

Collective Action on Smoke, Health, and Fire:

Prescribed Fire Policy Barriers and Opportunities in California

MICHELLE GREINER, HEIDI HUBER-STEARNs, AND COURTNEY SCHULTZ

Public Lands Policy Group Practitioner Paper #23 / Ecosystem Workforce Program Working Paper #129



About the Authors

Michelle Greiner is a Research Associate in the Public Lands Policy Group in the Department of Forest and Rangeland Stewardship at Colorado State University.

Heidi Huber-Stearns is Co-director of the Institute for Resilient Organizations, Communities and Environments and Ecosystem Workforce Program and Director of the Center for Wildfire Smoke Research and Practice at the University of Oregon.

Courtney Schultz is the Director of the School of Sustainable Futures at Colorado State University, Professor in the Department of Forest and Rangeland Stewardship, and the Director of the Public Lands Policy Group.

About The Public Lands Policy Group (PLPG)

The Public Lands Policy Group (PLPG) is a research group at Colorado State University. We conduct applied research at the interface of people, policy, and natural resources. Our work focuses on forest governance, with particular emphasis on wildfire resilience, climate adaptation, collaborative restoration, and the role of science in policy and decision-making. Our publications aim to inform agency practice, support federal and state partners, and contribute to scholarly and practical discourse.

More information:

<https://sites.warnercnr.colostate.edu/courtneyschultz/plpg-practitioner-papers/>

About the Ecosystem Workforce Program (EWP)

The Ecosystem Workforce Program (EWP) is a program of University of Oregon's Institute for Resilient Organizations, Communities, and Environments. We conduct applied social science research and extension services at the interface of people and natural resources. Our publications aim to inform policy makers and practitioners and contribute to scholarly and practical discourse.

More information:

<https://resilient.uoregon.edu/ewp/publications>

Acknowledgements

This study was made possible by funding from the Resources Legacy Fund. We would like to express our sincere gratitude to all our interviewees whose time, insights, and perspectives informed this research, including through member checking our results. We would also like to thank several individuals who advised on and supported this work. Special thanks to Sara Clark, Lenya Quinn Davidson, Natalia Reyes Becerra, Paul Mason, Will Barrett, Teresa Fao, Jon Hunter, Diana Van Vleet, and Tyler Garnier. We thank Stephanie Schneider for map creation, Jess Downey for report review and Figure 1 content, Ashtin Neikes for Figure 1 design support, Alison Deak (University of California Cooperative Extension) for the photography and Casey Davis for report design.

For more information, please contact:

Public Lands Policy Group, Department of Forest and Rangeland Stewardship,
Colorado State University, Fort Collins, CO 80523-1472

courtney.schultz@colostate.edu

sites.warnercnr.colostate.edu/courtneyschultz/

Table of Contents

Introduction	4
Background.....	5
Approach.....	7
Results	10
1. Air quality regulation and prescribed fire.....	10
2. Key considerations for prescribed fire	18
3. Perceptions on opportunities to maintain and increase perscribed fire programs	23
Implications for policy and practice	25
Bibliography	28
Appendix.....	30



Prescribed burn operations, Mariposa County, CA (June 11, 2024)



Prescribed burn operations: Mariposa County, CA (June 11, 2024)

Introduction

Fire-adapted ecosystems in California rely on fire to maintain ecological function (Stafford et al., 2022; Van Wagtenonk, 2018; Domènech et al., 2025; Yackulic, 2025). Prescribed fire¹ is an essential management tool for restoring these landscapes, and increasing its application is critical for mitigating wildfire risk (Kelp et al., 2025; Yackulic, 2025). Across the State of California, social, economic, and physical constraints complicate effective management, underscoring the need to better understand both the extent and nature of barriers to prescribed fire implementation (Williams et al., 2023; Domènech et al., 2025; Wear et al., 2025).

We conducted a research project focused on understanding challenges and opportunities for prescribed fire implementation on public forest lands in California, with particular attention to the role of air quality regulations. This project builds on our prior research on policy barriers to prescribed fire in the western United States (Schultz et al., 2018) and extends that work with a more focused investigation in California, integrating updated scientific and policy information derived from document review and primary data collection. Our primary objectives were to understand: (1) the nature of barriers to prescribed fire; (2) the factors that facilitate its application; and (3) whether air quality regulations were, or are expected to become, a major factor requiring increased attention. This report details our findings, which are based on 24 interviews with key informants, including land managers, air regulators, and agency partners.

¹ Prescribed fire, or planned fire used to meet management objectives, is a term synonymous with prescribed burns and planned or controlled burns or fires. Unplanned ignitions managed for resource benefit and cultural burning, together with prescribed fire, comprise “beneficial fire.” In our work, we focused on planned ignitions in our questions, although some interviewees also shared perspectives about management of unplanned ignitions and cultural burns.

Background

Although research on these topics is limited, prior studies have identified several key barriers that inhibit the use of prescribed fire on public lands. These barriers include limited capacity (e.g., insufficient funding or workforce during periods when weather conditions allow land managers to burn, also known as “burn windows,”² and limited capacity to complete environmental impact assessments), regulatory constraints (e.g., air quality permitting rules that restrict allowable times for conducting prescribed burns), incentive- and risk-related factors (e.g., concerns among burners or line officers about liability and negative public perceptions), and biophysical factors (e.g., weather constraints, such as wind speed or relative humidity) (Miller et al., 2020; Quinn-Davidson and Varner, 2011; Ryan et al., 2013; Schultz et al., 2019). Multiple studies also highlight the importance of collaboration and capacity building to increase prescribed fire, particularly in the context of steady federal funding declines, the need for budgetary flexibility achievable through partnership agreements, the value of engaging expertise outside federal agencies, and opportunities collaboration creates for institutional innovation and experimentation (Abrams, 2019; Schultz and Moseley, 2019).

Air quality regulations and their implications for prescribed fire application have been of particular interest. Past research has found that air quality regulations were not the primary barrier to the use of prescribed fire (Schultz et al., 2018). However, changes to Clean Air Act implementation could affect prescribed fire application. Specifically, the U.S. Environmental Protection Agency’s February 2024 rulemaking to strengthen the annual National Ambient Air Quality Standards (NAAQS) for fine particulate matter (PM_{2.5}) from 12 µg/m³ to 9 µg/m³ could result in states and tribes with nonattainment areas restricting prescribed fire use in order to meet the stricter standard. While the current administration has announced intent to roll back the standard (either through the courts or additional rulemaking), no final action has been taken as of May 2026 (U.S. EPA, 2025; Harvard EELP, 2026). Moreover, as prescribed fire use increases, states may have a harder time meeting even the more relaxed standard preferred by the current administration. As such, air quality regulations remain an ongoing and important issue for prescribed fire application.



Prescribed burn operations along Highway 41, Madera County, CA (May 31, 2023)

Scientists and public health experts agree that a significant increase in the use of prescribed fire is essential to reduce PM_{2.5} pollution. The only current pathway, the Exceptional Events Rule, is a complex and resource-intensive pathway, which limits its use (U.S. EPA, 2024; AAPCA, 2024; see page 9). Without a more accessible mechanism for increased prescribed fire, the NAAQS revisions may pose serious implications for public health and for the long-term ecological impacts of fire exclusion.

Additionally, this is a timely moment to track related efforts initiated in recent years, including the EPA-CDC-USFS-DOI memorandum of understanding and work plan on Wildland Fire and Air Quality Coordination, recommendations from the Wildland Fire Mitigation and Management Commission, and the proposed National Prescribed Fire Act and its implications (WFMMC, 2023; H.R.3889, 2025). Figure 1 includes a timeline of recent fire, smoke, and air quality policy actions relevant to California.

² Burn windows are the periods of time when weather and atmospheric conditions (e.g., wind speed, temperature, relative humidity) allow land managers to safely execute a controlled burn.

³ This memorandum of understanding established a cross-agency framework among the U.S. Environmental Protection Agency, the U.S. Centers for Disease Control and Prevention, the U.S. Department of Agriculture Forest Service, and the U.S. Department of the Interior to coordinate wildland fire management, air quality protection, and public health actions, including a joint work plan to address wildfire smoke and fire risk reduction (U.S. Department of Agriculture, 2023; U.S. Environmental Protection Agency, 2023).

Figure 1. Timeline of key dates for prescribed fire, wildfire smoke, and air quality policy actions relevant to California





Approach

The Resources Legacy Fund funded this project to identify perceived barriers to and opportunities for prescribed fire implementation on state and federally managed forestlands in California, with a focus on the current and anticipated role of air quality regulations. The project focused on National Forest System lands managed by the U.S. Forest Service (USFS), and on state-managed forestlands. Our goal was to develop a broad understanding of barriers to prescribed fire across the state, examine how air quality regulations intersect with these barriers, and identify opportunities to improve practice. We began by convening an advisory group of in-state leaders working in prescribed fire policy or public health to help shape our interview questions and identify potential interview participants with experience in prescribed fire application or air quality regulation in California.

In the fall of 2024, we began conducting interviews across California. Our approach was to interview five to nine current and former experts in each of the following groups (for 15 to 27 total interviews): (1) prescribed fire specialists and program managers with active prescribed fire programs at the U.S. Forest Service (e.g., Pacific Southwest National Forests and Regional Office) and state natural resource agencies (e.g., the California Department of Forestry and Fire Protection (CAL FIRE) and the Department of Conservation); (2) California public health and air quality agencies (e.g., the California Air Resources Board), including regulators from local air districts where prescribed fire is frequently conducted; and (3) individuals working to advance prescribed fire policy or science in California (e.g., collaboratives, academia, and legislative offices) (Figure 2). We sought to interview, at a minimum, one land management agency and one air quality agency in the Sierra Nevada and in Northern, Central, and Southern California, to ensure statewide representation; however, this study did not involve comprehensive case studies of individual forests or air basins. We employed snowball sampling, a purposive referral method in which participants recommend additional interviewees, to expand our sample. Some participants also served as partners in the California Wildfire & Forest Resilience Task Force and the California Air Pollution Control Officers Association (CAPCOA). We concluded the interview process after 20 interviews (24 interviewees), stopping based on funding constraints (Table 1). At the time of our study, we were unable to connect with as many federal agency employees as originally intended as they were unavailable for interviews. To address this, we expanded our sample to include additional state forest and land management representatives.

In California, state policymakers and agencies have expanded investments and research intended to support restoration of forest health and resilience, leading to updated strategies that increase the pace and scale of prescribed fire. One example is the California Wildfire and Forest Resilience Task Force⁴, which was established to address the unprecedented threat of wildfire to ecosystems and communities. The Task Force's Action Plan asserts that bold new policies, programs, and regulations are required to increase the pace and scale of forest management (Task Force, 2022). Since the release of the Task Force's *Strategic Plan for Expanding the Use of Beneficial Fire*⁵ (Task Force, 2022) the State of California has made progress on these priorities, including growth in the California State-Certified Prescribed-Fire Burn Boss (CARX) Program (with 67 certified burn bosses as of spring 2026), more than a doubling of prescribed fire treatments between 2021 and 2023, and implementation of the Prescribed Fire Liability Claims Fund (SB-926) (CAL FIRE, n.d.; CNRA, 2024).

