

High Water Mark Training

Initiative to Record Flood Elevations

April 24, 2018



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High Water Mark (HWM) Training

- Benefits of high water marks
- Setting and documenting marks
- High water mark field kits
- NC HWM photo submittal phone application



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Locating Marks

- The need for speed – marks can be highly perishable
- Rain can quickly degrade/destroy marks
- Important to locate and flag ASAP after a flood



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Benefits of a High Water Mark (HWM)

- Are the best resource to document a flood event
- HWM information can be used in a variety of mitigation and planning efforts
- Calibrate models
- Supports FIMAN (Flood Inundation Mapping Alert Network) and FRIS (Flood Risk Information System)
- Public safety



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Benefits of a High Water Mark (HWM)



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Benefits of a High Water Mark (HWM)

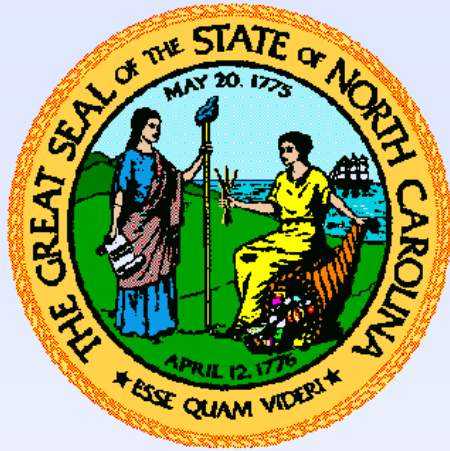


Turn Around... Don't Drown!

- Barricades are there for your safety.
- Turn around, don't drown.
- Vehicles can be swept off the roadway in 6 inches of water.
- If you see a barricade, find another route. Do not go around it

Photo Credit: FEMA

ReadyNC.org



Flood Risk Information System (FRIS)



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FRIS

Map Theme

Search, Help, Layers, Legend, Tools, Info icons



Who Am I : General Public Effective

Flood Information

Click the map to view information.

2342 New Hill-olive Chapel Rd, New Hill, NC
[Google Street View](#)

Map Location

Flood Zone:	AE (Floodway)
Flood Source:	Little Beaver Creek
Base Flood Elevation:	257.8 ft
County:	Wake
Political Area:	Wake County
CID:	370368
Panel:	0710
Map Number:	3720071000L
Panel Effective Date:	02/02/07
Latitude:	35.69042
Longitude:	-78.93987

- Risk Information
- Financial Vulnerability
- FIS Reports
- Map Export
- Data Export

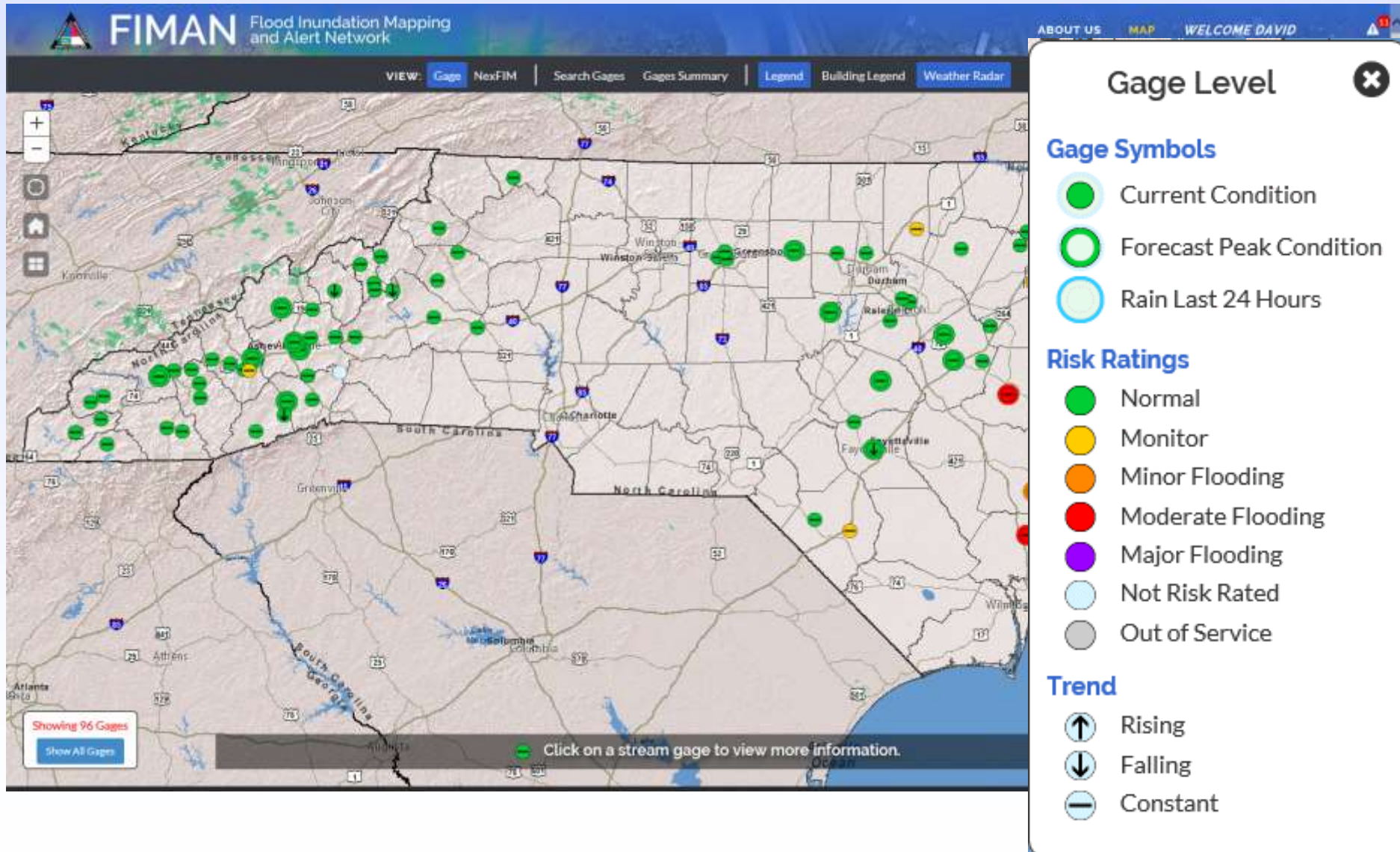
Flood Inundation Mapping Alert Network (FIMAN)



