



National Water Model

Improving NOAA's Water Prediction Services



In August 2016, NOAA took a giant leap forward in its ability to forecast the flow of rivers and streams throughout the entire continental United States with the launch of the

new high resolution National Water Model (NWM).

The NWM will enhance and expand NOAA's water flow forecasts, which to date have been available for approximately 4,000 river locations with stream gages operated by the U.S. Geological Survey. This new model will expand forecasts to 2.7 million stream locations nationwide. Leveraging the full network of nearly 8,000 U.S. Geological Service stream gauges and NOAA's investment in atmospheric modeling, the NWM will provide high-resolution forecasts of soil moisture, surface runoff, snow water equivalent, and other parameters.

We all recognize that water is an essential component of sustainable and resilient communities. But its also a stressed natural resource and potential threat to life, property, and livelihoods during extreme weather events.

Improved Water Information Services

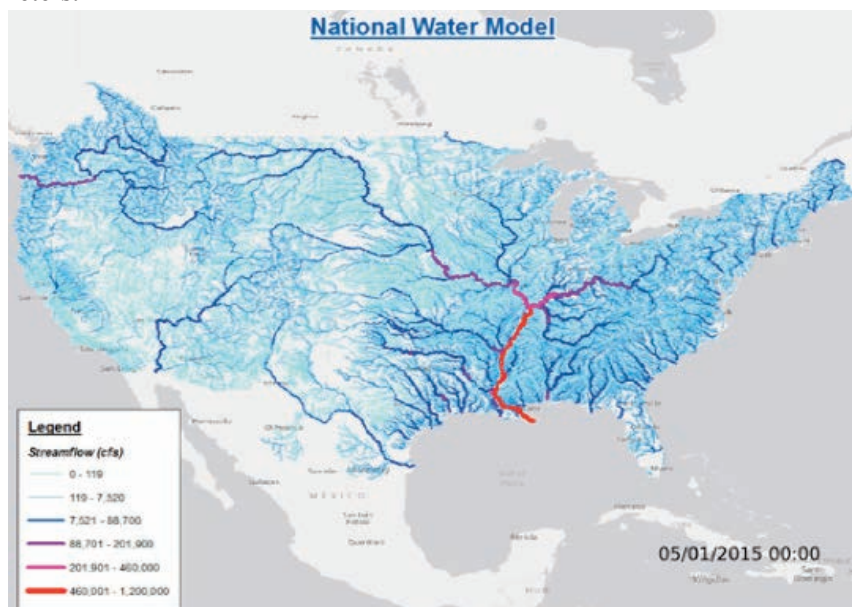
The new NWM improves the National Weather Service's ability to deliver impact-based decision support services nationwide by providing "street level" water information and guidance, as well as serve as the foundation for additional private sector water services. At a minimum, the NWM will immediately provide predictive water information for many locations where none previously existed.

Initially, this new NWM-based information will be particularly useful in headwater areas in support of NOAA's flash flood mission.

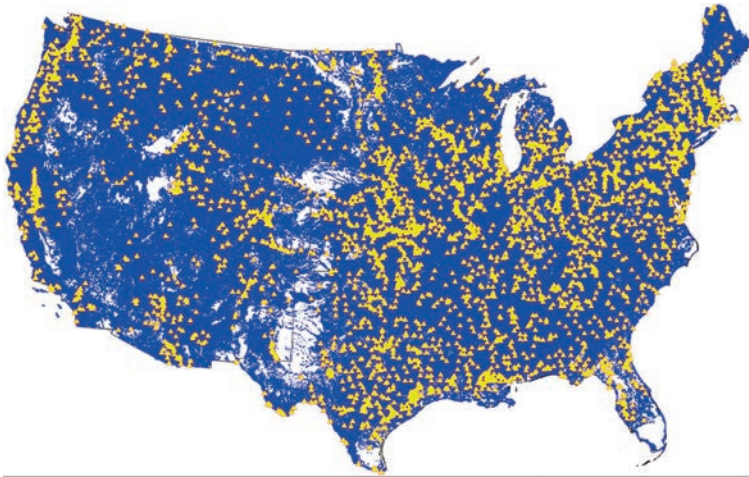
How it Works

The NWM simulates the water cycle with mathematical representations of the different processes and how they fit together. This complex representation of physical processes such as snowmelt and infiltration and water movement through the soil layers varies significantly with changing elevations, soils, vegetation types and a host of other variables.

Additionally, extreme variability in precipitation over short distances and times can cause the response on rivers and streams to change very quickly. Overall, the processes are so complex that to simulate it with a mathematical model means that it needs a "supercomputer" in order to run in the time frame needed to support decision makers when flooding is threatening.



National Water Model is a new forecasting tool that will help forecasters predict when and where flooding can be expected.



National Water Model provides many more locations nationwide with streamflow forecasts (blue) than the current Advanced Hydrologic Prediction Services of only about 4,000 locations (yellow).

The National Water Model is a cornerstone of the new NOAA Water Initiative, designed to provide more closely integrated water predictive capabilities to promote resilience to water risks. NOAA is seeking to establish an Integrated Water Prediction effort to deliver a suite of more holistic water intelligence products to help communities and industries make better-informed decisions about water management and how to prepare for and respond to extreme water events.

The Integrated Water Prediction initiative will bring together the National Water Model with coastal inundation models developed by the National Ocean Service to transform the nation's water prediction capabilities at the coast. This will bring a new generation of water-level products and forecasts for coastal communities that do not receive a hydrological forecast.



A Collaborative Effort That Will Pay Great Dividends

The NWM is a collaborative effort among a number of academic and federal research partners. The basis for the NWM is the community-based WRF-Hydro framework developed by the National Center for Atmospheric Research (NCAR).

The development and implementation of the NWM is the result of strong collaboration with NCAR and a partnership with the Consortium of Universities for the Advancement of Hydrologic Sciences, Inc., the National Science Foundation, and Federal Integrated Water Resources Science and Services partners.

To learn more about the National Water Model, visit <http://water.noaa.gov/about/nwm>, and NWS's Office of Water Prediction, visit <http://water.noaa.gov>.

Transforming NOAA Water Prediction	
TODAY	THE FUTURE
Approximately 4000 forecast locations at points	Approximately 2,700,000 forecast stream reaches
Forecast river flow/stage	Forecast all hydrologic parameters which define the water budget
Driven by large catchment "lumped" modeling	Driven by high resolution Earth System modeling
Average basin size greater than 420 square miles	Average basin size ~1 square mile
Impact-based forecasts at selected points	Predictions linked with detailed local infrastructure data to communicate street level impacts
13 River Forecast Centers developing separate versions of the same regional model	NOAA, academia, and federal partners developing/evolving same national, community-based model
For the hydrology community, the implementation of the NWM and the leap ahead capability it provides parallels the implementation of mesoscale atmospheric models in the 1970s (i.e., model resolution substantially greater than available observational network)	

Comparison of NOAA water prediction capabilities prior to and after the start of the National Water Model.

“Flash floods, punishing droughts, rising sea levels and harmful algal outbreaks are just a few of the problems we expect to worsen as the climate changes and high-impact weather events become more frequent. Strengthening our nation's water prediction and information services is a critical component for addressing that threat.”

NOAA Administrator Dr. Kathryn Sullivan