The Task Force's Strategic Plan noted that, despite broad agreement on the value of prescribed fire, "significant regulatory, capacity, liability, and social barriers continue to limit implementation at scale" (CNRA, 2022, p. 12). Recent Task Force meetings reaffirm that these challenges persist unevenly across regions, ownerships, and practitioner types. The plan further emphasized that "addressing these barriers requires improved understanding of where, why, and how constraints differ across regions and ownerships" (CNRA, 2022, p. 14), underscoring the ongoing importance of research to support and advance policy development, funding decisions, and implementation capacity.

⁴ Governor Gavin Newsom established the California Wildfire & Resilience Task Force. It is a collaborative effort to align activities of federal, state, local, public, private, and Tribal organizations to support programs and projects tailored to landscape management and community protection from wildfire. Available at: <https://wildfiretaskforce.org>

⁵ Beneficial fire is the controlled application of fire for ecological stewardship. It includes prescribed burns, cultural burning, and management of unplanned ignitions. In our work we focused on prescribed burns, or planned ignitions, although some interviewees shared perspectives about beneficial fire.

Figure 2. Map of Air Districts and land ownership in California. Air district names in embedded table correspond with ID numbers in map.

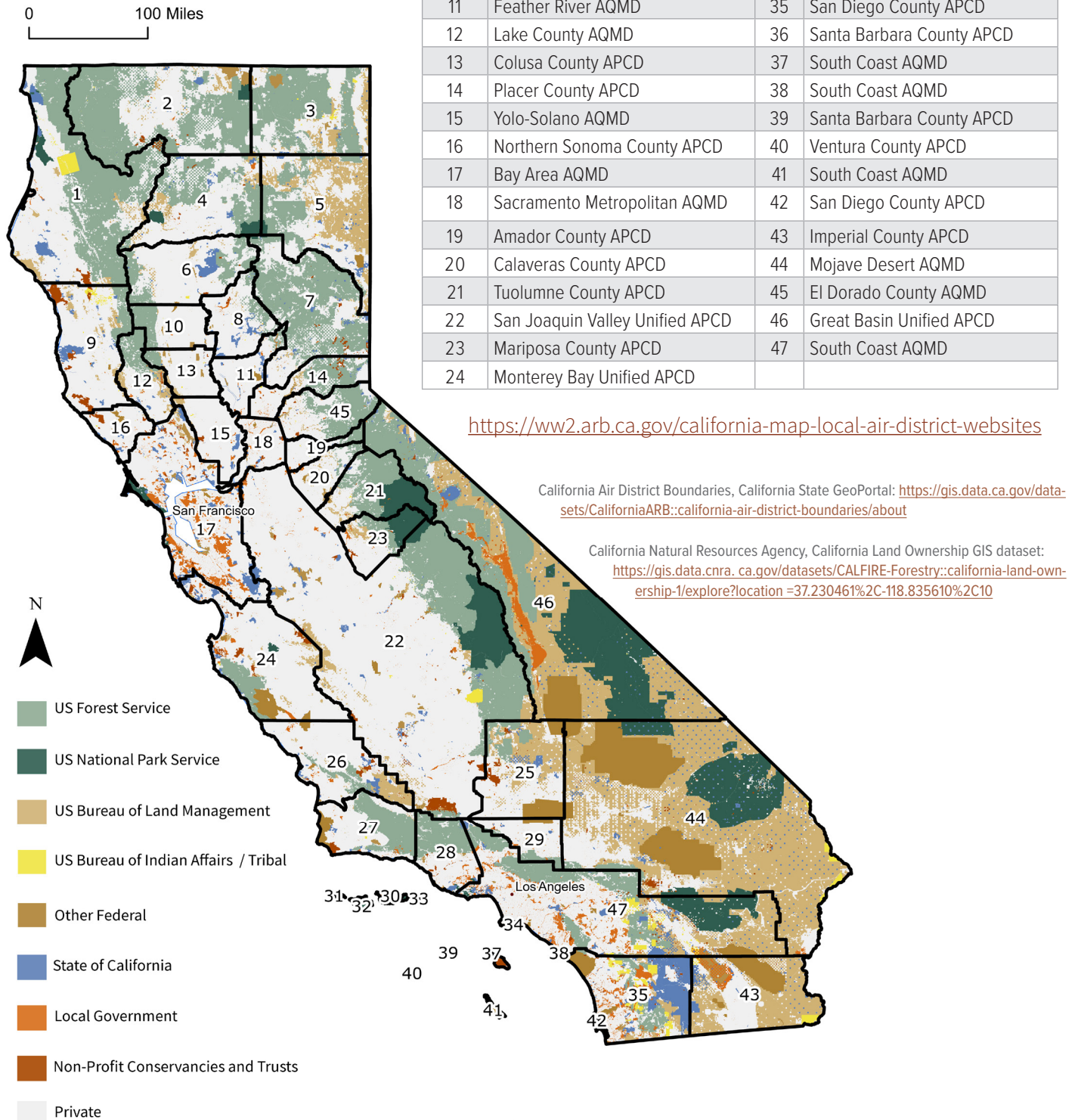


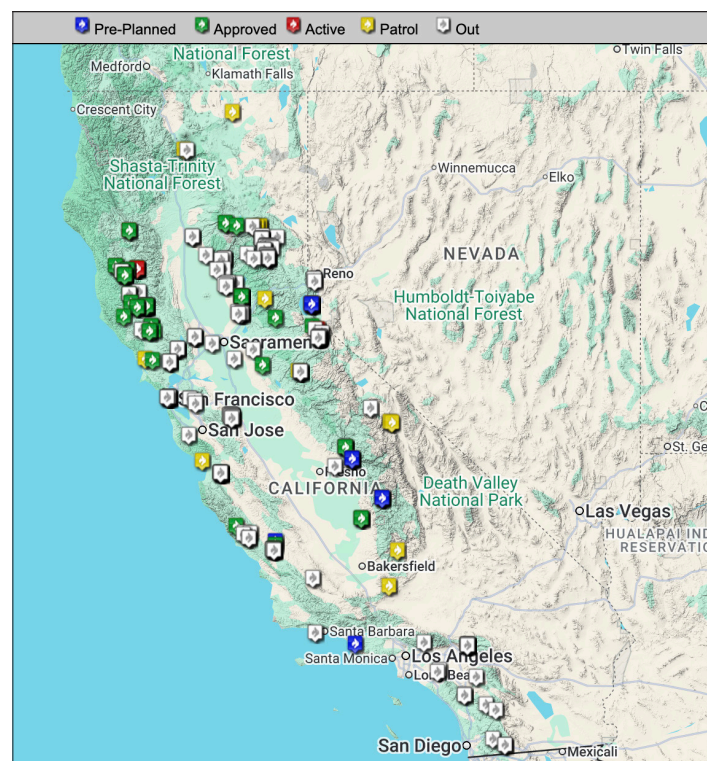
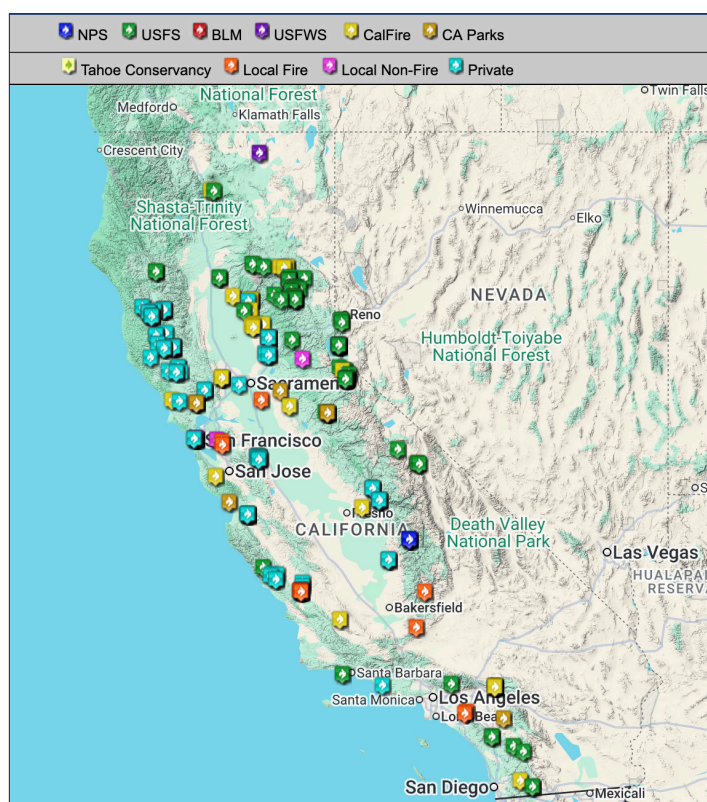
Table 1. Interviewee Organizational Affiliation

ORGANIZATION	# OF INTERVIEWEES
U.S. Forest Service	6
California Natural Resource Agencies	6
California Public Health and Air Quality Agencies	9
California non-profits, collaborative groups, and academia	3
Total Interviewees	24

⁶ The California Air Resources Board record of agricultural and prescribed burn monthly decisions is available at: <https://ww2.arb.ca.gov/ag-rx-burn-monthly-decisions>

In addition to conducting interviews, we reviewed existing secondary data to supplement our findings. This review included publicly available information on California's air quality regulations, the California Air Resources Board's (CARB) historical burn-day decision data,⁶ and other current and pending state policies relevant to prescribed fire and air quality permitting on federal and state lands. We also reviewed documents reporting on the National Forest System prescribed fire projects and accomplishments. Interviews provided additional details about on-the-ground implementation of policies and air quality permitting processes.

Our research followed an approved Institutional Research Board protocol (No. 5903, Colorado State University). Interviews were recorded and transcribed with interviewee consent and then analyzed for themes relevant to our research objectives. In addition, we conducted member checking with all interviewees, giving them the opportunity to review and respond to our findings. We revised our report based on this input and other reviewer feedback. This report includes selected interview excerpts to illustrate key findings while maintaining interviewee confidentiality.



Prescribed Fire Information Reporting System (PFIRS) ignitions from May 1-31, 2026, by agency (left) and status (right).

Available at <https://ssl.arb.ca.gov/pfirs>

Results

1 Air quality regulation and prescribed fire

In this section, we present an overview of air quality regulation, its interaction with current prescribed fire programs, and interviewees' perspectives on how regulation is affecting prescribed fire implementation. Because air quality regulation and prescribed fire implementation in California involve multiple authorities and processes, it is important to first understand how burn activity is regulated and which organizations play key roles. We therefore provide federal and state regulatory context within the Results section, as this information emerged directly from interviewee accounts.

Regulatory context:

Clean Air Act and air quality permitting process

To protect public health, the federal Clean Air Act requires the U.S. Environmental Protection Agency (EPA) to establish health based National Ambient Air Quality Standards (NAAQS). The NAAQS define the maximum allowable concentrations of pollutants (e.g., soot and smog) in outdoor air over specified periods. In California, Title 17 of the California Code of Regulations establishes California Ambient Air Quality Standards (CAAQS), as determined by the California Air Resources Board (CARB), including standards for pollutants such as PM_{2.5} (17 CCR § 70200).

Under the Clean Air Act, states recommend designations to the EPA which then makes the final determination to designate areas as either in attainment or nonattainment of the NAAQS based on monitored air quality data.

These designations determine whether states must develop or revise State Implementation Plans (SIPs), which describe how different areas within a state will attain the NAAQS. Attainment and nonattainment designations do not regulate individual emission sources directly; instead, they shape federal and state planning, reporting, and control obligations through SIPs (Clean Air Act §107, §110; U.S. EPA, 2025). In California, local air districts and CARB implement monitoring programs and control measures to manage emissions and support compliance with applicable standards.

