

Strategies for Managing Drought in the Northern Plains

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The purpose of this drought response plan is 1) to describe the drought indicators and response triggers that will be used to determine if drought response actions are needed and 2) to provide land owners and managers with a range of management options that will allow for a flexible and rapid response to drought.

The early detection and rapid response to drought is needed to minimize degradation of grassland resources. This document provides a description of monitoring methods that can be used to determine if the drought response triggers have been met.

Drought, a normal part of the climate for virtually all regions of the U.S., is of particular concern in the West, where an interruption of the region's already limited water supplies for extended periods of time can produce detrimental impacts (Wilhite, 1997). Drought is a recurring, albeit unpredictable, environmental feature that must be included in planning (Thurow and Taylor Jr., 1999).

Grassland managers and ranchers deal with drought before, during and after its onset. The degree to which drought impairs the range depends on the intensity, frequency and timing of grazing (Howery, 1999), and when the drought conditions occur (Heitschmidt and Vermeire, 2006).

The effects of drought often are far-reaching, impacting the environment and economy of an area. Specific impacts depend on drought severity, but often include:

- Lack of forage and drinking water
- Decreased vigor and production of plants
- Damage to plant community dynamics
- Increased wind and water erosion of soils
- Reduction and degradation of fish and wildlife habitat
- Increased mortality of wildlife and livestock
- Increased number and severity of fires
- Reduced livestock performance

Although the prairie of the Great Plains evolved with drought and is a remarkably resilient ecosystem, it can be mismanaged to the point where its soil and vegetative resources are degraded. Plant species composition can shift to less desirable communities, water infiltration decreases, and soil and site stability compromised.

To survive, perennial plants must develop above-ground (shoot growth) and below-ground (root growth) biomass through photosynthesis, transpiration and respiration (Howery, 1999). The intercalary meristem determines regrowth through the ability to divide and produce new cells; while, axillary meristem determines future growth through bud development (Briske, 1991). A lack of available soil moisture usually

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reduces above-ground net primary production (Whitman et al. 1943, Hurtt 1951, Reed and Peterson, 1961, Olson et al. 1985, Biondini and Manske 1996, Biondini et al. 1998). Heitschmidt et al. (2006) found the timing of drought during the growing season had the greatest impact on loss of above-ground herbage production, thus a loss of available forage.

A spring/early summer drought had the greatest negative impact on above-ground production because this period is when plants grow in the Northern Plains produce a majority of their growth (Whitman et al., 1943, Heitschmidt and Vermeire, 2006, Sedivec et al., 2009, Sedivec et al., 2010). Summer and early fall droughts can reduce or even eliminate any regrowth, thus shortening the growing season.

A full-season drought, a rare event, will have the greatest impact on plant growth, dramatically reducing above- and below-ground production of plants. Drought directly impacts above- and below-ground production and ultimately vegetation quantity; however, the severity of the impact is highly dependent on the timing of the drought (Heitschmidt and Vermeire, 2006).

The degree to which drought impairs the range's potential for future production depends on the intensity, frequency and timing of grazing (Howery, 1999). Drought-afflicted rangelands are

unable to support pre-drought stocking levels. Overutilization during drought can impact plant health negatively and reduce the ability of those plants to meet land manager's objectives in the future.

Plant health and growing conditions will influence the number of days a plant needs to recover. A general rule is to plan for a minimum of 30 days' recovery in eastern North Dakota and 45 days in western North Dakota under good growing conditions (fast plant growth) (Sedivec and Printz 2014.).

As plant growth slows and due to the vegetative reproduction strategy of grasses, recovery periods need to be extended to permit proper plant recovery after grazing. Recovery periods of at least 45 days in eastern North Dakota and 65 days in western North Dakota probably are required. Under drought conditions, longer recovery periods will be needed to ensure grazed plants recover adequate leaf area prior to the next grazing; often taking multi-years with severe droughts.

The most effective management for drought occurs before the drought happens by practicing good rangeland management and having a financial plan that includes drought contingency options. Proper implementation and timely reaction to drought should reduce short- and long-term effects.

Definition of Drought

The Society for Range Management defines drought or drought as (1) a prolonged chronic shortage of water, as compared with the norm, often associated with high temperatures and winds during spring, summer and fall, or (2) a period without precipitation during which the soil water content is reduced to such an extent that plants suffer from lack of water (Sedivec and Printz 2014).

