CALIFORNIA FIRE SCIENCE CONSORTIUM

JOINT FIRE SCIENCE PROGRAM

Research Brief for Resource Managers

Release:	Contact:	Phone:	Email:
August 2018	Jesse E. D. Miller	541.482.4923 (cell)	jedmiller@ucdavis.edu

Sierra Nevada Fire Science Delivery Consortium | One Shields Avenue, Davis, CA 95616

Increasing fire severity causes lichen diversity losses

Miller, Jesse E. D., Heather Root, and Hugh Safford. 2018. Altered fire regimes cause long-term lichen diversity losses. Global Change Biology, in press.
https://doi.org/10.1111/gcb.14393

Management Implications

- High severity fire may remove almost all tree-dwelling lichens from landscapes in dry forests, and recolonization may not occur for decades
- Landscape-scale lichen diversity in dry forests is unlikely to be harmed by low-severity fires such as most prescribed fire
- In some forested ecosystems, pre-fire fuels treatments and prescribed fire may maintain landscape-scale lichen diversity by reducing fire severity

Though often inconspicuous, lichens play critical ecological roles in many terrestrial ecosystems. Lichens are symbiotic organisms that contain at least one fungal partner and at least one photosynthesizing partner (algae or cyanobacteria). Lichens are one of the main sources of plant-available nitrogen in some ecosystems. Lichens are also a critical resource for wildlife; they provide an important winter food source for ungulates and flying squirrels, among many other animals, and are used for nesting material by birds.

Lichens are known to be generally flammable when dry, but there has been limited research on how lichens respond to fire severity or how fast lichens recolonize after fire. Miller et al. (2018) examined post-fire lichen communities across the full gradient of fire severity in areas that burned in five fires in the Sierra Nevada and Warner Mountains (as well as adjacent unburned areas). Sampling occurred at 4-16 years after fire (Fig. 1).

Lichen diversity in areas that burned at low severity was similar to diversity in unburned stands. Lichen diversity was significantly and progressively lower, however, in areas that burned at moderate and high severity (Fig. 2).

Miller et al. (2018) observed very little post-fire lichen recolonization in the study areas—even up to 16 years after fires. The lack of recolonization appears to be caused by the warmer, drier microclimate that occurs in the post-fire landscape after tree canopy cover is removed, and this effect may be strengthened by climate change. This suggests that the increasing area of high severity burns in California forests could lead to long-term lichen diversity losses, with possible implications for forest nutrient cycling and wildlife. This also raises the possibility that large wildfires could contribute to lichen range contractions that are expected in response to climate change.

These results suggest that pre-fire management efforts to reduce the severity of future fires—such as prescribed fire and fuels treatments—could help maintain long-term lichen diversity in dry forests (Fig. 3). Because low severity fire did not reduce lichen diversity, prescribed fire under normal conditions is not expected to harm lichen communities.

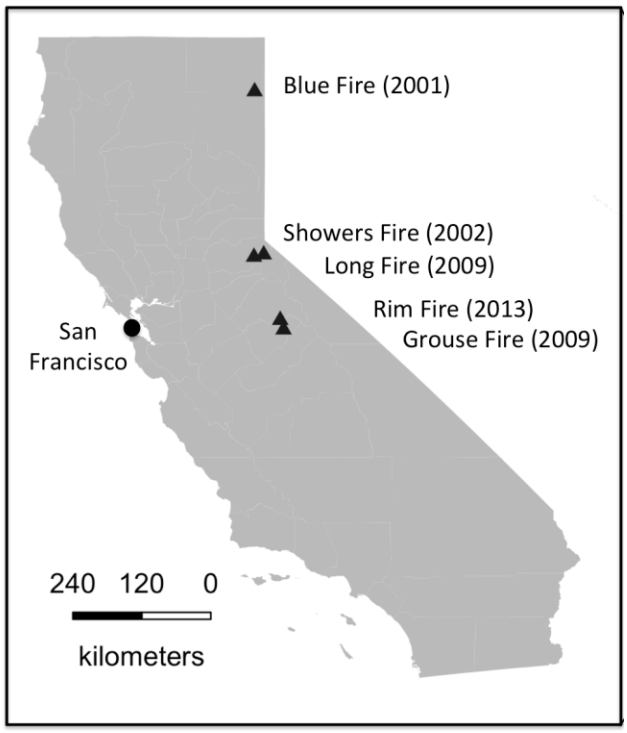

Fig. 1. Locations of fires studied by Miller et al. (2018)

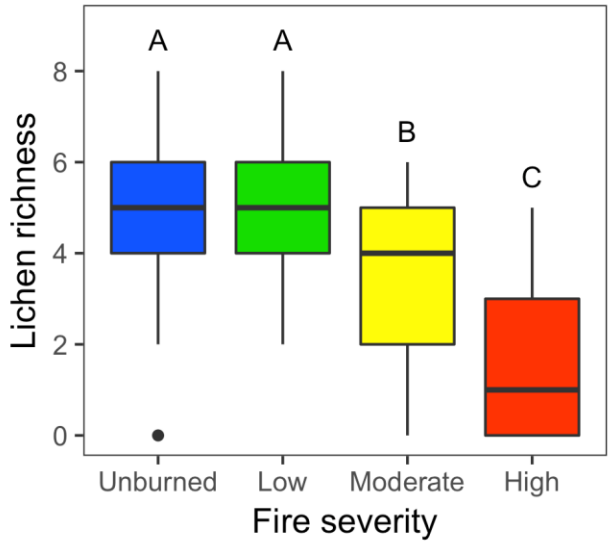

Fig. 2. Lichen diversity declined with increasing fire severity, though it was not affected by low-severity fires.

Fig. 3. Example of typical dry forest lichen community. *Bryoria*, the brown, hair-like lichen, is an important food source for wildlife.