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Historical wildfires do not promote cheatgrass invasion in a western Great Plains steppe

Written by: Carol Baldwin and Lauren Porensky

INTRODUCTION

The invasive species cheatgrass, *Bromus tectorum*, has been linked to increased fire frequency, reduced livestock weight gains and plant diversity, and degraded wildlife habitat in the Intermountain region of the western United States. In the Great Plains, annual bromes (cheatgrass as well as field brome, also called Japanese brome, *Bromus arvensis*), may not interact with fire in the same way. In particular, plants native to the Great Plains are well adapted to fire, which may be more damaging to invasive species than to native plants.

LOCATION

The study was conducted in the Thunder Basin region of northeastern Wyoming. Vegetation on the site is intermediate between northern mixed-grass prairie and sagebrush steppe. Wyoming big sagebrush (*Artemisia tridentata* Nutt. ssp. *Wyomingensis*) is about 10% of the vegetative cover, with another 39% consisting of perennial grasses in addition to 13% annual grasses. Common native grasses on the site include blue grama (*Bouteloua gracilis*), needle-and-thread (*Hesperostipa comata*), western wheatgrass (*Pascopyrum smithii*) and six-weeks fescue (*Vulpia octoflora*).

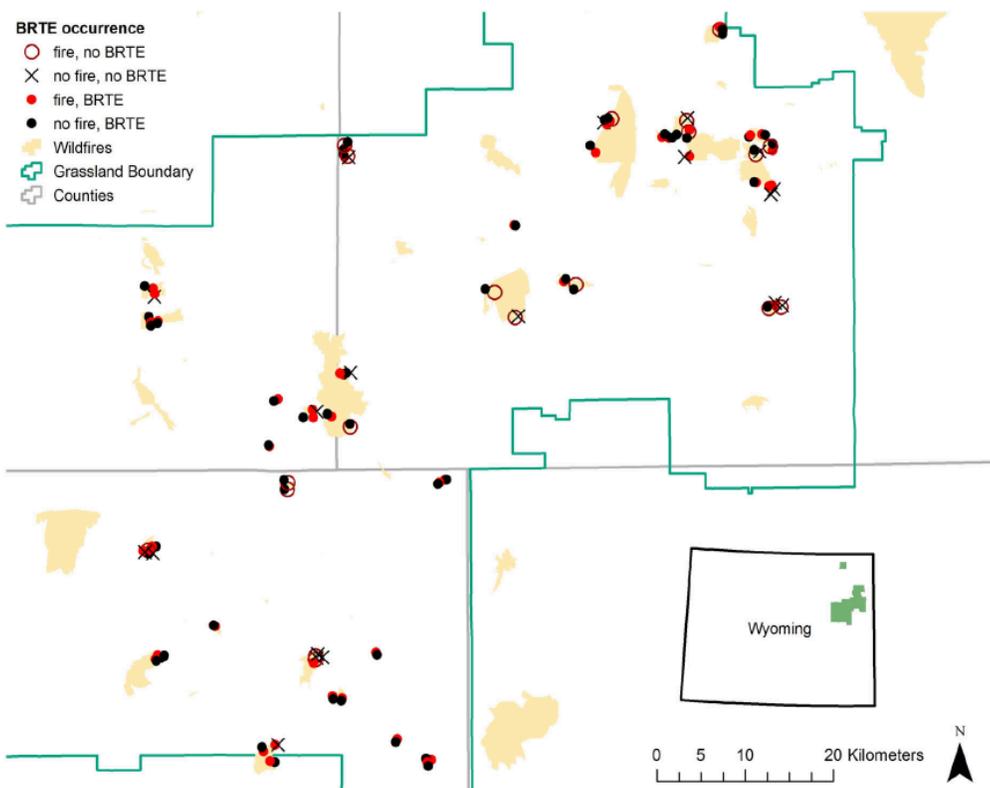


Figure 1. Sampling locations and *B. tectorum* (BRTE) occurrence in Thunder Basin, including 142 transects (71 pairs) sampled in 28 fires that varied widely in size and shape. Note that all sampling was conducted in association with fires, but perimeters of smaller fires are obscured by sampling points.

METHODS

Vegetation was sampled at 28 wildfire sites which had burned once during the past 26 years. Twenty of the wildfires had occurred in July and August, with the remainder burning in June and October. Burned area ranged from 12 to 8700 acres. Transects were located in pairs (one inside and one outside of the burned area) on sites with similar soils, slopes and aspects. At intervals along each transect, the presence and canopy cover of each plant species were recorded, and soil samples were collected. Models tested which factors were most correlated with predicting the presence of cheatgrass and field brome.

