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Trying to beat the brome: Understanding establishment thresholds and choosing competitive native species at Parashant National Monument

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More on Red Brome: Post-Fire Establishment, the Experiments Continue

Trying to beat the brome: understanding establishment thresholds and choosing competitive native species at Parashant National Monument

By Cayenne Engel and Scott Abella

Desert fires fueled by exotic grasses like the omnipresent red brome (*Bromus rubens*) can be intense and cause widespread mortality of native vegetation. Native desert scrub communities such as those dominated by blackbrush (*Coleogyne ramosissima*) do not readily reestablish after fire (Abella 2009) and may even become more abundant in the post-burn landscape initiating a fire cycle that occurs at a greater frequency than the recovery time of the long-lived desert perennial community.

Management is therefore driven to intervene in this cycle for at least two reasons. First, fuels must be reduced on desert landscapes infested with exotic annual grasses, or the landscapes will eventually burn, as was demonstrated by the record 2005 fire season when nearly 3% of the entire Mojave Desert burned (Brooks and Matchett 2006). Second, some type of vegetation competitive with the exotic annual grasses must be established, to provide vegetative cover for purposes such as minimizing soil erosion, while hopefully reducing the fire hazard. The reestablishment of native vegetation following fire could be a biotic factor that could aid in preventing the establishment (or re-establishment) of exotic grasses after fire.

We are partnering with the Arizona Strip BLM field office (K. Harcksen)to identify mechanisms by which brome establishment can be hindered. Specifically, we will evaluate which plant species may function as the best species to use in restoration with the goals of post-fire establishment, and actively hindering brome establishment through competition. The primary objectives of this project are to specifically address competitive mechanisms that may limit *Bromus rubens* establishment and reproductive potential, and determine which native species may best produce a competitive environment for *Bromus rubens*. We will approach this by experimentally testing *Bromus rubens* establishment at different levels of light and nutrient availability and testing density-dependent relationships of native species with *Bromus rubens* to address the influence of abundance and identity of native species on *Bromus rubens* biomass.

We are taking an experimental approach to assess the effects of light and nitrogen reduction (which naturally occurs with native perennial plant species) on brome establishment, abundance, and reproductive allocation. To do this, we are establishing 72 experimental plots in the Jacob06 fire in Parashant National Monument and applying five levels of shading, 15, 30, 50, 70, and 90 percent light reduction. Concurrently, we are applying sucrose as a carbon source to reduce the nitrogen availability.

The goal of this initial experiment is to mechanistically address what light reduction level is necessary to hinder *Bromus rubens* establishment. We hypothesize that at low levels of cover brome may be facilitated due to the lower temperatures and higher soil moisture associated with the shading, but as the shading level increases we expect to see detrimental effect due to low light level stress. Nitrogen

See Parashant experiment on page 7

Save the date: UNLV's Applied Ecology Research Group will give 5 presentations at the upcoming **36th Annual Desert Tortoise Council Symposium** to be held at Sam's Town Hotel and Gaming Hall - 5111 Boulder Highway, Las Vegas, NV 89122.

The conference is Fri. – Sun. Feb.18-20, 2011.

We are not sure which day we will be presenting, so please check the conference schedule once it is posted.

Parashant experiment

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reduction may result in interactive effects with the shading, maybe shifting the level at which shading becomes an effective brome determinant.

The shading experiment will begin in January, 2011. Following the shading experiment, we will initiate greenhouse competition experiments among native annual species and red brome, and in Fall, 2011, we will outplant native perennial species that we anticipate to be good competitors with red brome, such as those found in Abella et al (2010). We will arrange the outplantings to test density dependant relationships of the native species and brome to provide information about the number of individuals of native perennials that would need to be established in a given area to adequately limit red brome establishment. See the recently published JFS report by Abella et al. where they found that early successional native forb communities, as opposed to middle and late successional or grass dominated communities, best resisted invasion.

LITERATURE CITED:

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Abella, S. R., D. J. Craig, S. D. Smith, A. C. Newton., JFS report: Revegetating burned arid lands: identifying successful native species using trait and competition analysis. http://www.firescience.gov/, Project ID: 07-1-3-24

Abella, S., D. Craig, L. Chiquoine, K. Prengaman, S. Schmid, T. Embrey. 2010. Relationships of Native Desert Plants with Red Brome (*Bromus rubens*): Toward Identifying Invasion-Reducing Species. Invasive Plant Science and Management, online November 2010.

Brooks, M.L., and J.R. Matchett. 2006. Spatial and temporal patterns of wildfires in the Mojave Desert, 1980-2004. Journal of Arid Environments 67:148-164.

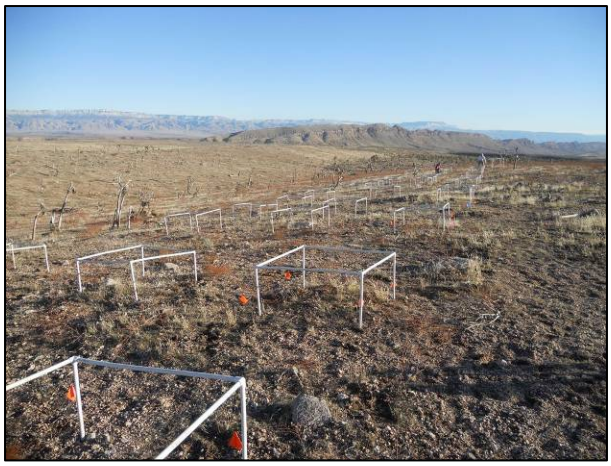

Figure 1. Frames for shade structures set in place along ridgeline in Jacob06 fire waiting for shadecloth application (Parashant).

Figure 2. Example of a shaded plot.

A new class at UNLV

AERG is happy to announce that in the Spring of 2011, UNLV will be offering ENV 794 (Restoration Ecology), which is a graduate student only course. We also regularly offer opportunities for motivated undergraduate students to work with our lab on projects as part of ENV 495 (internship) or ENV 492 (undergraduate research) and 493 (independent study).