ADVANCES in Hydrologic Engineering

Spring 2012

Director's Comments

By Christopher N. Dunn, P.E., D.WRE

It has been a while since HEC published our last newsletter. While I could attribute the delay to many things, I would have to say the level of activity we have experienced is the primary cause. One of the things I love about working at HEC is that we are asked to participate in many of the most technically challenging projects the Corps has to offer. However, by being involved in many high profile projects, we sometimes have difficulty finding the time to complete other tasks - like documenting our work. We understand the importance of informing others of our work but like most engineers, at least the ones I have worked with over the last twenty-six years, we like to work on problems and don't relish the idea of documentation. That being said, we know it is important to keep you informed and we will strive to improve the frequency of our newsletters.

To go along with the conversation above, I was asked recently how we market our tools and let others know of our most recent developments. I said that we have the HEC newsletter, our website, the PROSPECT (training) program, and we hit the conference circuit every year. My inquisitors were looking for more. A mode of communication that we have not used much in the past but is becoming popular within the Corps is the use of webinars to inform others of the

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Flood Relief Efforts in Bangkok, Thailand

By Jeff Harris

Flooding north of Bangkok, Thailand, November 2011

In late 2011 the Bangkok region of Thailand experienced flooding, a result from the Chao Phraya River overflows north of the city. Many areas experienced widespread flooding, with the central-northern provinces experiencing the worst flooding in fifty years. Twenty-four of seventy-seven provinces and 2.8 million people were affected. The Thailand military utilized 40,000 troops to assist the recovery.

In early November the United States Secretary of State authorized U.S. support for flood recovery. Subsequently, the Secretary of Defense authorized the Commander of the Pacific Command (CDRUSPACOM) to conduct humanitarian assistance activities. To support this activity, the U.S. Army Corps of Engineers (USACE) was asked to provide a team of three surface-water and pumping subject matter experts (SMEs) to provide assistance. Jeff Harris (Chief, Hydrology & Hydraulics, CEIWR-HEC) and Michael Wong (Chief, Civil Works Technical Branch, CEPOH) volunteered to support the surface water effort and Denny Lundberg (Chief, E&C, CEMVR) provided the pumping support. The USACE team worked under the C2 of the 3rd Marine Expeditionary Force out of Okinawa. The USACE effort took place 16 - 29 November 2011.

The Don Mueang airport, Bangkok's main domestic airport, was also flooded. The main mission of the U.S. effort was to help the

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latest policy, guidance and technological development. As a matter of fact, I recently participated in a webinar with the National Weather Service (NWS), where I presented on one of our newest pieces of software: the Watershed Analysis Tool (HEC-WAT). The NWS is interested in a number of HEC's tools and has requested a series of webinars with us. Obviously, if the NWS finds value in this kind of delivery, surely the Corps and HEC could benefit from webinars as well. Therefore, a goal of ours over the next year is to conduct a few webinars and see what kind of feedback we receive. We will still continue to perform the other methods of delivery as well, but they tend to address a smaller audience and are not necessarily as interactive as a webinar. Thus, you should be on the lookout for HEC webinars soon.

Earlier, I mentioned that HEC was involved in many technically challenging projects. They include the Columbia River Treaty 2014/2024 Review Study, the ACT/ACF (Alabama, Coosa, Tallapoosa and the Apalachicola, Chattahoochee, Flint) project in the Southeast, the Folsom Reservoir Reoperation study in Central California and the Mississippi River Flooding during the summer of 2011. Along with these domestic projects, HEC has also had a busy international program. In just the first half of FY 2012, HEC has been involved in over twenty international projects. These projects range from hosting hydraulic engineers from South Korea, Haiti and Taiwan, to performing reservoir modeling in Iraq and working with the World Meteorological Organization where we are helping write guidance that developing nations can use to perform their own hydrologic studies. The sources of funding for these activities vary and the rewards are great. Engineers from HEC have said that some of their most rewarding projects are the international ones. This may be because they can see how appreciative these people are for the assistance they receive. This newsletter features a number of our recent international activities.

On the engineering and software development front, HEC has made great strides with a number of pieces of software since the last newsletter. For example, the Water Management Team has logged many hours developing, testing and documenting the latest version of the Corps Water Management System (CWMS). Version 2.1 of CWMS is set to be deployed in the third quarter of FY12. They have worked with a number of validation sites (field testing sites) to prove that the suite of software tools and database work as advertised. Now that the deployment order is set, HEC will begin pushing the software to the field. Additional discussion on CWMS 2.1 can be found later in this newsletter.

Another tool that continues to be built with resources across HEC is HEC-WAT. This tool was originally constructed to help Project Delivery Teams perform system-wide studies more collaboratively through coordinated model building and intuitive model editing and review. Recently, through the Corps R&D program and the Columbia River Treaty 2014/2024 Review study, the WAT has grown to include a number of additional capabilities to support life-cycle and uncertainty analyses. These enhancements comprise the Flood Risk Analysis (FRA) compute option that is now being used with the CRT 2014/2024 study. The addition of these features makes HEC-WAT the first individual tool able to support many, if not all, of the system, watershed, life-cycle and risk analysis requirements that the Corps stipulates. HEC-WAT without the FRA compute option is expected to be released sometime in the third quarter of FY12. Meanwhile, the FRA compute option continues to be honed so the next release of the WAT will include the full uncertainty analysis and possibly the life-cycle approach.

Many other tools have made significant advancements as well. HEC-RAS (River Analysis System) made breakthroughs with water quality, sediment and even 2D capabilities. The 2D capabilities will allow the modeler to run a hydraulic model moving seamlessly in one and two dimensions. Among other developments, HEC-HMS (Hydrologic Modeling System) now features enhanced forecasting capabilities as well as its water quality and sediment capabilities. HEC-FIA (Flood Impact Analysis) enhancements were developed to improve GIS (Geographic Information System) capabilities to create, modify and evaluate the structure inventory and its loss-of-life estimation capabilities. HEC-FIA has been used extensively by the MMC (Modeling Mapping Consequences Center) to estimate the consequences (economic damage and loss-of-life estimates) of dam and levee failure scenarios. Many features of HEC-ResSim (Reservoir System Simulation) have

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been strengthened, added or improved, and is being used extensively during the Columbia River Treaty 2014/2024 Review Study to evaluate the operation of the reservoirs throughout the system for hydropower and to assist with flood damage reduction. All four products listed above are being enhanced with the ability to perform an uncertainty analysis as well. The goal is for the uncertainty analyses to be performed independently within the unique piece of software or to be performed within the WAT as part of the FRA compute option.

