National Integrated Drought Information System NIDIS

A Pathway for National Resilience

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Welcome to the second edition of the NIDIS Newsletter. In these pages you will find updated information on the NIDIS Regional Drought Early Warning Information Systems that are currently underway in the Apalachicola-Chattahoochee-Flint River Basin and the Upper Colorado River Basin, as well as drought early warning Pilot activities in California and tribal lands in the western U.S.

Apalachicola-Chattahoochee-Flint River Basin Regional Drought Early Warning Information System

The Apalachicola-Chattahoochee-Flint (ACF) River Basin Regional Drought Early Warning Information System (RDEWS) activities have been selected and prioritized and are currently under development. This newsletter features these related articles...

Apalachicola - photo courtesy of Joel Lanier (NOAA/NWS)

Also in this issue…

ACF River Basin Regional Drought Early Warning Information System

Apalachicola-Chattahoochee-Flint

The ACF River Basin

By Lisa Darby (NOAA/NIDIS Program Office)

As a normal part of the climate system, the southeast U.S. occasionally experiences drought. Droughts like the one that occurred in 2006-09 have many impacts on the Apalachicola-Chattahoochee-Flint (ACF) River Basin. Some of the drought-vulnerable sectors are listed on the map in Fig. 1. The impacts of drought are quite varied across the basin, with municipal water supplies in the northern part of the basin becoming vulnerable, while agricultural interests in the middle part of the basin suffer as ground water levels decrease when water for irrigation is in high demand. In the lower part of the basin the ecosystem is negatively affected in many ways, along with commercial and recreational fishing. These are just a few of the broad categories of impacts that can occur in the ACF basin during drought.

The economic impacts of severe drought in the ACF are significant. It is estimated that the releases from Lake Lanier (Fig. 1) in 2007-08 to bring water to the rest of the basin caused a $90.2 million loss in recreational spending associated with the lake in 2008, relative to 2007 (Lake Sidney Lanier Economic Impact Analysis, 2010). This does not include the ripple effect of this loss on the regional economy in the upper part of the basin.

Water allocation issues in the ACF basin further compound problems resulting from drought. For at least 20 years Alabama, Florida and Georgia have been involved in litigation regarding water allocation and the regulation of Chattahoochee River flows by the U.S. Army Corps of Engineers' projects (Buford Dam/Lake Lanier, West Point Dam and Lake, Walter F. George Dam and Lake, George W. Anderson Dam and Lake, and Jim Woodruff Dam/Lake Seminole, Fig. 1), as well as other smaller projects. Against this backdrop of litigation, NIDIS has been holding workshops the last couple of years to gather stakeholder input for the design of the NIDIS Regional Drought Early Warning Information System (RDEWS) for the ACF basin, led by Chad McNutt and Lisa Darby. One of the benefits of these workshops has been the opportunity to bring stakeholders from the basin together to discuss water issues and to ascertain what products and activities would be beneficial when planning for and dealing with drought.

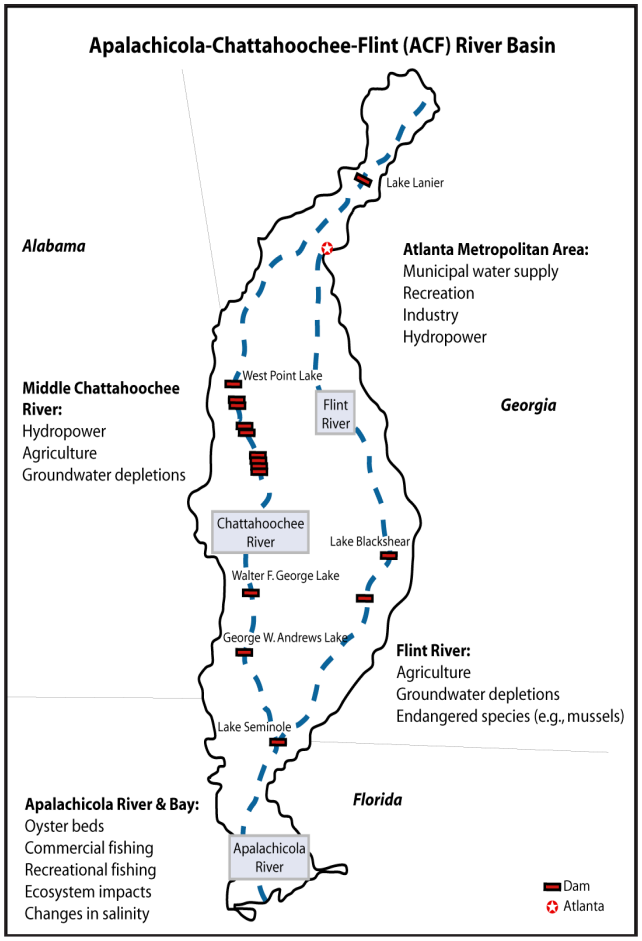


Figure 1: Map of the Apalachicola-Chattahoochee-Flint River Basin. Major dams are shown in red.

In this issue of the NIDIS Newsletter we present summaries of the last two NIDIS ACF basin meetings which took place in Albany, GA in November 2010. These meetings were the culmination of all previous stakeholder meetings. The first meeting was a Climate Outlook Forum where experts were assembled to present near- and long-term forecasts for the basin, taking a particular look at the projected impacts and duration of the current La Niña conditions. The second meeting was an opportunity for basin stakeholders to hear summaries of sub-basin meetings where drought concerns were discussed. The sub-basins include the Upper Chattahoochee (the basin above West Point Dam), the Apalachicola River & Bay (the basin below Lake Seminole), and the Middle Chattahoochee and Flint (between Lake Seminole and West Point Dam). Lastly, drought concerns that were common to all parts of the ACF basin were discussed as potential areas to be addressed by an RDEWS. The meeting summary specifies how the group prioritized these areas of concern and who will take the lead in addressing them.

Reference: Bleakly Advisory Group, Inc., B.A. Seaman, PBS&J, 2010: Lake Sidney Lanier Economic Impact Analysis, 1071 Coalition.

Climate Outlook Forum for the Southeast U.S.: Implications for the ACF River Basin

By Chad McNutt (NOAA/NIDIS Program Office)

On November 18, 2010, NIDIS and the Flint River Water Planning and Policy Center hosted a regional climate outlook forum in Albany, GA. The main objective of the Forum was to develop a seasonal climate-outlook, which could be applied at the scale of the Apalachicola-Chattahoochee-Flint (ACF) River Basin (Fig. 1, previous article) and disseminated to climate sensitive groups (Fig. 2).

Why hold a Climate Outlook Forum for the Southeast: The Southeast U.S. climate has a strong linkage to the El Niño/Southern Oscillation (ENSO) phenomenon. The strong ENSO connection allows for the use of seasonal climate forecasts and observations to provide early warning of potential hazards such as heat waves, wildfire, and drought. In May and June of this year sea surface temperatures in the equatorial Pacific began to cool, initiating the cold phase of ENSO, also called La Niña. In typical La Niña years, fall, winter and spring seasons in the Southeast are warmer and drier than normal due to changes in global atmospheric circulation patterns (Fig. 3)

The discussion at the Forum focused on current soil moisture, streamflow, groundwater, and reservoir conditions; the 90-day Seasonal Outlook produced by the Climate Prediction Center; implications of the seasonal outlook to the water supply, agriculture, and natural resources sectors; the long and short-term vulnerabilities and risks of warm-dry conditions to these sectors; and how this information could be used to improve planning and preparedness.

Figure 2: Southeast Climate Outlook Forum Participants included representatives from federal, state and county agencies, universities and NGOs.

The Climate Outlook Forum is part of the NIDIS effort to establish a Regional Drought Early Warning Information System in the Southeast. An early warning system communicates forecasts, monitoring, and observations and puts the information in a context that allows decision makers to take action and increases general awareness and education among stakeholders.

