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U.S. DEPARTMENT OF COMMERCE

FOR AN OVERSIGHT HEARING ON DROUGHT

BEFORE THE
COMMITTEE ON COMMERCE, SCIENCE AND TRANSPORTATION
SUBCOMMITTEE ON DISASTER PREVENTION AND PREDICTION
UNITED STATES SENATE

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Good morning, Mr. Chairman and members of the Committee. I am Chester (Chet) Koblinsky, Director of the National Oceanic and Atmospheric Administration's (NOAA's) Climate Program Office, which is part of NOAA's Office of Oceanic and Atmospheric Research. I am also the team leader of NOAA's Climate Mission Goal, which oversees all of NOAA's climate activities. Thank you for inviting me to discuss drought conditions in the United States and NOAA's role in drought research, monitoring, and forecasting.

NOAA's climate programs provide the Nation with services and information to improve management of climate sensitive sectors, such as energy, agriculture, water, and living marine resources, through observations, analyses and predictions, and sustained user interaction. Our services include assessments and predictions of climate change and variability on timescales ranging from weeks to decades for a variety of phenomena, including drought. In my testimony I will highlight: (1) the current drought conditions across the Nation; (2) the drought outlook for 2006; (3) NOAA's drought monitoring and forecasting capabilities; (4) the National Drought Information System (NIDIS); (5) NOAA's drought research activities; and (6) NOAA's interagency collaborations on drought.

Defining Drought

In the most general sense, drought refers to a period of time when precipitation levels are abnormally low, impacting human activities and the environment. While there is no single definition of drought that meets all needs, drought refers to a deficiency in precipitation over a period of time resulting in a water shortage. Scientists evaluate precipitation, temperature, soil moisture, ground water, and surface water data for the present and recent past to determine if drought conditions exist. Drought is not a purely physical phenomenon, but is an interplay between water availability and the needs of humans and the environment. Drought is a normal, recurrent feature of climate. It occurs almost everywhere, although its features vary from region to region. For consistency, I will be referring to drought conditions as defined using the U.S. Drought Monitor methodology, unless otherwise noted, throughout the remainder of my statement.

Drought is a unique natural hazard. It is slow in onset, does not typically impact infrastructure directly, and its secondary effects, such as impacts on tourism, commodity markets, transportation, wildfires, insect epidemics, soil erosion, and hydropower, are frequently larger and longer lasting than the primary effects, such as water shortages and crop, livestock, and wildlife losses. Drought is estimated to result in average annual losses to all sectors of the economy of between $6 to 8 billion (in 2005 dollars). The costliest U.S. drought of the past forty years occurred in 1988 and caused more than $62 billion (in 2005 dollars) of economic losses. Although drought has not threatened the overall viability of U.S. agriculture, it does impose costs on regional and local agricultural economies. Severe fire seasons due to drought and frequent winds can also result in billions of dollars in damages and fire suppression costs.

Current Drought Status

Drought conditions across the United States are depicted in Figure 1. Although drought is affecting at least part of the West for the seventh consecutive year, drought conditions are much less expansive than in the recent past, with severe to extreme drought restricted to a relatively small region from Arizona eastward through much of New Mexico and southeastern Colorado.

The protracted, multi-year drought that had been plaguing the West has finally loosened its grip on central and northern parts of the region, where both precipitation and snowpack are near- to above-normal since the beginning of the 2005/2006 water year (October 1, 2005). This precipitation, in concert with copious precipitation that fell on central and southern parts of the West during the 2004/2005 water year, gradually eliminated drought conditions and boosted reservoir levels in most areas to the north and west of southern Colorado, although pockets of moderate drought persist in portions of Wyoming. Precipitation totals are now above-normal for time periods extending back two years along the West Coast and no drought conditions are reported for this region as of late April 2006.

There remain two aspects of the current drought which have not fully recovered from the multi-year dry spell, even though most of the West is no longer shown as abnormally dry in the Drought Monitor (Figure 1). First, ground water levels in some areas, such as southeastern Idaho, remain exceedingly low. Second, the largest reservoirs in the West, such as Lakes Mead (58% full) and Powell (44% full), have not had enough time to recharge, and remain well below capacity.