Two versions of the HEC-FDA (Flood Damage Reduction Analysis) software continues to be constructed. You might ask, why work on two versions at the same time? As you probably know, the Corps primary flood damage reduction and plan evaluation tool, HEC-FDA, has been available for quite some time. Because of that, it has many users and we want the current version to be as effective as possible. Therefore, we continue to enhance the current version of FDA. Meanwhile, we are building a new version of FDA that will include many GIS capabilities that are also included in the HEC-FIA software discussed above. This way, FDA and FIA will be able to share the same structure inventory capabilities. These capabilities include the development of structure inventories from HAZUS (Federal Emergency Management Agency software), data or parcel data. With these tools, structure inventories may be updated in a cost effective and efficient manner, thus making our planning studies more cost effective and giving our decision makers some of the metrics to make their decisions faster. At this time, both tools are expected to have some sort of initial release this FY.

HEC is also proud to announce the initial release of HEC-ResPRM (Prescriptive Reservoir Model) which allows the user to optimize system reservoir operations across multiple purposes through the use of penalty functions. While an older version of HEC-PRM has "unofficially" existed for years, the release of HEC-ResPRM is the first release of the reservoir optimization tool that is compatible with the HEC-ResSim software. Now a user can build a schematic with either tool and share that schematic with the other. The output of HEC-ResPRM can be used to infer operation rules that then can be run in the reservoir simulation model, HEC-ResSim. If acceptable across a period-of-record simulation, the new optimized rules may be used for future reservoir operations.

Included with our last newsletter was a short description of the version of our CWMS software called HEC-RTS (Real-Time Simulation) which will be available to the public. It is gaining in popularity as it is being used by private entities as well as local agencies that don't have access to CWMS. Some of the most recent implementations of HEC-RTS include Mill Creek in the Nashville area and a private implementation by Southern California Edison. Instead of having an Oracle® database requirement like CWMS, HEC-RTS lets the user employ their own database along with the DSS (HEC Data Storage System) that stores the time series data for the models implemented in HEC-RTS. Even though it was originally designed and built for non-Corps users, HEC-RTS may be attractive to a few of the Corps Water Managers as well.

The above descriptions provide an overview of just a sample of the software development activities we are working on. For a more complete description of these tools, their enhancements and many of our other products, please go to our website, http://www.hec.usace.army.mil.

In closing, HEC's resources and tools continue to be sought domestically and internationally, and I believe the interest in HEC is not only because of the tools we offer but is also because of the level of professionalism, technical competency and support we provide. That said, the Corps continues to look for ways to perform their studies faster, more economically and efficiently so decisions can be made more quickly. Therefore, HEC will continue to offer the high level of support while looking for ways to implement methods and procedures to meet the newest goals of the Corps. If you have suggestions on how HEC could make our products better, faster and more efficient, we are interested in hearing from you.

Christopher Dunn, P.E., D.WRE
Director

HEC Flood Recovery Efforts in Bangkok, Thailand (continued)

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Thailand government un-water the airport.

A secondary effort was to meet with water resources experts in Thailand to initiate a relationship between U.S. and Thailand experts. The relationship is envisioned to be facilitated in conjunction with the Pacific Command (PACOM) and the U.S. Embassy. The USACE and Marine representatives met with several members of the Thailand government and military to discuss the airport. The Thailand government representatives informed the group that they had decided to just let the airport drain naturally over approximately the next thirty days and then work on reopening the airport which could take an additional three to six months. They did not anticipate needing any support from U.S. forces for un-watering the airport. They had originally planned to work an aggressive pump program to drain the airport, but pumping had become a sensitive issue with residents in the vicinity. The water in the airport would have had to be evacuated onto the local residents who had already suffered through prolonged flooding. Reopening the airport was no longer a priority. After this decision the USACE SMEs proceeded to concentrate on meeting with local water resource agencies. This was a somewhat difficult challenge, since many of the agencies were continually busy with the flood relief. However, the USACE SMEs successfully initiated working relationships with Thailand water resource agencies. The group met with the Royal Thailand Survey Department and was able to acquire mapping of the canal and pump system around Bangkok as well as mapping showing the general direction of overland flow. Next, they met with Dr. Seree Supaharatid of the Rangsit University Centre on Climate Change and Disaster. Dr. Supaharatid has a daily newscast on the Thailand PBS station discussing the current flood situation. The USACE SMEs also met in-person with the Royal Irrigation Department (RID). RID has a modern river flow monitoring system with real-time data collection, updated at one hour intervals and continuously monitored with closed circuit TV views of staff, gages and dam release gates. This system provides visuals of all the current data, graphs of previous data, and notifications when gages are not functioning. Updated equipment would greatly improve reliability. The telemetry equipment was supplied by DHI about twenty years ago. The next meetings were with Department of Disaster and Prevention and Mitigation (DDPM), Research and International Cooperation Bureau and with officials at the Department of Water Resources, Water Crisis Prevention Center, Water Operations Center. The main topic of conversation was real time forecasting.

Flooding at the Don Mueang airport

Although, initially, the Thailand government decided not to pump any water from the airport, ultimately they decided they could use some U.S. support to remove water from a portion of the airport. The water would be removed to another part of the airport. The Marine group was able to supply the pumping equipment to facilitate the drainage. Pumping concluded at the end of November.

As a result of the meetings with local agencies, discussions are moving forward toward the development of a U.S.-Thailand working group. This working group would produce LiDAR (Light Detection and Ranging) data of the region and two hydrologic/hydraulic models that could eventually be used for forecasting. HEC would be involved in this effort.

United States Marines set up a pump to remove water from a portion of the Don Mueang airport, Thailand's main domestic airport.

International Activities

Training Workshops in Ulaanbaatar, Mongolia

By Jeff Harris

In FY 2011, Jeff Harris and Cameron Ackerman, both from CEIWR-HEC, traveled to Ulaanbaatar (Ulan Bator), Mongolia and participated in a model building and technology transfer workshop in cooperation with the USACE Civil-Military Emergency Preparedness (CMEP) program. CMEP is a USACE program focused on international disaster planning, preparedness, and response. Its origin derives from the Office of the Secretary of Defense (OSD) and the Warsaw Initiative Program. USACE has been leading CMEP events on behalf of OSD since 1998. HEC has partnered with CMEP on several training missions.

