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# Family Forest Owners and Climate Change: Understanding, Attitudes, and Educational Needs

Amy T. Grotta, Janean H. Creighton, Christopher Schnepf, and Sylvia Kantor

Twenty-four focus groups were held throughout the Pacific Northwest to assess family forest owners' perceptions, understanding, and educational needs related to climate change and its potential impacts on family-owned forests. Participants cited many information sources and often referenced personal observations and connections. Perceptions of climate science were mixed, but skepticism was common, particularly regarding the extent to which research is driven by politics, money, or ideology. Participants were uncertain about possible climate change impacts but expressed concern about both biophysical and sociopolitical dimensions. Most participants did not expect to make significant changes to their management in anticipation of climate change. However, many participants wanted to learn more about climate change and how it might affect their forests. Results of these focus groups should provide insights for integrating climate science into extension programming in a variety of contexts, and suggestions for future extension programming are presented.

**Keywords:** extension, climate change, family forest owners, communication

Family forest owners (FFOs) control more than 60% of the private forestland in the United States (Butler 2008). In Oregon, Washington, Idaho, and Alaska, family-owned forests make up more than 6.9 million acres and more than 200,000 families each own between 5 and 10,000 acres (USDA Forest Service 2006). Family forests are critical to timber, water, wildlife, and many other shared values. Because these lands tend to be disproportionately located in lower elevations, along stream corridors, and near population cen-

ters, they provide critically important ecosystem functions and other public benefits.

Climate change is predicted to accelerate through the 21st century (Mote and Salathé 2010), leading to changes in forest species distribution (McKenney et al. 2007, Coops and Waring 2011), productivity (Coops and Waring 2001), and disturbance regimes (Waring et al. 2011). These changes may have profound impacts on public and private benefits from forests and managers' strategies to sustain these benefits.

Public land managers in the western

United States are actively addressing climate change through research into projected forest impacts, vulnerability assessments, and strategies for adaptation and mitigation (Council of Western State Foresters 2010, Peterson et al. 2011). Climate change will also affect family-owned forest lands, but how are FFOs addressing climate change? The degree to which landowners will participate in educational opportunities or undertake adaptation or mitigation activities may depend on their perception of individual risk from climate change (O'Conner et al. 1999). FFOs consider many aspects of risk when making management decisions (Fischer and Charnley 2010); however, it is not known to what extent these owners consider climate change as a risk to their forests. Charnley et al. (2010) suggested that FFOs could play a significant role in mitigating climate change through participation in carbon markets; however, they pointed out that there is very little research on how these owners perceive climate change and their interest in engaging in forest management practices to increase carbon sequestration.

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Although social scientists have documented the range of public attitudes and perceptions of climate change and of the validity of information sources regarding climate change (e.g., Nisbet and Myers 2007, Kahan et al. 2011, Leiserowitz et al. 2012a, 2012b), information regarding these attitudes specifically among FFOs is lacking.

FFOs often look to university extension as a partner and trusted source of education on forest management (Gootee et al. 2010). As new knowledge about potential climate change impacts on US forests is generated, extension educators are developing related education and technology transfer programs for FFOs. To ensure that new research and extension efforts related to climate change is relevant for FFOs, we conducted a needs assessment to determine FFOs' state of knowledge and educational needs regarding climate change and their forests. Our research yielded information regarding FFOs' perceptions and attitudes toward climate science, information, and impacts and provided insights into how they may (or may not) incorporate information they receive into the management of their forests.

## Methods

We conducted a series of focus group discussions (Krueger and Casey 2005, Morgan 1997) in Washington, Oregon, Idaho, and Alaska in 2009–2010. Focus groups are a research method often used to learn about people's perceptions on a complex topic (Krueger and Casey 2005); they have been used in researching public perceptions of various natural resource issues, including priorities for forest management (Kingsley et al. 1988, Racevskis and Lupi 2006), herbicide use (Howle et al. 2010), wildfire hazard (Winter and Fried 2000), and ecosystem services (Kaplowitz and Hoehn 2001), among many others. One of the unique strengths of focus group methods is participant interaction, which can draw out additional insights on participants' views compared with individual interviews or surveys (Egan et al. 1995, Krueger and Casey 2005).

