COLLEGE OF AGRICULTURE & LIFE SCIENCES
Cooperative Extension

AZ1725 January 2017

An Easy to Use System for Developing a Drought Management Contingency Plan

Douglas R. Tolleson

Introduction

Drought is a way of life in the southwestern U.S. No matter if we are talking about drought in the near term or long-term changes in climate; proactive planning and management will help ensure stewardship and sustainability of rangeland resources. Being prepared for drought and other weather extremes is probably more important now for range and livestock managers than at any time in the past. In this publication, we will walk through the steps of an easy to use framework that will help you develop a contingency plan for drought and any other ranching or natural resource management situation. The basic idea behind this style of contingency plan is to use a variety of large-scale, publically-available drought indicators to define a series of drought severity categories (contingencies) and then combine these with science-based range monitoring data along with personal on-the-ground experience of a collaborative management team to pre-determine a course of action in the event of any particular drought category occurring.

Co-development of drought contingency plans between various partners in ranch and land management is a concept currently being tested by the University of Arizona and the Tonto National Forest (Brugger and McClaran 2016). A collaborative team may consist of family members, business partners, employer and employees, or ranchers and agency personnel. Each will likely bring something useful to the planning process and by participating, will feel more "ownership" in the plan.

Developing a Contingency Plan

To start the planning process we will first employ a concept known as the time/stress wedge (Figure 1).

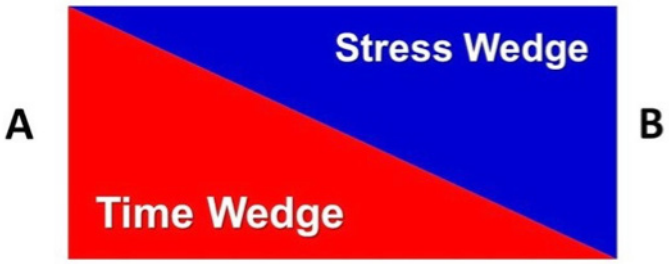


Figure 1. Time/Stress Wedge from Incident/Event Planning

Basically all this means is that if you are at point A and planning for some event at point B, you have more time to plan for it now than at any time in the future. No matter if we are talking years, months, or days. The flip side of that is that the more time you have to plan, the less stressful planning will be. The less stress involved, probably the more sound will be your decision making. Next, think of the most prepared people you know. Would that be the military, law enforcement, or emergency first responders? Maybe professional athletes and coaches? Each of these groups prepare for a wide variety of contingencies as if their life or jobs depended on it. Sustainable agriculture production and natural resource management is perhaps less dramatic than responding to a disaster or winning a championship, but no less important. So why shouldn't those of us in the range or other natural management professions plan for contingencies as well? Especially where drought is a way of life.

Large-scale Public Information

As mentioned above, we will start this planning process by using large-scale publicly-available information. The table provided below contains websites where this type of

Table 1. Large-scale publicly-available drought information

Website	Address
Westwide Drought Tracker	http://www.wrcc.dri.edu/wwdt/
U.S. Drought Portal	http://www.drought.gov/drought/
National Drought Mitigation Center	http://drought.unl.edu/
University of Arizona DroughtView	http://droughtview.arizona.edu/
High Plains Regional Climate Center Climate Maps	http://hprcc.unl.edu/maps.php?map=ACISClimateMaps/
Multiscale Standardized Precipitation Index Plots	http://cals.arizona.edu/climate/misc/spi/spi_contour.html

information can be found (Table 1). For illustration purposes let's work with a 3-month planning interval.

Let's begin by using data from the Westwide Drought Tracker website for Standardized Precipitation Index (SPI) to populate our table (Table 3). As shown, these can be color coded to match the particular drought information tools and to make them more visually intuitive. Next we will define what our range of cases would be based on the previous 3 month SPI; from > 2.0 (best) to < -2.0 (worst). Let's also include Normalized Difference Vegetation Index (NDVI) values obtained from the DroughtView website for another large scale indicator; specifically, departure from average NDVI values. We will define the best case/worst case scale for departure from average NDVI as dark blue (strongly greener) to dark brown (strongly less green).

