AVOIDING TECHNICAL DISASTERS DURING A NATURAL DISASTER:

LESSONS LEARNED FROM HURRICANE FLORENCE

NORTH CAROLINA EMERGENCY MANAGEMENT

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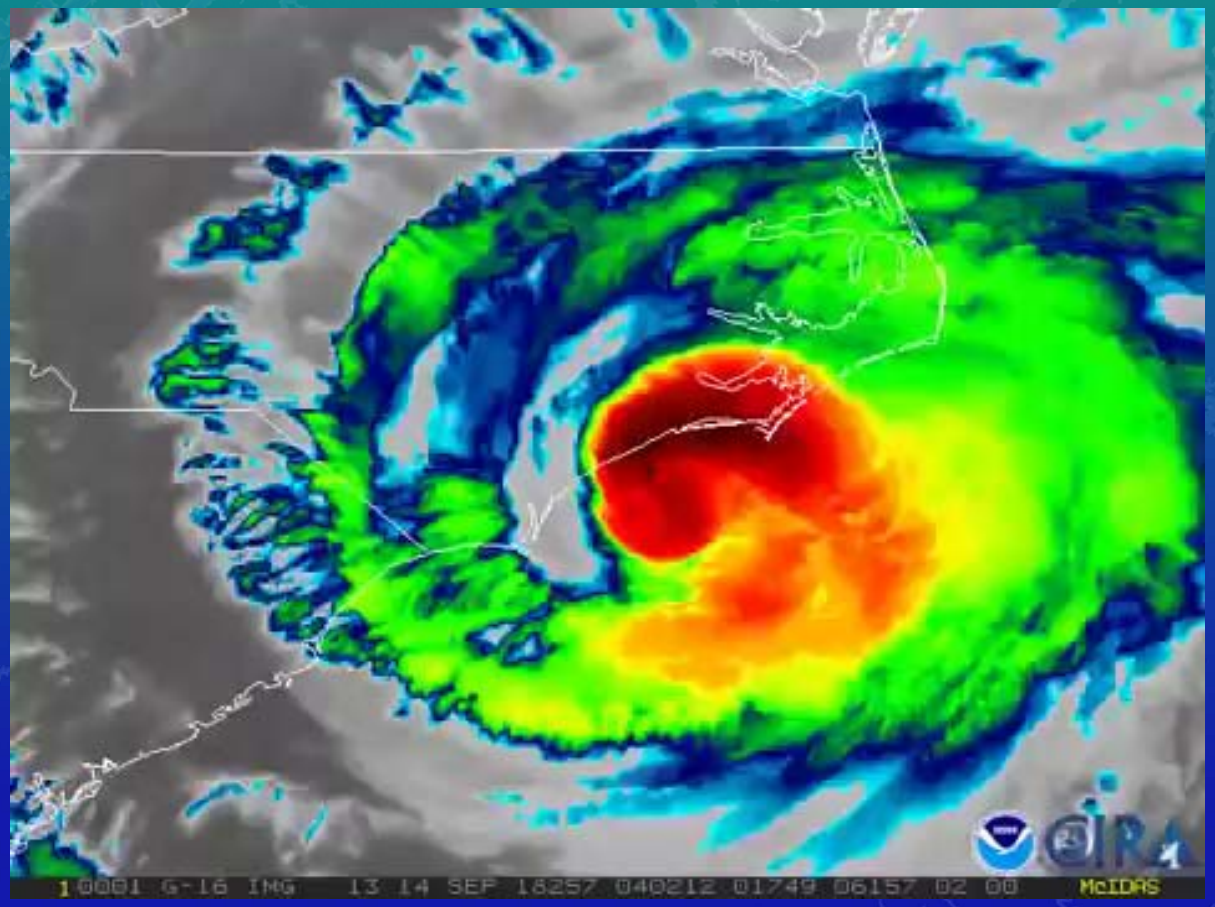
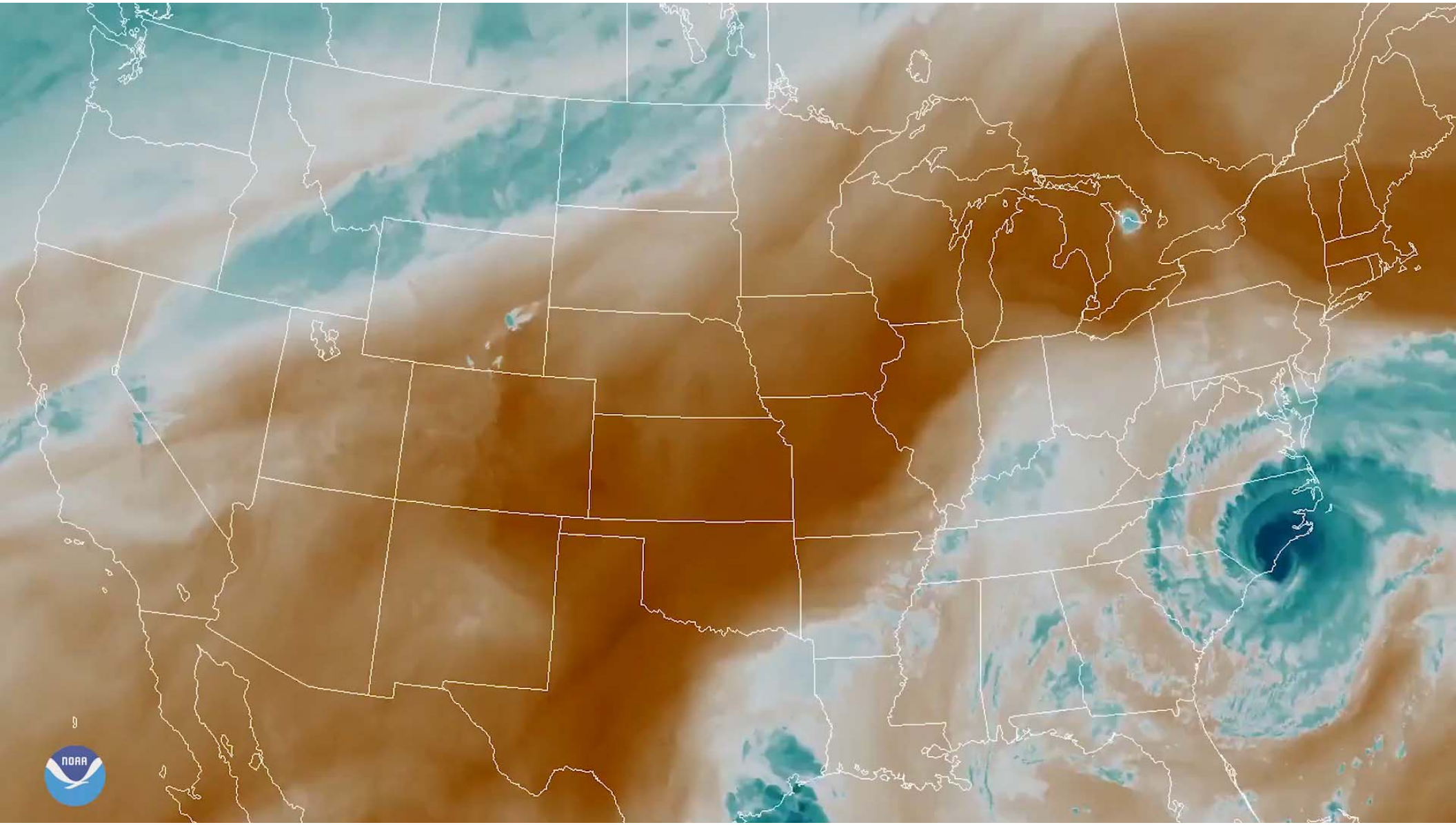
HURRICANE FLORENCE

