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Small Farmers' Climate Change Beliefs and Experiences with Weather Challenges in Oregon

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Introduction

As a region, the Pacific Northwest has already been experiencing the effects of a changing climate. Most notably for agriculture, increasing temperatures and decreases in snowpack have affected the timing of streamflow and increased competition for water resources used for irrigation, and large wildfires continue to negatively affect farmers' and farmworkers' health and livelihoods ¹. In total, there are approximately 35,000 small farms in Oregon, encompassing approximately half of Oregon's agricultural land ². The U.S. Department of Agriculture (USDA) defines small farmers as those with a gross cash farm income between \$1,000 and \$350,000 per year. These types of farms make significant contributions to production ³ as well as local food sovereignty by bringing greater control over the food system back to local communities and enhancing environmental sustainability ⁴. Adapting locally to these climatic changes is critical for small farmers to maintain their livelihoods and Oregon's food security.

Motivations to adapt to climate change are influenced both by concerns about local weather changes and beliefs about climate change, including whether or not its causes are anthropogenic ⁵. Therefore, it is important to understand both local, on-the-ground experiences with weather-related challenges and how those interact with farmers' beliefs since together they influence how farmers respond. In addition, small farmers often experience specific barriers to farming and adaptation, such as access to land, capital and labor ^{6,7}. This study aimed to understand the specific weather-related challenges small farmers across Oregon are experiencing, how they are responding to those challenges, their beliefs about climate change, and the barriers they face to successful adaptation. Together, these findings can allow those that work with farmers to provide additional information and support in more targeted ways.

Methods

This study took place from September 2019 through August 2020 and draws on in-depth interviews and on-farm observations with 22 small farmers as well as 48 responses to an online survey. Participants were recruited via OSU Extension and other farming-related listservs, at farmers markets, and by word-of-mouth from across the five most agriculturally prominent ecoregions in the state: the Willamette Valley, Coast Range, Klamath Mountains, Columbia Plateau and Blue Mountains (Figure 1). Both the interviews and

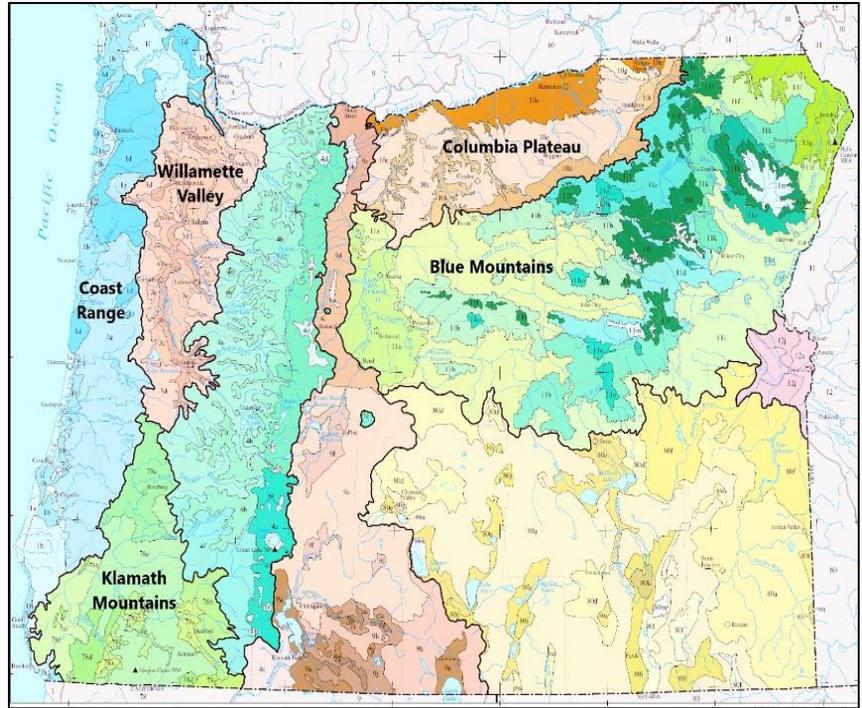


Figure 1: Locations of five ecoregions under study in Oregon¹¹

survey focused on variability or extremes farmers had observed in weather, weeds, pests, water resources and other weather-related aspects on their farms within the last 5 years. They were also asked how they are responding to each change and about their opinions on climate change. While the interviews and on-farm observations provided in-depth details about farmers' experiences and beliefs, the survey allowed for broader patterns to be assessed across the state. Details about the participants in the interviews and survey samples are located in Table 1. Details about the agricultural focus of study participants' farms are located in Figure 2.

