Role of the elders	

Finding 6.2 Residents of Central Oregon greatly value the natural environment and access to the outdoors.

	Physical	Emotional	Social	Economic
Nature is beautiful	Beautiful landscapes and forests, mild weather			
Nature provides opportunities for outdoor recreation	Abundant hiking trails, recreational bodies of water, mineral resources, hunting and fishing opportunities			
Tribal communities		Spiritual and reciprocal connection to the land	Long-term connection to the land -- caring for it and passing knowledge to the next generations	Access to First Foods

Respondents worry that climate change impacts, especially from wildfire, drought, and heat waves, will reduce their ability to enjoy these aspects of their lives. They feel that climate change will negatively affect them in the following ways (Table 6.7):

Table 6.44 Summary of Climate Impacts in Central Oregon

Finding 6.3 Wildfire and poor air quality will negatively impact the region by threatening its residents' physical and mental health

	Physical	Emotional	Social	Economic
Decreased air quality	Harms physical health	Indoor isolation harms mental health		
Emergency preparedness		Fear of wildfire harms mental health; Psychological pain for tribal community because not able to manage the land to prevent mass destruction from wildfires		

Finding 6.4 Drought threatens Central Oregonian's livelihoods and quality of life by negatively impacting agriculture and recreation opportunities.

	Physical	Emotional	Social	Economic
Water scarcity	Ecosystem degradation, plant and animal death	Loss of spiritual connection to land (tribal community)	Harder to participate in recreational activities in and on the water	Job loss, crop damage, livestock impacts, higher food costs
Disruption to cultural food sources		Stress of losing way of life	Loss of way of life	
Threat to water infrastructure	Need to dig deeper wells			

Finding 6.5 Heat waves threaten Central Oregonian's infrastructure and residents' ability to spend time outdoors.

	Physical	Emotional	Social	Economic
Prolonged periods of high temperatures	Need for A/C; Especially threatens sensitive populations like the elderly		Reduced opportunities to socialize through recreation	
Threat to infrastructure	Heat damages infrastructure like roads			Expensive energy for A/C

Based on these concerns, it is not surprising then that so many respondents from this region emphasized a desire for the legislature to act swiftly to address climate change impacts. Respondents from the region are calling for the legislature to prioritize the natural environment when allocating resources. Doing so will help maintain the viability and productivity of the region, which is central to their communities, wellbeing, and livelihoods.

Chapter 7 – Northeastern Oregon



Sources courtesy of Adobe Stock Photos (left) Michel Hersen/Danita Delmonico, (right)

Background

This section provides a summary of existing community characteristics for Northeastern Oregon. We drew from existing state planning documents, such as the Oregon Natural Hazards Mitigation Plan, and other background research materials to provide a high-level overview of environmental, demographic, and economic conditions in the region. This section concludes with an overview of climate projections for Northeast Oregon and known social vulnerabilities to the region.

Environmental characteristics

Northeast Oregon is bordered by the neighboring states of Washington and Idaho. Major waterways in the region include the John Day, Grande Ronde, and Snake rivers. The current climate of the region is arid that supports two distinct ecoregions.¹⁵⁷ The vast majority of Northeast Oregon is dominated by the Blue Mountains ecoregion. It has characteristics of being flat and having a dry continental climate with marine intrusions due to proximity to the Columbia Gorge and being underlain with volcanic rock. Areas in the Wallowa and Elkhorn ranges are composed of granitic intrusives, deep sediments, and metamorphic rocks. The region is also known for sagebrush grasslands, grand fir and spruce fir forests, and Douglas fir or ponderosa

Figure 7.44 Major Landmarks and Land Type of Northeastern Oregon by County

<u>Major Natural Landmarks</u>	<u>Land Types</u>
Baker County: Anthony Lakes Ski Area, Hells Canyon National Recreation Area, Wallowa Whitman National Forest	Baker County 51.7% Public Land 7.3% Developed/Cultivated
Grant County: John Day Fossil Beds National Monument, Malheur National Forest, Umatilla National Forest	Grant County 61.7% Public Land 1.2% Developed/Cultivated
Union County: Eagle Cap Mountain Peak, Mount Emily Recreation Area, Umatilla National Forest	Union County 58.8% Public Land 3.7 % Developed/Cultivated
Wallowa County: Wallowa Lake State Park, Wallowa Whitman National Forest, Zumwalt Prairie	Wallowa County 48.7% Public Land 13.2% Developed/Cultivated

Source: Oregon by the Numbers, 2022

pine canopy. The second ecoregion is the Snake River Plain consisting of alkaline lacustrine deposits, rolling foothills, alluvial fans, and badlands.¹⁵⁸ Figure 7.1 provides more information on major landmarks, public land, and land development by county.

¹⁵⁷ State Interagency Hazard Mitigation Team, *Oregon's Natural Hazards Mitigation Plan*, vols. (State of Oregon, September 24, 2020), Available:

https://www.oregon.gov/lcd/NH/Documents/Approved_2020ORNHMP_00_Complete.pdf.

¹⁵⁸ Ibid.

Community Characteristics

Northeast Oregon hosts a population of roughly 58,900 people across 12,800 square miles.¹⁵⁹ Approximately 75% of the region’s total population resides in either Baker or Union County. According to Oregon by the Numbers 2022 Report, all these Northeastern counties are growing in population. Table 7.1 provides additional details of population characteristics by county.

Table 7.45 Population Characteristics of Northeastern Oregon by County

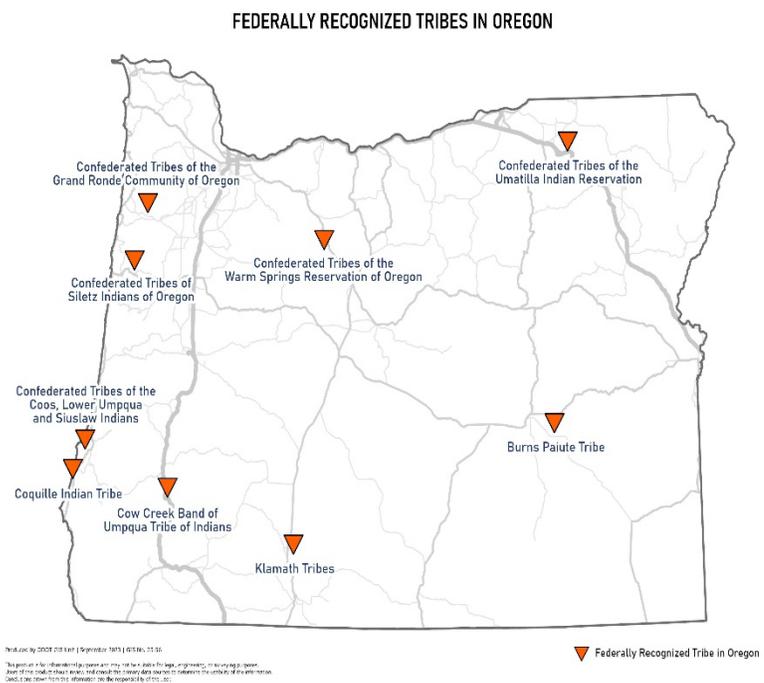
	Baker County	Grant County	Union County	Wallowa County	Region 7
Total Population	16,685	7,237	26,286	7,439	57,647
Total land area (mi²)	3,088	4,529	2,039	3,151	12,807
Population Density (people/mi²)	5	2	13	2	4
Net migration, 2020-2022 [per 1,000 population]	42.9	27.2	25.1	31.0	31.6

Source: Oregon by the Numbers, 2024

Federally Recognized Tribes

The Confederated Tribes of Umatilla Indian Reservation (CTUIR) is one of nine federally recognized tribes in Oregon, as shown in Figure 7.2. The Umatilla Indian Reservation is mostly located in Umatilla County, but some parts do cross over into Union County. The CTUIR is a union of three tribes: Cayuse, Umatilla, and Walla Walla. It has over 3,100 tribal members, with around half of those members living on the reservation. 30% of the members are composed of children under 18 and 15% are elders over age 55. The entire

Figure 1.45 Oregon's Federally Recognized Tribes



Source: Oregon Department of Transportation

¹⁵⁹ Shannon Caplan, David Keyes, Rachel Porter, and Elissa Schloesser, *Oregon by the Numbers*, vols. (The Ford Family Foundation and Oregon State University Extension Service, August 2024, Available: https://www.tfff.org/wp-content/uploads/OBTN_2024-091724-1.pdf)

reservation is around 172,000 acres (about 273 square miles).¹⁶⁰

Race and Ethnicity

Racial and Ethnicity demographics of Northeastern Oregon deviate from the state average. Baker County and Grant County has an above state average for communities of American Indian/Alaskan Native and White. Union County has an above state average of Native Hawaiian/Pacific Islander and White. Wallowa County has an above state average for white communities.

Social Vulnerability

The physical, mental, and financial well-being of specific populations groups in Northeastern Oregon are already vulnerable to unanticipated events and natural hazards. Figure 7.3 provides an overview of the vulnerable groups as identified in the OR NHMP. These groups are likely to experience disproportionate impacts from climate-related hazards and events.

Low median household income and high levels of poverty stress the existing resources of these communities to adapt to climate change. The vulnerability of children in Grant County is distinct where child poverty is ~27%. Table 7.2 provides additional detailed information on income and other metrics of financial stability.

Figure 7.46 Known Regional Vulnerabilities

- Low median household income
- High levels of poverty
- High percentage of seniors
- High percentage of people with disabilities
- High percentage of seniors with disabilities
- Older adults (age 65+) comprise larger share of population
- High levels of overall poverty and child poverty

Table 7.46 Social Vulnerability Measures for Northeastern Oregon by County

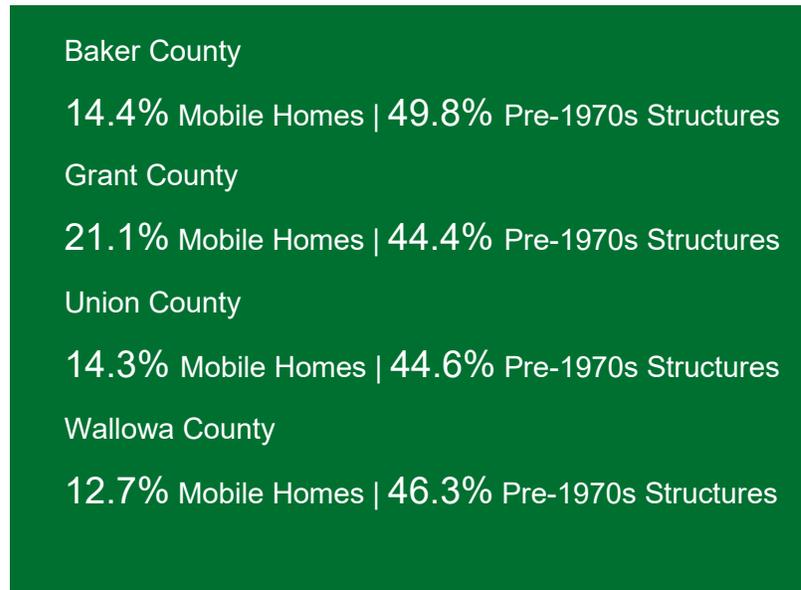
	Baker County	Grant County	Union County	Wallowa County
Median Household Income	\$51,657	\$56,045	\$61,946	\$62,238
Households in Financial Hardship	50.2%	42.0%	43.4%	45%
Child Poverty	ID	21.5%	16.6%	ID
Unemployment	4.7%	6.1%	4.7%	5.4%
Food insecurity	11.9%	13.5%	11.0%	9.3%

Source: Oregon by the Numbers, 2024

¹⁶⁰ “The Confederated Tribes of the Umatilla Indian Reservation” *Columbia River Inter-Tribal Fish Commission*. , n.d., Available: <https://critfc.org/member-tribes-overview/the-confederated-tribes-of-the-umatilla-indian-reservation/>.

Northeastern Oregon has a high percentage of manufactured homes and homes built prior to ordinances and standards that are intended to protect property from flooding and earthquakes.¹⁶¹ Approximately 50% of the housing stock was built before the 1970s, prior to the implementation of floodplain management ordinances; About 80% of the housing stock was built before 1990, and do not meet the seismic building standards that were codified in 1994. Figure 7.4 provides a detailed break-down by county of mobile homes and structures built prior to 1970. These conditions coupled with the lack of modernized flood insurance risk maps, make Northeastern Oregon community’s homes increasingly vulnerable to the impacts of climate change.

Figure 7.47 Housing Structure Characteristics in Northeastern Oregon



Community and individual well-being can be influenced by various financial, social, and environmental factors. Table 7.3

Source: Oregon Natural Hazard Mitigation Plan, 2020

details self-reported data from individuals in Baker, Grant, Union, and wallowa counties on their physical and mental health.¹⁶² Research from The Ford Family Foundation in their annual Oregon By the Numbers Report shows that counties with lower rates of poverty, unemployment, disability, and mortality also report fewer (physically) unhealthy days. Their researchers also note that addressing low mental health providers impacts the diagnosis and treatment of mental health conditions.

Table 7.47 Percent of Population Reporting Good Physical and Mental Well-Being in Southeastern Oregon

	Good Physical Health	Good Mental Health
Oregon	60.1%	57.3%
Baker County	56.0%	51.1%
Grant County	54.3%	52.9%
Union County	64.4%	62.4%
Wallowa County	68.3%	63.7%

Source: Oregon by the Numbers, 2022

¹⁶¹ State Interagency Hazard Mitigation Team, *OR NHMP*.

¹⁶² Caplan, Keyes, and Schloesser, *Oregon by the Numbers*.

Economic and Livelihood Characteristics

Figure 7.5 provides a high-level summary of the top employment industries in Northeastern Oregon across Baker, Grant, Union, and Wallowa County. The Northeast Oregon Economic Development District (NEOEDD) provides detailed information of the region's economic characteristics for Baker, Union, and Wallowa County. The Greater Eastern Oregon Development Corporation (GEODC) does the same for Grant County. The historic economic base of these four counties focused on cattle, hay, and grain. Other important regional crops include grass seed, mint, potatoes, and sugar beets. Other regional activities also include animal production and aquaculture.¹⁶³

Across the entire region, nearly half of the land base is publicly owned, with most of the land being under the jurisdiction of the U.S. Forest Service. The region's topography is very diverse, that gifts the region with rich agricultural, recreational, and natural resources.

In 2018, the five major supersectors by share of employment in Region 7 were:

1. Trade, Transportation, and Utilities
2. Education and Health Services
3. Local Government
4. Manufacturing
5. Leisure and Hospitality¹⁶⁴

Compared to the United States, Region 7 is relatively competitive in Forestry and Logging, Wood Product Manufacturing, Administration of Environmental Quality Programs, Animal Production and Aquaculture, and Private Households.¹⁶⁵

Climate Projections

Oregon Climate Change Research Institute (OCCRI) have detailed climate projections for Northeastern Oregon in OEM Region 7. Potential effects of climate change on Region 8 include increases in **mean temperature, heat waves, drought, wildfires, warmer winters, and extreme precipitation**. Data informing climate projections for Northeastern are based on continued high-level emissions of greenhouse gases (RCP 8.5)¹⁶⁶.

Figure 7.48 Top Employment Industries in Northeastern Oregon



Source: Oregon Natural Hazard Mitigation Plan, 2020

¹⁶³ Northeast Oregon Economic Development District, "Comprehensive Economic Development Strategy 2018-2023," 2023, Available: <https://www.neoedd.org/wp-content/uploads/2019/01/2018-2023-NEOEDD-CEDS.pdf>.

¹⁶⁴ U.S. Bureau of Labor Statistics, *Quarterly Census of Employment and Wages*, vols., December 20, 2019, Available: <https://www.bls.gov/cew/classifications/industry/industry-supersectors.htm>.

¹⁶⁵ State Interagency Hazard Mitigation Team, *OR NHMP*.

¹⁶⁶ ?



MEAN TEMPERATURE

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

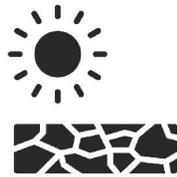
- Warmer nights
- Longer fire seasons
- Unmet chilling requirements
- Expansion of some pests, diseases, invasive species



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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Findings

This section presents the key findings that emerged from review and synthesis of 24 survey responses from Northeastern Oregon respondents and 11 workshop participants who attended regional workshops in Baker's City and John Day. These findings are supplemented by background research where appropriate.

Figure 7.7 provides a detailed overview of respondent characteristics. Overall, survey results overrepresented people who identified as between 18 and 64 years old, female, had higher levels of education attainment, and higher levels of income.

All workshop participants provided demographic information. The workshops in Region 7 were overrepresented by people over the age of 65, white, male, had higher levels of educational attainment, and higher levels of income compared to the average median income of Region 7.

Figure 7.49 Northeast Oregon Respondent Characteristics

Survey Respondent Characteristics

- Persons under 18 and over 65 underrepresented in survey results, by ~7% and ~10% respectively
- Female identifying persons overrepresented by ~9%
- Approximately 25% of respondents with a High School Degree or GED equivalent; 25% with bachelor's degrees, people with bachelor's or advanced degrees overrepresented by ~20%
- Most common annual household income: \$75,000 - \$124,999 (29%)
- Most common racial and ethnic groups: White or Caucasian (83%), which is below Region 7 average of 93% White (alone)

Workshop Participant Characteristics

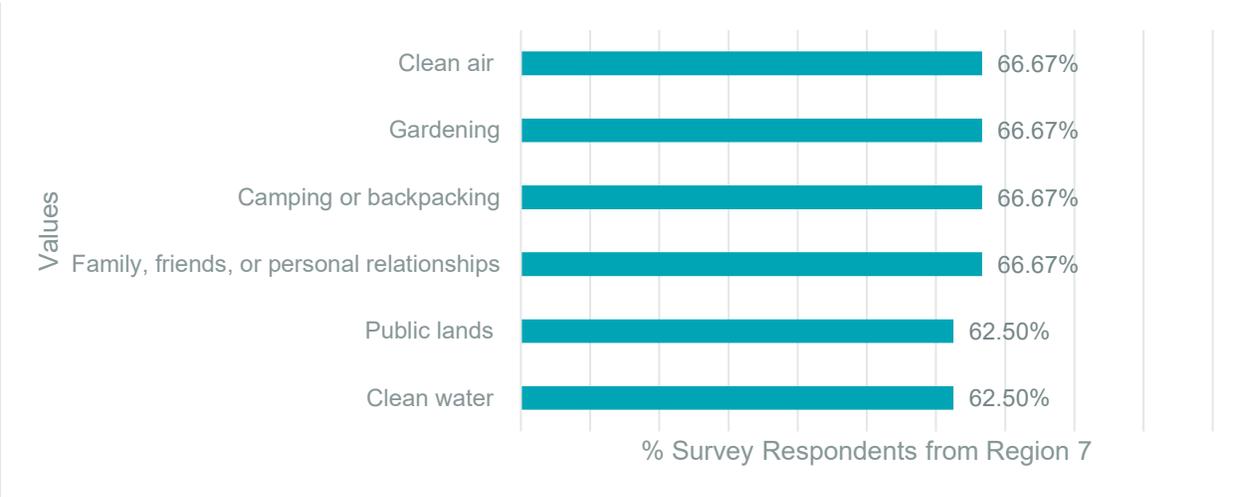
- Largest age groups: 65+ (64%)
- 90% of participants identified as male
- Bachelor's degree or higher (55%)
- Annual incomes between \$50,000 - \$74,999 (36%); \$75,000 or higher (45%)
- Of those reporting race or ethnicity,

Community Values

Finding 7.1 Respondents’ value a shared sense of identity that is linked to a rural lifestyle and access to the outdoors.

Figure 7.8 highlights the top five values that were most frequently chosen by Northeastern

Figure 7.50 Top Six Values Most Frequently Chosen by Survey Respondents



Oregon survey respondents. Survey respondents’ values for the natural environment closely mirrors input from workshop participants’ discussion on recreation, nature, and what was described as “Small town feel and connection”.

Workshop participants strongly connected their values for the land with their values of being proud participants in outdoor recreation. Participants discussed Northeastern Oregon’s access to recreation, open space, and lifestyle as factors that have led them to stay in the area. For both workshop and survey participants, being part of an outdoor community where most of the population shares similar values helps deepen their sense of freedom and connection to other communities within the region.

For other participants, **a major sense of their proud rural culture was being able to enjoy time in the outdoors engaging in activities such as hunting, fishing, foraging, hiking, camping, and generally enjoying the landscape** any way they deem fit. Workshop participants discussed how much they value their accessibility to public land around them, which they use for recreational purposes as well as activities that promote community bonding, such as community gatherings. Most of these activities reflect the respondents value for independence and locality.

Finding 7.2 Respondents value their shared beliefs, rural lifestyles, and opportunities to connect in public spaces

Finding 7.2.a Respondents from Northeast Oregon say their social connections and shared beliefs are a positive.

Northeastern Oregon participants value the social bonds they have with family and friends, as well as with the greater community. As shown in Figure 7.8, 67% of Northeastern Oregon survey respondents agreed on their value for friends, family, and personal relationships.

Workshop participants talked about the sense of living in a supportive community. One participant talked about the sense of the community supporting local businesses and knowing the community. They felt that actions such as **showing support for other locals as well as attending community gatherings were part of everyday life.**

Workshop participants talked about how shared values and beliefs make them feel a stronger sense of connection to the greater community. Participants from Baker City noted how having the possibility of making an impact on their community helps strengthen the small-town connection. Workshop participants described feeling shared beliefs and values when they had the capacity of having an impact on their community.

Finding 7.2.b Respondents also mentioned community events as a big source of social connection.

Workshop participants also mentioned how **events and organizations allow them more opportunities to collaborate.** Events such as Farmer’s markets give people a reason to get out of the house, enjoy public outdoor areas, and interact with others. Participants also mentioned that art and cultural events can play a big role in strengthening community. Art and cultural activities seem to provide people with mental relief. For example, Baker City has an event called “First Friday”, which is an art walk downtown, where residents and visitors celebrate art by participating in an art gallery crawl. Organizations, such as watershed councils or those that are natural resource focused, give yet another avenue that allows these communities to come together, speak their ideas, and collaborate with others that share similar beliefs on how to solve local issues.