Drought has been slowly intensifying since the start of the 2005/2006 water year across Arizona and New Mexico. During October 2005 – April 2006, less than 50% of normal precipitation fell over most of Arizona and New Mexico, resulting in a meager snowpack and unseasonably high fire danger. During the first 3 months of 2006, wildfires consumed almost 221,000 acres of land in the Southwest Area (comprised of western Texas, the Oklahoma Panhandle, New Mexico, and Arizona), more than 5 times the average January – March total for the previous 9 years. Surface moisture shortages are also affecting agriculture with about 94% of New Mexico topsoils characterized as short or very short of moisture, and 67% of the state's winter wheat crop in poor or very poor condition as of mid-April 2006. A majority of both Arizona and New Mexico are now depicted as experiencing severe to extreme drought, according to the U. S. Drought Monitor. However, except for southwestern New Mexico, water supplies are not as problematic across the Southwest because of heavy precipitation that fell last water year (2004/2005) boosting reservoir levels.

Moderate drought covers a significant portion of the central Great Plains, although recent storms have erased lingering dryness in parts of the northern Plains. Severe to extreme drought, aggravated by record heat in mid-April, encompasses the southern Great Plains from southern Kansas and southwestern Missouri southward through central Texas. Farther south, exceptional drought, the most serious drought classification depicted by the U. S. Drought Monitor, has settled into southern Texas. Moderate to heavy rainfall during March eliminated extreme to exceptional drought conditions in southeastern Oklahoma and adjacent parts of Texas and Arkansas, with additional improvement in late April, but a broad area of severe drought lingered in its wake. Record dryness occurred in 2006 with Kansas having the driest February on record, Oklahoma the driest November to February, and Arkansas the driest October to February and March to February.

The drought in the southern Great Plains has been highlighted by two particularly severe impacts: stressed winter wheat and dangerous wildfires. As of mid-April, 78% of Texas winter wheat was in poor or very poor condition, as was 67% of Oklahoma winter wheat. In contrast, 23% of Kansas winter wheat and just 12% of Nebraska winter wheat rated poor or very poor. Through the first 3 months of 2006, fire danger was frequently high in the Southwest, the Plains, and parts of the East, but the largest and most damaging wildfires have occurred in Texas and adjacent areas. A record season continues and as of April 20, 2006, the Texas Forest Service is reporting over 1.5 million acres burned in the state during 2006.

Across northern Illinois and southern Iowa, recent heavy rains have greatly ameliorated or eliminated the long-term drought which began affecting the region during the spring of 2005.

Severe to extreme drought has recently developed along the northern Gulf Coast, as 6-month rainfall from early October to mid-April totaled less than 50% of normal from southern Louisiana into southern Alabama, though recent thunderstorms (especially on April 21) brought some relief. To the east, short-term dryness recently developed along the eastern half of the Gulf Coast, and the central and northern sections of the Atlantic Coastal Plain. As a result of depleted surface moisture, wildfires developed across Florida in March and April, and fire danger remained high, while the most noticeable impact of the short-term dryness from the Carolinas northeastward through southern Maine has been a sharp drop in streamflows relative to historic observations for this time of year. In the New England hydrologic region, 23% of reporting gauges set new daily low flows on April 20, 2006, with 13% setting low flows in the South Atlantic region, and 10% in the mid-Atlantic region. Heavy rains falling over the Appalachians, mid-Atlantic states, and New England on April 21-24 have significantly eased drought concerns for the time being.

The dryness across most of the eastern states generally developed over the course of the last few months. In the central Carolinas and adjacent Virginia, however, rainfall shortages date back much longer, affecting water supplies in some areas. Most of this region is classified as experiencing moderate to severe drought in mid-April, with the largest and longest-duration precipitation deficits observed in central North Carolina resulting in almost 10% of the state's population under mandatory water conservation measures.

Historical Perspective

From a historical perspective of droughts, some indicators depict the recent multi-year drought (1999–2006) as one of the most severe in the past 40 to 100 years, comparable to the severe droughts in the 1950s and 1930s in some areas. On a national scale, 51% of the contiguous U.S. was affected by moderate to extreme drought, as defined by the Palmer Drought Index, during the peak of the drought in the summer of 2002. This comes in third, behind 80% and 60% at the peak of the 1930s and 1950s national droughts, respectively.

