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New Tools for Assessing Drought Conditions for Rangeland Management

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On the Ground

- Historical drought assessment and ongoing monitoring is essential for understanding past drought occurrence, the relationships between past drought and its impacts, and for triggering action during current drought events.
- A variety of new products have recently been developed to better monitor drought conditions and assess past occurrences at the local scale.
- A growing number of resources are available to assist rangeland managers to develop a monitoring system and incorporate it into a drought management plan.

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Drought is a normal part of the climate for any region and can occur in any type of climate regime around the world. It is also one of the primary risks faced by rangeland managers. Understanding the historical occurrence of drought and its resulting impacts, and monitoring current drought conditions, allows for the implementation of more informed drought risk management strategies. Previous studies have shown that farmers tend to have selective memories, remembering most vividly the first, worst, and last droughts they have experienced.[1] In addition to producing inaccurate recollections of drought frequency, the range of conditions experienced can form a mental model of how drought risk should be managed.[1,2] Therefore, rangeland managers who lack drought experience or have experienced a series of wet years may not have a full understanding of the range of potential drought conditions, resulting impacts, and management strategies necessary to effectively prepare for and respond to drought.

These factors can result in a limited range of experiences and information for rangeland managers to draw upon when choosing strategies to prepare for and respond to drought. Also, not having an accurate historical record limits the ability to evaluate relationships between precipitation and impacts of concern (e.g., forage production, water resources, finances, etc.). For example, research in the northern plains shows that the timing of precipitation can be correlated with herbage yields during the growing season.[3] This type of information can be used to develop an appropriate grazing management strategy, including the identification of critical decision-making dates and thresholds for implementing management decisions during times of drought.[4,5]

Similarly, in the past, Thurow and Taylor[6] pointed out that uncertainty associated with the identification of drought conditions often caused a lag in management decision making by ranchers. However, in recent years, an increasing number of drought monitoring products have become available to assist livestock producers and others to better understand the occurrence of past droughts and current drought conditions, which is critical for selecting and implementing informed drought risk management strategies and plans.

There are currently a variety of tools available for monitoring drought events, from the United States Drought Monitor and the weekly assessment associated with it, to individual drought indices that provide a historical perspective of current conditions and the severity of drought. The National Drought Mitigation Center (NDMC) and its partners have worked with stakeholders to develop a range of new drought assessment and monitoring products in recent years, which will be described in this article.

Drought Monitoring

There are many ways to identify and monitor drought conditions. The simplest concept is to measure precipitation and compare to historical values for like periods. More complex approaches use multiple inputs and data to calculate an index or even use satellite information to measure vegetative conditions. The NDMC works to bring monitoring tools to the public so they can assess drought conditions or compare drought conditions to past events.

