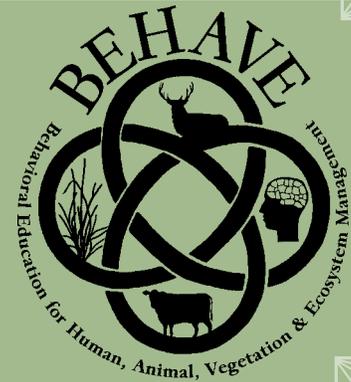


Factors Influencing Grazing Tolerance



Concern is increasing worldwide over land degradation from grazing, particularly by livestock. While grazing by herbivores, from insects to elephants, is a natural process, grazing that destroys vegetation and compacts soil inevitably degrades the land. Excessive or poorly timed grazing by any herbivore - domestic or wild - can harm soils, plants, aquatic species, and other wildlife. Problems are compounded when herbivores are confined by fences and when their numbers place excessive demands on forage or disproportionate grazing pressure on specific plant species.

The integrity of land, and the life it supports, depends on plants. Plants promote healthy soils by providing organic matter and increasing nutrient cycling and water infiltration. Stable soils and healthy plants nurture uplands and riparian areas which yield clean water and support aquatic systems and human communities. Plants nourish wild and domestic herbivores, whose urine and feces redistribute nutrients that benefit plants and soils.

When it comes to ecological relationships and sustained integrity of land and life, plants are the glue that binds soils, water, animals, and humans. Thus, it is essential that we understand the interactions among plants and herbivores and how plants tolerate grazing. In any environment, grazing tolerance will differ from species to species and season to season. The intensity, frequency, and timing of grazing and competition among plant species all affect a plant's grazing tolerance. Managers can favor different plant and animal species through grazing management and in the process influence the productivity and ecological integrity of the land.

Intensity and frequency. Grazing intensity (the amount of plant tissue removed) and frequency (the number of times a plant is grazed) are influenced by the number of animals and length of time they graze an area. Plants tolerate grazing best when they are grazed lightly or moderately, then allowed to regrow. As intensity and frequency of grazing increase, plants suffer proportionately. Herbivores rarely remove all of the leaf tissue from a plant the first time they graze a plant. They take a bite or two and move to the next plant. So moving animals quickly through a pasture, which prevents repeated grazing of regrowth, is less stressful on actively growing plants. By leaving 3 to 4 inches of tissue, rather than grazing plants to the ground, plants are better able to maintain enough leaves and stems to acquire energy through photosynthesis and roots to take up water and nutrients for regrowth. When grazing removes most of the leaf tissue, and when it occurs repeatedly, plant health is threatened and plants are more likely to die.

Time of grazing. The time of year when animals graze affects how well plants tolerate grazing, especially in arid areas. In arid areas, grazing early in the growing season, when plants are in the vegetative state, is relatively harmless because ample soil moisture normally is available for plants to regrow. However, during the early reproductive or boot stage of growth, grazing removes apical and intercalary meristems responsible for plant growth. When these meristems are removed, axillary buds at the base of the plant must initiate regrowth, a slow process that requires moisture and

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nutrients at a time when soil moisture is rapidly dwindling. Where moisture and nutrients are limited, plants may be safely grazed for short periods early in the growing season, when moisture levels are highest, or after plants have fully matured and are less vulnerable to grazing. Before fences, wild and domestic grazers in many arid areas followed the nutritious green-up of forages into the mountains in the spring, then retreated with winter's inclement weather. Their seasonal movements allowed ample time for plants to regrow following grazing. In areas where ample moisture is available for plant regrowth, timing of grazing is less critical for plant survival. On wet areas or irrigated pastures the primary management concern is rapid plant growth that produces too much forage that quickly becomes mature and low in quality. Timing is important, however, to maintain forage in a highly nutritious, vegetative state. Grazing in the late vegetative or early reproductive stages of growth removes apical meristems and stimulates new growth.

Competition. Competition from neighboring plants for moisture, nutrients, and light can intensify damaging effects of grazing. The amount of competition strongly influences a plant's ability to tolerate grazing. Plants tolerate grazing best when they have an abundance of moisture and nutrients to regrow. Even plants intolerant of grazing can withstand grazing when they don't have to compete for resources. Plant species that tolerate grazing well, or are not preferred by animals, often compete more effectively with their neighbors for moisture and nutrients. Palatable plants - those highest in nutrients and lowest in toxins - are most likely to be grazed placing them at a competitive disadvantage with ungrazed neighbors. When grazed repeatedly, these preferred plants eventually will be replaced by less preferred species that are higher in toxins or species better adapted to grazing.

Conclusions. Contrary to some popular beliefs, grazing has always been an integral component of ecosystems - life lives on life. The process of grazing is not bad, and properly managed grazing can benefit ecosystems. Indeed, in the absence of disturbances like grazing, plants often become overgrown and decadent. Lack of grazing - or improperly

timed grazing - reduces nutrient cycling, forage quality, and plant diversity as dead biomass, which has little nutritional value, accumulates. In the absence of disturbance, the diversity of wild species - insects, birds, mammals - often declines, primarily because sites become dominated by vegetation composed of a few plant species that are generally unpalatable.

Improperly managed grazing can cause problems, but properly managed grazing can benefit ecosystems. To achieve this, managers must understand how intensity, frequency, and time of grazing, along with competition from neighboring plants, influence the ability of different plant species to tolerate grazing. In devising grazing plans, managers should try to devise grazing systems that consider the nutritional needs of plants and animals and mimic the grazing pressures under which these plants evolved.

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