

Livestock and Big Game Forage Relationships

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In North America, rangelands support mixtures of large herbivore species that neither co-evolved nor evolved with the vegetation. Wild herbivores today are forced to exist in ecologically incomplete habitats (Cole 1971). Native animals are no longer able to exert preference for habitats or occupy historically used areas because many of the habitats have been altered or no longer exist. For example, low elevation winter ranges have become private crop or grazing lands, or have high density human populations, even cities. Land use practices such as grazing, log-

ging, recreation and roading may be disruptive to wildlife populations and alter summer range behavior. Ranchers commonly perceive elk grazing on winter range as reducing the forage available for livestock. Sportsmen resent livestock in areas they hunt and perceive livestock utilizing forage that would otherwise be available for more game animals.

Nutrition as a Driving Force

One of the major driving forces of wildlife behavior is nutrition. The breeding female is particularly sensitive to the availability of nutrients. The onset of estrus in the fall and ovulation, or multiple ovulation in some species, is contingent upon high forage quality. In the Western U.S., this means fall precipitation is

needed along with regrowth of forage. Fat reserves must also be put on at this time of year to help maintain the animal and fetus throughout the winter. Lactation imposes the highest nutrient demand on the female in spring after giving birth, and through the summer. With lactation, daily forage intake increases only 10%, but metabolizable energy demand increases 33%, so a higher quality diet must be consumed.

Prior to European settlement, animals met this demand by migration to areas of more plentiful and higher quality vegetation. The typical migration pattern is elevational. As the summer progresses, animals migrate to higher elevations where forage growth occurs later in the season and forage quality remains

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Encroachment of winter range by urban development.

high late into the summer. Disruption of this pattern may cause animals to return to winter range prematurely or to invade croplands in search of required nutrients. In areas where elevational gradients do not exist, or in dry years, animals may invade croplands as soon as native range forage quality drops below nutrient requirements. Big game have three areas of conflict with private farming and ranching operations: 1) use of cropland as high quality summer and fall range, 2) use of private rangeland in summer and fall as an escape from disturbance on public land, and 3) the use of private range and crop lands for winter range.

Diets of Herbivores

Large herbivores, either wild or domestic, attempt to meet their physiological needs for nutrients through selective grazing. Geist (1982) explained that animals live by the "law of least effort"; that is, necessary resources must be obtained with a minimum of effort in order to derive the most benefits (weight gain, milk production). The acquisition of nutrients either by increasing forage consumption or by increasing nutrient quality through selective grazing requires least effort so that net gain to the animal is maximized.

Food habits of any given herbivore are a function of forage availability, food preference of the herbivore species and nutrient demand. Herbivores may depart from the stereotype, e.g., cattle are grass consumers, deer are browse consumers, according to the law of least effort. In reality, animals will consume whatever forage type (grass, forb or shrub) they can in order to get the best meal. Managers allocating forage or defining dietary overlap must be familiar with each herbivore species, forage availability and the seasonal changes in animal needs and forage quality that occur.

Habitat Selection

Herbivores are driven by several variables in their selection of habitat. Preference for specific food items,

availability or proximity to cover and snow depth are some of the variables that influence where animals select to live and eat. Even though food habits are similar, two species may not overlap in the specific location where the food is consumed or may overlap on only a few plant communities.

Preference for or avoidance of specific landscapes may be the deciding factor on herbivore habitat. In winter, animals may seek forage areas that are adjacent to cover for escape from cold and/or wind. Extensive logging of timber pockets on winter range may force animals to move to other locations. Road traffic or snow mobile

resource each species reduces the other's population performance to levels below that which would occur in the absence of the competing species. If resources are not in short supply, there is no competition regardless of dietary or habitat overlap (Vavra et al. 1989).

When competition is perceived, many land managers look at decreased animal numbers as the solution. For example, continued season-long or late season use of bitterbrush ranges by cattle results in overuse of bitterbrush relative to grasses which are mature and less nutritious. Deer and cattle seek out bitterbrush because of its nutritional quality. Decreasing

Table 1. The percent similarity of cattle diets comparing years with each grazing period.

Year comparison	Late spring	Early summer	Late summer	Fall
Grassland				
1976-1977	48 ¹	70	76	72
1976-1978	46	45	66	67
1977-1978	38	44	65	72
Forest				
1976-1977	42	56	56	53
1976-1978	43	51	42	48
1977-1978	51	53	41	54

¹Numbers refer to the percentage of the diet that is the same between years and within season.

use have similar effects.

