

Livestock as a Tool FOR Biodiversity in the Sagebrush Steppe



Biodiversity, or the variety of plant and animal species in a given location, has declined in many areas in the West. For example, woody plants, such as sagebrush and juniper now dominate many western landscapes. These species have managed to out-compete the grasses and forbs that once shared the landscape in large part due to fire suppression and improper grazing. Grazing has facilitated the decline in diversity because 1) the numbers of grazers such as cattle and elk have increased, while mixed feeders and browsers such as sheep, goats, deer, and antelope have decreased giving woody plants a competitive advantage, and 2) livestock are often confined to the same area and repeatedly graze the same grasses and forbs, particularly during spring on sagebrush-steppe landscapes.

Why is biodiversity important?

Diverse ecosystems are generally more productive, in part because a variety of plant species captures water and nutrients more effectively. In addition, the more plant species on a landscape, the more stable and thus more resilient it is to environmental changes. Finally, diverse ecosystems provide a variety of nutrients and habitats for microbes, plants, and animals.

Rangelands decline as biodiversity declines. A decline in biodiversity adversely affects sagebrush-steppe ecosystems. As the number of sagebrush plants increases less water is available to support other plants. In addition, nutrient cycling, plant production, and herbivore nutrition are negatively affected

because sagebrush contains high levels of terpenes, compounds that are toxic to soil and rumen microbes and to ruminants. Sage grouse, pronghorn and mule deer populations also decline because the variety of foods and habitats they need are no longer available.

Now what? To reverse these trends in biodiversity, managers must decrease the abundance of sagebrush, and maintain a mixture of plant species. Grazing by livestock in the fall may be the most economical means to accomplish both objectives.

Enhancing Diversity. Sagebrush is not tolerant of grazing. Grazing by sheep during the fall, when grasses and forbs are dormant, decreases the abundance of sagebrush without harming grasses and forbs. In addition, providing sheep with supplemental nutrients increases sagebrush intake and shrub mortality. Sheep and goats supplemented with energy and protein eat nearly twice as much sagebrush as unsupplemented animals, because extra nutrients enable them to detoxify toxins in sagebrush.

The amount of supplement and number of animals per unit area (stock density) interact to affect intake of sagebrush that grows in dense stands. For example, in one experiment 40 ewes were fed a pound of supplement/head/day. The ewes grazed an acre and a quarter pasture for 15 days (stocking rate: 480 sheep-days/

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acre), and they ate 25% of the green biomass on sagebrush. When supplement was increased to about two pounds/head/day and 80 ewes grazed the same sized pasture for 6 days (stocking rate: 384 sheep-days/acre), they ate nearly all of the sagebrush on the pasture. The increased supplement and shorter period of time enabled sheep to eat more sagebrush.

What, when and how much to

supplement. Researchers at Utah State University have formulated a supplement to increase sagebrush use by mature sheep. This formulation is based on the supplement preferences of sheep browsing sagebrush. It contains 50% beet pulp, 30% corn, 5% soybean meal and 15% alfalfa (3.41 Mcal energy; 12% crude protein). They recommend feeding a pound of supplement/100 lbs of body weight and to feed half the supplement in the morning and the rest in the evening.

Timing of grazing. Fall grazing is key to manipulating sagebrush with livestock. Concentrations of terpenes in sagebrush are highest in late spring and summer. They begin to decline in the fall and reach their lowest levels in the winter. Thus, fall and winter grazing takes advantage of the lower concentrations of terpenes in sagebrush enabling animals to eat more sagebrush. Also, grasses and forbs are dormant in fall and therefore will sustain minimal damage even with the severe grazing at high stocking densities required to achieve high utilization of sagebrush.

Effects of grazing. In a recent study, sheep intensively grazed dense stands of sagebrush in the fall. The following summer, current annual growth of sagebrush decreased by 66% while grasses, forbs and other shrubs—winterfat, rabbitbrush, and horsebrush—increased by 43%, 60%, and 14%, respectively, compared to ungrazed plots. Sagebrush does not recover quickly after grazing. Therefore, the percentages of grasses, forbs and other shrubs are likely to increase even more in the future provided they are not overgrazed.

Managing for Diversity. Livestock can learn to mix nutrients and toxins to lessen the effects of toxins. Unfortunately, most grazing systems allow livestock to eat only the most preferred plants while avoiding unpalatable species. Under these systems sheep and cattle are unlikely to learn how to mix foods high in nutrients with foods high in toxins. In contrast, livestock repeatedly forced to eat all plants in an area may learn to eat mixtures of nutritious and toxic plants in ways that mitigate toxicity.

Whether or not animals eat unpalatable plants depends not only on an animals' experience with the plants but also on the community where they grow. Animals are more likely to eat unpalatable species if they grow in diverse communities. These communities provide nutrients for animals to detoxify the toxins in unpalatable species. In addition, animals are more likely to eat sufficient quantities of these species to control them if they make up a smaller percentage of an animal's diet.

Conclusion. At Deseret Land & Livestock, reducing sagebrush abundance on as little as 5% of the ranch appears to have significantly increased production and abundance of sage grouse and pronghorn. Thus, diverse plant communities facilitate diversity of animal species that forage and inhabit plant communities, which in turn helps to maintain the diversity of plant communities because of the increased diversity of animals. Thus, in such situations biodiversity begets biodiversity. By carefully planning the location and timing of grazing, livestock can be successfully used as a tool to enhance biodiversity while improving the bottom-line.

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