

Fire and Exotics in the Mojave Desert: An Irreversible Change? A State-Transition Model for Blackbrush (*Coleogyne Ramosissima*) Habitat

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Several species of invasive exotic plants are ubiquitous in the Mojave Desert and have the potential for increasing fire frequency. Some, such as red brome (*Bromus madritensis*), occur in sufficient densities to provide continuous fine fuel in intershrub spaces, encouraging the spread of fire over large areas. Positive feedbacks between fire and exotics have been observed in some areas; exotics return in higher densities after a fire, increasing susceptibility to future fires. Our goal is to describe a state-and-transition model for blackbrush (*Coleogyne ramosissima*) habitat in the Mojave Desert. Areas that have burned once usually have a higher biomass of exotic species, different species composition, and less perennial cover than adjacent unburned habitat for burns as much as 50 years old. Blackbrush recovery is very slow and could take millennia in a once-burned area. Some areas that have burned more than once appear to have been converted from desert scrub to annual grassland, with exotics dominating the landscape between scattered native perennials. While once-burned areas often show signs of native species recovery, areas with multiple burns typically show little natural recovery. Annual exotic grasslands may require significant environmental changes for transition reversal to occur, and the transition from desert scrub to annual grassland may be irreversible under the current climatic regime.