The National Weather Service lists three types of drought: meteorological, agricultural and hydrological.

Meteorological drought usually is defined based on the degree of dryness (in comparison with some "normal" or average) and the duration of the dry period. Drought onset generally occurs with a meteorological drought.

Agricultural drought links various characteristics of meteorological or hydrological drought to agricultural impacts, focusing on precipitation shortages, soil water deficits, reduced groundwater or reservoir levels needed for irrigation, etc.

Hydrological drought usually occurs following periods of extended precipitation shortfalls that impact water supply (streamflow, reservoir and lake levels, ground water), potentially resulting in significant societal impacts. Because regions are interconnected by hydrologic systems, the impact of meteorological drought may extend well beyond the borders of the precipitation-deficient area.

We will use agricultural drought as our basis for this publication. Timing of moisture is critical when determining direct impact on vegetative production. Analysis of 14 data sets collected across 11 years revealed that on average, 35, 69 and 91 percent of perennial grass production is completed in eastern Montana and western North Dakota by May 1, June 1 and July 1, respectively (Heitschmidt et al. 2006).

The 91 percent completion by July 1 was consistent across years in eastern Montana. From this, the opportunity to grow substantial amounts of forage after July 1 is limited.

In western North Dakota, 75 percent of perennial grass production is completed by July 1 and more than 85 percent is completed by Aug. 1 (Sedivec et al. 2009, 2010). Thus, proactive stocking rate adjustments can be made with considerable confidence for the Northern Plains, including North and South Dakota, eastern Montana and western Minnesota, thereby reducing ecological and economic risks that arise from late-season forage demand/availability imbalances.

Moisture later in the season, such as August and September, also can influence forage production, specifically cool-season grasses. Cool-season grasses have fall regrowth potential, allowing producers to harvest forage that would be available and palatable. It should be noted, this growth is relatively small in terms of biomass produced since plants have already matured.

Purpose and Goals of Publication

The purpose of this drought response plan is two-fold:

1. Describe the drought indicators and response triggers that will be used to determine if drought response actions are needed,
2. Provide land owners and managers with a range of management options that will allow for a flexible and rapid response to drought.

The goal of this publication is to provide ranchers and land managers with strategies to ensure livestock management during drought does not impact the natural resources adversely and compromise the land manager's ability to meet the fundamentals of grassland management. This publication will identify:

- Drought indicators
- Define drought response “triggers” that would be used to distinguish site-specific conditions and activate drought response actions
- Drought management strategies

This document is meant to ensure that ranchers and land managers are being proactive with the best available information. On public lands, open and honest communication between members of agencies and permittees is instrumental in grassland stewardship. When all parties know the actions that are being taken to adjust livestock management for drought-related conditions, confidence in each other and the resource is strengthened.

The early detection of drought is necessary for effective management during drought. The following list outlines the goals of a drought response plan:

- Goal 1.** Identify early detection of drought conditions
- Goal 2.** Identify and minimize impacts to grassland resources on lands affected by drought
- Goal 3.** Provide for the rapid implementation of a drought response action to ensure that financial and natural resource goals and objectives are met



Drought Indicators

Drought indicators are observations signaling the start or continuation of a drought. Ranchers and land managers can use the following indicators to determine the onset and/or continuation of a drought.

To determine if a chronic shortage of water is occurring, as compared with the norm, consult the U.S. Drought Monitor (<http://droughtmonitor.unl.edu>) to identify drought-afflicted areas. If drought stress is indicated, the impact of drought need be determined by site visits to the drought-afflicted areas. This site visit could be used to evaluate the current condition of water resources and determine if water shortages exist.

To determine if vegetation is suffering from the lack of water, the U.S. Drought Monitor and the Vegetation Drought Response Index (VegDRI) (USGS, 2010) (<http://vegdri.unl.edu/>) should be consulted to determine drought-afflicted areas and vegetation condition as it pertains to drought stress. Site visits to drought-afflicted areas should be used to evaluate the current condition and production of key species as described in the associated ecological site descriptions (ESD; see publication “Ecological Sites of North Dakota” – R1556) for the area.

