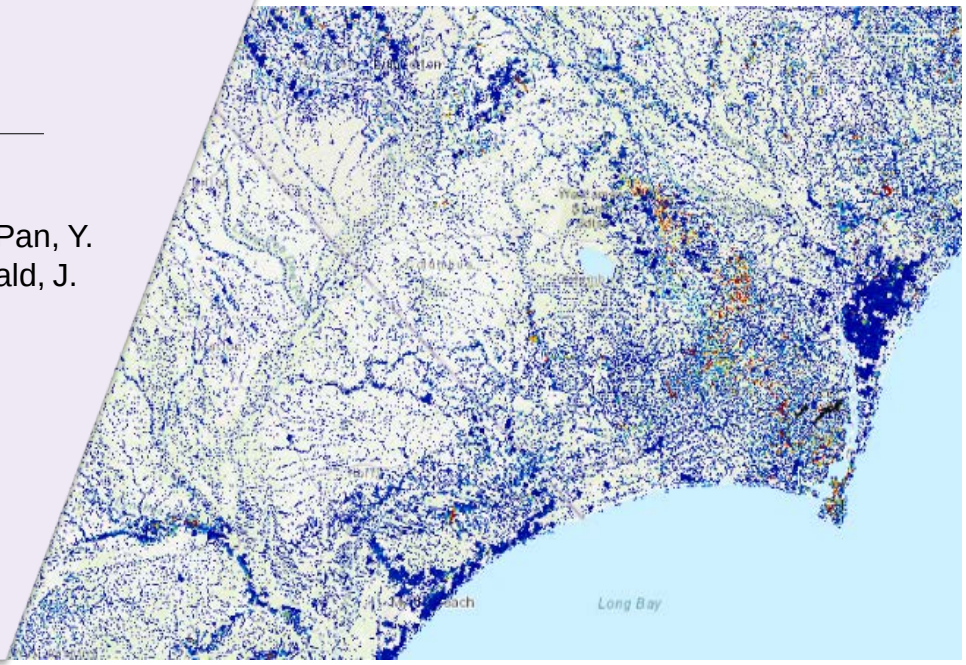
A revolution in water information... How technology is transforming knowledge and prediction of water risks

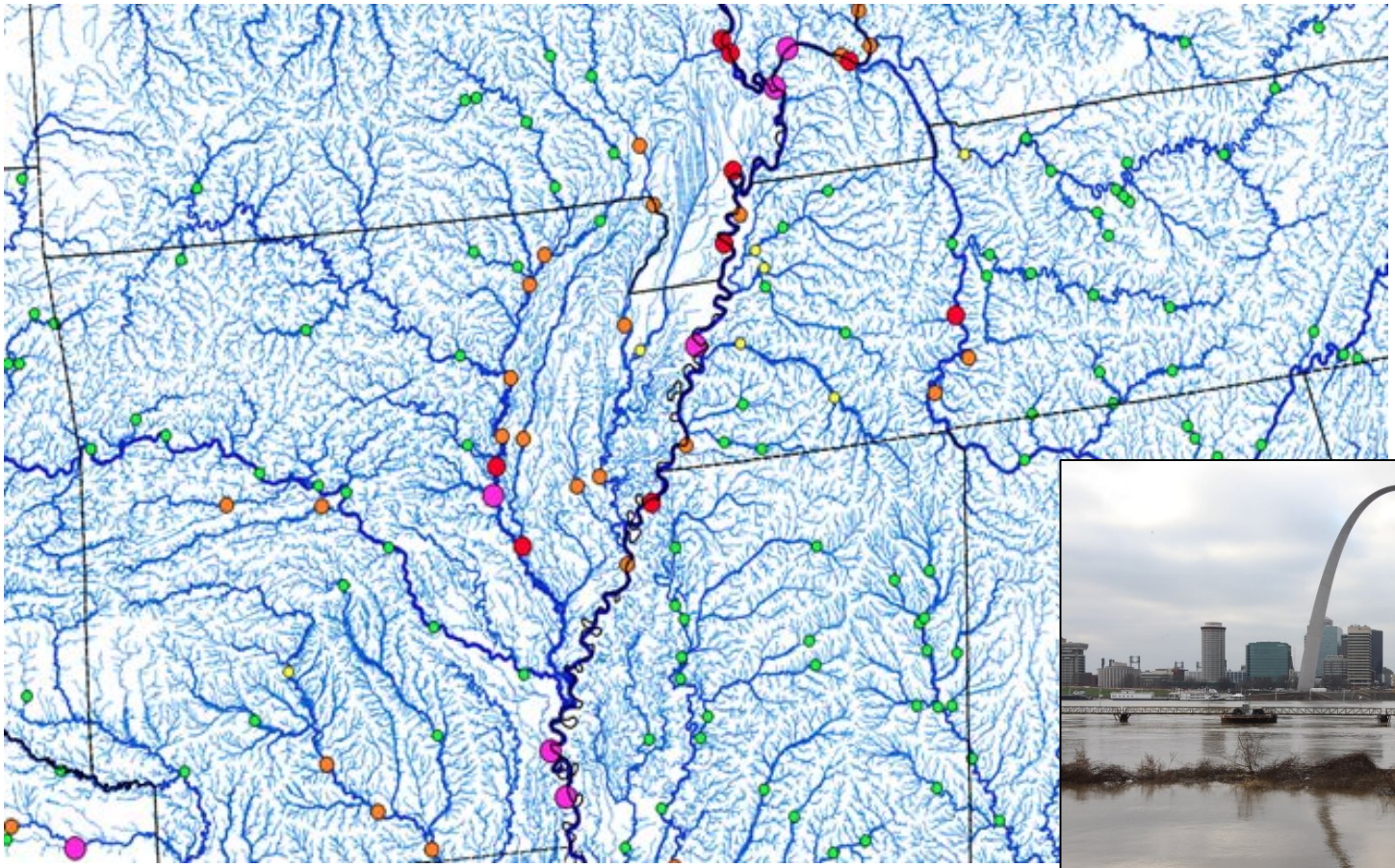


NCAR Research Applications Lab

D. Gochis, A. Dugger, D. Yates, K. Sampson, M. Barlage, L. Pan, Y. Zhang, J. McCreight, A. RafieeiNasab, L. Karsten, K. Fitzgerald, J. Mills, L. Read, A. Gaydos, R. Cabell, J. Grim, E. Towler

