Kansas State University Extension

Grass Turnout Decisions in Western Kansas

Following dry conditions, ranchers in western Kansas face difficult decisions regarding how many cattle to turn out on summer pastures, and when, or even if, turnout should occur. This publication provides guidance for producers explaining general concepts of how pastures respond to growing-season precipitation and defoliation, and guidance on making subsequent adjustments to stocking rates.

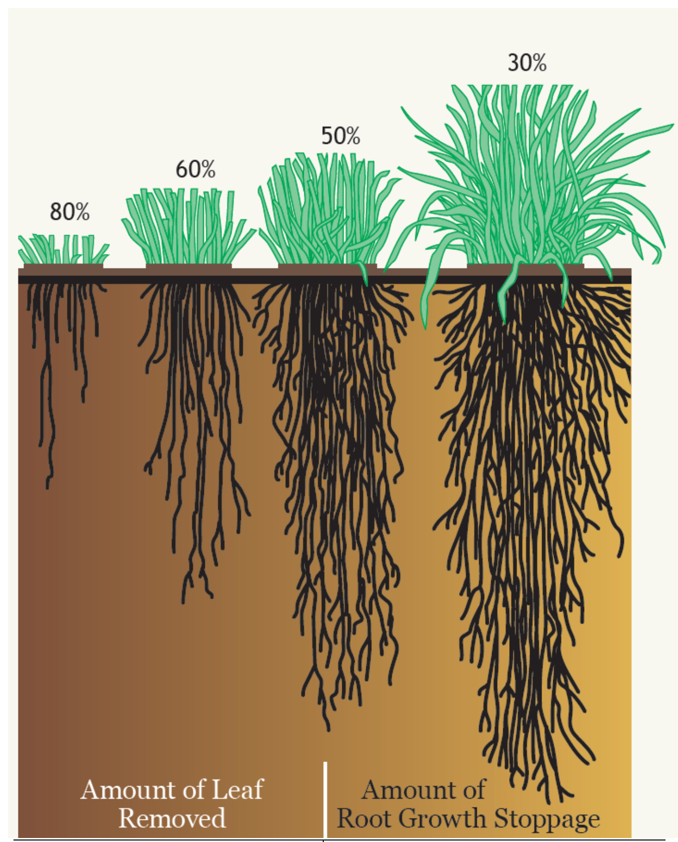
The numbers used in the pasture stocking decision tree are particularly adapted to rangelands west of Russell, Kansas, and the 99th meridian. In this area of Kansas, blue grama, western wheatgrass, and sideoats grama are the primary species in the grassland landscape. Other rangeland regions of the state may have varying, but similar responses.

Although it is impossible to precisely predict how much forage will be available over a summer growing season, simple calculations using readily available data allow ranchers to develop strategies to predict end-of-season forage production and subsequent adjustments to stocking rate, regardless of the year's precipitation.

Forage demand versus forage available

Forage availability drives the overall decision on whether to adjust animal demand over time (stocking rate). If animal demand exceeds the available forage, excessive leaf removal occurs. With excessive leaf removal from grazing (greater than 50%), overall plant photosynthesis is reduced, resulting in less carbohydrate production and energy available for the plant. Ultimately, this inhibits bud and root production as well as energy for starting next year's growth.

The root is often overlooked as a part of the plant that suffers the consequences of excessive grazing. Studies show that when 70% of a plant's leaf material is removed, well over half of the roots stop growing for 17 days (Figure 1). When 90% of the leaf area is removed, all root growth stops for 17 days. If only 50% of the leaf area is removed, almost all roots continue to grow. Roots are essential for absorbing water and nutrients from the soil, and healthy plants have more root mass, potentially reaching a greater soil volume to access more nutrients and water. Ranchers should target 50% or less leaf removal to maximize the following year's plant growth.



Amount of Leaf Removed	Amount of Root Growth Stoppage
10–40%	0%
50%	2–4%
60%	50%
70%	78%
80–90%	100%

If 80% of plant leaf material is removed, plant root growth can cease for 12 full days, which slows plant regrowth considerably (Crider 1955, Dietz 1989, USDA-NRCS 2016). If only 10% to 40% of plant leaf material is removed, plant root growth doesn't stop, and the plant regrows faster and remains healthier; but this effect varies by species (USDA-NRCS 2016).

Figure 1. Effects of leaf removal on root growth

Alternatively, drought conditions can lead to early dormancy during the growing season. The combination of drought-induced early dormancy and excessive leaf removal from grazing can be stressors for the next year's grass growth.

