

Managing Drought Risk on the Ranch

A Planning Guide for Great Plains Ranchers



University of Nebraska - Lincoln
National Drought Mitigation
Center

Available Online at:
www.drought.unl.edu/ranchplan



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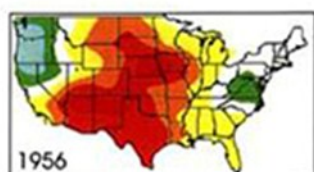
This guide to help rangeland managers better prepare for and manage drought is a project of the National Drought Mitigation Center (NDMC) at the University of Nebraska-Lincoln (UNL) and other collaborators at UNL, South Dakota State University, and Texas A&M Kingsville. This project was made possible through funding from the U.S. Department of Agriculture Risk Management Agency.

Much of the content of this handbook and the companion website was developed with information provided by Dr. Pat Reece, Professor Emeritus at UNL and now owner/consultant with Prairie Montane Enterprises, LLC.

The handbook and website were developed by, and will be maintained by, the National Drought Mitigation Center. Comments and questions about the handbook and website can be directed to the NDMC at ranchplan@unl.edu or 402-472-6781.

Why Plan for Drought?

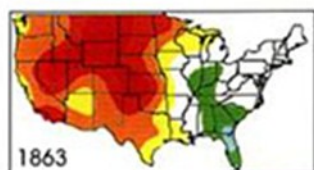
DROUGHT EXTENT and LENGTH



1950s
5 years



1930s
8 years



1860s
7 years



1810s
6 years

DRY  WET
Drought Index

1. DROUGHT IS INEVITABLE

For ranchers in the United States, drought can be defined as too little soil moisture to meet the needs of dominant forage species during their rapid growth windows. Drought is a natural part of climate in nearly every region on earth.

2. PRE-DROUGHT ACTION SHAPES CHOICES

Producers who focus on increasing flexibility and maximizing the health of resources are more likely to find solutions during drought that minimize painful decisions with limited resources.

3. EFFECTIVE RESPONSES TO DROUGHT ARE EARLY RESPONSES

The longer you wait to make decisions, the fewer options you will have available to you.

4. DROUGHT CREEPS UP ON YOU

Drought conditions occur gradually over time, sometimes making it difficult to take immediate action. A viable plan needs to have decision points.

A short-term drought (lasting one season or year) requires management adjustments, but generally won't impact the ranch's viability over the long term.

In contrast, a multi-year drought may last 3-5 years or more. Each year, drought effects will be multiplied by the management decisions made during previous years. A few years into a multi-year drought, ranch managers may have far fewer management alternatives and resources to work with. Long-term impacts on the ranch's financial health, ecological health, and rancher stress can be devastating.

Having a plan will help producers get through a short- or long-term drought while minimizing damages.

PLANNING LEADS TO EARLIER, MORE EFFECTIVE DECISIONS

The best time to make drought-related decisions is sooner rather than later. Here are some reasons why:

1. PLANT YEAR PRECIPITATION

Precipitation received between last year's killing frost and this year's spring green-up results in greater yield of forage per inch of moisture than does mid- to late-summer precipitation. If little to no precipitation falls during the dormant season, timely destocking is necessary to avoid damaging rangeland vegetation. So if you're entering green-up and have seen no precipitation since before last year's killing frost, or if you are lacking soil moisture, it is already a good time to make changes to this year's stocking rate.

2. CRITICAL RAIN MONTHS

Forage research shows that the most important months for precipitation are the months just prior to the rapid growth periods of your dominant plant species. For much of the Great Plains, those critical rain months occur in spring through early summer. Rainfall that occurs after the rapid growth period of dominant plant species does not result in as much useable forage.

3. DELAYS IN RESPONSE TO PRECIPITATION

Areas mapped on the U.S. Drought Monitor (<http://droughtmonitor.unl.edu>) as being in extreme or exceptional drought during the growing season are likely to have a one- to two-week delayed response to rainfall. Additionally, the process of "wetting-up" very dry soils in these areas reduces the availability of rainwater to plants. Delays in plant response to precipitation should be expected when current plant-year precipitation in your immediate area is 75 percent or less of long-term average. Excessive grazing pressure during drought will further reduce or preclude yield responses to even measurable amounts of precipitation.

NEBRASKA EXAMPLE - STOCKING DECISIONS DURING 2002-2004 DROUGHT

For example, based on the precipitation information shown at the right, destocking on limy upland ecological sites in the southern Nebraska Panhandle should have been 50 percent by mid May and 100 percent by mid to late June 2002.

Given the severity of drought in 2002, turn-out of cattle onto summer pastures in 2003 should have been delayed by two to four weeks, and stocking rates should have been lower than pre-drought.

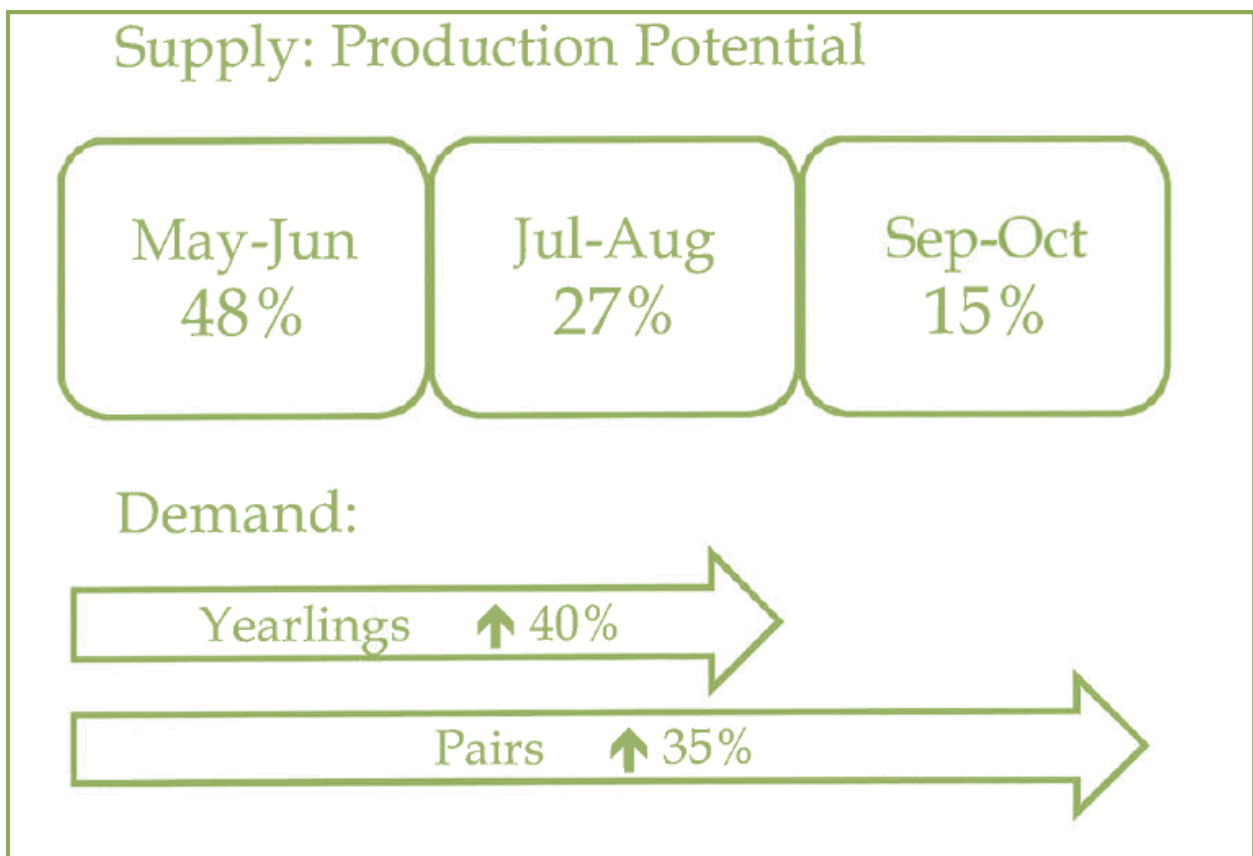
Because 2004 pre-growing season precipitation was relatively low, stocking rates should not have increased. Delaying turn-out on summer pastures in 2004 would have been beneficial.



DROUGHT EFFECTS ARE NOT LINEAR, THEY RAMP UP!

