

JANUARY 2023

BURN BACK BETTER

How Western States Can Encourage
Prescribed Fire on Private Lands

BY JONATHAN WOOD AND MORGAN VARNER



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BURN BACK BETTER

How Western States Can Encourage Prescribed Fire on Private Lands

INTRODUCTION

For millennia, Indigenous communities managed forests in the American West with fire to produce a range of environmental and cultural benefits.¹ This long history of cultural burning combined with frequent lightning produced fire-adapted forests, woodlands, and savannas.² For more than a century, however, the federal government and states pursued an aggressive policy of fire suppression that effectively removed fire from the landscape.³ While this policy has mostly been abandoned,⁴ its effects linger in the form of overgrown forests, policy barriers, and cultural obstacles to restoring beneficial low-intensity fires at the scale needed to improve forest resilience and reduce wildfire risks.

The growing wildfire crisis makes this need to restore “good fire” all the more urgent. Frequent, low-intensity fires are essential for bolstering forest health, maintaining wildlife habitat, and reducing smoke and other air pollutants. Today’s catastrophic “megafires,” however, scorch forests, degrade water quality, decimate habitat, and choke the air with smoke. Since 2005, the United States has three times eclipsed 10 million acres burned by wildfires in a year—an unfathomable total just a few decades ago—with the vast majority of that acreage concentrated in the West.⁵

Modern wildfires are not only burning larger areas but are also more harmful for people, forests,

and the environment. Nearly 100,000 structures have burned in wildfires since 2005, with two-thirds of that destruction occurring since 2017.⁶ Wildfires have killed between 13 and 19 percent of the world’s remaining giant sequoias in the past few years.⁷ And they have released massive quantities of harmful air pollutants, including 112 million tons of carbon dioxide in California alone during 2020—the equivalent of adding 25 million cars to the state’s roads.⁸

As with any large, complex phenomenon, no single factor explains the growing wildfire crisis. Past management decisions led to a dangerous accumulation of dead and diseased trees, small trees and shrubs, and other fuels.⁹ A changing climate has lengthened the wildfire season, the period of the year in which dry and hot conditions make it more likely a fire will ignite and spread.¹⁰ And development in the wildland-urban interface, the place where human development and wild areas meet, has increased the potential for human-caused ignitions.¹¹

The critical question is what’s to be done to tackle the wildfire crisis. Some of these factors require long-term policy and economic changes that will take decades to affect fire regimes. But as recent wildfires have shown, other factors can be addressed now, producing immediate benefits. One such factor is the use of prescribed fire, in which low-intensity fire is carefully applied to a landscape under controlled



conditions to improve forest resilience, reduce extreme wildfire risks, and achieve other land-management objectives. Time and again, when wildfires have spread to areas where cultural burning practices have been restored or that have otherwise been intentionally managed with prescribed fire to increase resilience, those fires have become less destructive and easier to fight.¹²

The benefits of prescribed fire were evident in Oregon's Bootleg Fire, which burned more than 400,000 acres in 2021. In the wake of the fire, the landscape revealed huge differences between areas that had been unmanaged, mechanically thinned, or both mechanically thinned and managed with prescribed fire, with the latter producing the most resiliency. (Because of the unnatural buildup of fuels, prescribed fire often cannot be applied unless western

forests are first thinned to produce safe conditions.)

The benefits of prescribed fire could also be seen in real time. When the Bootleg Fire moved from the Fremont-Winema National Forest to The Nature Conservancy's privately owned Sycan Marsh Preserve that had been thinned and burned, the fire's behavior changed dramatically.¹³ Katie Sauerbrey, a fire manager with The Nature Conservancy, described the fire as producing 200-foot flames on neighboring federal lands. But when it crossed onto the conservation group's private land, it went from "the most extreme fire behavior" that she "had ever seen" to a lower-intensity surface fire that spared the forest and could be fought effectively.¹⁴

Much of the wildfire debate understandably focuses on the role of national forests, which make up a majority of forested acres in many western states.

But expanding the use of prescribed fire on state, private, and tribal land would have significant benefits for forest resilience, community protection, and environmental conservation. In western states, non-federal lands make up between 4 percent (Nevada)¹⁵ and 56 percent (Washington)¹⁶ of forested acres, with an average of roughly 45 percent. Importantly, private lands are often located between the wildland-urban interface and more remote public lands, or within the matrix of remote fire-prone wildlands.

State policymakers and private land managers may be able to ramp up use of prescribed fire more quickly than the federal government,¹⁷ especially considering recent controversies over the U.S. Forest Service’s use of prescribed fire.¹⁸ And as the experience

in Sycan Marsh demonstrates, even pockets of well-managed areas within larger forested landscapes can make a difference in mitigating the consequences of wildfire. By producing areas that are more resilient to fire, private lands can also conserve wildlife habitat, water quality, and other ecosystem services. For these reasons, several states have identified making it easier for private landowners to use prescribed fire as a critical step in tackling the wildfire crisis.¹⁹

Landowners should have good incentives to restore “good fire” to western forests. Prescribed fire not only benefits their land but can also be a more cost-effective management tool than mechanical thinning and other methods.²⁰ Prescribed fires also produce numerous benefits for surrounding land-

Prescribed Fire Use

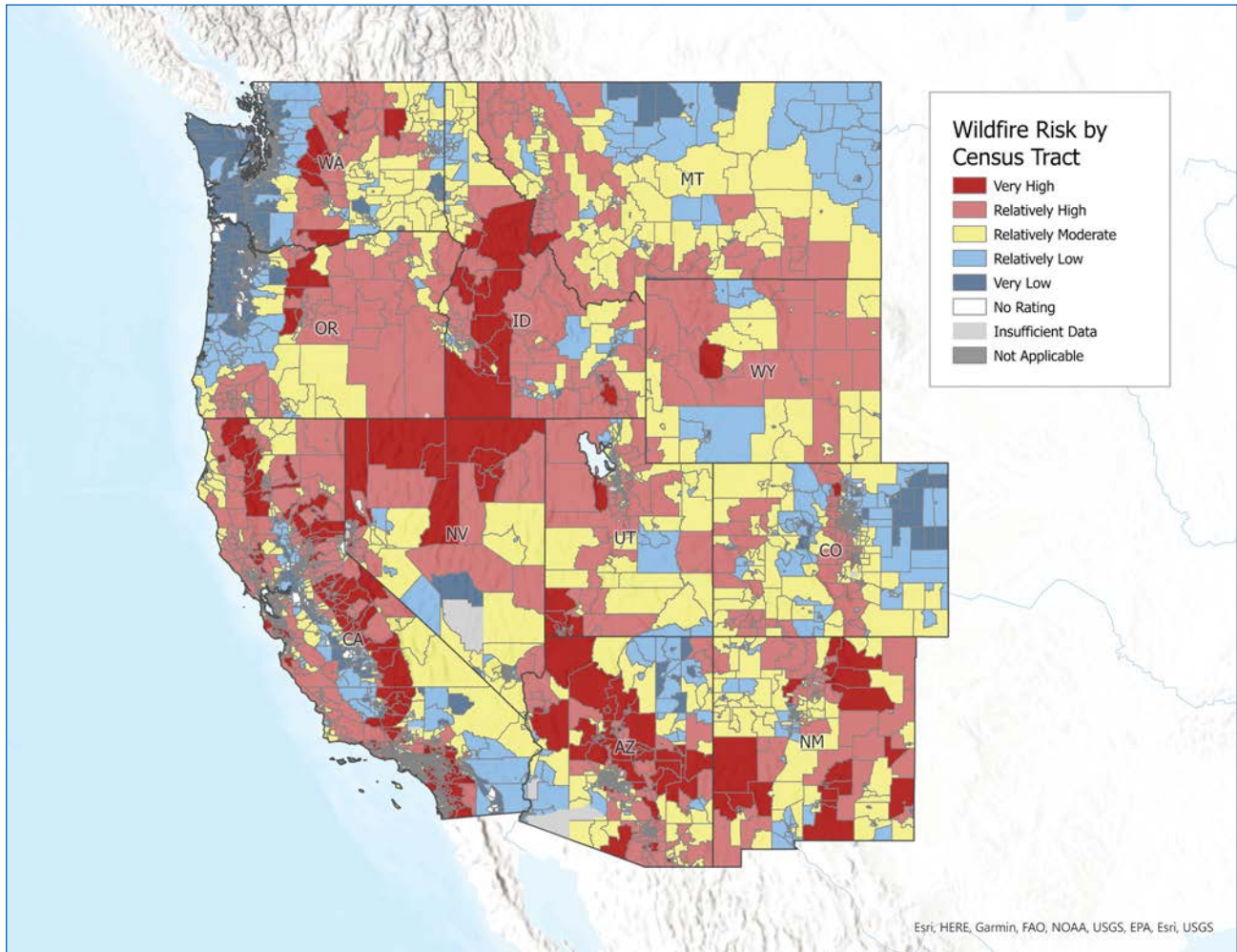


Prescribed fire, also referred to as prescribed burning or controlled burning, is the intentional and planned application of fire to achieve land-management objectives, such as reduced wildfire risk, improved forest health, or enhanced wildlife habitat. These fires are ignited under controlled conditions, including temperature, humidity, and wind speed, to reduce the risk of an escape and manage smoke.

There are several types of prescribed fires. In a **broadcast burn**, a crew constructs firebreaks to keep the fire from spreading outside the planned area, uses drip torches or helicopters to ignite ground-level fuels, and monitors the fire to make sure it does not increase in intensity or escape containment. In a **pile burn**, fuels are gathered and burned in a selected location surrounded by a firebreak.

Landowners may implement small, simple prescribed fires with the help of family or neighbors. For more complex burns, landowners may seek out the help of an experienced “burn boss,” an entrepreneur who plans, organizes, and supervises prescribed burns.

FIGURE 1:
Map of Wildfire Risk in Western States



The Federal Emergency Management Agency wildfire risk index rates a community's relative risk for wildfire. The map above displays FEMA wildfire risk by census tract for the 11 western states.

owners and communities, although landowners may receive no reward for producing these benefits. Surveys suggest that, for these and other reasons, landowners are interested in ramping up prescribed fire.²¹

Despite these benefits, there's limited use of prescribed fire in the West and little public data available about what burning does take place.²² The lack of the practice has deprived the West of a culture of burning among landowners and communities—especially compared to the Southeast, which maintained the practice through the 20th century and is currently responsible for 70 percent of the nation's prescribed burning.²³ Many landowners lack the experience and

resources needed to be comfortable embracing the tool. And there are too few expert practitioners available to plan, organize, and supervise the most complex burns, which both limits the number of ambitious burns and drives up their costs.

State policies, many of them holdovers from the era of aggressive fire suppression, can further discourage use of prescribed fire. Landowners must invest time and resources in understanding a state's permitting process and applying for permits. The limited number and unpredictability of "burn days" in which states allow burning can make it difficult for landowners to plan and implement a prescribed fire. Training

opportunities, including state certification programs, are limited, relative to demand. And state liability laws can make prescribed fires excessively risky compared to other, less ecologically effective management practices. Reforms to reduce these obstacles and provide better incentives for landowners are needed to expand the use of prescribed fire, improve forest health, and tame the wildfire crisis.

