

Western Ecological Research Center

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Competitive Interactions Between a Non-native Annual Grass and Mojave Desert Perennials

Competition between native and non-native species can change the composition and structure of plant communities, but in deserts, the highly variable timing of winter and spring rainfall also influences non-native plant establishment, thus modulating their effects on native species. Much research has focused on the dramatic impact that the non-native annual grass red brome (*Bromus madritensis* spp. *rubens*) has on desert plant communities by fueling wildfires that injure and kill native plants. A study by scientists of the USGS, Nevada Agricultural Experiment Station, and University of Nevada, Reno, recently published in *Biological Invasions*, highlights red brome's impact on perennial species in undisturbed habitat even before wildfire becomes a problem.



High densities of the non-native annual grass red brome establish beneath perennial plants in response to winter rainfall and before perennials are active. Its early establishment places native perennial species at a disadvantage. Photo: L. DeFalco.

Management Implications:

- As red brome continues to integrate into the native flora and to dominate the landscape in the Mojave Desert, the composition of species within these communities, especially the shorter-lived perennial grasses, are subject to change even in the absence of wildfire.
- Future mitigation of the effects of red brome in the Mojave Desert will require an understanding of the environmental cues that drive its establishment and dominance while simultaneously appreciating the interannual variation controlling these factors.

In a field experiment, the researchers varied densities of red brome around individuals of three native Mojave Desert perennials — creosote bush (*Larrea tridentata*), galleta grass (*Pleuraphis rigida*), and Indian ricegrass (*Achnatherum hymenoides*) — in either winter or spring. To determine whether native annuals have the same competitive effect as red brome, they prepared additional plots with individuals of the same perennial species and seasons, but with a mixture of native annual species as neighbors.

The growth of perennials declined when red brome established early in winter because the non-native grass had 2–3 months of growth and extracted soil moisture before perennials became active. However, water stress of the perennials was not significant, suggesting that direct competition for resources other than water, such as soil nitrogen, may be the mechanism driving reduced perennial growth. In comparison, red brome plants that established later in spring were smaller than those in

winter and thus did not effectively reduce growth of the perennials.

Growth of perennials with mixed native annuals as neighbors also did not differ from those with red brome neighbors of equivalent biomass, but stands of these native annuals did not achieve the high biomass of red brome stands that were necessary to reduce perennial growth. Seed dormancy and narrow requirements for seedling survivorship of native annuals produce den-

sities and biomass lower than those achieved by red brome. Thus, impacts of native Mojave Desert annuals on perennials are expected to be lower than those of red brome.

DeFalco, L. A., G. C. J. Fernandez, and R. S. Nowak. 2007. Variation in the establishment of a non-native annual grass influences competitive interactions with Mojave Desert perennials. Biological Invasions 9:293–307.