

**Senate Subcommittee on Disaster Prevention and Prediction
Drought Hearing
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Statement of

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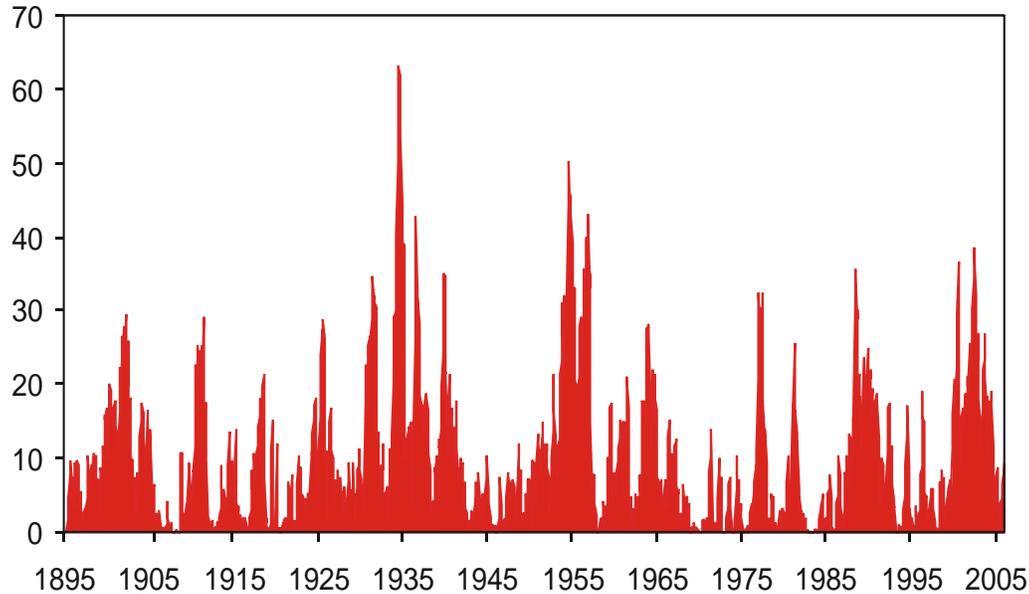
I appreciate the opportunity to submit this statement to the Senate's Subcommittee on Disaster Prevention and Prediction. My name is Don Wilhite; I am the founder and director of the National Drought Mitigation Center (NDMC), located at the University of Nebraska in Lincoln. The National Drought Mitigation Center (NDMC) was formed in 1995 following a sequence of severe drought years between 1987 and 1994 that affected virtually all portions of the United States. At the time of the NDMC's formation, there was no national initiative or program that focused on drought monitoring, mitigation, and preparedness. I have been involved in drought-related research and outreach since 1980. My efforts have principally been focused on how to lessen the nation's vulnerability to drought through improved monitoring and early warning, mitigation, and preparedness. We have made considerable progress, but much work remains. The National Integrated Drought Information System (NIDIS) has the potential to help improve the nation's capacity to cope more effectively with severe drought episodes that create significant impacts on the nation's economic, environmental, and social fabric.

It is imperative to point out that drought is a normal part of the climate for virtually all parts of the United States. For this reason, we need to be prepared for droughts, and focus our attention on mitigation and planning strategies that would reduce impacts before drought strikes. On average, approximately 15% of the nation is affected by drought each year, based on the historical record from 1895 to present. This drought record illustrates both single and multi-year events; in particular the droughts of the 1930s, 1950s, 1960s, 1974-77, 1987-94, and 1996 to present are noteworthy for their intensity, duration, and spatial extent. During the most recent drought period, 35-40% of the country was affected and for some regions drought conditions persisted for 5 or more years. For example, parts of the southeast, particularly Georgia, North Carolina, South Carolina, and Florida experienced 3 to 4 consecutive years of drought between 1999 and 2002. In the west, much of the southwest, especially Arizona and New Mexico, experienced 5 consecutive years of drought between 2001 and 2004 while much of Montana, Idaho, and surrounding states experienced severe drought for as many as 7 consecutive years since 1999. My state, Nebraska, has experienced 6 consecutive years of drought.

