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Summer 2008

DroughtScape- Summer 2008

Kelly Smith

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Summer 2008

VegDRI Expands West

Vegetation Drought Response Index (VegDRI) maps show drought-related vegetation stress for 22 states in the Midwest and West. In the future, the NDMC and partners will produce VegDRI year-round.

read more on page 8

Scholar Donates Books

Environmental historian Dr. John Opie donated "nine feet" of books on drought and the Plains to our library.

read more on page 7

Latest Workshop Info Up

Presentations from NDMC workshops in San Angelo, TX, and on two Hawaiian islands are on-line. Check What's New later this summer for fall workshop dates.

read more on page 9

About DroughtScape

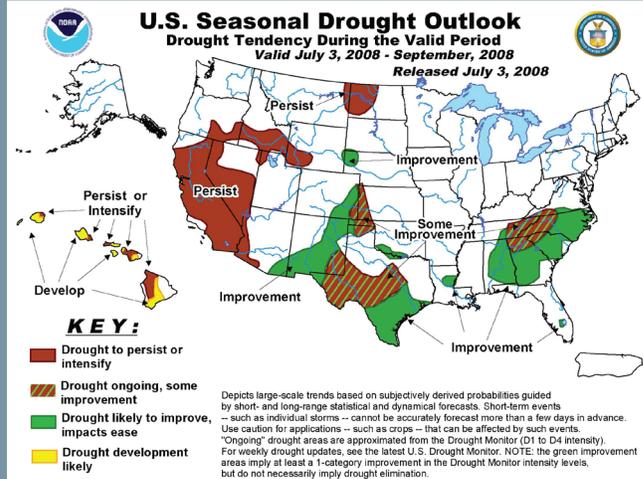
DroughtScape is the quarterly newsletter of the National Drought Mitigation Center (NDMC). The NDMC's mission is to reduce vulnerability to drought, nationally and internationally. Please email the editor with ideas: droughtscape@unl.edu

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Spring Rains Ease Drought But CA Still Dry

April-June brought some relief, with the area of the U.S. abnormally dry or drier shrinking from 46.9 to 40.5 percent. Gains in the east were offset by drying in the west.

read more on page 2



NDMC Welcomes Employees Bathke, Nothwehr



The NDMC is pleased to add employees Dr. Deborah Bathke, a climatologist with drought management experience, and Jeff Nothwehr, one of our own graduates.



read more on pages 6 & 7

State Lawmakers to Focus on Drought Planning

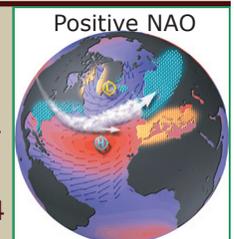
NDMC Director Mike Hayes, a Hawaii legislator, and a NOAA climatologist will be drought panelists at the 2008 Legislative Summit, July 22-26 in New Orleans. The panel, "Dealing with Drought: Opportunities for Innovation," will be 1-2:30 p.m. on Thursday, July 24.

read more on page 9

Decadal Variation -- Clues to Droughts and Floods?

The series on decadal climate variability by Dr. Vikram M. Mehta at The Center for Research on the Changing Earth System continues by examining the West Pacific Warm Pool variability and the North Atlantic Oscillation.

read more on page 4



Summer 2008

Summer 2008 U.S. Drought Outlook and April to June Summary

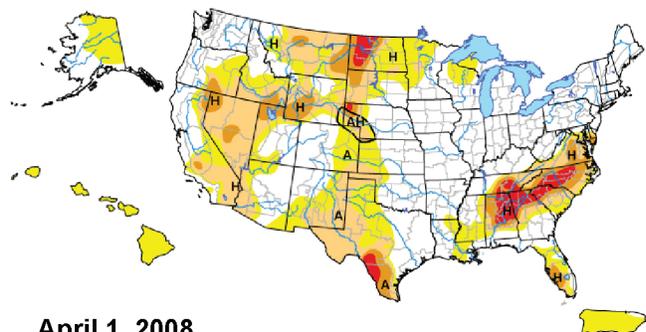
By Brian Fuchs, Climatologist, National Drought Mitigation Center