CMEP representatives Justin Pummel (HQUSACE) and Doug Swanson (CENWP) presented an Introduction to ArcGIS® workshop. This workshop provided the Mongolian attendees a basic understanding of GIS and laid the groundwork for building HEC-HMS and HEC-RAS models.

Map of Mongolia

One challenge facing the residents of Ulaanbaatar is the threat of flooding from the Selbe River which runs north to south through Ulaanbaatar. Therefore, one of the main goals of this effort was to supply the Mongolians with operating HEC-RAS and HEC-HMS models for the Selbe River. During the first workshop, Mr. Ackerman and Mr. Harris took advantage of the opportunity to go to the Selbe River and take measurements and pictures of the channel and bridges. Also, there were local government representatives in the ArcGIS® training class who were able to coordinate with HEC and provide GIS and digital topography information.

The Selbe River in Ulaanbaatar, Mongolia. Ulaanbaatar is listed as the coldest national capital in the world. During the January training, the temperature never got above 0°F and the coldest was -23°F.

After returning to the U.S., Mr. Ackerman and Mr. Harris, with help from Matt Fleming (CEIWR-HEC), built HEC-HMS and HEC-RAS models of the Selbe River and updated PowerPoint presentations for HEC-HMS and HEC-RAS in preparation for the next class. They also updated the hands-on workshops to be used in the class to incorporate the Selbe River into the workshops so the participants were working on a river they were familiar with. All the materials were provided to the U.S. Embassy and were translated to Mongolian for the participants.

During the training, the lectures were given in English and a translator, supplied through the U.S. Embassy, translated them to Mongolian. The training, which

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Training Workshops in Ulaanbaatar, Mongolia

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took place at the Mongolian State University of Agriculture (MSUA) in Ulaanbaatar, had forty-eight Mongolian participants from approximately fifteen different organizations. There were several participants that had also attended the previous ArcGIS® training.

The HEC-HMS and HEC-RAS models of the Selbe River were given to the training participants. The HEC-HMS model included reproductions of two historic flood events and an approximation of the 1% chance exceedance flood. The amount of historical rainfall available to make estimates of hourly rainfall amounts for the two historic events was fairly sparse but provided a basis to generate a representative rainfall-runoff model of the basin. The HEC-RAS model provided results for the estimated 1% flow. In addition, some alternative runs were made that added and removed some levees to estimate the amount of flooding. All of the flooding visualization was done by Mr. Ackerman using the RASMapper extension of HEC-RAS. The participants in the training were happy to receive the models and class instruction. As they move forward, they hope to be able to update the models with any additional data they have and prepare more detailed models of the Selbe River.

South Korean Activities

By Cameron Ackerman, P.E., D.WRE; Christopher Dunn, P.E., D.WRE

The CEIWR-HEC Director, Mr. Christopher Dunn, and two CEIWR-HEC Senior Hydraulic Engineers, John Hickey and Cameron Ackerman, traveled to South Korea to participate in several activities. One activity was the 8th International Symposium on Ecohydraulics in Seoul, South Korea. Other activities included a one-day symposium on Integrated Water Resources Management (IWRM) with K-water in Daejeon, South Korea, and assistance in H&H efforts regarding Camp Humphreys' development plan.

8th International Symposium on Ecohydraulics

HEC was invited by Dr. Woo (Conference Chair) to provide a workshop on Ecosystem Restoration using HEC-EFM (Ecosystem Functions Model) and HEC-RAS to open the Ecohydraulics conference. Students were provided information on the Corps' and HEC's environmental mission and role in environmental restoration; using HEC-EFM to statistically identify hydrologic flow conditions; and, the use of HEC-RAS in evaluating restoration alternatives; and building ecosystem relationships. The students were then directed through a demonstration of using HEC-EFM and HEC-RAS to analyze habitat response to flow conditions identified from ecosystem functions/relationships. The workshop concluded with presentations on the HEC-GeoEFM ArcMap® extension; additional capabilities of HEC-RAS for evaluating riverine environments using water quality, water temperature, and sediment transport; and future directions for HEC-EFM. Approximately sixty students attended the workshop session, with a total conference attendance of about 800 people (500 South Korean, 300 from other countries).

Camp Humphreys

Messrs. Dunn and Ackerman then attended meetings at the Far East District (CEFED) office with Mr. Oh, Chief, E&C Division, Paul Wu, Ray Martin, Jay Pak, and other CEFED personnel. Discussions were about the current construction plans for Camp Humphreys (and the impact to storm water and interior flooding). The master plan to fully develop land acquired for the future Camp Humphreys' expansion will result in significant loss of natural detention storage, placing structures at risk to flooding. Initial calculations suggest the loss of detention storage could render parts of the facility vulnerable to flooding from a 100-year rainfall event. A levee on the left bank of the Ansang River, built and maintained by the South Korean government, protects Camp Humphreys from flooding up to roughly a 1% chance exceedance event. Interior flooding is of great concern, and local engineers are uncomfortable with previous efforts to define the 24-hour rainfall volumes due to widely varied gauged precipitation. HEC has been asked to perform statistical analysis of precipitation data to determine rainfall totals for input into the hydrology model (HEC-HMS), which will eventually lead to floodplain mapping. HEC has also been asked to perform an ATR (Agency Technical Review) of the final hydrologic analysis. Messrs. Dunn and Ackerman toured Camp Humphreys with Ray Martin to identify existing hydrologic conditions and get a feel for future built-out conditions. We also met with CEFED's main contractor, MMI, who is performing the hydrologic analysis.

8th International Symposium on Ecohydraulics and other Activities in South Korea

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IWRM

Messers. Dunn and Ackerman then traveled to the K-water headquarters in Daejeon, South Korea to participate in an IWRM symposium. Mr. Dunn presented on the Corps use of IWRM and Mr. Ackerman presented on HEC Tools for water resources modeling. K-water manages or co-manages forty-six dams in South Korea for hydropower, water supply, and flood control.