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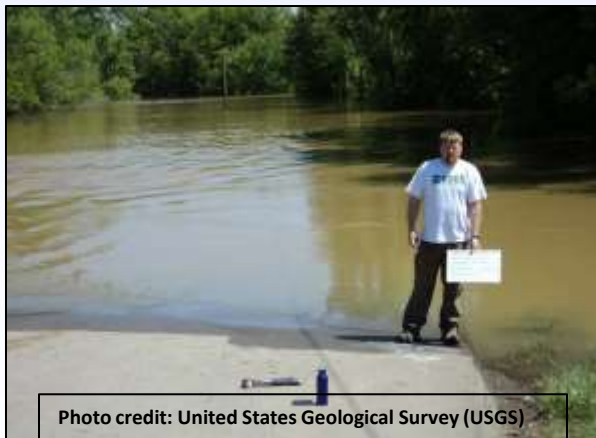


Home Screen / Current Severity



High Water Marks

- Locate marks
- Flag the marks with durable markers
- Document the flagged marks
- An elevation will need to be determined for the marks later for them to be useful.



Types of Marks

- Mud lines
- Seed Lines
- Debris lines on the ground
- Debris snags in branches



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Mud Lines



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Seed Lines



Photos credit: USGS



Debris lines on the ground



Debris snags in branches



You Found a HWM

Now What?



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Flagging a HWM

- Use a durable marker to note water surface
 - Nail/cap
 - HWM washer
 - Surveyor's tape
 - Paint mark
 - ~~– Wooden stake~~
 - ~~– Chiseled square or line in concrete/rock~~
- **IMPORTANT** – make sure you get permission of property owners before flagging marks!



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Basic HWM Field Kit

- Nails
- High Water Mark (HWM) plastic washers
- Paint crayon/ spray paint
- Surveying flagging tape – high vis.



Marking Examples





Photos credit: USGS

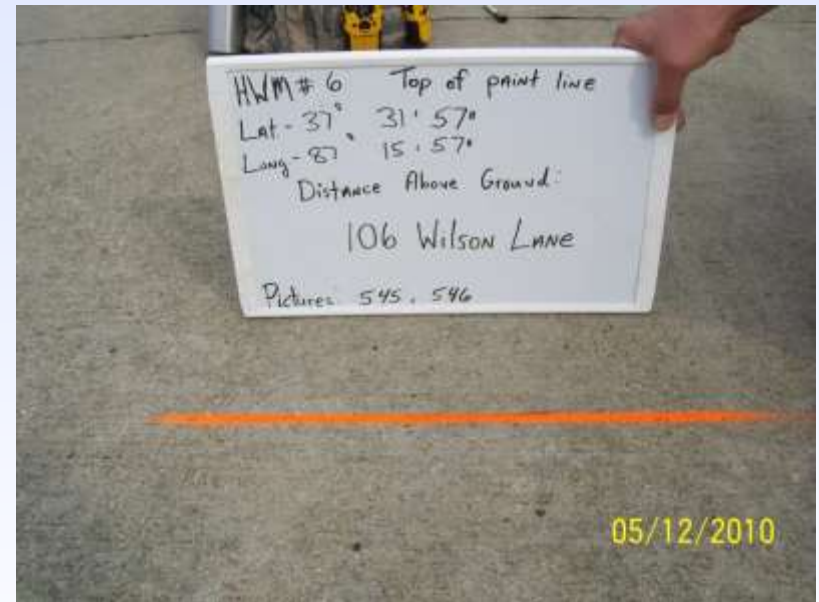


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Chiseled square on sidewalk

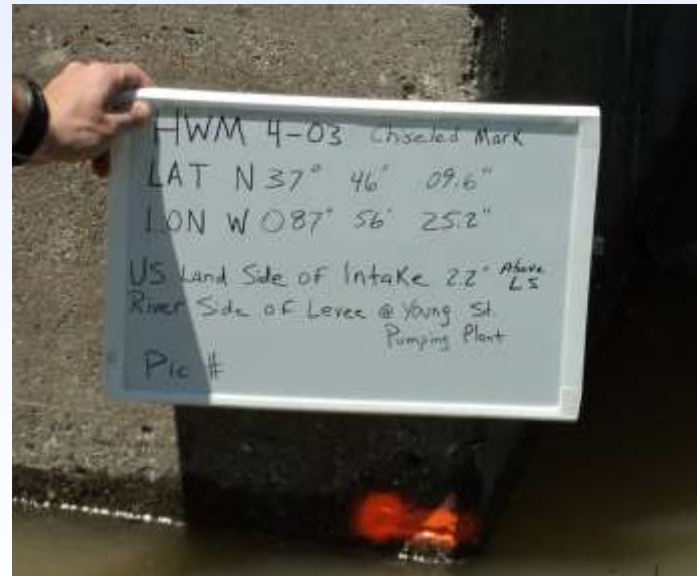


Painted Line on Boat Ramp



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Some Tips

- Always look a little higher
 - Make sure you are not:
 - Marking a lower, secondary peak which is common
 - Setting multiple marks can be advantageous, also try to get them on both sides of the channel
 - A HWM should represent the water surface in relatively still water