An added benefit of having more leaf material and residual forage is improved water infiltration. Heavily stocked pastures (66% of forage removed) were found to infiltrate water at approximately 0.7 inch per hour, while almost 1.6 inches per hour was recorded in lightly stocked pastures (38% of forage removed). This means that in a rain event where 1.6 inches of rain fell within an hour, less than half of this rainfall amount would be retained in the soil at the heavy stocking rate, but all would be retained at a light stocking rate.

Early-season rainfall versus growing-season production

Combining precipitation amounts from April, May, and June is a valuable tool for predicting end-of-year forage production in western Kansas. This relationship is very direct when rainfall totals are less than average. The most concerning years are those in which precipitation in April through June is less than 75% of average, because yields are often much lower than average. For example, in 2006 and 2012, when April through June precipitation totaled close to 5.5 inches (60% of average), total pasture production for those growing seasons was just above 2,300 pounds per acre (67% of average). If less than 75% of the average precipitation from these three months is recorded, the percentage reduction in predicted forage yield is similar to the percentage deficit in precipitation, and it may become critical to make decisions on reducing stocking rate for the remainder of the growing season. On the contrary, when rainfall totals are greater than average, the direct relationship disappears, and yield is usually adequate but harder to predict. In years when April through June precipitation was 75% or more of the average, forage yield was 90% or more of the average 90% of the time.

An objective approach to early-season stocking can be taken using a decision tree related to soil and plant parameters (Figure 2).

Beginning at the top of Figure 2, a pasture assessment should take place. Dry matter left at the end of the prior season should be evaluated and compared with previous years. This can be accomplished simply by measuring biomass or end-of-season forage height each year (a factor strongly correlated to biomass), comparing photos of the same location within a pasture, or, if no past data is available, using memory of past years' standing biomass amounts.

