Synthesizing Public Opinion on Prescribed Fire and Associated Smoke

A Review of Peer-Reviewed Literature in the Pacific Northwest United States

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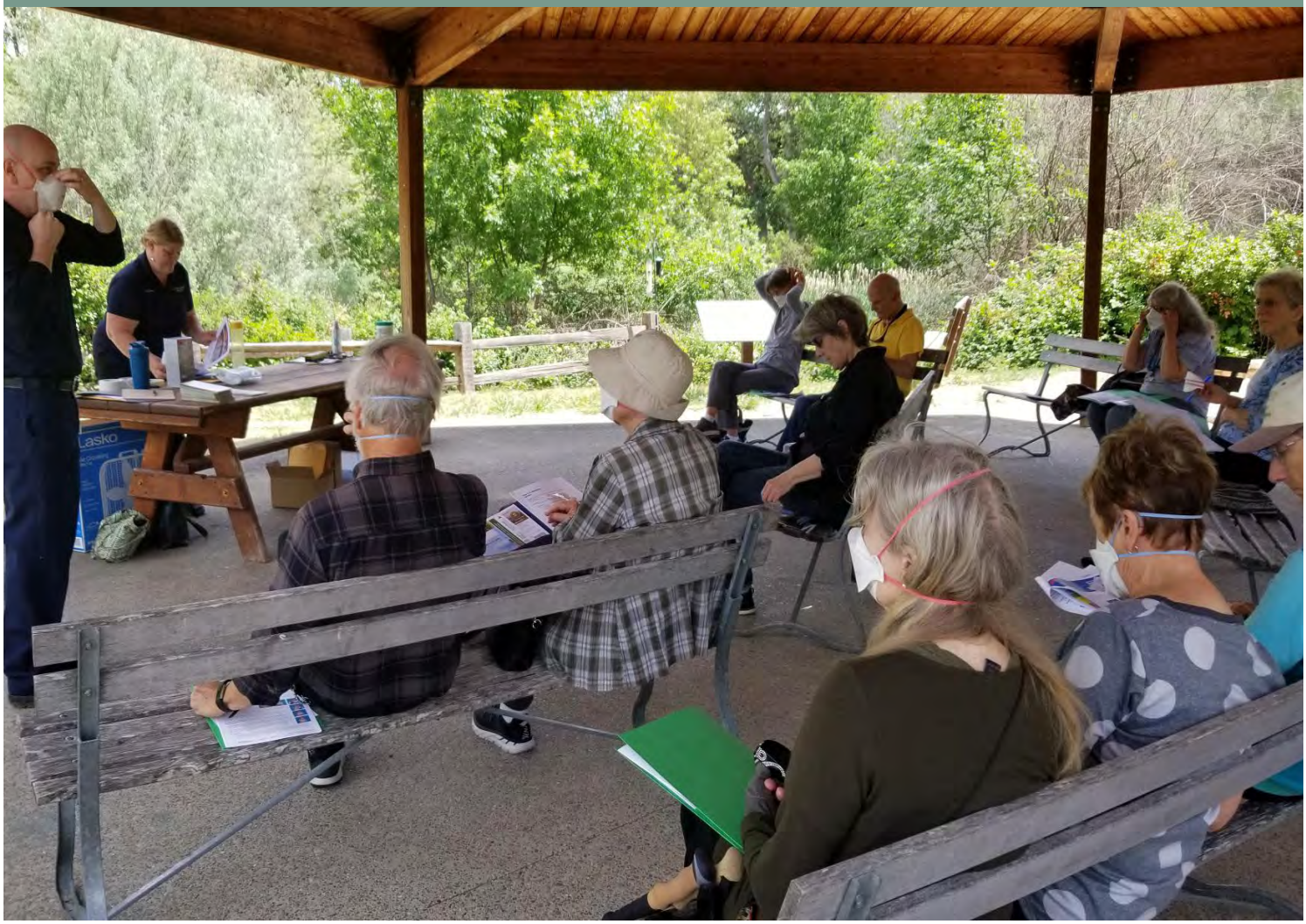

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About the Northwest Fire Science Consortium:

The Northwest Fire Science Consortium works to accelerate the awareness, understanding, and adoption of wildland fire science in Washington and Oregon. It connects managers, practitioners, scientists, local communities, and collaboratives working on fire issues on forest and range lands. The Northwest Fire Science Consortium is one of the 15 regional exchanges established by the Joint Fire Science Program's Fire Science Exchange Network to bring fire science users together to address regional fire management needs and challenges. Each regional exchange provides current and regionally relevant wildland fire science information to users in the region. For more information: http://www.nwfirescience.org/.

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Executive summary

Key themes

This report synthesizes peer-reviewed literature on public opinion regarding prescribed fire and associated smoke, with a focus on the Pacific Northwest. This body of literature finds widespread public support for prescribed fire on federal and state-managed lands, while also identifying concerns about smoke impacts, escaped fire, and recreational disruptions. The literature identifies the importance of effective communication strategies to improve public understanding and acceptance of prescribed fire, including educational campaigns, leveraging trusted local messengers, and providing actionable solutions for reducing smoke exposure. The reviewed literature further suggests that public health messaging should be integrated into prescribed fire communication efforts efforts in ways that are responsive to local populations' awareness and attitudes, to best ensure communities are well-prepared and informed about both the benefits and risks of prescribed fire.

The report includes several key themes in research on public opinion of prescribed fire and associated smoke:

1. **Support for prescribed fire:** The reviewed literature found that most studied participants expressed moderate to strong support for prescribed fire, particularly when it was framed as a tool for forest health and wildfire risk reduction (Shindler & Toman, 2003; Brunson & Shindler, 2004; Toman et al., 2014). However, this support was often for prescribed fire in the abstract and not based on direct experience (Brunson & Evans, 2005; McCaffrey & Olsen, 2012).

2. **Smoke concerns:** Concerns about smoke were a barrier to public acceptance of prescribed fire. Although some people were more willing to tolerate smoke when they understood its ecological benefits (Shindler & Toman, 2003; Toman et al., 2014), others—especially those concerned about health—remained opposed (Hamilton & Salerno, 2020; Brunson & Shindler, 2004); some studies found that concerns can vary by fire cause (Blades et al., 2014; Engebretson et al., 2016).

3. **Risk of escaped fire:** Fear that prescribed fires could escape control and threaten homes or lives consistently was among the public's top concerns (Brunson & Shindler, 2004; Shindler et al., 2009; A.S. Clark et al., 2022), especially in wildland-urban interface areas (Weisshaupt et al., 2005).

4. **Trust in agencies:** Public trust in land management agencies strongly influenced support for prescribed fire. People who trusted agencies to manage fire safely were more likely to support its use and accept its associated smoke (Winter et al., 2002; Shindler & Toman, 2003; Toman et al., 2014; Olsen et al., 2017).

5. **Wildlife impacts:** Concerns about harm to wildlife and habitat appeared frequently in the literature, though findings were mixed. Some studies linked these concerns to opposition for prescribed fire (Jacobson et al., 2001; Brunson & Evans, 2005), while others showed that wildlife-conscious landowners may support fuel treatments (Fischer, 2011). Research studying the effects of prescribed fire suggests moderate fire can benefit wildlife (Darracq et al., 2016; Hunter & Robles, 2020).

