

Larger inter-perennial gaps may increase invasibility of sagebrush systems

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Background

Land managers and scientists throughout the Intermountain West are collaborating in search of ways to combat the growing problem of *Bromus tectorum* invasion into sagebrush steppe ecosystems. Part of the solution is to understand how sites respond to disturbance (whether intended or unintended). SageSTEP is a regional experiment designed to evaluate different methods to maintain and/or restore sagebrush habitat while reducing fire fuel loads in the Great Basin. Fuel treatments being evaluated at the whole-plot level are prescribed fire, mechanical thinning of sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) by mowing, and aerial application of the herbicide tebuthiuron (Spike 20P[®]) to thin sagebrush. Additionally, the pre-emergent herbicide imazapic (Plateau[®]) was applied to subplots within fuels treatments to reduce cheatgrass. SageSTEP researchers are examining these treatments and their influence on gap size among perennial plants as an indicator of a sagebrush ecosystem's resilience, or a site's ability to recover from disturbance versus converting to cheatgrass.

Questions

What are inter-perennial gaps?

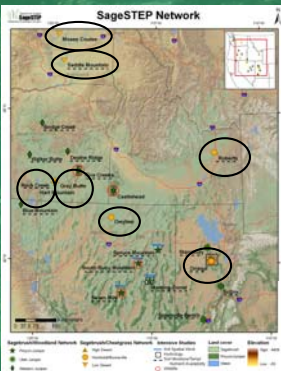
The distance among bases of perennial plants at the soil surface.

Inter-perennial plant gap



Why should we care about inter-perennial gaps?

- It is the portion of soil that is at the greatest risk to: Erosion, Disturbance, and Invasion.
- It may be used as an early warning indicator of invasion potential.



SageSTEP Site Overview

- Network of 20 sites
- 7 sites within the sagebrush/cheatgrass network (focus of this study)
- 13 sites within the juniper encroachment network
- sagebrush/cheatgrass sites

Results

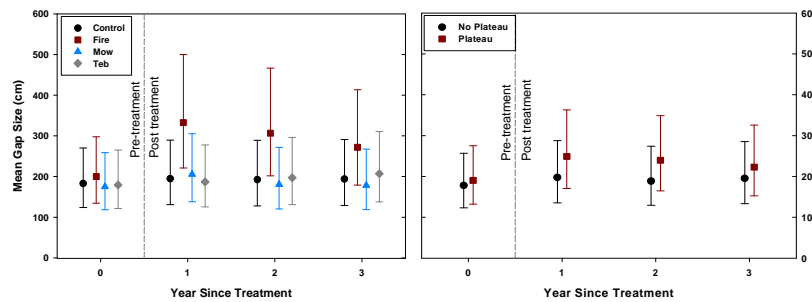


Figure 1. Prescribed fire significantly increased mean gap size the first 2 years post treatment. Other treatments had no effect on mean gap size.

Figure 2. Plateau significantly increased mean gap size the first 2 years post treatment.

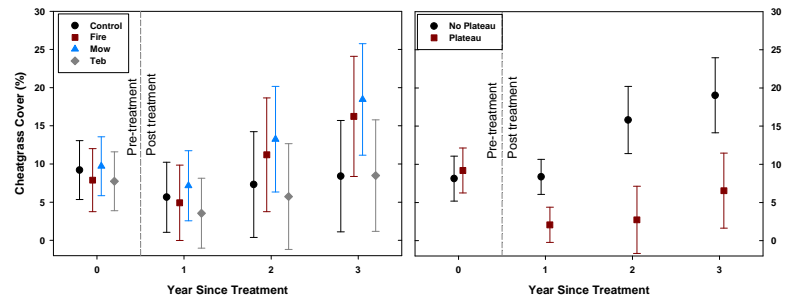


Figure 3. Prescribed fire increased cheatgrass cover, due possibly to the increase in basal gaps, but we cannot rule out the influence of fire-induced nutrient availability. Mowing also increased cheatgrass cover, but due to the soil disturbance caused by the mower and tractor.

Figure 4. The application of Plateau significantly reduced cheatgrass cover all three years post treatment.

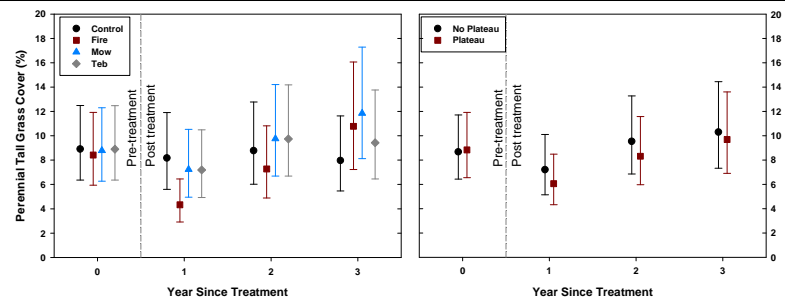


Figure 5. Prescribed fire significantly reduced perennial tall grass cover in the first year, but it recovered by year 2.

Figure 6. Plateau significantly reduced perennial tall grass cover consistently across all years.

Results (cont.)

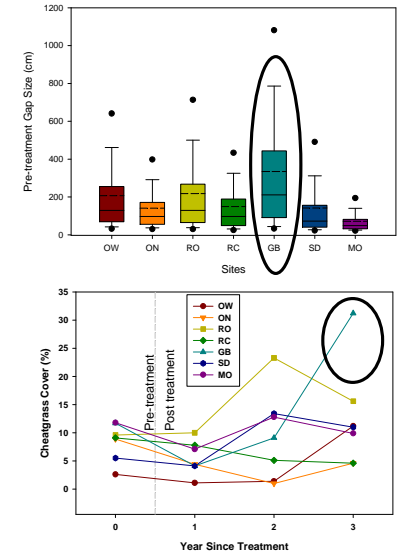


Figure 7 and 8. Grey Butte (GB) the site with the largest pre-treatment gap size has had the largest increase in cheatgrass cover.

Inter-perennial Plant Gap Summary

- Fire can kill shrubs and perennial grasses and increase inter-perennial gaps (Fig. 1 & 5)
- Plateau can temporarily decrease perennial plant cover and potentially increase inter-perennial gaps (Fig. 2 & 6)
- Increases in inter-perennial gaps increases soil exposure for possible cheatgrass establishment (Fig. 1, 2, & 3)
- Mowing does not increase inter-perennial gaps, but increases cheatgrass cover, possibly due to disturbance caused during mowing (Fig. 1 & 3)
- Plateau greatly reduces cheatgrass cover for at least 3 years (Fig. 4)
- Site with largest gaps to start with has had the largest increase in cheatgrass cover in year 3 (Fig. 7 & 8)
- Managers might consider maintaining smallest inter-perennial gaps possible
- Monitoring gaps among perennials may provide a fast early warning indicator of invasion potential