Look for areas off the main channel, where water would likely be pooled and not piling up due to swift current.

Photo courtesy of Arizona Geologic Hazards Center

If some time has elapsed between flood and a HWM search, look for them in sheltered areas. Note for a mark in a structure, transfer the mark height outside with a leveling device – that way if the owner cleans the structure the mark height is preserved.



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Be Careful at Boat Ramps



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Marks can be Highly Perishable

Still a few just get up and walk away!



 USGS

HWM Documentation

- Type of mark – e.g. mud line, seed line
- Location of mark – lat/long
- Type of flagging used e.g. nail through bottle cap
- ~~• Quality of the mark~~
- Miscellaneous important notes
 - Landowner contact info
 - Logistics/safety information
- ~~• Noting mark location on a map/site sketch is helpful~~
- Date stamped digital photo of mark



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High Water Mark (HWM) Photo Application

<http://ncem-gis.maps.arcgis.com/apps/GeoForm/index.html?appid=e4b0124896264c37aa7e235de3d89809>

High Water Mark Location

Please Mark the location of the building or object that exhibits a high water mark from flooding. Search for your location by using the buttons provided below, or use the zoom and pan tools to move the map to your exact location. Attach a photo to help surveyors locate the mark.


1. Enter Information

Name of Collector

Photo Type

High Water Mark

Notes (<150 char)

 Attach a photo of the high water mark

Select File

2. Select Location

Specify the location for this entry by clicking/tapping the map or by using one of the following options.

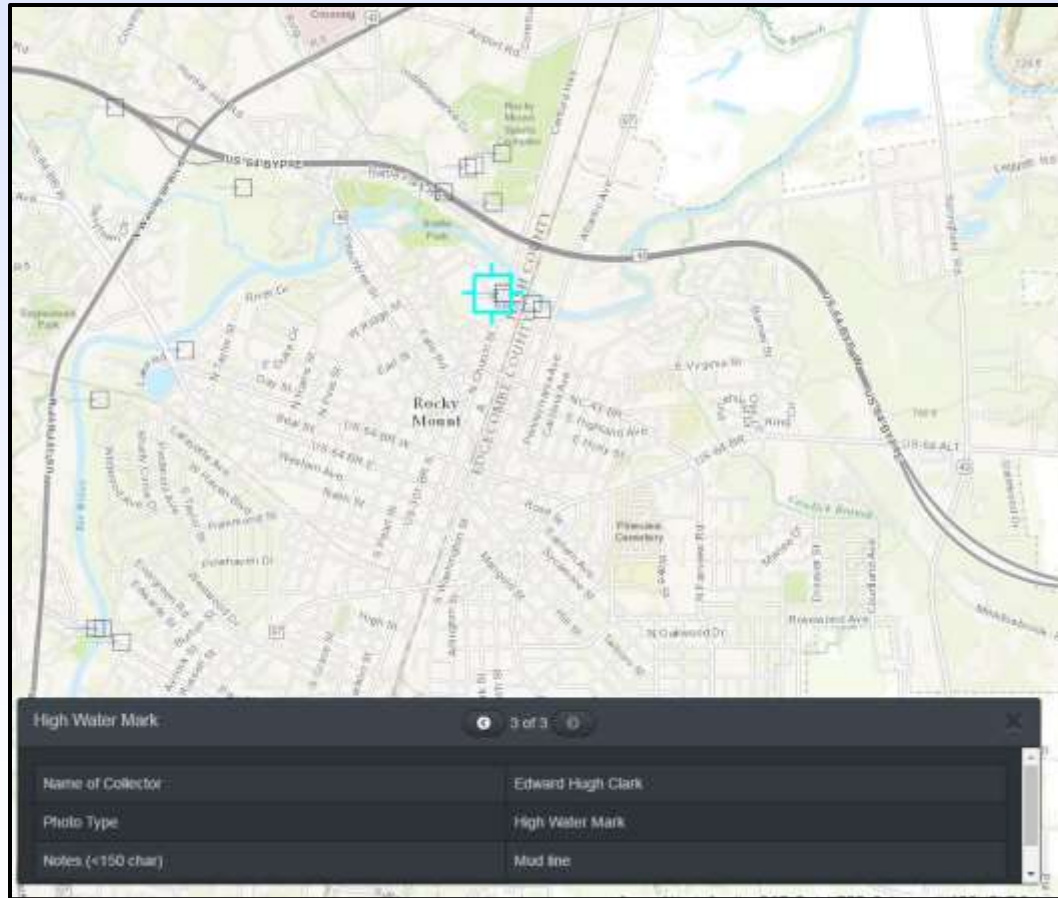
Search

Lat/Lon

Find address or place



HWM Web Viewer



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HWM Photo



High Water Mark (HWM) Photo Application

- <http://ncem-gis.maps.arcgis.com/apps/GeoForm/index.html?appid=e4b0124896264c37aa7e235de3d89809>

