

# TRANSFORMING NOAA WATER PREDICTION

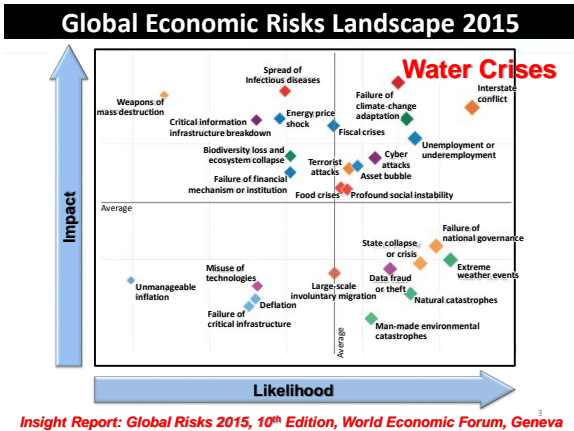
*Informing Decisions for a Water-Prepared Nation*

**AMS Washington Forum  
Water Resources Session**  
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Washington, D.C.

**Tom Graziano, Ph.D.**  
Acting Director, National Water Center  
National Weather Service, NOAA

## Outline

- Impetus for Change
  - Economic Security
  - Grand Challenges in Water
  - Stakeholder Priorities
- NWC Status and Plans
- Deep Dive into New Prediction Capabilities
- Partnering to Accelerate R2O
- Summary



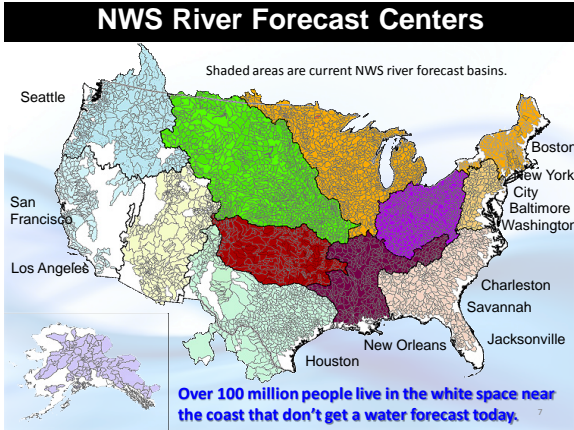
### WATER EXTREMES

**WATER SECURITY**

**WATER QUALITY**

**Interrelated Grand Challenges**





### National Water Center

Initial Operating Capacity: May 26, 2015

A catalyst to transform NOAA's water prediction program

**Mission: Nationally Integrated Water Prediction**

- Earth system modeling and geo-intelligence for water prediction
- Operations Center for water resources common operating picture
- Decision support services for spectrum of water stakeholders
- Proving ground to accelerate research to operations
- Interagency and Academia Collaboration

### Transforming NOAA Water Prediction

TODAY	THE FUTURE
Approximately 4000 forecast locations at points	Approximately 2,700,000 forecast stream reaches
Forecast river flow/stage, from summit to coastal zone	Forecast all hydrologic parameters which define the water budget, from summit-to-sea
Driven by large catchment "lumped" modeling	Driven by high/hyper resolution Earth System modeling
Forecaster "in the loop" – serial, basin to basin, modeling of flow through the river network	Forecaster "over the loop" – simultaneous modeling of the nation's entire river network (leveraging NCAR's WRF Hydro System)
Average basin size greater than 420 square miles	Average basin size ~1 square mile
13 River Forecast Centers (RFCs) developing separate versions of the same regional model	13 RFCs, NWC, academia, and federal partners developing/evolving same state-of-the-science national model
RFC-generated river forecasts coordinated with Weather Forecast Offices (WFOs) to deliver impact-based forecasts at selected points	National Water Model-based predictions coordinated among NWC, RFCs, and WFOs and linked with detailed local infrastructure data to communicate street-level impacts

### National Water Model (NWM)

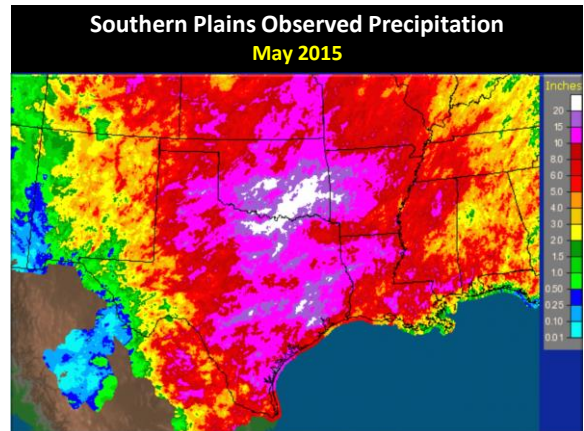
IOC Experimental Output (FY16 Q4)

