Tall grasses can be evenly grazed when grazing animals are controlled.
(photo courtesy of Bruce Anderson, U. of Neb.)

There are three fundamental processes that have an effect on the plant during grazing:

1. the grazing animal will either clip or tear off selected plant parts;
2. plants are trampled and can suffer some mechanical damage; and finally
3. fouling (manure and urine) will occur.

All of these are part of the grazing process, but defoliation is probably the most important from the standpoint of effect on the plant as well as its direct effect on the animal.

Understanding the defoliation process is important since the predictability of the defoliation process is an integral part of any grazing management program. *Livestock are very selective in their choice of plants and will consume the most palatable plants first.* They will also eat the most palatable plant parts first. Selective defoliation can be a very important factor affecting the stability of multiple species pasture through its effect on individual plants. A seeded mixture should contain plants with similar palatability and growth form. If a less palatable grass is included in a mixture with palatable species, the less palatable grass will soon dominate the pasture as a result of selective grazing.

Several factors determine what species of grass will dominate a pasture when certain grazing practices are employed. For example, if tall fescue is seeded with other cool-season grasses and the pasture is grazed continuously, in time tall fescue will become the dominant grass. Tall fescue's dominance occurs as a result of two basic factors. First of all, tall fescue has its growing point exposed to grazing livestock for a very short period of time during the growing season. Second, tall fescue is less palatable than most other cool-season grasses. Consequently, when the pasture is grazed continuously, the livestock are not repeatedly grazing or removing the leaf material of the tall fescue and it gets ahead of the cattle. If a grass is not constantly having its leaf material removed, it has an opportunity to remain vigorous, produce seed and increase. While the tall fescue is gaining in vigor and dominance, the other more palatable, less grazing resistant grasses are continuously having their regrowth grazed off again and again and do not have an opportunity to accumulate leaf area and store carbohydrates. This results in a loss of vigor and productivity.

The apparent grazing resistance and degree of palatability of one grass species is relative to other species. For example, if switchgrass is seeded with other warm-season grasses such as big bluestem and indiangrass, it will become the dominant grass, particularly if the pasture is grazed continuously and stocked at a rate that will carry the cattle all season. Switchgrass dominance is not due to grazing resistance, but to the fact that it grows at such a rapid rate early in the season and gets ahead of the cattle. As the switchgrass gets ahead of the cattle and starts to mature, it is less palatable and the cattle leave it alone allowing it to fully mature and increase in vigor, while the other grasses that do not mature so rapidly and remain palatable are regrazed. If switchgrass is dominating a mixture of other warm-season grass, the pasture should be grazed intensively early in the season to efficiently harvest the nutrients provided by the switchgrass. If a mixture that has become dominated by switchgrass is not intensively stocked and grazed on a rotational basis, much of the nutrients produced by the switchgrass will be lost as over-mature forage.

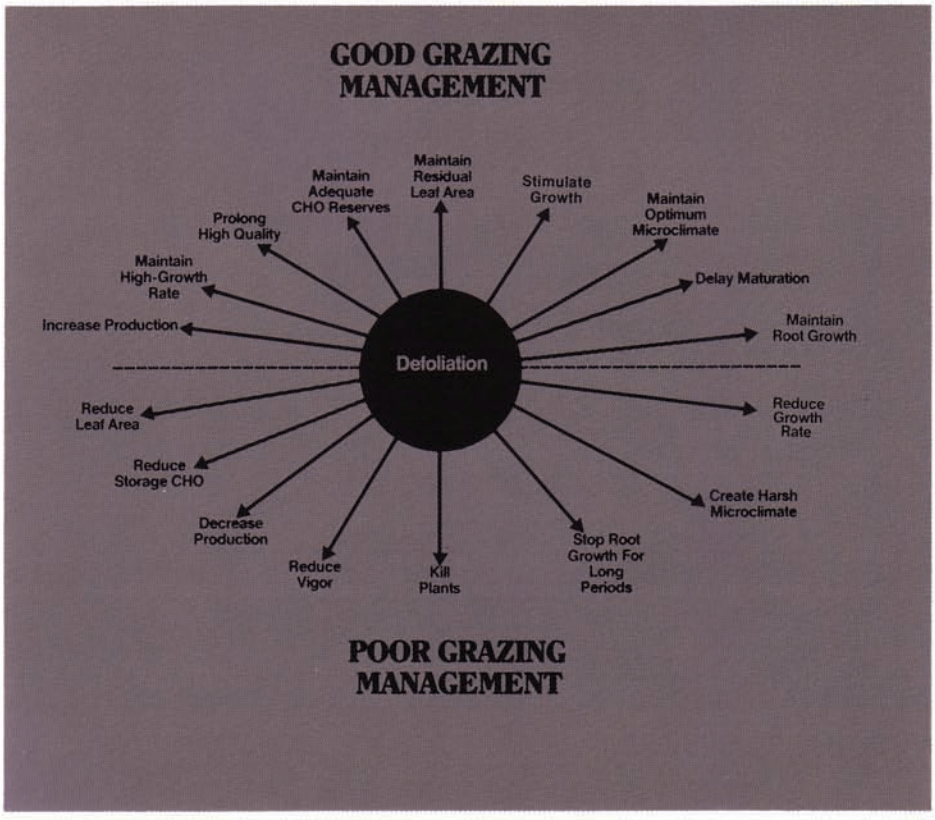
The above examples are presented to point out the importance of understanding the inherent properties of each grass that is grown. Used appropriately, tall fescue is a very productive grass and provides excellent spring, fall and winter grazing. Switchgrass, when used appropriately, is also a very nutritious and productive grass. In fact, at the University of Nebraska, switchgrass, without irrigation, consistently produces approximately 2.0 lbs. average daily gain and over 400 lbs. of live gain per acre when intensively grazed 60 to 75 days of the summer.