Range Monitoring Data

Once these drought severity categories are defined, the team can start to add range monitoring data that fit into these categories. There is no set pattern for deciding what data to use or what category they should go into. These decisions will be part of the collaboration and should be adapted as necessary. There are several good publications describing

Table 2. Template of a drought contingency plan.

	Large Scale Public Information Indicator Sources		Site Specific Information Indicator Sources			Adaptive Management Alternatives		
Scenario Category								
"Best Case"								
"Average Case"								
"Worst Case"								

Note:

Table 3. Example of a populated drought contingency plan using the template provided

	Large Scale Public Information Indicator Sources		Site Specific Information Indicator Sources			Adaptive Management Alternatives		
	3-month Standard Precipitation Indes	Departure from "Normal"	Range Trend Data (% Bare Ground)	Water Level in Highline Tank	Cow Body Condition Score	Livestock Inventory	Grazing System	Emergency Measures
Scenario Category	Westwide Drought Tracker	Drought View	AZ Coop. Range Monitoring Project	Personal Observation	Personal Observation	Culling or Stocker Groups	Pasture Rotation	Water Hauling
"Best Case"	> 2.0	Strongly Greener	Up 20%	Full to over-flowing	> 6.0	Ratain Steers	Defer Extra Pastures	NA
	1.5 to 2.0	Greener	Up 10%	Full	6.0	Retain Extra Heifers	Defer Extra Pastures	NA
	0.5 to 1.5	Slightly Greener	Up 5%	90% full	5.5	Breed/Sell Dry Cows	Proceed with Planned Rotation	NA
"Average Case"	0.5 to -0.5	Average	Unchanged	75% full	5.0	Normal Culling	Proceed with Planned Rotation	Lower Pastures
	-0.5 to -1.5	Slightly Less Green	Down 5%	50% full	4.5	Cull Older Cows	Proceed with Planned Rotation	West Side Pasture
	-1.5 to -2.0	Less green	Down 10%	25% full	4.0	Cull < 4.0 BCS	Scatter Cattle to Water	Upper Pasture
"Worst Case"	< -2.0	Strongly Less Green	Down 20%	Dry	< 4.0	Cull to "Base Herd"	Scatter Cattle to Water	Upper Pasture

range monitoring methods and how to use them (e.g. Ruyle et al. 1997 and Smith et al. 2012). In the grey portion of Table 3, our hypothetical collaborative management team has decided that trend for percent bare ground from the most recent range monitoring data on the allotment will also be useful as well as the water level in our most dependable dirt tank. Additionally, the current cow body condition score (BCS) data was included (Tolleson and Schafer 2017).

Personal Experience and Observations

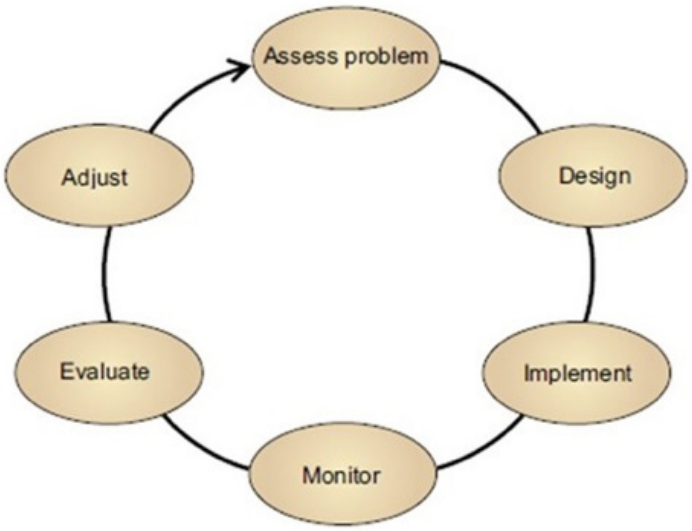
Many of us in agriculture and natural resources will also have a few favorite or "go to" on-the-ground indicators of range conditions in general and especially for drought in particular. There may be a certain plant that greens up early or flowers later than others and exactly when this occurs in a given year may be informative based on your experience. You may have a certain tank on your allotment that "always has water". So if that tank doesn't have much water in it at a certain time this year; that means something. There may be a plant that cattle in your area don't readily eat until they start to run out of plants that they prefer. These local indicators can and should be incorporated with our scientific data observations to help evaluate current conditions and formulate a proactive plan to deal with future conditions. This arrangement of high tech scientific information alongside locally collected monitoring data and personal observations is meant to illustrate that each type of input is important and each type should be used to inform the planning process.

