UNIVERSITY OF CALIFORNIA
Agriculture and Natural Resources

Forest Stewardship

Forest Stewardship Education Newsletter
July 2023

Shaded Fuel Breaks

Greetings from UC ANR

It would come as no surprise to our Forest Stewardship participants, that 96% of them agree or strongly agree that wildfire is their number one concern. Seventy-five percent have taken action towards reducing fire hazards through some type of vegetation management.

In this Forest Stewardship newsletter, we are going to take a closer look at shaded fuel breaks as a means of creating wildfire-resiliency. Thanks to the UC Fire Coordinator Katie Low and UC Forestry Advisor Ryan Tompkins for their contributions. Their paper *Shaded fuel breaks create wildfire-resilient forest stands: lessons from a long-term study in the Sierra Nevada* is a must read and can be found below.

Cheers,
Kim Ingram, Forest Stewardship Coordinator

Ryan Tompkins and Katie Low at their research plots. Photo by Ryan Tompkins

The combined application of structural thinning and prescribed fire may offer greater treatment longevity and restoration efficacy that can last two decades.

Shaded fuel breaks: leveraging fuel reduction and forest restoration

Shaded fuel breaks are a commonly-implemented fuel reduction treatment around many communities in California's fire-prone forests. A shaded fuel break is typically 0.25-0.5 miles long, treated with a combination of thinning from below, selective crown thinning, and prescribed fire, and is located adjacent to strategic features like roads or ridgetops. By reducing forest stand density through thinning small and medium diameter trees and reducing surface fuels with prescribed fire, shaded fuel breaks can reduce the behavior of an approaching wildfire and increase fire suppression efficacy (Agee et al. 2000). Depending on treatment type, intensity, and maintenance, fuel treatments in conifer forests can have an effective life span of about 5-20 years during which time they can effectively impact fire behavior. However, treatment efficacy is diminished as downed woody fuels and understory trees accumulate over time. Given the variability in treatment intensity and subsequent efficacy over time, it is important to assess the longer-term influences of wildfire on fuel treatment effectiveness to provide land managers with information to implement adequately designed fuel treatments.

A recent study conducted by staff at UC Berkeley, UC Cooperative Extension, and the Plumas National Forest assessed the impacts of fuel treatments and subsequent wildfire effects on forest structure in the short- and long-term (Low et al. 2023). Authors used data collected from 20-year-old forest monitoring plots within fuel treatment units that captured a range of wildfire occurrence (i.e. not burned, burned once, or burned twice by wildfires) following application of initial thinning treatments and prescribed fire. The study evaluated how shaded fuel breaks impacted forest stand structure post-treatment and post-wildfire and assessed if wildfire occurrence could extend the effective lifespan of a shaded fuel break. Treatments effectively achieved desired forest structural conditions with effects persisting throughout the 20-year study period (Figure 1). Wildfires of low-to moderate severity also maintained fuel loads initially created by shaded fuel breaks. Treatments also successfully reduced modeled fire behavior in the near- and long-term. Though fire behavior was not modeled beyond 2021, average fire behavior estimates remained well below pre-treatment estimates 20-years later.

Photo comparison of shaded fuel break treatment units by measurement year and wildfire count. All units shown were mechanically thinned followed by prescribed fire. The 5-yrs post-treatment photos capture stand conditions less than one-year post-wildfire (2006 Boulder Complex Fire for 1 Wildfire unit and 2007 Antelope Complex Fire for 2 Wildfires unit). The 20-yrs post-treatment photos capture 15-years post-fire for the 1 Wildfire unit and 2-years post-fire (2019 Walker Fire) for the 2 Wildfires Unit (Low et al. 2023).

These results echo similar findings that the combined application of structural thinning and prescribed fire may offer greater treatment longevity and restoration efficacy that can last two decades (Stephens et al. 2020). Treatments that modify forest structure, reduce forest density and reduce surface fuel loads in concert may have greater longevity and utility compared to surface fuel only treatments that may require more frequent maintenance (Collins et al. 2009). The restoration of forest structure and fuel conditions created by the treatments allow forests to persist through repeated unplanned wildfires. In turn, subsequent wildfires can enhance treatment longevity, so fuel reduction treatments could facilitate the use of managed wildfire to better meet restoration goals. Current research suggests that in order to be resilient under a changing climate, California forests will need to be less dense (Bernal et al. 2022) and more resistant to active fire regimes (Westerling 2011). These trends suggest that planning and implementing shaded fuel breaks to maximize their efficacy and longevity will be an important component of 21st century forest conservation.