The Clean Air Act also includes provisions for “exceptional events,” which recognize that some exceedances of NAAQS result from unpreventable or uncontrollable events. In 2005, Section 319 of the Clean Air Act established the Exceptional Event Rule, which allows states to petition the EPA to exclude air quality data influenced by outlying events such as wildfires or volcanic eruptions, when determining violations and exceedances of NAAQS and in the setting of attainment and nonattainment designations (Clean Air Act § 7619 Section 319(b)). In 2016, the EPA revised the Exceptional Events Rule (codified at 40 CFR 50.1, 50.14 and 51.930) to clarify how it works, which showed a greater willingness to allow prescribed fire to, in some cases, qualify as an exceptional event. At the time of our interviews, legislation was underway to provide certainty around the use of prescribed fire and the Exceptional Events Rule.

In California, the California Air Resources Board (CARB) is the primary state agency responsible for protecting public health from the harmful effects of air pollution.

CARB supports 35 air quality management districts or air pollution control districts, which serve as governing bodies responsible for regional air quality planning and issuing burn permits (See Figure 2 in Approach section for a map). Throughout this report, we refer to these entities collectively as local air districts. As part of its Smoke Management Program, CARB adopted the Smoke Management Guidelines, which establish the framework for managing smoke impacts from agricultural⁷ and prescribed burning under Title 17 (17 CCR, §§ 80100–80330). Most local air districts implement and enforce the framework through district-specific rules and regulations.

⁷ Agricultural burning focuses on disposing of crop waste from agricultural operations, while prescribed burning aims to reduce wildfire risk, improve habitat, and restore ecosystems.

Burn day determinations are guided by CARB-approved Smoke Management Programs required under Title 17 (17 CCR, §§ 80100–80330). Each day, CARB evaluates meteorological conditions to determine whether the following day will be designated as a “permissive burn day” or a “no-burn day.” In some cases, CARB also authorizes “marginal-burn days,” although the criteria for these designations vary by air district (Figure 3). Local air districts make the final decision on whether to approve individual burns on the day they are scheduled, using CARB burn day designations as guidance. As a result, burn day determinations vary across counties to reflect local conditions and considerations. Some air districts, including San Diego, the Bay Area, the South Coast, and the San Joaquin Valley, also conduct their own meteorological forecasting. One air quality interviewee explained,

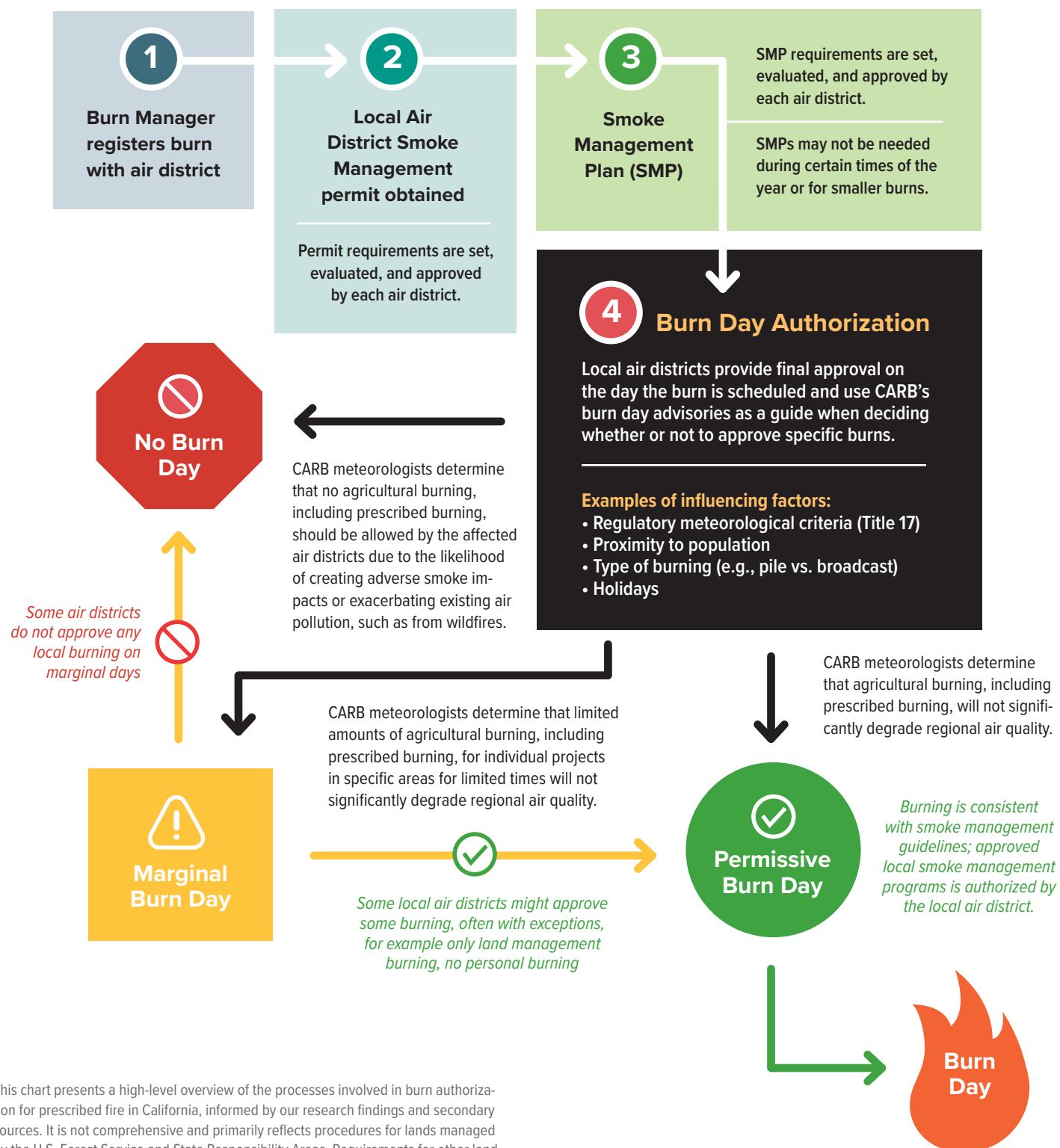
“[CARB] issue[s] burn day declarations for the majority of the state. Those can be a permissive-burn day or a marginal burn day, which is when dispersion conditions are not that great, but small burns may be okay, [or a] no-burn day. There are meteorological criteria that are set forth in Title 17 that we have to follow, and when those criteria are not met, then [we] issue a no-burn day.”

Title 17 and the California Air Resources Board (CARB)

California Health and Safety Code established smoke requirements in the California Code of Regulations, including Title 17, Section 80100, “Smoke Management Guidelines for Agricultural and Prescribed Burning.” These Guidelines direct local air pollution control and air quality management districts (air districts) in regulating agricultural and prescribed burning across California. The Guidelines are intended to provide for “the continuation of agricultural burning, including prescribed burning as a resource management tool, and provide increased opportunities for prescribed burning and agricultural burning, while minimizing smoke impacts on the public. The regulatory actions called for are intended to assure that each air district has a program that meets air district and regional needs” (17 CCR, §§ 80100–80330). Title 17 of the California Code of Regulations houses the health and air quality rules supported by CARB. CARB is the lead agency responsible for protecting public health from the harmful effects of air pollution in California to attain and maintain health-based air quality standards.



Prescribed burn, Mariposa County, CA (December 18, 2022)

Figure 3. California burn day determination and approval flowchart

This chart presents a high-level overview of the processes involved in burn authorization for prescribed fire in California, informed by our research findings and secondary sources. It is not comprehensive and primarily reflects procedures for lands managed by the U.S. Forest Service and State Responsibility Areas. Requirements for other land types and burns (e.g., residential burns, agricultural burns) follow similar but distinct processes. Additionally, each step contains important requirements that vary by air district, such as seasonal restrictions, CAL FIRE permits, burn size thresholds, cost, and other contextual factors.

Before a burn can take place, practitioners apply for a burn permit⁸, often months in advance. Permit types, requirements, and fees vary by jurisdiction, but applications generally include approved burn plan documents. In State Responsibility Areas, CAL FIRE issued permits are required during fire season and involve a site visit. However, there is an emergency Executive Order to remove the site visit requirement for California State-Certified Prescribed Fire Burn Bosses. Depending on the location and time of year, practitioners may not always need a CAL FIRE permit. On federally managed lands, practitioners obtain air quality permits from the local air district for each county in which work will occur. Depending on the burn, practitioners in State Responsibility Areas may need both a CAL FIRE permit and a local air quality permit. Although our work does not focus on burning in Local Responsibility Areas, local fire districts issue permits in those jurisdictions.

In addition to a burn permit, local air districts may require a Smoke Management Plan (SMP), pursuant to Title 17, CARB's adopted Smoke Management Guidelines and the local air district's rules. SMPs are required where CARB has approved a district's Smoke Management Program and are intentionally designed to be site specific, accounting for local meteorology, population and geography (17 CCR, §§ 80100–80330). SMPs vary based on local conditions, proximity to sensitive receptors⁹ (i.e., populations at higher risk of adverse public health outcomes from air pollution), and potential smoke impacts. These plans are intended to minimize public health effects by considering smoke dispersion, vulnerable populations, and contingency actions if smoke impacts exceed expectations.

Conditions for both burn permits and SMPs can vary depending on the season, the size and complexity of the burn, and the burn location. For example, in one air district, SMPs are required when burning more than one acre of material per day, for piles larger than a ten-foot diameter, burning multiple piles at a time, or if your burn will affect sensitive receptors. In most areas, burn plans, permits, SMPs, burn approvals, and emissions information are registered in the Prescribed Fire Information Reporting System¹⁰ (PFIRS), an online database used to coordinate air quality and land management agencies. Residential burns and



burns in Local Responsibility Areas follow different planning and permitting processes, which were not the focus of this research.

Several interviewees placed current discussions of Title 17 implementation within the broader historical context of California's smoke management framework. The state revised this framework following several large smoke incidents in California during the late 1990s that occurred with limited interagency coordination and public communication. Specifically, California revised, adopted, and codified the Smoke Management Guidelines¹¹ in 2001 to create a more flexible, site-specific framework. The revisions also aimed to improve collaboration between air quality and land management agencies by emphasizing advance planning, communication between burners and air districts, and the use of site-specific SMPs, rather than categorical restrictions on burning. This includes the daily interagency smoke coordination call, or the “1300” call interviewees noted, which has been key to ongoing cross-agency communication. As one interviewee explained,

“For our forecasters, we do an interagency smoke call at 1 o'clock every day, even during the weekends, during busy seasons. But, as we get later into the fall and into the winter, that takes a break on the weekends, and it's just during the week. We have four meteorologists on that call, one from CARB, one from both north and south ops of the GACs and San Joaquin Valley. APCD also joins us there. We discuss the weather, the dispersion, and then we hear from prescribed burn bosses that are doing projects, and they'll pop on and ask questions.”

⁸ We use the term burn permit broadly throughout this report to capture standard air quality burn permits issued by local air districts and CAL FIRE burn permits for general and broadcast burns, essential for legal and safe burning practices within California's State Responsibility Areas (SRA) or under CAL FIRE's jurisdiction.

