CHAPTER 13:
Targeted Livestock Grazing for Wildlife Habitat Improvement

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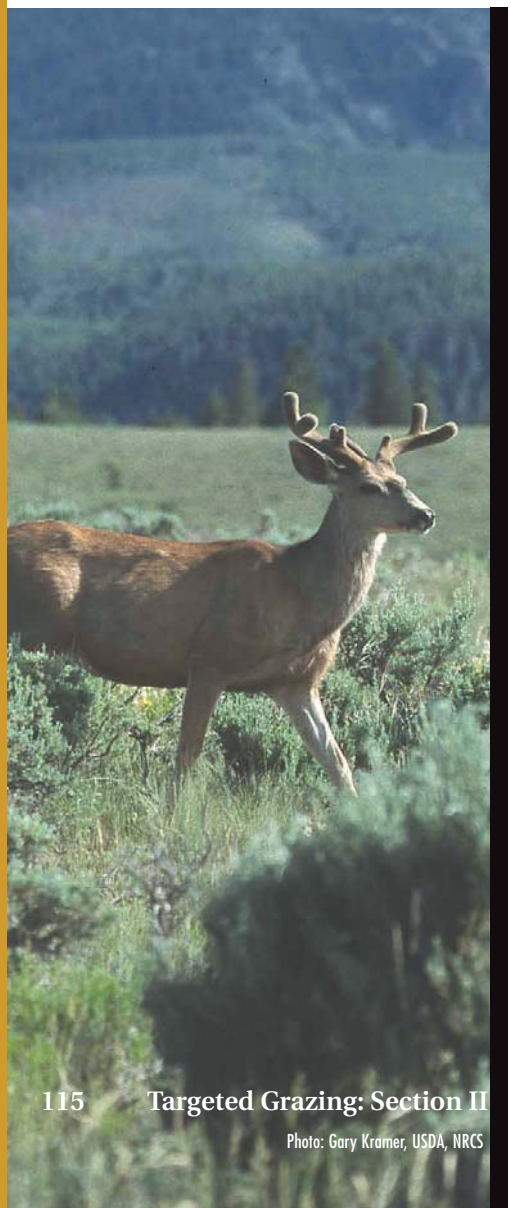

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10 KEY POINTS

- Some land managers have successfully used livestock grazing for many years to improve wildlife habitat, but this tool has not been widely applied.
- When wildlife habitat is altered, it is improved for some species and degraded for others.
- The maximum size of a wildlife species' population is limited by its poorest habitat essential (food, water, cover, or space).
- Unless the limiting habitat factor is improved, efforts to enhance targeted wildlife populations will fail.
- Success or failure depends on the land manager's ability to predict and control diet selection and grazing distribution of the livestock.
- Targeted livestock grazing can be used to enhance yield, accessibility, and nutritive quality of wildlife forage and alter cover, structure, and diversity of vegetation.
- Heavy grazing pressure in plant communities dominated by grazing-tolerant species can increase plant diversity.
- Grazing prescriptions must include strategies to mitigate impacts on wildlife from trampling and other disturbances.
- Livestock should be treated for parasites to avoid transfers to wildlife.
- Fencing used to manage livestock should be built with the needs of wildlife in mind.

INTRODUCTION

Food, water, cover, and space are the habitat essentials for wildlife. The quality of habitat is defined by how well the land provides these essentials. That quality, in turn, determines the vitality, numbers, and species of wildlife present on the land.

Many tools are available to improve wildlife habitat, including tree harvest, root plowing, chaining, seeding, and applying fertilizer and herbicides. Some of these traditional tools, however, are expensive and less socially and environmentally accepted than in years past. Prescribed fire is a useful tool, but increasing concerns about air pollution and risk of escape may limit its future use. Prescribed, or targeted, livestock grazing or browsing is another tool that can be used to purposely manipulate the environment to improve habitat for wildlife.