This observation is true for many damages from drought. Increases in feed and forage costs, while livestock prices plummet, ramps up weekly. Imbalances between forage supply and forage demand ramp up daily.

Even in non-drought years, herbage production rates decline as the summer grazing season progresses while forage demand increases 35% to 40% as cattle gain weight. In average years, plants “outgrow” livestock on the front half of the season. When this does not happen in drought years, you must be ready to act quickly. Having a plan ahead of time will help you act quickly when necessary.



Relationship between herbage supply and herbage demand on loamy plains sites during years with average precipitation.

Understanding Drought

GRASSES & DROUGHT

Understanding how moisture stress affects plants is essential when designing drought management practices.

PLANT GROWTH

Carbohydrates produced from photosynthesis provide energy for all plant growth and maintenance. When air temperatures are favorable for plant growth, lack of soil moisture is the limiting factor for photosynthesis.

Plant growth is reduced or delayed when green leaf area is removed, or when soil moisture limits the amount of carbohydrates that can be produced. Overgrazing and drought during the plant's rapid growth windows will reduce next year's plant growth.

Plants rely on stored energy to survive during dormancy, and for initial growth after dormancy. Plants must rely on stored energy for unusually long periods of time when drought-induced summer dormancy is added to winter dormancy. Early spring growth that is stopped by drought or frost will deplete the plant's energy reserves and reduce forage production potential the following year.

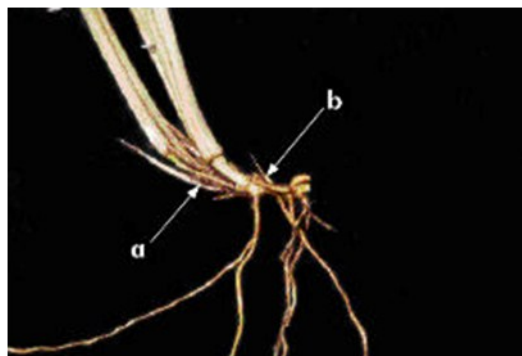
PLANT REPRODUCTION

Each year's forage crop is produced by a new set of tillers that develops from buds located in the crown and on rhizomes or stolons.

Year-to-year replacement of grass tillers primarily depends on the production and survival of vegetative buds on existing plants. Few perennial grasses become established from seed on rangeland.

Reduced plant growth under drought conditions or excessive grazing before grasses head may reduce or eliminate formation of new buds. Severe drought will lead to severe die off of tillers and rhizomes.

Grazing pastures every year at the same time will reduce next year's forage production of most mid-grasses and tallgrasses.



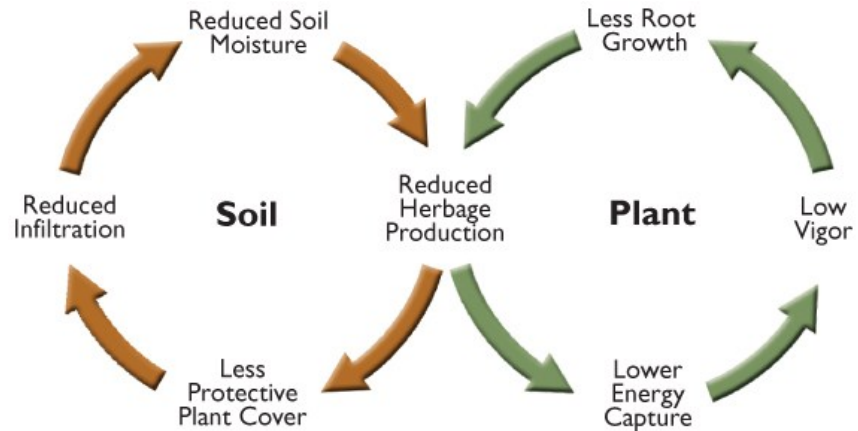
Buds on little bluestem crown ranging from 1-year-old (a) to 3-year-old (b) generations.

GRAZING AND DROUGHT

Understanding the interactions of livestock, plants, and precipitation is important to managing drought risk on the ranch.

Grazing management influences the effectiveness of precipitation. Plant cover and healthy root systems result in better infiltration of moisture into the soil. Overgrazing can cause drought-like conditions even with average precipitation.

The effects of drought are intensified at poorer range conditions. Rangeland in “fair” condition is often more severely affected by drought than rangeland in “good” to “excellent” condition. Range condition also influences the rate of recovery in forage production after drought.



Stocking rate and grazing system decisions are most likely to affect animal performance in the second half of the grazing season. In contrast, these decisions are most likely to affect plant vigor and herbage production potential during the first half of the next summer grazing season.

LIVESTOCK PERFORMANCE AND DROUGHT

Livestock gain and conception rates suffer during drought. If plant growth is stopped by drought, forage quality may decline rapidly because livestock selectively graze the highest quality forage first. The rate of decline in forage quantity and quality during drought is much more pronounced than in an average growing season.

Drought often reduces the number of days during which green forage is available to livestock. However, forage that cures at early stages of plant development can provide higher than average quality during mid and late summer. Ranchers who adequately reduce stocking rates to account for reduced quantities of forage under drought conditions often experience above-average animal performance.



FINANCES AND DROUGHT

The two kinds of risk generally associated with drought are production risk and market risk.

Production risk naturally emanates from the fact that drought limits forage production and availability, which directly limits the total productivity of the operation.

Increased **market risk** is realized when those affected by drought act in unison and dump animals on the market in an untimely manner.

To mitigate as much of this risk as possible, producers should have a viable drought management plan. Such a plan will not only specify all the options of demand and supply management strategies but may also use some form of insurance product where offered.

A viable plan needs to have several characteristics, including being able to identify key decision points. A series of smaller decisions can be effective in mitigating drought impact on the operation.

The key factor to remember in building a plan is that all of the options need to be carefully evaluated based on their cost of implementation. The producer can then use the combination of least cost options. In addition to the demand and supply management strategies one generally thinks about, insurance products and marketing tools should also be integrated where they can help mitigate risk.

SEASONAL AND CYCLICAL BEHAVIOR IN LIVESTOCK MARKETS

Market prices for cattle and beef fluctuate both seasonally and cyclically. When you combine such phenomenon with local conditions, such as drought, the amount of risk may be amplified.

Using drought management strategies, a producer may be able to exploit the market fluctuations and use them to alleviate heavy financial losses.

For example, it is commonly observed that cull cow prices generally bottom out in late fall. If this seasonality effect is preceded by prolonged drought in your area, you could expect that your local market may see a flood of more cull cows than is normal for the season. This even further dampens local prices, and makes a very poor time and place to sell cull cows.

If, however, you had culled heavily in the spring, you would probably have gotten a better price for your culls, and you would have conserved more pasture or range.

The earlier you can anticipate drought and be prepared to manage it, the likelier you are to avoid unfavorable market conditions and decrease your loss. In essence, early drought management provides greater flexibility and enhances your capability to avert unfavorable market conditions and "must sell" situations.

The Ranch Drought Plan

Ranchers with experience managing drought make the following recommendations:

1. Prepare for drought by increasing the health of the overall operation and maximizing flexibility
2. Write a Drought Plan that includes WHAT to do during drought and WHEN
3. When conditions require it, implement the plan and don't second-guess it
4. After drought, have a plan for restoring the health of all parts of the ranch operation
5. Monitor how the drought plan works, and improve it as you learn

Making decisions about what to do during drought, and when, can be overwhelming. Working through the following components may help you make decisions that are appropriate for your operation.

For example, deciding WHAT to do during drought may depend upon your ranch vision and objectives; the strengths, weaknesses, opportunities, and threats to your operation during drought; your ranch inventory; and the management strategies that you use before drought.

Deciding WHEN to take action might be informed by your ranch inventory, including when you can commonly expect precipitation and when your critical forage resources grow. "When" might also depend on your ranch objectives and management strategies. This information will help you set critical decision-making dates.

Finally, build a planning and management team, including on-ranch people and off-ranch mentors or advisors. These folks can help you think through the hard decisions.

DROUGHT MANAGEMENT PLAN COMPONENTS:

- ⇒ Communication and Planning Partners
- ⇒ Ranch Vision and Objectives
- ⇒ Understanding of Strengths, Weaknesses, Opportunities and Threats during Drought
- ⇒ Inventory of Ranch Resources
- ⇒ Critical Dates for Making Decisions
- ⇒ Monitoring Schedule
- ⇒ Management Strategies : Before, During, and After Drought
- ⇒ Ongoing Review of Drought Plan

COMMUNICATION AND PLANNING PARTNERS

Drought affects many aspects of a ranch operation, and there are many strategies that can be implemented to better prepare for and respond to drought. Planning partners can play a critical role in helping to understand the effects of drought and identify strategies that would be most appropriate for a particular situation.