6. **Aesthetics and recreation:** Aesthetic and recreational concerns influenced public opinion but typically were less of a concern than safety or health risks. Some studies found that participants reported improved aesthetic ratings after prescribed fire (R. L. Ryan, 2012), while others note concerns about scenery and recreation access (Shindler et al., 2009; Hamilton & Salerno, 2020).

7. **Role of knowledge and education:** Educational interventions—such as brochures, visuals, and direct communication— improved public understanding and support for prescribed fire in several studies (Loomis et al., 2001; Engebretson et al., 2016; R. L. Ryan, 2012). People with more knowledge of the purpose of prescribed fire as a tool for meeting forest health objectives, reducing risk of wildfire, and/or seeing before and after photos of prescribed fire treatments were more likely to accept prescribed fire and its impacts (Loomis et al., 2001; Engebretson et al., 2016; R. L. Ryan, 2012).

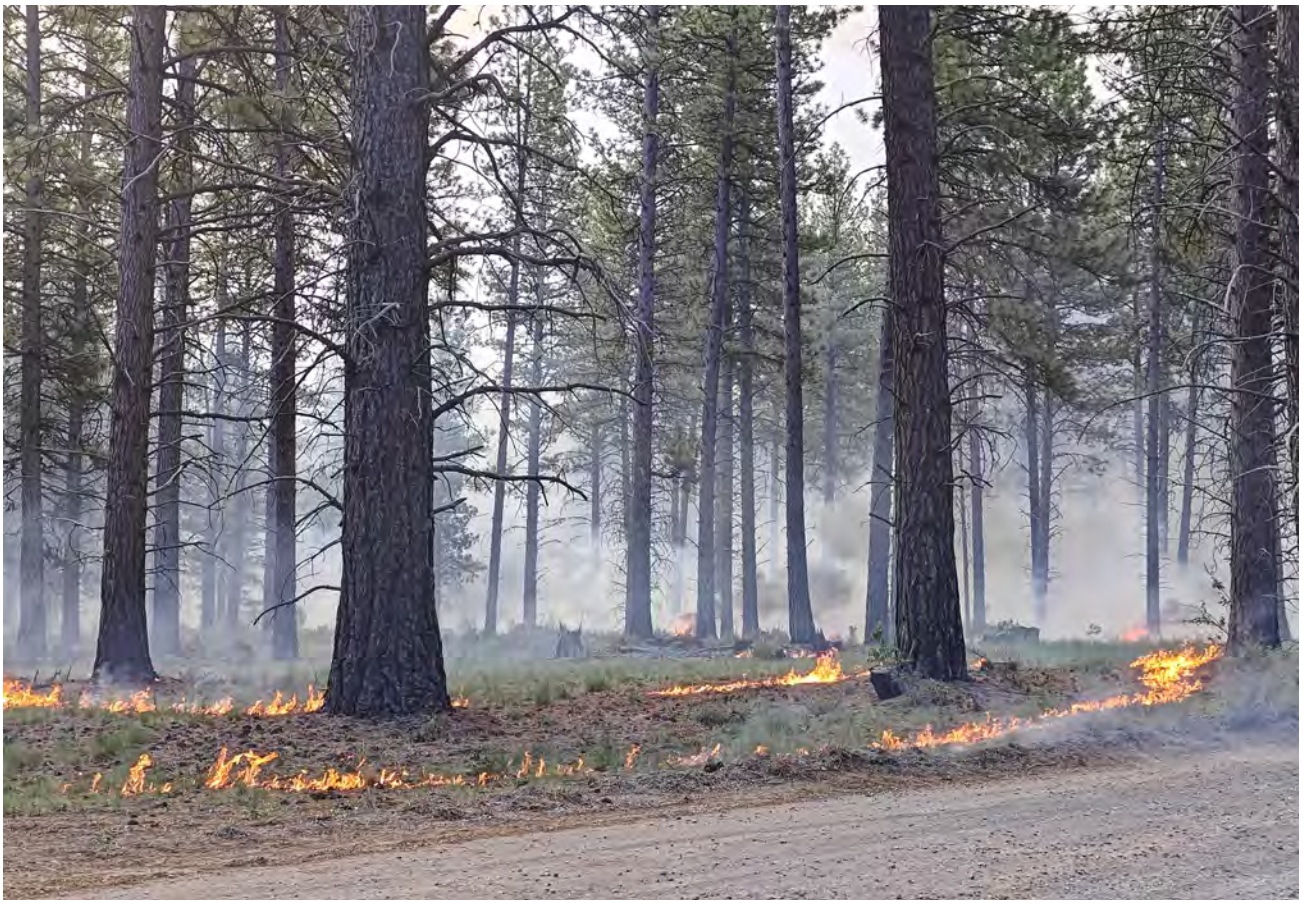
Gaps and areas for future research

While this review highlights key themes, it does not cover all aspects of public opinions of prescribed fire and associated smoke. Despite decades of research on public perceptions of prescribed fire, notable gaps remain.

Researchers could conduct more contemporary, real-time studies on public perceptions of smoke overall including health implications. This could more directly help inform the development of communication strategies tailored to this context. Few studies have examined public attitudes during or immediately after prescribed fire events, limiting our understanding of how real-time experiences shape support (e.g., Shindler & Toman, 2003; Brunson & Shindler, 2004). While study participants in the reviewed literature frequently expressed concern about smoke, the literature lacked consensus on how people perceive smoke from different types of fire or ignition sources (e.g., prescribed fire versus human-ignited and lightning-caused wildfires). More research is needed to understand whether (or how much) smoke source affects public opinion and how this knowledge could inform health-focused communication strategies. Moreover, most existing work does not focus specifically on communication approaches for prescribed fire, including message framing, delivery methods, and audience segmentation. Notable exceptions include D'Evelyn et al. (2023) and Kunkle et al. (2015), which begin to address these gaps but underscore the need for further targeted research.

Research has paid limited attention to the influence of education and knowledge about what to do to reduce smoke exposure during prescribed fire events. Although some studies show that educational interventions improve support, researchers have conducted only a small number of such studies and tested a limited range of interventions. Conducting more experimental research on the effectiveness of different educational tools and outreach strategies could help identify more specific, actionable, and effective strategies for practitioners communicating on these topics.

This review's narrow geographic focus limits its ability to account for regional and demographic variations that may influence public opinion. Additionally, the literature reviewed uses terms like "social acceptability" and "tolerance" inconsistently and employs varied measurement methods. These inconsistencies make it difficult to compare findings across studies and underscore the need for standardized definitions and metrics in future research.



Introduction

North American fire seasons—particularly in the American West—are growing in duration and severity (Coop et al., 2022; Hagmann et al., 2021; Jain et al., 2017; Parks & Abatzoglou, 2020). There are multiple reasons for these shifting fire regimes including longer, drier fire seasons due to climate change, as well as a century of suppression of low-to-moderate intensity wildfires resulting in large accumulations of forest fuels (Abatzoglou & Kolden, 2013; Abatzoglou & Williams, 2016; Hagmann et al., 2021; Jain et al., 2022; Radeloff et al., 2018).