Daejeon, South Korea

Other Activities

HEC personnel also met with K-water President Yang (R&D Executive Director), Vice President Mr. Yum (Water Resources Division), Dr. Ko (Director, Korea Institute of Water & Environment), and Dr. Koh (Director, Water Resources Research Center) in a series of several meetings to discuss collaboration with USACE/IWR/HEC. K-water sent an employee to HEC for a one-year detail (see article below) to work with HEC engineers and gain a well-rounded understanding of HEC tools and initiate implementations for South Korean analyses and projects. HEC also received a briefing about the Four Rivers Project from Dr. Park, Head of the Four Rivers Project. The Four Rivers Project is an attempt to revitalize and restore the four main rivers of South Korea to provide green growth, recreation, improved navigation, and water supply to the country through the building of several low-head dams. There is some concern that the Four Rivers Project may create more environmental harm than good. Dr. Park's division is also responsible for the review and selection of water resources modeling software. He spoke very highly of HEC software, noting their regular use of HEC-RAS and HEC-HMS, and expressed an interest in HEC-ResSim.

Work Exchange with South Korean Water Resource Engineer from K-water

By Chan Modini, P.E.

From March 2011 through early January 2012, CEIWR-HEC hosted Dr. Byoungdong Oh, a senior hydraulic engineer from the South Korean water resource agency K-water. Dr. Oh holds a Ph.D from Chungbuk National University and has a P.E. registration in South Korea. In addition, he also has sixteen years of professional experience mostly in the area of Water Resources Engineering. In construction, he worked on major dam rehabilitation projects, flood control improvement projects, and actual dam construction. He also performed hydrologic investigations in support of water management

Dr. Byoungdong Oh

operations and stream flow data reliability. The goals for his time spent at HEC included learning the mission and role of HEC in the Corps, acquire new skills in HEC software, collaborate with the Center on Water Management Systems, and share his technical experience and knowledge. Dr. Oh collaborated with several personnel on the use of HEC-RTS and CWMS for watersheds in South Korea.

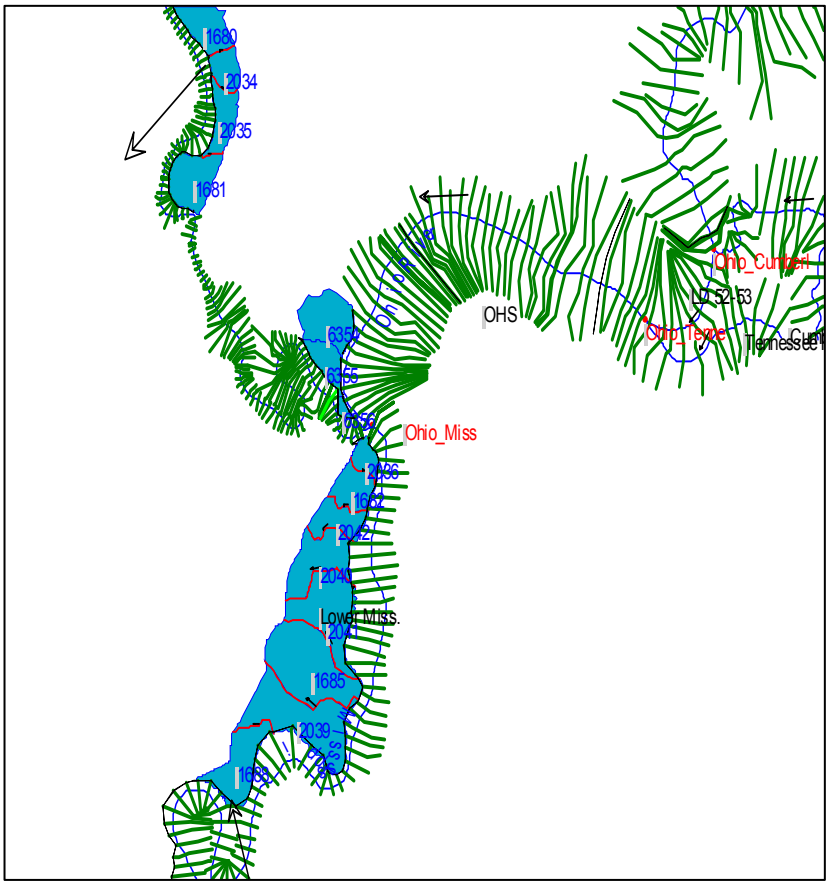
Operation of the Birds Point - New Madrid Floodway, Mississippi River Flood of 2011

By Gary W. Brunner, P.E., D.WRE and Cameron T. Ackerman, P.E., D.WRE

The Mississippi River & Tributaries (MR&T) project was authorized by the 1928 Flood Control Act, following the devastating flooding the prior year in the Mississippi Valley. Among other engineering methods, the MR&T project employed the use of an extensive levee system to contain flows, channel modifications to increase river capacity and improve navigation, and floodways to reduce flows on critical sections of the river. One such floodway that was developed was the Birds Point-New Madrid Floodway.

Completed in 1932, the New Madrid Floodway was designed to reduce flood stage on the Mississippi River at and above Cairo, Illinois. The floodway is separated from the Mississippi River by a 56-mile long levee that runs between Birds Point, Missouri and New Madrid, Missouri and is designed to divert 550,000 cfs from the Mississippi River which reduces the local river stages several feet with smaller reductions upstream on the Mississippi River and Ohio River. Operation of the floodway occurs through the removal of three fuse plug levee sections at the upper, middle, and lower sections of the levee during severe flood conditions.

An HEC-RAS model was developed jointly between the USACE and NWS for the Ohio River and significant portion of the Mississippi River upstream and downstream from the confluence. This model was applied during the 2011 floods to determine the impacts of operating the New Madrid Floodway. During flood operations, the HEC-RAS model used NWS flow forecasts, as well as USACE reservoir releases to determine flood water elevations on the Ohio and Mississippi Rivers. Multiple river forecasts were made each day as new observed rainfall, stage, and flow data became available. The model was used to forecast flows and stages for both twenty-four hour and five day future precipitation forecasts. Additionally, the model was used to evaluate multiple planning scenarios, in which the New Madrid floodway was operated at different times and levee breach widths.



HEC-RAS schematic at the confluence of the Ohio and Mississippi Rivers.

Results from the HEC-RAS modeling consisted of stage and flow hydrographs at points all along the river system, water surface profiles, and flood inundation maps for all of the evaluated scenarios. The HEC-RAS modeling results were used to assist in making decisions on flood fight efforts, as well as whether or not to operate the New Madrid floodway. The final decision to operate the floodway resulted in significant reduction in river stages on both the Ohio and Mississippi Rivers. The most significant stage reduction occurred at Cairo, just upstream of the floodway at the confluence of the Ohio and the Mississippi rivers. The models predicted that if the new Madrid floodway was not operated, the stage at Cairo would go over sixty-three feet. At the time of operating the floodway, the stage at Cairo was at 61.7 feet. Once the floodway was operated, the stage dropped over one foot in two hours, and ultimately resulted in a 3.5 foot reduction in stage at Cairo.

