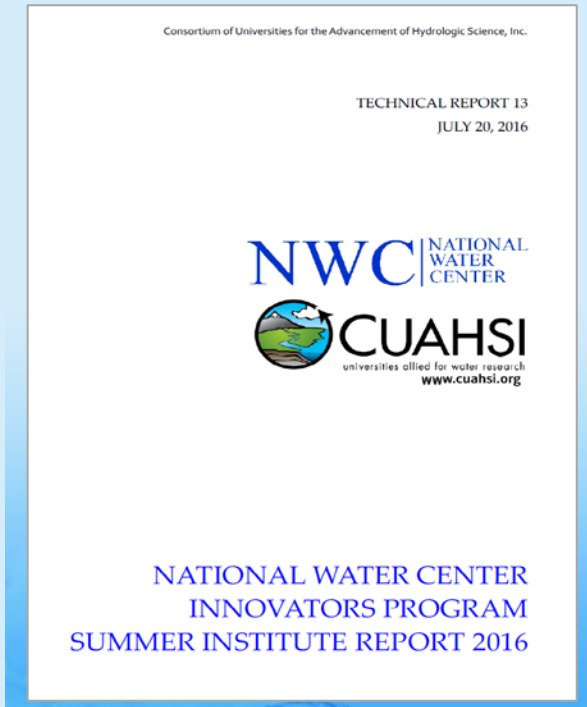
# The National Water Center 2016 Summer Institute: Program Description and Main Outcomes

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**David Maidment,** University of Texas Austin
**Sarah Praskievicz**, University of Alabama
**Adnan Rajib**, Purdue University

# The National Water Center

The National Water Center (NWC) open mid-2015 on the University of Alabama campus by National Weather Service (NOAA)

Now under Office of Water Prediction

It is a first-in-the world facility that will enable NOAA, in partnership with other federal agencies, to deliver a new generation of water information and services to the nation

Has a mission to assess hydrology in a new way at the continental scale for the United States

# The National Water Model

The National Water Model (NWM) - a hydrologic model that simulates streamflow over the entire continental United States (CONUS).

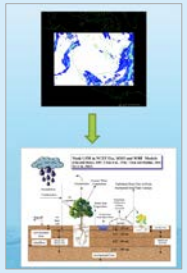
The core of the NWM is the National Center for Atmospheric Research (NCAR)  Weather Research and Forecasting Hydrologic model (WRF-Hydro), a configuration of the Noah-MP Land Surface Model (LSM).

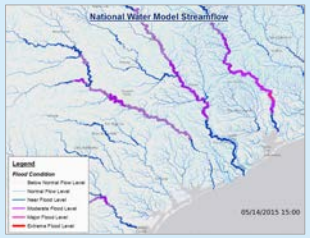
It ingests forcing from a variety of meteorological and hydrological sources