Using livestock grazing to improve wildlife habitat is not a new idea. The concept was introduced into the scientific literature in 1933 by Aldo Leopold, the father of wildlife management in North America.[39] Others have followed Leopold and promoted this tool,[43, 62, 71, 72] but few managers have applied targeted livestock grazing to improve wildlife habitat. Most who have successfully implemented the practice have been forced to develop their own strategies through trial and error. While trial and error can be a good teacher, it is not the most efficient. The goal in this chapter is to synthesize the existing knowledge about how to use grazing or browsing by livestock, particularly sheep or goats, to enhance wildlife habitat in North America.

Vegetation Management Opportunities

Enhancing wildlife habitat is a noble goal. A difficult reality, however, is that it is impossible to maximize the habitat quality of all wildlife at the same time. Trade-offs must be considered. This is because the particular combination of food, water, cover, and space required by a specific wildlife species (i.e., its niche) is unique. Any time the habitat is altered, it is improved for some species, yet simultaneously and inevitably degraded for others.

Habitat Essentials and the Limiting Factor

The enhancement or degradation of habitat does not always affect a wildlife species' ability to survive, thrive, and reproduce. Improvement or degradation only affects a wildlife species when the habitat essential that is improved or degraded is the limiting factor for that species. Consider a wooden barrel with four slats (Figure 1, see next page). The maximum volume of liquid the barrel can contain is determined by the height of the lowest slat. In similar fashion, the maximum size of a species' population that can exist on the land is limited by the poorest habitat essential. If the limiting habitat essential is food, as in Figure 1, improvements to the water, cover, or space essentials will not affect the species' population. Similarly, degradation to water, cover, or space will not affect the population unless the degradations are so severe that one of these habitat essentials replaces food as the limiting factor. Habitat manipulations only affect a population when the species' limiting factor is enhanced or degraded.

It is also important to know which specific characteristic of the habitat essential is limiting the population. For example, if food is the limiting factor, what is it about the food that is limiting? Is it the quantity, accessibility, or nutritive quality of the available food that is limiting the population, and does this limitation occur in one or more seasons of the year? Consider a situation where the protein content of winter food is limiting (Figure 2, see next page). In this case, habitat improvement practices that improve the quantity, accessibility, or energy content of available food might be well-intended, but these habitat alterations would have no effect on the targeted wildlife species. Positive effects will occur in this example only if a habitat improvement project enhances the protein content of the food available in winter.

The examples in Figures 1 and 2 illustrate the importance of correctly identifying the limiting factor before initiating a project to improve wildlife habitat. Unless the limiting factor has been correctly identified, efforts to enhance targeted wildlife populations will fail. A knowledgeable wildlife biologist or wildlife habitat specialist can help identify the habitat's limiting factor (i.e., the weakest link) for a particular wildlife species in a specific place and time. Once the limiting habitat

Figure 1. Wildlife poplulation size is limited by the poorest habitat essential. For the four-slatted wooden barrel depicted to the left, food is the limiting factor.

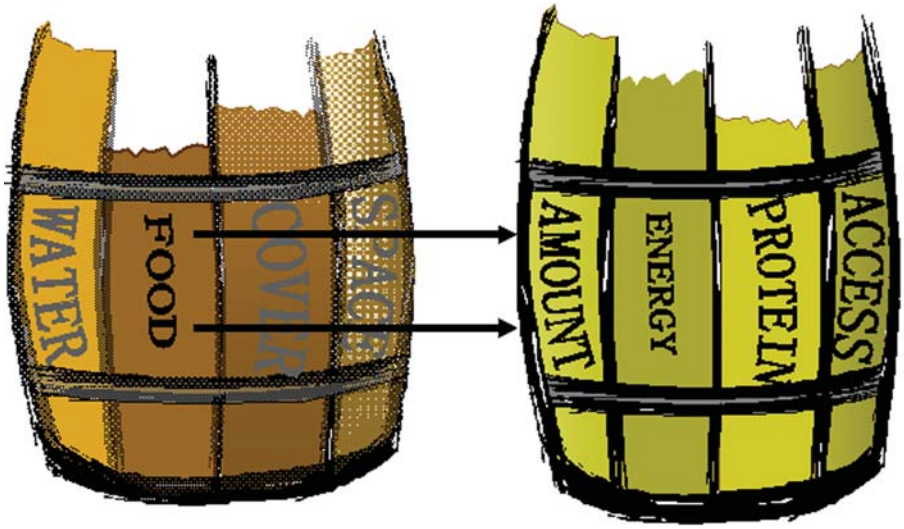

Figure 2. In the four-slatted wooden barrel depicted to the right, protein content is more precisely identified as the characteristic that is causing food to be the limiting factor, rather than food quantity, energy content, or accessibility.

factor is identified, targeted livestock grazing potentially can be used to address the limitation.