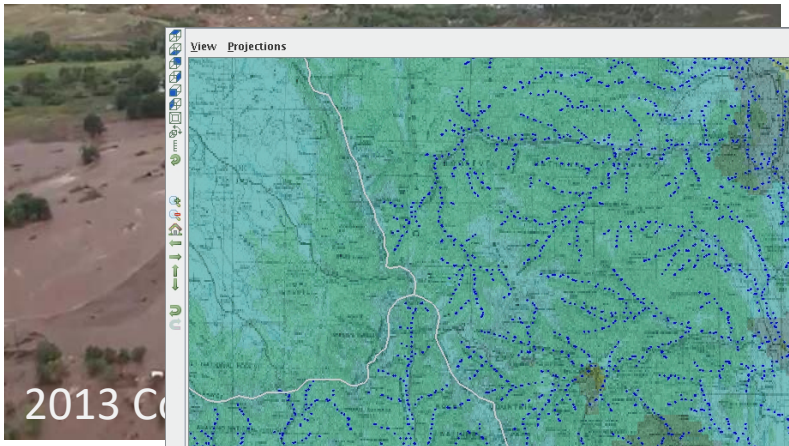
Where we've been…:

- Traditional hydrologic forecasts were 'point based' and mostly on larger river systems to support navigation and specific infrastructure.



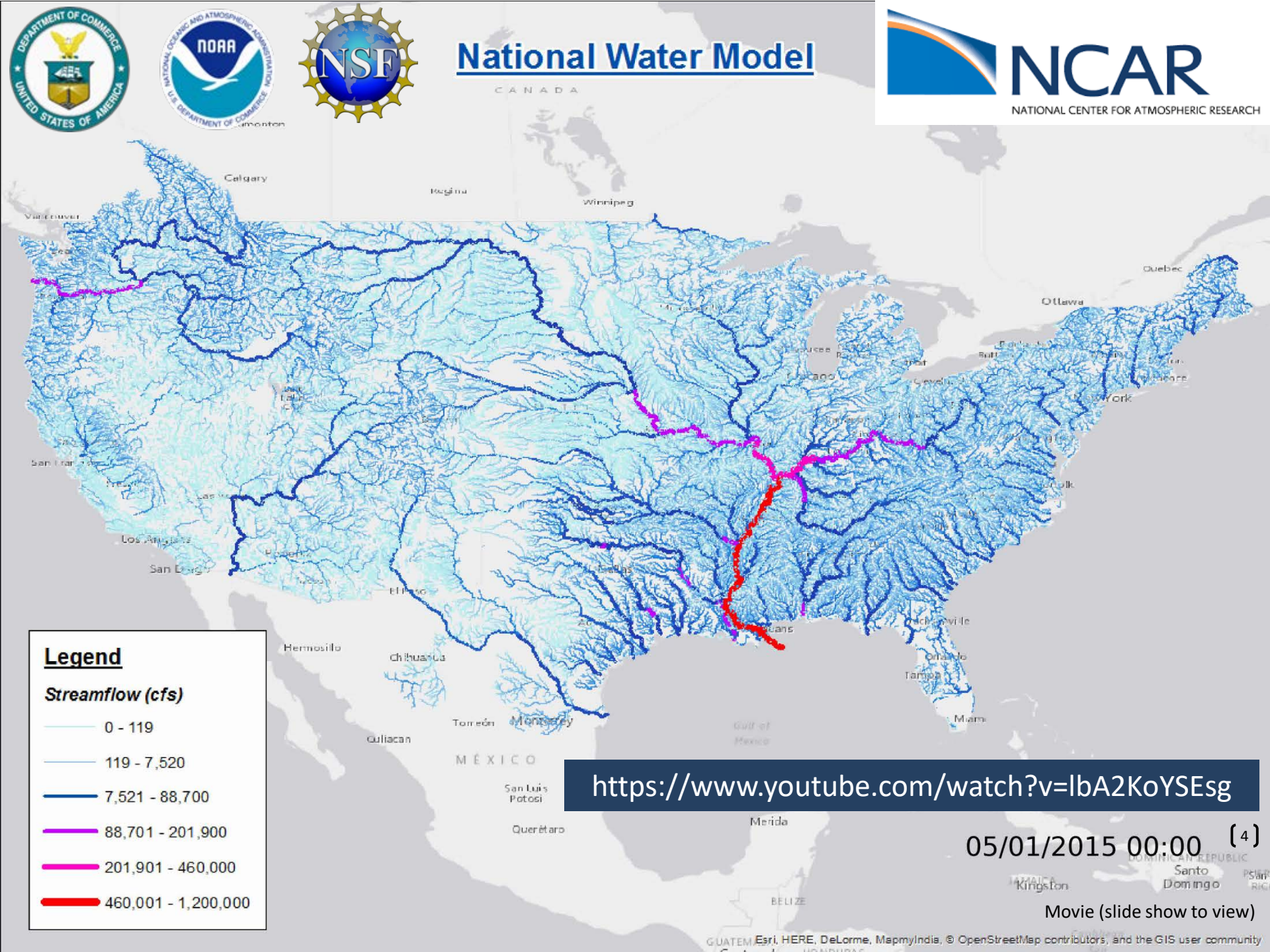
Where we've been:

- Majority of the nation's water ways and landscape lacked regular hydrologic forecasts
- Large inconsistency between flash flood and water resources forecasting methods



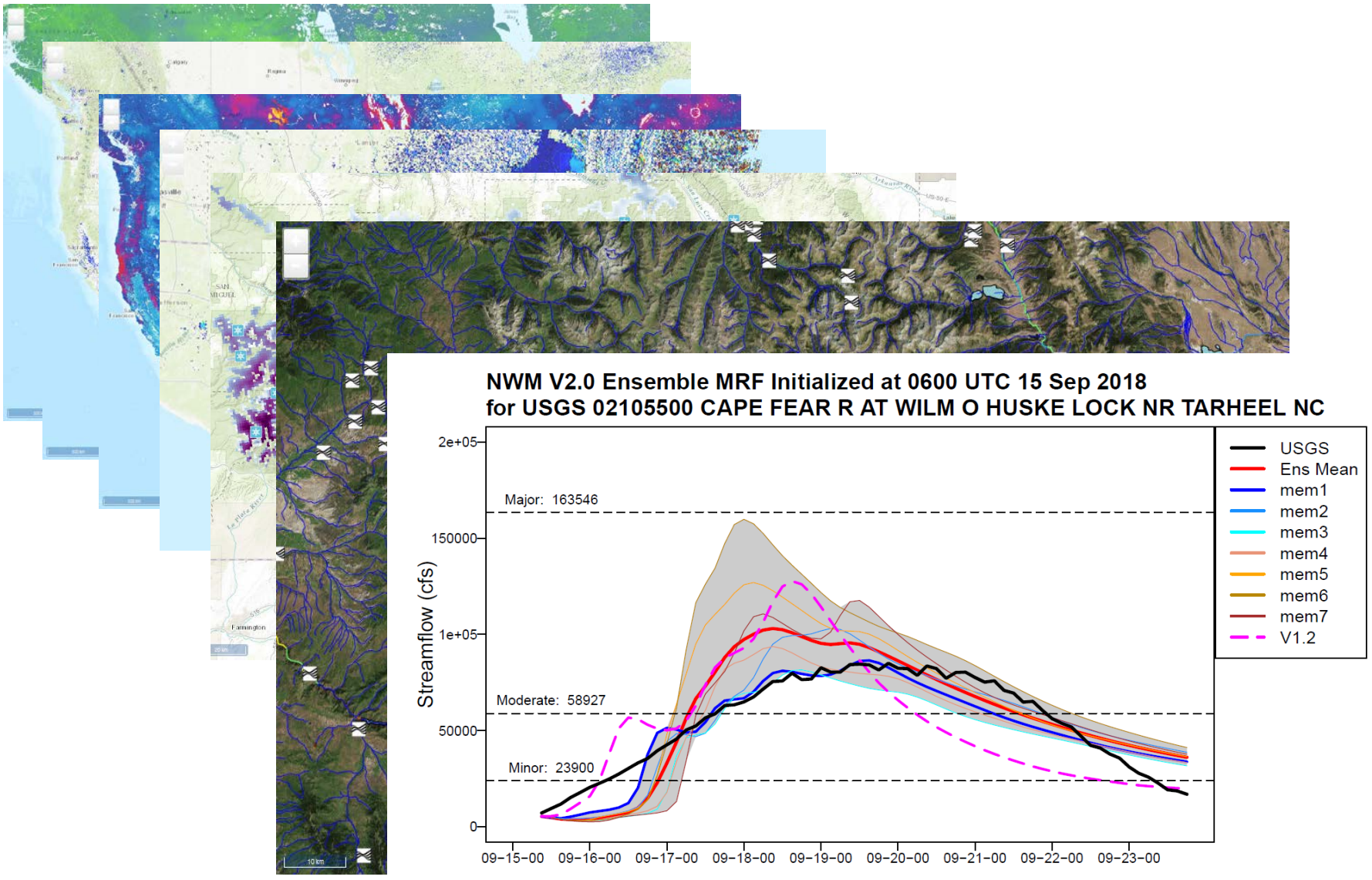
National Water Model

NCAR
NATIONAL CENTER FOR ATMOSPHERIC RESEARCH



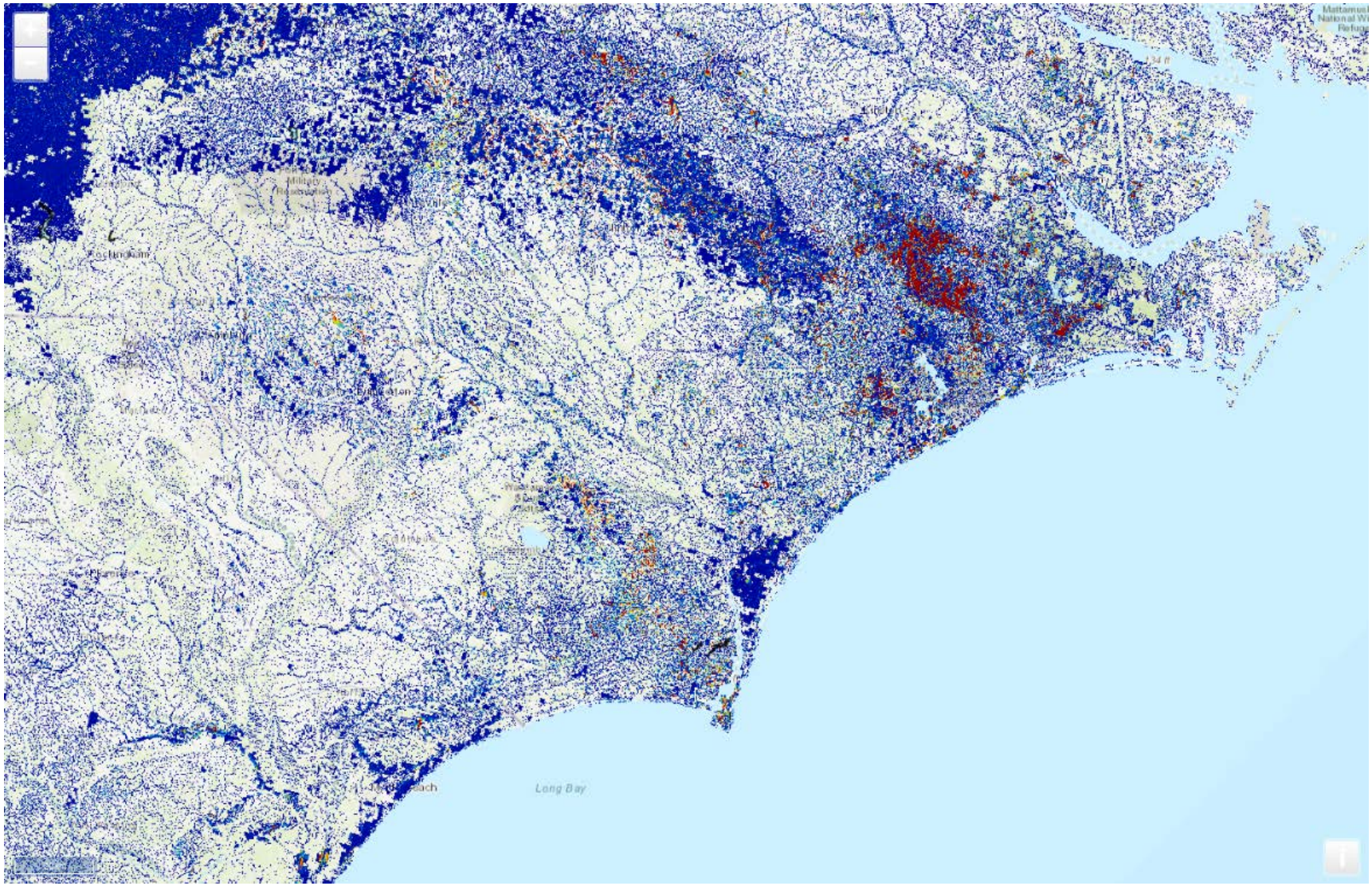
Movie (slide show to view)

Operational National Water Model outputs:



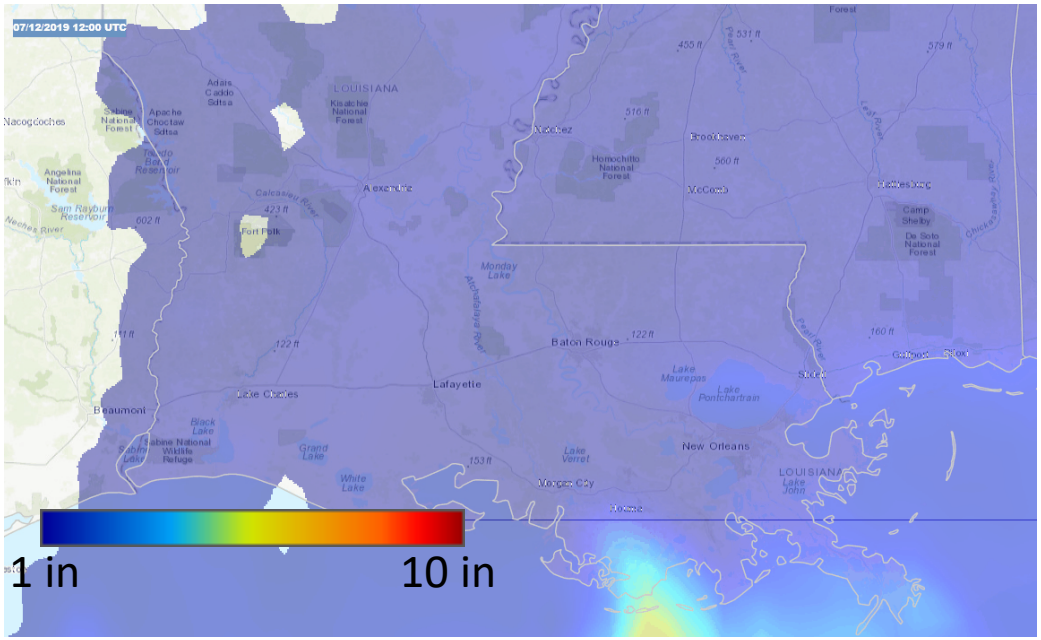
Ensemble streamflow predictions

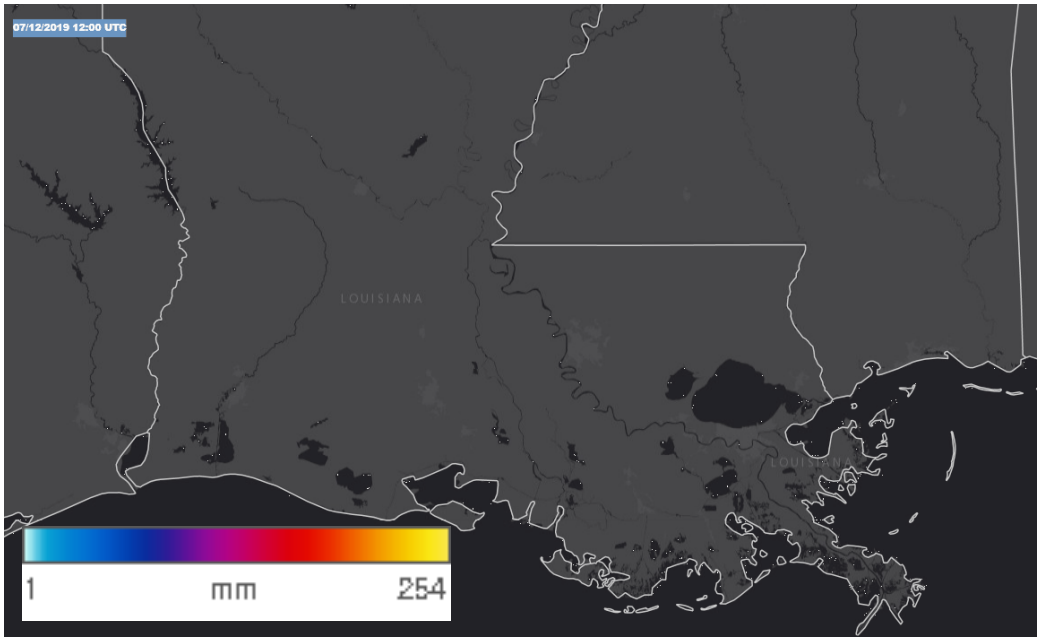
NWM v1.2 Medium Range Forecast Surface Overland Flow Water Depth (mm):
Eastern N. Carolina, Hurricane Florence….Forecast guidance up to 6 days in advance