Climate Change Impacts

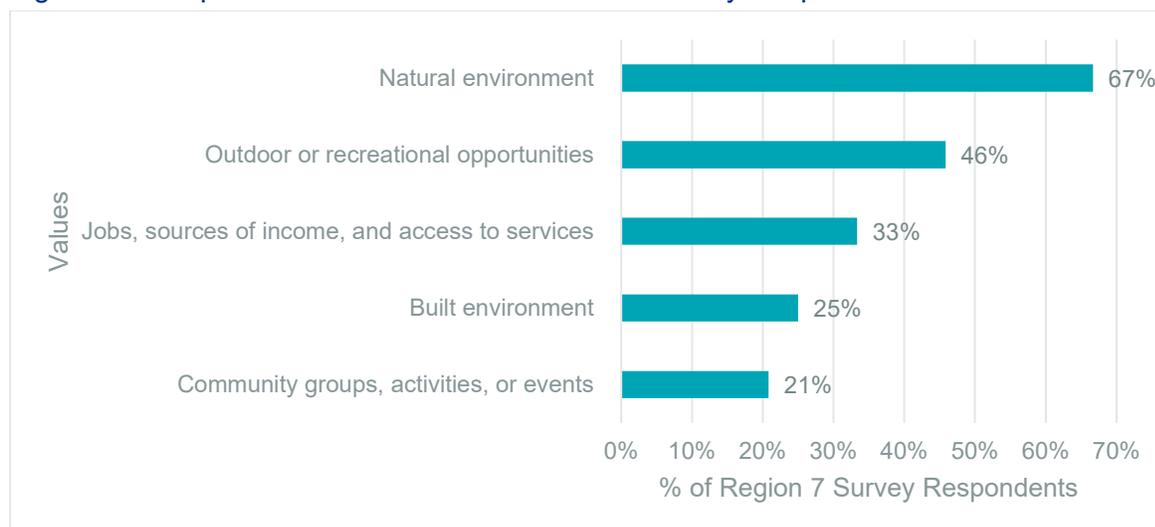
As shown in Table 7.4, survey respondents are most concerned about the negative impacts of climate projections for wildfire, followed by drought and heat waves. The key findings from workshop discussions spanned across hazard types and often related to multiple or compounding impacts.

Table 7.48 Percent of Survey Respondents Concerned About Climate Impacts by Hazard

	Strong/somewhat negative impact	Neither positive nor negative	Strong/somewhat positive impact
Wildfires	83%	17%	0%
Drought	79%	21%	0%
Heat Waves	75%	25%	0%
Mean Temperature	58%	42%	0%
Warmer Winters	58%	33%	8%
Extreme Precipitation	50%	33%	17%

Finding 7.3 Northeastern Oregon respondents are worried about the impact of drought and wildfire.

Figure 7.29 Top Five Values of Most Concern for Survey Respondents



Survey respondents in Northeastern Oregon reported their top concerns for the negative impacts of climate change were for the natural environment, outdoor and recreational opportunities, and resources related to livelihood and services. Figure 7.9 provides a detailed breakdown of how survey respondents prioritized their concerns for different types of values they were asked about.

Finding 7.3.a Respondents from Northeastern Oregon are worried about climate impacts to the natural environment.

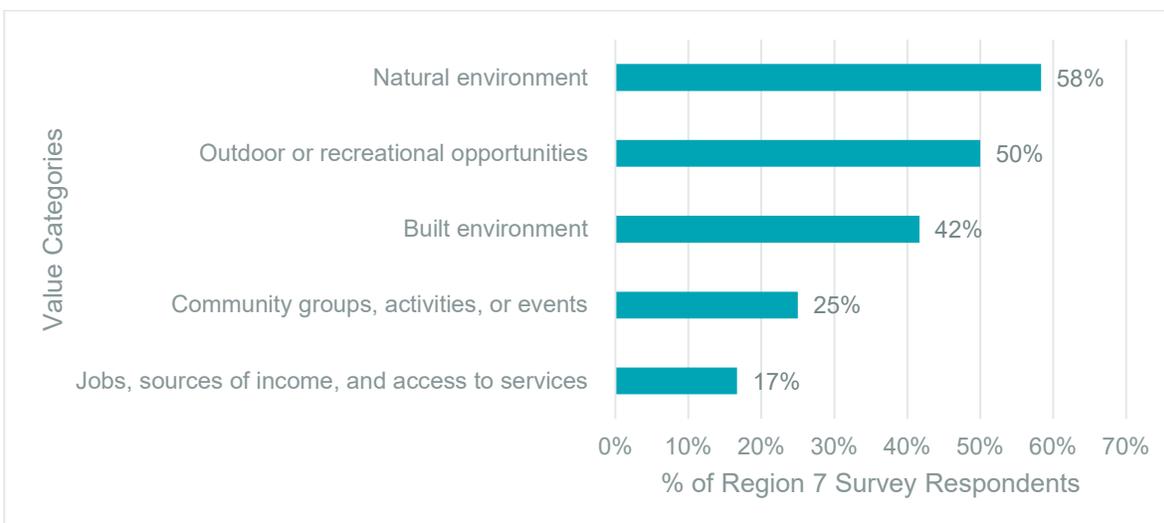
Approximately 67% of survey respondents from Northeastern Oregon reported their top concern related to climate change was for the natural environment, as shown in Figure 7.9. Workshop participants vocalized their concerns that wildfire, heat, and drought would have direct and negative consequences on the local and regional ecosystem. Specifically, participants talked about the potential for less stable water systems, stresses on fish and wildlife, and the possible health impacts.

Negative impacts to the ecosystem, and the services it provides for both the natural environment and for people, would have domino impacts to respondents' values for activities such as access and availability of outdoor recreation, hunting, and fishing. Respondents viewed these values as a way of life for people in this region, the people have a deep connection to the natural environment and view as a top reason as to why they decided to live in the area.

Finding 7.3.b Survey respondents expressed apprehension regarding the potential consequences of drought, wildfires, and rising temperatures on outdoor recreational activities.

Workshop participants expressed their concerns for outdoor recreation as changes in their

Figure 7.52 Survey Respondents' Priority for Allocating Adaptation Resources



accessibility to outdoor activities and worse winter tourism and recreation. Tourism across the state plays a big economic role. In Baker County travel and tourism accounts for \$16.5 million in earnings and 770 jobs, Grant County \$3.4 million and 190 jobs, Union County \$15.4 million and 670 jobs, and Wallowa County \$14.3 and 630 jobs.¹⁶⁷ Winter and Summer recreation and tourism play a large roll in these numbers and a change in accessibility or availability to outdoor recreation could heavily impact the region's economy.

Tourism would not be the only part of everyday life that is impacted by climate impacts. Participants shared their **worries about the impacts it could have on youth sports** and adult recreation. They also shared their strong feelings of disliking when they are “forced inside” due to events such as poor air quality among other things. As shown in Figure 7.9, 46% mentioned outdoor and recreational opportunities. Figure 7.10 shows that survey respondents had a slight increase for outdoor and recreational opportunities when viewed as a category for resource allocation. John Day and Baker City workshop participants both agreed that sustaining the natural environment is a concern they all share.

Finding 7.3.c Workshop participants worried about how increased demand for water will impact agriculture and agricultural livelihoods.

Participants talked about their concerns of how **drought and increase heat could alter the regions access of usable water for agriculture as well as drinking water**, especially in communities with growing populations. They discussed the impacts that drought, wildfire, and increased temperatures could have on agriculture, with the main concern being an increased difficulty to grow crops. All participants showed concerns towards access to fresh water agricultural use. In addition to these climate concerns having direct impact to the agricultural industry, locals also feel as though these impacts also cause disruption or harm to other businesses that support agriculture. Participants were worried that **drought and increased demand would lead to stress on the water system**, increased water usage bills, food insecurity, higher food costs, stress on soil, and more unpredictable growing seasons which

¹⁶⁷ Dean Runyan Associates, “Oregon Travel Impacts, Statewide Estimates, 1992-2019p,” 2020, Available: <https://industry.traveloregon.com/wp-content/uploads/2020/04/ORImp19.pdf>.

could lead to the downfall of certain farms. These stresses could be especially prominent in Baker and Wallowa County due to both those counties experiencing fast population growth.

Finding 7.4 Community members are concerned about climate impacts to physical safety and infrastructure.

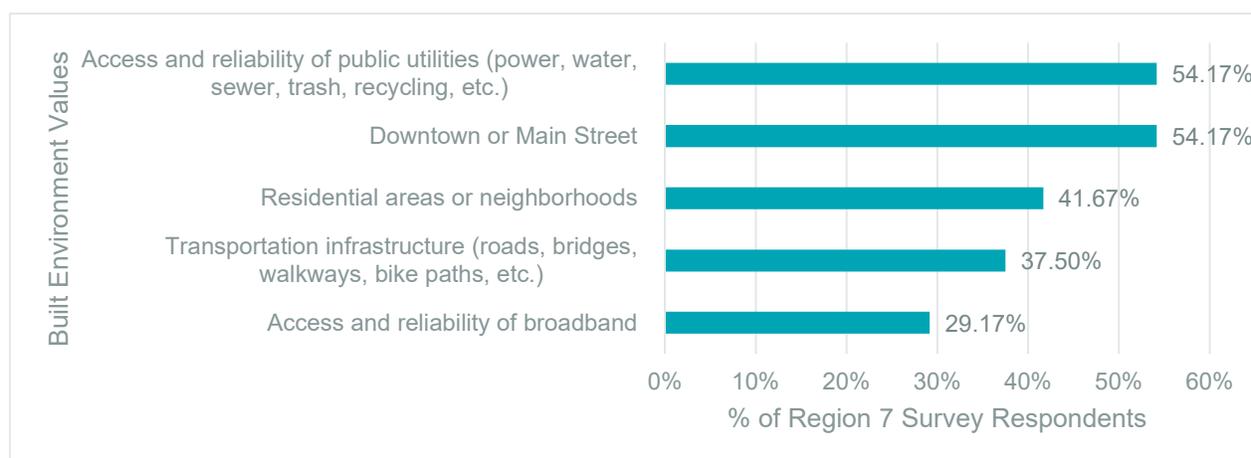
Finding 7.4.a Workshop attendees were concerned that heat and air quality would cause direct adverse effects on physical well-being, particularly among susceptible populations.

Workshop participants expressed their **concern for their health, due to climate impacts such as heat and poor air quality**. Respondents mentioned how during heatwaves or extreme heat people who enjoy being outside during the day are at a much higher risk of suffering from heat related illnesses, sometimes potentially becoming deadly. Participants raised concerns about poor air quality affecting people's ability to go outside at all, especially during fire season due to ample amounts of smoke. Groups that are more vulnerable to these effects, coming from the workshop, are the **elderly and outdoor workers who are constantly exposed to the elements**. Both groups could be at real risk of suffering heat or smoke related illnesses. Some other health impacts participants spoke up about include sleep loss, smoke and dust inhalation, heat exhaustion, and heat stroke.

Finding 7.4.b Workshop attendees worry that public services and infrastructure are not prepared for increased heat, flooding, and wildfire.

Workshop participants voiced their **concerns about public infrastructure not being up to date** when it comes to projected heat effects. Concerns over inadequate air conditioning came up, as well as concerns over roads being damaged because of flooding or wildfires. **Disruption to roads** could prevent people from getting to work and needs such as delivery drivers being unable to deliver potentially very important supplies. **Services such as power were also of huge concern** for workshop participants. They believe as though climate impacts will cause their electricity to be cut off, or in other cases they are scared their electric bills will skyrocket because of battling against the elements, specifically the heat. Other infrastructure impacts workshop participants are worried about include flash flooding on roads and bridges, impacts on energy grid, electrical supply, extended power outages, brown outs, and a greater need for air conditioning units in buildings that were built without them.

Figure 7.53 Percent of Survey Respondents that Valued Built Environment Factors



Survey respondents also expressed similar concerns to power use. As shown in Figure 7.11, just over 54% shared concern over reliability of public utilities. Respondents also shared concerns about increased utility costs due to things such as increased heat resulting in more power being used by each household.

Finding 7.5 Participants see climate change and related policymaking as a potential stressor to their value for community connections and locally led efforts.

Workshop participants described a **tension between the independence of rural communities and their interdependence on resources, policies, or management decisions made at the regional, state, or federal level.** Baker City workshop participants talked about how the connectedness and interdependence that their city has with urban areas, which they **rely on to sustain local services and other opportunities.** Participants specifically mentioned several livelihood factors such as economic opportunities, housing, utilities, and access to services and how vulnerable those factors are given the changing climate. Baker City workshop participants also discussed the division they've already seen from politicized community issues and public communication. Overall, participants emphasized the importance of knowing their own community to communicate their needs for support effectively and efficiently.

John Day workshop participants also emphasized their value for independence. Values for self-sufficiency were strongly connected with a rural identity and lifestyle. John Day participants voiced long-standing frustrations of not having local input to state or federal policy or management decisions, particularly as it related to land and forest management. Nearly 62% of the land in Grant County is public land that is managed by federal agencies.¹⁶⁸

Community Solutions

“Eastern Oregon is a lot different than the west side, and that one size does not fit all..”

– John Day Workshop Participant

Northeastern Oregon residents discussed what they saw as potential solutions to reduce their community vulnerabilities and build resilience against the impacts of climate change. In this section, we present their suggestions with the acknowledgement that local communities are more closely in sync with their own communities' needs and values than our project team. It is important to note that the community solutions listed here are a starting point for evaluating how future adaptation strategies can align with community values and needs.

Local Engagement

“ The [Governor] must listen to people in the areas that are of concern. Local citizens that have spent their lives in Grant County have a far better knowledge of issues and have the experience to deal with the situations. Listen and don't tell us the way things will be.” – John Day Workshop Participant

Approximately 27% of open-ended responses directed towards informing policy and policymakers called for **increasing local input into how the local environment is managed.** Participants across both workshops discussed a desire to be able to inform and shape policies, expressing the uniqueness of Eastern Oregon communities. They shared their perspectives on

¹⁶⁸ Caplan, Keyes, and Schloesser, *Oregon by the Numbers*.

feeling left out of statewide decision making and cited examples of past policy successes that came from Eastern Oregon communities' input, such as Senate Bill 372 which was adopted in 2017 and allowed for wildlife salvage permitting.¹⁶⁹ Continued engagement with local communities by state, regional, and local policymakers would align with what participants defined as community needs and values and potentially support future success in identifying and implementing adaptation strategies.

Education and Research

Multiple workshop participants from Baker's City also called for **continued access and resources for community education around climate impacts**. John Day workshop participants also desired access to information that could clearly and transparently communicate how climate change data is compiled, interpreted, and applied in policymaking and programs. A notable outcome of discussion with John Day workshop participants also raised the importance of communication after policies are implemented. For some participants, there was a lack of connection between past climate-related legislation and positive outcomes.

Agriculture and Local Industry

"Small farmers don't have the capital to make efficiency changes" – Baker's City Workshop Participant

Additional comments from workshop participants and survey respondents were focused on agriculture and supporting local industry. Workshop participants largely discussed their suggestions for policy makers as concerns, such as access to capital, capacity, reliance on markets outside the region, and road closures from climate hazards. Participants identified a desire for **research and resources related to adapting agriculture to changing climate conditions** spanning from transition to other agricultural products to protecting crops from smoke. Participants also called for adapting to disruptions in transportation networks to support the flow of goods and services in and out of the area.

¹⁶⁹ Oregon Legislature Assembly, "Senate Bill 372," 2017, Available: https://www.dfw.state.or.us/agency/commission/minutes/18/10_oct/E/Ex%20E_Attachment%203_SB%20372%20Enrolled.pdf.

Conclusion

This regional report concludes with a high-level summary of key findings related to Northeastern Oregon community values (Table 7.5) and how they perceive they will be impacted by climate change (Table 7.6). Each finding is broken down into how it relates to social aspects of vulnerability, including physical, emotional, social, and economic.

Table 7.49 Summary of Northeastern Oregon Respondents' Values

Finding 7.1 Respondents' value a shared sense of identity that is linked to a rural lifestyle and access to the outdoors				
	Physical	Emotional	Social	Economic
Outdoor recreation	Supports outdoor physical activities	Increases mental health	Supports outdoor activities with others; Reflects community values for independence	Supports many jobs that are created through tourism and use of the outdoors
Access to public land	Outdoor physical activities which are mostly on public land	Connection with the landscape; beauty of open spaces; Reflects community values for independence	Community events that occur on public land and bring people together	Supports local economies, especially agriculture and livestock
Small town		Strengthens sense connection, sense of freedom	Shared sense of community; shared values with others	
Finding 7.2 Respondents value their shared beliefs, rural lifestyles, and opportunities to connect in public spaces.				
	Physical	Emotional	Social	Economic
Sense of community		Provides sense of being known and looked after in their community	Provides sense of being known and looked after in their community; shared rural identity	
Shared values, beliefs, and goals		Connection to the larger community; Creates sense of pride; Feeling that you can make a difference	Connection to the larger community; Creates sense of pride	

	Physical	Emotional	Social	Economic
Community events and spaces	Adults clubs/sports support being active/youth sports	Provides mental relief through social events	Provides structure for getting together; Activities that highlight shared values and cultures; collaboration within community organizations	Support local business through events such as farmer's markets and arts and cultural events

Northeastern Oregon participants worry that wildfire, drought, and heat will reduce their ability to enjoy these aspects of their lives. They feel that climate change will negatively affect them in the following ways (Table 7.6):

Table 7.50 Summary of Climate Impacts in Northeastern Oregon

Finding 7.3 Northeastern Oregon respondents are concerned about the negative impacts of drought and wildfire to natural resources and outdoor recreation.				
	Physical	Emotional	Social	Economic
Destruction of natural environment	Disrupts the ability to participate in physical outdoor activities	Negative impacts on community cultures of hunting, fishing, hiking, and other activities	Negative impact on outdoor activities with others; Youth no longer able to experience the same wilderness	Negative impact on tourism industry, especially winter recreation and ranching
Water scarcity	Disrupts health due to less accessible amounts of freshwater	Negative mental health impacts on community members that own agricultural businesses	Unable to recreate in water dependent activities	Negative impact on agriculture, ranching, and supporting industries such as transportation and processing
Increased heat and/or worsened air quality	Increased heat-related illnesses; unable to recreate outdoors	More time spent indoors	More time indoors and isolated from others; Cancellation of community events; Unable to celebrate local culture; unable to recreate outdoors	Loss of events that drive tourism economy and supportive industries

Finding 7.4 Community members are concerned about climate impacts to physical safety and infrastructure.

	Physical	Emotional	Social	Economic
Prolonged periods of intense heat	Disrupts the ability to participate in physical outdoor activities; increase of heat-related illness; loss of sleep	More time spent indoors;	Negative impact on outdoor activities with others; decrease in time spent with community	Negative impact on tourism industry, especially winter recreation and ranching; increased utility bills
Decreased air quality	Increased rate of smoke-related illnesses or disease	Negative mental health impacts on community members that own agricultural businesses; more time spent indoors	Decrease in time spent with community	Negative impact on agriculture, ranching, and supporting industries such as transportation and processing
Threat to transportation infrastructure	Physical isolation from flooding; Change in access to affordable foods			Increased demand/strain on emergency services and public works; Negative impacts to supply chain; Impact to access and cost of food; Workplaces and schools become inaccessible
Threat to utility infrastructure		Negative mental health impacts on those who depends on lower utilities		Amplify existing vulnerabilities of infrastructure and dependency on outside sources for power
Increased demand on public services	Increased demand for healthcare			Increased demand/strain on existing emergency services and public works

Finding 7.5 Participants see climate change and related policymaking as a potential stressor to their value for community connections and locally led efforts.

	Physical	Emotional	Social	Economic
Interdependence between rural and urban areas	Access to services	Tension of being reliant on regional or state resources	Instances of division over politicized issues; access to public information; perceived lack of shared values	Inconsistent access to regional, state, or federal funds to support community and economic development
Independence from others, local lifestyle	Access to services	Value for independence and self-sufficiency; feelings of frustration of being left out of decision making	Shared sense of independence and self-sufficiency as part of a rural lifestyle	Inconsistent access to regional, state, or federal funds to support community and economic development

Respondents from this region emphasized a desire for the legislature to prioritize local engagement and locally led efforts that can incorporate their 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. Doing so will help protect Northeastern Oregon’s communities, well-beings, and livelihoods.

Chapter 8 – Southeastern Oregon



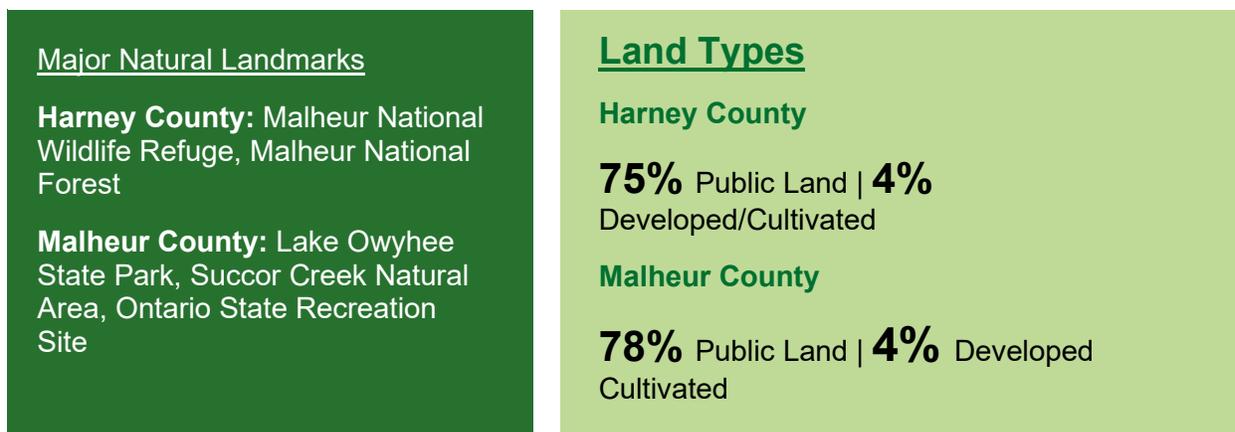
Background

This section provides a summary of existing community characteristics for Southeastern Oregon. We drew from existing state planning documents, such as the Oregon Natural Hazards Mitigation Plan, and other background research materials to provide a high-level overview of environmental, demographic, and economic conditions in the region. This section concludes with an overview of climate projections for Southeastern Oregon and known social vulnerabilities.