Still more confounding, is that the habitats of different animals may overlap as the numbers of those animals change. Increasing animal numbers of any or all species using a rangeland eventually causes each animal to overuse its preferred habitat and forces it into the habitat of another, thus causing several species to spend more time in shared habitats. Constriction of habitat by winter weather, drought, disturbance or other factors may cause the same effect.

Competition Among Herbivores

Identifying competition among herbivores is an extremely difficult task, and in practicality, usually consists of assigning blame. Scientifically, competition between species is difficult to determine. Competition is judged by two criteria (Wagner 1969): 1) two species compete when they share a resource that is present in short supply, and 2) in using that

cattle numbers does not solve the problem. A management change utilizing cattle earlier in the season when grass has a higher nutrient content may alleviate the problem. On the other hand, a periodic entry by cattle late in the season to use bitterbrush may alter morphological characteristics of the shrub canopy and increase browse availability to mule deer in future years.

Allocating Forage to Herbivores

Land managers are faced with dividing up the forage on public lands among wild herbivores and livestock. Overstocking of one or all species can result in resource degradation as well as a decline in all animal populations. Developing proper stocking rates is one of the most difficult tasks in public land management.

In the allocation of forage on public lands, most agencies have developed animal-unit-equivalents based

on forage intake of each species. Equivalencies are then based on the number of individuals of a given species needed to equal the amount of forage for the standard Animal-Unit-Month (5 deer = 1 AUM).

Arguments over exactness of these equivalencies have often occurred among land management agencies, state wildlife departments and private land owners. The Oregon Department of Fish and Wildlife went to the extent of developing the forage intake of the "average elk" based on herd composition in order to deal with the argument of how many elk equal one AUM.

The problem with animal equivalencies based solely on intake is that animals differ in their food habits and distribution across rangelands. Holechek et al. (1982) compared cattle diets within grazing periods and between years (Table 1) and found similarity of their diets increased as the season progressed. Percent similarity is an index to assess the overlap in diet selection, in this case how similar cattle diets are from one year to another. The research indicated that for the purpose of allocating forage, one cow does not even equal one cow on a seasonal or annual basis. Allocating forage strictly on an intake basis does not give an accurate estimate of potential stocking rates of a mix of diverse herbivores.

Facilitative Grazing

The use of one species of animal to alter forage characteristics or change vegetation composition of a plant community to improve foraging conditions for another species is called facilitation. A classic example occurs in Africa as various species of herbivores migrate across the Serengeti Plain in a progression that allows

each to use the forage class of choice and prepare the remaining forage for the "next in line" (Bell 1971).

In Eastern Oregon, Anderson and Scherzinger (1975) identified a similar scheme whereby controlled cattle grazing in the late spring and summer conditioned forage for elk use the following winter. Elk use of the Bridge Creek Wildlife Management Area increased when the cattle grazing program was initiated. Urness (1982) suggested several livestock grazing schemes to enhance deer winter range, particularly the bitterbrush component. U.S. Fish and Wildlife Service uses cattle grazing and haying as tools to enhance forage quality and availability for waterfowl. The potential for facilitative grazing systems of multiple herbivores is an area that has much potential in land management.

Summary

I have attempted to convey the complexity of animal factors that contribute to the utilization of rangelands. Dietary overlap may occur among herbivores in some years or seasons. Overlap is not a constant, but is dependent on animal preferences, environmental influences and external disturbance factors, i.e., improper logging, roading, recreation. Competition is a commonly perceived problem on private and public lands. The real key to herbivore conflict management is balancing numbers to the forage resource. Managers must be aware of the complexity of inputs that determines what and where an animal will eat. Animal unit equivalencies can be used to make initial stocking estimates, but the response of the vegetation must be the driving force in determining animal numbers. That point cannot be stressed enough; it is the plant community and the

health of the plants themselves that must be the ultimate measure of use by herbivores. Numbers of animals must be balanced to the available forage and proper use.

Obviously more research is needed on both wild and domestic herbivores to define the variables associated with diet selection and animal behavior. Research cannot provide an ultimate answer to livestock and big game conflicts, but can provide managers with information on the species and their habitats that can be incorporated into viable management plans to benefit both animal and range resources.

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