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INTRODUCTION

Wildfire has become widespread in southwestern USA deserts. In a record 2005 fire season in the Mojave Desert, for example, more than 385,000 hectares burned (Brooks and Matchett 2006). This burned area is approximately 3% of the entire Mojave Desert. Fueled in large part by exotic annual grasses, these fires burned desert ecosystems thought to have only burned infrequently historically. Burns now occupy significant portions of desert landscapes, posing prominent management challenges. Improving our understanding of plant recovery on desert burns is important for evaluating future fire hazard, whether natural revegetation will meet management objectives, and for planning active revegetation if this becomes a management goal. Desert burns may afford an opportunity for intervention in the grass-fire cycle immediately following a burn if exotic grass competition is temporarily reduced while available nutrients liberated by the fire increase. However, post-fire recovery of plant communities is not a well understood process in desert ecosystems.

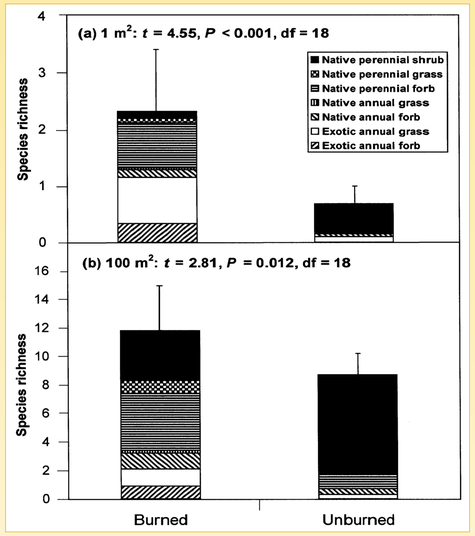

Fig. 1. Plant species richness on the burned and unburned area. Error bars are one standard deviation for total mean richness. Total mean richness was compared between the burned and unburned area using a two-tailed *t* test.

STUDY RATIONALE

To contribute to our understanding of post-fire recovery, we examined plant establishment, soils, and soil seed banks on the 348-ha, 2005 Loop Fire in Red Rock Canyon National Conservation Area, 15 km west of metropolitan Las Vegas, Nevada. This burn is of special concern to resource managers because more than 900,000 people/year visit a scenic Loop Drive encompassed by the burn.

METHODS

♦ We conducted sampling two years after the fire by measuring 10, 0.01-ha plots on the burn and on an adjacent paired unburned area. We measured the percent cover of plant species on these plots.

♦ We collected soil and soil seed bank samples from three microsites on each plot: interspaces (>1 m from any shrub), and below *Larrea tridentata* and *Yucca* spp. (*baccata* or *schidigera*).

♦ We assessed responses of seed bank samples to simulated fire exposure in a factorial experiment consisting of heat (two levels: presence or absence of 100º heating) and liquid smoke (two levels presence or absence of 10% smoke).

♦ We analyzed the study and the seed bank experiment as a split-plot design. We used ordination and indicator species analysis to further analyze plant community data.

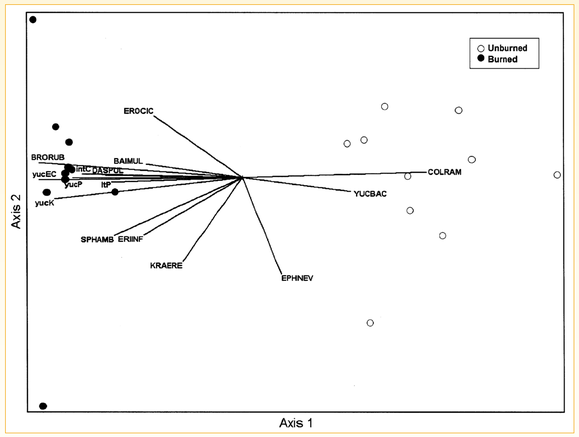

Fig. 2. Non-metric multidimensional scaling ordination of plant species composition on the burned and unburned area. The length of vectors are proportional to correlations with ordination axes.

RESULTS

♦ The burn was more species-rich, with richness of live plants averaging 26 (100 m^2 scale) and 239% (1 m^2 scale) greater (Fig. 1).