This report is a collaboration between the Property and Environment Research Center, the national leader in creating market solutions for conservation, and Tall Timbers, an internationally recognized organization with over 60 years of experience using prescribed fire science to solve land management problems. Informed

by a workshop featuring leading prescribed fire experts from across the West, this report is the most comprehensive analysis of prescribed fire policy in the 11 western states, with a focus on state-level policies affecting the use of prescribed fire on private lands. It analyzes in detail the most significant obstacles to prescribed fire in the West, describes western states' recent progress on these fronts, and proposes reforms that could unleash private landowners and entrepreneurs to scale up prescribed fire. Below is a summary of the report's key topics and recommendations. Each topic is analyzed in more detail in the sections that follow with more detailed recommendations for how these reforms could be implemented.

RECOMMENDATIONS

- 1. Improve permitting systems to remove bureaucratic obstacles to prescribed burning.**
- 2. Develop more flexible approaches to setting “burn days” in which different types of prescribed fires can be implemented.**
- 3. Design training opportunities and other resources to educate and support, rather than regulate, landowners' use of prescribed fire.**
- 4. Clarify and improve liability regimes to reflect the public benefits of prescribed fire.**
- 5. Harness private investment to benefit forest health through catastrophe bonds.**

NOTES

1. See Jonathan W. Long, Frank K. Lake, Ron W. Goode, *The Importance of Indigenous Cultural Burning in Forested Regions of the Pacific West*, 500 *Forest Ecology and Mgmt.* 119597 (2021), https://www.fs.usda.gov/psw/publications/jwlong/psw_2021_long003.pdf.
2. See R.K. Hagmann et al., *Evidence for Widespread Changes in the Structure, Composition, and Fire Regimes of Western North American Forests*, 31 *Ecological Applications* e02431 (2021), <https://esajournals.onlinelibrary.wiley.com/doi/epdf/10.1002/eap.2431>.
3. See Holly Fretwell & Jonathan Wood, *Fix America's Forests: Reforms to Restore National Forests and Tackle the Wildfire Crisis*, PERC Public Lands Report (2021), <https://www.perc.org/wp-content/uploads/2021/04/fix-americas-forests-restore-national-forests-tackle-wildfire-crisis.pdf>.
4. See Alison Berry, *Forest Policy Up in Smoke: Fire Suppression in the United States*, PERC (2007), https://www.perc.org/wp-content/uploads/2007/09/Forest_Policy_Up_in_Smoke.pdf. See also U.S. Forest Service, *Sustainability and Wildlands Fire: The Origins of Forest Service Wildland Fire Research* (2017), https://www.fs.usda.gov/sites/default/files/fs_media/fs_document/sustainability-wildlandfire-508.pdf.
5. Nat'l Interagency Fire Ctr., *Total Wildfires and Acres* (2022), <https://www.nifc.gov/sites/default/files/document-media/TotalFires.pdf>.
6. Headwaters Econ., *Wildfires Destroy Thousands of Structures Each Year*, <https://headwaterseconomics.org/natural-hazards/structures-destroyed-by-wildfire/> (Aug. 2022 update).
7. Vimal Patel, *Wildfires in California Killed Thousands of Giant Sequoias*, N.Y. Times (Nov. 20, 2021), <https://www.nytimes.com/2021/11/20/us/california-fires-killed-sequoias.html>.
8. Cal. Air Resources Bd., *Draft Report: Greenhouse Gas Emissions of Contemporary Wildfire, Prescribed Fire, and Forest Management Activities* (Dec. 2020), https://ww3.arb.ca.gov/cc/inventory/pubs/ca_ghg_wildfire_forestmanagement.pdf.
9. See Fretwell & Wood, *Fix America's Forests*, *supra* n.3.
10. Deb Schweizer, *Wildfires in All Seasons?*, USDA blog (July 29, 2021), <https://www.usda.gov/media/blog/2019/06/27/wildfires-all-seasons>.
11. Volker C. Radeloff et al., *Rapid Growth of the US Wildland-Urban Interface Raises Wildfire Risk*, *Proceedings of the Nat'l Academy of Sciences* (2018), https://www.fs.fed.us/nrs/pubs/jrnl/2018/nrs_2018_radeloff_001.pdf.
12. See USDA Climate Hubs, *Prescribed Fire in the Northwest*, <https://www.climatehubs.usda.gov/index.php/hubs/northwest/topic/prescribed-fire-northwest> (last visited Oct. 10, 2022).
13. See Henry Fountain, *This Vast Wildfire Lab Is Helping Foresters Prepare for a Hotter Planet*, N.Y. Times (Jan. 5, 2022), <https://www.nytimes.com/2022/01/05/climate/fire-forest-management-bootleg-oregon.html>.
14. See *id.*
15. James Menlove et al., *Nevada's Forest Resources: 2004-2013*, U.S. Forest Serv. Rocky Mountain Research Station Resource Bulletin RMRS-RB-22 (2016), https://www.fs.usda.gov/rm/pubs_series/rmrs/rb/rmrs_rb022.pdf.
16. See Wash. Forest Prot. Ass'n, *Diversity of Forestland Ownership*, <https://bit.ly/3VkdAiL> (last visited Oct. 10, 2022).
17. See Eric Edwards & Sara Sutherland, *Does Environmental Review Worsen the Wildfire Crisis?*, PERC Policy Brief (2022), <https://www.perc.org/wp-content/uploads/2022/06/PERC-PolicyBrief-NEPA-Web.pdf> (finding that the time between when the U.S. Forest Service proposes a prescribed fire to when it implements the burn varies from an average of 3.6 years when a project is categorically excluded from review under the National Environmental Policy Act to an average of 9.4 years for projects that undergo the most rigorous level of NEPA analysis and are litigated).
18. See Mike Baker, *Prescribed Burns Are Encouraged. Why Was a Federal Employee Arrested for One?*, N.Y. Times (Oct. 28, 2022), <https://www.nytimes.com/2022/10/28/us/oregon-prescribed-burn-boss-arrested.html>; Simon Romero, *How New Mexico's Largest Wildfire Set Off a Drinking Water Crisis*, N.Y. Times (Sept. 26, 2022), <https://www.nytimes.com/2022/09/26/us/new-mexico-las-vegas-fire-water.html>.
19. See, e.g., Cal. Wildfire and Forest Resilience Task Force, *California's Strategic Plan for Expanding the Use of Beneficial Fire* (2022), <https://www.fire.ca.gov/media/xcqjpmc/californias-strategic-plan-for-expanding-the-use-of-beneficial-fire-march-16-2022.pdf>.
20. See Lenya Quinn-Davidson & Jeffery Stackhouse, *Burning by the Day: Why Cost/Acre is Not a Good Metric for Prescribed Fire*, Cal. Native Grasslands Ass'n (2019), https://cnga.org/resources/Documents/Resources/Wildfire%20Resources/Burn%20Cost_Quinn-Davison,%20Stackhouse_Summer%202019-3.pdf.
21. See Lenya Quinn-Davidson & J. Morgan Varner, *Impediments to Prescribed Fire Across Agency, Landscape and Manager: An Example from Northern California*, 21 *Int'l J. of Wildland Fire* 210 (2018) (reporting survey of Northern California landowners and land-managers that found 66 percent of respondents wished to increase their use of prescribed fire but were prevented from doing so by regulatory obstacles, limited capacity, and local conditions).
22. See Coal. of Prescribed Fire Councils, *2020 Prescribed Fire Use Report* 4, 6 (2020), <https://www.prescribedfire.net/pdf/2020-Prescribed-Fire-Use-Report.pdf> (reporting that no western state burns more than 50,000 acres across all lands but not providing granular data).
23. See Crystal A. Kolden, *We're Not Doing Enough Prescribed Fire in the Western United States to Mitigate Wildfire Risk*, 2 *Fire* 30 (2019), <https://www.mdpi.com/2571-6255/2/2/30>.

1: Improve Permitting Systems to Encourage Private Burning

Western states may require permits for some or all uses of prescribed fire by private landowners, with requirements varying significantly among states.¹ These permit requirements can serve several functions: notification to agencies that may be called upon to provide suppression assistance, external review of a plan's adequacy for safety and consistency with air quality regulations, and reassurance to a public that may be wary of prescribed fire. But they may also introduce costs, bureaucracy, delay, and uncertainty that discourage landowners from using prescribed fire.²

The first choices states must make are what types of permits to require and when to require them. Permit requirements are generally divided between ignition permitting, which considers the safety of a prescribed fire plan, and smoke permitting, which considers

air quality impacts. These permitting requirements may be administered by different agencies or levels of government, depending on who is the primary air regulator or provider of fire-suppression services.

One option for states is to recognize a “right to burn” and forgo any formal permitting process, at least for some seasons or types of burns.³ This approach reduces burdens on both landowners and the state agency that would otherwise have to divert personnel to review applications for low-risk burns. In Wyoming, for instance, small burns (those under six acres in forests, eight acres in shrublands, and 25 acres in grasslands) at least 500 feet from any human-occupied structure require neither an ignition permit nor smoke permit from the state.⁴ Montana similarly limits state permitting to “major burners,”



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A stand of ponderosa pine trees after a prescribed burn in Arizona

those who burn more than 5,000 acres per year, or burning during winter, when inversions can sharply increase the impacts of smoke on local air quality.⁵ Many Montana counties have also established seasons in which no local permit is required.⁶

New Mexico takes the strongest “right to burn” approach, requiring neither an ignition permit nor smoke permit at the state level.⁷ Indeed, the state recently limited local governments’ permitting authority, under a 2021 law that directs a state agency to develop a model permit local governments may use.⁸ Unless they adopt this model permit, local governments are forbidden from having a permit requirement.⁹

Most state-level permitting in the West concerns smoke and its effect on local air quality. The complexity of this permitting varies according to state regulation, the number of emissions sources in an airshed, and other factors. In Washington, for instance, a state agency writes an individual smoke permit for each burn plan, which can now be submitted through an online portal.¹⁰ Other states, like California, establish state smoke permits but administer the program through local agencies.¹¹

Relatively few western states require state permits for igniting a prescribed fire. Instead, if this permitting occurs at all, it’s done at the local level, usually through the local fire department. A few states require state ignition permits in areas where a state agency provides fire-suppression services. CalFire and the Oregon Department of Forestry, for instance, provide services to most of the forested areas in their respective states and require a permit to ignite a prescribed fire.¹² Table 1 describes ignition and smoke permitting requirements in western states.

While these permitting programs are intended to protect air quality, reduce the risk of escapes, and serve other public purposes, they can also increase the costs of using prescribed fire for landowners. One of the most obvious costs is the fee charged to obtain the permit. Fortunately, many states distribute permits for free or a nominal fee. But others charge a much larger fee based on the cost of administering the program. In some areas of California, for instance, permits cost up to \$1,400 before accounting for the landowners’ cost to prepare the burn plan and other permitting materials.¹³ Washington’s fee, which is based on the amount of

TABLE 1:
Western State Prescribed Fire Permitting Requirements

STATE	State ignition permit required?	State smoke permit required?
Arizona	No	Yes, but deemed granted if DEQ does not respond by 10 p.m. night before
California	Yes, if CalFire provides services	Yes, administered through local air districts
Colorado	No	Yes, over a certain size
Idaho	Yes, during part of the year and outside city limits	No
Montana	No	Yes, for major burners and for all burners during winter
Nevada	Yes	Yes, over a certain size
New Mexico	No	No
Oregon	Yes, if ODF provides services	No, DEQ publishes map where burning is prohibited
Utah	No	Yes, over a certain size
Washington	Yes, over a certain size	Yes, but small fires approved over the phone
Wyoming	No	Yes, over a certain size



In Northern California, smoke rises above a community prescribed burn carried out on private land to decrease wildfire risk.

debris burned, can exceed \$10,000.¹⁴ Large permitting fees essentially punish landowners for adopting a practice that produces both private and significant public benefits, including reduced state liability for future wildfire suppression costs.