Biological Diversity

One possible objective for improving wildlife habitat is to promote biological diversity. This approach reduces the importance of knowing the limiting factor for one or more species and the need to make value judgments about which species of wildlife to favor at the expense of others. Rather than focusing on improving the habitat for a particular species, the goal becomes promoting habitat diversity to improve wildlife habitat overall. Biological diversity is maximized by providing a diverse array of habitat features, in varied patterns, across the landscape. Biological diversity is favored by mixtures of plant communities composed of varied plant species, vegetative cover and structure, plant ages, and plant densities. Targeted livestock grazing is a viable tool for creating or maintaining such diversity because: 1) various species of livestock can consume many different plant species and plant parts, 2) livestock can traverse many topographic landforms, 3) livestock grazing requires low fossil fuel inputs, and 4) the grazing locations of livestock, especially sheep and goats, can be controlled on the landscape without fences, if desired.

Criteria for Animal Selection

What, when, where, and how livestock graze or browse will determine whether the targeted wildlife habitat approaches the desired condition. The success or failure of using livestock grazing to enhance wildlife habitat depends on the land manager's ability to predict and control the animals' diet selection and grazing distribution. *(Additional information about using animal behavior principles to achieve targeted grazing goals is presented in Chapter 2 – "Animal Behavior Principles and Practices.")*

Lambs, wethers, and yearling ewes may be more likely to ingest woody plants than ewes,[18] but goats typically consume more browse than sheep.[9, 41] Both sheep and goats will readily consume grass-dominated diets when grasses are succulent or when other forages are unavailable.[41] Forb consumption by sheep and goats tends to increase as forb availability increases.[9, 10] Cattle and horses usually eat grass-dominated diets when grasses are available.[73]

Livestock usually select foods that limit unpleasant sensations to the animal. Plant parts that are tender, succulent, readily visible, and pleasant smelling and/or tasting are usually selected over those that are coarse, dry, obscure, and obnoxious smelling and/or tasting.[2]

Armed with this knowledge, a resource manager can survey the vegetation on a site at a specific point in time and reasonably predict which plants livestock will readily consume.

Livestock graze more selectively within plant communities and across landscapes that have diverse vegetation[77] and topography.[2, 73] Dense stands of vegetation of similar palatability will be grazed more uniformly.[2] Close herding or high stock densities also decrease grazing selectivity.[18, 60] However, vegetation with large relative differences in palatability must be watched carefully when grazed at high stock densities. In these situations, the most palatable plants and preferred foraging sites are often grazed heavily before the livestock select less desirable options.

Fast herding also decreases selectivity of grazing by livestock,[18] but may not promote uniform grazing pressure across plant species. For example, fast herding through sites with showy, readily accessible flowerheads may force animals to primarily consume the flowers because that is largely what they are able to select when traveling rapidly through a site.

Grazing selectivity can be altered by controlling the hunger level of livestock before they enter a site to be grazed and by controlling the time of day when livestock are allowed to graze an area. Hungry animals are usually less selective, which may help explain why livestock that graze in the morning tend to be less selective than animals grazing in the evening.[18, 36, 74]

The types of forage that livestock have been grazing immediately before they enter a site can also affect their diet selectivity. If livestock have been grazing highly palatable vegetation, they will be more selective when foraging, whereas livestock that have been grazing less attractive vegetation are usually less selective when entering a new site.[59] The type of forage they have been recently grazing may affect diet selection in other ways. Consumption of forbs or browse containing toxins, for example, is usually greater after livestock have been eating grass-dominated diets for two to three days prior. It is believed that grass may help buffer the toxins and enable livestock to consume them in higher concentrations.[75] Finally, livestock are also more likely to consume plant species with which they are familiar. Using animals unaccustomed to an area often results in diet selection patterns that differ from those of animals more familiar with the vegetation and terrain.[52]

Grazing Strategies to Meet Ecological Objectives

Targeted livestock grazing can be used to change the plant species composition, yield, accessibility, nutritive quality, cover, structure, or diversity of the vegetation. The effects depend largely on the timing, frequency, intensity, and selectivity of grazing.