Or

www.arcgis.com

Search for “NCEM, High Water Marks”

To view HWM submissions: <http://arcg.is/10vrKm>



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Best Practices

- Safety first
 - Think ahead
 - Visualize the flood
 - Be aware of hazards
- Obtain permission (private property)
- Be aware of local effects (pile up)
- Bushes can get bent down during a flood and bend back up after the flood, creating a false high water surface
- **Safety First**



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HWM Examples



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HWM Examples



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HWM Examples



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HWM Examples



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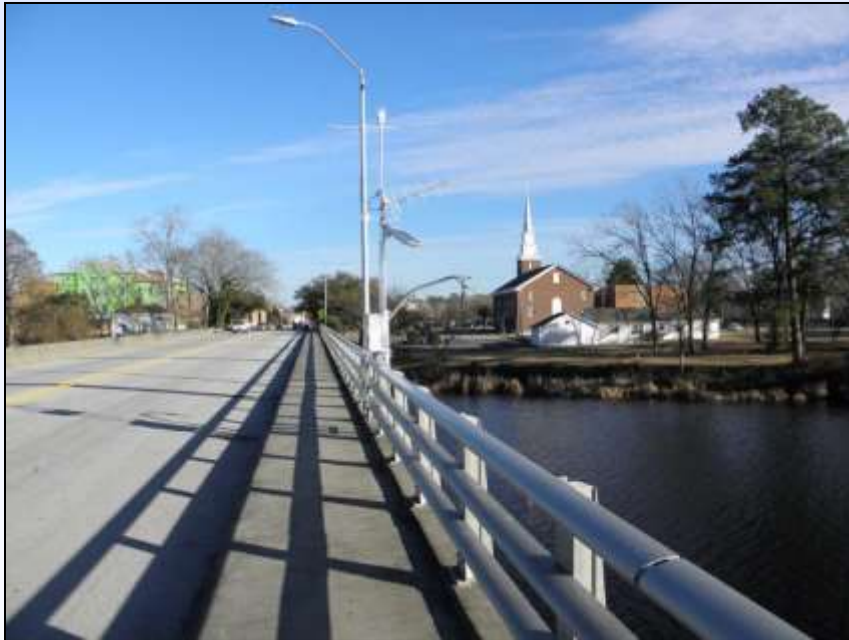
HWM Examples



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Jacksonville Gage



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HWM Collection- Julia's Impacts in Windsor