The complexity of a permitting system can also increase the costs to landowners by requiring them to figure out multiple systems within multiple agencies or levels of government. To reduce these costs, states should consolidate requirements into a single permit administered by whichever state or local agency landowners would logically expect to require a permit. In Oregon, for instance, the Department of Environmental Quality notifies the Department of Forestry whether burning is appropriate for air quality, which the latter takes into account when issuing permits.¹⁵ In other states, a local government, agency, or fire department may be the best choice as the lead permitting agency.

States also vary in how long it takes to obtain burn permits and how long those permits are valid. In

Idaho, for instance, an ignition permit can be obtained online, is issued virtually instantaneously, and is good for 10 days.¹⁶ In Wyoming, review of a local ignition permit takes 72 hours, but the permit is good for the year.¹⁷ And in Washington, the Department of Natural Resources reports that a smoke permit typically takes two weeks to obtain; however, it cautions that the personnel who process permit applications also have fire suppression duties that may cause them to stop reviewing permit requests for extended periods of time “when the fire bell rings.”¹⁸

States should also seek to establish clear standards for when permits will be issued, the timeline for issuing permits, and what conditions will be imposed. This has already been accomplished in states that issue general permits for certain burn types or seasons. When these questions are left instead to the individual agency official reviewing a permit request, a risk-averse official may delay or unreasonably condition a permit in ways that increase the costs to burners.¹⁹



Western larch seedlings sprout following a prescribed fire in Montana.

In addition to general permitting, states have adopted several other models to reduce permitting delays and uncertainty. In Arizona, for instance, a smoke permit request is deemed approved if the Department of Environmental Quality does not respond by 10 p.m. the night before the planned burn.²⁰ Washington requires agencies to track and publicly report how long it takes to issue any permit, including prescribed burn permits, to hold agencies accountable for unnecessary bureaucracy.²¹ This process, which began in 2015, revealed that the state’s Department of Environmental Quality did not track and thus did not know how long it took to issue a prescribed fire permit. After repeated proddings from the governor’s office, the department implemented an online application portal in 2020 to streamline the process and track the agency’s progress toward reducing permitting delays.²²

By increasing costs and uncertainty, complex permitting regimes discourage landowners from adopting prescribed fire as a management tool. Considering the

growing interest among western states to encourage use of the practice, states should continue to look for ways to streamline and simplify the permitting process, without sacrificing safety or air quality.

RECOMMENDATIONS FOR STATES

- Limit permitting fees, especially where prescribed fire produces significant public benefits.
- Use right to burn laws, general permitting, and other policies to reduce procedural hoops for low-risk burns.
- Consolidate requirements for formal permits into a single permit, and designate a lead agency at the state or local level to issue the permit.
- Establish clear standards for when burn permits will be needed, the timeline for issuing permits, and the conditions permits will impose.
- Create procedures to make agencies accountable for permitting delays.

NOTES

1. While this report focuses on prescribed burning on private land, surveys of federal agency personnel have found that they face similar obstacles, although permitting and other requirements on federal land are generally set by federal rather than state law. See Courtney Schultz et al., *Prescribed Fire Policy Barriers and Opportunities: A Diversity of Challenges and Strategies Across the West*, Univ. of Oregon 8–9 (2018), https://ewp.uoregon.edu/sites/ewp.uoregon.edu/files/WP_86.pdf (survey of BLM and Forest Service prescribed burners); Courtney Schultz et al., *Policy Barriers to Implementing Prescribed Fire*, Colo. State Univ. Pub. Lands Pol’y Gp. Briefing Paper (2017), https://www.firescience.gov/projects/16-1-02-8/project/16-1-02-8_Policy-Barriers-to-Prescribed-Fire-BP-Updated.pdf (same).
2. See Sara A. Clark, Andrew Miller, & Don L. Hankins, *Good Fires: Current Barriers to the Expansion of Cultural Burning and Prescribed Fire in California and Recommended Solutions*, Karuk Tribe (2021), https://karuktribeclimatechange-projects.files.wordpress.com/2022/06/karuk-prescribed-fire-rpt_2022_v2-1.pdf; Robert A. York et al., *Burn Permits Need to Facilitate—Not Prevent—“Good Fire” in California*, 74 Cal. Ag. 62 (2020), <https://ucanr.edu/sites/CentralSierra-LivingwithFire/files/329508.pdf>. But see Morgan Russell et al., *Legal Barriers to Prescribed Burning*, Texas A&M AgriLife Extension Rep. (2016), <https://agrillife.org/rxburn/files/2017/09/Legal-Barriers-to-Prescribed-Burning-ERM-022.pdf> (finding that permit requirements may encourage landowners to adopt prescribed fire by providing assurance that they won’t later be deemed to have acted negligently).
3. See, e.g., Wash. Dept. of Nat. Res., *Burn Permits*, <https://www.dnr.wa.gov/programs-and-services/wildfire/outdoor-burning/burn-permits>.
4. See Nick Dillinger et al., *Wyoming Prescribed Burning Regulations: Review of Policy, Guidelines, and Case Law for Private Lands*, U. Wyo. College of Ag. and Nat. Res. Extension Rep. (2020), <https://wyoextension.org/publications/html/B1354/>; John Derek Scasta et al., *Burning Irrigation Ditches*, U. Wyo. College of Ag. & Nat. Res. Extension Rep. 13 (2019), https://www.lglpwyoming.org/vertical/sites/%7BFA6BF46D-42F2-425B-A2D5-9C28F7E2121E%7D/uploads/Irrigation_Ditch_Burning_Guidelines.pdf. See also 10 Wyo. Admin. Rules § 2.
5. See Montana Dept. of Enviro. Quality, *Open Burning*, <https://deq.mt.gov/ait/Programs/burning>.
6. See Fire Safe Kalispell, *Need a Burning Permit?*, <https://www.firesafekalispell.com/>.
7. See Working Group Report to the New Mexico Legislature, *Expanding the Use of Prescribed Fire in New Mexico* (2020), <https://nmrxfire.nmsu.edu/documents/expanding-the-use-of-prescribed-fire-in-new-mexico---june-2020.pdf>. The lack of a permitting requirement is not the only way in which New Mexico is unique among western states. It also imposes double liability on anyone whose prescribed fire escapes. See *id.*
8. See Prescribed Burning Act, H. B. 57 § 5 (2021).
9. See *id.* § 6.
10. See Schultz et al., *Prescribed Fire Policy*, *supra* n.1, at 9. See also Wash. Dept. of Nat. Res., *Burn Portal*, <https://burnportal.dnr.wa.gov/>.
11. See Schultz et al., *Prescribed Fire Policy*, *supra* n.1, at 8.
12. See CalFire, *State Responsibility Areas*, <https://calfire-forestry.maps.arcgis.com/apps/webappviewer/index.html?id=468717e399fa4238ad86861638765ce1>; Or. Dept. of Forestry, *Prescribed Forest Burning*, <https://www.oregon.gov/odf/fire/pages/burn.aspx>.
13. See Clark, Miller, & Hankins, *Good Fires*, *supra* n.2, at 14–15.
14. See Wash. Dept. of Nat. Res., *Burning Permit Fee Schedule* (2012), https://www.dnr.wa.gov/publications/rp_burn_feesched.pdf.
15. See Schultz et al., *Prescribed Fire Policy*, *supra* n.1, at 8.
16. See Idaho Dept. of Lands, *State Burn Permits required May 10 – October 20* (2021), <https://www.idl.idaho.gov/pressrelease/state-burn-permits-required-may-10-october-20/#:~:text=Permits%20are%20free%20and%20good,are%20immediately%20issued%20and%20valid>.
17. See Natrona County, *Burn Permit Payment System*, <https://burnpermit.natronacounty-wy.gov/>.
18. See Washington Governor’s Office of Regulatory Innovation and Assistance, *Burn Permit*, <https://apps.oria.wa.gov/permithandbook/permitdetail/32#:~:text=Processing%20times%20for%20individual%20burn,a%20completed%20application%20is%20received>.
19. See Clark, Miller, & Hankins, *Good Fires*, *supra* n.2, at 14, 17.
20. See Ariz. Admin. Code § R18-2-1506.
21. See Wash. Office of Reg. Innovation & Assistance, *Permit Timeliness Report: 2015* (2015), https://www.oria.wa.gov/Portals/_oria/VersionedDocuments/Regulatory_Improvement/ORIA-2015-PermitTimelinessProgressReport.pdf.
22. See Wash. Office of Reg. Innovation & Assistance, *Permit Timeliness Report: 2020* (2020), https://www.oria.wa.gov/Portals/_oria/VersionedDocuments/Regulatory_Improvement/ORIA-2020-PermitTimelinessProgressReport.pdf.



Before (top) and after (bottom) a forest restoration project in Oregon that included mowing, thinning, and prescribed burning

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2: Expand Burn Opportunities to Promote the Use of “Good Fire”

One of the chief benefits of prescribed fire is that it can be applied when conditions are relatively good, unlike a catastrophic wildfire during peak fire season. Therefore, *when* to burn is an essential practical and policy question. Throughout the West, however, the period with the best conditions is shrinking as the wildfire season expands.¹ Greater flexibility regarding when prescribed fires can be conducted will make it easier to expand their use.

The timing of burning is governed by three factors: local conditions (such as humidity and wind speed), regional air quality, and the availability of fire-fighting resources.² The ideal windows to take advantage of each of these factors may not align. In some areas, for instance, local conditions and fire-fighting resources might favor increased burning in the winter.³ But many areas of the West experience winter inversions, during which a layer of cold air gets trapped under a layer of warm air, which prevent smoke and other air pollutants from dispersing.⁴ In the arid Southwest, the optimal local conditions and air quality can be in the summer before monsoon season, but fire-fighting resources are often limited during this period because they are occupied responding to wildfires in other areas across the West.⁵

Burn windows are not merely seasonal but can open and shut from day to day. A study of burn days in California’s Tahoe basin from 1999 to 2019, for instance, found that all three factors aligned for an average of only 50 to 100 days per year.⁶ And consecutive burn days were uncommon, with two or fewer two- to three-day burn windows per year during spring and fall.⁷ Such unpredictability can make it difficult to plan and organize resources and manpower.

Air quality restrictions on prescribed fire stem from the federal Clean Air Act, which directs states or the Environmental Protection Agency to manage emissions to meet air quality standards.⁸ Despite

wildfire smoke being a recurring, major, and growing source of several harmful air pollutants, it does not count against emissions limits because federal law treats wildfires as “exceptional events.”⁹ Smoke from prescribed fires, by contrast, is treated less favorably than wildfire smoke and must be accounted for under air quality standards, even though Indigenous burning was integral to the ecological function and fire-hazard reduction of western wildlands.¹⁰ Thus, air quality standards can prevent prescribed fire use during periods when smoke dispersal is limited, there are other significant sources of pollution, or wildfire smoke from neighboring states has already degraded the air.¹¹

States, of course, cannot change federal requirements. But there are several steps they can take to reduce air quality-related obstacles to prescribed fire. Washington and Oregon impose stricter air quality standards on prescribed fire than required by federal law, prohibiting any smoke intrusion into populated areas.¹² While avoiding these impacts is a laudable goal, applying this rule in the prescribed fire context ignores the worse air quality impacts if an area instead burns in a catastrophic wildfire.¹³ To expand opportunities for prescribed fire, these states should apply federal air quality standards to prescribed fire rather than a more stringent standard.¹⁴

Other states should consider whether the criteria they use to measure air quality unnecessarily penalize prescribed fire. In 2008, for instance, California’s Air Resources Board altered its criteria from one that focused on the presence of high-pressure systems (which are generally associated with hot, dry conditions) to one that gave greater weight to the atmosphere’s capacity to disperse smoke.¹⁵ This small, technical change in how the state assessed air quality meaningfully increased the number of burn days available to prescribed burners.¹⁶ Other states should



A winter pile burn in Arizona

evaluate the metrics they use for similar opportunities to increase the number and predictability of burn days.