National Drought Mitigation Center: Objectives, Programs, and Activities

The NDMC's program is directed at lessening societal vulnerability to drought through a risk-based management approach. The Center's activities include promoting and conducting research and outreach activities on drought monitoring, mitigation, and preparedness technologies; improving coordination of drought-related activities and actions within and

Percent Area of the United States in Severe and Extreme Drought January 1895–January 2006



Based on data from the National Climatic Data Center/NOAA

Figure 1. Percent area of the United States in severe and extreme drought.
(Source: National Drought Mitigation Center, University of Nebraska-Lincoln)

between levels of government; and assisting in the development, dissemination, and implementation of appropriate mitigation and preparedness technologies in the public and private sectors. Emphasis is placed on research and outreach projects and mitigation/management strategies and programs that stress risk management measures rather than reactive, crisis management actions. It has been demonstrated that crisis management responses, such as drought relief, actually decrease self-reliance and, therefore, increase vulnerability to future drought episodes. Mitigation and preparedness increase self-reliance and reduce vulnerability. Programs that provide incentives for mitigation and preparedness are a very good investment for government at all levels and for the private sector as well. It has been demonstrated that for every dollar invested in mitigation and preparedness, four dollars are saved through reduced impacts when a natural disaster occurs. It is imperative that we shift the emphasis from crisis to risk management, as illustrated by the cycle of disaster management (Figure 2).

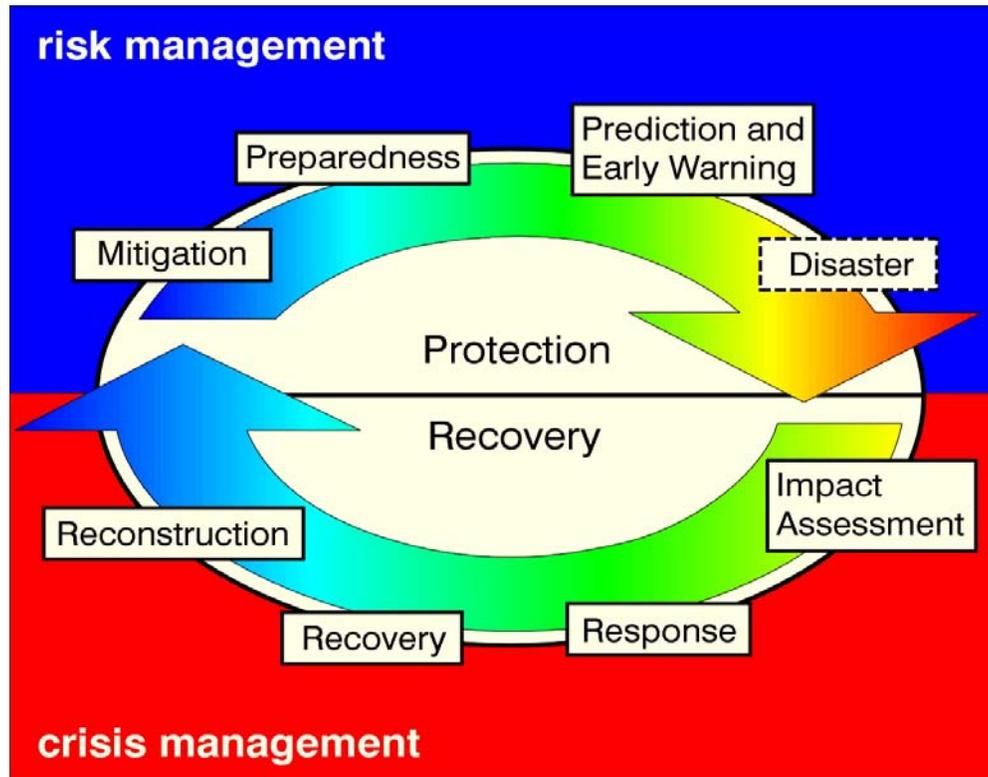


Figure 2. The Cycle of Disaster Management. (Source: National Drought Mitigation Center, University of Nebraska-Lincoln).

To respond effectively to the nation's needs for drought early warning, mitigation, and preparedness, the NDMC has been conducting research and outreach activities since 1995 in the following areas:

- Developing and enhancing an information clearinghouse or web-based drought portal on drought early warning, impact assessment, mitigation, preparedness, and response options for decision makers.
- Conducting and fostering collaborative research on drought monitoring, risk management, impact and vulnerability assessment, mitigation, and preparedness techniques and methodologies.
- Assisting state and federal agencies, Tribal and local governments, and regional organizations in developing integrated assessments of drought severity and impacts, including current climate/drought and water supply assessments.
- Advising policy makers and others by providing scientific and policy-relevant information on drought and water management issues.
- Organizing workshops, conferences, and seminars on drought preparedness planning and mitigation measures to reduce vulnerability to drought.