⁹ Sensitive receptors are defined as “children, elderly, asthmatics and others who are at a heightened risk of negative health outcomes due to exposure to air pollution.” (California Health and Safety Code § 42705.5(a)(5)). Locations where sensitive receptors congregate are considered sensitive receptor locations. These locations may include hospitals, schools, and day care centers, as well as other locations identified by the air district board or CARB. Available at: <https://ww2.arb.ca.gov/capp/cst/rdi/sensitive-receptor-assessment>

¹⁰ The Prescribed Fire Incident Reporting System (PFIRS), established in 2012, is an online database that serves to facilitate communications between air quality managers, land management agencies, and individuals who conduct prescribed burning in California, about burn plans, burn approvals, and emissions information. Available at: <https://ssl.arb.ca.gov/pfirs/index.php>

¹¹ The Smoke Management Guidelines also require burners to consider alternatives to burning in planning their burn projects. However, when alternatives to burning are not feasible – due to excessive costs, technical inability, ecological needs or the potential to cause adverse environmental impacts – burning may be the only option” (California Air Resources Board, n.d.).

Although the intent to expand prescribed burning is embedded in existing Title 17 regulatory authorities, interviewees noted that this history and intent are not always widely understood or consistently applied in practice, contributing to ongoing perceptions of misalignment or constraint.

Within this regulatory framework, interviewees emphasized the ongoing challenge of expanding prescribed fire programs while also addressing smoke regulation and attaining or maintaining federal public-health-based air quality standards.

Several interviewees, particularly those in air quality roles, noted ongoing confusion among burners and others about who makes local-level burn decisions. As one air quality interviewee noted:

“The actual go/no-go decisions are done at the local air district level. CARB does smoke forecasting for much of the state to help the air districts make those decisions, but ultimately, it’s the air districts who are making those decisions on a day-to-day basis. It is not CARB, that is not their role in this process. . . . [CARB hears] a lot of frustration from burners and from CAL FIRE, [with people asking] ‘Can’t you make this easier?’ and [CARB would] be like, ‘We could try, but we don’t actually have direct control over that.’ [CARB understands] the need to facilitate burning [and] can work on policy changes that’ll make it easier to work with air districts. But ultimately, it is air districts [making those decisions].”

Another air quality interviewee described this confusion between CARB and the local air districts for burn declarations:

“So, if [CARB] call[s] a permissive burn day, if there are local factors in any of those [local AQ] districts, they can call a no burn day for their own jurisdiction. We run into that sometimes with folks that will read [CARB’s] burn declaration that’s published on the prescribed fire site, but they don’t look at the district site, or they don’t know that the districts can be different than [CARB], so we run into some confusion there.”

Air quality regulations as a barrier to prescribed fire

Although air quality is a consideration for all burners, most interviewees said air quality regulations are not the primary limiting factor for their current prescribed fire activities. As discussed in more detail in the *Key Considerations* section, land managers across both state and federal agencies emphasized that other factors, particularly limited capacity (e.g., staffing and

resources) and funding, more strongly constrain their ability to plan and implement prescribed fire. However, some interviewees noted that air quality regulatory compliance could become more challenging if prescribed fire is conducted at larger landscape scales, over multiple days, or at acreages necessary to achieve ecologically meaningful outcomes.

In some locations, interviewees explained that it can be difficult to remain in attainment for PM_{2.5} because of large population centers and multiple sources of pollution within the airshed. Several interviewees noted that communities with poorer air quality or more smoke-sensitive populations may be less tolerant of smoke, leading air quality and land management agencies to take a more cautious approach to potential smoke intrusions. One interviewee explained that “certain air districts are compromised [in terms of staying in attainment],” citing the South Coast Air Quality District (including Riverside and Los Angeles), the Bay Area Air Quality Management District, and the San Joaquin Valley Air District. According to this interviewee, these districts face significant challenges due to industrial and transportation emissions and because the San Joaquin Valley serves as a collection area for smoke transported from the southern Sierra Nevada into the Central Valley. “Those three air districts, by themselves, represent a fair portion of the state,” the interviewee explained, adding that “those areas are going to have the hardest time, regardless of what the thresholds are or any changes to the Clean Air Act.” Another air district regulator emphasized how population density shapes permitting decisions, explaining, “You can burn way out in the forest, and you are not going to impact people, so, I can approve of things that I know are not going to have a huge public influence. If you’re going to be burning in the valley, that is not so true.” The interviewee further noted that their district experiences relatively few high-particulate days in winter, stating that “we don’t have a lot of days where we would have to call it a no-burn day . . . because we are not super urban.”



Prescribed burn operations along Highway 41, Madera County, CA (May 31, 2023)

Relationships between air quality and land management agencies

Several interviewees described a history of misalignment between air quality agencies and land management agencies.

Interviewees explained that air districts were once considered difficult for land managers to work with, but that coordination has substantially improved in many of the places we interviewed in this study. As one interviewee from an air district noted, their burn program has “been successful for a number of reasons, and it’s primarily because of the good communication, building relationships, and lowering the barrier of access, where people feel comfortable to ask questions. That’s been a real key.”

Although interviewees emphasized interagency coordination has improved, some noted that perceptions shaped by earlier periods of disconnect may persist.

One air quality interviewee explained, “I think with the PM emission standards being lowered, it’s not stopping us . . . I think there’s a misperception - maybe carryover from years gone by. But nobody has been more supportive and hands-on than our agency. We really take great effort to build those partnerships.” Similarly, a land manager described long-term changes in air district approaches to prescribed fire, saying, compared to the past “the air districts have changed a lot, especially since we’ve had the big fires in the central Sierras. [They’re] a lot more open to burning as a method of fuels reduction than they were 20 years ago. . . . That’s been a big plus for us, but it’s taken a real solid working relationship with air regulators in my area . . . to accomplish that.”

Almost all interviewees emphasized the importance of strong interagency partnerships between air quality and land management agencies.

Although interviewees described historical disconnects between these groups, most clarified that alignment has improved through advances in interagency coordination and transparency, and that partnerships in many areas are longstanding. For example, interviewees noted that air regulators are often invited to attend prescribed burns and, in some cases, participate in burn plan meetings. These interactions were described as helping to build trust and improve communication. As one land manager explained, “I found that most air resource boards have actually been really supportive of prescribed fire. They want to come out and be part of the planning. They want to come out to the burn. They want to put sensors out.”

Interviewees also noted that increasingly, there are more actors in the airsheds wanting to burn, and as such, the role of strong partnerships and coordination is even more important.

As one land management agency interviewee explained,

“The Park Service wants to burn, [USFS] wants to burn, and private industry wants to burn. Then we have to, kind of play nice in the sandbox and say, ‘Okay, how much smoke? Do you [the Air District] have to open an air shed for all of us to burn?’ Or does one of us have to wait? . . . So, it’s a lot of coordination on some of those marginal days of burning. That’s where our daily briefing, especially during burn season, get pretty focused. . . . When we start planning burns, especially with CAL FIRE coming onto the table now, [they’re] planning their burns as well. Historically, CAL FIRE really hadn’t done any burning in the past 20 years, and now they’re starting to come on-line with their burn projects as well. It’s starting to impact the airshed. And again, in California, we are getting a little influx of private land burning from the new [California State-Certified Prescribed Fire Burn Boss] program.”

Another interviewee from an air district noted,

“The closest relationship that I’ve built over the last 10 years has been with our local county fire department. We consider ourselves to be two agencies, but one team. Literally, it’s immersive, where both agencies have to come in and start to learn to see things through each other’s eyes, and where the boundaries are with each other’s abilities and regulations. What am I looking at? What are you looking at? Then we start to see through that lens together.”

Many interviewees also attributed partnership success to the California Wildfire & Forest Resilience Task Force, which includes working groups focused on addressing key interagency challenges.

Additional forums for coordination include the daily interagency smoke coordination call (1300 call), PFIRS, and the joint prescribed fire trainings by the California Air Pollution Control Officers Association and CARB. Several interviewees noted that these forums create valuable opportunities for agencies to share information and learn from one another. One interviewee from an air district described these relationships as long-standing and collaborative, stating, “I’ve been out to quite a few of [the USFS] burns to see what [the land managers are] doing. The previous deputy who worked here had a great relationship with them for a long time, and I’ve been the same way. We’ve always had a really good working relationship.” The interviewee further explained that participation in planning meetings allows air district staff to review permit conditions, address concerns, and ensure shared understanding of air quality expectations. Other interviewees noted that in rural air quality districts, interagency partnerships have a long history of prescribed fire use.

Additional themes on air quality: technology innovations, smoke permitting and planning

Most interviewees reported that investments in technology for planning, monitoring, and modeling have helped improve coordination and decision-making between air regulators and fire practitioners. For example, most air districts we spoke with use PFIRS to facilitate communication about planned burns and approvals. At the time of our interviews, PFIRS was undergoing a revision (due out by end of 2026). One interviewee noted that “the additional time it takes to fill in a smoke management plan can be cumbersome, and we’re working on addressing that by basically rebuilding the PFIRS system to make it more efficient and more user-friendly.”

Several interviewees also described ongoing innovations aimed at existing systems, including longer-term smoke forecasting models and enhanced air quality monitoring.

Interviewees emphasized that investments in these technologies provide prescribed fire practitioners and air regulators with tools and resources that support successful implementation. As one interviewee explained,

“In the state, we have done a lot to build relationships between land managers, like CAL FIRE and air districts, to try to create more comfort and more knowledge transfer and then use that as a means to facilitate getting these burns done. The Air Resources Board has been investing in improved modeling to [support] longer-term smoke forecasts, so that people doing burns have a bigger lead time to know when a good day might be to burn.”

Interviewees also highlighted CARB’s efforts to streamline information for fire practitioners and air quality agencies.

One interviewee described a dashboard tool¹² under development that integrates PFIRS data with satellite imagery, air-quality data, and smoke modeling for individual burns. According to this interviewee,

“If there is an impact, we can deduce where the smoke came from and whether it was due to a [single] burn or a collection of burns. . . . We have a wealth of information across different systems, and we’re working to bring it together into a single tool that people can use.”



While coordination between air quality and land management agencies has improved, several interviewees noted that, at the local level, inconsistencies in permitting and smoke management plans can still pose barriers to implementing prescribed fire. Although most burn authorization requests are approved by air districts, in the areas we interviewed, interviewees reported that the discretionary nature of permitting and SMP review process can sometimes delay or circumscribe burn operations. Title 17 establishes statewide standards for smoke attainment, but final implementation and discretion reside with individual air districts. In practice, air districts may apply standards that are more stringent than those outlined in Title 17. As one interviewee explained, “Local districts can be more restrictive than [CARB] on burn day declarations. So, if [CARB] calls a permissive-burn day, and there are local factors in any of those districts, they can call a no-burn day for their own jurisdiction.” Interviewees noted that such local factors can include proximity to urban areas, schools, or hospitals. In addition, some districts experience significant public feedback as the primary point of contact for smoke-related concerns, which interviewees said can weigh heavily in permitting decisions. For example, when discussing communication with vintners in Sacramento, one interviewee explained: “Last year, we wanted to do a prescribed training burn with the [County] Fire Department. It would have been a low-intensity burn . . . the vintners were very concerned. We had reassured them, based on our experience there, the meteorology, the modeling, [but the burn] ended up not happening.”

