Confluence

NWS Hydrology Program News

Issue #6
December 2013

Headwaters

Rob Hartman

Welcome to the current issue of the Confluence. In this issue you'll find a really nice mix of what we're (corporately) doing to meet short, medium, and long-range challenges. Also, we celebrate the contributions of new retirees that have brought so much to our program. Two are described in this issue. I thank you for your dedicated service to our program and our customers. We will miss you and wish you the very best in your future endeavors.

This is an extremely exciting (and scary) time for the NWS and the NWS Hydrology Program. Big changes are coming. How we manage the process and opportunities will determine if the changes are beneficial, detrimental, or just a waste of time. My goal is to make sure that the change process benefits our program and the customers we support.

I had the opportunity to visit the National Water Center construction site in early November. By now you should have all seen the photos of the building and its spaces. I have to say that Don Cline has done an outstanding job of designing and managing the project. I had no idea how much thought and effort has gone into this project. It really is a "purpose built" facility. Purposely designed to support our program both developmentally and operationally. As I stood in what will become the Software Engineering and Science Studio and gazed into the

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Geointeligence Laboratory, I couldn't help but imagine the teams of people working away to address our most evasive science issues and integrate innovative solutions into practical operational systems that help us deliver Improved customer service and support. The NWC is a game changer for us. The potential is there, but it will take all of us to realize it. Now that the building is nearly complete, the real work begins…

While NWC work has been consuming a lot of my time and energy, I don't want to leave you with the impression that it's all OHD is working on and thinking about. Quite the opposite is true. In the past month I've had the opportunity to sit down with many of the OHD staff to better understand what they're focusing on. My picture is far from complete, but you should know that there are many dedicated and talented folks working hard on issues that are important to our program. What I don't see is a well communicated rock-solid vision. A vision that everyone identifies with, filters every-day decisions, and guides our path into the future. Everyone wants to understand where we're headed and see how their efforts fit into the bigger picture. I believe we can make that happen over time.

Communications remains a significant challenge for our program. This newsletter is one way that we're attempting to daylight what's going on in OHD and elsewhere. The weekly OCWWS/HSD support calls, monthly HSD calls, and the monthly HPRC calls are other ways we can exchange information. Your participation in these forums is important but by themselves don't fulfill our communication needs. There really is no substitute for periodic face-to-face meetings. With the potential challenges and opportunities that lay before us today, I feel strongly that we need to find a way to re-initiate national HIC/HSD meetings. In the absence of these, it remains our common responsibility to intentionally communicate across our program. It's not just an OHD responsibility, it's everyone's responsibility. My phone works, my email works, and my Google calendar is up-to-date. Don't be a stranger…

Retirement Announcements

Thomas M. Donaldson

Thomas M. Donaldson, Hydrologist-in-Charge of the West Gulf River Forecast Center, will be retiring January 1, 2014. Tom began working for the US Army Corps of Engineers Fort Worth District as a student in May of 1969. Tom completed his degree from the University of Texas at Arlington in 1975, and he was eventually promoted to Manager of the Reservoir Control Section at the USACE Fort Worth District in 1981.

Tom left federal service in 1982 for nearly two decades, working first in the private sector before joining the Flood Control District of Maricopa County in Phoenix, AZ, and later the Lower Colorado River Authority in Austin, TX. In 2002, Tom rejoined the federal workforce as the National WFO Services Program Leader in the Hydrologic Services Division at NWS Headquarters in Silver Spring, MD. Tom returned to Texas for the final

Retirement Announcements Continued…

Thomas M. Donaldson

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time as the Hydrologist-in-Charge of the West Gulf River Forecast Center in early 2007.

Anyone who knows Tom well, and even those who have only made his acquaintance, knows the energy and enthusiasm he brings to any detailed discussion or light-hearted conversation. His stature, his laugh, and Texas accent always grab attention and make interactions with Tom a memorable event. Following retirement, Tom is looking forward to spending more time with his wife, Sherrylynn, their daughters and sons-in-law, and their grandchildren. We are sure he will also be excited to devote more time to his passion for aviation.

Gary Barbato

After 35 years of exemplary public service in hydrology, Gary Barbato retired from the National Weather Service on December 3, 2013. Gary served at the NWS Forecast Office in Reno as Service Hydrologist since 1993 where he was responsible for Nevada and the eastern Sierra Nevada mountain range. He became Senior Service Hydrologist at Reno in 2000. Prior to coming to Reno, he also served as Service Hydrologist in NWS offices in northern California, South Dakota and Wyoming.

Gary's interest in weather, climate and rivers began at an early age while on family trips in southern California. During those trips he became interested in significant weather variations between valley and mountain locations. He built a homemade weather station in 9th grade and began a weather log which he maintained into college and periodically after college. He received a B.A. in Geography from California State University, Northridge and a M.S. in Water Resources from the University of Wyoming. Gary's early Federal career, prior to the NWS, included working for the U.S. Bureau of Reclamation, Environmental Protection Agency and U.S. Geological Survey.

Gary is admired by his co-workers for his extensive knowledge of historic flooding and impacts and ability to explain scientific processes in terms the public can understand. These abilities made him a favorite of local TV reporters who frequently interviewed Gary about current conditions, forecasts and seasonal water outlooks. Nevada and California water resource managers and dam tenders also routinely called on Gary for consultation and decision making assistance. "I have been with the Water Master's Office for 20 years, and during that time we have seen many significant events, including major floods, and Gary Barbato has been there for us as a consistent, dependable communicator of NWS information, and he is very much appreciated." -- United States District Court Water Master.

Gary's networking with partners, research and reporting have clearly increased public safety and preparedness in Nevada and the eastern Sierra. A regional NWS Hydrologic Program Manager recently commented, "Gary's monthly reports and river impacts studies are among the most detailed and accurate in the National Weather Service." Gary's plans post-retirement include traveling with family, photography and volunteer scientific work with the Bureau of Land Management (BLM). While Gary's expertise will be sorely missed in the NWS, we wish him all the best for his new adventures in retirement.

IWRSS Updates

By IDS and FIM Teams

Interoperability and Data Synchronization Team:

The tri-agency Interoperability and Data Synchronization (IDS) team recently completed the scoping and requirements reports for System Interoperability and Data Synchronization. Enhanced sharing of water resources information is a core component of the Integrated Water Resources Science and Services initiative between the National Oceanic and Atmospheric Administration (NOAA), the U.S. Army Corps of Engineers (USACE) and the U.S. Geological Survey (USGS). In order to develop the requirements for this seamless exchange of water resource data, the team investigated and deconstructed three workflows, or use-cases, spanning three temporal-horizons across which the agency currently collaborate. The workflows examine the coordination of historical water resources information, the immediate period, and future conditions and are referred to respectively as the Long Term Water Resources Analyses (e.g. Water Census), a Common Operating Picture for Water Resources, and Water Resources Forecasting and Management.

As the team deconstructed these workflows in order to identify specific functional, technical and performance requirements 5 grouping of requirements were identified. These groupings includes seamless data exchange requirements for Hydrometeorological Forcings and model results, streamflow observations and measurements, Water Resources management (e.g. reservoir, levee and diversion), and information supporting Flooding Inundation Mapping. A fifth category, "Integration and Interoperability," focused on the technical and performance requirements that are applicable to the overall data exchange requirements in the previous categories. Some of the requirements included in the integration and interoperability category include adopting modern community data and metadata standards as well as mechanisms for the agencies to communicate, monitor and respond to problems in the system-to-system exchange of water resources information.

