# Pasture Recovery from Drought Depends on Previous Management

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Effective grazing management can help alleviate drought's detrimental effects on pastures, says a North Dakota State University range scientist.

"Parts of the Northern Plains experienced drought conditions during the 2002 growing season. Two primary factors determine the amount of time perennial grass pastures in these areas require for recovery before they can withstand grazing pressure at full stocking rate: the practices used to manage pastures prior to the dry conditions and the resulting level of plant health at the onset of the drought," says Lee Manske, a range scientist at NDSU's Dickinson Research Extension Center.

"Certainly, the severity of drought stress and the severity and time of grazing during a drought affect plant response and recovery. However, effective pre-drought management minimizes reductions in herbage production during precipitation shortfalls and decreases pasture recovery time afterward," he emphasizes.

Management practices that meet plants' biological requirements produce strong, healthy vegetation, while traditional management practices like seasonlong, deferred, and repeat seasonal grazing produce only moderately healthy plants. Grazing prior to the time when grass tillers have the third new leaf in the spring or grazing summer pastures late into the fall leads to low levels of plant health, as does emergency grazing during drought.

Most beef producers whose operations were in drought-affected areas in 2002 and who used traditional management practices experienced herbage reductions at about twice the percentage of precipitation reduction, Manske says. In other words, if precipitation was reduced by 25 percent, herbage production may have been reduced by about 50 percent.

"The blame for the reduction in herbage biomass has been commonly and incorrectly placed solely on the reduction in levels of precipitation," he says. "About half of the reduction in herbage was caused by precipitation deficits and about half was caused by management practices used prior to the drought and by their effects on plant health."

Plant health has a considerable effect on herbage production during periods of water deficiency, Manske notes. The percentage of herbage reduction in healthy plants is about equivalent to the percentage of reduction in precipitation below the normal range. Percentages of herbage reduction greater than the precipitation reduction percentage result from the ineffectiveness of traditional management practices in meeting plant biological requirements and from the resulting deterioration in plant health. Plants that are in poor or moderate health when a drought begins incur extensive biological damage from the effects of water stress, and this damage results in the greater herbage production decreases.

The length of the recovery period for repair of plant biological damage and return to normal herbage production during the seasons following a drought also is related to plant health because plants at different health levels are impaired at different degrees from the effects of water stress. Moderately healthy plants and weakened plants are more severely damaged than healthy vegetation. The increasing amount of damage water stress causes to plants at decreasing health levels requires that the weaker plants have progressively longer recovery periods.

"Plants that are healthy at the onset of a drought need little or no recovery period from water stress at levels caused by the precipitation shortfall in 2002," Manske says. "Moderately healthy plants require one to two years to recover from water stress at levels occurring during 2002. Plants that are in poor health when a drought begins or that are weakened by emergency grazing during a drought require two to four years to recover. Herbage biomass production will be below normal during the recovery period for plants that were in moderate or poor health at the onset of drought conditions and stocking rate reductions will be necessary."

Management practices that produce low levels of plant health also cause slowed plant growth-stage development during the early portion of the growing season following the drought and delay the time at which grazing can begin without further damaging the grass. During the later portion of the grazing season, cool-season grasses produce vegetative fall tillers, which develop into the next year's lead tillers, Manske explains. The number of leaves that grow and survive until early spring affects the next season's herbage biomass production in relation to normal production levels.

Both the number of fall leaves, which is affected by the health status of the plants and the level of water stress, and the stress of leaf area removal from fall tillers by late-season grazing influence the rate of growth-stage development in the following growing season.

When fall tillers produce 2.5 to four leaves, plants develop through growth stages at normal rates the next season. However, fall tillers that enter winter dormancy with 2.5 leaves produce normal amounts of herbage biomass the next season, while fall tillers with four leaves produce greater than normal amounts. Fall tillers that develop only 1.5 leaves produce less than normal biomass the next season and their growth-stage development in the spring may be two to four weeks later than normal. Fall tillers that develop 2.5 leaves but have the equivalent of one leaf removed by grazing produce less than normal herbage biomass the following season. Most fall tillers with one or fewer leaves do not survive until spring; any surviving tillers produce low herbage biomass the next season, and their growth-stage development lags two to eight weeks behind normal rates.

Implementing grazing management practices that meet the biological requirements of the plants and enhance plant health status is the long-term solution to management-caused herbage reduction and will help minimize the effects of future drought conditions, Manske says. He recommends three effective management practices to improve plant health:

- Begin grazing in the spring only after plants have reached the third-leaf stage (early May for crested wheatgrass and smooth bromegrass and early June for native rangeland).
- Coordinate grazing rotation dates with plant growth stages. Plant density increases when secondary tiller growth is stimulated by light grazing for seven to 17 days during the period when grasses are between the third-leaf stage and flowering growth stage (early June to mid July for native rangeland).
- Do not graze spring and summer pastures or haylands during the fall. Fall grazing persists because of the common and incorrect assumption that grazing perennial plants after a frost does not hurt them. In fact, the grass plant's ability to survive the winter and produce biomass the following season depends on late-season growth.

Delayed grass growth-stage development and herbage biomass reductions greater than the percent reduction in precipitation create additional problems for producers coping with precipitation shortfalls. "Implementing management practices that meet plant biological requirements will enhance plant health status, minimize the reduction of herbage production during water deficit periods, and shorten pasture recovery time following a drought," Manske says. "While drought cannot be controlled, the management-caused problems that accompany it can be avoided or lessened with effective pasture management."