*See full paper below for cited works

Where to place shaded fuel breaks, how big should they be, and how dense?

Colorado State's *Fuelbreak Guidelines for Forested Subdivisions & Communities* describes how the effectiveness of a fuel break is increased when "anchored" to a natural or artificial barrier. These barriers can be places such as rivers, creeks, large rock outcroppings, wet meadows or roads, anyplace that is easily accessible and provides defensive positions for those fighting wildfire.

Fuelbreaks without an associated anchored barrier, such as those located along strategic ridge lines, are still useful in fire suppression. In those areas, they are often strengthened and held using aerial retardant drops until fire crews can walk in or be ferried in by helicopter.

The minimum recommended fuelbreak width is approximately 300 feet for level ground. Because fire 'runs uphill', areas that are sloped should increase the minimum width. Recommendations range from an additional 3 feet for slopes of 10%, up to an additional 40 feet for slopes of 60%.

According to Colorado State, crown separation is a more critical factor for fuelbreaks than a fixed tree density level. A minimum 10-foot spacing between the edges of tree crowns is recommended on level ground. As slope increases, crown spacing should also increase. However, small, isolated groups of trees may be retained for visual diversity. Increase crown spacing around any groups of trees left for aesthetic reasons and to reduce fire intensities and torching potential.

Shaded fuel break on slope. Photo by Rob York, UC Specialist

Shaded fuel breaks: lessons from a long-term study in the Sierra Nevada (full paper)	Shaded Fuel Break Research Brief	CAL FIRE Fuels Reduction Guide

Shaded fuel break. Photo provided by Stevenson Brown

Q&A with Forest Landowner and Forest Stewardship Particpant Stevenson Brown

As a landowner who has implemented a shaded fuel break, what goals and objectives did you have for this management activity?
There has been a lot of fire suppression work done using my land both as access to an active fire and to build dozer control lines. I decided to create an environmentally friendly "Shaded Fuel Break" down a long unimpacted ridge and tie it into the old wildfire control line, in the hope that during the next fire event, the landscape would be more resilient and minimize new dozer line construction. My primary goal was to thin the number of trees, prioritizing the larger healthier trees of all species. In areas with large fir stumps I tended to favor Douglas-Fir over hardwoods. Deciduous oaks were prioritized wherever they occured within the project area.The secondary goal was to reduce the ground and ladder fuels for reduction of mortality and damage during the next wildfire event.

Can you describe the implementation process you went through? Did you receive grant funding for implementation?
The 22-acre project was partially funded through the North Bay Forest Improvement Program (NBFIP) and was performed by a three person chainsaw hand crew. My rubber tracked 121 Kubota excavator was especially helpful for burn pile creation in areas where grade was suitable. Another added benefit was its ability to move larger diameter poles out of the unit to road edges making it easily available to friends and neighbors for winter firewood. My strategy entailed 2-3 entries. Some areas had over seven hundred trees/acre, thus it was not feasible to drop everything at once. In these sites I chose to remove remaining trees after burning the first

round of piles. One advantage of this method is that if fires burn hot, a standing tree slated for removal can protect a more desirable tree from scorching. I also used my 750 gallon fire trailer to ensure safety while burning piles. I had to burn through May, so having strategically placed live hose lines in active fire areas was a comfort.

How will you maintain the shaded fuel break?
The project units were designed to become future prescribed burn units. This should continue to restore ecological function in the project area. The active roads, abandoned skid trails and ridges will make it easy to prepare when it's time to implement good fire.

Are you happy with the results?
I am pleased with the results. Work efforts of this sort always provide new insights for making the next one even better and safer.

Would you have done anything differently?
The timeline on this project was short and I tried to do it with just a couple of family members. We had a large snow event and were unable to access the work areas from February 29 thru April 4, that combined with necessary environmental review, added some stress. Looking back, I should have lined up a larger crew or requested a longer window of time to get the work done.

Shaded fuel break. Photo provided by Stevenson Brown.

"My primary goal was to thin the number of trees, prioritizing the larger healthier trees of all species... The secondary goal was to reduce the ground and ladder fuels for reduction of mortality and damage during the next wildfire event." Stevenson Brown

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More on shaded fuel breaks from Mary Mayeda, NRCS - "What every private forest

Grazing goats and guard dog. Photo by Tracy Schohr

Shaded Fuel Break Maintenence

As with any vegetation management, maintenance of a shaded fuel break should be planned for and is necessary to maintain its effectiveness.