Additionally, although air quality regulations were not identified as a primary barrier overall, interviewees identified permitting inconsistencies across air districts as a notable challenge in areas that fall within more than one air district. Because air district boundaries do not always align with forest boundaries or county lines, some interviewees noted that tracking requirements for SMPs and permitting is unclear. One interviewee from CARB explained,

¹² For more information on this dashboard, visit the Fire & Exceptional Event Assessment, Screening, & Toolkit, available at: Feast.dri.edu.

“A frustration that I hear from grantees is that if they’re in multiple air districts, the air districts aren’t necessarily consistent in their permitting decisions. A good example is land management agencies that are in the Tahoe Basin . . . [which spans] two different counties and two air districts. . . . It’s caused a lot of friction [and has] been a barrier to getting work done. There are probably thousands of burn piles [ready to be burned], and it’s very difficult for them to get burned. A big part of that, from my understanding from our [contacts] up there, is the burn permitting issue. It’s tougher [for example], for them in Placer [County] than in El Dorado [County].”

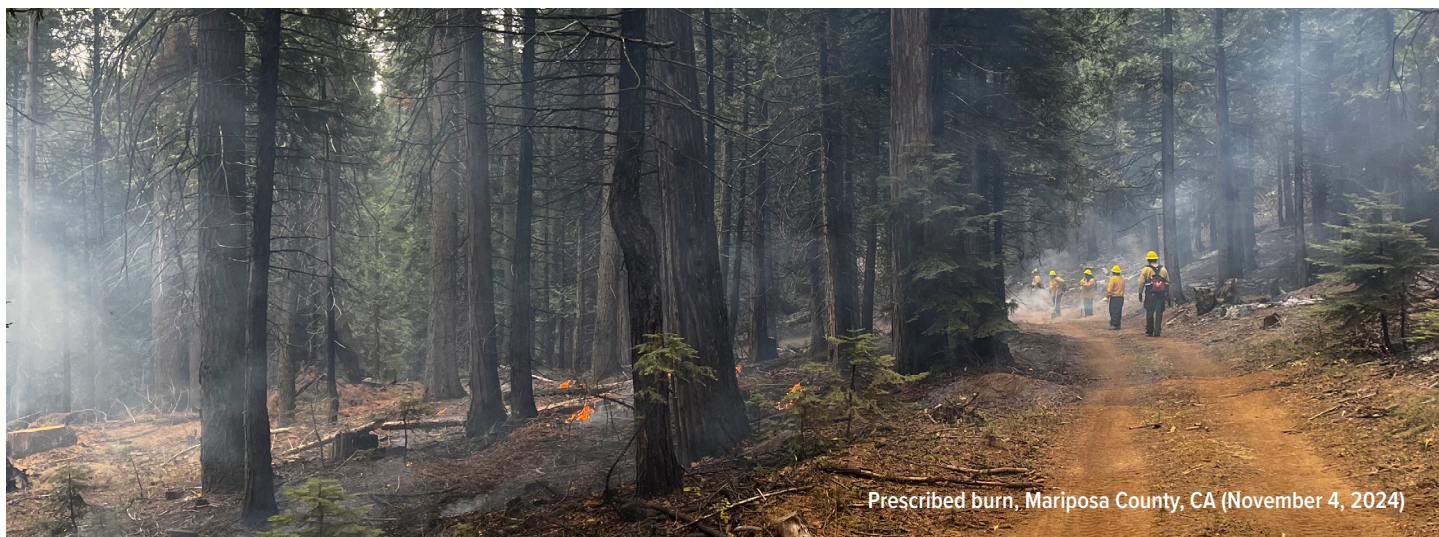
Conversely, some interviewees emphasized the importance of locally tailored smoke management. As one interviewee explained,

“Approved programs and the smoke management plans are geographically tailored. A burn next to a preschool or a hospital more likely will require additional detail than a burn that is far from a population center. Therefore, a smoke management plan addresses how a burn would be appropriately managed to minimize smoke impacts. Standardizing plans takes away the ability to make a plan fit the situation appropriately.”

Interviewees also reported that requirements for submitting smoke management plans vary across air districts, and that this variability can delay approvals. A few interviewees noted that differences in air district capacity, including staff experience, specialized expertise (e.g., in meteorology or fire behavior), and access to advanced smoke-modeling tools, can influence how SMPs are evaluated. A couple of interviewees emphasized that limited clarity on what standards are used for evaluating SMPs (not in Title 17 nor local rules) locally can cause uncertainty for burners about what must be included in their plans. Some air districts apply more prescriptive requirements, while others allow greater flexibility. For example, interviewees described some air basins as being highly specific about firing techniques detailed in SMPs, while others focus primarily on overall emissions. Some interviewees expressed frustration with these differences, with comments such as, “I was just blown away by how involved [the air district] was in what they required in submitting their plan,” and “I don’t understand staff [members] who get that nitty-gritty about the plan.”

Many interviewees emphasized that even after an air district approves all the planning requirements, including the burn permit, SMP, and authorization to ignite, a burn is not guaranteed to occur. Final decisions may still depend on other factors, such as fuel conditions, staff availability, or concerns about nuisance smoke.¹³ For example, one interviewee explained that nuisance smoke “can be grounds to not permit a burn, or to shut down a burn that’s happening. So, it may have no regulatory impact. It might not be anything for compliance. But if somebody downwind is complaining and the air district agrees that the smoke is problematic, they will call up the burner and say, ‘No, you’re done. You’ve got to put it out as fast as you can.’ Or they will say, ‘It is likely to cause a nuisance, so we’re not going to permit it’, even though it’s a permissive-burn day.” In short, this interviewee emphasized that even when a burn does not register on a regulatory monitor and trigger a potential exceedance or violation under the Clean Air Act, it may still be curtailed for other reasons.

¹³ Nuisance smoke is air pollution that constitutes a public annoyance but does not necessarily violate regulatory standards.



Prescribed burn, Mariposa County, CA (November 4, 2024)

2 Key considerations for prescribed fire

Funding and capacity challenges

Most interviewees across both air and land management agencies identified inadequate funding and limited capacity (i.e., workforce and resources) as the most significant barriers to accomplishing prescribed fire objectives. Interviewees emphasized that funding and capacity constraints affect planning and permitting operations as well as on-the-ground implementation. Many interviewees expressed this view directly. As one interviewee explained, “If I had to rank [barriers], the funding and the resource support would be the highest. . . . We need the support of increased personnel and funding.” As another interviewee noted, “Typically, a lot of burns get canceled because they don’t have enough resources or a qualified burn boss, so they have to wait until someone becomes available, or they don’t have enough contingency resources.” Interviewees also described broader limitations in organizational and workforce capacity.

One interviewee explained,

“There’s a finite number of organizations in California that have the organizational capacity and wherewithal to manage multimillion-dollar grants to do this type of work. There’s a finite number of registered professional foresters out there to do this type of work. There’s [finite] help with the permitting aspects of this work. There is a finite number of burn bosses and other people who can go out there and do this work. Organizational capacity and workforce capacity are definitely issues.”

Several interviewees further described persistent workforce constraints that limit prescribed fire implementation. Interviewees cited weak workforce incentives, including limited hazard pay, job instability, certification barriers, overtime caps, insufficient mental health support, and limited opportunities for advancement, as factors that hinder recruitment and retention. Many noted a shortage of qualified burn bosses and prescribed fire agency administrators, particularly for Type I burns, as well as limited access to advanced training and qualifications.



Test fire, Madera County, CA (June 5, 2025)

Interviewees also emphasized insufficient resources to prepare and conduct burns, including challenges in securing contingency resources. Land management agencies reported additional constraints related to operational and fuel costs, as well as the expense of site preparation. Interviewees from the USFS described increasing reliance on non-appropriated funds due to inconsistent federal fuel-reduction budgets, which makes it difficult to sustain staffing and maintain program momentum during periods of limited burning activity.

Several interviewees across sectors further explained that limited organizational and administrative capacity poses additional constraints on prescribed fire planning and permitting operations. Interviewees reported limited capacity for grant application and management, permitting and surveying at air districts, resource ordering and mobilization during burns, and logistics coordination, particularly across agencies. Permitting agencies noted that understaffing can strain review timelines, for example, by increasing the time required to review Smoke Management Plans. CAL FIRE interviewees noted that resource procurement and logistical support can be difficult to secure during large-scale prescribed fire operations. However, interviewees also indicated that recent legislation to streamline procurement (SB 1101) may help address some of these challenges.

Secondary barriers to prescribed fire:

Operational burn windows and coordination challenges across air quality and fuel conditions

Interviewees noted that burn window limitations, combined with operational capacity constraints and ecological and cultural considerations, continue to constrain prescribed fire implementation. Even on permissive-burn days (i.e., days favorable for burning from an air quality perspective), favorable dispersion conditions do not always align with fuel readiness or intended ecological outcomes. Ecological and cultural considerations included, for example, endangered species, hydrology and water resources, or the protection of cultural areas. One interviewee described this tension as follows:

“In terms of the other [barriers], obviously air quality days tend to surface. While there’s lots of days that are good burn days, the other factor is there may not be the right ecological or cultural conditions at a certain place that allow for that. Sometimes when the conditions are right, there’s a misalignment with air quality regulations on their own . . . I’m looking at ecological and cultural indicators constantly. . . . This last week on [a nearby] ridge [there were] sizable burns. They’re not necessarily in a time frame that I would say ecologically is achieving the benefits within the landscape . . . While they’re permissive, what are you really getting out of it? Those are important questions I think we need to be asking.”

Another interviewee framed this misalignment as less about regulatory constraints and more about differences in how air quality and fuel experts interpret favorable burn conditions. The interviewee indicated that air quality agencies may point to the availability of permissive-burn days as evidence that air quality is not limiting. In contrast, fire practitioners noted that these same days do not necessarily align with appropriate fuel readiness or ecological considerations, which can limit their ability to implement prescribed burns. They explained that this disconnect can complicate perceptions of the factors that constrain burning:

“From an operational standpoint, I’ve been in this field for almost 20 years, and I’ve heard [comments like], ‘air quality is in the way,’ or ‘air quality is a barrier,’ and it really boils down to communication. The air folks generally don’t have the fuels experience [that practitioners have], so that shared knowledge is really, really important when it comes to getting fire on the ground. Studies [show] that the majority of days are permissive-burn days, if you include marginal burn days. The issue is that those burn days don’t always line up with the best fuel conditions . . . the dispersion windows don’t match up well with the fuel windows. That [mismatch] is the tightrope we’ve got to walk.”



Prescribed burn, Madera County, CA (February 4, 2023)



Unhealthy air quality event triggered by the 2025 Garnet Fire, Mariposa County, CA (September 3, 2025)

Risk aversion and organizational culture

A few interviewees also discussed how risk aversion, organizational culture, and professional experience influence willingness to use prescribed fire in some locations. Interviewees explained that some land management agencies are more reluctant to burn, particularly at larger scales, because resources are often prioritized for suppression, leaving prescribed fire programs understaffed and increasing concern about risk from under-resourced burns. Several interviewees observed that reluctance to use prescribed fire tends to increase following escaped burns, mentioning the escaped burns that lead to the Hermit's Peak/Calf Canyon wildfire in New Mexico in 2022.