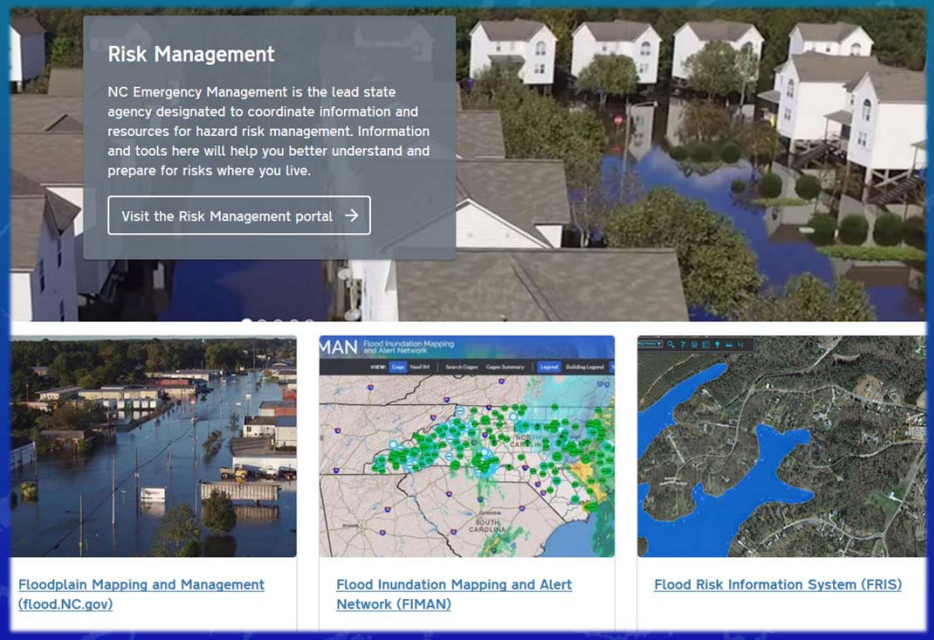
- Landfall September 14, 2018 near Wrightsville Beach, NC
- Category 1 – 90 mph
- Very slow moving causing upwards of 30+ inches
- Record Floods
  - 18 in NC
  - 10 in SC
- Record Stream Flows
  - 45 in NC
  - 4 in SC




NOAA

RISK MANAGEMENT – THE TECHNICAL SIDE OF EM

- GIS Analysts
- Photogrammetrist
- Programmers
- DBA
- IT staff
- Engineers
- Surveyors

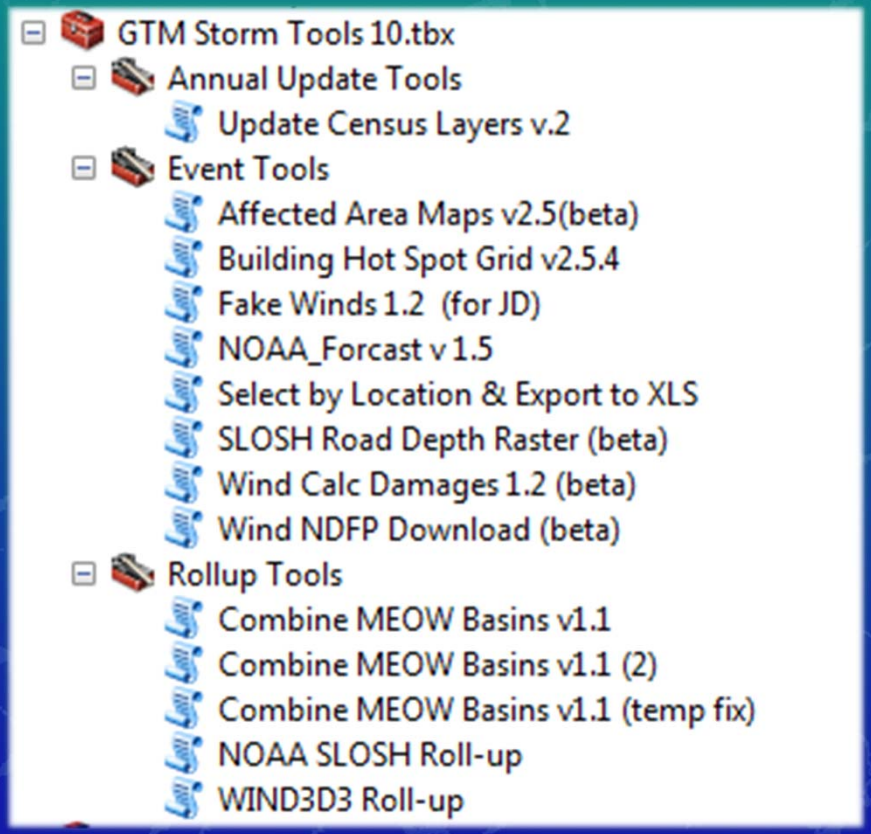


PREPARATION, PYTHON, PRACTICE

- Preparation
  - What requests came to us in prior events?
  - Were those requests similar to other requests?
  - How time sensitive were the requests?
  - Did we need to find data for analysis?
  - What new data has been produced this year that could assist us?
  - What new technology do we have

PYTHON

- Wind damages
- Hurricane path and forecasts
- Storm Surge
- Ice damages
- Reports
- WebEOC Service updates



PRACTICE

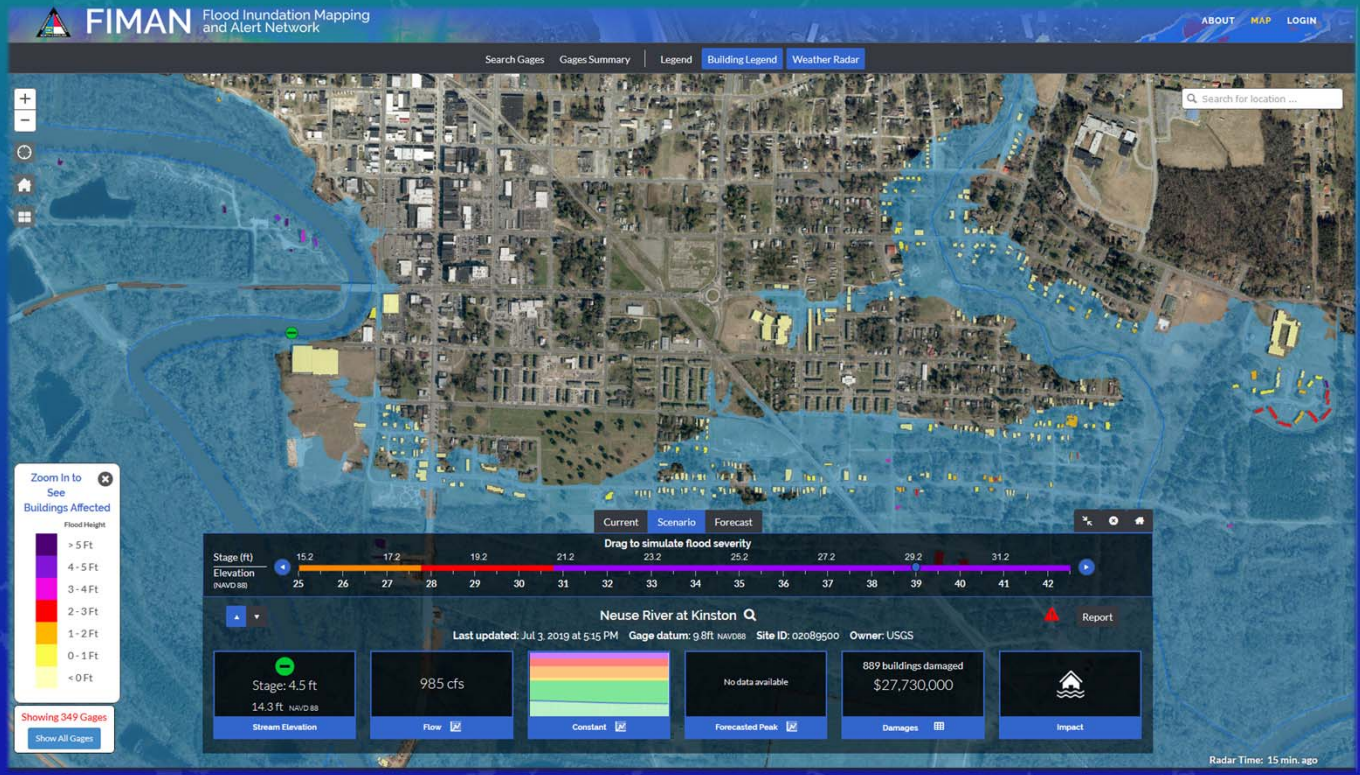
- Install and test scripts
- Coordinate with users to test field apps
- Know logins/have permissions
- Knows where data is