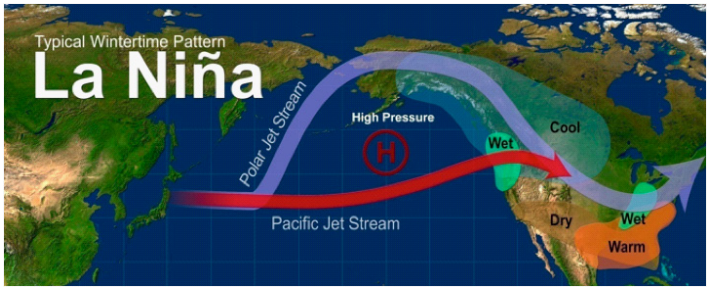


Figure 3: Typical global atmospheric circulation patterns as a result of reduced sea surface temperature in the equatorial Pacific. (Graphic courtesy of NOAA/Climate Prediction Center)

Conclusions from Forum

Current Conditions: Drought has developed over a large part of the Southeast. This past summer was particularly hot and ranks as one of the hottest on record. For the past six months (April - Nov) rainfall was below normal, particularly in southeastern Alabama. As a result, soil moisture and groundwater levels are low and streamflow is below normal in several places. It was not just the lack of land falling hurricanes that hurt the Southeast this year but also a lack of streaming tropical moisture from the Gulf of Mexico. As of the most recent U.S. Drought Monitor update, approximately 50% of the Southeast is in at least a D1 drought designation (Fig. 4).

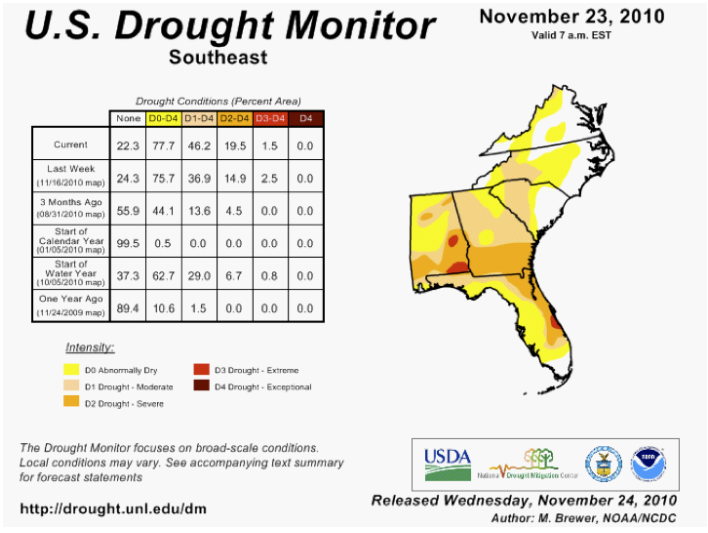


Figure 4: U.S. Drought Monitor depiction of drought coverage in the Southeast (http://www.drought.unl.edu/dm/monitor.html)

December-January-February Seasonal Outlook: The upcoming winter and spring are likely to have below normal rainfall and above normal temperatures (Fig. 5). Average accumulated rainfall in the headwaters of the ACF Basin for December through February is approximately 12 inches. During past strong La Niña events rainfall has ranged from approximately 7 to 14 inches for December-February.

Seasonal Outlook Uncertainty: In El Niño or La Niña years the precipitation seasonal forecast is generally better than the temperature forecast. The relationship to La Niña is strongest in Florida and tends to become weaker in the upper part of the ACF Basin.

Implications of Forecast: *Water supply* - La Niña typically means lower streamflows and lower inflows into the U.S. Army Corps of Engineer reservoirs, such as Lake Lanier. If La Niña persists through Spring 2011, it is likely that groundwater level declines will result in intermittent flows in parts of the ACF Basin by mid-summer. If La Niña persists into the winter of 2012, groundwater level declines could occur throughout the lower ACF Basin resulting in significant streamflow declines and the need for increased water releases from federal reservoirs in the upper Basin to meet required flows in the Apalachicola River; *Agriculture* - The dry weather during La Niña years is usually not conducive to fungal diseases such as Anthracnose and Botrytis fruit rots, thus requiring less applications of fungicides. Winter vegetables tend to yield more during La Niña years than during neutral or El Niño years due also to reduced incidence of fungal disease. Impacts to row crops from La Niña are less obvious since the strongest effects occur in winter-spring before most row crops are planted; *Natural Resources* - La Niña brings the potential for a very active wildfire season. Average acreage burned during La Niña years is often more than double that of normal as seen in 1998 and 2001. Listed and endangered species in the ACF are also at risk. For example, there are several listed freshwater mussel species in the ACF. Tributary streams support the greatest richness and abundance of mussel populations and these are susceptible to stagnation and going dry. Reduced streamflow and level also has implications for the gulf sturgeon. When flow and river levels are low this reduces habitat for reproduction. It also has implications for salinity levels in Apalachicola Bay, which can adversely affect the oyster fishery through increased incidence of disease and predation.

Likelihood of Two-Year La Niña: Strong La Niña conditions are projected to persist at least through Spring 2011, with a better than 50 percent chance that the present event could extend into a second year. This could mean warm-dry conditions will persist for a second recharge season (December 2011-April 2012); however, it is unclear if the second year of a La Niña will be as severe as the first.

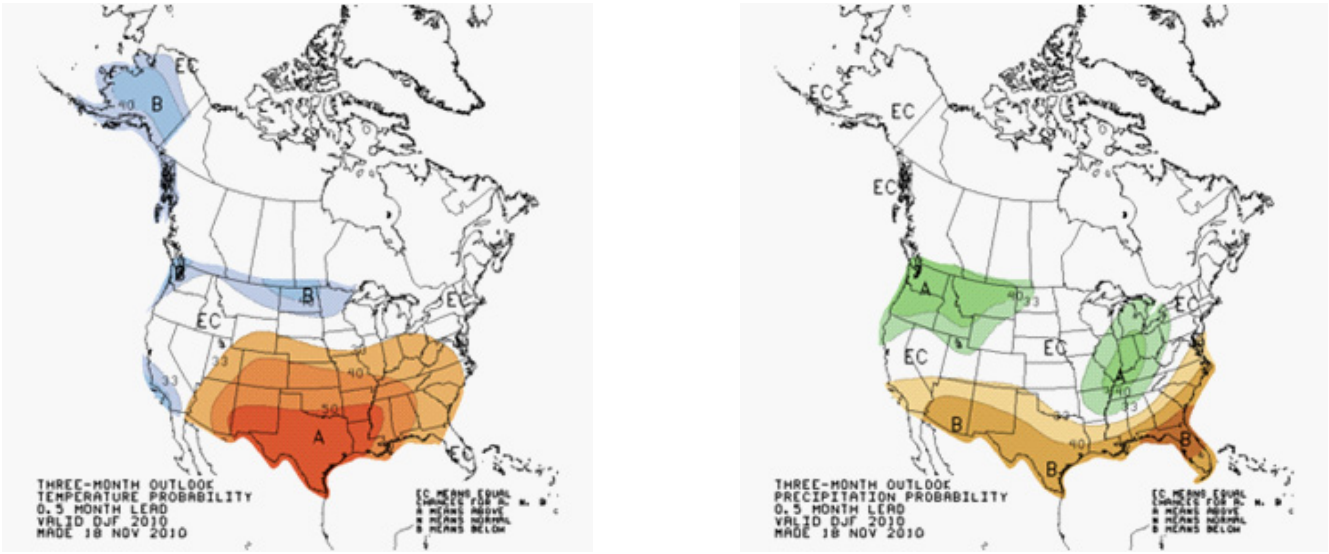


Figure 5: Three-month outlook for temperature (top) and precipitation (bottom) from NOAA's Climate Prediction Center (http://www.cpc.noaa.gov/).

UPDATE to the Outlook Forum: Why has this winter been colder than expected across the Southeastern US?

By Christopher Martinez, University of Florida

This winter has been unusually cold in the Southeast, colder than would typically be expected during a La Niña, largely due to the Arctic Oscillation (AO). Like ENSO, the AO is a climate phenomenon that affects weather in North America during winter. The AO represents opposing atmospheric pressure patterns between the Arctic and mid-latitudes. When the AO is in its negative (cold) phase, arctic air pushes further south into the US due to higher pressure in the Arctic. Unlike ENSO, the phase of the AO can change in 1-2 weeks. So, while the AO may be responsible for recent cold weather in the Southeastern US, it can change relatively quickly to its positive phase – where pulses of arctic air into the Southeastern US are infrequent and warmer weather may resume.