A Look Inside the Hydrologic Engineering Center

By Diane Cuming

The Hydrologic Engineering Center (CEIWR-HEC) was created in 1964, became a support office within the Institute for Water Resources (CEIWR) in 2000, and in a couple of years will be celebrating it's golden anniversary (50 years). Over the years the mission has remained the same - a technical center of expertise in hydrologic engineering and planning through research, training, technical assistance, and software development. The configuration and personnel of HEC has changed throughout the years, so lets take a look at the current configuration

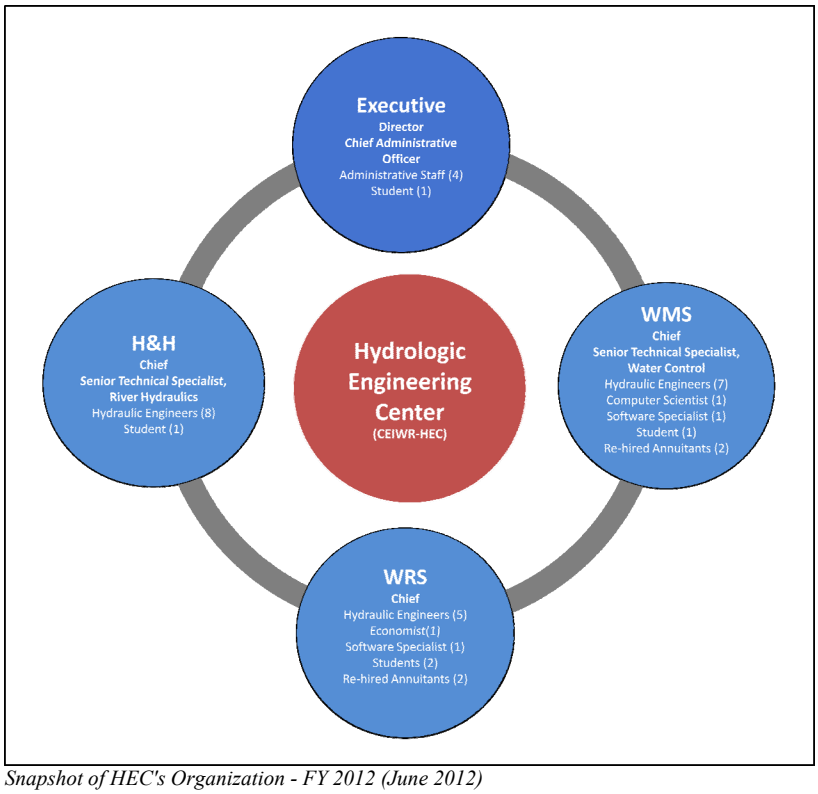
The current staff is at about forty-five employees, with thirty-five full-time employees, four re-hired annuitants, and six students. This includes hydraulic engineers with seventeen being registered professional engineers (California, Oregon, and Michigan); an economist; computer scientist; software specialists, and administrative staff. There are three Engineering Divisions within HEC and the Executive Office. Following is a brief overview of each Division and a snapshot of HEC's current organization.

The **Executive Office** through the Director provides guidance, policy, management and administrative support for the Center. Functional responsibilities include: financial, Human Resources (HR), contracting, and administrative support.

The **Hydrology and Hydraulics Technology (H&H) Division** administers the applied research program to develop systematic procedures for field application. The technical and functional responsibilities of the H&H Division are: research program administration; surface water hydrology; river hydraulics and surface erosion/sediment transport; hydrologic statistics; H&H GIS; and, HEC software engineering/ integration standards and practices.

The **Water Management Systems (WMS) Division** provides support for technical studies and water control management. Technical and functional responsibilities of the WMS Division are: water control management technology; data acquisition, communications and management; CWMS models applications and support; hydrology and hydraulics forecasting; reservoir regulation; HEC software engineering/integration standards and practices; and, IT management and administration through ACE-IT.

The **Water Resource Systems (WRS) Division** manages the training and technical transfer activities of the Center and develops and integrates analytical methods for water resource planning activities. Technical and functional responsibilities of the WRS Division are: training program administration; reservoir systems; water resource systems optimization; flood risk management analysis including consequence analysis; risk analysis; river/ecosystem restoration; and, watershed studies.



Snapshot of HEC's Organization - FY 2012 (June 2012)

HEC Role in Agency Technical Reviews (ATR) of Risk Analysis

By Matthew McPherson, P.E., D.WRE

In November 2010, the Corps' Chief of Engineering and Construction, Mr. James Dalton, requested the Institute for Water Resources work through CEIWR-HEC and the Hydrology, Hydraulics, and Coastal Community of Practice (HH&C CoP) to "prepare a strategy for developing and fielding guidance and training on the appropriate identification, analysis and written communication of risk and uncertainty for planning decision documents". Mr. Dalton also directed HEC to coordinate with CEIWR-RMC, Flood Risk Management Planning Center of Expertise (FRM-PCX), and PCX-CSDR on ATRs to "ensure all Planning decision documents involving HH&C related risk reduction measures are fully reviewed and all issues resolved", until vetting enough SMEs from the field to support the ATR process.

In December 2010, Mike Deering, HEC senior hydraulic engineer, and Christopher Dunn, Director, HEC, proposed a ten-point "Strategy for Developing and Maintaining RA Competency". The primary elements of the plan consist of:

1) Updating Corps guidance that addresses risk analysis such as ER 1105-2-101 (Risk Analysis for Flood Damage Reduction Studies) and EM 1110-2-1619 (Risk-Based Analysis for Flood Damage Reduction Studies),
2) Identifying the Corps current experts and establishing a risk analysis area of expertise within the HH&C CoP,
3) Creating a review checklist to promote consistency in reviews,
4) Creating a template risk analysis report to guide Project Delivery Teams and other risk communicators,
5) Preparing and conducting training in the application of EC 1165-2-209 to ATR of risk analysis reporting, including use of the checklist and template, and
6) HEC staff members serving as needed on ATR teams regarding risk analysis

Implementation of the strategy began in the summer of 2011 as funding became available, and culminated in a workshop held at HEC 24-26 January 2012, in partnership with the FRM-PCX. The group consisted of thirty-one SMEs in hydrology, hydraulics, geotechnical, economics, and planning, from HQ, FRM-PCX, CSDR-PCX, CEIWR, RMC, HEC, and field offices across six MSC's. Also, the group clarified the purpose of the risk analysis ATR team member, confirmed availability of a vetted pool of reviewers, provided feedback about a list of review considerations for both the ATR and DQC level, determined the need for a section in Planning reports that summarizes the key risks and uncertainties of a project, and discussed the proposal for a separate appendix consolidating the risk information.