EOC SHIFTS

- 9 – 12 hour shifts
- Routine scripts 3-6h
- Custom map requests
- Custom analysis requests
- Aerial imagery coordination
- Maintain Portal maps for WebEOC
- Tech support for mobile apps
- Keep WebEOC and all supporting servers running

GIS GOALS: PREDICT AREAS WHERE DAMAGE IS LIKELY TO OCCUR USING WIND, STORM SURGE, AND FLOOD DATA

- Locals can store life saving equipment in safe locations, but near where needed
- First responders can plan for types of assistance likely



GIS GOALS: FAST DELIVERY OF DAMAGE ESTIMATES TO OBTAIN A DISASTER DECLARATION

- Bring desperately needed resources to citizens as quickly as possible

HURRICANE Florence

Sep 14, 2018
11:00AM
Max Sustained Winds 80MPH
Present Movement WSW at 3MPH
Min Central Pressure 958 MB 28.29 Inches

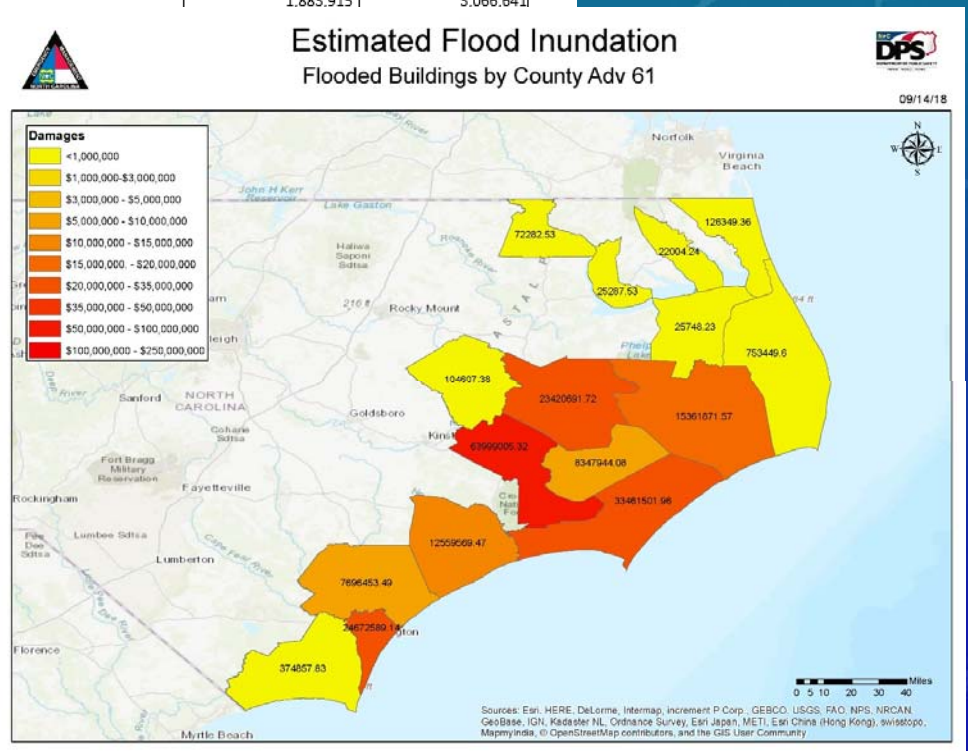
Incident ID: 1113

Storm Advisory Number	61	60A
Total Population	*Total Number In Probability Area*	*Total Number In Probability Area*
Total Population	3,553,776	5,931,915
Median Income (US Dollars)	$38,265	$40,463
Structures	1.883.915	3.066.641

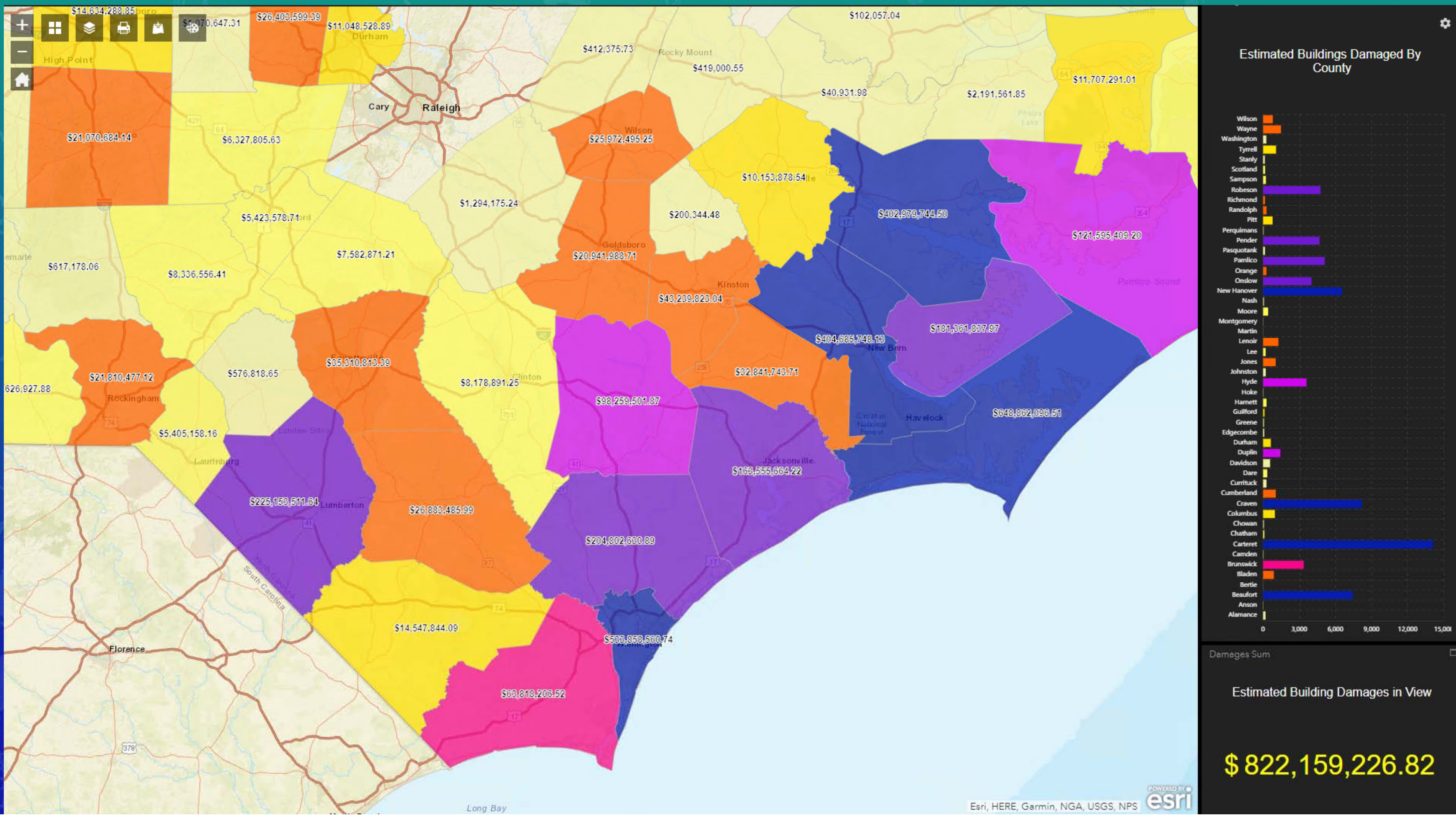
Critical Infrastructure:
Chemical
Dams
EMS
Fire stations
Gas stations
Grocery stores
Pharmacies
Police Stations
Power Stations
Shelters