ACF River Basin: Full-Basin Meeting Summary

By Lisa Darby (NOAA/NIDIS Program Office)

The goals of the ACF full-basin meeting held on 19 November 2010 at the Bridge House in Albany, GA included (1) providing updates to stakeholders regarding current NIDIS work in the basin, (2) providing a summary of the feedback heard regarding drought issues at all three NIDIS sub-basin meetings that were held last year, (3) determine the priority elements for the NIDIS Regional Drought Early Warning Information System (RDEWS) for the ACF basin and to (4) establish committees to begin implementation of the RDEWS.

In order to keep stakeholders in the basin up to date, reviews of two projects in the ACF basin currently being funded by NIDIS were given. The project titles and lead principal investigators (PI) are listed below:

- Reducing Drought Risks in the Southeast USA: Quantification of Drought Information Value, Development of Drought Indices, and Communication of Drought Information (Puneet Srivastava, Univ. of Auburn, Lead PI)

- Needs, Uses, Perceptions, and Attitudes towards Weather and Climate Forecast Information by Water Resource Managers in the Southeastern United States (Chris Martinez, Univ. of Florida, Lead PI)

The goals of the projects along with the rest of the participating investigators were presented to the stakeholders.

Pam Knox, Assistant State Climatologist for Georgia, presented a review of the data committee's activities, including the latest version of a spreadsheet of data sources relevant to the ACF basin. The data committee compiled this spreadsheet over the last few months and it is available to stakeholders for their use and for their input. If you would like to review the spreadsheet, or contribute to it, please contact Pam Knox (pknox@uga.edu).

Stakeholders saw a brief overview of the new ACF RDEWS web page on the Drought Portal (http://www.drought.gov/portal/server.pt/community/acfrb). This web page is a work in progress and NIDIS is open to receiving feedback on web page content and layout.

Meeting summaries were given for the three sub-basin meetings that were held in the past year: Upper Chattahoochee (Pam Knox), Middle Chattahoochee and Flint (Tom Littlepage, ADECA), and the Apalachicola River & Bay (Dan Tonsmiere, Apalachicola Riverkeeper). To prioritize RDEWS activities that will benefit stakeholders across the basin, concerns that were heard at the sub-basin meetings were categorized for presentation to the group to consider as potential elements of an RDEWS for the basin. There were nine general areas of common concerns heard across the basin. These common concerns, ranked in order of importance by the group, are as follows:

- Drought education and enhanced communication across the basin
- ACF Basin webinars and climate outlooks to assess current conditions and present short- and long-term forecasts
- Basin data sets (inventories, access)
- Presentation of information (emphasis on basin-scale graphics)
- Forecasting improvements
- Development of a drought index for the basin
- Improved interactions with the US Army Corps of Engineers
- Consistency in drought planning among the 3 states
- Resolve discrepancies in our understanding of groundwater issues in the basin

Committees were formed to address the top four concerns, with data and presentation of information combined into one.

The Education and Communication Committee will be led by Chris Martinez at the University of Florida. This committee has a wide range of topics and stakeholder groups that could be addressed. A workshop to educate the media about drought was brought up as a valuable task for this group.

The ACF Basin Webinars and Climate Outlooks Committee will be led by Keith Ingram at the University of Florida. It is anticipated that stakeholders from all three basin states will contribute to the production of these webinars, which will address current and future conditions in the basin.

The Data and Presentation of Information Committee will be led by Pam Knox at the University of Georgia. This group will continue to develop the ACF basin data spreadsheet and make plans for future activities which will allow easier access to data in the basin.

A more detailed account of the meeting can be found on the Drought Portal (www.drought.gov).

Shiny-rayed pocketbook: Considered to be among the most beautiful of North American mussel species. The one pictured shows staining from the seasonally tannic waters of the lower Flint. Mussels like the shiny-rayed pocketbook are filter feeders extracting food particles and dissolved oxygen from the water that circulates within their shells. - Photo courtesy of the J. W. Jones Ecological Research Center

Upper Colorado River Basin Regional Drought Early Warning Information System

Weekly Climate, Water and Drought Assessment for the Upper Colorado Basin: A New Webinar Series from the Colorado Climate Center and NIDIS

By Christina Alvord (CIRES/NIDIS Program Office) and Wendy Ryan (Colorado Climate Center)

Reprinted from the Intermountain West Climate Summary - Western Water Assessment, NOAA-CIRES

In March 2010, the Colorado Climate Center (CCC) at Colorado State University began conducting weekly web-based water and climate briefings to stakeholders and agencies within the Upper Colorado River basin (Fig. 1). These "webinars" are part of the NIDIS Upper Colorado River Basin Regional Drought Early Warning Information System (RDEWS). The overarching goal of the RDEWS is to provide better drought early warning for the region, and improve coordination and collaboration of researchers and producers working on drought and water supply conditions for the Upper Colorado River Basin.

How Do the Webinars Work?
Each week a teleconference call-in number and URL for the webinar is e-mailed to an e-mail listserv of participants. Participants call in to hear the discussion, and through the web, view the corresponding PowerPoint presentation on their own computers. The teleconference line allows participants to engage with regional climate and water supply experts in real-time. A summary of conditions is e-mailed to listserv subscribers after each webinar.

How Do I Register for the Webinars?
To register for the webinar, go to http://climate.colostate.edu/drought_webinar.php and click on "Register for weekly Webinar here" located on the left navigation tab. You can select upcoming webinars to register by date. You must register separately for each webinar to allow the planning team to set up appropriate number of teleconference lines for each webinar. For questions concerning the registration process, please contact Henry Reges (hreges@atmos.colostate.edu).