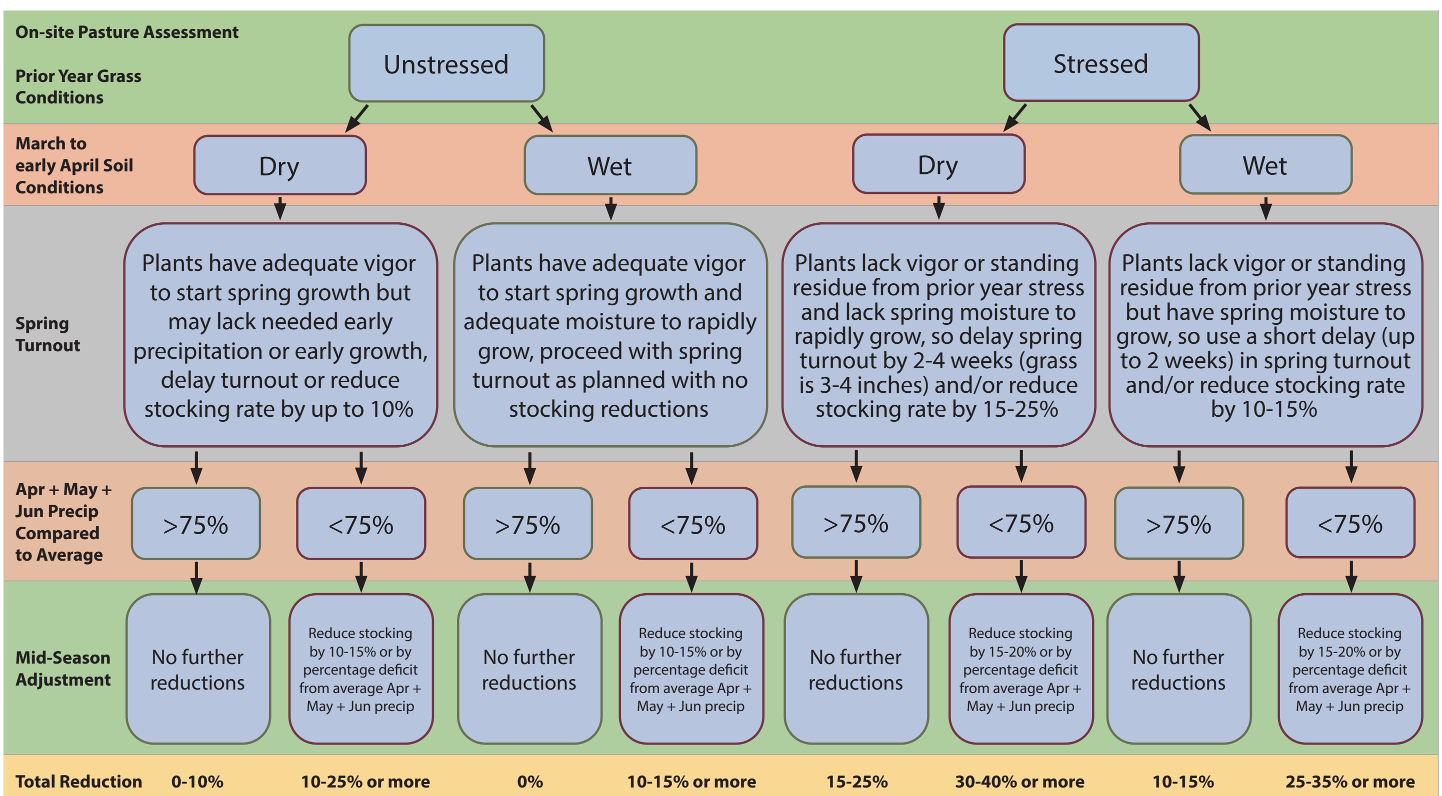


Figure 2. Stocking rate decision tree

Ranchers should evaluate if the residual forage reflects expected levels for the stocking rate, as well as expected growth from the amount of precipitation received in the given pasture. If forage height or biomass measurements have not been taken in the past, begin measuring forage annually for comparison over the years and for use in future calculations and predictions.

Some rules of thumb for forage height at 50% use of common grass species over the course of the growing season are shown in Figure 3. Pastures with forage heights below the late-season levels listed due to drought or grazing may be considered stressed entering the next year.

Another tool that helps with early stocking decisions is the Kansas Mesonet, which shows soil moisture status for given locations (Figure 4). Moist soil at the start of the growing season from winter precipitation allows grass growth to begin as soon as temperatures warm enough. Current data for locations around Kansas can be found at: *https://mesonet.k-state.edu/agriculture/soilmoist/*

When the condition of the previous year's grass growth has been determined, soil moisture at the start of green-up (March to early April) should be evaluated. Because the majority of grass roots are located within the top foot (30.5 centimeters) of soil, moist soil conditions in that upper foot will be most beneficial for spring growth. For help in determining the moisture of your soil, see the following link: *https://www.wcc.nrcs.usda.gov/ftpref/wntsc/waterMgt/irrigation/EstimatingSoilMoisture.pdf*

	Jun. 7	Jun. 21	Jul. 5	Jul. 19	Aug. 2	Aug. 16
Buffalo grass	1.2	1.7	1.9	2.0	2.0	2.0
Blue grama	1.5	2.5	2.5	3.8	3.8	3.8
Western wheatgrass	8.0	9.0	9.0	9.0	10.0	10.0
Sand dropseed	2.0	3.0	3.2	6.5	6.7	7.8
Little bluestem	2.2	3.0	3.2	3.4	4.0	4.0
Side-oats grama	2.4	2.5	2.6	2.9	3.2	3.7
Big bluestem	3.4	3.4	3.4	3.8	4.7	5.0

Figure 3. Rules of thumb for forage height (in inches) at 50% forage use at Hays, Kansas

