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OUTLOOK

Burn permits need to facilitate — not prevent — "good fire" in California

The weather last fall was unusually favorable for private landowners to carry out prescribed burns to reduce wildfire hazard. Burn permits, however, made burning unnecessarily difficult. Safe and effective prescribed burns can benefit from changes in permitting.

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In California, there is intense focus on expanding the use of prescribed burns — fires that are intentionally set to burn with low intensity and to consume litter and woody debris across the forest floor. Policymakers have recognized the critical importance that prescribed burns have in reducing the impact of large, damaging wildfires (Little Hoover Commission 2018), and $1 billion in state funding over the next 5 years is aimed at reducing the century-long buildup of fuel on forest floors. Yet only a small fraction of what is needed to facilitate these "good fires" is being done.

In 2017–2018, only 33,000 acres of private land were treated by state agencies (Newsom 2019), and much of this work was mechanical (i.e., thinning and chipping), not prescribed burns. By contrast, the California Carbon Plan has the goal of treating 500,000 acres of private land every year. Private landowners, who own roughly half of the mixed-conifer forests in California, can help protect their property and contribute to reducing the broad public impacts of large wildfires by implementing prescribed burns. But a burn permit is often needed, and based on our outreach experience, it is clear that permits are a significant challenge to landowners.

Permits vary

The California Department of Forestry and Fire Protection (Cal Fire) is the primary agency that issues permits for prescribed burns on private land. The permit notifies landowners of their potential liability (see sidebar, page 63) and documents their responsibilities during the burn, which may include ensuring safe weather conditions, having adequate personnel and equipment present, and confirming with local Air Pollution Control Districts that it is an allowable burn day.

Permit duration is variable, with no standards for how long a permit lasts. Permits may or may not be contingent upon Cal Fire resources being present for the burn; and on any given day after the permit is issued, Cal Fire may deny permission for a burn if conditions are thought to be unsafe. A burn plan may or may not be required. If required, there is no recognized burn plan template that landowners can follow.



Susan Kocher

A prescribed burn is contained by creating a break in surface fuel along the burn area perimeter. Prescribed burning is critically important in reducing the impact of large wildfires.





Pile burning (left) is a generally accepted and common method of burning surface fuels. Per unit of fuel burned, it typically causes more air pollution than a prescribed fire (right). As with prescribed burns, pile burning requires expertise and appropriate weather conditions, but the permit process is simple, unlike the permitting for prescribed burns.

Perceived barriers to prescribed burns

Some examples exist of the successful use of prescribed burns on federal lands, but there are very few examples on private lands. Lack of expertise, air quality regulations and liability issues are typically cited as barriers to the expansion of prescribed burns (Miller et al. 2020). A counter-argument suggests that these cited barriers are based on the cultural perceptions of prescribed fire, and not necessarily empirical evidence (Quinn-Davidson 2019).

Miller et al. (2020) estimated recently that 6,663 burns were done in California on all land ownership types between 2013 and 2018. We estimate the vast majority of those burns — as many as 90% of them based on a sampling of available data — were either grassland or pile burns. Pile burning involves concentrating forest fuels by hand or with equipment into a pile and then burning it under appropriate conditions. Pile sizes can vary from 4 feet tall on residential land to over 40 feet tall on industrial and federal land. Pile burning is done by small landowners and large agencies and timber companies, after a relatively quick and simple permit application. The practice is common, even though it requires expertise that is similar to prescribed burning.

Air quality regulations are often not as big a barrier as they are perceived to be. During our landowner workshops, California Air Quality Control Board officials were clear that they are encouraging of prescribed burns, and the agency has a transparent process for approving smoke emissions. Of all of the steps involved with prescribed burns, smoke management is arguably the clearest and most achievable. It is even possible to do a prescribed burn on a no-burn day. Pile burning can be dirtier from an emissions perspective than prescribed burns (Robinson et al. 2011). Piles contain higher amounts of dirt and duff because fuel is raked or pushed into the pile, resulting in less efficient combustion and emission of more particulate matter. Further, ignition of piles usually occurs in the winter when fuel is wet, leading to less efficient combustion than prescribed burns of drier fuel.