Plant Species Composition

Targeted livestock grazing can change the plant species composition by altering the competitive interactions among plants. For example, summer sheep grazing in mountain meadows can increase the relative abundance of grasses and sedges,[5, 6] which are important elk forages in these habitats.[68] In sagebrush steppe, heavy sheep grazing in spring and early summer can reduce grasses and forbs and increase sagebrush,[37] which enhances the winter food supply for mule deer, pronghorns, pygmy rabbits, and sage-grouse.[16, 26, 27, 31, 61] If heavy spring sheep grazing continues for several years, weedy forbs, which are an important food source for juvenile sage-grouse,[16] can increase.[45] Heavy periodic goat browsing of Gambel oak in summer also can be used to increase the abundance of sagebrush for sage-grouse, wintering mule deer, and other species.[55, 56] Grazing and browsing guidelines to alter plant species composition to meet desired habitat conditions are summarized in Table 1. These guidelines can be used to select and implement the appropriate grazing strategy to favor the desired plant life form (e.g., bunchgrasses, rhizomatous grasses, shrubs, weedy forbs, or non-weedy forbs).

Table 1. Targeted grazing and browsing strategies used to favor different life forms and alter species composition of a plant community.

Desired Life Form	Grazing Strategies
Bunchgrasses	Late season grass and forb use or late season shrub use
Rhizomatous Grasses	Early season grass and forb use or late season shrub use
Shrubs	Growing season grass and forb use or dormant season grass and shrub use
Weedy Forbs	Extended early season grass and forb use
Non-weedy Forbs	Late season grass and shrub use

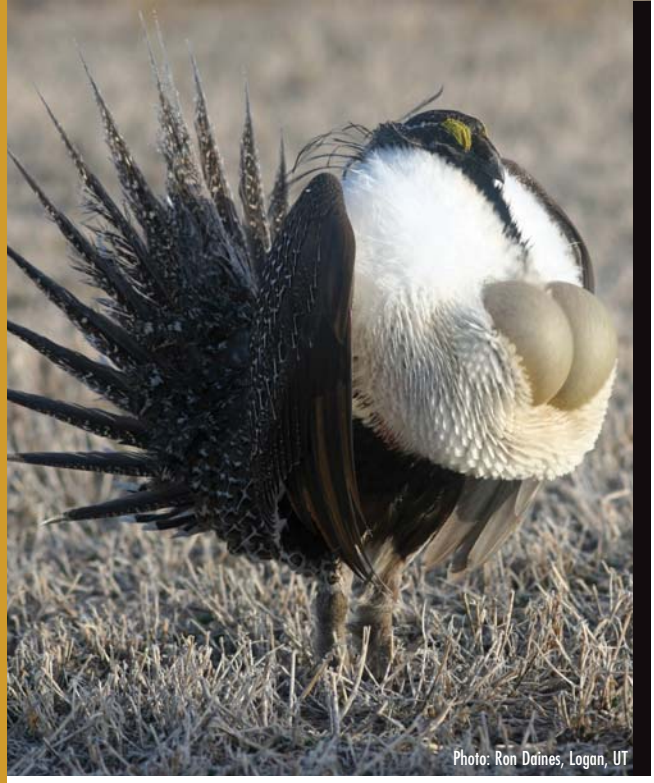

Photo: Ron Daines, Logan, UT

Forage Yield, Accessibility, and Nutritive Quality

Targeted livestock grazing can be used to enhance the yield and accessibility of wildlife forage. Bitterbrush, for example, is important forage for mule deer on many winter ranges, but it often grows too tall to be accessible to mule deer.[38] Also, if not browsed sufficiently, bitterbrush production declines.[69] Targeted livestock browsing can keep bitterbrush forage within reach of deer and can increase the production of nutritious twigs. Livestock should browse bitterbrush in spring until it sets seed, and bitterbrush should receive a season of rest every four or five years.[29]