With the requirements phase completed, a design team will be charted in early FY2014. This team will review the requirements and identifying solutions and systems that will create the IWRSS System and Interoperability capabilities. Ahead of this design effort, a few requirements identified in the scoping process have already been addressed. For example, the USGS National Water Information System is changing the frequency of rating table synchronization on their Rating Depot site. This allows the NWS Hydrometeorological Automated Data System (HADS) to better synchronize the stage corrections applied to the conversion of the raw GOES telemetered messages from Data Collection Platform (DCP), to river gage height observations provided by HADS. This is an initial step in ensuring the data used within NWS operations is synchronized with that provided by the USGS through their NWIS system. Moreover as new systems are designed and implemented to provide IDS, these capabilities will result in enhanced collaboration and increased confidence in the decision support service in which all three IWRSS agencies play a vital role. The full IDS report is in final review by the IWRSS Governance Board and will be published sometime in the new year.

IWRSS Updates

By IDS and FIM Teams

Flood Inundation Mapping Team:

The IWRSS agencies share a common goal of providing flood inundation map (FIM) products to support stakeholders for all phases of the flood risk management lifecycle. Flood inundation maps display the consequences of current and forecast river flood impacts and provide an important source of information to the planning, response, and mitigation cycle for community planners and emergency managers. Currently, all three IWRSS agencies are actively developing valuable flood inundation maps for various purposes and have different approaches for producing flood inundation maps. These maps are served to the public on separate platforms, which include NWS AHPS, USGS FIMI and USACE District websites. Respective agency mapping approaches could be better integrated to form a common operating picture to more efficiently and effectively produce and share data, models and maps. FIM stakeholders and the public would benefit from the federal agencies adopting a consistent, common approach to flood inundation map development and dissemination.

The IWRSS agencies have begun the process of unifying federal flood inundation mapping by adopting a set of common requirements. This process began when the IWRSS agencies formed a Flood Inundation Mapping Requirements Team in November 2012. The IWRSS Flood Inundation Mapping Requirements Team worked throughout FY13 to craft a FIM requirements document. The draft FIM requirements document was delivered to the IWRSS Governance Board in September 2013.

As proposed by the IWRSS Flood inundation Mapping Requirements Team, the requirements for an integrated National Flood Inundation Mapping Service emphasize the development of consistent mapping products and establish data sharing requirements for a common operating picture. Consistent mapping products require; (1) uniform scoping, (2) development of flood inundation maps based on common standards and methods, and (3) consistent presentation of the mapping products. Requirements for data sharing include the need to (a) develop a common operating picture that will enable IWRSS agencies to share data, models and maps, (b) enable online access/print interactive and pre-formatted static maps, (c) provide access to complete project data, metadata and reports via download, and (d) ensure compliance with Open Geospatial Consortium (OGC) standards.

Benefits of a more common federal approach to FIM include:

- Cost efficiencies resulting from sharing procedures, tools and possibly systems;
- Quality improvements to products and services resulting from improved sharing of gage, stage forecast, reservoir regulation, and other information already developed by partnered agencies for FIM; and
- Improved accessibility, informed decision support, and enhanced flood communications.

The next steps are to gather feedback from the IWRSS Governance Board by January 2014 and develop a charter for the IWRSS Design Team to address the requirements for the National Flood Inundation Mapping Services.

Partner Spotlight
High Water Mark Campaign

Vincent Brown, FEMA

The High Water Mark (HWM) Campaign is a National initiative to enhance awareness of flood risks as well as motivate communities to take action concerning flood hazard mitigation. The HWM initiative, "Know Your Line: Be Flood Aware" was created by the Federal Emergency Management Agency (FEMA) and seven partner Federal Agencies. The initiative has helped communities remind residents of major local flood events and encourage residents to mitigate their flood risk.

Communities that launch High Water Mark campaigns underscore their commitment to the well-being of residents and the local business community as well as galvanize their community to take steps to reduce the impact of floods. Also, communities can receive points from FEMA's Community Rating System (CRS) Program, which reduces the cost of flood insurance premiums for their residents. Residents can also put existing applicable Federal and State mitigation assistance funds to work in their areas.

To date, five HWM events have taken place, in Frankfort/Franklin County, KY, Nashville, TN, Harrisburg, PA, Orange Beach, AL, and, most recently, a joint launch in Sacramento and Roseville, CA. Participating communities posted High Water Mark signs in prominent places, held high profile launch events to unveil high water mark signs, and conducted corresponding ongoing education events to build awareness of flood risk and motivate people to take mitigation actions.

Federal, state, and local officials in Sacramento, CA. at the High Water Mark campaign launch event.

A High Water Mark sign in Orange Beach, AL.

Partner Spotlight continued…

The two most recent events held in Orange Beach, AL and Sacramento/Roseville, CA were great examples of HWM launches in a coastal and levee/riverine community respectively. The Orange Beach HWM Pilot Launch event was held on September 10, 2013, commemorating the anniversary of the devastating Hurricane Ivan. The shoreline in Orange Beach, AL was heavily damaged by hurricane winds. The surging water reached over 11 feet and displaced hundreds of coastal families and businesses. The Orange Beach community plans on placing 15 high water mark signs throughout the parks and trail systems, including the most popular and highly visited areas. Further, the event was supported by association partners, in particular, NOAA, who was heavily involved in the planning and coordination of the event. Other organizations, such as Sea Grant, will continue to work with the community on outreach initiatives as well as provide potential funding for activities which promote the campaign further.

During the Sacramento/Roseville event, held on November 8, 2013, the cities teamed up to host a HWM campaign launch during California's Flood Preparedness Week. Both communities have extensive flood histories from inland flooding and each has taken extensive action in mitigating for flood risks via their involvement in the CRS program. The City of Roseville is the highest rated CRS community in the nation (the only CRS Class One community). Their high ranking is a result of their highly advanced Flood Warning System, which utilizes various stream and rain gauges to monitor flood threats as they develop, and various other mitigation activities The City of Sacramento, with a high CRS rating of Class 5, has also worked proactively to educate the public about flood risk measures that protect life and property.

Thanks to organizations like NOAA, the United States Army Corps of Engineers (USACE), FEMA and other Federal Agencies speaking at conferences and other events, the HWM initiative has had a national impact as well, as there are over 35 additional communities interested in participating in the initiative. FEMA continues to develop tools and resources for the HWM initiative, recognizing that this is a great way to start and continue conversations about flood risk. FEMA's goal is to be able to roll out the program nationally in 2014, enabling all interested communities to bring awareness to the fact that where it rains, it can flood. If your community is interested in the HWS initiative, please contact the NWS HWM team representative, Katie Garrett (katie.collins.garrett@noaa.gov) for more information.

Announcement

We would like to welcome Noreen Schwein of Central Region Headquarters to the OCWWS Hydrologic Services Branch. During her temporary reassignment to National Weather Service Headquarters, Noreen will serve as the National Hydrologic Policy Services Leader. She will focus on policy, service assessment actions and will be the focal point to the USACE/USGS/NWS Fusion team, which spans Central, Southern and Eastern Regions. Welcome, Noreen!

NWS Hydrology Community Represented in Prominent Leadership Program

Katie Garrett

The Leadership Competencies Development Program (LCDP) is a NOAA-wide opportunity that provides a series of training and learning experiences, including rotational assignments to other parts of NOAA or elsewhere. Employees were selected competitively based on their high potential for being leaders of the agency. The program, which finishes its eighth 18-month class in January, includes two participants from the NWS Hydrology community. Though they both took very different paths, they both agree that the experience gained from participating in the program is invaluable.