Table 1: Demographics of Participants				
	Number of Farmers		Percent of Sample	
Ecoregion	<i>Interviews</i>	<i>Survey</i>	<i>Interviews</i>	<i>Survey</i>
Willamette Valley	6	28	27%	58%
Coast Range	3	7	14%	14%
Klamath Mountains	3	4	14%	8.5%
Columbia Plateau	7	3	31%	6%
Blue Mountains	3	6	14%	12.5%
Gender				
Man	12	21	54%	44%
Woman	10	27	46%	56%
Race <i>*participants could select more than 1</i>				
White	20	43	91%	89.5%
Hispanic	2	1	9%	2%
Native American	1	4	4.5%	8%
Asian	0	2	0%	4%
Age (years)				
	<i>Interviews</i>	<i>Survey</i>		
Average	49	52		
Range	30-71	29-77		
Farm Size (acres)				
Average	52	283		
Range	1.5- 338	1- 6,000		
Length of Time Farming at Current Location (years)				
Average	14	13.8		
Range	4-40	1-50		
Note: The interview and survey samples partially overlapped, with seven individuals taking part in both the interviews and the survey.				

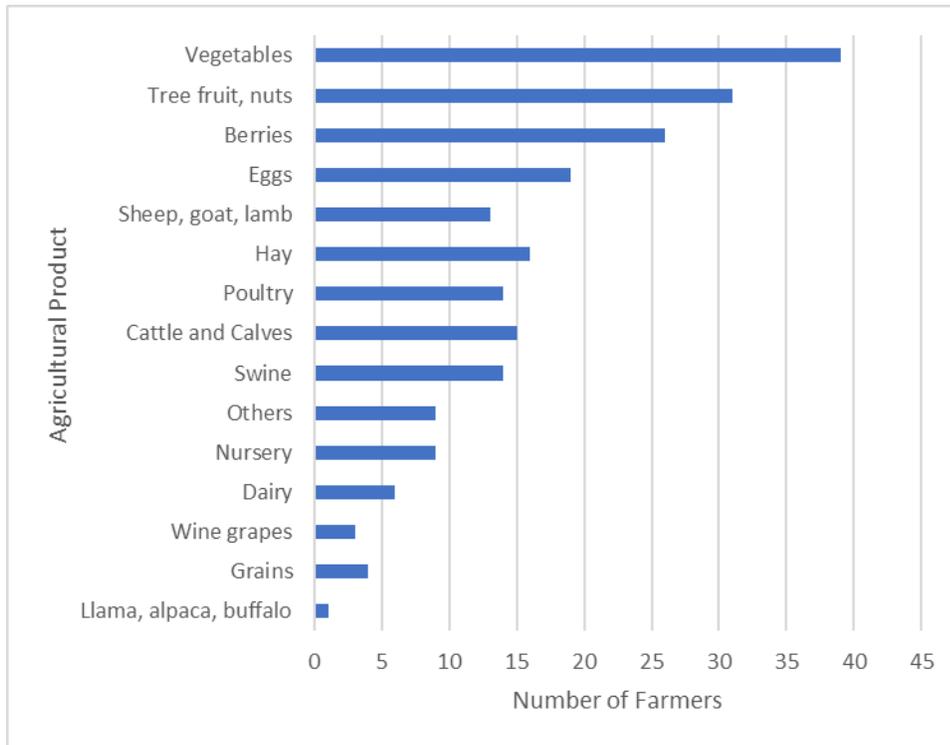


Figure 2: Agricultural focus of participants’ farms

Weather-Related Challenges

Results show that farmers across all five ecoregions are experiencing many of the same challenges, despite the ecological differences of their regions. Figure 3 shows the most common weather challenges from the survey, including drought, extreme heat, and variation in the timing of precipitation. These most common challenges mirror those that are expected to occur in this region due to climate change and have also been documented by climate scientists ¹. Farmers’ self-reported experiences therefore illustrate the real-world implications of climate change. For example, in discussing the increasing weather extremes and variability he has experienced, a Willamette Valley farmer explains that:

“It means more scrambling, it means more improvisational reaction, you don't get to just settle into what you think you can depend on.”

