

Confluence

NWS Hydrology Program News

Issue #9

Fall 2014

Headwaters

Don Cline, Acting Director, Office of Hydrologic Development



As 2014 comes to a close, I want to reflect on the Hydrology Program's many accomplishments during this very successful year, and share what we have to look forward to in Fiscal Year 2015 (FY15).

Highlights of FY14 include: We assumed beneficial occupancy of the National Water Center (NWC) in March of 2014 and held a series of meetings in this millennial collaborative space including the September Flash Flood Summit (Page 2). We established a Service Level Agreement with NCEP Central Operations for the provision of NWC compute and storage and we initiated the Initial Operating Capability (IOC) staffing and operations at the NWC (Page 8). The Community Hydrologic Prediction System (CHPS) received significant enhancements,

including the integration of Hydrologic Ensemble Forecast Service (HEFS) V1. CHPS and Dual-Pol Hydrologic software upgrades were delivered to AWIPS. We advanced our federal partnerships through the Integrated Water Resources Science and Services (IWRSS) by conducting partnered stakeholder engagements and signing charters for two design teams. We improved the provision of information available to the public by implementing AHPS services at an additional 168 locations, making AHPS web page enhancements, and adding 28 flood inundation map libraries.

In FY15 we will build on our FY14 successes. The highest priority is to complete the IOC at the NWC and develop the Centralized Water Forecasting (CWF) Master Plan. As part of the CWF demonstration we will create design documents for a Water Resources Data Service, Water Resources Evaluation Service, and a Water Resources Modeling Testbed. In collaboration with NCAR, we will enhance the WRF-Hydro model to demonstrate, short-to-medium range data assimilation, hydrologic analysis and forecasting

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capability. Additionally, as another component of the CWF demonstration, we have committed to providing hydrologic data to support the National Flood Interoperability Experiment (Page 6). Other goals for FY15 include supporting RFC implementation of HEFS, implementing AHPS services at an additional 167 forecast locations, and completing the IWRSS chartered teams design documents. Finally, I am looking forward to seeing many of you at the National Hydrology Managers' Meeting we are planning to hold at the NWC in May (Page 10)!



Project Spotlight: Flash Flood Summit

Mary Mullusky, Ernie Wells and Ed Clark, OCWWS HSD and Donna Page and Kate Abshire, OHD

Flash floods are a critical issue of concern to communities nationwide. A changing climate is increasing the uncertainty and the frequency of extreme flash flood events. In some areas, an aging infrastructure is reducing communities' protection from flooding. In addition, increased development in flood-prone areas is putting more citizens in harm's way. The combined impact of these factors increases the flood management challenges faced by many communities.

Reducing the societal cost of flooding, both in terms of economic losses and tragic fatalities, is a grand challenge facing the nation. To effectively prepare for and respond to these flood risks, stakeholders' needs must be documented, service gaps identified, science and technology developed and implemented, and operations enhanced to advance flash flood services. Effective communication is another critical component of flash flood services and includes communication between warning and response officials, media, and the general public.

On September 9 -11, 2014, the National Weather Service (NWS) convened a two-and-a-half day Flash

Flood Summit to begin to refine the vision for the future of flash flood services in the U.S.. The Summit, held in the newly constructed National Water Center in Tuscaloosa, Alabama, brought together 60 representatives from federal and state government, the private sector, academia and non-governmental organizations.



The objectives of the Summit were to:

- Agree on a shared vision for future flash flood services: a hydrologically consistent end-to-end flash flood model to be implemented through a national water modeling and information services framework;
- Identify priority requirements/functional components to achieve the flash flood services vision;
- Explore the intersection between science and social science requirements to help inform priorities; and
- Agree on a path forward to transform flash flood services over the next 10 years.

At the outset of the Summit, the organizers proposed a vision for future flash flood services as a starting point for discussion over the course of the Summit:

Transform predictive flash flood services for any causative event by establishing an end-to-end nationally consistent framework that provides:

- *Seamlessly integrated observation and monitoring networks;*
- *High-resolution, hydrologically continuous (from flash flooding to flooding) national water model directly coupled with numerical weather prediction datasets and other forcings;*
- *Objective forecasting and characterization of the urgency, severity, and certainty of flood impacts at the street level; and*
- *Actionable information, consistent communication, and decision support services to transform society to become ready, responsive, and resilient to flash flood and flood threats.*

Participants were charged with further defining and developing specific requirements to refine the vision, reflecting their knowledge, practical experience, and emerging technical, scientific, and social science developments in the area of flash floods. The Summit was structured to hone in on the most important needs among four primary elements of the flash flood vision – observation/monitoring; modeling; forecasting/characterization; and communication -- and explore interrelationships among these elements.