In addition to the threats wildfires pose in terms of mortality risk and property damage (Buechi et al., 2021; Burke et al., 2021; Wang et al., 2021), the smoke generated from these fires presents other, unique threats to health and quality of life that affect exponentially more of the population than those that are affected by actual flames (Chen et al., 2021; Fann et al., 2018; Liu et al., 2015; Reisen et al., 2015; Rice et al., 2021; Wen et al., 2023; Sacks et al., 2025). Smoke from wildfires has been linked with respiratory, cardiovascular, and cerebrovascular impacts, especially for those with chronic conditions such as asthma and chronic obstructive pulmonary disease (COPD) (McCaffrey et al., 2022; Cascio, 2018; Gould et al., 2024; Heaney et al., 2022; Rice et al., 2021). Moreover, smoke from wildfires can be transported over vast distances, meaning that the health impacts of wildfire smoke are more widespread and can affect communities far away from the fire (Hung et al., 2021; Li et al., 2021; Magzamen et al., 2021; Vaughan et al., 2018). This makes smoke an especially pernicious consequence of fire. The United States is facing a future with more smoke both within and across years. This will create increases in both short-term and long-term exposures to smoke, and a larger threat to public health (Sacks et al., 2025; Connolly et al., 2024).

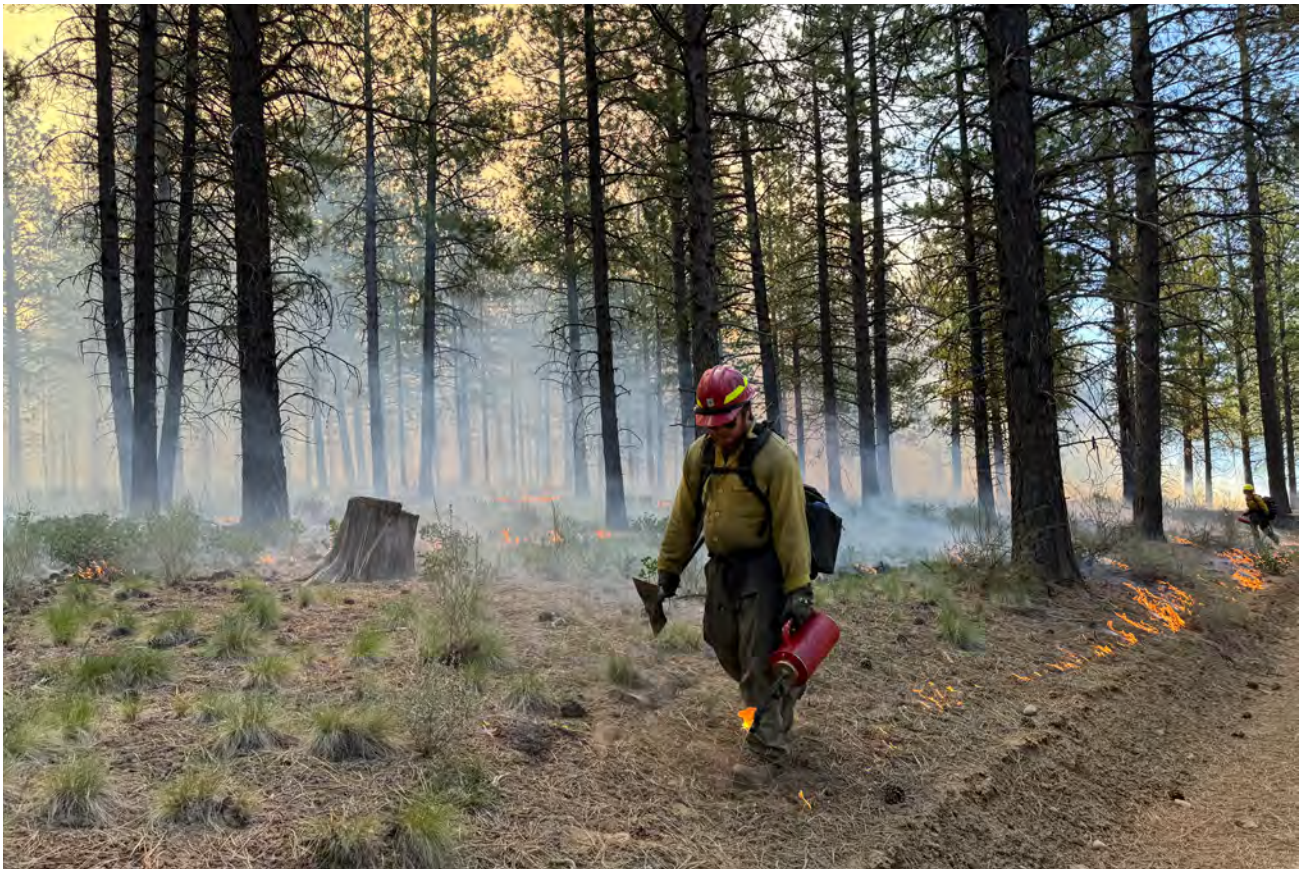
The prospect of continued and worsened fire seasons has sparked a resurgence of interest in forest management practices aimed at fuel reduction, including prescribed fire and thinning (Johnston et al., 2021; Pollet & Omi, 2002; K. C. Ryan et al., 2013; Shrestha et al., 2021; Stephens et al., 2012; Williams et al., 2023). Prescribed fire—the focus of this report— is one of the approaches that can reduce fuels in a cost-effective manner (Fernandes & Botelho, 2003; Jose et al., 2023; Kelp et al., 2023; Latif et al., 2021; Schollaert et al., 2023; Stephens et al., 2012). Restoring fire's ecological roles also necessitates an increase in the scale of prescribed fire across federally managed lands where suppression has been the primary guiding approach to fire for over a century. However, prescribed fire comes with its own set of obstacles—logistical, political, and social—including smoke emission (Brunson & Evans, 2005; Jones et al., 2022; Miller et al., 2020; Schultz et al., 2018; Swain et al., 2023; Williams et al., 2023). Some communities and land managers in the United States are hesitant about the use of prescribed fire, at least in part because of perceived public concerns related to smoke exposure, potential escaped fire, and carbon emissions (Joe et al., 2024; K. C. Ryan et al., 2013). In addition, an increase in both prescribed fires and wildfires will lead to fluctuating smoke levels for some communities, likely exposing them, at least initially, to more smoke than they have experienced before on an annual basis (Sacks et al., 2025).

Despite these challenges and concerns, however, there is also a key opportunity for land management and public health agencies in messaging about smoke impacts from prescribed fire. The need to plan prescribed fires in advance allows managers the flexibility to start or delay a prescribed fire until conditions are most favorable, which can help minimize smoke impacts (N. Clark et al., 2024; Sacks et al., 2025). This level of location-specific planning, coordination, and adjusting of cumulative smoke emissions and impacts provides a level of control over preparing for conditions in a shared airspace, in contrast to smoke conditions during a wildfire that cannot be planned for or easily altered (N. Clark et al., 2024). This opportunity for planning and communicating before planned prescribed fires means that effective strategies are both helpful and–from a public health perspective– essential for communicating about smoke from prescribed fires. Strategies that involve structured decision-making and communication within the planning process can provide communicators with a specific timeframe to proactively message about potential health risks and actions that can be taken to reduce smoke exposures before a prescribed fire (Joe et al., 2024).