Because states rather than the federal government determine whether wind, humidity, and other local conditions are appropriate for prescribed fire, they have more flexibility in taking these factors into account when setting burn windows. These conditions affect the likelihood that a prescribed fire will grow more intense than intended or escape containment. Based on these factors, states or local governments declare seasonal or daily burn windows.¹⁷ In some states, this is a binary choice: burning is either allowed or suspended.¹⁸ In others, there's a third choice: "marginal" days during which a limited amount of burning is allowed on a case-by-case basis.¹⁹

To encourage more use of prescribed fire and reduce uncertainty, states should adopt more gradual approaches to determining burn days to better reflect the gradual changes in risk as conditions change. States

should expand the "marginal" day concept to set burn days for different types of burns based on prevailing conditions. In good conditions, all types of burns could be authorized. But as conditions depart from ideal, rather than prohibiting burning entirely, a state could allow smaller and less complex burns. Spreading out burning in this way could have other ancillary benefits, like making better use of limited manpower and prescribed fire resources.

Perhaps because the West does not have a strong culture of prescribed fire and recent history of its use, there is some evidence that landowners underuse opportunities to burn because they do not know of them. A recent study suggests, for instance, that winter can be an effective time to apply prescribed fire in the Sierra Nevada, especially during periods of drought where snowpack is less of a constraint.²⁰ The risk of escape is minimal during this time.²¹ And more resources to implement a burn or contain an escape



One challenge to planning and executing prescribed burns is the need to manage smoke emitted from them.

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are potentially available since there is less competition from regional wildfire suppression. These windows have been underused, even as burning during peak seasons of spring and fall have been constrained by drought, wildfires, and other factors.²² States that have historical records of air quality and local conditions aligning to allow for burning should publicize previously overlooked opportunities, highlighting the potential cost-savings, reduced bureaucracy, and other benefits available for landowners who seize them.

Finally, states should announce burn days as early as possible to give landowners time to arrange burns. States vary considerably in when they make these announcements. Colorado does not announce burn days until 9 a.m. the day of, effectively requiring landowners and contract burners to make preparations with no certainty whether burning will be allowed.²³ California's Air Resources Board announces whether air quality is sufficient to allow burning by 3 p.m. the day before, giving some time to make arrangements after learning that a burn can go forward.²⁴

The Montana-Idaho Airshed Group, a collaboration between state agencies and the timber industry, forecasts conditions for smoke dispersion a week ahead

of time and updates them daily.²⁵ Although smoke dispersion models are improving, forecasting is not an exact science, and air quality, wind conditions, and other factors can change. But to the extent practicable, states should try to publicize when burning will be allowed as far in advance as possible to allow burners to make arrangements with more confidence. Increasing certainty will enable decisions that prioritize lands based on potential benefit rather than on smaller, and often less impactful sites.

RECOMMENDATIONS FOR STATES

- Review state air quality standards and metrics for unintended obstacles to prescribed fire.
- Adopt more incremental and flexible approaches to determining burn days.
- Publicize previously overlooked seasonal burn opportunities, highlighting the potential cost-savings, reduced bureaucracy, and other benefits available for landowners who seize them.
- Announce burn days as early as possible to give landowners time to arrange burns.

NOTES

1. See Raymond Zhong, *Why Climate Change Makes It Harder to Fight Fire With Fire*, N.Y. Times (May 5, 2022), <https://www.nytimes.com/2022/05/05/climate/wildfires-prescribed-burn.htm>. See also Janine A. Baijnath-Rodino et al., *Historical Seasonal Changes in Prescribed Burn Windows in California*, 836 *Sci. of the Total Enviro.* 155,723 (2022), <https://www.sciencedirect.com/science/article/abs/pii/S0048969722028194>.
2. See Randy Striplin et al., *Retrospective Analysis of Burn Windows for Fire and Fuels Management: An Example From the Lake Tahoe Basin, California, USA*, 16 *Fire Ecology* 13 (2020), <https://fireecology.springeropen.com/counter/pdf/10.1186/s42408-020-00071-3.pdf>.
3. See Baijnath-Rodino et al., *Historical Seasonal Changes*, *supra* n.1.
4. See Courtney Schultz et al., *Prescribed Fire Policy Barriers and Opportunities: A Diversity of Challenges and Strategies Across the West*, Univ. of Oregon (2018), https://ewp.uoregon.edu/sites/ewp.uoregon.edu/files/WP_86.pdf (identifying inversions as a significant limit on prescribed fire in Montana, Nevada, Utah, and Wyoming). See also Montana Dept. of Env'tl. Quality, *Why Can't I Burn?: Weather, Air Quality, and Open Burning*, <https://deq.mt.gov/files/Air/AirQuality/Documents/OpenBurn/WhyCantIBurn.pdf>.
5. See Schultz et al., *Prescribed Fire Policy*, *supra* n.4. (identifying resources devoted to wildland fire as a significant limit on prescribed fire in Arizona and New Mexico).
6. See Striplin et al., *Retrospective Analysis*, *supra* n.2.
7. See *id.*
8. See Sara A. Clark, Andrew Miller, & Don L. Hankins, *Good Fires: Current Barriers to the Expansion of Cultural Burning and Prescribed Fire in California and Recommended Solutions*, Karuk Tribe (2021), https://karuktribeclimatechangeprojects.files.wordpress.com/2022/06/karuk-prescribed-fire-rpt_2022_v2-1.pdf
9. See Holly Fretwell & Jonathan Wood, *Fix America's Forests: Reforms to Restore National Forests and Tackle the Wildfire Crisis*, PERC Public Lands Report (2021), <https://www.perc.org/wp-content/uploads/2021/04/fix-americas-forests-restore-national-forests-tackle-wildfire-crisis.pdf>. See also Marissa L. Childs et al., *Daily Local-Level Estimates of Ambient Wildfire Smoke PM_{2.5} for the Contiguous US*, 56 *Env'tl. Sci. Tech.* 13,607 (2022), <https://pubs.acs.org/doi/abs/10.1021/acs.est.2c02934#>; Rosana Aguilera, *Wildfire Smoke Impacts Respiratory Health More Than Fine Particles From Other Sources: Observational Evidence from Southern California*, 12 *Nature Comms.* 1493 (2021), <https://www.nature.com/articles/s41467-021-21708-0>; Jes Burns & Maya Miller, *Change To Oregon Smoke Rules Seeing Early Results For Prescribed Burns*, Or. Pub. Broadcasting (June 19, 2019), <https://www.opb.org/news/article/oregon-smoke-rules-prescribed-fires-wildfire-air-quality/> (reporting that 93 percent of Oregon's unhealthy air quality days in 2018 were due to wildfire smoke).
10. See Fretwell & Wood, *Fix America's Forests*, *supra* n.9; Clark, Miller, & Hankins, *Good Fires*, *supra* n.8.
11. See Clark, Miller, & Hankins, *Good Fires*, *supra* n.8; Schultz et al., *Prescribed Fire Policy*, *supra* n.4 (survey of federal land managers identifying air quality standards as a primary barrier in every state except Washington and New Mexico).
12. See Schultz et al., *Prescribed Fire Policy*, *supra* n.4, at 10.
13. See Brittany West et al., *Amending Oregon's Air Quality Rules to Allow More Prescribed Fire*, Oregon State Univ. Natural Resource Policy Brief (June 2, 2020), <https://blogs.oregonstate.edu/brittanywest/2020/06/02/amending-oregons-air-quality-rules-to-allow-more-prescribed-fire/>.
14. See *id.*
15. See Striplin et al., *Retrospective Analysis*, *supra* n.2, at 12.
16. See *id.*
17. See, e.g., Cal. Fire, *Current Burn Status*, <https://burnpermit.fire.ca.gov/current-burn-status/>.
18. See *id.*
19. See Montana Dept. of Env'tl. Quality, *Open Burning*, <https://deq.mt.gov/air/Programs/burning> (allowing prescribed fire on a case-by-case basis during winter).
20. See Robert A. York et al., *Opportunities for Winter Prescribed Burning in Mixed Conifer Plantations of the Sierra Nevada*, 13 *Fire Ecology* 33 (2021), <https://fireecology.springeropen.com/articles/10.1186/s42408-021-00120-5>.
21. See *id.*
22. See *id.*
23. See Colorado Dept. of Public Health & Enviro., *Colorado Open Burning Forecast*, https://www.colorado.gov/airquality/burn_forecast.aspx.
24. See Cal. Air Resources Bd., *Prescribed Burning*, <https://ww2.arb.ca.gov/our-work/programs/prescribed-burning>.
25. See Montana-Idaho Airshed Group, *Airshed Management System*, <https://mi.airshedgroup.org/>.

3: Unleash Prescribed Fire Resources for Landowners

Because prescribed fire has long been absent from western landscapes, many private landowners are unfamiliar with the method and lack the resources needed to safely implement burns. Making more resources, training, and experiential opportunities available to landowners, entrepreneurs, and other would-be burners is essential to expanding the use of prescribed fire.

While prescribed fire can be safely applied without complicated or expensive equipment, there are still some significant upfront costs required to start burning. In 2019, experts from the University of California Cooperative Extension estimated the cost to put together a “burn trailer” containing necessary and useful equipment for a prescribed fire.¹ Excluding the items the experts identified as lower priority, the cost was \$43,000.² An individual landowner execut-

ing only a small burn might be able to avoid some of this expense, but she would still need to make a five-figure investment to get started.

Because land is burned only intermittently, it makes more sense for landowners to coordinate and share resources or for entrepreneurs to provide this service. Prescribed burn associations have proven to be an effective way to provide this coordination and resource-sharing.³ These voluntary, grassroots organizations make it easier for landowners to adopt prescribed fire as a management tool by pooling resources, providing training, coordinating burns across property lines, and organizing crews to implement burns.⁴ They also provide a way for those who benefit from prescribed fire to support its use. The Humboldt County Prescribed Burn Association in

TABLE 2:
Prescribed Fire Certification Programs and Private Associations in Western States

STATE	Has certification program?	Year certification program established	Certification required to burn?	Gross liability for certified burners?	Additional incentives for certification?	Reciprocity for certification?	Cultural burners recognized?	Prescribed fire council	Prescribed burn association(s)
Arizona	No	N/A	N/A	N/A	N/A	N/A	N/A	No	Yes
California	Yes	2021	No	Yes	Avoid suppression cost liability	No	Yes	Yes [^]	Yes
Colorado	Yes	2013	No	Yes	No	No	No	Yes	Yes
Idaho	No	N/A	N/A	N/A	N/A	N/A	N/A	Yes	No
Montana	No	N/A	N/A	N/A	N/A	N/A	N/A	No	No
Nevada	No	N/A	N/A	N/A	N/A	N/A	N/A	Yes	No
New Mexico	Yes	Developing	No	No	No	Proposed	TBD	Yes	Yes
Oregon	Developing	Developing	No	No	TBD	TBD	TBD	Yes	Yes
Utah	No	N/A	N/A	N/A	N/A	N/A	N/A	Yes	No
Washington	Yes	2022	No	Yes	No	TBD ^l	No	Yes	No
Wyoming	No	N/A	N/A	N/A	N/A	N/A	N/A	Yes	No

[^]California has a prescribed burn council that covers only the northern part of the state.