Wildlife access to nutritious forage can be improved by targeted livestock grazing. For example, grazing livestock in spring can remove excessive standing dead material from grasses and enhance the nutritive quality of available forage. Removing this dead material allows plants to green up earlier the following spring, which enables deer and elk to shift their diets to succulent, more nutritious grass growth earlier in spring.[54, 66] This is important for wild herbivores because their winter mortality and reproductive failure is often caused by limited forage quality rather than forage quantity.[78] Removing dead grass in spring also makes forbs, low-growing shrubs, and grasses more accessible to deer and elk in autumn and early winter, which enables wild herbivores to delay consumption of key winter browse species until more critical periods later in winter.[24]

Forage nutritive quality is often enhanced in subsequent seasons when forage plants are preconditioned by light to moderate grazing in spring or early summer. In the northern Rocky Mountains, for example, moderate sheep grazing in spring has been used to improve the winter nutritive quality of bluebunch wheatgrass and Idaho fescue, important forage resources for elk and mule deer.[11] Additionally, moderate sheep browsing in early summer has been used to improve winter browse quality for elk and white-tailed deer,[1] and elk in winter-early spring prefer to forage in foothill and mountain grasslands where cattle have grazed moderately during the previous summer.[15]

Plant Cover and Structure

Some wildlife species expend more energy and become more stressed if vegetative cover is too sparse, forcing them to maintain greater vigilance for predators. Targeted livestock grazing can be used in these situations to promote plant growth, especially of shrubs. Other species of wildlife, however, rely on their ability to *"see and flee"* as their primary mode of predator defense. These species are best served if plant cover does not restrict their vision. Targeted livestock grazing can be used to increase visibility. For example, the long-billed curlew, a ground-nesting bird, prefers areas where vegetation is 4 inches high or less and curlews often confine their nesting activities to sites that have been grazed recently by livestock.[4] Other bird species that prefer very short vegetation and can benefit from heavy prescribed grazing include the mountain plover[25] and the horned lark.[13]

Many wildlife species require relatively dense hiding cover for rearing offspring. Where precipitation is scant and vegetation is sparse, these wildlife (e.g., desert tortoise) need some areas on the landscape to remain ungrazed year after year. In landscapes that receive plentiful moisture for plant growth, such as tallgrass prairie, coastal grasslands, or riparian meadows, habitat for rearing young may benefit from rotational grazing systems where only some of the habitat is ungrazed for a year or less at a time. Prairie chickens, wild turkeys, and sage-grouse are examples of species that can benefit from this strategy.[8, 16, 33] Many small mammals, such as ground squirrels, jackrabbits, cottontail rabbits, deer mice, and pocket mice, also benefit from opening dense plant canopies.[51, 64] Increased populations of small mammals, in turn, improve the prey base for eagles, hawks, and other raptors. In brood-rearing habitat, sage-grouse prefer lower vegetation (i.e., 2-6 inches vs. 12-20 inches) created by moderate cattle grazing on meadows.[38, 46] Dense, ungrazed vegetation is avoided by sage-grouse[34] as are heavily grazed meadows,[22, 34, 46, 47] but sage-grouse are attracted to succulent forb growth stimulated by moderate cattle grazing.[22, 46]

Height and patchiness of plant cover combine to partially define the different types of plant structure favored by wildlife species. For example, among grassland birds, Leconte's sparrows favor plant cover that is tall and uniform, horned larks favor plant cover that is uniformly short, western meadowlarks favor cover that has mixed heights, and lark buntings favor plant cover that has tall patches and short patches intermixed.[13] Grazing and browsing strategies for creating these plant structures are summarized in Table 2.

Table 2. Targeted grazing and browsing strategies used to alter vegetative structure of a plant community.

