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Absence of a Grass/Fire Cycle in a Semiarid Grassland: Response to Prescribed Fire and Grazing

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Abstract

Many nonnative invasive grasses alter fire regimes to their own benefit and the detriment of native organisms. In southern Arizona the nonnative Lehmann lovegrass (*Eragrostis lehmanniana* Nees) dominates many semiarid grasslands where native grasses were abundant. Managers are wary of using prescribed fire in this fire-prone community partly due to the perceived effects of a grass/fire cycle. However, examples of the grass/fire cycle originate in ecosystems where native plants are less fire-tolerant than grasses and the invasive plant does not mimic the physiognomy of the native community. We investigate the effects of prescribed fire and livestock grazing on a semiarid grassland community dominated by a nonnative invasive grass. Lehmann lovegrass does not appear to alter the fire regime of semiarid grasslands to the detriment of native plants. Prescribed fire reduced the abundance of Lehmann lovegrass for 1 to 2 yr while increasing abundance of native grasses, herbaceous dicotyledons and fall richness, and diversity. Effects of livestock grazing were less transformative than the effects of fire in this long-grazed area, but grazing negatively affected native plants as did the combination of prescribed fire and livestock grazing. Although Lehmann lovegrass produces more fuel than native plants, fire frequency in semiarid grasslands appears to be limited by the paucity of above-average precipitation, which constrains high fuel loads. In addition, many native grasses tolerate high temperatures produced by Lehmann lovegrass fires. Consistent with previous research, fire does not promote the spread of Lehmann lovegrass, and more importantly human alteration of the fire regime is greater than the nominal effects of Lehmann lovegrass introduction on the fire regime.

Resumen

Muchos de los pastos invasores exóticos alteran el régimen del fuego para su propio beneficio y en detrimento de los organismos nativos. En el sur de Arizona, el pasto exótico *Eragrostis lehmanniana* Nees es dominante en muchos pastizales semiáridos en los que los pastos nativos fueron abundantes. Existe una aprensión en el uso del fuego en estas comunidades susceptibles a incendios en parte debido a los efectos percibidos de un ciclo de pasto/fuego. Sin embargo, los ejemplos del ciclo pasto/fuego son originarios de ecosistemas en los que las especies nativas son menos tolerantes al fuego que los pastos y en los que la fisonomía de la planta invasora es diferente al de la comunidad nativa. Se investigaron los efectos de quemas prescriptas y el pastoreo del ganado en una comunidad de pastizal semiárido dominada por un pasto exótico invasor. *E. lehmanniana* no aparenta cambiar el régimen del fuego de pastizales semiáridos en detrimento de las plantas nativas. Las quemas prescriptas redujeron la abundancia de *E. lehmanniana* durante uno o dos años favoreciendo el aumento en la abundancia de pastos nativos, dicotiledóneas herbáceas, y la riqueza y diversidad en el otoño. Los efectos del pastoreo del ganado fueron menos transformadores que los efectos del fuego en esta área pastoreada desde hace mucho tiempo, pero tanto el pastoreo sólo o en combinación con el fuego afectaron a las plantas nativas negativamente. Si bien *E. lehmanniana* produce más combustible que las plantas nativas, la frecuencia del fuego en pastizales semiáridos parece estar limitada por la escasez de precipitaciones anuales superiores a la media que restringen la generación de altas cargas de combustible. Además, muchos pastos nativos toleran las altas temperaturas de los fuegos inducidos por *E. lehmanniana*. En consonancia con investigaciones previas, el fuego no promueve la propagación de *E. lehmanniana*, y de mayor importancia es el hecho de que la alteración humana del régimen del fuego es mayor que los efectos nominales de la introducción de *E. lehmanniana*.

Key Words: Arizona, *Eragrostis lehmanniana*, invasive grasses, Lehmann lovegrass, livestock grazing, native plants

INTRODUCTION

The introduction of nonnative species and land-use impacts are two prominent disturbances that threaten biodiversity (Wilcove et al. 1998). The effects of nonnative invasive species on native plant communities and fire regimes are well documented, particularly the effects of grass introductions (D'Antonio and Vitousek 1992; Brooks et al. 2004; Zouhar et al. 2008). Management strategies also can influence the preservation of biodiversity by altering extirpation and extinction rates (Pimm and Lawton 1998). In southern Arizona, the introduction of Lehmann lovegrass (*Eragrostis lehmanniana* Nees) coupled with more than a century of intensive management has resulted in a loss of biodiversity on multiple trophic levels (Bock et al. 1986).

Many nonnative plants have the ability to change the fire regime by altering the frequency, type, extent, timing, intensity,

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