The Effect of Discing to Reduce Cheatgrass Densities Following Wildfires

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Introduction

Wildfires in the Intermountain West are an annual event. The introduction and subsequent invasion of cheatgrass (*Bromus tectorum*) onto millions of hectares of rangelands throughout the Intermountain West has resulted in devastating wildfires. Cheatgrass truncates secondary succession by out competing native perennial grass seedlings for limited moisture and providing a fine textured, early maturing fuel that increases the chance of ignition as well as the rate, spread and season of wildfires. Cheatgrass has increased the frequency of wildfires from an estimated 60-110 years to a 5-10 year fire cycle in many Intermountain West habitats, simply too short of a period to allow critical shrub species to return to the site and resulting in plant communities dominated by this exotic and invasive annual grass. The restoration/revegetation of burned habitats throughout the Intermountain West is definitely an uphill battle and very frustrating to resource managers charged with these efforts. The best known method to actively suppress cheatgrass is through the establishment of long-lived perennial grasses, the problem though is getting these perennial grasses established in environments where cheatgrass seedbank densities are simply too dense (Figure 1) and out compete perennial grass seedlings.

Figure 1. Cheatgrass seed in the interspaces of the burnt shrubs. These seeds in their safe sites as well as in the seedbank often lead to seeding failures. These densities must be measured to know if further weed control practices are needed.

Remember, this competition is at the seedling stage. Early researchers recognized the ability of the disc and fallow method to reduce competition for increased perennial grass establishment (Young et al. 1969, Klomp and Hull 1972). Here we report on the use of the disc and fallow method following a wildfire in northwestern Nevada in a xeric Wyoming big sagebrush (*Artemisia tridentata* ssp. wyomingensis) community where the perennial grass understory was virtually absent and cheatgrass seed was visible on the soil surface.

Results and Discussion

These results are a preliminary report of a larger effort. Here we just report on the effect of discing as it relates to cheatgrass densities. Prior to discing (September 2006) the burned habitat averaged 302 cheatgrass seeds/m², r = 148-970/m² (Table 1). Discing reduced the cheatgrass densities in our bioassays down to 87/m², r = 0-257/m². The following spring, 2007, the above ground cheatgrass densities were 8/m² and 9/m² for the disced and undisced plots, respectfully. Following seed set the bioassay sampling yielded a significant increase in cheatgrass densities at 2,415/m² in the disced plots and 3,286/m² in the undisced plots. The spring 2008 above ground cheatgrass densities increased to 18/m² and 48/m² in the disced and undisced plots, respectfully (Figure 4). This significant increase in cheatgrass densities should be very alarming to resource managers trying to establish desirable vegetation in cheatgrass ranges following wildfires. If you are unable to successfully establish perennial grasses the first year following the wildfire, the build up of cheatgrass both in the seedbank and above ground virtually closes the site to any recruitment of perennial grasses and converts the site to cheatgrass dominance. Discing as a weed control practice is just one aspect of this larger study, the ability of selected native and introduced perennial grasses to germinate, sprout and establish is also very important in suppressing cheatgrass (Figure 5). The mechanical weed control method of discing is also limited due to topographical features such as rocky, rough or steep terrain. Resource managers should be very aware of cheatgrass densities before implementing a restoration/revegetation project, additional weed control practices such as discing may increase their chances of success in these efforts.

Table 1. Cheatgrass seedbank and plant densities monitored over three years after 2006 Empire fire.

	*Seeds per square meter.		Plants per square meter	
	Undisced	Disced	Undisced	Disced
FALL 2006 (post fire & seed set)	302	87		
SPRING 2007 (pre seed set)			9	8
SUMMER 2007 (post seed set)	3286	2415		
SPRING 2008 (pre seed set)			48	18

* Number of seeds determined by soil bioassay technique, counting only germinated seeds.

Figure 4. The increase in cheatgrass densities the second year following the initial wildfire shows the need for effective weed control if you miss that initial open window.

Figure 2. Empire site burning in July 2006. Notice the density of shrubs.

Figure 3. Burned habitat at the Empire Site. Notice the intensity of the fire beneath the burnt shrubs, this intensity kills the majority of the cheatgrass seed on the surface and in the seedbank.

Figure 5. The establishment of a long-lived perennial grass is essential in the suppression of cheatgrass and the decrease in wildfire frequency that is so critical to allow succession to proceed.

Methods

We refer to the study site as the Empire Fire which is located 140 km north of Reno, Nevada. The site burned during the summer of 2006 (Figure 2). Slow burning wildfires are know to burn hot enough for a long enough period of time to burn that the majority of cheatgrass seed below the canopy is killed (Figure 3). The cheatgrass seed in the interspaces that is not damaged though poses serious problems for perennial grass establishment (Figure 1). We established 30 12m x 60m plots in which 15 of the plots were disced and seeded (not seeded in the case of the control), while the other 15 plots were not disced and seeded (again the control was not seeded). The seeded plots were as follows: #1) 'Hycrest' crested wheatgrass (*Agropyron cristatum*), #2) Sherman big bluegrass (*Poa ampla*), #3) Bottlebrush Squirreltail (*Elymus elymoides*), and #4) a mix of these three species plus Indian ricegrass (*Achnatherum hymenoides*), 'Immigrant' forage kochia (*Kochia* prostrate), 'Ladak' alfalfa (*Medicago* sativa) and Wyoming big sagebrush. Each plot was bioassayed to determine seedbank values before discing and seeding efforts and then this process was repeated before seed set and after seed set through July 2008. Above ground cheatgrass densities were also recorded.

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Literature

Klomp, G. J. and A. C. Hull. 1972. Methods for seeding three perennial wheatgrasses on cheatgrass ranges in southern Idaho. J. Range Management 25(4): 266-268.

Young, J. A., R. A. Evans and R. E. Eckert Jr.. 1969. Wheatgrass establishment with tillage and herbicides in a mesic medusahead community. J. Range Management 22(3): 151-155.