Evaluating the Use of Thresholds’ Concepts for Improving Habitat Through Cheatgrass Management

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Introduction
Cheatgrass (Bromus tectorum) is an invasive annual grass that is widely distributed throughout western North America with the ability to alter fire frequency, leading to degradation of critical wildlife habitat and forage for livestock. Identifying thresholds in cheatgrass-invaded systems is a primary challenge for land managers as management thresholds are ill-defined for invasive species in rangelands. An ecological threshold refers to a point where there is an abrupt change in the quality or function of an ecosystem (Groffman et al., 2006), whereas other thresholds (economic, minimum response, etc.) relate to specific relationships between weed species’ abundance and management implications. Increased understanding of where such thresholds occur may lead to well-informed cheatgrass-management decisions, especially at landscape scales.

Objectives
Our objective is to determine if there is a direct, predictable relationship between pre-treatment vegetation conditions and post-treatment increases in perennial grass biomass.

Materials and Methods
This study is being conducted on multiple field sites throughout Wyoming, but for this paper we only present data from a site near Pinedale in western Wyoming. To determine landscape variability we mapped cover of cheatgrass and perennial grasses through ocular estimation at an approximated 50-foot grid pattern. A balanced subset of mapped points was selected for intensive sampling across each treatment area and across a range of cheatgrass and perennial grass cover. At each intensive sample location vegetation cover is measured using both transects and quadrats; additionally, all herbaceous biomass is collected from the cover quadrats.

Pre-treatment data were collected in June 2015, and pre-emergence herbicide treatments were conducted in September 2015 using two formulations of imazapic. Plateau®, a liquid formulation, and Open Range™ G, a granular formulation, were applied at a rate of 7 oz/ac and 13 lb/ac, respectively. Post-treatment data were collected in June 2016.

Results and Discussion
Pre-treatment cheatgrass cover was highly variable across the landscape, but post-treatment cheatgrass cover mapping revealed reductions in cheatgrass (Figure 1). Cheatgrass cover was reduced across herbicide treatments, yet we observed a slight increase in cheatgrass cover in areas with low pre-treatment cheatgrass cover in the untreated check (Figure 2). Perennial grasses also increased in both herbicide treatments relative to the untreated check (Figure 2).

With further data collection and analysis we intend to see if these data continue to show similar trends and begin to determine where thresholds occur. A better understanding of thresholds’ concepts relating to cheatgrass management could aid in implementing landscape-scale management to reduce fire frequency, increase perennial grasses and shrubs, and improve wildlife habitat and forage for livestock.

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Literature Cited
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**Figure 1.** Pre-treatment and one-year post-treatment cheatgrass cover across three treatments near Pinedale. Darker colors indicate higher cheatgrass cover (black=high, white=low or none).

**Figure 2.** One year post-treatment changes in cheatgrass (a) and perennial grass (b) cover at Pinedale. Change in cover is absolute change in cover (%), not percent change across years. Multiple equations per panel indicate differences among herbicide treatments for slope or intercept (p<0.05). ORG=Open Range G herbicide.

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