Drought classifications are based on the US Drought Monitor. For a detailed explanation, please visit <http://drought.unl.edu/dm/classify.htm>. The outlook integrates existing conditions with forecasts from the National Oceanic and Atmospheric Administration's Climate Prediction Center: <http://www.cpc.ncep.noaa.gov/>

Outlook: El Niño and La Niña sea surface temperature patterns have in the past provided forecasters with hints regarding the likelihood of wet and dry years in parts of North America, but not this time. Strong correlations between El Niño/La Niña and climatology have not been as prevalent during the last few episodes. Currently, La Niña conditions are moving back toward normal. The cooler-than-normal winter was typical of La Niña, but if it had followed its previous patterns, there would have been a drier winter and spring over the Southwest and Gulf of Mexico states.

Based on current trends, temperatures through the summer are expected to be above normal over much of the West and cooler than normal from the Midwest into the Southeast. Below-normal precipitation over the Pacific Northwest, northern Rockies and northern Plains is expected through the summer months. Drought conditions may improve over portions of the Plains and the Southeast, but will persist over areas of the West, Hawaii, the Carolinas and Texas.

April: April was a cool month for much of the United States. Temperatures were 4 to 8 degrees Fahrenheit below normal for the Central Plains and much of the Western United States. Precipitation was above normal for portions of the Midwest, Plains, Mid-Atlantic and Florida, all of which saw 150-300 percent of normal precipitation for the month. Spring rains reduced the intensity of drought in the Southeast. Texas and parts of the West got drier in April. For Texas, the Drought Monitor began showing D4, exceptional drought, in the south, and D3 and D2, extreme and severe drought, elsewhere in the state. Abnormally dry conditions stretched across California and Arizona, and early stages of drought expanded in California, New Mexico and Nevada. But overall, drought status for the United States improved slightly in April, with 45.6 percent abnormally dry or in drought at the end of the month, compared with 46.9 percent at the beginning.



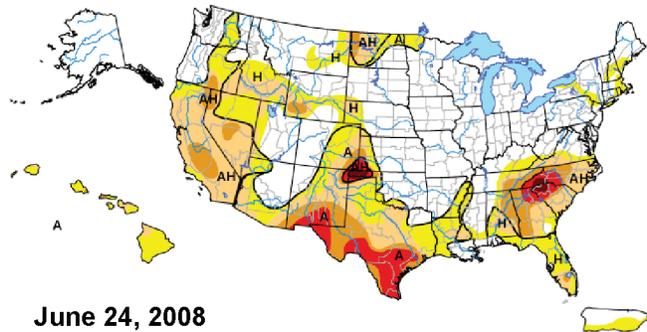
April 1, 2008

May: With below-normal temperatures and rain falling in some of the areas that needed it, the proportion of the United States in drought decreased during May. The month started with 45.1 percent of the country abnormally dry or in drought, and ended with 37.1 percent in those categories. Improvements in the Nebraska panhandle reduced an area that had been in

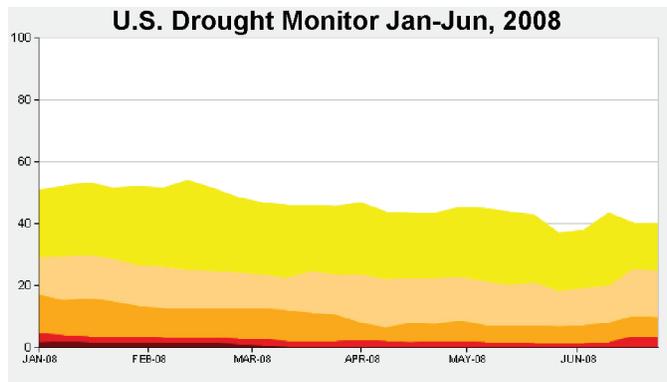
April to June Summary, continued

D3, extreme drought, to D2, severe drought. Abnormally dry conditions improved over much of Arizona and the exceptional and extreme drought in south Texas eased. Conditions in the Southeast continued to improve, with most short-term drought problems eliminated, but long-term hydrological problems still hampering full recovery in the region. The cool spring continued into May, with temperatures 2-4 degrees Fahrenheit below normal for much of the United States and 6-8 degrees Fahrenheit below normal in the northern Plains. A very active weather pattern continued over the northern Rocky Mountains, Plains and Midwest, where 100-200 percent of normal precipitation fell. An exception to the improvement was Hawaii, where continuing dryness led to portions of the islands being downgraded from abnormally dry to moderate drought.

