



Public Health Impact of Prescribed Fire: Report on Listening Sessions with Community Members, El Dorado and Nevada Counties, California

November 8, 2021



**Environmental Health Investigations Branch
Center for Healthy Communities
California Department of Public Health**

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Table of Contents

FUNDING STATEMENT AND ACKNOWLEDGEMENTS..... 2

ABSTRACT..... 5

KEY TAKE-AWAYS..... 6

INTRODUCTION AND BACKGROUND 8

METHODS 10

RESULTS 11

 LISTENING SESSION PARTICIPANTS 11

 POLL RESULTS (SEE APPENDIX A FOR COMPLETE POLL RESPONSES) 11

 LISTENING SESSION—COMMUNITY MEMBERS’ COMMENTS 13

Domain 1: Attitudes and concerns about prescribed fire 13

Domain 2: Health symptoms and conditions from smoke 19

Domain 3: Health and exposure protective behaviors 24

Domain 4: Messaging—what content is desired..... 28

Domain 5: Messaging—how information is communicated..... 32

Domain 6: Emerging themes..... 41

DISCUSSION..... 50

CONCLUSION..... 53

APPENDIX A: POLL RESULTS..... 54

APPENDIX B: POST-LISTENING SESSION SURVEY RESULTS 58

APPENDIX C: CONTENT FROM LISTENING SESSION 63

APPENDIX D—DETAILED METHODS..... 69

BIBLIOGRAPHY 73

ABSTRACT

Background: California plans to substantially increase vegetation treatment of land, including the use of prescribed fire, to reduce the risk of catastrophic wildfires and improve forest health. Although prescribed fire offers an important tool to reduce wildfire risks, concerns exist about the public health implications of smoke generated by prescribed burning.

Methods: In December 2020, the California Department of Public Health held virtual Listening Sessions with residents living in Nevada and El Dorado Counties, of the Sierra Nevada foothills, to gauge community knowledge, attitudes and perceptions of the health impacts of prescribed burns, and messaging preferences.

Results: Participants voiced strong support for prescribed fire as a means to reduce the life-threatening risks presented by wildfires, while emphasizing the importance of safety measures. Most participants reported experiencing negative health impacts from smoke exposures, with wildfire smoke being considered a more significant threat than prescribed fire smoke. Residents in these high wildfire risk areas described experiencing anxiety when they smell smoke, creating a compelling need to quickly determine whether the source is wildfire or prescribed fire. The desire was expressed for a centralized source for authoritative, accurate information.

Conclusions: The overall feedback from residents was that more notification for prescribed fire is needed. They also perceived a need for alternative communication methods, such as phone or text, as many areas lack quality internet. Participants felt that increased education about prescribed fire should be implemented to improve support for and understanding of the practice. They advocated both a broader public media campaign as well as local community educational activities.

KEY TAKE-AWAYS

This report covers findings from two Listening Sessions in the wildland-urban interface (WUI) of the Sierra Nevada foothills held virtually with Nevada and El Dorado County residents in December 2020. We heard directly from residents about their knowledge of prescribed fire, health- and exposure-protective behaviors, perceived health effects, and attitudes towards prescribed fire. Residents are actively seeking solutions to the threat of wildfires, and offered ideas not limited to what agencies could do, but what they could additionally do as communities.

Prescribed fire is strongly supported by residents as a useful tool

- Prescribed fire is seen as a key tool to protect residents from life-threatening wildfire risks.
- Participants shared that their quality of life has been greatly affected by the pervasive smoke that large wildfires emit.
- They would rather have the perceived trade-off of smaller episodes of appropriately planned prescribed fire, than extensive wildfire smoke episodes which from experience have a much greater impact on their quality of life.

Residents have become highly sensitized to wildfires

- Previous experiences with wildfires have affected some residents' level of apprehension about future wildfire events.
- Any smoke can create anxiety and residents need to quickly determine with confidence if it is from a wildfire or prescribed fire.
- They want an authoritative information source to help them determine this.

Residents reported experiencing health impacts from smoke

- Most participants experienced smoke symptoms, with some being more serious.
- They view wildfire smoke as posing the more significant health threat, but recognize some individuals are sensitive to smaller amounts of smoke.

Resident support for prescribed fire is accompanied by caution

- Participants stressed the importance of careful planning and monitoring by agencies (e.g. CAL FIRE and CARB).
- Residents want assurance about prescribed fire safety.

Private landowners would benefit from a system and support in notification methods.

- Landowners find it burdensome to manage notifications and they seek a systematized way to handle this.
- Residents seek knowledge about whether smoke is from a wildfire or neighbor's burn.
- Better coordination of landowner burns could create an added benefit of more clear air.
- Increasing the number of green waste disposal days was suggested to reduce the need to burn excess vegetation.

Participants suggested a need for more information than they currently receive about prescribed fire

- They seek advance notice and more detail about when and where to expect smoke.
- Differences in air quality data sources were noted and participants felt they would benefit from more clarity.
- They desire information on effectiveness of products such as air filters and guidance, including recommendations on which to purchase.
- They shared support for multiple channels for dissemination of information.

Participants felt that the lack of reliable internet poses a significant barrier

- During wildfires, local internet sites may fail as many people try to log on (this concern was in addition to insufficient availability of authoritative information about smoke events).
- Suggestions were made for alternative solutions such as text- or phone-based notification systems.
- Power outages can commonly occur with fire events and threaten internet channels of communication.
- Some residents, e.g. older ones, require alternatives to internet sources.

Concerns about access and equity, especially for low-income populations were expressed

- There is concern about access to protective resources (e.g. availability and affordability for portable air cleaners).
- Residents expressed the need for low-cost alternatives for protection.

Participants shared a need for education to build support and understanding for prescribed fire

- Residents expressed a need for greater education about prescribe fire, its benefits, and how it is done.
- They believe that a person-to-person approach would be effective.
- They support community-level education and events, such as a fun, community festival in partnership with a local fire agency and community groups.
- They expressed interest in connecting with and learning from indigenous groups about prescribed burn practices.
- Participants suggested educational activities could be efficiently accomplished through existing structures and frameworks like Firewise and Fire Adapted Communities.
- They recommended educational materials about prescribed fire and wildfire be routinely provided to new residents.

INTRODUCTION AND BACKGROUND

California is facing a turning point in its relationship with wildlands and fire. In 2020, over four million acres of land burned across California,¹ causing smoke to blanket much of the state during the height of the fires.² Current climatological projections indicate that significant wildfire seasons and the smoke they produce are anticipated to continue in California and the western United States.³

To reduce wildfire risk, especially large and catastrophic wildfires, CAL FIRE and the US Forest Service have entered into a joint agreement to substantially increase the use of prescribed burning in California, with the goal of treating one million acres of land annually by 2025. This represents a dramatic increase from previous years.⁴

Although prescribed fire plans are designed to minimize air quality impacts to populations, even prescribed fire will produce smoke. Substantial scientific literature has demonstrated health effects associated with wildfire smoke.⁵ However, very few studies exist to date on prescribed fire's potential impact on public health and this is increasingly recognized as an information gap.⁶



¹ CAL FIRE. *A Summary of All Incidents (2017-2020)*

² European Commission. *CAMS Monitors Smoke Release from Devastating US Wildfires*. Copernicus Atmosphere Monitoring Service, 2020.

³Westerling et al. (2006)

⁴ State of California (2020)

⁵ (Reid et al. 2016) and (Liu et al. 2014)

⁶ (Schweizer, 2017), (Prunicki, 2019), (Haikerwal, 2015), (Williamson, 2016)

Definition: Prescribed fire (or prescribed burning, terms to be used here interchangeably) is the planned and controlled application of fire to the land, under specified, low-risk weather conditions. Prescribed burns may be conducted not only to help prevent high-intensity wildland fires by reducing the quantity and continuity of wildland fuel, but to achieve other benefits, such as promoting forest ecological health, improving wildlife habitat, watershed management and range improvement.

This research aims to understand the community's perspective and experience with prescribed burns and wildfires, asking:

- What are broad community health impacts and concerns regarding prescribed burns and wildfires?
- What do communities need to protect their health, given the planned increase in prescribed burning?

The study is part of a larger research study with the overarching goal of investigating the potential public health impact of increasing prescribed burns in California. Our purpose in this research study is for public health, air quality, and other agencies to utilize its findings to better inform and protect communities likely to experience impacts from wildfires and prescribed fire.

To this end, CDPH held Listening Sessions to hear directly from community members in areas at high risk for wildfires that also experience prescribed fires. Specifically, we sought to gather information about their knowledge of prescribed fire, health- and exposure-protective behaviors, perceived health effects, and attitudes towards prescribed fire.

METHODS

Listening Sessions were held virtually in Nevada and El Dorado Counties, on December 2 and 9, 2020, respectively, in the Sierra Nevada foothills of the wildland-urban interface (WUI).

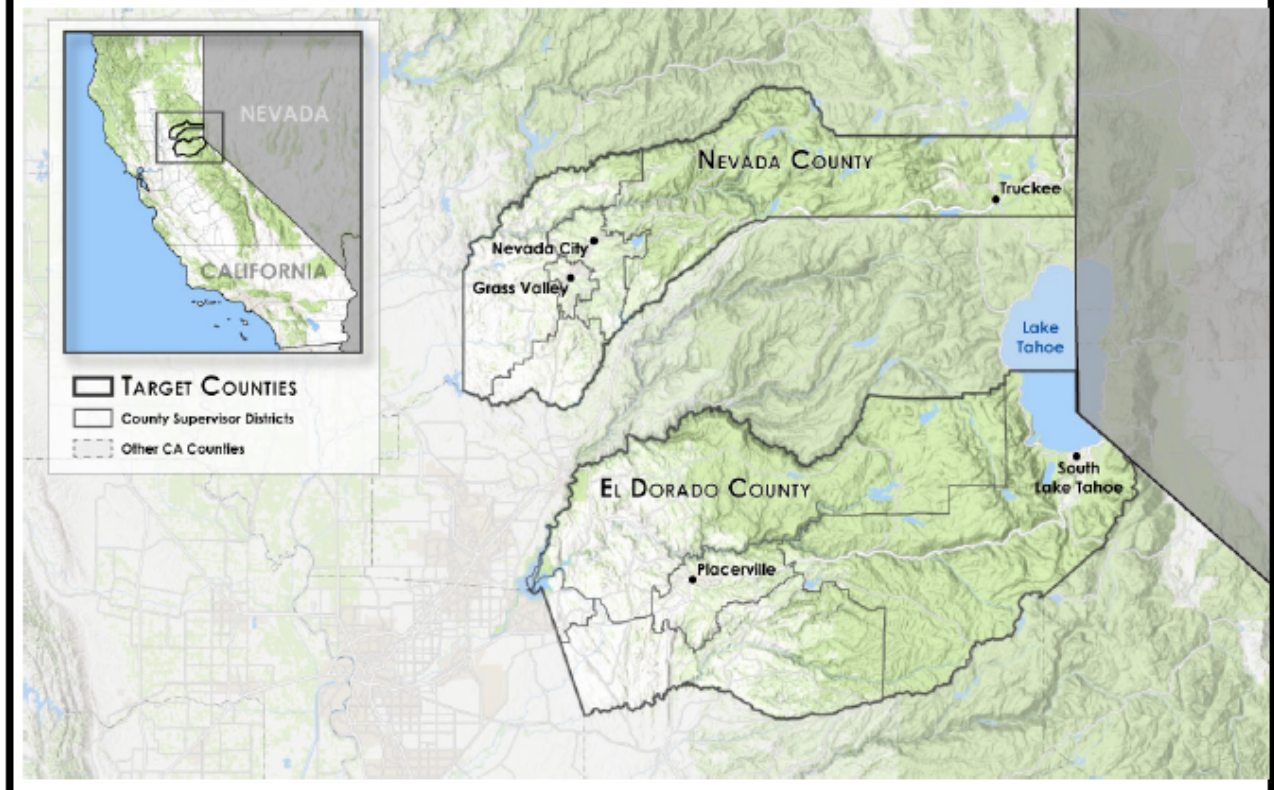
Recruitment was conducted using primarily a convenience sampling method. To enhance diversity, we sought to recruit subjects from different county supervisorial districts, which generally vary by income levels and characteristics such as rural or town-dwelling.

The Listening Sessions consisted of a main room, breakout rooms, polls, whiteboard notes, chat; a post-session poll was also taken via email. Sessions were recorded and transcribed by software. We sought input across five specific content Domains:

- 1) Attitudes and concerns about prescribed fire
- 2) Health concerns and symptoms from wildfire and prescribed fire smoke
- 3) Health- and exposure-protective behaviors—actions taken and barriers
- 4) Messaging desired content—information and level of detail desired
- 5) Messaging and communication—sources, effectiveness

A detailed description of methods is available in Appendix D.

Figure 1: Map of Nevada and El Dorado Counties, location of virtual Listening Sessions, December 2 and 9, 2021, respectively.



RESULTS

Listening Session participants

The Nevada County and El Dorado County Listening Sessions were conducted on December 2 and December 9, 2020, respectively. The sessions were held from 6-8 p.m. A total of 24 Nevada County and eight El Dorado County residents participated. We combined data for the counties for purposes of confidentiality. The distribution of participant characteristics was very comparable.

The majority of residents were long-term, rural residents. While the largest political affiliation was liberal (38%), moderates and undisclosed each comprised one-fourth of the group, with 9% identifying as conservative. Excluding five retirees, employment types included 22% in health care, 22% in community or social services, 30% in management, skilled profession, or other office-based occupation. Participants in occupations involving familiarity with firefighting, emergency response or air quality comprised 15%.

Poll results (See Appendix A for complete poll responses)

Although Listening Session participants were generally familiar with wildfires and most with prescribed fire, some reported little knowledge or familiarity with prescribed fire. Overall, however, participants likely had more experience with fire than county residents on average. Poll data generally was consistent with and thus served to confirm the experiences and opinions qualitatively expressed by participants in breakout and main room discussions, whiteboard, and chat notes.