DROUGHT PLANNING TEAM

Involve key family members, business partners, and your banker, as well as advisors with knowledge of range management, business, and marketing in the planning process.

"If you have a plan, even if it's in your head, you need to share it with the people that work with you. Whether it's your children or your employees... it needs to be shared information." (Texas Rancher, 2010)

Identifying relevant planning partners and establishing communication between them early in the drought planning process will help ensure that a range of ideas and perspectives are openly discussed as you develop your plan.

WHO'S ON YOUR TEAM?

RANCH VISION AND OBJECTIVES

"The first thing you're going to do is look at your operation, you're going to make some goals, some plans. If you've got the goals, you've got your plan, then you can start picking out what do if this happens, what do to do if that happens. But for gosh sakes keep it as simple as you can because if you get it too complex it overwhelms you..." (Nebraska Rancher, 2009)

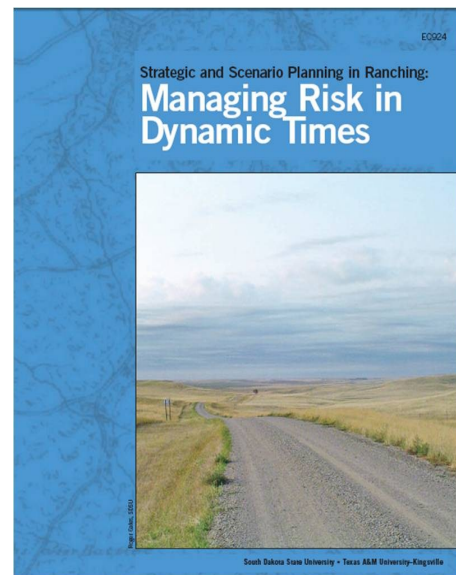
Dealing with drought is just one management aspect of the overall ranch business. Developing a ranch vision and strategic plan makes it possible for the manager to fit drought planning into this larger plan. The strategic planning process described in *Strategic and Scenario Planning in Ranching: Managing Risk in Dynamic Times*, published by South Dakota State University, outlines how to develop a vision statement and objectives, develop scenarios and strategies, implement the plan, and measure success.

Example of a ranch vision statement:

"To manage all integrated resources in order to maximize the production of protein, shape a harmonious existence with nature and maintain economic viability."

Objectives:

1. Regenerate range while using optimum percent of herbage grown
2. Enhance water and nutrient cycling and energy flow
3. Continue the management education process
(Kansas Rancher, 2009)



While a vision statement can be quite broad, the objectives identified to foster that vision should be more specific and could focus on such areas as how the ranch operation will maintain natural resources (e.g., range health, water resources); production; financial health; customer relations; and lifestyle, learning, and growth. The decisions you make before, during, and after drought should help move you closer to the vision and objectives you have for your ranch.

Worksheet 1 can be used to document your ranch vision and strategic objectives.

STRENGTHS, WEAKNESSES, OPPORTUNITIES AND THREATS (SWOT)

You should understand the threats and benefits drought presents to your operation in order to identify appropriate management strategies. With the ranch resource inventory in hand, you can talk to advisors about the likelihood of drought occurrence, the effects of drought on your operation, the relationship between grazing management and drought, and related topics to gain a better understanding of the role drought plays in your particular operation. *Worksheet 3 can be used to help you better understand how drought affects your ranch.*

A SWOT analysis is another tool that can be beneficial for helping you to understand potential drought risks and benefits. SWOT is an acronym for doing an analysis of strengths, weaknesses, opportunities, and threats posed by drought. The **strengths** (S) and **weaknesses** (W) originate from within the operation; they are internal factors that influence ranch or farm performance. The **opportunities** (O) and **threats** (T) originate from outside the operation; they are external factors. If you've already conducted a SWOT analysis as part of whole-ranch planning, you may want to review it from the perspective of drought readiness. Source: Strategic and Scenario Planning in Ranching: Managing Risk in Dynamic Times

Having conversations with other ranchers and advisers and carrying out these types of assessments will provide a better basis for making more informed management decisions. A hypothetical SWOT analysis is shown below.

Example SWOT Analysis

Strengths • Pasture health on north place is good • Core herd is profitable • Purchase of south place increases AUMs • Custom grazing cattle on south place	Weaknesses • Water holes on south place dry up frequently • South place somewhat overgrazed • Ranch debt/asset ratio too high
Opportunities • Two calls asking for hunting leases • New EQIP program • Custom grazing partner interested in increasing cattle numbers	Threats • High fuel prices raise cost of shipping hay • "Above Average" likelihood of drought this year

INVENTORY OF RANCH RESOURCES

Ranch management cannot be optimized without accounting for all natural resources. An inventory of your resources helps you and all of your partners know what you have to work with. You may have conducted a whole-ranch inventory with the help of your local NRCS, Extension, or grazing organizations. Below are some recommended items to include in your inventory that are relevant to drought planning. *Worksheet 2 can be used to complete your ranch inventory.*

Resource	Why Inventory?	How?
Precipitation • Historical frequency of drought • Precipitation extremes • Average precipitation and timing	Plan for drought based on past frequency of drought and weather extremes. Knowing when to expect precipitation helps determine critical dates and target states.	Find precipitation and temperature information at http://www.hprcc.unl.edu/data/historical
Range & Forage • Plant composition & growth period • Pasture health/condition • Pasture forage production potential • Other feed supplies	Knowledge of your carrying capacity in years with near-average precipitation and your current rangeland condition and residual herbage will be critical for determining when to reduce forage demand as drought develops.	Ranchers can produce individual pasture maps with range sites at web-soilsurvey.nrcs.usda.gov
Herd • Number & class of livestock • AUs throughout the year • Feed needs • Current stocking rate	Develop appropriate grazing system. Plan for feed needs during drought.	See: Doing the Math: Calculating a Sustainable Stocking Rate (http://hdl.handle.net/10365/16832)
Water • Wells/pipelines • Capacity • Water quality	Understand water capacity, and plan for water development, if needed, to support grazing system and withstand drought.	See: Water Resource Inventory and Monitoring (http://drought.unl.edu/ranchplan/InventoryMonitor/WaterResources.aspx)
Finances • Cash flow • Debt/asset ratio • Unit cost of production • Market alternatives	Gauge the ranch financial strengths and weaknesses. Weigh decisions before, during, and after drought against how those decisions might affect ranch finances.	Assessing the Economic Status of Your Beef Cow Herd (http://marketing.uwagec.org/MngTCMkt/EconStat.pdf)
Human Resources • Family members' interests/abilities • Hired labor resources	Involve family in developing vision/goals, utilize talents, and determine labor needs.	

GUIDELINES FOR EVALUATING FINANCIAL HEALTH

Liquidity	Not A Problem	Caution	Serious Problem
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Net Cash Flow:

Annual Inflow
-- Outflow

Large
Positive

Small
Difference

Large
Negative

Solvency	Not A Problem	Caution	Serious Problem
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Debt/Asset

< 40%

40 - 60%

> 60%

Networth:

Total Assets -
Total Liabilities

Large

Moderate

Small

Change In
Net Worth

Positive

Small

Large
Negative

Unit Cost	Not A Problem	Caution	Serious Problem
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\$/cwt¹

Low

Above
Average

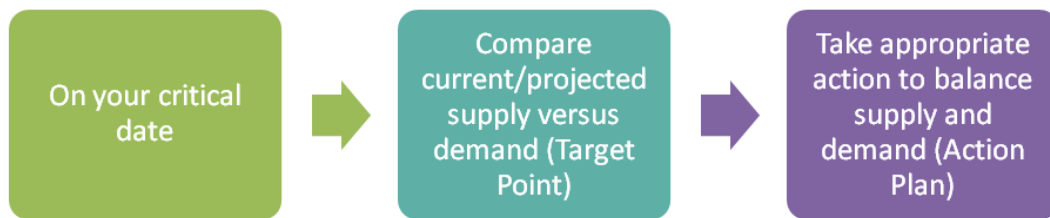
High

¹Compared to benchmark herds.