June: During June, drought intensified over the United States, but conditions are still better than earlier this year, which began with over half of the country abnormally dry or in drought. June ended with 40.5 percent in those categories, up from 38.4 percent. The nation saw both extremes. Precipitation was abundant over much of the central and northern Plains as well as the Midwest, with flooding rains over Iowa, Missouri, Indiana and Wisconsin. Drought eased by a category over North Dakota, where it disappeared in the southeast corner but only improved to severe in the west. The Nebraska panhandle saw continued improvement, with severe drought reduced to moderate. But dryness continued to plague much of California, Nevada and Arizona, as well as south Texas. D4, exceptional drought, emerged in the Oklahoma panhandle and western portions of the Carolinas. Drought expanded and intensified over much of south and west Texas and New Mexico. Abnormally dry conditions deteriorated to moderate and severe drought over California. Drought in Hawaii intensified to severe on parts of the islands of Oahu and Molokai.



June 24, 2008



This time series shows changes in the percent area of the United States in various categories of drought, January-June 2008. Its peak earlier this year was around 56 percent abnormally dry or worse, compared with 40.5 percent at the end of June.

The Nebraska panhandle saw continued improvement, with severe drought reduced to moderate. But dryness continued to plague much of California, Nevada and Arizona, as well as south Texas. D4, exceptional drought, emerged in the Oklahoma panhandle and western portions of the Carolinas. Drought expanded and intensified over much of south and west Texas and New Mexico. Abnormally dry conditions deteriorated to moderate and severe drought over California. Drought in Hawaii intensified to severe on parts of the islands of Oahu and Molokai.

Summer 2008

Introduction to Major Decadal Climate Variability Phenomena, Part II: The West Pacific Warm Pool Variability and the North Atlantic Oscillation

by *Vikram M. Mehta, The Center for Research on the Changing Earth System, Columbia, Maryland, vikram@crces.org*

Following the general background on decadal climate variability (DCV) in the Autumn 2007 issue of *DroughtScape*, we looked at two major DCV phenomena in the Spring 2008 issue: the Tropical Atlantic Gradient variability and the Pacific Decadal Oscillation. In this issue, two more DCV phenomena are described: the West Pacific Warm Pool variability (WPWP) and the North Atlantic Oscillation (NAO).

Editor's Note

Dr. Mehta is working on an analysis of how closely the flooding in the Midwest this year correlates with decadal climate variability phenomena. He anticipates results later this year.

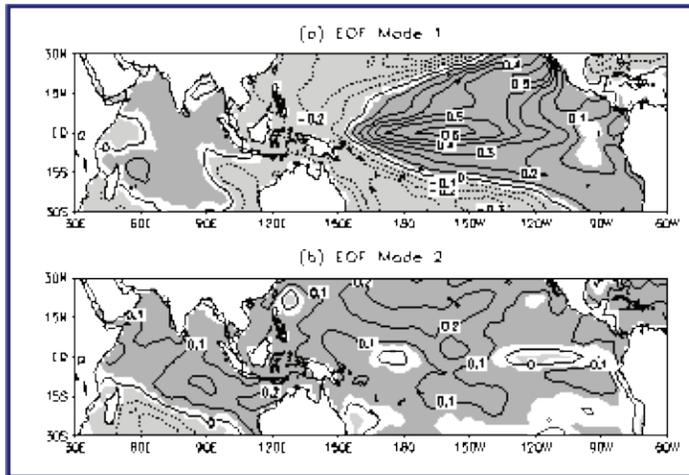


Figure 1: Regression patterns of SST anomaly (contours) associated with a two standard deviation departure in corresponding Empirical Orthogonal Function (EOF) time series. Contour interval is 0.1 degree C and negative contours are dashed. Dark (light) shadings indicate positive (negative) SST anomaly at the 1 percent significance level, estimated by Monte Carlo tests.