In instances where key species referenced in the Ecological Site Description (ESD) are absent, alternative key species should be identified using site-specific and/or past monitoring data. Evaluations should be used to determine if plants are exhibiting signs of drought stress and if vegetation shortages exist. Signs of drought stress include reduced shoot and leaf growth, reduction in seed head development, induced senescence (premature aging) and plant mortality.



Interpreting Drought Severity

Figure 1. Interpretation of drought severity by intensity level as reported in the U.S. Drought Monitoring report by the National Drought Mitigation Center (<http://droughtmonitor.unl.edu>).

Abnormally Dry

Going into drought:

- Short-term dryness slowing planting, growth of crops or pastures

Coming out of drought:

- Some lingering water deficits
- Pastures or crops not fully recovered

Moderate Drought

- Some damage to crops, pastures
- Streams, reservoirs or wells low; some water shortages developing or imminent
- Voluntary water-use restrictions requested

Severe Drought

- Crop or pasture losses likely
- Water shortages common
- Water restrictions imposed

Extreme Drought

- Major crop/pasture losses
- Widespread water shortages or restrictions

Exceptional Drought

- Exceptional and widespread crop/pasture losses
- Shortages of water in reservoirs, streams and wells, creating water emergencies

Drought Monitoring: Drought Response Triggers

When drought indicators signal that drought conditions exist, site visits to drought-afflicted areas should occur where drought monitoring would be completed for upland and riparian areas. Drought response triggers could be used to determine site-specific drought affects and activate drought response actions.

Triggers are thresholds associated with water and vegetation resources that indicate the need for action. Triggers could be used separately or in combination to activate response actions.

The following is a list of the resource triggers:

Water

The presence or absence of available water is the trigger and is classified as available or unavailable. Available is defined as an amount of sufficient water to provide a safe and reliable source of water for livestock, aquatic species and wildlife while maintaining natural resource values. Resource values associated with riparian areas include riparian vegetation, bank stability, wildlife habitat, and water quantity and quality. Resource values associated with upland sites include vegetation, nutrient cycling, biotic integrity, soil site stability, hydrologic function and wildlife habitat.

Unavailable is defined as an absence of water or a quantity/quality of water that is insufficient to provide a safe and reliable source of water for livestock, aquatic species and wildlife while maintaining resource values. Field observations and professional judgment should be used to determine availability. If water quality is in question, send a sample to a reputable water testing laboratory for analysis. Criteria such as reduced quantity or quality of water, evidence of excessive loafing of livestock in riparian areas, or presence of unstable, unprotected banks should be used.

Vegetation

Triggers within this section are based on plant production parameters. The following triggers associated with vegetation are intended to ensure proper utilization levels of upland and riparian **key species** described in the associated ESD. In instances where **key species** referenced in the ESD are absent, **alternative key species** such as green needlegrass, western wheatgrass, needle and thread, and blue grama would be identified using site-specific and/or past monitoring data.

Appropriate utilization levels provide adequate residual matter for the maintenance of plant health, especially during a drought, and sufficient cover for wildlife habitat. These triggers have been organized into three categories; a) utilization and stubble height by vegetation community and/or ecological site, b) livestock distribution and c) plant production/drought stress.

a. Utilization and Stubble Height

These vegetative parameters were chosen due to the reduced vigor and production of plants resulting from drought. Key species would be identified using the ESD for a specific area. For example, in a loamy ecological site in MLRA 54 (southwestern North Dakota), key species would include western wheatgrass, green needlegrass and blue grama. A shallow loamy in MLRA 54 would include western wheatgrass, little bluestem, needlegrasses and sideoats grama. In instances where key species referenced in the ESD are absent or in riparian areas, alternative key species would be identified using site-specific and/or past monitoring data.

Stubble height (used as a measurement to evaluate utilization levels) triggers were developed to ensure adequate amounts of residual matter to maintain riparian plant communities occur at the end of the grazing season. Generally, stubble heights of 4 to 6 inches help preserve forage plant vigor, retain sufficient forage to reduce cattle browsing of willows, stabilize sediments, provide effective stream bank protection, limit streambank trampling, maintain cattle gains and maintain or improve plant communities, thereby increasing water quality (Clay and Leininger, 2000).