Knowledge and experience with prescribed fire and wildfires

- Most participants were aware of at least one prescribed fire in their area (72%) and had smelled smoke (69%) from a prescribed fire in their area.
- Many (41%) had themselves participated in some way in a prescribed fire.
- Others (29%) reported no experience with prescribed fire, or little or no familiarity with prescribed fire.
- Nearly all had experienced a wildfire in their area (91%).

Health effects of smoke

- A majority of residents (61%) reported their health has been negatively impacted by smoke (either wildfire or prescribed fire).
- A majority (72%) indicated their health has not been affected by smoke from a prescribed fire.
- No participants indicated their health had been seriously impacted by prescribed fire smoke.

Prescribed fire notifications

- A minority of participants (16%) reported receiving notifications about prescribed fires, either by text or email
- 59% indicated they have not received notifications about prescribed fire but would like to receive this information.

Prescribed fire concerns

- One-fourth reported concern about prescribed fire because it could get out of control.
- 100% indicated support for having more prescribed fire because it reduced the risk of large wildfires.
- A large majority supported prescribed fire for ecological reasons, reducing invasive species or improving areas for cattle grazing.
- 6% indicated lack of familiarity with the benefits and risks of prescribed fire.

Increased prescribed fire as policy

- A majority of participants indicated their support for the policy of increasing prescribed fire (79%).
- Another 21% indicated that they could support this policy, but wanted to know more or had other reservations.
- No participants indicated they did not support the policy, or were unaware, or did not know.

Managed fire policy

- All but one participant (who selected “didn’t know”) expressed support for the policy of allowing fire agencies to manage fire in a controlled manner for a beneficial purpose.
- No participants indicated opposition to the policy.

Confidence in protecting oneself from smoke health impacts

- Participants generally indicated confidence in their ability to protect their health from smoke impacts.
- A few reported either having knowledge but not being confident in their ability to protect themselves, or having little knowledge and confidence.

Listening Session—community members' comments

The following sections are designed to convey an overall picture of community members' responses to the questions posed in each of the content Domains.

Note: Gender-neutral pronouns (e.g. they, their) were used instead of specific pronouns (e.g. he/she).

Domain 1: Attitudes and concerns about prescribed fire

Domain 1 Summary: Attitudes and concerns about prescribed fire

Given their residence in Sierra Nevada foothill communities, participants voiced awareness of wildfire risks, both directly from the fire itself and from the associated health impacts of smoke.

Participants were overwhelmingly supportive of prescribed fire, considering the practice essential in enabling their ability to survive in the area.

Safety and prevention of catastrophic wildfires were described as the primary reason for prescribed fire.

Participants identified secondary benefits, including ecological (forest health and habitats), aesthetic (preventing wildfire scarring of the landscape), and economic (avoiding the economic damage caused by wildfire) as additional positive outcomes of prescribed fire.

Support for prescribed fire was conditional. Participants recognized that prescribed fire still produces smoke, which therefore presents exposure risks and potential negative health impacts.

Concerns were voiced about prescribed fire getting out of control. Participants emphasized the imperative for proper planning and oversight to prevent escaped fire.

Participants voiced reservations that other members of the community might not be adequately educated about or in support of prescribed fire.

Domain 1 Findings: Attitudes and concerns about prescribed fire

Overall positive perceptions of prescribed fire

“We need to be burning a lot of material out here. And we all know, everyone who has land out here has to deal with a lot of material, a lot of branches falling and little trees growing up. It’s definitely a big part of our lives out here. And it [prescribed fire] feels completely necessary if we’re to survive at all.”

Generally, participants from both Listening Sessions were supportive of prescribed fire, with the most salient reason expressed being the need to reduce risk of more dangerous, catastrophic wildfires. It was also viewed that those fires could create smoke that would cause issues not only near the fire origin, but in areas that would affect more people.

“We need to be burning a lot of material out here. And we all know, everyone who has land out here has to deal with a lot of material, a lot of branches falling and little trees growing up. It’s definitely a big part of our lives out here. And it [prescribed fire] feels completely necessary if we’re to survive at all.”

Participants also often expressed that prescribed fires produce much smaller amounts of smoke than wildfires, so they perceived the health impact as lesser.

“One of my big reasons that I’m really supportive of prescribed fire is because I feel like it reduces the amount of catastrophic fire and that catastrophic fire is where we get really bad smoke releases, and the prescribed burns are so much less smoky than the catastrophic wildfires that I’ve seen.”

“And so I think for us that compromise of losing a little air quality to prevent the out-of-control fires is worth it.”

“I’m okay with a little bit more smoke, because I think of what it prevents. And I think over the next period of—you know—five to ten years or so if we had more prescribed fires, we can really cut back

on what the potential is for uncontrolled wildfires. . . . But we've gotten to a point where so much of the forest in areas so out of control that we—there's a compromise that has to be made there. And so I think for us that compromise of losing a little air quality to prevent the out-of-control fires is worth it."

"I think that I would prefer to—myself—prefer to have some prescribed burns going on, cleaning up work, than . . . having a major fire come through, which would be more damaging. Not only that, but I think it causes a lot more smoke and health problems across the valley. . . . By not having those prescribed burns, we have issues with the fires getting way out of control, causing a lot of issues with people who live not only in the area where the fire is, but with the people who live in the valley."

The negative economic and ecological impacts of wildfires were also raised as a reason to support prescribed fire.

"So ultimately, that means that the cost [prescribed burn approach] is less to the local economy and, and also really to the overall state economy. You start having these huge wildfires and millions and millions of dollars that we're spending, because the size of the fires And then what's lost during that time, whether it's related to, you know, farming type of things, livestock grazing area, wildlife, forest areas, or . . . recreational areas, you lose so much from that."

"I can look out and see the damage that the XXX Fire has caused today. . . . You can see the scars that are left by it, which is much more devastating than prescribed burns. You know, I don't think the prescribed burns are anywhere close to as damaging. . . for the health of the environment."

The concept that smoke from wildfires could be more dangerous if the fire spreads to burning structures arose several times.

". . . And when you have structures burned, you've got a lot more toxic, you know, paint and insulation and plastic and things like that burning."

Concerns about prescribed fire—conflicting feelings

However, a number of concerns were nevertheless expressed over the course of the sessions. Although participants in these Listening Sessions were quite supportive of prescribed fire, it was recognized that their opinion was not uniform in their communities.

"I think a lot of people are still against prescribed burns and aren't fully on board with how important and necessary they are to control future wildfire."

It was further acknowledged that there was a trade-off between wildfire and allowing prescribed fire.

"But unfortunately, I think for the area we live in, that it's a little bit of taking a pick of the choice of the two evils—having some smoke that can be, uh, have negative health effects for people, but get rid of the fire danger, or live with the fire danger."

"When there are forest fires or prescribed fires, I have to use my inhaler quite a bit."

At least one participant shared they were conflicted because they personally experienced health effects.

"So I'm in the middle of the forest. So they [prescribed fires] go on all around me, for several months of the year, of course, not every day, but during certain times, it'll be every day. In fact, a big one was just down at the end of our street. . . . I have a lot of issues, I have asthma, I'm asthmatic. And as long as the air quality is good, I don't have to take my inhaler. When there are forest fires or prescribed fires, I have to use my inhaler quite a bit. . . . However, all that being said, it's very important for us, in my opinion, to do this. I agree that it needs to be done for the safety of many, but it really affects my health."

Concerns about prescribed fire—safety concerns about escaped fire

Despite this group's stated support for prescribed fire, there was the recognition that escaped fire was a risk, with the view that fires started could get out of control. Concerns about escaped fire were often paired with comments about the need for appropriate preparation and oversight:

"To me, the primary concern is making sure that it's planned properly, so that the fire doesn't get out of control. [This] has to do with the conditions, the weather, all those kind of things. And then, again, part of the planning of making sure that the weather being appropriate, because that certainly helps to dissipate the smoke. And I know there's a battle that certainly goes back and forth between air quality or the fire district as to when the appropriate time is to burn. Those are kind of the main things as far as I'm concerned."

"I think there's a lot of fear around them, I've noticed—for people being fearful that they would get out of control, but in my experience, I haven't really seen that."

Concerns extended to private landowners conducting burns, with some desire for agency involvement and oversight for greater assurance of safety. It was also felt to be important to reassure residents that adequate crew, water and contingency plans were in place, and a concern that there's a perception that a prescribed burn may not be under control if there is no visible staff present to monitor the burn.

"It's always an issue going on with the prescribed burns, that they could get out of hand."

"It's always an issue going on with the prescribed burns, that they could get out of hand. And I agree with [another participant] that it has to be watched, and it has to be monitored. Unfortunately, some of the prescribed burns are—they set fire to it, and then leave it."

"People say, I don't see any staff out there. Perception is not controlled situation." [whiteboard]

"I think one point that may need more attention is educating the public on how to safely and properly conduct a permitted burn on their private property. . . . In addition to health issues, I think there is quite a bit of fear behind people conducting private permitted burns, fearful that the fires can become escaped and threaten neighbor's homes." [chat]

Awareness of prescribed fire

Although this group of participants were on average more familiar with prescribed fire than the general public, the interest and need for greater awareness was expressed.

"I became aware of prescribed burns AFTER the event when they became news for going out of control, but was never aware beforehand of any." [chat]

Challenges and the pressure to conduct prescribed burns

Although the prevention of wildfires as well as ecological reasons are clear reasons for prescribed burns, private landowners are faced with the simple need to dispose of vegetation waste from their property.

"I would like to think that people understand that we can't get rid of this stuff. We don't have the ability to get rid of the green waste we're collecting. So we get stuck with having to burn as the only way we can get rid of this stuff. But there's such a narrow window even in the spring from when the snow melts, when we can—to when it becomes unsafe and burn, it's almost down to a couple of weeks. In the fall side is a little bit better, it just depends on when we start getting storms at this altitude."

**Domain 1 Recommendations and desires expressed by participants:
Attitudes and concerns about prescribed fire
Prescribed fire**

- Be sure burn plan is thorough to ensure safety
- Provide visible personnel monitoring fires for reassurance
- Enable residents to get rid of green waste from their properties to reduce how much burning is required

Domain 2: Health symptoms and conditions from smoke

Note: Domain 2 does not have a Recommendations and desires section; it focuses on reporting what participants described.

Domain 2 Summary: Health symptoms and conditions from smoke

Most, but not all, persons felt that their health had been negatively affected by smoke. Smoke exposures that resulted in adverse health impacts generally were attributed to wildfire sources.

Nearly all participants reported experiencing adverse physical symptoms from wildfire smoke. Most reported symptoms and conditions did not result in utilization of the healthcare system, so these events represent impacts that would not be captured in other analyses of the health impacts of wildfire smoke.

Physical symptoms that have been noted in response to wildfires such as burning or watery eyes, headache, runny nose, and nausea were reported. Potentially more serious health conditions and symptoms were also reported, including asthma, shortness of breath, chest pain, and heart palpitations.

Less-common health impacts mentioned included inhalation of poison oak and skin dryness. One participant shared an anecdote about how they felt smoke had contributed to their measurably low oxygen saturation levels.

Adverse mental health impacts as a result of smoke took several forms. These included feelings of depression from needing to stay indoors for prolonged smoky periods. Many participants reported worry, anxiety or hyper-vigilance prompted by smoke, related to concerns that smoke could be indicative of a nearby wildfire threat. The level varied from concern to a state of fear.

Domain 2 Findings: Health symptoms and conditions from smoke

Health symptoms reported—prescribed vs. wildfire smoke

Although a few participants reported distinguishing between wildfire and prescribed fire smoke, participants generally associated their symptoms with episodes of wildfires, so unless otherwise noted, comments should be viewed in that context. When a moderator in one group asked specifically about prescribed burns, that group said they were not affected by the smoke produced by those and were not concerned about them. One person who reported being able to distinguish smoke types reported experiencing a lesser reaction to prescribed fires.

“My reaction anyways, personally, is different to prescribed burning fire than the wildfire, and I’m suspecting that’s because of all the other, maybe inorganic, materials that go up in wildfires that produce the higher volumes of particulates. While I have reactions when I’m close and in the smoke of prescribed fires because of work, I do get some of the symptoms, but not as significant as when there’s a large wildfire nearby or the smoke gets blown into our region.”

“So I’m in the middle of the forest. So they [prescribed fires] go on all around me, for several months of the year, of course, not every day, but during certain times, it’ll be every day. In fact, a big one was just down at the end of our street. . . . I have a lot of issues, I have asthma, I’m asthmatic. And as long as the air quality is good, I don’t have to take my inhaler. When there are forest fires or prescribed fires, I have to use my inhaler quite a bit. . . . However, all that being said, it’s very important for us, in my opinion, to do this. I agree that it needs to be done for the safety of many, but it really affects my health.” (This quotation is also included in Domain 1, Attitudes.)

Health symptoms reported—general

Smoke from fires caused health symptoms for nearly all of the participants, including those associated with asthma, such as shortness of breath, runny nose, nasal congestion, nausea, headache, and burning, itching or watery eyes. Participants felt that many people have chronic health problems that are affected by smoke, including serious ones. Some more specific conditions were also raised, either pertaining to themselves or a child or parent.

“Heart palpitations. Burning eyes. Blowing nose more.”

“I have asthma, and the smoke definitely triggered it. So sometimes I have a hard time breathing and my throat will get irritated and itchy and then I’ll just like have a chest congestion and a little bit of difficulty breathing. And then it also sometimes will affect my eyes as well. They’ll just get burny.”

“For those of us with chronic illness, symptoms can range from burning eyes and respiratory issues to full blown body involvement because of activation of mast cells. Some can go into an anaphylactic reaction.”