Six focus groups were held within each state for a total of 24 groups (Figure 1), ranging from 4 to 14 participants each (median = 8; total participants in all groups = 193). The group locations were also categorized into four broad regions: Boreal/Alaskan Interior, Coastal, Inland Northwest, and Northern Rockies.

Most participants were recruited by lo-

cal extension personnel and were selected to represent a cross-section of FFO demographics in terms of ownership size and tenure (Table 1). Nearly all participants were FFOs; however, about one-third of the Alaska participants identified themselves as public resource managers and Native corporation representatives.<sup>1</sup> Length of tenure among our participants reflected the overall FFO population in the four states (Butler 2008); however, ownership size was skewed toward larger ownerships among our participants. We intentionally tried to recruit participants who were familiar with extension programming, so participants would understand the context in which climate change extension programming might be provided. This sampling strategy introduces a potential bias; thus, although our results provide insights into how extension clientele perceive the topics discussed, they cannot be generalized to all FFOs.

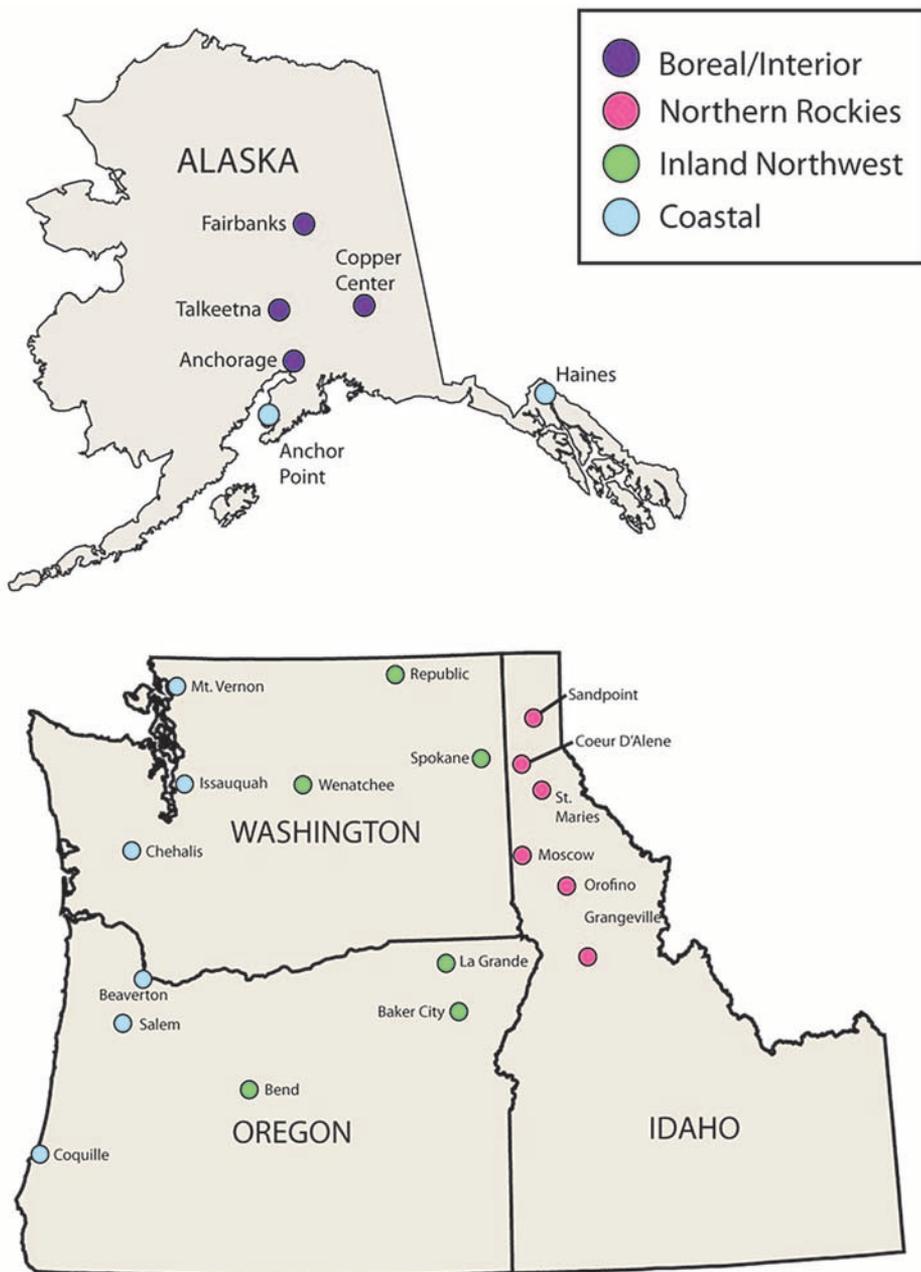
Two researchers conducted each focus group, with one serving as the lead facilitator and the other recording notes. After a brief introduction and discussion of logistics and confidentiality, the facilitator asked participants to introduce themselves and describe their forest and then introduced guiding questions as the discussion unfolded (Table 2). These questions were purposely open-ended to stimulate active discussion among participants about their knowledge, attitudes, and educational needs regarding climate change and potential forest management impacts. One question was added to the questioning route because it emerged as an important theme in the first focus group (Table 2). Discussions typically lasted 2 hours and included a meal. Each session was videotaped and audio recorded with partic-

