Cheatgrass Removal and Revegetation at Camp Polk Meadow

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12/10/2008

Abstract. This study looks at several different techniques for removing cheatgrass prior to planting native grasses. Solarization, plowing and the application of an herbicide were implemented on three test plots at Camp Polk Meadow in Sisters, Oregon. At this point in the study, solarization has proven to be very effective at removing cheatgrass and greatly reducing the number of viable seeds within the test plot. Other methods of cheatgrass removal may be as effective and less labor intensive than solarization.

Introduction

Bromus tectorum, also know as cheatgrass, is an annual grass that is native to Eurasia. After its introduction on the east coast of the United States in the 1800's, cheatgrass spread to every State in the U.S., including Alaska and Hawaii (USDA Plants 2008). Cheatgrass is an annual grass that thrives on rangelands, roadsides, pastures and other disturbed sites. After a disturbance (e.g. fire or intense grazing) cheatgrass is capable of quickly colonizing a site and preventing the recovery of native species. This feat is accomplished by effectively accessing shallow soil moisture, producing large quantities of seeds and altering fire return intervals (Humphrey and Schupp 2004). Management of this invasive species has been a great challenge that will continue long into the future.

There is a wide variety of techniques that have been employed to remove cheatgrass prior to restoring native vegetation. Burning, plowing, disking, mowing, grazing and herbicides are some of the options that have been utilized (Pellant 2006). These options vary in effectiveness based on the applications of the treatment, pre- and post-treatment climatic conditions, soil moisture, timing and other factors. The use of fire to remove cheatgrass prior to revegetation has been a common practice in many areas in the Pacific Northwest. A controlled burn in the spring can reduce cheatgrass densities by as much as 90% the following year (Brooks et. al. 2004). In

addition to removing cheatgrass, fire may also have undesirable outcomes by removing native vegetation or allowing for the further proliferation of invasive plants if seeding is unsuccessful. Careful consideration must be taken when choosing a technique for removing cheatgrass prior to revegetation.

There are many factors that need to be examined before deciding which technique will be most effective. The first question that must be asked is: To what extent has the cheatgrass encroached onto the site? In some cases, cheatgrass encroachment is minimal and can be controlled by mowing or spraying areas that have been invaded and encouraging growth of native vegetation. On other sites, cheatgrass encroachment is extensive and a more invasive approach must be used in order to control the invasion and restore native vegetation.

Camp Polk Meadow is located near Sisters Oregon and has a long history of grazing and agricultural production that has resulted in cheatgrass encroachment. Some locations in Camp Polk Meadow are approaching a monoculture of cheatgrass with very few native plants remaining. The objective of this study is to examine three techniques for removing cheatgrass and to determine the effectiveness and feasibility of applying them to larger portions of Camp Polk Meadow.

Methods

The Spring 2008 Restoration Ecology class started developing a plan for removing cheatgrass at Camp Polk in early April. We discussed several experimental designs and looked at the benefits and drawbacks of each. After several discussion periods and one field visit, a final experimental design was developed. On May 9, 2008, the class began implementing the final experimental design.

We decided to create two test plots that were 10 meters wide and 15 meters long with a half-meter buffer surrounding the plots. A decision was made to create a third plot in November 2008 in order to compare the use of an herbicide to remove cheatgrass. After the treatments were completed, a silt fence was to be installed around all three plots and between the plots in order to prevent cheatgrass seeds from encroaching into the study or transferring from plot to plot. Specific details about each plot are elaborated below.

Plot #1 – Solarization. The first test plot was solarized on May 9th, 2008. We used a rototiller to break up the soil and stir in the aboveground plant material. Some of this plant material was raked into piles and removed entirely from the test plot. The plot was raked flat and saturated with about 200 gallons of water that was transported from a nearby pond using buckets. After water was applied, the plot was covered with 3mm clear plastic. The plastic was pinned down on the edges by soil and rocks to prevent it from blowing away in the wind. On June 19, the plots were checked and the plastic was entirely intact, but it had largely disintegrated a month later and was completely removed on July 21. On this date a silt fence was installed around the plot.

Plot #2 – Plowing: In this test plot we want to look using a plow to bury the cheatgrass seed bank to a depth that the seeds cannot effectively germinate. Plowing, if successful, could be a more feasible option than solarization when applied to larger portions of the meadow. We chose to use a moldboard style plow because it flips the soil in larger sections than a disk, which cuts smaller pieces and may distribute cheatgrass seeds throughout the soil. A disk is commonly used in Central Oregon for cultivation because of the rocky soil. In the flood plain at Camp Polk Meadow, the soil is sandy and few rocks are present which will allow for the use of a plow. On November 14, 2008, the second plot was plowed using a moldboard style plow. This plow dug

to a depth of approximately 8 inches and flipped the soil. This action buried the majority of the dead cheatgrass material and provided a new soil surface. At that point, the plot was lightly raked to level the soil surface to prepare for seeding. A slit fence was installed around this plot after it was plowed and seeded on November 14.

