National Flood Interoperability Experiment:

Leveraging National Hydrography Dataset to explore the future of flood forecasting

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Goals
National Flood Interoperability Experiment

Close the gap between national flood forecasting and local emergency response

- Impact at the street level

Create real-time flood information services

- Shared among organizations, geographies, people

Engage academic community through the National Water Center

- Innovation for transformative change
- Glimpse the future of hydrologic forecasting

Why – People

On Average, more people die annually from flooding than from any other form of natural disaster

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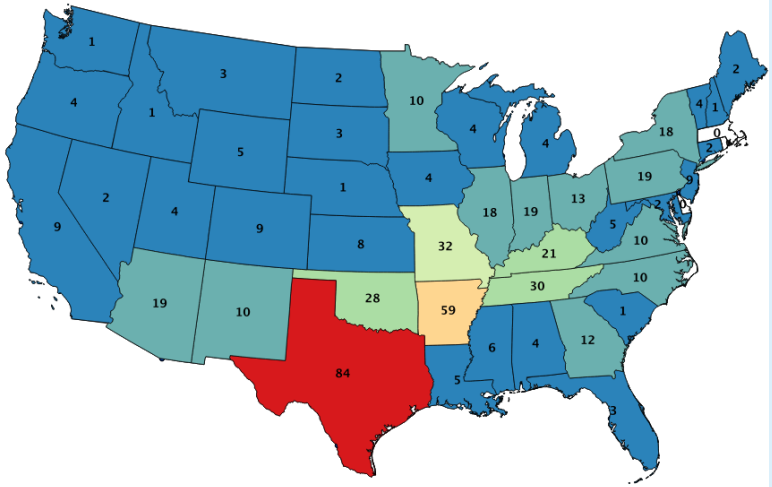
2 dead as flash floods slam Arizona, Nevada

By **Josh Levs, Catherine E. Shoichet**, and **Amanda Watts**, CNN
updated 11:09 AM EDT, Tue September 9, 2014

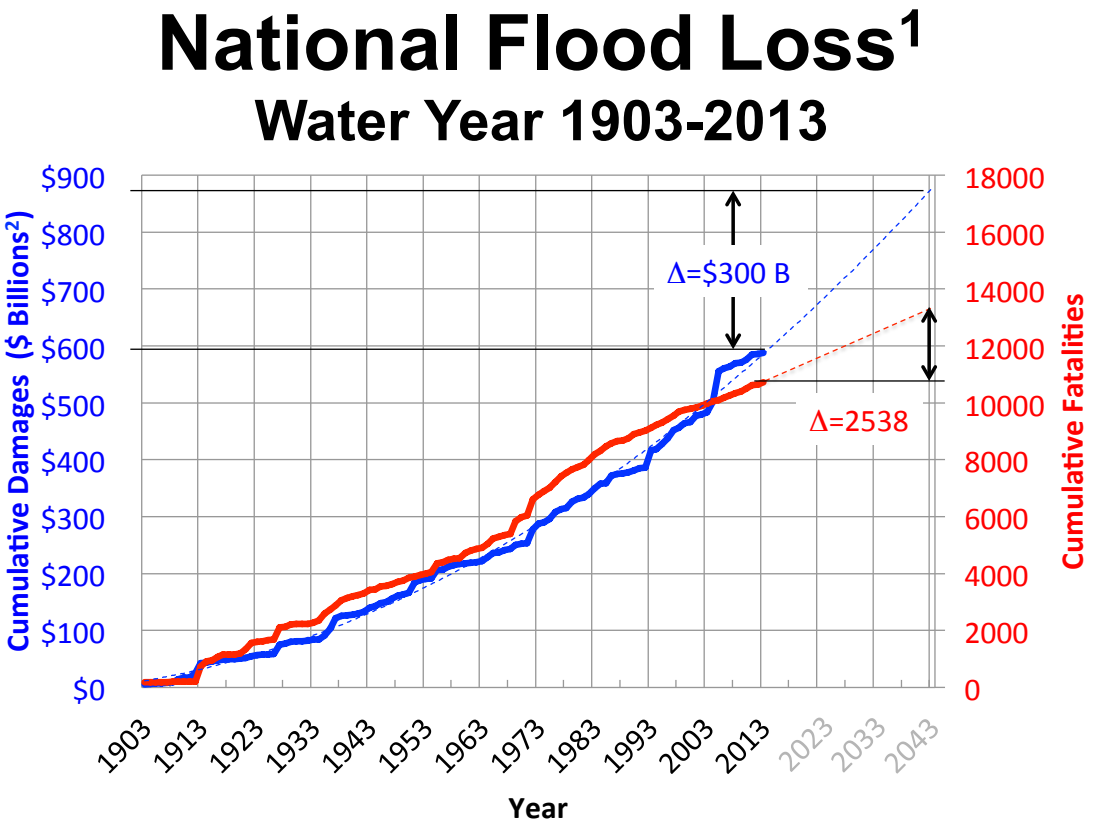


Spatial Distribution of
Flood Fatalities 2007-2013
(source: NWS StormDat)

Low water crossing

Why – Cost

More cost to federal government from flooding
than any other form of natural disaster



[1]National Weather Service Hydrologic Information Center (www.nws.noaa.gov/hic/)
[2]Damages are adjusted for inflation to 2013. Damages are considered to be minimum estimates.

