Prescribed pile and broadcast burn windows for northern California

Research Brief • May, 2026

Background

Prescribed burning reduces the loading and continuity of accumulated fuel and helps restore ecosystem function in fire-dependent and fire-adapted landscapes. This study documented favorable environmental patterns that support prescribed burn windows, with a goal of helping burn practitioners prioritize when and where to implement beneficial fire treatments in the Northern California Geographic Area Coordination Center's region (ONCC).

Research Overview

Using a dataset of 15,468 burn permits from 2011–2024 and co-located environmental data in the ONCC, the authors defined burn-prescription criteria separately for two burn types: pile and broadcast. Criteria comprise a fire-danger indicator and variables related to fire weather, fuel moisture, and smoke for two elevation bands and three general landcover types: forests, grass/savanna/shrub, and croplands. By default, the prescription criteria capture burn-practitioner preferences associated with past known "go-burn" days. The authors count the expected number of burn days available each month across ONCC that meet these criteria. Last, the authors document the mean large-scale atmospheric circulation patterns associated with each burn type. Compared to localized weather, these large-scale patterns are more predictable in weather models and therefore can provide advance notice of upcoming burn windows.

MANAGEMENT IMPLICATIONS

Consider atmospheric circulation patterns: Look for patterns that are favorable for the specific burn type and month of year. Weather models provide forecasts of the circulation patterns days to weeks into the future. This can help identify upcoming opening or closing burn windows. Keep in mind that forecasts become less certain at longer forecast horizons.

Be flexible with burn type: There are generally ample opportunities for burning each month, but it varies widely by burn type. Changes from year to year may increase or decrease opportunities, so a flexible strategy will help one take advantage of "good" years.

Take advantage of late spring windows: June is the most popular month for prescribed broadcast burning, yet May has more burn windows, from a weather and fuels perspective. Using earlier windows may enable more strategic burning ahead of the peak wildfire season, especially in high-risk firesheds.

Key Findings

<u>Burn type matters:</u>

Broadcast burns were most common in June and October. Pile burns were most common in November-December and comprised ~80% of the prescribed burns in ONCC. Our results affirm what practitioners likely know: there are more go-burn days than can be used at present and thus unrealized opportunities exist.

Burn practitioners, on average, preferred to burn piles under cooler and wetter conditions than they did for broadcast burns, likely to support containment. Medians of the atmospheric and fuel moisture variables were typically higher on pile-burn days than they were on broadcast-burn days.

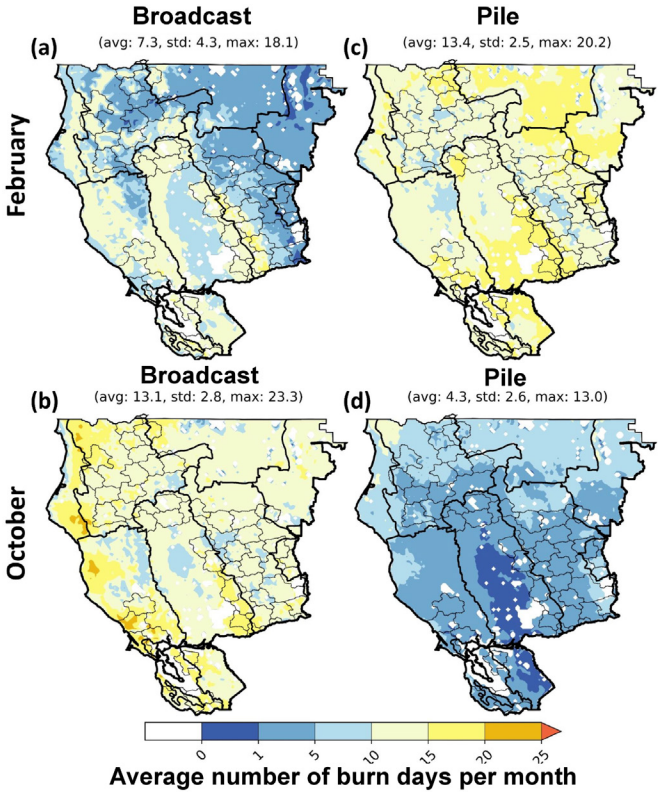
- In October, the daily average 100-hour dead-fuel moisture, average 1000-hour dead-fuel moisture, and minimum relative humidity were 18%, 17%, 49%, respectively for piles compared to 11%, 13%, 24%, respectively for broadcast burns. October pile burns often occurred within one day of a wetting event (precipitation of more than 0.1 inches/day), while October broadcast burns usually occurred 10 days after a wetting event. The general preference towards a recent wetting event and moister conditions for pile burns was true for all months.
- Broadcast burns conducted in cooler months (December-April) were typically associated with unusually warm and dry conditions that spanned several days ahead of ignition.

Time of year matters:
Because data showed that practitioners prefer different weather and fuels conditions for pile and broadcast burning, the number of burn windows for each burn type varies throughout the year.

Certain atmospheric circulation patterns are associated with each burn type:
Because regions underneath and downstream of ridges (i.e., high pressure centers) are typically associated with higher surface temperatures and lower relative humidities, these ridging patterns are, on average, suitable for broadcast burning in December-May. Stronger ridges persisting for ~7 days ahead of ignition are often required in January-April to ensure that fuels are more receptive to burning in an otherwise cool and moist time of year.

Because regions underneath and downstream of troughs (i.e., low pressure centers) are typically associated with lower surface temperatures, higher humidities, clouds, and potentially precipitation, these trough patterns are, on average, suitable for pile burning in May, October, and November, with the strongest anomalies required in October and November to conduct piles while it is cool and moist.

There are many prescribed burn windows every month:
From a weather perspective, there are, on average, more than 15 burn days per month at locations across ONCC, including in high-risk firesheds. Whether these opportunities exist for broadcast, pile, or both depends on the month. Upwards of 25 days open up if prescription criteria are relaxed, especially in October-May.



Average number of burn days in February and October for each burn type.

ADDITIONAL INFORMATION:

Websites that display forecasts of atmospheric circulation patterns:

- Pivotal Weather LINK: select "500 mb Height Anomaly [mean]" for the closest match to the circulation variable used in this study.
- Tropical Tidbits LINK: select "Upper Dynamics" > "500mb Height Anomaly" for the closest match to the circulation variable used in this study.

Additional Information

This brief is based on the following article:
Worsnop, Rochelle P., Andrew Hoell, Benjamin J. Hatchett, Teresa B. Chapman, Melissa L. Breeden, Zach Tolby, Karen C. Short, and Mike Hobbins. 2026. Characterizing windows of opportunity for prescribed pile and broadcast burning in Northern California. Fire Ecology. https://doi.org/10.1186/s42408-026-00492-6

This brief was written by Rochelle P. Worsnop, Benjamin J. Hatchett, Karen C. Short, Andrew Hoell, Mike Hobbins, Melissa L. Breeden, Teresa B. Chapman, and Zach Tolby, reviewed by Signe Leirfallom, Ian Spring, Theo Stein, and Autym Shafer, and produced by the CFSC.

For additional information, contact: rochelle.worsnop@noaa.gov