A recent review of health risk communication materials around wildland fire smoke found limited resources that specifically addressed prescribed fire smoke-related health risks, with most messaging focused on wildfire smoke risks, though the authors note that communication strategies may be highly transferable between the two (Joe et al., 2024). This review also found that there were no overarching inter-agency frameworks for communicating about prescribed fire or any public health impacts from it. Some studies have found a lack of information on the strategies land managers and other practitioners use to communicate smoke-related health risks more generally (Joe et al., 2024; Fish et al., 2017), along with limited evaluation of messaging effectiveness (Sugerman et al., 2012; Joe et al., 2024). Although reducing exposure to smoke's health effects requires actionable information and a clear understanding of how best to deliver it, most peer-reviewed literature on prescribed fire smoke has yet to address health risk communication or public health actions aimed at reducing exposure. **In this report, we present a synthesis of peer-reviewed research on public opinion of prescribed fire and associated smoke, with a focus on literature from the Pacific Northwest.**

Comparative Assessment of the Impacts of Prescribed Fire Versus Wildfire (CAIF): A Case Study in the Western U.S

The U.S. EPA CAIF report was one of the first reports that aimed to assess the "differences in emissions, and air quality and public health impacts of smoke between prescribed fire and wildfire that could be informative to multiple levels of government as they engage and plan for future land and fire management activities" (U.S. EPA, 2021). The CAIF report also informs future research on air quality and public health impacts due to smoke from fire.



Approach

This report presents a qualitative review of peer-reviewed literature examining public opinion on prescribed fire and associated smoke, with an emphasis on studies conducted in the Pacific Northwest. This synthesis identifies patterns, consistencies, and inconsistencies in the literature, offering a disciplined scientific perspective on what the compiled information means (Smith, 2015). The report provides an overview of the current state of knowledge and is not intended as a comprehensive review of barriers to prescribed fire, which would include legal and political considerations that are already covered elsewhere (e.g., Miller et al., 2020; Schultz et al., 2018; Williams et al., 2023).

Identifying topic interest and review process

In collaboration with the Northwest Fire Science Consortium, we identified public opinion and communication about prescribed fire and associated smoke as a topic of key interest to public land managers and practitioners. We refined this topic scope during the West Bend Prescribed Fire Tabletop Exercise in late 2023 and through the request of land managers and their agencies within the Wildland Fire Leadership Council (WFLC), an intergovernmental committee of federal, state, tribal, county, and municipal government officials convened by the Secretaries of the Interior, Agriculture, Homeland Security, and Defense dedicated to promoting consistent wildland fire policies, goals, and management activities.

These recent state and national efforts have focused on expanding prescribed fire while addressing smoke as a public health concern. In 2023, the USDA Forest Service, U.S. Department of the Interior (DOI), U.S. Environmental Protection Agency (EPA), and U.S. Centers for Disease Control and Prevention (CDC) signed a national Memorandum of Understanding (MOU) and a FY 2024-2025 Cooperative Work Plan around wild-

land fire and air quality coordination. In 2024, the EPA tightened the annual PM2.5 standard to 9.0 μg/m³ to reflect updated health science (U.S. EPA, 2024). The West Bend Pilot Project (following the tabletop exercise noted above) was one of the first local efforts (in addition to work in California and Georgia) to respond to these priorities to align prescribed fire goals with public health protection, emphasizing public education and interagency coordination (R. Gordon, 2024). As these intergovernmental collaborations around prescribed fire evolved, we heard the need to understand what science tells us about how to improve the effectiveness of prescribed fire communications between government agencies and their publics. This report addresses that need by synthesizing existing literature.

In March 2024, we presented a draft of key findings from this literature review at a Wildland Fire Leadership Council (WFLC) meeting and gathered feedback from attendees. Five subject matter experts from the U.S. EPA also reviewed the draft findings in 2024 and provided feedback relative to their experiences and needs around communicating about prescribed fire smoke. We share key reflections from these discussions in a separate paper (Huber-Stearns et al., forthcoming), and we revised the draft based on their input. In September 2024, two additional subject matter experts—one from a federal agency and one from academia—reviewed the updated report. In spring 2025, members of the Northwest Fire Science Consortium conducted a final review.

Key considerations about report scope

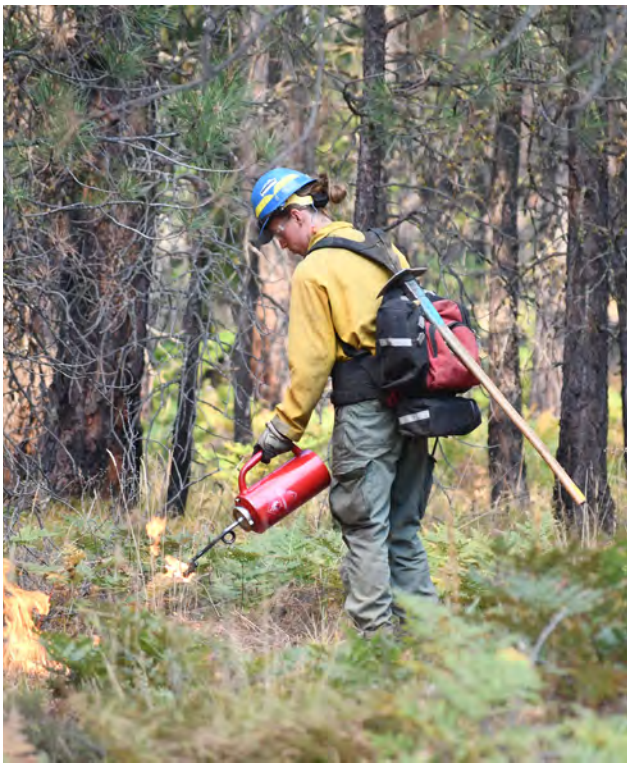
Our review focuses on the Pacific Northwest and does not offer a national or global perspective. While we included sources from across the U.S., we did so cautiously, recognizing that prescribed fire practices vary widely by region (A. S. Clark et al., 2022; Elmore et al., 2010; Rideout et al., 2003; Rosen et al., 2023; K. C. Ryan et al., 2013). Research shows that "one-size-fits-all" approaches to wildland fire policy and engagement are ineffective due to regional differences (Brunson & Shindler, 2004; Paveglio & Edgeley, 2023). Prescribed fire serves multiple purposes—beyond fuels reduction—including soil restoration and invasive species management. As such, communication strategies must reflect regional goals, though comparative research on this topic is lacking.

We reviewed studies on prescribed fire across land ownerships (state, federal, Tribal) and agencies, though most of the studies focused on federal lands. Our goal was to identify communication strategies that have been shown in academic research to support public preparedness and understanding of prescribed fire and its impacts, including smoke impacts. We excluded literature on wildfire smoke communication to focus on strategies for proactive health risk communication that are afforded by pre-planned and often adaptable prescribed fire operations (Joe et al., 2024). Researchers have addressed wildfire smoke communication in other reviews (Fish et al., 2017; Remenick, 2018; Santo et al., 2021). After identifying limited empirical research examining any aspect of communicating about prescribed fire (including around health impacts or anything else), we broadened our focus to include studies on public opinion of prescribed fire with the assumption that a better understanding of public opinion could help guide effective communication strategies. We found limited empirical research on how to communicate all aspects of prescribed fire—especially in the Pacific Northwest—so we broadened our focus to public opinion more generally.

To provide a comprehensive understanding of the academic literature on public attitudes toward prescribed fire—and given the limited research available—we included foundational studies dating back to 1984. These early works were among the first to explore this topic and offer valuable historical context. We present their findings clearly, with dates and contextual details, to help readers situate them in time. While we acknowledge the importance of these early contributions, our analysis emphasizes the more recent literature identified in our review to reflect current perspectives and ensure the work remains grounded in contemporary research. This approach enables us to trace the evolution of public opinion while maintaining both relevance and rigor.