Hurricane Barry: Inland flooding predictions

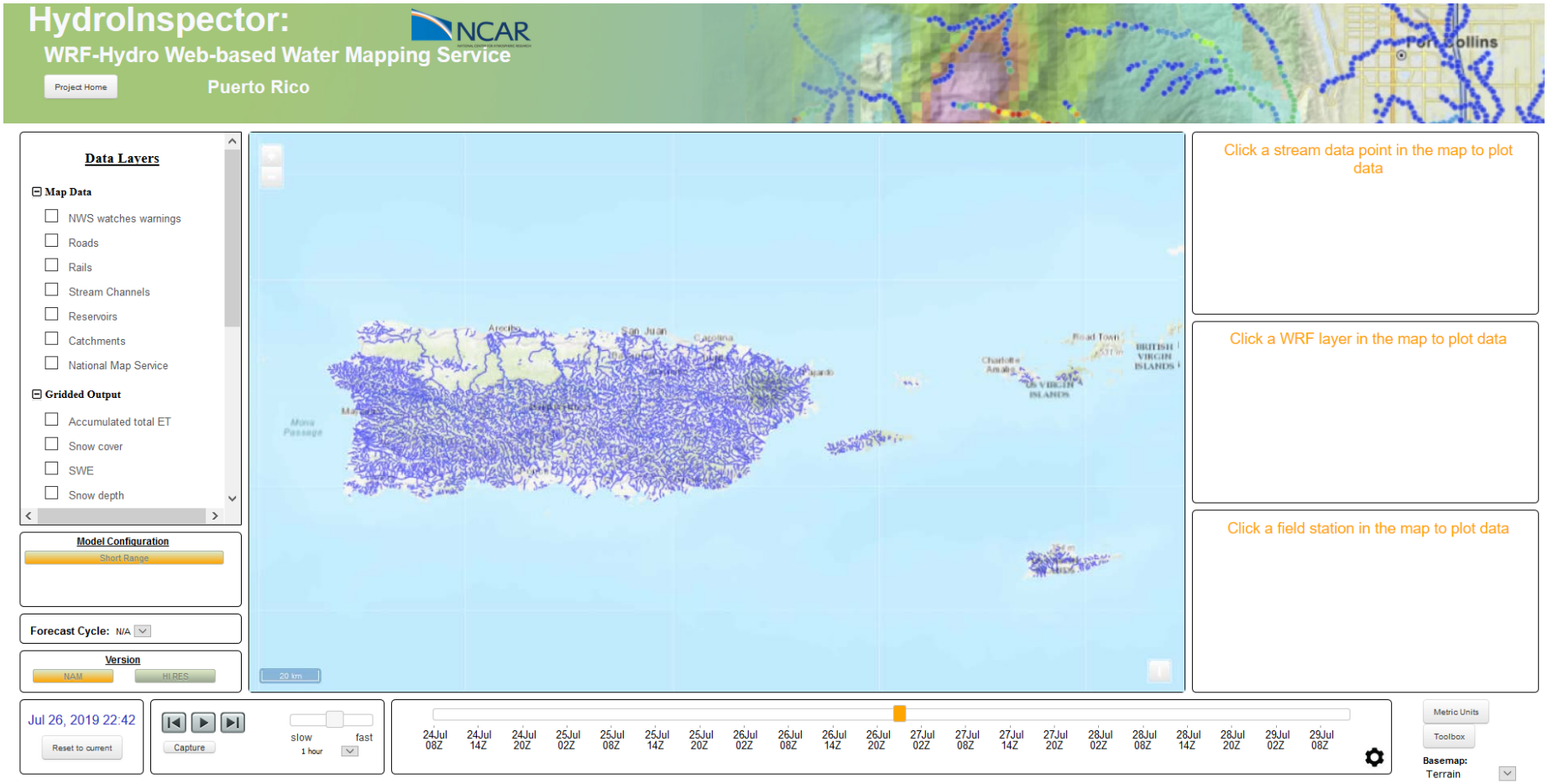
- National Water Model overland flow forecast…Medium Range Forecast: init 12 Jul 12 UTC thru 22 Jul 12 UTC





Implementation of Puerto Rico and the U.S. V.I.