Environmental Characteristics

Southeast Oregon is bordered by the neighboring states of Idaho, Nevada, and California. Major waterways in the region include the Malheur and Owyhee rivers. The prevailing climate of the region is arid and semi-arid and supports three distinct ecoregions.¹⁷⁰ Southeastern Oregon is dominated by the Northern Basin and Range ecoregion and is characteristic of lava plains, valleys, deep river canyons, and dispersed mountain ranges. The Blue Mountains, in the northern part of the region, hosts an ecoregion of steep mountains, cold basins, mixed forests of Ponderosa Pine, Fir, and Juniper and sagebrush steppe. The third ecoregion of the area is the Snake River Plain, also referred to as Treasure Valley. This ecoregion consists of valleys cut by rivers, canals, rolling foothills, and badlands. Southeastern Oregon is largely public land with small, dispersed areas of development.¹⁷¹ Figure 8.1 provides more information on regional landmarks, public lands, and development density.

Figure 8.54 Major Landmarks and Land Types in Southeastern Oregon



Source: Oregon by the Numbers (2022), Ford Family Foundation

¹⁷⁰ State Interagency Hazard Mitigation Team, *Oregon's Natural Hazards Mitigation Plan*, vols. (State of Oregon, September 24, 2020), Available:

https://www.oregon.gov/lcd/NH/Documents/Approved_2020ORNHMP_00_Complete.pdf.

¹⁷¹ Shannon Caplan, David Keyes, Rachel Porter, and Elissa Schloesser, *Oregon by the Numbers*, vols. (The Ford Family Foundation and Oregon State University Extension Service, August 2024, Available: https://www.tfff.org/wp-content/uploads/OBTN_2024-091724-1.pdf

Community Characteristics

Southeastern Oregon hosts a population of 39,000 people across 20,000 square miles.¹⁷² Approximately 79% of the region’s total population is in Malheur County. Table 8.1 provides additional detail of population characteristics by county and for the region overall.

Table 8.51 Population Characteristics of Southeastern Oregon

	Harney County	Malheur County	Region 8
Total Population	7,496	31,538	39,034
Total land area (mi²)	10,228	9,930	20,158
Population Density (people/mi²)	1	3	2
Net migration, 2020-2022 [per 1,000 population]	26.8	17.9	22.3

Source: Oregon by the Numbers, 2024

¹⁷² Ibid

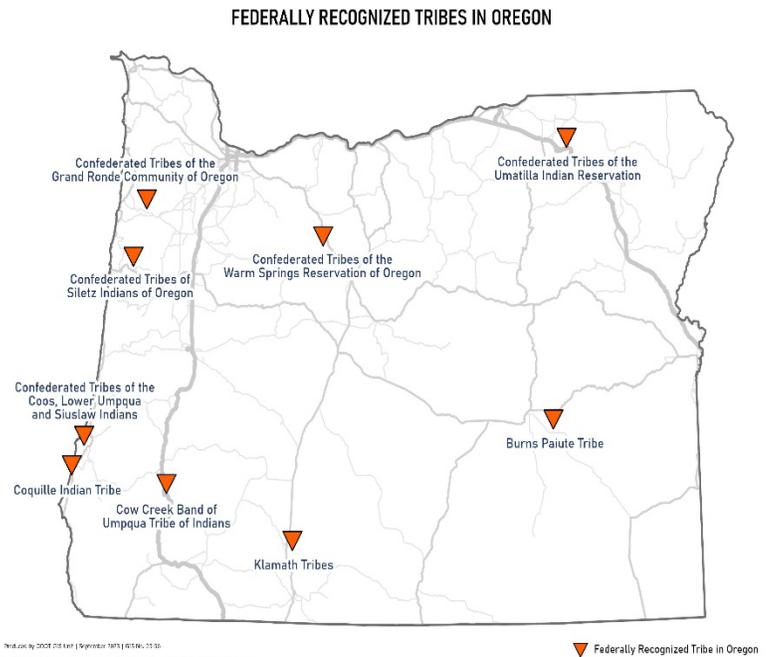
Federally Recognized Tribes

Figure 8.2 displays the locations of the nine federally recognized tribes in the state of Oregon. The Burns Paiute Reservation is located in Harney County. The Burns Paiute Tribe is one of nine federally recognized tribes in Oregon. Members of the Burns Paiute Tribe are primarily descendants of the Wadatika Band of Northern Paiutes. The Tribe's traditional homelands span across nearly 5,250 square miles of central and southern Oregon, and parts of Nevada, Idaho, and California. The Tribe has a current membership of 402 enrolled members, of which approximately 142 live on the reservation.¹⁷³

Race and Ethnicity

Racial and ethnicity demographics of Southeastern Oregon diverge from the state average. Harney County has an above state average for communities of American Indian/Alaska Native, Native Hawaiian/Pacific Islander, two or more races, and White populations. Malheur county has an above state average of Hispanic/Latino community members, which account for 33% of Ontario and Malheur County as a whole.¹⁷⁴

Figure 1.55 Oregon's Federally Recognized Tribes



Source: Oregon Department of Transportation

Figure 8.56 Housing Structure Characteristics in Southeastern Oregon

Harney County

22.4% Mobile Homes | **53.4%** Pre-1970s Structures

Malheur County

16.4% Mobile Homes | **43%** Pre-1970s Structures

¹⁷³ "About The Tribe," n.d., Available: <https://burnspaiute-nsn.gov/about-the-tribe/>.

¹⁷⁴ Caplan, Keyes, Porter, and Schloesser, *Oregon by the Numbers*.

Social Vulnerability

The physical, mental, and financial well-being of specific population groups in Southeastern Oregon are already vulnerable to unanticipated events and natural hazards. Figure 8.3 provides an overview of the vulnerable groups as identified in the OR NMHP. These groups are likely to experience disproportionate impacts from climate-related hazards and events. Additionally, the CDC’s Social Vulnerability Index identifies Harney County with an overall medium to high vulnerability score and Malheur County with high vulnerability score.

Low median household income and high levels of poverty strain the existing resources of these communities to adapt to climate change. The vulnerability of children in Malheur County is especially pronounced where child poverty is 30.3%. Table 8.2 provides additional detailed information on income, and other metrics of financial stability, by county.

Table 8.52 Social Vulnerability Measures for Southeastern Oregon

	Harney County	Malheur County
Median Household Income	\$45,462	\$48,371
Households in Financial Hardship	60.8%	61.1%
Child Poverty	17.1%	23.9%
Unemployment	4.9%	4.5%
Food insecurity	11.0%	11.7%

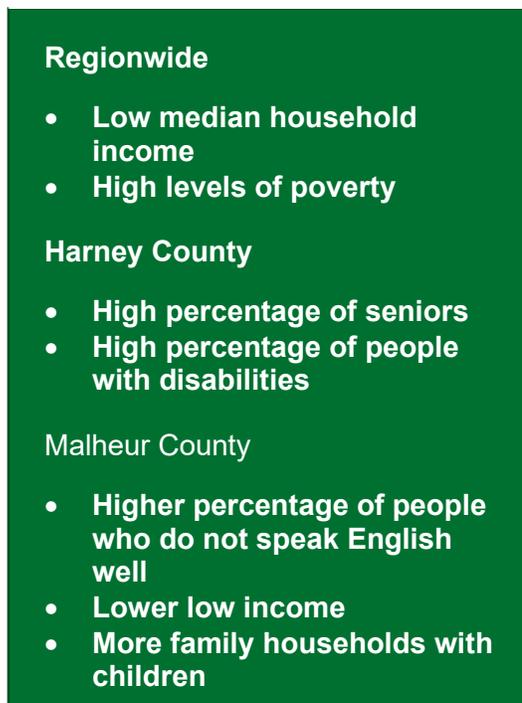
Source: Oregon by the Numbers, 2024

The built environment in OEM Region 8 is closely tied to regional industry and livelihoods. The OR NHMP describes the susceptibility of Southeast Oregon’s transportation system to winter storms and flooding. Damage or interruption to transportation networks, including roads, railways, and bridges can impact on the regional economy and services. The main transportation routes of the region include I-84, US-20, US-26, and US- 85, which are also areas where most of the population is focused. The region is also home to two major power-generating facilities as well as oil and natural gas pipelines and electrical transmission lines. These resources are essential power sources. Disruption to these power sources from climate and hazard events will affect people at home and at work.

Southeastern Oregon has a high percentage of manufactured homes and homes built prior to ordinances and standards that are intended to protect property from flooding and earthquakes.¹⁷⁵ Approximately 45% of the housing stock was built in the 1970s, prior to the implementation of floodplain management ordinances; More than three quarters of the housing stock was built before 1990, and do not meet the seismic building standards that were codified in 1994. Figure 8.4 provides a detailed break-down by county of mobile homes and structures built prior to 1970. These conditions

Source: Oregon Natural Hazard Mitigation Plan, 2020

Figure 8.57 Known Regional Vulnerabilities



¹⁷⁵ State Interagency Hazard Mitigation Team, *NHMP*.

make Southeastern Oregon community's homes increasingly vulnerable to climate impacts.

Individual and community well-being can be influenced by various financial, social, and environmental factors. Table 8.3 details self-reported data from individuals in Harney and Malheur Counties on their physical and mental health.¹⁷⁶ Research from The Ford Family Foundation in their annual Oregon by the Numbers Report shows that counties with lower rates of poverty, unemployment, disability, and mortality also report fewer (physically) unhealthy days. Their researchers also note that addressing low mental health should consider access to care.

Table 8.53 Percent of Population Reporting Good Physical and Mental Well-Being in Southeastern Oregon

	Good Physical Health	Good Mental Health
Oregon	60.1%	57.3%
Harney County	69.8%	54.8%
Malheur County	53.6%	56.2%

Source: Oregon by the Numbers, 2022

Economic and Livelihood Characteristics

Figure 8.5 provides a high-level summary of the top employment industries in Southeastern Oregon across Harney and Malheur County.¹⁷⁷ The Greater Eastern Oregon Development Corporation (GEODC) provides detailed information of the regional economic characteristics for both counties.¹⁷⁸ While current employment industries are reflected in Figure 2, the historic economic base of Harney County revolved around cattle raising, sheep raising, and timber.

In Malheur County, nearly 94% of the region is rangeland, 72% of which is controlled by the Bureau of Land Management (BLM). Treasure Valley, within the northeast corner of Malheur County, is the center of intensive farming. Malheur County's two largest employers are the Snake River Correctional Institution and Ore-Ida.

In 2018, the five major supersectors by share of employment in Region 8 were:

6. Trade, Transportation, and Utilities
7. Local Government
8. Education and Health Services
9. Natural Resources and Mining
10. Leisure and Hospitality¹⁷⁹

Figure 8.58 - Top Employment Industries in Southeastern Oregon



an, 2020

¹⁷⁶ Caplan, Keyes, and Schloesser, *Oregon by the Numbers*.

¹⁷⁷ Caplan, Keyes, and Schloesser, *Oregon by the Numbers*.

¹⁷⁸ Greater Eastern Oregon Development Corporation, "Comprehensive Economic Development Strategy 2014-2019," 2014, Available: https://www.geodc.net/wp-content/uploads/2015/02/GEODC-2014-CED_complete_web12-29.pdf.

¹⁷⁹ U.S. Bureau of Labor Statistics, *Quarterly Census of Employment and Wages*, vols., December 20, 2019, Available: <https://www.bls.gov/cew/classifications/industry/industry-supersectors.htm>.

Compared to the United States, Region 8 is competitive in Crop Production, Animal Production and Aquaculture, Support Activities for Agriculture and Forestry, Justice, Public Order and Safety Activities, and Food Manufacturing.¹⁸⁰ Four of the region's most concentrated industries give Region 8 a competitive edge in growing and processing food products.

Climate Projections

Oregon Climate Change Research Institute (OCCRI) produced detailed climate projections for Southeastern Oregon. Potential effects of climate change include **mean temperature, heat waves, drought, wildfires, warmer winters, and extreme precipitation**. Data informing climate projections for Southeastern Oregon are based on continued high-level emissions of greenhouse gases (RCP 8.5).¹⁸¹

¹⁸⁰ State Interagency Hazard Mitigation Team, *OR NHMP*.

¹⁸¹ ?



MEAN TEMPERATURE

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

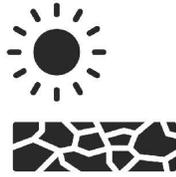
- Warmer nights
- Longer fire seasons
- Unmet chilling requirements
- Expansion of some pests, diseases, invasive species



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.



blogs.oregonstate.edu/occri/

Findings

This section presents the key findings from review and synthesis of 15 survey responses from Southeastern Oregon respondents and six workshop participants who attended regional workshops in Burns and Ontario. These findings are supplemented by background research. The survey and workshops combined reached participants from Ontario, Burns, Hines, and rural areas of Malheur and Harney counties.

Figure 8.6 provides a detailed overview of survey respondent characteristics. Overall, survey results closely resembled regional demographics for age, gender, and race and ethnicity. Survey respondents

underrepresented individuals with a bachelor's degree or higher and individuals of higher income.

Four workshop participants provided demographic information. Overall, workshop participants did not represent individuals under the age of 18 or over the age of 65, which comprise approximately 44% of Region 8. Participant demographics had higher levels of income and educational attainment than the regional average and closely resembled racial and ethnic compositions of the area which is 91% white.

Figure 8.59 Region 8 Survey Respondent Characteristics

- Persons under 18 not underrepresented in survey results
- Individuals with a bachelor's degree or higher are underrepresented by ~7%
- 73% of respondents reported annual incomes of \$50,000 or less.
- 7% of survey respondents reported a bachelor's degree, compared with the regional average of 15% having a Bachelor's degree or higher.

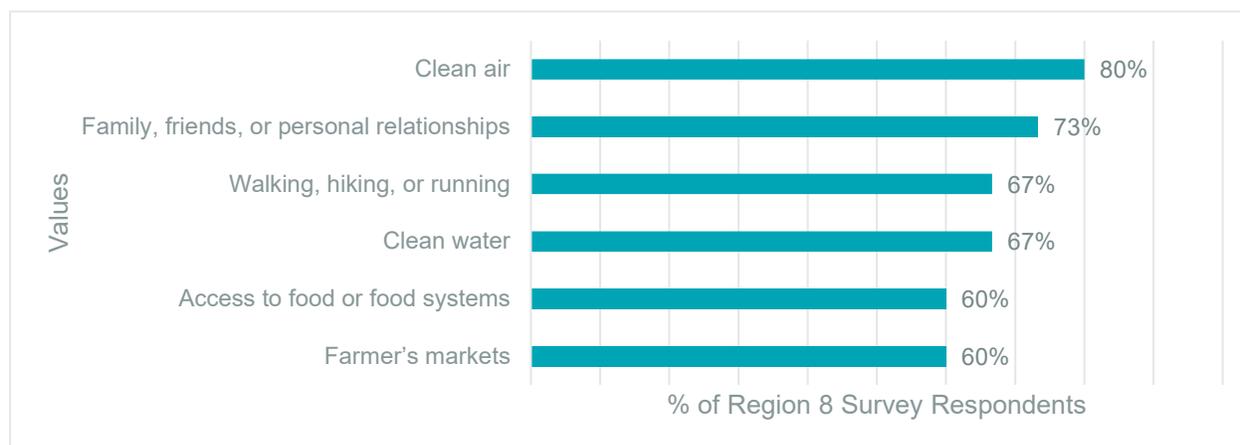
Community Values

Finding 8.1 Respondents' value for their rural identity is closely tied with the characteristics of the landscape and the outdoor activities they engage in.

"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 8.7 highlights the top five values that were most often chosen by Southeastern Oregon survey respondents. Survey respondents' values for the natural environment and relationships, closely mirrors input from workshop participants' discussion on nature, recreation, and what they characterized as "Rural Life".

Figure 8.60 Top Five Values Most Frequently Chosen by Survey Respondents



Workshop participants strongly connected their values for the landscape with their values for living in and being a part of a rural community. Workshop participants discussed Southeastern Oregon's open space, remoteness, and dry climate as factors that drew them to the area and motivated them to stay. For both workshop and survey participants, being part of a small town, with a small population, and far from population centers bolsters their sense of independence and connection to others who share the same lifestyle.

For some participants, **a key feature of their rural identity was spending time outdoors,** engaging in activities such as fishing, hunting sage grouse, rock prospecting, or generally enjoying access to abundant and healthy natural resources. Workshop participants discussed how much they value their access to public lands in the area, which they use for recreation as well as activities that support their livelihood, such as livestock grazing. Many of these activities exemplify respondents' value for independence and self-reliance.

Finding 8.2 Southeastern Oregon Respondents' value their social relationships, shared goals, and the community events that bring them together.

Southeastern Oregon participants value the social bonds they maintain with friends and family, as well as with the wider community. As shown in Figure 8.7, 73% of Southeastern Oregon survey respondents widely agreed on their value for friends, family, and personal relationships. Workshop participants talked about the sense of being known and cared for in their community. One workshop participant talked about this as the interaction you might have with someone walking down the street and expressed through an informal conversation, a head nod, or a wave. They felt that these small actions were part of the social norm to check-in and care for other people within your community, even those who may not be your close friends or acquaintances.

Workshop participants talked about how **shared goals and hobbies make them feel connected to the wider community and gave them a sense of feeling needed.** Participants from Burns noted how their local watershed council was an example of what they described as "bring[ing] people together for community-based goals through collaboration." Workshop

participants described feeling a shared sense of purpose when they had the ability to make a difference in their community.

Workshop participants also discussed how **community events and activities gave them opportunities to come together**. Workshop participants shared their values for youth sports that bring students and families together, particularly high school football. Burns workshop participants spoke more specifically of community events that highlight their shared values for the region's natural resources and provided them opportunities to see neighbors who live in isolated areas of the county such as the Malheur County Fair and the Migratory Bird Festival. Burns workshop participants talked about the Malheur County Fair as an annual event that people prioritized coming to, taking off from work or other activities to attend, and sometimes the only time you might see a neighbor for the year.

Climate Change Impacts

As shown in Table 8.4, survey respondents are most concerned about the negative impacts of climate projections for wildfire, followed by drought and heat waves. The key findings from workshop discussions spanned across hazard types and often related to multiple or compounding impacts.

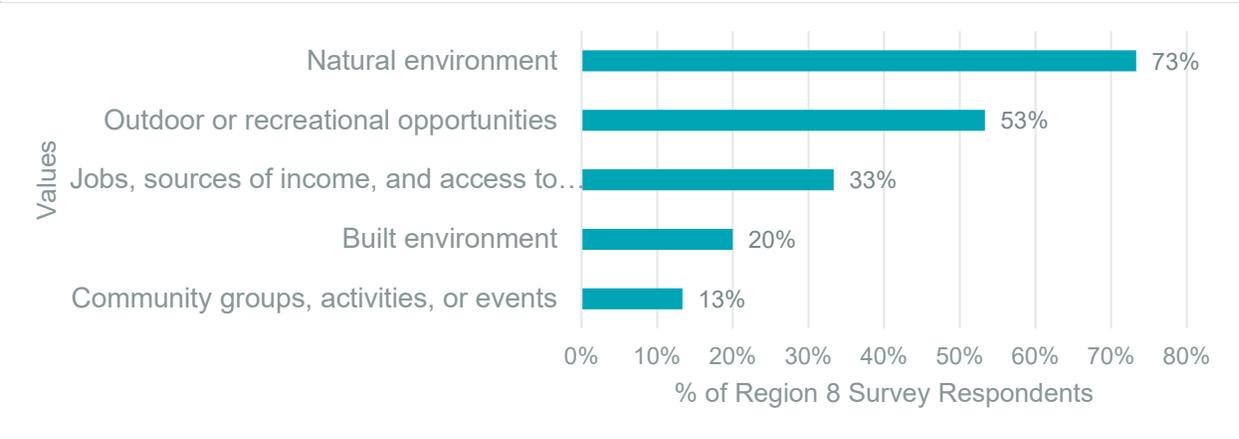
Table 8.54 Survey Respondents’ Perception of Regional Climate Projections

	Strong/somewhat negative impact	Neither positive nor negative	Strong/somewhat positive impact
Wildfires	87%	13%	0%
Drought	67%	27%	7%
Heat Waves	60%	40%	0%
Mean Temperature	47%	53%	7%
Extreme Precipitation	40%	7%	7%
Warmer Winters	27%	47%	67%

Finding 8.3 Southeastern Oregon respondents are concerned about the negative impacts of drought and wildfire to natural resources and outdoor recreation.

Survey respondents in Southeastern Oregon reported their top concerns for the negative impacts of climate change were for the natural environment and the local industries that rely on it such as outdoor recreation, agriculture, and ranching. Figure 8.8 provides a detailed breakdown of how survey respondents prioritized their concern for different types of values they were asked about.

Figure 8.61 Community Values of Most Concern



Finding 8.3.a Respondents from Southeastern Oregon are worried about climate impacts to the natural environment.

Approximately 73% of survey respondents from Southeastern Oregon reported **their top concern related to climate change was for the natural environment**, as shown in Figure 7. Workshop participants discussed their concerns that wildfire, drought, and heat would have direct and negative consequences on the local and regional ecosystem. Specifically, workshop

participants talked about the increased stress on fish and wildlife, earlier drying of wetlands and watersheds, the negative impacts on bird habitat, and the potential for increased erosion.