For more information, please contact Matt McPherson of HEC or Eric Thaut of the FMR-PCX.

CWMS Version 2.0 Implementation Working Session

By Chan Modini, P.E.

During the week of 31 January 2011, HEC hosted a CWMS Version 2.0 Implementation Working Session in Davis, CA. There were over twenty-five personnel from over seventeen different Corps offices and the Lower Colorado River Authority (LCRA) attended this working session. CWMS Version 2.0 was released in the summer of 2010. Mr. Carl Franke and Mr. Bill Charley in addition to other Water Management Systems Division personnel helped lead this working session. The goal of this four-day working session was to familiarize water management field personnel with the latest features in Version 2.0 and provide an opportunity to work with the software.

On the first day, instructors provided an overview of the CWMS database, Account Management, and Data Acquisition, which included reception and transmission of data. The day concluded with the focus on the capture of data streams using the Local Data Manager (LDM), a collection of "cooperating programs" that capture, manage, and distribute data products. On the second day, instructors provided an overview of NetApp storage devices, CWMS Data (Oracle® and HEC-DSS), CWMS Administration Tasks, and CWMSVue (CWMS version of PC-based HEC-DSS). Also covered was a discussion on the Local Readout Ground Station (LRGS) which can obtain data simultaneously from a variety of sources including domestic satellite (DOMSAT), NOAAPORT receivers and other network feeds. The working session focused on the LRGS data feeds and the use of CWMSVue. The third day covered the new CWMS computational processor (CCP), migration of existing watersheds and data, and data exchange. The presentation on data exchange focused on the interaction between the Oracle® database and HEC-DSS. On the fourth and final day, topics included Gridded Data, the Application Programming Interface (API) to Oracle®, Jython scripting, and report creation. Discussion of report creation focused on using the REPGEN application and newer tools such as the CWMS API in combination with Jython scripting. Feedback from the class indicated that the working session was well received. With the release of Version 2.1, HEC expects to offer a similar working session for the new version of CWMS.

PROSPECT Training Program

FY12 Current Training Program & FY13 Proposed Training Program

By Kayla Myrick

The PROSPECT training program at CEIWR-HEC for FY 2012 has offered traditional classes, such as Water and the Watershed, Hydrologic Analysis for Ecosystem Restoration, and twelve other classes.

The courses with available seats for the remainder of this fiscal year are Unsteady Flow Analysis with HEC-RAS (9-13 July 2012) and Flood Frequency Analysis (23-27 July 2012).

As students continue to gain insight into water management through these core courses, we are excited to release the proposed FY 2013 PROSPECT training schedule featured in the table below.

To register for our classes, please contact the appropriate section in your office or contact the PDSC.

The students featured above participated in Hydrologic Modeling with HEC-HMS

Registration is handled by Training and Operations (CEHR-P-RG). Course descriptions are provided in the "Purple Book" at the PDSC site, http://pdsc.usace.army.mil. A short description and course agendas are also provided on HEC's website under the Training web page.

Please sign up early to help ensure these classes will be taught. For enrollment information, contact the PDSC in Huntsville with the course number, name, date, and location:

CEHR-P-RG
USACE Professional Development Support Center (PDSC)
550 Sparkman Drive
Huntsville, AL 35817
Phone: (256) 895-7421
FAX: (256) 895-7465

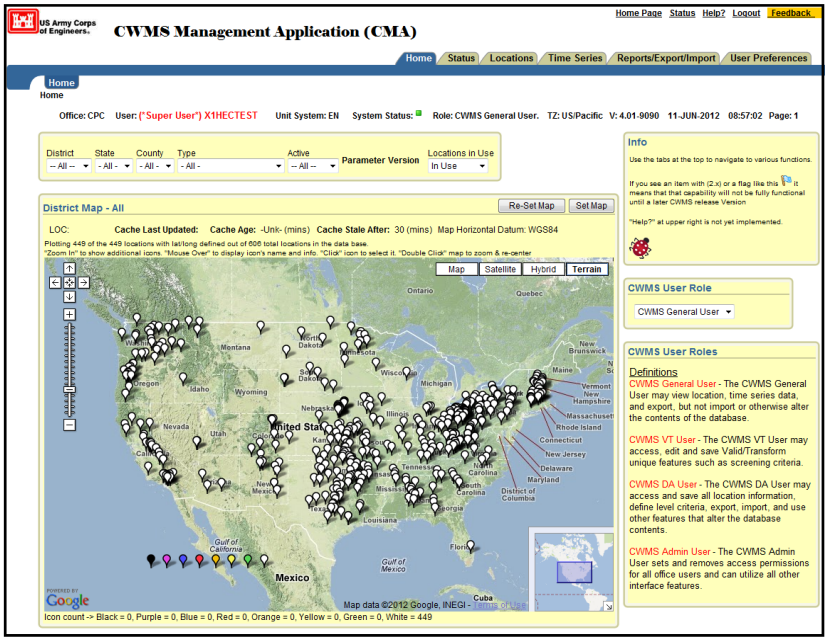
Course Number	Course Title (all classes located in Davis, CA)	Dates
155	CWMS Modeling for Real-Time Water Management	15-19 Oct 2012
164	Water and the Watershed	29 Oct-2 Nov 2012
369	Advanced Applications of HMS	10-14 Dec 2012
98	Reservoir System Analysis with HEC-ResSim	28 Jan-1Feb 2013
122	Sediment Transport Analysis with HEC-RAS	4-8 Feb 2013
209	Risk Analysis for Flood Damage Reduction Projects	25-29 Feb 2013
320	H&H for Dam Safety Studies	11-15 Mar 2013
152	Water Data Management with HEC-DSSVue	25-29 Mar 2013
161	Hydrologic Analysis for Ecosystem Restoration	8-12 Apr 2013
219	Hydrologic Engineering Application for GIS	22-26 Apr 2013
60	Consequence Estimation with HEC-FIA	6-10 May 2013
67	Advanced Steady Flow Analysis with HEC-RAS	3-7 Jun 2013
139	Water Quality Modeling with HEC-RAS	24-28 Jun 2013
58	Statistical Methods in Hydrology	8-12 Jul 2013
43	Water Resource Analysis Using HEC-WAT	22-26 Jul 2013