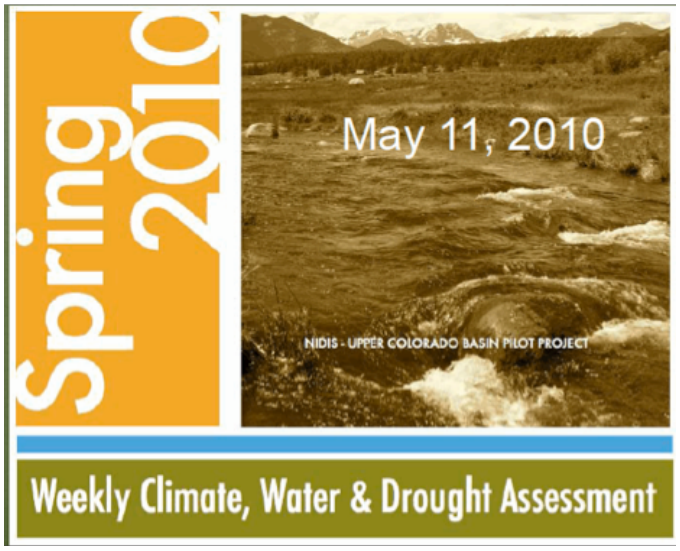


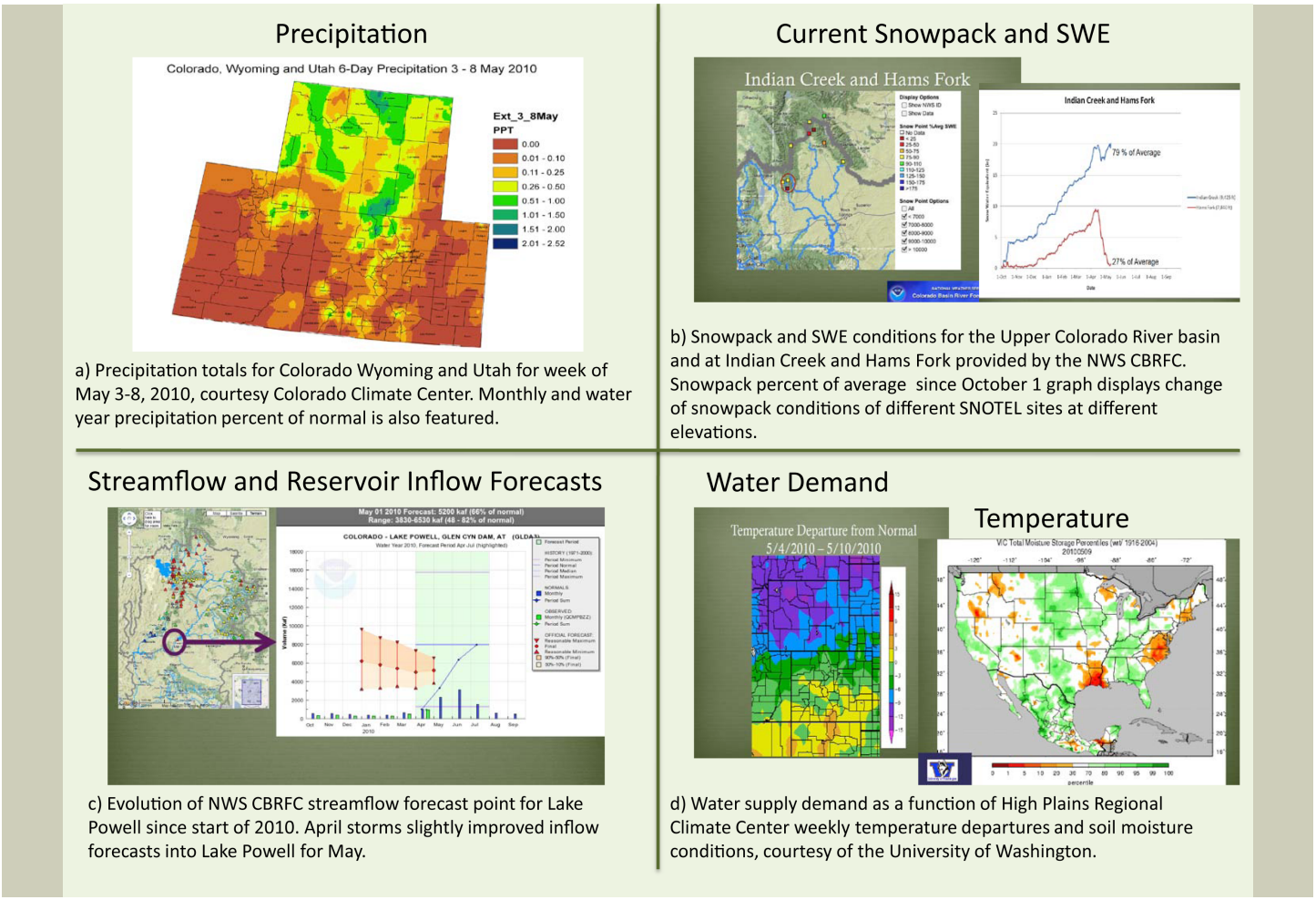
Figure 1: Title slide of the Weekly Climate, Water and Drought Assessment webinars.

The webinars provide an opportunity for data providers and users to discuss updated drought and water supply conditions and ensure accuracy and consistency of conditions across climate and water supply products and information sources. In 2010 the webinars were held on Tuesdays at 10 AM MDT from March through the snowmelt season into mid-June. The webinars are scheduled for 30 minutes, plus follow-up discussion of the US Drought Monitor (USDM). Each webinar presentation is also posted as a PDF file by the following day, on the CCC website: http://climate.colostate.edu/drought_webinar.php.

Each webinar features several presenters who present data and other input from multiple federal agencies and state and local partners, including NOAA, the NWS Colorado River Basin Forecast Center (CBRFC), US Geological Survey, Colorado State University, Utah State University, and the University of Wyoming. The state climatologists of Colorado and Wyoming provide additional regional perspectives on current conditions.

The information covered in each webinar includes:

- Upper Colorado River basin precipitation
- SNOTEL snowpack and water-year precipitation updates at varying elevations
- USGS streamflow updates
- CBRFC (Colorado Basin River Forecast Center) streamflow forecasts
- Selected reservoir level updates and historic context
- Temperature departures from normal
- Soil moisture conditions
- Precipitation outlook for upcoming week
- Assessment and recommendations for weekly updates to the U.S. Drought Monitor (USDM)



a) Precipitation totals for Colorado Wyoming and Utah for week of May 3-8, 2010, courtesy Colorado Climate Center. Monthly and water year precipitation percent of normal is also featured.

b) Snowpack and SWE conditions for the Upper Colorado River basin and at Indian Creek and Hams Fork provided by the NWS CBRFC. Snowpack percent of average since October 1 graph displays change of snowpack conditions of different SNOTEL sites at different elevations.

c) Evolution of NWS CBRFC streamflow forecast point for Lake Powell since start of 2010. April storms slightly improved inflow forecasts into Lake Powell for May.

d) Water supply demand as a function of High Plains Regional Climate Center weekly temperature departures and soil moisture conditions, courtesy of the University of Washington.

Figure 2: Several examples of the climate, water supply and drought information presented in the webinars.

Figure 2 shows a sample of the information and products covered in each webinar. At the conclusion of each webinar, presenters have the opportunity to give recommendations to the authors of the USDM on changing the classification and/or spatial extent of drought areas for the upcoming USDM, released every Thursday. The webinars originated from interviews conducted by Nolan Doesken, Colorado State Climatologist, in summer 2009 to better understand the data and information needs of stakeholders in the basin. The interviews identified several needs, including better depiction of reservoir levels and how they relate to the past, water demand status and projections for the Front Range, timely updates on snowpack conditions during critical snow accumulation and melt periods, and access to professional interpretation of water supply information and forecasts.

If you have any questions, comments or suggestions to improve the webinars, please contact Wendy Ryan (wendy@atmos.colostate.edu).

UPDATE:
Beginning February 15, 2011, these webinars will be held on a weekly schedule (Tuesdays, 10 am MT) through mid-June 2011.

Other water supply briefings and publications relevant to NIDIS Stakeholders

Upper Colorado River Basin: The Colorado Basin River Forecast Center (CBRFC, http://www.cbrfc.noaa.gov/) produces water supply briefings for the Colorado River and eastern Great Basins, consisting of graphics of current precipitation, snow and runoff conditions, and climatological outlooks and water supply forecasts. Visit the CBRFC web site to learn more.

Apalachicola-Chattahoochee-Flint River Basin: The Water Resource Team at the Southeast River Forecast Center (SERFC, http://www.srh.noaa.gov/serfc/) provides Water Resources Outlook (WRO) Briefings, by state, at http://www.srh.noaa.gov/serfc/?n=wro. The Briefings provide long-term hydrometeorological information for river systems in the southeast U.S. The briefings are presented in short (10-15 min) videos using PowerPoint graphics and audio, which the user can access at any time. The SERFC also provides river flow and forecast information through the SERFC Journal. To sign up for WRO Briefing alerts, to receive the Journal by email, or to obtain other products, visit: http://www.srh.noaa.gov/serfc/?n=autosubscriber.

Improved Surface Water Supply Index (SWSI) for Colorado

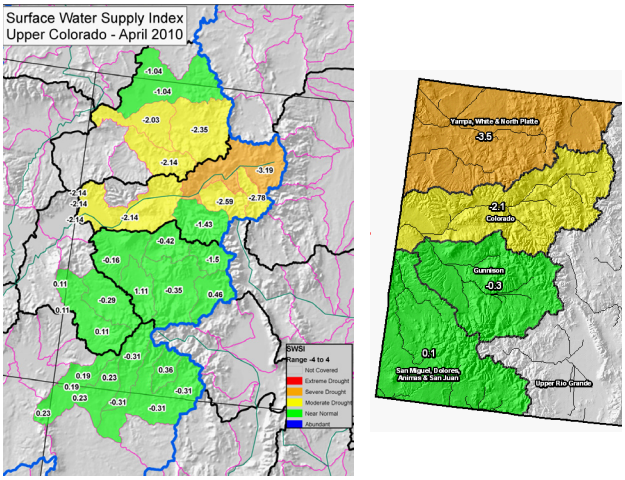
By Mike Gillespie (Natural Resources Conservation Service)

Interaction with drought information users in the Upper Colorado River Basin has shown that the Surface Water Supply Index (SWSI) is one of the most well known and popular drought indicators in the basin. Through discussions it also became clear that use of the index could be enhanced in two important ways. One is to improve the level of detail by calculating the SWSI for an increased number of smaller sub-basins. The other is to transition from the original formulation in favor of the revised SWSI (Garen, 1993), which is defined on a more rigorous physical and statistical basis.