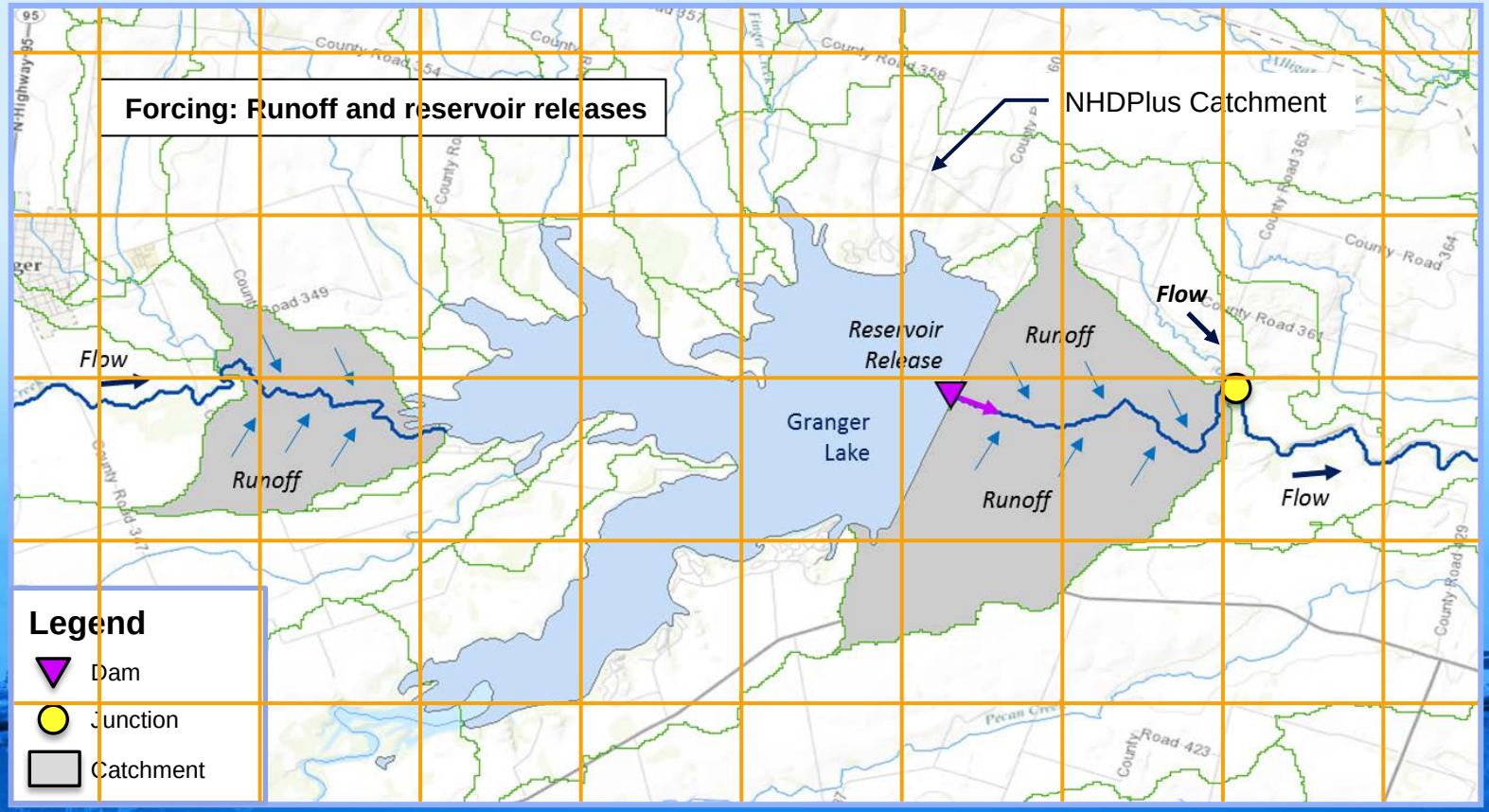
Incorporate a diffusive wave surface routing and saturated subsurface flow routing and Muskingum-Cunge channel routing based on the National Hydrography Dataset (NHDPlusV2) stream reaches.

The system includes an analysis and assimilation of USGS streamflow observations and 1,260 reservoirs.