Interviewees further noted that when line officers responsible for authorizing burn plans have limited experience with prescribed fire, they tend to adopt more risk-averse approaches, resulting in more conservative decisions about when and how much prescribed burning can occur. At the same time, several interviewees emphasized that organizational culture at CAL FIRE and within air quality agencies has shifted toward greater acceptance of – and advocacy for – increasing the pace and scale of prescribed fire.

Public perception and community outreach

Most interviewees felt that public support for, and perceptions of, prescribed fire are generally positive across the state. At the same time, interviewees emphasized that community outreach remains an essential component of successful prescribed fire programs. As one interviewee explained, “There’s only so much smoke that can be tolerat-

ed from a public health standpoint, and we have a century of fire exclusion to try to chip away at. We have a lot of fire deficits out there. Trying to balance [those realities] will certainly be a challenge. . . . I really would encourage the people of California to invest in training, fire education, exposure for the public to go out on burns, and to really systematically build out that social license for prescribed fire.”

Compliance with other environmental policies

Non-federal interviewees reported that navigating the California Environmental Quality Act (CEQA), or projects moving through USFS National Environmental Policy Act (NEPA) review processes, can pose barriers to cross-jurisdictional work. Some interviewees explained that environmental compliance can slow the planning process, particularly in areas with fragmented land ownership. One interviewee described the challenge, saying, “There’s CEQA and NEPA that needs to be done, and there’s the air permitting. CEQA and NEPA can be challenging and can be a lot of work depending on the project. For our forest health projects, we explicitly encourage large landscapes, multiple landowners, and multiple project partners in those grants. Often, those grants are doing work on several different parcels that may or may not be connected across the landscape, so they are often meeting their environmental compliance obligations through a variety of different pathways and documents. There could be a little bit of NEPA over here, and a little bit of CEQA down here, and maybe a timber harvest document down here, or [California Vegetation Treatment Program, or an Environmental Impact Report] over here.” In short, the interviewee was noting that piecing together these multiple environmental impact analyses across jurisdictions can be challenging.

A few interviewees noted that species conservation requirements can conflict with the application of prescribed fire. For example, some interviewees discussed how protections for nesting birds, particularly the California Spotted Owl (*Strix occidentalis*), can limit burning through the use of limiting operating periods (LOPs), which are implemented to prevent disturbance during the critical breeding and nesting seasons. Another interviewee described a landscape-scale prescribed fire project with LOPs in place to protect critical habitat for Pacific fisher (*Pekania pennanti*) and Yosemite Toads (*Anaxyrus canorus*). In this case, LOPs restricted burning from March through July. This interviewee expressed concern that constraints on prescribed fire intended to protect key species have left Sierra mixed-conifer forests more susceptible to uncharacteristically severe wildfire.

Challenges on the horizon

Most interviewees emphasized the urgent need to expand prescribed burn programs, while also considering smoke regulations and the need to attain or maintain federal public-health-based air quality standards. To accomplish this, interviewees emphasized that capacity building and partnerships remain critical for scaling prescribed fire across landscapes. Specifically, they highlighted the need for a sustained prescribed fire workforce, qualified burn bosses and prescribed fire agency administrators, and adequately staffed smoke-permitting offices, in addition to the need for sufficient resources and funding.

Some interviewees noted the importance of new capacity-building funding programs, such as the Regional Forest and Fire Capacity Program, to help meet these needs. Several interviewees highlighted that continued coordination among burners, legislators, and air regulators remains essential for scaling up prescribed fire efforts. Air regulators also underscored the need to maintain a strong focus on protecting public health through safety measures and effective outreach.

Some burners identified the need to update forest management performance metrics¹⁴ beyond the number of forest acres treated. Interviewees described this shift as a challenging but important consideration for expanding prescribed fire. For example, some suggested prioritizing acres that advance restoration objectives or protect the wildland urban interface as alternative performance metrics. As one interviewee explained,

“There’s this acreage [metric]. I think that’s useful, but it doesn’t necessarily tell us about the health of those places. It doesn’t tell us about the fire resistance and the resilience aspects of it . . . even at another 10 percent [increase in burning], it’s still a drop in the bucket. We really need to think more in terms of how much of our landscape is in a fire-maintained state. That’s really what we’re looking toward.”

Interviewees also discussed short-term metrics, emphasizing the role of pretreatment activities¹⁵, such as hand-pile burning (a form of prescribed burning) or mechanical treatments conducted in advance of prescribed fire.



Blackened acres from prescribed burn in Mariposa County, CA (June 11, 2023)

A few interviewees noted that managing and tracking a larger number of increasingly complex burn projects may require innovative approaches, improved modeling, and new tools. Some interviewees anticipated that larger burns could introduce additional complexity and require different management considerations. Accordingly, they emphasized the importance of sustaining investment in emerging technologies and creative solutions. For example, one interviewee highlighted the need to better understand how smoke management for maintenance burns would function under an expanded burn program, noting that dispersion patterns may differ under these conditions. Another emphasized the importance of ensuring that, as large-scale burn projects expand, support for smaller, community-level burns is maintained. As this interviewee explained,

“There’s a lot of work that goes into budgeting those smoke allotments. . . . One concern I have as we get into a scaled future, [is whether] the air districts [will] be beholden to very large projects at the expense of individual community burns, or smaller projects.”

¹⁴ Performance metrics (or indicators) refers to the quantifiable outputs by which land management agency performance is measured. Although land management agencies measure numerous performance metrics each year, the one that is consistently identified as most important is the number of acres treated for hazardous fuels.

¹⁵ Interviewees particularly emphasized pre-treatment activities in advance of broadcast burns (planned, low-intensity fire applied across large areas) and underburns (low-intensity prescribed fire designed to consume surface fuels).

Other interviewees anticipated that substantially expanding the scale of prescribed fire (e.g., to 10-20 times the current annual acreage) could present future challenges related to air quality regulations. As one interviewee explained, “I do think if we get to that new [NAAQS] standard, it could change the ability for us to scale larger.” Several interviewees suggested that continued developments of supportive policies, programs, and planning processes will play a key role in significantly expanding the scope and scale of prescribed fire. For example, some suggested federal exceptional events determinations could provide additional opportunities for implementation. As discussed more in the *Air quality regulations* sub-section, the Exceptional Events Rule allows the EPA to exclude certain air quality data from NAAQS compliance determinations. However, interviewees expressed mixed views on this approach, with some noting that reliance on the Exceptional Events Rule may not represent a viable long-term solution.

Several interviewees explained that maintaining progress in expanding beneficial and cultural fire¹⁶ represents an additional key goal, alongside continued advances in prescribed fire. For example, the federal 2012 Forest Planning Rule requires forest plans to provide for ecological integrity by maintaining or restoring opportunities for the presence of fire as a key ecological process in fire-adapted ecosystems. In California, new forest plans include provisions for the use of fire as a beneficial ecological process. Several interviewees also advocated for increased resources to support the implementation of partnership agreements, particularly Cultural Burn Agreements (SB-310).

This legislation authorizes California natural resource agencies and local air districts to enter into cultural burn agreements with federally recognized Tribes in lieu of certain permitting requirements.

Finally, interviewees expressed optimism about the future of prescribed fire and public health, emphasizing that expansion of fire is possible while still meeting air quality standards. Interviewees grounded this optimism in increasingly strong coordination between air and land management agencies, as well as the state’s demonstrated commitment to improving wildfire resilience and forest health. Researchers also continue to study the effects of prescribed fire relative to wildfire on human health (Strabo et al., 2026). As one interviewee summarized. “Right now, in California today, there’s a chance of rain in the forecast, so, I’m wearing long sleeves, and I have my umbrella. I’m hoping that someday we prepare for smoke like we prepare for rain. To return California to a more natural fire-return interval – every five to twelve years – [as much as] California used to burn, we are going to have to accept smoke as a daily potential in our lives . . . because we really can’t stop it, [but] we can either have a little bit of a drizzle or we can have a flood. The floods are the catastrophic wildfires, and the drizzles are the prescribed fires. I would much rather have the drizzles on a regular basis than the floods.”

¹⁶ Cultural fire is the “intentional application of fire to land by a California Native American Tribe, a Tribal organization, or a cultural fire practitioner to achieve cultural goals or objectives” (California Public Resources Code § 4002.4). In our work we focused on prescribed burns, or planned ignitions, although some interviewees shared perspectives about cultural burning.



Prescribed burn operations, Mariposa County, CA (November 4, 2024)

3 Perceptions on opportunities to maintain and increase prescribed fire programs

Interviewees described a range of existing strategies and future opportunities to support and expand the statewide application of prescribed fire. Primary recommendations for land management agencies focused on addressing funding and capacity limitations related to planning, permitting, and implementation. Most interviewees reported a need for more qualified burn bosses, expanded joint training opportunities, dedicated year-round prescribed fire positions, and practical mechanisms for interagency resource sharing. Many land management agencies also called for greater and clearer guidance in permitting and smoke management plan decisions to promote consistency across air basins. In addition, land managers advocated for more strategic and opportunistic burn planning to capitalize on burn windows in high-priority fuel reduction areas. One interviewee suggested that enabling forest-wide prescribed fire through NEPA coverage could also advance burning, noting that the recently signed Sierra and Sequoia National Forest plans may offer useful examples. Adequate legal protection for burners also emerged as a key priority. Overall, interviewees emphasized strategies that support continued coordina-

tion between fire practitioners and air districts, as well as sustained investment in public outreach.

Nearly all interviewees stressed that prescribed fire is not occurring at the scale needed to promote landscape resilience or meaningfully reduce wildfire risk. To improve program effectiveness, several interviewees reiterated that capacity building and partnerships remain critical for scaling prescribed fire across landscapes. Many anticipated that, as prescribed fire expands, air quality regulations could become more constraining. A few interviewees viewed the use of the exceptional events pathway to support prescribed fire as a potentially effective short-term approach, while noting this process can be cumbersome. Other interviewees suggested that regulatory changes to the Clean Air Act that more directly exempt prescribed fire and reduce the regulatory burdens associated with the Exceptional Events Rule could represent a more durable pathway. Finally, some interviewees identified the need to examine additional incentives for the use of prescribed fire, such as developing outcomes-based performance measures alongside continued investment in modeling innovations (See Table II).



Prescribed burn, Fresno County, CA (February 20, 2023)

Table 2. Summary of primary reported facilitators and opportunities to maintain and increase prescribed fire

Theme	Interviewee's Perspectives on Prescribed Fire Opportunities
Workforce	• Expand joint training and qualification opportunities, including for land managers, burn bosses, agency administrators, grants and agreements staff, and air quality agencies. • Establish dedicated year-round prescribed fire positions with long-term career incentives within state and federal agencies. • Improve efficiencies in resource ordering and equipment availability for prescribed fire, ideally, systems that are comparable to suppression response. • Build organizational capacity to track, document, and report detailed burn information to state databases, such as PFIRS.
Resource Sharing, Partnerships & Communication	• Encourage and support proactive, frequent coordination among fire practitioners and air districts, and legislators (e.g., joint prescribed fire trainings by the CAPCOA and CARB, enable use of Air Resource Advisors¹⁷ on prescribed fires). • Expand Tribally led cultural burning through implementation of SB-310. • Establish a statewide master mutual-aid agreement to facilitate resource sharing and increase capacity. • Sustain CARB engagement with the California Wildfire & Forest Resilience Task Force. • Implement innovative, experiential public outreach strategies (e.g., PFIRS communications and opportunities for the public to observe burns). • Emphasize prescribed fire as a public health tool and explicitly evaluate trade-offs associated with limiting fire use.
Permitting and Planning	• Examine specific examples of permitting and smoke management plan barriers, assess how they have affected operations, and identify opportunities to streamline processes (e.g., requests for smaller burns). • Standardize, refine, and further integrate PFIRS across the state. • Enable more nimble and opportunistic burn planning, as conditions allow (e.g., longer authorization windows, cross-jurisdictional burns, and managed fire). • Ensure broad access to innovative modeling, planning, tools, and technologies (e.g., E-BAM, BlueSky, PODs).
Policy and Governance	• Develop and expand policies that provide adequate legal protection for practitioners (e.g., the SB 926 pilot Prescribed Fire Liability Claims Fund, and gross negligence standards). • Streamline procurement and logistical support for large-scale burns (e.g., SB 1101 CAL FIRE contracting and procurement process). • Consider statutory changes to the Clean Air Act to better accommodate prescribed fire. • Develop outcome-based performance measures for forest treatments that recognize and reward prescribed fire that improves forest conditions.