For the western United States, the current drought started in 1999 and grew to affect 87% of the West at its peak in the summer of 2002. This is second only to the summer of 1934 when 97% of the West was affected. In terms of the combined effects of intensity and duration, the 1999-2006 and 1986-1993 western droughts are unprecedented in the 110-year historical record. However, based on tree rings and other paleoclimatic data, droughts that have been more extreme than the current one have periodically affected the West during the last one thousand years, with some droughts lasting 20 to 30 years or longer. Paleoclimatic dating of these multi-decadal drought coincide with evidence of societal stresses on native populations, including the Anasazi of the four corners region. Recent population growth throughout the U.S. and particularly in the West has placed increased demands on water supplies, so drought vulnerability has increased because of greater numbers of water users.

The Outlook

In order to fully appreciate the long-term outlook for the drought, it is helpful to understand the meteorological causes and ongoing research issues. Recent research, much of it coming from NOAA laboratories or from NOAA-funded projects at universities and based on collections of statistical and physical models, shows the important role existing ocean and ground conditions play in establishing wind patterns leading to "blocking" in the atmosphere. Blocking is an important factor in setting up the weather conditions which cause prolonged warm and dry conditions and reduced rainfall and above-normal warmth. Climate trends should also be considered when forecasting the future evolution of a drought. Climate across much of the U.S. has been getting warmer for about 20-25 years, especially in the winter and spring. These conditions contribute to drought by increasing the rate of snow melt in the spring and early summer, and also by increasing water evaporation.

The seasonal drought outlook (Figure 2) incorporates medium and long-range forecasts of precipitation and temperature from NOAA's Climate Prediction Center and also considers the spring-summer streamflow forecasts from the U.S. Department of Agriculture and NOAA's National Weather Service. While precipitation has eliminated drought conditions across much of the West, recent precipitation in the Southwest will not be enough to make up for the extreme dryness experienced from October into early March. As of late April, mountain snow water content stood at less than 25% of normal for much of Arizona and New Mexico. As the dry season sets in, opportunities for further improvement will be quite limited through June. Furthermore, the official seasonal outlook produced by NOAA's Climate Prediction Center suggests that for May through July the Southwest will experience higher than normal temperatures which will increase mountain snow melt and evaporation. The latest streamflow forecasts for this spring and summer produced by USDA's Natural Resources Conservation Service and NOAA's National Weather Service indicate much below-normal streamflow for Arizona, New Mexico, southern Colorado and parts of southern Utah. Therefore, the seasonal drought outlook through July shows drought persisting over much of the region, although the monsoon season and its increased chance for showers and thunderstorms during July and August, should lead to some improvement in a few areas.

NOAA's seasonal forecasts indicate that there is an increased chance for below normal rainfall during the spring and summer over the central and southern Plains. These forecasts also indicate an enhanced probability for higher than normal temperatures. Persistent drought is expected throughout July over southern and western Texas, eastern New Mexico, western Oklahoma, western Kansas, and eastern Colorado, as well as southern Nebraska. Ongoing drought accompanied by varying degrees of improvement is expected from Misssouri into eastern parts of Kansas, Oklahoma, and Texas, and along the Gulf Coast, with more significant improvement over Arkansas and adjacent parts of Oklahoma and Texas.

Elsewhere, the recent rains have reduced the odds for drought expansion or intensification from the mid-Atlantic states northeastward, but near-drought conditions will likely remain a concern this spring from Florida into southern Georgia.

Drought Monitoring and Forecasting

NOAA continues to work with its partners to improve our Nation's ability to monitor drought. The U.S. Drought Monitor is produced on a weekly basis by drought experts from four U.S. organizations (NOAA's National Climatic Data Center, NOAA's Climate Prediction Center, the U.S. Department of Agriculture (USDA), and the National Drought Mitigation Center at the University of Nebraska) with input from other federal and state agencies, as well as feedback from a network of over 100 experts around the nation. The U.S. Drought Monitor provides a consensus on the current state of drought in all 50 states and Puerto Rico using multiple objective drought indices and indicators (e.g. soil moisture and streamflow) combined with reports of current conditions and impacts (e.g. weekly crop progress and condition reports) from a wide range of public and private sector partners at the federal, state, and local levels. Among its varied uses, federal officials have used the U.S. Drought Monitor in recent years to determine disaster assistance allocations to ranchers and farmers affected by severe drought.