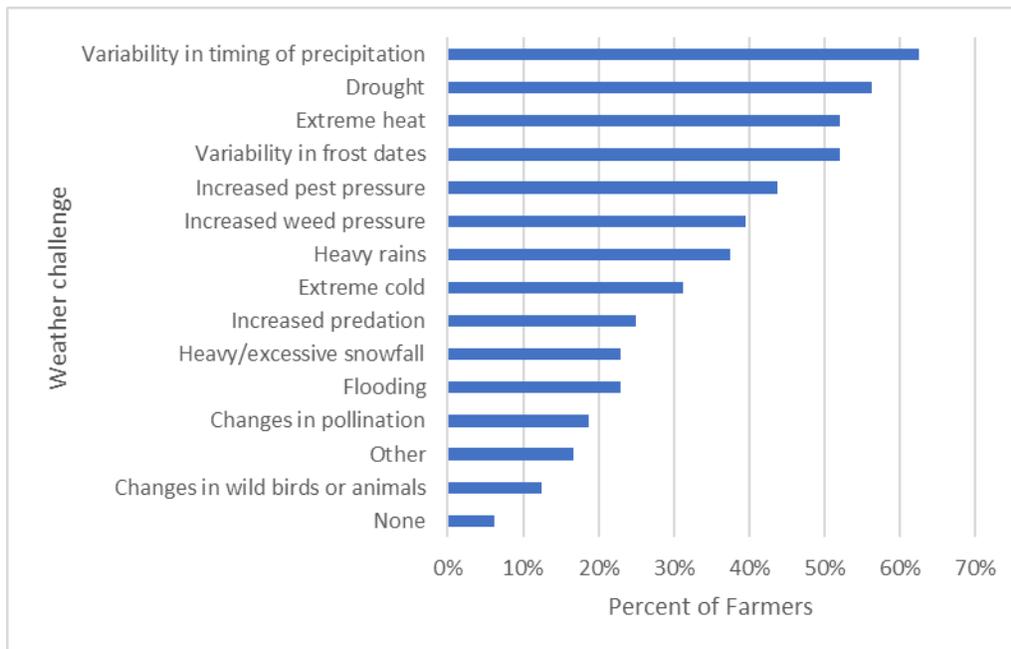


Figure 3: Common experiences with weather-related challenges among survey respondents

The interviews highlighted how weather challenges affected farmers in different ways depending on their particular contexts, such as their soil type, what they grew or where they got water for irrigation. For instance, a farmer in the Klamath Mountains region noted how changes in the timing of precipitation affected him especially because of his clay soil:

“This [2019] was the wettest September I’ve ever experienced in my years here...With 4 inches of rain here, and having clay soil, I just spaded this yesterday and it’s still chunky and wet.”

Finally, despite the overwhelming similarities in responses across ecoregions, issues with extreme cold and heavy snowfall or ice were slightly more common in the Blue Mountains region. This was confirmed by a chi-square correlation test conducted in R. This trend reflects the ecological differences of this region, which unlike the other ecoregions has very few frost-free days each year⁸. No other significant patterns were noted based on ecoregion or the crops/livestock produced, which is likely due to how diversified these small farms are. This makes them distinct from other groups of farmers who may focus on one agricultural product or another.

Climate Change Beliefs

Results indicate that most small farmers are concerned about climate change and its impacts on their farms but are not clear to what extent climate change is contributing to the weather-related challenges they are experiencing. Most attributed the weather-related challenges they were experiencing in part to climate change (Table 3). However, a significant portion also thought that natural cycles or variations in the climate, such as El Niño/La Niña oscillations, were contributing, and a smaller portion were unsure altogether. Variations in local geography, deforestation and increased water-intensive hemp production were also commonly mentioned as exacerbating these challenges.

Table 3: Commonly mentioned causes of weather-related challenges		
<i>Cause</i>	<i>Number of Farmers</i>	<i>Percent of Sample</i>
Climate Change	14	64%
Natural Cycles/Variation	13	59%
Local Geography	11	50%
Deforestation/habitat loss	8	36%
Increased hemp production	5	23%
Unknown/not sure	5	23%
Conservation efforts	2	9%

Furthermore, a majority of farmers in both the interviews and survey noted that they were concerned about the impacts of climate change on their farm to some extent, but a significant portion were also unsure or felt there was not enough evidence to say (Figure 4). More details about these opinions were provided in the interviews. For example, a Klamath Mountains farmer thought that:

“[The climate] is always changing and... I think the change is slow enough that we won't see any impacts in my lifetime.”