“I have chest pains, have trouble breathing. I have a pulse oximeter. So it allows me to know what my oxygen saturation level is. And I have gone—believe it or not, down to 82. Now I do have oxygen in the house. So I just go on my oxygen level. Up here, most

“I have chest pains, have trouble breathing. I have a pulse oximeter. So it allows to allows me to know what my oxygen saturation level is. And I have gone—believe it or not, down to 82.”

people—I say 99% of everyone—do not have air conditioning. So we don't have a method of cleaning or clearing our air that we breathe. So even though the house may be shut down, we still get the smoke in from the outside. But if I go outside, that's where this last episode occurred where my oxygen saturation was very low.”

“And I also find that the wildfire smoke is really drying on my system and so summertime, the climate here, I mean it tends to be dry here anyways, but my skin will feel dry from that smoky air, and just my whole system will tend to feel more dehydrated and stuff like that.”

“But that progressive—like consecutive days of wildfire smoke—and not being able to go outside, I noticed also has like an effect on my ability to get enough exercise and be outside and get vitamin D, because I'm inside more to avoid the smoke.”

“So my mom, she's 74 so she's actually here, was here through our fire season and she actually has now an emphysema diagnosis since then.”

One participant emphasized that they did not experience any health symptoms related to smoke, although they indicated they would take action to put distance between them and the burn if the smoke got close.

“I have not experienced the same respiratory issues that they've had [others in the breakout room].”

“No, no, doesn't bother me at all. The only thing I hate about smoking (is) cigarette smoke. I won't let anyone smoke cigarettes around the house.”

“I have not experienced the same respiratory issues that they've had [others in the breakout room]. . . . I have not had the heart palpitations, respiratory [symptoms].”

Symptoms reported—mental health

“There is trauma. Now, whenever I see a burn of any size, I call to see if we need to act.” [whiteboard]

Anxiety was a key theme. People who have experienced wildfires have heightened or hyper-awareness about possible wildfires. If they smell any smoke, they can experience anxiety and will immediately try to determine if it is wildfire or prescribed burn. Participants reported that there are residents who are refugees from the deadly Camp Fire that occurred in nearby Butte County in 2018.⁷ However, Listening Session participants who were not themselves Camp Fire refugees or personally affected by the Camp Fire also reported experiencing this reaction.

- *“Smell smoke can lead to PTSD” [whiteboard].*
- *“There is trauma. Now, whenever I see a burn of any size, I call to see if we need to act.” [whiteboard]*
- *“Stress associated with fires is very real (we are exposed in a rural area).” [whiteboard]*
- *“My mom lived in constant fear of fires.”*
- *“I would definitely say I watch smoke and fire and don't relax until I know that it is being contained.”*

There was possibly some ambiguity between what was a physiological reaction to the smoke itself and a stress-related response.

“I'm up in XXX. . . . We're definitely rural. And we definitely sat in a lot of smoke this year with just the wildfires. So my experience—I can't really speak to health impacts when it comes to prescribed fires but it—you know that we all sat in smoke for a good five weeks up here. . . . Everything in my heart did kind of react, like I noticed that if I was exerting myself, I was out of breath and my heart was really pumping pretty quick from not very much activity also. . . . I don't know. I think a lot of us carry a lot of damage that could be kind of more noticeable around prescribed burns just because of what we went through this year.”

It was further raised by one participant that particularly among persons who are already dealing with mental health issues, this can be a triggering event. This participant works in a professional capacity with clients who can experience anxiety and panic when they smell smoke. They described that for these persons, although they may be familiar with what steps to take if there is smoke and how

⁷ CAL FIRE News release (2019)

to protect their health, they may go into panic mode and not remember what to do in these situations.

Participants identified mental health stress due to not being able to go outside during poor air quality. However, most of these symptoms were attributed to wildfire smoke and not prescribed burns.

“And I think that that pattern of being inside has health repercussions. And I know that I've talked to friends too. During that time period, they found themselves a little bit more depressed because of not being able to go outside.”

There was also the sense that having ability to protect oneself from smoke was not only helpful to alleviate symptoms but to feel better emotionally as well.

“Yeah, I had to work in it [meaning outside in smoke], for parts of the day, every day. I'm really impacted by it. And getting that relief of coming home was, I mean, it was palpable, like, stepping into the house, right? I was changing out the HVAC filter pretty regularly. I noticed it was picking stuff up. It just gave me the peace of mind at least that I wasn't out in smoke anymore.”

Domain 3: Health and exposure protective behaviors

Domain 3 Summary: Health and exposure protective behaviors



Participants expressed general familiarity with commonly recommended actions to reduce exposure and protect health such as sheltering inside, utilizing air filters, and masking.

During past wildfire seasons, participants shared experiences of being unable to purchase equipment that would allow them to engage in exposure protective behaviors, such as air filters or respirators due to supplies being sold out.

Issues of equity, specifically that community members might not be able to afford respirators, air filters, or even the materials to construct a do-it-yourself (DIY) filter using a fan and MERV filters were also expressed.

Questions were also posed about how to determine which products to purchase to most effectively engage in exposure protective behaviors, how effective these devices were (e.g. different air purifiers, DIY fans with air filters, respirators), and how to properly operate them.

Participants shared that community members often lack air conditioning in their homes, and that many of these same homes cannot be tightly sealed to prevent intrusion of outside smoke. These widespread shortcomings in the construction and design of built environments seemed to present an obstacle for many community members who seek to engage in exposure protective behaviors, according to participants.

Domain 3 Findings: Health and exposure protective behaviors

“I was very aware of running out of resources and several points going, there's nowhere left to go and there's no filter left to use. And there's no end in sight.”

Measures taken and challenges

Participants were generally quite familiar with common health and exposure protective measures. They reported taking measures such as staying indoors; avoiding all outdoor activity, including not going for a walk like they usually do; using N95 masks if they were available; purchasing air filters; and running their air conditioners on recycle. One participant reported drinking tea to stay hydrated.

Participants raised a number of challenges in their efforts to protect themselves, including not being able to access protective equipment.

“I was very aware of running out of resources and several points going, there's nowhere left to go and there's no filter left to use. And there's no end in sight.”

“I know for me personally, there were a few things I tried to get that were just sold out, because I learned about it a little too late as events were unfolding.”

Sealing up the house was seen as important, and there was discussion about ways to do this and challenges.

“It's so thick, I'm highly sensitive to smoke. And so we thought I should stay and I couldn't go out.”

“And lock your house up, shut all the doors, shut all the windows. Don't leave anything open for the smoke come in. . . . Close it up tight. Even if you gotta throw a rug down by the door, if it's a little high or something, you know.”

“We're staying in—we had all the doors shut and you know, try as best we can to use our filters. We don't have HEPA filters in the house. But we did keep the circulating fan on for the interior to try and keep it a little bit going through the filters.”

Residents also spoke about how they were adapting to staying indoors.

“One participant focused on indoor activities with kids; learned some techniques during lockdown to apply when smoke got bad—focused

activities inside; neutral corners—everyone getting their own space; watching the AQI—if it got better would go outside and do as much as possible” [whiteboard].

Information about interventions and protections

Despite the general familiarity with different interventions, participants were unsure which represented the best choices, some expressing skepticism or lack of confidence in the effectiveness of interventions. They felt there was a lack of consolidated information on what the most effective—and cost-effective—approaches were for reducing smoke exposure and protecting health. They suggested a website that provided mitigation ideas and guidance on products would be helpful.

“Actually, I am curious to learn more about those [air purifiers]. Just like a lot of things, I started getting targeted by products before buying, and I wasn't sure which ones actually work or help. So we were open to that, but we just weren't sure which products would be the smartest investment.”

“Actually, I am curious to learn more about those [air purifiers]. Just like a lot of things, I started getting targeted by products before buying, and I wasn't sure which ones actually work or help.”

“We are subscribers to Consumer Reports. And then Wirecutter is a pretty good website by the New York Times that has a review of different products. And I found both of those to be good sources.”

“We're in a big old house and we did what we can, but I wasn't totally confident that I was—you know—that it was 100%. Sure, we used it [an air filter]. But yeah, I'm sure I wasn't 100% protected.”

“I'm a little embarrassed to share this. But I think for all intents and purposes it might be just interesting to add to the conversation. I guess I'm realizing I have a held belief that things like air filters or air purifiers are just a way that people spend money to make themselves feel like they're doing something to improve the situation. Yeah, and I don't actually personally think they do anything. . . . I guess I just I'm just sharing this like in transparency because all kinds of people have different ideas about this and, and—I'm surprised that that's actually my belief around this, but I sort of roll my eyes whenever someone mentions like oh, well I'm running an air purifier. I just think, oh wow, you bought something expensive, so you think it's doing something?”

“When our son sent us this air purifier, I didn't actually see it working. I mean, we ran it for a while and then we looked at the filter that was supposed to clean the smoke out. . . . You can tell, I mean there's smoke, there's the ash, the dust in the house, you could tell that there's smoke in here, but really

thinking that it did that much, but again, you know, it was a gift and I'm sure it wasn't sized for the house.”(same speaker as previous)

“Is there data on if these strategies work? [referring to DIY filters on fans] [whiteboard]

Other resources for exposure mitigation

Participants expressed concern about outdoor workers' ability to protect themselves and options to protect people who may have underlying health conditions and are unable to shelter safely in their own home. A suggestion was made that a safe center could be established for such individuals, even during prescribed burns, similar to how Pacific Gas and Electric has power outage centers or cooling centers during Public Safety Power Shutoff (PSPS) events. Suggestions were made to provide information on cleaner air locations for smoke-sensitive individuals as well as information on how to adjust one's heating, ventilation and air conditioning (HVAC) system.

- *“I'm concerned about populations who work outside. I'm able to stay inside. . .” [chat]*
- *“A safe center (like a cooling center or PSPS center) for folks who have health problems to go to.” [chat]*
- *“Having a good database of places that have healthy air quality in town, you know, gyms or wherever. If you didn't know where you could go for indoor, good indoor air.”*

Domain 3 Recommendations and desires expressed by participants:

Health- and exposure-protective behaviors

- Information on effectiveness of various interventions and guidance on purchasing and using equipment
- A location (like a cooling center or PSPS center) for persons with health problems
- A database on where to access cleaner air locations

Domain 4: Messaging—what content is desired

Domain 4 Summary: Messaging—what content is desired

Participants shared the desire for an ability to discriminate between a potential wildfire and a prescribed fire when they smelled smoke, thus indicating that this ability would be important in alleviating stress and assuaging anxiety in a community with previous experience with serious wildfires.

Although participants were varyingly familiar with different sources of information, particularly a local community website, they expressed uncertainty and at times frustration about the lack of a reliable source to determine with certainty the source of smoke.

Participants shared the need for more detailed information about prescribed fire, asserting that this additional information would be welcomed and not perceived as overbearing or unnecessary.

Desired information included when and where the burn would occur, who would conduct and oversee it, and the window of time when smoke would be present. Participants stated they would alter their activities based on this information.

While recognizing the inherent uncertainty in whether a prescribed burn would go forward or not, being alerted of a possible burn as early as possible was desirable, as was being provided increased context about what would impact the decision to delay, cancel, or proceed, and then prompt notification once it was determined that conditions would allow the prescribed fire to be conducted.

There was great interest in air quality information as guidance for protective behaviors, but much uncertainty was shared about why different sources gave different readings.

Domain 4 Findings: Messaging—what content is desired

Participants spent considerable time discussing the topic of making sure residents in the community were given helpful and accurate information about prescribed burns, with the impression that at present there was a need for more clarity. It was felt that it was important to provide more detailed information about the burn, e.g. when, where, who, and anticipated duration. Participants wanted both advance notice, including the window of time when the presence of smoke would be expected, and immediate information once it was decided that the fire would definitely occur.

- *“When a burn is scheduled and where? Who is conducting it? Who is on hand to ensure it doesn't escape?” [whiteboard]*
- *“Info include: why it's being done, by whom, where, how big, how long it will last, what people can do (go inside, etc), how many acres” [whiteboard]*
- *“What expected air quality impact is to be.” [whiteboard]*

Participants specifically recommended one week's advance notice for planning purposes.

- *“Like at least a week notice, especially for folks who have animals that might need to move down.”*
- *“And just making plans to, not make plans to be outside and things like that, to be healthy and safe.”*
- *“I think the more information the better and as far in advance as possible, so that people can prepare.”*

“Some people really get information overload, but a lot of people, including myself, really—just bring it on, tell us all the dates.”

Participants also expressed that it was important for community residents to understand that prescribed fires are complicated and recognized that exact timing is hard to predict because weather patterns change. Although some expressed concern that confusion can occur when giving notice too far in advance given the uncertainty, the overall sense was that providing information in advance was worthwhile. Residents suggested that more information, along with an explanation about how the decision would be made, would be preferable to not giving out information in advance.

“Can you share some about that decision-making process? . . . If it's too much to share right now and here, but I think that it would benefit the public to know like, oh, there's a prescribed burn planned on this day, it will be a go on Monday, as long as the winds less than 100 miles per hour. Otherwise, it might happen Tuesday or Wednesday. Just actually giving some of that information to the public, that includes the timeframe that you're planning, and the reasons why it might not happen on the exact day. Because some people really get information overload, but a lot of people, including myself, really—just bring it on, tell us all the dates.”

Importance of identifying smoke as prescribed, not wildfire

Because these Listening Sessions were held in high wildfire risk communities, importance was noted for residents' ability to quickly verify if smoke is from wildfire or prescribed fire.

"We thought there was a fire. Right, we had no idea. . . . The smoke was really thick in our neighborhood. We didn't know what was going on until we found out the next day that a neighbor had a burn pile. Nobody was notified."

"We thought there was a fire. Right, we had no idea. . . . The smoke was really thick in our neighborhood. We didn't know what was going on until we found out the next day that a neighbor had a burn pile. Nobody was notified."

This timely information was flagged as important in order to learn whether nearby private property owners are conducting burns, as this is something that many of the people in this group had experienced. Having this information would reduce residents' stress.

