

Western Ecological Research Center

Publication Brief for Resource Managers

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Early Successional Changes Following Fire in California Chaparral

Western U.S. shrublands naturally burn at periodic intervals in high-intensity crown fires that kill all above-ground biomass over large portions of the landscape. Postfire recovery is critical to proper management of these ecosystems. Although the fundamentals of the recovery process have been long studied in California chaparral and sage scrub, in the October issue of *Ecological Applications* USGS research scientist Dr. Jon E. Keeley and coauthors report on a five-year study designed to evaluate hypothesized determinants of postfire recovery and succession.

Postfire succession in these mediterranean-climate shrublands is driven largely by residual species present at the time of fire. These residual species are predominantly California endemics that survive fire by underground vegetative structures and soil-stored seed banks. Postfire colonization is unimportant in determining the first-year flora.

Residual species present in the immediate postfire environment dominated early succession. By the fifth year postfire, roughly half of the species were colonizers not present in the first year, but they comprised only about 10% cover. Successional changes were evaluated in the context of four hypotheses: 1) event-dependent, 2) fire interval, 3) self-regulatory, and 4) environmental filter hypotheses. Characteristics specific to the fire event (e.g., fire severity and annual fluctuations in precipitation) were important determinants of patterns of change in cover and density supporting the “event-dependent” hypothesis. The “fire interval” hypothesis is also supported, primarily through the impact of short intervals on reproductive failure in obligate seeding shrubs and the impact of long intervals on fuel accumulation and resultant fire severity. Successional changes in woody

Management Implications:

- Postfire vegetation recovery is almost entirely from seeds and vegetative structures in the soil, and thus fire size is not important to the recovery and early successional process.
- Postfire recovery patterns are substantially slower in the interior southern California sage scrub formations, and thus require different management strategies than coastal formations. Fuel manipulations at short intervals threaten the persistence of this ecosystem.
- Sites where the immediate postfire recovery was inhibited by high-severity fire exhibited no effect five years after fire.
- Fire severity affects the recovery of different species in different ways. Some woody species exhibit improved recovery under high-intensity burning, whereas others are inhibited by high-severity fires. These patterns suggest that landscapes with combinations of high and low severity may lead to enhanced biodiversity.
- Predicting postfire management needs is complicated by the fact that vegetation recovery is significantly controlled by patterns of precipitation.

cover were correlated with decreases in herb cover, indicating support for “self-regulatory” effects. Across this landscape there were strong “environmental filter” effects that resulted in complex patterns of postfire recovery and succession between coastal and interior associations of both vegetation types.

Keeley, J. E., C. J. Fotheringham, and M. Baer-Keeley. 2005. Determinants of postfire recovery and succession in mediterranean-climate shrublands of California. Ecological Applications 15:1515–1534.