Ken Pavelle, with the Office of Hydrologic Development in Silver Spring, Maryland completed his rotations locally in the D.C. metro area. Sequestration took a toll on travel funding for rotations during the latter half of the program. "Some people were able to stay with friends or family at locations away from their home base but many of us rearranged our rotations to stay locally," said Ken. His interest in finance led him to a rotation with the Department of Commerce Budget Office where he worked as the NOAA analyst for the National Ocean Service (NOS) and the Office of Oceanic and Atmospheric Research (OAR). During this rotation he had the opportunity brief the Secretary of the Department of Commerce. Ken also served as Acting Division Chief for the NOS Integrated Ocean Observing System (IOOS) and he worked as a Legislative Affairs Analyst at the National Institute of Standards and Technology (NIST) where he was worked with various House and Senate Members and Committee staff on various hearings, meetings and other topics.

Kevin Werner, the Service Coordination Hydrologist at the Colorado Basin River Forecast Center in Salt Lake City, Utah spent time in both Washington D.C. and Seattle, Washington during his rotations. During his time in the Washington D.C. area, Kevin served as the NOAA representative on the President's Interagency Sandy Rebuilding Taskforce. While in Seattle, Kevin had the opportunity to put his hydrologic background to work, participating in a study with NOAA Fisheries and the Bureau of Indian Affairs on how the streamflow in Puget Sound impact the salmon fisheries. He also spent time working with two non profits, The Nature Conservancy and EcoAdapt, on new policies and activities related to climate adaptation. His classmates in the LCDP elected Kevin to receive the Linda Winner Award for Outstanding Leadership.

Both Kevin and Ken highly recommend the program to anyone who is interested. "This program is for someone who is interested in learning to be a leader; not necessarily a supervisor, but an instrument for change in the organization. It also gives you an opportunity to really learn about yourself and address your development plan," said Ken. Kevin encourages those interested in the program to step outside of their comfort zone when it comes to choosing rotation assignments. "Through the LCDP you have the opportunity to embrace experiences you might never encounter in your current position if you're willing. I highly recommend taking the leap for this chance for personal growth." The next recruitment cycle for the LCDP will begin in early 2014. For more information visit lcdp.noaa.gov.

Project Spotlight:
Soil Moisture - Monitoring and Modeling

Mike Smith, Victor Koren, Brian Cosgrove, Zhengtao Cui, Jongkwan Kim (HSMB), Andy Rost, Greg Fall, Brandon Krumwiede, Logan Karsten, Carrie Olheiser (NOHRSC), Eric Jones (ABRFC)

Soil moisture constitutes less than 0.01% of the earth's water, yet it plays an important role in Earth's terrestrial environment and greatly impacts the human population. Estimates of soil moisture play a crucial role in the simulation and forecasting of river conditions and the onset of flash floods, and have become useful in predicting the onset of landslides. They are vital for the agricultural and forestry industries for planting schedules, planning equipment movement, drought monitoring, and wildfire, pest, and disease management. Further, soil moisture data are increasingly used by the crop insurance industry when determining claims. The US military is also interested in soil moisture for planning vehicle maneuvers.

The need for comprehensive soil moisture data has been understood for many years. To meet this need, many efforts have been made to both monitor and model soil moisture. In the last two decades, a number of national, regional, and local networks have emerged. At a national scale, these include the Soil Climate Analysis Network (SCAN) operated by the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS), as well as the U.S. Climate Reference Network (USCRN). Regional networks include such examples as the Snow Telemetry (SNOTEL) network in the western mountainous US, and statewide networks operated by Oklahoma, Illinois, and others. Dense sensor networks such as the West Texas Micronet have been installed to monitor specific locations.

Complementing these in-situ networks are a growing number of airborne and satellite remotely-sensed observations. For many years, the National Operational Hydrologic Remote Sensing Center (NOHRSC) has used aircraft-mounted instruments to gather soil moisture estimates as part of its Snow Data Assimilation System (SNODAS). These are developed by detecting the gamma radiation emitted from the surface. Satellite estimates of soil moisture have been derived from several remote sensing platforms including Soil Moisture Ocean Salinity (SMOS), Advanced Microwave Scanning Radiometer 2 (AMSR2), and the Advanced Scatterometer (ASCAT), and will soon become available from the Soil Moisture Active Passive (SMAP) mission.

In spite of the growing number of such observations, several drawbacks limit their utility. The density of in-situ networks is sparse compared to variability of the landscape. On the other hand, satellites and

Project Spotlight continued…

airborne sensors can cover wide swaths of the surface, but typically only measure soil moisture in the top 5 cm (or less) of the soil column. Newer tower-mounted cosmic ray sensors in the Cosmic Ray Soil Moisture observing System (COSMOS) have shown promise for deeper soil penetration, especially when calibrated to a large number of soil moisture samples within the observing umbrella. However, the COSMOS network is limited at this time to 54 stations in the CONUS.

To 'fill in these gaps', a growing number of hydrologic and land surface models are being used (in a variety of venues) to simulate and predict soil moisture. Recent years have seen an emphasis on modeling over the entire CONUS domain at increasingly finer spatial and temporal resolutions. For example, a suite of hydrologic and land surface models is run within the North American Land Data Assimilation System (NLDAS) to provide soil moisture and other variables at an hourly time step and 1/8th degree resolution. This, along with other model- and observation-based sources of soil moisture data feed into the US Drought Monitor, a key component of the National Integrated Drought Information System (NIDIS).

NWS River forecast centers (RFCs) have begun to generate soil moisture products such as departures from soil moisture climatologies. For example, the Arkansas-Red Basin RFC (ABRFC) generates soil moisture products such as ~4 km gridded fields of 'percent of normal' values (http://www.srh.noaa.gov/abrfc/?n=exp_soil). To compute these products, current values of simulated soil moisture in the upper and lower zones are compared to a 16-year model-based soil moisture climatology. Soil moisture is also a key component of RFC-calculated flash flood guidance (FFG).

As part of the launch of the National Water Center, the NWS Office of Hydrologic Development (OHD) has begun running hydrologic and land surface models to develop prototype soil moisture and hydrologic products. One model is an advanced version of the Sacramento Soil Moisture Accounting model (SAC-SMA). Recently developed in OHD, this version incorporates the physically-based frozen soil and canopy resistance algorithms from the Noah land surface model and is called the Heat Transfer Evapo-transpiration version or SAC-HTET. The SAC-HTET model is being run at the NOHRSC at

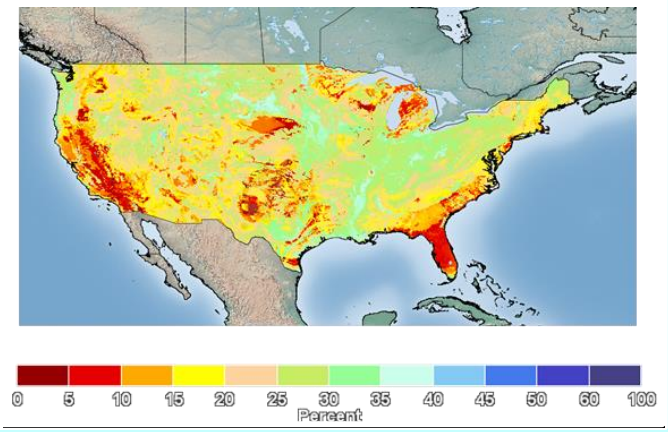


Figure 1. Volumetric soil moisture (%) in the top soil layer computed by the SAC-HTET model

Project Spotlight continued…

a ~4km spatial scale and one hour time step over CONUS. The inputs include a priori land surface parameters along with precipitation and temperature from the Rapid Refresh (RAP) numerical weather prediction model (rapidrefresh.noaa.gov). A priori estimates of model parameters are used. Products from these runs include gridded fields of soil moisture saturation and temperature at various depths, frozen soil products, and gridded runoff amounts. Figure 1 shows the volumetric soil moisture in the top soil layer on November 5, 2013 at 12Z.