Community Context:

Parts of Region 8's Blue Mountain ecoregion are home to sagebrush steppe ecosystems. Sagebrush steppe ecosystems are threatened by invasive species, altered fire regimes, intensive historic grazing practices, and development amongst other factors. Sagebrush steppe is also essential habitat for the Greater Sage-Grouse, though its distribution in the Pacific Northwest has declined to 56% of its historic range.¹⁸² In 2015, the US Fish and Wildlife Service narrowly avoided listing Greater Sage-Grouse under the Endangered Species Act by 11 western states adopting conservation plans¹⁸³

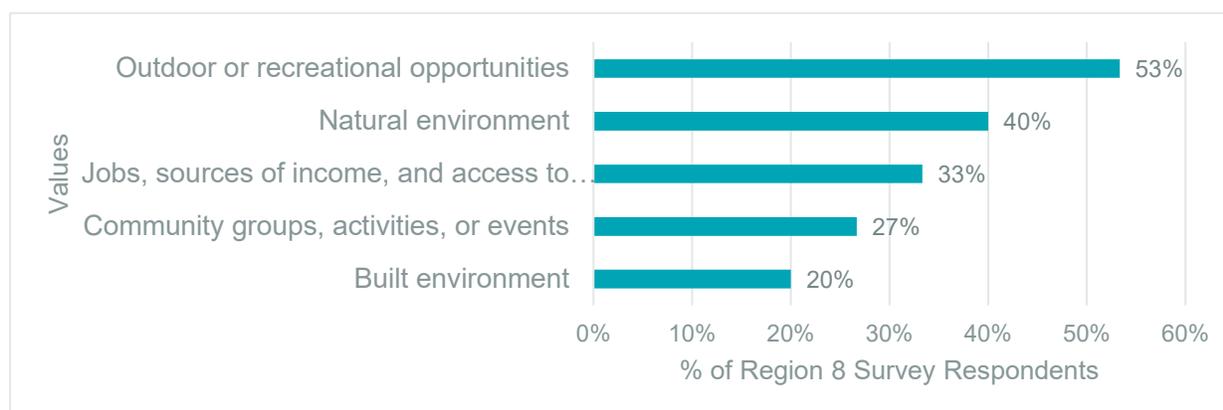
Climate changes, such as wildfire, increasing temperatures, drier summers, decreased snowpack, and shifting vegetation distribution present additional challenges for restoring and maintaining the Greater Sage-Grouse and their habitat.

Negative impacts to the ecosystem, and the services it provides for both the natural environment and for people, **would have rippling impacts** to respondents' values for activities such as hunting, fishing, and community events that showcase the natural environment or wildfire.

Finding 8.3.b Workshop participants were concerned about the impact of drought and wildfire would have on outdoor recreation.

Workshop participants **expressed their concerns for** outdoor recreation as **changes to their ability to access public lands**, a decrease in water-related recreation, and a decrease in winter sports. As shown in Figure 8.8, 53% of survey respondents noted that they were concerned about climate impacts to outdoor or recreational opportunities. Figure 8.10 shows the same percentage (53%) of survey respondents would also prioritize outdoor and recreation for climate adaptation resources. A workshop participant who grew up in Burns recalled recreating in a reservoir which no longer has enough water to access. Burns workshop participants overall agreed on their common value for maintaining the natural areas they have treasured be preserved and maintained for future generations to enjoy.

Figure 8.62 Survey Respondents' Priority for Allocating Adaptation Resources



¹⁸² Megan K. Creutzburg et al., "Climate change and land management impact rangeland condition and sage-grouse habitat in southeastern Oregon" *AIMS Environmental Science*. 2.2 (2015): 203–236.

¹⁸³ "Greater Sage-Grouse" *Portland Audubon*. , n.d., online, Internet, 7 Jun. 2023. , Available: <https://audubonportland.org/our-work/protect/habitat-and-wildlife/central-and-eastern-oregon/greater-sage-grouse/>.

Finding 8.3.c Workshop participants expressed their concern about the economic and livelihood impacts of drought and wildfire on agriculture and ranching, with emphasis on the increased demand for water use.

“...Drought is concerning to me because it makes me worry if there will be enough water for everyone.” – Harney County Survey Respondent

Participants noted how **climate projections would shift the amount and availability of water** throughout the year and have cascading impacts to when and how long agricultural seasons occur. They also discussed the **impact of drought and wildfire to the health of crops and livestock**. One participant from Ontario talked about wildfire smoke reducing the overall yield of onion and potato crops. In addition to direct impacts, workshop participants perceive that drought and wildfire also pose negative impacts to the industries that support agriculture and ranching such as transportation and processing.

Finding 8.4 Changing climate conditions impact community events that represent the uniqueness of the region, support community cohesion, and contribute to the local economy.

Impacts from heat, wildfire, and air quality threaten community events that bring dispersed communities together. Workshop participants discussed the impact of event cancellations as negatively impacting their ability to come together and alternatively increasing the amount of time that they would have to spend indoors. As discussed in Finding 8.2, Southeastern Oregon participants highly value these local events and activities that feature the region’s unique landscape, shared cultural heritage, and reaffirm the community’s shared values for a rural lifestyle that embodies independence and self-reliance.

Participants also expressed concern about event cancellation and the **impact it would have on local tourism**. In addition to county fairs and the migratory bird festival, participants also talked about organized bike and running races that bring people to the area. In 2019, tourism in Region 8 generated approximately 21 million dollars and over 950 jobs.¹⁸⁴

Finding 8.5 Southeastern Oregonians are concerned about climate impacts to physical safety, community services, and infrastructure.

Finding 8.5.a Workshop participants perceive heat and air quality to have direct negative impacts on physical health, particularly for vulnerable groups.

Workshop participants discussed the potential negative impacts to human health from heat stress, poor air quality caused by smoke, and safety impacts from hazard events such as flooding. Participants from Burns pointed out the **disproportionate impacts of heat to vulnerable groups**, such elderly community members who may have a lower heat resistance threshold and outdoor workers who might see magnified health effects from spending longer amounts of time outside. Participants also voiced concern **for young children and the**

¹⁸⁴ Dean Runyan Associates, “Oregon Travel Impacts, Statewide Estimates, 1992-2019p,” 2020, Available: <https://industry.traveloregon.com/wp-content/uploads/2020/04/ORImp19.pdf>.

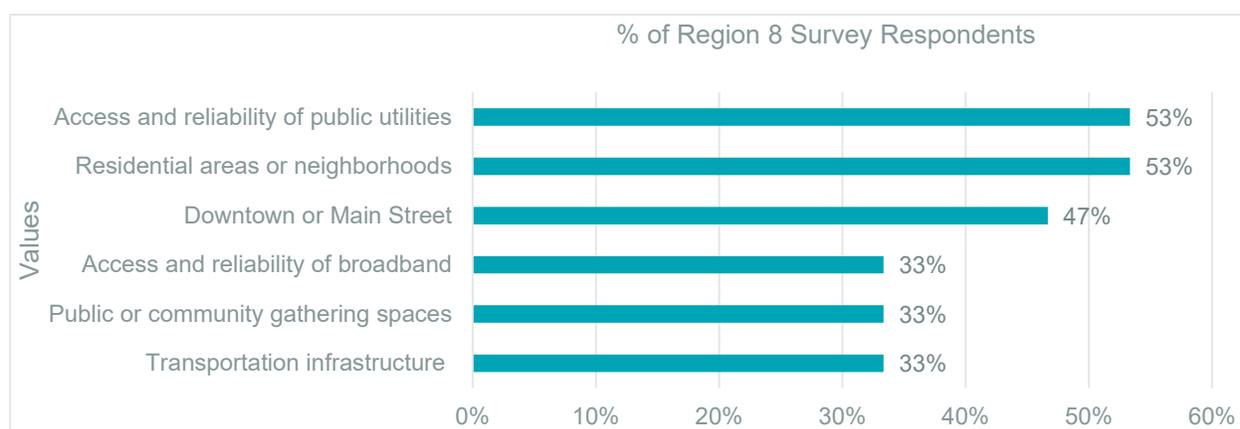
availability of air conditioners in homes and schools, as well as **access to cooling centers or clean air shelters** when conditions at home are not adequate.

Finding 8.5.b Participants perceive that community services and public infrastructure are not equipped to withstand the negative impacts of climate projections.

Workshop participants from Burns and Ontario expressed **concern over increased demand for community services** such as health care, public works, and emergency services. Burns participants discussed a flooding event from the Silvies River in 2017 that strained their current infrastructure, the community’s emergency response capacity, and damaged peoples’ homes. Flood waters also blocked transportation routes, increasing travel time for residents trying to get to work or take their children to school, and sometimes cutting people off entirely from being able to leave their homes. Flood waters also covered farm and range land and destroyed agricultural buildings.¹⁸⁵ In April of 2023, Harney County experienced another flood event from the Silvies River which flowed over flood gates and required resources and coordination from across regional jurisdictions and county and tribal departments. An even more devastating flood occurred in April 2025, damaging 952 homes and causing the City of Burns sewage system to fail. These floods are thought to be exacerbated by recent wildfires in the surrounding mountains.¹⁸⁶

Workshop participants also talked about the **climate impacts to public infrastructure** including their electrical and transportation infrastructure and access to cooling or clean air shelters. Both Burns and Ontario participants talked about their **reliance on outside resources for electricity** whose power sources rely on either neighboring states or the power that is generated elsewhere in the state of Oregon. Over half of survey respondents from Region 8 expressed a value for access and reliability of public utilities and 33% reported transportation infrastructure as something they valued about their community, as shown in Figure 8.11. Workshop participants also talked about the **increased household and community costs that come with increased heat and smoke events** such as increased utility bills, increased cost from new or updated HVAC systems, increased demand for electricity, and the need for public cooling or clean air shelters.

Figure 8.63 Percent of Survey Respondents' that Value Built Environment Factors



¹⁸⁵ {Citation}

¹⁸⁶ Burns, Oregon residents continue to grapple with historic floods | kgw.com;

<https://www.kgw.com/article/news/local/hundreds-of-people-displaced-in-burns-oregon-after-historic-floods-officials-say/283-69dff5f-3cb2-4663-bff6-fc6f3b8e79be>

Lastly, one participant from Ontario talked about **the impact of climate events on the community's ability to access food** that is imported from outside of the community via its transportation networks. The participant noted the community's dependence on outside commercial agricultural shipments and the potential for climate projections to increase the household cost of food as well as increased costs to businesses such as restaurants or groceries.

Finding 8.6 Southeastern Oregon participants perceive that climate change will amplify existing vulnerabilities within their communities.

"I think the local community is really lacking in access in availability to resources for [low-income] families." – Malheur County Survey Respondent

Workshop participants talked about their values for housing and health care as what they wanted more of in their communities. The remote geographies and small populations, characteristic of **what community members value about Southeastern Oregon, also presents a challenge for financing and building homes and the availability and affordability of health care.** Current access to housing and health care can be further impacted by regional influences, such as close proximity to neighboring states that have different taxation or incentive structures that outcompete small Oregon communities for businesses and residents.

When workshop participants evaluated how climate change would impact their communities, they talked **about the tradeoffs of Oregon's land use program** benefit to preserving farmland and reducing sprawl with what has **resulted in limited available housing supply and the pressure to expand** growth boundaries onto green-fields. Burns participants talked about the direct impact from climate events that have resulted in property damage or destruction from flooding or wildfire, further straining their available housing stock.

Community Solutions

"Rural communities are important part of the Oregon landscape. An opportunity to uplift rural communities during climate change is for the betterment of the state. Leaving rural communities behind during this climate crisis will be a failure of action." – Burns Workshop Participant

In both the survey and the workshops, Southeastern Oregon residents discussed what they saw as potential solutions or starting points to reducing their vulnerabilities and building resilience against the impacts of climate change to their lives and their communities. We present their suggestions in this findings section with the acknowledgement that they are more closely in sync with their own communities' needs and values.

Local Engagement

Both workshop and survey participants expressed a feeling of being left out of policy and legislative decisions in Oregon. One workshop participant in Burns reiterated that the Oregon Legislature must consider that, **"What works for the [I-5] corridor does not work for [Rural Eastern Oregon]."** Participants went on to discuss the challenges they've seen for their communities when the large population centers are focused on the western side of the state and programs are created as one-size-fits-all. Burns workshop participants felt that this approach overshadowed the values and needs of their small rural communities. The same workshop

participant called for “comprehensive legislation that addresses rural [communities’] needs,” and urged us to consider that the needs of densely populated areas shouldn’t outweigh the needs of the small communities that also play critical and important roles in the state.

Local Capacity Building

Policy makers should work to engage with communities in Region 8 and build capacity in their local organizations and municipalities. **Building trust and enduring relationships** can be one strategy for addressing the urban/rural divide in Oregon, amplifying the voices of rural community members, expand who has access to participating in decision-making, and providing much needed capacity to organizations that are already working to engage with community members. Building relationships with local organizations and municipalities may also help to navigate tensions around Region 8’s community values for independence and self-reliance with the reality of having interdependency on policies or programs decided at the state level and large areas of land under federal management practices.

Engagement with local communities and organizations can help to identify and implement climate adaptation measures that better align with their community needs and values. While our assessment aimed to engage with communities across the state, our engagement in Region 8 was limited; Region 8 is home to many demographic groups that are not fully represented in our assessment, particularly for those who are historically and currently underrepresented in most levels of policy and decision-making. Local, regional, and state policy makers should continue to engage with local communities to ensure that climate adaptation programs provide options for eligibility criteria that meets the unique factors of communities that are small, rural, sparsely developed, unincorporated, and/or tribal communities.

Seasonality in Region 8

Lastly, policy makers should be **mindful of the seasonal activities of communities in Region 8 when planning for and implementing engagement activities**. These activities may be directly related to agriculture or ranching, such as planting or harvesting, but may also include other regionally important activities like hunting or fishing seasons. One Ontario workshop participant noted that February is a time where many folks are looking for things to do. Time and resources dedicated to engagement can be better leveraged when community members are not engaged in activities that are essential to their livelihoods or culture.

Conclusion

This regional report concludes with a high-level summary of key findings related to Southeastern Oregon community values (Table 8.5) and how they perceive they will be impacted by climate change (Table 8.6). Each finding is broken down into how it relates to social aspects of vulnerability, including physical, emotional, social, and economic.

Table 8.55 Community Values Summary for Region 8

Finding 8.1 Respondents' value for their rural identity is closely tied with the characteristics of the landscape and the outdoor activities they engage in.				
	Physical	Emotional	Social	Economic
Outdoor recreation	Supports outdoor physical activities		Supports outdoor physical activities with others	
Access to public lands	Supports outdoor physical activity which is often on public lands			Supports livelihoods, such as livestock grazing
Natural beauty; Remoteness; Open landscape		Reflects community values for independence	Reflects community values for independence	
Small town; Small population		Provide a sense of being known and cared for in their community		
Finding 8.2 Southeastern Oregon Respondents' value their social relationships, shared goals, and the community events that bring them together.				
	Physical	Emotional	Social	Economic
Personal relationships		Provide a sense of being known and cared for in their community	Provide a sense of being known and cared for in their community	
Shared goals		Foster feelings of connection to the wider community; supports feelings of being needed	Foster feelings of connection to the wider community; supports feelings of being needed	
Community events	Youth sports support physical activity		Provides structure for getting together; activities that highlight shared values and culture	Community events are important to the tourism industry and generate revenue to the local economy

Table 8.56 Climate Impact Summary for Region 8

Finding 8.3 Southeastern Oregon respondents are concerned about the negative impacts of drought and wildfire to natural resources and outdoor recreation.				
	Physical	Emotional	Social	Economic
Destruction of natural ecosystem	Shift in ability to engage in physical outdoor activity	Negative impact to values for hunting, fishing, and other outdoor activities	Negative impact to outdoor activities with others; outdoor places no longer available to future generations; Bird and animal migration pattern changes will impact community events	Negative impacts on tourism industry, winter recreation, agriculture, and ranching
Water scarcity				Negative impacts on agriculture, ranching, and supporting industries such as transportation and processing
Finding 8.4 Changing climate conditions impact community events that represent the uniqueness of the region, support community cohesion, and contribute to the local economy.				
	Physical	Emotional	Social	Economic
Increased heat and/or worsen air quality		More time spent indoors	More time indoors and isolated from others; Cancellation of events that bring people together; Unable to celebrate local culture or shared heritage	Loss of events that drive tourism economy and supportive industries
Restricted outdoor and public lands access	negative effects on physical health	Reduced recreational activities like hunting, fishing, water-recreation, and winter sports; negative effects on mental health	Loss of shared hobbies and activities connect people	Negative impacts on tourism industry, winter recreation

Finding 8.5 Southeastern Oregonians are concerned about climate impacts to physical safety, community services, and infrastructure.

	Physical	Emotional	Social	Economic
Prolonged periods of high temperatures	Heat stress; negative health impacts on outdoor workers and elderly populations		Cancellation of events that bring people together; Unable to celebrate local culture or shared heritage	Increased cost of AC; Access to AC; Expense of public cooling centers; Loss of community (tourism); amplify current community vulnerabilities
Decreased air quality	Increased demand for health care	More time spent indoors	Cancellation of events that bring people together; Unable to celebrate local culture or shared heritage	Loss of events that drive tourism economy; Expense of public clean air shelters
Threat to transportation infrastructure	Physical isolation from flooding; Change in access to affordable foods			Increased demand/strain on emergency services and public works; negative impacts to supply chain; impact to access and cost of food; Workplaces and schools become inaccessible;
Threat to utility infrastructure				Amplify existing vulnerabilities of infrastructure and dependency on outside sources for power
Property loss	Households physically displaced from flooding	Homes lost due to wildfire and flooding		Homes lost due to wildfire and flooding; Destruction of agricultural buildings
Increased demand on public services	Increased demand for health care			Increased demand/strain on existing emergency services and public works.

Finding 8.6 Southeastern Oregon participants perceive that climate change will amplify existing vulnerabilities within their communities.

	Physical	Emotional	Social	Economic
Constrained Housing Conditions			Close proximity to neighboring states disincentivize local housing development.	Rising housing prices; reduction of available housing
Access to Health Care	Lack of access to health care			Unaffordable health care

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. These relationships can help to benefit the development of climate-related programs or policies to better include small, rural, and unincorporated communities and provide them with resources that align with their community values.

Chapter 9 – Community Values and Climate Impacts by Development Density

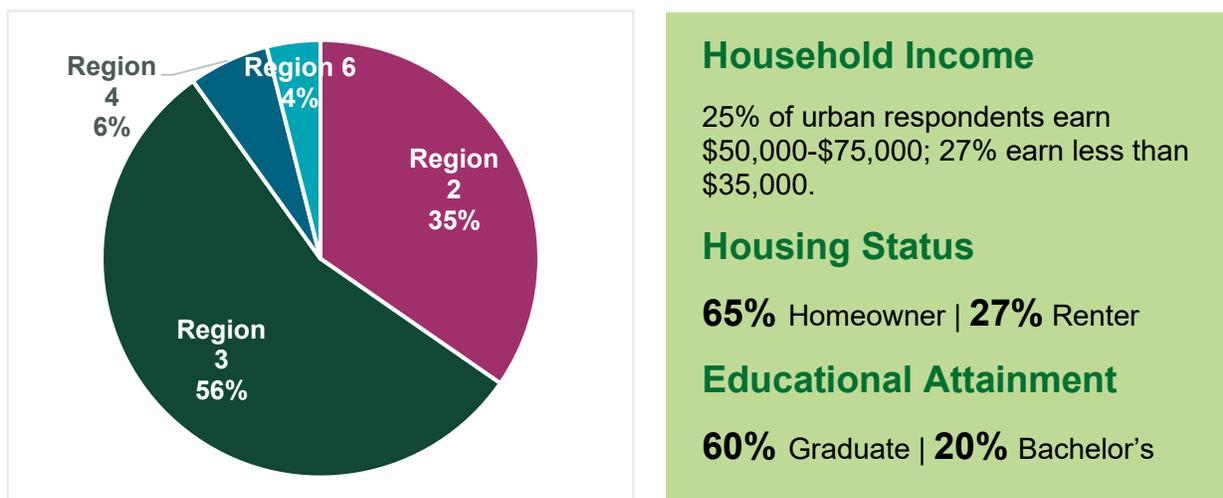
This chapter summarizes findings from interviews, the statewide survey, and regional workshops by development density. Some survey and workshop data are omitted due to incomplete information related to participants' residences. We utilized definitions for urban, rural, and frontier and compiled ZIP code data from the Oregon Office of Rural Health, housed at the Oregon Health and Science University.¹⁸⁷ Our definitions for urban, rural, and frontier may not align with how participants would have defined them. While these terms have various definitions across state and federal agencies and departments, they also carry community and cultural significance. For example, participants in the Medford workshop would not have self-identified their community as "urban", but definitions from both the Oregon Office of Rural Health and the US Census Bureau would categorize their community as such.

Participants by Development Density

Urban

Urban regions are defined as geographic areas less than 10 miles from the centroid of a population center of 40,000 or more.¹⁸⁸ Urban areas in Oregon include Portland, Hillsboro, Beaverton, Gresham, Beaverton, Tigard, Lake Oswego, Salem, Albany, Corvallis, Eugene, Springfield, Bend, and Medford. Sixty-five percent of Oregon's population lives in urban areas.¹⁸⁹ Figure 9.1 provides a snapshot of demographics from urban participants. The figure represents a total of 52 survey respondents and regional workshops held in Woodburn and Pendleton where urban respondents attended.

Figure 9.1 Regional Breakdown of Urban Respondents



Rural

Rural regions are defined as any geographic areas ten or more miles from the centroid of a population center of 40,000 people or more.¹⁹⁰ Thirty-three percent of Oregon's population lives in rural areas. Figure 9.2 provides a snapshot of demographics from rural participants. This

¹⁸⁷ "About Rural and Frontier Data" *Oregon Office of Rural Health*. , n.d., online, Internet, 30 May 2023. , Available: <https://www.ohsu.edu/oregon-office-of-rural-health/about-rural-and-frontier-data>.