Throughout this report, we use the terminology found in the literature when relaying findings. For example, we use "social acceptability" to reflect how authors frame these issues in some research. However, we also acknowledge that framing the public as needing to simply accept or tolerate more smoke conflicts with current trends in prescribed fire and smoke communication that focus on the growing need to address and mitigate the public health impacts of wildland fire smoke, regardless of its source. Despite these differences in framing and

messaging (i.e., "tolerate" vs. "mitigate"), we believe that understanding the science behind concepts like 'public tolerance' or 'social acceptability' can nonetheless help managers and researchers identify opportunities to improve communication and integrate protective public health actions with ecologically appropriate land management.



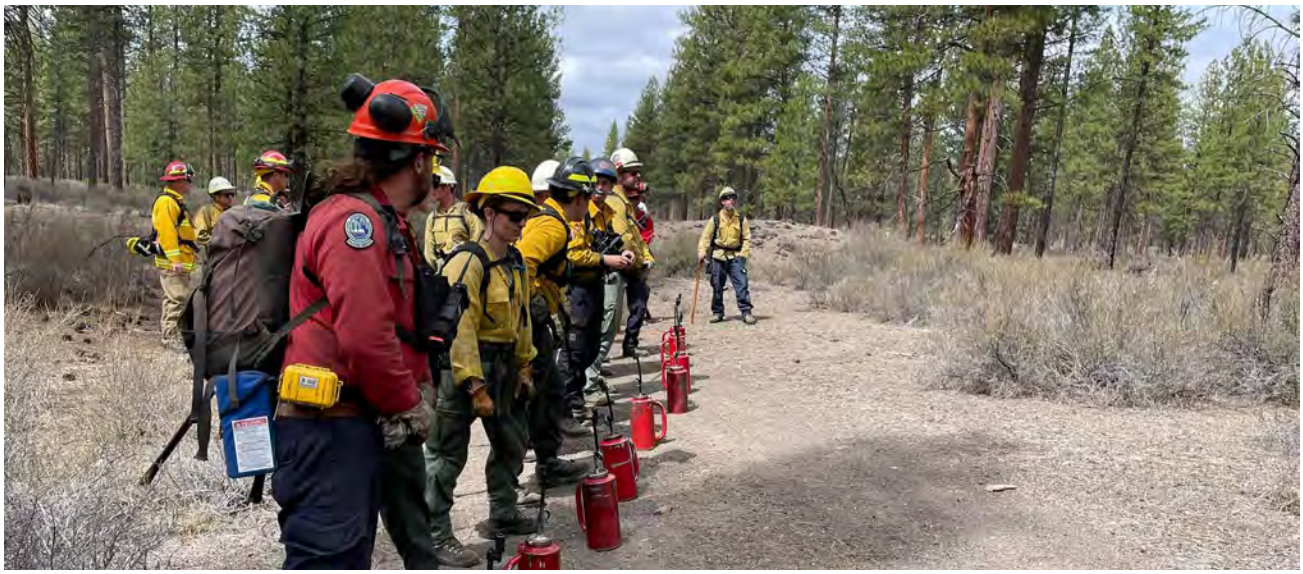
Literature search strategy

Between February and May 2024, we used the Google Scholar academic search engine and the following search phrases to identify articles: "prescribed fire and public opinion," "prescribed fire and homeowner attitudes," "prescribed fire and attitudes," "prescribed fire and policy support," and "prescribed fire and behavior." We did not put date limitations on our search. We also substituted "prescribed fire" with "controlled burning" and "planned burning" to create a total of 15 unique search phrases. We ordered the search results in Google Scholar by 'relevance,' which we selected after pilot searches showed that the literature base was small and that relevant articles not appearing in the first 250 results typically appeared with more relevancy under a different search phrase. We assessed topical relevance by reviewing titles and abstracts.

We excluded articles that did not mention both prescribed fire (or controlled/planned burning) and public opinion (e.g., attitudes, policy support) or behavior in the title or abstract. For example, we excluded articles that discussed legal or regulatory barriers to prescribed fire but lacked data on public opinion or behavior. After this initial screening, we further narrowed the list by removing articles focused outside the United States. This criterion ensured that the studies we included reflected similar regulatory, political, and cultural contexts.

We sought to focus our review on content relevant to the Pacific Northwest (PNW) in the United States. However, many articles examined public opinion across a broader area, including some locations in the PNW along with other locations in the western US. Due to limited peer-reviewed research on public opinion of prescribed fire and associated smoke conducted exclusively in the PNW, we included studies from other parts of the United States, while primarily maintaining a focus on the western portion of the country. We conducted a preliminary scan on all identified articles to determine whether they contained data on public opinion or behavior related to prescribed fire. We retained articles with new data (e.g., survey results) and literature reviews that addressed public opinion or behavioral data and excluded any articles that did not meet these criteria. For articles with data specific to the Pacific Northwest, we conducted a reverse citation search to identify additional relevant studies. We manually reviewed the resulting citations to check for any missing articles that met our criteria, but we did not find any additional ones.

This process yielded 78 articles for in-depth review. We reviewed each of these articles alongside our guiding objective of identifying research that can help inform communication strategies that improve public preparedness and understanding of prescribed fire and its impacts. We further excluded articles that did not provide relevant information to this end after an in-depth review. Ultimately, we included 40 articles in this literature review, with dates ranging from 1984–2024.



Findings

1.1 Public opinion of prescribed fire and associated smoke

Research on what has been termed the "social acceptability" of prescribed fire and associated smoke has emerged in roughly the past three decades, although the literature is small compared to social science research around wildland fire more broadly (Dupéy & Smith, 2018). Most of the studies included in this review used a combination of surveys (typically mail-out) and small focus groups to gather data on public perceptions of prescribed fire and associated smoke impacts. In the sections below, we highlight findings from the literature that cover public opinion of prescribed fire and any correlations, frequently noted public concerns about the practice, and any identified outreach efforts to foster more public preparedness, including ways to reduce exposure to impacts of prescribed fire smoke.

General support for the use of prescribed fire

Studies across the U.S. generally found relatively high levels of support from homeowners for prescribed fire as a fuel reduction technique. Most of the literature we reviewed focused on federal land management and did not differentiate between types of prescribed fire (e.g., pile vs. broadcast burning), instead addressing the practice more generally. In early work, a 2003 study in eastern Oregon and Washington found that nearly 90 percent of survey respondents supported at least some use of prescribed fire (Shindler & Toman, 2003). A year later, surveys in Oregon, Arizona, Colorado, and Utah showed similar results, with more than 90 percent of respondents supporting some prescribed fire use (Brunson & Shindler, 2004). In that study, respondents in Oregon showed the highest level of support compared to those in other states. A decade later, a 2014 study reported that roughly three-quarters of participants from western (Arizona, Colorado, Oregon) and Midwest/Lake states (Michigan, Minnesota, Wisconsin) supported prescribed fire (Toman et al., 2014). Toman et al. (2014) distinguished between levels of discretionary use and found that 44 percent of respondents believed local and federal forest agencies should have full discretion over where to use prescribed fire, while 41 percent preferred its use only in selected areas. A 2009 study in the Great Lakes region (Michigan, Minnesota, Wisconsin) reflected similar findings: 38 percent of respondents agreed that federal land managers should use prescribed fire whenever they saw fit, while 44 percent supported limited use in carefully selected areas (Shindler et al., 2009). Over the past forty years, other studies using samples from western, midwestern, and eastern U.S. states also found moderate-to-strong general support for prescribed fire (Blanchard & Ryan, 2007; Brunson & Evans, 2005; Cortner et al., 1984; Engebretson et al., 2016; Gardner et al., 1985; Hamilton & Salerno, 2020; Lim et al., 2009; Loomis et al., 2001;

Manfredo et al., 1990; McCaffrey & Olsen, 2012; R. L. Ryan, 2012; Shindler & Reed, 1996; Taylor et al., 1986; Taylor & Daniel, 1984; Thapa et al., 2023; Toman et al., 2011; Vogt et al., 2005; Weisshaupt et al., 2005). Across these studies, respondents generally said they believed that "controlled burns" or "prescribed burns" could reduce fire risk and support forest management.