NOHRSC is also running two land surface models to generate soil moisture over a large portion of North America, including regions in northern Mexico, the US, and southern Canada. One model is the Community Land Model (CLM) version 2.0 and the other is Noah version 3.2. Both models are executed within the NASA Land Information System (LIS) version 6.2 and are run on a 1-km grid at an hourly time step. Inputs to these models include precipitation, temperature, incoming shortwave radiation, incoming longwave radiation, wind, specific humidity, and surface pressure from RAP. Outputs from these models include soil moisture, soil temperature, snow water equivalent, snow depth, evapotranspiration, snow melt, and surface runoff. Figure 2 shows the soil moisture in the top 0-5cm soil layer computed by the Noah and CLM models for November 5, 2013. The NOHRSC Experimental soil moisture simulations can be viewed at: http://www.nohrsc.noaa.gov/land_surface/ . These products have not been validated, and do not yet benefit from assimilation of ground, airborne, and satellite soil moisture data.

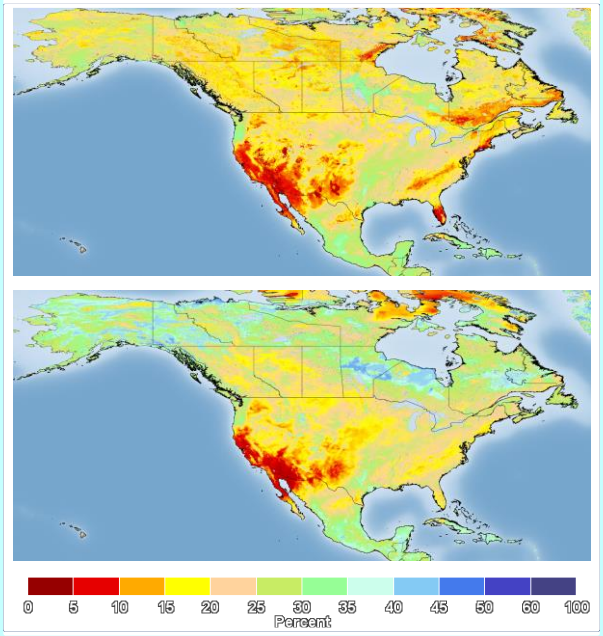


Figure 2. Volumetric soil moisture (%) in the top 0-5cm soil layer for Nov 5, 2013 at 12Z. CLM (top) and Noah (bottom) models.

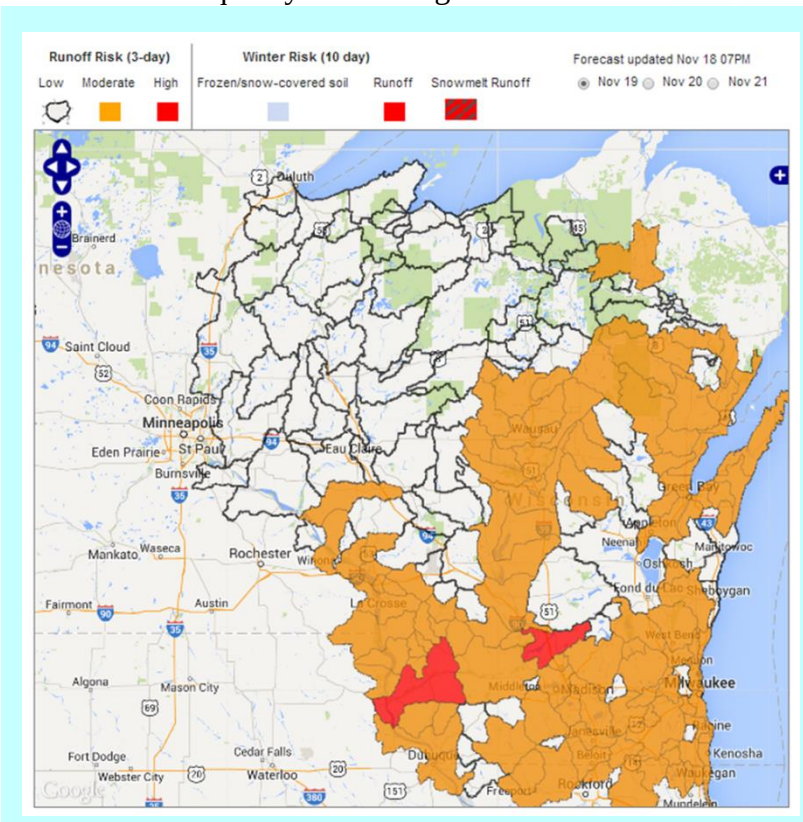
Enhancements to these systems are envisioned that would lead to more refined products in support of the IWRSS mission. Plans are being developed to ingest real-time soil moisture observations from various networks and satellites into NOHRSC data streams. The gamma flight line network for year-round soil moisture measurements will be expanded. With such values, validations could be made of simulated and observed soil moisture at various soil depths. Future plans also include assimilation of in-situ, gamma, and satellite soil moisture measurements. Also planned are forecast values of soil moisture and soil temperature, which could be used to assist in real-time decision-making at RFCs and other IWRSS stakeholders. In addition, given long term records of precipitation, temperature, and other meteorological variables, climatologies of soil moisture and temperature could be developed, which would aid in drought and flood monitoring.

Improving the Nation's waters: The Runoff Risk Advisory Forecast Development

NCRFC

In 2007, Brian Connelly of the North Central River Forecast Center (NCRFC) was participating in an AHPS focus group in Green Bay, Wisconsin. A participant in the group suggested that some of the routine forecast guidance generated by the NCRFC as part of its regular forecasting process could be leveraged by farmers to aid their decision process for determining the best time to spread, and not to spread, manure and other fertilizers. That seminal idea resulted in a multi-year collaboration project with the Wisconsin Department of Agriculture, Trade and Consumer Protection (DATCP) and several State and Federal agencies to develop, evaluate, and fine-tune a new decision support product known as the Runoff Risk Advisory Forecast (RRAF). Responsibility for the detailed analysis, design, and implementation of the product fell on Dustin Goering of the NCRFC, with continuing support and guidance from Brian. Routine collaboration was accomplished with the RRAF Working Group. Major shareholders in the Working Group included: DATCP, the Department of Soil Science and the College of Agriculture and Life Sciences at the University of Wisconsin, Madison, the Wisconsin Discovery Farms program, Pioneer Farm of the University of Wisconsin- Platteville, the USGS. Soil moisture model output forecasts , the basis for the RRAF became an official NWS product on April 15, 2013, thus making the RRAF the first inroad of the NWS towards water quality forecasting.

The current generation of the RRAF uses the lumped Snow-17 and Sacramento Soil Moisture Accounting Model to simulate soil conditions and runoff amount. The operational runoff forecasts incorporate 5 days of forecast precipitation and 10 days of forecast temperatures. The RRAF guidance was validated against several years of observed edge-of-field (EOF) runoff data as well as several small USGS gauged watersheds with promising results. To reduce the number of false alarms and to stratify the risk into low, moderate, and high risk conditions, the NCRFC developed two basin specific thresholds for each of the basins, associated with the moderate and high-risk conditions, respectively.



Improving the Nation's Waters: continued…

A thorough analysis of 2011 forecast guidance, including verification against additional EOF datasets, highlighted the RRAF's competency as well indicated future areas for improvement. The goal of the RRAF is to reduce incidents of contaminated runoff from fields entering water bodies, thus helping to accomplish several goals: 1) improved water quality on the tributaries to the Great Lakes and the Gulf of Mexico; 2) reduction of hypoxia zones in the Great Lakes and Gulf of Mexico; and 3) reduction on wasted fertilizer applications by farmers, thus reducing farmer's operating expenses.