Desired Structure	Grazing Strategies
Tall / Uniform	No grazing or light use
Short / Uniform	Moderate to heavy use with low selectivity among plants
Mixed Tall & Short / Uniform	Moderate use with moderate selectivity among plants
Tall & Short / Patchy	Light to moderate use with high selectivity among plants

Plant Species Diversity

As mentioned earlier, one habitat management goal might be to increase plant species diversity, a goal that can be achieved with targeted livestock grazing. In plant communities dominated by grazing-tolerant species, plant species diversity is often increased by moderate to heavy grazing intensities, an effect that is more pronounced in moist climates. In communities dominated by plants that are more sensitive to grazing, plant species diversity is often increased by low grazing intensities.[42] These effects, however, also depend on how selectively the animals graze and whether they ingest plant species that are competitively dominant or inferior. If livestock selectively consume competitively dominant plants and the grazing intensity is sufficiently high, plant species diversity will likely increase.[27, 28] For example, when livestock grazing suppresses a noxious weed such as leafy spurge, grasses flourish and diversity increases.[49] However, if livestock selectively consume competitively inferior plants, plant species diversity may decline even with moderate grazing intensity.[3, 28] For example, bluebunch wheatgrass plant vigor is reduced by moderate early summer sheep grazing when it occurs for three or four successive years.[11, 76] Effects of grazing on competitive relationships between plants will be lessened when grazing occurs during plant dormancy. Grazing and browsing guidelines to increase plant species diversity are summarized in Table 3.

Table 3. Targeted grazing and browsing strategies used to increase species diversity of a plant community.

If Dominant Plant Species Are:	Grazing Strategies
Grazing Tolerant	Moderate to heavy use
Less Tolerant to Grazing	Light use
If Livestock Preferentially Select:	**Grazing Strategies**
Competitively Dominant Plants	Moderate to heavy use
Competitively Inferior Plants	Exclusion or light use

Other Management Considerations

All techniques used to improve wildlife habitat have disadvantages, and targeted livestock grazing is no exception. The principal negative impacts to wildlife from livestock grazing are trampling, social intolerance, parasite/disease transmission, and fences. Strategies to mitigate potential negative impacts should be included in livestock grazing prescriptions for enhancing wildlife habitat.

Trampling

Livestock trampling rarely kills small mammals, reptiles, or birds, and nest destruction by trampling is also rare.[50, 53] However, the presence of livestock can cause ground-nesting birds to abandon their nests, and this is more likely to happen when livestock are congregated.[50, 53] It is best to exclude livestock from prime nesting areas during egg-laying through incubation, but if livestock are not crowded excessively they are very careful where they place their feet and will avoid stepping on nests, young birds, and other wildlife. Livestock should be herded as loosely as possible, and herders should ensure that livestock avoid prime nesting areas when trailing livestock in spring. Sheep and goat bed grounds, water troughs, salt, or supplemental feed should be located away from prime nesting areas in spring. Herd dogs should be used sparingly because nest destruction and desertion will be more likely when livestock are startled and step without caution.

