Outstanding Accomplishments in Research

Drought

Research is at the center of all National Oceanic and Atmospheric Administration services. NOAA's Office of Oceanic & Atmospheric Research (OAR) conducts research, develops products, and provides scientific understanding and leadership to support NOAA's mission to meet our nation's economic, social and environmental needs.

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Drought is a natural phenomenon, like hurricanes, tornadoes, or earthquakes. Unlike these examples, however, drought develops slowly, lasts longer, and often is very subtle – it can creep up on a region and cause damage before being identified. Economic losses to drought average $6–8 billion annually. Pioneering efforts by NOAA Research in the past decade have resulted in products that allow water managers and water-dependent industries to make more informed decisions.

Drought and Climate Change

In early 2007, NOAA scientists undertook a systematic analysis of a new suite of model simulations from tools used in compiling the 2007 Intergovernmental Panel on Climate Change. They found that water flowing in the Colorado River, which serves water needs of six western states, was reduced by warmer temperatures noted in the late 20th and early 21st centuries. Model runs simulating future droughts showed declines of 25-45 percent in streamflow in the Colorado due to the overwhelming effect of heat-related moisture loss due to persistent drought conditions.

Creating a Drought Early Warning System

Working with the Western Governors' Association, NOAA created the National Integrated Drought Information System (NIDIS). NIDIS is a result of the National Drought Policy Commission Report, and its goals are to:

- Improve and expand compilation of reliable data on indicators of droughts – both hydrological data as well as information on societal impacts; and,
- Integrate and interpret the data with easily accessible and understandable tools to provide timely and useful information to decision makers and the public.

Established in 2006 at NOAA's Earth System Research Laboratory, NIDIS offers a proactive approach to drought. NIDIS will provide a real-time status report on the current levels and future risks of drought in given locations and establishes coordinated planning and preparedness measures for the Nation. Efforts include integrating existing independent monitoring, identifying monitoring gaps and developing plans to close those gaps.

Regional Prediction, Mitigation

Scientists at NOAA's Earth System Research Laboratory and colleagues at the NOAA-supported Cooperative Institute for Research in Environmental Sciences at the University of Colorado recently created the Western Water Assessment (WWA). The goal is to identify and characterize regional vulnerabilities to climate change and variability, such as drought. By gathering, analyzing and presenting data about the state of the climate and hydrology issues, and producing forecast products, the WWA is providing decision support to state governments, water managers, industry interests such as skiing and tourism, and others in the Intermountain West.

Wooly Hollow State Park — Faulkner County, Arkansas. Photo courtesy of John Lewis, NWS, Little Rock, Arkansas

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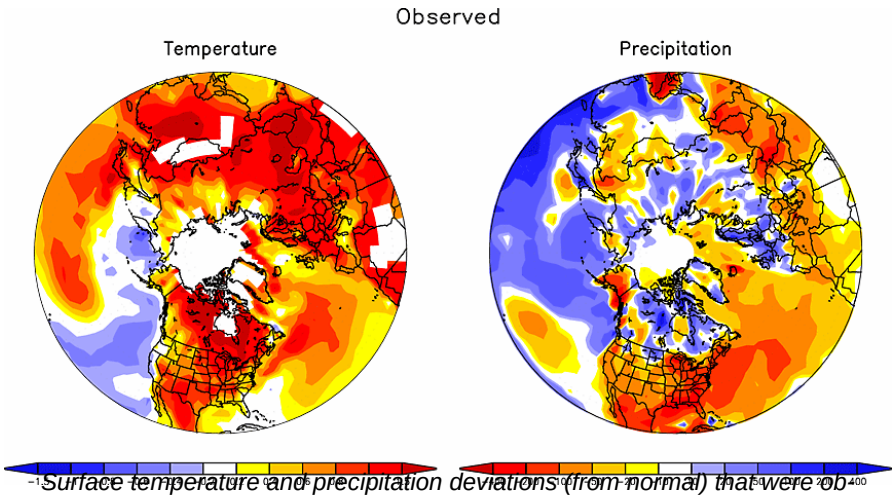
PREEMINENT RESEARCH

Effects of Oceans on Drought

Scientists at NOAA Research have long studied the impact of ocean circulation and currents on the climate of continents, including drought. Their identification and monitoring of the El Niño/La Niña phenomena, marked by warmer or cooler than usual sea-surface temperatures in the Eastern Pacific near South America, has allowed them to predict risk for flooding or drought in various regions around the globe. Other oscillations in the oceans worldwide monitored by NOAA researchers contribute to climate changes, including drought, on land.



Surface temperature and precipitation deviations (from normal) that were observed and annually averaged during the 4-year drought period from June 1998 to May 2002. Temperature departures are degrees Celsius computed relative to a 1971-2000 climatology. Precipitation departures are millimeters/year computed relative to a 1979-1995 climatology. The largest warm and dry departures are highlighted in red.

NOAA researchers investigated a persistent drought in the mid latitudes of the United States, the Mediterranean, southern Europe, and Southwest and Central Asia in the late 1990s and early 2000s. During La Niña conditions in the Eastern Pacific, the scientists noted a warmer ocean to the west in the Indian Ocean. Climate attribution studies found that this western ocean warm pool, unprecedented in modern history, was partly due to the ocean's response to increased greenhouse gases. Atmospheric modeling results during the severe drought that has affected parts of the western United States since 1998 suggest that if these oceanic conditions continue to occur, there's an increased risk for severe and concurrent drying of the mid-latitudes including much of the continental United States and large portions of southern Europe and Asia.

Collecting and Transmitting Climate Data

Drought planning and mitigation is based on gathering high-quality information related to a variety of physical, environmental, and human conditions. A NIDIS goal is to make more efficient use of existing data as well as "filling in the holes" in local, state, regional and federal networks. NOAA's interest in and work on the Global Earth Observing System of Systems envisioned by world leaders will include drought observation systems. NOAA works with other agencies and institutions of scientific research to gather and analyze key information, including: climate data; soil moisture; stream flow; ground water; reservoir and lake levels; and vegetation health or stress and fire danger. NOAA researchers also have long been involved in paleoclimate studies, building understanding of how the climate has changed over scores, hundreds and even thousands of years.

VALUE TO SOCIETY:

Droughts causes between $6 billion and $8 billion a year in direct estimated losses to the U.S. economy. The infamous Dust Bowl of the 1930s in American midlands is an example of the devastating effects land-use practices and long-standing unmitigated drought can have on a society. Less known impacts include wildfire dangers, wildlife losses, and ecosystem damage. State and local governments, water-dependent industries, and water managers all depend on the information that NOAA provides to help them deal with and mitigate the effects of drought.

To Learn More, Visit These Sites:

National Integrated Drought Information System (NIDIS): http://wwa.colorado.edu/resources/nidis/
NOAA Drought Information Center: http://www.drought.noaa.gov/
U.S. Drought Monitor: http://drought.unl.edu/dm/monitor.html
Western Water Assessment: http://wwa.colorado.edu/

To Work or Study at OAR, Visit These Sites:

NOAA Careers: http://www.careers.noaa.gov
Hollings Scholarships: http://www.orau.gov/noaa/HollingsScholarship/
Knauss Fellowships: http://www.seagrant.noaa.gov/knauss/