Stubble height is a short-term management trigger applied during drought conditions to help attain long-term grassland objectives and is not used as a long-term management objective. It should be noted that utilization by grazing using percent reduction by height is not inter-changeable with weight. Since much of a grass plants growth is in the lower 1/3 of the plant, a 50 percent utilization of height would equal much less utilization by weight (Figure 2).

The following utilization levels and stubble heights would function as triggers within each respective upland and riparian vegetation community and would trigger the implementation of response actions.

Uplands

- 50 percent degree of disappearance of key species by weight
- 40 percent degree of disappearance of key plant species (by weight) within sensitive areas such as wildlife areas, areas that need plant recovery, Dakota skipper critical habitat, etc.

Riparian Zones

- At least 4 to 6 inches of key riparian species within the riparian zone/flood plain
- 20 percent utilization of key woody species such as willows (if present)

The key plant species method will be used to determine utilization levels. This method is adapted to areas where perennial grasses, forbs and/or browse plants are the key species. A key species is determined for the monitoring location based on the vegetation community defined in the ESD correlated to the location. In instances where key species referenced in the ESD are absent, key species will be identified using site-specific and/or past monitoring data.

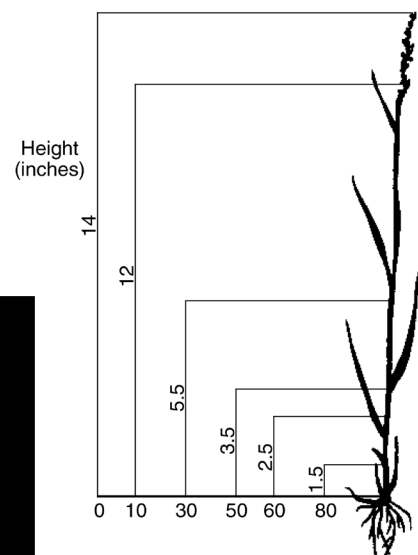
For upland sites, a transect bearing and distance between observation points is selected. Utilization levels are based on an ocular estimate of the amount of forage removed by weight on individual key species, and observations are recorded in one of seven utilization classes, rather than as a precise amount. Different examiners are more likely to estimate utilization in the same classes than to estimate the same utilization percentages.

Utilization estimations are improved through a calibration process prior to the collection of utilization data. Sampling techniques include:

- Walking the pre-determined transect, stopping at the pre-determined interval, and estimating and recording the percent of utilization of the key species nearest the toe
- Utilizing use pattern mapping that shows where livestock utilization patterns occur across the pasture. In times of drought, use pattern mapping can identify early distribution problems, allowing for modifications to a grazing management plan.

The stubble height method will be used to determine stubble heights within riparian areas. The concept of this method is to measure stubble height, or height (in inches), of key riparian species at any given time. This method, because of its simple application, is becoming a well-accepted method for expressing rangeland use. Examples of key riparian species found include sedge (*Carex spp.*), rush (*Juncus spp.*) and/or cordgrass (*Spartina spp.*).

Figure 2. Percent weight of western wheatgrass utilized at different stubble heights. (Montana State University, 1987)



b. Plant Production/Drought Stress

The following plant production and/or drought stress indicators would trigger response actions:

- Drought-induced senescence or reduced production of key upland and/or riparian species, which results in an insufficient quantity/quality of vegetation for livestock and/or wildlife
 - Decadent, wolf plants or non-native plant species still may show areas of adequate production, but quality and palatability will be low, resulting in high use of the key native plant species and reduced animal performance.
- Drought-induced senescence of key riparian herbaceous species, which results in insufficient plant growth/height to provide for stubble heights equal to or greater than 4 to 6 inches within riparian areas
 - Herbaceous riparian species such as sedges, rushes, grasses and forbs capture and filter out fine materials, while their root masses help stabilize banks and colonize newly captured sediment (Leonard et al. 1997).
- Noticeable signs of drought stress that impede the ability of key species to complete their life cycle (for example, drought-induced senescence and/or reduced seed head development)

c. Livestock Distribution

A pattern of use or distribution of livestock resulting in a concentration of animals, which contributes to grazing in excess of the aforementioned utilization levels and/or stubble heights, would trigger response actions to improve animal distribution and minimize rangeland degradation.