Functionally Fragile & Medical Fac
Age 65 +
Medically Fragile
Correctional Facilities
Hospitals
Nursing Homes
Under 5 years of age

Agricultural Livestock:
Cattle Ranches
Dairy Ranches
Poultry Farms
Swine Farms
Livestock Lagoons

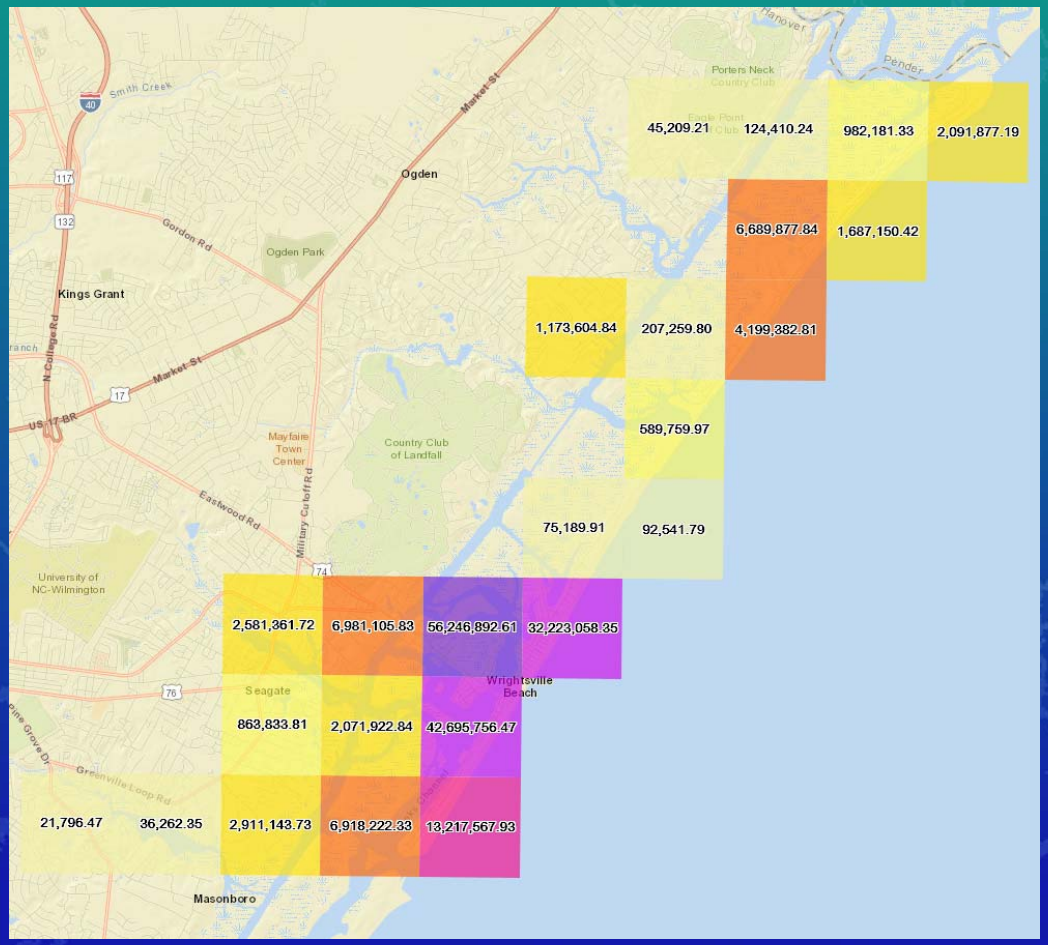


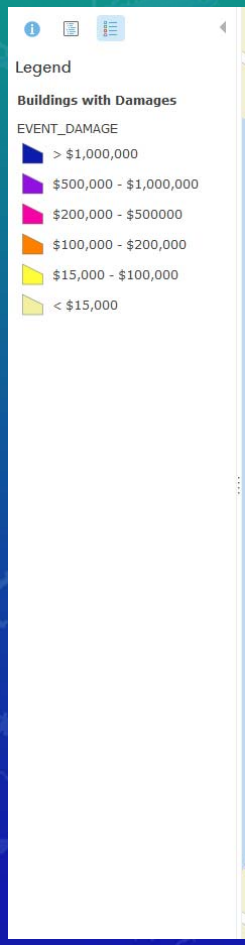
DAMAGE MAPS

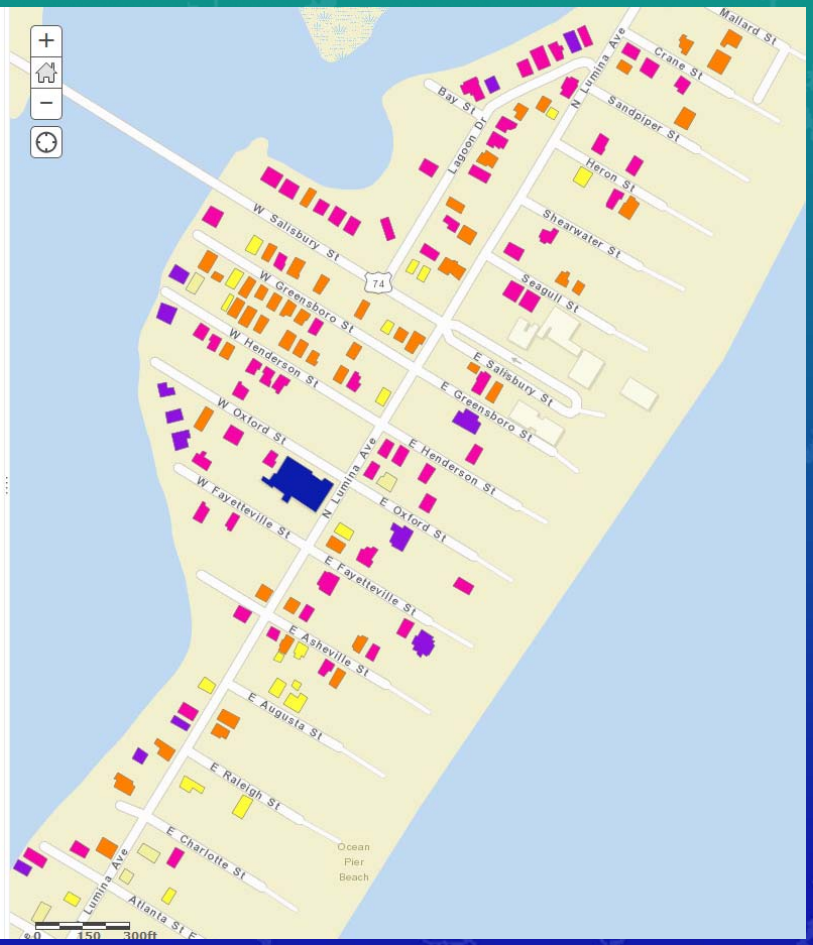


$26,403,599.39
$11,048,528.89
Durham
High Point
$102,057.04
$412,375.73
Rocky Mount
$419,000.55
$40,931.98
$2,191,561.85
$11,707,291.01
Cary
Raleigh
$21,070,684.14
$6,327,805.63
$25,972,495.25
Wilson
$10,153,878.54
$1,294,175.24
$200,344.48
$402,979,744.50
$121,595,409.20
$5,423,578.71
$617,178.06
$8,336,556.41
$7,582,871.21
$20,941,988.71
Goldsboro
Kinston
$43,239,823.04
Pamlico Sound
$181,361,837.97
$404,685,748.13
New Bern
$35,310,813.39
$21,810,477.12
Rockingham
$576,818.65
$8,178,891.25
Clinton
$32,841,743.71
626,927.88
$98,259,501.87
$648,862,090.51