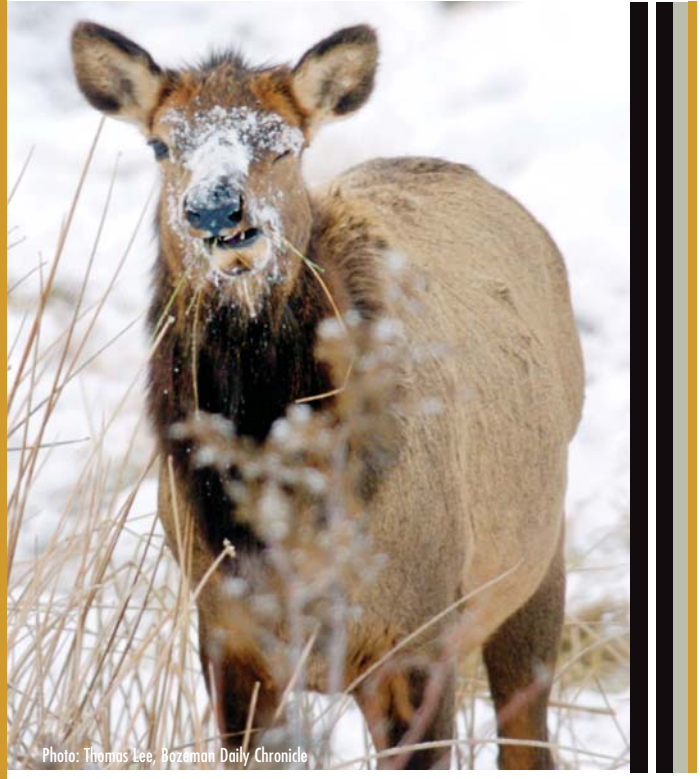

Photo: Thomas Lee, Bozeman Daily Chronicle

Social Intolerance

Livestock presence sometimes temporarily displaces wildlife into less favorable habitat. For example, elk may leave mountain meadows and forage in adjacent forests due to the arrival of sheep,[67] or elk may simply remain nearby and graze the meadow whenever the sheep are away from the meadow.[57] White-tailed deer, mule deer, and elk usually ignore cattle, but deer and elk avoid large concentrations of cattle.[14, 63, 80] Domestic sheep, cattle, and horses are socially dominant over elk, mule deer, bighorn sheep, pronghorns, and white-tailed deer.[44] The relative social rank of goats and wildlife has not been studied extensively in North America.

Prescriptive grazing programs to enhance wildlife habitat should minimize noise and potential disturbances caused by herding dogs, herders, camp tenders, and vehicles, and many of the same husbandry practices that limit trampling impacts also minimize social intolerance conflicts. Loosely herded livestock, for example, are less likely to displace wildlife. Pronghorns are one species that often associates with loosely herded livestock, and the mere presence of livestock does not cause pronghorns to leave an area.[12, 21] At fawning time, however, a closely herded band of sheep can sometimes cause pronghorn does and their fawns to become separated and fawns to be abandoned.[21] Livestock grazing should be timed to minimize disturbance to desired wildlife during fawning and calving. Sites where livestock congregate, such as bed grounds, water troughs, salt, or supplemental feed, should not be situated in prime fawning or calving habitat. When wildlife habitat objectives require livestock to be concentrated at high densities, a rotational grazing system will decrease social intolerance conflicts by always providing areas without livestock. Many species of wildlife, including bighorns, deer, elk, and pronghorns, often adapt and habituate to the presence of livestock as long as the wildlife's needs for food, water, and cover are met.

Parasites and Diseases

Parasite transfers between livestock and wildlife are not a serious threat or problem, except when livestock have high levels of internal parasites. Internal parasite transfers can be avoided by routinely treating livestock with a broad spectrum anthelmintic.

Disease transmission from livestock to wildlife is not usually a concern except between domestic sheep and bighorns. This concern is not surprising because the two species are very closely related and are susceptible to many of the same diseases. However, many bighorn herds have coexisted with domestic sheep for decades without the loss of bighorns, and bighorns commonly fraternize with many mammals, including sheep, horses, cattle, elk, mountain goats, and especially mule deer.[65] Some declines and die-offs of bighorns have occurred in populations that had no association with domestic sheep.[40, 81]

The most common pathogens associated with bighorn die-offs have been pneumophilic (pneumonia-causing) bacteria such as *Pasteurella* spp. or *Mannheimia* sp. This has been true regardless of whether bighorns have had contact with domestic sheep. Pneumophilic bacteria are frequently isolated from healthy bighorns[20, 48] and may, in at least some cases, genetically differ from strains carried by nearby domestic sheep.[79] High bighorn density, poor nutrition, adverse weather, and human harassment can stress bighorns, lower their resistance to bacterial pneumonia, and initiate die-offs.[17, 23] Prescriptive grazing programs should minimize disturbance of bighorns. Much remains unknown about disease transmission by sheep and its effects on bighorns, and research is continuing to address these questions. Current knowledge suggests that "nose-to-nose" contact between sheep and bighorns is required for transmission of pneumophilic bacteria. Sheep husbandry practices that minimize the risk of transmission include night penning and keeping close account of all domestic sheep.