Implementation Details:

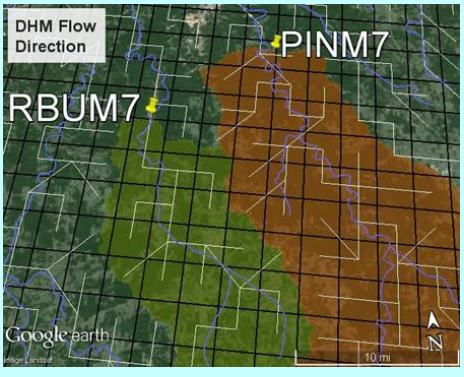
•Wisconsin's Department of Agriculture, Trade, and Consumer Protection (DATCP) is the lead state agency for the RRAF and manages web hosting at: http://gis.soils.wisc.edu/app/runoffrisk
•RRAF is currently operational for 216 NWS watersheds in Wisconsin (average size 300 mi2)
•List of runoff events sent 3 times daily to DATCP which processes and populates the webpage
•DATCP implemented three overlapping 72-hour windows to communicate risk to users
•There are two modes: in regular mode, forecasts cover a three day window. In Winter mode, RRAF risk is based on the entire 10-day window to aid with snowmelt events.

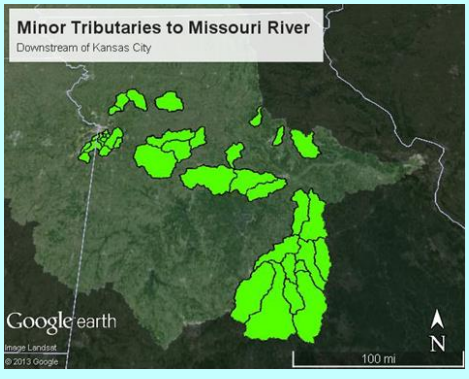
Modeling Tributaries Near the Kansas City Metropolitan Area

MBRFC

The Missouri Basin River Forecast Center (MBRFC) has made recent strides in its efforts to develop and implement a distributed model for the tributaries that flow directly into the Missouri below the Kansas City Metropolitan area. Distributed modeling has recently been a new focus area of the MBRFC; therefore initial goals were to familiarize themselves with running a distributed model, specifically with its implementation, parameter estimation and calibration.

The MBRFC has been investigating whether distributed modeling provides any advantages over the 1-hr lumped model currently used operationally for that area. Work is also being done to determine whether distributed modeling could offer more useful alternative simulations for other flashier, irregularly shaped basins, where a 6-hr time step, lumped unit hydrograph theory begins to fail.



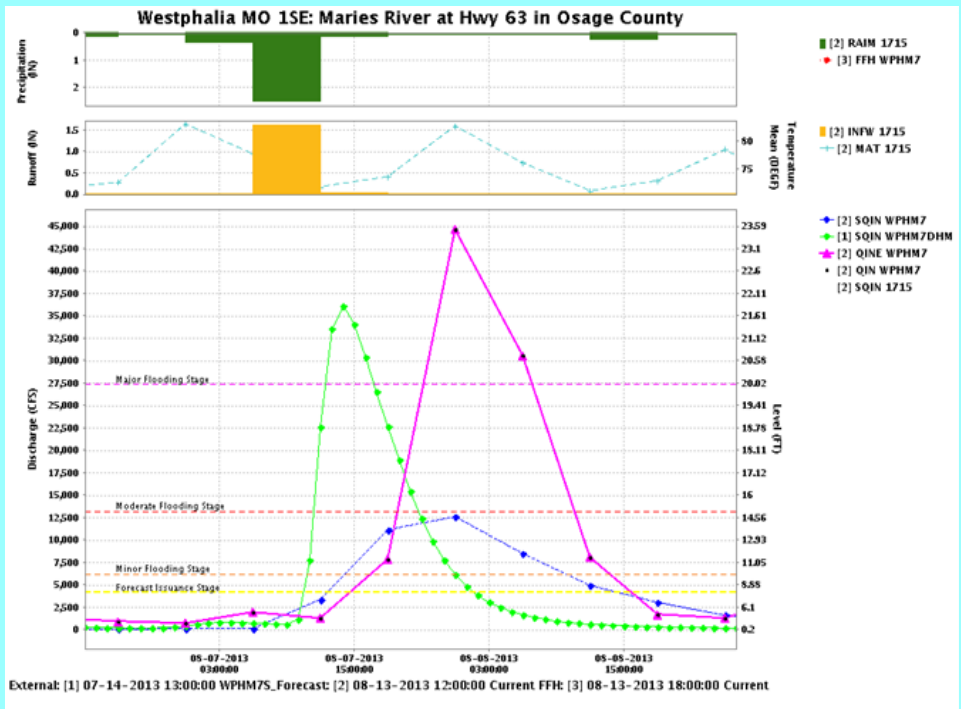


Modeling Tributaries Near the Kansas City Metropolitan Area continued…

Per OHD literature and guidance, the MBRFC is running the distributed model using the lumped calibrated SACramento Soil Moisture Accounting (SAC-SMA) parameters. This was done to quickly spin-up and implement a 'semi-distributed' model within its area. Model output has been generated for basins with river gage observations and is being displayed in the Community Hydrologic Prediction System (CHPS) alongside operational 1- and 6- hour lumped model plots. The Pi Service was used to import the data into CHPS through eXensible Markup Language (XML) files with a similar process used to import the Hydraulic Model (i.e.; Hydrologic Engineering Center's River Analysis System [HEC-RAS]) data into CHPS.

Next steps currently being worked on are to implement the Research Distributed Hydrologic Model (RDHM), Sacramento Heat Transfer and EvapoTranspiration (SAC-HTET) version of the model, re-examine and modify the flow connectivity field to have it more closely resemble the river basin connectivity observed in nature. Also forthcoming is work to implement various versions of the distributed model; one that scales the a priori SAC-SMA parameters to the calibrated lumped model parameters, and one using a priori parameters from the STATe Soil GeOgraphic (STATSGO) soil dataset and running initial values through Office of Hydrologic Development (OHD) provided calibration routines.

In tandem with SAC-HTET modeling efforts, the MBRFC is developing a pilot study using Distributed Hydrologic Modeling-Threshold Frequency (DHM-TF) as an enhancement to Gridded Flash Flood Guidance (GFFG). More than ten years of historical precipitation and temperature data will be used to perform statistical post-processing of the RDHM SAC-HTET. After the initiation of flash flooding, DHM-TF will provide a way to cast flood severity in terms of return period as a flood wave is routed downstream. By gaining more experience in distributed modeling through real-time flood events and post-event verification, the MBRFC is hopeful to gain further insight in to which locations distributed modeling could improve MBRFC forecast products and services.