ipants' consent and recordings were transcribed verbatim.

Using an inductive approach, four researchers organized the data according to the conceptual linkages of expressions that emerged during the discussions. Based on these linkages and the recurrence of topics, themes were developed (Glaser and Strauss 1999, Ryan and Bernard 2003). In analytic induction, this type of thematic analysis is a means for identifying and expressing patterns in qualitative data. The researchers coded statements made by participants into categories reflective of observed patterns in the data. Statements were coded using computer-assisted qualitative data analysis software (NVivo; QSR International, Doncaster, VIC, Australia). The coded statements were then positioned into larger themes and illustrated by representative quotations. The initial codes and themes were reviewed by all the authors through multiple stages of increasingly restrictive coding (Boyatzis 1998) to standardize and refine the understanding of the patterns in question. Narratives of the emergent themes were then reviewed and simplified by retaining the most representative quotations and noting the most common overlap in statements by participants. To ensure intercoder reliability, each transcript was coded independently by at least two researchers. Intercoder reliability was achieved when strong agreements occurred between individual coders regarding the identified themes and appropriate linkages developed for a given transcript. This agreement provides confidence that the identified themes are appropriate, given the use of the same coding techniques, and suggests that the conceptu-

## Management and Policy Implications

Understanding climate change and its potential impacts is critical to maintaining productive and healthy forestlands. Family forest owners' understanding and perceptions of climate change are wide-ranging, and complicated by mistrust in source information, lack of certainty, and anxiety regarding potential regulatory impacts. Extension is regarded by many forest owners as a source of less-biased information and is poised to engage family forest owners on climate change, potential impacts to forests, and adaptation strategies. Effective extension programming should embrace relevant and sound climate science and develop information and tools that are applicable to landowners' needs in the context of their decisionmaking processes. Maintaining stakeholder trust is often critical to being an effective educator at the local level; therefore, some extension educators may be reluctant to address climate change because the topic has become so politicized. The results of this study may help extension educators develop programming around climate in a way that maintains or even builds on those trusting relationships. Programs built around transparency, local relevance, and risk assessment should resonate well with the intended audience.



**Figure 1. Location of focus groups.**

alization of the themes and their linkages are valid (Sandelowski 1995).