- **Provide first in time NWS operational hydrologic analyses and forecasts for islands.**
- **Advanced forecasting and situational awareness for extreme events like Hurricane Maria 2017**
- **Target operational activation, spring 2020**



What lies ahead…:

- **Expanded, mobile ‘water intelligence’…integrated guidance for public safety, transportation/logistics, contaminant transport, water supply…**

- **On-demand prediction services…**
  1. **Cloud-centered**
  2. **Service-based**
  3. **Community-evolved**

- **Integrated Inland-Coastal Predication and Risk Reduction**

Publicly-accessible Web Services for Decision Making

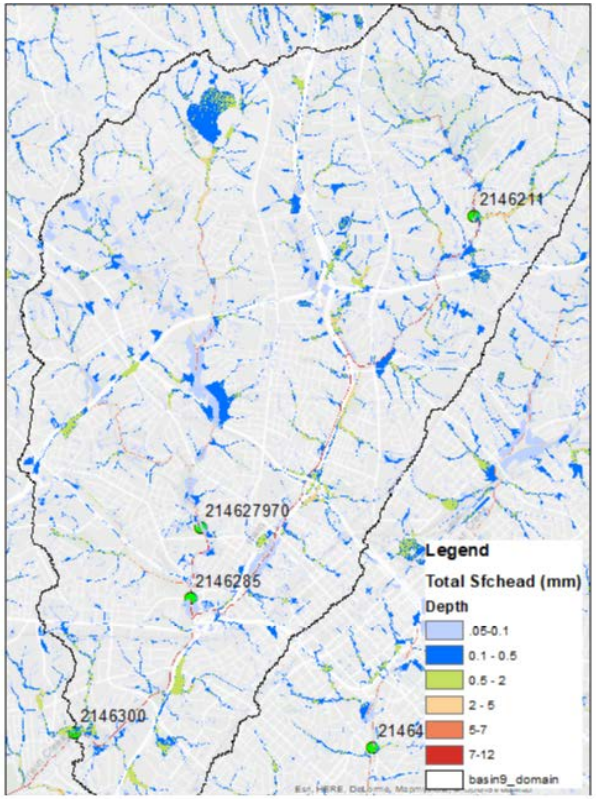
- Analys
- Short I
- Mediu
- Long R

Hyper-resolution flood modeling:

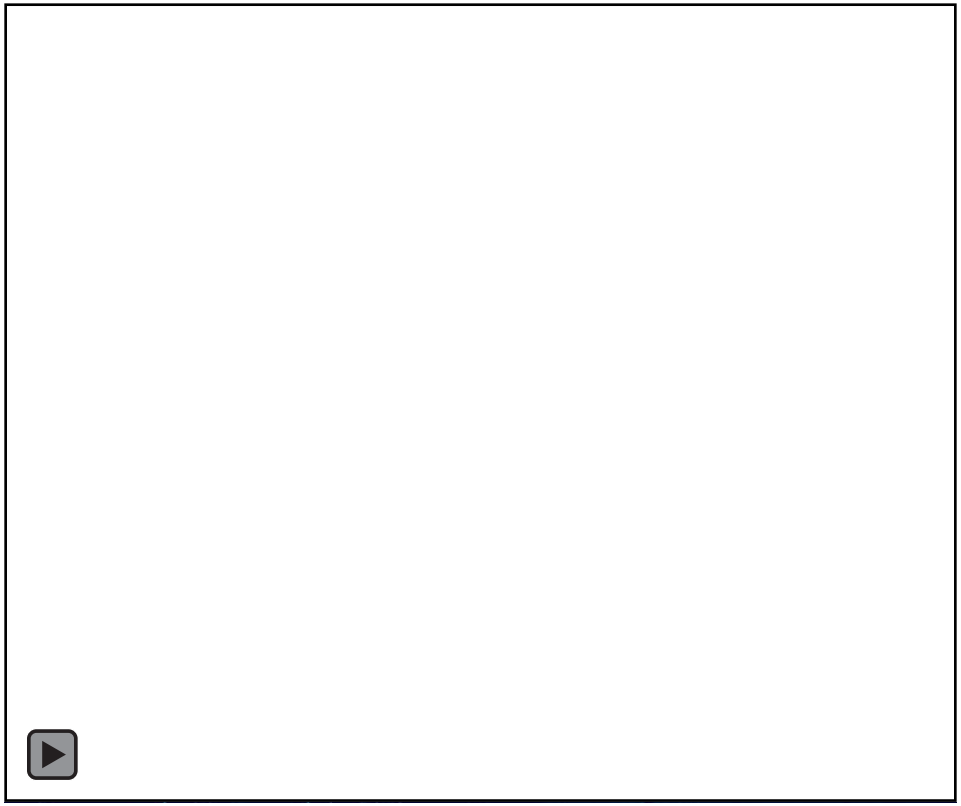
L. Read, K. Sampson, L. Karsten

- Explicit characterization of landscape-constrained inundation modeling
  - Spatial scale of 1's to 10s' of meters
  - Akin to LES for atmosphere (not CFD though…)