Havelock
$5,405,158.16
Laurinburg
Jacksonville
$183,555,684.22
$225,158,511.64
Lumberton
$26,880,485.99
$204,802,630.89
South Carolina
$14,547,844.09
$583,858,560.74
Florence
$63,818,208.52
Long Bay
Esri, HERE, Garmin, NGA, USGS, NPS
esri
Estimated Buildings Damaged By County
Wilson
Wayne
Washington
Tyrrell
Stanly
Scotland
Sampson
Robeson
Richmond
Randolph
Pitt
Perquimans
Pender
Pasquotank
Pamlico
Orange
Onslow
New Hanover
Nash
Moore
Montgomery
Martin
Lenoir
Lee
Jones
Johnston
Hyde
Hoke
Harnett
Guilford
Greene
Edgecombe
Durham
Duplin
Davidson
Dare
Currituck
Cumberland
Craven
Columbus
Chowan
Chatham
Carteret
Camden
Brunswick
Bladen
Bertie
Beaufort
Anson
Alamance
0
3,000
6,000
9,000
12,000
Damages Sum
Estimated Building Damages in View
$ 822,159,226.82

DAMAGE ESTIMATES – HOTSPOTS, BUILDING LEVEL

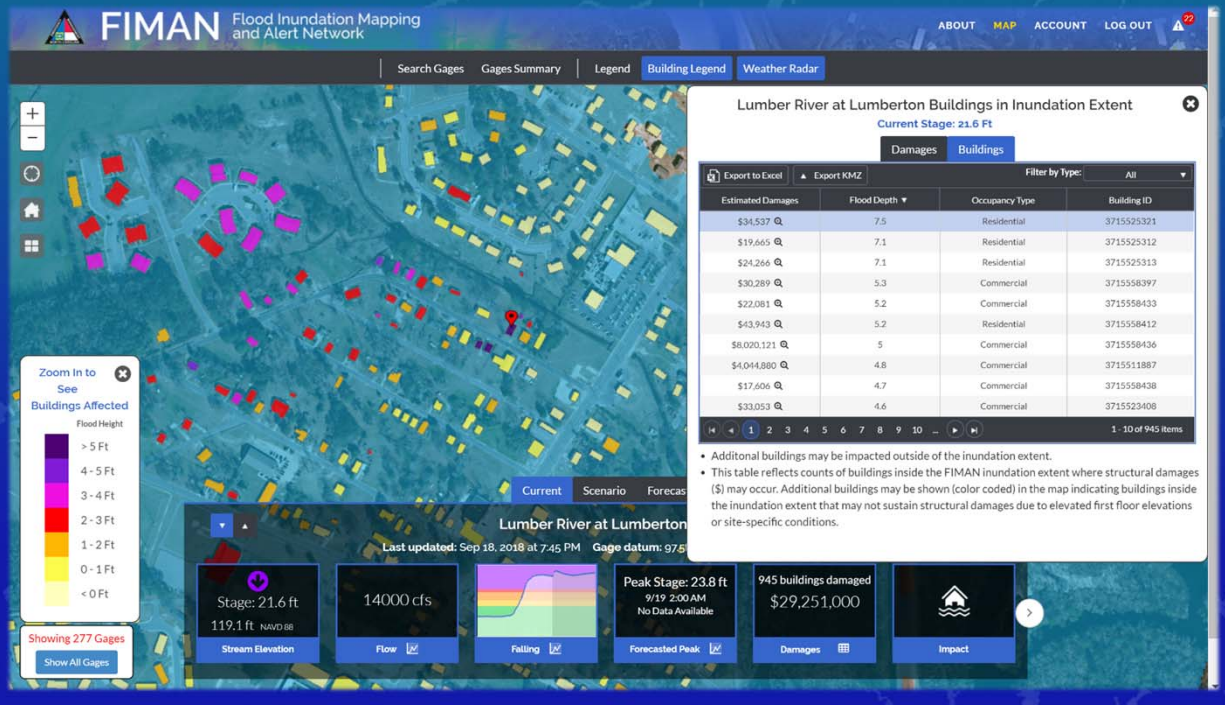






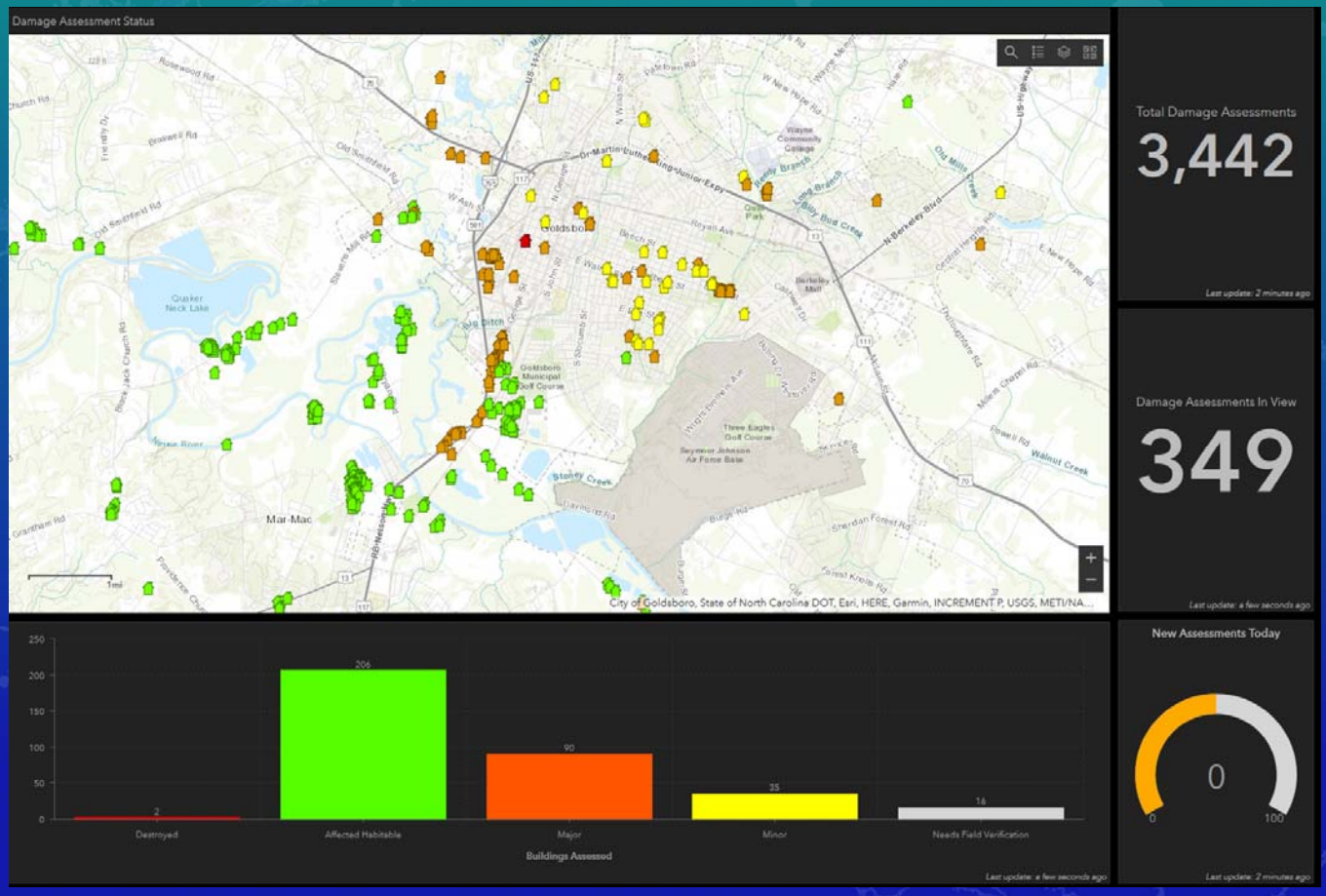
HOW CAN WE ESTIMATE DAMAGES SO QUICKLY?