DEFOLIATION

The net effect of defoliation can be either detrimental or beneficial (Fig. 8). It is dependent on the severity of defoliation as characterized by grazing height, frequency, duration and rest interval.

Proper defoliation of a perennial grass is very beneficial. Most grass plants have evolved with grazing animals and are adapted to defoliation. When properly used, defoliation is very advantageous, but there can be "too much of a good thing." Proper irrigation (amount and scheduling) can be very beneficial to crop yields; however, improper timing or amount can be detrimental. Fertilizer applications can dramatically increase yield while excess amounts are not only uneconomical but can actually shift pasture composition and cause yield reductions. The usefulness of irrigation and fertilization is dependent on managerial skills. Plant defoliation should be viewed in the same manner. When properly implemented, its effect can be as dramatic as irrigation or fertilization. When improperly done, its effect is devastating.

FIG. 8 The effect of defoliation under good grazing management and poor grazing management.



Proper defoliation can increase total production. If a grass is allowed to "head out" and only harvested once at the end of the growing season, the total yield would be much less and qualilty would be lower than if it were harvested several times during the growing season. If harvesting is done with consideration of the plant requirement, (i.e. water, fertilizer, height of cutting, frequency, etc.), the forage is maintained in an active growth and tillering phase longer than if it were allowed to mature naturally. As long as the plant is vigorous and an active growing point remains forage production can continue. Forage production will decline as the plant nears dormancy. *Consequently, the goal of grazing management is to maintain the shoot in an active growth phase under the most suitable conditions for as long as possible and then provide conditions for retillering and/or carbohydrate storage.*

The degree of defoliation during the growing season should be designed to allow enough leaf area to remain to provide carbohydrates for regrowth rather than using stored carbohydrates. Previously, defoliation during the early stages of growth was thought to be most detrimental because root carbohydrate reserves are lowest at that point and regrowth required a major "draw down" of carbohydrates. However, vigorous plants have a great capacity to replenish carbohydrate reserves during the season of peak growth. Consequently, severe defoliation during the *late part* of the growing season is more detrimental than *early season* defoliation followed by rest. Late in the season environmental conditions do not favor the bursts of growth observed in the early season.

REMEMBER: *Energy reserves increase in crowns during the latter part of the growing season and buds for next years tillers develop. Consequently, severe defoliation near the end of the growing season will reduce the production of crown tissue and cause a decline in forage production the following year.*

Overgrazed cool-season pasture in July: cattle are ahead of grass.

Generally, plants are not capable of supporting rapid growth in their shoots and roots simultaneously for an extended period of time. If pastures are grazed severely, root growth stops and roots may die back. If overgrazing continues, the grass has little leaf area to carry on photosynthesis so the plant is low in energy. Leaf growth has "first call" on carbohydrates from photosynthesis so there is no downward movement of carbohydrates for root growth. Roots then die back and the plant has only enough energy to maintain a shallow root system. The result is a pasture that is much more susceptible to environmental factors such as dry weather. Some plants may die out allowing weeds to invade *(Fig. 9)*. Even if plants stay alive, there may be enough open ground for weeds to establish if they have little competition for light. This whole process accelerates as unfavorable conditions increase. *The pasture begins a downward spiral which ends when the desirable pasture plants are replaced by plants that are grazing resistant because of low palatability or short growth form.*