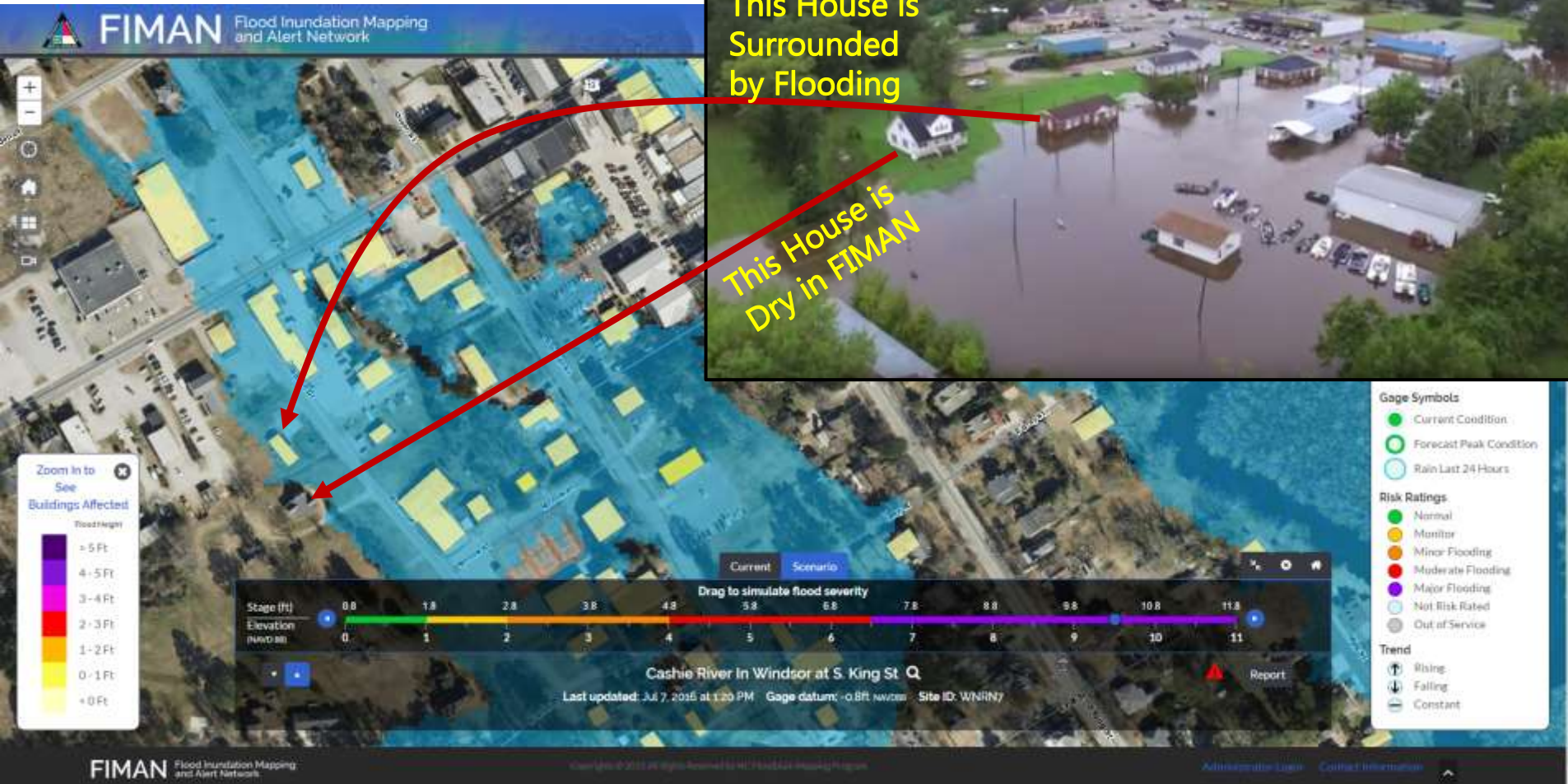




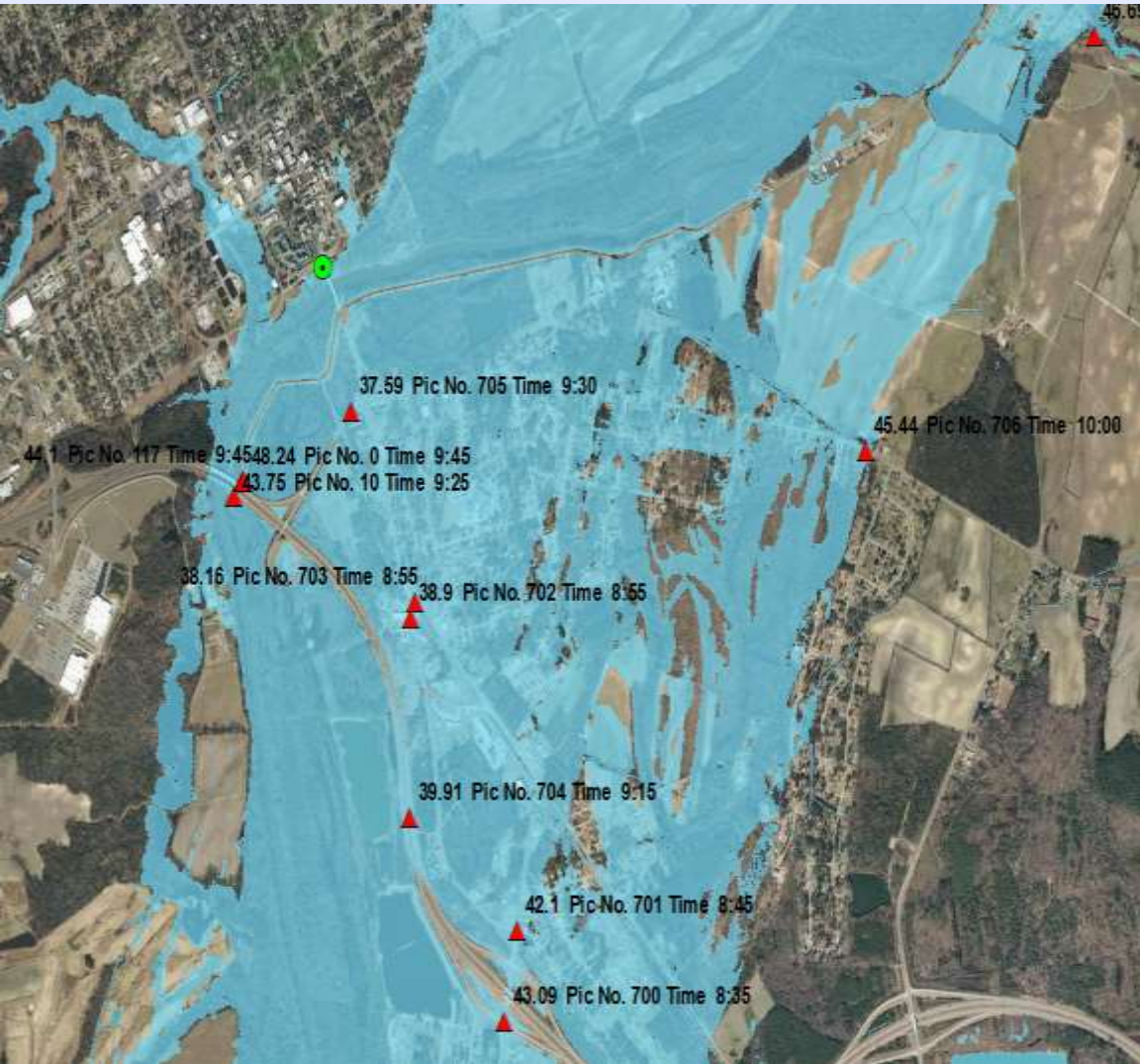


Windsor – Sept 2016

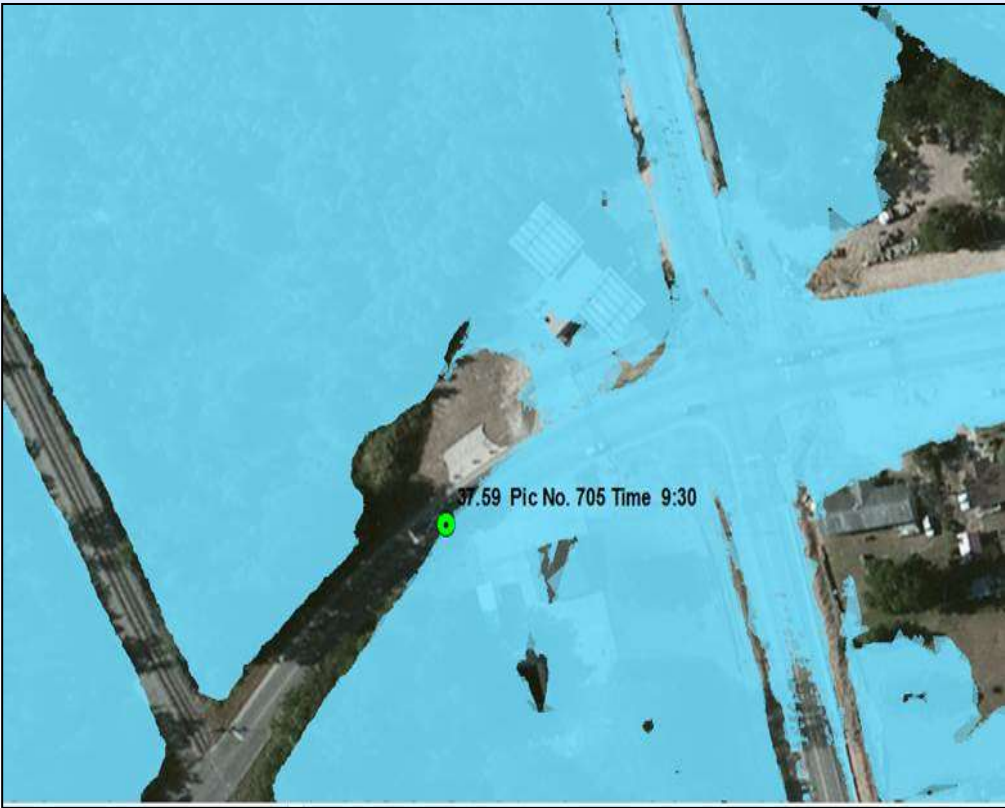
Windsor Flooding 9/22/16 - Morning



Hurricane Matthew-Flood Origin Assessment Princeville