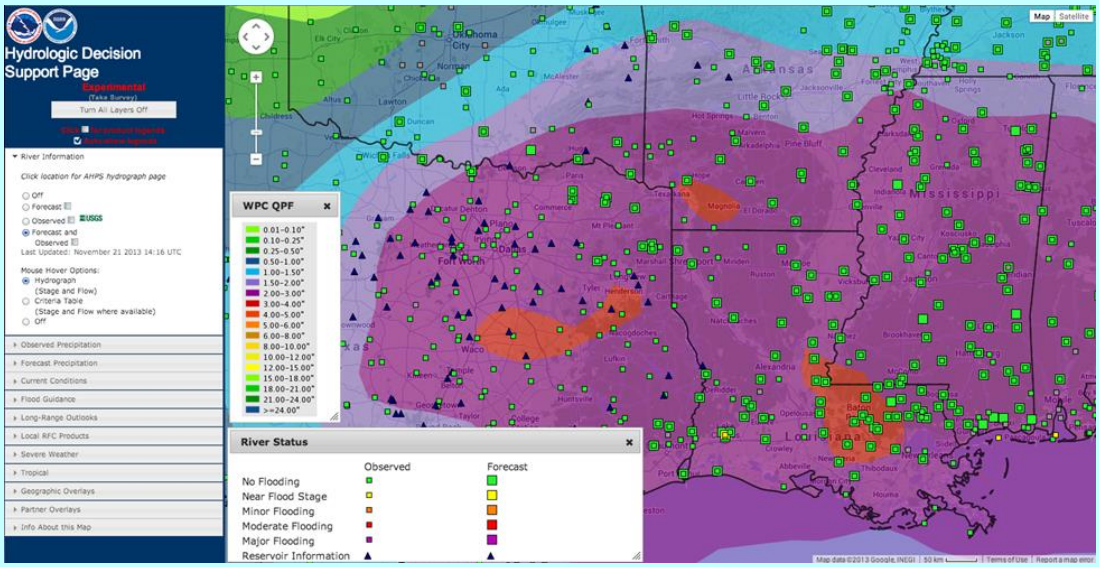


Hydrologic DSS Tool

SR Hydro Decision Support Team

Over the past decade, the River Forecast Centers (RFC) within the National Weather Service (NWS) have developed informational maps for publication on their respective Internet web pages. RFCs produce a variety of spatial data products published as static graphical images updated on periodic cycles, and the result has been each graphical product being independent of the others. This has offered limited to no ability to seamlessly integrate and display products together on the same background map for analysis, such as 24 hour rainfall estimates with flood forecast status. The RFCs have noted an increase in stakeholders using RFC web products to make critical water management decisions. However, some states have up to four different RFCs providing services within their boundaries, requiring reference among four different RFC web pages. The ability to scale maps beyond a single RFC boundary has been a widely requested capability from customers serviced by multiple RFCs, as evidenced in recent flood-related NWS Service Assessments.

As each RFC has had primary responsibility for its own web presence, there are often inconsistencies in the display of RFC products on statewide, regional, or national perspectives.
Some local and regional initiatives have been undertaken to develop Google Earth-based maps to display hydrologic information from RFCs. One such initiative is the concept of a Hydrologic Decision Support Tool, which was developed by the Southern Region (SR) Hydro Decision Support Team. The Hydrologic Decision Support Tool uses a Google Maps API to overlay a variety of existing NWS hydrometeorological products in addition to data from core partners.



Hydrologic Decision Support Tool displaying Observed and Forecast River conditions and Forecast Precipitation.

Hydrologic DSS continued…

The ability to overlay and compare this multitude of data sets all in one interface, saves decision makers time formerly spent digesting that same data via several different web sources, and many times would otherwise make meaningful spatial comparisons nearly impossible. Internally within the NWS, this tool has the capability of being used as an effective briefing tool to communicate hydrologic issues to NWS customers. As such, the interface has the ability to save time within the office formerly spent gathering information included in this interface from many sources and compiling them into a format they can use to brief partners.

This experimental tool has replaced the legacy status maps at each of the 4 SR RFCs' main web pages. The SR RFC web pages can be found at:
ABRFC – http://www.srh.noaa.gov/abrfc/
LMRFC – http://www.srh.noaa.gov/lmrfc/
SERFC – http://www.srh.noaa.gov/serfc/
WGRFC – http://www.srh.noaa.gov/wgrfc/
In addition, a national interface was developed to assist NWS offices with performing Decision Support activities, which can be found at: http://www.srh.noaa.gov/rfcexp/main.php?fs=1

Customer feedback on this experimental tool has been very favorable to date. If you would like to provide feedback after exploring the Hydrologic Decision Support Tool, please visit the survey at: http://www.nws.noaa.gov/survey/nwssurvey.php?code=RFCDSM

The National "Turn Around Don't Drown" Program Turns 10 years old in 2014!

Katie Garrett

Flooding remains one of the top weather killers with the average number of annual fatalities totaling near 90. More than half of these fatalities are vehicle related. The National Weather Service's "Turn Around Don't Drown" campaign is dedicated to teaching the public about flood safety.

Hector Guerrero, the Warning Coordination Meteorologist at the San Angelo, Texas Forecast Office, began formulating a plan for a program to raise awareness of the dangers of driving or walking into flooded areas in the early 2000s. While Hector worked at the NWS Office in

WCM, Hector Guerrero.

TADD continued…

Brownsville, Texas, he became concerned when hurricane evacuees from the Texas coast would relocate to the heart of Texas' Flash Flood Alley. He was also aware of the dangers associated with flash floods having grown up in Austin, Texas, also part of Flash Flood Alley. "I wanted a catchy phrase along the lines of the fire-safety mantra "Stop, Drop and Roll." After brainstorming with a group of firefighters from Harlingen, Texas, I chose 'Turn Around Don't Drown.'"

Hector worked with a team from NWS Southern Region Headquarters and together they partnered with the Texas Division of Emergency Management, The Federal Alliance for Safe Homes (FLASH), and the City of Fort Worth Fire Department. The "Turn Around Don't Drown" program was launched in Texas in 2003. Once the phrase was officially trademarked by NOAA, the program made its national debut in 2004. Since then, hundreds of permanent "Turn Around Don't Drown" signs have been established along roadways prone to flooding across the U.S. and the slogan has become an often repeated catchphrase in the media, classroom and even the home. In addition to the education materials developed by NOAA/NWS, our partners also distribute resources bearing the phrase.

In an effort to renew the "Turn Around Don't Drown" trademark, the Hydrologic Services Division provided documentation to the Patent and Trademark Office in fall of 2013 to show that, "Turn Around Don't Drown" is actively used in print and as a public education campaign. "The breadth of use from NOAA/NWS employees, other national and local government entities, the media and local communities has made renewing the trademark easy", said Mary Mullusky, NWS Hydrologic Services Branch Chief. The 10th Anniversary of the national campaign will be highlighted during Flood Safety Awareness Week, March 16-22, 2014.

For more information about the national "Turn Around Don't Drown" program, visit http://tadd.weather.gov or contact Katie Garrett, Hydrologic Services Division Outreach, Training and Interagency Coordinator.

The Hydrology Professional Development Program

Rick Koehler

Training has always been an important part of anyone's career development within the National Weather Service. Regardless of the office or specific field of study, changes are constantly occurring within NWS. In order to keep up with new job duties or to be competitive for open positions, focused and specific training is critical.

To address the need for training guidance, the Hydrologic Services Division within OCWWS has partnered with the NWS Training Division and with team members from regional, WFO and RFC offices to produce the Hydrologic Professional Development Series (PDS) for the primary hydrologic job

PDS continued…

responsibilities within NWS. The competencies and related training (instructional components) identified in the PDS have been reviewed by the field at the regional and national level. Whenever possible, existing modules from the NWS LMS have been used for the instructional components. The PDS covers three general areas: 1) Provide hydrologic services, 2) Develop, Implement and Maintain Models and Tools, 3) Manage a Hydrology Program. Under each general area are a set of Professional Competency Units each supported by a list of instructional components.

The purpose of the PDS is to provide managers and staff the list of competencies and related training requirements are needed to achieve a level of knowledge skills in a particular area. For example, say the Hydro Program Manager at a particular WFO has taken a position elsewhere in the agency. The WFO management for that office now needs to fill the HPM position. By knowing the PDS elements for an HPM, the office management can review the training records of the staff to see who has had training that matches the PDS or what training is still needed. Alternately, if a person wishes to be competitive for a position, awareness of the competencies to fulfill the positions duties and access to the training to address those competencies would be beneficial.

