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Research Brief for Resource Managers

Release:	Contact:	Phone:	Email:
January 2018	Kate Wilkin	(530) 822-7515	*kwilkin@ucdavis.edu*
	Jon E. Keeley	(559) 565-3170	*jon_keeley@usgs.gov*
	Marti Witter	(805) 370-2333	*marti_witter@nps.gov*
	Liz van Mantgem		*evanmantgem@usgs.gov*

Central and Southern California Team, USGS Sequoia and Kings Canyon Field Station, Three Rivers, CA 93271

Effects of Two Kinds of Fuel Treatments and Their Season after Ten Years in Northern CA Chaparral

Wilkin, K.M., L.C. Ponisio, D.L. Fry, C.L. Tubbesing, J.B. Potts, and S.L. Stephens. 2017. Decade-long plant community responses to shrubland fuel hazard reduction. Fire Ecology 13: 105-136. doi: 10.4996/fireecology.130210513

In hopes of improved fire safety, chaparral fuel treatments are routinely applied across California. However, the long-term effects of these treatments have been poorly understood. This study fills that knowledge gap by quantifying how treatment type (prescribed fire or mastication) and season (fall, winter, or spring) combine to affect both native biodiversity and native plant cover over time, as well as non-native species establishment and non-native persistence over time in Northern California chaparral.

Within the 50-year old, late successional chaparral of northern California at UC Hopland Research and Extension Center; BLM South Cow Mountain OHV Recreational Area; and private land, two treatments (fire or mastication) were applied to 2-hectare units over three seasons from 2001 to 2003. The final experimental design consisted of four replicates for each of six treatment combinations of type (fire, mastication, and control) in either Fall, Spring, or Winter, resulting in the establishment of 24

Management Implications

- There is no "best" fuel treatment for native plant communities. All treatments degrade one aspect of the community, and only reduce shrub cover for a short time.
- If you must complete a fuels treatment, the recommended ones are:
  - Fall fire is recommended as a fuel treatment in natural areas because it reduces shrub cover for 8 years while also promoting native shrub diversity. However, research is needed on the effect of repeated fires to determine if they are as detrimental as in Southern California.
  - Fall mastication is cautiously recommended for fuel breaks or type conversion because these treatments reduce shrub cover for the longest time, but they also promotes flammable understory and nonnative plants that must be mitigated annually.
- These results should be applied cautiously throughout Mediterranean-climate shrublands because of possible differences in fire behavior, climate, and plant communities between Northern California's chaparral and other Mediterranean-climate regions.

experimental units of 2 hectares each (Table 1). Fifteen permanent, 15m transects and five 2.5m radius vegetation plots were installed in each 2 ha unit. Native and non-native vegetation structure and composition were measured one year before treatment, then again the first, second, third and twelfth year after treatment. Control plot vegetation was measured in 2001, 2004 and 2012. Generalized linear mixed effects models tested the response variable significance between the six treatment types and season combinations over time, and accounted for the repeated measurements of each sample unit.

Table 1. Six treatment combinations by type and season of treatment.

Treatment	Season	Treatment dates
Fire	Fall	3 to 20 November
	Spring	31 March to 3 April
	Winter	8 to 18 January
Mastication	Fall	3 to 20 November
	Spring	23 April to 2 June
Control	No treatment	

Both treatment type and season of application had distinct influences on plant communities. In contrast to fire, mastication shrub cover was lower for longer, while it also increased the abundance of non-native plants, non-native annual grasses, and surprisingly increased buckbrush (*Ceanothus cuneatus*) which is an obligate seeder and a preferred deer browse. The season of treatment also influenced the outcomes, but to a lesser magnitude. Fall treatments had lower shrub cover for longer and greater abundance of non-native plants, non-native annual grasses, and greater cover of buckbrush than spring or winter treatments. In addition, fall mastication surprisingly promoted buckbrush more than treatments in other seasons. Ten years after treatment, fall mastication had the lowest shrub fuel load, but increased annual grass cover. The fire treatment and the control had similar shrub cover and much less annual grass cover after ten years. There are trade-offs for all treatments and their season of application between shrub cover, native shrub diversity, and nonnative annual grasses and plants which managers must carefully consider.

Further, the authors recommend that planners reduce the amount of wildland urban interface in chaparral by fully developing partially developed chaparral areas and leaving undeveloped areas alone.

Figure 1. While the fuel hazard reduction treatments reduced vegetation, mastication redistributed all of the shrub biomass to the ground, creating a discontinuous layer of surface fuel (top left and bottom left) whereas fire consumed the fine materials and left larger diameter stems standing (top right and bottom right). Photos: J. Potts and D. Fry