CHAPTER 8:
Targeted Livestock Grazing to Suppress Invasive Annual Grasses

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Photo: Lovina Roselle, University of Idaho

10 KEY POINTS

- Targeted livestock grazing can suppress annual grasses where these grasses are considered weedy invaders.
- Invasive annual grasses have a self-perpetuating relationship with fire.
- Targeted grazing can be used to disrupt fine fuel continuity and reduce fuel loads.
- Annual invasive grasses can be suppressed when livestock grazing reduces the production of viable seeds.
- Seedheads of invasive grasses must be removed while the grasses are still green.
- It may be necessary to graze annual grasses two or three times in the spring.
- In mixed stands of annual grasses and perennial plants, livestock should be observed closely to avoid heavy grazing of any desirable perennial plants.
- Livestock perform well on annual grasses in the spring, producing weight gains similar to those from uninfested ranges.
- Targeted grazing can be integrated with prescribed fire, herbicides, and mechanical treatments to improve efficacy.
- Applying targeted grazing before artificial seeding can help in restoration efforts.

INTRODUCTION

Invasive annual grasses are a serious problem on North American rangelands. These undesirable species, such as cheatgrass (or downy brome), Japanese brome, and medusahead, often out-compete desirable perennial species.[14,29,50] Invasive annual grasses can form nearly pure stands that exclude most other plants, decrease biological diversity and forage production, and increase soil erosion. In some areas, invasive annual grasses also create continuous fine fuel loads that promote wildfires more frequent than native shrubs and perennial grasses can tolerate.[35, 36]

The range livestock industry has adapted to the presence of invasive annual grasses, especially where infestations are extensive. For example, on California annual grasslands dominated by soft chess, wild oat, and other species, livestock grazing is typically managed to retain sufficient residual dry matter of annual grasses. Light to moderate livestock grazing provides enough standing grass at the end of the grazing season to limit soil erosion and conserve soil moisture and nutrients.[2, 18] Elsewhere, however, where infestations of invasive annual grasses are less extensive or less advanced, opportunities exist for using targeted, or prescribed, livestock grazing to suppress annual grass plants.[19, 28, 44] This chapter focuses on using prescribed livestock grazing to suppress invasive annual grasses on sites where these grasses are considered weedy invaders.

Vegetation Management Opportunities

Invasive annual grasses, especially cheatgrass, have a self-perpetuating relationship with fire.[36] Fire creates conditions that favor their growth, which, in turn, creates fine fuel loads that favor subsequent wildfire. Targeted livestock grazing can help diminish this fire hazard by disrupting fine fuel continuity and reducing fuel loads. Extending fire-free intervals enhances the competitiveness of perennial plants. Protecting existing stands of shrubs or perennial grasses from frequent fire should be a high priority as it is easier and less expensive to prevent annual grasses from dominating than to restore or rehabilitate depleted plant communities.[46] Grazed fire lines should be at least 250 feet wide.[47, 48]

Using livestock grazing to suppress invasive annual grasses and enhance desirable perennials assumes that desirable perennials will fill the temporary void left by the annual grasses. In many areas, however, desirable perennials may be out-competed by species considered even more undesirable than annual grasses, such as yellow starthistle or spotted knapweed. Sites should be thoroughly inspected before initiating any form of plant control.[49]

Disking and plowing, prescribed burning, and herbicides are commonly used to manage invasive annual grasses. These treatments can temporarily reduce the abundance of annual grasses on specific sites, but they seldom provide long-term control unless followed by artificial seeding and revegetation.[27, 29] As discussed near the end of this chapter, targeted livestock grazing can be integrated with these treatments to help prepare sites for seeding with desirable herbs and shrubs.

Criteria for Animal Selection

Sheep, goats, cattle, and horses readily consume grass-dominated diets, provided grasses are plentiful.[43] All four of these livestock species can be used to suppress invasive annual grasses. Sheep and goats can be particularly effective because their grazing can be closely controlled by herding or confined with portable electric fence. The heavy grazing intensities required to suppress many annual grasses are easier to manage when livestock can be confined in small grazing areas. Effective management also requires applying grazing at the appropriate time, a precision more easily achieved when a herder can manage the animals. With their larger mouths, cattle and horses may not select annual grasses as readily as sheep or goats because livestock prefer plants they can eat quickly and efficiently.[3] Sheep or goats can get a full bite of annual grasses more easily than cattle or horses, especially when annual grass plants are small. In winter, goats will favor shrubs over annual grasses.