# Combining Grid and Vector Modeling



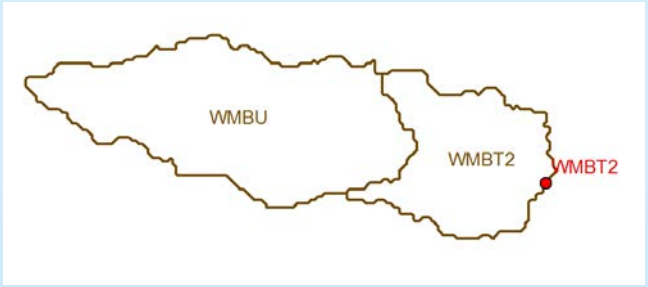


# Flow Continuum Model

Blanco River at Wimberley

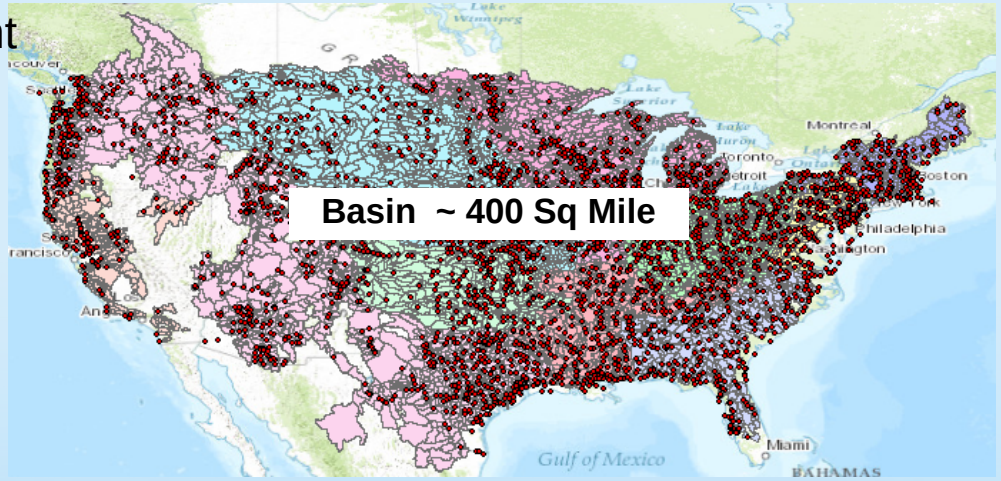
Two basins and one forecast point



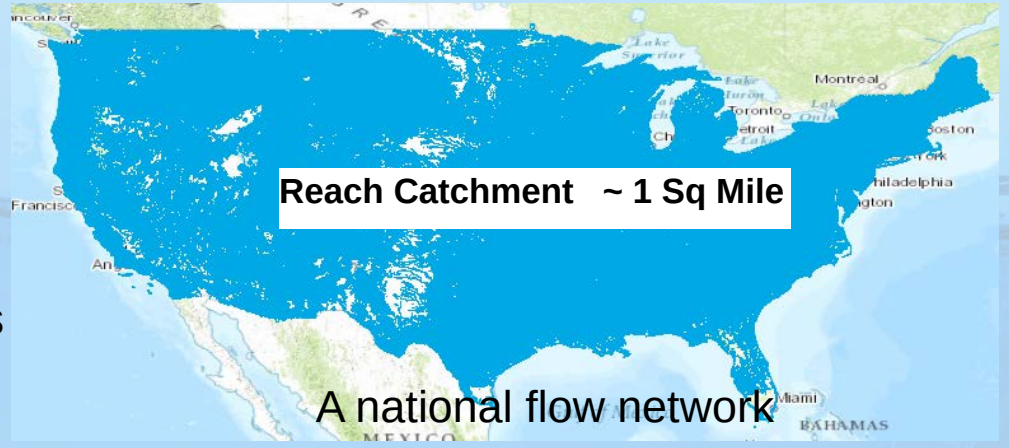

becomes

130 Catchments and Flowlines uniquely labelled

Current: 6600 basins and 3600 forecast points



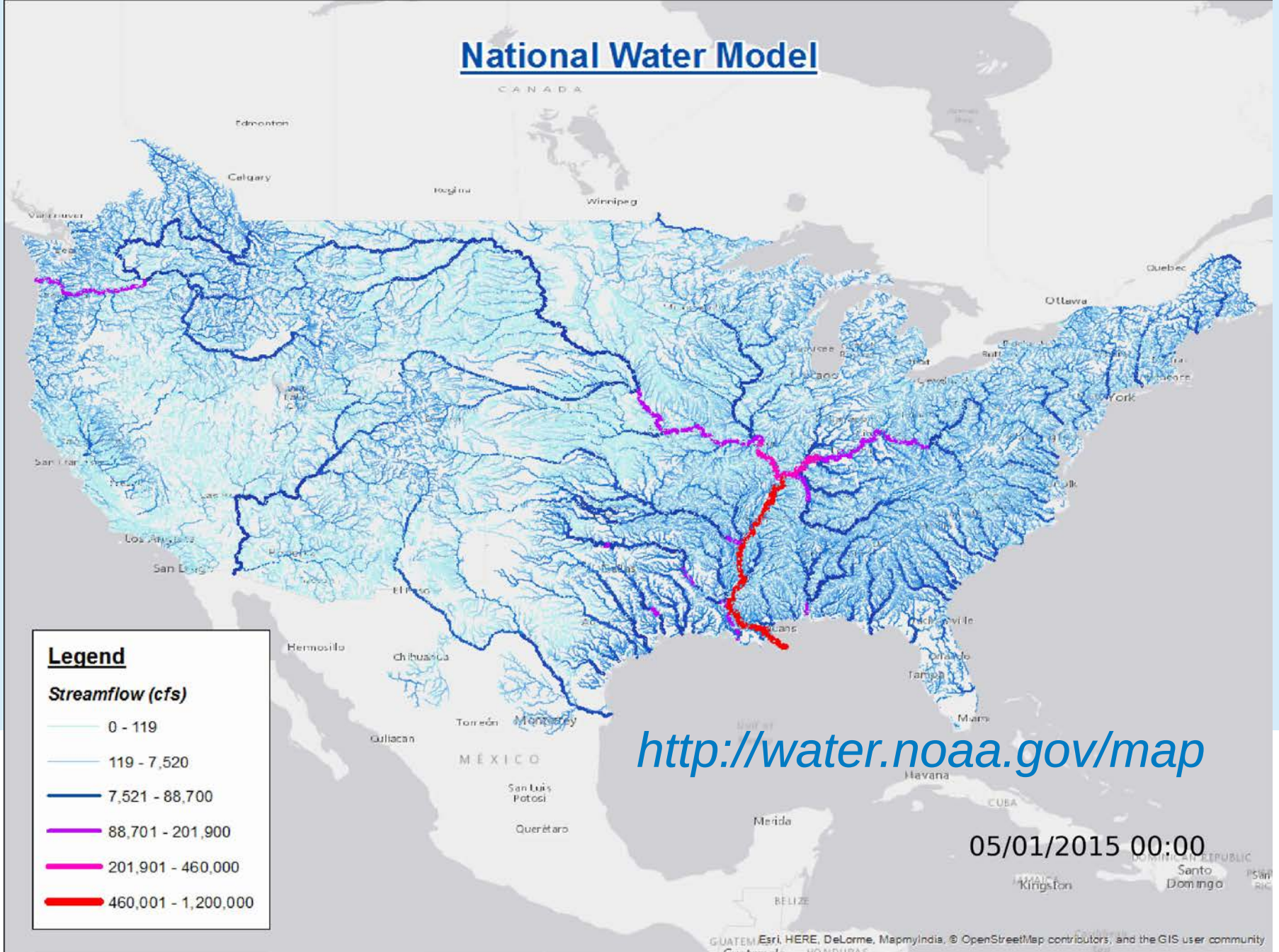

NFIE: 2.7 million stream reaches and catchments




A national flow network

# National Water Model Configurations – August 2016

| Analysis & Assimilation | Short-Range ‘Flood Prediction’ | Medium Range ‘Flow Prediction’ | Long Range ‘Water Resources’ |
|---|---|---|---|
| **Cycling Frequency** | | | |
| Hourly | 3-Hourly | Daily | ~Daily (x16) |
| **Forecast Duration** | | | |
| - 3 hrs | 0-2 days | 0-10 days | 0-30 days |
| **Spatial Discretization & Routing** | | | |
| 1km/250m/NHDPlus Reach | 1km/250m/NHDPlus Reach | 1km/250m/NHDPlus Reach | 1 km/catchment /NHDPlus Reach |
| **Meteorological Forcing** | | | |
| MRMS blend/ HRRR-NAM bkgnd. | Downscaled HRRR /RAP/NAM blend | Short-range + Downscaled GFS | Downscaled & bias-corrected CFS |


National Water Model
CANADA
Edmonton
Calgary
Regina
Winnipeg
Vancouver
Seattle
Quebec
Ottawa
York
San Francisco
Los Angeles
San Diego
El Paso
Hermosillo
Chihuahua
Torreón
Monterrey
Culiacan
MÉXICO
San Luis Potosi
Querétaro
Merida
Tampa
Orlando
Miami
Havana
CUBA
Kingston
Santo Domingo
BELIZE
Legend
Streamflow (cfs)
0 - 119
119 - 7,520
7,521 - 88,700
88,701 - 201,900
201,901 - 460,000
460,001 - 1,200,000
http://water.noaa.gov/map
05/01/2015 00:00
Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community

# NWC Summer Institute Program

The NWC Summer Institute (SI) is an annual program under the auspices of the NWC's Innovators Program.