Source: Hughes et al. 2010

CRITICAL DATES AND TARGET POINTS

Identifying “critical” dates when management decisions will need to be made is another important part of drought planning. Critical dates are also timely monitoring points in annual management cycles. On **critical dates**, current and predicted forage resources should be compared to current and predicted forage demand (**target points**), and balancing steps taken (**action plans**). *Worksheet 4 can be used to document your critical dates and target points.*

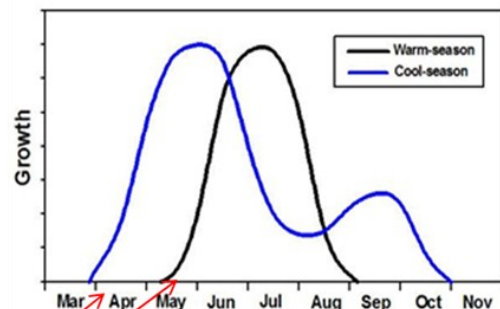


Critical dates may be based upon midpoints of rapid-growth windows for dominant grass species. Precipitation and soil moisture reserves are most important just prior to and during the rapid growth windows of dominant forage species.

Critical dates will be earlier for cool-season forage resources compared to warm-season species. Many semiarid rangelands are composed of mixtures of cool and warm-season species. It is often helpful to select two critical dates when most species of each growth-season category have headed to evaluate the contribution of each component to total herbage production.

Work with NRCS, university folk, or your own advisors to identify the earliest possible indicators of pending forage deficits. Some possible indicators:

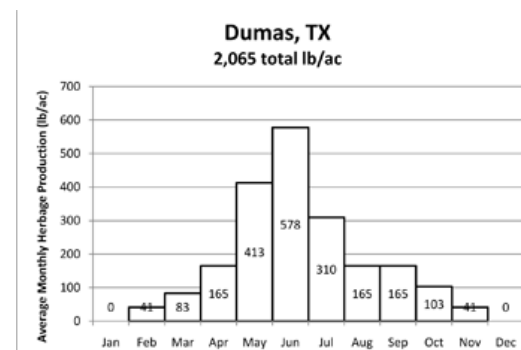
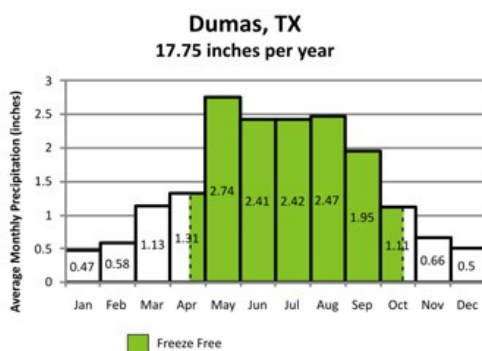
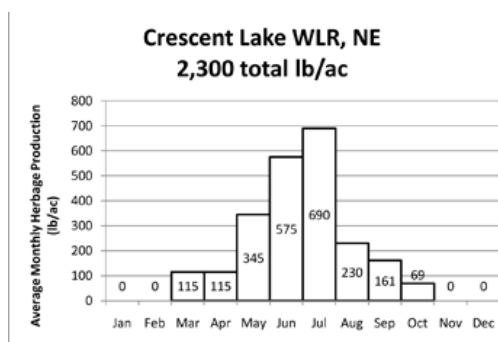
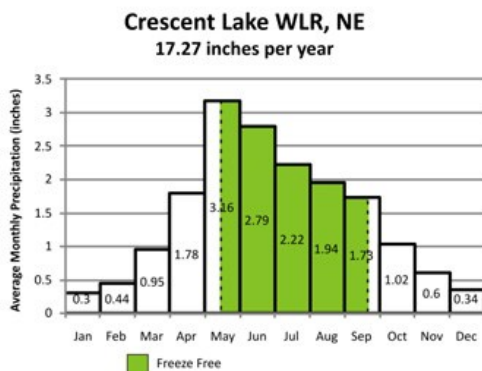
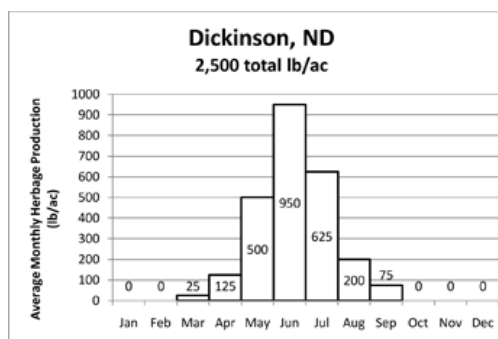
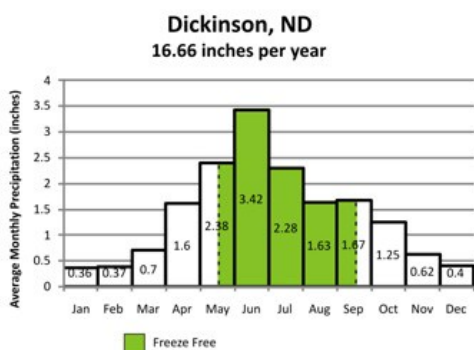
- Soil moisture
- Last year's precipitation and plant growth
- Precipitation starting in October
- Precipitation in recent months
- Short-term precipitation and temperature forecasts
- Current standing herbage
- All residual herbage



Critical Dates for Monitoring Resources in cool season vs warm season pastures

SET DATES BY LINKING PRECIPITATION PATTERNS AND FORAGE GROWTH

This example looks at three sites with similar soil types and plant communities, located near Dickinson, North Dakota (N 46° 53'), Crescent Lake Wildlife Refuge (WLR), Nebraska (N 41° 43'), and Dumas, Texas (N 35° 52'). In all of these locations, sand bluestem (*Andropogon hallii*) and prairie sandreed (*Calamovilfa longifolia*) or big sandreed (*Calamovilfa gigantea*) co-dominate upland sites in high ecological condition on loamy fine sands.



Notice how the timing of precipitation and forage growth varies tremendously among these sites.

Your NRCS, Extension, or other consultant can help you gather this type of information for your location, and use the information to select critical dates that make sense for you.

SELECTING TARGET POINTS: FORAGE PRODUCTION PER INCH OF PRECIPITATION

Target points may be based on carrying capacity of current forage or a prediction of forage growth based upon the percentage of average precipitation received.

In general, drought management plans for semi-arid regions are implemented when cumulative plant-year precipitation is 20 to 25% below average on critical dates. Livestock producers in sub-humid regions may select precipitation deficits of 30 to 35% because of relatively high yield responses to precipitation.

Seasonal growth patterns in the Great Plains correspond to precipitation regimes.

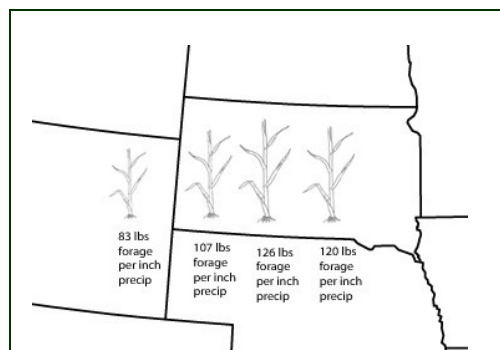
HOW MUCH FORAGE WILL PASTURES PRODUCE PER INCH OF MOISTURE?

Information from the NRCS Web Soil Survey was used to develop graphic summaries of changes in peak standing herbage along west-east transects through Texas, Colorado-Kansas, and Wyoming-South Dakota. The amount of herbage produced per inch of precipitation increases as average annual precipitation increases on all 3 transects.

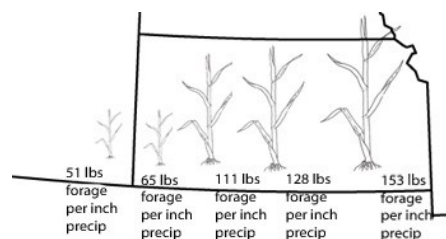
Eastward increases in yield response also correspond to lower elevations, longer growing seasons, and higher soil fertility. On rangeland in high ecological condition, about twice as much herbage is produced per inch of rain when annual precipitation doubles in the southern and central Great Plains.

Average yield per inch of annual precipitation increases from about 74 to 144 lb/in through Texas, from about 58 to 153 lb/in from eastern Colorado through Kansas, and from 85 to 124 lb/in from eastern Wyoming through South Dakota.

