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Cheatgrass Invasion in Salt Desert Shrublands: Benefits of Postfire Reclamation

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Abstract

In 1998, fires burned more than 11 330 ha of rangeland on Dugway Proving Ground in Utah's west desert. Postfire revegetation was implemented in 2 affected salt desert shrub communities (greasewood; *Sarcobatus vermiculatus* Hook. and black sagebrush/shadscale; *Artemisia nova* A. Nels; *Atriplex confertifolia* Torr. & Frem.) to deter cheatgrass (*Bromus tectorum* L.) encroachment. We monitored cheatgrass densities for 3 years after the fire in burned drill seeded, burned not-seeded, and unburned plots to assess the rate of invasion and determine the impact on cheatgrass of drill seeding perennial species. Cheatgrass invaded quickly in both shrub sites following the fires. In the greasewood site, drill seeded species germinated but did not establish. This was likely due to a combination of soil salinity and extremely dry weather conditions during the second year of the study. Drill seeded species in the black sagebrush site germinated and established well, resulting in the establishment of 16.5 perennial grasses $\cdot$ m^{-2} and 1 356 shrubs $\cdot$ ha^{-1}. Cheatgrass densities were consistently lower in drill seeded versus not-seeded plots, although these were not always statistically different when Bonferroni comparisons were considered. The initial decrease in cheatgrass densities in drill seeded plots may have resulted from soil disturbance coupled with extremely low precipitation rather than competitive effects. Nevertheless, as seeded species mature and increase their competitive ability, we predict long-term suppression of cheatgrass in the absence of further disturbance.

Resumen

En 1998, el fuego quemó más de 11 330 ha de pastizal en Dugway Proving Ground en la región desértica oeste de Utah. Se implementaron acciones de revegetación posterior al fuego en dos comunidades arbustivas halófilas desérticas (''Greasewood''; *Sarcobatus vermiculatus* Hook. y ''Black sagebrush''/''Shadscale''; *Artemisia nova* A. Nels; *Atriplex confertifolia* Torr. & Frem.) para prevenir la invasión del ''Cheatgrass'' (*Bromus tectorum* L.). Monitoreamos las densidades de ''Cheatgrass'' durante tres años después del fuego en áreas: quemadas y sembradas mecánicamente, quemadas sin sembrar y áreas sin quemar, para evaluar la tasa de invasión y determinar el impacto de la siembra de especies perennes sobre el ''Cheatgrass.'' Después del fuego, el ''Cheatgrass'' invadió rápidamente ambos sitios de comunidades arbustivas. En el sitio ''Greasewood,'' las especies sembradas germinaron pero no se establecieron, esto probablemente debido a la combinación de la salinidad del suelo y las condiciones climáticas extremadamente secas que ocurrieron durante el segundo año del estudio. En el sitio ''Black sagebrush,'' las especies sembradas germinaron y se establecieron bien, estableciéndose 16.5 zacates perennes o m-2 y 1 356 arbustos o ha-2. Las densidades de ''Cheatgrass'' fueron consistentemente más bajas en las parcelas sembradas que en las no sembradas, aunque las diferencias no siempre fueron estadísticamente diferentes cuando se compararon con la prueba de Bonferroni. La disminución inicial de las densidades del ''Cheatgrass'' en las parcelas sembradas pudo haber resultado por el disturbio del suelo en conjunto con la precipitación extremadamente baja, mas que por efectos competitivos. No obstante, conforme las especies sembradas maduran e incrementan su capacidad competitiva, nosotros predijimos una supresión a largo plazo del ''Cheatgrass'' en ausencia de mas disturbio.

Key Words: black sagebrush, *Bromus tectorum*, drill seeding, greasewood, invasive, rehabilitation

INTRODUCTION

One of the greatest threats to ecosystems in semiarid regions of the western United States is the invasion of cheatgrass (*Bromus tectorum* L.). Once established, particularly in disturbed areas, cheatgrass can become a major obstacle preventing the recolonization and growth of more desirable native perennial species (Young et al. 1969; Young and Evans 1973, 1978). The rapid germination and early spring growth of cheatgrass allows it to utilize moisture and nutrients that are critical for native plant growth and survival (Melgoza et al. 1990; Smith and Nowak 1990). This preemptive use of resources puts native plants at a competitive disadvantage.

Cheatgrass also deters native perennial plant growth by altering natural fire regimes. Cheatgrass is extremely flammable and grows in dense stands in shrub interspaces, providing the accumulation of fine fuels necessary to carry fire to widely spaced woody plants (Young and Evans 1978; Whisenant 1990). The presence of a highly flammable continuous fuel load substantially increases the probability, frequency, and intensity of fire (Knapp 1996). Fire frequency in some cheatgrass infested rangelands has increased from 60 to 100 years to 3 to 5 years (Whisenant 1990). This increase in fire frequency combined with the propensity of cheatgrass to germinate quickly and produce large numbers of viable seeds perpetuates

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