The grazing animal can be used to alter the plant composition of a pasture. Coordinating the natural selectivity of livestock with the period of active growth of undesirable species is a very useful management tool. Many times shifts in species composition are the result of mismanagement. However, knowledge of plant growth and animal behavior enables the producer to cause a desired shift rather than be a victim of an undesirable shift. For example, if a cool-season grass is invading a warm-season pasture, the cause could be heavy grazing in the summer with little or no spring or fall grazing. This grazing management scheme would favor cool-season grasses and harm warm-season grasses. A possible alternative that would shift the species composition back towards warm-season dominance would be intensive grazing in the spring and fall and non-use or limited use during the summer for a year of two.

REMEMBER: *A livestock producer must visit his pastures frequently to not only check the livestock, but to also check on the grasses to see how they are doing. Anticipate what is happening with the grasses and correct any potential problem before it is apparent in livestock performance.*

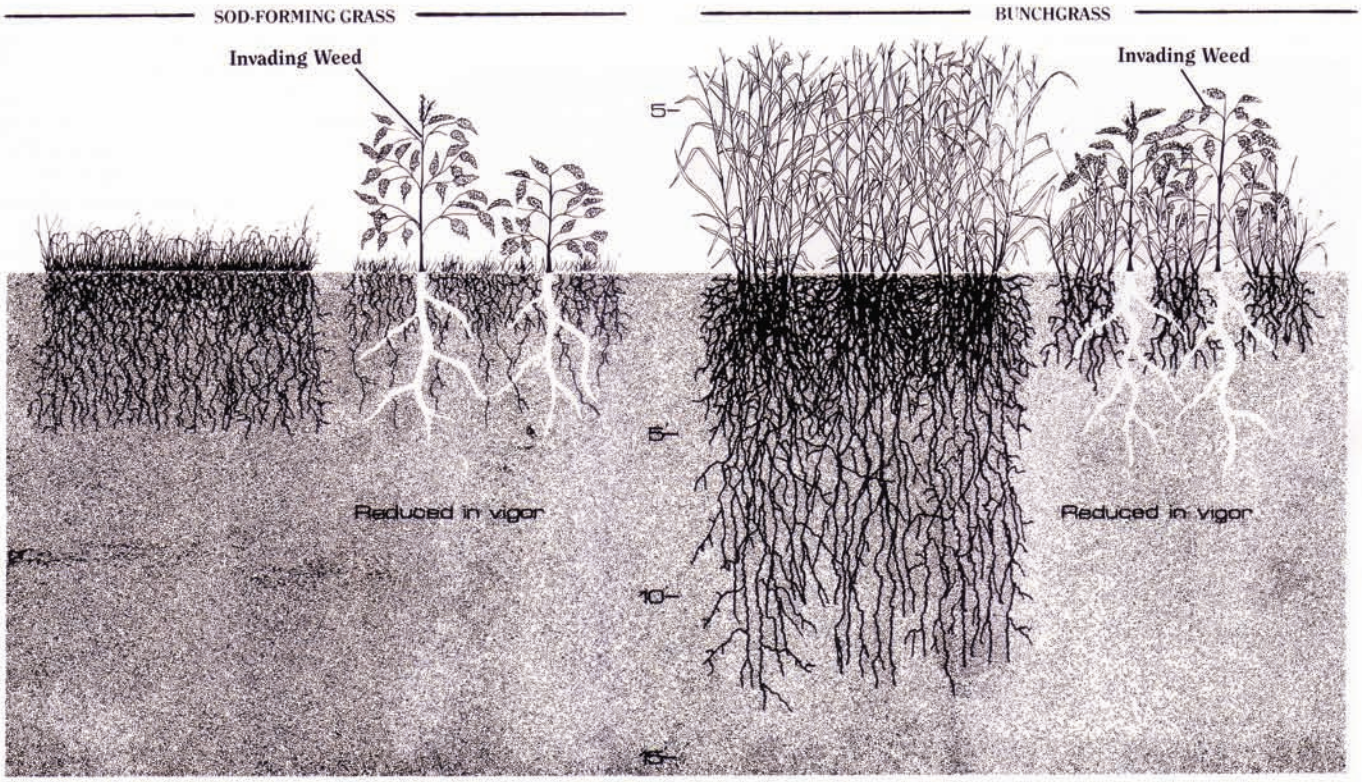


FIG. 9 The effect of overgrazing on root production and weed invasion.