Why is NFIE a Use-case for Hydrography dataset

Build a national high spatial resolution, near real-time river and stream model

- The National Hydrography Data provides the data infrastructure to facilitate next-generational hydrologic modeling
- Adopting NHDPlus as the frame work for data conflation facilitates interoperability across the federal water enterprise
- Provides a common frame of reference for research and academic communities

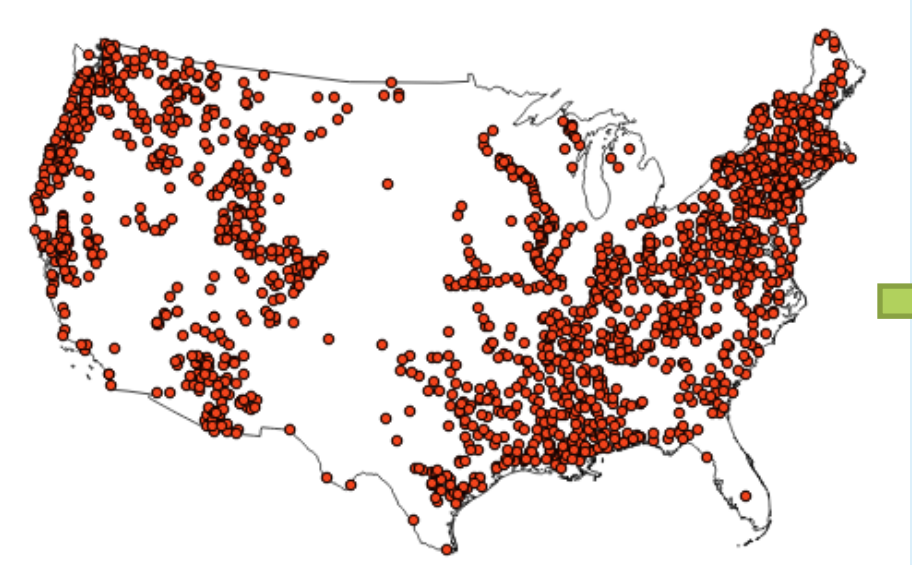
Why – Transform the NOAA and NWS Forecasting paradigm

- Forecasts produced by River Forecasts
  - Current system – 3600 locations
  - NFIE system – 2.67 million locations

700 times more

- New Information to help emergency managers to save lives and keep people safe

Current

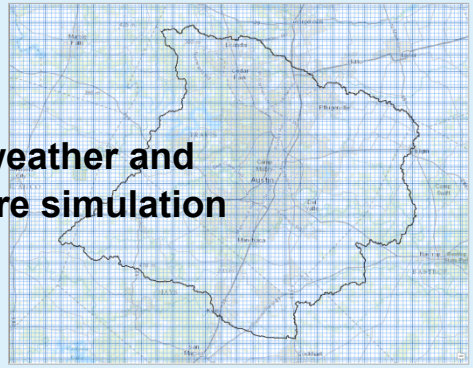


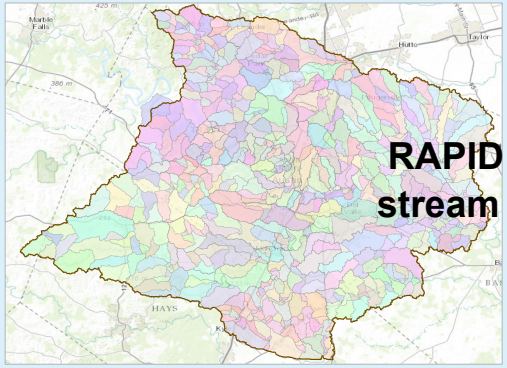
Proposed

National Available Hydrography Data allows the community to explore new concepts

1. How can near-real-time hydrologic simulations at high spatial resolution, covering the nation, be carried out using the NHDPlus?
2. How can this lead to improved emergency response and community resilience?
3. How can an improved interoperability framework support the first two goals and lead to sustained innovation in the research to operations process?

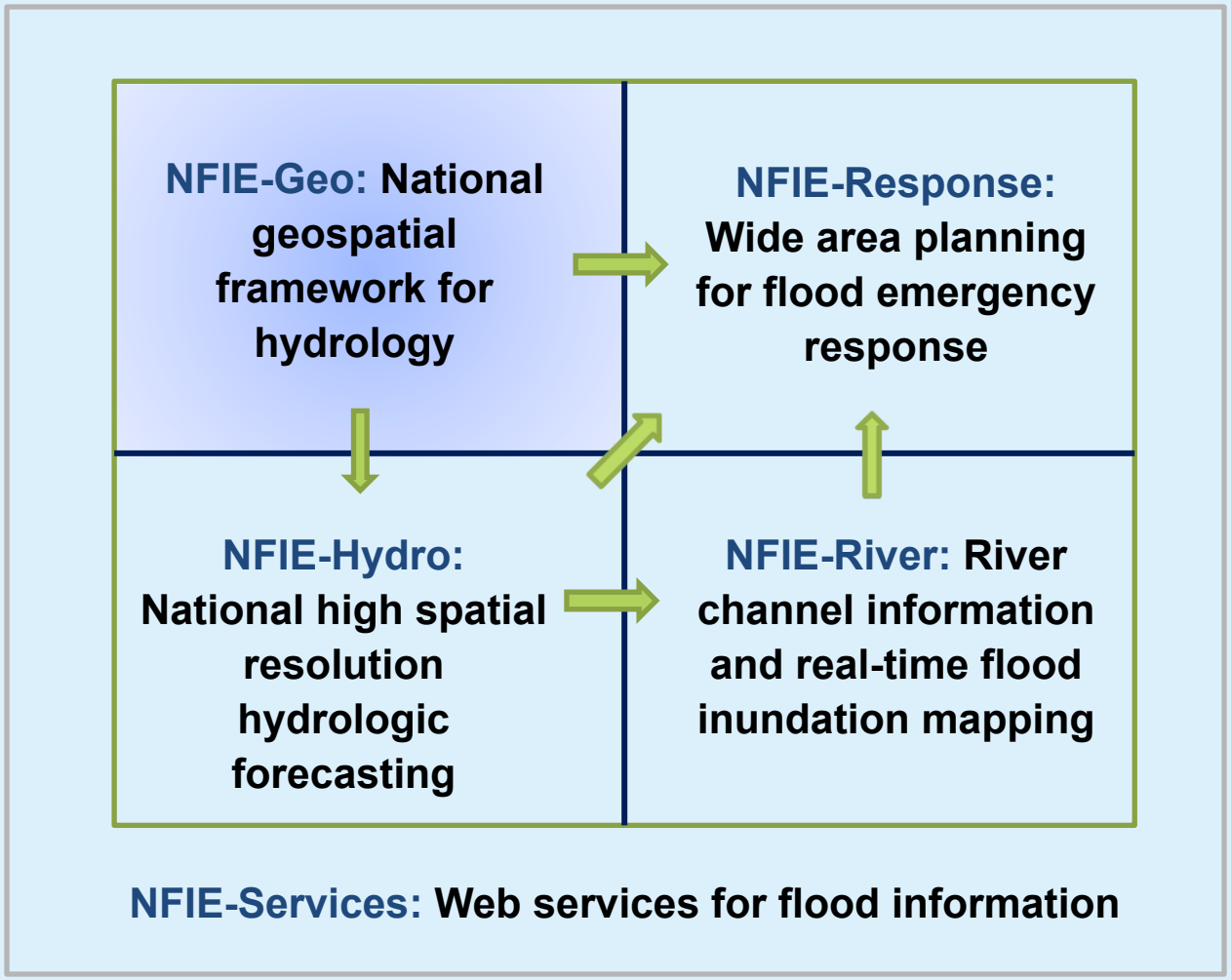
WRF-Hydro weather and land-atmosphere simulation