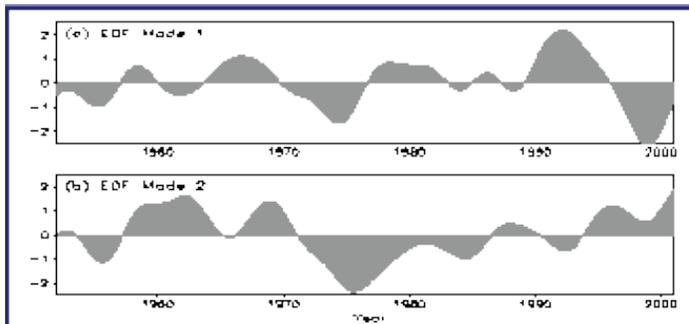


Figure 2: Normalized monthly time series (1952–2001) of (a) EOF1 and (b) EOF2 of the WPWP SST.

Research on the WPWP dates back to the 1980s, when researchers first found associations between variations in the WPWP SST and El Niño-La Niña events in the eastern tropical Pacific Ocean.

Since then, as more and better ocean and atmosphere observations have become available, it has been found that variability of many atmosphere and ocean variables are associated with the WPWP SST variability shown in Figures 1 (spatial pattern) and 2 (time series of variation of each spatial pattern), such as winds in the lower troposphere; heat transferred between the Pacific Ocean and the overlying atmosphere; rainfall in Asia and Australia; Pacific typhoons; and rainfall in the central, Midwestern, and southeastern U.S.

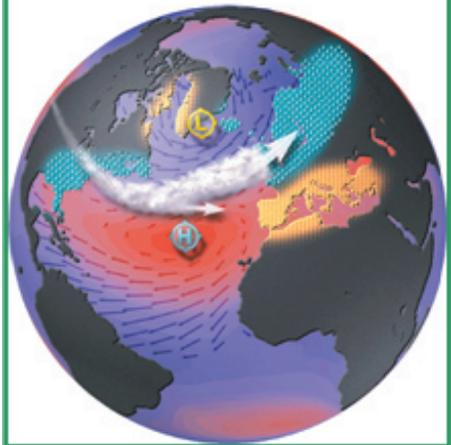
Sir Gilbert Walker of the India Meteorological Department first discovered a phenomenon he termed the North Atlantic Oscillation (NAO) in the late 1920s. Sir Gilbert wanted to find precursor signals to predict the Indian monsoon rainfall and the NAO was an atmospheric pressure seesaw he found during his studies using worldwide atmospheric pressure measurements. During the positive NAO phase (Fig. 3a), the subtropical high is stronger and the Icelan-

West Pacific Warm Pool Variability and North Atlantic Oscillation, continued

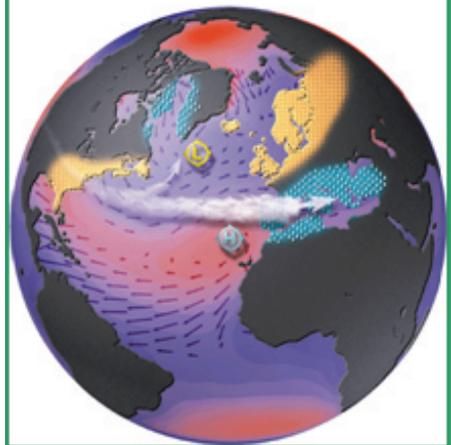
dic low is weaker. This stronger north-south pressure gradient results in more frequent and stronger winter storms on a more northern track, leading to warm, wet winters in northern Europe and cold, dry winters in Canada and Greenland. During the negative NAO phase (Fig. 3b), the subtropical high is weaker and the Icelandic low is stronger. This weaker north-south pressure gradient results in fewer and weaker winter storms on a more southern track, leading to cold, dry winters in northern Europe and cold, snowy winters over the East Coast of the United States. This north-south pattern oscillates at a variety of time scales as shown in Figure 4. The decadal and longer time scales are prominent.

