5.3 NEW TECHNIQUES FOR CLIMATE AND DROUGHT INFORMATION DELIVERY AT THE NATIONAL CLIMATIC DATA CENTER

Michael Brewer*[1], Jason Symonds[1]
[1] NOAA's National Climatic Data Center, Asheville, NC

1. Introduction

Water availability is a critical concern in the 21st Century. Lack of water leading to drought is among the most dangerous and least understood of all natural hazards. As a result, many state and federal agencies are beginning to recognize the need to move forward with a more proactive, risk-based drought management approach. The National Integrated Drought Information System (NIDIS) Act of 2006 (15 U.S.C. § 313d and § 313d note) put in motion the implementation of an interagency activity to improve drought monitoring, forecasting, and early warning that will improve the nation's capacity to proactively manage drought-related risks. In large part, this will be accomplished by providing those affected with the best available information and tools to assess the potential impacts of drought and to better prepare for and mitigate the impacts of drought. Led by NOAA, NIDIS focuses on the consolidation of physical, hydrological and socio-economic impacts data; integrated observing networks; development of a suite of drought decision support and simulation tools; and interactive delivery of standardized products through an internet portal. The vision for NIDIS is a dynamic and accessible drought risk information system that informs user decisions in preparing for and mitigating the effects of drought.

The U.S. Drought Portal (USDP, http://www.drought.gov) has been developed as a national resource for data, models, risk information and impacts of drought and has the responsibility for integrating, archiving, and disseminating data via the internet. The USDP has proven especially helpful in assimilating drought-related information from multiple federal, state, and other agencies in support of drought early warning. The current status of the USDP and plans for the future are discussed below as is a prototype National Climate Services Portal informed by the many lessons learned from the USDP.

2. U.S. Drought Portal Current Status

Since the initial release of the USDP in November 2007, numerous improvements and augmentations have been instituted. Hardware and software infrastructure for the USDP was determined based upon requirements and recommendations from the software vendor and was integrated into the infrastructure of the National Climatic Data Center (NCDC). Since, improvements have focused on content. A major update of USDP content was undertaken by an interagency group and released in Fiscal Year 2009. This update was based upon feedback received through the USDP and directly addressed user needs and requirements (see figure 1).

Information in the USDP focuses around answering three main questions: what are the drought conditions right now, what will the drought conditions be in the future, and how are these drought conditions impacting me? These questions are answered through grouping information from NIDIS partners into the broad categories of Current Drought, Forecasting, Impacts, Planning, Education, Research, and Recovery. Participating partners providing information, products, and services include the National Oceanic and Atmospheric Administration, the U.S. Geological Survey, the U.S. Department of Agriculture, the Department of Interior, the Army Corps of Engineers, as well as other agencies, universities, and research partners.

3. USDP Recent Enhancements

Following the most recent content overhaul of the USDP, focus has been turned to improved visualization and display of data and information to help decision makers make better decisions. Recently, the USDP has implemented an Earth Systems Research Institute (ESRI) web mapping service (WMS) viewer in conjunction with the existing open source WMS viewer. This newer viewer enables the USDP to leverage ESRI base maps and backgrounds as well as analytics (coming soon) not previously available in the open source viewer used. Both of these viewers are Open Geospatial Consortium (OGC) compliant and serve information from the NCDC as well as partner-provided WMS. The new ESRI viewer utilizes Adobe Flex technology and yields a performance improvement over the previous Java-based viewer. The viewers are used to provide national- and regional-level looks at the distribution of drought and climatic parameters leading to drought as well as impacts and forecasts of drought.

In addition to the new WMS viewer, additional map layers have been included in the USDP map viewer. Now totaling more than 50 layers of information, new highlights include a WMS version of the US Drought Outlook, produced by the Climate Prediction Center, new satellite-derived information, and the North American

* *Corresponding Author Address:*
Michael Brewer, NOAA's National Climatic Data Center, 151 Patton Ave, Asheville, NC 28801; email: Michael.J.Brewer@noaa.gov.

Drought Monitor. The map viewer is augmented by a link to the NCDC Weather and Climate Toolkit. This free software allows access to an even greater assortment of geographic information including NEXRAD data. It also allows users to save the information they are viewing as an ESRI shapefile for further geographic analysis.

Figure 1. The second US Drought Portal homepage. This page emphasizes the importance of drought observations, impacts, and forecasting.

Further improvements were made to the USDP with the development and implementation of a Relief and Recovery section. At the request of the Office of the Secretary of the Interior, USDP staff designed, vetted, and implemented a new section that provide decision makers impacted by drought with a one-stop shop for information on where to turn for assistance with recovery from drought impacts that could not be mitigated. Links to programs across various agencies are included with a strong focus on the USDA and its programs designed to aid farmers.

A data viewer was also added to the USDP. This viewer, leveraging Multigraph technology, allows users to visualize various datasets available at the NCDC. This tool also allows the USDP to display data from partner agencies and institutions that have provided the USDP with access to their data (see figure 2).

4. Enhanced Collaboration through Communities

The USDP allows the establishment of "communities" with enhanced services. These communities can be organized around a location or a theme and can take advantage of collaboration tools, document and information sharing, and archiving of projects and services created within the community. Communities currently exist only through secure log-in to the USDP and are available to a limited number of people involved in specific NIDIS and NOAA climate activities.