- Rainfall and Gage forecasts + Prepared Data + Python Scripts = Fast Damage Estimates
  - Statewide Lidar and mobile survey of First Floor Elevations
  - 10, 25, 50, 100, and 500 year flood water surface elevations
  - PreEvent calculation of depth of water, structure, and content damages
    - Flood
    - Wind
    - Ice
    - Earthquake



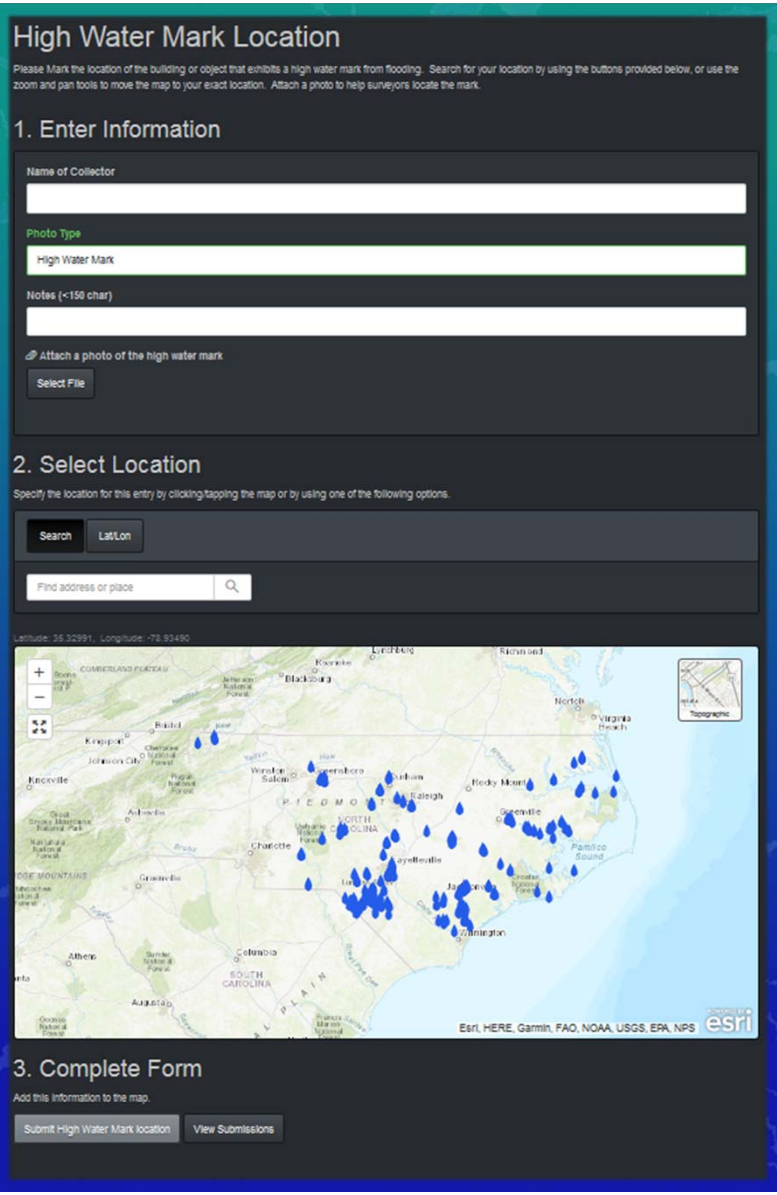
DAMAGE ASSESSMENT: ON THE GROUND DATA

- AGOL map in WebEOC
- Scripts to update addresses
- Collector App (field editing)
- Dashboard
- AGOL user management
- Coordination with private industry