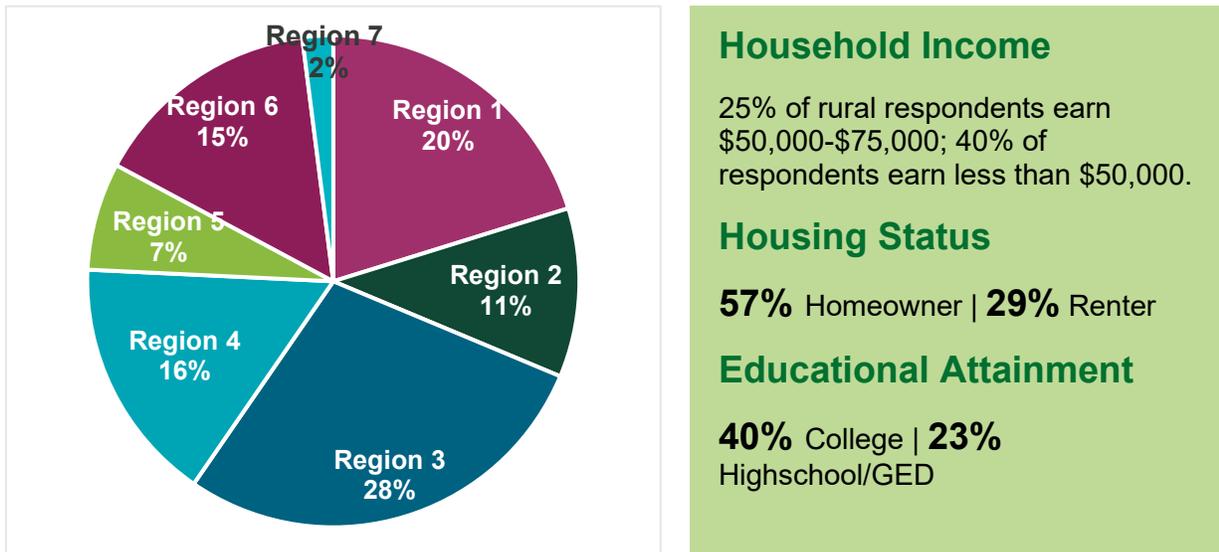
¹⁸⁸ Oregon Office of Rural Health, "ORH Urban Rural map | OHSU," n.d., online, Internet, 28 Jun. 2023. , Available: <https://www.ohsu.edu/media/881>.

¹⁸⁹ "About Rural and Frontier Data."

¹⁹⁰ Ibid.

figure represents a total of 512 survey respondents and rural workshop participants from in-person workshops held in Klamath Falls, Brookings, and Pendleton.

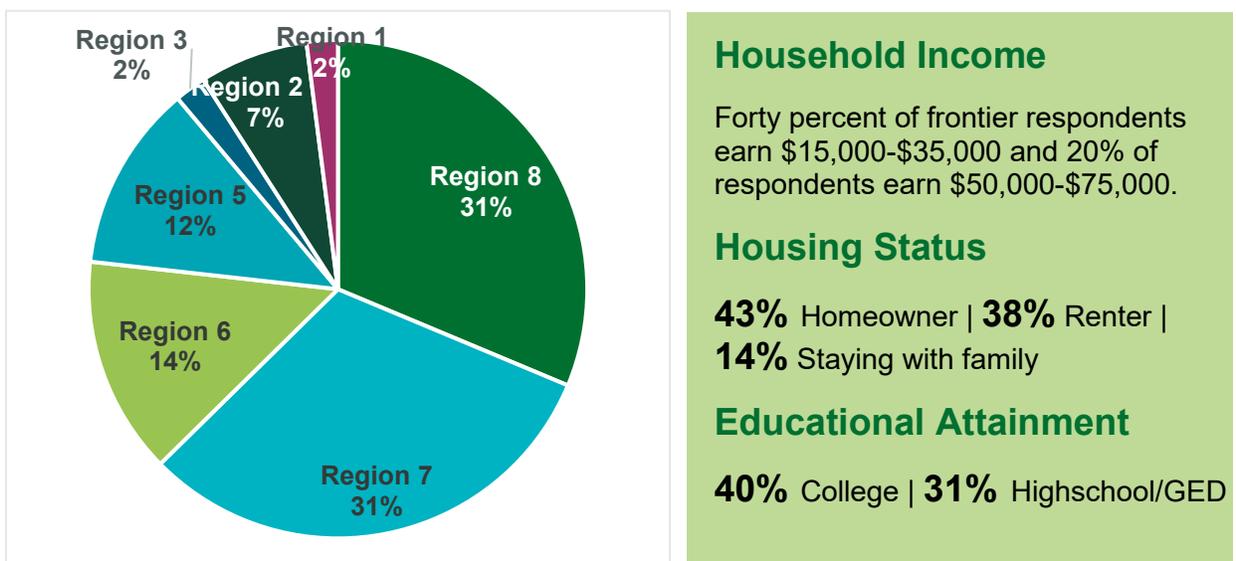
Figure 9.2 Regional Breakdown of Rural Respondents



Frontier

Frontier regions are defined as geographic areas with six or fewer people per square mile. Two percent of Oregon’s population lives in frontier areas.¹⁹¹ Figure 9.3 provides a snapshot of demographics from frontier participants. This figure represents a total of 42 survey respondents and frontier workshop participants from in-person workshops held in Baker City, John Day, and Burns, Oregon.

Figure 9.3 Regional Breakdown of Frontier Respondents



¹⁹¹ Ibid.

Community Values

Residents living in different development densities around Oregon reported both similar and different community values. Figure 9.4, Figure 9.5, and Figure 9.6 show the top values for urban, rural, and frontier areas, based on survey data.

Overall, **respondents from across urban, rural, and frontier communities value things related to the natural environment or outdoor activities.** Interestingly, urban respondents had higher agreement with their values. All of their top values had a higher percentage of agreement than any of the values for frontier and rural. This could infer that rural and frontier respondents have more dispersed values than urban respondents.

Figure 9.4 Top Community Values of Urban Survey Respondents

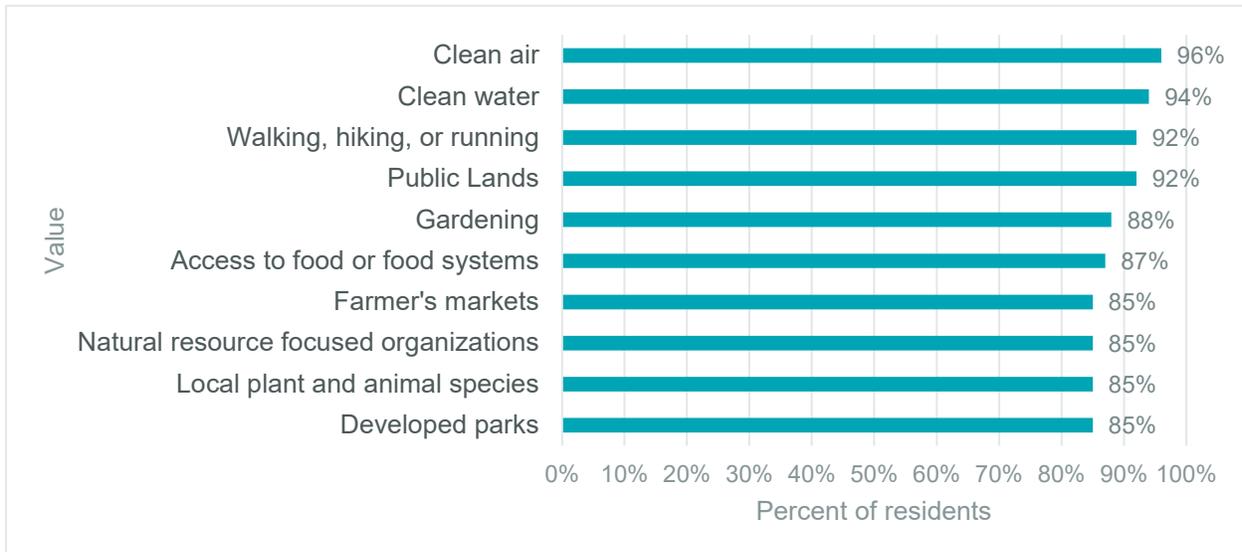


Figure 9.5 Top Community Values of Rural Survey Respondents

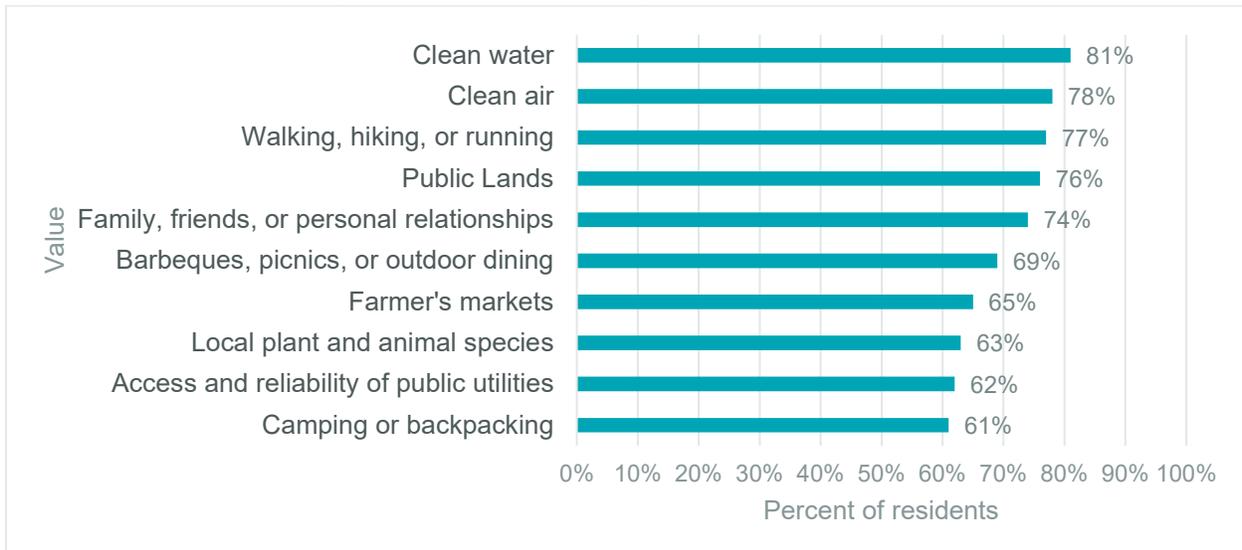
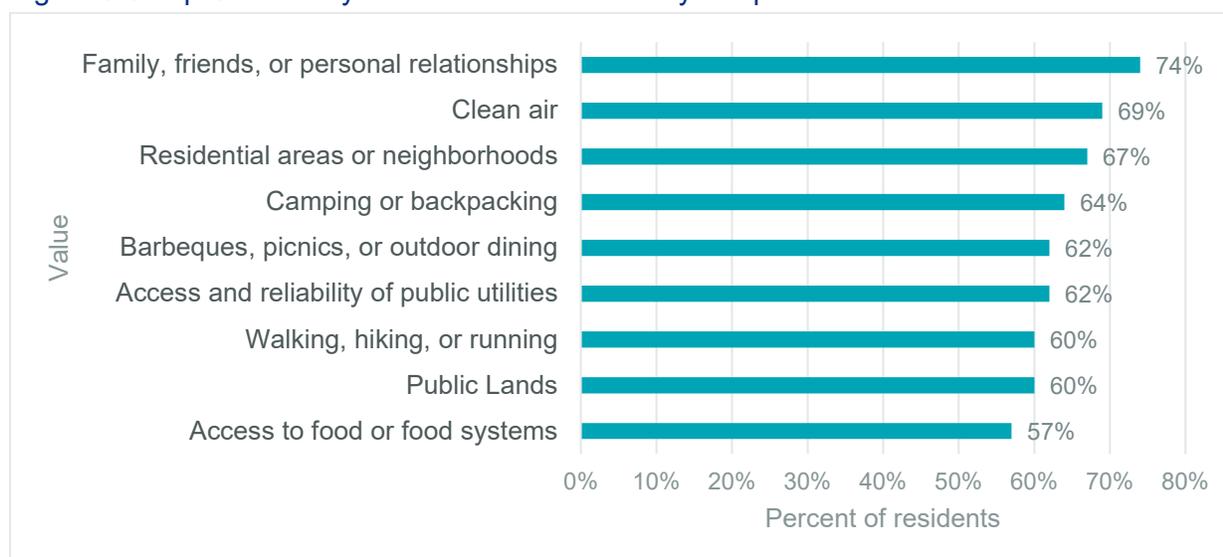


Figure 9.6 Top Community Values of Frontier Survey Respondents



Social Capital

Regardless of the development densities people live in, people **valued the social capital in their community**. Around 75% of urban, rural, and frontier respondents reported value for “Family, friends, or personal relationships” (Figure 9.4, Figure 9.5, and Figure 9.6). Workshop participants from each development density discussed the importance of their relationships within the community and how they valued the different aspects of what social capital brings, like community **trust and dependability, like-minded people, connection, and collaboration**. Rural and frontier participants explained further how they valued their small towns and how they perceived smaller population sizes as what enhanced the social capital of the community. They spoke about values for recognizing people in their community, feeling able to talk with anyone, sharing similar life experiences, and a sense of being able to count on community members looking out for each other. For both rural and frontier densities, the identity of the community as small and independent is very closely linked with the identity of individuals.

Residents of each density discussed their value of **community events and cultural activities**, which some workshop participants believe is important for strengthening social capital. The type of events and activities vary by population density. Urban workshop participants brought up summer festivals, potlucks, music, and theater while rural participants discussed local festivals, local art, cultural celebrations, and volunteer opportunities. A shared value among urban and rural survey respondents is “Farmer’s markets” (85% and 65%, respectively). Rural and frontier respondents value “Barbeques, picnics, or outdoor dining” (69% and 62%, respectively). Frontier participants value art and entertainment, “local events that showcase community identity”, downtown gatherings, and outdoor events.

Natural Environment and Access to Nature

All development densities valued **the natural environment and the ecosystem services it provides**. Some common values among workshop participants include healthy ecosystems, clean water, rain, breathable air, natural beauty, forests, wildlife, biodiversity, dark skies, and unspoiled coastlines. “Clean air” was the top or second top value for survey respondents across all densities (Figure 9.4, Figure 9.5, and Figure 9.6) For urban and rural respondents, “Clean water” (94% and 81%, respectively) and “Local plant and animal species” (85% and 63%, respectively) were top values related to the natural environment.

Workshop participants, regardless of their urban-rural designation, discussed **accessing the outdoors** either for **recreation, community events, or cultural activities**. This connects to their appreciation for public lands where many of these activities occur. Survey respondents from all development densities valued “Walking, hiking, or running” (Figure 9.4, Figure 9.5, and Figure 9.6). Some recreational activities urban workshop participants enjoy include boating, skiing, camping, dancing, and biking. Rural participants value fishing, hunting, bird watching, and beach activities. Fishing, hunting, youth and adult sports, and biking were frequent responses with frontier participants.

Economy and Livelihood

Workshop participants and survey respondents across all development densities expressed their **appreciation for important livelihood factors, like food security, the economy, and healthcare**. Respondents from urban and frontier densities share the top values of “Gardening” and “Access to food and food systems” (Figure 9.4 and Figure 9.6) yet provided different explanations for those shared values. Urban workshop participants discussed the importance of locally grown food and how they valued a diversity of food options. For frontier participants, as well as rural participants, **farming and ranching were important aspects of the food system**. Rural and frontier participants mentioned how local agricultural products, agritourism, and small farms were important for their and their community’s livelihood. A few rural participants that identified as part of local tribes discussed that growing, hunting, and foraging for food was an important cultural aspect of their tribe.

Rural and frontier participants value **natural-based industries**, like agriculture, farming, and ranching, which are important to their economy. Urban and rural participants value the tourism economy, mainly as it related to recreational activities and agritourism. Both urban and rural participants expanded further when discussing their values of living wages, financial security, and affordable housing. Respondents from all development densities discuss the **importance of supporting local or small businesses and access to good healthcare**.

Infrastructure, Access to Services, & Amenities

While all development densities **value infrastructure, access to services, and amenities**, they reported values for different things in those categories. Eighty-five and eighty-three percent of urban respondents valued “Developed parks” and “Transportation infrastructure”, respectively. One rural respondent said they value infrastructure that supports ranchers and farmers and another reported value for roads without potholes. Workshop participants from all densities said they value infrastructure and hope to see more walkability or bikeability.

Survey respondents valued “Access and reliability of public utilities” (Figure 9.4, Figure 9.5, and Figure 9.6). Urban respondents valued amenities and utility access such as non-automotive transportation options, dense development, libraries, and other municipal governmental buildings. Frontier respondents reported value for “Residential areas or neighborhoods” (67%). Overall, **infrastructure and the built environment were important** for all respondents and participants from all densities.

Perspective on Government

One of the biggest differences between development densities was their perspective on the role of the government in implementing climate adaptation strategies. Rural and frontier workshop participants and survey respondents clearly emphasized a value and need for more locally based and locally informed policy decisions. Some rural respondents discussed their concern about increases in taxes from statewide programs and policies, particularly when programs are designed for urban populations or environments. They also noted concern about what they perceived to be impacts to the rural character of their communities, noting examples like liberal

policies, large populations, and light pollution. Urban respondents reported specific values for political organizations, unions, grassroots organizations, good representation, progressive policies and values, and local governments including their employees and elected officials. Overall, our data suggests that urban residents expect their governments to be leaders in providing services and identifying and implementing climate change solutions than rural and frontier residents.

Climate Change Impacts

We provided survey respondents and workshop participants with six different climate impacts relevant to the region they reside in. As a result, residents of the same development density but from different OEM regions responded to different sets of climate impacts. Table 9.1 summarizes the climate projections that most residents perceived as negatively impacting urban, rural, and frontier densities. Table 9.1 excludes climate projections that received five responses or lower, which included:

- Frontier: Ocean Acidification, 100% (1 respondent)
- Frontier: Population Growth, 100% (4 respondents)
- Urban: Drought, 100%, (5 respondents)

Table 9.57 Percent of Survey Respondents Who Perceive Negative Impacts on Their Lives From Climate Projections

Urban		Rural		Frontier	
Air Quality (n= 50) and Heat Waves (n=53)	94%	Wildfires (n=512)	85%	Wildfires (n=42)	84%
Wildfires (n=53) and Drought (n=53)	92%	Drought (n=408)	83%	Drought (n=41)	73%
Mean Temperature (n=33)	91%	Air Quality (n=311)	78%	Heat Waves (n=41)	66%

Table 9.1 shows that high percentages of respondents, regardless of population density, are concerned about the negative impacts of climate change, especially wildfires, drought, air quality, and heat. More urban respondents expressed concerns over negative climate impacts than rural or frontier respondents. National research has found that political party affiliation, more than living in urban or rural areas, is the strongest predictor of attitudes towards climate change. These attitudes affect how intensely someone perceives weather impacts from climate change, with Republican-identified respondents in the national study reporting less severe impacts than their Democratic-identified counterparts.¹⁹² In Oregon today, political party affiliation overlaps significantly with residential density.

Community Context:

In 1966, only six percent more voters in Multnomah County were registered as democrats than in Eastern Oregon compared to the 70% more today. A team of three Oregon university professors cites globalization, demographic changes, urbanization, gerrymandering, and differing views on the environment as causing the growing political wedge between rural and urban Oregon. For example, Oregon democrats became increasingly associated with

¹⁹² Emily Pechar Diamond, Robert Bonnie, and Elizabeth Rowe, "Rural Attitudes on Climate Change" (n.d.).

conservation efforts, like spotted owl conservation, that rural Oregon perceived as being in tension with natural resource economies like the timber industry. 193

Wildfires

All survey respondents were concerned about wildfires. Workshop participants from all development densities expressed concerns about **secondary impacts from wildfires**, like bad air quality. Both rural and urban participants were worried about smoke and its effect on vulnerable populations, such as outdoor workers, children, and the elderly. They worried about how wildfire smoke will limit outdoor recreation and opportunities to socialize, leading to social isolation and poor mental health. Frontier respondents focused more on the economic consequences of smoke, with several mentioning that smoke can result in smaller crop yields.

However, since rural and frontier communities live in close proximity to public lands, they are also more likely to experience the **primary impacts from wildfires**, like property damage or destruction. Rural workshop participants in Cottage Grove, Medford, and Brookings talked about how the unpredictability of wildfires meant they felt increasingly anxious about having to be ready to evacuate at any time.

Drought

At least 70% of survey respondents from all development densities expressed concern about the impacts of drought. Workshop participants across all development densities shared concerns about the **impact of drought on the state's agriculture**. They specifically discussed food systems, including personal gardens. Urban participants recognized their reliance on regional and state agriculture. Frontier participants emphasized drought's effects on the economic viability of farming. In addition to talking about drought's impacts on agriculture, rural workshop participants, in Cottage Grove especially, discussed how drought would **impact infrastructure like building foundations and roads**.

Impacts on Livelihoods and Resource Allocation

Despite rural and frontier participants' concerns for natural-based resource economies, **urban survey respondents were more likely than rural or frontier respondents to say climate adaptation resources should go towards jobs and access to services** (Table 9.2). A study from Duke University based on national polling and focus group data found that rural voters are more receptive to climate change messaging that ties climate policies to job creation.¹⁹⁴ However, **frontier survey respondents prioritized the natural environment and outdoor or recreation opportunities over jobs**. This deviation could point to an Oregon-specific difference from national data, a difference between frontier and rural populations (which were not distinguished in the Duke University study), or a framing error/anomaly in the CCVA survey. Additionally, **rural and frontier participants may not have seen a strong distinction between expressing concern for the natural environment and concern for jobs**, since many depend on the natural environment to support work such as farming, ranching, and self-employment and these values are closely intertwined. Additional engagement with frontier communities will better explain this trend.

¹⁹³ Associated Press, "Oregon's urban-rural divide has deepened" *oregonlive*. , 5 Jan. 2019, online, Internet, 27 May 2023. , Available: <https://www.oregonlive.com/pacific-northwest-news/2019/01/oregons-urban-rural-divide-has-deepened.html>.

¹⁹⁴ Diamond, Bonnie, and Rowe, "Rural Attitudes on Climate Change."