A landowner's potential liability is the same for pile and prescription burning. Yet during workshops, we often heard that liability is a primary reason why landowners conduct pile burns but not prescribed burns. Landowners conducting fires in California may be held liable if, *through negligence*, a burn escapes their control and causes damage to another landowner's property. Fire suppression agencies are not able to seek compensation from a landowner for suppression costs unless the fire burns onto someone else's property.

Miller et al. (2020) quantified the rate of "escape" during prescribed burns in California at 1.76%. This surprisingly high rate, however, included pile burning and assumed that any fire that was marginally larger than planned was an escape. The percentage of prescribed burns that resulted in liable damage or monetary reimbursement of agencies because it escaped and caused damage to another's property was very likely far lower than 1.7%.

Counter to conventional wisdom, pile burning may be more risky than prescribed burns; embers are typically cast high into the sky because of the intensity of the fire and the heat that builds up in the pile causes the material to smolder for days or months. Many escapes, especially those that cause damage through negligence, are likely to be from pile burns, not prescribed burns. A thorough evaluation of escape rates from pile burning versus prescription burning would be a helpful step toward understanding actual escape risk and possibly a step toward greater acceptance of prescribed burns.

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Ecological benefits of fall burning

A guiding principle of sustainable silviculture is that forest treatments should mimic, to the extent possible given other factors, the ecosystem's natural disturbance regime. An important element of a disturbance regime is its seasonality. In Sierra Nevada forests, fires historically (prior to European American settlement) tended to occur during summer and fall, depending on annual weather variability and long-term climatic trends (Stephens and Collins 2004; Swetnam and Baisan 2003). Because prescription burning in summer is typically viewed as too risky, fall is the only time when landowners can burn in line with the natural disturbance regime.

Prescribed burns effectively reduce the buildup of fuel with little or no negative ecological side effects (Stephens et al. 2012). Fall is optimal for meeting fuel reduction and ecological restoration objectives.

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Fall burn window depends on weather, permit factors

Burning in the fall (September through November) is preferable for the practical reason that fires can consume fuel thoroughly without damaging trees, and also for ecological reasons (see sidebar). The fall weather window for burning opens when either early fall rain or high humidity increases fuel moisture. The window shuts after heavy storms in late fall make burning impossible. This favorable weather window is interrupted on any given day, however, by dry foehn winds (e.g., Santa Ana winds) that can be particularly hazardous in late fall, as they were in the destructive 2017 and 2018 fall wildfires in Northern California.

During the fall weather window for burning, the status of permitting is highly variable. When the weather window opens, the permit suspensions Cal Fire puts in place during summer (fig. 1) are typically still in effect, meaning that it is extremely difficult or impossible for a landowner to get a permit. Permits eventually become obtainable when the suspension is lifted, but this occurs at varying times during the weather window. A significant influence on the timing of lifting suspensions is the number of wildfires occurring across the state. Because "contingency resources" (i.e., firefighters available to contain a burn escape) are considered when issuing permits, the permit suspensions are much less likely to be lifted during a large wildfire, even if it is in a different part of the state.

Three burn cases in fall 2019

The 2019 fall season had particularly good weather for conducting prescribed burns along the western slopes of the Sierra Nevada. Following a relatively wet and late spring, early fall precipitation and high humidity preceded an extended period of dry and stable weather across much of the region, providing an unusually long weather window for burns, prior to heavy storms in November.

During this period, we conducted three prescribed burns across a south-to-north transect on the west

Winter	Spring	Summer	Fall
• Open burning season. • Permit not required in many counties (but a smoke emission permit may still be required). • Fuel consumption is often limited because of high fuel moisture.	• Permit season begins (often on May 1) at the start of wildfire season. • Season lasts from zero days to several weeks, depending on when permits are suspended. • Burning can be effective, but high soil moisture often limits fuel consumption.	• Permits are suspended across large regions and eventually the entire state as forest fuels dry out. • If appropriate levels of planning and resources are demonstrated, a permit may be issued, but this is rare. • Burning can be effective, but risk is typically perceived as too high.	• Optimal time for effective prescribed burns. • After fuels moisten from rain or high humidity, permits may be issued. • Burn window lasts from zero days to several weeks. • Often permitting does not begin until after storms end the season for effective burns.

FIG. 1. In California, a burn permit is required in most seasons. The permit pattern often does not match well with the best times for effective burns.

slope of the Sierra Nevada mixed-conifer forest. The burns were part of a UC ANR education program for landowners and professionals interested in conducting prescribed burns (see sidebar). They reveal how the permitting process can either encourage or prevent "good fires" on private land.