^lWashington has explicitly authorized an equivalency test in lieu of completing certification for experienced burners, but the policy has not yet been implemented.



Elk and other wildlife benefit from abundant green forage that appears after prescribed burns, such as in this Oregon forest.

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California, for instance, purchased its burn trailer through contributions from the California Deer Association, which values the habitat that prescribed fire creates and maintains.⁵

While there are more than 100 prescribed burn associations nationwide, they are relatively new to the West. California is the only western state to have more than one, with 16 spread across Northern California, the Central Coast, and San Diego.⁶ Outside of California, three prescribed burn associations cover portions of Arizona, Colorado, New Mexico, and Oregon.⁷ And the Ember Alliance is working to expand prescribed burn associations in Colorado, focusing on opportunities for pile burning.⁸

Even with access to needed tools, many landowners and entrepreneurs would need training and practice to feel comfortable applying fire to their land. To provide this training, several western states have developed government-administered certified burner (or “burn boss”) programs that teach how to plan, execute, and supervise prescribed burns of various complexities.⁹ In the West, less than half of states have these programs, and most are in their infancy.

Government-run certification programs involve a mix of education and regulation. The primary incentives for would-be burners to participate are regulatory. State rules may require certification to plan and supervise certain types of burns. Certified burners may enjoy a reduced risk of liability. (See p. 26.) And they may be exempt from some burn bans and other restrictions.¹⁰ Tasking a state agency with developing a program that is both educational and regulatory can make it difficult to strike a balance between achievable and rigorous standards; the former will encourage landowners to participate, but the latter will make communities more accepting of prescribed fire.¹¹ Table 2 summarizes various aspects of western states’ certification programs and private prescribed fire associations.

Existing certification programs charge relatively low fees compared to the costs of developing and implementing them, which can cause them to be a tax on the resources of an already strained agency responsible for implementing one.¹² Furthermore, an agency could face criticism if a certified burner is responsible for an escaped fire. For these reasons, agencies may be overly risk averse in implementing programs and



Prescribed Fire Councils

All western states except Arizona and Montana have established prescribed fire councils, which bring together federal and state agencies, nongovernmental organizations, and tribal and private interests.²⁰ Depending on the challenges to implementing prescribed fire in a state, a council may be focused on sharing information, techniques, and experiences, or it may seek to foster dialogue between regulators, the regulated, and interest groups to spur changes in policy. State prescribed fire councils are organized under the national Coalition of Prescribed Fire Councils,²¹ which acts as a clearinghouse for individual councils and a single voice for the need to reduce hurdles to prescribed fire. The unique challenges for prescribed fire implementation in the West highlight the need for council development and adoption of policies that work in other regions.

certifying burners.¹³ Unless an agency's leadership is strongly committed to the program's success and willing to prioritize resources for it, it may fail to achieve the state's goals due to lack of promotion, infrequent trainings, and bureaucratic delays—as have limited several western states' programs.¹⁴

To increase certification opportunities, states could better harness existing private training resources. Prescribed burn associations, as discussed above, provide valuable training and practice opportunities that could be used to qualify for certification.¹⁵ In addition, The Nature Conservancy, through a cooperative agreement with the Forest Service, has a Prescribed Fire Training Exchanges (TREX) program that teaches participants through work on prescribed burns that achieve locally supported management objectives.¹⁶ The program has grown from training 68 people in 2008 to more than 600 in 2021.¹⁷

Many tribes also train their members, members of other tribes, and others on cultural burning practices.¹⁸ But few states have capitalized on tribal experience and interest in prescribed fire. California is an exception, having recently recognized tribal certification programs and given them the same treatment as the state's own new certification program.¹⁹

Having state agencies set the requirements for certification while allowing private entities to qualify burners under those requirements would separate regulatory and educational objectives and could help improve incentives for prompt, efficient certifications. Providers of private training resources have strong incentives to maintain quality, including protecting their reputations among potential participants and remaining eligible to certify burners.²² But if a state agency wanted to maintain control over certification for some burns, it could establish different tiers of certification and allow private trainers to certify for lower tiers.²³ A tiered system could also better account for the fact that landowners interested in simpler burns and prescribed fire contractors specializing in more complex burns have different training needs, timelines, and willingness to navigate bureaucracy.

Another approach states could use to expand the number of trained, qualified burners would be to give reciprocity to certified burners from other states where prescribed fire is more common. This would also allow entrepreneurial burners to more easily scale their operations. While varying climates, forest types, and other conditions mean that prescribed fire practice differs among states, this need not be an obstacle to



A Prescribed Fire Training Exchange (TRÉX) program takes place in Oregon.

reciprocity. In other contexts, states limit the amount of duplicated effort required when a licensed professional relocates from another state. In law practice, for instance, states admit attorneys from other states through a streamlined process rather than requiring them to retake the bar exam.²⁴ They do so even where a state requires knowledge of uncommon areas of law or has rules unique to that state. In such cases, states credit applicants for their existing license and require only that they supplement their knowledge by, for instance, attending a short seminar concerning the state's unique rules.²⁵ Washington and New Mexico have proposed, but not yet implemented, a reciprocity process for out-of-state burners. And California allows experienced burners to skip certain prerequisites to sit for its certification program.

RECOMMENDATIONS FOR STATES

- Harness private training resources, such as those from prescribed burn associations and tribal organizations. Private groups can provide valuable training and practice opportunities that could be used to qualify for burner certification.
- Establish different tiers of certification and allow private trainers to certify for lower tiers if states want to maintain control over certification for some burns.
- Adopt reciprocity for burner certification in other states. If regulations, fuels, weather conditions, or other particular factors warrant additional, state-specific training, states should require only supplementary training for those factors.

NOTES

1. See Lenya Quinn-Davidson & Jeffery Stackhouse, *Field Report: Building a Burn Trailer to Support Your Community's Prescribed Fire Efforts*, Univ. of Cal. Coop. Extension Grasslands (2019), <https://ucanr.edu/sites/forestry/files/312932.pdf>.
2. See *id.*
3. See *id.* (reporting that prescribed burn associations are seen “as the only realistic model for bringing fire back to private lands at a meaningful scale”); John R. Weir, *Prescribed Burning Associations: Landowners Effectively Applying Fire to the Land* in Proceedings of the 24th Tall Timbers Fire Ecology Conference: The Future of Prescribed Fire: Public Awareness, Health, and Safety (2010), https://talltimbers.org/wp-content/uploads/2018/09/44-Weir2010_op.pdf. See also John Diaz, Jennifer E. Fawcett, & John R. Weir, *The Value of Forming a Prescribed Burn Association*, Southern Fire Exchange Fact Sheet (2016), <https://ucanr.edu/sites/Mariposa/files/321638.pdf>.
4. See Diaz, Fawcett, & Weir, *The Value of Forming a Prescribed Burn Association*, *supra* n.3. See also David Toledo et al., *The Role of Prescribed Burn Associations in the Application of Prescribed Fires in Rangeland Ecosystems*, 134 J. of Env'tl. Mgmt. 323 (2014), <http://sonora.tamu.edu/files/2015/12/The-role-of-prescribed-burn-associations-in-the-application-of-prescribed-fires-in-rangeland-ecosystems.pdf> (finding that prescribed burn associations cause landowners to feel more comfortable with prescribed fire and less concerned with liability risks).
5. See Quinn-Davidson & Stackhouse, *Field Report*, *supra* n.1.
6. See California PBA, *California's Prescribed Burn Associations*, <https://calpba.org/connect-ca-pba>; Great Plains Fire Science Exchange, *Prescribed Burn Associations*, <https://gpfirescience.org/prescribed-burn-associations/>. See also <https://CalPBA.org> (website providing advice on how to set up a prescribed burn association, contact for existing associations in the state, and training resources that associations can use).
7. See Great Plains Fire Science Exchange, *supra* n.6.
8. See The Ember Alliance, *Colorado Prescribed Burn Associations*, [https://emberalliance.org/cpba/#:~:text=Prescribed%20Burn%20Associations%20\(PBAs\)%20are,health%20management%20and%20wildfire%20mitigation](https://emberalliance.org/cpba/#:~:text=Prescribed%20Burn%20Associations%20(PBAs)%20are,health%20management%20and%20wildfire%20mitigation).
9. See Forest Guilds Steward, *Insights and Suggestions for Certified Prescribed Burn Manager Programs 5* (2020), <https://foreststewardsguild.org/wp-content/uploads/2020/03/InsightsRecommendationsCPMBprograms.pdf>.
10. See *id.* at 12, 27. See also Lenya Quinn-Davidson, *Finding the Sweet Spot: Rigor Versus Impact in Certified Burner Programs*, Fire Adapted Communities Learning Network (2019), <https://fireadaptednetwork.org/finding-the-sweet-spot-rigor-versus-impact-in-certified-burner-programs/>.
11. See Forest Guilds Steward, *Insights and Suggestions*, *supra* n.9., at 25. See also Quinn-Davidson, *Finding the Sweet Spot*, *supra* n.10.
12. See Forest Guilds Steward, *Insights and Suggestions*, *supra* n.9, at 25–26. Cf. Courtney Schultz et al., *Strategies for Increasing Prescribed Fire Application on Federal Lands: Lessons from Case Studies in the U.S. West*, Public Lands Policy Group Practitioner Paper Number 6 (2020), https://ewp.uoregon.edu/sites/ewp.uoregon.edu/files/WP_99.pdf (reporting that limited agency resources and lack of support from agency leadership are two of the primary obstacles to increasing the use of prescribed in the West).
13. See Sara A. Clark, Andrew Miller, and Don L. Hankins, *Good Fires: Current Barriers to the Expansion of Cultural Burning and Prescribed Fire in California and Recommended Solutions*, Karuk Tribe (2021), https://karuktribeclimatechangeprojects.files.wordpress.com/2022/06/karuk-prescribed-fire-rpt_2022_v2-1.pdf (reporting that agency culture, including at state agencies, is a significant obstacle to increased use of prescribed fire). See also Lynn A. McGuire & Elizabeth A. Albright, *Can Behavioral Decision Theory Explain Risk-Averse Fire Management Decisions?*, 211 Forest Ecology & Mgmt. 47 (2005), https://trainingcenter.fws.gov/courses/ALC/ALC3159/resources/Maguire_and_Albright_2005.pdf (discussing the role of irrational risk aversion in keeping federal land management agencies from meeting prescribed fire goals).
14. See Lenya Quinn-Davidson, *California Burn Boss Program: New Path Forward or Dead-End Street?*, Fire Adapted Communities Learning Network (2022), <https://fireadaptednetwork.org/california-burn-boss-program-new-path-forward-or-dead-end-street/> (reporting that California had not certified anyone eight months after the state's first class of extremely experienced prescribed fire practitioners completed the course); Colo. Div. of Fire Prevention & Control, *Colorado Certified Burn Program*, <https://dfpc.colorado.gov/certifiedburnprogram> (showing that only two trainings were offered in 2022 and none are yet scheduled for 2023). See also Forest Guilds Steward, *Insights and Suggestions*, *supra* n.9, at 25–26.
15. See Diaz, Fawcett, & Weir, *The Value of Forming a Prescribed Burn Association*, *supra* n.3.
16. See The Nature Conservancy, *Fact Sheet: Prescribed Fire Training Exchanges*, Conservation Gateway (2019), https://www.conservationgateway.org/ConservationPractices/FireLandscapes/FireLearningNetwork/Documents/FactSheet_TREX.pdf.
17. See The Nature Conservancy, *Prescribed Fire Training Exchanges 2008–2021*, Conservation Gateway (2022), <https://www.conservationgateway.org/ConservationPractices/FireLandscapes/HabitatProtectionandRestoration/Training/TrainingExchanges/Documents/TREX-graphic.jpg>.
18. See The Nature Conservancy, *Fact Sheet: Indigenous Peoples Burning Network*, Conservation Gateway (2021), https://www.conservationgateway.org/ConservationPractices/FireLandscapes/FireLearningNetwork/Documents/FactSheet_IPBN.pdf. See also Brian Bull, *Indigenous Firefighter Training Teaches Traditional Native Practices in Woodlands Management*, KLCC.org (Mar. 12, 2022), <https://www.klcc.org/2022-03-12/indigenous-firefighter-training-teaches-traditional-native-practices-in-woodlands-management>.