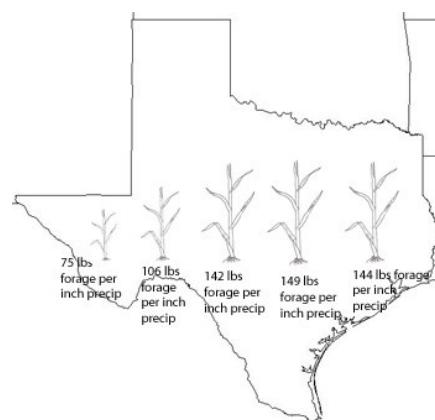
The National Resources Conservation Service (NRCS) provides plant growth-curve information for many range sites on websoilsurvey.nrcs.usda.gov. The information may be limited to range sites in good to excellent condition (historical climax plant communities (hcpc)). Check with local NRCS and university range management advisory personnel for additional information. Site specific precipitation and temperature records including long-term and monthly data are available at regional climate centers.



Herbage production per inch of precipitation on loam soils near Bill WY, Edgemont SD, White River SD, and Winner SD.



Herbage production per inch of precipitation on silt loam soils near Bent County CO, Hartland KS, Windhorst KS, Hutchinson KS, and Moran KS.



Herbage production per inch of precipitation on clay loam soils near Pecos TX, Big Lake TX, San Angelo TX, Goldthwaite TX, and Gatesville TX.

SAMPLE CRITICAL DATES

NORTHERN/CENTRAL GREAT PLAINS

**END OF JUNE
+
THROUGH-
OUT
SEASON** In the northern and central Great Plains, annual herbage production on good-condition loamy and silty sites dominated by mixtures of shortgrasses and midgrasses is correlated with total precipitation during May and June. Periodic monitoring will still be necessary.

CENTRAL GREAT PLAINS

JANUARY 1 On good-condition semiarid Sandhills rangelands in the central Great Plains, total annual precipitation for the two preceding years is a good indicator of herbage production during May and June (Dahl 1963).

MID APRIL Depth of moist soil in mid April in these ecosystems correlates highly with peak standing herbage in early August. Depth of moist sand is easily measured when replacing fence posts in the spring. When there are 3 feet or more of wet soil in mid April, there will be enough herbage to support moderate stocking through the grazing season in at least 8 out of 10 years.

JUNE 1 Most cool-season grasses are in the reproductive stage of growth and warm-season grasses are in a vegetative growth stage. Height and production of the cool-season grasses has some correlation with the potential production of warm-season grasses.

**LATE JUNE &
LATE JULY** Near average or better precipitation during June and July would remove all concern of forage deficits.

SOUTHERN GREAT PLAINS

**MARCH,
JUNE,
OCTOBER** Forage resources must be monitored throughout the year. In a Uvalde, Texas, example for rangeland, Larry White recommended conducting forage surveys in March, June, and October (critical dates) to determine if current forage supplies will last until additional plant growth is expected. Southern Great Plains range management advisors also emphasize the need to leave enough non-grazed herbage to support hydrological condition.

MONITORING PLAN AND SCHEDULE

It is important to monitor key resources on your critical dates, if not more frequently, so that you have the information you need to make decisions. Maintaining precipitation and grazing records for every pasture are the most critical rangeland monitoring activities every year. Scouting for indicator species and assessing hydrologic condition of rangeland should also be done annually. Below are some examples of key resources that may need to be monitored. Go to drought.unl.edu/ranchplan/inventorymonitor to see techniques for monitoring ranch resources.

You can create your own monitoring plan and schedule using Worksheet 5.

What to Monitor	When	Target Condition
Precipitation	On critical dates, prior to forage rapid growth, or monthly	Normal or percent of normal
Forage Availability	On critical dates or as needed when rotational grazing	Meet AUM needs
Residual (Remaining) Forage	After moving animals out of pasture	Meet hydrologic needs
Range Condition	Every few years	Meet ranch objectives
Livestock Grazing Records	Throughout grazing season as animals moved	Meet ranch objectives
Livestock Gain	Beginning and end of grazing season	Meet ranch objectives
Body Condition	Critical intervals in production cycle	Meet ranch objectives
Financial Health	Annually	Meet ranch objectives
Markets	As needed	Meet ranch objectives
Water Resources	Annually	Meet water quantity and quality needs

EVALUATE DROUGHT MANAGEMENT STRATEGIES

Drought is only one of the management challenges that ranchers need to plan for. It is important that the decisions you make before, during, and after drought fit into your overall plan. The decisions you make before, during, and after drought should help move you closer to the vision or goals that you have for your ranch.

As you think through best management practices to implement before, during, and after drought, you may want to consider:

Does it move you toward your vision or goals? Drought planning is just one piece of your overall ranch vision and goals, but can help you achieve your goals if you keep them in mind.

Is it feasible? Reflecting back on your inventory of your ranch resources, and the strengths, weaknesses, opportunities, and threats you identified, is this strategy something you can realistically do?

Will it make an impact? To explore what other producers and advisors have identified as being effective strategies to prepare for drought, seek out examples such as the Managing Drought Risk on the Ranch website (<http://drought.unl.edu/ranchplan>) or local resources.

Do the benefits outweigh costs? Financial decision making tools may help you identify the costs and benefits of proposed projects, and help you see the larger financial implications of your decision. The next few pages present some issues to consider in making changes to your operation. *Worksheet 6 may also be useful for documenting your ideas.*

EVALUATE BEST MANAGEMENT PRACTICES THAT HELP YOU PREPARE FOR DROUGHT

There are many strategies that you could use to achieve your overall objectives, and to reduce the impacts experienced in drought. With a limited amount of money, time, and energy, you must determine what actions you can take now and in the future that are most appropriate for creating a drought resilient operation.

These important decisions are outside of the realm of this publication, except to say again that management strategies that maximize the health of range resources and make the most of flexibility in the operation will contribute to an operation that weathers drought relatively well. Avoid overgrazing. Leave adequate plant cover for hydrologic condition of pastures. Strive towards financial health. Establish communication habits within the family and ranch business. Be clear about objectives and long range vision.

There are many excellent ranch management resources. Find more information at www.drought.unl.edu/ranchplan/beforedrought.

EVALUATE DROUGHT MANAGEMENT STRATEGIES

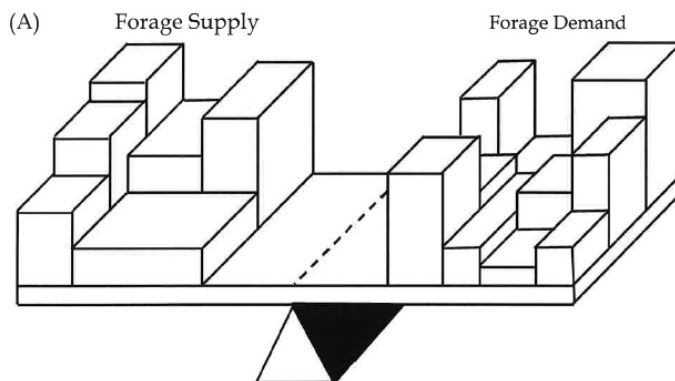
EVALUATE STRATEGIES TO BE IMPLEMENTED DURING DROUGHT

Some action will have to be considered and undertaken during and after drought, no matter how well you have designed your operation for drought resilience.

Use your ranch goals and strategic objectives to select action plans when managing forage demand. For example, if you have a registered or other specialized cow-calf enterprise, initially you may choose to manage forage supply more than forage demand. In contrast, commercial livestock producers should primarily focus on reducing forage demand with early sale of livestock subsets. Replacing grazing days with hay days dramatically increases cost of production. Complete liquidation of commercial cow herds may be a viable alternative to minimize loss of financial and ecological health.

Avoiding overgrazing then becomes a critical objective especially for native rangeland during drought. Herbage deficits can occur at different times of the year and the magnitude of these shortages differs among years. Consequently, drought plans need to identify prioritized subsets of livestock for sale or relocation. Sorting criteria should be based on ranch goals and objectives. They may include those listed in the figure below.

When action plans involve removing livestock, they need to be implemented quickly. When the likelihood of drought is relatively high, put the first-to-go livestock subsets in separate herds at turnout. Put a drought clause in every grazing lease and the necessary terms to make early removal of cattle efficient and equitable. Attach a copy of your drought plan to each grazing lease.