"As long as we knew what was going on . . . when you have smoke in the air, it's disconcerting. So if you have a notification that it might be happening, at least we'd know what it is, right? and not be upset about it. And even if people told you, we are doing something today, that's what you're smelling. That would certainly help. . . or you could just do it on the day It's like, okay, we see smoke in the air. And we've all got a message on our text . . . so we know. That would work."

"I like the idea of a neighborhood communication board or something, because homeowners are allowed to have a prescribed fire, even the ground burns, without any special need to, they don't even need to call it in necessarily. But . . . letting your neighbors know would certainly keep people from being unnecessarily stressed."

Value in messaging for reassurance

Some participants with high familiarity with prescribed fire expressed the importance of providing assurance to residents that the work was being done under permit by the appropriate agency or was on an allowable burn day, and as suggested that it was important that messaging be done when the burn was completed to confirm that the smoke had dispersed out of the area and that it had been a safe burn.

"We probably ought to include a message when the burn is done, just to let people know that, it's over, the smoke's out, it was a safe burn—[that] could be an important piece of the message, to let people know it

happened. And how things went, and so on, which hopefully can build that over time. . . that this is a relatively safe thing to do, maybe people will become less nervous about it."

Air quality information

Participants generally paid attention to air quality indicators and used such information to guide their activities. In one group, this generated a discussion in which participants asked each other and shared which sources each one was using and how to access those for which they lacked familiarity. Many people have started using Purple Air monitors.

Domain 4 Recommendations and desires expressed by participants: Messaging—what content is desired

- Provide advance notification (at least a week) about planned prescribed fires; include details about why it may or may not occur
- Provide all relevant information, such as who to contact; convey what the expected air quality will be as specifically as possible.
- Provide more general education about what prescribed fires are and why they are conducted; this was viewed as helping alleviate concerns among people less familiar with the practice.

Domain 5: Messaging—how information is communicated

Domain 5 Summary: Messaging—how information is communicated

The overall sentiment from participants was that current messaging about prescribed fire was insufficient. Despite being a relatively well-informed group of individuals that generally resided in an area of both high wildfire risk and presence of prescribed fires, only a minority of participants had received notifications about prescribed fire events in the past (besides highway signs), leaving most participants actively seeking increased notification of such events.

Residents wanted a clearinghouse-type source that they could confidently consult to obtain complete, accurate and timely information about smoke events.

A common frustration was not knowing where and how to get the most accurate information about a smoke-generating event, with participants reporting having needed to search through a number of sources.

Lack of reliable internet access and technology challenges were identified as barriers to communication about smoke events. While some residents, especially older residents, lacked familiarity with social media and websites, even those who were comfortable with technology cited problems with internet unreliability in these rural areas. The combination of power outages and/or too many people trying to simultaneously access and thereby crashing community websites had made online sources functionally useless at times during past smoke events, according to participants.

Domain 5 Findings: Messaging—how information is communicated

Availability of messaging

In general, participants were not aware of receiving proactive messaging about prescribed fires, other than seeing road signs (like on Highway 20 or nearby an active burn) if they happen to be driving by. Sources mentioned that were used to search for information include Yubanet, USDA Forest Service website, and MyNevadaCounty website. Some participants said they are signed up for alerts via Nixle to get texts, but they have never been alerted about prescribed burns. Even in these foothill communities, despite signing up to receive notifications about wildfires, notices about prescribed burns is not received.

"We're not alerted at all."

"I'm actually quite in touch. . . . We have two local newspapers that are online, and I have signed up for both. So we'll get some messaging from them regarding newsworthy stories, but I've never gotten any message from them saying that there's prescribed burns going on in the area."

"I've been here eight years, full time—the only way I ever know that there is a prescribed burn—if I smell it, I don't know if it's prescribed burn or forest fire— is if I'm driving in my car and there are these big electronic billboard-type things that are over the road that alert you to traffic issues. They will say, 'Prescribed burn going out in your area, do not call.'"

Clear, authoritative source of information sought

"Well, I use Nextdoor, and it's not always accurate. And it's okay, but I would prefer going to a website that actually has the information."

There was considerable discussion about how and where to access information as people searched various agency and social media websites. There was confusion about where to find the best sources of information and a desire for a centralized source of authoritative, accurate information. Residents wanted a clearinghouse-type source they could go to and feel confident they were getting complete, accurate information.

"I do not know where to get specific information about prescribed burns. I would look first on Yubanet."

"I have used a lot of these resources and I do feel like it's a patchwork. Like I'm patchworking together information I need. I go here and go there. I'll look on Nextdoor, I'll look on what's happening now. It's like there's a [specific local] Facebook page, but you know, sometimes it's hit and miss. And then on Yubanet, and I'm looking like in three, four different places."

"Well, I use Nextdoor, and it's not always accurate. And it's okay, but I would prefer going to a website that actually has the information."

"I feel like the actual prescribed burns that are conducted by the fire department or Forestry, I think it is a little convoluted. I don't think it's very clearly broadcast."

Even more knowledgeable participants described similar experiences in searching for information.

"There's a lot of good information now, between the air quality agencies and between CALFIRE and local . . . emergency agencies. Like having some clearinghouse on the internet that everyone knew to go to would

make it a little bit easier. It was hard for me to figure out an accurate smoke forecast this summer. . . . I spent quite a lot of time bouncing around between different websites."

Centralized website that community members can easily access and update

Participants wanted a trusted source they could easily check and came up with functional suggestions. One participant described their idea for a site in which community members could update the map with their burn plans.

"I'm picturing a website, where people have an account in there, right, as a free account, whatever. And you can go in, log in to your neighborhood and there's a map. And you can, if you're gonna do a burn, you drop a pin on the map . . ."

"I'm picturing a website, where people have an account in there, right, as a free account, whatever. And you can go in, log in to your neighborhood and there's a map. And you can, if you're gonna do a burn, you drop a pin on the map . . . then like, Oh, I have to cancel because of weather, you can delete your pin from the map. I'm picturing like, one color pin would be for agencies and one color of a pin to be for private people. And so if you . . . smell smoke, or you just want to see if people are going to be burning around you this week, or whatever, you can log in and look, and you'll see if there's pins on the board or not. . . . So like it can be for people who are concerned and want to know what's up, and it can be for people who are doing burns. . . . I would really like that, that would make it really simple."

". . . if everybody knows that this [website for reporting prescribed burns] is there . . . you wouldn't need to get notifications, right? Because like, if every one of your neighbors, you'd be getting pings, all the time, sometimes, right? If you've got 10 neighbors that are going to do a burn file today, your phone would blow up with text notification. But if you just go check this thing and look there, then people can put their pins up and take them down if conditions aren't right, and it can be flowing . . . it can be updating itself in real time."

This model of a clearinghouse was also viewed as possibly relieving a burden for private landowners who are conducting burns.

"One of the most valuable parts of the discussion (sounds like true in many of the groups) was where people would look for information about burns. For a private landowner to not only do the logistics to be ready to burn but also to put out PR in a lot of places is a big ask. A central hub (or, say, 3-5 media outlets) would be a real boon." [chat]

The website option was envisioned as being hosted by an agency. It would be searchable by location and include prescribed fire activities and require reporting of prescribed fires in the area. Such a system could be used by private landowners in order to report their use of prescribed fire and community members for their own awareness.

“Yeah, I don't want to task yet another governmental entity with something. But I'm wondering if the homeowner landowner would be able to call in and say, Hey, I'm doing a 1-acre, a 2-acre, a 5-acre, and there could potentially be some smoke, and it's in this area. I don't know that that exists.”

“I think an agency should host it right? Because it could be county-wide, right. But then people would just hone into their own neighborhoods, like maybe their login would just be for their zip code or just in their neighborhood or whatever. But anyone in the county could use it, and it would just show them their neighborhood or . . . maybe you could have the option to see the whole county. I'd like that a lot.”

“That's why I was wondering if there's—but they [211] take information for all sorts of stuff. This would seem like it would be the perfect kind of thing that you call them and say I'm doing this [referring to a prescribed burn].”

“Yeah, I don't want to task yet another governmental entity with something. But I'm wondering if the homeowner landowner would be able to call in and say, Hey, I'm doing a 1-acre, a 2-acre, a 5-acre, and there could potentially be some smoke, and it's in this area. I don't know that that exists.”

Further brainstorming led to the ideas of a phone app or text-based option.

- “As a phone app, you could just like pull up your app and be like, yeah, we’re going to burn this weekend.”
- “[If] there’s like a, you know, like a text, “text 5375 and drop your pin on your map.” That way, if you can’t get apps up on your phone. . . . There’s many ways to set it up. . . . I like that idea a lot.”

The smoke app that is being developed by the California Air Resources Board was mentioned. It was described as being able to tell users the source of smoke, whether it is a prescribed burn or wildfire, and that it will have links to actions residents can take. [Note: The [SmokeSpotter](#) App has been subsequently released.]

Proactive notification

Many participants indicated they would like to receive automatic notifications, despite a few others’ concerns about receiving too many notifications. Participants who favored automatic notifications brainstormed that they would like early notification, perhaps with a system like Code Red that goes directly to their cell phones, social media, or TV.

“. . . when my kids were in school, and we had snow days, it’s an automatic like robo-call. And I think that you maybe could sign up for those. So people who aren’t on computers or, again, social media, could sign up to get the robo-call when there’s a prescribed burn . . .”

“Yeah, I like text notifications, as well. I get them faster, and it’s easier for me.”

“I would really appreciate notifications going, you know, potentially, even through the Emergency Alert System that people are already hopefully signed up for, to let people know that there’s not an emergency—could also be used for that.”

“Hey, I have one input, I just I just thought about it. Because I think that this is good based on what we were just talking about with people of certain ages. I know that when my kids were in school, and we had snow days, it’s an automatic like robo-call. And I think that you maybe could sign up for those. So people who aren’t on computers or, again, social media, could sign up to get the robo-call when there’s a prescribed burn in their area. I think that that would be really good.”

Situations of limited electronic access

Access to technology was identified as a potential limiting factor in notification. It was noted that past practices of using newspaper notices would not work well now since not everyone subscribes to a newspaper.

However, it was also suggested that non-electronic notifications should be considered, as not everyone has a smart phone or may only have a flip phone. It was suggested that multiple notifications across different venues were needed, in addition to roadway signs, options such as posting flyers in places that people gather, like coffee shops, food banks, and counseling offices.

“I live in good internet right now, but at times, or when there's power outages, I don't have great internet, or in other places in the county, and in places without great internet—if the only place you can find information is by scrambling to try to connect to Yubanet, but if everyone else is also trying to connect to Yubanet, you're out of luck, as far as finding out what whether that smoke is out of control or planned.”

One participant reported that although they do not always have enough internet to go online, they would have phone service, so they suggested a phone-based system. This request was independently raised in several breakout rooms. One participant asked if there could be a number people could call to get information; this would be available to anyone, but especially for people who do not have a smart phone.

“Some of us had difficulty getting cell service. So it's a tricky—it's a challenging problem of how do we just get the information or have a phone-in place where we can hear a recorded message.”

“Let me add this—because of where that fire was, some of us had difficulty getting cell service. So it's a tricky—it's a challenging problem of how do we just get the information or have a phone-in place where we can hear a recorded message. . . . So where to go to get the information, I think, is the challenge.”

Community-level notification systems

Neighborhood-specific communication systems were also suggested as a means to alert others in the vicinity about planned private landowner burns.

“My neighborhood has like a text message thing, just for our local neighborhood where we tell each other things like that. It's kind of like a neighborhood watch, but for fire concerns. And that's how we communicate with each other.”

“I think one thing that might be something to look into would be a way for private homeowners to call and say that, you know, this is the day I'm going to be having a burn pile, this is where I live. And this is the time that'll be happening. And then that information can be broadcast to, you know, a 1-mile radius or a 2-mile radius or something to inform people in the neighborhood. Because I know for me, I know most of the people that live on my street, but I have houses behind me. And I don't know them, because I don't ever see them.”

Media campaigns and social media

“And therein is your problem, I have a Twitter account, but I don't have the app. I don't use it at all. Twitter is a younger generation thing.”

Current social media outlets, while used by some participants, were not necessarily known or meeting residents' needs. The moderator of one breakout room mentioned Nixle and the option of receiving text messages from CAL FIRE, but the two participants in that room were unaware of either, although they were interested in learning more. Similarly, when the moderator mentioned that the local air management district had a Twitter account, they did not think that would work for them, and reiterated the need for text or other alerts.

“And therein is your problem, I have a Twitter account, but I don't have the app. I don't use it at all. Twitter is a younger generation thing. But like I said, actually, I'm kind of—I mean, compared to most people my age—I'm in my 50s—I'm quite comfortable. I used to be a programmer, so I'm quite comfortable with it. But I'm just not a Twitter person.”

Although the desire for a centralized place to look for information about prescribed fires was expressed, there was also support for a broader media campaign to try to reach people through a variety of venues, both for general education and notification of specific planned burns.

“I might also say, maybe do some more, you know, either PSA's, or some type of campaign to talk about either, why we're doing prescribed burns, like how they're gonna affect us—in a good way. And then also, what are

the health implications? So people understand—because I know a lot of people say, oh, let's do prescribed burns. And then there's another group that's like, Oh, this smoke is so bad. But, you know, if you let people know ahead of time, and give them some knowledge about it, then maybe they'd be better equipped to make decisions."

"I mean, we watch news pretty religiously. And we'll watch Channel 3, and then we'll watch the national news, too—of course, national news are not going to do it. But a message coming in saying, hey, there's a prescribed, especially if they know it's going to be affected in your area that you live. . . say, hey, there's going to be a prescribed fire, or, there IS a prescribed fire currently going on, and that is why you're seeing smoke. Yeah, what would be very helpful."

One breakout group suggested communication could be achieved through existing channels and systems, such as Code Red, Fire Safety Councils, social media, and apps such as Neighbor or Nextdoor, and that the biggest communication need is to promote community acceptance of prescribed burns. This group also felt there will always be a margin of people who will not be attentive to the communication.