♦ Perennial species composition shifted from dominance by late-successional native shrubs (e.g., *Coleogyne ramosissima*) on the unburned area to native perennial forbs (e.g., *Sphaeralcea ambigua*, *Baileya multiradiata*) on the burn (Figs. 2, 3).

♦ Fire and microsite (interspace, below *Larrea* or *Yucca*) interacted to affect 0-5 cm soil properties, with higher pH, conductivity, and total P and K on burned *Yucca* microsites

♦ *Bromus rubens* density in 0-5 cm soil seed banks was four times lower on the burn, and its distribution among microsites reversed. Below-shrub microsites contained the most brome seeds on the unburned area but the least on the burned area (Fig. 4).

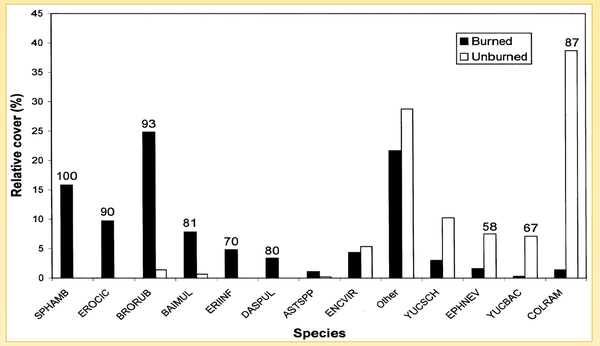

Fig. 3. Mean relative cover and indicator values (top of bars and only given for values significant at $P < 0.05$) of the 12 most dominant species on the burned and unburned area. ASTSPP = *Astragalus* spp., BAIMUL = *Baileya multiradiata*, BRORUB = *Bromus rubens*, COLRAM = *Coleogyne ramosissima*, DASPUL = *Dasyochloa pulchella*, ENCVIR = *Encelia virginensis*, EPHNEV = *Ephedra nevadensis*, ERIINF = *Eriogonum inflatum*, EROCIC = *Erodium cicutarium*, SPHAMB = *Sphaeralcea ambigua*, YUCBAC = *Yucca baccata*, and YUCSCH = *Yucca schidigera*.

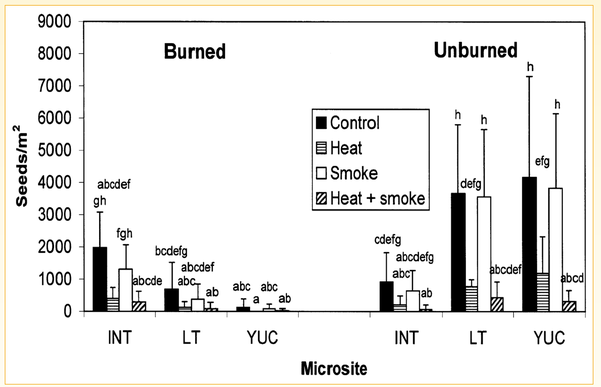

Fig. 4. Emergence density of *Bromus rubens* among treatments performed on 0-5 cm soil seed bank samples from the burned and unburned area. Error bars are one standard deviation. Means without shared letters differ at $P < 0.05$.

DISCUSSION

Our finding that *Bromus rubens* was reduced after fire concurs with Brooks (2002), who reported that *B. rubens* biomass declined after prescribed fires at three Mojave Desert sites. This finding was supported by our experimental heating of seed bank samples, where *B. rubens* was reduced by more than 3-fold. Dominant native perennials colonizing the burn, such as *Baileya multiradiata*, *Sphaeralcea ambigua*, *Eriogonum inflatum*, and *Dasyochloa pulchella*, have previously been found to be early colonizers after fire and other disturbances (e.g., road abandonment, land clearing). For example, *B. multiradiata* exhibited a density 1.7 times greater than the next highest species (among 35 species) one year after fire in an upper Sonoran Desert burn (Wilson et al. 1995). Similarly, *S. ambigua*, the most abundant perennial on the burn in our study, had the third highest density among all burn colonizers in Wilson et al.'s (1995) study. These observations suggest that the major native perennial colonizers of the burn in our study are early colonizers of a wide variety of disturbance types. Precipitation was less than 65% of the long-term average between the burn and our sampling period, underscoring a need for longer term monitoring that evaluates aesthetic recovery on this heavily visited burn. In the short term, two years post-fire, this burn exhibited colonization by native perennial forbs and grasses and reduced *B. rubens*.

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