The original SWSI was developed in Colorado in 1981 by the Soil Conservation Service (now named the Natural Resources Conservation Service) and the Colorado Division of Water Resources. The purpose of the index was to describe drought severity where water availability is driven by winter snow accumulation and subsequent melt, which is typical in the Western US. During the winter months (Dec. - May) the index uses snowpack, water year precipitation and reservoir storage. In summer and fall, (June - November) the index switches to streamflow, previous month's precipitation and reservoir storage. The index is computed by determining each variable's nonexeedance probability, then multiplying by a subjective weighting factor. The variables are summed and converted to an index of generally +4 (abundant supplies) to -4 (exceptional drought). The +4 to -4 range was used to mimic the widely accepted Palmer Drought Index.

In the early 1990s the NRCS refined the SWSI calculation to improve upon the known deficiencies of the existing SWSI procedures that had evolved differently in many western states (Garen, 1993). It had long been recognized that one of the primary deficiencies of the SWSI formulation is the use of weighting factors which are a subjective assessment of water availability in the basin in an attempt to index surface water supplies. Substituting streamflow forecasts for these variables is an objective, statistical assessment of the data relating to snowmelt runoff. Streamflow forecasts are optimized from the data for the hydrologic components and implicitly contain optimal weighting of the components.

Additionally, the result of a weighted sum of nonexeedance probabilities does not behave statistically like a nonexeedance probability itself. A preferable method in this application is to base the index on a single aggregated variable designed to describe surface water supply (the water supply forecast plus available reservoir storage). By doing this, only one nonexeedance probability is used, and the index will have the appropriate statistical behavior.



Comparison of the older SWSI (right side) and the improved SWSI (left side), which has increased spatial resolution.

Lastly, the revised technique will provide a more stable month to month transition which should eliminate some of the illogical shifts in index values, which the existing SWSI sometimes produces as the variables change throughout the year.

Both Utah and Wyoming have already adopted SWSI procedures similar to this revised SWSI procedure. A transition to this technique in Colorado will improve cross-state comparisons of drought severity. This consistency would assist with the coordination of drought categories used in the US Drought Monitor.

The revised SWSI was implemented for the western portion of Colorado in 2010, and coverage for the remainder of the state will be completed in 2011. The original SWSI will continue to be calculated in parallel with the revised SWSI until the results of a retrospective comparison of the two indices is finished by experienced climatologists at Colorado State University and the University of Colorado.

Garen, D.C., 1993: Revised surface water supply index for the Western United States. ASCE Journal of Water Resources Planning and Management, Vol. 119, No. 4.

The revised SWSI will use the following variables as an index of available water supplies:

Time Period	Variables
January - June	Forecasted Runoff + Reservoir Storage
July - September	Previous Month's Streamflow + Reservoir Storage
October - December	Reservoir Storage

Overview of the NIDIS Four Corners Pilot Activities

By Christina Alvord (CIRES/NIDIS Program Office)

A Four Corners Pilot is currently being developed in effort to provide regional tribal communities with drought information and resources needed to better monitor and respond to inter-annual drought conditions and long-term climate changes. These efforts by NIDIS are grounded in the commitment to help facilitate and establish long-term partnerships with tribes and affiliate organizations by focusing on three main objectives:

1) Identification of critical drought and climate needs & concerns facing regional tribes,
2) Identification of monitoring, data and information shortfalls on tribal lands, and;
3) Formation of partnership networks

A critical first step is engaging with interested regional partners to identify drought and climate-related concerns of tribal communities and resultant entry points for cross-entity linkages. NIDIS has sponsored several workshops aimed at identifying drought-related needs and impacts, and identification of partnerships and roles of federal, state, tribal, academic, and NGO entities in addressing identified needs. This summary of tribal initiatives in the Four Corners region will focus on discussion and outcomes from two workshops in 2010.

On April 8-9, 2010, NIDIS sponsored the Drought Preparedness for Tribes in the Four Corners Region Workshop in Flagstaff, AZ, with participants from the Four Corners and Southwest tribes and federal and state agencies. Drawing on recommendations from the Climate, Drought and Early Warning on Western Native Lands Workshop in June 2009 (url: http://www.drought.gov/portal/server.pt/community/drought.gov/tribal_workshop), this meeting aimed to identify vulnerable areas in the region in order to identify avenues of collaboration between tribes and federal agencies that support the development and implementation of a Four Corners Pilot.

Workshop recommendations include:
1) Integration of Local Traditional Knowledge (LTK) to inform comprehensive drought planning
2) Improved communication between and within federal and state entities and tribes
3) Conduct needs and impact assessments for regional, resource, financial, and institutional vulnerabilities, especially with respect to water resource availability
4) Increased technical training and capacity building opportunities and activities for tribes

Sand dune mobility in the Four Corners region tied to prolonged dry and windy conditions is increasingly impacting farming and ranching productivity, transportation, surface water supplies, and partial or complete burial of cultural resources and residences within these areas. (Photo courtesy of Margaret Hiza Redsteer, USGS)

5) Improve data collection and monitoring gaps on tribal lands by:
- Integrating tribal observations and data into federal and state monitoring efforts
- Maintain and sustain existing observation networks
- Improve data sharing and access, using the NIDIS Portal (www.drought.gov) for coordinating information
- Develop tools, products, and indices to address tribal-specific needs

Insufficient and incongruent data and monitoring networks on Four Corners tribal lands were identified as primary hurdles. As a result, NIDIS will support projects to address monitoring shortfalls and other workshop recommendations in fiscal year 2011. On October 6-7, 2010, in affiliation with the University of Colorado Law School, National Wildlife Federation, and the

Western Water Assessment, NIDIS sponsored the Tribal Climate Change Adaptation Planning & Inter-Governmental Coordination Workshop. Drawing on successes of Pacific Northwest tribal communities in developing and implementing climate adaptation plans, representatives from the Swinomish and Tulalip tribes provided recommendations to representatives from Southwest tribes including Navajo, Hopi, Hualapai, Zuni, Jicarilla Apache, and White Mountain Apache. In addition, evaluation of current federal legal and policy measures demonstrated the complexity of generating legal traction to implement widespread climate adaptation measures on tribal lands.

Workshop recommendations include:

1) Improve coordination between and within federal and state agencies, tribes, and academic entities by working together to elevate research agendas that address climate impacts and adaptation strategies on tribal lands
2) Assessment of water rights settlements in the West including evaluation of unsolidified water rights, adjudicated settlements, and state water law processes
3) Develop method for recording and transferring tribal climate narratives to inform climate adaptation policy and planning on a local and national scale
4) Establish a coordinated effort between tribes and entities to identify linkages and opportunities to engage in other relevant climate adaptation activities

Drawing from above workshop recommendations, a model letter addressed to Secretary Salazar was drafted requesting a substantial increase in funding for tribes from $200K to $8.4 million as part of the Department of Interior (DOI) Climate Change Adaptation Initiative. This letter was sent out to NIDIS tribal partners in November 2010, encouraging interested tribes to personalize and submit the letter to Secretary Salazar. Currently, 40 tribes have submitted a letter. Using the letter as a template, the National Congress of American Indians (NCAI) passed a resolution in December 2010 calling for increased funding for climate adaptation as well.

The Four Corners Pilot implementation team is currently identifying projects and collaborations to identify recommendations from prior workshop findings, with priority in addressing data and monitoring gaps in the region. Four Corners tribal Pilot web pages are on the NIDIS Portal and content is continually being added (http://www.drought.gov/portal/server.pt/community/four_corners_tribal_lands). Please contact Christina Alvord or Roger Pulwarty, NIDIS for additional information concerning the Four Corners Pilot activities.

Correction: In the article entitled "Climate Reference Network Soil Moisture Workshop" on page 5 of our last newsletter the workshop was listed as held at "Oak Ridge National Laboratory." The workshop was actually held at the NOAA/Air Resources Laboratory's Atmospheric Turbulence and Diffusion Division in Oak Ridge, TN (NOAA/ARL/ATDD).

NIDIS-Sponsored Projects Supporting Drought Early Warning

New Guide Makes Community Drought Planning Easier

By Kelly Helm Smith (National Drought Mitigation Center)

LINCOLN, Neb. -- Drought researchers in three states teamed with communities to create the Guide to Community Drought Preparedness, released in summer 2010.