Some annual grasses are relatively palatable and readily eaten by grazing livestock. Others are rather unpalatable and may require grazing strategies that

reduce selectivity and encourage consumption. The degree of diet selectivity by livestock can be influenced, for example, by controlling their hunger level and the time of day when they begin grazing. Hungry livestock are usually less selective,[1] which may help explain why livestock tend to be less selective when grazing in the morning than in the evening.[8, 23, 45] The type of forage that livestock have grazed recently before they arrive in an annual grass infestation also affects their diet selectivity. Livestock that have been eating palatable vegetation may be more selective when foraging, whereas livestock that have been eating less attractive vegetation are usually less selective.[38] The breed of livestock used for targeted grazing can also affect diet selectivity. For example, intra-specific relationships within bands or flocks of highly gregarious breeds like Rambouillet or Merino may cause these sheep to graze less selectively than sheep within less cohesive breeds like Suffolk or Dorset.[28] Close herding or high stock densities also decrease grazing selectivity as does relatively rapid rotation among small areas or paddocks.[8, 39]

Grazing Strategies to Meet Ecological Objectives

Whether targeted livestock grazing achieves its desired effect depends on a manager's ability to apply the appropriate levels of defoliation at the proper times. Identifying the best time to graze is by far the most important decision determining success or failure in suppressing annual grasses. Repeat grazing will likely be needed when grazing occurs during spring, and grazing intensity and selectivity need careful consideration to limit negative impacts to associated plants.

Timing of Grazing

Annual grasses reproduce by seed; therefore, invasive annual grasses can be suppressed when targeted livestock grazing limits their production of viable seeds. Seedheads of invasive grasses must be removed while they are still green, before seeds reach the dough stage. In Michigan alfalfa fields, for example, cheatgrass was controlled by livestock grazing in late April and early May, but control failed when grazing was delayed until after May 15.[26] In Nebraska, mowing cheatgrass shortly after young seeds emerged controlled cheatgrass in native grass pastures.[11] Likewise, in southern Idaho, cheatgrass densities and seed reserves were reduced when disked in the spring before cheatgrass seeds ripened.[35] To prevent cheatgrass from producing viable seeds, cheatgrass plants should be grazed in the spring before cheatgrass begins to turn purple.[20]

Targeted grazing managers can encourage livestock to preferentially select invasive annual grasses by applying grazing at the appropriate time. Livestock readily graze most annual grasses in the spring before annual grasses set seeds. Seed set coincides with decreased forage nutritive value and lower digestibility of annual grass forage.[6]

Although medusahead is less palatable than cheatgrass and has a narrower window of acceptability for grazing animals (J. DiTamaso, personal communication), sheep and cattle will graze it when it is green for a few weeks in early spring before seed set.[13, 25] When medusahead seeds mature, they become armed with stiff barbs and awns that reduce palatability and repel grazing.

Defoliation of annual grasses generally suppresses their plant yield on a site, but it may not reduce the total number of annual grass plants. For example, in Nevada clipping in early spring (end of March to end of April) reduced cheatgrass biomass compared with an ungrazed control but did not reduce cheatgrass density.[40]

Frequency of Grazing

Grazing annual grasses several times during spring growth is an important and often essential element of an effective management strategy. Cheatgrass, for example, usually requires a second or third grazing in spring because it can regrow and produce new seedheads about three to four weeks after the first defoliation.[20] Cheatgrass populations crash when cheatgrass plants do not produce viable seed for two or more successive years, leaving only scattered, thin populations.[7,11] Seed maturity must be prevented by prescribed grazing every year or every other year to prevent cheatgrass from reinvading. Cheatgrass plant yield and plant density also will be reduced if cheatgrass plants can be heavily defoliated twice in late spring when cheatgrass plants are in the early boot stage.[40] Repeated defoliation will also suppress Japanese brome, an annual grass similar to cheatgrass. Clipping to either a 3- or 6-inch stubble height every week or every other week for two months reduces root growth and yield of Japanese brome.[15]