Table 9.58 Survey Respondent Choices for Climate Adaptation Resources Allocation

	Urban	Rural	Frontier
Natural Environment	81%	72%	60%
Built Environment	58%	33%	21%
Outdoor or recreational opportunities	15%	36%	52%
Community groups, activities, or events	15%	14%	29%
Jobs, sources of income, and access to services	58%	43%	21%

Vulnerable Populations

Rural participants emphasized that **rural communities are on the frontlines of climate change impacts**. They reported facing **disproportionate financial costs**, especially significant for low-income households, due to the costs of property adaptation, repair, loss, and potential relocation from hazards such as wildfires and sea level rise. Additionally, many rural and frontier participants expressed concerns about natural hazards like shutting down the limited transportation routes that communities might depend upon for evacuation or emergency services. They worried that local emergency response systems might be too strained to adequately cover needs. In the long term, these participants also identified that closed roads could mean a disruption of essential goods and services for more remote residents.

Finally, a shared concern between urban and rural workshop participants was that **low-income households may struggle with rising energy costs** from increased heating and cooling needs.

Community Solutions

The following section provides an overview of community solutions on climate change by development densities. In all density designated regions, the community members expressed a **need for urgency in addressing climate change**.

Urban

“I want my elected officials and policy makers (including state agencies) to stop looking at short-term financial gain instead of long-term sustainability. And accounting for cumulative impacts” –Marion County Respondent

The health of the natural environment and the long-term effects of climate change are a concern for urban area respondents, which they expressed more directly than their counterparts in rural or frontier areas. Urban respondents proposed solutions that could be implemented through the built environment that would mitigate changing climate conditions, such as changes to building codes, permeable pavements, and street trees.

Urban respondents also noted solutions that were oriented to the reduction of carbon emissions such as strategies related to renewable and clean energy, the reduction of fossil fuel use, resilient transportation infrastructure, and multi-modal transportation options. They called for accountability of the fossil fuel industry and the increased protection of workers broadly. Additionally, urban respondents identified mitigation strategies that would lessen the impact of wildfires and drought such as innovation in forest land management and habitat restoration.

Mental health was a frequent concern for respondents. One survey respondent said, “I have been keeping track of weather and climate conditions but get overwhelmed with so much change happening so quickly now (Benton County).” There was a call for attention on climate-related anxiety and isolation, “Without effective institutionally driven remediation, individuals and families cope with the consequences of climate disruption in isolation and fear. (Multnomah County).”

Lastly, urban respondents discussed their concern about the disproportionate impact of climate change to vulnerable populations. They identified increased social and health services, access to transit, and housing as essential needs to address current inequities and lessen the disproportionate impacts that vulnerable groups will face from climate change.

Rural

“I want elected officials to recognize and consider the differences between urban and rural areas. The needs and reality in one are totally different from the other, there is no one size fits all solution.” –Wasco County Respondent

Rural respondents reported the desire for more education and access to information on climate change. Specifically, respondents wanted people to be able to access information that would help them more clearly connect how climate change was affecting their lives and the things that are important to them. Others identified a need for information on how climate change would impact key industries and the natural environment. Rural respondents frequently identified the need to include local communities in decision-making and including local input when shaping policy or climate adaptation solutions. One survey respondent said, “Give us the tools, the education, for doing what we can do to adapt to a changing climate. (Jackson County).”

Rural residents suggested that adaptation measures should focus on addressing wildfires – the biggest concern for rural areas. One survey respondent wrote, “I guess wildfire prevention would be the top priority for me as I live on the edge of a forested area and we did have quite a bit of smoke from fires this past year (Josephine County).” Rural respondents also proposed solutions such as increased resources for home hardening, evacuation routes, burying utility lines, and access to clean air spaces.

Additional solutions discussed by rural respondents included

- Resources that would support agriculture and ranching
- Environmental protection such as habitat conservation, stream restoration, water protection, and changes to forest management practices

Frontier

“Learn that Eastern Oregon is a lot different than the west side, and that one size does not fit all.” –Harney County Respondent

Frontier residents need unique support and attention from the State. A workshop participant said, “small farmers don't have the capital to make efficiency changes, [they are] reliant on markets outside the region. Transition to other agricultural products, [like] cattle to grapes, need[s] time and capital (Baker County).” Workshop respondents expressed the need for more local support, “Let our county have its control and take care of our cities (Grant County).” Frontier respondents agreed with rural respondents on the need for information access, resources for agriculture, and local input.

Drought and wildfires are a concern for frontier residents, one survey respondent wrote, “the drought is concerning to me. because it makes me worry if there will be enough water for

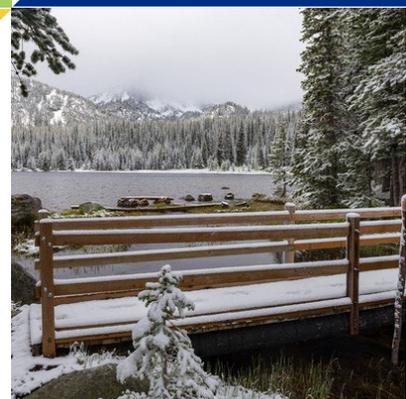
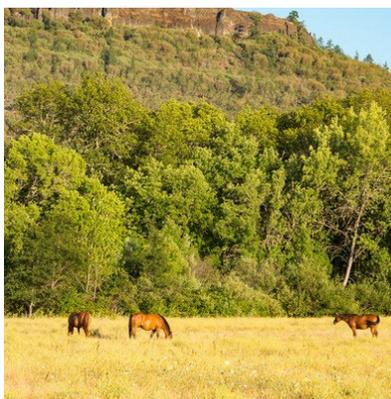
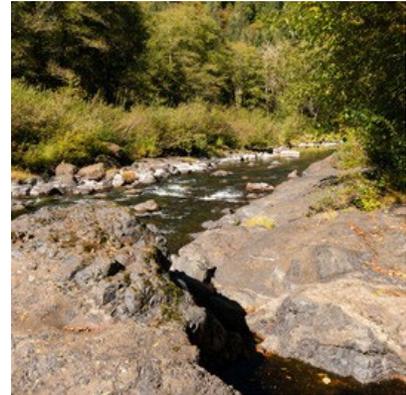
everyone.” Another survey respondent said, “Wildfires are becoming more and more of a threat. Transportation of goods and services are impacted yearly because of adverse weather conditions. (Baker County).”

Oregon Climate Change Social Vulnerability Assessment Appendices



DLCD

Department of
Land Conservation
& Development



Appendix A: Vulnerability Indices

DLCD staff examined several indices that are commonly used by federal agencies, philanthropic organizations, and others to distribute resources toward reducing vulnerability or increasing resilience in underrepresented or underserved communities.

Federal agencies, universities, and community-based organizations have developed screening tools, usable in GIS environments, to help identify places that exhibit characteristics of vulnerability. Examples of such tools include Council on Environmental Quality (CEQ) Climate and Economic Justice Screening Tool, CDC/ATSDR Social Vulnerability Index, Distressed Communities Index, Baseline Resilience Indicators for Communities, Social Capital Index, and the Climate Change Vulnerability Index. These indices rely on publicly available data, most often from the US Census. Index developers created each tool for their specific purpose, and as a result, the areas identified as vulnerable differ.¹⁹⁵

These national-scale tools share other limitations. First, they aggregate information over large areas such as by county or census tract¹⁹⁶. This scale of analysis does not reflect characteristics at the neighborhood scale. Second, many national-scale indices report relative ranking over a nationwide dataset, which can hide differences within states or regions. Using these indices at a local level requires post processing to extract and rank state- or local-only information. Even with such post processing indices are no substitute for engaging communities to identify their own vulnerabilities, many of which are not captured in statistics collected over wide areas or can't be described quantitatively, or numerated per se. Nonetheless, indices are widely used.

DLCD staff found that existing indices tend to describe vulnerability in terms of population or asset characteristics without examining the systems that cause vulnerability. Finally, relying on indices to identify vulnerabilities does not illuminate what people and communities aspire to do and be. For these reasons, the DLCD project team conducted interviews, workshops, and a survey to better understand how people are experiencing vulnerability in the face of climate change.

¹⁹⁵ <https://experience.arcgis.com/experience/376770c1113943b6b5f6b58ff1c2fb5c>

¹⁹⁶ Derakhshan S, Blackwood L, Habets M, Effgen JF, Cutter SL. (2022) Prisoners of Scale: Downscaling Community Resilience Measurements for Enhanced Use. *Sustainability*.14(11):6927. <https://doi.org/10.3390/su14116927>

Appendix B: Inventory of Oregon State Agency Vulnerability Assessments

List compiled by the Department of Energy: [State of Oregon Climate Programs and Actions Energy 101](#)

Oregon Department of Energy

[State of Oregon: Energy in Oregon - Climate Vulnerability Assessment](#)

Oregon Department of Transportation

[Oregon Department of Transportation: Climate Action Plan : Programs : State of Oregon](#)

Oregon Department of Forestry

[Climate Change and Carbon Plan](#)

Oregon Department of Fish and Wildlife

[OSU Climate Vulnerability Assessment of Oregon Hatchery Programs.pdf](#)

Oregon Health Authority

Oregon Climate and Health Resilience Plan

<https://www.oregon.gov/oha/ph/healthyenvironments/climatechange/pages/resilience-plan.aspx>

Appendix C: Interview Protocol and Summary

DLCD engaged the Institute for Policy Research and engagement to interview advisory group members and stakeholders in the summer of 2022 to understand local dynamics and community needs, including local impacts or events, perceptions of climate change, existing efforts or climate change related programs, and support for community outreach. Additionally, the interviews informed public engagement efforts for the CCVA and grounded the concepts of wellbeing, livelihood, and community. This appendix provides IPRE's interview protocol and summarizes the main themes that emerged from these interviews.

Table C.1 provides the list of advisory group members and stakeholders we interviewed with.

[Table C.59 List of interviewees](#)

Interviewee	Organization	Advisory group/ Stakeholder
-------------	--------------	--------------------------------

Artemio Paz Jr.		Advisory group
Jairaj Singh	Unite Oregon	Advisory group
Jan Lee	Oregon Association of Conservation Districts	Advisory group
Meet Panchal	Beyond Toxics	Advisory group
Priscilla Calleros		Advisory group
Carly Werdel		Advisory group
Tonya Graham	Geos Institute	Advisory group
Ron Bunch		Advisory group
Susan Heath		Advisory group
Janet Lee Redmond	Farm Owner/ Retired Utility worker	Advisory group
Sharla Moffett	Oregon Business & Industry	Advisory group
Mark Healy	Coquille Tribe	Advisory group
Jennifer Eislie	CIAC	Advisory group
Kaety Jacobson	DLCD	Advisory group
Barbara Boyer	DLCD	Advisory Group
Briana Spencer		Stakeholder
Colleen Sanders		Stakeholder
Jeff Blackwood		Stakeholder
Krizia Polanco		Stakeholder
Marshall McGrady		Stakeholder
Mary Lemm Davis		Stakeholder

Interview Protocol

IPRE conducted advisory group and stakeholder interviews using a semi-structure process. Each interview lasted 30-45 minutes, focusing on the following objectives:

- Grounding the concepts of wellbeing, livelihood, and community.
- Exploring the preliminary impacts of climate change.
- Identifying communities and organization to support survey distribution, workshop outreach, as well as further engagements.

We provide the list of interview questions below. Numbered questions indicate ones that we asked all interviewees, while bulleted questions indicate probing or clarifying questions we only used as needed.

Advisory group interview questions

1. What perspectives or experiences do you bring to your role in the advisory group?
 - Can you share about the work you do?
 - What is something unique, not many know about the line of work you do?
 - What groups are served by your organization?
2. Can you tell me about the community you live in?
 - What is something unique about your community? What is your community known for?
 - How might [thing community is known for] be affected by climate change?
3. How do you think climate change has impacted your community?
 - Do you feel that everyone within your community experience climate impacts in the same way?
 - What factors might change someone's experience of climate impacts? (notes to interviewer: what about historically marginalized, communities of color, low-income, rural communities?)
4. This climate change vulnerability assessment is specifically focused on understanding the impacts of climate change on livelihood, well-being, and community/cultural identities and we're hoping that you can help us to refine these terms.
 - What comes to mind when you think about the word community/cultural identity?
 - What comes to mind when you think of the word livelihood?
 - What comes to mind when you think about the word well-being?
5. What do you think climate change's biggest impacts to livelihood, well-being, community/cultural identities will be for the perspectives/experiences you represent/community you live in?
6. Is there anything else you'd like us to know about your perspective to inform our community interviews and workshop design?
7. What question(s) do you wish we had asked?
8. Do you have any suggestions of who we should reach out to for community interviews?

Stakeholder interview questions

1. First, can you tell me a little bit about your role at your organization and who you serve through your programs?
2. Can you tell me about the community you serve?
 - What is something unique about the community you serve? What is the community known for?
3. As I mentioned in the beginning, this project is specifically focused on understanding the impacts of climate change on people throughout the state of Oregon. How do you think climate change has impacted on the lives of the people your organization works closely with?
 - From your perspective, what factors might change someone's experience of climate impacts?
 - In what ways do you think people's well-being is impacted by climate change?
 - In what ways do you think climate change impacts the sense of community in your location?
 - In what ways do you think climate change impacts peoples' livelihood or ability to make a living?

- What do you think are the top 3 pressing issues for the people you serve related to climate change?
4. Are there existing efforts or groups working to support your community in dealing with climate change consequences?
 5. Our project team plans to gather community input from twelve public workshops in various locations across the state and one virtual workshop. We expect to hold the first round of these workshops in the early fall of this year, with the second round occurring in early 2023.
 - Would folks that you work with be willing to participate in a community workshop?
 - Would you be willing to share information on dates and locations with your community as we get closer?
 - Are there any local events or tabling opportunities you are aware of that we can do community outreach at?
 - Do you have a suggestion for a location where we can lead a workshop in your region?
 6. Is there anything else you'd like to share about how climate change impacts people in your community?

Interview Summary

Foundation of Concepts

IPRE used the advisory group interviews to ground the definitions of community, wellbeing and livelihood. The following subsections reveal the findings from the advisory group interviews.

Definitions of Community

When asked about what *community* meant to the interviewees, most responses mentioned culture, places, identity, and relationships. Below are some phrases the advisory group used to describe community:

- Able to share cultural experiences together
- Comfortability with representing culture
- Celebrating holidays with others of the same culture
- Bound by place
- Being able to relate with someone else who has a similar background to yourself
- The joy of being able to celebrate together brings people together

Based on these finding, IPRE used the following definition for public engagement: “Community: Your sense of belonging within a group of people and within a place.”

Definitions of Wellbeing

When asked about what *wellbeing* meant to the interviewees, most responses mentioned physical health, mental health, security, and quality of life. Below are some phrases the advisory group used to describe community:

- Physical health
- Mental health
- Clean environment
- Climate anxiety
- Sense of purpose
- Presence of love and compassion
- Positive and constructive relationships with friends/family

Based on these finding, IPRE used the following definition for public engagement: “Wellbeing: Your physical and mental health.”

Definitions of Livelihood

When asked about what *livelihood* meant to the interviewees, most responses mentioned ability to make money/provide, basic needs, and income. Below are some phrases the advisory group used to describe community:

- Having access to resources such as food and A/C to provide family and oneself
- Being paid a living fare wage
- Having good benefits, access to healthcare
- Need for services
- Basic necessities
- Financial resources
- Access to markets

Based on these finding, IPRE used the following definition for public engagement: “Livelihood: your ability to make a living to provide basic needs for yourself and your household.”

Impacts of Climate Change

We asked the advisory group and stakeholders about the impacts of climate change. Interviewees collectively are concerned with changes in environmental conditions that will impact outdoor activities, including work and recreation.

When identifying the impacts of climate change on livelihood, wellbeing, and community, interviewees are most likely to mention effects on basic needs (a livelihood impact), such as agricultural work. Other concerns interviewees frequently brought up were around impacts on lifestyle (wellbeing) and its effect on people’s relationship (community).

Interviewees are concerned about climate change’s disproportionate impact on outdoor workers, especially agricultural workers, while identifying agricultural workers as being underrepresented in climate change discussions.

Interviewees were most likely to mention wildfires as a key type of climate change impact. This frequency could correspond to concerns over air quality for outdoor workers and recreators. The second most concern was around water security. This connects to their concern of disproportionate impacts on agricultural workers through changes to their livelihood. Additionally, several interviewees specified water security as a concern for tribal populations.

Appendix D: Workshop Design

From October 2022 to March 2023, the Institute for Policy Research and Engagement (IPRE) conducted twelve in-person workshops across Oregon:

1. Baker City
2. Brookings
3. Burns
4. Cottage Grove

5. Hood River
6. John Day
7. Klamath Falls
8. Madras
9. Medford
10. Ontario
11. Pendleton
12. Woodburn

IPRE also conducted a virtual workshop targeted at youth statewide.

The workshops had four main goals:

1. To build awareness of regional climate impacts throughout Oregon,
2. To gather feedback from community members on how climate change impacts their lives,
3. To collect written feedback through worksheets and questionnaires,
4. To convene a space that is interactive and inclusive for all community members.

This appendix provides the series of activities IPRE led workshop participants through to accomplish these goals in in-person workshops. The activities remain the same for the virtual workshop, except that participants capture their ideas on Google Jamboard instead of sticky notes and posters. Each workshop lasted approximately 2.5 hours.

Welcome and Introduction

IPRE facilitators welcome participants in the room. Each participant makes a name tag and marks where they live on the Oregon map.

Christine Shirley – DLCD’s Climate Change Resilience Coordinator introduces the project background, scope, main deliverables, timeframe, and desired outcomes.

Facilitators and participants take turns introducing themselves, either in small groups or to all audience. IPRE facilitators then review the workshop’s objectives and agenda and provide the framing concepts of wellbeing, livelihood, and community.

Community Value

Picture D.1 Value activity
example poster

IPRE facilitators lead participants through a group activity to answer the following prompts:

- What do you and your community values?

- How will the changing climate affect you, your community, and your surrounding areas?
- How should allocate resources be allocated?

Participants spend time collecting their thoughts individually and some share their notes out loud.

Appendix E: English Language Survey

Project background and instructions



in response to climate change.

Changing climate and weather patterns are altering how people live, make a living, and maintain their sense of place throughout Oregon. In 2021, a work group consisting of 24 state agencies coordinated by the Department of Land Conservation and Development (DLCD), completed a [statewide framework](#) to guide state leadership and staff as they make decisions about where and how to invest resources

Although state agencies and policymakers have no shortage of ideas about how to adapt to a changing climate, they do not have a way to evaluate which adaptation measures best support the needs and values of communities across the state.

This survey is part of a larger effort to gather community input on how changing climate conditions and weather patterns will affect peoples' day to day lives in Oregon. This is an anonymous survey administered by a third-party consultant. Your name will never be connected with your responses.

For more information about this project, please visit our project website: <https://bit.ly/3RULmbp>

With further questions, please contact:

Christine Shirley
 Climate Change Resilience Coordinator
 Department of Land Conservation and Development
christine.shirley@dlcd.oregon.gov
 Phone: 971-239-9457

Melissa Graciosa
 Project Coordinator
 Institute for Policy Research and Engagement, University of Oregon
mgracios@uoregon.edu



Survey instructions:

This survey will take 5-10 minutes to complete.

Use the next and back buttons to navigate between questions. The progress bar at the top of the screen will show you where you are within the survey.

You may choose to complete this survey in more than one sitting. Once you start, you will have seven days to complete the survey. After seven days, the form will refresh and direct you to provide answers starting from the beginning of the survey.

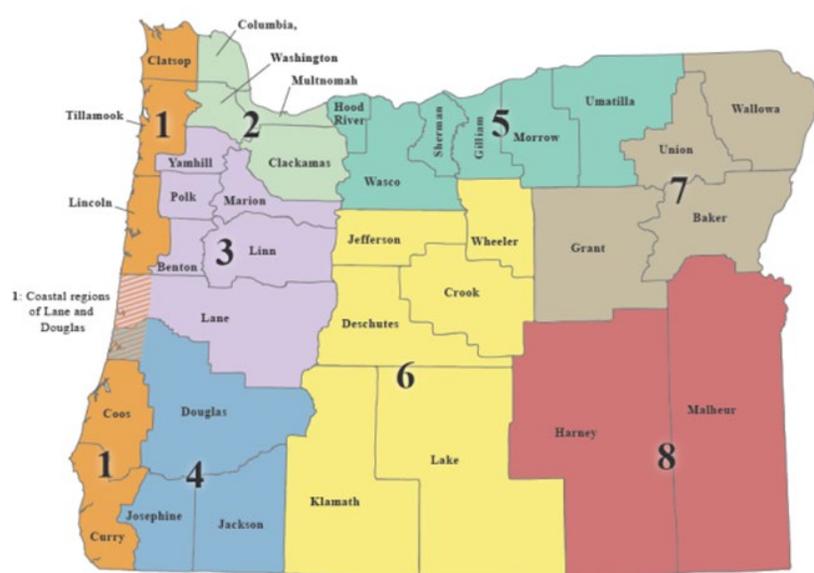
This survey will remain open until **April 30th, 2023.**

Please feel free to share this survey to anyone who might be interested in participating.

Thank you again for your participation!

1. I consent to taking this survey. y/n
2. I am 18 years of age or older. y/n
3. I would like to take this survey in Spanish. y/n

We will organize our assessment based on the eight emergency management regions of Oregon (see picture).



4. Please tell us the region where you live: _____ [dropdown menu – OEM Region 1 – 8]

Community Values

In the following section, we would like to know more about what you value about the place you live in and the communities that you are a part of. We will ask you what you value about the following categories:

- Natural environment
- Built environment
- Outdoor and recreational activities
- Community groups, activities, and events
- Jobs, sources of income, and access to services

Each question will provide a list of elements that you can choose from. Each question will also provide you options for adding elements that are not listed. At the end of this section, we will provide you an additional space to write-in any other things that you value about your community.

5. What, if any, of the following **natural environment** elements do you value about the place that you live in? Choose all that apply.

- a. Public lands (National forest, national parks, rangeland, wildlife refuges, beaches, etc.)
- b. Developed parks (City parks, public or private gardens, etc.)
- c. Unique geological formations/sites
- d. Local plant and animal species
- e. Natural resource-based industries (timber, mining, agriculture, ranching, etc.)
- f. Clean air
- g. Clean water
- h. Other, please specify: _____
- i. Prefer not to answer

6. What, if any, of the following **built environment** elements do you value about the place that you live in? Choose all that apply.