"We've made the drought management process easier," said Mark Shafer, an Oklahoma Climatological Survey researcher on the project. "The checklist walks people through what needs to be done, including some very general things that don't take a lot of time or resources to do. Communities can download the guide and walk themselves through the process."

"This guide builds on decades of experience with state and national governments, and takes what we've learned about monitoring and reducing vulnerability down to the local level," said Mark Svoboda, the monitoring program area leader at the National Drought Mitigation Center (NDMC) who led the research. The NDMC is based in the School of Natural Resources at the University of Nebraska-Lincoln.

The Guide suggests that at a minimum, communities should have someone checking regularly to detect emerging drought conditions that could affect water supplies. City officials can then take steps to reduce demand. The Guide also recommends long-term measures to build drought resilience, such as water conservation education for K-12 students, homeowners and others.

The Guide was produced as part of the Drought Ready Communities project, funded by the Sectoral Applications Research Program within the Climate Program Office of the National Oceanic and Atmospheric Administration. Researchers on the project were from the NDMC, the Oklahoma Climatological Survey, the Illinois State Water Survey, and the Lower Platte River Corridor Alliance. They worked with community leaders, water suppliers and others in Nebraska City, Neb., Norman, Okla., and Decatur, Ill. to devise worksheets and processes.

"The City of Norman already had a water conservation plan that incorporated aspects of what to do in a drought, or when heading toward a drought," said Ken Komiske, director of utilities for the City of Norman. "The Drought Ready Community project added more details to our plan and laid out a better framework

for increased communications. It also pointed out better sources of information to be able to predict when heading into a drought. These drought predictors are now part of our monthly reporting at the water treatment plant, giving us a three-month look into the future for weather patterns and the anticipated water demands."

Nebraska City is considering steps such as adding a link to the U.S. Drought Monitor to the city utility's web page, developing triggers for voluntary and mandatory conservation, partnering to develop landscaping alternatives to lawns, and ramping up its water conservation education, said Leroy Frana, general manager of Nebraska City Utilities. He noted that while the city is next to the Missouri River and has a good water supply from wells, "it still needs to be treated before it goes into our water distribution system, so wise landscape water practices are beneficial to customers."

In Decatur, Drought Ready Communities led to "community-wide team building and comfort in knowing that when – not if – the next drought occurs, that the community already has a valuable and useful plan of action in place," said Keith Alexander, director of water management for the City of Decatur.

Jim Angel, the Illinois State Climatologist, said that in the past, when he has helped communities plan for drought, "It's always been crunching the numbers." In contrast, with Drought Ready Communities, "Actually sitting down with a wide range of stakeholders and listening to their concerns about drought and how to respond to drought was very interesting." Angel noted that because Decatur has faced the threat of water shortfalls in the past, it is further along than many other communities in planning for drought. Having a nationally devised drought planning process to go through may provide more assurance and credibility to city officials or investors than a strictly local effort would, he said.

The Guide takes communities through a five-step process:
- forming a leadership team and involving the public and other interested parties,
- collecting information about water sources and users, about past droughts and impacts, and about underlying factors that determine how seriously drought affects a community,
- establishing drought monitoring and drought status updates,
- building public awareness,
- identifying steps to take before and during a drought to reduce drought impacts.

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(1) Forming a leadership team and involving the public and other interested parties,
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(3) Establishing drought monitoring and drought status updates,
(4) Building public awareness,
(5) Identifying steps to take before and during a drought to reduce drought impacts.

According to the research team, the benefits of being a drought-ready community include increased community awareness of water, climate and drought, reduced dollar losses during the next drought, less stress, protecting wildlife habitat, and increasing community resilience to drought and other hazards.

Planning for drought is also a good way to focus attention on planning for climate change. "It is our understanding that current climate change trends are predicting more extreme weather events and conditions, both wet and dry. Therefore, drought planning is more important than ever," Alexander said. "Climate change is a slow process that may easily be ignored by people believing that it will happen later – in the next generation, or in 100 years," Komiske said. "A drought is something that most generations have experienced at one time or another, so planning for a drought will bring the thoughts of climate change closer to reality and get communities better prepared."

The Guide is free and available online at http://drought.unl.edu/plan/DRC.htm. The research team is interested in finding more communities that would like to go through the drought planning process. Community representatives or any other interested parties can contact the NDMC by sending email to ndmc@unl.edu.

"We want to learn from the experiences of more communities so we can share what does and doesn't work," Svoboda said. "Our goal is to help build a proactive approach and resilience to drought at the grassroots level everywhere."

The research team for this project included Mark Svoboda, Kelly Helm Smith, Melissa Widhalm, Donna Woudenberg and Cody Knutson from the National Drought Mitigation Center; Meghan Sittler, Lower Platte River Corridor Alliance; Jim Angel and Mike Spinar, Midwestern Regional Climate Center and Illinois State Water Survey; Mark Shafer and Renee McPherson, Oklahoma Climatological Survey; and Heather Lazrus, University of Oklahoma.

For more information please contact Mark Svoboda, 402-472-8238, msvoboda2@unl.edu, NDMC monitoring program area leader, or Kelly Helm Smith, 402-472-3373, ksmith2@unl.edu, NDMC communications.

Coping with Drought (CWD) in Support of the NIDIS Initiative: Preliminary Findings from NOAA-Supported Research

By Nancy Beller-Simms (NOAA/Climate Program Office)

The NOAA Climate Program Office's CWD Initiative began in 2007 as a joint Regional Integrated Sciences and Assessments (RISA), Sectoral Applications Research Program (SARP), and Transition of Research Applications to Climate Services (TRACS) effort to develop a focused decision-support research and service delivery effort to aid risk management in the context of severe, sustained drought and broader water resources management issues.

The initiative had several impetuses including a long-term commitment by the NOAA Climate Office in supporting research focused on the use of climate prediction information in decision-making across a range of sectors. This research has included stakeholders at the local, state, regional and federal levels to (a) ascertain the type of climate information that would be most useful in their decision making, (b) determine how scientific information could help to reduce vulnerability to drought, specifically in light of other extreme events and long-term climate trends and other socioeconomic influences and (c) develop information, models or tools of use to these decision makers.

The first of the CWD-funded projects are completing their work and reporting on their results. An example of a RISA-led project was entitled "Reconciling Projections of Future Colorado River Stream Flow" (PIs: Nick Graham (HRC), Dan Cayan (CAP), Dennis Lettenmaier, Andy Wood (CIG), Robert Webb (NOAA), Brad Udall (WWA), Martin Hoerling (NOAA-WWA), Jonathan Overpeck, Holly Hartman (CLIMAS). These researchers understood the difficulties that decision makers and water managers have in reconciling widely differing Colorado River streamflow projections in preparing and planning for future streamflow reductions in light of a changing climate. Among their conclusions are that input data to the models matters, a lack of observed information can influence the model output, and models differ for a variety of reasons including how they represent vegetation, soils, transpiration, evaporation, wind, solar energy, etc. The results of this project have influenced NIDIS work in the Upper Colorado River Basin in regards to (a) how precipitation, snowpack, soil moisture, evaporation and streamflow in the Colorado basin have and will vary with respect to changes in precipitation and temperature, and (b) the importance of scale in hydrologic modeling.

Related Publication

Hoerling, M., D.P. Lettenmaier, D. Cayan, and B. Udall. 2009. Reconciling projections of Colorado River streamflow. Southwest Hydrology 8(3): 20-21, 31.

A project supported through SARP, entitled "Development of a Drought Decision Support Portal for the Republican River Basin of Colorado, Nebraska and Kansas" led by Cody Knutson (U NE – Lincoln, NDMC) is nearing completion. This project's purpose is to develop a prototype watershed level web-based drought decision support portal that (1) provides climate- and drought-related data and information to community officials, agricultural producers and water planners throughout the basin and (2) serves as a prototype basin-level portal that could be incorporated into NIDIS in the future. In May 2010, the completed website was handed over to the Upper Republican Natural Resources District for incorporation in their existing website. The researchers found that a local drought information portal needs to reflect the nature of the local environment and the needs of its inhabitants and in so doing requires that it address a range of issues in addition to drought. For more information, see: http://www.rrbdp.org/.