Initial communities were developed for administration of the USDP and to vet content offered for inclusion in the USDP. Recently, numerous communities have been developed to facilitating tasks for NIDIS, interagency and international drought coordination, as well as for NOAA climate services coordination. One such community was implemented for the authors of the U.S. Drought Monitor, which represents an attempt to provide a single, national depiction of drought. A standard set of tools was provided for developing the weekly product, and document sharing and other collaboration activities were enabled including an archive function to track tasks passed from one author to another in successive weeks.

Additional communities have been implemented for the Upper Colorado River Basin and Southeast US NIDIS Pilot Projects. These communities are available to those participating in the pilot projects and are designed to facilitate discussion and idea sharing as well as to provide a central clearinghouse for tools used by local decision makers in the pilot area. These communities also keep track of tasks, provide document handling, and allow sharing of information within the pilot group that a particular contributor does not wish to distribute to the entire internet. Once the pilot project is sufficiently mature, a public instance for the area or region will be developed and implemented, providing a more detailed local look at drought than is currently available via the USDP. Pilot projects will serve as prototypes for regional information available through the USDP, allowing other regions to tap into pertinent products and services while allowing region-specific tailoring of products and services.

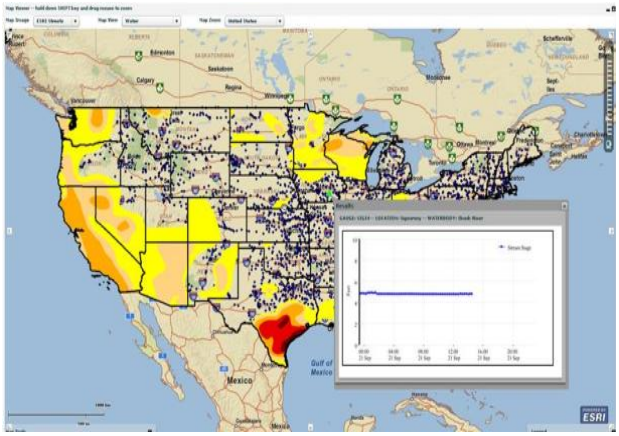

Figure 2. A data visualization tool available through the USDP. Common Flex technology allow a single application to render map and data access tools.

5. International Drought Monitoring

In addition to the emphasis of moving from national to regional scales, the USDP has also begun to coordinate information and activities on the continental and global scales. This is being done under the context of various drought initiatives in concert with the Group on Earth Observations (GEO), the United Nations, and the

NIDIS Implementation Team. Initial efforts at continental-scale assessments, such as the North American Drought Monitor (NADM) are underway (see figure 3). The NADM is available through the USDP and activity is underway to provide access to numerous monthly products, currently produced by NCDC and used to develop the NADM, through the USDP. The USDP is also serving as a coordination mechanism for projects underway through U.S.-Canadian GEOSS bilateral agreements.

NIDIS and USDP staff are discussing the development of a central clearinghouse for international drought monitoring and early warning information in conjunction with United Nations personnel. Lastly, an effort is underway to provide detailed information on high-impact climate and weather events in the Pacific Region and to make that information available leveraging the USDP platform. This activity, led by the NOAA IDEA Center, will be online within the next few months and will replace the existing Pacific Region Integrated Climatology Information Products site, which is part of the Pacific Climate Information System.

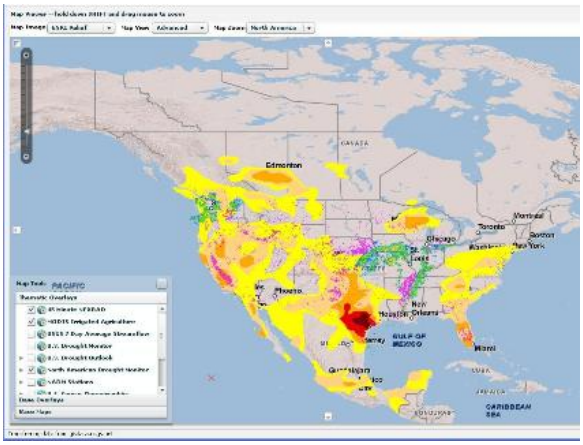

Figure 3. Mapping capabilities available in the U.S. Drought Portal. In this example, areas of radar-observed precipitation are overlaid upon the North American Drought Monitor depiction which is overlaid by irrigated agricultural land estimated from the US Geological Survey MODIS satellite.

5. DEVELOPMENT OF A NOAA CLIMATE SERVICES PORTAL

Building upon the success of the USDP, NOAA has undertaken an activity to develop a NOAA Climate Services Portal (NCSP). This portal is being designed to provide an unbiased, scientifically-based clearinghouse for climate information and products. NCSP is designed to provide access to NOAA data and services as well as to provide scientific information to help users understand the climate system. This includes educational materials and data, as well as a *ClimateWatch Magazine* aimed at informing the public so they can make the best possible use of NOAA's climate products and services

An initial phase of the NCSP is ready for deployment and should be active by the time of the AMS 2010 Annual Meeting. This initial release will have a fully fleshed-out *ClimateWatch Magazine* function as well as limited data and services. Future phases of the NCSP will be developed and deployed which will encompass more of the myriad NOAA climate data and information, forecasts, educational materials, and services.

6. Conclusion

The U.S. Drought Portal is a living web service that is constantly evolving in response to user requirements. Through an emphasis on both regional and international scale activities, enhanced information will be available to decision makers for mitigating the impacts of and adapting to drought. The utility of the USDP has led to a spin-off of one additional clearinghouse in the NOAA Climate Services Portal.