RAPID modeling of flow in stream reaches of NHDPlus

National Flood Interoperability Experiment (NFIE): Five Components



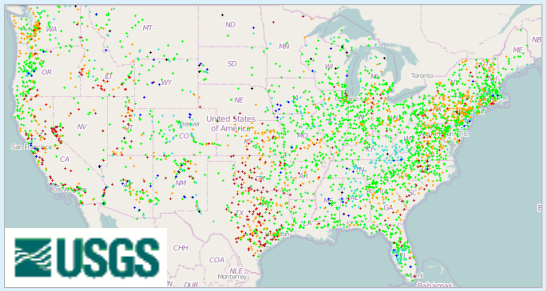
NFIE-Geo for National Flood Interoperability Experiment

Enhanced geospatial database for a national water data infrastructure

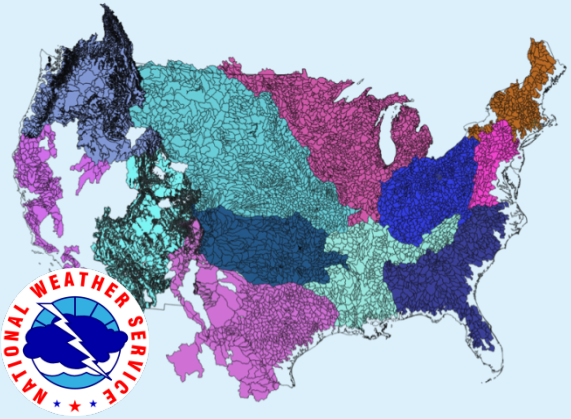
NFIE-Geo

9 feature classes

- ***4 from NHDPlus***
- ***4 from IWRSS***

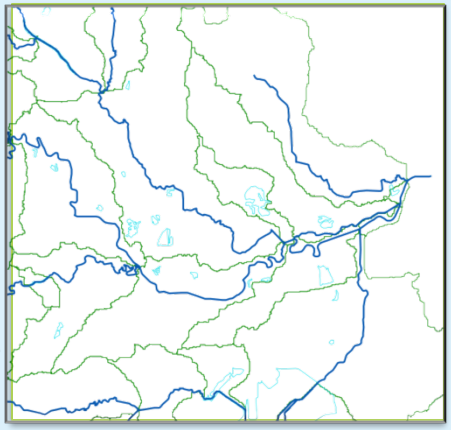


USGS Water Watch Points



NWS Basins and Forecast Points

National Flood Hazard Layer



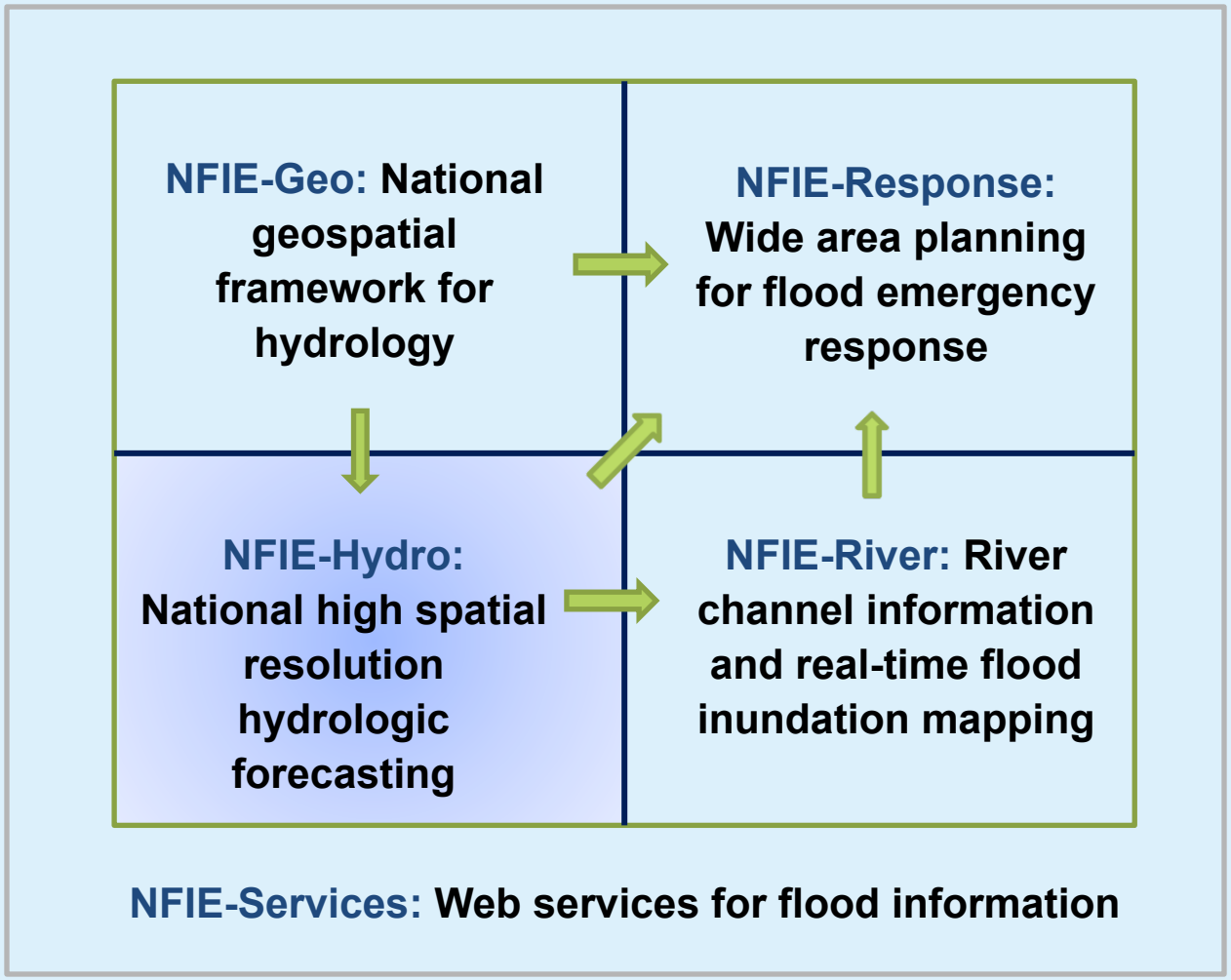
