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Dominance and Environmental Correlates of Alien Annual Plants in the Mojave Desert

Land managers are concerned about the negative effects of alien annual plants on native plants, threatened and endangered species such as the desert tortoise, and ecosystem integrity in the Mojave Desert. Results from a recent study in the *Journal of Arid Environments* by USGS scientists Drs. Matt Brooks and Kristin Berry can be used in estimating the baseline dominance of alien annual plants across the region.

The authors documented the biomass dominance of alien annual plants and their environmental correlates during two years of contrasting rainfall in three Desert Wildlife Management Areas and critical habitat for the federally threatened desert tortoise, representing the central, southern, and western Mojave Desert. Their findings indicate that alien plant species comprised a small fraction of the total annual plant flora, but most of the annual plant community biomass.

When rainfall was high in 1995, aliens comprised 6% of the flora and 66% of the biomass. When rainfall was low in 1999, aliens comprised 27% of the flora and 91% of the biomass. *Bromus rubens, Schismus* spp. *(S. arabicus* and *S. barbatus),* and *Erodium cicutarium* were the predominant alien species during both years, comprising 99% of the alien biomass. *B. rubens* was more abundant in relatively mesic microhabitats beneath shrub canopies and at higher elevations above 800-1000 m, whereas *Schismus* spp. and *E. cicutarium* were more abundant in the relatively arid interspaces between shrubs, and, for *Schismus* spp., at lower elevations as well. Disturbance variables were more reliable indicators of alien dominance than were productivity or native plant diversity variables, although relationships often varied between years of contrasting rainfall. The strongest environmental correlates occurred between dirt road density and alien species richness and biomass of *E. cicutarium,* and between frequency and size of fires and biomass of *B. rubens.*

Management Implications:

- A target set at 50% proportional alien biomass can be used to define project goals for alien plant control or native plant restoration projects.
- Minimizing the density of dirt roads may minimize dominance of alien annual plants.
- Reduced biomass of alien annual grasses may reduce the frequency and size of fires.
- Protection of lands from continuing and new disturbances can also have beneficial effects by reducing dominance of alien annual plants.
- Monitoring to detect changes in the status of alien species should focus on regions of high road density or fire frequency, especially near urban or off-highway vehicle areas.
- Alien plants that originated in mesic ecosystems are more likely to invade areas where rainfall is high; alien plants that evolved in arid ecosystems can potentially invade a wider range of sites.

The results of this and other studies suggest that the proportion of biomass from alien species in the annual plant community may seldom drop below 50% during years of above-average rainfall, and is typically much higher during years of low rainfall.

Brooks, M. L., and K. H. Berry. 2006. Dominance and environmental correlates of alien annual plants in the Mojave Desert, USA. Journal of Arid Environments 67:100–124.