NOAA continues to develop new products to improve our drought monitoring capabilities. More accurate precipitation mapping capabilities have resulted in experimental soil moisture products that are now being refined in collaboration with the National Aeronautics and Space Administration (NASA), Princeton University, and the University of Washington to create practical tools for monitoring soil moisture. NOAA's Climate Prediction Center operates a U.S. Precipitation Quality Control and Analysis program that produces daily high resolution maps of precipitation. To provide better coverage and more accurate measurements to aid in monitoring drought, NOAA continues to modernize its network of cooperative observation sites as well. NOAA continues to improve its drought forecasts. NOAA's Climate Prediction Center produces a monthly U.S. Seasonal Drought Outlook which forecasts drought conditions over the next 3 ½ months. The drought outlooks combine information from NOAA's suite of forecast products, from daily to seasonal, to show where drought will likely persist, ease, or develop during the next season. NOAA's National Centers for Environmental Prediction also creates other numerous products useful for drought forecasting, such as 2-week soil moisture forecasts based on temperature and rainfall forecasts and seasonal soil moisture forecasts based on soil moisture pattern from previous years. These forecasts help farmers, land managers and others prepare for and take steps to manage the effects of drought.

NOAA can report some instances where the Agency accurately predicted several of the recent and ongoing droughts with the seasonal drought outlooks, especially in recent months. The early December 2005 Outlook predicted drought expansion in the southern Plains and the Southwest and improvement in the Northwest by February 2006. The mid-January Outlook accurately projected that drought would expand into Kansas and the Southwest, and this occurred by mid-March leading to problems with winter crops and pastures and increasing the danger of wildfires. The Outlook issued on March 16 warned of possible drought development from Florida northward into the mid-Atlantic region. By the end of March, drought had expanded northward into Virginia and Delaware and abnormal dryness had spread across Florida.

NOAA's drought monitoring is supported by critical remotely sensed data provided by NOAA's Geostationary and Polar-orbiting Operational Environmental Satellites (GOES and POES, respectively). POES satellites are used to monitor vegetation stress, a precursor for the early on-set, severity and duration of drought. In the United States, vegetation stress is an indicator used by farmers and the agricultural industry to track the condition of crops. As an indicator of biomass, satellite data are valuable in assessing wildland fire potential. NOAA's next generation geostationary and polar-orbiting satellites – GOES-R and the National Polar-orbiting Operational Environmental Satellite System (NPOESS) – are being designed to continue these important drought monitoring capabilities. We urge the Committee to support the FY 2007 President's Budget Request for these programs.

National Drought Information System (NIDIS)

Drawing from experiences with stakeholders in drought-affected regions and recent reports on drought and stakeholder needs, NOAA has identified a significant demand for a concentrated research and stakeholder interactions effort that: (1) assesses the Nation's vulnerability to drought; (2) develops products useful for drought planning; and (3) develops ongoing collaborations with stakeholders to communicate climate impact information, co-produce tools, and participate in drought planning activities. In response to this demand and a request from the Western Governors' Association (WGA), NOAA has taken the lead on the development and implementation of a National Intergrated Drought Information System (NIDIS) in partnership with other federal, regional and state organizations.

NIDIS is an ambitious program to significantly enhance the Nation's ability to monitor and forecast drought. It will establish a modern, dense network of observing locations to observe and monitor all aspects of drought and enhance stakeholder access to information on drought conditions, impacts, and forecasts. NIDIS, in turn, will be supported by a focused drought research program. NIDIS will create a national drought early warning system to enable the Nation to move from a reactive to a more proactive approach to drought. The vision is for NIDIS to be a dynamic and accessible drought information system that provides users with the ability to determine the potential impacts of drought and their associated risks and also provides the decision-support tools needed to better prepare for and mitigate the effects of drought.

NIDIS will provide more comprehensive and timely drought information and forecasts which are required by numerous sectors to mitigate drought-related impacts. The Bonneville Power Administration and other hydropower authorities will benefit from enhanced water supply forecasts and drought information for hydropower management decisions. Water resource managers will have access to more information when balancing irrigation water rights with the needs of wildlife. Purchasing decisions by ranchers for hay and other feed supplies will be enhanced through the use of drought information to identify areas of greatest demand and the potential for shortages. Farmers will be better positioned to make decisions on which crops to plant and when to plant them. Municipalities and state agencies will have improved drought information and forecasts when allocating domestic and industrial water usage. Since drought information is used in allocating federal emergency drought relief, improvements in monitoring networks will also lead to more accurate assessments of drought and, as a result, emergency declaration decisions that better reach out to those communities in need of assistance.