Generally, though, participants were enthusiastic about the idea of a website that includes data on prescribed fire events from private landowners and agencies and publishes it so that it can be searchable by location.

Domain 5 Recommendations and desires expressed by participants:

Messaging—how information is communicated

- Desire for more proactive notification about prescribed fires, such as automatic text notifications, like an emergency alert system or Amber alerts.
- Desire for an authoritative, reliable source of information about wildfires and prescribed fires, a clearinghouse, including the ability to check in real-time to identify smoke source and a map where residents could scan their county or neighborhood.
- Desire for a system by which private landowners could easily report their burns, especially so neighbors would be notified.
- Support for private landowners who are burning to help them with messaging to the community and neighbors.
- Desire for a system that would facilitate coordination of burns with neighbors.
- Desire for an alternative, in addition to an internet-dependent information source, e.g. phone app, texting system (people can often text even when they do not have internet access), a phone number to call (such as 211) or proactive robo-calls.
- Desire for a media campaign, including television and PSAs, to educate the public about why and how prescribed burns are being

conducted.

- Desire for physical flyers to be posted in areas that are frequented in the community, in recognition that not everyone receives messages on social media.
- Desire for increased use of neighborhood communication systems, such as those established for general neighborhood watch, to share notifications about prescribed fires, especially those conducted by local landowners.
- Desire for increased use of existing channels to notify and provide education about prescribed fires, such as [Firewise](#), [Fire Adapted Community](#), and [California Fire Safe Council](#) structures.

Domain 6: Emerging themes

Domain 6 Summary: Emerging themes

Equity

Participants expressed concern for residents who would not have the resources to take recommended actions to protect themselves, including those who may not even be able to afford low-cost alternatives such as DIY filters. This concern was placed in a broad social and economic perspective, that if we as a society are making the decision to invest in more burning, we also need to make sure that people are able to stay healthy during these periods.

Community-level education

Participants expressed a clear need for more education about the benefits of prescribed fire and how it was conducted and communicated that this education could be effectively conveyed in a setting which actively involved the community.

Need for education—newcomers and tourists

There was discussion about newcomers to the area, and participants expressed a specific need to routinely provide them with education about prescribed fire and safety.

Managing fire for resource purposes

Participants generally support this practice, provided they were identified as useful and being monitored closely and not creating danger to people or personal property.

Role of agencies

The role of agencies came across in conversations as both necessary but also at times constraining. Participants expressed a need for the expertise of agencies and their capacity to communicate and educate across the community. Participants felt community-led burns require expertise from agencies to enforce safety precautions and that local agencies should manage burns given their knowledge of local conditions.

Indigenous practices

Participants regarded the historical use of fire by indigenous people as deserving of recognition and an important learning opportunity.

Ecology/animals

Participants raised concerns about whether prescribed burns could be managed in such a way as to minimize possible detrimental effects on wildlife.

Domain 6 Emerging Themes: Findings

Equity

The theme of equity emerged, as access to interventions was considered key for community members. Participants recognized that lower-resourced persons would have diminished capacity to protect their health during smoke periods. There was also support for providing assistance to individuals at higher risk of health impacts.

“So just to say that people need to be educated, and they need resources, in my opinion—they need to be able to have access to resources if they don’t have other means to protect their health during major smoke events.”

“Many people know what actions they need to take but do not have the resources to reduce the impact on their health. Specifically people who are low income and have chronic health conditions.” [chat]

“Provide N95 masks to high-risk individuals (e.g. children with asthma, people with lung issues)” [whiteboard]

“We [referring to this participant’s social service agency] provide a lot of technical assistance on how to do that, how to get cheaply made air purification system. But literally, if you live on \$800 a month, or \$900 a month—some people \$500 a month, believe it or not—you don’t have an extra \$30 for a fan and a filter. And then those nonprofits, they’re trying to meet that need . . . don’t necessarily have money budgeted even for \$30, you know, for 10 people to get a system.”

One participant expressed—and others in the group agreed—that if we as a society, or agencies need to have a policy of increasing prescribed burns for the benefit of all, then we need to also invest to protect public health, particularly for those individuals who are unable to afford the intervention strategies needed to protect themselves.

“If you look at the bill—if you look at the cost to our economy from raging wildfires, the costs of not doing anything are huge. So then, if we’re going to do this, and this is a fundamental part of doing that is ensuring that people are healthy during a prescribed burn regimen, then that has to be part of funding this—is providing the measures needed for people to be able to be healthy if we’re going to be doing prescribed burn, man just seems like, it has to happen.”

Need for education—community-level

A theme that emerged in multiple ways and across various groups was a desire for community-led or community-level solutions. Participants felt that more direct experience would strengthen understanding and therefore greater acceptance

of prescribed burns, as well as allow people to understand the importance of conducting private burns within the regulatory process.

“[it would be helpful if] that people knew there are rules [about prescribed burns] so that they’re not worried about that kind of thing, right? Because a lot of folks don’t know that. Yeah, I think that would be really helpful. Just more education, about what exactly is a prescribed burn and how it’s done. Because I don’t know those details. And I don’t think a lot of the public does now. So that would alleviate some concerns.”

Community activities would also present an opportunity to provide education not only about how prescribed burns are safely conducted, but give a chance to explain the multiple benefits of prescribed fire. It was suggested that community members could even be invited to attend a burn to gain firsthand knowledge. There was also support for more education about interventions and how to protect oneself from smoke.

“I feel like it could be a lot more education. I’ve done several prescribed burn trainings, and have brought a lot of people out on prescribed burns, just to give them a sense of what it feels like to be on a burn and how to do it safely. And I feel like the more experience we have on the ground to helping each other out, the more we are empowered to deal with what’s going on and have skills about dealing with live fire.”

Participants brought up the idea of using existing organizations and frameworks such as Fire Adapted Communities, Firewise, and the California Fire Safe Council, citing their role in helping neighbors get to know one another for safety, and saw this as a possible venue to provide education about prescribed fires also. This prompted other participants to ask how to get more information about this type of community activity. It was pointed out that the California Fire Safe Council’s mission includes community education, and influencers thought they would welcome working with agencies to conduct education such as a community program. It was felt that agencies and other stakeholders involved with prescribed fire could play an important role in educating the community on the importance of and reasons for prescribed fire and how it can help with overall forest management.

Participants affiliated with a local burn association invited others in the group to become involved. A number of people offered specific ways in which they could personally help.

- *“If people in this group are interested in volunteering on a prescribed burn or observing a burn with the XXX please get in touch with me at xxx.” [chat]*
- *“I am willing to do tours of our private property after next Tuesday’s prescribed burn (xxx acres), and to educate other landowners on the prep it took, etc.” [chat]*
- *“I would volunteer for Free Green Waste Disposal days as I availed myself of*

most of the days available this year.” [chat]

Another topic of discussion was the desire for coordination among residents who are conducting their own burns. This was especially relevant for these rural areas where a lot of private landowners are conducting burns, and some of them quite often (reportedly one neighbor burned almost daily for a week in the spring). It was felt that more coordination could allow for more clear air days.

The balance between providing education versus more mandatory measures and enforcement was illuminated. However, even when participants had somewhat differing views on approach, they sought common ground.

“ . . . just having like the fire department have like a fun education event (when we can gather again). And they can do like a demo burn pile, just to kind of make it like something— with ice cream and just, you know, make it so it feels communal and fun and educational.”

“I’d say, in this county especially, it’s going to be similar to the whole mask conversation. And I just feel like having a focus on education. It’s a very, very similar kind of thing. We’re like— mandating things—is unlikely to be successful, especially when it comes to people burning on their property. And [instead] just having like the fire department have like a fun education event (when we can gather again). And they can do like a demo burn pile, just to kind of make it like something—with ice cream and just, you know, make it so it feels communal and fun and educational. I’m a big believer in that being the way to go, as opposed to permits and mandates and all that kind of thing. Especially when it comes to like what people do on their personal property.

Another participant commented:

“But people wait until it’s night, and then they just burn and then you can’t even call anybody to go out and help you. And in the meantime, you have an elderly person in your house who can’t breathe, you have to take to the hospital. You know, it’s ridiculous.”

“Absolutely. I guess I just feel like doing it, trying to emphasize it from an educational standpoint. I mean, there needs to be penalties for people that are flagrant violators, of course, like always gotta be a carrot and a stick approach I guess.”

Some of the perceived problems with private residents burning were attributed to lack of knowledge of how to burn correctly.

"Yeah, people aren't burning well, and also. . . there's a ton of woodstoves. And not everybody has the new woodstoves that have good levels of combustion. I mean, it's just part of living, where we live, to some degree."

"I totally agree with that. The open burning is a problem, people don't know how to do it. I feel like in order to get a permit, you should have to take a class on how to burn hot enough that you're not going to smoke out all your neighbors. . . . I don't know if they have a permit or not. But they don't cover their piles. . . . I mean, for the last 30 years, they've been doing it their own way and they don't care if it's wet."

Need for education—newcomers and tourists

There was discussion about newcomers to the area, and a specific need to provide them with education about prescribed fire and safety.

". . . when we moved into [the neighborhood] we got a little welcome package. It would be really helpful to have maybe an informational educational packet about what it [prescribed fire] looks like and why it's done."

"I wonder if—you know—whenever you move into a new neighborhood, at least when we moved into [the neighborhood], we got a little welcome package. It would be really helpful to have maybe an informational educational packet about what it [prescribed fire] looks like and why it's done. For instance, we had a neighbor that moved in a couple houses up from us. They were from the city they have no experience living in this area. She texted me one day and she says, Oh, your husband inspired me the other day, I'm gonna go out and I'm going to burn this giant pile of leaves I just raked up. And I said, whoa whoa whoa, and I called her and said, Have you ever done that? She says, No, I haven't. And I said, Well, I don't think that's a good idea. You need some education."

Another challenge was highlighted that relates to providing education to vacationers as they are hard to reach. Some expressed the opinion that the majority of complaints come from this group and that this may be related to the financial implications for vacationers.

Desire for training for prescribed fires and wildfire safety

Interest in community education addressing the reasons for prescribed fires also expanded to include training on how to conduct prescribed burns, as well as more general training on wildfire fire safety, prevention,

and even lay-oriented firefighter knowledge. Participants expressed a desire to personally access this type of training.

"I think that everyone should have access to firefighter training, just basic, like an afternoon thing where it's like, here's how you cut lines. Here's how you can, you know, here are some effective things you can do if you come upon flame on the side of the road, here's what you do, and so that people, you know that that's like a basic thing, like learning how to read a map or, you know, do math or whatever. I think that we should teach it in the school, too. I feel like every kid should know how to fight fire."

*"I would love private burn classes through Cal Fire or other agency."
["private" here referring to private landowners, not private classes] [chat]*

"There are private burn classes through UC Cooperative Education (workshop)." [chat]

Note: University of California Cooperative Extension programs provide training and are assisting in forming prescribed burn associations.

Managing fire for resource purposes

In addition to soliciting opinions about prescribed fires, the moderators also raised the question of managing fire for resource purposes. The dialogue clarified and encouraged some convergence of views, and more accurate understanding.

"Wildfires shouldn't always be suppressed unless they're threatening structures, right? if it's just out in the woods, sometimes it's better to let a wildfire be wild."

Participant 1: "I think it is important to do more education of the public [regarding managed fire]. Wildfires shouldn't always be suppressed unless they're threatening structures, right? if it's just out in the woods, sometimes it's better to let a wildfire be wild."

Moderator: "How many others agree with that? Is that a concern that others have? Or would you agree as well?"

Participant 2: "Knowing when to let a wildfire burn is a pretty complicated decision to make—it's a certain kind of, I feel like—yes, it's true that, that when you're out in a really in a wilderness zone or something that could be beneficial. But you definitely need some authorities and some scientists who are doing the math and checking the maps and the wind and the weather to make that kind of decision."

Participant 1: "Yeah, absolutely. I just—what I mean is, I think so many people in the public think if there's any, any little fire in the woods, it has to be extinguished immediately. And I think some education to let people

know that that's not always the case. I wasn't saying like, Oh, just let fires burn in general, I was saying that, you know, some education of the general public so that they, you know, aren't outraged if authorities are letting allow fire burn, that's not threatening."

Participant 2: "Yeah, absolutely."

Participant 1: "And let them know that that is healthy for the ecosystem. And to prevent future you know, uncontrolled fires in populated areas."

Role of agencies

The role of agencies emerged in conversations as necessary but also at times constraining. Again, fitting the theme of trade-offs, there appeared a need for the expertise of agencies and their capacity to communicate and educate across the community. Participants felt community-led burns require expertise from agencies to enforce safety precautions and that local agencies should manage burns because of their knowledge of local conditions.

"Like you were asking about with the different agencies and stuff, and in my experience has been the agency the district is in should be the primary agency in charge of doing fire. . . . But I believe that the local agencies should be the ones to do it, because they're the ones who know the terrain, and the ecology of their area probably better than anybody else."

It was suggested that the agencies involved should include not only fire and air management agencies but others, such as the California Department of Fish and Wildlife because of their knowledge of the needs and lifecycles of wildlife.

However, the agencies were also perceived as setting up barriers to achieve the necessary amount of prescribed burn activities.

"But I think sometimes the—I personally think the air quality people get a little too involved, and they can dictate when things get done and when they don't."

Indigenous practices

Native Americans' historical use of fire before introduction of modern suppression and fuel management practices was viewed as important to recognize and learn from.

“I would love to see more indigenous leadership projects, such as prescribed burns. So if you are able to reach out to the local tribe, I think that would be appreciated. . . . Even just being approached and asked for leadership in that direction, they may have a lot of knowledge that hasn't been tapped yet.”

Ecology/animals

A question was raised about whether prescribed burns could be managed to minimize possible effects on wildlife.