According to the NRCS Conservation Practice Standard for Fuel Breaks, landowners should:

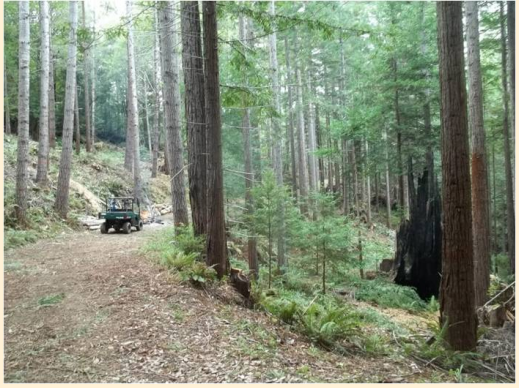
- Mow or graze vegetative fuels breaks to avoid buildup of excess litter and maintain low densities of live fuels;
- Inspect all fuel breaks for downed woody material, such as dead limbs or blown down trees, and remove or treat as necessary to maintain low woody fuel loads. If conducting a prescribed burn as a maintenance treatment, ensure burn units are properly prepped; and
- Monitor or manage surface and canopy fuels to maintain desired spacing between trees and reduce fire behavior.

landowners should know about shaded fuel breaks."

Shaded fuel breaks are not intended to completely stop wildfire, but rather to modify its behavior and aid firefighting efforts by slowing fire spread and providing an area of less extreme fire behavior from which other actions (e.g., back burns) may be taken. Additionally, it is important for landowners to understand that under extreme conditions even properly designed fuel breaks cannot significantly reduce fire behavior in the event of large, rapidly spreading wildfires, regardless of the efforts of firefighters. That being said, as a landowner or manager are planning their management strategy and road map, strategically located shaded fuel breaks are a great place to start. While there are often not enough resources (e.g., funding, time, available crews) to treat an entire property, a well designed and located shaded fuel break can have the greatest landscape impact while treating a relatively small proportion of the overall property.

The “ideal” shaded fuel break is one that increases the vertical and horizontal spacing between fuels. This may look different depending on the forest type. Gaining some degree of crown spacing is important while leaving enough canopy cover to help suppress brushy understory regrowth. Additionally, leaving a few young, healthy trees in the mid and understory to retain a multi-aged stand supports conservation goals beyond fire behavior modification, including wildlife habitat and forest health objectives.

There is an art to multi-use forest management. Landowners and



Shaded fuel break on the north coast of CA. Photo courtesy of Mary Mayeda.

managers should work with a professional like a NRCS Planner and/or RPF to prescribe an appropriate treatment prescription for their specific forest, topography, and goals.

NRCS Conservation Practice Standard for Fuel Breaks

Programs forest landowners can use to fund fuel break construction or maintenance...

CalVTP | **NRCS EQIP** | **North Bay Forest Improvement Program**

Other Stewardship items of note...

- Have you had your initial site visit with an RPF, Burn Boss or Certified Range Manager? **The deadline for all site visits is May 1, 2024.**No matter which workshop you participated in (even back in 2020!), if you completed the workshop, you are eligible. You DO NOT need to complete your forest management plan before your site visit, just having your management goals thought out is good enough! Need to make up a session in order to qualify for your free site visit, we can arrange that. Contact Kim Ingram at kcingram@ucanr.edu for more details.
- **L.A. Moran Reforestation Center - Seedling Requests Open Now!** Are you a forest landowner looking for seedlings to plant in fall 2024-spring 2025? The LAMRC nursery is currently accepting order requests (min. 1000 seedlings) for the 2024 growing season. Seedling requests will be accepted online (link here) until August 11th, 2023, or until nursery capacity is reached. Please submit your request application as early as possible to ensure consideration. For more details, please visit the Reforestation Services Program website.

Cone & Seed Collection Field Day, Blodgett, CA. Photo by Kim Ingram

For more information on the workshops, and to share with a friend, please visit:

Stewardship:
http://ucanr.edu/forestryworskhopregistration

Post-fire:
http://ucanr.edu/post-fireworkshops

Upcoming Forest Stewardship and Post-Fire Forest Resilience Workshops and Field Days:

- **Forest Stewardship Bioenergy Webinar**, Online, Thursday, August 3rd, 6:00pm-7:30pm.
- **Forest Stewardship** Workshop Series, San Bernardino 2 Co-hort beginning September 6 - November 1 (Sept. 23rd field day)
- **Forest Stewardship** Workshop Series, Santa Clara-Santa Cruz Co-hort beginning October 24 - December 19 (Nov. 18th field day)

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