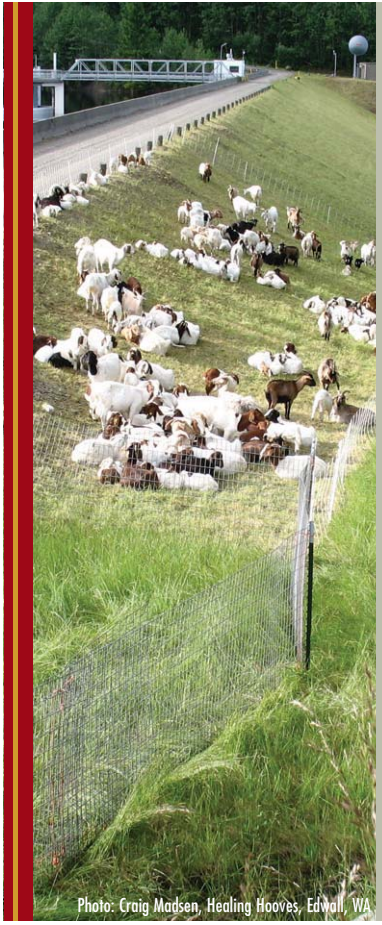

Photo: Craig Madsen, Healing Hooves, Edwall, WA

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Grazing Monocultures vs. Mixed Stands

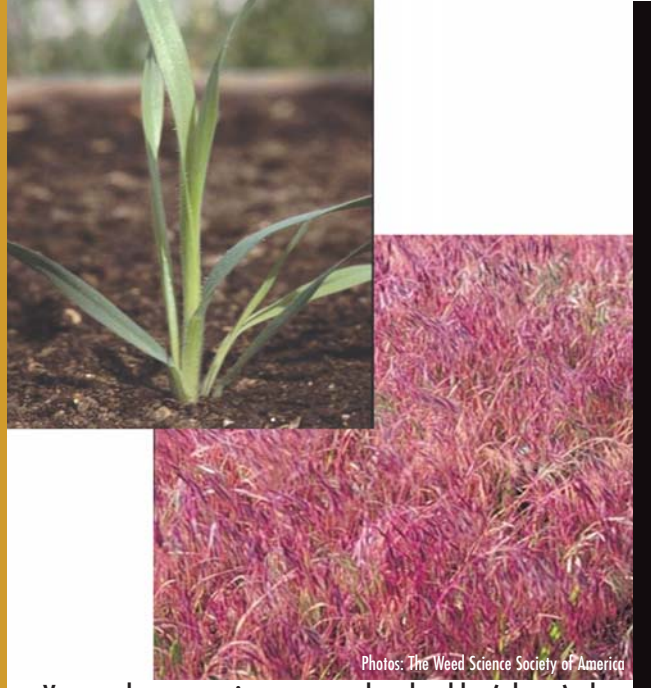
It is relatively easy to suppress invasive annual grasses where they form nearly pure stands (i.e., monocultures) that exclude most other plants. On these sites, prescribed livestock grazing can be applied to achieve maximum damage to annual grasses with little concern for non-target plants. Grazing intensity can be high (residual stubble height less than 3 inches) and grazing relatively uniform if a site is largely dominated by invasive annual grasses. The specific stubble height or utilization level is less important than selecting a grazing intensity heavy enough to prevent annual grasses from developing viable seeds. Clipping in spring to a height of 2 to 3 inches should be effective.[11]

When livestock grazing in late spring or early summer is applied to mixed stands of annual grasses and perennial plants, livestock should be observed closely to ensure they are selecting annual grasses and not heavily grazing desirable perennials. Desirable cool-season perennial grasses such as bluebunch wheatgrass, Idaho fescue, and rough fescue can sustain defoliation in spring to a 3-inch stubble height, provided it does not occur more than two years in a row.[4, 41] Perennial bunchgrasses also benefit when livestock in early spring are not allowed to graze an area for longer than three weeks before being moved to a new unit, a strategy that helps perennial bunchgrasses to recover in the weeks that follow.[34]