Scientists hypothesize that the principal cause of the WPWP and the NAO is the variability of heat transported by currents and slow-moving waves in the Pacific and Atlantic Oceans, respectively, as a result of their interactions with the atmosphere. The WPWP variability is associated with decadal droughts, floods, and crop yields in the Missouri River Basin. The NAO variability is associated primarily with winter weather in the northeastern U.S.

Positive North Atlantic Oscillation Phase



Negative North Atlantic Oscillation Phase



Figures 3a and 3b: Schematic patterns of the NAO; (a) positive phase and (b) negative phase.

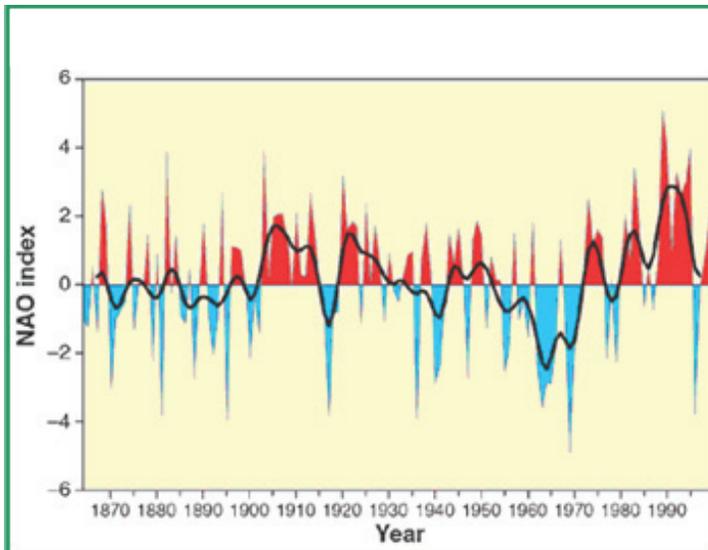


Figure 4: The NAO index, defined as sea level pressure difference between Iceland and the Azores/Lisbon/Gibraltar, averaged and normalized from November through March.

Summer 2008

NDMC Welcomes Climatologist Deborah Bathke Back from New Mexico

We are pleased to welcome Dr. Deborah Bathke, a climatologist with drought management experience, to the NDMC and to the University of Nebraska-Lincoln's School of Natural Resources and Department of Geosciences.

Although Dr. Bathke grew up in northeast Nebraska and has strong ties to Lincoln — two degrees and a fiancé — she didn't anticipate returning, and was pleased when the right opportunity presented itself.

"We are delighted to be adding Deborah to our staff," said NDMC Director Mike Hayes. "She brings valuable experience in drought planning and management, and is well respected in the climate community."

Bathke spent the past three years as the assistant state climatologist in New Mexico, where she chaired the state's Drought Monitoring Working Group. She is familiar with the challenges states face in drought planning, such as "the ebbs and flows of resources, with precipitation and drought events." One of the perpetual challenges of drought management is to maintain focus during non-drought times, when actual planning is possible, rather than crisis response.

"Having grown up in the Plains and the Midwest, living in the Southwest, I learned a lot," Bathke said. Water rights, cultural traditions, and physical differences such as flood irrigation all contribute to different attitudes and options.

She represented New Mexico in the Climate Assessment for the Southwest program, or CLIMAS, which is one of the National Oceanic and Atmospheric Administration's Regional Integrated Science Assessment programs. Among the projects she collaborated on were adapting the Dynamic Drought Index for Basins in the Carolinas to the Southwest; implementing a western version of the AgClimate Tools developed by the Southeast Climate Consortium; and convening technical workshops on tree-ring reconstructions of streamflow.

Bathke is supervising ongoing student research on urban landscaping and drought, and is on the Program Implementation Team of the National Integrated Drought Information System.

Her doctorate in atmospheric sciences is from The Ohio State University, and her bachelor's and master's degrees are from UNL.



Dr. Deborah Bathke, climatologist, has joined the National Drought Mitigation Center.

Summer 2008

Nothwehr Already Versed in Drought Center Projects

When Jeff Nothwehr took a Climate & Society course as a Geography undergrad from Don Wilhite, the NDMC's founding director, Don recognized a potential drought scholar, and recruited Jeff as a graduate student. Nothwehr completed an M.S. in Natural Resource Sciences with a Climate Assessment and Impacts specialization in 2007, and in summer 2008 became a full-time employee of the NDMC.