10m model of Charlotte, NC



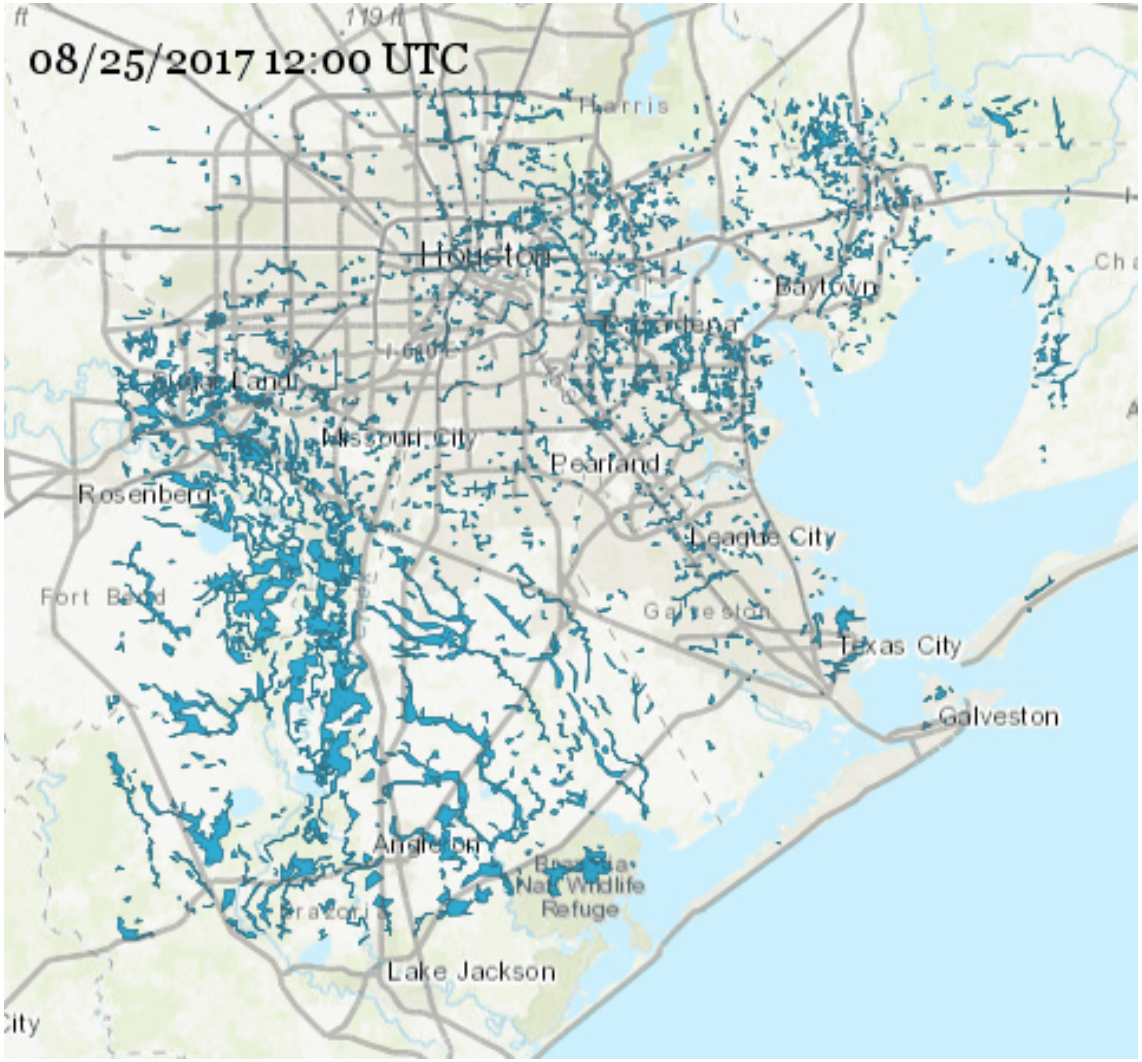
30m model of 2013 Colorado Floods



Hurricane Harvey: Inundated Area Evaluation

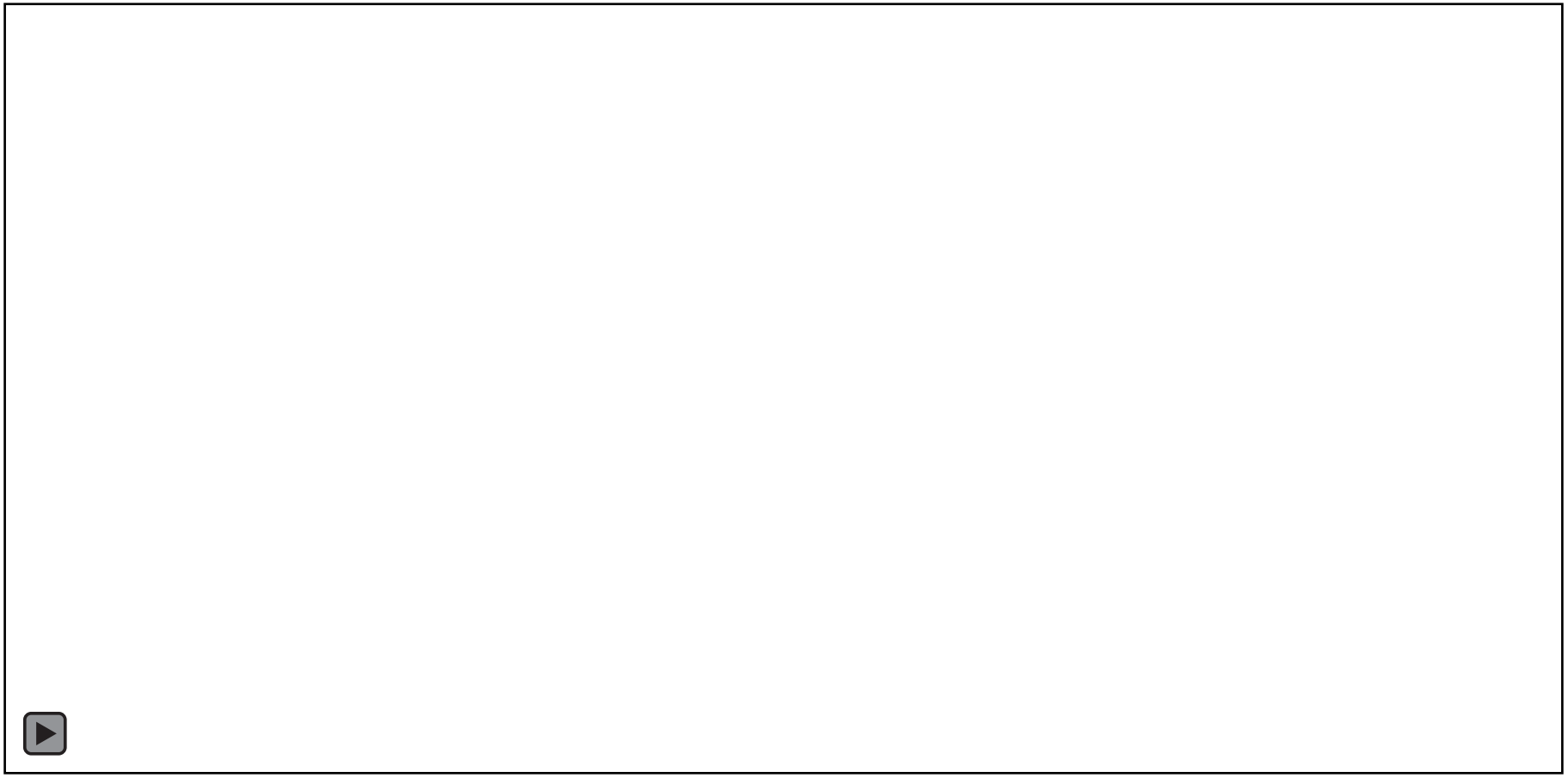
2D Grid Evaluation (example: hyper-resolution inundation):