In order to provide visual cues and to help participants add detail to the high level vision, a 4 by 10 foot vision-board, consisting of cartoon depictions of the physical elements and causative processes of flash flooding, was erected in the auditorium of the National Water Center. Throughout the summit, participants visited the vision board to populated requirements and ponder the information flows across the primary elements. Smaller versions of the vision board were posted in each of the

break rooms.

During a series of small breakout group sessions, each building on the work accomplished during prior sessions, participants quickly embraced the vision and identified, discussed, and prioritized the most pressing needs/requirements for advancing the vision.

Over the course of the next several years, the NWS will use the vision crafted during the Summit to outline a series of near-term, mid-term and long-term projects and activities to begin implementing the requirements set

identified in the Summit. At the same time, the NWS will establish a *Community of Practice*, a cadre of interested parties within the NWS, other federal agencies, and research organizations to cultivate those capabilities aligned with the vision. This community will serve as the focal group for requirements validation; establish an interdisciplinary approach to design and development; and work to integrate other related water

resources capacity building activities to transform flash flood information and services.

A number of new initiatives and activities will help create the building blocks for meeting the flash flood vision and its associated requirements. Beginning in 2015, a centralized water forecasting demonstration project with critical data and evaluation services will be established at the National Water Center. Concurrently, a high resolution, hydrologically continuous, physically based water model will be established for testing and evaluation, including the exploration of new geospatially based datasets and services that can better inform stakeholders. Midterm and longer-term proposals build on these capabilities to provide objectively derived characterization of flash flooding at the street level. A final report of the Summit will be available in January.



Retirements

Robin Radlein, Hydrologist in Charge, Alaska Pacific River Forecast Center and Regional Hydrologist Alaska Region retired on October 4, 2014 after 38 years of federal service. Among Robin's many accomplishments was her leadership of a team in 2009 that put together the concept for a National Water Center and how it could benefit the NWS Hydrology Program. That laid the groundwork for what is today progressing toward Initial Operating Capability at the National Water Center - Tuscaloosa.



and Columbus, Georgia while working towards earning her bachelor's degree in atmospheric sciences from Florida State in 1980. She went on to become an intern and later the Service Hydrologist at WSFO Slidell, which cemented her interest in hydrology. Noreen went on to a journey forecaster position in Charleston, WV in 1987 and in 1990 became a lead forecaster in Binghamton, Alabama. After a brief stint as the first Instructor/Developer/Coordinator for COMET's Hydrometeorology Course, Noreen moved to Central Region Headquarters in Kansas City, Missouri in 1993 where she was able to focus on furthering the NWS Hydrology Program throughout the remainder of her career.



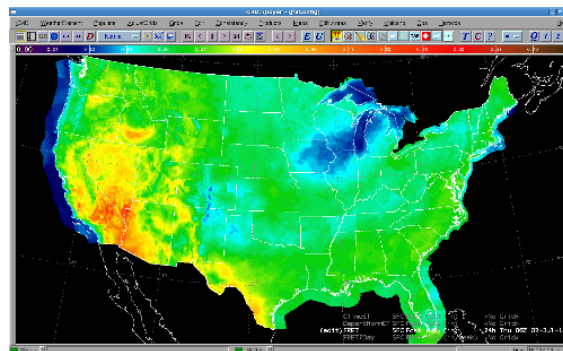
Noreen Schwein worked as a summer student aide in the NWS Ag Office in Auburn, Alabama and as a CO-OP student (today's SCEP) in Apalachicola, Florida

Forecast of Reference Crop Evapotranspiration (FRET): Nationwide Implementation

Dan Matusiewicz, OCWWS HSD

Effective November 5, 2014, NWS Weather Forecast Offices (WFO) will begin providing on an experimental basis three FRET grids for the conterminous United States in the National Digital Forecast Database (NDFD). The following FRET grids will be added to the NDFD on an experimental basis:

- Daily FRET grids for the next 7 days
- Total Weekly FRET grids for the 7-day period



- Daily FRET departure from normal grids.

