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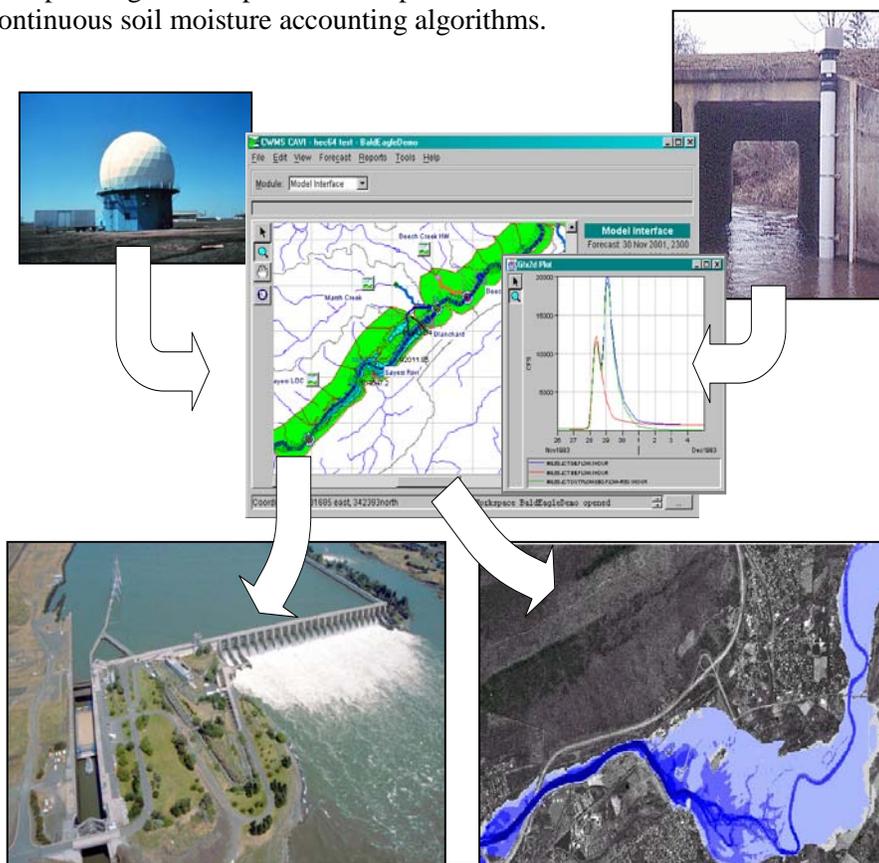
## Flood & Coastal Storm Damage Reduction R&D Program

# Flow/Stage Forecasting Enhancements

### Description

The Corps Water Management System (CWMS) is an integrated comprehensive data acquisition and hydrologic modeling system for short-term real-time decision support of water control operations that has been implemented at U.S. Army Corps of Engineers offices throughout the United States. CWMS, a Corps Army Information System (AIS), retrieves precipitation, river stage, gate settings, and other data from field sensors and validates, transforms, and stores those measurements in a database. The measurements are used for calibration and adjustment of hydrologic and hydraulic models to reflect current conditions. Once the models have been adjusted to reflect current hydro-meteorological conditions within a watershed, they are executed to produce forecasts of hydrologic conditions that will assist water managers to evaluate the effects of their operating decisions in the near future.

The flow and stage forecasting enhancements are to investigate and implement methods to better represent soil moisture conditions and the partitioning of rainfall into direct runoff and losses in the hydrologic modeling components of CWMS. This includes developing appropriate automated parameter adjustment methods for use in real-time forecasting, and incorporating more sophisticated representations of the soil column in CWMS, such as continuous soil moisture accounting algorithms.



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<https://swwrp.usace.army.mil/>

The enhancements also include investigating and implementing algorithms to utilize probabilistic forecast information in the CWMS forecasting /modeling programs. This includes retrieving, decoding, processing and storing Ensemble Streamflow Prediction (ESP) data from the National Weather service. These data sets will be used as input to Hydrologic Engineering Center-Reservoir System Simulation program (HEC-ResSim) to model and simulate operational decisions from the multitude of probabilistic flows from the data sets and calculate probability limits and confidence bands. The results will show the input ESP data, probability limits, confidence bands, and other results, in both tabular and graphical outputs.

**Benefits** The flow and stage forecasting enhancements will improve forecasting for both short-term and seasonal water control operational decisions. This will provide decision-makers with superior information for improved water control operations and the potential reduction in flood damages and improved management of conservation of water in reservoirs. The use of Ensemble Streamflow Prediction will provide confidence bands to indicate statistical accuracy of forecasts and operations. Continuous soil moisture accounting algorithms will provide an initial estimate of flows and stages for a quick response in short-term (flashy) watersheds, such as those in Los Angeles County, California.

**Status** CWMS version 2.0 is being prepared for a release in winter 2008. Some enhancements have been made to the precipitation modeling portion of CWMS. A study has been completed on the applicability of continuous soil moisture accounting and how to incorporate it into CWMS. An initial rough design on the use of ESP and HEC-ResSim has been preformed. HEC-ResSim is currently being integrated into the National Weather Service River Forecast System (NWS-RFS) for use on the Yuba-Feather system in California with Ensemble forecasting.

**Distribution Source(s)** CWMS is currently available for Corps offices only. A public release of CWMS is planned for spring 2008, and will be available from: [www.hec.usace.army.mil](http://www.hec.usace.army.mil).

**Available Documentation** Complete documentation, User's Manuals, program briefings, etc., are available for download at the CWMS Web site at: <https://cwms.usace.army.mil>.

**Available Training** A one-week CWMS modeling class is offered at HEC through the PROSPECT training program each year. The tuition cost is approximately \$2,500. Various CWMS workshops are given throughout the year at HEC and at District offices.

**Available Support** CWMS is fully supported, including a 24x7 helpdesk through both e-mail and phone.

**Application** CWMS has been in use by the majority of Corps Water Control offices since 2002. Numerous papers have been presented on the practical use of CWMS for water control. CWMS has been requested by various national and international non-Corps agencies, and has been implemented by the Lower Colorado River Authority (LCRA) in Texas.

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**Partners** CWMS is developed by the Hydrologic Engineering Center. Support has been received from Corps Water Control offices and the Lower Colorado River Authority (LCRA) in Texas.