Expressing a different opinion, a Willamette Valley farmer said:

“I’m definitely concerned about the specific impacts [of climate change] and I’d say I’m changing my farming trajectory because of it, we’re changing management here because of it.”

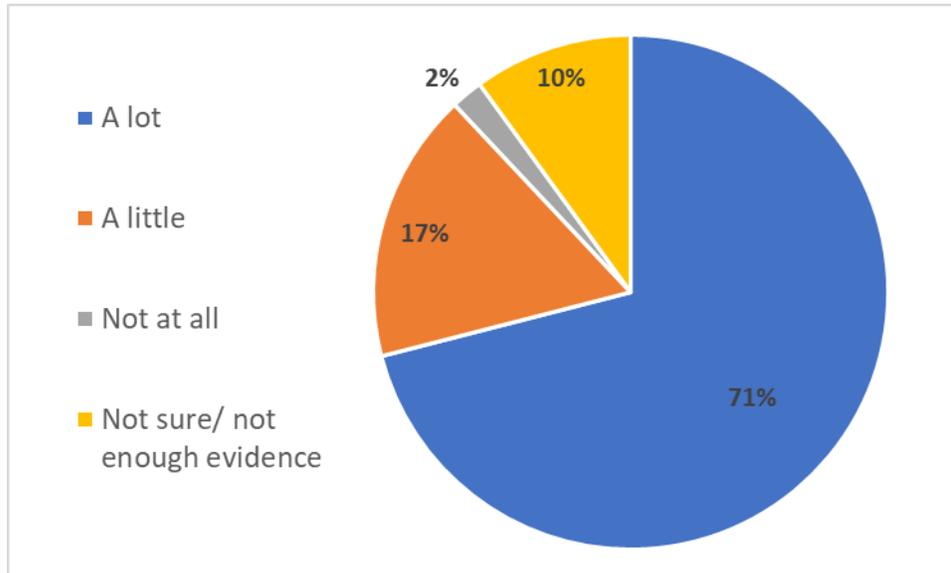


Figure 4: Level of concern about climate change’s impacts on their farm among survey respondents

Finally, when it came to the causes of climate change, responses were again similar across both the interviews and survey, with about equal amounts of participants thinking that climate change is exclusively human-caused or equally caused by both humans and natural changes in the climate. Only 6% thought it was caused exclusively by natural changes in the environment (Figure 5).

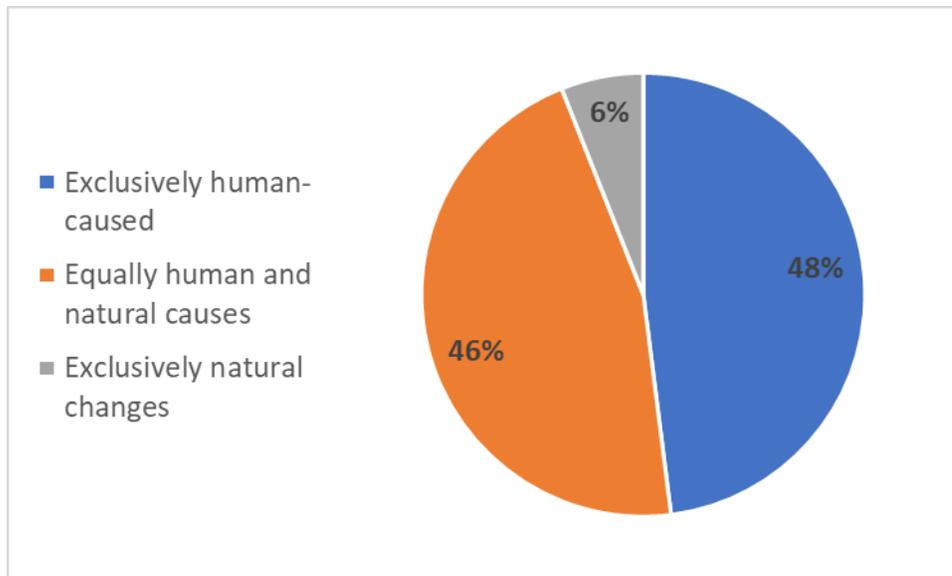


Figure 5: Survey respondents' beliefs about the causes of climate change

Overall, this tells us that there was largely a consensus among the small farmers in thinking that climate change is of concern locally. However, there is a significant portion of people who are unsure or unclear about the local impacts of climate change. Farmers are also not in agreement about the causes of climate change. Confusion appears to exist around the extent to which the causes are anthropogenic or natural. This is significant since concern about the local impacts of climate change and a recognition of its anthropogenic causes is correlated with high motivations among farmers to adapt to and help mitigate climate change ⁵. Therefore, confusion about these aspects could deter people from adapting or result in maladaptive behavior, increasing their risk of adverse climate-related outcomes ⁹.