NHDPlusV2

Feature classes:

Subwatershed (HUC12)
Catchment
Flowline
Waterbody

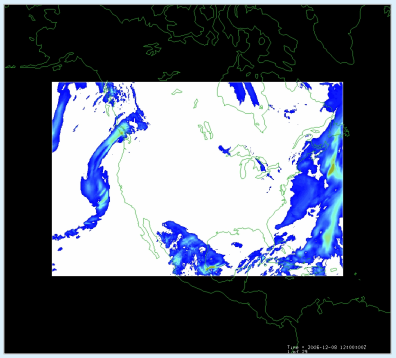
National Flood Interoperability Experiment (NFIE)

Component Two: NFIE-Hydro

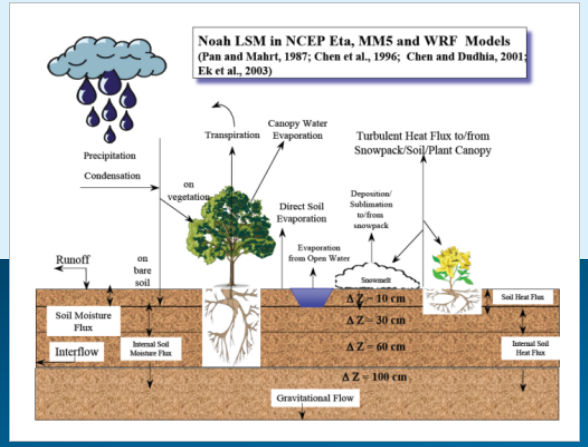


Forecasting Model Components…

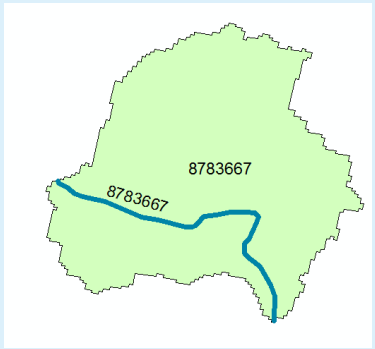
Weather model and forecasts



Weather → Precipitation

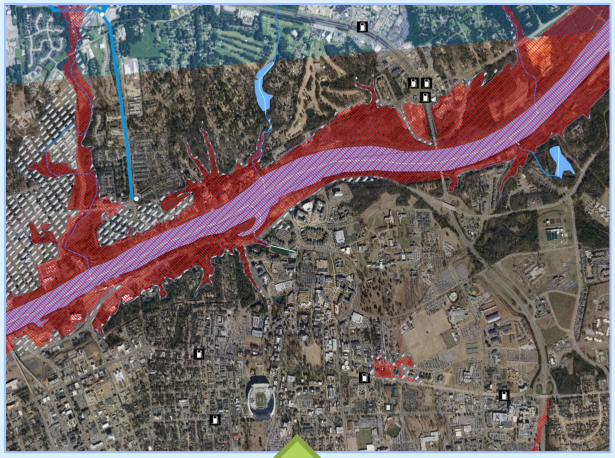


Land-Atmosphere Model

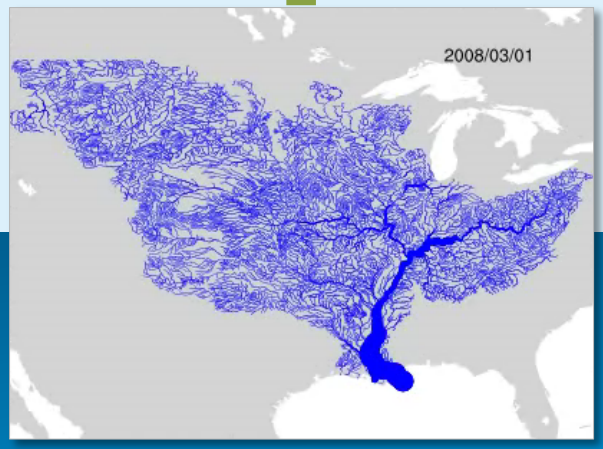


Runoff

Impacts



Streamflow



Channel flow routing (for all continental US)

