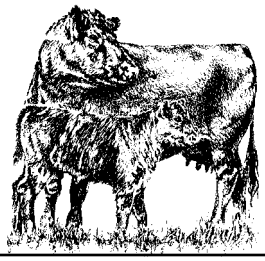

Western Beef Resource Committee *Fourth Edition*

Cattle Producer's Handbook

Range and Pasture Section 544

Targeted Grazing for Weed Control

Missy Merrill-Davies, Livestock and Natural Resources Advisor, University of California Extension
Josh Davy, University of California Cooperative Extension, Farm Advisor
Joe DiTomaso, University of California Cooperative Extension, Weed Specialist
Guy Kyser, University of California, Davis, Plant Sciences Department, Weed Specialist

Targeted or prescription grazing describes a method of manipulating foraging animals to achieve a desired effect. The difference between good grazing management and targeted grazing is the refocus of outcomes from livestock production (pounds of meat) to ecological and vegetative enhancement (Launchbaugh and Walker 2006).

As with any grazing system, it is important to first determine what the problem(s) is and define a set of achievable goals and objectives based on the desired outcome(s). A land manager and livestock producer must recognize not all goals will be synergistic, and some may even be antagonistic. For example, it may not be possible to graze yearlings to reduce cheatgrass and obtain 2 pounds of gain per head per day without supplemental feeding.

Land managers can use grazing animals to manipulate range vegetation by adjusting timing and stocking rates, modifying livestock behavior, and/or changing the types and classes of livestock used.

Timing

Timing is an important component of prescription grazing. One of the primary objectives of most targeted grazing systems is to give desirable plants a competitive advantage over undesirable plants, which can be accomplished through correctly selecting the timing of grazing.

The timing of grazing includes season of use and duration. The goal of targeted grazing is to damage the targeted species at the most vulnerable or susceptible time, thus making it less competitive and reducing growth and seeding potential.

When grazing to reduce undesirable plants, it is important to understand how the target plant responds to grazing in terms of regrowth, carbohydrate allocation, and how these responses are affected by environmental factors such as soil type and moisture availability. Ideally, target grazing occurs at the proper timing when plants are using stored carbohydrates, and moisture supplies have become limited. The greatest amount of success occurs when both factors are aligned. This is especially apparent in arid areas where the sensitive period coincides with water availability.

Plants are most tolerant of grazing when they have developed a strong root system but have not yet started the reproductive phase. Once they enter the reproductive phase, most plants exert a large amount of their carbohydrate reserves to complete reproduction. Thus, it is important to target undesirable plants during their most susceptible phase, which reduces their ability to photosynthesize and gain carbohydrate reserves more so than the desired species. This can occur when the weedy species shifts its carbohydrate allocation from vegetative and root growth to reproduction by grazing to reduce seed production or through heavy repeated grazing during vegetative growth to prevent carbohydrate allocation to root development, consequently shrinking the root system.

Annual plants are especially vulnerable during the time period just before seed set. Target grazing is usually applied at this timing when nutrient reserves are being depleted and the ability to adapt to damage or re-grow is decreased. If plant carbohydrates are optimally depleted, weed control is attained because the target plant does not have enough energy for full seed maturation (annuals) or in some cases dormancy (perennials).

A single session of grazing heavily during the reproduction phase may be successful if moisture is not abundant from rainfall at the time of grazing, or the area does not have heavy soils with high available

water storage. Significant rainfall or high available water storage soils may complicate target grazing because the plants are provided an avenue for recovery through an extended growing season. If this is the case, it may be required to target an area repeatedly in a single year for successful weed reduction.

In some years high success may not be possible if soil moisture persists past the grazing window of the target plant, which could be when the weed develops awns or the forage quality is depleted below animal requirements. In these cases grazing may need to be terminated before optimal plant control is attained, which may require multiple years of attempts to align proper timing of carbohydrate storage and available moisture depletion.

Timing of grazing can also affect the competitive advantage of desirable plants. For example, in a Mediterranean climate, grazing heavily during the reproductive phase of desirable forages such as soft chess (*Bromus hordeaceus)* and wild oats (*Avena* spp.), then pulling livestock can encourage some later maturing weeds such as starthistle (*Centaurea solstitialis*) and medusahead (*Taeniatherum caput-medusae*). The weeds are then left to flourish with the advantage of adequate soil moisture and no competition.