Administered by the The Consortium of Universities for the Advancement of Hydrologic Science, Inc. (CUAHSI)

Seven-week event at the NWC and UA in which graduate student collaborated intensively to work on projects designed to contribute to the NWC goals.

Project themes are defined in advance to reflect the NWC goals.

The SI is led by faculty theme leads with daily oversight provided by post-doctoral or senior PhD course coordinators (selected by a committee; open application).

# Summer Institute Process

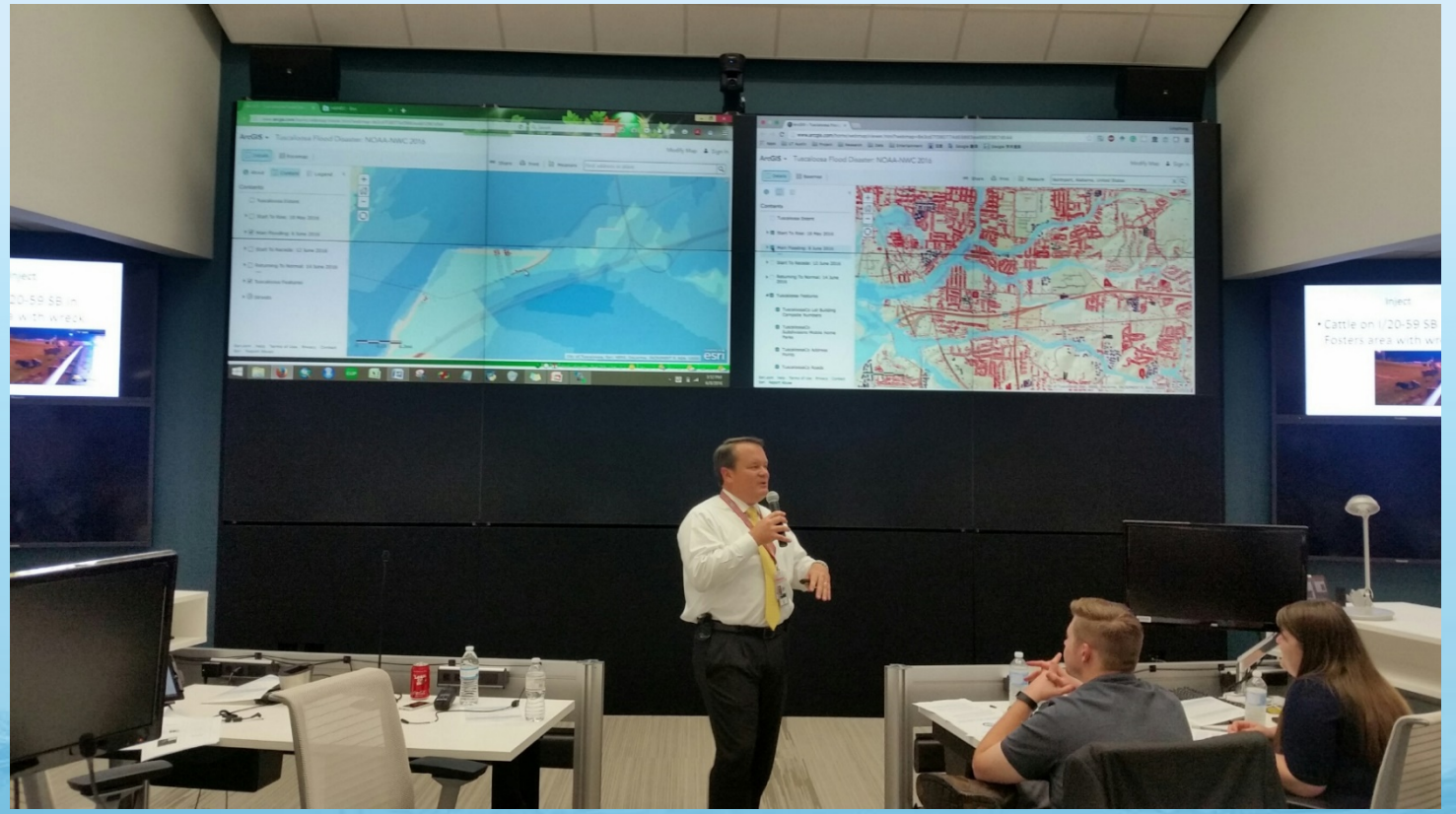

**Goals:** 2015 – a prototype national flood forecasting system
2016 – flood inundation mapping for continental US
2017 – hyper-resolution simulation in cities (streets, pipes, streams)