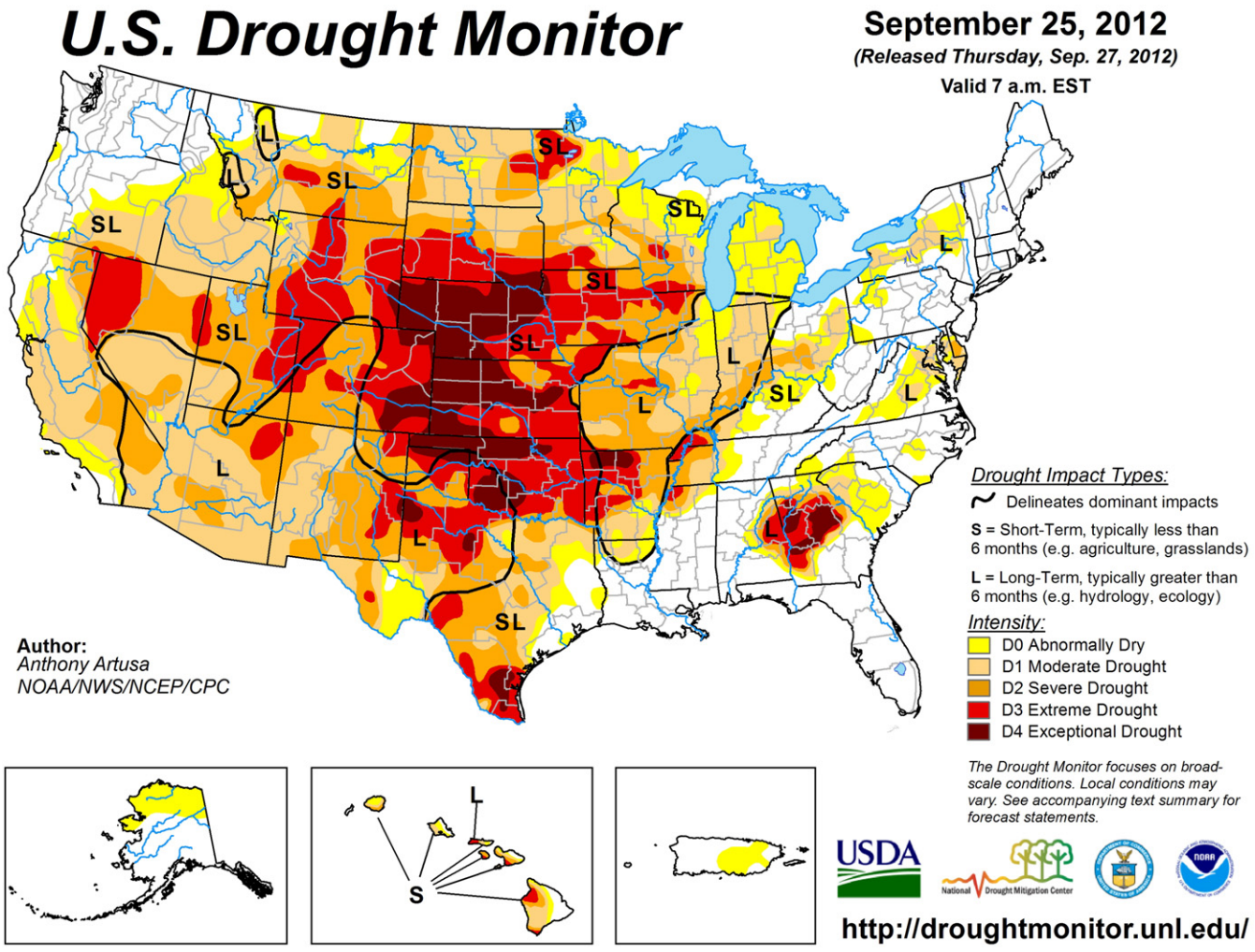

Figure 1. The United States Drought Monitor showing especially severe drought affecting the country in 2012 (http://droughtmonitor.unl.edu).

One of the most widely known tools the NDMC has helped to develop is the United States Drought Monitor, which is a product that is used to assess and identify drought and its intensity each week across the country (Fig. 1). Through a "convergence of evidence" approach bringing together many sets of data (e.g., precipitation, streamflow, soil moisture, etc.), the Drought Monitor has provided a current status of drought conditions across the United States since 1999.[7] It is used as a trigger for several federal relief programs aimed at livestock producers, as well as a number of state drought plans.

In the last few years, two additional tools have also been developed by the NDMC and its partners to assist in monitoring local drought conditions: the Drought Risk Atlas (DRA) and the Vegetation Drought Response Index (VegDRI). Both of these tools are unique in their approaches to drought monitoring and can provide valuable information to livestock producers as part of their drought monitoring and planning activities.

Drought Risk Atlas

Many times questions arise as to the nature of drought occurrence for a particular area. How can current drought conditions be compared to historical events? This was one of the main questions that led to the development of the DRA. The DRA utilizes a database of the most complete, long-term recording stations associated with data collected at cooperative locations within the National Weather Service. It was anticipated that by using data from those locations determined to be the "best" reporting sites, a good historical perspective of drought could be developed.[8] For each station in the DRA, several drought indices were calculated, as well as climatology of precipitation. No single drought index is ideal for identifying and monitoring drought conditions. Therefore, the DRA provides information on the Standardized Precipitation Index (SPI), Standardized Precipitation Evapotranspiration Index, the Palmer Drought Severity Index, the Self-Calibrated Palmer Drought Severity Index, Deciles, and information on the United States Drought Monitor[i]. The variety of information presented allows users to determine the index or indices that best represents drought in their area, which can be used for monitoring the development of drought in the future.

[i] See http://drought.unl.edu/Planning/Monitoring/ComparisonofIndicesIntro.aspx for a description of the drought indices.