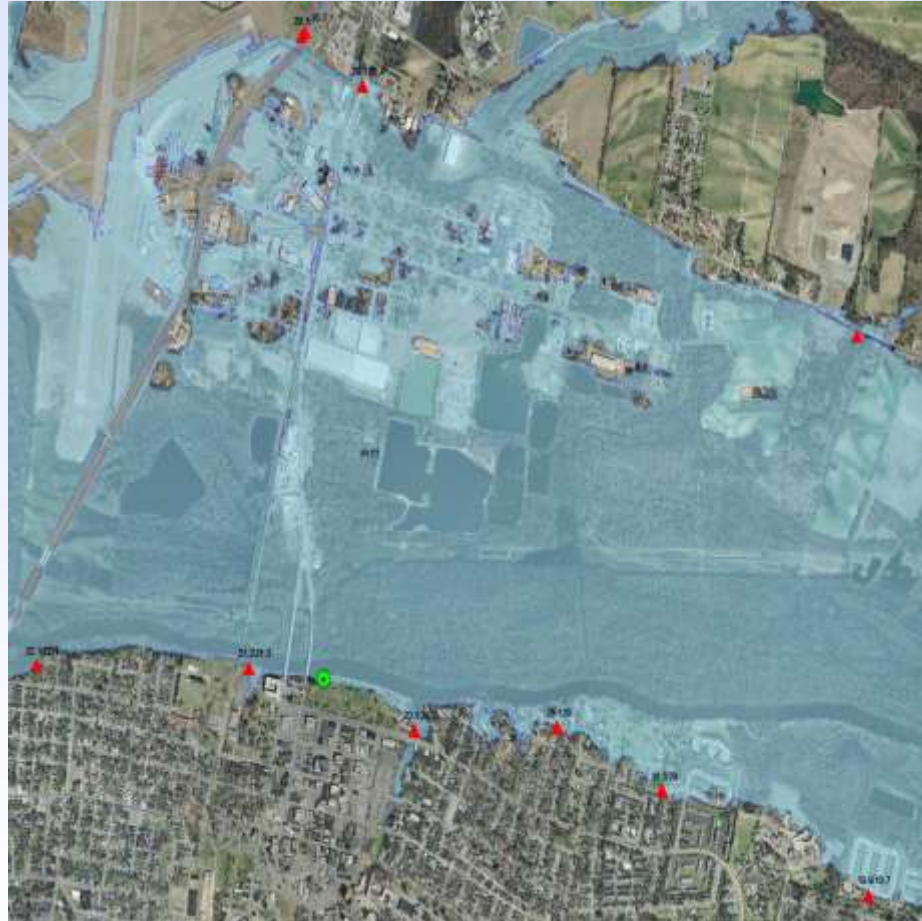
Comparing LiDAR based flood mapping to surveyed edge of water



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FIMAN Library Comparison to HWM- Greenville