- Collaborating with and providing training for international scientists and facilitating the timely exchange of information on drought mitigation technologies with foreign governments, international and non-governmental organizations, and regional organizations.

Understanding Vulnerability, Preparedness, and Response Strategies

Vulnerability to drought is dynamic and influenced by a multitude of factors, including increasing population, regional population shifts, urbanization, technology, government policies, land use and other natural resource management practices, desertification or land degradation processes, water use trends, and changes in environmental values (e.g., protection of wetlands or endangered species). Therefore, the magnitude of drought impacts may increase in the future as a result of an increased frequency of meteorological drought, changes in the factors that affect vulnerability, or a combination of these elements. The development of a national drought policy and preparedness plans at all levels of government that place emphasis on risk management rather than following the traditional approach of crisis management would be a prudent step for the United States to take. Crisis management decreases self-reliance and increases dependence on government, as illustrated by the hydro-illogical cycle.

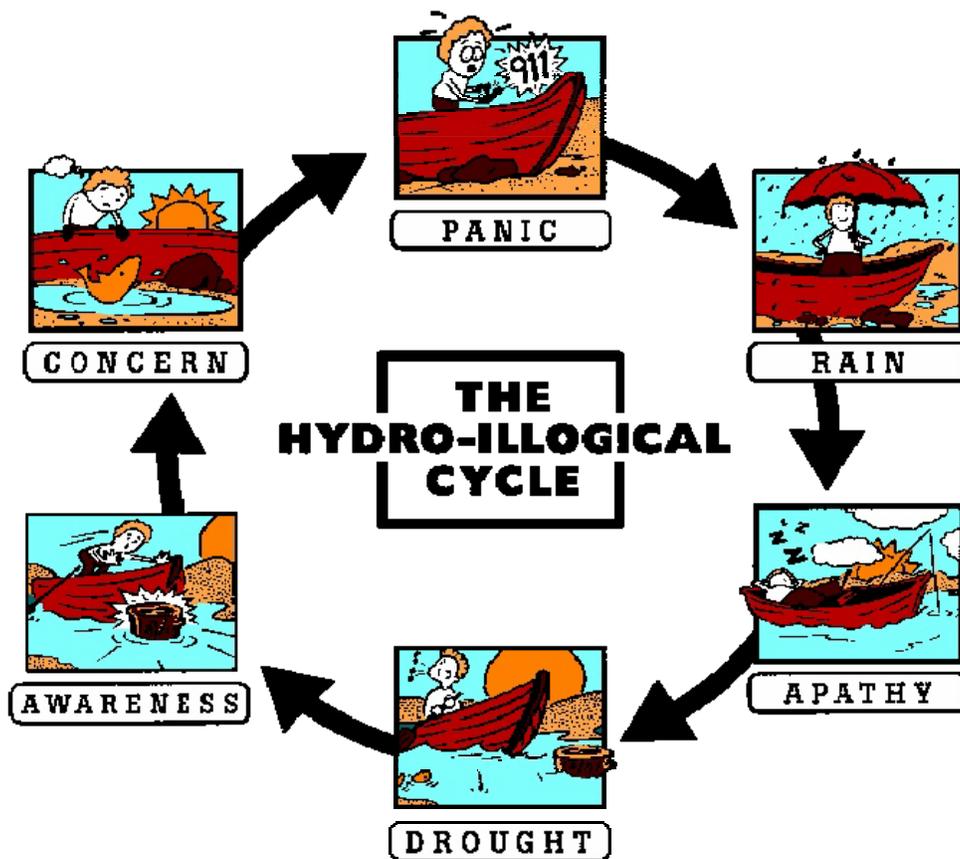


Figure 3. The hydro-illogical cycle. (Source: National Drought Mitigation Center, University of Nebraska-Lincoln)

The impacts of drought in recent years have been increasing and, it appears, at an accelerating rate, although a systematic national assessment and database of drought impacts has only recently been developed by the NDMC in the form of the web-based Drought Impact Reporter tool. FEMA (1995) estimated annual losses in the United States because of drought at \$6-8 billion, making drought the most costly natural disaster in the country. Losses from the 1988 drought have been estimated at more than \$39 billion. The NDMC has estimated that losses associated with the 2002 drought exceeded \$20 billion. It is important to note that these are estimates for a single drought year, while major drought events often occur over a series of years, as noted previously.