“Another thing that I'm just thinking about as we're talking about is how other beings in our ecosystem are affected by a prescribed burn. And if there's ways to time prescribed burns so that the impacts on some animals in their habitat is minimized. . . . I noticed like after some of the recent fires, anecdotally, it seemed like there is a spike in animals in our little neck of the woods that could have been because of animals fleeing the fires north of here.”

Domain 6 Recommendations and desires expressed by participants:

Emerging themes

Equity

- Provide support for a yet to be defined program that would provide health protective measures for those who cannot afford it. (This was raised, but we did not specifically request feedback from the group as a whole as to the level of support for this, though we did not hear any objections or concerns.)

Communication needs

- More education should be made available to let the public know that it is not always necessary to immediately suppress every fire, that it may serve a purpose in preventing more destructive wildfires as well as ecological benefits.

Other Comments

- Desire for community-centered education about prescribed fire, in a setting focused on fun, such as a neighborhood festival, ideally in partnership between fire agencies and local communities.
- Interest in making available more education and training (burn classes) for residents who want to learn how to conduct prescribed burns or learn more details about it
- Need for education (and perhaps more enforcement) about air quality concerns and requirements.
- Suggestion to provide educational materials to newcomers in impacted counties covering key points on prescribed fire, including rules and safe practices.
- Interest in holding training on community-appropriate basic information on firefighting, e.g. what to do if you come across fire on the side of the road. Note: this was expressed by one participant; the authors of this report do not hold opinions, but defer to fire protection agencies.

DISCUSSION

These Listening Sessions brought together a group of residents living in the Sierra Nevada WUI who were highly invested in the topics of wildfires and prescribed fires and willing to share with the researchers and one another. Residents conveyed their appreciation of their natural forested landscape and rural environment, while at the same time acknowledging the stark realities of increasing wildfires as they grapple with how their communities can best mitigate these risks, including that from smoke.

The residents of these impacted communities voiced clear support for prescribed fire, but also indicated they are seeking more information, including more details and notification about prescribed fires. The health effects reported suggest that residents experience symptoms and conditions that not only impact their health and quality of life, but may be life-threatening, and these health outcomes are not being systematically captured in routine analyses of health effects of wildfire smoke that are based health care utilization. Furthermore, living in an area at high risk for wildfires appears to confer stress from direct exposure to smoke and as well as anxiety about possible wildfires, which can be triggered from smoke from any source.

Despite the challenges posed by their surrounding environment, participants readily generated creative and positive suggestions for solutions. These included beneficial actions that others, such as agencies, could implement, in addition to actions that could be taken by individuals or communities. Spontaneously, a number of offers from this group emerged to help one another.

Although the Listening Sessions were designed for the benefit of the researchers to elicit information from participants, we found that the forum serendipitously created co-benefits for participants, in particular serving as a natural environment in which community members gained important knowledge about prescribed fire and community resources, as well as stimulating their interest in learning more. The convivial interactions that sprang up between participants reinforced the value of building community.

Current public health and emergency preparedness recommendations for smoke and wildfire-resilient communities could have the serendipitous benefit of strengthening neighborhood connections, enhancing quality of life in addition to providing practical safety protections. The Listening Sessions provided a window into a model of a resilient community in which members collaboratively develop solutions.

Another example of the positive benefits of neighbor-to-neighbor communication came to light in the post-Listening Session survey. A participant reported they had posted about a prescribed burn they

were planning and had received numerous replies from people who were less informed, prompting some other more well-informed neighbors to respond. This participant felt that the presence of these additional community voices on social media was an important contribution to educating the public.

Findings from the Listening Sessions were largely consistent with previous surveys of prescribed fire attitudes,⁸ although previous publications have generally been based on data collected prior to the last few years of extreme wildfires,⁹ so it is possible that familiarity with and perceptions of prescribed fire have changed. Findings from the Listening Sessions were largely consistent with previous surveys of prescribed fire attitudes, as other studies have also found the majority of the public supports prescribed fire.^{10,11}

However, other topics have also been reported in other studies such as concerns about smoke negatively impacting economies in tourist-dependent areas.¹² One area of potential difference is that previous studies found tolerance of smoke was greater when smoke originated from naturally ignited fires rather than other fire types such as prescribed or managed fire.¹³ Although we did not pose this question explicitly, we did not have the sense that this was an opinion held by participants in our Listening Sessions; there may also have been a shift in attitudes over the past few years of mega-wildfires with increasing public awareness of the importance of mitigation tools such as prescribed fire.

Previous research has demonstrated that greater familiarity with¹⁴ and more first-hand knowledge¹⁵ of fire was associated with less concern about smoke impacts. Also, greater awareness of ecological benefits has been associated with less concern about negative health impacts from prescribed fire smoke.¹⁶ Participants in our Listening Sessions similarly expressed support for more education and promoted experiential education as a way to increase acceptance of prescribed fire.

⁸ McCaffrey et al. 2021

⁹ McCaffrey et al. 2021

¹⁰ McCaffrey et al. 2021

¹¹ (Blanchard and Ryan 2007), (Brunson and Evans 2005), (Jacobson et al. 2001), (Pilatek and McGill 2010) and (Ryan and Wamsley 2008)

¹² (Cisneros et al. 2018) and (Davis et al. 2014)

¹³ (Blades et al. 2014)

¹⁴ (Loomis et al. 2001)

¹⁵ (McCaffrey 2004)

¹⁶ (Shindler and Toman, 2003), (Toman et al. 2004), (Loomis et al. 2001) and (McCaffrey 2004)

Communication methods that involve more personalized contact,¹⁷ including dialogue with the public,¹⁸ have been found in multiple studies to be more influential in increasing public acceptance of smoke, another perspective supported by our findings.

¹⁷ (McCaffrey 2004) (Blades et al. 2014)

¹⁸ (Weisshaupt et al. 2005, p.192) (Olsen et al 2017)

CONCLUSION

The findings from the Listening Sessions suggest strong support for and benefit of increased communications and education in WUI communities regarding prescribed fire. Residents in these areas are especially vigilant regarding wildfire and expressed that in order to avoid unnecessary anxiety, there is need for an authoritative source to determine if smoke is from a wildfire or prescribed fire. An overall assessment from the represented residents was that more notification for prescribed fire is needed, including alternative communication methods that are not internet-dependent.

Smoke from prescribed fire was perceived as minimal in comparison with wildfire smoke. Residents voiced clear support for prescribed fire, as it was viewed as important to reducing wildfire risk, despite the additional smoke produced. However, the health effects described illustrate the potential for pervasive impacts of wildfire smoke on communities and provide further support for the need to continue advancing knowledge and guidance on best practices for interventions.

Consistent with current public health recommendations, these findings underscore the value of proactive messaging to help communities prepare ahead of the wildfire season. Community members' desires expressed in Listening Sessions for more prescribed fire notification and their support for community education is especially timely and welcome, given the planned substantial increases in prescribed fire land treatment. Promotion of community engagement to increase knowledge of prescribed fire and wildfire preparedness may produce multiple benefits for community health, safety, well-being and resilience.

APPENDIX A: POLL RESULTS
(FROM VIRTUAL LISTENING SESSIONS HELD IN NEVADA AND EL DORADO COUNTIES, DECEMBER 2 AND 9, 2020, RESPECTIVELY)

Question 1: Extent of participant experience with or knowledge of prescribed fire (select all that apply) (N=32)

Possible Responses	Percent of Respondents
I am aware of at least one prescribed fire in my area	72
I have seen smoke from a prescribed fire in my area	69
I have smelled smoke from a prescribed fire in my area	69
I have participated in a prescribed fire	41
None of the above apply to me—I have no experience with prescribed fire in my area	16
I have little or no knowledge familiarity with prescribed fire or in general	13

Question 2: Participant experience with wildfires/health effects of wildfire smoke (select all that apply) (N=33)

Possible Responses:	Percent of Respondents
I have experienced a wildfire in my area	91
I have not encountered wildfire in my area	3
I have been directly affected by wildfires (i.e. evacuated, considered evacuating, or otherwise affected)	73
My health has been affected negatively by smoke by fires, whether wildfire or prescribed fire	61
I am concerned about my health and whether it could be affected by smoke	61
My health has not been affected by wildfire or prescribed fire smoke	15

Question 3: Health effects of prescribed fire smoke (select one) (N=29)

Possible Responses:	Percent of Respondents
My health was affected by smoke from a prescribed fire	7
My health was seriously affected by smoke from a prescribed fire	0
My health was not affected by smoke from a prescribed fire	72
My health has been affected by smoke, but I don't know if it was prescribed or wildfire smoke	21

Question 4: Prescribed fire concerns (select all that apply) (N=32)

Possible Responses	Percent of Respondents
I am concerned about prescribed fire because it could get out of control	25
More prescribed fire is needed to reduce risk of large wildfires	100
More prescribed fire is needed to improve forest health and ecosystems, such as reducing invasive plants or improving areas for cattle grazing	91
I am not very familiar with the benefits and risks of prescribed fire.	6

Question 5: Prescribed fire notifications (select all that apply) (N=32)

Possible Responses	Percent of Respondents
I receive notifications about prescribed fire sent directly to me, such as by text or email	16
I have received news in the general media about a prescribed fire	47

I have not received any notifications about prescribed fire, but would like to receive these	59
Other opinion/experience	9

Question 6: Support prescribed fire increase as policy (select one) (N=29)

Possible Responses	Percent of Respondents
Yes, I support this policy change.	79
I could support this, but I want to know more or have other reservations.	21
No, I don't support this.	0
I don't know or am unaware of this policy.	0

Question 7: Support of managed fire as policy (select one) (N=28)

Possible Responses	Percent of Respondents
Yes	96
No	0
I don't know	4

Question 8: Confidence in protecting oneself from smoke health impacts (select one) (N = 32)

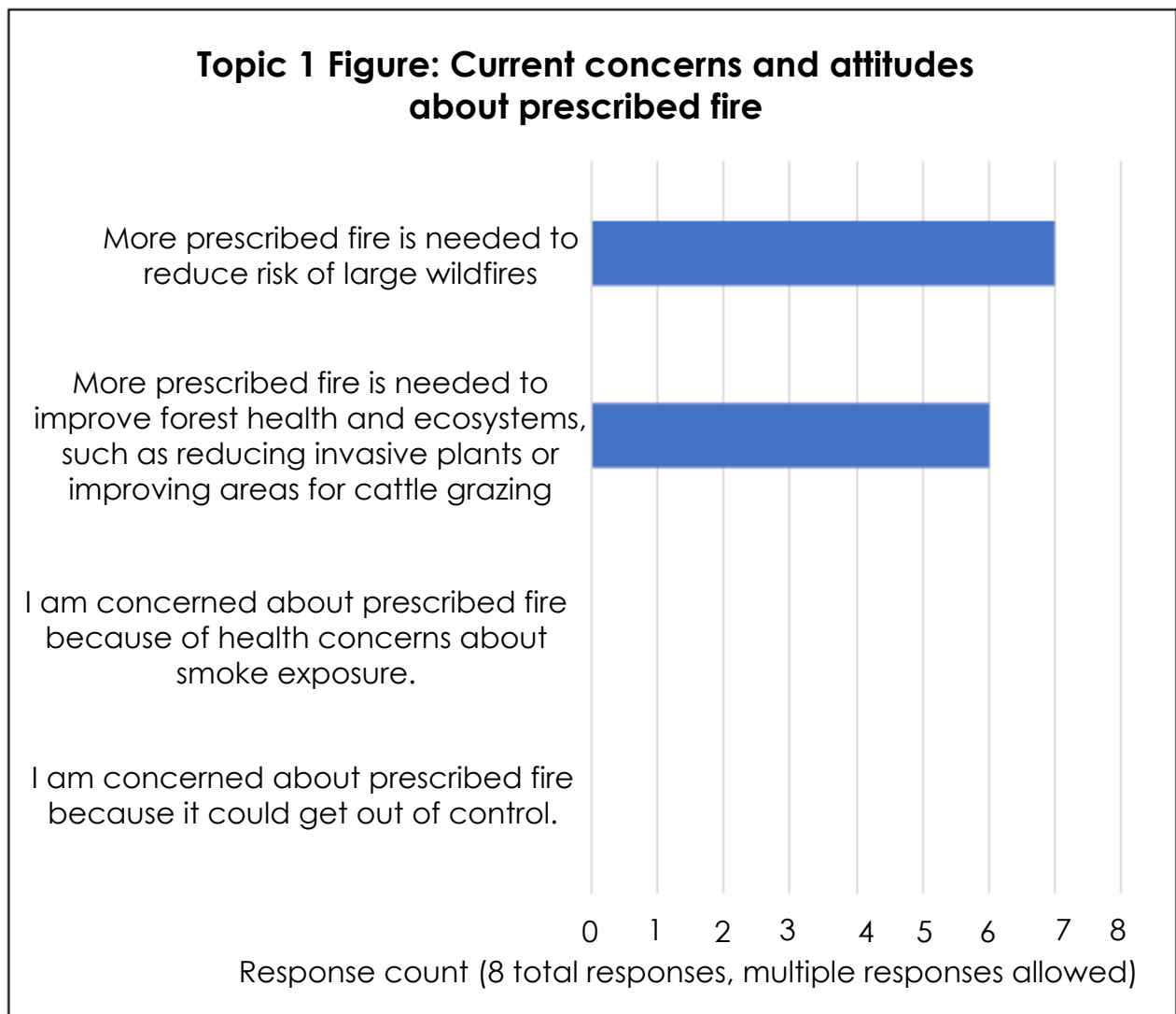
Possible Responses	Percent of Respondents
I am confident I know how to protect myself from harmful health impacts of smoke	63
I have some knowledge about actions to take, but I am not confident I can reduce smoke impacts on my health	25
I have little knowledge about what actions to take and I am not confident I can reduce smoke impacts on my health	13
I have no knowledge about what actions to take and I am not confident I can reduce smoke impacts on my health	0
I don't feel I need this information	0

APPENDIX B: POST-LISTENING SESSION SURVEY RESULTS

Appendix B presents results from an email survey sent after the Listening Session addressing Listening Session participants’ attitudes and experiences compared with participants’ communities. This poll was anonymous and marked as optional.