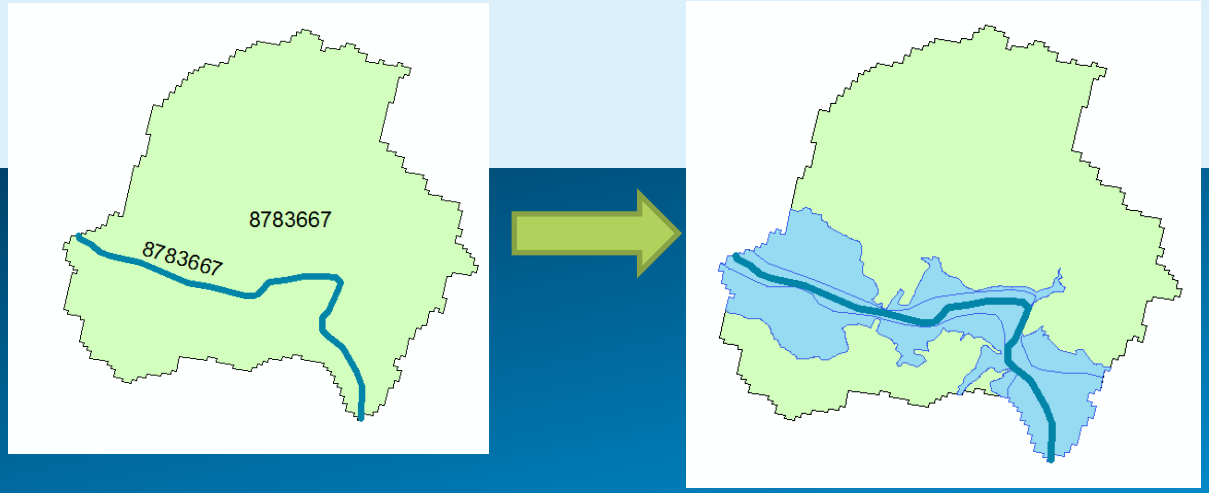
Flood risk zones…

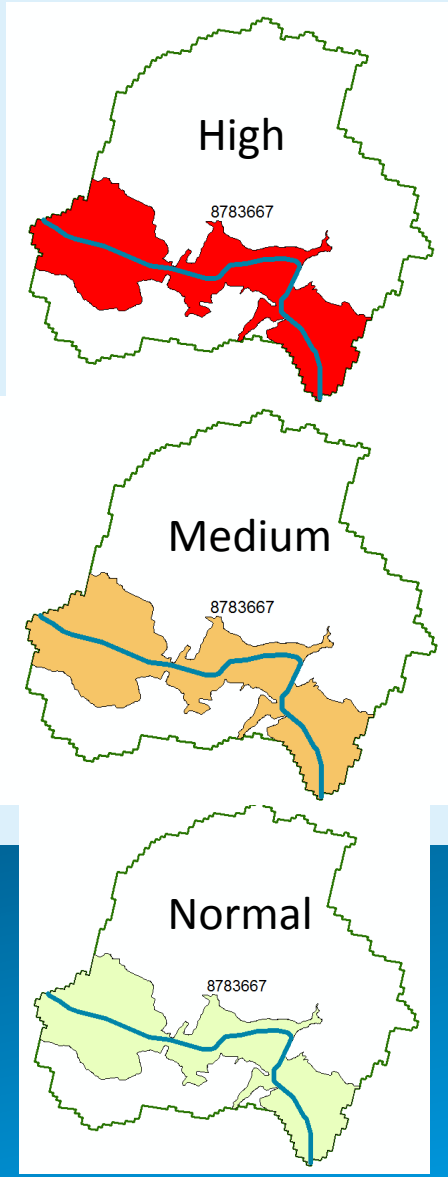
Each catchment has its own flood hazard zone (FEMA National Flood Hazard Layer