Burn 1: Oct. 16, northern Sierra Nevada

Local permit suspensions had been lifted on Oct. 3, following fall precipitation, and the permit was issued Oct. 14 for a period of 1 week. Cal Fire staff had visited the site in September to discuss how the burn would be conducted; they did not insist on being present for the burn but offered to send an engine for contingency resources if seasonal staffing allowed. After receiving the permit, forest managers tracked fuel and weather conditions before deciding on the burn day, just 2 days later. A high degree of nimbleness was necessary to organize resources on short notice; forecasted precipitation later in the week would make fuel too wet.

Cal Fire was notified the day before the burn. The burn was conducted successfully by the landowner and met objectives of reducing hazardous fuels without excessive damage to canopy trees. Cal Fire staff visited the site a few days after the burn and offered a permit extension, but the fuels had become too wet.

Burn 2: Nov. 6, southern Sierra Nevada

The region had not experienced significant precipitation, but local permit suspensions had been lifted. Although live fuel moisture was relatively low, stable weather and elevated relative humidity created good prescribed burn conditions. The permit was issued for an entire year after a Cal Fire review of the landowner's plans for burning. Cal Fire was notified the day before the burn, and the burn was completed without Cal Fire being present.

The fire consumed logging slash, which was a particularly important objective for this burn, while minimizing damage to young trees of desired species. The landowner let the fire burn downslope overnight, when humidity was higher, to consume more fuel over a larger area. Although sometimes explicitly not allowed on permits, burning at night can be an effective tactic to conduct prescribed burns when fuel moisture is low.

Burn 3: Nov. 13, central Sierra Nevada

Over 2.8 inches of precipitation had occurred at this site between Sept. 16 and Sept. 30, an above-average amount of early fall rain, yet permit suspensions had not been lifted in central Sierra Nevada counties. A detailed burn plan (developed by fire scientists) was submitted. Cal Fire required that numerous Cal Fire firefighting resources be on site, in addition to the landowner's resources, which were adequate for the

UC ANR trains Sierra Nevada landowners in live burns

Since 2018, UC ANR advisors and specialists have been helping landowners understand prescribed burning and gain practice in live burns during workshops throughout the Sierra Nevada. The Sierra Nevada prescribed fire education program builds on successful workshops held by Lenya-Quinn Davidson, UC ANR fire advisor, throughout the state in 2016 and 2017. Funding has been awarded from Cal Fire for the UC ANR outreach team* to host additional workshops through 2021.

Fifteen workshop days have taken place so far, attended by about 350 people. Participants have included owners of forest, range, farm and recreational lands, as well as staff and volunteers from Fire Safe Councils, Resource Conservation Districts, state and federal agencies, tribes, local government, conservation organizations, farm and forestry associations and consulting companies. Workshops include content on these topics:

- Use of prescribed burns to manage forests and rangelands
- Prescribed burn options, including conducting their own burns, contracting them out or participating in Cal Fire's Vegetation Management Program
- Cal Fire permitting and legal considerations
- Air quality permitting and smoke management
- Fire weather, fire terms and fire behavior
- Burn planning, burn unit preparation
- Tools, safety and personal protective equipment
- Firing techniques, mop up and patrol



An educational burn for landowners. Mark Garrett, UCCE Mariposa County; Stacey Frederick, UCB California Fire Science Consortium; Susan Kocher, UCCE Central Sierra; Fadzayi Mashiri, UCCE Mariposa; Rebecca Ozeran, UCCE Fresno; Rob York, UC Berkeley.

All workshops have included an opportunity to participate in live burn training. For more information, visit https://ucanr.edu/sites/forestry/Prescribed_fire/Rx_workshop/.

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* *Sierra Nevada Prescribed Fire Outreach team*: Rob York, Ariel Roughton, Susie Kocher, Ryan Tompkins, Dan Macon, Scott Oneto, Fadzi Mashiri, Rebecca Ozeran, Lenya Quinn-Davidson, Jeff Stackhouse, Mark Garrett, Sheri Mace.

burn. Because Cal Fire resources were difficult to schedule, the burn had to be planned to occur on a specific day several days in the future. This requirement resulted in a delay of almost 2 weeks after the time when conditions at the burn site were assessed as appropriate, given weather forecasts and the monitoring of fuel and local weather patterns. During this delay, fuels dried out to the point that conditions were on the hot end of the prescription (weather and fuel conditions prescribed in the submitted burn plan).