Inundation now being evaluated using CYGNSS retrievals via UCAR President's Fund project



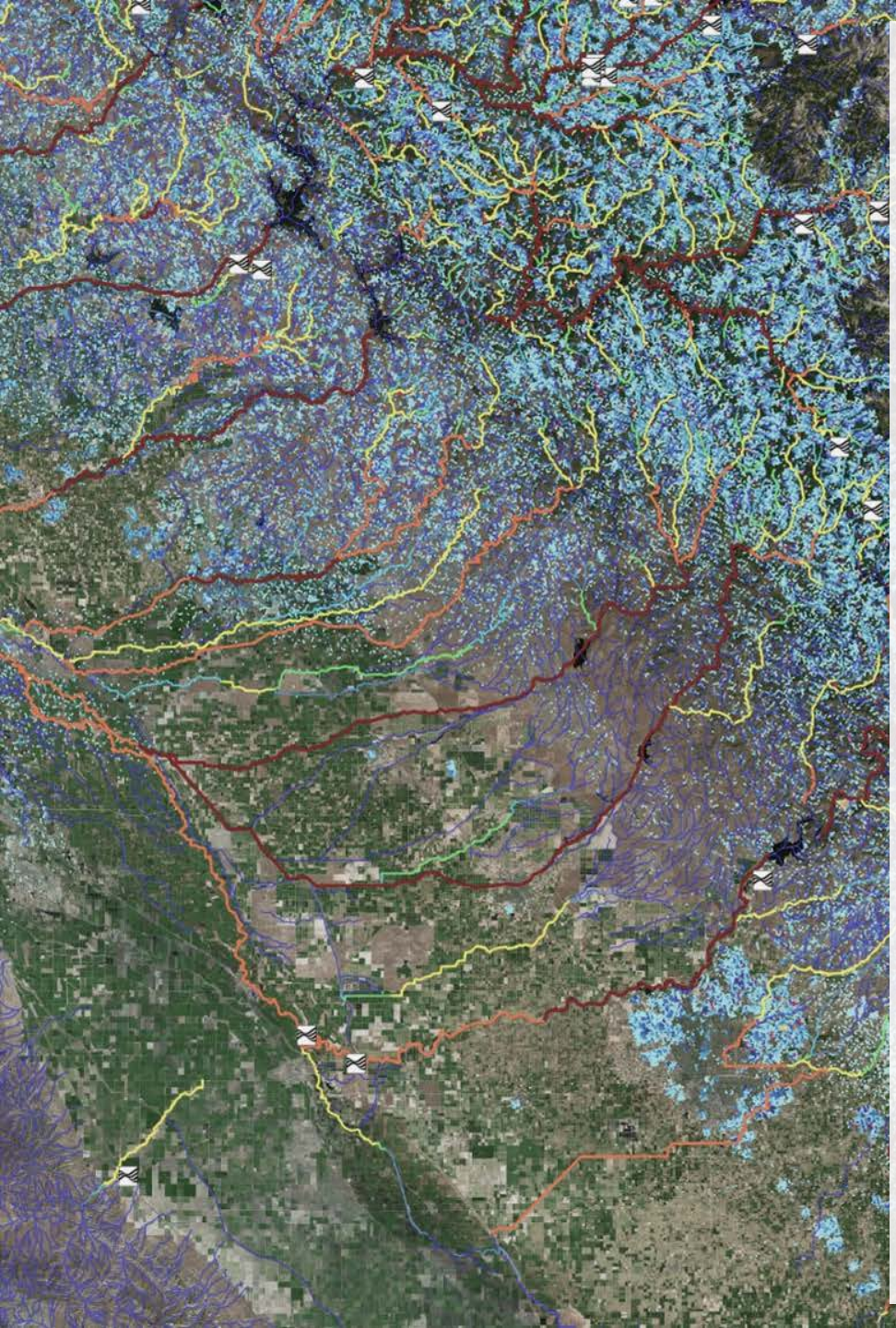
Hurricane Harvey hyper-resolution simulation

Comprehensive flowpath tracing:



- Environmental tracers for transport timing prediction
- On-demand capability using existing operational NWM
- Nearly instantaneous response
- Amenable to stochastic perturbation of flows to generate probabilisitc guidance
- Example of the Gold King Mine Spill


TRITON



Thank you!

Resources:

WRF-Hydro Community Model:
https://ral.ucar.edu/projects/wrf_hydro