Plowing Plot #2

Plowed plot on left, solarized plot on right

Plot #3 – Herbicide Application: We contacted Rick Leeper at Round Butte Seed Growers who recommended that we incorporate a test plot that is treated with an herbicide. A new product called Plateau, which is an imazapic ammonium salt (USDA, 2008), is being used by Round Butte that kills annual grasses without killing perennial grasses and shrubs. Plateau has been used by land management agencies, private landowners and highway departments to control medusahead, cheatgrass and other undesirable plants. In addition to killing existing plants, Plateau also acts as a pre-emergent and kills certain species of plants as they attempt to germinate.

On November 14, 2008 we removed a portion of the dead cheatgrass material from the plot. This was done in order prevent the dead cheatgrass material from intercepting the spray and not allowing it to hit the small green cheatgrass shoots and the soil surface. The plot was then seeded and lightly raked. The herbicide Panoramic, which is a generic version of Plateau, was applied on November 17, 2008 by Round Butte Seed Growers using an ATV and a boom

sprayer. Panoramic was applied at a rate of 6 ounces of product per acre and mixed to 20 gallons per acre. The silt fence was installed around this plot on December 7, 2008.

Seeding: A custom seed mix was created and donated by Round Butte Seed Growers. The seed mix was roughly two pounds and consisted of 30% Idaho fescue (9.6 ounces), 30% squirrel tail (9.6 ounces), 15% sandburg's bluegrass (4.8 ounces), 15% blue bunch wheatgrass (4.8 ounces) and 10% Great Basin wildrye (3.2 ounces). All three plots were seeded evenly using a broadcast spreader on November 14, 2008. The calculated density is approximately 15 lbs. per acre. After seeding, the plots were lightly raked to bury the seed to a depth of no more that one half inch.

Spreading native seed

Irrigation: It may be possible to use water from Whychus Creek in order to grow native vegetation in portions of Camp Polk Meadow after the re-meander project. We would like to look at whether irrigation is helpful in the establishment of natives. Irrigating during the first season might result in more plants surviving after germination which could lead to a greater dominance over cheatgrass. We looked at setting up a gravity-fed irrigation system but realized, through contacting local plumbing supply shops, that the small drop in elevation would not be sufficient for automatic irrigation. Instead, we will hand water the plots during the most critical

dry periods. According to Rick Leeper, the most critical time to water is during March, April and May. Native plants have adapted to the extremely dry summers on the high desert but do not fare well with a dry spring. Dry periods in the spring can kill the young seedlings which, at this point in time, will have very small and shallow root systems. Half of each of the three plots should be irrigated during dry parts of the first spring after seeding. A decision could be made to continue irrigation into a second season if it is necessary.

Results/Discussion

It is hard to determine which plot will establish the greatest numbers of healthy native plants. I assume that our study will show that irrigation, if implemented properly, has a significant impact on establishment of natives. Water is very critical to the growth of existing plants and especially important to the germination and growth of new plants. This limiting factor might be the key to revegetation of Camp Polk Meadow in the future. It will also be very interesting to see the differences between solarization, plowing and the application of an herbicide. Solarization has been demonstrated to be very effective at killing cheatgrass seeds. Even five months after removing the plastic from the solarized plot, very few seeds had germinated. In fact, one area where the silt fence had deteriorated allowed several seeds into the plot, which germinated and provided a strong contrast to the bare solarized soil (see photo on next page). The majority of the plot had very few seeds that had germinated. One of the problems with solarization is that the heat could have negative effects on soil microbes and nutrients. This may result in slower establishment of natives. It might be necessary to amend solarized plots.

Cheatgrass that germinated in the solarized plot. Notice that it has entered the plot from outside through a hole in the fence, and the adjacent solarized areas(foreground) remain bare.

Plowing is a much cheaper and much less labor intensive alternative than solarization. If it proves to be successful it could be applied to larger portions of the meadow (10 acres or more). In the plot we plowed, there was cheatgrass that did not get entirely buried which contained seeds of unknown viability that had not dropped from the plants (see photo of plowed plot). These seeds may germinate and cause problems for newly establishing native plants. It may have been possible to mow the plot prior to plowing in order to more successfully bury the seeds. Another option could have been to use a larger machine to plow that could have dug to a greater depth and completely bury the cheatgrass seed bank.

The application of Plateau could prove to be very effective at removing cheatgrass and allowing natives to re-colonize. This technique could also be applied at a larger scale or it could be used in conjunction with plowing to achieve the desired results. One issue with that arises with the use of this herbicide is that it can suppress the growth or kill native grasses and forbs. A list of species and how each is affected by Plateau is provided at this website: http://www.tinyurl.com/5b4qej. In the test plot that was treated with Panoramic, very few native grasses or forbs were present.

Acknowledgements:

This work was made possible by a grant from T. Montag. I would like to thank Round Butte Seed Growers and Rick Leeper for donating the native seed and herbicide. I want to thank Jim Simon, the local Hay Hauler, for allowing us to use his plow for this project. I would also like to thank the students that have been involved in creating the experimental design of this study. Last, but not least, I want to send out a special thanks to Matt Orr and Ron Reuter for providing me with the skills that are necessary to address issues in ecological restoration.

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