The landscape appearance method (LAM) could be used to determine the distribution of livestock across pastures identified as being affected by drought. This method is adapted to areas where perennial grasses, forbs and/or browse plants are present and to situations where utilization data are obtained from large areas.

The method uses an ocular estimate of forage utilization based on the general appearance of the rangeland. Utilization levels are determined by comparing observations with written descriptions of each class. A transect bearing and distance between observation points is selected.

Sampling techniques include moving along the predetermined transect, stopping at the predetermined interval and estimating, and recording the utilization class at each observation point. A complete description of this method can be found in the "Utilization Studies and Residual Measurements Interagency Technical Reference," 1999.

Drought Management Strategies

No special prescription exists for drought management. Good range management is good drought management. This embodies utilizing a good prescribed grazing system, proper livestock distribution, season of use and stocking rate, as well as the kind and class of livestock. Of these, stocking rate is the most important. No tricks can compensate for overgrazing.

A basic understanding of the potential capabilities and limitations of all ranch resources is fundamental to sound management. High levels of plant vigor and range condition are critical for rapid recovery from drought. Knowing which practices optimize livestock performance and minimize risk of financial loss is equally important. Drought considerations must be incorporated into each year's management plan and multi-year plans for dealing with drought often needed when determined necessary hay supply stock piles for example.

1. Management Preparation for Drought

Drought will challenge the mental toughness of even the best managers. Diverse practices can be used to maintain ownership of cows under drought conditions. Some ranches will liquidate or relocate part or all of their breeding stock. The value of keeping breeding herds on the ranch must be weighed against the additional costs that probably are incurred when drought continues.

Recovery of additional production costs will depend upon: (1) productivity of livestock, (2) productivity of rangelands and (3) livestock market prices during and following drought. Several additional questions will help you determine how much risk you can afford to accept:

- What are your family and ranch goals?
- What are your short- and long-term family needs?
- What is your current financial position, including financial assets and obligations?
- How secure is your relationship with the banker?
- Are you prepared to accept the additional stress of added risk?
- How soon must losses incurred during and following drought be recovered?
- Would you rather risk the loss of the ranch and/or breeding stock herd than sell out?

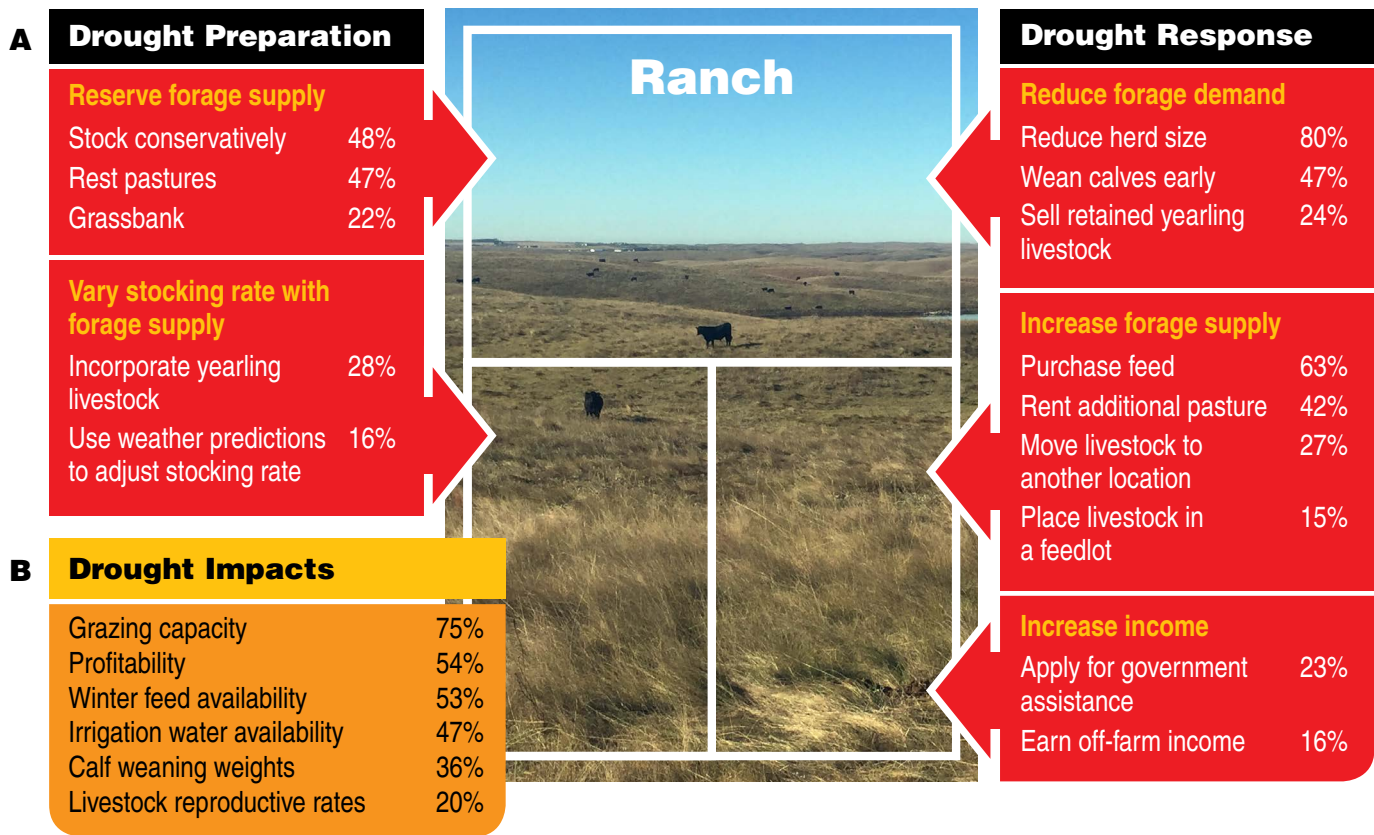
Desperation caused by financial problems can lead to the use of excessive stocking rates that reduce animal performance and cause dramatic reductions in plant vigor. Overgrazed land is worth less to future buyers or renters. If serious financial problems