RESULTS

Annual bromes were not increased in occurrence or abundance by historical wildfires. Cheatgrass was present in 73% of the transects and accounted for 0 to 40% of the vegetative cover. Sandier soils and areas with high cover of other (non-brome) vegetation were associated with more cheatgrass. Burned transects had about 30% lower cheatgrass cover than unburned transects. Slopes and areas with less shrub cover tended to have more cheatgrass.

Field brome was present in about 60% of the transects. There was little association between the abundance of field brome and fire. Field brome tended to be more abundant on southeast-facing slopes with high cover of other plants, and was slightly more abundant on sites with high clay content and few rocks or shrubs.

MANAGEMENT IMPLICATIONS

This research suggests that historical wildfires do not promote annual bromes in this northern Great Plains ecosystem. Wildfire impacts during the summer dormant season have substantially the same impact on annual bromes as prescribed fire at the same time.

Several different factors might help to explain why annual brome response to wildfires differs between the Great Plains and the Intermountain West. Because vegetation in the Great Plains is well adapted to grazing and fire, wildfires may have less of an impact on the native vegetation as compared with the Great Basin region of the United States. Native perennial grasses

can utilize post-fire summer rains, common in the Great Plains, for fast regrowth, but annual grasses cannot take advantage of summer moisture because they have already set seed and died. Fire may also reduce brome seedling survival by removing the litter layer which protects annual brome seedlings during the winter. Fire reduces shrub cover over time and increases perennial grass cover, which is likely more competitive with annual grasses.

It is important to note that this research looked only at sites that had experienced a single fire in the past 26 years. Annual brome response may be different on sites that have burned more often. Overall, results suggest that soils, slope, aspect, and vegetative cover are better indicators than wildfire perimeters for determining where annual bromes will be found. Prescribed burning in the Northern Great Plains may pose less risk than previously thought in facilitating increases in annual brome presence and canopy cover.

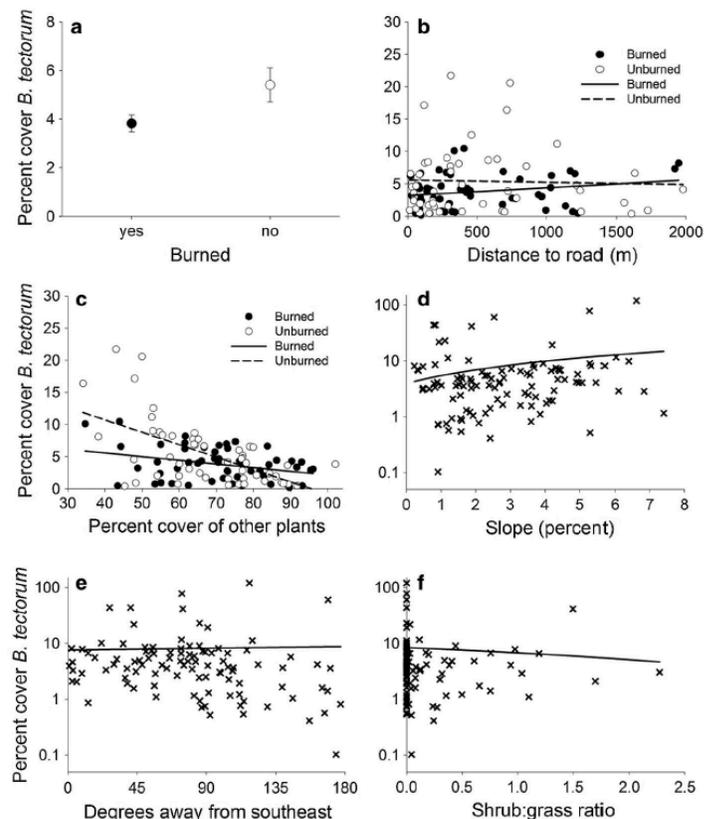


Figure 2. Effects of **a** fire, **b** disturbance, **c** vegetation, **d** slope, **e** aspect and **f** shrub: perennial grass ratio on *B. tectorum* abundance.

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Porensky, L.M. and D.M. Blumenthal. 2016. Historical wildfires do not promote cheatgrass invasion in a western Great Plains steppe. *Biological Invasions* 18:3333-3349.