19. See Hayley Smith, *Newsom Signs 'Monumental' Law Paving Way for More Prescribed Burns*, LA Times (Oct. 7, 2021), <https://www.latimes.com/california/story/2021-10-07/newsom-signs-fire-law-paving-way-for-more-prescribed-burns>. See also Clark, Miller, and Hankins, *Good Fires*, *supra* n.13 (criticizing California's regulation of cultural burning in other respects).
20. See Coal. of Prescribed Fire Councils, *About Our Coalition*, <https://www.prescribedfire.net/index.php/about-us>.
21. See Coalition of Prescribed Fire Councils, <https://www.prescribedfire.net/>.
22. Cf. Timothy D. Lytton, *The Advantages of Private Certification Over Government Regulation*, The Reg. Review (Oct. 6, 2014), <https://www.theregreview.org/2014/10/06/lytton-private-certification/>.
23. See Forest Steward Guild, *Insights and Suggestions*, *supra* n.9, at 17 (recommending states adopt multiple tiers of certification to cover different types of burns).
24. See Shari Davidson, *Reciprocity: Guide to States Where You Can Practice Law*, JD Supra (Aug. 19, 2021), <https://www.jdsupra.com/legalnews/reciprocity-guide-to-states-where-you-7387684/>.
25. See State Bar of Montana, *Applying for Admission to the State Bar of Montana*, <https://www.montanabar.org/Membership-Regulatory/Admissions/Admissions-Home> (discussing the "Montana Law Seminar" that attorneys seeking admission by motion must complete); Texas Board of Law Examiners, *Admission Without Examination Information*, <https://ble.texas.gov/admission-without-examination> (requiring applicants to complete a free course on Texas law).

4: Improve Liability Regimes to Align Private Risk and Public Benefits

Despite the benefits of managing land with prescribed fire, a large body of research shows that many private landowners decline to adopt the practice due to fear of liability.¹ Although the following examples are exceedingly rare, a prescribed fire presents several potential risks: smoke could cause a car accident on a nearby road, a fire could escape containment and require costly suppression efforts, and an escaped fire could cause significant damage to neighboring property and communities.

Ordinarily, holding people liable for the harms they create works well to encourage responsible behavior and discourage carelessness by requiring people to internalize risks and costs imposed on others.² In the prescribed burn context, however, it has produced closer to the opposite result. If landowners bear all of the costs and risks of prescribed fire while capturing

only a portion of its benefits, they will likely decline to use the tool even when the total benefits far exceed the risks.

While fear of liability is a major factor discouraging landowners from using prescribed fire, the actual risks of an escape are quite small. The Forest Service, which ignites about 4,500 prescribed fires per year, reports that only 0.16 percent escape.³ Studies of prescribed fire use on private land similarly show a risk of escape below 1 percent.⁴ But even these low figures may give a misimpression about the magnitude of the risk because many escapes cause only minor damage, such as burning a small area of neighboring forest or grassland.⁵ As the authors of a recent study put it, “the risk of using prescribed fire is often considered unacceptable even though [it] . . . is far less than driving a car.”⁶



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A crew digs a fireline while preparing for a prescribed burn in Oregon.

How liability is determined varies by state, as shown in Table 3. There are three basic standards: (1) Under **strict liability**, a person is liable for any damages resulting from their actions regardless of the steps they took or could have taken to reduce the harm or risk. This standard commonly applies to actions that cause pollution to spread to neighboring land as well as unusually dangerous activities.⁷ (2) Under **simple negligence**, a person is liable if harm results from their carelessness or failure to take reasonable steps to reduce risks. It is intended to encourage people to balance the benefit of their actions against the potential harm.⁸ And (3) under **gross negligence**, a person is liable for conduct that shows reckless disregard for others and their property.⁹ Although more often used as the trigger for imposing punitive damages, gross negligence has also been used as a standard for determining liability in situations with large social benefits and small or no private benefits. A common example is Good Samaritan laws, which protect someone who inadvertently causes harm while offering aid to a stranger in an emergency.¹⁰

In theory, these standards should lead to the same results if rights are clearly defined and there are low costs for parties to bargain with each other.¹¹ In the prescribed fire context, however, liability risks have discouraged the practice even where the benefits far exceed the costs. There are several reasons for this.

First, landowners considering using prescribed fire often do not have reliable information about the risks of escape in similar circumstances and whether an escape would cause significant damage. National statistics, like those discussed above, may be insufficient comfort for a western landowner surrounded by poorly managed forests in a high wildfire-risk area. Where risks are uncertain, people are likely to assume the worst and be more risk averse than they would be with more confidence in the extent of risks.¹² The worst case scenario—an escaped fire that destroys homes and causes human casualties—could easily bankrupt a private landowner if she is liable for the damage. Thus, this uncertainty can have a powerful effect on decision-making.

TABLE 3:
Liability Standards for Prescribed Fire Use in Western States

STATE	Liability standard
Arizona	Simple negligence
California	Strict liability
Colorado	Uncertain
Idaho	Simple negligence
Montana	Uncertain
Nevada	Gross negligence
New Mexico	Simple negligence*
Oregon	Simple negligence
Utah	Uncertain
Washington	Simple negligence
Wyoming	Uncertain

*New Mexico imposes double liability for damages from escaped burns. For example, if an escaped burn causes damages of \$100,000, then the burner must pay \$200,000 in damages.

Second, rights are not always clearly defined. Several states have never clarified the liability standard for prescribed fire practitioners, leaving them to guess.¹³ When a liability standard is uncertain, people are likely to “overcomply” by either avoiding the activity that could trigger liability or taking excessive precautions to minimize risks.¹⁴ As noted in Table 3, four western states have not clearly established what liability standard applies to escaped prescribed fires. Additional uncertainty exists over how liability would be allocated between a landowner and a burn boss contracted to plan and oversee a prescribed fire that escaped.¹⁵ Although unresolved, there is some precedent in California (and outside the West) for holding landowners liable for the actions of employees and contractors.¹⁶ If the landowner has more resources than the burn boss, she may be a more attractive target of a lawsuit.



A burner lights a fuel break during a prescribed fire in California.

Third, landowners cannot easily negotiate with everyone who may benefit from their use of prescribed fire. As recent years have shown, an area managed with prescribed fire may lower the intensity or severity of a wildfire, allowing it to be contained before spreading to other areas.¹⁷ Prescribed fire may also promote habitat for wildlife valued by hunters and conservationists.¹⁸ But the landowner who produces these benefits cannot exclude others from them or charge for their enjoyment. Thus, she will likely weigh the costs of implementing a prescribed fire against only those benefits accruing to her land, rationally ignoring the benefits accruing to surrounding landowners, communities, or the public generally. Instead, she may choose other management techniques that have lower risks but also yield fewer benefits.¹⁹

Fourth, many of the factors contributing to the liability risk are outside of landowners' control. This is obvious with respect to an "act of God," like a sudden shift in the wind that causes a prescribed fire to escape. But perhaps more importantly, the effects of an escaped fire depend on how surrounding lands are

managed. A fire that escapes into a neighboring well-managed forest may cause only minor damage, but a fire that escapes into a forest with unhealthy levels of fuel may become a catastrophic wildfire that spreads into developed and residential areas.

In other contexts, rules have been developed for dividing responsibility in situations where someone contributed to a risk or located new development near a known risk.²⁰ But these rules have not been extended to the prescribed burn context. And it would be difficult to do so due to the prevalence of federal land in the West and federal agencies' immunity from liability for unsafe wildfire conditions, damage from fire that spread from federal to non-federal land, and other wildfire-related harms.²¹

Due to the law imposing liability for escaped prescribed fires while largely ignoring inaction that allows dangerous conditions to develop, inaction can be the safer approach for private landowners from a liability perspective. This is so even though catastrophic wildfires are orders of magnitude more dangerous than prescribed fires. According to one study, wildfire-

related fatalities exceed those from prescribed burns by 3,350 percent.²² Wildfires also destroy more structures, degrade more forests and wildlife habitats, and diminish more resources of other types.²³

The question, therefore, is how to address liability rules to improve incentives for landowners to use prescribed fire, while not going so far as to encourage its unsafe use. The low-hanging fruit is to address uncertainty. The risks of a prescribed fire escaping and causing damage may vary by climate, forest type, and other factors. Reliable, local information about those risks would give landowners more confidence about deciding whether to conduct prescribed fires. So too would clarifying the liability standard that a state will apply to escaped fires and the approach it will follow to allocate liability between landowners and contractors who implement burns. These changes would allow landowners to rationally compare liability risks with the benefits of using prescribed fire, rather than assuming the worst.

Another effective reform would be to narrow the risk that falls on the individual landowner. As in the case of a Good Samaritan coming to a stranger's aid, prescribed fire produces large benefits that are not captured by the person deciding whether to burn. Consequently, a gross negligence standard can better encourage landowners to adopt the practice compared to a strict liability or simple negligence regime.

Indeed, adoption of a gross negligence standard has already proven effective at doing so in the Southeast. A study of prescribed fire use in border counties in Alabama, Florida, and Georgia found that private landowners used prescribed fire more often and burned larger areas when governed by a gross negligence standard compared to landowners in neighboring states governed by simple negligence.²⁴ On average, there was a 10 percent increase in the area managed with prescribed fire under a gross negligence regime.²⁵ As shown in Table 3, five states follow a simple negligence approach, with New Mexico uniquely requiring liable landowners to pay two times the amount of damage they cause.

To address fears that a gross negligence standard would lead to unsafe practices, several states have paired this reform with additional policies to encourage careful use of prescribed fire, although practitioners have expressed concern when those policies are onerous or vague.²⁶ California, for instance, recently enacted legislation providing that burners who complete a state certification process will be liable for the costs to suppress an escaped fire only if they were grossly negligent.²⁷ Other states have adopted a gross negligence standard but only for prescribed burns that comply with state-determined regulatory standards. Georgia, however, has adopted a gross negligence standard without pairing it with any additional regulatory restrictions.

A gross negligence standard effectively shifts liability from the person carrying out a prescribed fire to neighboring landowners and communities who may be harmed by an escape, which they may perceive as unfair.³⁰ Considering the lack of a prescribed fire culture in much of the West and the potential for neighboring landowners and communities to block its use, a complementary approach would be to instead share the total risk between the landowner and others who benefit from expanded use of prescribed fire. The next section addresses an innovative solution to this problem.