As an NDMC GIS and Research Specialist, Jeff Nothwehr is helping on many fronts.

He is a GIS and Research Specialist within the Monitoring sub-group of the NDMC, and already has experience with several of the NDMC's products and tools, including the Drought Monitor, the Standardized Precipitation Index, the Drought Impact Reporter, and the Drought Atlas. He is also helping with NDMC contributions to the National Integrated Drought Information System.

"Jeff is a strong addition to our GIS and drought monitoring research capabilities," said NDMC Director Mike Hayes. "His familiarity with our products will enable him to contribute to a variety of efforts."

"I like doing GIS-related work, and the Drought Center is willing to give me the opportunity to do it," Nothwehr said. His efforts will supplement those of Soren Scott, the NDMC's GIS Developer.

Noting the growing awareness of drought, due in part to media attention to climate change, he said, "It doesn't seem like there's a massive amount of people studying drought, and I feel fortunate to be part of the effort."

Jeff grew up in Cedar Rapids, Iowa, and reported that his family there was not directly affected by recent flooding.

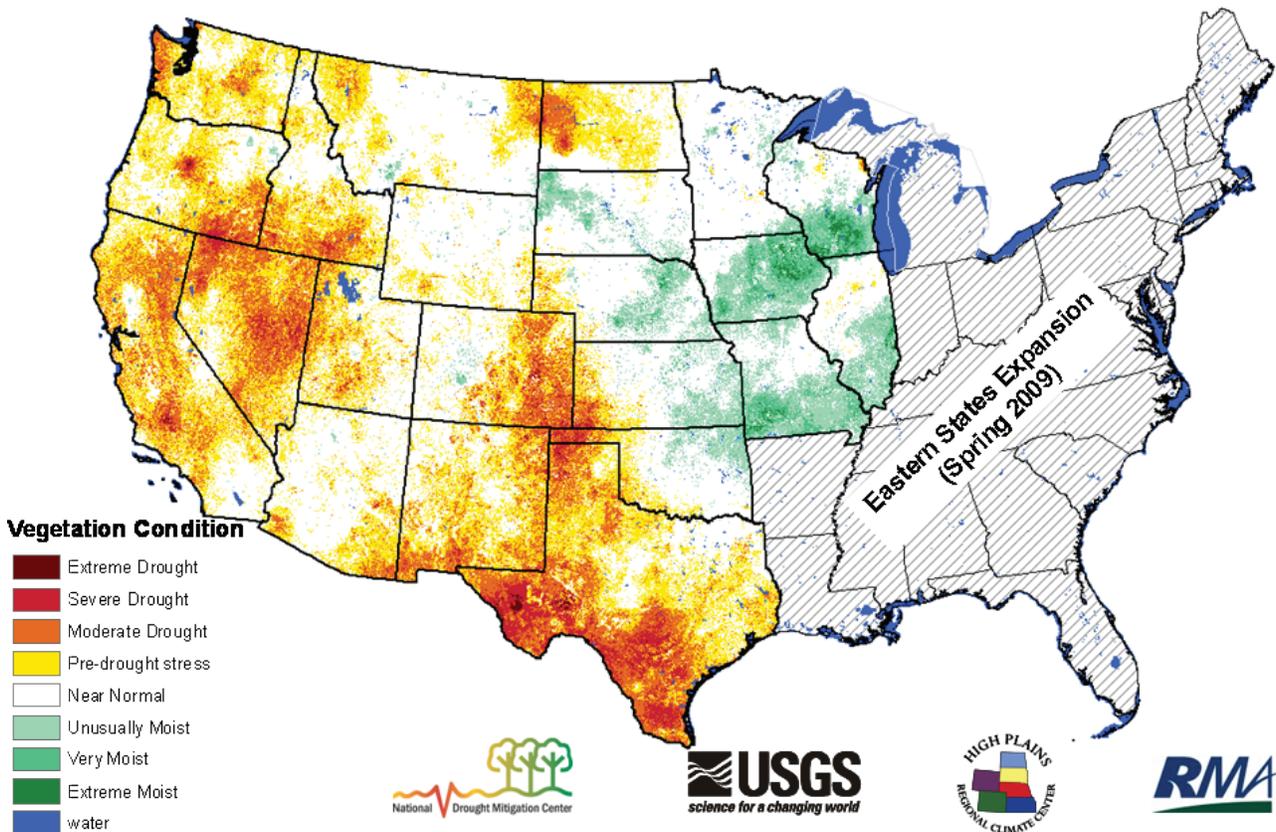
Scholar Donates Book Collection on Plains and Drought