In contrast, in some mountain environments, cheatgrass can be grazed as it matures earlier in the season than some native perennial grasses. The earlier maturing cheatgrass is impacted heavily while it is maturing, but the desirable native grass is rested later in the growing season as it matures, thus allowing continuation of the native stand of grass.

Behavior

Modifying the behavior of animals to increase concentration in specific locations can achieve targeted grazing goals. This can be accomplished through different methods such as: stocking rate, herding, supplementation, fences, and introduction to novel feedstuffs.

Stocking Rate—Increasing stocking rate (number of animals over a given length of time) is one way to control the ability of grazing animals to avoid target plants (weeds), which are generally less palatable than non-target plants. Higher stocking rates increase competition between individual animals and encourage uniform vegetation use, regardless of palatability. However, higher stocking rates also require more intensive management than traditional grazing, including frequently moving animals to reduce pressure on non-target plants.

Herding—Herding has been in use as a method to modify grazing animals for centuries. Herding is effective in areas where fences may not be feasible, but this strategy does require more labor inputs. This is because the herding method requires a range rider to be present with the livestock much of the time in order to keep them in the desired area. With this strategy, the rider replaces fencing with their time by physically preventing livestock from leaving a desired grazing area. Once a target grazing pressure is achieved, the rider moves the livestock to a different site. In one example, Bailey et al. (2008) successfully employed herding to increase the amount of time cattle spent in upland areas compared to lower riparian areas that cattle traditionally preferred.

Supplementation—Supplementation can be used as an effective tool to concentrate animals on a problematic area. Depending on the terrain and management level, supplementation may be low-moisture blocks, pellets, alfalfa, molasses, or any other agent that draws animals to the area. Supplementation may also be necessary to correct for nutritional deficiencies in targeted vegetation.

When grazing large areas, it is important not to move supplement more than 400 yards from its previous location, or to herd cattle to the supplement so they can be familiarized with its location. The effectiveness of supplementation, in terms of distribution, may be limited to a small range around the supplement. In some cases, only the direct area around the supplement tubs may show impact because the animals simply disperse again once supplement consumption ceases (Larson et al. 2008). Thus, other methods of behavior modification may need to be employed such as herding or fencing to keep animals concentrated on the targeted vegetation.

Fences—Fencing is a direct method of concentrating animals for targeted grazing. Fencing has a large advantage over the other methods of target grazing because it has the ability to 100 percent contain livestock in the target area. No other method can be this strict in establishing an exact stocking rate over the target grazing area. This allows the vegetation management of the given area to be the most uniform of all methods. Additionally, once the fences are established, the labor to keep the livestock in is less than methods such as herding. A major disadvantage is that fencing requires a great deal of capital investment.

Electric fencing is probably the best option to use because targeted grazing tends to be temporary, not permanent. Solar powered electric fence energizers make operating temporary or permanent electric fencing possible in even the most remote locations. Electric fencing has the advantage of being much cheaper and faster to construct compared to conventional barbed wire permanent fencing. It has a disadvantage of requiring animals to be trained for it to work because it is more of a psychological barrier than an actual physical barrier. Additionally, electric fences are easily "shorted out" requiring more maintenance than a conventional fence to ensure that adequate voltage is maintained for deterring stock.

A fence is "shorted out" when something causes the wire to come in contact with an object that is also in contact with the ground. An example is a metal fence post. When this happens the voltage in the fence, along with its ability to turn animals, is lost. Shorts have many causes such as livestock or wildlife hitting the wire causing an insulator to fall off a metal post, which causes the wire to directly contact the post. Fallen limbs hitting the fence are also common. These problems can take a lot of time to diagnose. More on electric fencing can be found in fact sheet 536.

Introduction to Novel (New) Feedstuffs—In many targeted grazing activities, animals are expected to eat novel or undesirable vegetation. It may be of some value to introduce the animals and/or their offspring to the forage source before taking them to the field. They will become more familiar with the vegetation and will more readily consume it. During the introduction phase, some method of enticement may be employed, such as mixing harvested knapweed with hay or spraying molasses on small noxious weed patches.