Finally the PDS is useful when deciding what new training should be developed. The PDS lists existing instructional components matched to competencies but also reveals which competencies that are lacking any relevant, existing training. Lack of existing training may be due to new software releases, new procedures, or changes in policies and directives. These training gaps provide guidance for the program office to help allocate NWS Training Division resources to address important training needs. The Hydro PDS is an evolving guide for focused training relating to hydrology-related positions within the agency. It will help both managers and staff know where they stand when it comes to needed training. For more Hydro PDS information, visit: http://www.nws.noaa.gov/training/hydrologyPDS_home.php

CHPS Bits : Ongoing and Upcoming Activities

Jon Roe

The semi-annual release of CHPS, identified as CHPS-4.0.1, was made available to the RFCs on November 21, 2013. The original August release date target was missed due to our inability to secure a new support contract with Deltares-USA until the second half of July and the government shutdown in October. CHPS-4.0.1 includes the second release of the Graphics Generator, the initial baseline release of the CHPS Calibration Service, performance improvements to the HEC-RAS adapter, and assorted

CHPS Bits continued…

improvements to the FEWS component of CHPS. Documentation for OHD-delivered CHPS features is consolidated on the web at http://www.nws.noaa.gov/oh/hrl/general/indexdoc.htm. A three-hour CHPS Calibration Service training webinar for all RFCs is scheduled for December 3, 2013.

Since Spring 2013, NWS offices (OHD, OCWWS/HSD, and OST) have been collaborating on a large integration project to move CHPS operations from prototype hardware to operational AWIPS hardware at all 13 RFCs. In the past couple of months this project has accelerated with the acquisition of new servers and development of CHPS system configurations. The three offices are meeting on a weekly basis and project schedules have been developed that expect completion by late summer 2014. The first examples of refreshed AWIPS processors, intended to host CHPS, are now being configured and tested on HSD's NHO-R system in Silver Spring.

Flash Flood Forecasting with a Distributed Hydrologic Model

Brian Cosgrove

Flash floods are a devastating natural disaster, causing millions of dollars of damage each year and putting many lives in danger. Accurate and timely predictions of flash floods are essential for the protection of life and property. Unfortunately, the nature of these events makes them quite difficult to monitor and predict. Flash floods feature a fast onset, less than six hours from the causative event, are local in scope, and depend greatly on fine scale weather and land surface conditions.

NWS forecasters use a variety of tools to monitor meteorological and environmental conditions for the possibility of flash flooding. The most widely adopted approach is to compare observed rainfall amounts against Flash Flood Guidance (FFG) values using the Flash Flood Monitoring and Prediction Advanced (FFMPA) tool. While rainfall–FFG comparison in FFMPA provides a base level of service, this concept of operations does not meet all stakeholder requirements. Specifically, the technique does not account for the hydrologic conveyance of water from upstream areas, nor does it provide an objective characterization of the severity of the flood. In order to bridge the gap between rainfall-FFG comparisons and the anticipated advanced hydrologic simulations of flow at all locations, the NWS Office of Hydrologic Development (OHD) developed a novel approach to providing meaningful estimates of flooding at ungauged locations: the Distributed Hydrologic Model Threshold Frequency (DHM-TF) application for flash flood monitoring and forecasting. By casting routed discharge from a hydrologic model in terms of a return period, it places the discharge at each model pixel into historical context and provides end users with an intuitive means of quantifying how unusual current and forecasted streamflow values are. Forecasters can then use this information to gain a sense of whether flooding is ongoing, where flooding may occur, and how severe such flooding will be.

Flash Flood Forecasting with a Distributed Hydrologic Model continued…

The Lower Mississippi River Forecast Center (LMRFC) worked with staff from OHD to implement DHM-TF on an RFC server in an automated test mode and have worked with their WFOs to evaluate the output. Based on discharge produced by hourly runs of OHD's Sacramento distributed hydrologic model, maps of return period are made available to all of the WFOs within their domain. The Lake Charles WFO, in particular, has taken a leading role in assessing DHM-TF, and the model showed itself to be particularly useful in a recent flash flooding incident. From the night of September 20th through the morning of September 21st, a cluster of slow moving thunderstorms dropped up to 16 inches of rain over southwestern Louisiana (Figure 1). Several water rescues were necessary as cars became trapped on flooded roads and 20-25 homes were flooded. DHM-TF was used to augment information from existing operational tools such as FFMP in the issuance of multiple flash flood and areal flood warnings (Figure 2). In particular, Jonathan Brazzell, the service hydrologist at the Lake Charles WFO, reported that "While the initial [flash flood warning] polygon was based solely on the FFMP output, the second and third flash flood warnings were based on a combination of the FFMP and DHM-TF. The second and third warnings were expanded on the south and southwest sides based on the DHM-TF output. DHM-TF was heavily relied upon when we transitioned to areal flood warnings later that morning."

Along with the work at LMRFC, DHM-TF is currently being tested at APRFC (Hawaii WFO), and the Binghamton, Pittsburgh, and Baltimore/Washington WFOs. Other regions and offices have expressed interest in developing and providing similar services to their stakeholders. Users at these test sites are leveraging DHM-TF's high resolution gridded representation of routed discharge based mainly on precipitation observations with some use of short-term nowcasts. However, work is underway to test mid-range forecast abilities using precipitation forecasts produced by the High Resolution Rapid Refresh (HRRR) and Weather Research and Forecasting (WRF) models. More importantly, these demonstrations represent an initial foray into the operational application of hydrologic models at the flash flood scale. These projects greatly advance the overall concept of operations for bridging the gap between legacy method flash flood detection and warning methods and the future.

Article Collaborators

Jonathan Brazzell

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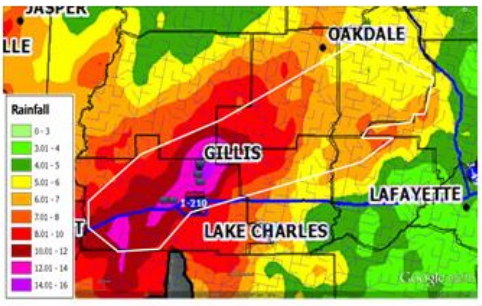


Figure 1. Storm total rainfall (inches) September 21-22, 2013. Blue wave symbols indicate local reports of flash flooding. White line represents Lake Charles WFO flash flood warning.

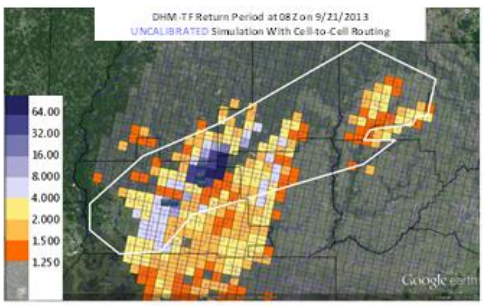


Figure 2. Return period map from 08z September 21, 2013 simulation of uncalibrated DHM-TF. Blue wave symbols and white line are as in Figure 1.

IT Corner: Asset Management – The Backbone of ITSM

Jim Rawls

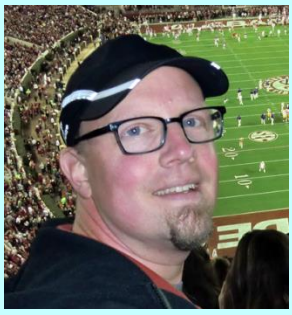
In our last issue the discussion was on the people, technology, and the management and monitoring for process improvement. All three of these must work together for any sustainable ITSM and long term customer satisfaction. So it's time to drill down a bit and begin looking at the processes enabling ITSM. With people and management in place nothing can really get done without pure technology, the hardware and software that those people use to get their work accomplished. Asset Management, sometimes referred to as Life Cycle Management (LCM), might be viewed as just Personal Property Management though far from the truth. The ability for an IT Manager to monitor initial costs, project outyear budgets to refresh, and ensure the technology required by the people is in place can be a challenge. I refer to it as having "good years and bad ones" – budgets vary and today are difficult to predict much less the execution piece, making a contingent refresh plan essential.