Summary: Responses to the post-Listening Session survey found that of 8 respondents, 6 reported their attitudes were similar to those in their own community, 1 reported differing attitudes, and 1 was unsure. Regarding experiences with prescribed fire, of 7 respondents, 4 reported their experiences were similar, 1 different and 2 unsure.

Topic 1: Current concerns and attitudes about prescribed fire

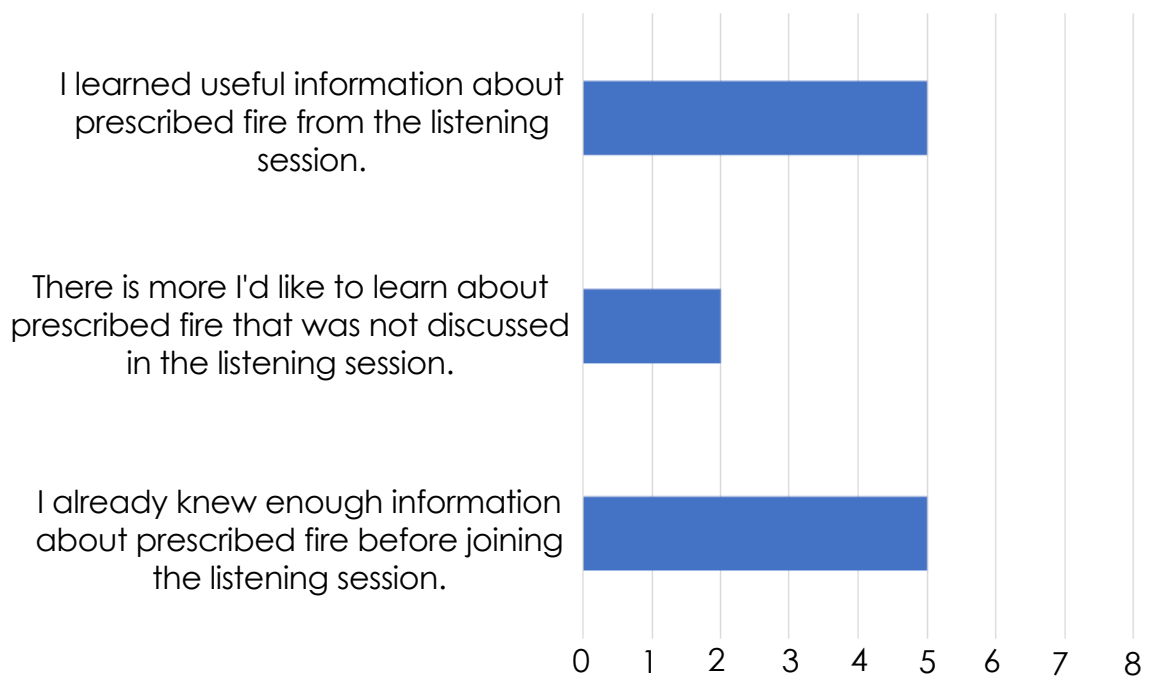


Topic 1 Free response: Current concerns and attitudes about prescribed fire
How have your thoughts on increasing the use of prescribed fire changed, if at all, as a result of the Listening Session?

- "People in other groups seemed less concerned about smoke than expected. That was also true on the NextDoor site I posted our press release on"
- "Not substantially but appreciated the forum"
- "no I've always agreed with them, just never heard about them near me."

Topic 2: Perceptions of knowledge gained during Listening Session regarding prescribed fire

Topic 2 Figure: Perceptions of knowledge gained during Listening Session regarding prescribed fire



Response count (8 total responses, multiple responses allowed)

Topic 2 Free Response: Perceptions of knowledge gained during Listening Session regarding prescribed fire

What useful information did you learn about prescribed fire, if anything?

"Learned about the broad community interest in prescribed fire and messaging around it"

"The outlets that our state/county use to get information out to the public about burns"

"I learned about the limitations of the communication systems that are in place."

"what to include in the press release about our upcoming burn; which media outlets people turned to; and how much shorter the burn windows in Truckee are!"

What do you still want to know about prescribed fire, if anything?

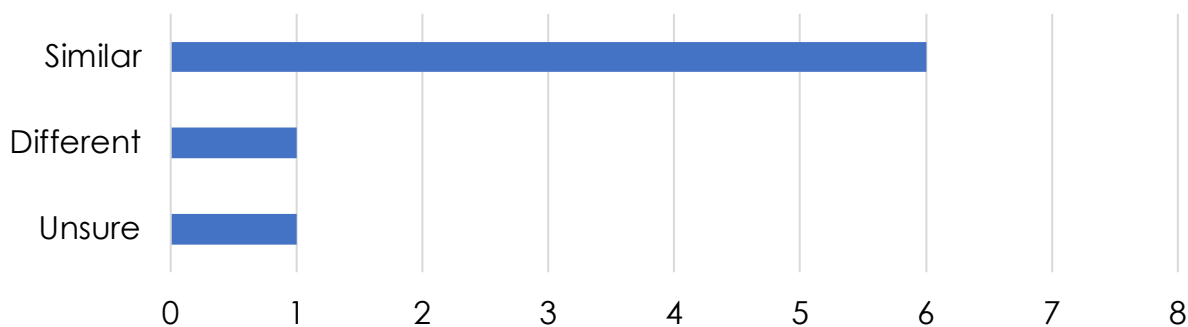
"How to change CalFire culture and policy"

"The balance between fewer large prescribed fires versus more frequent smaller prescribed fires"

"How Cal Fire decides to do burns... is there like a schedule, etc?"

Topic 3: Differences between the attitudes and experiences in the Listening Session compared to your community?

Topic 3A Figure: Whether the attitudes in the forum were similar or different to those in your community



Response count (8 total responses, multiple responses allowed)

Topic 3A Free response: Whether the attitudes in the forum were similar of different to those in your community

Describe in more detail how the attitudes in the forum were similar or different than those in the community?

"seemed to be consensus that prescribed burns were good for forest management"

"This group was more knowledgeable about prescribed fire than I think many are in my community. Less afraid of escapes or smoke."

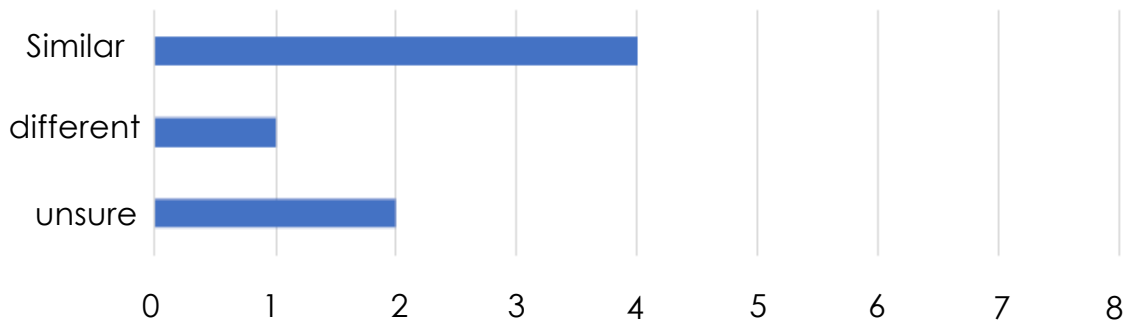
"I think more people are recognizing the need"

"I think most people who have been affected by fires (evacuations, burned property, burned home, etc.) see the for prescribed fires, as long as we're notified in advance, and they are kept in control."

"There seems to be a mix of people that are in support of prescribed fire, some that would like to be in support, but are not yet comfortable, and a small group of people that feel that prescribed fire is never the right choice. This is my experience with the community at large as well."

"Our community supports prescribed fire in order to reduce wildland fire threats and improve forest health."

Topic 3B Figure: Perceptions of how experiences were similar to or different from your community



Response count (8 total responses, multiple responses allowed)

Topic 3B Free response: Perceptions of how experiences were similar to or different from your community

Describe in more detail how the experiences in the forum were similar or different than those in the community?

"There was concern about air quality and burns but more so from wildfires than from prescribed burns. Although there was concern from neighbors burning and creating smoke"

Topic 4: Additional free response comments provided by participants

- "After posting my press release on several Facebook groups and NextDoor social media, I got a lot of replies from folks concerned about burning in the high wind even, and people less informed about prescribed burns. There were a couple of well-informed neighbors who replied and educated. Having additional voices on social media sites validating the value and conditions for a prescribed seems an important aspect of educating the public. A tactic no one mentioned, nor had I thought of."
- "I felt that there was not enough emphasis on forest health discussed. If there is less ladder fuel due to grazing, logging, and prescribed fire, the fires that do get loose won't be as hot and disastrous. But I am very encouraged about more discussion and work on prescribed fires being used to help prevent forest fires."
- "one person expressed concern about smoke did a good thing, contacted a local fire department, who validated wanting drier material for a less smokey burn."

APPENDIX C: CONTENT FROM LISTENING SESSION

Other relevant quotations not included in Results Section

Domain 1: Attitudes and concerns about prescribed fire

Positive Perceptions of Prescribed Fire

"[prescribed fire]. . . to prevent future, you know, out-of-control fires, in populated areas."

*"[wildfire] causes issues not only where fire is, but people in the valley"
[whiteboard]*

*". . . And when you have structures burned, you've got a lot more toxic, you know, paint and insulation and plastic and things like that burning."
[referring to wildfire smoke in comparison with prescribed fire smoke]*

Domain 2: Health symptoms and conditions from smoke

Health symptoms reported—general

"For those of us with chronic illness, symptoms can range from burning eyes and respiratory issues to full blown body involvement because of activation of mast cells. Some can go into an anaphylactic reaction."

"My daughter got poison oak because someone burned poison oak. She had it all inside her system, she was three years old. You couldn't recognize her, she swelled up so much, she basically had no face. She was crying all the time. And she was too young to get steroids."

Note: While caution is advised when prescribing steroids, age itself is not a medical contraindication.

"If it's too thick right where I'm at close by the fires, I guess, I just peel off to the side. . . .People got asthma—they ought to jump in their car and go the opposite way the smoke's coming."

Domain 3: Health- and exposure-protective behaviors

Measures taken and challenges

"I'm concerned about populations who work outside. I'm able to stay inside and use masks to mitigate smoke inhalation . . . [chat]"

*"Would be good to know about what we need, what to buy to prepare."
[whiteboard]"*

“Because of my asthma and the smoke really bothers me I've purchased air filters and then there's like a few times when it's really really bad that I've actually worn my COVID mask outside since I had it this year, just because but more for the smoke. So just wearing it outside because it helps with the smoke.”

“taking herbs to help epithelial tissue and stay moist” [whiteboard].

Information about interventions and protections

“To the question of have we considered one of the air filters, we have. But . . . we have not taken action to actually purchase it. But yeah, we considered it this past season. You know, whether we will do that come the next—well, I don't even know that we've gotten out of this fire season—but the next spring, when the temperatures start coming back up, that is a possibility.”

“We stay inside with all the windows shut. That's the only way to do it here. We're lucky, not being in the Central Valley, we don't get stifling hot. So we're able to do that. Even mid-summer, which I know is not usually when they do prescribed burns. So it'd be more smoke. Now, in the winter, obviously, you know, it's freezing cold. So that's okay for us to shut the windows, but that's what we do. We just shut the windows and I don't go out at all.”

“And the only knowledge I really had to mitigate was rain and N95 mask when I could. But that being said, they're not always easy to get especially given the current public health crisis.”

“So we had some of those [N95 masks] and at the beginning we thought, okay, we would work outside but we just got so filthy. And we sweat so much. . . . When we took them off, you can see a ring of color around her face. And that was just the ash. So we stopped doing that.”

“We didn't run an air purifier. But we did run our h HVAC system to circulate the air. But we feel fortunate—we had replaced our windows over the last few years and felt like the house was pretty sealed.”

“I did get a device called an ozonator. And it actually generates ozone that takes the dust out of the air. It works but it created a health problem. So it's not very good for you. But it reduced the odor and the sensation of smoke. So I ran it when I was not in the house. And when I came in, I can turn it off. That did a fairly good job.”

Note: Guidance from the California Air Resources Board and other agencies recommends that ozone generators not be used, except for approved industrial purposes and when no people are physically present. Please refer to [CARB](#) and [USEPA](#) guidance.

“I live in a motorhome. So there is no central air. We took that suggestion [DIY air filter on a fan] and ran with it. And it worked very well.”

“I haven't seen formal studies on it [DIY box fan with air filter]. But I know the Mariposa health officer, they basically, you know, put an air quality monitor

in the room, you know, and started it up and watched it drop as it was filtering. Fairly impressive.”

“The new homes in California are being designed to high levels of air tightness standards, which then require mechanical ventilation for indoor air quality, like on that older [buildings] air just kind of comes in willy-nilly through cracks in the building, and you don't have as much control over the air quality. And then you're also having to spend a lot more money on heating and cooling. . . . Even a home that is older, you know, obviously you can have a plug-in air filter, [but] those homes are going to still be more vulnerable because their windows and walls have air infiltration at way higher levels than the newer homes.”

Domain 4: Messaging—desired content

Importance of identifying smoke as prescribed, not wildfire

“As long as we knew what was going on. . . . When you have smoke in the air, it's disconcerting. So if you have a notification that it might be happening, at least we'd know what it is, right? and not be upset about it. And even if people told you, we are doing something today, that's what you're smelling. That would certainly help. . . or you could just do it on the day. . . . It's like, okay, we see smoke in the air. And we've all got a message on our text . . . so we know. That would work.”

General comments

“Where it's happening, how many days and a window of when it will occur.”
[whiteboard]

“And like it's a rock and a hard place—the timing [can] be so narrow. That is, the weather forecasts can only go out so far and to be dependable. And our burn . . . we had 45 people signed up to help. That's a lot of folks to coordinate at a very last-minute way.”