The FRET grids will be available from NDFD in the following standard methods:

- Gridded Binary Version 2 (GRIB2) files via Hypertext Transfer Protocol (HTTP) and File Transfer Protocol (FTP)
- Extensible Markup Language (XML) via Simple Object Access Protocol (SOAP)
- Graphics via web browser: <http://preview.weather.gov/graphical/>

Evapotranspiration Table (ETT) text products composed of daily FRET values for particular locations for the next seven days will also be available on an experimental basis. FRET is the expected depth of water (in hundredths of inches) that would evaporate and transpire from a reference crop under the forecast weather conditions on a daily and weekly basis over the next 7 days. The FRET is for short crops with an approximate height of 12 cm similar to full cover grasses.

These new elements will remain experimental until NWS assesses feedback and completes a technical analysis. At that time, the NWS will determine whether to move these experimental elements to operational status, discontinue them, or revise and extend the experimental feedback period.

NWS Leadership visits the Iowa Flood Center

NWS Central Region

Louis Uccellini, NWS Director, Don Cline, Acting Director OHD, Thomas Graziano, NWS Chief of Staff, and Chris Vaccaro, NOAA PA, visited the Iowa Flood Center (IFC) on the campus of the University of Iowa in Iowa City, IA on October 14-15, 2014. Meetings were held with Larry Weber, Director IHR Hydroscience & Engineering; and Witold Krajewski, Director of the Iowa Flood Center, Wendy Pearson, NWS CRH; and representatives from the USACE and USGS. Discussions focused on the functions of the Iowa Flood Center (river gauge network, modeling, flood inundation mapping, the IFIS web page, and river forecasting). Wednesday morning some NWS WFO staff from Des Moines, IA and the Quad Cities joined in the meetings and attended the regular weekly IFC staff meeting. Louis Uccellini and Don Cline gave public forum presentations for a larger audience which included media. Then they met with the Iowa Congressional Delegation and the President of the University of Iowa. Later that afternoon the NWS HQ visitors traveled to WFO Quad Cities to meet with the WFO staff.



National Flood Interoperability Experiment

David Maidment, University of Texas and Ed Clark, OCWWS HSD

The National Flood Interoperability Experiment (NFIE) is a one-year collaboration (September 2014–November 2015) between the National Weather Service and its government partners, and the academic community and commercial partners. It is designed to demonstrate a transformational suite of science and services for the next generation of national flood hydrology and emergency response. The intent is to better connect the flow of information among the federal, state and local entities responsible for measurement, forecasting and planning for floods, with the corresponding entities in the emergency response community.

This experiment leverages new communications standards that simplify the exchange of water information among disparate producers and consumers, as well as integrates cutting edge hydrologic modeling and analysis techniques from the research community. The NFIE will be conducted through the new National Water Center, recently established by NOAA-National Weather Service on the Tuscaloosa campus of the University of Alabama to support and expand the forecasting function of the thirteen regional River Forecast Centers, and to develop a new seamless suite of analyses and guidance data sets for the water budget variables spanning the entire continental United States.

The NFIE will address the following questions:

- How can real-time hydrologic simulations at high spatial resolutions, covering the nation, be developed using a next generation “HydroFabric” – a framework of open water data services in space and time.
- How can this lead to improved emergency response and community resilience?
- How can an improved interoperability framework support the first two goals and lead to sustained innovation in the research to operations process?

The NFIE will consist of two phases:

1. A *Mobilization Phase* from September 2014 to May 2015, when the initial elements of the HydroFabric will be assembled within the existing systems of the participating federal, academic and private partners. And,
2. A *Summer Institute*, from June to July 2015, when students and faculty from the University of Alabama and from other universities around the country will join with the NOAA-National Weather Service and other partners to assemble, demonstrate and explore alternatives for the next generation flood data, modeling, forecasting and inundation mapping system for the United States.

The Consortium of Universities for the Advancement of Hydrologic Science, Inc, (CUAHSI) will help to coordinate the participation of the academic community in the NFIE.

An Open Water Data Initiative was recently launched by the Federal Geographic Data Committee (FGDC) and the Advisory Committee for Water Information (ACWI), which will be administered by the Subcommittee on Spatial Water Data. The FGDC and ACWI are the principal bodies for coordination of geospatial

and water information at the federal level. Prior to this, an initiative was formed between the National Oceanic and Atmospheric Administration (NOAA), U.S. Geological Survey (USGS), and the U.S. Army Corps of Engineers (USACE) in 2011, called Integrated Water Resources Science and Services (IWRSS). FEMA is an anticipated critical addition to the consortium.