- a. Public or community gathering spaces (swimming pool, tennis courts, or community centers)
- b. Transportation infrastructure (roads, bridges, walkways, bike paths, etc.)
- c. Downtown or Main Street
- d. Residential areas or neighborhoods
- e. Commercial areas for goods or services
- f. Boat launches or public marinas
- g. Industrial lands
- h. Access and reliability of public utilities (power, water, sewer, trash, recycling, etc.)
- i. Access and reliability of broadband

7. What, if any, **outdoor or recreational opportunities** do you value about the place that you live in? Choose all that apply.

- a. Water sports and recreation (Boating, sailing, canoeing, kayaking, etc.)
- b. Winter sports and recreation (Skiing, snowboarding, snowshoeing, ice climbing, sledding, etc.)
- c. Walking, hiking, or running
- d. Skateboarding, roller skating, or biking
- e. Outdoor rock climbing
- f. Outdoor fitness classes
- g. Golfing
- h. Team sports activities (Football, soccer, softball, tennis, pickleball, etc.)
- i. Hunting, fishing, or foraging
- j. Gardening
- k. Outdoor playgrounds
- l. Camping or backpacking
- m. Barbeques, picnics, or outdoor dining

8. What, if any, **community groups, activities, and/or events** do you value about the place you live in? Choose all that applies.

- a. Family, friends, or personal relationships
- b. Arts organizations, groups, or events
- c. Cultural organizations, groups, or events
- d. Religious and spiritual groups or places of worship
- e. Youth-focused organizations
- f. Watershed or natural resource focused organizations

- g. Farmer's markets
 - h. County or local fairs
 - i. Shared values and beliefs
 - j. Local history and heritage
9. What, if any, **jobs, sources of income, or access to services** elements do you value about the place that you live in? Choose all that applies.
- a. Living wage jobs or job opportunities
 - b. Local industries or markets
 - c. National or global industries or markets
 - d. Small business support
 - e. Educational opportunities or professional training
 - f. Professional opportunities (networking, promotion, etc.)
 - g. Access to housing
 - h. Access to transportation
 - i. Access to care (childcare, healthcare, eldercare, mental health services)
 - j. Access to food or food systems
 - k. Engagement with local government representatives, agencies, or processes
 - l. Language translation and interpretation
 - m. Private or nonprofit community-based organizations
10. Is there anything else you would like us to know about what you value about the place you live in or the communities that you are a part of?

Regional Climate Projections

Next, we'd like to ask you a series of questions about how climate impacts and changing weather patterns in your region and how these climate impacts would impact what you value.

The poster below summarizes projected climate conditions for your region. The data presented on these posters was compiled by the Oregon Climate Change Research Institute (OCCRI) and based on best available data including current and historic measurements of temperature, precipitation, and snowpack, amongst other indicators. This data represented in the graphic below is a scenario in which greenhouse gas emissions remain at current rates. For more information on how these impacts were compiled, please visit OCCRI's website and see background research compiled and reported in the Fifth Oregon Climate Assessment:

<https://blogs.oregonstate.edu/occri/>

11. Of the following climate impacts, which do you feel have, or would have, an impact on your life and what you value?

	Strong negative impact	Somewhat negative impact	Neither positive or negative	Somewhat positive impact	Strong positive impact
Sea level rise					
Warming ocean water					
Ocean acidification					
Wildfires					
Water security					
Population growth					
Drought					
Heat waves					
Extreme precipitation					

Air quality					
Average (mean) temperature					
Warmer winters					

12. Are there other climate conditions or weather patterns not listed in previous questions that would impact your life and what you value? Choose any that apply.

- a. None
- b. Yes, please describe: _____
- c. Prefer not to answer

13. Of the follow choices, which category, if any, concerns you the most? Choose up to three.

- a. Natural environment
- b. Built environment
- c. Outdoor or recreational opportunities
- d. Community groups, activities, or events
- e. Jobs, sources of income, or access to services
- f. Other, please describe: _____
- g. None
- h. Prefer not to answer

14. Of the following choices, which category do you think should have resources for climate adaptation allocated to it?

15. What do you want elected officials and policy makers to know about how changing climate conditions and weather patterns will impact your life and what you value? [

Demographics

In this last section, we want to ask you some questions to better understand how representative our survey responses are of Oregon. Your information will be compared to data available from the US Census and American Community Survey.

16. What is your zip code?

17. What is your age?

- a. under 18
- b. 18-24
- c. 25-34
- d. 35-44
- e. 45-54
- f. 55-64
- g. 65+

18. What is your gender identity?

- a. male
- b. female
- c. non-binary
- d. I identify as: _____
- e. Prefer not to say

19. What is your highest level of educational attainment?
- a. Less than high school graduate
 - b. High school graduate, GED, or equivalent
 - c. Some college or an associate's degree
 - d. Bachelor's degree
 - e. Graduate, post-graduate, or professional degree
 - f. Apprenticeship or trade school
 - g. Other, please specify: _____

20. What is your household income?

- a. less than \$15,000
- b. \$15,000- \$24,999
- c. \$25,000-\$34,999
- d. \$35,000-\$49,999
- e. \$50,000-\$74,999
- f. \$75,000-\$124,999
- g. \$125,000-\$149,999
- h. \$150,000 or more
- i. Prefer not to say

21. What is your race/ethnicity?

- a. White or Caucasian
- b. Black or African American
- c. Native Hawaiian or other Pacific Islander
- d. Latino/a/x or Hispanic
- e. American Indian or Alaska Native
- f. Asian or Asian American
- g. Multi-racial/Mixed race
- h. Other: _____
- i. Prefer not to say

22. What is your current housing status?

- a. Homeowner
- b. Renter
- c. Currently staying with friends or family
- d. Not currently housed
- e. Other, please describe: _____
- f. Prefer not to say

23. Use the space below to share anything else you would like us to know about your identify: _____

Would you like to stay connected? Please visit our project website: <https://bit.ly/3RULmbp>

With questions, please contact:

Christine Shirley
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Department of Land Conservation and Development
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Phone: 971-239-9457

Melissa Graciosa
Project Coordinator
Institute for Policy Research and Engagement, University of Oregon
mgracios@uoregon.edu



Appendix F: Spanish Language Survey

The statewide survey was available in Spanish. The following appendix provides the translated version. Please note that some phrases and options were omitted in the text that was translated, but included within the survey instrument to mirror the English language version.

Sección 1: Información general sobre el proyecto e instrucciones

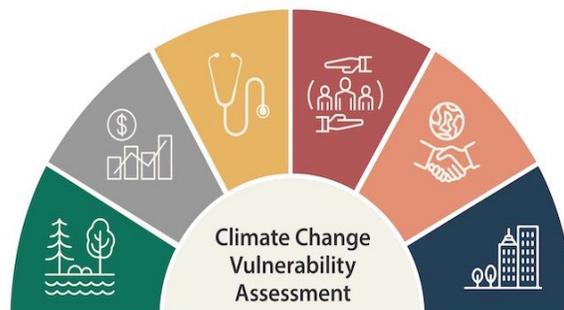
El cambio climático y los patrones meteorológicos están alterando la forma en que la gente vive, se gana la vida y mantiene la percepción de su entorno en Oregon. En 2021, un grupo de trabajo formado por 24 organismos estatales coordinados por el Departamento de Conservación y Desarrollo del Suelo (DLCD, por sus siglas en inglés), completó un [marco estatal](#) para orientar a los dirigentes y al personal del Estado a la hora de tomar decisiones sobre dónde y cómo invertir recursos en respuesta al cambio climático.

Si bien a las agencias estatales y a los responsables políticos no les faltan las ideas sobre cómo adaptarse a un clima cambiante, no disponen de una forma de evaluar cuáles son las mejores medidas de adaptación para apoyar las necesidades y los valores de las comunidades de Oregon.

Esta encuesta forma parte de un proyecto más amplio para recabar la opinión de la comunidad sobre cómo afectarán las condiciones climáticas y los patrones meteorológicos cambiantes a la vida cotidiana de las personas en Oregon. Se trata de una encuesta anónima administrada por un consultor externo. Su nombre nunca se relacionará con sus respuestas.

Los resultados de esta encuesta se agruparán por áreas geográficas y se resumirán en un reporte que se presentará a la Asamblea Legislativa de Oregon en junio de 2023 y que se compartirá a través del sitio web de nuestro proyecto.

Para más información sobre este proyecto, visite nuestra página web: <https://bit.ly/3RULmbp>
Si tiene más preguntas, póngase en contacto con:





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Instrucciones para la encuesta:

- Completar esta encuesta le tomará entre 5 y 10 minutos.
- Utilice los recuadros de siguiente y atrás para navegar entre las preguntas. La barra de progreso situada en la parte superior de la pantalla le mostrará en qué punto de la encuesta se encuentra.
- Puede completar esta encuesta en más de una sesión. Una vez que comience, dispondrá de siete días para completar la encuesta. Transcurridos los siete días, el formulario se actualizará y le pedirá que responda desde el principio de la encuesta.
- Esta encuesta estará disponible hasta el 30 de abril de 2023.
- Favor de compartir esta encuesta con cualquier persona que pueda estar interesada en participar.

¡Gracias de nuevo por su participación!

- Doy mi consentimiento para participar en esta encuesta. *sí/no*
- Tengo 18 años o más. *sí/no*
- Me gustaría hacer esta encuesta en español. *sí/no*

Organizaremos nuestra evaluación basándonos en las ocho regiones de gestión de emergencias de Oregon (veáse la imagen).



- Indique la región en la que vive: _____ [dropdown menu – OEM Region 1 – 8]

Valores comunitarios

En la siguiente sección nos gustaría saber más sobre lo que valora del lugar en el que vive y de las comunidades de las que forma parte. Le preguntaremos qué valora de las siguientes categorías:

- El entorno natural
- El entorno construido
- Actividades al aire libre y recreativas
- Grupos, actividades y eventos comunitarios
- Trabajos, fuentes de ingresos y acceso a los servicios

Cada pregunta le proporcionará una lista de elementos que puede elegir. Cada pregunta también le ofrecerá opciones para agregar elementos que no aparecen en la lista. Al final de esta sección, encontrará un espacio adicional para escribir otras cosas que valora de su comunidad.

5. ¿Cuáles de los siguientes elementos del **entorno natural** valora, si es que valora alguno, del lugar en el que vive? Elija todas las que procedan.
 - Terrenos públicos (bosques nacionales, parques nacionales, pastizales, refugios de vida salvaje, playas, etc.)
 - Parques urbanizados (parques municipales, jardines públicos o privados, etc.)
 - Formaciones/sitios geológicos únicos
 - Especies animales y vegetales locales
 - Industrias basadas en los recursos naturales (madera, minería, agricultura, ganadería, etc.)
 - Aire limpio
 - Agua limpia

- Otros, especifique: _____
 - Prefiero no contestar
6. ¿Cuáles de los siguientes elementos del **entorno construido** valora, si es que valora alguno, del lugar en el que vive? Elija todas las que procedan.
- a. Espacios de reunión públicos o comunitarios (piscina, pistas de tenis o centros comunitarios)
 - b. Infraestructuras de transporte (carreteras, puentes, pasarelas, carriles para bicicletas, etc.)
 - c. Centro de la ciudad o calle principal
 - d. Áreas residenciales o vecindarios
 - e. Áreas comerciales de bienes o servicios
 - f. Embarcaderos o puertos deportivos públicos
 - g. Terrenos industriales
 - h. Acceso y fiabilidad de los servicios públicos (electricidad, agua, alcantarillado, basura, reciclaje, etc.)
 - i. Acceso y fiabilidad de la banda ancha
7. ¿Qué **oportunidades recreativas o al aire libre** valora, si es que valora alguna, del lugar en el que vive? Elija todas las que procedan.
- a. Deportes acuáticos y recreativos (navegación, vela, piragüismo, kayak, etc.)
 - b. Deportes y actividades recreativas de invierno (esquí, snowboard, raquetas de nieve, escalada en hielo, trineos, etc.)
 - c. Caminar, hacer senderismo o correr
 - d. Montar en monopatín, patines o bicicleta
 - e. Escalada al aire libre
 - f. Clases de fitness al aire libre
 - g. Golf
 - h. Actividades deportivas en equipo (fútbol, fútbol americano, softball, tenis, pickleball, etc.)
 - i. Cazar, pescar o buscar comida en el entorno natural
 - j. Jardinería
 - k. Parques infantiles al aire libre
 - l. Acampar o ir de excursión
 - m. Barbacoas, picnics o cenas al aire libre
8. ¿Qué **grupos, actividades o eventos** comunitarios valora, si es que valora alguno, del lugar en el que vive? Elija todas las que procedan.
- a. Familia, amigos o relaciones personales
 - b. Organizaciones, grupos o eventos artísticos
 - c. Organizaciones, grupos o actos culturales
 - d. Grupos religiosos y espirituales o lugares de culto
 - e. Organizaciones juveniles
 - f. Organizaciones centradas en las cuencas hidrográficas o los recursos naturales
 - g. Mercados agrícolas
 - h. Ferias locales o del condado
 - i. Valores y creencias compartidos
 - j. Historia y patrimonio locales
9. ¿Qué **trabajos, fuentes de ingresos o elementos de acceso a servicios** valora, si es que valora alguno, del lugar en el que vive? Elija todas las que procedan.
- a. Trabajos con salarios dignos y oportunidades de trabajo
 - b. Industrias o mercados locales

- c. Industrias o mercados nacionales o mundiales
- d. Apoyo a los pequeños negocios
- e. Oportunidades educativas o formación profesional
- f. Oportunidades profesionales (creación de redes, promoción, etc.)
- g. Acceso a la vivienda
- h. Acceso al transporte
- i. Acceso a los cuidados (guarderías, atención médica, cuidado de ancianos, servicios de salud mental)
- j. Acceso a los alimentos o a los sistemas alimentarios
- k. Compromiso con los representantes, organismos o procesos del gobierno local
- l. Traducción e interpretación de idiomas
- m. Organizaciones comunitarias privadas o sin fines de lucro

10. ¿Hay algo más que le gustaría que supiéramos sobre lo que valora del lugar en el que vive o de las comunidades de las que forma parte?

Proyecciones climáticas regionales

A continuación, nos gustaría hacerle una serie de preguntas sobre el impacto del clima y el cambio de los patrones meteorológicos en su región, y cómo afectaría este impacto climático a lo que usted valora.

La siguiente lista resume las condiciones climáticas previstas para su región. Los datos presentados en esta lista han sido recopilados por el Instituto de Investigación sobre el Cambio Climático de Oregon (OCCRI, por sus siglas en inglés) y se basan en los mejores datos disponibles, incluidas las mediciones actuales e históricas de temperatura, precipitaciones y acumulación de nieve, entre otros indicadores. Los datos que aparecen en esta lista corresponden a un escenario en el que las emisiones de gases de efecto invernadero se mantienen al ritmo actual. Para obtener más información sobre cómo se recopilaron estos impactos, visite el sitio web de OCCRI y consulte la investigación de fondo recopilada y reportada en la Quinta Evaluación Climática de Oregon: <https://blogs.oregonstate.edu/occri/>

11. De los siguientes impactos climáticos, ¿cuáles cree que tienen o tendrían un impacto en su vida y en lo que usted valora? [Mostrar lógica de la P3: sólo se mostrarán las opciones regionales].

	Fuerte impacto negativo	Impacto algo negativo	Ni positivo ni negativo	Impacto algo positivo	Fuerte impacto positivo
Aumento del nivel del mar					
Calentamiento de las aguas oceánicas					
Acidificación de los océanos					
Incendios forestales					
Disponibilidad de agua					
Crecimiento de la población					
Sequías					

Olas de calor					
Lluvias intensas					
Calidad del aire					
Temperatura media (promedio)					
Inviernos más cálidos					

12. ¿Existen otras condiciones climáticas o patrones meteorológicos no enumerados en las preguntas anteriores que afecten a su vida y a lo que usted valora? Elija los que considere que se aplican en su caso.
- Ninguna
 - Sí, describa: _____
 - Prefiero no contestar
13. De las siguientes opciones, ¿qué categoría, si es que hay alguna, le preocupa más? Elija un máximo de tres.
- El entorno natural
 - El entorno construido
 - Oportunidades al aire libre o recreativas
 - Grupos, actividades o eventos comunitarios
 - Trabajos, fuentes de ingresos o acceso a servicios
 - Otras, describa: _____
 - Ninguna
 - Prefiero no contestar
14. De las siguientes opciones, ¿a qué categoría cree que deberían destinarse recursos para la adaptación al cambio climático?
15. ¿Qué quiere que sepan los cargos electos y los responsables políticos sobre cómo afectarán a su vida y a lo que usted valora los cambios en las condiciones climáticas y meteorológicas?

Información demográfica

En esta última sección, queremos hacerle algunas preguntas para determinar la representatividad de las respuestas de nuestra encuesta en Oregon. Su información se comparará con los datos disponibles del Censo de EE. UU. y la Encuesta sobre la Comunidad Estadounidense.

16. ¿Cuál es su código postal?
17. ¿Qué edad tiene?
- Menos de 18
 - 18-24
 - 25-34
 - 35-44
 - 45-54
 - 55-64
 - 65+
18. ¿Cuál es su identidad de género?
- Hombre
 - Mujer
 - No binario

- d. Me identifico como: _____
- e. Prefiero no decirlo
19. ¿Hasta qué grado fue usted a la escuela?
- Menos de la secundaria/preparatoria
 - Secundaria/preparatoria, GED o equivalente
 - Algunos estudios universitarios o un título de asociado
 - Licenciatura/diplomatura
 - Licenciatura/diplomatura, posgrado o título profesional
 - Formación profesional o escuela de oficios
 - Otro, especifique: _____
20. ¿Cuáles son los ingresos de su hogar?
- Menos de \$15,000
 - \$15,000- \$24,999
 - \$25,000-\$34,999
 - \$35,000-\$49,999
 - \$50,000-\$74,999
 - \$75,000-\$124,999
 - \$125,000-\$149,999
 - \$150,000 o más
 - Prefiero no decirlo
21. ¿Cuál es su raza/etnia?
- Blanco o caucásico
 - Negro o afroamericano
 - Nativo de Hawai u otras islas del Pacífico
 - Latino/a/x o hispano
 - Indio americano o nativo de Alaska
 - Asiático o asiático americano
 - Multirracial/Mexcla de razas
 - Otro: _____
 - Prefiero no decirlo
22. ¿Cuál es su situación actual en cuanto a vivienda?
- Propietario
 - Rento/alquilo
 - Actualmente en casa de amigos o familiares
 - No tengo vivienda
 - Otro, describa: _____
 - Prefiero no decirlo
23. Utilice el espacio a continuación para decirnos cualquier otra cosa que le gustaría que supiéramos sobre usted: _____

¿Le gustaría mantener el contacto? Visite el sitio web de nuestro proyecto:

<https://bit.ly/3RULmbp>

Si tiene preguntas, póngase en contacto con:

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Appendix G: Bibliography

- Alameldeen, A. (2021). What is a Resilient Community? *Academia Letters*.
<https://doi.org/10.20935/AL3615>
- Cutter, Susan L., Kevin D. Ash, Christopher T. Emrich (2014) The geographies of community disaster resilience, *Global Environmental Change*, Volume 29,
<https://www.sciencedirect.com/science/article/abs/pii/S0959378014001459>.
- Derakhshan S, Blackwood L, Habets M, Effgen JF, Cutter SL. (2022) Prisoners of Scale: Downscaling Community Resilience Measurements for Enhanced Use. *Sustainability*.14(11):6927. <https://doi.org/10.3390/su14116927>
<https://www.mdpi.com/2071-1050/14/11/6927>
- Diamond, Emily Pechar, Robert Bonnie, and Elizabeth Rowe. “Rural Attitudes on Climate Change” (n.d.).
- Fraser, T., Page-Tan, C. & Aldrich, D.P.(2022) Social capital's impact on COVID-19 outcomes at local levels. *Sci Rep* 12, 6566. <https://doi.org/10.1038/s41598-022-10275-z>
- Gupta, Sujata. “How extreme heat from climate change distorts human behavior.” *ScienceNews*, 18 Aug. 2021, sec. Science & Society. Available:
<https://www.sciencenews.org/article/extreme-heat-climate-change-human-behavior-aggression-equity>.
- 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
- Oregon Office of Rural Health. “ORH Urban Rural map | OHSU,” n.d. Online. Internet. 28 Jun. 2023. . Available: <https://www.ohsu.edu/media/881>.
- Oregon Tourism Commission. “Travel Guide to Oregon Indian Country.” *Travel Oregon*, 8 Aug. 2022. Available:
<https://issuu.com/traveloregon2019/docs/travelguidetooregonindiancountry>.
- Page, Emily & Kris Smith (2021) Improving benefit-cost analyses for rural areas <https://headwaterseconomics.org/equity/improving-benefit-cost-analyses/>), accessed 12/14/2022.
- 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>
- Press, Associated. “Oregon’s urban-rural divide has deepened.” *oregonlive*, 5 Jan. 2019. Online. Internet. 27 May 2023. . Available: <https://www.oregonlive.com/pacific-northwest-news/2019/01/oregons-urban-rural-divide-has-deepened.html>.
- 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
- Quah, Danny (2021) Building back better with trampolines (nus.edu.sg), accessed 12/14/2022).
- 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
- 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
- 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>
- White, S., & Abeyasekera, A. (Ed.) (2014). *Wellbeing and Quality of Life Assessment: A practical guide*. Practical Action Publishing.
- 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>
- “A Brief History of the Coos, Lower Umpqua & Siuslaw Indians.” *Confederated Tribes of Coos, Lower Umpqua & Siuslaw Indians*, n.d. Available: <https://ctclusi.org/history/>.