## Findings<sup>2</sup>

### Climate Change Information Sources, Credibility, and Trust

Participants heard about climate change from many sources. Some had sought out in-depth information about climate change but most described a passive flow of information from their “regular” media outlets including watching network television, listening to the radio, or reading news from Internet sources. Participants repeatedly questioned the validity of information

received through the media and other sources: not knowing whom to trust or what information was credible and expressing con-

cern about how much of it seemed biased toward a specific ideological, political, or financial agenda. The media were often described as providing conflicting information or not delving deeply enough into the science. The idea that climate change information is highly politicized and therefore a factor that creates ambiguity emerged frequently:

I think you always have to look at what the source is of the information and what kind of an ax they have to grind by what they're tellin'. There's politics involved in almost all of that stuff and, if they've got a reason for saying that global warming is bad, and we've got to turn off these fossil fuels maybe that's because they're in the alternative energy business and they've got somethin' to gain from it—and that's why I'm to the point where I'm just totally confused on the issue. I have no idea whether man is having any impact on global warming or not. [Coeur D'Alene, ID]

Participants generally described the scientific community as a more credible information source than the media. However, concern about scientific bias arose repeatedly among the groups. Bias in climate science was discussed from several angles and engendered substantial skepticism and distrust, for example, the perception that scientists are biased by the need to generate funding:

Well even science is—you know, they get the grants, and they write the grants to climate change, and that's the way you get 'em—'cause that's what's popular. And so I don't trust a lot of the scientific stuff that comes out. [Baker City, OR]

Climate models were another source of skepticism and distrust. Participants did not always make distinctions among models that are predictive, simulative, or explanatory of existing trends, nor did they necessarily connect models to their basis in empirical data. Some indicated that climate models could be manipulated to produce desired results

**Table 1. Forest owners participating in focus groups by ownership size and length of tenure.**

Ownership size	No. of forest owners	Years of ownership	No. of forest owners
1–24 acres	30	0–10	28
25–49 acres	21	11–20	38
50–99 acres	25	21–30	29
100–249 acres	36	31–40	25
250–999 acres	24	>40	26
1000+ acres	29		

Acreage and tenure data were not available for two of the focus groups. Nonforest owners are not shown.

**Table 2. Questioning route used for all focus group discussions.**

1. Tell us about your forest . . . [icebreaker].
2. Where do you get information about climate change?
3. How do you assess the validity of the information you receive about climate change?\*
4. How do you think climate change may or may not impact your forest?
5. What are you doing differently on your forest (if anything) as a result of anticipated climate change?
6. What are your major questions about climate change?
7. In what form would you like to get information about climate change?
8. Do you have any further questions or comments?

\* This question was added to the questioning route after the first focus group because it emerged as an important topic.

and expressed discomfort with scientists' relying on modeled predictions:

You can tweak the variables, to make things come out the way you would like them to come out. [Moscow, ID]

Computer models don't demonstrate anything. [Bend, OR]

Participants' personal connections, such as friends or relatives who were highly educated or worked in the environmental sciences, and sources related to a participant's profession (e.g., technical and peer-reviewed journals) were also cited as sources of information about climate change. Participants also noted a variety of public figures, nonprofit and science-based organizations, and associations of which they were members. In Alaska, both Native and non-Native participants cited longtime residents, especially Native elders, as knowledgeable sources. All of these sources, together with participants' own life experiences or observations were described as trusted sources of information. The recognition that individual belief systems can trump scientific evidence was articulated by one participant:

. . . It's what you believe; it's what you have built your whole life internalizing. So either you're in one camp or the other. You may be able to rationally discuss it, but what you believe is what you believe. [Coeur D'Alene, ID]

### Perceptions of Biophysical and Socio-political Impacts

In nearly all groups, participants referenced personal observations, including current weather, climate trends (or lack thereof) over the course of their lives, and historical records. Generally, Washington, Oregon, and Idaho landowners did not attribute

their observations to climate change, nor was there consensus about whether observed conditions such as increased insect or fire activity were related to climate change. However, Alaskans attributed a variety of environmental changes to climate change, such as receding glaciers, thawing permafrost, forest regeneration problems, shorter hunting seasons, spruce trees encroaching on bogs, and lower-lake levels:

We don't know how fast it's coming . . . and we don't know exactly what's causing it, but we can kind of put two and two together to see that there are drastic changes on a big scale that are affecting a lot of areas; so that's what kind of concerns me is, global warming was kind of a thing that, when I was younger we barely knew the term, didn't really understand much about it and we thought it affected other parts of the world. But now we realize that it's right here, it's affecting us a lot. [Anchor Point, AK]

