Broadcast burning and pile burning

There are two types of prescribed fire that have different outcomes and objectives: broadcast burning and pile burning. Broadcast burning is when a section of forest is prepared by a land manager to burn across the forest floor. Broadcast burning is used to maintain the vegetation matrix by consuming various levels of fuel, managing brush and understory plants, and clearing out overcrowded or suppressed small trees.

The second type is pile burning, which is more similar to campfires strategically placed throughout the forest. Woody materials and debris are piled up, left to dry, and burnt. Pile burning is commonly used to remove woody material from the landscape that presents a fuel hazard, often following a management activity like a thin or harvest or storm event that creates damage and downed material in the forest.

Indigenous cultural burning is another critical pathway for ecosystem management that has a wide suite of benefits and outcomes and is tied to different cultural and community practices. Cultural burning is unique and distinct from prescribed burning and typically has more holistic objectives, whereas prescribed burning is primarily focused on fuels reduction and decreased wildfire risk.

Preparing for a prescribed burn

The first component of broadcast burning involves intensive planning, permitting, and determining capacity requirements for both people (to light the fire and keep watch around the perimeter of the unit) and equipment (ranging from chainsaws to water holding containers on site). Planning also considers the exact location of the burn unit, size of the area, topography and current vegetation matrix, and various potential weather conditions. All of these factors are written into the prescription. The prescription itself is critical in outlining the goals of a burn, the steps needed for the burn, and specific ranges of conditions that allow a land manager to determine if a day is safe for burning. These conditions include relative humidity, fuel moisture content, temperature, and wind speed. When all these conditions align into the ranges set by the prescription, it is called a burn window and may only last for a day or two. Different agencies also require different levels and chains of approval (for example CAL FIRE and the Forest Service have their own processes and requirements for allowing fire). A properly constructed prescription tells the team that lighting a fire is safe and containable on a certain day and tells the permitting agency and signing authorities that the land manager has done the due diligence required to conduct a burn safely.

Fuels reduction is often the primary goal of a prescribed burn, but other goals can include habitat restoration, plant propagation, and safeguarding infrastructure. Establishing key goals of a burn can help determine where the burn will happen.

taking tree density, unit size, and slope into account. When the area, or burn unit, is selected the fire line can be established around its perimeter. This step, called **cutting a line**, involves clearing away all the forest debris that may be on the ground, like leaves, branches, and pinecones (getting down to bare mineral soil along the burn unit boundary). The width of the line of bare mineral soil is generally about twice the expected flame length (these expectations are based on the prescription). Certain burns and unit sizes may call for the need and presence of water sources. This prep can include filling water storage vessels, (like water tender vehicles to transport water or mobile tanks like a pumpkin), placing and digging out flat spots for these containers to sit, and setting up hose lines to fill with water and be ready in case the fire escapes the line.

Before a burn, the team will want to identify potential dangers to the crew or risky spots where fire could escape. With the fire line prepared, the unit often is cruised for snags. Snags are dead trees that are still standing; they're often great habitat features with lots of opportunity for cavity nesters and can be important food sources. Snags are generally not as moist as living trees, which puts them at risk of chimneying. When a tree chimneys, it burns up from the inside and can release sparks from much higher than a burn on the forest floor. The risk here is that these sparks could carry in a breeze over to other forested areas outside of the prepared area. In addition to safety, knowing where snags are and having them marked is helpful for follow up maintenance and containing the fire, as broadcast burns generally continue to burn and smolder for a few days. Snags are not as strong as living trees and have a greater risk of falling over, so crews will make sure there aren't any snags that could potentially fall over and land outside of the fire line when they start to burn. These snags can sometimes be cut down, but due to rot and decay it is often unsafe to do so. In this case, the crew will cut a specific fire line around these snags to lower the risk of them burning and subsequently falling over.

In certain cases, prep can also include cutting a line around particularly big and old trees, other special features, or cultural resources on a landscape. As a result of decades of fire suppression, fuels of all levels have built up to hazardous levels. Ground fuels, made of leaf litter and duff material on the forest floor, have built up into thick layers on today's forest floors. This debris layer is often slightly damp, particularly during burn windows, when some level of fuel moisture and relative humidity is required by the prescription. These combining factors mean those ground fuels can burn hot and continue to smolder for much longer than in a frequent fire regime, even lasting multiple days after the burn was conducted. While big trees in fire adapted ecosystems are adapted to low severity, low intensity fire, they are not adapted to heat on their roots and bark for extended periods of time. Prolonged heat can stress trees, damage their roots, and around the base of tree trunks, it can kill the cambium (the living cell layer of a tree trunk), thereby killing the tree. Cutting a fire line around important individual trees allows those fuels to still be consumed without risking damage to forest giants.

With fastidious planning and preparation, 99.84% of prescribed burns go according to plan. Writing a prescription takes into account many different forest conditions, weather conditions, resource constraints, objectives, and the safety of the ecosystem, nearby communities, and people working the event. Prescribed burns also require various levels of authority and permissions to get permits. While all things involve some risk, far more often than not, the biggest challenge I've encountered is that the prescription is so conservative that it's actually too cold or too wet to burn, so the test fire only creeps a bit and goes out, instead of fully consuming fuel and moving across the forest floor. This can compound the challenge of finding an appropriate burn window based on the prescription. Often, a burn unit is fully prepared and the crew