A Self-Learning Resource From MSU Extension

MONTANA STATE UNIVERSITY EXTENSION

MontGuide

Revegetating Weed-Infested Rangeland with a Single Field Entry

by Matthew Rinella, James Jacobs and Roger Sheley; graduate research assistant, post-doctoral research associate and MSU Extension Service noxious weeds specialist, respectively. Department of Land Resources and Environmental Sciences, Montana State University

A field study demonstrated that knapweed-infested rangeland can be rehabilitated when herbicides are applied in the same operation in which grass is seeded. Includes analysis of various combinations of herbicides and types of grass seed.

MT 199912 AG reviewed 5/2006

NOXIOUS WEEDS HAVE DISPLACED DESIRED vegetation on millions of acres in the western United States, and they continue to spread rapidly. These plants are detrimental to soil and water resources, decrease biodiversity, decrease forage production for wildlife and livestock and alter water and nutrient cycling.

Over the past several decades various tools such as herbicides, grazing and biological control have been developed for reducing weeds and increasing desired vegetation on weed-infested lands. Because these tools are only effective in temporarily removing weeds and do not otherwise encourage niche occupation by competitive desired species, implementation of weed management strategies based upon these tools typically results in inconsistent and temporary increases in desired vegetation. Successful weed management will ultimately rely on combinations of tools that are used to decrease weeds and directly increase desired species.

Revegetation strategies that combine herbicides for controlling weeds and the seeding of desired species have been considered but these strategies are often not used because of the high cost and risk of failure.

Failures in revegetating weed-infested rangeland usually result from a combination of factors. The most frequent causes of failure are insufficient soil moisture and intense weed competition. Inadequate weed control or precipitation results in seedling failure, and several attempts at revegetation are required to establish desired stands.

Revegetating weed-infested rangeland is costly because of the number of attempts required for success and the number of entries onto a site needed to maximize the potential for seedling establishment. Traditionally, revegetation of infested rangeland requires multiple entries. Land managers till the site in late fall to loosen the soil surface and encourage the germination of weed seeds present in the seed bank. A few weeks later, they apply a non-selective herbicide, such as Roundup Ultra® (glyphosate) to control the newly emerging weeds. The combination of tillage and herbicide reduces weed seed density and weed competition the following spring. Soon after the herbicide is applied, managers seed fall dormant grasses, generally using a no-till drill. The following spring some of the remaining weed seeds and seeded grasses germinate and emerge. With adequate spring precipitation, both weed and grass seedlings survive. If grass seedlings survive until mid-summer, the managers use a broadleaf herbicide such as 2,4-D to reduce weed competition.

Although revegetation with aggressive species has been shown to limit weed reinvasion, managers are reluctant to attempt it because it is an expensive multi-attempt, multi-entry approach. Researchers at Montana State University began to explore the potential for revegetating weed-infested rangeland with a single field entry strategy, realizing that if revegetation could be accomplished with one operation, it might become economically feasible, costing less money and requiring less time.

Field study

A field study was conducted to determine if grass stands could be established in weed-infested areas using fall seeding and herbicides on the same day. We used a tractor with a herbicide rig on the front and a rangeland no-till drill on the back in order to both plant grass seeds and apply a herbicide at the same time as it moves across rangeland, completing a revegetation project with one field entry. In many cases, agricultural producers could share such a rig. Small land owners without access to a drill seeder could broadcast the seed, but would need to double or triple the seeding rate.

Three grass species and eight herbicide treatments were combined in plots at two spotted knapweed infested sites. The grass species were 'Luna' pubescent wheatgrass (Thinopyrum intermedium), bluebunch wheatgrass (Pseudo—rogneria spicata) and 'Bozoyski' Russian wildrye (Psathyrostachys junceae). Grasses were seeded using a no-till rangeland drill and a seeding rate of 5.3 pounds pure live seeds per acre. Seeds were sown at a depth of 0.2 inches.

The herbicide treatments were:

1. none
2. Roundup® (glyphosate) at one pint per acre
3. Tordon 22K® (picloram) at 1/2 pint per acre

4. Tordon 22K® at one pint per acre
5. Curtail® (clopyralid + 2,4-D) at 1 quart per acre
6. Tordon 22K® at l/2 pint per acre + Roundup® at 1 pint per acre
7. Tordon 22K® at one pint per acre + Roundup® at one pint per acre
8. Curtail® at one quart per acre + Roundup® at one pint per acre.