Four engines, at Cal Fire's expense, each with five firefighters, and two 12-person inmate crews were deployed to help conduct the 17-acre burn. Burn effectiveness was mixed, with undesired torching and killing of some large trees in the canopy. Strong winds occurred shortly following the burn, which required the landowner to devote additional resources for patrolling the area and extinguishing hot spots. Cal Fire was not involved with this postburn activity.

A permit for the burn was never issued to the landowner, so the burn took place with no clarity of responsibilities. The landowner was not given a permit to burn additional acres later in the fall weather window, and then heavy storms shut the burn window. The additional acres were burned in the winter, when a permit was not necessary (fig. 1) but fuel consumption was less effective.

Permits facilitate or constrain

Burn 2 demonstrates the most facilitative permitting approach, with the permit issued for an entire year. Key to the success of this burn and also burn 1 were several factors: the good preburn collaboration between Cal Fire and the landowner; the landowner was allowed to time the burn based on local monitoring of fuels and weather; permit restrictions did not unreasonably constrain needed flexibility (e.g., allowing the night burn); and Cal Fire resources were offered but not required to be present. The permit constraint for burn 1 was the 1-week permit duration; conditions were adequate for only 1 day during the permit window, and the burn was only possible because of the nimbleness of the landowner.

For more information, explore this UC ANR educational video series, where experts demonstrate the many ways prescribed fire can be used to meet resource management objectives in California's forests, woodlands and grasslands: https://youtube.com/channel/UCiA9f4-WZcFyK9ayh_TkEZQ?view_as=subscriber

Burn 3 demonstrates some of the permitting constraints that are common for private land burning. During fall 2019 in the central Sierra region — the first opportunity for fall burning since the tragic 2018 wildfire season — the permit window for effective prescribed burns was kept closed. The permit suspension in this region was lifted only well after heavy storms in late November precluded the possibility of any prescription burning. Although strong winds occurred on specific days, just as they inevitably do every year in fall, climatically there was a relatively broad window of opportunity. Some days were too risky to burn, but many more days were in prescription.

Our experience suggests that inconsistency in permitting and narrow or nonexistent time periods for issuing permits are significant barriers to a successful prescribed burn strategy on private land in California. If conditions are appropriate and an adequate burn plan has been developed, then a burn permit should be issued readily. Instead, our experience with burning and conducting outreach throughout the state over the past decade suggests that the closed window at the burn 3 site is a reality that constrains burning on private lands. Landowners who want to protect their property and contribute to solving the wildfire problem currently do not have sufficient opportunities to burn during fall, the optimal time for effective fuel burning.

Suggestions for permitting changes

To promote discussion at various scales among policy, regulatory and practitioner stakeholder groups, we suggest the following adjustments to the permitting process in order to more effectively facilitate prescribed burns in California:

1. *Let burn permits serve their original purpose* — to give landowners permission to conduct their own burns. Rather than controlling each burn, Cal Fire can focus on offering standby support during burns or assistance with mop-up and patrolling.
2. *Increase permit duration*. Issuing permits for a year provides landowners flexibility in timing burns while still allowing agencies to suspend permits when necessary.
3. *Lift permit suspensions earlier or at more local scales*. Extrapolating fire hazard conditions across large regions or from lower elevations to higher elevations limits prescribed burns unnecessarily. In some cases, prescribed burn prescriptions may be in alignment on north-facing slopes but not on south-facing slopes. Landowners need maximum flexibility to schedule burns, which is only afforded by site-specific decision making.
4. *Track, report and analyze the issuance of permits*. Data on permitting prescribed burns on private lands should be available for objective third-party analyses so that trends can be monitored. If a permit request is denied, a written justification should be given to the landowner, and an appeal process created, so denying permit requests without reason is not the default response to a permit application.
5. *More clearly articulate when permits are required*. Improve permit descriptions for landowners — most, for example, are unaware that winter burning can be done without a permit in many mountain counties of Northern California (fig. 1).

While funding and policy priorities are building important foundations for facilitating more prescribed burns on private land, considerable adjustments to permitting are likely needed before "good fire" can make a difference in reducing wildfire risks in California. CA

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