In some cases, aversion to some novel plants may be appropriate. This can be useful to keep animals from grazing novel toxic plants or to avoid novel plants that a manager does not want grazed, yet still be able to concentrate animals in the area of these plants. Ralphs and Provenza (1999) and Lane et al. (1990) fed lithium chloride at 200 mg/kg to livestock as they were introduced to the novel forage in a corral. In this case the novel forages were toxic plants.

Lithium chloride causes an upset stomach (emetic), which the animals associate with the novel feeds and avoid in the future when turned out. In California, researchers are currently using this aversion type of training to teach sheep to avoid grazing the vines in vineyards and concentrate on the understory grasses and forbs.

Type and Class

It is important to note that high pressure livestock grazing has the potential to negatively affect animal performance; therefore, despite meeting vegetation goals, targeted grazing may not be conducive with the immediate ranch economic goals. To minimize loss of profits, it may be necessary to use dry females or castrated males on targeted grazing projects.

Changing the species of grazing animal may also be necessary to reach vegetation goals in areas of multiple resource concerns (i.e., having undesirable broadleaf plants, shrubs, and grasses). The digestive system of grazing animals differs. Sheep and goats may be more suitable to consume browse than cattle. Additionally, cattle digest some toxins in plants much differently than sheep or goats and, thus, may be either immune or more susceptible to toxins present in the plant. An example of using multiple species is in the spotted knapweed section that follows.

Examples of Targeted Grazing Specific Undesirable Plants

Medusahead *(Taeniatherum caput-medusae)*—This grass can be timely grazed to reduce population numbers. Boot stage defoliation reduces root carbohydrates as they are being used for seed production. However, success can be variable depending on spring rainfall. The target time to graze this species is during the boot to early heading stages before the awns harden and palatability is reduced (Becchetti et al. 2008 and DiTomaso et al. 2008).

Although defoliating through the heading stage can be successful, mowing or burning are the only options for the heading stage because livestock will no longer consume the plant at later maturity. If soil moisture exists when the plant is reaching full maturity, it may not be possible to sufficiently graze medusahead as intensely as is necessary to prevent seed formation.

Yellow Starthistle *(Centaurea solstitialis)*—Late season grazing can be successful in reducing the population of starthistle in the same manner as medusahead (Thompsen et al. 1993). The difference in starthistle is that the proper timing is in the late bolting stage, which is later than the timing for medusahead. Additionally, it is usually necessary to repeat grazing treatments because the plants will continue to make seed again. An exception is if mowing (not grazing) is used during the early spine stages but before bloom (Benefield et al. 1999).

Targeted grazing too early in the bolting stage, or not repeating the process, will simply cause plants to head out at a lower height. This information is also valid for the closely related malta or tocalote starthistle *(Centaurea melitensis)*.

Spotted Knapweed *(Centaurea stoebe)*—Sheep find spotted knapweed more palatable than cattle. In many instances desirable grasses and spotted knapweed reach maturity, the carbohydrate depletion stage, at the same time. Consequently, adequate consumption of knapweed by cattle to prevent knapweed seed production can negatively affect desirable grasses because cattle will consume the grasses before consuming the knapweed. To avoid harming the grasses, cattle can be used to graze the bulk of the knapweed and then followed by sheep to effectively prevent seed production and cause minimal harm to desirable grasses (Henderson et al. 2012).

Cheatgrass or Downy Brome *(Bromus tectorum)*—Cheatgrass has developed a competitive niche in its environment that is different than starthistle or medusahead. This grass matures early, thus ensuring that it does not run out of available soil moisture before seed maturation. Even with this adaptation, target grazing can still be used for cheatgrass infestations if employed correctly.

Heavy defoliation of cheatgrass while it is in the boot stage (just before seedhead emergence), followed by a repeat defoliation 2 weeks later, can greatly suppress seed production (Mayer and Pyke 2008). The advantage of this method is that it can be accomplished without causing permanent damage to native perennial grasses that mature later than cheatgrass.

Conclusion and Additional Information

This is a summary of a broad site and plant specific subject. Targeted grazing can play a part in sustainable ecosystems and enhancing vegetative components of landscapes. A myriad of factors contribute to the success or failure of prescription grazing. These may include, but aren't limited to, timing and amount of precipitation, soil type, climate, and species involved.