Although many studies found relatively high levels of support for the use of prescribed fire, there were key nuances. In studies that compared mechanical thinning and prescribed fire, respondents tended to rate prescribed fire as less acceptable or similarly acceptable as mechanical thinning (Brunson & Evans, 2005; Brunson & Shindler, 2004; R. L. Ryan, 2012; Shindler et al., 2009; Shindler & Reed, 1996; Toman et al., 2014; Vogt et al., 2005). Very few of the studies targeted a more discreet pool of participants who had recent or relevant experience with prescribed fire, and very few measured attitudes during or immediately after a nearby prescribed fire. As a result, participants typically expressed abstract support rather than forming opinions through recent, direct experiences with prescribed fire and smoke. In addition, most studies we found on this topic were over a decade old, suggesting the need for more contemporary work on the issue.

Concerns about smoke from prescribed fire

Smoke was identified as a recurring theme across many studies of public perceptions of prescribed fire over the last 20 years, with many finding that concerns about smoke where a key factor in public support or acceptance of prescribed fire. A variety of the studies identified concerns about smoke and air quality impacts as key barriers to public support or acceptability of prescribed fire. Some also identified a negative association between public concerns about smoke from any source and the acceptability of prescribed fire. In other words, researchers found that when people were more worried about smoke—no matter where it came from—they were less likely to support the use of prescribed fire. Hamilton and Salerno (2020), for example, reported that participants in central Oregon perceived prescribed fire as harmful to air quality, and those more concerned about smoke expressed less support for the practice. In early work, Loomis et al. (2001) reported that only 26 percent of Florida residents opposed prescribed fire due to smoke. Similarly, Piatek and McGill (2010) found that just 26 percent of private forest owners in West Virginia said they would not tolerate smoke. Brunson and Shindler (2004) also found that surveyed participants from western U.S. states ranked smoke as a greater concern than other issues, such as fire's impact on scenery. Studies using surveys and focus groups highlighted smoke as affecting public perceptions of prescribed fire (Brunson & Evans, 2005; A. S. Clark et al., 2022; Jacobson et al., 2001; Lim et al., 2009; Loomis et al., 2001; Olsen et al., 2017; Shindler et al., 2009; Weisshaupt et al., 2005; Winter et al., 2002). More recently, Olsen et al. (2017) reported that 55 percent of residents in Oregon, California, Montana, and South Carolina considered smoke from prescribed fire acceptable. Some of this research suggested that the relationship between smoke concerns and prescribed fire depended on people's prior knowledge of the practice; we discuss this further below.

Some research about public concern about smoke from prescribed fire has found that acceptance levels are influenced by other factors. For example, Shindler and Toman (2003) found that in their Oregon and Washington sample, 68 percent of participants in 1996—and 58 percent in 2000—agreed that smoke was acceptable if it led to healthier forests. Other studies noted that respondents often viewed smoke as less concerning than risks like escaped fire or harm to wildlife (Blanchard & Ryan, 2007; Shindler et al., 2009). Focus group data from eastern Washington and western Montana showed that people felt more accepting of smoke when agencies clearly explained the rationale and methods behind prescribed fire (Weisshaupt et al., 2005).

Evidence also varied on whether the perceptions of smoke risk depended on the fire's cause. One survey in Oregon, California, Montana, and South Carolina found that participants tolerated smoke from prescribed fires and wildfires at roughly equal levels (Engebretson et al., 2016). However, another study found that participants expressed less acceptance for smoke from prescribed fire than for smoke from lightning-caused fires (Blades et al., 2014; see also Olsen et al., 2014). These differences in findings across studies highlight two important takeaways from this body of literature:

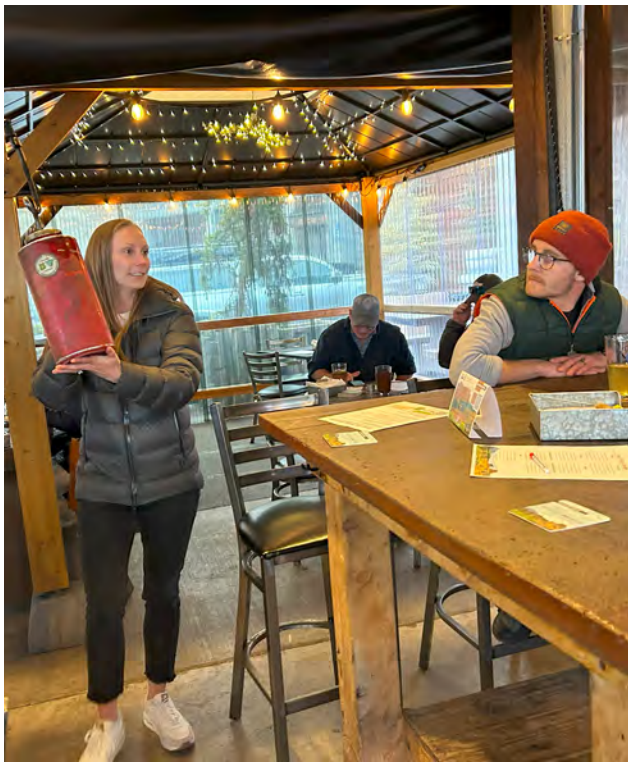
1. Research to date on public opinion of prescribed fire smoke has been varied and differences in populations queried and how questions are asked has likely led to disparate findings; and
2. The body of literature has not as a whole provided a consensus on how the public at large perceives smoke from prescribed fire that can be generalized outside of studied groups to broader populations.

1.2 Other key influences on public opinion of prescribed fire

Public perception of smoke from prescribed fire is the focus of this literature review—the research included in this review all provides some insight on this topic. However, much of this literature did not focus exclusively on smoke but rather includes it as just one of many factors that can influence public opinion of prescribed fire. While the previous section shows that smoke is clearly a concern that can affect public opinion of prescribed fire, it is important to note that there are other influences on this public opinion. In many of the studies, concerns about smoke were just one of several factors influencing public perceptions of prescribed fire and were often less prominent than other concerns. This section describes the other, non-smoke factors that were consistently found in this body of literature to affect public opinion of prescribed fire.