A hallmark of NIDIS will be the provision of decision support tools coupled with the ability for users to report localized conditions. To this end, NIDIS will link multi-disciplinary observations to 'on-the-ground' conditions that will yield value-added information for agricultural, recreational, water management, commercial, and other sectors.

The four key components of NIDIS are: (1) improved integrated observations and data systems and forecasts; (2) new tools for analysis and decision support; (3) coordinated monitoring, forecast, and impacts research and science; and (4) improved information dissemination and feedback.

The implementation of NIDIS will require: (1) building a national drought monitoring and forecasting system; (2) creating a drought early warning system; (3) providing an interactive drought information delivery system for products and services – including an internet portal and standardized products [databases, forecasts, Geographic Information Systems (GIS), maps, etc];

and (4) designing mechanisms for improved interaction with the public (education materials, forums, etc).

NOAA will work internally to integrate planning for the observing system requirements, research priorities, and operational needs of NIDIS. A NIDIS executive team will be established to oversee implementation and coordination of NIDIS among the federal partners [NOAA, U.S. Department of Agriculture (USDA), U.S. Army Corps of Engineers (USACE), Bureau of Land Management (BLM), Bureau of Reclamation (BOR), U.S. Geological Survey (USGS), Environmental Protection Agency (EPA), NASA] and will be facilitated by the National Science and Technology Council's Committee on Environment and Natural Resources. The result will be a sustained and coordinated interagency program, which will report regularly on its status, accomplishments, and plans for improvements.

The expertise and tools of a number of NOAA programs are being brought together under the NIDIS framework to help the nation address the challenge of drought. Climate services conducted in NOAA's National Weather Service; National Environmental Satellite, Data, and Information Service; and Office of Oceanic and Atmospheric Research will support NIDIS. NOAA's cooperative institute partners, Regional Integrated Sciences and Assessments (RISAs) teams, and Regional Climate Centers will be involved as well. NIDIS will also be supported by NOAA's current operational drought monitoring and outlook products and NOAA's applied climate research program.

The President's FY 2007 Budget Request for NOAA includes $16.2 million for Climate Observations and Services, with a $4.0 million increase to directly support NIDIS related activities. This increase will sponsor integrated, problem-focused research and research-to-operations transition projects. Additional increases of $1.2 million for the Climate Reference Network and $0.5 million for regional climate services will help NOAA realize improvements in observation systems required by NIDIS. NOAA is projecting that it will take 5 to 6 years to fully implement NIDIS with gradual improvement in NOAA's drought monitoring and forecasting capabilities occurring throughout the implementation process.

NIDIS is part of a larger NOAA effort over the past several years to deliver climate services that are produced and delivered in on-going consultation with affected stakeholders in order to ensure that the research-based insights, information products and expert opinions delivered are of the highest relevance and utility to the set of challenges at hand.

Drought Research Activities

NOAA research activities support drought risk assessment and management. The research is focused on developing predictions of drought onset, termination, duration, and severity and the prediction of multi-year to decadal drought as a function of sea surface temperature variability, deep soil moisture/ground water variability, and other factors. NOAA's research also includes assessments of societal, economic, and environmental vulnerability to drought to inform risk reduction efforts. This work objectively quantifies drought and its associated economic impacts to accurately quantify the monetary benefits of improved drought prediction and mitigation. Our methods incorporate uncertain drought predictions to improve public and private sector planning and operational decision making for water supply, transportation, hydropower, and irrigation.

An integral part of NOAA's drought research activities is NOAA's support over the last 15 years of university-based research focused on the use of seasonal and inter-annual climate prediction information in decision making across a range of sectors (e.g., agriculture, water management, public health, forest fire management, fisheries). In recent years, these university-based researchers through NOAA programs, such as the Regional Integrated Sciences and Assessments (RISA), Sectoral Applications Research Program (SARP), and NOAA Climate Transition Program (NCTP), have been working with stakeholders at the local, state, and regional levels to determine what type of climate information would be useful to their decisions and determining how scientific information could help to reduce vulnerability to drought, in particular, along with other extreme events and long-term climate trends (e.g., declining snowpack). NOAA-funded researchers have been working with farmers, ranchers, state governors' offices, water management agencies, ditch companies, forest fire managers, and other stakeholders to analyze vulnerability to climate, assess the need for different types of climate information, and develop information of use to these decision makers. NOAA-funded drought research activities support the U.S. Climate Change Research Program (CCSP), and are in turn enhanced by the broader CCSP research going on at universities and other federal agencies. By understanding the role of drought in human affairs and how information on the probability of drought can be integrated into existing decision environments, it is possible to move from drought response to pro-active drought management.