Timing is critical when trying to control annual grasses in mixed stands. For example, cheatgrass often grows adjacent to perennial grasses such as Sandberg bluegrass and bottlebrush squirreltail. Both of these perennials can initiate spring growth and become green and accessible to grazing animals before the winter rosettes of cheatgrass.[42] Livestock allowed access to such sites too early in the spring may graze almost exclusively on the perennials instead of the cheatgrass.[31]

Fall and Winter Grazing Opportunities

Grazing dormant cheatgrass or other annual grasses in late fall or winter reduces mulch accumulations and enhances seedling establishment of perennials.[21] Also, late fall grazing can target the fall germinating crop of annual grasses, prior to winter dormancy, thereby reducing the vigor of annual grasses the following spring. Grazing during winter dormancy has minor effects on perennial grasses as long as enough residue remains to insulate plant crowns from severe cold. Two-inch residual stubble heights are usually adequate after winter grazing. Browsing shrubs during winter will have minimal impact on shrub vigor as long as utilization does not exceed 50 to 60%.[12, 17, 22] In some areas, sagebrush or



Photos: The Weed Science Society of America

Young cheatgrass is green and palatable (above), but when the seedheads turn purple (below), the plant is less palatable and the seeds are viable. To prevent the seeds from becoming viable, cheatgrass needs to be grazed before the seedheads turn purple.

other shrub densities may need to be reduced to help perennial grasses and forbs compete with annual grasses. Shrub densities can be reduced with heavy sheep or goat grazing in late autumn (November and December) at stocking rates between 30 to 60 sheep or goat days per acre.[24, 30]

Animal Production Considerations

Although livestock performance is often a secondary objective in a targeted livestock grazing program, few livestock producers will agree to graze their animals to suppress annual grasses if meat or fiber production suffers greatly or variable production costs rise significantly. Grazing in the spring, before seed set and when annual grasses are relatively nutritious, should not materially hinder animal performance. Further, few annual grasses contain alkaloids, terpenes, or other aversive secondary chemicals sufficient to cause toxic effects or low palatability. One exception with cheatgrass is the susceptibility of its seed heads to ergot, a fungus that is poisonous to livestock.

Livestock perform well on annual grass diets in spring, producing weight gains similar to those from uninfested rangeland. For example, yearling ewes gained an average of 0.3 pounds a day from early April to mid May in southern Idaho.[31] Wethers grazing cheatgrass in northwestern Utah also gained 0.3 pounds a day during early May, but gained only 0.01 pounds per day during mid June.[6] Predictably, these weight gains followed the decline in nutritive content of cheatgrass as it matured. Crude protein content declined from 15.4% in early May to 8.2% at the end of May. During the same period, daily dry matter intake decreased from 3.3 to 2.3 pounds per head.[6] Yearling steers in spring gained 1.7 to 2.0 pounds per day on cheatgrass diets in southern Idaho.[32] Animals grazing dormant annual grasses will likely need energy and protein supplements to meet nutrient requirements.

Animals grazing mature or dormant stands of cheatgrass, Japanese brome, medusahead, ripgut brome, or several other annual grasses risk flesh or fleece damage from seeds with long, sharp awns. The awns can become embedded in an animal's nose or mouth, causing cysts and inflammation. In severe cases, these grass awns can penetrate the gums and jaw, causing irritation and infection in a condition called lump jaw. When embedded in fleeces, seeds and awns of annual grasses can reduce the commercial value of wool or hair clips.

Integrated Management

Targeted livestock grazing can be effectively integrated with prescribed fire, herbicides, or mechanical treatments to improve their efficacy. For example, fire removes excess mulch and reduces the number of annual grass seeds in the soil. This in turn greatly reduces the density of annual grass plants the next growing season. However, plants that do establish may produce so many more seeds per plant that total seed production for the site may actually increase by a factor as high as 100.[49] Targeted livestock grazing can be applied in the spring following a fall burn, reducing the vigor of the few annual grass plants that establish and preventing them from producing viable seeds.