flood forecast + impacts define risk

Color the zones according to risk

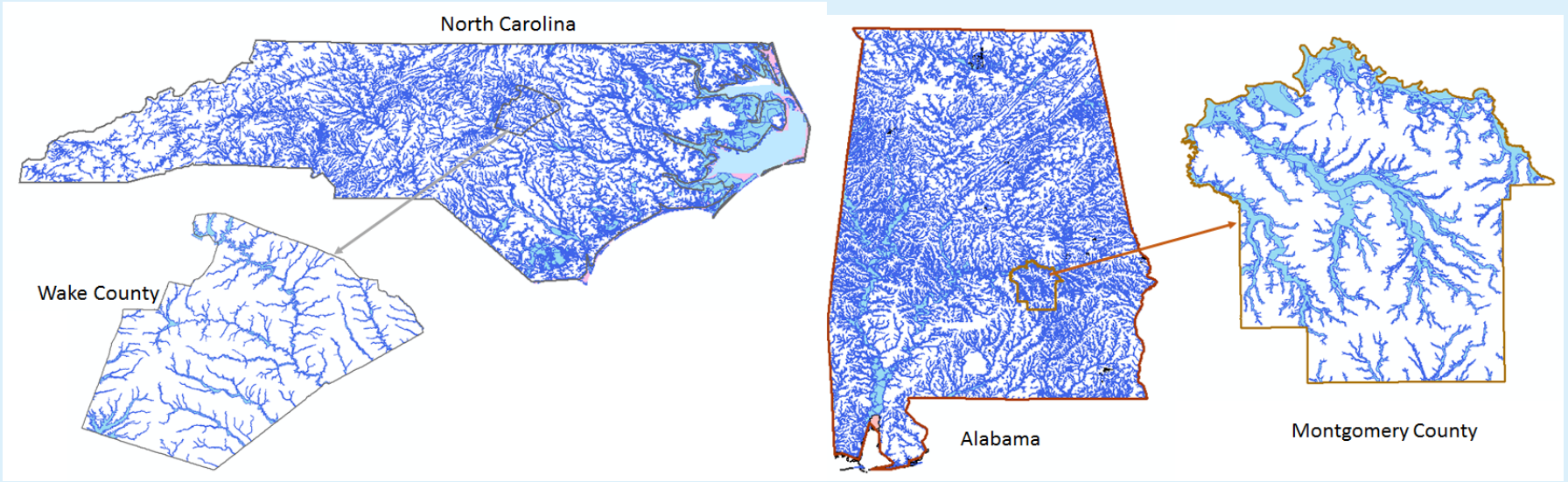
Provides flood warning
at “stream and street level”



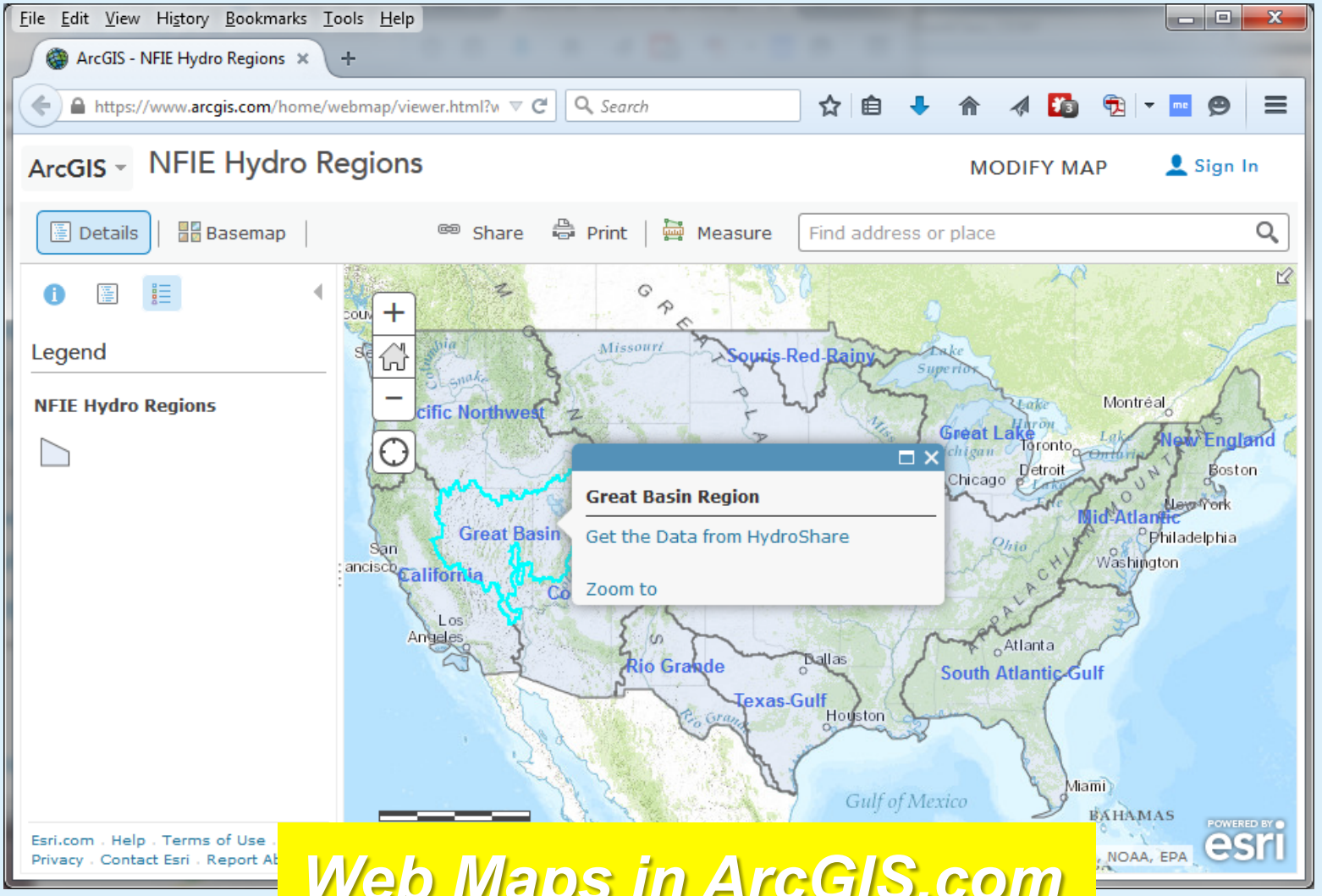


Extend to a comprehensive solution…

- Dynamic flood modeling, forecasting and inundation mapping in space and time
- Requires LIDAR terrain data so can only be done for particular regions



Interoperability enabled by web services enables us to establish a system combining multiple components