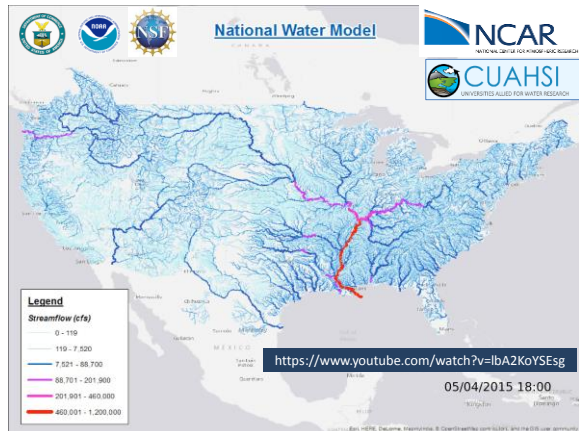
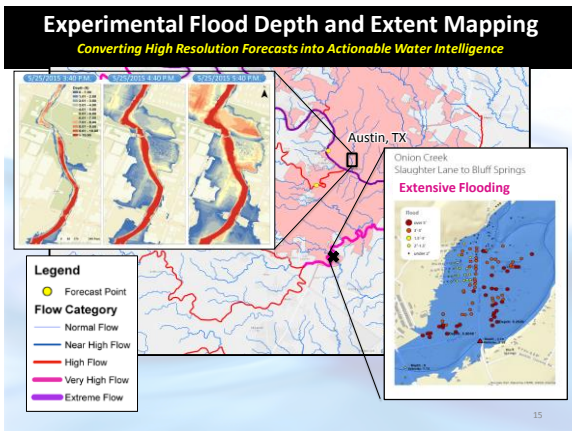
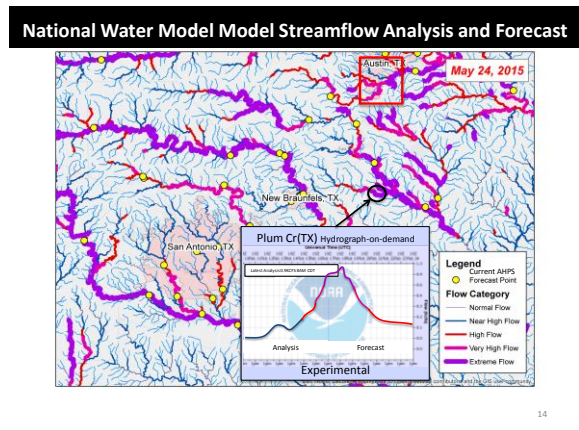
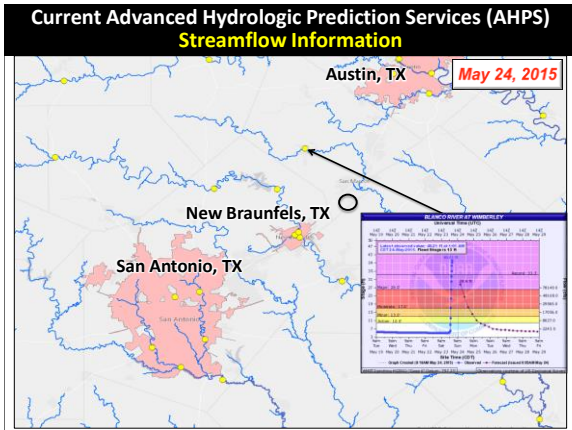
- **Hydrologic Output**
  - River channel discharge and velocity at 2.7 million river reaches
  - Surface water depth and subsurface flow (250 m CONUS+ grid)
- **Land Surface Output**
  - Soil moisture on 1km CONUS+ grid
- **Data Services**
  - Public-facing NWC website
  - Data feed to River Forecast Centers
  - NOMADS data service (NOAA National Operational Model Archive & Distribution System)

Current NWS AHPs locations (red)  
NWM output locations (blue)

Howard County, Maryland (300k People)

Current River Forecast Locations: Zero  
NWM Forecast Locations: 300+ [1]





### NWC Innovators Program

- Partnership between **NWS and the academic community** (Interagency Agreement between NSF and NOAA)
- Two Thematic Goals
  - Provide a **framework for collaboration** between the federal and academic communities that fosters innovation and creativity, and enables a pathway for that innovation to transition into operational water prediction
  - Target emerging technologies** such as advanced water resources modeling capabilities, cutting edge data and interoperability services, or interdisciplinary techniques aligned with NOAA and the NWC's strategic Science and Service

### National Flood Interoperability Experiment (NFIE)

(Sept 2014 to August 2015)

- First instance of the **NWC Innovators Program**
- Included a **Summer Institute** for 44 graduate students from 19 Universities at the National Water Center, June 1 to July 17, 2015 on the University of Alabama Campus and NWC
- Demonstrated ability to **simultaneously model the entire continental United States** river network at high spatial resolution, in near real-time for 2.7 million stream reaches
- A more elaborate version of this prototype is being made operation as the **National Water Model** in June 2016 at the National Water Center

## Summary

- **NOAA's Water Services are Evolving**
  - Deliver comprehensive, integrated actionable water intelligence
  - Complement current services with new information spanning Summit-to-Sea, Floods to Droughts, Treetops to Bedrock
- **Implementing State-of-the-Art Technical Approach**
  - Water prediction through state-of-the-science earth system modeling
  - Impact-based decision support services underpinned by geo-intelligence
- **Scale Change: Orders of Magnitude More Data**
  - Reach-based "Street Level" prediction
  - High Performance Computing
- **New Organization, Cornerstone Facility and Philosophy**
  - National Water Center
  - Collaborative, cross-NOAA, interagency, academic partnerships

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