As NOAA's global climate models improve, particularly the land component of Earth System Models, NOAA will be able to aggressively focus on drought prediction in the United States, at seasonal-interannual timescales. In turn, as our understanding and skill at forecasting seasonal to interannual climate improves, the ability to use long term climate models to assess regional drought risks increases as well. To better predict drought and other climate events, NOAA continues to invest in research to better understand the interdependencies of the ocean and land and their combined influence on climate.

Recent data shows a warming trend for the past several decades over much of the West, especially during the winter season. Climate models, using historical data, accurately simulate temperature increases consistent with this observed long term warming trend. These models project the general warming trend will continue for the remainder of this century. However, neither climate model projections nor observations show any identifiable trend in precipitation, but they do reveal a changing distribution of precipitation intensity, similar to what would be expected in a warming climate. Specfically, NOAA's National Climatic Data Center and other research efforts have demonstrated that more of our precipitation is tending to fall in heavier precipitation events which can ultimately impact drought severity through changing precipitation run-off.

Research at NOAA's Earth System Research Laboratory indicates recent decadal swings in precipitation in the western U.S. may be largely attributable to decadal variations and trends in ocean temperatures, especially in the tropical Pacific and Indian Oceans. The causes of these changes in ocean temperature are not fully understood, but are likely due in part to a combination of long term climate change and variability in the atmosphere and ocean. Even with unchanging total precipitation in the western United States, continuation of current temperature trends may significantly influence the annual water cycle as well as water demand, with subsequent implications for water management.

NOAA and sister science agencies in Mexico are co-leading the North American Monsoon Experiment (NAME), an international effort to enhance understanding of the sources and limits of predictability of warm season precipitations over North America, with emphasis on time scales from seasonal to interannual. Improved understanding and prediction of monsoon rainfall in the southwestern U.S. and Mexico is critical for water resource management in the region. NOAA's research community continues to interact with researchers, nationally and internationally, to improve climate and statistical models based seasonal and longer-term outlooks, enabling a steady increase in our understanding of the causes of drought. Learning the mechanisms triggering drought will enable us to better forecast the likelihood of drought development months and years ahead of time.

To improve NOAA's ability to detect and analyze interannual-to-decadal variability in climate and weather-climate trends, NOAA has proposed in FY 2007 to invest in research to analyze and understand the causes of the 1930's and 1950's Dust Bowl droughts. One component of this research will be an extension of the current model-based reconstruction of climate back beyond 1948 to cover the entire 20th Century to enhance NOAA's ability to describe atmospheric conditions during the 1930's Dust Bowl. The second component in this effort will be research focusing on diagnosing the causes of 1930's and 1950's droughts and identifying opportunities to improve NOAA's capability to forecast the onset, severity and duration of high-impact scale droughts. This work will help NOAA address concerns and questions from stakeholders about comparisons between current conditions and those of the 1930's and 1950's.

NOAA drought forecasters routinely meet with researchers to explore methods to improve the drought forecasts. Advanced forecast methods based on statistical and global numerical models will continue to be incorporated into drought outlooks, using the best forecast tools and research available. We are encouraged by recent research which helps to explain the reasons behind drought development. Realistically, it is (and always will be) a continuing challenge to produce seasonal forecasts which are consistently accurate. However, as with our weather forecasts, we believe we can continuously improve.

Collaboration with Other Agencies

NOAA collaborates with many state and federal agencies (e.g., USDA, NASA, USGS, EPA BOR, USACE, and others) and universities to understand, monitor, and predict drought. The U.S. Drought Monitor is only one example of this collaborative effort. NOAA works cooperatively with other agencies on research projects that can lead to improved drought monitoring tools. For example, we are currently working with NASA to incorporate additional satellite data from NASA and NOAA sensors into drought monitoring and forecasting. NOAA also works closely with the USDA on water supply forecasting in the western United States, and relies on the USGS for streamflow data critical to both water supply and flood forecasting. NOAA is also working with agencies, such as NASA, to improve seasonal drought forecasting. In May 2005, NOAA held a workshop with NASA to kick off this new effort in research collaboration. The workshop focused on what is needed to accelerate progress on drought prediction with a focus on developing capabilities and products that facilitate water management and agricultural applications for the Americas.