Web Maps in ArcGIS.com

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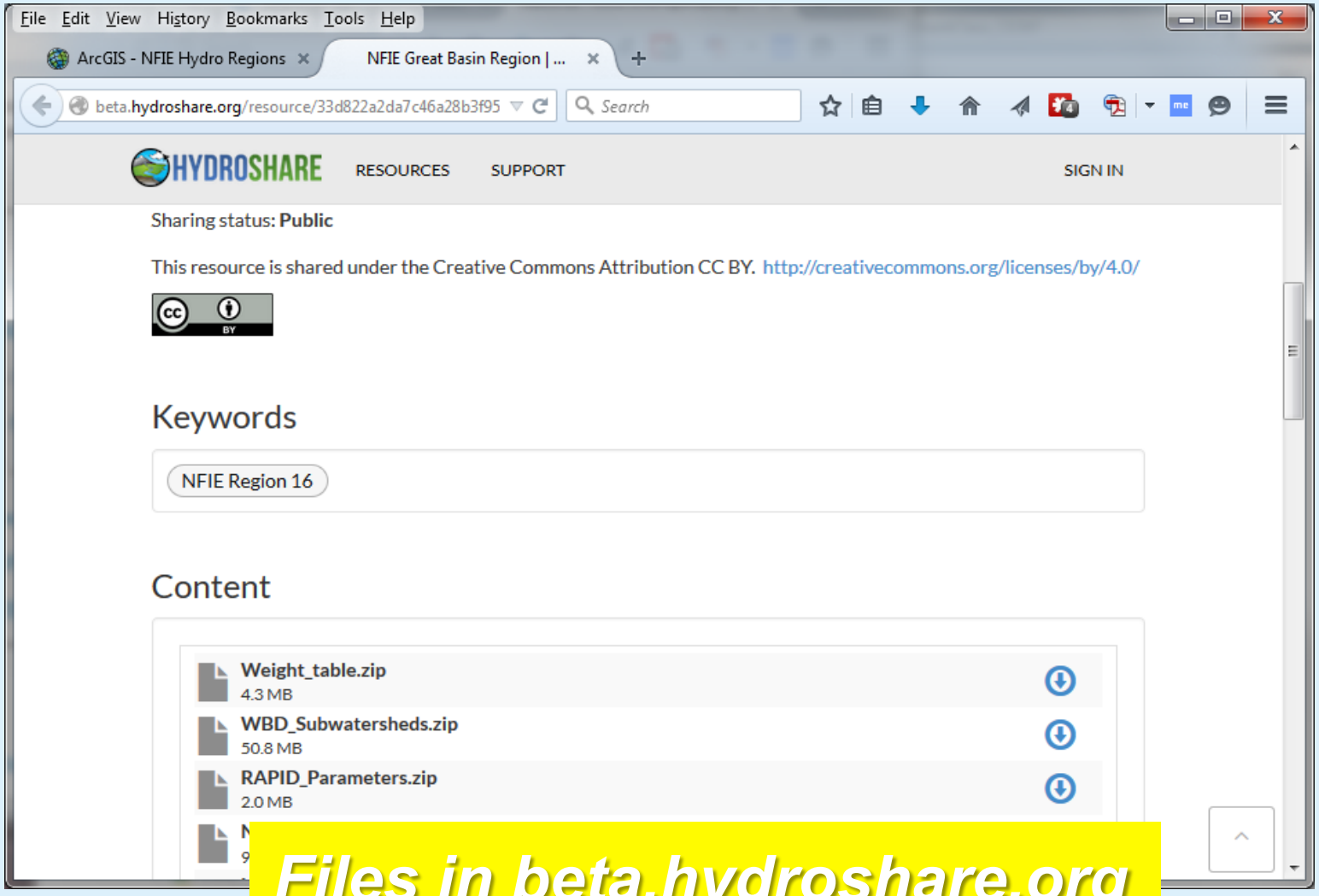
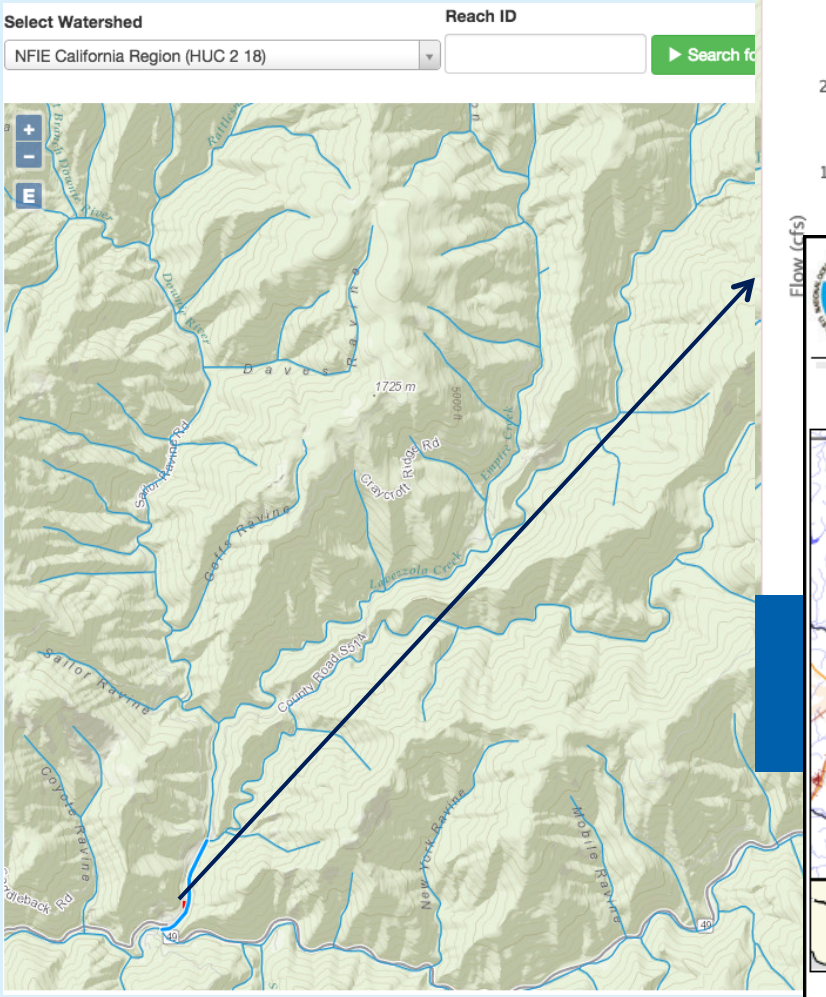
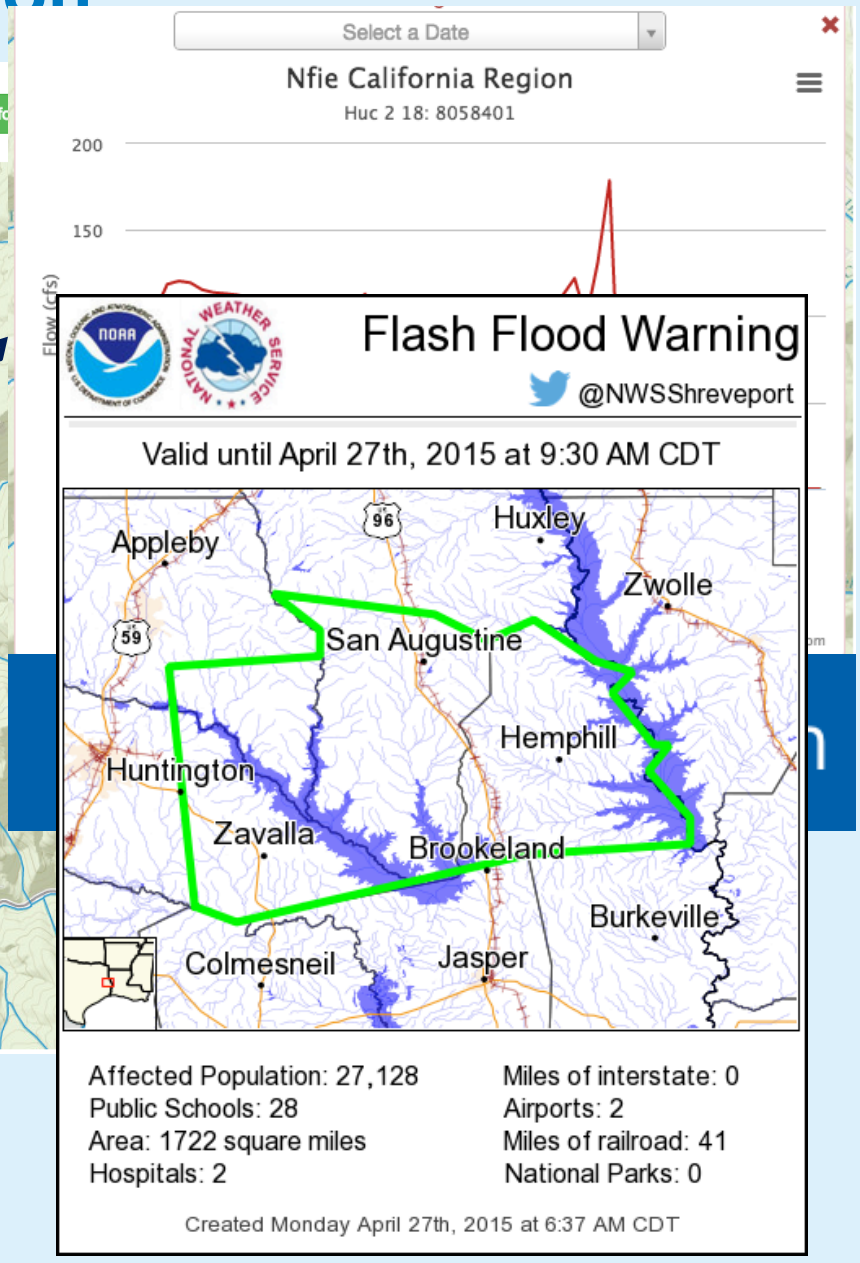