¹⁷ Air Resource Advisors are available during wildfires as “technical specialists with expertise in air quality science including air quality monitoring, smoke modeling, pollutant health thresholds, and communicating about smoke risks and mitigation. During wildfire incidents when smoke is a concern, their objective is to provide timely smoke impact and forecast information and messages based on best-available science” (Interagency Wildland Fire Air Quality Response Program, <https://www.wildlandfire-smoke.net/ara/>)

Implications for policy and practice

This research aimed to inform opportunities for improved partnership and coordination among air and land managers at the state level, as well as between federal and state agencies in California. Our findings align with prior research identifying barriers to prescribed fire in the western United States by underscoring that significant resource and capacity constraints affecting both burn planning and implementation remain pervasive across agencies (Miller et al., 2020; Schultz et al., 2018; Quinn-Davidson and Varner, 2012). While resource and capacity constraints are still the primary barriers, other important but secondary challenges include limited operational burn windows, risk aversion and agency culture surrounding prescribed fire, and compliance with certain environmental policies.

Our findings also offer insights into local air quality permitting and planning challenges and highlight anticipated federal regulatory considerations related to air quality. In addition, this research complements the work of the California Wildfire and Forest Resilience Task Force by illustrating how agencies and partners can leverage and share resources, establish interagency and partnership agreements, and build community agreement around forest restoration needs and approaches. In the paragraphs that follow, we identify areas where our key recommendations align with Governor Newsom's recent Executive Order (N-35-35)¹⁸ to expedite beneficial fire projects; these recommendations are marked with an asterisk.

Interagency collaboration plays a critical role in facilitating coordination, resource sharing, and problem solving. Our results point to numerous benefits associated with partnership efforts and communication across sectors, such as air quality and land management, and across multiple levels of governance and jurisdictions. Interviewees across organizations observed that existing partnerships helped streamline burn authorization approvals, enabling prescribed fire projects to move forward while still meeting public health objectives. Collaboration has also supported innovation and shared learning through initiatives such as the Task Force, enhancements to PFIRS, and opportunities for air quality agencies and members of the public to observe and learn more about prescribed burns.



Prescribed burn, Madera County, CA (November 8, 2024)

To encourage early and frequent collaboration among federal, state, local, and Tribal agencies, and between land management and air quality agencies, we suggest the following state-level approaches, noting that many of these efforts are already underway:

- Continue supporting accessible online platforms for tracking burn requests, permits, and related information (e.g., PFIRS) to help air districts promote faster, more efficient, and lower-cost permitting.*
- Sustain investments in innovative smoke monitoring and modeling technologies, analytical tools, and related efforts.*
- Support participation by land management and air quality agencies in the joint prescribed fire trainings by the California Air Pollution Control Officers Association and CARB, the daily interagency smoke coordination call, and other interagency forums.
- Dedicate air quality agency staff time to visit project sites, observe burns, and build relationships with land management counterparts.
- Encourage land managers to invite air quality agency staff to observe burns and build reciprocal working relationships with air quality counterparts.
- Ensure air quality liaison or smoke coordinator positions are established and staffed in all regions.
- Maintain joint investment by air quality and land management agencies in robust, unified prescribed fire public outreach efforts, such as communications distributed through PFIRS.

** Areas where our key recommendations align with Governor Newsom's recent Executive Order (N-35-25) to expedite beneficial fire projects.*

¹⁸ October 29, 2025, Governor Newsom signed an executive order directing state agencies to expand tools to safely deploy beneficial fire projects. State of California Executive Order N-35-35. Available at: <https://www.gov.ca.gov/wp-content/uploads/2025/10/Executive-Order-Beneficial-Fire.pdf>

Successful project planning and implementation of prescribed fire depend on a full set of enabling conditions and capacities.

Consistent with prior research, our results indicate that persistent workforce and funding constraints continue to challenge prescribed fire programs. Interviewees emphasized shortages of qualified burn bosses and prescribed fire agency administrators, limited workforce training opportunities, and insufficient staffing for administrative and planning functions at both permitting agencies and land management offices. Interviewees also highlighted the ongoing challenge of sustaining long-term resources and funding dedicated to prescribed fire as increasing portions of agency budgets are diverted to emergency wildfire suppression. In a context of limited capacity and declining agency budgets, agencies require efficient and flexible mechanisms for sharing resources and fire personnel.

We suggest policy approaches that address key capacity and workforce constraints, including the following actions:

- Expand access to prescribed fire training opportunities (e.g., the Beneficial Fire Training Network) and pathways for fireline qualifications through cooperative burning partnerships.*
- Identify and implement practices that improve recruitment and retention, provide adequate incentives, and promote career longevity, including increased funding and direction to establish a dedicated prescribed fire workforce.
- Establish dedicated, long-term funding sources and grant opportunities to build prescribed fire programs that support cross-agency collaboration and holistic efforts beyond implementation, including administrative and planning capacity, equipment, logistical support, and outreach (e.g., Regional Forest and Fire Capacity Program).
- Design outcome-based performance measures for forest treatments that could reward prescribed fire activities that improve forest conditions.
- Ensure that positions responsible for establishing and overseeing grants and agreements are adequately staffed, as well as positions responsible for authorizing burn requests.
- Address liability and insurance challenges, including the need for multi-year policies and reduced insurance premiums and deductibles* (e.g., SB 926, which established a pilot Prescribed Fire Liability Claims Fund).
- Authorize funding to support resource sharing among agencies and other partner organizations.

* Areas where our key recommendations align with Governor Newsom's recent Executive Order (N-35-25) to expedite beneficial fire projects.

The state may need to address whether local smoke management plans and air quality permitting processes require updates in the growing presence of fire.

Greater transparency and clearer guidance on how permitting decisions are made, as well as on the conditions required for SMP approval, could optimize planning and implementation, particularly in multi-jurisdictional areas. Emerging modeling tools and advances in permitting-tracking systems show promise for addressing some of these challenges; however, additional research is needed to better understand how variability across smoke management programs affects operations and decision-making. Evaluating SMP and permitting procedures could help identify opportunities to improve transparency and consistency while still allowing for local flexibility. For example, pilot efforts in other states, such as a permitting reform initiative in Georgia, offer models of how state-level regulatory processes may be adapted to better support prescribed fire (Etters, 2026).

Although interviewees did not identify federal air quality regulation as a primary barrier under current conditions, several noted that more stringent NAAQS for PM_{2.5} create additional challenges for implementing larger and longer-duration landscape-scale burns.

In recent policy developments, environmental justice organizations have filed a lawsuit seeking to compel the EPA to enforce the 2024 soot regulations, which are required unless the 9 µg/m³ limit is overturned or formally rescinded. At the time of writing, litigation appears to be ongoing, and no final decision has yet to be issued (California et al. v. Zeldin, 2026). This possibility warrants ongoing attention and careful consideration of regulatory options. If the Biden-era PM_{2.5} standards remain in place and are implemented, prescribed fire implementation will require enhanced planning, coordination, and facilitative policy frameworks. One potential approach discussed by some interviewees was statutorily excluding prescribed fire smoke from NAAQS compliance under the federal Clean Air Act. Another noted that this approach would be essentially impossible since states are tasked with protecting ambient air quality, not regulating sources of pollution.

Recent federal policy developments may also affect how wildfire and prescribed fire smoke is treated under the Clean Air Act, though implications for prescribed fire are limited.

The Fire Improvement and Reforming Exceptional Events (FIRE) Act (H.R. 6387) would change how PM_{2.5} measurements from wildfires or prescribed burns are counted in attainment determinations when the EPA eval-

uates whether an area meets federal air quality standards. Specifically, the bill expands the definition of “exceptional events” to explicitly include wildfires and certain state-approved wildfire mitigation activities, potentially facilitating states to more readily exclude related PM_{2.5} exceedances from regulatory decisions (Executive Office of the President, 2026; U.S. Congress, 2026a). However, the bill mainly clarifies EPA’s existing authority under the Exceptional Events Rule and as such, it is unlikely to substantially change prescribed fire implementation or address current procedural barriers.

The FIRE Act builds on the existing Exceptional Events Rule by potentially streamlining eligibility for fire-related events but retains requirements for states and air districts to document event causality, mitigation efforts, and public notification. This could also open the policy door for other industrial pollution. For California, where wildfire smoke is a major contributor to PM_{2.5} exceedances, these changes could reduce the likelihood that air basins are designated or remain in nonattainment due to fire-related pollution. Such changes could affect SIP obligations while maintaining existing PM_{2.5} standards (U.S. Congress, 2026a; U.S. EPA, 2025).

However, as the Alliance for Wildfire Research notes, excluding wildfire-related PM_{2.5} data does not reduce population exposure or associated health risks and may limit the extent to which recurring wildfire smoke is reflected in long-term air quality planning and public health protections (AWR, 2026). As of April 2026, H.R. 6387 has passed the U.S. House and is pending before the U.S. Senate Committee on Environment and Public Works, with Administration support for enactment (Executive Office of the President, 2026; U.S. Congress, 2026b).

Finally, to support an increased scale and pace of prescribed fire, particularly under more stringent air quality standards, it may be valuable to explore stra-

tegic approaches that promote flexibility in planning and air quality permitting while expanding partner capacity. One potential approach is to amend provisions in Title 17 of the California Code of Regulations to facilitate larger, strategically located burns and, where feasible, provide practitioners with greater flexibility to extend burn authorization windows. Another potential strategy is for Congress to support more effective integration among state agencies, Tribes, and community-based groups to leverage diverse capacities. For example, efforts to better engage Tribal organizations and cultural fire practitioners to expand Tribally led cultural burning on state and private lands are already underway through cultural burn agreements authorized under SB 310. Congress could build on this model for federally administered lands.

One limitation of this study is that it did not capture the full nuance and geographic variability of air quality regulations across the state. Agencies may benefit from more in-depth analyses that provide greater regional or local context for air quality permitting and regulation. Future research could also benefit from engagement with additional federal land management agencies that conduct prescribed burns, such as the Bureau of Land Management or the Department of Defense.

Although this research focuses on the USFS and state agencies in California, many of the lessons identified here may be applicable to other states seeking to expand prescribed fire. Central to these efforts are strong interagency coordination, sustained capacity building, and resource sharing. If the federal government moves forward with implementing the more stringent PM_{2.5} NAAQS, states may need to deliberately evaluate regulatory options for prescribed fire. Future work can build on these findings to examine where policy synergies exist across prescribed fire, cultural burning, and fire managed for resource benefit to strengthen the resilience of fire-dependent ecosystems while meeting public health and safety objectives.