Environmental historian Dr. John Opie recently honored the NDMC with a donation of books on drought, the Great Plains, and related topics. Opie said the books were source material for two of his books and many essays, including *Ogallala: Water for a Dry Land* (University of Nebraska Press, 1993 and 2000).

Opie is a Distinguished Professor Emeritus of Environmental Policy and History at the New Jersey Institute of Technology and has been a lecturer in Environmental Studies at the University of Chicago. He is retired and lives in the Indiana Dunes along Lake Michigan.

VegDRI Expands Spatial, Temporal Coverage

The Vegetation Drought Response Index (VegDRI), June 16, 2008



As of May 2008, VegDRI's westward expansion in the 48 contiguous United States was complete. It now covers 22 states in the Midwest and West, and is scheduled to add coverage of the Eastern U.S. in Spring 2009. Westward expansion brought with it the challenge of more variation in growing seasons. As a result, VegDRI will become a year-round product, extending through the winter, said NDMC researchers Brian Wardlow and Tsegaye Tadesse. They noted that this would also serve south Texas, Florida and the Gulf Coast well.

Another new feature of VegDRI is the "pre-drought stress" category, yellow on the legend, to denote areas that are drier than normal but not yet in drought.

The NDMC produces VegDRI in collaboration with the U.S. Geological Survey's Center for Earth Resources Observation and Science, and the High Plains Regional Climate Center, with sponsorship from the U.S. Department of Agriculture's Risk Management Agency. For the most current map, to provide comments and feedback, and to learn more about VegDRI, please visit the website: http://drought.unl.edu/veg dri/VegDRI_Main.htm

Summer 2008

West Texas, Hawai Host NDMC-RMA Workshops

Recent presentations from NDMC workshops are available on the What's New section of our website (<http://drought.unl.edu/new.htm>). Goals of the workshops, sponsored by the Risk Management Agency of the U.S. Department of Agriculture, are:

- To gather user input on the suite of drought decision making tools that the NDMC is developing.
- To share what we've learned about reducing vulnerability to drought, and to learn from our hosts.



Left, Mark Svoboda, NDMC climatologist, awaited his dining companions at an outdoor catered lunch at the Texas AgriLife Research and Extension Center at San Angelo on April 24. The audience of 70 was evenly divided between ranchers and agency employees.

Above, Dr. Cheryl Anderson, Director of the Hazards, Climate, and Environment Program at the University of Hawaii, left, and Neal Fujii, Hawaii State Drought Coordinator, joined the NDMC for a field trip to Sumner Erdman's Ulupalakua Ranch, upcountry on the island of Maui. Erdman provided valuable information about how his operation collects and uses climate data. Workshops were June 24 on Maui and June 26 on Hawaii.

State Legislators to Learn About Drought

NDMC Director Mike Hayes, a Hawaii legislator, and a NOAA climatologist will be drought panelists at the 2008 Legislative Summit, July 22-26 in New Orleans. The panel, "Dealing with Drought: Opportunities for Innovation," will be 1-2:30 p.m. on Thursday, July 24.

The Hawaii representative will discuss that state's drought mitigation needs, and how the governor and legislature are backing drought mitigation. As part of Hawaii's Act 238, Gov. Linda Lingle released \$4 million for drought mitigation, \$1 million for each county in Hawaii. Dr. Thomas Peterson, a coauthor of *Weather and Climate Extremes in a Changing Climate* (June 2008), will discuss key findings and projections. The session will be moderated by Sen. Beverly Gard of Indiana, who will briefly address the Great Lakes Compact.

The summit is also the annual meeting of the National Conference of State Legislatures, and will probably attract 6,000 legislators, staffers, and others interested in public policy.