CALIFORNIA FIRE SCIENCE CONSORTIUM

JOINT FIRE SCIENCE PROGRAM

Research Brief for Resource Managers

Release:	Contact:	Phone:	Email:
June 2019	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

Losing Southern California Sky Islands with Big Fire

Nigro, K. and N. Molinari. 2019. Status and trend in fire activity in southern California yellow pine and mixed conifer forests. Forest Ecology and Management 441:20-31. https://doi.org/10.1016/j.foreco.2019.01.020

Management Implications

- The loss of southern California's sky island forests would affect many wildlife populations and important ecosystem services.
- Targeted reforestation efforts for heavily burned sky islands forests include: planting trees, as well as fuel management in nearby, unburned forests.
- Focusing on fuel management legal constraints where stand-replacing fire risks are high may be required.

Unlike the well-studied, large conifer forests of the northern Sierra Nevada, southern California conifer forests are less-studied and represent only about 8% of the landscape. Broken into small "sky islands" that are found at the highest elevations (>1500m), surrounded by lower elevation chaparral, oak woodlands, and grasslands, these isolated mixed conifer and yellow pine forests have a very high risk of type-converting to other vegetation types.

By comparing historic and current fire return intervals, analyzing changes in burn severity patterns over the last 32 years, and evaluating fire size trends since the early 1900s, these researchers show that many of the fire trends that are occuring in northern California forests are also happening in these smaller, disparate southern California forests. However, they warn that recovery difficulties will be compounded in these sky islands due to the naturally fragmented layout of the forests. Such distant isolaton limits the seed dispersal capabilities of the remaining trees after fire.

Specifically, results showed a lengthening of the fire return intervals (reduced FRIs) compared to the historic fire frequency for the skly islands in all five National Forests (Fig. 1). Of the fires that occurred, there was an increase in the average proportion of high severity fire (Table 3), an increase in average high severity patch size, and an increase in maximum high severity patch size. Average fire proportion burned is now 1.5 times higher than predicted for the natural range of variation (NRV) (2000-2016). Further, average fire size increased significantly from 1910-2016, mostly due to after 2000 NRV deviation.

As in the northern Sierra Nevada, these results come directly from the densification and connectivity of ladder fuels resulting from fire suppression. Because these forested sky islands are so remote, anthropogenic ignitions are not a an issue, and lightening ignition frequencies are unchanged.

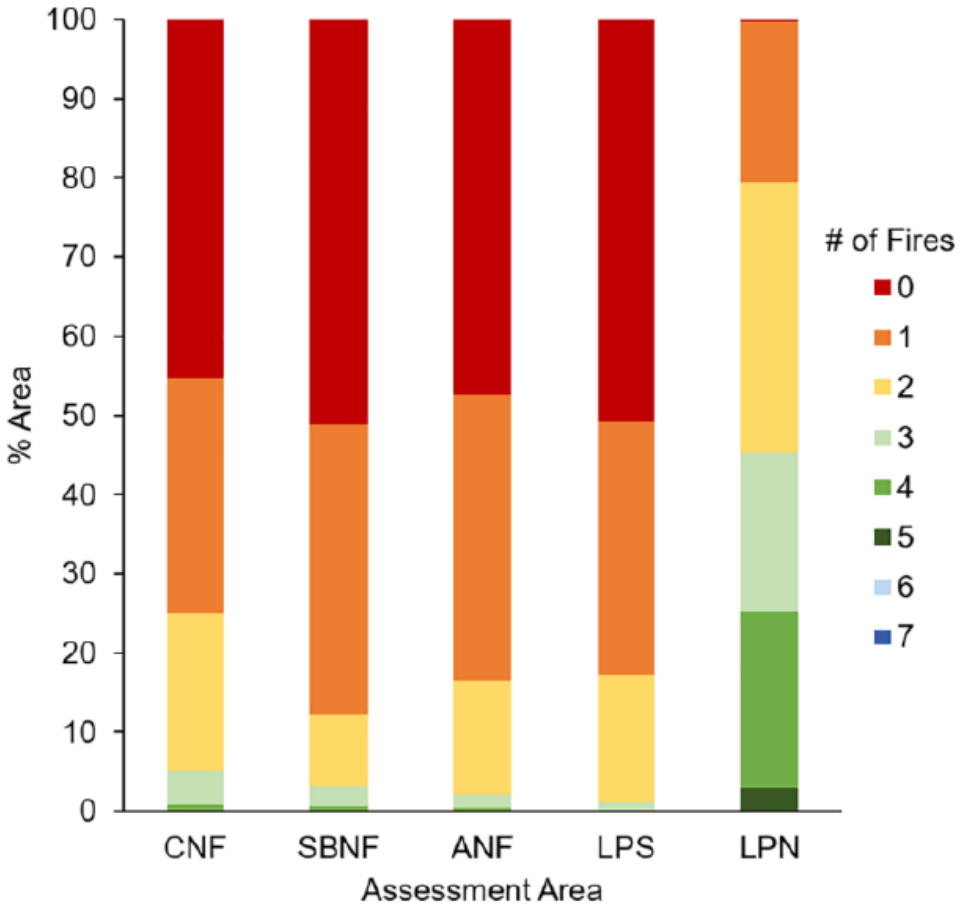

Fig. 1. Percent area of conifer forest in each assessment area burning 0–7 times since 1908. If burning at the mean fire return interval (FRI) predicted for pre-Euro-American settlement mixed conifer and yellow pine forests, most of these areas would have burned 5–9 times during this period.

Table 3
Summary of current fire regime characteristics found for yellow pine and mixed conifer forests in this study compared to the natural range of variation (NRV) estimated from other studies for these forest types. Current fire return interval (FRI) was calculated using all fires in the record (1908–2016), which generally excludes fires < 4 ha after 1950 and < 40 ha before 1950. Current fire severity statistics represent fires > 400 ha in the period 2000–2016 and current fire size statistics represent fires > 40 ha in the period 2000–2016.

	FRI[a,b,c,d]	Mean % high severity[a,e,f]	Mean high severity patch size[a]	Maximum high severity patch size[a]	Fire size[a]
NRV	10–19 yrs	2.5–16%	0.2–4.2 ha	100 ha (rarely larger)	210–456 ha
Current (2000–2016)	78 yrs	24%	2.54 ha	824 ha	761 ha

[a] Safford and Stevens (2017).
[b] McBride and Laven (1976).
[c] McBride and Jacobs (1980).
[d] Skinner et al. (2006).
[e] Minnich et al. (2000).
[f] Rivera-Huerta et al. (2016).