Timely adjustments must be made in rangeland forage demand to minimize risk to carrying capacity and animal performance (A). Drought plans should identify livestock class and sorting criteria for specific target dates (B).

(B) Reducing Pre-drought Demand

Class	Sort By
• Stocker Steers	Ownership
• Stocker Heifers	Enterprise
• Breeding Heifers	Risk
• Heiferettes	Quality
• Cows	Age
• Bulls	Weight
	Pregnancy
	Weaning

Divide average weight by 1,000 lb = AU

PARTIAL BUDGETING

Partial budgeting is a financial tool used to assess the costs and benefits associated with a specific change in an individual enterprise within the business operation.

1. IDENTIFY THE PROPOSED CHANGE(S)

Before starting partial budgeting, farm managers need to be clear in their minds about why they are considering making a change and to recognize the possible alternatives to the current practice that might help them meet their desired outcome. Since partial budgeting requires some effort, it is wise to choose among the best alternatives based on your initial assessment.

2. LIST THE KEY INFORMATION NECESSARY FOR ANALYSIS

This step is crucial and involves carefully gathering information pertinent to the costs and benefits associated with the proposed alternative(s). This process includes listing information about anything that would be different among the choices, such as costs, interest, yields, time, revenue, etc.

3. IDENTIFY THE POSITIVE AND NEGATIVE EFFECTS

Positive effects of the proposed change may result because of the elimination or reduction in cost of ceasing current activities and/or the generation of additional revenues by adoption of the new activities.

The negative effects of such a change could be generated by an increase in the cost by implementing the new activity and/or a reduction in the revenue from ceasing the current activity.

For example, in the case of a livestock enterprise, where buying replacement heifers is compared to raising replacement heifers from the ranch, the positive effect could be the reduction in the cost of feeding heifers limited range resources. Other cost savings may include labor, building, equipment, and management costs. The negative effects of this proposed change could be the cost of buying cows, the inclusion of inferior genetics (which results in reduced returns from the calves), or any other added cost or loss in revenue that can be attributed to buying versus raising cow replacements.

4. ESTIMATE THE NET EFFECT

Positive Effects	Negative Effects
1. Reduced Costs \$	1. Additional Costs \$
2. Additional Returns \$	2. Reduced Returns \$
Total Positive Effects \$	Total Negative Effects \$
Net Effects \$	

In the final analysis, the difference between the positive and negative effects determines how the proposed alternative(s) compares with the current method of production. It is important to note that a partial budget decision is no better than the information that goes into it. The old adage “garbage in, garbage out” is very relevant. The table at left presents a simple format of partial budgeting.

Supply management includes options that increase the supply of forage and/or water by digging a well, trucking water to livestock, renting additional pasture, grazing alternative forages such as crop residue, and trucking livestock longer distances to obtain additional pasture.

Demand management options include decreasing the demand for inputs such as selling livestock, weaning calves early and moving them to a drylot or sale, and decreasing the grazing time in various pasture.

EVALUATING FEED OPTIONS DURING DROUGHT CONDITIONS

One of the most difficult parts of drought planning is determining viable feed options. Like many difficult things, the process can be better managed by reducing it to a series of steps.

1. ESTIMATE THE AMOUNT OF FEED YOU NEED TO CARRY ALL ANIMALS THROUGH THE FEEDING PERIOD.

This would be all animals, young stock, bulls, etc. It is important to be realistic and honest with yourself about the amount of feed it will really take.

2. ASSESS YOUR CURRENT FEED INVENTORIES; INCLUDE ALL FEED SOURCES THAT YOU HAVE CONTRACTED, BOUGHT, OR HAVE ACCESS TO.

It is important to consider the quality as well as the quantity.

The economic efficiency of supplements declines as the difference between livestock requirements and forage quality increases.

3. IDENTIFY ALL THE RELEVANT FEEDING OPTIONS AND EACH TOTAL COST.

This may include the purchase price, including transportation; harvesting cost if it is a standing crop, including losses; storage cost, including losses; feeding out cost, including losses; and dry matter and nutrient content.

What is key to remember here is that it really isn't what the feed cost, but rather the difference between the cost and revenue. That's what makes or breaks the bank. Two great tools for doing this are the Feedcost Cow-Q-Lator and the Partial Budgeting Work Sheet found at www.AgManagersTools.com. Don't forget any of the grazing management costs and make sure you include fencing and water, moving livestock, land rent, and wasted feed.

4. EVALUATE THE OPTIONS AVAILABLE WITH RESPECT TO YOUR GOALS AND BUSINESS PLANS, THE RANCH'S RESOURCES, OTHER RESOURCES YOU MAY HAVE ACCESS TO AND AVAILABLE FUNDS AND FINANCING.

Other sources of feed may be non-traditional in your area, such as crop residue. Having access to such extra resources may require thinking years in advance and developing those resources over time. Consider all the costs and benefits associated with buying feed from various different sources. Use partial budgeting to help you understand the economic implications of your decisions.

EVALUATE DESTOCKING OPTIONS

It is important to consider this option in different degrees and different ways considering both short-term and long-term costs. For example, a long-term benefit could be the opportunity to cull out the bottom of the herd and increase the productivity of each cow.

The basic idea when you consider reducing the herd size is to determine the potential loss of income from livestock (calves and cull animals) sales in the future as well as the reduced costs incurred for the care of fewer livestock numbers including all animal types. Timing of these sales is likely to differ from the normal operation, so include such things as the sale of animals sold earlier than normal.

The table below provides an example of how proper drought planning can lead to cost savings in a ranch operation.

Drought management strategy adopted at Gudmundsen Sandhills Ranch during 2002 drought and resulting cost-saving estimate.

Source: Nebraska Ranch Practicum 2009 Presentation by Dr. Don Adams, WCREC; Pasture rental rates for 2002 provided by Dr. Jerry Volesky, WCREC

Action taken during drought	AUM savings	Cost savings (@ \$25/aum in 2002 prices)
Kept inventory current - 15 cull cow sold as identified	1.2 aum x 15 cows x 1 month = 18 aum	450
Identified 15 cows in May as culls and sold them as pairs in June instead of at weaning in October	1.5 aum x 15 cows x 5 months = 113 aum	2825
Weaned 300 March-born calves one month early in September	0.4 aum x 300 cows x 1 month = 120 aum	3000
Surplus 30 heifer calves sold 3 weeks after weaning (2 months early)	0.4 aum x 30 cows x 3 months = 24 aum	600
30 cows reduction (5% herd reduction) from September through May	1.2 aum x 30 cows x 9 months = 324 aum	8100
20 open cows sold in September (2 months early)	1.2 aum x 20 cows x 2 months = 48 aum	1200
110 cows to corn stalks in early November to late February	1.2 aum x 110 cows x 3.5 months = 462 aum	11550
25 pregnant June calving cows sold in January rather than in April as normal	1.2 aum x 25 cows x 2.5 months = 75 aum	1875
Total savings to drought management	1184 AUM	29,600

Source: Weathering Tough Times: Drought and Heat, UNL Extension

WORK TOGETHER AS A FAMILY

During crisis times, family and friends are the people who can help us see hope and a reason to look toward the future. Nurture relationships with family and friends. Avoid keeping secrets or purposefully withholding information from your spouse or partner. As problems arise, schedule time to deal with them. Weigh the costs and benefits and try to arrive at a mutually agreeable plan. Remember the value of each family member and remind each other how much they are needed and loved.

TAKE CARE OF YOURSELF

During these tough times it is even more important not to ignore basic self care and health habits.

FIND SOMEONE TO TALK TO

Our emotional and mental well-being is just as important as physical health. Family and friends usually provide emotional support. However, in times of severe stress, family and friends may not be able to offer the depth of help necessary. Mental health counselors, health workers, ministers, extension educators, and other professionals are trained to assist with problem issues and make appropriate referrals. Talking about problems doesn't make them go away, but it does help to voice concerns, deal with emotions, and examine various options.

DEVELOP A PLAN

Extended drought causes many people to reevaluate their financial situation. It is human nature to think the worst without really taking an objective assessment of what resources might be available. It is easy to get stuck in the mindset that resources are strictly financial. Resources can mean many things. Identify the different types of assets at your disposal, looking beyond the obvious common financial resources. Resources include skills, interests, talents, past volunteer and work experiences, your physical location and environment, connections to other people, and, of course, family and friends, just to name a few. From that inventory, start to develop a plan based on several "what if" scenarios. Think about short-term and long-term needs, both from a family and business perspective. Be honest with yourself and your family. Working through this process will give you a clearer picture of your situation and possibly open up some options.