exist before drought, the best option may be to sell before remaining equity is lost or additional debt is incurred. Having a written financial plan that contains contingencies for dealing with drought will help land managers be better prepared when a drought occurs.

Even when range livestock operations are solvent, liquidating or relocating part of or the entire breeding herd may be prudent to avoid additional production costs or damaging rangeland. Under severe or prolonged drought conditions, the cost of replacement livestock is almost always less than the cost of long-term reductions in rangeland productivity. Furthermore, acting early likely will be more beneficial at the sale barn, compared with waiting until everyone else is selling cattle after most of the grass is gone.

The most popular strategies focus on reserving forage supply, reducing herd size and buying feed (Bastian et. al. 2006, Coppock 2011 and Kachergis 2014). The fact that many ranchers use similar drought management practices, potentially triggering major price fluctuations, highlights the market risks associated with drought. This reinforces the importance of flexibility in drought management strategies for drought adaptation because doing something different may help a producer reduce market risks (Kachergis 2014).

Figure 3. (A) Drought management strategies Wyoming ranches use to balance forage demand with forage supply, reported as the percentage of respondents who use each practice. (B) Drought impacts on Wyoming ranches that were more severe than expected, with percentages of survey respondents who reported each impact.



2. Herd Management

The best alternative for drought management is to reduce total forage requirements. Reducing stocking rates during drought pays dividends in terms of:

- Optimized animal performance
- Reduced supplemental and winter feeding costs
- Minimized damage to natural resources
- Enhanced range and pasture recovery following drought

Sell or relocate livestock as soon as shortages in forage and feed resources are anticipated because market value tends to be highest at the beginning of a regional drought. If additional shortages in forage occur, calculate the additional costs associated with keeping cows on the ranch (feed, interest, labor, etc.) or transporting the cows to another location with adequate feed or forage. If your calculations show an unreasonably high cost of producing a weaned calf, selling or relocating part of or the entire cow herd may be prudent.

The following practices can help minimize liquidation of the breeding herd:

- Wean early to extend the forage base.
- Practice early and heavy culling of less-productive cows, such as late-calving cows and older cattle.
- Remove yearlings from summer pastures early.
- Consider curtailing the production of replacement heifers for one year.
- Supplement bulls earlier than other classes of livestock if necessary so they are in acceptable condition when the breeding season begins.
- Maintain a percentage of the livestock, such as yearlings or stockers, as a readily marketable class of stock.
- Evaluate the potential for other forage sources, such as poor-producing hay land due to drought, or annual forages (cover crops).