Response Strategies

The most common ways small farmers were responding to these weather-related challenges were by adopting practices that enable them to dry farm or be less reliant on irrigation, and those that improve soil health, reduce tillage, and attract beneficial insects (Figure 6). Many of these methods can be effective for adaptation or mitigation ¹⁰. However, about 45% of survey respondents were also using at least one potentially maladaptive strategy, such as increasing irrigation, pesticide or herbicide use, which could increase vulnerabilities to climate change over time. These trends indicate opportunities for organizations that work with farmers to provide support for implementing more effective types of on-farm adaptations and information about climate-appropriate varieties and strategies.

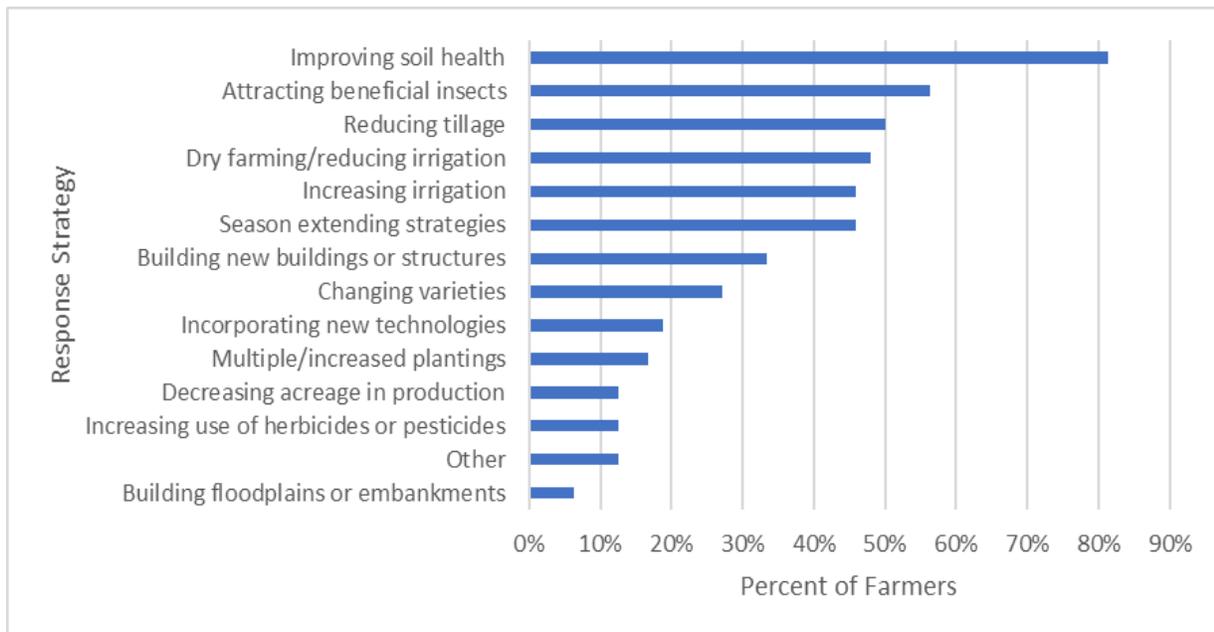


Figure 6: Common response strategies among survey respondents

Finally, a theme of note that arose from interviews was an attitude of “just dealing” with weather challenges in the moment rather than planning ahead to help mitigate their effects. Half of interviewed farmers expressed the idea that there was not much they could do to adapt to the weather-related challenges they were experiencing, and that instead they had to “just deal” with whatever happened. For example, when discussing his issues with water availability, a Coast Range farmer said “The scary part is not knowing what's happening and how it's going, how it affects us down the road...you just have to deal with what we get, so it is hard to plan long term.” This sentiment highlights that support is needed for small farmers in developing a plan to adapt to more variable weather and the warmer climate. Of course, this attitude also stems from the many barriers that make it harder for small farmers to adapt successfully. These barriers are discussed in the next section.