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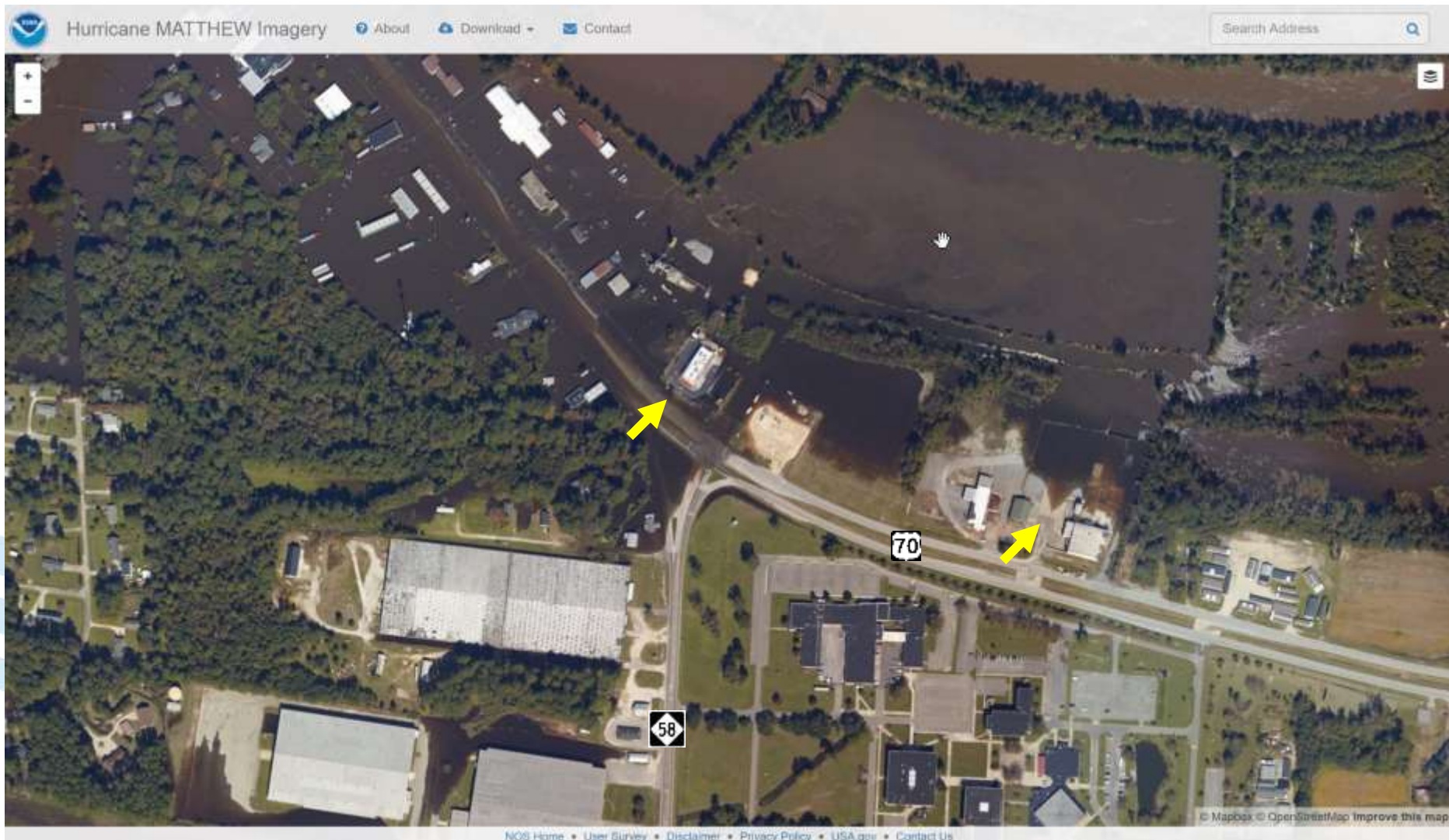