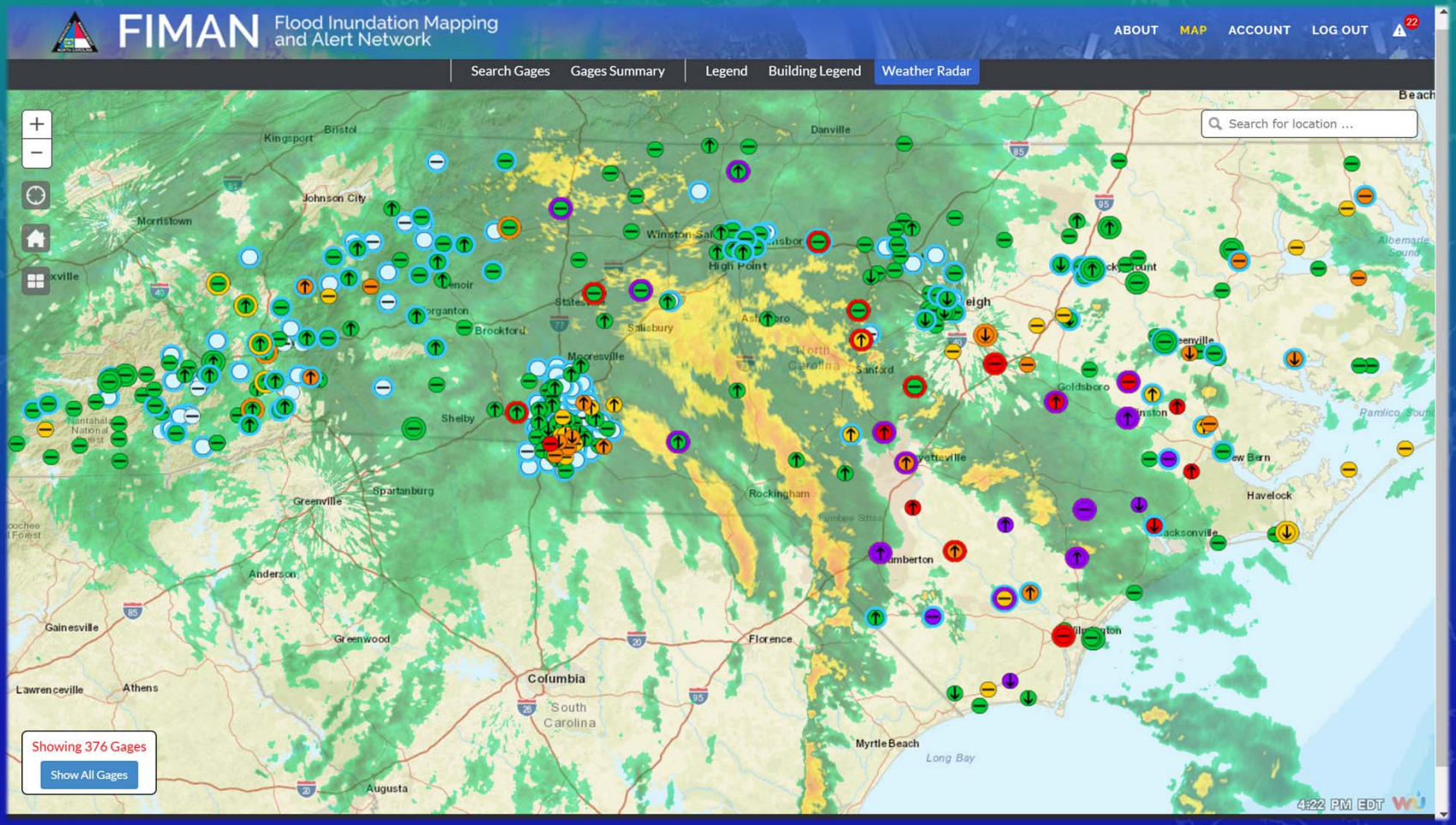


HIGH WATER MARK APP

- Requested during Matthew
- Tested during Matthew
- Returned for Florence
- Mobile “app” – just a website

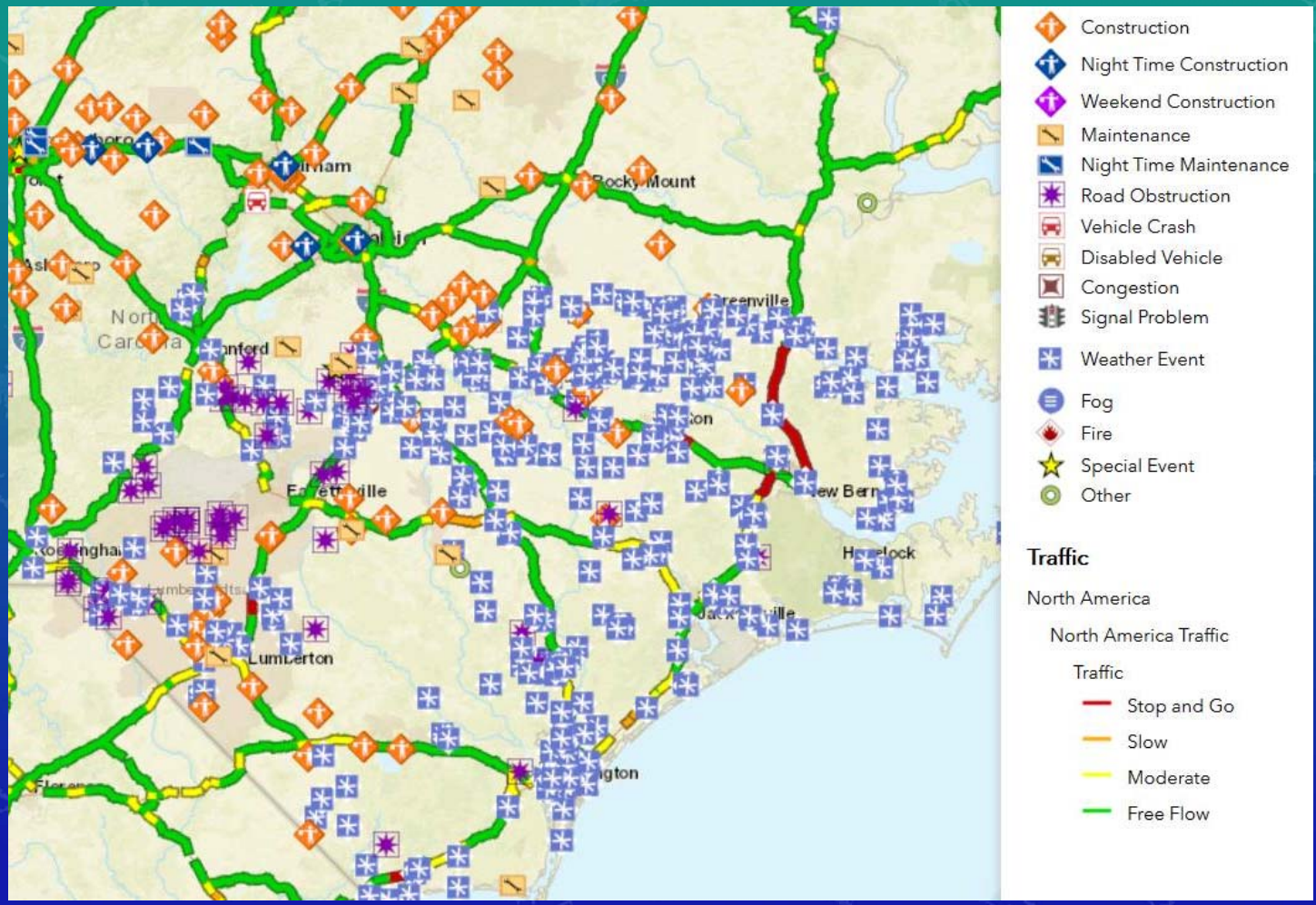


WHERE ARE THE ROADS FLOODING NOW?



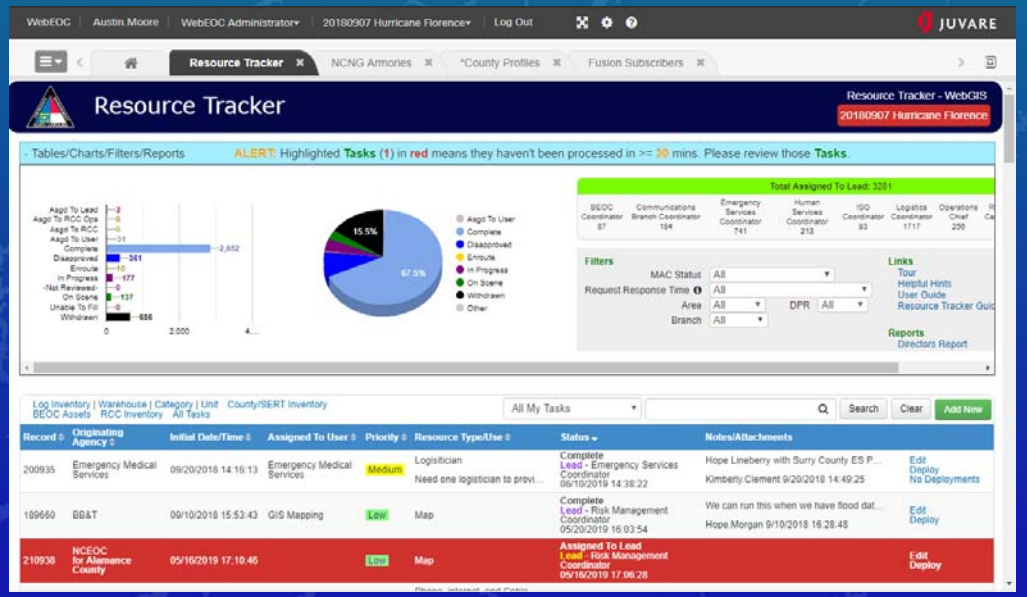
ROAD CONDITIONS

- Has been an issue in the past
- New data available for Florence: Gas Buddy and Waze, ESRI road conditions
- Map in WebEOC for everyone to use
- Working on better mapping