Participants from all four states were unsure about potential future impacts of climate change on their forests. Some anticipated reforestation failure, increased insect or disease, increased fire, invasive species, and species distribution changes, but felt uncertain about the magnitude of these changes or their consequences:

A two-degree change in temperature could have a big impact on what kind of insects are gonna start attacking our trees. But I think it's the subtlety of change, and the lack of understanding of what that change can mean in terms of impact, that we need to have a better handle on. [Baker City, OR]

Some landowners believed climate change impacts would be positive, citing the possibility of increased tree growth from higher CO<sub>2</sub> levels, longer growing seasons, or increased precipitation. Some remarked that they were accustomed to changing conditions because of the dynamic nature of forest systems and long-term forest management cycles. They did not distinguish changing conditions due to climate versus other drivers:

I think if you're a forest landowner, you work or you live in a dynamic environment. Forests are continually changing. So we're all familiar with the changing environment I think. The other thing is if you deal with forests you already have a long-term view. And the way that I look at climate change is it's almost like a forest: it's changing, and it's a long-term thing; it's been changing forever. [Baker City, OR]

Concern about the social and political impacts of climate change commonly engendered lively discussion. Some landown-

ers said they were more concerned about regulatory constraints to their forest management from climate change-related policies than about potential biophysical impacts. Sometimes, these ideas were expressed in connection to attitudes toward existing policies affecting local forests, for example, west of the Cascades, endangered species policy, and in the Inland Northwest, fire and public lands policies:

I'm not so worried about climate change as I am concerned about the impact of climate change policy on my ability to manage my tree farm. I do see more stress on our ground, particularly in the last 10 years that I think is somewhat related to drought, whether or not there's a tie to climate change, goes back to the conflicting information somebody needs to sort out. . . . But I think the agenda behind some of the more extreme groups pushing the climate change policy has far more implications for how we can manage our forest. It looks to me like it's—the next spotted owl. [Centralia, WA]

The thing that I'm concerned about, is this kind of attitude, or a policy position that's been mentioned by the US Forest Service, that we have climate change, and that explains why we're suffering so many thousands of acres of beetle kill. We're not suffering thousands of acres of beetle kill because of climate change; we're suffering thousands of acres of beetle kill, in my opinion, from decades and decades of fire suppression. And, the withdrawal of a national forest timber sale. [Baker City, OR]

### Responses to Perceived Impacts

Generally, participants reported that they were managing forests to provide wildlife habitat, increase biodiversity, improve forest health, and seek financial gain, but very few reported changing or adapting management practices on a significant scale in anticipation of climate change. Many participants indicated that they lacked sufficient local information to change their management practices, but that managing for resiliency, by diversifying species and reducing stand density, made sense. Several believed climate change would be gradual, giving them time to react or that species might adapt to changing conditions. Some indicated that changing management practices now to adapt to climate scenarios many decades away was at odds with the time scale of timber growing rotations or with the landowners' management horizons of a few years to decades. For many, more immediate concerns were a priority.

How much do I want to invest on the basis of climate change when I don't know that there's enough information out there—I mean, do we really know that 10 years from now our summers are gonna on average be

drier? Or are they gonna be warmer, but wetter? I don't know. [St. Maries, ID]

I work with a lot of Native corporations as well as individual landowners and so far I have not seen it on their radar screen. They're much more focused on the immediate problems and needs. Even the largest Native corporation, Sealaska, which is about the most advanced one for forestry, it's just not on their planning horizon at the moment. And they have other issues that are more pressing: subsistence for their shareholders and income. [Anchorage, AK]

## Research and Education Needs

Some participants expressed a desire for extension to help them sort through competing claims and complex information and distill climate science into more easily digestible forms:

We're not able to transcend the political rhetoric and get to the core issues, and I think that would be a great, great process for a university to try to sort that out. Or give us the tools to sort that out. 'Cause how do you make your mind up when you've got 1,500 PhDs on one side and 2,300 PhDs on the other side and they're diametrically opposed? [Centralia, WA]