HEC's FY 2013 Proposed PROSPECT Training Program

CWMS (Corps Water Management System) Version 2.1

By Thomas A. Evans, P.E., Ph.D. & Kayla Myrick

CWMS is an automated information system that supports the Corps' water management mission by providing districts and divisions with a consistent set of tools to collect, process, and store hydro-meteorological data and make it available for evaluation and operational forecasting. This integrated system of hardware and software, originally released in 2001, has improved decision making concerning water control management for over a decade. CEIWR-HEC is excited to announce the release of CWMS 2.1. The updated version features key revisions to the program which will meet more user needs.



The incorporation of Google map tools into CWMS 2.1 allows users to view location and time series spatially.

The most prominent improvement over the preceding release is the integration of the CWMS Computational Processor (CCP) into CWMS. CCP was originally developed by ILEX Software, now a subsidiary to Sutron, and will be used for screening, validation, and transformation of field data for posting to the CWMS database.

Another key development featured in CWMS 2.1 is the CWMS Management Application (CMA). The CMA is a web-based interface for viewing and modifying relational data in the CWMS database. Google map tools enable the user to view locations and time series spatially in addition to tabular format. A major feature is the ability to export data to an Excel® supported spreadsheet, edit the data on your local machine, and import the data to update the CWMS database. This feature enables users to easily update relational data for locations, time series as well as SHEF criteria files.

Other improvements include upgrades to the modeling components HEC-HMS, HEC-ResSim, and HEC-RAS, as well as updates to the model interface to RiverWare, making it compatible to work with the current version of RiverWare. RiverWare is a product of CADSWES in Boulder, Co.

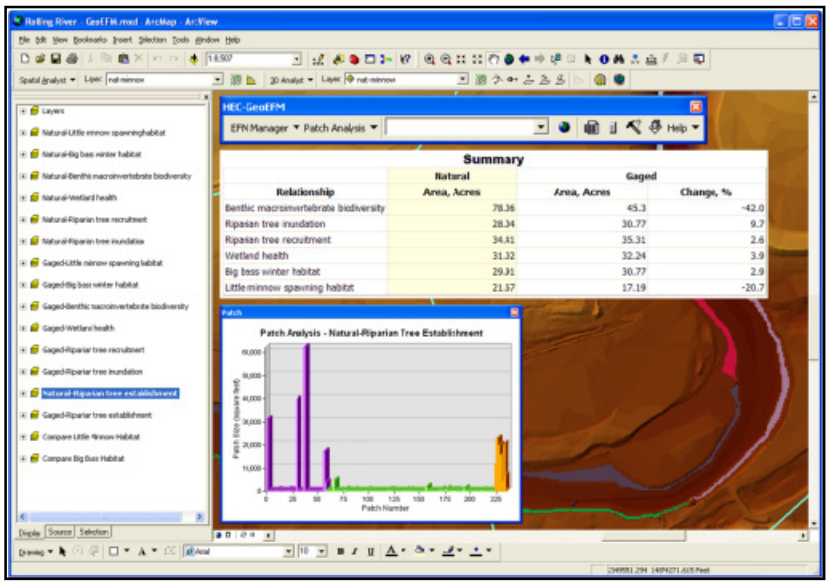
The testing of data acquisition, database, and modeling components of Version 2.1 began in November of 2011. The primary test sites were core district offices in Albuquerque, Omaha and the Northwestern Division, which ran the new version in parallel with their 2.0 production systems. The Los Angeles and Nashville district offices also aided in testing features of the new version.

On a related note, HEC has begun working on the national implementation of CWMS to build models that will be used for real time water management throughout the Corps. Following the success of the Accelerated CWMS campaign in 2010, which implemented CWMS watersheds in eleven district offices, Corps headquarters has tentatively approved the plan of a large scale deployment that would create modeling and data support configurations for every watershed managed by USACE in the U.S. HEC looks forward to this continued advancement in water control management as CWMS becomes more available throughout the U.S.

HEC-GeoEFM Version 1.0

By John Hickey, P.E.

HEC-GeoEFM is an ArcMap® extension developed to support spatial analyses commonly used during applications of the Ecosystem Functions Model (HEC-EFM). Use of HEC-GeoEFM requires a user license for ArcView® 9.3 or 9.3.1. Spatial Analyst® and 3D Analyst® extensions for ArcMap® must also be installed and activated.



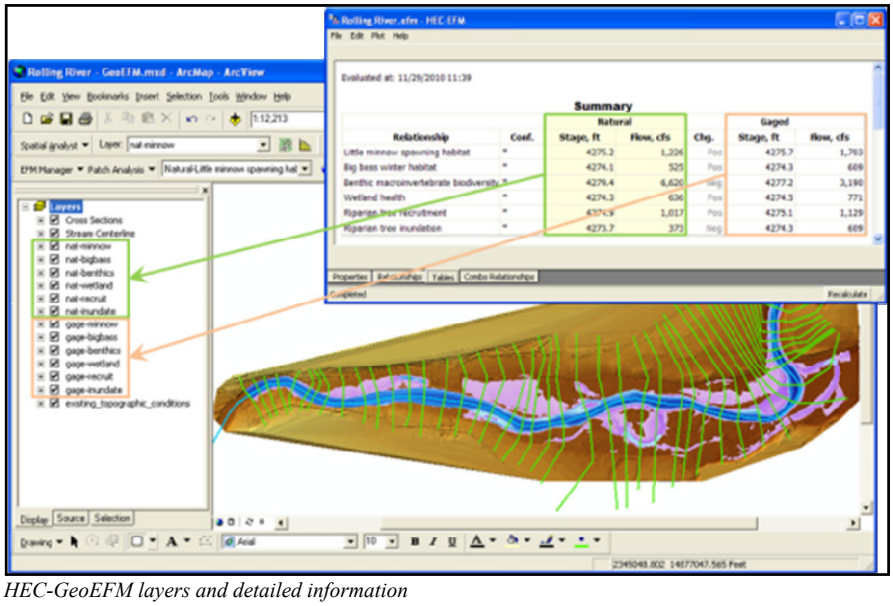
HEC-GeoEFM basic interface

HEC-GeoEFM provides three primary capabilities for users planning ecosystem restoration projects or water management scenarios: 1) management of spatial data sets, 2) computation and comparisons of habitat areas, and 3) assessment of habitat connectivity.