**2016 Summer Institute Program:**
Introduction (1 week)
Project Formulation (1 week)
Project Execution (4 weeks)
Capstone Event (1 week)

# 2016 Summer Institute: 34 Graduate Students from 21 Universities

# Field work – Cahaba River


# Flood Emergency Response Exercise for Tuscaloosa County

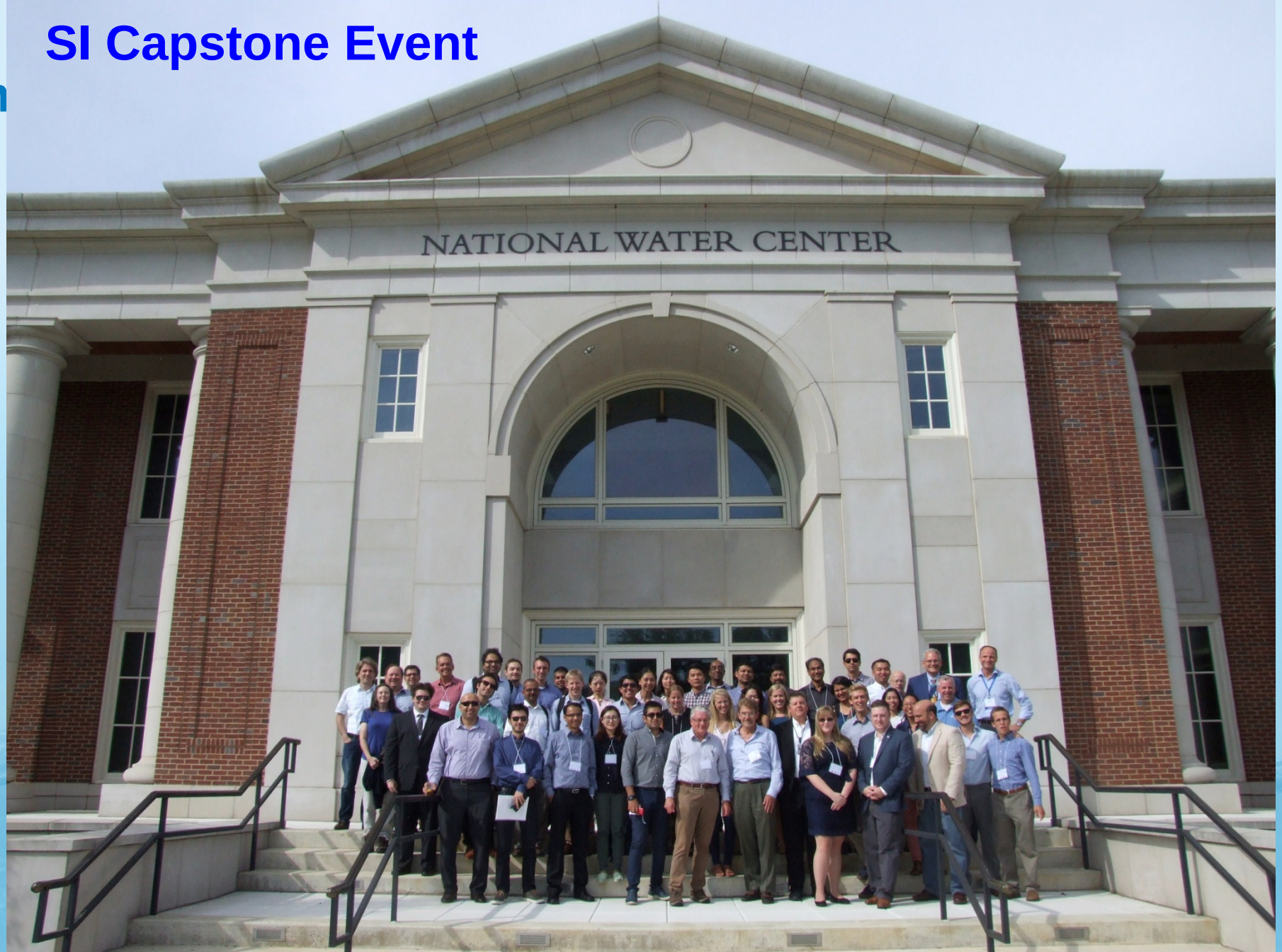


# Summer Institute Projects

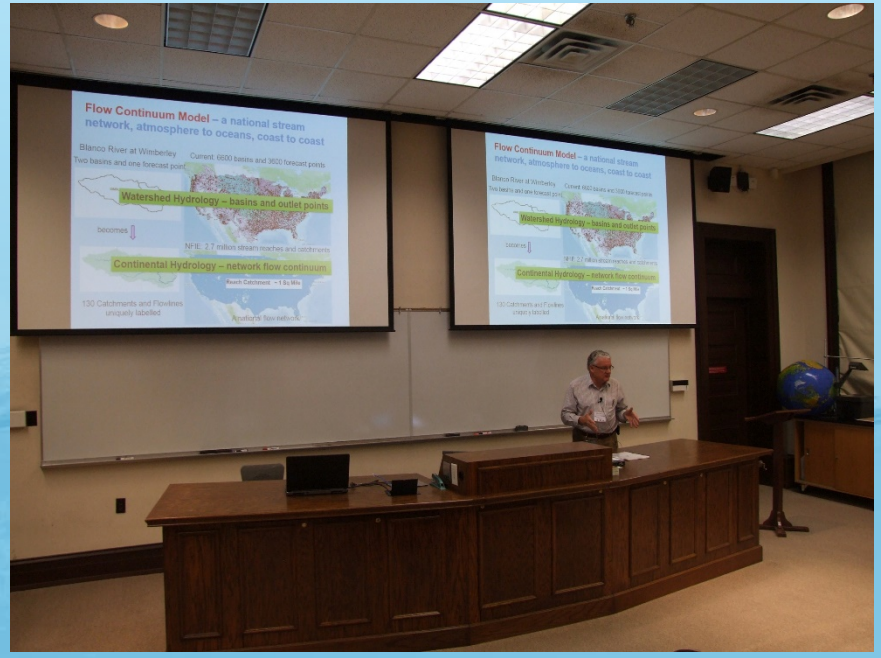
| *Theme* | *Project* | *Topic* | *Students* |
|---|---|---|---|
| **Flood Modeling** | 1 | Radar measurement and flow modeling | James Coll, Mike Johnson, Paul Ruess |
| | 2 | Hydrologic mapping of the Lower Rio Grande Valley | Brenda Eliza Bazan, Mark Hagemann, Kyungmin Kim |
| | 3 | Flood Inundation by Physical and Non-physical models | Shahab Ansari, Ehsan Omranian, Dongmei Feng |
| **Inundation Mapping** | 4 | The Modified HAND Method | Ryan McGehee, Lingcheng Li, Emily Posten, |
| | 5 | Object-based Flood Inundation Mapping | Yan-Ting Liau, Krishna Gadiraju |
| | 6 | Comparison of Flood Inundation Mapping Techniques | Jiaqi Zhang, Dinuke Munasinghe, Yu-Fen Huang |
| **Forecast Uncertainty** | 7 | Real-Time Postprocessor for Flood Inundation Mapping | Sanjib Sharma, Binqing Lu |
| | 8 | Uncertainty in Flood Inundation Mapping | Ridwan Siddique, Christopher Zarzar, Hossein Hosseiny, Michael Gomez |
| | 9 | Assimilation of Water Level Observations | Amir Javaheri, Mohammad Nabatian |
| **Emergency Response** | 10 | HAND Flood Mapping through the Tethys Platform | Savannah Keane, Christian Kesler, Xing Zheng |
| | 11 | Reimagining Disaster Warning Systems | Mike Johnson, Paul Ruess, James Coll |
| | 12 | Translater TTX and Citizen Awareness of Floods | Whitney Henson, Richard Garth, Chris Franklin, Dawne Butler |

# SI Capstone Event

## Sun



# SI Capstone Event


# Post-SI

Consortium of Universities for the Advancement of Hydrologic Science, Inc.

TECHNICAL REPORT 13
JULY 20, 2016

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Special Issue