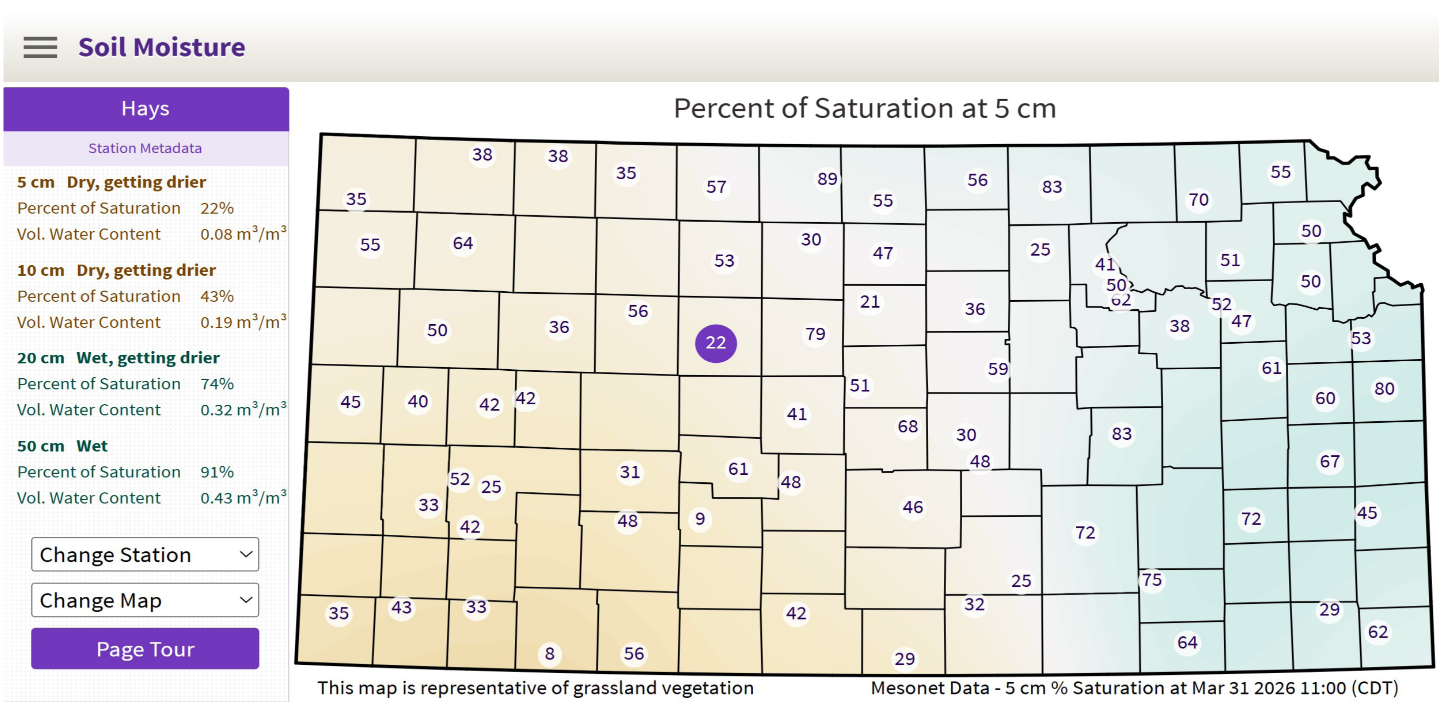


Figure 4. Example soil moisture map with station metadata for Hays, Kansas, 03/31/2026

If last year's grass was stressed, but the current soil conditions are moist, the grasses will be able to start growing, but the grasses may still lack vigor from the previous stress. Thus, it may be a good idea to reduce stocking rate or delay turnout. On the other hand, if conditions remain dry, further stocking reductions should be strongly considered. The combination of April, May, and June moisture could then be an indicator of expected forage production for the growing season. If the April through June precipitation total is less than 75% of the average, the total reduction in precipitation will approximate the reduction in forage production for the year.

Methods of reducing pasture stress

Ranchers have several options for relieving pasture stress beyond simply delaying turnout to decrease stocking rate. Some of these include early weaning; pregnancy checking and culling open cows earlier than usual; culling more strictly for poor performance, poor body composition, or other factors that might limit production; removing more easily marketable animals, such as stocker cattle; and taking animals to a dry lot or leased pasture outside of the drought-stricken region.

Summary and helpful links

Pasture stress can be mitigated by evaluating and acting upon early-season precipitation. Plant vigor from the previous season and soil moisture at turnout should be evaluated, though it should be noted that early growing season precipitation does have a greater influence on expected pasture growth than the previous year's precipitation. Because of this, many pastures can rebound in one normal growing season after a year of drought.

However, if the dry trend continues for two or more years, long-term negative impacts can present themselves in factors such as reduced plant growth, tiller density, and possibly even plant survival.

Because so many factors come into play, it is impossible to take a completely objective approach to managing cattle herds in drought conditions; however, the calculations and predictors provided here can help ranchers make proactive decisions regarding stocking pastures. Qualitative observations and record keeping also can aid management and understanding of drought responses at the ranch or pasture scale.

Some helpful links that also provide information on precipitation or estimates of forage production on rangelands that may aid with stocking decisions are as follows:

Kansas Monthly Precipitation Map (current and historic precipitation by county): *https://climate.k-state.edu/precip/county/*

GrassCast Grassland Productivity Forecast (find expected end-of-year production based on precipitation by region. Based on satellite imagery and ground truthing from historic data and current weather outlook): *https://grasscast.unl.edu/Outlook.aspx*

Rangeland Analysis Platform-Production Explorer (provides 16-day production estimates based on current satellite imagery for a specific area): *https://rangelands.app*

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