The impacts of drought have also been growing in complexity. Historically, the most significant impacts associated with drought have occurred in the agricultural sector (i.e., crop and livestock production). In recent years, there has been a rapid expansion of impacts in other sectors, particularly energy production, recreation and tourism, transportation, forest and wildland fires, urban water supply, environment, and human health. The recent drought years in the western United States, for example, have resulted in impacts in non-agricultural sectors that have likely exceeded those in agriculture. In addition to the direct impacts of drought, there are also significant indirect impacts that, in most cases, would exceed in value the direct losses associated with drought episodes.

Drought Policy and Preparedness

In the past decade or so, drought policy and preparedness has received increasing attention from governments, international and regional organizations, and non-governmental organizations. Simply stated, a national drought policy should establish a clear set of principles or operating guidelines to govern the management of drought and its impacts. Creation of a national drought policy is one of the goals of the National Drought Preparedness Act (S 802; HR 1386), and the National Integrated Drought Information System (NIDIS) is a component of this bill. National drought policy should be consistent and equitable for all regions, population groups, and economic sectors and consistent with the goals of sustainable development and the wise stewardship of natural resources. The overriding principle of drought policy should be an emphasis on risk management through the application of preparedness and mitigation measures. Preparedness refers to pre-disaster activities designed to increase the level of readiness or improve operational and institutional capabilities for responding to a drought episode. Mitigation refers to short- and long-term actions, programs, or policies implemented in advance of and during drought that reduce the degree of risk to human life, property, and productive capacity. These actions are most effective if done before the event. Emergency response will always be a part of drought management because it is unlikely that government and others can anticipate, avoid, or reduce all potential impacts through mitigation programs. A future drought event may also exceed the “drought of record” and the capacity of a region to respond. However, emergency response should be used sparingly and only if it is consistent with longer-term drought policy goals and objectives.

A national drought policy should be directed toward reducing risk by developing better awareness and understanding of the drought hazard and the underlying causes of societal vulnerability. The principles of risk management can be promoted by encouraging the improvement and application of seasonal and shorter-term forecasts, developing integrated monitoring and drought early warning systems and associated information delivery systems, developing preparedness plans at various levels of government, adopting mitigation actions and programs, and creating a safety net of emergency response programs that ensure timely and targeted relief. A key element of an effective drought policy is the delivery of information in a timely manner so informed decisions can be made by resource managers and others. Creation of a user-friendly drought information system is one of the principal goals of NIDIS.

The traditional approach to drought management has been reactive, relying largely on crisis management. This approach has been ineffective because response is untimely, poorly coordinated, and poorly targeted to drought-stricken groups or areas. In addition, drought response is post-impact and relief tends to reinforce existing resource management practices. It is precisely these existing practices that have often increased societal vulnerability to drought (i.e., exacerbated drought impacts). The provision of drought relief only serves to reinforce the status quo in terms of resource management--i.e., it rewards poor resource management and the lack of preparedness planning. Many governments and others now understand the fallacy of crisis management and are striving to learn how to employ proper risk management techniques to reduce societal vulnerability to drought and, therefore, lessen the impacts associated with future drought events.

In the United States, there has been some progress in addressing the impacts of drought through the development of preparedness plans. The most noticeable progress has been at the state level, where the number of states with drought plans has increased dramatically during the past two decades. In 1982, only three states had drought plans. In 2006, thirty-eight states have drought plans. The basic goal of state drought plans should be to improve the effectiveness of preparedness and response efforts by enhancing monitoring and early warning, risk and impact assessment, and mitigation and response. Plans should also contain provisions (i.e., an organizational structure or framework) to improve coordination within agencies of state government and between local and federal government. Initially, state drought plans largely focused on response efforts aimed at improving coordination and shortening response time; today the trend is for states to place greater emphasis on mitigation as the fundamental element of a drought plan. Thus, some plans are now more pro-active, adopting more of a risk management approach to drought management. This trend needs to continue, and at an accelerated pace. States also need to be encouraged to require municipalities to develop drought preparedness plans. Some states (e.g., South Carolina, Kentucky, and Texas) have already adopted this approach.