Barriers to Adaptation

Based on the interviews, the most common barriers small farmers faced when adapting to weather challenges were:

1. A **lack of reliable information**, such as weather forecasting or climate predictions specifically for their region of Oregon, was mentioned by 27% of interviewees.

2. High costs **and a lack of available capital** to complete projects on their farm, such as building infrastructure or restoring habitats, were mentioned as barriers by 27% of interviewees.
3. **Access to labor** made it hard for 22% of interviewees to keep up with their already extremely heavy workloads and complete projects.
4. **Access to water rights** and the water rights system in general made it harder for farmers to mitigate against many of the water-related issues they were experiencing. This was mentioned by 22% of interviewees.
5. **Instability of markets or limited market access** made it harder for 41% of interviewees to pivot when weather challenges changed how much or what they had available to sell.

Overall, it is notable that these barriers which make it harder for farmers to adapt to climate change are many of the same issues that make it hard to be a small farmer in general⁷. This indicates that opportunities and projects already aimed at helping to make small farms more viable economically could also help them to be more resilient in the face of climate change and other food system stressors.

Summary of Essential Points

Overall, small farmers across Oregon are experiencing many of the same weather issues, including drought, extreme heat, and changes in the timing of precipitation. However, as a group, there was not a consensus about what was causing those weather challenges and they found it hard to tease apart the effects of climate change from natural variation in the weather. Although they were concerned about climate change, the causes of climate change and the specifics of its local impacts were not clear and thus it was hard for many to know how to adapt. This played into their response strategies, which largely focused on reducing irrigation, improving soil health, and reducing tillage, all of which are helpful when adapting to extreme and variable weather. However, some farmers are still pursuing more conventional methods, such as increasing irrigation, herbicide, or pesticide use, which can be maladaptive. Therefore, more work could be done to provide small farmers with information about what changes are occurring or will occur in their area as well as guidance on how to adapt in appropriate ways. Further support should also be given to programs which help provide small farmers with greater access to capital and labor, and those which help further develop methods for small-scale farming under new climate conditions in Oregon.

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https://ir.library.oregonstate.edu/concern/graduate_thesis_or_dissertations/pz50h4112

Any questions can be directed to the author at parksmel@oregonstate.edu

Bibliography

1. May, C., Luce, C.H., Casola, J.H., Chang, M., Cuhaciyan, J., Dalton, M., Lowe, S.E., Morishima, G.S., Mote, P.W., Petersen, A.S., et al. (2018). Northwest (U.S. Global Change Research Program) 10.7930/NCA4.2018.CH24.
2. Oregon Dept. of Agriculture (2021). Oregon Agricultural Statistics & Directory.
3. Burns, C.B., and MacDonald, J.M. (2018). America's Diverse Family Farms: 2018 Edition (U.S. Department of Agriculture Economic Research Service).
4. Nyéléni (2007). Declaration of the Forum for Food Sovereignty, Nyéléni. <https://nyeleni.org/spip.php?article290>.
5. Chatrchyan, A.M., Erlebacher, R.C., Chaopricha, N.T., Chan, J., Tobin, D., and Allred, S.B. (2017). United States agricultural stakeholder views and decisions on climate change. *Wiley Interdisciplinary Reviews: Climate Change* 8, e469. 10.1002/wcc.469.
6. Bulla, B., and Steelman, T. (2016). Farming through change: using photovoice to explore climate change on small family farms. *Agroecology and Sustainable Food Systems* 40, 1106–1132. 10.1080/21683565.2016.1225623.
7. Janssen, B. (2017). Making local food work: the challenges and opportunities of today's small farmers (University of Iowa Press).
8. Detweiler, A.J. (2018). Gardening in Central Oregon's climate. OSU Extension.
9. Schipper, E.L.F. (2020). Maladaptation: When Adaptation to Climate Change Goes Very Wrong. *One Earth* 3, 409–414. 10.1016/j.oneear.2020.09.014.
10. Roesch-McNally, G., Moore-Kucera, J., and Owens, C. (2019). Applying Soil Health Management Systems to Reduce Climate and Weather Risks in the Northwest (USDA).
11. Thorson, T. D., Bryce, S. A., Lammers, D. A., Woods, A. J., Omernik, J. M., Kagan, J., Pater, D. E., & Comstock, J. A. (2003). *Ecoregions of Oregon* [Color poster with map, descriptive text, summary tables, and photographs]. U.S. Geological Survey.