# Proper Grazing Management Can Minimize Severity of Problems during Drought

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Biologically effective grazing management that improves plant health can help reduce the severity of problems beef producers encounter during drought conditions, says a North Dakota State University range scientist.

"Drought is a recurring natural phenomenon in the Northern Plains, with western North Dakota experiencing drought growing seasons about twice in every twelve-year period. The occurrence of drought conditions in 16 percent of growing seasons makes proper management of perennial grasses critical to the success of beef operations. Managing grasslands to enhance plant health prepares perennial grasses to withstand water stress and helps to minimize the herbage reductions that occur during the region's frequent periods of low-normal or below-normal precipitation," says Lee Manske, a range scientist at NDSU's Dickinson Research Extension Center.

Drought can be simply understood as a period of low rainfall. However, drought is an ambiguous concept that is difficult to define, and drought's effects on vegetation are difficult to quantify. The degree to which a specific departure from normal precipitation levels affects vegetation varies with geographic region, time of year, and condition of plant health.

Several methods are used to measure drought severity and compare conditions among diverse regions. The National Weather Service presents two indices of drought, the Palmer Drought Severity Index (on the Web at *www.cpc.ncep.noaa.gov/*) and the U.S. Drought Monitor (*www.drought.unl.edu/*). The methods the Weather Service uses to measure moisture conditions are complex and performing the calculations requires training.

A simple procedure for evaluating rainfall shortage is to calculate the relationship of received precipitation to average long-term local levels. Received precipitation is divided by mean normal precipitation to give the percent of normal precipitation. The range of normal is ± 25 percent of the mean precipitation. Precipitation levels of 75 percent or less of the mean precipitation indicate dry conditions.

While this technique is helpful in indicating rainfall deficiencies and the existence of dry conditions, it does not show the degree to which a specific deficiency in precipitation affects perennial grassland plants. Because of variable influences from temperature and time of year, the severity of a precipitation deficiency's effect on healthy vegetation is not consistent with percent of normal precipitation values.

The physiological and ecological status of grassland plants is determined by a balance between rainfall and evapotranspiration. When the amount of rainfall is less than potential evapotranspiration demand, a water deficiency exists in the soil. Under water deficiency conditions, plants are unable to absorb adequate water to match the transpiration rate, and water stress develops in those plants. Plants experiencing water stress conditions have reduced photosynthetic activity and limited growth.

Evaporation rates increase or decrease with changes in average temperature, and water deficiencies occur at variable levels of precipitation, depending on the average period temperature. When high average temperatures increase evapotranspiration rates, water deficiency conditions can exist even when precipitation levels are within the normal range.

Growing-season months with water deficiencies great enough to cause water stress in healthy perennial plants can be determined from just temperature and precipitation information. Water deficiency exists during months in which the total received precipitation expressed in millimeters is less than twice the mean temperature of the month expressed in degrees centigrade.

Evaluation of 112 years of growing-season temperature and precipitation information from Dickinson, North Dakota, indicates that water deficiency severe enough to cause healthy perennial grassland plants physiological damage from water stress occurs when the amount of monthly rainfall and the percent of long-term mean monthly normal precipitation are below the following levels: 0.42 inches and 29 percent in April, 0.91 inches and 39 percent in May, 1.31 inches and 37 percent in June, 1.6 inches and

71 percent in July, 1.53 inches and 87 percent in August, 1.05 inches and 79 percent in September, and 0.52 inches and 55 percent in October. In August and September, water deficiency conditions have existed even when precipitation levels were above the low-normal range.

During the past 112 years, water deficiency conditions have placed grassland plants under water stress in 32.4 percent of the growing-season months: water stress limited the growth and herbage production of grassland plants about two months during every six-month growing season, on average. Water deficiency conditions have occurred with the following frequencies in each growing-season month: 16.1 percent in April, 14.3 percent in May, 8.9 percent in June, 37.5 percent in July, 50.9 percent in August, 50.9 percent in September and 48.2 percent in October.

Only seven (6.25 percent) of the past 112 years have had all growing-season months with no water deficiency conditions. Over a forty-year career, a beef producer will likely see only two or three growing seasons in which perennial grassland plants do not experience water stress.

Despite the high frequency of water deficiency conditions, many beef producers operate as if each year had ideal growing conditions. Management practices based on the assumption that precipitation levels will be normal during every growing season magnify the biological and economic problems livestock producers endure during periods of low rainfall.

Traditional grazing management practices designed for priorities other than to meet plant biological requirements cause plant health to deteriorate, and these practices intensify the severity of drought-related problems. Reduction in herbage biomass production during water deficiency periods is far greater for plants in poor health than it is for healthy plants, and grasses in poor health at the start of a water deficiency period require a longer time to recover than healthy plants.

The severity of problems experienced during recurring periods of low precipitation should not be attributed entirely to rainfall shortage. The effects from low rainfall are increased by annual operational management plans that do not take into account the region's frequent water deficiency conditions and by grazing practices that do not manage grasslands specifically for the health of the plants.

Grazing management practices that meet the biological requirements of grass plants and enhance plant health status are the long-term solution to management-caused herbage reduction problems and will help minimize the effects of future drought conditions. Producers can implement 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 tillers are stimulated by light grazing for 7 to 17 days during the period 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 hay lands during the fall. The grass plant's ability to survive the winter and produce biomass the following season depends on late-season growth.

Producers can minimize the severity of water deficiency problems by recognizing the frequency of their occurrence and implementing grazing management appropriate to the region's challenging climatic conditions. Management practices that improve plant health and prepare forage grasses for water stress should be a permanent part of every grazing strategy in the Northern Plains.