Grasses were planted and herbicides were applied in November of 1994. Grass and spotted knapweed weights were sampled to determine the control of spotted knapweed and establishment and yield of the grasses.

Results

Tordon 22K® at 1/2 or one pint per acre provided consistent control of spotted knapweed for up to three years (Figure 1). Including Roundup® with Tordon 22K® did not significantly affect spotted knapweed control, and in most cases those treatments that included Tordon 22K® had the greatest grass yield, presumably as a response to effective weed control (Figure 2).

In treatments where grasses successfully established, 'Luna' pubescent wheatgrass consistently had the highest yield (Figure 2). 'Bozoisky' Russian wildrye was the poorest establishing grass in this study. ('Bozoisky' Russian wildrye established well on leafy spurge-infested sites in another study.) 'Goldar' bluebunch wheatgrass, a native species, did not establish as well as 'Luna' pubescent wheatgrass, but it did develop successful stands in plots where Tordon 22K® was applied.

Conclusion

Although revegetation with aggressive species can limit weed reinvasion, land managers are reluctant to attempt it because of the number of attempts required for success and the number of entries onto a site needed to maximize the potential for seedling establishment. The results of this study suggests that a single-entry revegetation program applying Tordon 22K® in late fall at the time of seeding will optimize seedling establishment in spotted knapweed infested rangeland. This single entry revegetation strategy may provide managers with a cost effective and reliable revegetation strategy and ultimately a sustainable weed management program.

This information is for educational purposes only. Reference to commercial products or trade names does not imply discrimination or endorsement by the Montana State University Extension Service.

Figure 1. Effect of herbicide or herbicide combinations on spotted knapweed weight at peak standing crop three years after revegation. Herbicide treatments were: 1–none, 2–Roundup®, 3—Tordon 22K® at 1/2 pint/acre, 4–Tordon 22K® at 1 pint/acre, 5–Curtail®, 6–Tordon 22K® at 1/2 pint/acre + Roundup®, 7–Tordon 22K® at 1 pint/acre + Roundup®, and 8–Curtail® + Roundup®.

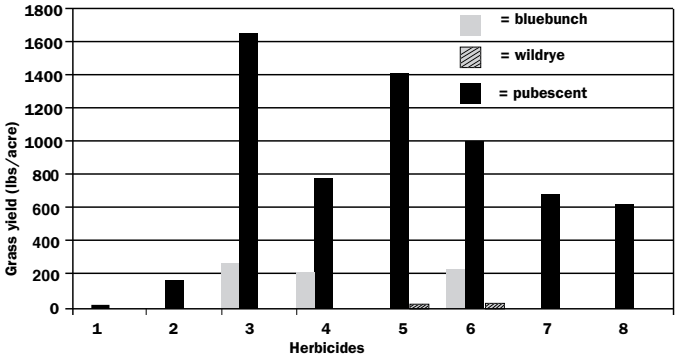

Figure 2. Effects of herbicide or herbicide combinations on grass yield three years after revegetation. Herbicide treatments were: 1–none, 2–Roundup®, 3—Tordon 22K® at 1/2 pint/acre, 4–Tordon 22K® at 1 pint/acre, 5–Curtail®, 6–Tordon 22K® at 1/2 pint/acre + Roundup®, -7–Tordon 22K® at 1 pint/acre + Roundup®, and 8–Curtail® + Roundup®.

http://www.montana.edu/wwwpb/pubs/mt9912.html

MONTANA STATE UNIVERSITY EXTENSION

The U.S. Department of Agriculture (USDA), Montana State University and the Montana State University Extension Service prohibit discrimination in all of their programs and activities on the basis of race, color, national origin, gender, religion, age, disability, political beliefs, sexual orientation, and marital and family status. Issued in furtherance of cooperative extension work in agriculture and home economics, acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, Douglas L. Steele, Vice Provost and Director, Extension Service, Montana State University, Bozeman, MT 59717.

File under: Weeds

A-13 (Range and Pasture)

Reviewed May 2006
500-05/06JM