Targeted livestock grazing also can be applied before artificial seeding in restoration efforts. Artificial seeding of depleted sites seldom succeeds unless invasive annual grasses are first suppressed. For example, cheatgrass at densities of 64 and 256 plants per square foot competes strongly with crested wheatgrass seedlings, but competes only moderately at cheatgrass densities of four and 16 plants per square foot.[9] Unless the seeded species becomes established and out-competes invasive annual grasses, the annual grass density may exceed pre-treatment levels within one to five years.[48] Prescribed livestock grazing can suppress invasive annual grasses before artificial seeding, especially on steep or rocky terrain or where predicted economic returns are low, and livestock can be used following broadcast seeding to help trample desired seed into the

ground.[16] A high stock density for a brief period on moist ground usually works best. If soils are too wet, excessive trampling damage and soil compaction will occur.

Prescribed fire often is used before artificial seeding to lessen competition between annual grasses and the new seedlings.[5, 37, 49] Targeted livestock grazing can be applied to remove annual grass seedlings that germinate after the fire, preparing the site for artificial seeding with desirable perennials. Drilling the site can be delayed until after the grazing treatment, or the site can be broadcast-seeded immediately before the grazing treatment so livestock can trample in the seeds. Ideally, the site should be re-grazed soon after new seedheads develop on annual grass plants that were grazed earlier in the spring. Similarly, targeted livestock grazing can suppress annual grasses before artificial seeding on sites that have been pre-treated with herbicides[10, 33] or disking.[35]

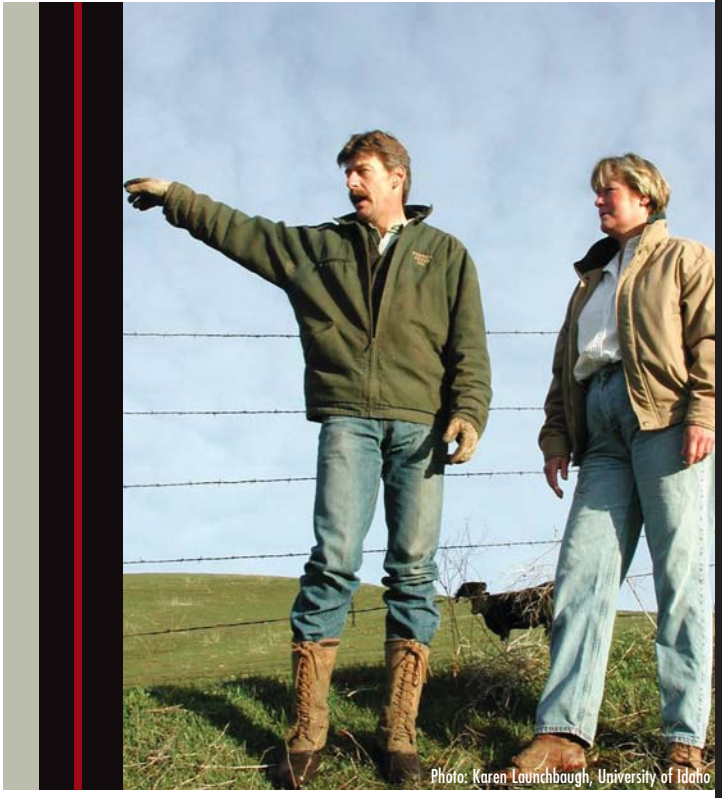


Photo: Karen Launchbaugh, University of Idaho

SUMMARY

Targeted livestock grazing can be used to suppress cheatgrass, medusahead, and other invasive annual grasses where these plants are considered weedy invaders. Yield, density, seed production, and mulch accumulations can be reduced, thereby favoring perennial plant species and improving biological diversity. Targeted livestock grazing also can favor perennial plants by disrupting fine fuel continuity, reducing fine fuel loads, and lengthening fire-free intervals. To limit seed production and yield of invasive annual grasses, livestock grazing should defoliate target plants twice in spring, separated by one to three weeks. Targeted livestock grazing should be repeated in spring for at least two consecutive years. Desirable perennials, if present, will likely suffer if spring grazing occurs for more than two years in a row. Also, targeted livestock grazing applied in winter can reduce the buildup of annual grass mulch to enhance seedling establishment of perennial plants. Livestock grazing to suppress invasive annual grasses is best suited to localized areas, either for protecting existing stands of perennial plants from fire or for aiding the artificial seeding of severely depleted sites. Targeted livestock grazing may work best when integrated with other rangeland restoration tools including prescribed fire, herbicides, disking, and seeding.

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