The NFIE will culminate in a near-real time demonstration-level system capable of characterizing the state of surface water resources, specific to flood or near flood stage on a spatial domain that spans the continental United States, and at a resolution that facilitates decision-making within the emergency management community. The NFIE is an initial activity that will help the federal partners explore and refine the requirements for a high-resolution real-time water resources modeling and forecasting platform. While such a platform will require significant resources to develop and implement, the NFIE will facilitate some of the data organizational strategies as well as aid in the development of novel dissemination techniques. Moreover, the NFIE begins the conversation on how the national science infrastructure can better integrate with the applied, operational science sector to support and sustain innovation. NFIE is a agile and nimble approach to the research-to-operations pathway with exciting ramifications for the academic and governmental participants.

AHPS Enhancement of Flood Risk Communication with FEMA's National Flood Hazard Layer

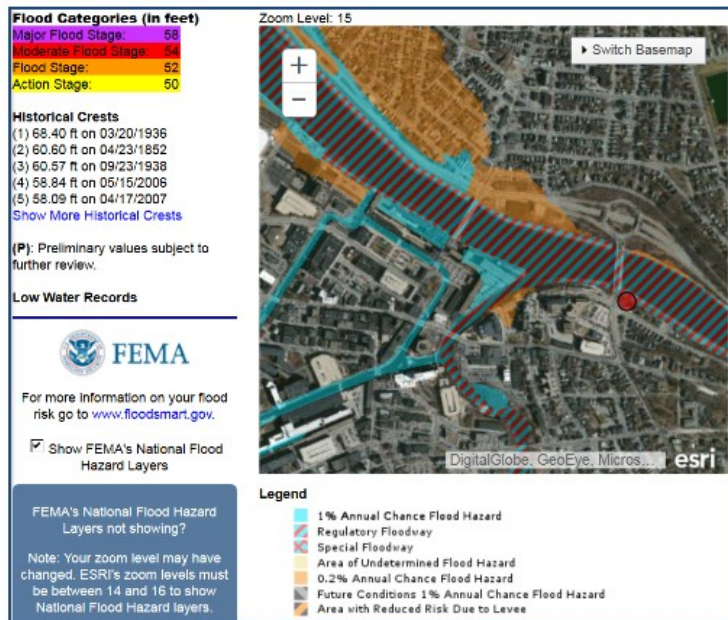
Nicole Belk and Laurie Hogan, Eastern Region, and Victor Hom, OCWWS HSD

The National Weather Service (NWS) is integrating the Federal Emergency Management Agency (FEMA) National Flood Hazard Layer (NFHL) into the NWS's Advanced Hydrologic Prediction Services (AHPS) web pages as a new way to communicate flood risk to the public. Inclusion of FEMA NFHL was launched in the summer of 2013 and combines flood risk information, flood forecasts, warnings, and impacts shown on AHPS webpages. Currently, over 4,500 river locations have this new enhanced capability.

By displaying key data from the NFHL within AHPS, Emergency Managers can monitor a single site to review both real-time river forecasts and their relationship to the regulatory flood plain. In addition, NWS is leveraging this new capability to improve the identification of flood impacts, refine warnings with these associated impacts, and better understand the impacts to the structures and transportation network. This new capability helps build a ***Weather-Ready Nation*** and allows users to ***Be a Force of Nature*** by knowing the risk, taking action, and being an example in their community. Moreover, this partnership shows good governance on how agencies can be working together to share, exchange, and enhance mutual goals for saving lives, property, and safeguard the economy. By doing so, the nation can

be more resilient and more able to mitigate flood losses.

The following image depicts the NFHL (i.e. the regulatory floodway, the 1%, and 0.2% Annual Chance Floods) for Lowell, Massachusetts in the vicinity of the AHPS forecast point ([LOWM3](#)).