Use of HEC-GeoEFM requires a solid understanding of HEC-EFM. EFM is a planning tool that helps analyze ecosystem response to changes in the flow regime of a river or wetland. The process of applying EFM involves three basic phases: statistical analyses, river hydraulics modeling, and spatial analyses. Results from the statistical phase are input to external hydraulic models (i.e., HEC-RAS) that generate layers of water depth, velocity, and inundation, which are then used in GIS to investigate spatial criteria and results for the flow regimes and relationships. GeoEFM is used in the third and final phase (spatial analyses) of the EFM process.

GeoEFM was developed through a partnership between CEIWR-HEC and the Environmental Systems Research Institute, Inc. (ESRI), in recognition of both the power of GIS and the importance of ecological considerations in water systems.

HEC-GeoEFM is available for download from the HEC website at http://www.hec.usace.army.mil/software/hec-geoefm/downloads.html. The HEC-GeoEFM User's Manual (CDP-80b) is available at http://www.hec.usace.army.mil/software/hec-geoefm/documentation.html.



HEC-GeoEFM layers and detailed information

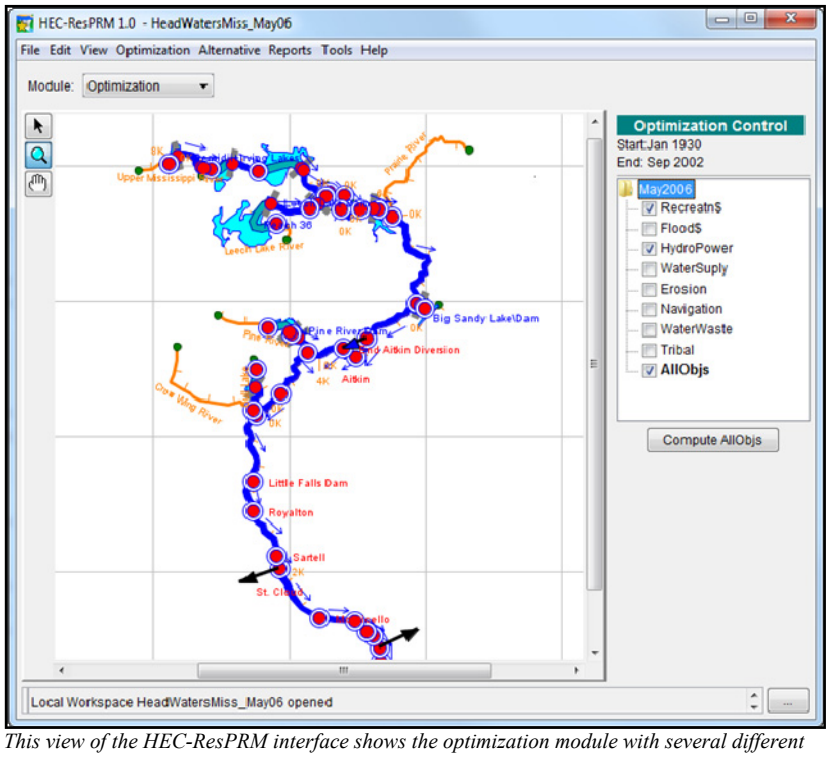
HEC-ResPRM (Prescriptive Reservoir Model) Version 1.0

By Sara O'Connell, P.E.

The Hydrologic Engineering Center (CEIWR-HEC) announces the release of Version 1.0 of its reservoir system operations optimization software, HEC-ResPRM (Prescriptive Reservoir Model).

HEC-ResPRM performs deterministic network-flow optimization of reservoir system operations. HEC legacy software, HEC-PRM is the computational core of the GUI-based and more user-friendly HEC-ResPRM software.

HEC-PRM prescribes optimal values of flow and storage over time by formulating the operating problem as a minimum-cost network flow problem. The objective function of this network problem is the sum of user-defined penalty functions representing different interests in the system. The multi-objective nature of water resource problems is addressed by allowing any number of penalty functions (including those with differing units) to be added at any network location. Penalties can be quantified using monetary or nonmonetary units, with exchange rates and priorities reflected using weights. A modified Simplex Algorithm is used to determine the optimal allocation of water within the system. A PRM compute uses a monthly time step and optimizes over the entire time window and network simultaneously, resulting in perfect foresight and perfect system coordination. Perfect foresight of the entire time-window tends to produce operations than are not achievable in reality (where foresight is not perfect) and makes the software less useful on a real-time basis. However, foresight can be limited by the option to optimize only a year at a time across the period of record. PRM's primary utility lies in its ability to determine the best possible operations and trade-offs between objectives. This information can then be used to identify the optimal long-term operational strategy or to improve upon rules developed over years of experience and observation.



This view of the HEC-ResPRM interface shows the optimization module with several different single-objective optimization scenarios, each focusing on a different interest. The individual objectives were also combined to form a multi-objective scenario that balances all interests.

A PRM run results in time-series of optimal flows and storage volumes throughout the network. The HEC-Res graphical user interface allows users to easily visualize the system and produce default or custom plots of input and results. HEC-ResPRM shares the HEC-Res interface with HEC-ResSim, HEC's reservoir system simulation tool. This shared framework facilitates the joint development and use of simulation and optimization models. HEC-Res allows different network configurations and model runs to be managed and visualized within a single interface, thus forming a robust platform for complex, data-intensive modeling studies. HEC's Data Storage System (HEC-DSS) is used for efficient storage and retrieval of input and output time-series data.

The simplicity and versatility of the HEC-PRM model formulation has enabled its use in a wide variety of studies. Fields of application include development of reservoir system operating rules, shared vision planning, multi-objective management, hydrologic-economic modeling, conflict resolution, climate change impact assessment, and trans-boundary cooperation. PRM has been applied to several large and complex water systems including the Columbia River System, the Missouri River System, the Mississippi Headwaters, and California's water resource system.