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# EFFECTS OF GRAZING ON GRASS

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## INTRODUCTION

What is grazing? Grazing is the consumption of herbaceous plants by herbivores. Herbaceous plants include forbs (non-woody broadleaf flowering plants), grasses, and grass-like plants (sedges and rushes). Probably the most important and most identifiable herbaceous plant for grazing is grass (Family – Poaceae). There are well over 100 species of grass present on the rangelands of eastern Colorado, and approximately 10,000 grass species can be found across the globe. Grasses account for about a quarter of the earth's vegetation and make up the preponderance of food (plant parts and seed) for both people and grazing animals. Management of grasses is important for land managers, and principally, understanding how grazing effects grass is paramount.

## GRASSES ON THE RANGE

Describing and understanding the diversity of grasses on the rangelands of North America is not simple. Grasses vary greatly according to species. While different species of grass may look similar from a distance in shape and general parts, they can range in height from a few inches to over five feet tall at maturity. Each species will also fall into one of two categories: warm season or cool season. Cool season grasses will begin spring growth or maintain growth when soil temperatures (Fahrenheit) are in the 40's, while warm season grasses will begin growth or maintain growth when soil temperatures are approximately in the 60's. The other main category to consider is whether or not the grasses are annual or perennial. Annual grasses are born from seed and only live one growing season, while perennial grasses have indeterminate growth that may allow them to live for a few years to well over 100 years. Perennial grasses may also reproduce from stolons, rhizomes, or clonal fragmentation.

## RESPONSE TO GRAZING

Whether a grass is grazed by cattle, sheep, goats, horses, or wildlife it will respond to the defoliation event according to its specific species, the amount of tissue that was removed, the amount and type of growing points remaining intact, the timing of defoliation and how much time remains in the growing season, availability to nutrients, water availability, number of times it was defoliated, and whether or not it will have to contend with competition from other plants.

Grasses depend on growing points (meristems). These growing points are where the plant cells divide and elongate. Early in the growing season these growing points are

close to the ground. Through the growing season, grass stems and leaves extend and these growing points become elevated above the ground. This timing of growing point elevation occurs early in the growing season for cool season grasses and later in the growing season from warm season species as these plants are producing flowers and seeds. Each stem of a grass plant is called a tiller. These tillers have growing points that consist of intercalary meristems, apical meristems, and axillary buds.

When the leaves of a grass are removed, but the apical meristem is left unharmed, then grass growth will continue seemingly unharmed. This happens most often to grasses early in the growing season when leaves are near the ground and stems of each tiller have not elongated: before plants begin to produce reproductive parts. However, if the grass is grazed below the apical meristem growing point, then vertical growth for that tiller will cease and new growth will have to be initiated from dormant axillary buds or remaining leaves that occur below the height of the grazing event. Initiation of growth for axillary buds relies on consumption of carbohydrate reserves stored in the roots. Repeated removal of apical and intercalary meristems results in further initiation of axillary buds if they are present, which can deplete root carbohydrate reserves and root mass. If no more buds are present, growth will cease. Bunchgrasses often have relatively high growing points, while grasses that reproduce by rhizomes and stolons have growing points that can occur below ground and along the soil surface, respectively.

Early in the growing season, grasses are considered to be in the vegetative phase. At this time, growth is initiated from leaves at intercalary meristem tissue near ground level: stems are not being produced, growing points are typically low to the ground and safe from grazing, and numerous buds of the plant remain at the base. When tillers elongate their stems and the apical meristem is raised and begins the formation of reproductive parts, this is considered to be the transition phase. Finally, in the reproductive phase, tillers are fully elongated and growth for that tiller is complete. Often, cool season perennial grasses have fall regrowth, this occurs from dormant buds located at the base of the grass plant.

Depending on plant size and plant species, research has shown that grazing of grass plants will affect root growth. Removal of approximately half of the above ground shoot volume of grass can disrupt root growth for about 1 week to almost 3 weeks. Removal of 80 to 90% of shoot volume can disrupt root growth for about 2 to 3 weeks. However, multiple defoliations occurring at approximately 70% of shoot volume at three times per week can complete stop root growth for over a month. In summary, root response of grasses to defoliation can result in decreases in root growth, root diameter, root branching, and total root production.

In the field, grasses may respond three different ways to grazing overall: decreased growth, equal growth, or increased growth. When growth is decreased by grazing, grazing will cause the plant to have slowed growth or will cause the plant to stop growing all together. This response may be species specific or it may due to factors such as lack of time left in the growing season, removal of all growing points, drought, plant competition, lack of root reserves, or other factors. Equal growth is the response by a grass plant where there appears to be no increase or decrease in seed or biomass production. Increased growth may be realized where grazing increases plant growth

and/or seed production. Compensatory factors such as timing of grazing, amount of material removed by grazing, high water availability, high soil fertility, lack of plant competition, optimum temperatures, and other factors contribute to plants being able to have increase growth with grazing. A caution - since field conditions are not always optimal for growth and due to a high likelihood of plant competition, increased growth is the least likely to occur of the three different scenarios. Best production of grasses will occur when soil water and fertility are not limiting, plant competition with undesirables are at a minimum, grazing occurs at a frequency and amount that does not over limit root growth or remove plant growing points, there is time left in the growing season for plants to have regrowth, and expectations of managers match the ecological site, environment, and year to year variability in which the grasses are growing. Best management of pasture grasses will not only maintain plant growing points and root biomass, but management should also allow for reproduction of desirable species by seed, rhizomes, or stolons.

**NOTES**