“So people might like to know a month ahead but, the exact date, which is going to matter to them—because that's the day that smoke might happen or eventually happen—we don't have [that] a whole lot of time, so I would expect them to know once we make a date.”

“One of the things that is difficult about informing people ahead of time is that you are, when you're planning a prescribed fire, you have to deal with the fact that the weather's changing, and maybe your fuels aren't dry enough or they're too dry. There's a lot of times when you're planning a prescribed fire for Tuesday, and then you have to put off and put off again. . . . You may be planning and rescheduling and rescheduling, and it's not like—you can really say next Tuesday, you can say, in the next five days, we're gonna try to do this section, if the conditions allow. And maybe that would be even . . . good

information for people to be clued into the sort of window that you're looking at? I think that would work.”

“Yeah, a lot of what's being done right now other than the burn piles and summer homeowners associations that is being done with the Forest Service, and they use the same kind of basic press release every time they do one. But they run into the exact same problems that you folks are talking about. And that is, we're going to try and do it next week, they start messaging and then the weather changes and they can't get the inversion layer right, they can't get the wind right and so now they have to they put it out again and try and message again. So they use just a kind of a basic template. . . we're going to be burning in this area, we're taking all the precautions, it's permitted because they still have to do AQL, and of course, they also then have to do all the environmental impact reports, EIR's, because on it's government property, so that tends to create even more work for them. But at the end of the day, when they go to burn, it's probably almost as perfect as it can be.”

Value in messaging for reassurance

“I think it's important to assure people that we are doing it under permit by CAL FIRE or not, that it is indeed, allowable, because we're no longer on property restrictions, we're allowed to burn. . . . So those things seem to assure people that we're not just sneaking this in.”

Domain 5: Messaging—how information is communicated

“It's like where's that hub or central place that we all know. . . . This was true for the XXX Fire here. You know, do I need to evacuate? which way are the winds going? which way is this fire going? and when I learned about 211 who were sending out—for me—text updates about how that fire was proceeding and as the different areas were shifted from warning to mandatory, that was very helpful, and I would wish for the similar kind of thing for anybody that wanted to sign up for say, for prescribed burns, just to know it's going to be coming—in the information that you all listed, you know, when, the duration and where etc. I think a hub that anybody can access in various media.

“I like the question of 211. I don't have the answer—I'll preface this. But I'm wondering if they would be willing to take that information from—not burn pile owners, you know, single quarter acre pile owners, but when we start doing larger private burns, or even the public burns, and have that information so that people call them.”

“So I have a suggestion. . . . When we have that Amber Alert, and or—I think the Silver Alert . . . it goes through on my cable system, as well as my phone, and you actually have to clear it. And in other words, it knows you're seeing it. And, honestly, where I live, you know—it's different for other people in California—[but] it's extremely important that we know that. And obviously, for

Caltrans, to put that on those signs. . . . They must be getting a lot of phone calls from people saying there's a fire in our area, when it's not. So I think utilizing the you know, a television system and the phone text alert system is important. And they could design something similar, might not have to be the same thing, but that would be where I would suggest."

"It would be nice to be on some kind of email contact list. So that when, you know, the agencies are creating, prescribed burns that they can email people in the general area, that information, the date, how long, that kind of thing."

Situations of limited electronic access and alternatives

"Or if there was someone you could call, if you could call CAL FIRE or whoever, because I don't always have enough reception to do anything online. But I have enough I can make a phone call, you know, and if there was, if I could call the fire department and just say yeah, I'm about to light this fire here, and could you please drop me a pin so my neighbors know what's going on."

"I agree with all the signage ideas, because we have a lot of elders that don't get emails and texts, but also utilizing the emails and text system would be great too."

"Like the Forest Service or fire departments with their boards out, with their rainbow meter saying what the fire danger is, there could be a board that shows air quality and even signage about prescribed burns, whether it's digital boards, or any other signage, especially at fire departments for people kind of look for that kind of information, and tend to be in areas that people are driving past or maybe at schools too, just through kind of old school signage. That's what I would recommend, as well as you know, radio and Yubanet and press releases."

Community-level notification systems

"I think that if you even have, you have a forum for communicating with the people who are not on your road, but may have an adjacent property line or something—that seems like—having some sort of like a message board or something so that people could just check in and see what's going on around them."

Domain 6: Emerging Themes

Need for education—community-level

"And I don't need to [do prescribed burns] anymore because I cleared all my grounds and I brought in 600 head of goats, got my herd up to 600 and we killed all the brush off. . . . Hmm if anybody likes to see my grounds, I'm more than happy to show them."

“A Firewise community structure is designed so that you can coordinate with your neighbors, and that you're all sort of on an email list together, and you have meetings and talk about your neighborhood risks. Like if, in order to escape a fire, you have to go out a road and there's a terrible brush thicket that if it was on fire, you wouldn't be able to get out, then you can sort of communicate to each other and find out whose land that is, and maybe get some help to make your make yourself more safe by helping out your neighbors.”

Role of agencies

“Where we live, I think you have to involve the Fish and Game to some extent because they know what the wildlife situation is and whether there's, you know, animals that are trying to mate, or that have a lot of babies and stuff that may not be able to handle the fire—I think those things need to be taken into consideration. Also, and the weather and air management people do have a role to play because they have—they can help understand, predict maybe where some of the smoke is going to go, so that they can try to minimize that impact. So it's good to have them involved.”

“But I think sometimes the—I personally think the air quality people get a little too involved, and they can dictate when things get done and when they don't. They often want things burned when there's a lot of wind and doing prescribed fires when it's super windy is probably not the best idea in our area.”

Indigenous practices

“From things that I have read about historically. . . . Native Americans, that's how they control some of the areas and they would actually burn areas off, so that they could then use them to create better areas for them for farming or grazing, and that kind of thing. So they saw what the benefits were.”

“There's indigenous history to prescribed burns, which I think is really good to educate about. But it's also important to recognize that our forests now have been entirely changed. During the Gold Rush, the original forests were cut down. And so these are man-made forests, and they don't operate the same as indigenous forests did. So I think that having a balance of understanding where that history comes from, and also, how it is different now would be really beneficial for people to understand.”

APPENDIX D—DETAILED METHODS

Study population

Listening Sessions were held in Nevada and El Dorado Counties, both located in the foothills of the Sierra Nevada mountains and part of California's WUI. The two counties are relatively rural, with 46.4% of Nevada and 36.9% of El Dorado Counties' populations considered rural, as compared to the State of California at 6.4%.¹⁹ Median household incomes are somewhat lower in Nevada (\$66,096) than El Dorado (\$83,377); California's is \$75,235. The percent of persons living below the poverty line in Nevada (8.4%) and El Dorado County (9.3%) is somewhat lower than California as a whole (11.8%). Demographically, the majority of residents in Nevada and El Dorado Counties are non-Hispanic white, at 85% and 77% respectively, differing from 36% of Californians overall. Internet subscription rates are comparable between Nevada (86%), El Dorado (87%) and California (87%).

Recruitment was conducted by a local consulting organization in the study area, Ellis Planning Associates, Inc. (EPAI), using primarily a convenience sampling method. To achieve greater diversity of participants, we sought to recruit subjects from different county supervisorial districts, which generally vary by income levels and characteristics such as rural or town-dwelling. We also asked about length of time living in the county, education, political preference, age category, and occupation. EPAI aimed to recruit persons in categories of interest, using existing connections, referrals, and soliciting participants through selected social media, e.g. local Facebook groups and NextDoor. Participants were screened by characteristics to enhance variability among participants and for our background understanding, although we did not impose strict quotas.

The majority of residents identified as rural rather than town (66% vs. 31%), and their residences were spread throughout the different supervisorial districts in each county. All participants were full-time residents. The length of time living in the county ranged between 2 years to over 40 years. The median length of time in the county was 23 years, and several persons reported being born in their county of residence. In terms of age, 39% were between 35 and 50; 29% between 50 and 64; 29% were 65 and above, and one was younger than 35. For political affiliation, the largest category was liberal (38%), followed by moderate (25%), undisclosed (25%) and conservative (9%). In terms of occupation, excluding five persons who identified as retired, 22% worked in health care occupations; 22% in community or social services, 19% in management and other skilled professional; 11% in other office-based administrative capacity or

¹⁹ US Census Bureau (2021)

computer occupations; and 11% in occupations involving working on or with lands. For participants with occupations involving familiarity with firefighting, emergency response or air quality comprised 15%.

During the recruitment process, we encountered individuals from the community who were interested in participating but would likely have greater than average knowledge and experience with prescribed fire and wildfires. We were concerned their opinions could unduly influence others or overshadow the conversation. Rather than exclude them, we considered them “influencers” and assigned them together to a separate breakout room in each Listening Session. In this way, we could still include them and benefit from their knowledge. These persons included a public health professional, a local air pollution control staff, a resident involved in a prescribed burn organization, staff at a forest ecology non-profit, and several others with experience related to fires.

Listening Session format

The Listening Session format is similar to a focus group and a town hall. Like a town hall, it affords the opportunity to hear from a variety of residents, but also allows for structure, more specificity in selection of participants, and the ability to solicit information in more depth. We also viewed the Listening Session format as an opportunity to capture exchanges between participants, as participants could respond to and build off comments voiced by others, resulting in a richer dialogue and collaboration in generating ideas.

The Listening Sessions began with an overview of the event. Questions were then posed to the full group, with participants able to express feedback via speaking, polls and chat. This was followed by smaller breakout room sessions of 2-5 participants, plus a research staff moderator, to allow for more interaction and conversation. In addition to speaking and chat formats, moderators took virtual whiteboard notes on the conversation. Finally, all participants rejoined the main discussion room, and breakout room moderators shared whiteboard notes and verbally summarized the discussion that had occurred in their breakouts.

As a reference, a recording (audio only for greater privacy) was made and transcribed with [Otter.ai](#) software and subsequently destroyed. Participants were asked to log in ahead of the start time to allow for a technology/sound check with each participant. Industry-standard software with federally compliant security protections (Adobe Connect) was used to ensure privacy and online security for the Listening Session environment.

Educational materials about prescribed fire and community health and safety resources including behavioral health were provided at the close of the session and in follow-up email.

Content Domains

The research team sought input from key stakeholders and community leaders in formulating questions and content areas of highest value. These stakeholders included representatives from CAL FIRE; California Air Resources Board (CARB); USDA Forest Service; local air pollution management districts; non-governmental organizations concerned with prescribed fire, including the Northern California Prescribed Fire Council; and local community members involved in prescribed burn associations. An extensive list of interest areas and questions were generated, which we ultimately consolidated into five specific content Domains:

- 1) Attitudes and concerns about prescribed fire—level of knowledge and support
- 2) Health concerns and symptoms related to wildfire and prescribed fire smoke
- 3) Health- and exposure-protective behaviors—actions taken and barriers
- 4) Messaging desired content—information and level of detail desired
- 5) Messaging and communication—sources, effectiveness

Each breakout room was typically assigned two or more topics. In addition to the above five Domains, all breakout room participants were asked for their thoughts, ideas, and recommendations to promote resilience to prescribed fires.

Although the Listening Sessions were structured to solicit and report findings directly in response to the five *a priori* established Domains listed above, the qualitative and open-ended nature of the method allowed us to capture new concepts and ideas that were presented, which we present as Emerging Themes, Domain 6.

Content within each of the question Domains are grouped with subheadings based on *a priori*, logical subcategories for the Domains and also themes that arose from the responses. Information is supported and exemplified by direct quotations, whiteboard notes and chat. Participant comments were slightly edited at times for ease of understanding.

Findings from the two Listening Sessions for each Domain were described together, unless an issue seems specific to a particular county, in which case that will be noted. Gender-neutral pronouns (e.g. they, their) were substituted to avoid the more specific pronouns (e.g. he/she).

Polls

Polls addressing key topics were taken in the main room and in breakout rooms. This provided the moderators background about the participants, as well as an opportunity for participants to engage immediately, which was especially important given the virtual nature of the venue. Additionally, aggregated poll

results were shared with the group after completion of each poll. Poll questions were multiple choice, with different statements on a topic and participants could select the one or more (depending on the question) that reflected their best answer.

Poll results from the two Listening Sessions are combined in this report due to the small numbers, especially in the second session. Results were relatively similar; if a potentially meaningful difference between the groups was detected, that is noted, although formal statistical tests were not performed.

Poll questions posed in the main room addressed awareness, familiarity, and experience with prescribed fire. Several questions addressed perceptions of health effects from wildfire or prescribed fire smoke. Another question addressed notifications and messaging. Following the breakout sessions, participants were asked two additional poll questions in the main room. The first assessed their level of support for the policy of increased prescribed fire. The second assessed their support for the concept of managing fire for resource objectives; that is, allowing controlled management of fire that was not intentionally ignited, but which is serving a useful purpose as a prescribed fire would. There was also a question posed at the beginning of the breakout rooms to assess participants' level of confidence about their knowledge of how to take health protective action regarding smoke.

Post-Listening Session survey (Appendix B)

After the Listening Sessions we sent an optional and anonymous follow-up online survey (Esri Survey123) which drew eight responses (we do not know affiliated county or identity of respondents). The survey asked about whether their participation in the Listening Session had affected their knowledge, changes in their thoughts on prescribed fire, what they learned and would like to learn still, current attitudes, and whether they thought the opinions expressed in the Listening Session were similar or different from their own community. Because of the small number, we will briefly report a few findings in relevant sections of the report and provide complete responses in Appendix B.

Institutional Review Board and human subjects' protections

Consent to participate in the research was sought prior to the Listening Sessions, with study procedures, risks and benefits, and Participant's Bill of Rights reviewed and documented via [DocuSign](#). Participants received a \$25 gift certificate incentive for participation.

This research is approved by the California Health and Human Services Agency Institutional Review Board, Project #: 2020-181, and is affiliated with #2020-138, the overarching research study of prescribed fire public health impacts.

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