Bibliography

Association of Air Pollution Control Agencies. (2024). *Exceptional events workshop summary*. https://cleanairact.org/wp-content/uploads/2024/04/7_AAPCA_Exceptional-Events_April-2024.pdf

CAL FIRE, n.d., *State Certified Prescribed-Fire Burn Boss*. <https://osfm.fire.ca.gov/what-we-do/state-fire-training/professional-certifications/state-certified-prescribed-fire-burn-boss> (Accessed April 23, 2026)

California Air Resources Board. (n.d.). *CA Title 17 Subchapter 2 Smoke management guidelines for agricultural and prescribed burning: Program overview and purpose*. Fire Research and Management Exchange System. <https://www.frames.gov/catalog/70298>

California Air Resources Board. (n.d.). *Prescribed burning in California*. <https://ww2.arb.ca.gov/our-work/programs/prescribed-burning/about> (Accessed April 23, 2026)

California Air Resources Board. (2001). *Initial statement of reasons: Smoke management guidelines for agricultural and prescribed burning (Title 17 rulemaking)*. California Environmental Protection Agency. <https://ww2.arb.ca.gov/rulemaking/2001/smoke>

California Natural Resources Agency. (2024). *California unveils first-of-its-kind dashboard mapping out fire-prevention work to protect communities*. <https://resources.ca.gov/Newsroom/Page-Content/News-List/California-Unveils-First-of-Their-Kind-Dashboards-Fire-Prevention-Work>

California Wildfire and Forest Health Task Force. (2021). *California's wildfire and forest resilience action plan*. State of California. <https://wildfiretaskforce.org/wp-content/uploads/2023/04/californiawildfireandforestresilience-actionplan.pdf>

California Wildfire and Forest Health Task Force. (2022). *California's strategic plan for expanding the use of beneficial fire*. State of California. <https://wildfiretaskforce.org/wp-content/uploads/2022/05/californias-strategic-plan-for-expanding-the-use-of-beneficial-fire.pdf>

Etters, K. (2026). *Improved air quality rule set for Albany 2026 burn season*. Tall Timbers. <https://talltimbers.org/articles/improved-air-quality-rule-set-for-albany-2026-burn-season/>

Environmental and Energy Law Program, Harvard Law School. (2026). *National ambient air quality standards (NAAQS) for particulate matter regulatory tracker*. <https://eelp.law.harvard.edu/tracker/epa-finalized-stricter-national-ambient-air-quality-standards-naaqs-for-particulate-matter-pm/>

Executive Office of the President. (2026). *Statement of administration policy: H.R. 6387—Fire Improvement and Reforming Exceptional Events (FIRE) Act*. The White House. <https://www.whitehouse.gov/>

H.R.3889 - 119th Congress (2025-2026): National Prescribed Fire Act of 2025. (2025, June 10). <https://www.congress.gov/bill/119th-congress/house-bill/3889/text>

Kelp, M. A., Burke, M., Qiu, M., Higuera-Mendieta, I., Liu, T., & Diffenbaugh, N. S. (2025). Effect of recent prescribed burning on wildfire burn severity and smoke emissions in the western United States. *AGU Advances*, 6(1), e2025AV001682. <https://doi.org/10.1029/2025AV001682>

Safford, H. D., Paulson, A. K., Steel, Z. L., Young, D. J. N., & Wayman, R. B. (2022). The 2020 California fire season: A year like no other, a return to the past or a harbinger of the future? *Global Ecology and Biogeography*, 31, 2005–2025. <https://doi.org/10.1111/geb.13500>

- Schultz, C., Huber-Stearns, H., McCaffrey, S., Quirke, D., Ricco, G., & Moseley, C. (2018). *Prescribed fire policy barriers and opportunities: A diversity of challenges and strategies across the West*. University of Oregon. <https://scholarsbank.uoregon.edu/server/api/core/bitstreams/88bd88fb-b872-4cf3-83fb-dd99e497a7ef/content>
- Schultz C.A., McCaffrey S.M., and Huber-Stearns H.R. (2019). Policy barriers and opportunities for prescribed fire application in the Western United States. *Int J Wildland Fire*, 28(11):874–884.
- Strabo, F., Bryan, C., & Reimer, M. N. (2026). Wildfire damages and the cost-effective role of forest fuel treatments. *Science*, 392(6798), 629-635.
- Title 17, California Code of Regulations**, Division 3—Air Resources, Subchapter 2—Smoke Management Guidelines for Agricultural and Prescribed Burning, §§ 80100–80330 (2001). <https://ww2.arb.ca.gov/sites/default/files/2021-06/Title17.pdf>
- U.S. Congress. (1970). Clean Air Act, 42 U.S.C. §§ 7401–7671q.
- U.S. Congress. (2026a). *Fire Improvement and Reforming Exceptional Events (FIRE) Act* (H.R. 6387, 118th Congress). <https://www.congress.gov/bill/118th-congress/house-bill/6387>
- U.S. Department of Agriculture. (2023). *Wildland fire and air quality coordination memorandum of understanding* (Public version with seals). <https://www.usda.gov/sites/default/files/documents/usda-epa-doi-cdc-mou.pdf>
- U.S. Environmental Protection Agency. (2023, November 9). Biden-Harris Administration agencies sign interagency agreement to address wildfire risk and protect communities from smoke. <https://www.epa.gov/newsreleases/biden-harris-administration-agencies-sign-interagency-agreement-address-wildfire-risk>
- U.S. Environmental Protection Agency. (2024). *PM_{2.5} wildland fire exceptional events tiering document*. <https://downloads.regulations.gov/EPA-HQ-OAR-2023-0586-0003/content.pdf>
- U.S. Environmental Protection Agency. (2024). *Exceptional events and prescribed fire demonstrations* (presentation and guidance materials). https://westar.org/wp-content/uploads/2024/03/13-Rx-Fire-Demonstrations_EPA.pdf
- U.S. Environmental Protection Agency. (2025). *Process of working with areas to attain and maintain National Ambient Air Quality Standards (NAAQS)*. <https://www.epa.gov/criteria-air-pollutants/naaqs-implementation-process>
- U.S. Environmental Protection Agency. (2025, March 12). *EPA announces path forward on particulate matter (PM_{2.5}) standards*. <https://www.epa.gov/newsreleases/trump-epa-announces-path-forward-national-air-quality-standards-particulate-matter>
- Van Wagtendonk, J. W. (Ed.). (2018). *Fire in California's ecosystems* (2nd ed.). University of California Press.
- Wear, D., Wibbenmeyer, M., & Zhu, Y. (2025). *Costs of forest fuel treatment programs: Spatially explicit estimates for California* (Working paper). Resources for the Future. <https://www.rff.org/publications/working-papers/the-costs-of-achieving-forest-resilience-in-california/>
- WFMMC (2023). *On Fire: The Report of the Wildland Fire Mitigation and Management Commission*. <https://alliance-wr.org/wp-content/uploads/2024/05/wfmmc-final-report-092023-508.pdf>
- Williams, J., et al. (2023). Overcoming barriers to prescribed fire in North America's Mediterranean ecosystems. *Frontiers in Ecology and the Environment*, 21(8), 417–425. <https://escholarship.org/uc/item/433270sv>
- Yackulic, E., Elias, M., Shannon, J., Gilbert, S., Koontz, M., Plumb, S., Sloggy, M., & Duffy, K. (2025). Rising from the ashes: Treatments stabilize carbon storage in California's frequent-fire forests. *Frontiers in Forests and Global Change*, 8, 1498430. <https://doi.org/10.3389/ffgc.2025.1498430>

Appendix

Sources for Figure 1.

Timeline of key dates for prescribed fire, wildfire smoke, and air quality policy actions relevant to California

American Lung Association. (n.d.). *California prescribed fire: What you need to know*. <https://www.lung.org>

Bay Area Air Quality Management District. (2026, February 6). *Current rules*. <https://www.baaqmd.gov/rules-and-compliance/current-rules>

State of California et al. v. Zeldin, No. 3:26-cv-03375 (N.D. Cal. filed Apr. 24, 2026). <https://oag.ca.gov/system/files/attachments/press-docs/04.24.26%20PM%20NAAQS%20Designations%20-%20Complaint.pdf>

California Air Resources Board. (2023). *Assembly Bill 661 report: California wildfire smoke emergency response programs*. <https://ww2.arb.ca.gov/sites/default/files/2024-05/2022%20AB%20661%20Legislative%20Report.pdf>

California Department of Industrial Relations. (n.d.). *Wildfire smoke emergency standard (Title 8 §5141.1)*. <https://www.dir.ca.gov/dosh/doshreg/Protection-from-Wildfire-Smoke/Wildfire-smoke-emergency-standard.html>

Center for Economic and Policy Research. (2024, October 28). *US Forest Service decision to halt prescribed burns in California is history repeating*. <https://cepr.net/publications/us-forest-service-decision-to-halt-prescribed-burns-in-california-is-history-repeating/>

Executive Office of the Governor of California. (2025, October 29). *As Trump cuts fire response, Governor Newsom expands the state's fire prevention strategy using proven beneficial fire techniques*. <https://www.gov.ca.gov/2025/10/29/as-trump-cuts-fire-response-governor-newsom-expands-the-states-fire-prevention-strategy-using-proven-beneficial-fire-techniques/>

Governor's Wildfire & Forest Resilience Task Force. (n.d.). *Task forces issue strategic plan for prescribed burns*. <https://wildfiretaskforce.org/task-forces-issue-strategic-plan-for-prescribed-burns/>

Governor's Wildfire & Forest Resilience Task Force. (2025, October 29). *Governor Newsom signs executive order to expand beneficial fire use*. <https://wildfiretaskforce.org/governor-newsom-signs-executive-order-to-expand-beneficial-fire-use/>

LegiScan. (2024). *SB 1101 — Fire prevention: Prescribed fire: State contracts: Maps*. <https://legiscan.com/CA/text/SB1101/id/2927284>

MSN News. (2025, October 16). *EPA eases air quality rules to boost prescribed fire use, combat wildfires*. <https://www.msn.com/en-us/news/us/epa-eases-air-quality-rules-to-boost-prescribed-fire-use-combat-wildfires/ar-AA10BMAb>

PolicyEngage / Digital Democracy. (2024). *SB 1101: Fire prevention: Prescribed fire: State contracts: Maps*. https://calmatters.digitaldemocracy.org/bills/ca_202320240sb1101

State of California Legislature. (2022). *Senate Bill No. 332*. https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=20210220SB332

State of California Legislature. (2024). *Senate Bill No. 310*. https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=202320240SB310

U.S. Environmental Protection Agency. (2025, October 16). *EPA policy on provisions to allow wildland prescribed fire in Clean Air Act state implementation plans (Policy memo)*. https://www.epa.gov/system/files/documents/2025-10/signed_final_prescribed-fire-policy-memo_25-06684-oar-gsg.pdf

U.S. Forest Service, U.S. Department of the Interior, U.S. Environmental Protection Agency, & Centers for Disease Control and Prevention. (2023). *Wildland fire and air quality memorandum of understanding*. <https://www.usda.gov/sites/default/files/documents/usda-epa-doi-cdc-mou.pdf>