The risk of escaped fire

When researchers asked homeowners to rate their degree of concern about potential negative aspects of prescribed fire, they commonly expressed concern about escaped fires causing property damage or threatening lives as a leading concern. In the early 2000s, participants in studies conducted in Arizona, Colorado, Utah, and Oregon identified safety during prescribed fires as a primary concern (Brunson & Shindler, 2004). In an early study, Weisshaupt and colleagues conducted focus groups in eastern Washington and western Montana and found that participants hesitated to support prescribed fire near homes in the wildland-urban interface. Participants cited concerns about "escaped burns" (defined as prescribed fires out of prescription) as a reason for opposition (2005). Shortly after, data from Utah supported the idea that concerns about property damage and risks to human safety represented key sources of opposition when participants responded to questions about prescribed fire (Brunson & Evans, 2005). Across the 2000s and early 2010s, several studies in the Great Lakes region showed that participants listed escaped fire as a primary concern about using prescribed fire in the region (Shindler et al., 2009; Toman et al., 2014; Winter & Fried, 2000). Throughout this period, studies in Massachusetts (Blanchard & Ryan, 2007) and Florida (Jacobson et al., 2001) reported similar findings. More recently, in their review of research on prescribed fire and factors affecting support in the Great Plains region, A.S. Clark and colleagues noted that concerns about escaped fires posed one of the primary obstacles to broader acceptance of the practice (2022).



Trust and confidence in federal agencies managing prescribed fire

Public trust and confidence in federal land management agencies to safely and effectively manage prescribed fires closely relates to the issue of escaped fire. Most research in this area has focused on federal agencies and federal lands. In one of the earliest studies, Winter et al. (2002) engaged residents from Florida, California, and Michigan in focus groups and found that agency trust and perceived ability to control fire shaped participant attitudes toward prescribed fire. The following year, Shindler and Toman (2003) reported that participants in eastern Oregon and Washington showed stronger support for prescribed fire when they trusted the U.S. Forest Service. Vogt et al. (2005) provided similar evidence using data from California, Florida, and Michigan, where they found that confidence in agency capacity to implement prescribed fires predicted acceptability.

This meant that people were more likely to support prescribed burns when they trusted the agencies in charge to do them safely and effectively.

In a comparative study, Toman et al. (2011) surveyed residents in Oregon and Utah living near public lands and found that Oregon participants had higher confidence in agencies than Utah participants. In statistical models that included variables like age and gender, agency confidence emerged as the strongest predictor of prescribed fire acceptability. Building on this work, Toman et al. (2014) surveyed residents in western (Oregon, Arizona, Colorado) and Great Lakes (Michigan, Minnesota, Wisconsin) states and again found that confidence in agencies and managers to carry out prescribed fires served as the strongest predictor of support (see also: Shindler et al., 2009; Shindler et al., 2014; Steel et al., 2023). Olsen et al. (2017) analyzed survey data from Oregon, California, Montana, and South Carolina and found that confidence—or lack thereof—in state and federal agencies to carry out prescribed fire safely correlated with acceptance of smoke from prescribed fires.

Perceived adverse effects on wildlife

Public concern about the effects of prescribed fire on wildlife has emerged as a consistent theme in research over the past two decades, with findings evolving over time. In an early study, Jacobson et al. (2001) reported that participants in Florida ranked harm to wildlife as one of their top concerns—second only to escaped fire. Brunson and Evans (2005) then found that among those concerned about prescribed fire in their Utah sample, loss of fish and wildlife habitat was a common concern. Fischer (2011) surveyed forest owners in Oregon and found that those who expressed greater concern for wildlife were more likely to implement fuel treatments on their land. This contrasted with more recent work by Hamilton and Salerno (2020), who conducted research in eastern Oregon and found that concerns about harm to wildlife reduced support for prescribed fire. When McCaffrey and Olsen reviewed related literature in 2012, they noted that many studies identified concerns about impacts on wildlife. Some studies on the effects of prescribed fire suggested that moderate fire benefited wildlife, though risks still existed (Darracq et al., 2016; Hunter & Robles, 2020; Knapp et al., 2009; Russell et al., 2009).

Impacts on aesthetics and recreation

Researchers have also explored how concerns about aesthetics and recreation influence public acceptance of prescribed fire and some of the earliest research on public opinions of prescribed fire focused on this these concerns. In one of the earliest studies, Taylor et al. (1986) identified aesthetic and recreational impacts as recurring concerns in the literature, echoed by McCaffrey & Olsen (2012). In a 1984 article, Taylor and Daniel showed people photos of forest areas before and after a prescribed fire. People thought the areas looked better after the fire. However, the photos did not influence perceptions of recreation, which in this study primarily related to camping access and smoke exposure (see also: Taylor et al., 1986). In other early work, Manfredo et al. (1990) conducted a national survey (which had an oversample in Montana and Wyoming) and found that, regardless of whether participants supported or opposed prescribed fire, many believed it would damage the landscape's aesthetic qualities.

More than a decade later, Jacobson et al.'s (2001) Florida sample found aesthetics ranked as a concern about prescribed fire, but less so than others such as escaped fire or wildlife harm (see also: Lim et al., 2009). Brunson and Shindler (2004) reported that nearly 50 percent of participants in Oregon, Arizona, Colorado, and Utah agreed that fuel reduction techniques like prescribed fire should proceed even if they negatively affected scenery—though they viewed aesthetic concerns as less important than risks like escaped fire. In a follow-up study, Shindler et al. (2009) surveyed residents in Michigan, Wisconsin, and Minnesota and found that aesthetic concerns ranked sixth (42 percent), just behind smoke (43 percent), while recreation impacts from activities such as camping ranked ninth (35 percent). R. L. Ryan (2012) found that participants in New York and Massachusetts who frequently used forested areas for recreation and wildlife viewing expressed greater support for prescribed fire.

More recently, Hamilton and Salerno (2020) also found in their central Oregon sample that concerns about aesthetics from use of prescribed fire were linked to lower acceptability. Recreation concerns were also mentioned in this study but were not associated with reduced acceptability of prescribed fire.

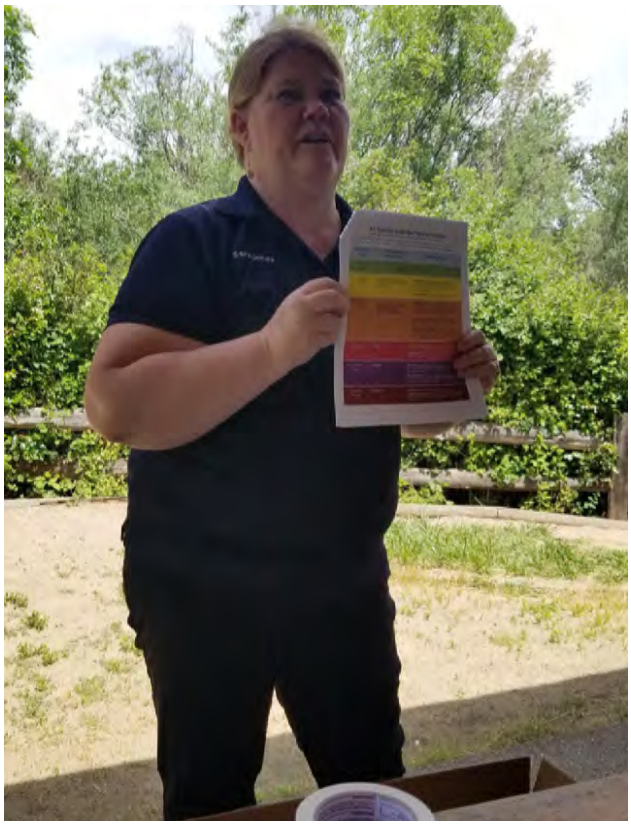
1.3 Improving public understanding of prescribed fire: The roles of prior knowledge and educational interventions