3. Past and Future Stocking Rates

Grazing management during years preceding drought is a major factor in range vegetation response to drought. Managers may have assumed that no change in stocking rate has occurred on their ranches because they have not increased livestock numbers.

The amount of forage consumed in a pasture depends upon animal size, as well as animal numbers and days of grazing. The average size of cows, calves and yearlings has increased on many ranches during the past 10 years. A 10 to 40 percent increase in average animal weight should be equated to a 7 to 28 percent increase in stocking rate based on metabolic body weight.

Inadvertent increases in stocking rates may lead to overgrazing and reduced plant vigor before drought. All range livestock producers need to evaluate their animal weights critically and use an appropriate animal unit (AU) equivalent when calculating stocking rates. Inadvertent overstocking may reduce animal performance and will damage the forage resource.

4. Developing a Drought Management Plan

A drought plan should minimize financial hardships and hasten vegetation recovery after drought. Plans identify action to be taken at the first sign of drought, as well as with continued indications of pending forage shortages. Plans for stocking rate adjustments need to be specific in terms of method and date. The timing of actions should be based upon seasonal checkpoints.



Drought Calculator

The North Dakota version of the Drought Calculator is available at <http://nrrc.ars.usda.gov/DCND/>.

The Drought Calculator is a tool developed by the U.S. Department of Agriculture-Agricultural Research Service to assist ranchers and other rangeland managers in assessing the impacts of drought on forage production. This tool utilizes local precipitation data (downloaded from the closest weather station or entered by the rancher/manager from local records) to establish an average long-term precipitation baseline against which it compares current precipitation to estimate the impact of below-normal precipitation on forage production.

Critical evaluation dates at which livestock requirements are balanced with available forage and feed resources are:

April 15-30

- Review the previous year's records on pasture condition to determine which pasture(s) may need stocking rate or grazing date adjustments.
- Assess pasture drinking water conditions. Many stock dams, dugouts and ponds received minimal recharge due to low snow amounts in 2014-2016.
 - Test water quality for total dissolved solids, sulfates and nitrates. Water quality should be monitored as long as drought conditions persist.
 - Make sure you have an adequate water supply and haul water if necessary.
 - Expect lower calf weight gains if the calves are drinking poor-quality water.
- If drought conditions occur in April (precipitation is 70 percent of average for your region or less), growth of introduced cool-season pastures (crested wheatgrass, smooth brome grass) will be below average.
 - If lower production is expected, delay turnout and feed hay longer, evaluate alternative feeds available or plan to graze fewer days.
- Evaluate stand quality and probable forage production of winter and spring cereal crops seeded for forage to be used for grazing purposes.

May 1-31

- If drought conditions occur in May (70 percent of average moisture – rainfall – for your region or less), expect reduced forage production of 10 percent or more.
 - Plan for removing cattle earlier, reducing the stocking rate or weaning calves early.
 - Plan for alternative forages or feeding options if none of the above are desired.
 - Plan to begin grazing in tame pastures or post-contract Conservation Reserve Program lands if available, then look to rangeland that has been invaded heavily by Kentucky bluegrass or smooth brome grass.
- Cool-season grasses grow 30 to 40 percent of their total growth during May.
- Warm-season grasses only grow 10 to 20 percent of their total growth during May.
- Check plants (tame and native pastures) for grazing readiness prior to turnout (third-leaf stage) and have a monitoring plan in place to measure utilization and prevent overgrazing.
- Develop water drinking sources or haul water if your supply becomes limited or potentially toxic.

Estimate probable stocking rates and alternative (annual) forages based upon April through May precipitation to compensate for forage production shortfalls on pasture and rangeland.