RECOMMENDATIONS FOR STATES

- **Broadcast reliable, local information about the risks of a prescribed fire escaping and causing damage based on climate, forest type, and other factors.**
- **Clarify the liability standard that applies to escaped fires and the approach to allocating liability between landowners and contractors who implement burns.**
- **Consider adopting a gross negligence standard to narrow the risk that falls on the individual landowner whose use of prescribed fire produces public benefits.**

NOTES

1. See Carissa Wonkka et al., *Legal Barriers to Effective Ecosystem Management: Exploring Linkages Between Liability, Regulations, and Prescribed Fire*, 28 *Ecological Applications* 2382, 2383 (2015), <https://bit.ly/3yM0Ojk> (collecting studies).
2. See, e.g., Henry N. Butler, *A Defense of Common Law Environmentalism: The Discovery of Better Environmental Policy*, 58 *Case W. Res. L. Rev.* 705 (2008); Roger Meiners & Bruce Yandle, *The Common Law: How It Protects the Environment*, PERC Policy Series (1998), <https://www.perc.org/wp-content/uploads/2018/02/PS13.pdf>.
3. See Forest Serv., *National Prescribed Fire Program Review 7* (2022), <https://www.wildfirelessons.net/HigherLogic/System/DownloadDocumentFile.ashx?DocumentFileKey=d19e4406-ac0a-c1c2-273d-e4577e5a56e8&forceDialog=0>. The liability risks discussed here do not affect the Forest Service the same way they do private landowners. Courts have effectively insulated the agency from any liability for its contributions to wildfire risks. See Lawson Fite & David Bechtold, *Fire Liability Imbalances—An Issue Worth Revisiting?*, 35 *ABA Nat. Res. & Enviro.* 50 (2021).
4. See John R. Weir et al., *Liability and Prescribed Fire: Perception and Reality*, 72 *Rangeland Ecology & Management* 533, 535–36 (2019), https://agrilife.org/kreuter/files/2020/01/Liability-and-Prescribed-fire_Perception-and-reality.pdf. See also J. Morgan Varner et al., *Increasing Pace and Scale of Prescribed Fire via Catastrophe Funds for Liability Relief*, 4 *Fire* 77 (2021), <https://www.mdpi.com/2571-6255/4/1/77/pdf>.
5. See Weir et al., *supra* n.4, at 535.
6. See *id.*
7. See Meiners & Yandle, *The Common Law*, *supra* n.2.
8. See *United States v. Carroll Towing Co.*, 159 F.2d 169, 174 (2d. Cir. 1947). See also Peter Z. Grossman, Reed W. Cearley, & Daniel H. Cole, *Uncertainty, Insurance and the Learned Hand Formula in Law, Probability and Risk* vol. 5, 1 (2006).
9. See *Gross Negligence*, Black’s Law Dictionary (8th ed. 1999).
10. See Brian West & Matthew Varacallo, *Good Samaritan Laws* (2021), <https://www.ncbi.nlm.nih.gov/books/NBK542176/#:~:text=Good%20Samaritan%20laws%20give%20liability,the%20same%20or%20similar%20circumstances> (explaining that these laws are motivated by the recognition that “we are improved as a society if the potential rescuers (i.e., the good Samaritans) are solely concerned about helping a person in need as opposed to worrying about the possible liability associated with assisting their fellow man or woman”).
11. See Ronald Coase, *The Problem of Social Cost*, 3 *J. Law & Econ.* 1 (1960). See also Meiners & Yandle, *The Common Law*, *supra* n.2.
12. See Grossman, Cearley, & Cole, *supra* n.8.
13. See Mark A. Melvin, *National Prescribed Fire Use Survey Report*, Coalition of Prescribed Fire Councils Tech. Rep. (2018), <https://www.stateforesters.org/wp-content/uploads/2018/12/2018-Prescribed-Fire-Use-Survey-Report-1.pdf>.
14. See John E. Calfee & Richard Craswell, *Some Effects of Uncertainty on Compliance with Legal Standards*, 70 *Virginia L. Rev.* 965 (1984).
15. See Changyou Sun, *Common Law Liability for Landowners When Using Prescribed Fires on Private Forest Land in the Southern United States*, 53 *Forest Science* 562 (2007).
16. See *Presbyterian Camp & Conference Centers, Inc. v. Superior Court*, 12 Cal.5th 493 (2021) (holding a church camp liable for a fire inadvertently set by one of its employees). See also Sun, *Common Law Liability*, *supra* n.15.
17. See Henry Fountain, *This Vast Wildfire Lab Is Helping Foresters Prepare for a Hotter Planet*, *N.Y. Times* (Jan. 5, 2022), <https://www.nytimes.com/2022/01/05/climate/fire-forest-management-bootleg-oregon.html>.
18. U.S. Forest Serv. Pacific-Northwest Research Station., *Using Prescribed Fire to Enhance Wildlife Habitat*, <https://www.fs.usda.gov/pnw/pnw-research-highlights/using-prescribed-fire-enhance-wildlife-habitat#:~:text=In%20fact%20prescribed%20fires%20can,like%20elk%20and%20their%20offspring> (last visited Oct. 17, 2022).
19. See Dirac Tidwell et al., *First Approximations of Prescribed Fire Risks Relative to Other Management Techniques Used on Private Lands*, 10 *PLOS One* 13 (2015), <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0140410> (finding that mechanical thinning is more likely to cause injury or death than a prescribed fire, although this risk is limited to a relatively smaller area and fewer people). Of course, in extreme cases, timber harvesting and thinning could start a wildfire which could generate significant liability. See *United States v. Sierra Pacific Industries, Inc.*, 862 F.3d 1157, 1163–65 (9th Cir. 2017) (describing a settlement in a case where a timber company’s employee allegedly caused through negligence a wildfire that burned Forest Service land).
20. See Jonathan Wood, *Coming to the Wildfire Nuisance: Using Property Rights to Restore National Forests and Avoid Moral Hazard*, CGO Working Paper (forthcoming) (available from author). See also *Contributory Negligence Doctrine*, Black’s Law Dictionary (8th ed. 1999).
21. See Wood, *Coming to the Wildfire Nuisance*, *supra* n.20 (suggesting that nuisance law may provide an alternative to after-the-fact liability for a wildfire, especially if paired with adoption of a “coming to the nuisance” defense to avoid moral hazard); Fite & Bechtold, *supra* n.3 (suggesting that the Forest Service immunity from wildfire liability is unfair when the agency readily sues its neighbors for fires and, for that and other reasons, should be reconsidered).
22. See Tidwell et al., *supra* n.19, at 9.

23. See Holly Fretwell & Jonathan Wood, *Fix America's Forests: Reforms to Restore National Forests and Tackle the Wildfire Crisis*, PERC Public Lands Report (2021), <https://www.perc.org/wp-content/uploads/2021/04/fix-americas-forests-restore-national-forests-tackle-wildfire-crisis.pdf>.
24. See Wonkka et al., *Legal Barriers*, *supra* n.1, at 2386–87.
25. See *id.* at 2387.
26. See Stephen McCullers, Note, *A Dangerous Servant and a Fearful Master: Why Florida's Prescribed Fire Statute Should Be Amended*, 65 Fla. L. Rev. 587 (2013).
27. See Cal. S.B. 332 (2021).
28. See Wonkka et al., *Legal Barriers*, *supra* n.1, at 2386.
29. See *id.*
30. See Letter from Mike Christianson, President of Montana Forest Owners Association, to Chairman and Members of Montana Environmental Quality Council (Mar. 20, 2018), <https://leg.mt.gov/content/Committees/Interim/2017-2018/EQC/Meetings/Mar-2018/fire-comments.pdf> (opposing prescribed fire legislation over concerns it would shift liability to innocent landowners).

5: Harness Catastrophe Bonds to Invest in Ecosystem Health and Forest Resilience

While reducing landowners' liability for escaped prescribed fires is essential to expanding use of the tool, shifting that risk to surrounding landowners and communities may undermine support for "good fire."¹ This concern is especially acute in the wake of a high-profile escape, such as the Hermit's Peak Fire that started as an escaped Forest Service prescribed fire in 2022 and eventually burned over 300,000 acres, destroyed nearly 1,000 structures, and cost more than \$100 million to extinguish.² Leaving the victims of such fires with no recourse can be devastating, especially for families and communities who lack the resources to rebuild and may have limited access to insurance.³ Doing nothing, however, leaves communities vulnerable to an even more catastrophic wildfire, against which they also have no recourse.

An innovative, market solution to this problem would be to use a catastrophe bond to cover damages in situations where a burner was not negligent or not grossly negligent, depending on which liability regime a state follows, or where the damages exceed the liable burner's ability to pay.⁴ First developed in 1997, catastrophe bonds are a widely used tool to reduce exposure to low-probability but high-cost events.⁵ The market for catastrophe bonds grew quickly following the 2008 financial crisis, to an estimated \$12.5 billion in 2021.⁶

To understand how a catastrophe bond works, consider a 2010 bond issued by an insurance company to cover its payouts in the event of an exceptionally destructive year of tornadoes and thunderstorms.⁷ That bond covered up to \$100 million in claims if the insurance company's annual liability surpassed \$825 million over the bond's three-year term.⁸ Otherwise, investors would get their principal back plus a return of 6.5 percent per year paid by the insurance company.⁹ For the issuer, a catastrophe bond may be lower cost than traditional reinsurance, and it has a lower

default risk since the bond is fully funded at inception.¹⁰ For investors, catastrophe bonds offer good returns and diversification where the risks covered by the bond are not correlated with market risks.¹¹ Today, these bonds are drawing attention from investors for their social impact as much as their financial returns.¹²

A prescribed fire catastrophe bond could be an attractive impact investment opportunity, provided there is a mechanism for generating a return. This could be done through contributions from those who benefit from expanded use of prescribed fire or reduced liability. For instance, a catastrophe bond could be a cost-effective way for government entities to encourage prescribed fire that reduces future fire suppression costs, threats to public property and infrastructure, and impacts to environmental resources. Utilities and insurance providers might similarly benefit by reducing their exposure to wildfire-related liability. In exchange for reduced liability, prescribed burners might be willing to pay a fee on permits that would fund a bond. More broadly, the ecological benefits of prescribed fire could attract support from the conservation community, which has a burgeoning interest in using risk transfers to address environmental risks and encourage stewardship.¹³

A similar conservation-investment approach is already working to reduce wildfire risks on federal land. Under a forest resilience bond, investors contribute money to cover the upfront costs of mechanical thinning, prescribed fire, and other management actions, which they recoup over time from payments made by those who benefit from healthier federal forests.¹⁴ In the Tahoe National Forest, for instance, a forest resilience bond was used to fund restoration projects on 15,000 acres.¹⁵ The bond was funded by two nonprofit organizations, an investment firm, and an insurance company. The State of California and a water utility, both of whom benefit from healthier



A forest resilience bond helped fund prescribed burns and other forest restoration work in Northern California.

© Tahoe National Forest



Prescribed fire improves habitat for wildlife, including lesser sandhill cranes and other migratory birds that stop at the Columbia National Wildlife Refuge in Washington.