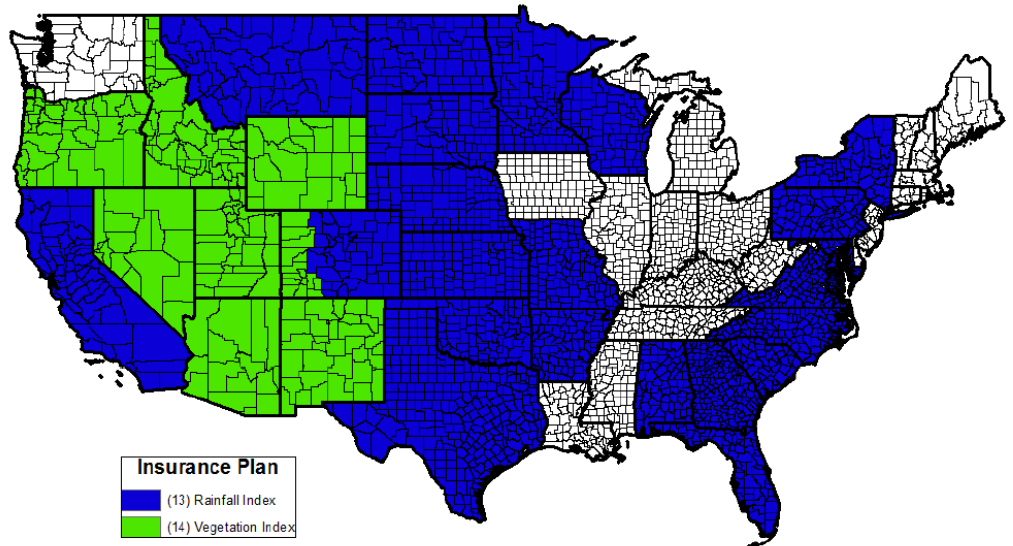
TAKE A BREAK!

Once you have decided upon a course of action and followed your plan, it's time to get your mind off of the drought. Give yourself permission to take a break from the busyness of your life. Entertainment can come in small and inexpensive packages but still give a boost to your day.

PROGRAM OVERVIEW

- AREA plan only
- Losses cover an area called a grid
- No individual coverage
- Does NOT measure actual individual production
- Index – based on deviation from normal/historical
- No loss adjustments, records, etc.
- Timely payments
- Does not reward poor management practices
- Producer cannot influence outcome/losses

2013 and Succeeding Crop Years – Pasture, Rangeland, Forage Availability



INTENDED USE

- Grazingland
- Established acreage of perennial forage
- Intended for grazing by livestock
- Acreage must be suitable for grazing
- Hayland
- Established acreage of perennial forage
- Intended for haying
- Acreage must be suitable for haying

Learn more about how the program might work for you with the Pasture Rangeland Forage Decision Tool—
<http://agforceusa.com/rma/ri/prf/maps>.

HOW IT WORKS

- Not required to insure 100% of acreage
- Forage utilized in the annual grazing or hay cycle can be insured without insuring all acreage
- All acres within a property may not be productive, e.g., rocky areas, submerged areas
- Provides additional flexibility for the insured to design the coverage to their specific needs
- Because the program is an area program, there is no opportunity to 'move' production

Learn more at <http://www.rma.usda.gov/policies/pasturerangeforage/>

EVALUATE DROUGHT MANAGEMENT STRATEGIES

EVALUATE STRATEGIES FOR DROUGHT RECOVERY

The length of the drought, the severity of the drought, market conditions, and other factors have a great impact on drought recovery options. Complacency in the aftermath of any scale of drought is hazardous. Cumulative effects of excessive grazing and intermittent drought can change species composition enough to cause measurable long-term declines in herbage production. When drought ends, vegetation recovery should become a primary management objective.

Priorities after drought breaks:

1. Restore hydrologic condition of rangelands
2. Restore plant vigor
3. Animal production objectives

In general:

- Do not graze weed infested pastures.
- Restock based on the recovery of mid- and tall-grasses by looking at the cover and height of preferred species.
- Delay entry of summer pastures by 1-2 weeks.
- Restoration of hydrological condition requires a reduction in spring and summer stocking rates.
- Rest pastures when air temperatures and soil moisture are simultaneously favorable for relatively rapid plant growth of preferred species.

HOW LONG WILL DROUGHT RECOVERY TAKE?

Factors that will shorten recovery time: relatively high pre-drought plant vigor and ecological condition; higher average annual precipitation (eastern Great Plains); and higher yield per inch of average annual precipitation (northern Great Plains).

Factors that will lengthen recovery time: excessive grazing pressure during drought, regardless of pre-drought condition; lower average annual precipitation (western part of Great Plains); and lower yield per inch of precipitation (southern part of Great Plains).

Attempting to increase yield responses to precipitation with fertilizer or other agricultural chemicals is likely to be ecologically disastrous.

RE-EVALUATE AFTER DROUGHT

After a drought period is a good time to reflect and assess the performance of your response to drought conditions. This evaluation will help you understand how to prepare and plan for the next drought. The recovery strategy is just as critical as the drought response plan.

WHICH PART(S) OF YOUR OPERATION TO KEEP?

With the end of the drought comes the opportunity to look at your enterprise mix and evaluate how each part has either contributed to, or hindered, drought mitigation, and to determine how these enterprises might aid or hinder in the recovery process. As you identify weak and strong links in your business, you can make the necessary changes in your enterprise mix to strengthen your operation. You may decide to add or remove parts or whole enterprises.

ARE YOU GETTING A READ ON THE FINANCIAL HEALTH OF YOUR RANCH AFTER A DROUGHT?

Your financial analysis will help you pinpoint areas of your operation you need to improve on, and those that are adding to your success. Indicators of financial health such as cash flow, debt to equity ratio, and net worth are helpful in this regard. Whole farm and enterprise budgets can be used to assess profitability associated with the different operations in your ranch.

CAN EXTERNAL FORCES ALTER YOUR DROUGHT RECOVERY PLAN?

The market situation is probably the single most important variable you will need to consider. Market outlook for both inputs and outputs will guide you on what kind of ranch operations will be most profitable.

DO YOU NEED AN INVENTORY REASSESSMENT? HAS YOUR RESOURCE ENDOWMENT CHANGED? USE YOUR RESOURCE ASSESSMENT AS PART OF YOUR RECOVERY PLAN.

You need to take account of how the drought has affected your resource base. Depending on your financial health and the current state of the market, decisions can be made to use the resources wisely. It is important to keep a close eye on your natural resources, since they are what drive the cow-calf business. Overused resources are likely to have hidden costs and be less productive than well-managed ones.

NOTES:

IMPLEMENT AND MONITOR YOUR PLAN

As you implement your drought plan, ask yourself: Is it working for you? Is it moving you toward your goals? Are you satisfied with how you managed through a drought using your plan? Would you make any changes to it?

If you are doing ongoing monitoring of your finances, range, and livestock, you will have a much easier time answering these questions, as you will be able to see trends appearing.

One method of tracking your progress is called the "Balanced Scorecard". This approach provides a simple "scorecard" method of tracking performance and goals.

Resource: Barry Dunn, Roger Gates, Jack Davis, and Argustin Arzeno (2006) Using the Balanced Scorecard for Ranching and Management, South Dakota State University and Texas A&M-Kingsville

NOTES:

WORKSHEET 1: RANCH VISION AND STRATEGIC OBJECTIVES

Date _____ Form Completed by _____

RANCH VISION:

STRATEGIC OBJECTIVES	GOAL	ACTUAL
NATURAL RESOURCES (Range Health, Water Resources) 1. 2. 3. 4.		
PRODUCTION 1. 2. 3. 4.		
FINANCIAL 1. 2. 3. 4.		
CUSTOMER 1. 2. 3. 4.		
RANCH LIFESTYLE, LEARNING, AND GROWTH 1. 2. 3. 4.		

Source: "Strategic and Scenario Planning in Ranching: Managing Risk in Dynamic Times" (Gates, Dunn et al 2007).