Management Actions

The green portion of Table 3 contains a list of proposed management actions to take for each of the defined scenarios. Howery 1999 is a good source of drought management examples. In our example, we have included 3 management categories: 1) livestock inventory, 2) grazing system and, 3) emergency measures. This is where the actual planning aspect comes in to play and where most of the discussion among the collaborative team will occur. Creating what-if contingency scenarios by collecting a lot of data and recording personal observations about range conditions is the easy part of the planning process even though it can be time-consuming. Deciding what to do when you find yourself in one of those scenarios is the hard part. Think back to the time/stress wedge and your personal example of who exhibits preparedness. Doing these steps ahead of time and then using your training (past experience) to discuss and work through what an appropriate management response might be in each of these scenarios will prepare you to deal with that situation should it arise.

Summary

There is an old saying that states *"no plan survives contact with the enemy."* This is often true in ranch management, but it does not mean that the planning process is not useful. Common sense will also tell us that just because we line up these indicators on a chart, they may not all line up perfectly



From: Williams et al. 2009. Adaptive Management.
The U.S. Department of the Interior Technical Guide

Figure 2. Steps of the Adaptive Management Process.

in any given real-world situation. Due to any number of our previously discussed factors we may have: 1) an SPI -1.5, 2) slightly less green NDVI departure values, 3) no change in percent bare ground, 4) Highline Tank 75% full and, 5) cows in BCS 4.5. What we are looking for here is convergence of evidence and/or there may be one of these indicators that carries more weight than others. Success in applying this method will be like many other management skills, it will take time and experience. But once you start it will fit well within the adaptive management process (Figure 2).

"… we can all ranch when it rains…"

The above quote is one I overheard from an old rancher talking about one of his neighbors. There is a lot of truth in that statement. It was not meant as a complement. In the southwestern U.S. we can all look like geniuses in years with enough well-timed precipitation. It certainly takes more experience and skill to ranch when and where it doesn't rain. The better we have planned for a drought, the more benefit we will derive from rain when it occurs.

One last thought before we close. Notice in Table 2 that there is a space for notes at the bottom. The notes one takes to record what actually happened, what changes (if any) were made to the plan and why, may be the most important part of the process. Recording what we do and the reasons for it

will help inform the next generation of ranchers and land managers and help them be prepared for whatever climate the future holds.

References

Brugger, J. and M. McClaran. 2016. Ranchers, Forest Service, UA co-developing approaches to improve planning for drought on public lands (Part II). Droughtscape: The Newsletter of the National Drought Mitigation Center, Winter Issue. p 11-14.

Ruyle et al. 1997. Some methods for monitoring rangelands and other natural area vegetation. The University of Arizona, Extension Report 9043. 90 pp.

Smith, L., G. Ruyle, J. Dyess, W. Meyer, S. Barker,

C. Lane, S. Williams, J. Maynard, D. Bell, D. Stewart and A. Coulloudon. 2012. Guide to rangeland monitoring and assessment: Basic concepts for collecting, interpreting, and use of rangeland data for management planning

and decisions. Arizona Grazing Lands Conservation Association. 161 pp with appendices.

Tolleson, D. and D. Schafer. 2016. An easy to use system for determining range cattle body condition. The university of Arizona Cooperative Extension. AZ (AZ1726-2017) 5pp.

Howery, L. 1999. Rangeland management before, during, and after drought. The University of Arizona Cooperative Extension. AZ1136. 6 pp.

COLLEGE OF AGRICULTURE & LIFE SCIENCES
Cooperative Extension

The University of Arizona
College of Agriculture and Life Sciences
Tucson, Arizona 85721

Douglas R. Tolleson
Associate Specialist, Range Management

Contact:
Douglas R. Tolleson
drt2@email.arizona.edu

This information has been reviewed by University faculty.
extension.arizona.edu/pubs/az1725-2017.pdf

Other titles from Arizona Cooperative Extension can be found at:
extension.arizona.edu/pubsion can be found at:
cals.arizona.edu/pubs