June 1-30

- If drought conditions occur in June (precipitation is 70 percent of average for your region or less), expect reduced forage production of 20 percent or more, depending on timing and amount of rain, and severity of the drought.
 - Plan for removing cattle earlier, reducing the stocking rate, weaning calves early or culling cows
 - Assess the establishment and stand quality of summer annual forages and soil moisture conditions.
- Cool-season grasses grow 70 to 80 percent of their total growth during May and June, and during summer droughts, as much as 100 percent of potential growth will have occurred up to this period.
- Warm-season grasses only grow 50 to 60 percent of their total growth during May and June
- Graze pastures that will have drinking water shortages later in the grazing season during this period, saving pastures with better water resources for summer use.
- If hot, dry conditions persist, monitor dugout and ponds for cyanobacteria (blue-green algae), which is toxic to livestock.
 - Water should be treated or access to the water by livestock needs to be restricted.
- Some plants accumulate nitrates during periods of drought, so take precautions to prevent nitrate poisoning (see NDSU publication “Nitrate Poisoning of Livestock,” V839).
- Maintain a monitoring plan to measure utilization and prevent overgrazing.
- Assess hay land to determine if adequate forage is available to justify harvesting. If the hay land has poor production potential, consider using it for grazing.

Most plant growth in the Northern Plains occurs in June. If drought conditions have occurred in May and continue into June, forage production will be reduced dramatically for the season, regardless of the amount of moisture received after June 30. Serious consideration should be given to stocking rate reductions and herd management.

July 1-30

- If drought conditions persist throughout July (precipitation is 70 percent of average for your region or less), expect reduced forage production of 30 percent or more, depending on the timing and severity of the drought.
 - Little to no new plant growth will occur, with forage produced up to this period being your feed base for 2016.
 - Plan for removing cattle earlier, culling cows, weaning calves early, or moving them to alternative forages or crop residue earlier than planned.
- Assess the establishment and stand quality of late-planted summer annual forages and soil moisture conditions.
- Maintain a monitoring plan to measure utilization and prevent overgrazing.
- Assess the forage quality of vegetation being grazed. Consider supplementing protein if needed for the class of livestock to be grazed.



Aug. 1-30

- If drought conditions persist throughout August (precipitation is 70 percent of average for your region or less), expect reduced forage production of 40 percent or more because plant growth will die off earlier than normal and standing feed will be reduced.
 - Expect lower-quality feed and lower cow performance unless the cattle are supplemented with high-quality feed.
- Maintain a monitoring plan to measure utilization and prevent overgrazing.
- Assess the current-year and carryover winter feed inventories. Purchase hay resources as needed.

The diet quality of annual forages declines dramatically after the soft-dough stage. If maximum tonnage is the objective, then harvesting after the soft-dough stage may be desirable. If high forage quality is the objective, harvest at the late-boot to soft-dough stage.

Sept. 1-30

- Make a final assessment of the yield of annual forages grown for late-season grazing.
- Inventory other harvested feed and determine the quantity of crop residue on cropland.
- Estimate the amount of forage in winter pastures.
- Maintain a monitoring plan to measure utilization and prevent overgrazing.

Oct. 1-30

- Use September through October precipitation to predict stocking rates for the next summer.
- Conduct a monitoring program to measure utilization and prevent overgrazing.

Exercise caution. Green plant growth can have profound psychological effects on range livestock producers. Even a small amount of spring or fall green-up can cause a false sense of security and delay prudent management decisions. Premature, aggressive restocking can cause serious economic loss because of long-term reductions in the rate of vegetation recovery. If vegetation recovery is slow or restricted by continued drought, a destocking plan will be needed.

A plan of action should be developed for best- and worst-case scenarios. If drought breaks early the following year, a gradual restocking plan may be appropriate.



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- Areas of this publication were obtained from "Drought Management on Range and Pastureland: A Handbook for Nebraska and South Dakota," Nebraska Cooperative Extension, EC91-123. Modifications were made to adjust guidelines for the northern Plains.

Publications to Reference

- "Livestock Water Requirements" – AS1763
- "Livestock Water Quality" – AS1764
- "Ranchers Guide to Grassland Management IV" – R1707
- "Determining Grazing Readiness for Native and Tame Pastures" – R1061
- "Alternative Feeds for Ruminants" – AS1182
- "Nitrate Poisoning of Livestock" – V839
- "Cyanobacteria Poisoning (Blue-green Algae)" – V1136
- "North Dakota Grazing Monitoring Stick" – R1780
- "Livestock and Water" – AS-954 (revised)

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