Refresh cycles do vary, but whether the goal is to refresh every three, or four years, for a desktop or laptop, or better yet core/edge infrastructure devices that are very expensive - the point is there is a process in place for asset management. It's simple math to say we just refresh 25% of the technology each year, but budget factors into this simple of an approach. My comment made in the last sentence of the first paragraph is important – you MUST have a backup plan and the ability to quickly reassess and re-adjust when needed.

Asset Management involves all technology resources, like printers, software/hardware maintenance costs, etc. A lot of moving parts that take planning, execution, and monitoring to ensure the success of ensuring the people have the adequate technology to perform their jobs. Let's extend this discussion into the next issue and look at how to plan refresh efforts, especially involving one time and recurring costs.

Life in Tuscaloosa, Alabama

Dave Riley



Dave at the Alabama vs LSU Game

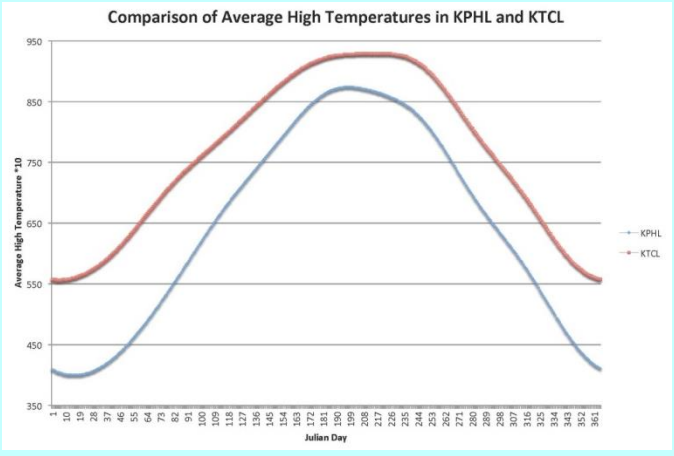
Since I moved to Tuscaloosa, Alabama this past July the question I am most frequently asked is, "What is it like to live in Tuscaloosa?" Keep in mind I moved here by choice. My wife was offered a professorship with tenure at the University. I had been commuting to Silver Spring, MD from Philadelphia, PA (125 miles) twice a week and working from home the rest of the time and after doing this for years it grew tiresome. Although my wife was ready to move before the National Water Center (NWC) opened, I got permission to support the River Forecast Centers (RFCs) and Community Hydrologic Prediction System (CHPS) by full time telework from home in Tuscaloosa until the NWC opens. I have never lived in the South before, growing up and working in the Northeast and more recently living and working in the Mid-Atlantic. What would Tuscaloosa be like for this Northerner?

Life in Tuscaloosa continued…

We chose to live in town close to the University and the NWC. We are within walking and biking distance. There are many affordable options in town or within a 15 minute drive. There are affordable, dare I say luxurious, homes on Lake Tuscaloosa, just a little bit north of the River. We found house prices, at least compared to Silver Spring or Philadelphia, quite affordable even right near Campus. The university is well ranked nationally for undergraduate education (consistently in the top 100 universities) and offers many excellent undergraduate and graduate programs for family members seeking to further their education while in Tuscaloosa. In-state tuition is a bargain relative to private universities.

We enjoy the farmers market that is a short walk from our house on the River Walk. There are some nice restaurants (e.g. Five Bar, Epiphany, Surin, Cypress Inn, etc) and cultural events at the University and in downtown Tuscaloosa or nearby Northport, which is known for its art scene and galleries. Admittedly, for a zoo, Whole Foods, or an art or science museum we need to go to Birmingham. The airport in Birmingham (BHM) is just an hour drive, with some direct flights to many locations including BWI, Philadelphia and NYC. We also took the Amtrak train to New Orleans and it was a pleasant trip. We were pleasantly surprised to find a decent public school system and great private schools and preschools. My 4-year old is attending the Capital School and loves it. Property taxes are quite low, however, we were surprised to find the groceries are taxed. Football "game day" is quite a spectacle. It is crowded but manageable.

Are the summers unbearable? On average it is warmer in Tuscaloosa than Philadelphia. Average high and low temperatures on every day of the year are warmer. Being a meteorologist (before I was a hydrologist) of course implored me to examine it quantitatively so I made a number of plots. It is also wetter than Philadelphia but I concentrated on temperatures. Everyone says summer is hot in the South, and it is, but not as much warmer as one would think. It turns out that the average high (and low) temperatures are much higher in the winter (about twelve degrees), while there is less of a difference in the summer (only about five degrees). As an example I have attached a graph of the average high temperatures. So winters are pleasant and summers are only slightly hotter. However, it was quite humid this July and August.



The NWC is going to be a spectacular place to work. I just got my first tour a few weeks ago. The space is equivalent to about five floors of SSMC2 in Silver Spring. There is a great deal of collaborative space with an open floor plan. It was interesting to find out it will feature some walking desks where one could walk or run on a treadmill while working on a PC or tablet.

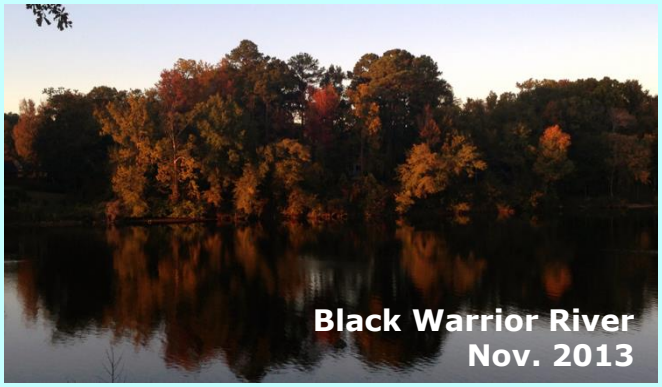
So what is it like to live in Tuscaloosa? Just fine!

National Water Center Update

Sam Contorno

As of late November, construction of the 65,000 square ft. National Water Center (NWC) facility in Tuscaloosa, Alabama, is entering its final stages. Overall construction is nearly 90% complete. The exterior cast stone has been installed, and building entranceways are finished except for the presence of construction doors. Ceiling treatments are finished in the basement and second floor and are being installed on the first floor. Much of the drywall finishing and prime coat painting is complete throughout the building. The first coat of final paint is being applied, and installation of terrazzo flooring in the first floor rotunda area is underway. It is expected that NOAA will assume possession of the NWC in January. Installation of furniture and IT and audio-visual equipment will follow, and the facility should be ready for day-to-day work in March.

Although the National Water Center (NWC) will provide information on regional, national, and global scales, the facility will reflect the local "flavor" of its Alabama setting. Conference rooms and collaborative spaces in the building are named after Alabama rivers. The first floor will be the home of the Cahaba and Sipsey conference rooms, while the second floor will include the Perdido, Conecuh, Coosa, and Tallapoosa conference rooms and the Black Warrior collaboration space. (The Black Warrior flows through Tuscaloosa.) The overall architectural design of the NWC conforms with that of the University of Alabama campus. So, although national in scope, the NWC will definitely have the look and feel of "Sweet Home, Alabama."



Have an idea for an article for the next issue of Confluence? Please contact Katie Garrett at katie.collins.garrett@noaa.gov. Confluence is now published quarterly.