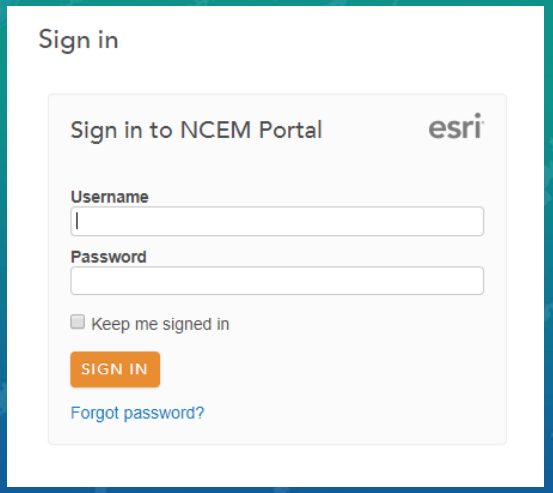
WEBEOC

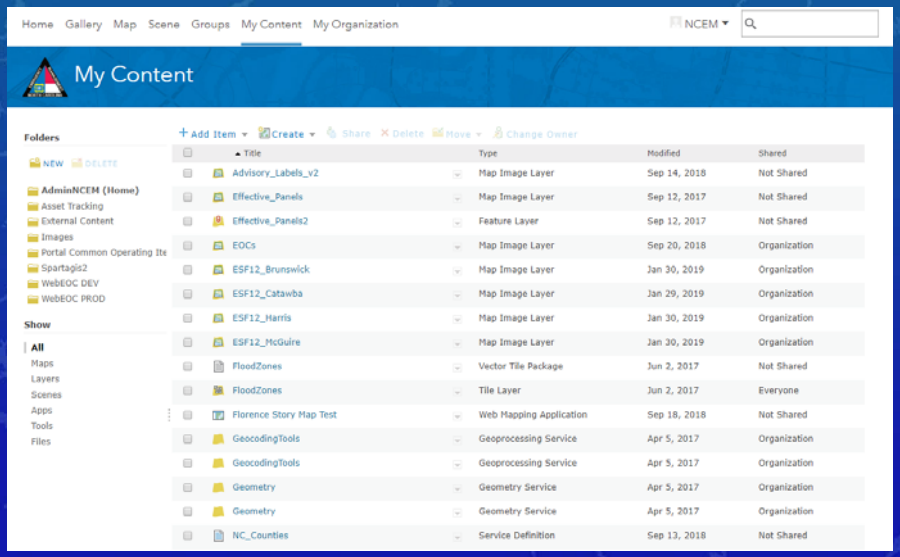
- Crisis Management Software
  - Data
  - Documents
  - Communication
  - Security
- International Customer Base
  - Governments (public)
  - Companies/Corporations (private)
- North Carolina - user base
  - Counties
  - FEMA
  - States
  - Private Sector
  - NCNG
  - Gov Agencies
  - SERT
  - CERT
  - American Red Cross
  - Baptist Ministry
  - Volunteers
  - Many more



ARC PORTAL

- Your local instance of AGOL on premise
- Arc Portal 10.5
- Internal/Mission Critical ESRI products that can not fail
  - Loss of internet
  - Loss of communication to the outside
  - Loss of support





WEBEOC + ARC PORTAL = COMPLETE SYSTEM

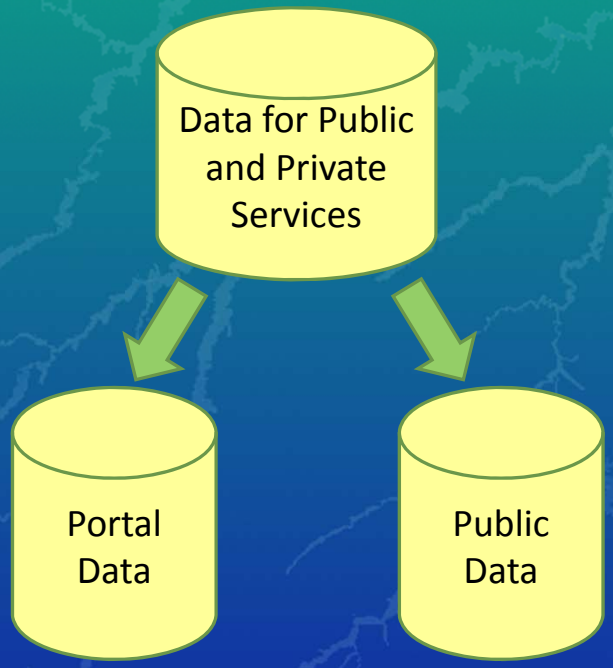
- Ability to communicate real-time data captured via WebEOC and displayed to the user on a map in Arc Portal
- With a custom proxy, we can tokenize an Arc Portal login to see secure/locked down Portal maps without having to remember a second set of credentials (user/pass)
  - Users log into WebEOC and have full access to Arc Portal maps
- If the internet goes down OR we lose communication with AGOL, everything still functions like normal during emergency operations
- NCDPS/NCEM has been nationally recognized as with an Exceptional Response Award in 2019 by Juvare

HURRICANE FLORENCE & SYSTEM INFRASTRUCTURE

- Arc Server overloaded with traffic which brought it down
- Arc Sockets flooded with incoming request
  - NC DOT was referencing a service, and their site got slammed with requests
- By default, when publishing a service, two Arc Sockets are create to help mitigate traffic to the service, ArcSOC.exe
  - Service Editor -> Pooling -> Max # of instances per machine
  - Consider when publishing services, what kind of traffic you can expect (Ie. Lots of users vs a few once in a while)

SPLITTING SERVICES

- Move services to another Arc Server
  - Divide requests by public vs private
- Ran python script to repoint the data
- Republish services
- Repoint all links in WebEOC to the new Arc Server



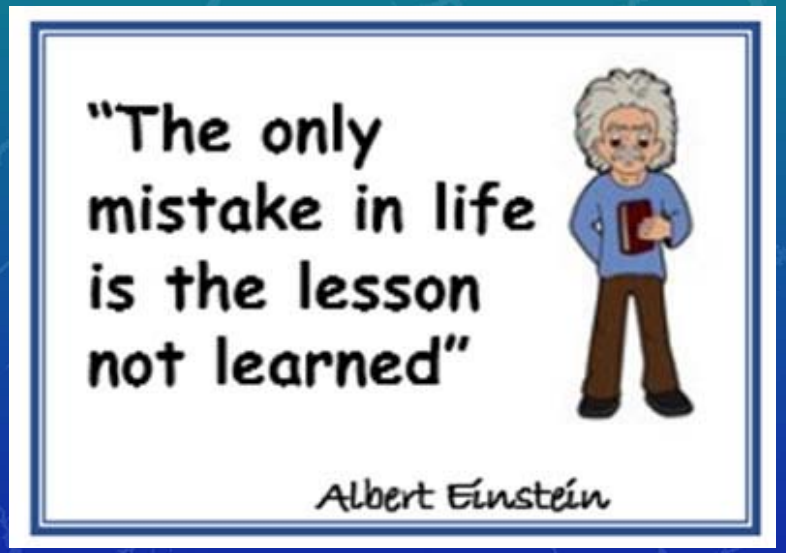
FIMAN

Fast delivery of damage estimates to obtain a damage declaration

- Flood Inundation Mapping and Alert Network
- Whenever “FIMAN” was mentioned on the national news, our network traffic exploded beyond capacity
  - Every system communicating to the outside came to a screeching halt
  - In conjunction with DIT, had up increase throughput from 250 Mb to 1 Gb

LESSONS LEARNED

- Communication is Key
- Know your audience
  - Public (external) vs Private (internal)
- Practice and test scripts, services, sites
- Python scripts in a central location- reuse, recycle
- Use the tools you know to streamline work
- Think outside the box
- We still need better real time road flooding data
- Who has access to your data
- Monitoring systems
- Always have a backup plan/server



QUESTIONS?

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