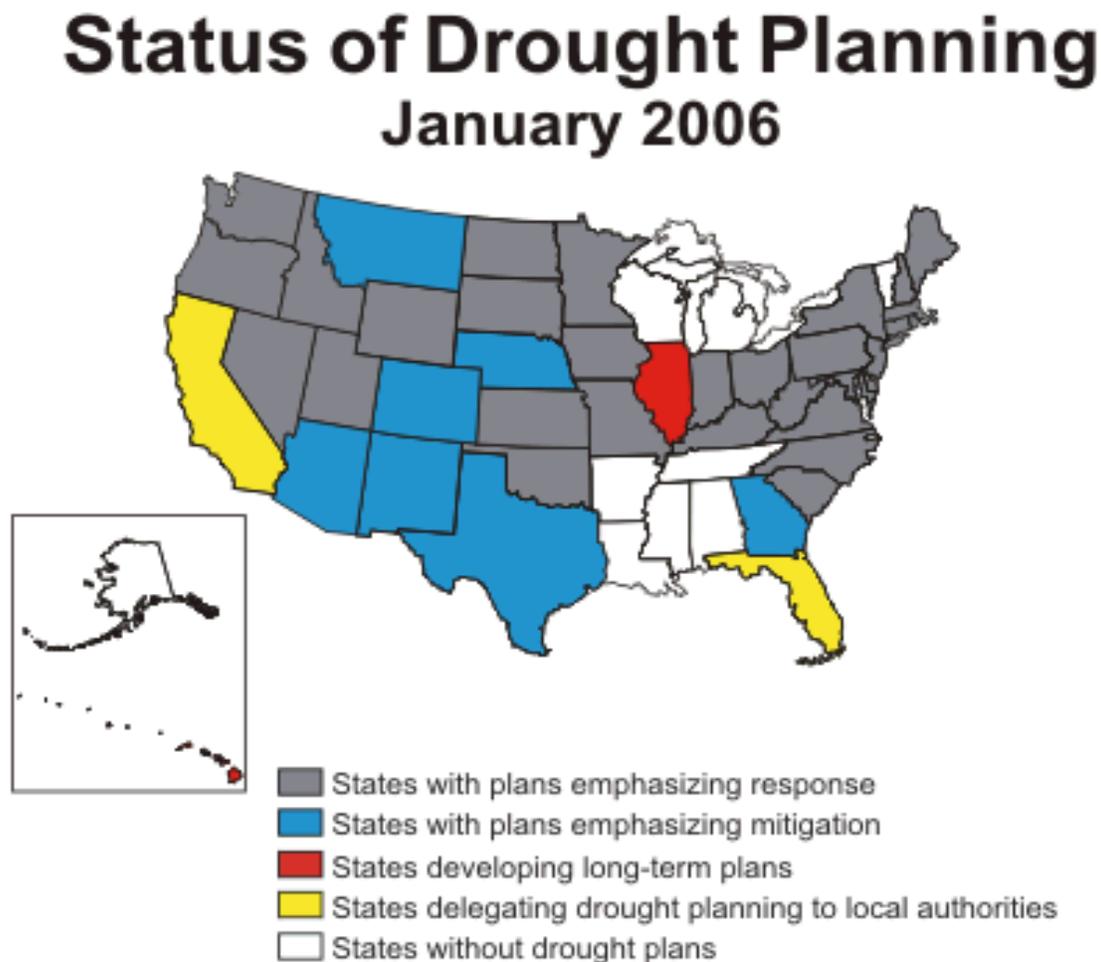


Figure 4. The status of drought planning in the United States, by state.
(Source: National Drought Mitigation Center, University of Nebraska-Lincoln)

The growth in the number of states with drought plans suggests an increased concern at that level about the potential impacts and conflicts associated with extended water shortages and an attempt to address those concerns through planning. Initially, states were slow to develop drought plans because the planning process was unfamiliar. With the development of drought planning models, such as the 10-step drought planning process developed at the NDMC, and the availability of a greater number of drought plans for comparison, drought planning has become a less puzzling process for states. As states initiate the planning process, one of their first actions is to study the drought plans of other states to compare methodology and organizational structure.

The rapid adoption of drought plans by states is also a clear indication of their benefits. Drought plans provide the framework for improved coordination within and between levels of government. Early warning and monitoring systems are more comprehensive and integrated and the delivery of this information to decision makers at all levels is enhanced. Many states are now making full use of the Internet to disseminate information to a diverse set of users and decision makers. Through drought plans, the risks associated with drought can be better defined and addressed with proactive mitigation and response programs. The drought planning process also provides the opportunity to involve numerous stakeholders early and often in plan development, thus increasing the probability that conflicts between water users will be reduced during times of shortage. All of these actions can help to improve public awareness of the importance of water management and the value of protecting our limited water resources.