- “About Rural and Frontier Data.” Oregon Office of Rural Health, n.d. Online. Internet. 30 May 2023. . Available: <https://www.ohsu.edu/oregon-office-of-rural-health/about-rural-and-frontier-data>.
- “About The Tribe,” n.d. Available: <https://burnspaiute-nsn.gov/about-the-tribe/>.
- “About Us.” Confederated Tribes of the Warm Springs, n.d. Available: <https://hunting.warmsprings-nsn.gov/about/>.
- “Abundance: Confederated Tribes of Coos, Lower Umpqua, and Siuslaw Indians.” Abundance, n.d. Available: <https://clusi.maps.arcgis.com/apps/Cascade/index.html?appid=27e3174e06514e55b45d7a0cef5a59f9>.
- IPCC <https://www.ipcc.ch/report/sixth-assessment-report-working-group-ii/>
- “Our Connection to the Falls.” Confederated Tribes of Grand Ronde, n.d. Available: <https://www.grandronde.org/history-culture/history/our-connection-to-willamette-falls/>.
- “Our History.” The Klamath Tribes, n.d. Available: <https://klamathtribes.org/history/>.
- “Our Lands Today.” Coquille Indian Tribe, n.d. Available: <https://www.coquilletribe.org/our-lands/our-lands-today/>.
- “Our Story.” Confederated Tribes of Grand Ronde, n.d. Available: <https://www.grandronde.org/history-culture/history/our-story/>.
- “Tribal Story.” Cow Creek Band of Umpqua Tribe of Indians, n.d. Available: <https://www.cowcreek-nsn.gov/tribal-story/>.

Region 1

- Alam, Mayesha et al. Women and Climate Change. Impact and Agency in Human Rights, Security, and Economic Development. Georgetown Institute for Women, Peace and Security, 2015.
- Camhi, Tiffany. “How Oregonians came to own the state’s beaches.” OPB, 3 Jul. 2020. Available: <https://www.opb.org/news/article/history-oregon-tom-mccall-public-beaches/>.
- Caplan, Shannon, David Keyes, and Elissa Schloesser. Oregon by the Numbers. The Ford Family Foundation and Oregon State University Extension Service, August 2022. Available: https://www.tfff.org/wp-content/uploads/OBTN_2022_101022-Digital.pdf.
- Caplan, David Keyes, Rachel Porter, and Elissa Schloesser, Oregon by the Numbers, vols. (The Ford Family Foundation and Oregon State University Extension Service, August 2024, Available: https://www.tfff.org/wp-content/uploads/OBTN_2024-091724-1.pdf
- Census Bureau, and Social Explorer. “American Community Survey, 5-year (2017-2021).” Census, ACS 2021. Available: https://www.socialexplorer.com/tables/ACS2021_5yr.
- Cooke, Sandra L., and Sojung C. Kim. “Exploring the ‘Evil Twin of Global Warming’: Public Understanding of Ocean Acidification in the United States.” Science Communication 41.1 (2019): 66–89.
- Fleishman, Erica, and Oregon Climate Change Research Institute. Sixth Oregon Climate Assessment. Oregon State University, January 2023. Available: https://ir.library.oregonstate.edu/concern/technical_reports/gt54kw197.
- Oregonian/OregonLive, Kale Williams | The. “Ocean acidification is impacting Dungeness crabs, Oregon’s most-valuable fishery, study shows.” oregonlive, 24 Jan. 2020. Available: <https://www.oregonlive.com/environment/2020/01/ocean-acidification-is-impacting-dungeness-crabs-oregons-most-valuable-fishery-study-shows.html>.
- State Interagency Hazard Mitigation Team. Oregon’s Natural Hazards Mitigation Plan. State of Oregon, September 24, 2020. Available: https://www.oregon.gov/lcd/NH/Documents/Approved_2020ORNHMP_00_Complete.pdf
- . Oregon’s Natural Hazards Mitigation Plan. State of Oregon, September 24, 2020. Available: https://www.oregon.gov/lcd/NH/Documents/Approved_2020ORNHMP_00_Complete.pdf

U.S. Bureau of Labor Statistics. Quarterly Census of Employment and Wages, December 20, 2019. Available: <https://www.bls.gov/cew/classifications/industry/industry-supersectors.htm>.

“A Brief History of the Coos, Lower Umpqua & Siuslaw Indians.” Confederated Tribes of Coos, Lower Umpqua & Siuslaw Indians, n.d. Available: <https://ctclusi.org/history/>.

Region 2

Caplan, Shannon, David Keyes, and Elissa Schloesser. *Oregon by the Numbers*. The Ford Family Foundation and Oregon State University Extension Service, August 2022. Available: https://www.tfff.org/wp-content/uploads/OBTN_2022_101022-Digital.pdf.

Caplan, David Keyes, Rachel Porter, and Elissa Schloesser, *Oregon by the Numbers*, vols. (The Ford Family Foundation and Oregon State University Extension Service, August 2024, Available: https://www.tfff.org/wp-content/uploads/OBTN_2024-091724-1.pdf

Census Bureau, and Social Explorer. “American Community Survey, 5-year (2017-2021).” Census, ACS 2021. Available: https://www.socialexplorer.com/tables/ACS2021_5yr.

Fleishman, Erica, and Oregon Climate Change Research Institute. *Sixth Oregon Climate Assessment*. Oregon State University, January 2023. Available: https://ir.library.oregonstate.edu/concern/technical_reports/gt54kw197.

Oregon Climate Change Research Institute. *Oregon Climate Assessments*, n.d. Available: <https://blogs.oregonstate.edu/occri/oregon-climate-assessments/>.

State Interagency Hazard Mitigation Team. *Oregon’s Natural Hazards Mitigation Plan*. State of Oregon, September 24, 2020. Available: https://www.oregon.gov/lcd/NH/Documents/Approved_2020ORNHMP_00_Complete.pdf

U.S. Bureau of Labor Statistics. Quarterly Census of Employment and Wages, December 20, 2019. Available: <https://www.bls.gov/cew/classifications/industry/industry-supersectors.htm>.

“About.” Bonneville Power Administration, 18 May 2023. Available: <https://www.bpa.gov/about>.

Region 3

Ahima, Rexford S. “Global warming threatens human thermoregulation and survival.” *The Journal of Clinical Investigation* 130.2 (2020): 559–561.

Caplan, Shannon, David Keyes, and Elissa Schloesser. *Oregon by the Numbers*. The Ford Family Foundation and Oregon State University Extension Service, August 2022. Available: https://www.tfff.org/wp-content/uploads/OBTN_2022_101022-Digital.pdf.

Caplan, David Keyes, Rachel Porter, and Elissa Schloesser, *Oregon by the Numbers*, vols. (The Ford Family Foundation and Oregon State University Extension Service, August 2024, Available: https://www.tfff.org/wp-content/uploads/OBTN_2024-091724-1.pdf

Census Bureau, and Social Explorer. “American Community Survey, 5-year (2017-2021).” Census, ACS 2021. Available: https://www.socialexplorer.com/tables/ACS2021_5yr.

Dutchen, Stephanie. “The Effects of Heat on Older Adults.” *Harvard Medicine*, 14 Oct. 2022. Available: <https://hms.harvard.edu/magazine/aging/effects-heat-older-adults>.

Fleishman, Erica, and Oregon Climate Change Research Institute. *Sixth Oregon Climate Assessment*. Oregon State University, January 2023. Available: https://ir.library.oregonstate.edu/concern/technical_reports/gt54kw197.

Gupta, Sujata. “How extreme heat from climate change distorts human behavior.” *ScienceNews*, 18 Aug. 2021, sec. Science & Society. Available: <https://www.sciencenews.org/article/extreme-heat-climate-change-human-behavior-aggression-equity>.

State Interagency Hazard Mitigation Team. *Oregon’s Natural Hazards Mitigation Plan*. State of Oregon, September 24, 2020. Available:

https://www.oregon.gov/lcd/NH/Documents/Approved_2020ORNHMP_00_Complete.pdf

- U.S. Bureau of Labor Statistics. *Quarterly Census of Employment and Wages*, December 20, 2019. Available: <https://www.bls.gov/cew/classifications/industry/industry-supersectors.htm>.
- White, Robyn. “Why Flooding Can Happen After A Drought.” *Newsweek*, 11 Jan. 2023, sec. Tech & Science. Online. Internet. 6 May 2023. . Available: <https://www.newsweek.com/flooding-after-drought-california-explained-1773032>.
- “CDC/ATSDR Social Vulnerability Index Map.” Interactive Map. Agency for Toxic Substances and Disease Registry, 2020. Available: https://www.atsdr.cdc.gov/placeandhealth/svi/interactive_map.html.
- “Definition of hyperthermia.” *NCI’s Dictionary of Cancer Terms*. National Cancer Institute, 2 Feb. 2011. Nciglobal,ncicenterprise. Available: <https://www.cancer.gov/publications/dictionaries/cancer-terms/def/hyperthermia>.
- “How Drought Affects Soil Health.” *Iowa State University Extension and Outreach*, 23 Aug. 2017. Available: <https://crops.extension.iastate.edu/cropnews/2017/08/how-drought-affects-soil-health>.
- “Oregon Agriculture Regions.” Oregon Department of Agriculture, Sep. 2020. Available: <https://www.oregon.gov/oda/shared/Documents/Publications/Administration/ORGrowingRegions.pdf>.

Region 4

- Caplan, Shannon, David Keyes, and Elissa Schloesser. Oregon by the Numbers. The Ford Family Foundation and Oregon State University Extension Service, August 2022. Available: https://www.tfff.org/wp-content/uploads/OBTN_2022_101022-Digital.pdf.
- Caplan, David Keyes, Rachel Porter, and Elissa Schloesser, *Oregon by the Numbers*, vols. (The Ford Family Foundation and Oregon State University Extension Service, August 2024, Available: https://www.tfff.org/wp-content/uploads/OBTN_2024-091724-1.pdf
- Census Bureau, and Social Explorer. “American Community Survey, 5-year (2017-2021).” Census, ACS 2021. Available: https://www.socialexplorer.com/tables/ACS2021_5yr.
- Fleishman, Erica, and Oregon Climate Change Research Institute. Sixth Oregon Climate Assessment. Oregon State University, January 2023. Available: https://ir.library.oregonstate.edu/concern/technical_reports/gt54kw197.
- Medford Planning Department. Climate Adaptation and Resiliency Plan: Vulnerabilities (Draft). City of Medford, 2022. Available: https://www.medfordoregon.gov/files/assets/public/planning/documents/long-range/carp_background-3-3-22.pdf.
- State Interagency Hazard Mitigation Team. Oregon’s Natural Hazards Mitigation Plan. State of Oregon, September 24, 2020. Available: https://www.oregon.gov/lcd/NH/Documents/Approved_2020ORNHMP_00_Complete.pdf
- U.S. Bureau of Labor Statistics. *Quarterly Census of Employment and Wages*, December 20, 2019. Available: <https://www.bls.gov/cew/classifications/industry/industry-supersectors.htm>.
- “CDC/ATSDR Social Vulnerability Index Map.” Interactive Map. Agency for Toxic Substances and Disease Registry, 2020. Available: https://www.atsdr.cdc.gov/placeandhealth/svi/interactive_map.html.
- “Connecting food makers with food takers at Rogue Valley Food System Network.” The Jefferson Exchange. Jefferson Public Radio, 11 Apr. 2023. Available: <https://www.ijpr.org/show/the-jefferson-exchange/2023-04-11/wed-9-25-connecting-food-makers-with-food-takers-at-rogue-valley-food-system-network>.
- “History & Board.” Pear Blossom Parade & Festival, n.d. Available: <http://pearblossomparade.org/history-board/>.

- “Immigrant workers on illegal marijuana farms struggle with working conditions.” Think Out Loud. Oregon Public Broadcasting, 17 Nov. 2021. Available: <https://www.opb.org/article/2021/11/17/immigrant-workers-on-illegal-marijuana-farms-struggle-with-working-conditions/>.
- “What is a Food System?” *Rogue Valley Food System Network*, 1 Apr. 2019. Available: <https://rvfoodsystem.org/about/whatisafoodsystem>.

Region 5

- Building Codes Division. “What homeowners need to know about home hardening.” Department of Consumer and Business Services, n.d. Available: <https://www.oregon.gov/bcd/codes-stand/Documents/5785-howfirehardeningworks.pdf>.
- Caplan, Shannon, David Keyes, and Elissa Schloesser. *Oregon by the Numbers*. The Ford Family Foundation and Oregon State University Extension Service, August 2022. Available: https://www.tfff.org/wp-content/uploads/OBTN_2022_101022-Digital.pdf.
- Caplan, David Keyes, Rachel Porter, and Elissa Schloesser, *Oregon by the Numbers*, vols. (The Ford Family Foundation and Oregon State University Extension Service, August 2024, Available: https://www.tfff.org/wp-content/uploads/OBTN_2024-091724-1.pdf
- Census Bureau, and Social Explorer. “American Community Survey, 5-year (2017-2021).” Census, ACS 2021. Available: https://www.socialexplorer.com/tables/ACS2021_5yr.
- Flavelle, Christopher, Jill Cowan, and Ivan Penn. “Climate Shocks Are Making Parts of America Uninsurable. It Just Got Worse.” *The New York Times*, 31 May 2023, sec. Climate. Available: <https://www.nytimes.com/2023/05/31/climate/climate-change-insurance-wildfires-california.html>.
- Jaquiss, Nigel. “New Numbers Show Oregon Homes at Their Least Affordable in 15 Years.” *Willamette Week*, 25 May 2022. Available: <https://www.wweek.com/news/2022/05/25/new-numbers-show-oregon-homes-at-their-least-affordable-in-15-years/>.
- Lackner, Alana. “Wheat harvest impacted by heat, drought.” *Columbia Gorge News*, 11 Aug. 2021. Available: https://www.columbiagorgenews.com/news/wheat-harvest-impacted-by-heat-drought/article_bdec4a80-fa0c-11eb-b4b7-b7826d17c97b.html.
- Penman, Trent D et al. “Retrofitting for wildfire resilience: What is the cost?” *International journal of disaster risk reduction* 21 (2017): 1–10.
- State Interagency Hazard Mitigation Team. *Oregon’s Natural Hazards Mitigation Plan*. State of Oregon, September 24, 2020. Available: https://www.oregon.gov/lcd/NH/Documents/Approved_2020ORNHMP_00_Complete.pdf.
- U.S. Bureau of Labor Statistics. *Quarterly Census of Employment and Wages*, December 20, 2019. Available: <https://www.bls.gov/cew/classifications/industry/industry-supersectors.htm>.
- Williams, Kale. “We’re just trying to survive at the moment’: Oregon agricultural sector hit hard by severe drought.” *The Oregonian (oregonlive)*, 18 Jun. 2021, sec. Environment. Available: <https://www.oregonlive.com/environment/2021/06/were-just-trying-to-survive-at-the-moment-oregon-agricultural-sector-hit-hard-by-severe-drought.html>.
- “CDC/ATSDR Social Vulnerability Index Map.” Interactive Map. Agency for Toxic Substances and Disease Registry, 2020. Available: https://www.atsdr.cdc.gov/placeandhealth/svi/interactive_map.html.
- “Mt. Hood & The Columbia River Gorge.” Travel Website. *Travel Oregon*, n.d. Available: <https://industry.traveloregon.com/regions/mt-hood-the-columbia-river-gorge/>.

Region 6

- Bergh, Casey et al. Bend Community Climate Action Plan, n.d.
- Caplan, Shannon, David Keyes, and Elissa Schloesser. *Oregon by the Numbers*. The Ford Family Foundation and Oregon State University Extension Service, August 2022. Available: https://www.tfff.org/wp-content/uploads/OBTN_2022_101022-Digital.pdf.

- Caplan, David Keyes, Rachel Porter, and Elissa Schloesser, *Oregon by the Numbers*, vols. (The Ford Family Foundation and Oregon State University Extension Service, August 2024, Available: https://www.tfff.org/wp-content/uploads/OBTN_2024-091724-1.pdf)
- Census Bureau, and Social Explorer. “American Community Survey, 5-year (2017-2021).” Census, ACS 2021. Available: https://www.socialexplorer.com/tables/ACS2021_5yr.
- Deur, Douglas. “‘A Caretaker Responsibility’: Revisiting Klamath and Modoc Traditions of Plant Community Management.” *Journal of Ethnobiology* 29.2 (2009): 296–322.
- Dillemuth, Holly. “Caring for neighbors: Bonanza nonprofit offers resources during pandemic.” *Herald and News*. Klamath, 21 Apr. 2020, sec. Featured. Available: https://www.heraldandnews.com/klamath/caring-for-neighbors-bonanza-nonprofit-offers-resources-during-pandemic/article_ef0ea361-cdc6-562a-bea5-c3a5628f8c00.html.
- Fleishman, Erica, and Oregon Climate Change Research Institute. *Sixth Oregon Climate Assessment*. Oregon State University, January 2023. Available: https://ir.library.oregonstate.edu/concern/technical_reports/gt54kw197.
- Kingsman, Kay. “Oregon Tribal Spotlight: Klamath Tribes.” *Travel Oregon*, 8 Oct. 2021. Available: <https://traveloregon.com/things-to-do/culture-history/oregon-tribal-spotlight-klamath-tribes/>.
- Oregon State University. “Toxic algal blooms behind Klamath River dams create health risks far downstream.” *PhysOrg*, 16 Jun. 2015, sec. Environment. Available: <https://phys.org/news/2015-06-toxic-algal-blooms-klamath-river.html>.
- State Interagency Hazard Mitigation Team. *Oregon’s Natural Hazards Mitigation Plan*. State of Oregon, September 24, 2020. Available: https://www.oregon.gov/lcd/NH/Documents/Approved_2020ORNHMP_00_Complete.pdf
- U.S. Bureau of Labor Statistics. *Quarterly Census of Employment and Wages*, December 20, 2019. Available: <https://www.bls.gov/cew/classifications/industry/industry-supersectors.htm>.
- “CDC/ATSDR Social Vulnerability Index Map.” Interactive Map. Agency for Toxic Substances and Disease Registry, 2020. Available: https://www.atsdr.cdc.gov/placeandhealth/svi/interactive_map.html.
- Central Oregon: State of the Region. Oregon Values and Beliefs Center, November 2022. Available: https://www.ci.madras.or.us/sites/default/files/fileattachments/community/page/12687/ovbc_coic_central_oregon_state_of_the_region_2022_summary_report.pdf.

Region 7

- Caplan, Shannon, David Keyes, and Elissa Schloesser. *Oregon by the Numbers*. The Ford Family Foundation and Oregon State University Extension Service, August 2022. Available: https://www.tfff.org/wp-content/uploads/OBTN_2022_101022-Digital.pdf.
- Caplan, David Keyes, Rachel Porter, and Elissa Schloesser, *Oregon by the Numbers*, vols. (The Ford Family Foundation and Oregon State University Extension Service, August 2024, Available: https://www.tfff.org/wp-content/uploads/OBTN_2024-091724-1.pdf)
- Dean Runyan Associates. “Oregon Travel Impacts, Statewide Estimates, 1992-2019p,” 2020. Available: <https://industry.traveloregon.com/wp-content/uploads/2020/04/ORImp19.pdf>.
- Northeast Oregon Economic Development District. “Comprehensive Economic Development Strategy 2018-2023,” 2023. Available: <https://www.neoedd.org/wp-content/uploads/2019/01/2018-2023-NEOEDD-CEDS.pdf>.
- Oregon Legislature Assembly. “Senate Bill 372,” 2017. Available: https://www.dfw.state.or.us/agency/commission/minutes/18/10_oct/E/Ex%20E_Attachm ent%203_SB%20372%20Enrolled.pdf.
- State Interagency Hazard Mitigation Team. *Oregon’s Natural Hazards Mitigation Plan*. State of Oregon, September 24, 2020. Available:

https://www.oregon.gov/lcd/NH/Documents/Approved_2020ORNHMP_00_Complete.pdf

U.S. Bureau of Labor Statistics. Quarterly Census of Employment and Wages, December 20, 2019. Available: <https://www.bls.gov/cew/classifications/industry/industry-supersectors.htm>.

“The Confederated Tribes of the Umatilla Indian Reservation.” Columbia River Inter-Tribal Fish Commission, n.d. Available: <https://critfc.org/member-tribes-overview/the-confederated-tribes-of-the-umatilla-indian-reservation/>.

Region 8

Caplan, Shannon, David Keyes, and Elissa Schloesser. *Oregon by the Numbers*. The Ford Family Foundation and Oregon State University Extension Service, August 2022. Available: https://www.tfff.org/wp-content/uploads/OBTN_2022_101022-Digital.pdf.

Caplan, David Keyes, Rachel Porter, and Elissa Schloesser, *Oregon by the Numbers*, vols. (The Ford Family Foundation and Oregon State University Extension Service, August 2024, Available: https://www.tfff.org/wp-content/uploads/OBTN_2024-091724-1.pdf

Dean Runyan Associates. “Oregon Travel Impacts, Statewide Estimates, 1992-2019p,” 2020. Available: <https://industry.traveloregon.com/wp-content/uploads/2020/04/ORImp19.pdf>.

Greater Eastern Oregon Development Corporation. “Comprehensive Economic Development Strategy 2014-2019,” 2014. Available: https://www.geodc.net/wp-content/uploads/2015/02/GEODC-2014-CED_complete_web12-29.pdf.

K. Creutzburg, Megan et al. “Climate change and land management impact rangeland condition and sage-grouse habitat in southeastern Oregon.” *AIMS Environmental Science* 2.2 (2015): 203–236.

State Interagency Hazard Mitigation Team. *Oregon’s Natural Hazards Mitigation Plan*. State of Oregon, September 24, 2020. Available:

https://www.oregon.gov/lcd/NH/Documents/Approved_2020ORNHMP_00_Complete.pdf.

———. *Oregon’s Natural Hazards Mitigation Plan*. State of Oregon, September 24, 2020.

Available:

https://www.oregon.gov/lcd/NH/Documents/Approved_2020ORNHMP_00_Complete.pdf.

U.S. Bureau of Labor Statistics. *Quarterly Census of Employment and Wages*, December 20, 2019. Available: <https://www.bls.gov/cew/classifications/industry/industry-supersectors.htm>.

“About The Tribe,” n.d. Available: <https://burnspaiute-nsn.gov/about-the-tribe/>.

“Greater Sage-Grouse.” *Portland Audubon*, n.d. Online. Internet. 7 Jun. 2023. . Available: <https://audubonportland.org/our-work/protect/habitat-and-wildlife/central-and-eastern-oregon/greater-sage-grouse/>.