Important is to understand both animal behavior and plant physiology before embarking on the undertaking to prevent either an economic or ecological disaster. Land managers must know how their animals will act and react to the situation along with specifics on the species of concern to fully develop an effective grazing system.

Targeted grazing requires land managers and owners to monitor sites and be diligent about recording the results and using adaptive management. It is important to be patient when using livestock to control noxious weeds.

The links below are valuable sources for more specific information on weeds, animal behavior, and soils.

University of California Weed Research and Information Center: http://wric.ucdavis.edu/

University of California Integrated Pest Management: http://www.ipm.ucdavis.edu/

Oregon State University Weed Science: http://cropandsoil.oregonstate.edu/weeds/publications

Utah State BEHAVE program: http://extension.usu.edu/behave/

New Mexico State livestock and range publications: http://aces.nmsu.edu/pubs/_b/

USDA web soil survey: http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm

References

Bailey, D. W., H. C. Van Wagoner, R. Weinmeister, and D. Jensen. 2008. Evaluation of Low-Stress Herding and Supplement Placement for Managing Cattle Grazing in Riparian and Upland Areas. Rangeland Ecology & Mgmt. 2008 61(1), 26-37.

Becchetti, T. A., C. Schriefer, J. Zhang, C. Cherr, J. M. Harper, M. P. Doran, S. R. Larson, S. Barry, J. S. Davy, R. Larsen, L. C. Forero, and E. A. Laca. Controlling Medusahead: Identifying the Period of Susceptibility. Accepted 2008 Joint Meeting of the Society for Range Management and the American Forage and Grassland Council (Jan. 26-31, 2008).

Benefield, C., J. M. DiTomaso, G. B. Kyser, S. Orloff, K. Churches, D. Marcum, and G. Nader. 1999. Success of Mowing to Control Yellow Starthistle Depends on Timing and Plant's Branching Form. California Ag 53(2):17-21. DOI: 10.3733/ca.v053n02p17.

DiTomaso, J. M., G. B. Kyser, M. R. George, M. P. Doran, and E. A. Laca. 2008. Control of Medusahead Using Timely Sheep Grazing. Invasive Plant Science and Management 1:241–247.

Henderson, S. L., T. K. Mosley, J. C. Mosley, and R. W. Kott. 2012. Spotted Knapweed Utilization by Sequential Cattle and Sheep Grazing. Rangeland Ecol. Mgmt. 65:286–291 DOI: 10.2111/REM-D-09-00194.1.

Lane, M. A., M. H. Ralphs, F. D. Olsen, F. D. Provenza, and J. A. Pfister. 1990. Conditioned Taste Aversion: Potential for Reducing Cattle Loss to Larkspur. J. of Range Mgmt., 43(2), 127. doi:10.2307/3899029.

Larson, S. R., J. M. Harper, T. A. Becchetti, M. P. Doran, S. Barry, J. S. Davy, C. Cherr, C. Schriefer, J. Zhang, and E. A. Laca. Grazing Strategies to Control Medusahead on California Rangelands. Accepted 2008 Joint Meeting of the Society for Range Management and the American Forage and Grassland Council (Jan. 26-31, 2008).

Launchbaugh, K., and J. Walker. 2006. Targeted Grazing Handbook. American Sheep Insitute. Found at http://www.cnr.uidaho.edu/rx-grazing/handbook.htm.

Mayer, K. H., and D. A. Pyke. 2008. Defoliation Effects on Bromus Tectorum Seed Production: Implications for Grazing. Rangeland Ecology and Management: Vol. 61, No. 1, pp. 116-123.

Ralphs, M. H., and F. D. Provenza. 1999. Conditioned Food Aversions: Principles and Practices, with Special Reference to Social Facilitation. Proceedings of the Nutrition Society, 58, 813–820.

Thomsen, C., W. Williams, M. Vayssiéres, F. Bell, and M. George. 1993. Controlled Grazing on Annual Grassland Decreases Yellow Starthistle. California Ag 47(6):36-40. DOI: 10.3733/ca.v047n06p36.

Fourth edition; December 2016 Reprint