© Paul Hiebert/USFWS.

forests through reduced firefighting and water-treatment costs, will gradually repay both the initial investment and a return as benchmarks are met.¹⁶

Unlike the large companies that ordinarily issue catastrophe bonds, landowners do not have sufficient access to capital markets or the resources to cover the transaction costs of establishing a bond. However, a state or local government, national or regional prescribed fire council, or coalition of conservation organizations could provide the needed coordination between landowners and those who benefit from prescribed fire. California is already showing interest in a similar approach. In 2021, the state enacted legislation sponsored by The Nature Conservancy to establish a Prescribed Fire Claims Fund that will cover otherwise uninsured losses from escaped prescribed fires that were carried out according to state regulations.¹⁷ The state appropriated \$20 million to the fund, which is paired with a change in the state's liability standard for certified prescribed burners.¹⁸

One of the promising benefits of a catastrophe bond is the potential to transfer much larger risks than could be done under a traditional compensation fund, through the use of leverage. To avoid its fund being depleted too quickly, California capped the amount that could be paid out for a single escaped prescribed fire at \$2 million.¹⁹ While the risks of a catastrophic

escape are low, a worst-case scenario could easily exceed this limit, which might undermine support of the program and prescribed fire generally.²⁰ A catastrophe bond could provide considerably greater coverage for losses. Funds raised from those who benefit from expanded use of prescribed fire would need only cover the interest on the bond, attracting a larger pool of private capital to fund potential losses.²¹

Another benefit of a prescribed fire catastrophe bond is that it would encourage greater use of prescribed fire and improvements in managing the risk of escape. An escape is less likely to cause damage if fire spreads to an area that has also been burned to reduce fuel loads and promote forest resilience. Therefore, sponsors or investors in a catastrophe bond could reduce their risks by providing incentives for more landowners to adopt prescribed fire. They may likewise have incentives to provide landowners and burners with resources and training to reduce the risk that a fire escapes or causes significant damage.

RECOMMENDATION FOR STATES

- Harness private investment through catastrophe bonds, which have the potential to transfer enormous amounts of risk, rather than relying on traditional compensation funds.

NOTES

1. See J. Morgan Varner et al., *Increasing Pace and Scale of Prescribed Fire via Catastrophe Funds for Liability Relief*, 4 Fire 77 (2021), <https://www.mdpi.com/2571-6255/4/4/77/pdf?version=1634796391>.
2. See Eric Westervelt, *New Mexico Wildfire Sparks Backlash Against Controlled Burns. That's Bad for the West*, Nat'l Public Radio (May 20, 2022), <https://www.npr.org/2022/05/20/1099625787/new-mexico-wildfire-sparks-backlash-against-controlled-burns-thats-bad-for-the-w>.
3. See Varner et al., *Increasing Pace and Scale*, *supra* n.1, at 6–7. See also Monique Dutkowsky & Holly Fretwell, *California Can Learn from Colorado on Protecting Homes from Wildfire Risks*, O.C. Register (Nov. 13, 2020), <https://www.oregister.com/2020/11/13/california-can-learn-from-colorado-on-protecting-homes-from-wildfire-risks/> (discussing California restrictions on market-price insurance and its impact on the availability of insurance).
4. See Varner et al., *Increasing Pace and Scale*, *supra* n.1.
5. See Andy Polacek, *Catastrophe Bonds: A Primer and Retrospective*, Chicago Fed Letter No. 405 (2018), https://www.chicagofed.org/-/media/publications/chicago-fed-letter/2018/cfl405-pdf.pdf?sc_lang=en.
6. See *id.* at 4 (reporting that the U.S. market grew from issuing about \$3 billion in bonds in 2008 to more than \$10 billion in 2017). See also Artemis, *Q4 2021 Catastrophe Bond & ILS Market Report*, <https://www.artemis.bm/wp-content/uploads/2022/01/catastrophe-bond-ils-market-report-q4-2021.pdf> (reporting that the market grew to \$12.5 billion in 2021).
7. See Polacek, *Catastrophe Bonds*, *supra* n.5, at 2.
8. See *id.*
9. See *id.*
10. See *id.* Reinsurance is insurance for insurers. Unlike a catastrophe bond, reinsurance contracts are vulnerable to the risk that the reinsurer will go bankrupt before fully satisfying the contract.
11. See Andre Rzym & Tarek Abou Zeid, *Catastrophe Bonds: Investing With Impact*, Man Institute (2018), https://www.man.com/maninstitute/documents/download/MoOwK-6FEOL-IAfsa-3eOpN/Man_AHL_Analysis_Catastrophe_Bonds_Investing_With_Impact_English_%28United_States%29_31-10-2018.pdf. See also Polacek, *Catastrophe Bonds*, *supra* n.5, at 3.
12. See Rzym & Zeid, *Catastrophe Bonds*, *supra* n.11.
13. See Carolyn Kousky, *Insurance-Sector Tools to Combat Biodiversity Loss*, 377 Science 714 (2022), <https://www.science.org/doi/10.1126/science.abo7282>; The World Bank, *Wildlife Conservation Bond Boosts South Africa's Efforts to Protect Black Rhinos and Support Local Communities* (Mar. 23, 2022), <https://www.worldbank.org/en/news/press-release/2022/03/23/wildlife-conservation-bond-boosts-south-africa-s-efforts-to-protect-black-rhinos-and-support-local-communities>; Conservation Finance Alliance, *Risk Financing for Nature-Based Solutions* (June 20, 2021), <https://www.conservationfinancealliance.org/news/2021/5/26/cfa-webinar-risk-financing-for-nature-based-solutions>; Ocean Risk and Resilience Action Network, *Insuring Nature to Reduce Risk: Risk Transfer Solutions for Coral Reefs* <https://oceanriskalliance.org/project/risk-transfer-solutions-for-coral-reefs/>; Doug St. John & Finn Krogstad, *Increasing Habitat by Voluntary Transfer of Risk of Owning Big Trees*, <https://www.for.gov.bc.ca/hfd/LIBRARY/Documents/bib96089/62.pdf>.
14. See Holly Fretwell & Jonathan Wood, *Fix America's Forests: Reforms to Restore National Forests and Tackle the Wildfire Crisis*, PERC Public Lands Report 20–21 (2021), <https://www.perc.org/wp-content/uploads/2021/04/fix-americas-forests-restore-national-forests-tackle-wildfire-crisis.pdf> (describing forest resilience bonds).
15. See *id.*
16. See *id.*
17. See Cal. S.B. 926 (2021), https://leginfo.ca.gov/faces/billPdf.xhtml?bill_id=20210220SB926&version=20210SB92694CHP; See also Varner et al., *Increasing Pace and Scale*, *supra* n.1, at 7.
18. See Varner et al., *Increasing Pace and Scale*, *supra* n.1, at 7.
19. See Cal. S.B. 926 (2021)
20. See, e.g., Nicole Friedman, *The Bond That Could Be Wiped Out by California's Wildfires*, Wall. St. J. (Dec. 5, 2018), <https://www.wsj.com/articles/the-bond-that-could-be-wiped-out-by-californias-wildfires-1544005801> (discussing Pacific Gas & Electric's ill-fated \$200 million catastrophe bond issued months before the Camp Fire generated billions in liability for the company). Of course, PG&E's liability risks are markedly different than prescribed burners, and that bond did nothing to encourage activities that reduce wildfire risks, unlike a prescribed fire bond.
21. Consider, for example, that the average return on a catastrophe bond has varied between 6 percent and 8 percent over the past five years. See Artemis, *Catastrophe Bonds Softer in 2021, But Investors Holding the Line on Pricing* (Dec. 22, 2021), <https://www.artemis.bm/news/catastrophe-bonds-softer-in-2021-but-investors-holding-the-line-on-pricing/>. At these rates, \$20 million could provide a return on a bond providing between \$250 million and \$350 million in coverage.

APPENDIX

**TABLE A:
Prescribed Fire Use on Private Lands in Western States**

STATE	Arizona	California	Colorado	Idaho	Montana	Nevada	New Mexico	Oregon	Utah	Washington	Wyoming
Total acres burned by wildfire (2017-21) ¹	2,482,858	9,674,342	1,301,414	2,328,721	2,646,458	2,796,239	837,199	3,661,904	1,171,790	2,529,391	804,493
Total non-federal acres burned by wildfire (2017-21) ²	234,252	3,298,851	404,398	304,929	785,363	568,252	345,899	390,670	372,060	814,099	216,873
Percent of wildfire on non-federal land ^a	9%	34%	31%	13%	30%	20%	41%	11%	32%	32%	27%
Percent of forests on non-federal land ^b	48%	43%	35%	20%	33%	4%	53%	40%	24%	56%	17%
Acres at high to very-high wildfire risk ^c	12,629,525	32,496,608	8,109,021	19,303,713	8,896,574	21,639,840	12,140,842	14,652,696	12,703,671	6,982,154	4,025,805
Percent of acres at high to very-high wildfire risk ^c	17%	32%	12%	36%	9%	31%	16%	24%	23%	16%	6%
Liability standard	Simple negligence	Strict liability	Uncertain	Simple negligence	Uncertain	Gross negligence	Simple negligence*	Simple negligence	Uncertain	Simple negligence	Uncertain
Prescribed fire council ^d	No	Yes ^e	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Prescribed burn association(s) ^e	Yes	Yes	Yes	No	No	No	Yes	Yes	No	No	No
Certification program	No	Yes	Yes	No	No	No	Yes	Developing	No	Yes	No
Year certification program established	N/A	2021	2013	N/A	N/A	N/A	Developing	Developing	N/A	2022	N/A
Certification required to burn	N/A	No	No	N/A	N/A	N/A	No	No	N/A	No	N/A
Gross liability for certified burners	N/A	Yes	Yes	N/A	N/A	N/A	No	No	N/A	Yes	N/A
Additional incentives for certification	N/A	Avoid suppression cost liability	No	N/A	N/A	N/A	No	TBD	N/A	No	N/A
Reciprocity for certification	N/A	No	No	N/A	N/A	N/A	Proposed	TBD	N/A	TBD ^f	N/A
Cultural burners recognized	N/A	Yes	No	N/A	N/A	N/A	TBD	TBD	N/A	No	N/A
State smoke permit	Yes, but deemed granted if DEQ does not respond by 10 p.m. night before	Yes, administered through local air districts	Yes, over a certain size	No	Yes, for major burners and for all burners during winter	Yes, over a certain size	No	No, DEQ publishes map where burning is prohibited	Yes, over a certain size	Yes, but small fires approved over the phone	Yes, over a certain size
State ignition permit	No	Yes, if CalFire provides services	No	Yes, during part of the year and outside city limits	No	Yes	No	Yes, if ODF provides services	No	Yes, over a certain size	No
Recent legislation to expand prescribed fire	No	2022	2022	No	No	No	2021	2021	2020	2021	No

¹ California has a prescribed burn council that covers only the northern part of the state.
² New Mexico imposes double liability for damages from escaped burns. For example, if an escaped burn causes damages of \$100,000, then the burner must pay \$200,000 in damages.
³ Washington has explicitly authorized an equivalency test in lieu of completing certification for experienced burners, but the policy has not yet been implemented.
⁴ National Interagency Fire Center; ⁵ State Sources; ⁶ U.S. Forest Service; ⁷ Coalition of Prescribed Fire Councils; ⁸ Great Plains Fire Science Exchange

ABOUT THE AUTHORS



Jonathan Wood is vice president of law and policy at PERC. An attorney, Jonathan has litigated environmental and property-rights cases in the Supreme Court of the United States, federal and state appellate courts, and trial courts across the country. In 2021, he co-authored PERC's "Fix America's Forests" report, which identified key reforms to restore national forests and tackle the wildlife crisis.



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The Property and Environment Research Center (PERC) is the national leader in market solutions for conservation. Through research, law and policy, and innovative applied conservation programs, PERC explores how aligning incentives for environmental stewardship produces sustainable outcomes for land, water, and wildlife. Founded in 1980, PERC is nonprofit, nonpartisan, and proudly based in Bozeman, Montana.



Established in 1958, Tall Timbers is recognized as the home of the study of fire ecology and is an advocate to protect the right to use prescribed fire for land stewardship. Also recognized as one of the nation's leading land trusts, Tall Timbers utilizes layers of expertise to solve land management issues and support ecosystem health, biodiversity, and reduced wildfire risk on public and private lands.

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