Low-flow Impacts Database Project

By Donna Woudenberg (National Drought Mitigation Center)

The National Weather Service (NWS) Advanced Hydrologic Prediction Service (AHPS) currently provides forecast information related to flooding on rivers throughout the United States (see [http://www.nws.noaa.gov/oh/ahps/] and click on "National River Conditions"). A national database of river stages and flows has been created to allow forecasters and the public to know when flooding is likely to occur at a particular place and the corresponding impacts that may be expected with the flood event.

There are situations, however, when a lack of water in a stream or river can cause negative effects that are equal to or worse than flooding. Water shortages can affect many segments of society including – but not limited to – industry, agriculture, energy, recreation, environment, and government. Therefore, a similar system for low flow forecasting is being created. The current AHPS river forecasting system will be enhanced to forecast low river flow or reservoir levels for locales, and will include information on corresponding impacts that may be expected as flows or levels decline – both now and in the future.

To assist in collecting data and information, the NWS has partnered with the National Drought Mitigation Center (NDMC). The NDMC identifies and collects data and information from local experts on potential impacts associated with low river/reservoir levels near selected AHPS sites (forecast points or stream gauges) in contracted river basins. NDMC personnel contact water management professionals to determine: the typical impacts of low flows/levels; at which flows or levels these impacts occur; and any specific times of the year when these impacts are likely to take place. Data and information are then delivered to the NWS for inclusion in the AHPS database. It is expected that this work will provide valuable advance information for public and private sector professionals – as well as for the general public – to help them better prepare for and respond to water shortages in the future.

Contracts have been completed for seven river basins to date. The first five contracts include: the Upper Mississippi River Basin in Minnesota (completed in 2004/21 forecast points); the North Platte River Basin in Colorado, Nebraska, and Wyoming (2005/17 points); the Upper Missouri River Basin in Montana, North Dakota, and Wyoming (2006/45 points); the Upper Trinity River Basin in Texas (2007/29 points); and the Red River of the North River Basin in North Dakota and Minnesota (2007/35 points). The two most recent contracts were for the Upper Colorado River Basin in Arizona, Colorado, New Mexico, Utah, and Wyoming (164 points), and the Alabama-Coosa-Tallapoosa and Apalachicola-Chattahoochee-Flint (ACT-ACF) River Basins in Alabama, Florida, and Georgia (58 points); both were completed in early 2010.

Low flows/levels are quite often associated with drought. These projects, therefore, also augment the implementation of NIDIS Pilots – particularly the Upper Colorado and ACF River Basins, which are NIDIS Pilot Project areas – as one of the NIDIS goals is to "develop the leadership and networks to implement an integrated drought monitoring and forecasting system at federal, state, and local levels."

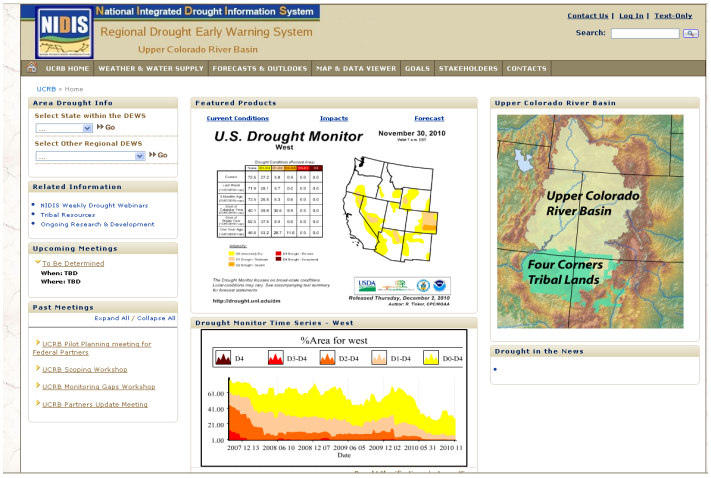
Map of low-flow project areas

U.S. Drought Portal
www.drought.gov

U.S. Drought Portal Update

By Mike Brewer (NOAA/National Climatic Data Center)

In 2010, the US Drought Portal expanded to the international scale while improving information dissemination within basins in the US. Web pages for the NIDIS Regional Drought Early Warning Information Systems (RDEWS) were developed and implemented. Each of these RDEWS pages provides links to information and services specific to that region and were developed in concert with stakeholders in the region.

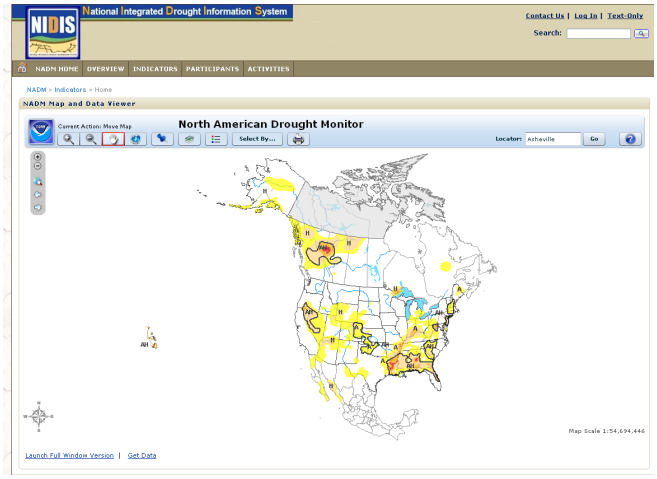


http://www.drought.gov/portal/server.pt/community/ucrb

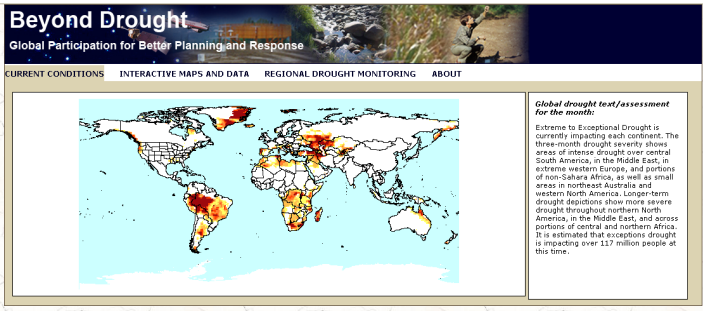
Additional improvements included expanded access to data through web viewer and interactive graphing applications. New data comes from both NOAA and partner holdings.

At the international scale, the US Drought Portal began to take over housing the North American Drought Monitor in 2010. In addition to the internationally-agreed upon monthly product, the Portal hosts a number of new web mapping services, providing enhanced data access to drought indicators from the three countries involved.

On the global-scale, the Portal team has been working with the World Meteorological Organization and the Group on Earth Observations to establish a Global Drought Monitoring Portal, a first-step toward a global drought early warning system. A prototype portal was released to the public in advance of the November meeting of the GEO ministers in Beijing, China. Currently the effort includes a small suite of global products and access to more detailed continental information for North America, Europe, and Africa.



http://www.drought.gov/portal/server.pt/community/indicators



http://www.drought.gov/portal/server.pt/community/global_drought

NIDIS-Sponsored Meetings

2011 UN Global Assessment Report on Disaster Risk Reduction: Case Study Review Workshop

By Christina Alvord (CIRES/NIDIS Program Office)

In preparation for the 2011 UN Global Assessment Report (GAR) on Disaster Risk Reduction, the World Meteorological Organization (WMO), the secretariat of the United Nations International Strategy for Disaster Reduction (UNISDR), and NIDIS hosted a workshop for invited international drought representatives on September 27-30, 2010 in Boulder, CO. This workshop featured case studies from around the world for the 2011 UN Global Assessment Report on Disaster Risk Reduction. The final report will be launched in spring 2011. The workshop committee was led by Andrew Maskrey (UNISDR), M.V.K. Sivakumar, (WMO) and Roger Pulwarty (NIDIS/NOAA). The primary objective of this workshop and case studies include:

1. Identification of drought risks in respective countries
2. Planning alternatives that can facilitate the management of drought risk
3. Policies that strengthen communities' resilience

Represented regions were selected based on documented drought-related vulnerabilities and impacts to water resources, ecosystem health, food security, and political and institutional stability, and human health stemming from prolonged drought and associated socioeconomic conditions. Organized in five topic-based sessions, workshop discussion focused on identifying regional and other differences and similarities in characterizing, assessing, and responding to drought (Table 1). Session topics include: drivers of drought risk including socioeconomics and vulnerable groups, networks, early warning systems, and seasonal forecasting; and effective response: minimizing drought impacts. Presentations demonstrated the need for an international effort to improve early warning detection, mitigation, and response to drought. Emphasis was placed on identifying socioeconomic as well as climatic relevant indicators and their use.