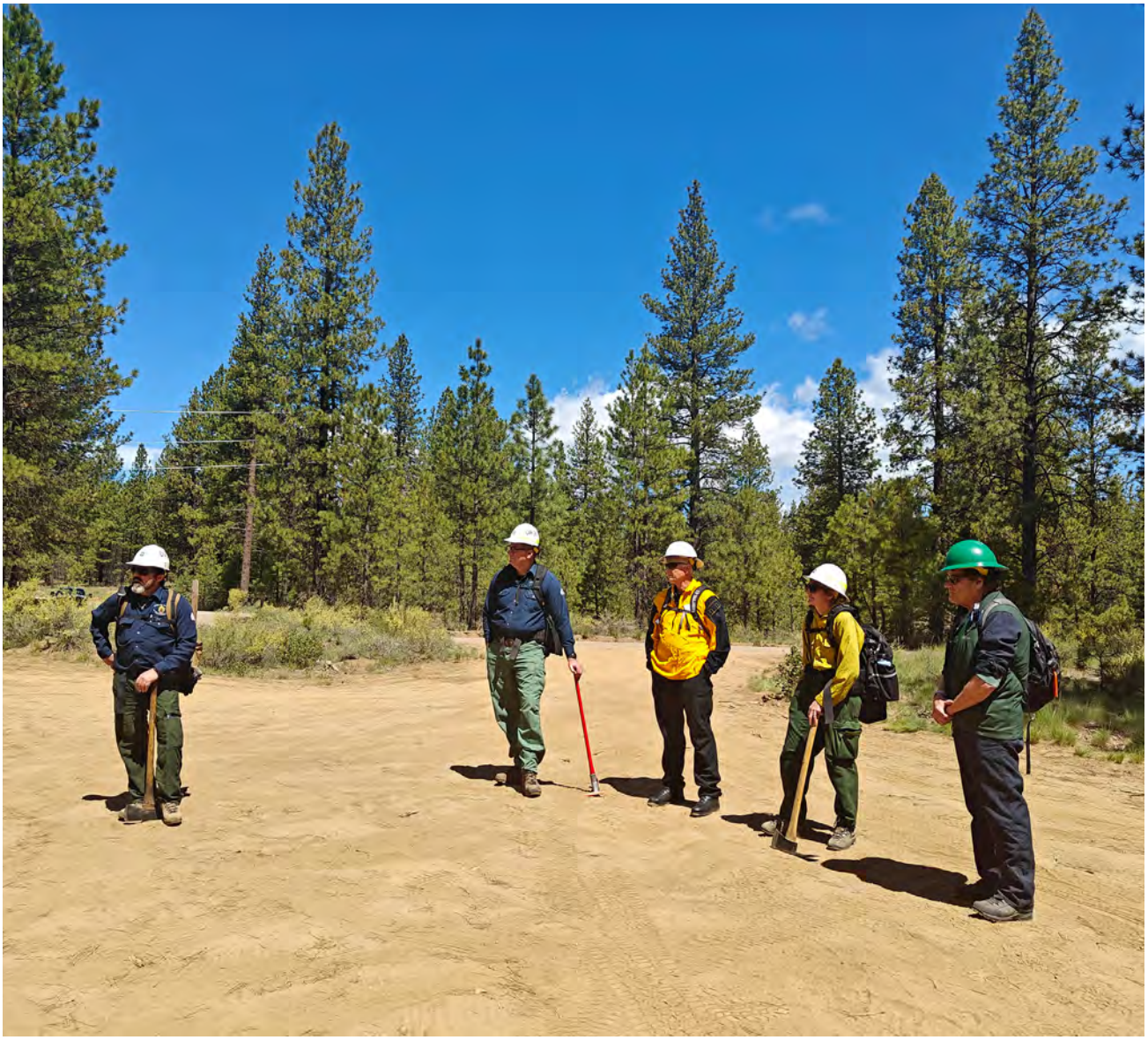
As noted in earlier sections, multiple studies have found that people's prior knowledge of prescribed fire influenced their perceptions of both the practice and the smoke that it produces (Brunson & Evans, 2005; A. S. Clark et al., 2022; Jacobson et al., 2001; Lim et al., 2009; Loomis et al., 2001; Olsen et al., 2017; Shindler et al., 2009; Weisshaupt et al., 2005; Winter et al., 2002). Furthermore, educational efforts—especially informational interventions—have been found across studies to increase public understanding and acceptance of prescribed fire while reducing negative attitudes toward the practice (McCaffrey & Olsen, 2012). Over time, researchers have identified specific aspects of prescribed fire and smoke that can inform these interventions and improve communication about public health actions during smoke events. These efforts are not meant to simply increase acceptance of smoke, but rather to support informed decision-making.

In one of the earliest studies, Cortner et al. (1984) found that increased knowledge about prescribed fire led to greater public support. A few years later, Manfredo et al. (19901) surveyed a national sample and reported that participants who knew more about prescribed fire were more likely to support it. More than a decade later, Blanchard and Ryan (2007) found a similar pattern in Massachusetts, where participants who reported greater familiarity with prescribed fire expressed stronger support.

In recent years, Thapa et al. (2023) studied wildfire management in California's wildland-urban interface and found that homeowners with more self-reported knowledge about prescribed fire showed greater interest in seeing it implemented locally. Earlier, McCaffrey (2004) reported that Nevada residents who had seen educational materials about prescribed fire were more likely to say they understood and accepted its use. Similarly, Olsen et al. (2017) found that in Oregon, California, Montana, and South Carolina, higher education levels correlated with greater acceptance of smoke from prescribed fires. Lim et al. (2009) reported comparable findings in the southern U.S.

Beyond observational studies, several researchers have tested the effects of specific educational interventions. For example, Engebretson et al. (2016) found in their survey results that simply mentioning the forest health benefits of prescribed fire increased public acceptance. In an earlier study, Loomis et al. (2001) provided educational information over the phone to Florida participants and observed a drop in reported opposition to prescribed fire due to smoke—from 26 percent before the call to 17 percent after. R. L. Ryan (2012) used an intervention that showed participants forest stand photos before and after treatment by mechanical thinning or prescribed fire, which appeared to increase overall approval of prescribed fire. Decades earlier, Taylor and Daniel (1984) created brochures explaining the role of fire in the landscape and distributed them to participants in Arizona. This intervention led to increased knowledge and more positive attitudes toward prescribed fire. Taken together, these studies—though limited in number—illustrate diverse approaches to providing information about prescribed fire and suggest that well-designed educational interventions can improve public understanding and support for prescribed fire.





Conclusion

Public land managers and health agencies can build or advance collaborative relationships with communities to support effective messaging and action. Sacks et al. (2025) emphasize that advancing smoke exposure science requires studies that track exposure duration, frequency, and intensity to better protect public health in a smoke-prone future. Similarly, McCaffrey et al. (2022) identify key information gaps on prescribed fire smoke, including understudied health effects, economic trade-offs, and the lack of centralized guidance on standards and actions.

For more information about prioritizing communication about protective health actions during smoke events, see Huber-Stearns et al. (forthcoming). Additional resources, like Kunkle et al. (2015), outline best practices for prescribed fire communication, and Santo et al. (2021), share lessons from wildfire communication and offers transferable insights for effective smoke messaging.

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