Participants emphasized that they wanted information that addressed local conditions whenever possible. It was important that climate projections be compared with historic climate and weather fluctuations, at a local scale:

Give us some sense of—like you're seeing we have these drought periods and wet periods and whatnot, what's that look like in the past, and then—lookin' over all those trends, are we lookin' at peaks that are bigger than we had historically or valleys that are bigger than we had historically? [Granville, ID]

They're not collecting data other than just this national, across-the-board worldwide kind of thing and they're not really getting into specifics zones and areas. What does it mean in Athol? [Coeur d'Alene, ID]

Interest in learning about adaptation strategies (i.e., changing the mix of species or seed sources in planting, or density management to improve forest health and resilience) was expressed more often than mitigation strategies (i.e., carbon sequestration). Generally, participants were less interested in engaging in climate science debates than in prescriptive forest management alternatives for different types of sites and stands keyed to different climate projections:

I know you can't make any hard and fast predictions or anything, but maybe if you could come up with something that would kind of suggest which trees would be expected to thrive and which ones maybe

would decline. That sort of practical information would be very helpful. [Mount Vernon, WA]

## Discussion

### Trust in Information Sources, Values, and Beliefs

Although we did not ask participants specifically about their acceptance of climate change as a fact, we did ask them to identify their individual sources of information on climate change. Distrust of scientific research regarding climate change emerged as an important theme; on the other hand, participants' personal observations and interpretations of climatic trends as well as those of individuals or organizations with whom they were aligned personally or professionally were influential in shaping their perceptions of climate change. The relative importance of these latter forces may explain why Alaskans in our study were more likely to perceive climate change as an important factor shaping their forests. In Alaska, recent changes to the natural landscape are much more dramatic and visible than those in the other three states of our study; Native elders were also noted as an important and trusted reference for long-term patterns of change.

Our findings agree with previous studies of public trust in science, which showed that individuals place more trust in "nonexperts" such as friends and close associates than in scientific or government "experts" (Greenberg and Williams 1999). Other studies exploring public perceptions of climate change suggest that when confronted with conflicting information about a topic, people do not necessarily consider all they hear, rather, they tend to listen to sources they trust the most (Malka et al. 2009), and that individuals form opinions regarding what is presented as factual evidence based on their core values and beliefs, not necessarily on the strength of the evidence itself (Kahan et al. 2007).

Landowners perceived climate change as highly politicized. Whereas many forestry applications that ultimately emerge from climate research may be thought of as apolitical (e.g., modifying thinning regimes or seed source selections), some landowners might reject them if they associate climate change with a belief system they do not share. On the other hand, espousal of these concepts by a trusted individual (i.e., a peer landowner or professional) might promote adoption—as conceptualized in the classic

"diffusion of innovation" model (Rogers 1962).

### Risk Management

Risk management incorporates an analysis of risk factors, their likelihood, magnitude of impacts, and positive and negative consequences of action or inaction (Hummel et al. 2009). Landowners in our focus groups did not explicitly mention risk analysis or management when discussing their response to climate change; however, their conversations suggest their use of risk analysis principles in assessing and responding to climate impacts. For example, their recognition of uncertainty within climate science implies consideration of the likelihood and magnitude of an impact from climate change, and their attention to time scales of projected impacts in the context of their own management time horizons implies consideration of the consequences of action or inaction. Extensionists are accustomed to incorporating risk management principles into programming for FFOs focused on various forest threats, such as insect and diseases. Our focus group participants' stated interest in practical information regarding climate impacts and management strategies to mitigate those impacts suggests their interest in risk management tools related to climate change as well.

In agriculture, risk management tools, namely seasonal climate forecasts, may only be one factor in farmers' complex decision-making processes about yearly operations, alongside commodity prices, time and labor supply, and social and cultural values (Crane et al. 2010). A wide set of personal values and goals factor into FFOs' management decisions (Brunson et al. 1996, Creighton et al. 2002). Therefore, it may not be reasonable to expect risk management tools developed to assess climate change adaptation strategies to quickly translate into FFOs' adoption of new strategies, especially when they do not fit an owner's management time horizon, time and labor supply, and management objectives.