Drought is a climate phenomenon with major impacts in North America and around the world. In today's global economy the costs and effects of drought extend beyond international borders and the North American Drought Monitor helps address this challenge. The North American Drought Monitor is a monthly product that the U.S. drought monitoring team produces in collaboration with Canadian and Mexican meteorologists. NOAA works with the U.S. Agency for International Development’s Famine Early Warning System Network (USAID FEWS-NET) to monitor drought and significant weather events affecting water and food supplies in Africa, Central America, and Afghanistan. NOAA’s contribution through a United States Agency for International Development-Office of Foreign Disaster Assistance (USAID-OFDA) partnership has resulted in the production of prototype scientific decision tools, such as prediction models for hydropower resource management in Eastern Africa where more than 70% of the countries rely on hydropower for electricity.

Concluding Remarks

Mr. Chairman, this concludes my testimony. I thank you for the opportunity to discuss drought conditions in the United States and NOAA’s role in drought research, monitoring, and forecasting. The topic is critical given the economic and environmental impacts of drought in the United States and the increasing demand for drought information to help manage to the demand for water. I would be happy to answer any questions you or other Members of the Committee may have.

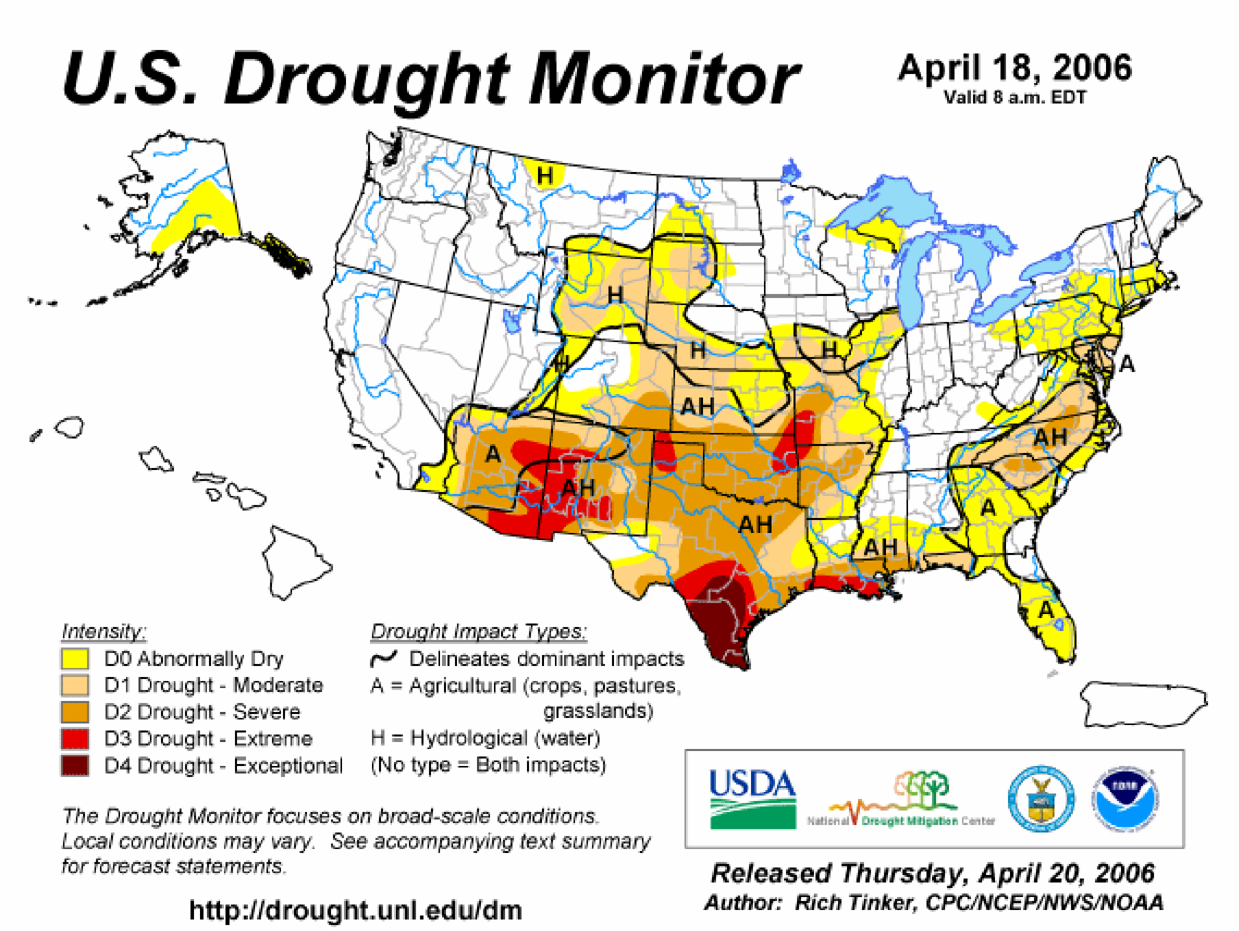

Figure 1. U.S. Drought Monitor released Thursday, April 20, 2006

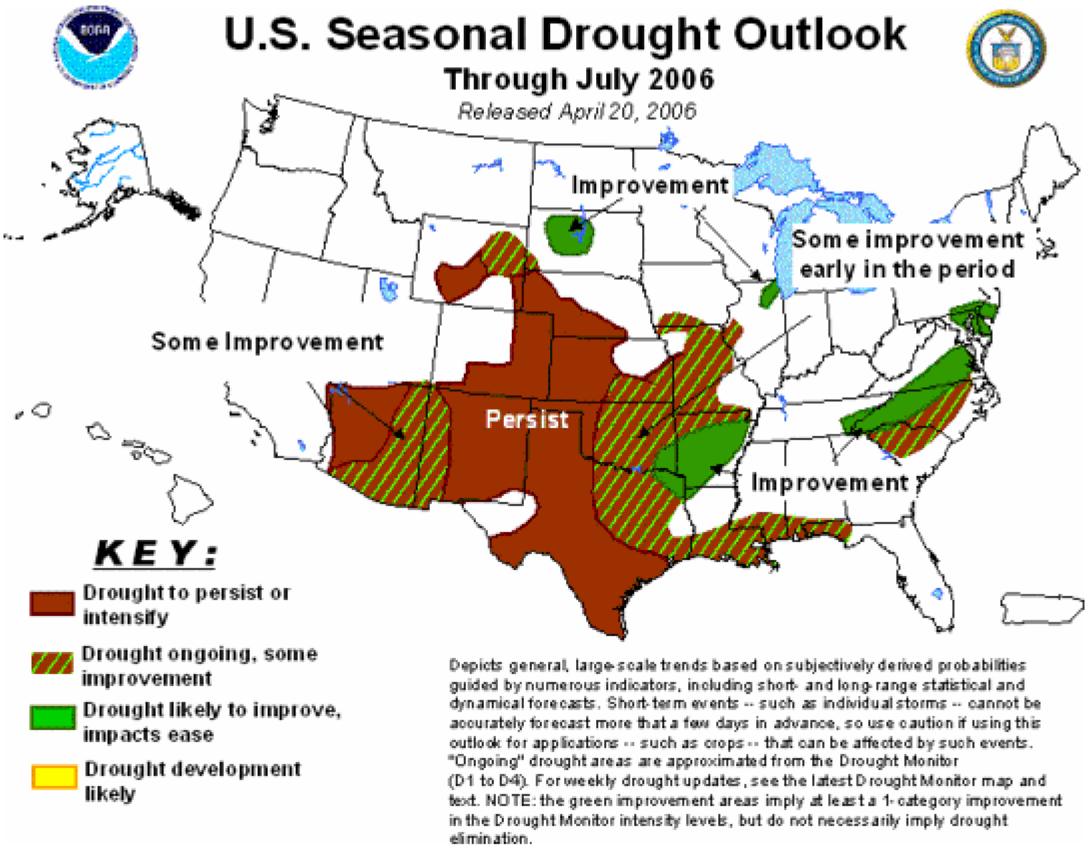

Figure 2. U.S. Seasonal Drought Outlook released April 20, 2006