National Water Center: Initial Staffing Approved

NWS Headquarters

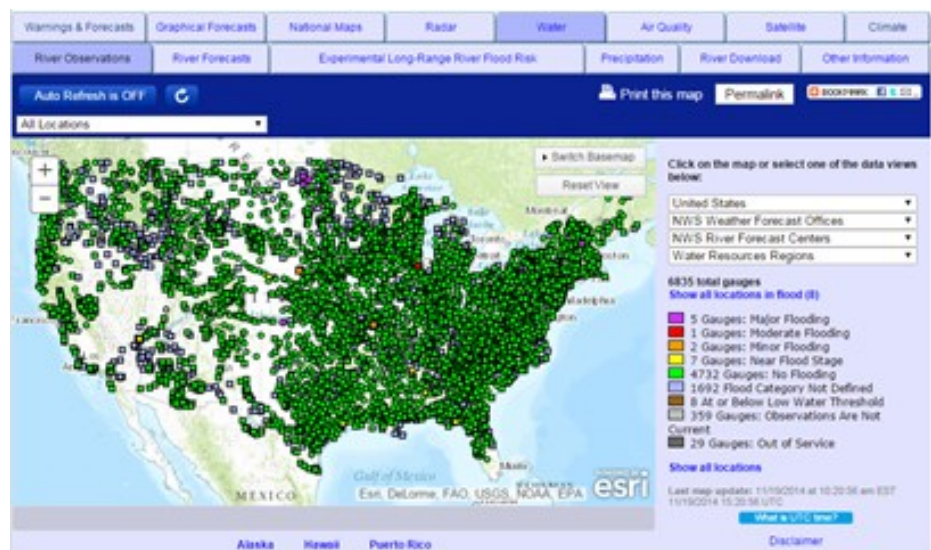
The House and Senate Appropriations Committees overseeing NOAA and the National Weather Service recently approved the initial staffing and operations plan for the NWS National Water Center (NWC) in Tuscaloosa, Alabama. This is a key milestone in NWS efforts to build a Weather-Ready Nation and modernize and improve hydrologic science and services. With approval in place, the NWS is now moving forward with the initial staffing process. Five employees (Commander Nathan Hancock, Andy Rost, Jim Rawls, Sam Contorno, and Mara Suter) are already on-site and are conducting initial preparation work and planning for the facility. Five NWC positions, re-allocated from OHD and OCWWS/HSD, were announced and recently closed. In addition, it is expected that other Federal agency staff and early career scientists hired through the University Corporation for Atmospheric Research/Visiting Scientist Program will move into the facility in the coming months. Twelve additional NWS vacancies will become available, although some of these positions still require negotiation with NWSEO. Since the NWS assumed occupancy of the facility in February, initial activities in the NWC have focused on equipping and furnishing the building, preparing for the initial operating capability in 2015, and hosting internal and multi-agency meetings, such as the Hydrology Program Review Committee meeting in May and the National Flash Flood Summit in September.

Advanced Hydrologic Prediction Service (AHPS) Phase X Webpage Enhancements for 2015

Dan Matusiewicz, OCWWS HSD

By February 2015, the NWS will implement several enhancements to its AHPS webpages. These will include:

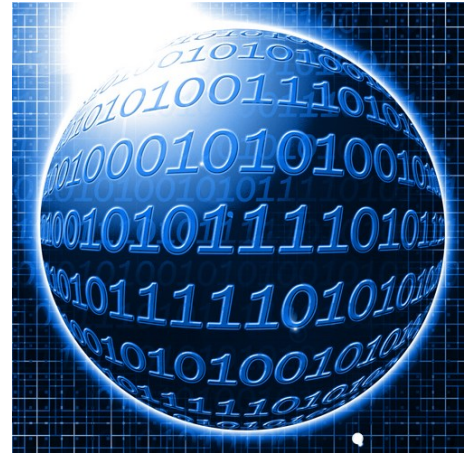
- A web-based Graphical User Interface (GUI) for the National River Location Database (NRLDB). This will allow NWS employees, including those at the WFOs, RFCs, Regional Headquarters, and NWS Headquarters, will be able to collect and query information for agency operations and manage the Hydrologic Services Program at all levels of the organization. They will be able to produce customized reports (e.g., E-19s, spreadsheets for national stakeholders, etc.).
- Two new items will be added to the drop-down menu at the upper left-hand corner of national and regional maps to give users the ability to view only sites that are near or above flood stage or at or below their low water threshold.
- The ability for stakeholders to identify sites with no flood stage defined.
- The ability for users to identify sites that are data points, forecast points, and probabilistic points.
- The ability for users to view a site's hydrograph when mousing over its location on a regional map.
- Access to maximum forecast flood category files for all available time increments in shapefile and KMZ formats.
- The ability for HPMS and the Regions to modify hydronotes within the AHPS Configuration Management System (CMS) for all or multiple gages.
- An AHPS CMS out-of-service feature that will ensure that all briefing pages (e.g., Southern Region Decision Support page, etc.) display the same version of hydrograph.
- The ability for users to view recent crests.
- The ability for users to view the normal pool level on the hydrograph.
- A national map page that employs ESRI's full pan and zoom capabilities.
- The ability for users to view flood inundation mapping (FIM) forecast data shapefiles in their true resolution.
- Access to long-range river flood risk data in shapefile and KMZ formats.



