

Fire Ecology of Exotic Grasses in the California Desert

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Abnormally heavy precipitation between 1978-1985 and 1991-95 and the invasion of exotic annuals from the Mediterranean basin and Middle East have increased fire hazard in desertscrub in the Mojave and Sonoran Deserts. Studies indicate that some members of creosote bush scrub (*Larrea tridentata*, *Ambrosia dumosa*, *Coleogyne ramosissima*, *Opuntia acanthocarpa*, *O. echinocarpa*) have low tolerance to burning, weakly developed adaptations to fire, and the community is subject to longstanding changes in the structure and species composition. Postfire succession is dominated by short-lived species with high growth rates and high reproductive capacities, including *Encelia farinosa*, *E. actonii*, *Hymenoclea salsola*, *Salazaria mexicana*, *Viguiera deltoidea*, *Happlopappus cooperi* and *Salvia mojavnensis*. These shrubs commonly grow along washes, sandy sites, and steep slopes subject to recurrent fluvial and aeolian disturbances. Microphyllous woodland species, *Olneya tesota*, *Cercidium floridum*, *Prosopis juliflora*, and *Dalea spinosa* are all strong resprouters and seem unaffected by fire. Such sprouting behavior may be a generalized adaptation to flash flood disturbances which are recurrent along washes and alluvial fans.

Before the invasion of exotics, fire occurred periodically in Joshua Tree woodland and blackbrush scrub because the semi-arid climate supports subcontinuous cover of native fuels including *Hilaria rigida*, *Stipa speciosa*, and *Coleogyne ramosissima*. The most important desert exotic *Bromus rubens* was first reported in the deserts during the 1930s. It was not abundant in the 1950s, but had developed dense stands by 1978.

B. rubens has been since joined by *Schismus barbatus* and *Brassica tournefortii*. Fire incidence with high rainfall is manifested in spurts of rapid growth and fuel accumulation, which increase short-term regional fire probability. Fuel build-up over long succession times is diminished by dieback of the ground layer as a consequence of drought. Dead fuels may also be shredded by wind action, and blown away. Saltation of fuels may break down undecomposed litter into nonflammable size particles. The recent outbreak of fires may be an ephemeral event in desertscrub ecology because burning is phased with a rare period of unusually heavy precipitation. Alternatively, the higher build-up of flashy exotic fuels than formerly provided by native annuals may increase rates of burning and directional species changes in California desertscrub.