Drought mitigation plans have three essential components, regardless of whether they are developed at the state, national, regional, or local scale. First, a comprehensive monitoring and early warning system provides the basis for many of the decisions that must be made by a wide range of decision makers as drought conditions evolve and become more severe. Equally important, early warning systems must be coupled to an effective delivery system that disseminates timely and reliable information. As drought plans incorporate more mitigation actions, it is imperative that these actions be linked to thresholds (e.g., reservoir levels, climate index values) that can serve as triggers for mitigation and emergency response actions. Second, a critical step in the development of a mitigation plan is conduct of a risk assessment of vulnerable population groups, economic sectors, and region. The purpose of the risk assessment is to determine who and what is at risk and why. This is successfully accomplished through an analysis of historical and recent impacts associated with drought events. This risk assessment task is accomplished as part of the 10-step drought planning process developed by the NDMC. Third, after impacts have been identified and prioritized, the next step is to identify appropriate mitigation actions that can help to reduce the risk of each impact for future drought events. In many cases, appropriate response actions are also identified through this process, but these actions should not conflict with the basic goal of the drought mitigation plan: to reduce vulnerability to drought events. As noted earlier, some response actions may increase reliance on government and encourage the continuation of inappropriate resource management practices.

Recommendations for Improving Drought Mitigation and Preparedness

- Implement the National Integrated Drought Information System (NIDIS) through a full partnership between NOAA and other federal agencies, non-federal agencies, and organizations, including the National Drought Mitigation Center, in order to improve monitoring and early warning systems and seasonal climate forecasts to provide better and more timely and reliable information to decision makers; address data gaps in drought monitoring and enhance networks, particularly for soil moisture, snow pack, and ground water; and develop new monitoring and assessment tools/products that will provide resource managers at all levels with proper decision support tools at higher resolution.

- Improve knowledge of the scientific and policy communities and resource managers about the drought hazard.
 1. Augment paleoclimate and historical climate research to better understand the drought climatology of all regions for more effective planning and design.
 2. Communicate information on probabilities of single- and multiple-year drought events to natural resource managers and planners, policy makers, and the public.
- Improve the reliability of seasonal climate forecasts and train end users on how to apply this information to improve resource management decisions with the goal of reducing drought risk.
 1. Develop more competitive research grant programs to fund research on drought prediction. In particular, there is a need for enhanced observations and research on both the paleoclimate record and the drought-related dynamics of ocean-atmosphere coupling.
 2. Form a consortium of scientists to encourage collaboration on drought prediction.
 3. Develop a network of scientists and end users to assess the practical needs of end users and how forecast information can be communicated more effectively to the user community to maximize its application.
- Assess the economic, social, and environmental impacts associated with drought.
 1. Develop a standard methodology for assessing the impacts of drought on multiple economic sectors and the environment and systematically assess the losses associated with drought events at the local, state, and national levels.
 2. Evaluate the effect of mitigation actions in reducing the impacts of drought at the local and state level.
 3. Improve early assessments of drought impacts through the application of appropriate models (i.e., crop, hydrologic).
- Assess the science and technology needs for improving drought planning, mitigation, and response at the local, state, Tribal, regional, and national levels.
 1. Evaluate current drought planning models available to governments and other authorities for developing drought mitigation plans at the state and local levels of government and require plans to follow proposed standards or guidelines.
 2. Develop improved triggers (i.e., links between climate/water supply indicators/indices and impacts) for the phase-in and phase-out of drought mitigation and response programs and actions during drought events.
 3. Develop vulnerability profiles for various economic sectors, population groups, and regions and identify appropriate mitigation actions for reducing vulnerability to drought for critical sectors.
- Increase awareness of drought, its impacts, trends in societal vulnerability, and the need for improved drought management.
 1. Initiate K-12 drought/water awareness programs/curriculum.
 2. Launch public awareness campaigns for adult audiences, directed at water conservation and the wise stewardship of natural resources.

Summary

The National Drought Mitigation Center at the University of Nebraska-Lincoln strongly supports greater investment in research and policies directed at reducing this nation's vulnerability to drought through a more risk-based approach. The implementation of the National Integrated Drought Information System is a critical step in this direction. Improved climate and water assessments, more reliable forecasts at various timescales, better decision-support tools, and more timely communication of this information to decision makers through an interactive delivery system will greatly enhance management of water and other natural resources. The NDMC will help NOAA develop an implementation plan for NIDIS and partner with them and other federal and non-federal entities to ensure the success of this program. My years of experience with drought management have convinced me that a wise initial investment in improved monitoring, early warning and prediction, mitigation, and planning will reduce this nation's vulnerability to drought and concomitant impacts on economies, the environment, and the social well-being of its citizens.