Fences

When herding is not used, targeted livestock grazing will require fences. Fences should be constructed in ways that limit their impacts on wildlife. If possible,

avoid using permanent fences with net or woven wire that can restrict the movements of some wildlife. Permanent fences should be as short as possible (< 48 inches total height) to make it easier for wildlife to jump or fly over, and the space between the two top wires on a wire fence or between a top wire stretched above woven wire should be 8-10 inches. This gap reduces the likelihood that wildlife hitting the top wire when jumping will become entangled in the fence. With wire fences, the bottom wire should be at least 16 inches above the ground, and a smooth bottom wire is preferred for wildlife species that crawl under, rather than jump over, fences. Electric fences charged at 0.5-4.5 joules will not harm pronghorns, elk, or mule deer.[32]

Wildlife conflicts with fences will be reduced when fences are visible. Wire fences can be made more visible by using white-topped steel fence posts, and newly constructed wire fences can be made more visible by temporarily tying white cloth or flagging to the top wire. Wooden fences, such as log-worm, log-rail, and log-block,[19, 58] reduce conflicts because they are more visible and usually easier for wildlife to cross. At traditional crossing points along wire fences, the top wire can be lowered or the top wire can be replaced with a wooden pole set slightly lower than the top wire.[35] Gates also can be left open when not needed to control livestock.

Lay-down or let-down fences can be used where wildlife commonly cross a fence. In one type of lay-down fence, wires are attached to stub posts or stays that stand upright on the ground next to permanent posts.[19, 58, 70] Wire loops attached to the permanent posts hold the stubs in place. Whenever the fence is not needed to control livestock movements, the fence can be laid flat on the ground by removing the stubs from the wire loops. Two other styles of let-down fence do not use stub posts. Instead, wires attach to permanent posts with removable staples[19] or specialized Davison fence clips[30] that enable each wire to be lowered separately.

Photo: Thomas Lee, Bozeman Daily Chronicle

Photo: Gary Kramer, USDA, NRCS

SUMMARY

Targeted livestock grazing is a low-cost, low-energy input tool for manipulating and improving the species composition, yield, accessibility, nutritive quality, cover, structure, or diversity of vegetation in ways that favor wildlife. It is important to recognize that altering vegetation will only enhance a wildlife population if the species' limiting habitat factor is improved. Trade-offs must be considered because it is impossible to maximize the habitat of all wildlife at once. Any habitat alteration improves the habitat for some species but at the same time degrades the habitat for others. For these reasons, targeted livestock grazing practices that promote habitat diversity generally improve wildlife habitat overall. Significant improvements to plant standing crop, plant accessibility, and nutritive quality can occur with one year of targeted grazing. Changes to plant species composition usually require at least three to five years in riparian areas and five to 20 years in upland sites. Areas of low precipitation or land in poor condition may require 20-50 years or more for significant improvement in plant species composition.

The timing, intensity, frequency, selectivity, and species of livestock can be adjusted and managed to purposely create habitat features that favor targeted wildlife species. These grazing strategies include:

Grazing Intensity

- Light to moderate grazing intensities (≤ 60% utilization) at low stock densities generally create or maintain vegetation patchiness, increase forage palatability, and promote greater plant diversity than heavy grazing or no grazing.

Timing and Frequency of Grazing

- Rotational grazing can be used to apply infrequent heavy grazing (once every three or four years) in late spring-early summer for brief periods (≤ three to four weeks) to 20-30% of the area each year.
- Rotational grazing can decrease the potential for conflicts by always providing areas without livestock.
- Targeted livestock grazing in prime calving and fawning areas for wild ungulates (e.g., elk, deer, pronghorns), or in prime nesting areas for waterfowl or upland birds, should be deferred until early summer.
- If deferment of targeted grazing in calving, fawning, and nesting areas is not possible, openly and calmly herded livestock will likely have minimal impacts.
- Palatability and nutritive quality of forage in autumn, winter, and spring will be best after a site is prescriptively grazed during the first half of the previous year's growing season.

Other Guidelines

- Bunchgrasses are favored by late season grazing, by selective grazing of forbs, or by selective browsing of shrubs.
- Rhizomatous grasses are favored by grazing early in the growing season, by selective grazing of forbs, or by selective browsing of shrubs.
- Most forbs and shrubs are favored by heavy grazing of grasses in spring or early summer.

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