Files in beta.hydroshare.org

Explore Dissemination





NFIE Summer Institute Plan

- Establish a baseline end to end model
  - 2 week boot camp at beginning
- Form teams to focus on improving specific components
  - Iterative refinement
  - Metrics to quantify efficacy
- Daily “flood” briefing
- Report results weekly
- Capstone event 3rd CUAHSI conference on HydroInformatics, "Model and Data Interoperability: From Theory to Practice" July 15-17, Tuscaloosa Alabama. https://www.cuahsi.org/Posts/Entry/26293

National Flood Interoperability Experiment: NWS Perspective

- Community Initiative: private sector, academia, federal agencies
  - Demonstrate initial set of water **data services** using community standards
  - Demonstrate the **future real time flood simulation and mapping** using cutting edge tools and techniques
  - Prototype a project-based interdisciplinary **education model** for emerging scientists and technologists
    - Semester curricula and NWC Summer Institute

THE UNIVERSITY OF ALABAMA
THE UNIVERSITY OF TEXAS AT AUSTIN
CUAHSI UNIVERSITIES ALLIED FOR WATER RESEARCH
NCAR NATIONAL CENTER FOR ATMOSPHERIC RESEARCH
ESRI
NOAA NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION U.S. DEPARTMENT OF COMMERCE
USGS
U.S. DEPARTMENT OF HOMELAND SECURITY

Scientific excellence and innovation driving water prediction and decisions for a water-resilient nation.

- Collaborative R&D, Operations
  - Support River Forecast Centers through robust data service
  - Support mission-oriented research and development
    - a catalyst for engagement with Academia
  - Proving Ground Facility
    - Science and Technology Transition
  - Interagency Staffing

Thank You

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