Margaret Hiza Redsteer (USGS, NIDIS) presented the preliminary case study for the Four Corners region of the Southwest, highlighting increased risk to tribal communities tied to aridification of tribal and adjacent lands and subsequent initiatives by NIDIS, USGS, and associated partners to address poor conditions. Prolonged drought conditions have resulted in widespread instability of regional topsoils and sand dunes, impacting subsistence farming practices, contributing to transportation and health issues, and partial or complete burial of community and resident homes, buildings, and cultural resources. Recent research has linked dry and unstable topsoil in the Four Corners region to depositions in the Southern Rocky Mountains of Colorado and Utah, resulting in earlier snowmelt of mountain snowpacks attributed to low albedo rates of deposited dark and dense desert soils. Redsteer further discussed impacts to tribal community and daily living, explaining the practice of hauling water from freshwater springs is necessary for many residents on the Navajo Nation due to unreliable and unclean water supplies on the reservation. Diminished recharge levels of surface and ground water supplies and springs force residents to travel greater distances or wait extended periods of time to obtain necessary drinking water. Similar impacts and urgency in action was echoed by many international representatives, highlighting the significance of a coordinated international response to increasing drought risk worldwide.

Currently the case studies are in review and the GAR 2011 will be released at the Global Disaster Platform in Geneva in May 2011. Workshop information including an agenda and presentations is featured on the NIDIS Drought Portal, available under the 'Events and Announcements' left navigation bar on the home page: http://www.drought.gov/portal/server.pt/community/drought_gov/202/2011_UN_Drought_Risk_Assessment_Workshop.

Workshop Session Focus	Region & Case Study	Representing Institution(s)
Political Factors: National Drought Policy		
	USA: U.S. Drought Risk Monitor and Drought Risk Management	National Drought Mitigation Center (NDMC), University of Nebraska-Lincoln
	USA/Native American Tribes of the Four Corners Region	National Integrated Drought Information System (NIDIS)
Drivers of Drought Risk: Socio-Economics and Vulnerable Groups		
	Mexico: Sonora	Centro de Investigaciones y Estudios Superiores en Antropología Social (CIESAS)
	Central America	Facultad Latinoamericana de Ciencias Sociales (FLACSO)
	Brazil	FUNCEME (Research Institute for Meteorology and Water Resources)
	Caribbean Islands	Caribbean Community Climate Change Centre (CCCCC) and Caribbean Institute for Meteorology and Hydrology (CIMH)
Networks, Early Warning Systems, Seasonal Forecasting		
	East Africa	Famine Early Warning System Network (FEWS NET)
	West Africa	AGRHYMET Regional Centre
	Southern Africa	South African Weather Service
	Middle East	Arab Center for the Studies of Arid Zones and Dry Lands (ACSAD)
	Iran	Islamic Republic of Iran Meteorological Organization (IRIMO)
Effective Response: Minimizing Drought Impacts		
	India	India Meteorological Department
	Pan-Asia	Kyoto University
	China	China Meteorological Administration
	Spain	Agencia Estatal de Meteorologia (AEMET)

Table 1: Overview of workshop session topics, and respective region, case study, and involved institutions at the September 2010 UN GAR Workshop in Boulder, CO, organized by UNISDR, WMO, and NIDIS. Visit the NIDIS Portal for a complete list of agenda session topics and presenters.

Background on GAR and the UN Global Platform on Disaster Risk Reduction
(Text extracted from Concept Note: 2011 United Nations Global Assessment Report on Disaster Risk Reduction (GAR11), Concept Note: Assessing drought risk and identifying policy alternatives for drought risk management)

"The objective of the GAR is to increase political and economic commitment to risk reduction as well as the effectiveness of risk reduction policy and strategies. GAR11 builds on the success of GAR09 which was launched by the Secretary-General of the United Nations in Manama, Bahrain on 17 May 2009 and which informed the second session of the Global Platform on Disaster Risk Reduction, held in Geneva between 15 and 19 June 2009. The objective of GAR11 will be to provide guidance on the most effective strategies to reduce different kinds of risk and to characterize the enabling environment, which can enable countries to reduce risk and adapt to climate change. GAR11 will provide national governments, regional and international organizations, civil society and other stakeholders with strategic policy advice on how to adapt to climate change and to reduce disaster risk. It is expected that GAR11 will orient help to orient strategic dialogue on these challenges at the international, regional and national levels."

Hyogo Framework for Action (HFA) 2005-2010: Building the Resilience of Nations and Communities to Disasters
The GAR process originated from the 2005 HFA 2005-2010: Building the Resilience of Nations and Communities to Disasters endorsed by 168 UN member states at the World Conference on Disaster Reduction in Kobe, Japan. HFA primary goal is achieving a substantial reduction in disaster risks, and to contribute to the sustainable development of nations. Implementation of HFA with respect to reducing drought related risk is coordinated by ISDR, NDMC, University of Nebraska-Lincoln, and other partners vis-à-vis GAR initiatives and reports in 2009 and forthcoming in 2011.

NIDIS in California

NIDIS California Update

By Christina Alvord (CIRES/NIDIS Program Office), Anne Steinemann (Scripps Institution of Oceanography) and Robert Webb (NOAA/Earth System Research Laboratory)

During 2010, the NIDIS Implementation Team began engaging with state and federal stakeholders in the development of a Regional Drought Early Warning Information System in California. Activities are intended to explore drought issues in regions of water supply vulnerability due to climate, demand pressures, and other drought factors. California planning will focus on engaging federal, state, and local partners to ensure adequate representation of complex issues facing California. These partners will shape the development of regional drought early warning information systems (RDEWS) within the state, drawing upon lessons learned from the Upper Colorado River Basin and Apalachicola-Chattahoochee-Flint River Basin RDEWS.

On September 23, 2010, a scoping meeting, held in La Jolla, CA, convened primarily federal agency representatives to plan the initial NIDIS activities. NIDIS Director, Roger Pulwarty, reviewed NIDIS objectives, governance, activities, the drought portal, and results of the recent NIDIS executive committee meeting. Dr. Pulwarty also explained the implementation time table for NIDIS. In the first year, NIDIS activities concentrate on the collection of requirements from decision makers, and the development of RDEWS to address specific identified needs. Priority is placed on assessment of user organization capacity and identification of data and monitoring gaps. In the second year, activities concentrate on implementing the prototype early warning system, documenting successes and insights for improvement. Subsequent presentations summarized the process used to develop RDEWS in the Upper Colorado River Basin and in the Southeast, how the activities are focused based on identification of a subset of critical issues, the portfolio of strategies for engagement, the implementation process, and lessons learned. These presentations led to discussions on applying NIDIS objectives to meet drought information needs in California, along with identifying potential basins/regions of priority.

Some examples of drought information needs include:

- Improved regional-scale hydrological modeling that assesses water availability across the state, the driving forces for changes in habitat and fisheries, the evolution of municipal versus agricultural water use, and consideration of long-term climate change
- Improved characterization of drought parameters across the state, including how drought intensity, frequency and duration might change under different climate and hydrologic scenarios
- Development of a suite of short-term, seasonal, and long-term water supply forecasts and reservoir inflow projections, with emphasis on providing information during critical time frames for agriculture and water providers
- Comprehensive monitoring of groundwater resources and impact on surface water discharge
- Improved snowpack and snow water equivalent monitoring and better understanding of impact on water supplies

The next step will be a one-day joint federal and state meeting in mid-February 2011 to coordinate planning efforts for NIDIS activities in California.

A California pilot home page is available on the drought portal (http://www.drought.gov/portal/server.pt/community/california). Information about the September meeting, including an agenda, presentations, and meeting notes, is also available. Content will be continually updated in coming months.

NIDIS activities in California are a joint leadership effort between multiple federal, state, and academic entities, spearheaded by Robert Webb, NOAA/ESRL, Anne Steinemann, Scripps Institution of Oceanography, and Roger Pulwarty, NOAA/NIDIS.

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