Date: _____ Inventory Completed by: _____

(attach additional pages as necessary)

CATEGORY	RANCH INVENTORY
PRECIPITATION • Historical Frequency of Drought • Range of Annual Precipitation Amounts • Average Precipitation and Timing	
RANGE & FORAGE RESOURCES • Range/Ecological Site • Range Condition • Forage Production Potential of Each Pasture • Other Feed Supplies	

CATEGORY	RANCH INVENTORY
HERD RESOURCES • Number and Class of Live-stock • AUs throughout the Year • Feed Needs (AUMs) • Current Stocking Rate	
WATER RESOURCES • Well Capacity and Ability to Pump • Flow Rate • Water Quality	
FINANCIAL RESOURCES • Cash Flow • Debt/Asset Ratio • Unit Cost of Production • Participation in Insurance Programs • Marketing Alternatives	
HUMAN AND PERSONNEL RESOURCES • Family members' interests and abilities • Hired labor resources	

WORKSHEET 3: IDENTIFY HOW DROUGHT IMPACTS YOUR RANCH OPERATION

Droughts may have direct consequences, such as reduced crop yields, livestock losses, or pond depletion. These direct impacts may then lead to secondary consequences such as physical and emotional stress, or financial insecurity. Some of the more common types of drought impacts are listed below.

Rate the following drought impacts according to how severe each impact has been for your operation during past droughts:

1 = not impacted

2 = slight impact

3 = moderate impact

4 = severe impact

5 = devastating impact

RANGE/PASTURE

Reduced productivity of rangeland	
Range fires	
Increased weeds	
Disrupted plant communities	
Decrease in desirable forage species	
Wind and water erosion of soils	
Other	

WATER

High cost/unavailability of water for livestock	
Reservoir or pond levels dropping	
Reduced flow from springs	
Water quality problems	
Other	

HERD

Forced reduction of foundation stock	
Decreased livestock gains	
Greater disease, pests, health issues	
High cost/unavailability of feed	
High livestock mortality rates	
Disruption of reproduction cycles	
Decreased stock weights	
Increased predation	
Other	

FINANCIAL

Inability to support ranch employees	
Inability to fulfill debt obligations	
Decrease in capital	
Increase in debt/asset ratio	
Borrowing value of land and stock drops	
Tax penalties from sell down	
Future price/income risks	
Watering and feed costs increase	
Other	

SOCIAL/FAMILY

Mental and physical stress (e.g., anxiety, depression, loss of security, domestic violence)	
Increased respiratory ailments	
Reduction or modification of recreational activities	
Off-farm/ranch employment required at higher levels	
Family Stress	
Other	

Based on the impacts you see on your operation, you can begin to plan the areas that will take priority in your drought plan.

WORKSHEET 4: CRITICAL DATES AND TARGET CONDITIONS

Date _____

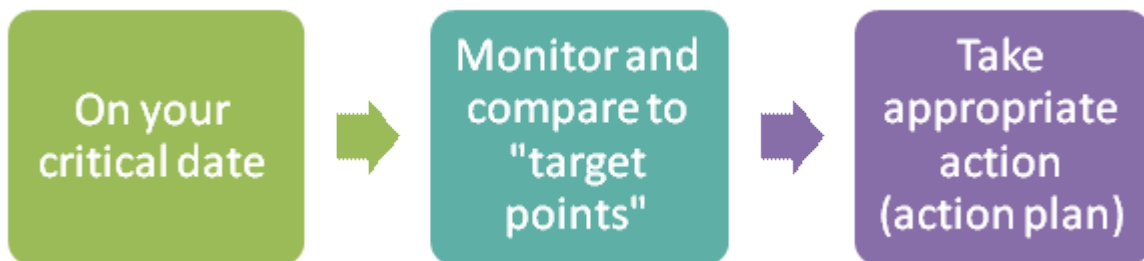
Form Completed by _____

Critical dates are timely monitoring points in annual management cycles. Current and predicted forage resources are the primary focus of critical dates.

Each **critical date** should have an **action plan** that clearly states **target points** for initiating the plan.

Target points may be based on carrying capacity of current forage or a percentage of average precipitation, i.e., 75%.

See "Identify Critical Dates and Targets" at <http://www.drought.unl.edu/ranchplan> for suggested critical dates by region.



CRITICAL DATE	TARGET CONDITION

Date _____ Form Completed by _____

WHAT TO MONITOR	WHEN	TARGET CONDITION
PRECIPITATION	My Dates:	My Targets:
FORAGE AVAILABILITY	My Dates:	My Targets:
RESIDUAL (REMAINING) FORAGE	My Dates:	My Targets:
RANGE CONDITION	My Dates:	My Targets:
LIVESTOCK GRAZING RECORDS	My Dates:	My Targets:
LIVESTOCK GAIN	My Dates:	My Targets:
BODY CONDITION	My Dates:	My Targets:
FINANCIAL HEALTH	My Dates:	My Targets:
MARKETS	My Dates:	My Targets:
WATER RESOURCES	My Dates:	My Targets:

WORKSHEET 6: EVALUATE STRATEGIES TO IMPLEMENT BEFORE DROUGHT

Date _____

Form Completed by _____

STRATEGIES	IS IT FEASIBLE?	WILL IT MAKE AN IMPACT?	GREATER BENEFIT THAN COST?	TO DO?
IMPROVE FORAGE RESOURCES				
MODIFY HERD/ENTERPRISE MIX				
MODIFY GRAZING STRATEGY				
IMPROVE WATER/ INFRASTRUCTURE RESOURCES				
IMPROVE FINANCIAL RESOURCES				
OTHER				

WORKSHEET 7: EVALUATE MANAGEMENT STRATEGIES DURING DROUGHT

Date _____

Form Completed by _____

DROUGHT STRATEGIES	IS IT FEASIBLE?	WILL IT HAVE AN IMPACT?	WILL BENEFITS OUTWEIGH COSTS?	TO CONSIDER?
FORAGE SAVING STRATEGIES				
FINDING ALTERNATIVE FEEDS & FORAGES				
FINANCIAL STRATEGIES				
FAMILY & PEOPLE STRATEGIES				
OTHER				

WORKSHEET 8: EVALUATE DROUGHT RECOVERY STRATEGIES

Date _____ Form Completed by _____

DROUGHT RECOVERY STRATEGIES	IS IT FEASIBLE?	WILL IT HAVE AN IMPACT?	WILL BENEFITS OUTWEIGH COSTS?	TO CONSIDER?
STRATEGIES TO RESTORE HYDROLOGIC CONDITION OF RANGELAND				
STRATEGIES TO RESTORE PLANT VIGOR				
ANIMAL PRODUCTION STRATEGIES				
FINANCIAL STRATEGIES				
FAMILY AND PEOPLE STRATEGIES AND OTHER				

South-Central Kansas

AVERAGE ANNUAL RAINFALL- 21 inches/year.

CRITICAL DATES- April 1, June 15, August 15, & Nov 1

This example includes critical dates, trigger points (percent of average precipitation), and management decisions. A document like this might be the result of your work on ranch vision/objectives, inventory, monitoring, setting dates and triggers, and evaluating strategies that fit your operation.

April 1

- End of the winter dormant season and the beginning of the growing season for warm season grasses
- < 4" of moisture during the winter dormant season (killing frost or Nov 1 till April 1) No prescribed burns should be conducted.
- Plan to increase the length of rest periods earlier than usual.

June 15

- About half of the forage is produced by June 15
- 75%(15.75") of the annual average rainfall is received between Nov 1 & June 15
- If the rainfall is <80% (12.60") of the 75% (15.75") then the stocking rate should be decreased 30% by weight. (Finish culling herd C)
- If the rainfall is < 60%(6.30") of the 75%(15.75") then the stocking rate should be decreased 40-50% by weight (Cull herd B deep)
- The 3 weeks following June 15th is very critical. By July 15 the destocking should be completed.
- Rest periods should be as long as possible by June 1 if any indicator of a drought is present.
- Graze periods should be as long as possible to allow the other paddocks to rest for as long as possible.

August 15

- About 90% of the annual forage has been produced. Warm season grasses are preparing for next year growing season. Rest between now & frost will benefit next year's grass production.
- Length of grazing season-Based on the rainfall in July & August
- If rainfall is <70% (1.50") of the average 5" during July & August end herd C grazing by Sept 1(Cull Deep)

November 1

- End of the growing season and the beginning of the winter drought(drought season)
- < 80%(16.80") of the 21" average annual precipitation would indicate the beginning of a drought for the next growing season unless the winter is exceptionally wet