CHPS Bits: Ongoing/Upcoming Activities and Events

Jon Roe and Robert Schedd, OHD

The CHPS Development Workshop was held in Kansas City during the week of September 15th. With representatives from all 13 RFCs, OHD, OCWWS/HSD, and Deltares in attendance, the RFCs were able to share innovative ideas to improve products and services provided through CHPS. Other topics discussed at the workshop included calibration, WFO and external user access to CHPS, system maintenance, training, and future directions for CHPS and FEWS. A number of recommendations for future meetings and training were forwarded to Hydrology Program leaders for consideration. Setting up a CHPS community in the NWS VLAB collaboration environment to enhance sharing between offices is in progress.



On October 1 CHPS-5.0.1 was distributed to the RFCs. It includes a one-year newer version of FEWS (i.e., 2014-01) plus fixes and enhancements to the CHPS-CORE software (please see the release notes at http://www.nws.noaa.gov/oh/hrl/general/chps/OHD-CORE-CHPS_release_notes.pdf). OHD has recently started planning the release of CHPS-5.1.1 which will be due to the RFCs in spring 2015. Details will be discussed in the next issue of Confluence.

National Hydrology Program Managers Meeting

Mary Mullusky, OCWWS HSD Chief

The NWS Hydrology Program is coming into a new era with Integrated Water Resources Science and Services (IWRSS), the opening of the National Water Center (NWC), and the linkage of both with a Weather-Ready Nation. Hydrologic services will be dynamically changing as we implement new technology such as Hazard Services and the Hydrologic Ensemble Forecast Service (HEFS). Our Hydrology Program Managers (HPMs) need to be engaged in the ongoing processes as we implement these changes to provide the best products and information possible and to better communicate risks associated with a variety of water-related issues. We are therefore planning the first national HPM meeting since 2007.

The meeting will be held in Tuscaloosa, Alabama, May 11-15, 2015. An agenda team is currently being formed and will be announced soon. Expect information about hotel accommodations and a meeting agenda to be available early in 2015.



IT Security Management – FISMA and OMB Compliance!

Jim Rawls, OHD IT Manager

In the last article, an overview of FISMA and OMB compliance with IT Security was covered. OHD FISMA systems were undergoing not only the annual assessment, but also being consolidated into a single, portfolio managed, suite of IT resources. HADS, NOHRSC, and DEIT (AWIPS Dev.) systems are covered under the new system, “The National Water Center”, NOAA8202. This represented the first consolidation activity under the NOAA OCIO, with the expectation of a more efficient management approach while still delivering those vital products and services provided by each individual system.

Consolidating, or centralizing FISMA (DOD refers to them as National Security Systems) is not a new approach. In fact DOD has been doing it for years. The most common practice is inserting a web front, or centric gateway to those systems, and having each system’s data and processing resources centralized much like a cloud architecture. In this configuration enabling multi-factor authentication by CAC enhances identity management, reduces password complexities, and by enabling Single Sign On, can reduce the password count to one single authentication event and having access to all data and resources within that given infrastructure. Imagine only having to remember one password.

The National Water Center, or NOAA8202, doesn’t offer Single Sign On nor are our resources centrally located. But those are opportunities to explore over time. At the end of the day, HADS is still HADS and NOHRSC still offers the same products and services it did last year. The consolidation eliminates multiple IT security annual assessments and allows the security team to look across the program office rather than focusing on one unique piece of it at a time. That in itself realizes efficiencies. We still have work to do this coming year, but we’ve taken that first step.

Upcoming Events:

December: American Geophysical Union (AGU) - San Francisco, CA

January: American Meteorological Society - Phoenix, AZ

May: National Hydrology Program Managers Meeting - Tuscaloosa, AL