### Recommendations for Extension Programming

Because the topic of climate change has become so highly politicized, some extension educators may be hesitant to address it with their clientele. However, although focus group participants held varying degrees of skepticism, belief, and concern regarding climate change, most were interested in

learning about potential impacts to their forests. Our results suggest that transparency, local context, uncertainty, and forest management and policy implications are important considerations for engaging FFOs on climate change. Landowners' management objectives, interest, and skills and abilities should also be considered in developing effective programs.

### Transparency

Because of the perception of "politics and money" that many forest owners associate with climate change dialogue, research that supports climate change programming needs to be as transparent as possible. Extension and research can support this by acknowledging FFOs' concerns and attitudes regarding climate science. Possible approaches to improving transparency include clarifying who did the research and why and how it was funded and making research methods and results clear and understandable to a layperson.

### Local Frame of Reference

Rural residents' views of global environmental issues are often framed by local conditions (Hamilton et al. 2012). Our study and those of others (e.g., Kahan et al. 2007, Creighton et al. 2008, Gootee et al. 2010) show that information sources that reflect an individual's cultural context or sense of place are influential in shaping perceptions. Because these FFOs referenced their personal landscape in thinking about climate change, information that is tied to a place, an ecosystem, or even a particular forest stand type is likely to be more meaningful.

### Understanding Modeling and Uncertainty

Modeling is a key tool for understanding climate change projections, yet skepticism toward models is common across the general public and in the media (Akerlof et al. 2012). Extension programming to increase understanding of development and use of models (e.g., predictions versus projections), evaluation of model quality, and sources of model uncertainties can help landowners navigate climate science. Discussing model projections many people use every day (e.g., weather and economic forecasts) and models that have long been used within forestry (e.g., forest growth-and-yield models) may be helpful. Given their interest in local information on temperature, precip-

itation, and potential impacts, FFOs need to understand the risk of applying larger-scale model projections to finer, local scales. Understanding model outputs and their associated uncertainties is important in analyzing the risks and benefits of adaptation strategies.

### Adapting Forest Management to Changing Climate

Programming focused on managing forests for resiliency in the face of environmental uncertainty and extreme events may be well received by landowners regardless of their position on climate change. Emphasizing practical on-the-ground management strategies and their associated risks and benefits offers FFOs tools they can use and appreciate. For example, given participants' interest in impacts on forest insects, disease, and invasive species, consideration of best-case to worst-case climate change scenarios and related implications for forest management could offer useful decision tools for many forest owners.

### Programming on Forest Policy

Landowners were concerned about potential regulatory constraints on their ability to manage their forests. Kahan et al. (2007) suggested that individuals with negative expectations regarding policy arising from climate change are more likely to distrust information that affirms climate change and more willing to believe such information if proposed policy solutions are not threatening. In light of this, extension could facilitate landowner participation in shaping climate-related public policies that affect forestland. Suggested intermediate strategies include developing leadership skills among FFOs, enabling participation in state and local committees and task forces, and facilitating development of grassroots collaborations on local forest policy issues. Reaching landowners through an issue of personal value (in this case, forest policy) could be an avenue for deeper discussions of climate change, climate science, and forest management implications and lessen distrust associated with these topics.

### Conclusion

A variety of views and levels of understanding about climate change were expressed among FFOs in the focus groups we conducted. We have highlighted findings related to perceived credibility of climate science, the importance of personal experience

and worldviews in shaping perceptions about climate change, concern about current and future biological and sociopolitical impacts, and interest in adaptation strategies. Although these findings are unique to the extension clientele in the Pacific Northwest who participated in our study, they can be useful in understanding the spectrum of FFOs throughout the United States and in developing climate change-related programming to serve them.

### Endnotes

1. Alaska has relatively few FFOs and its forests are dominated by federal and Native corporation-owned lands. Because Alaska extension personnel view these latter groups as critical audiences, we included them in our focus group recruitment.
2. More detailed results from each state are available in Creighton et al. (2011), Grotta et al. (2011), Kantor et al. (2011), and Schnepf et al. (2011).

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