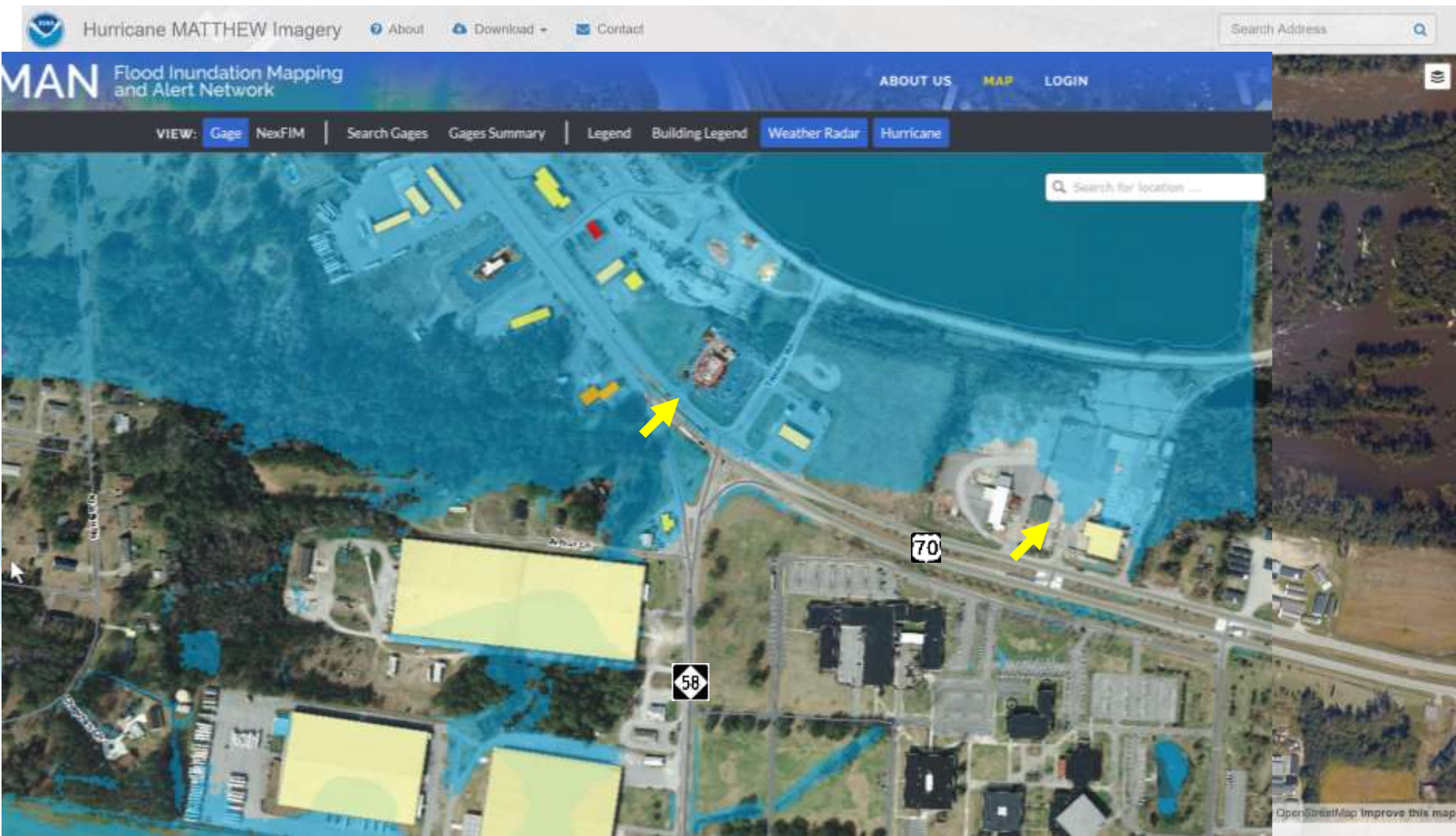
Kinston

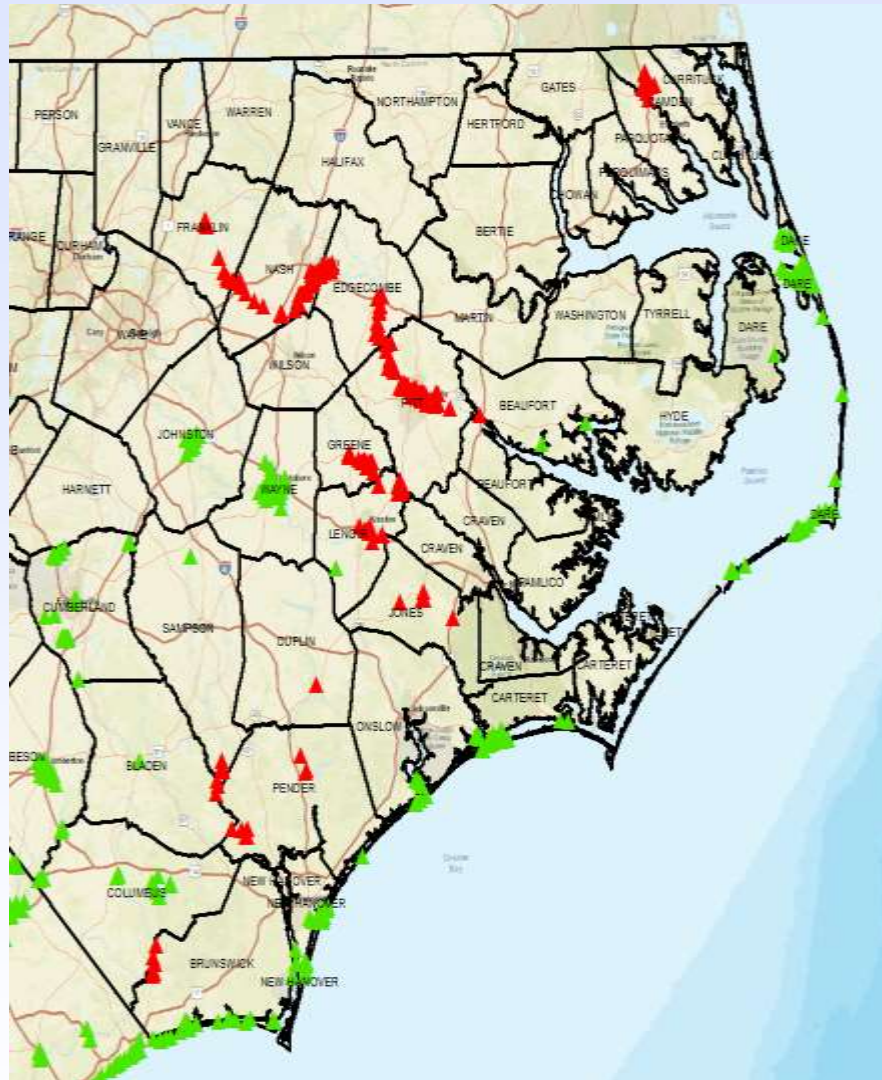


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© Mapbox © OpenStreetMap Improve this map

Kinston

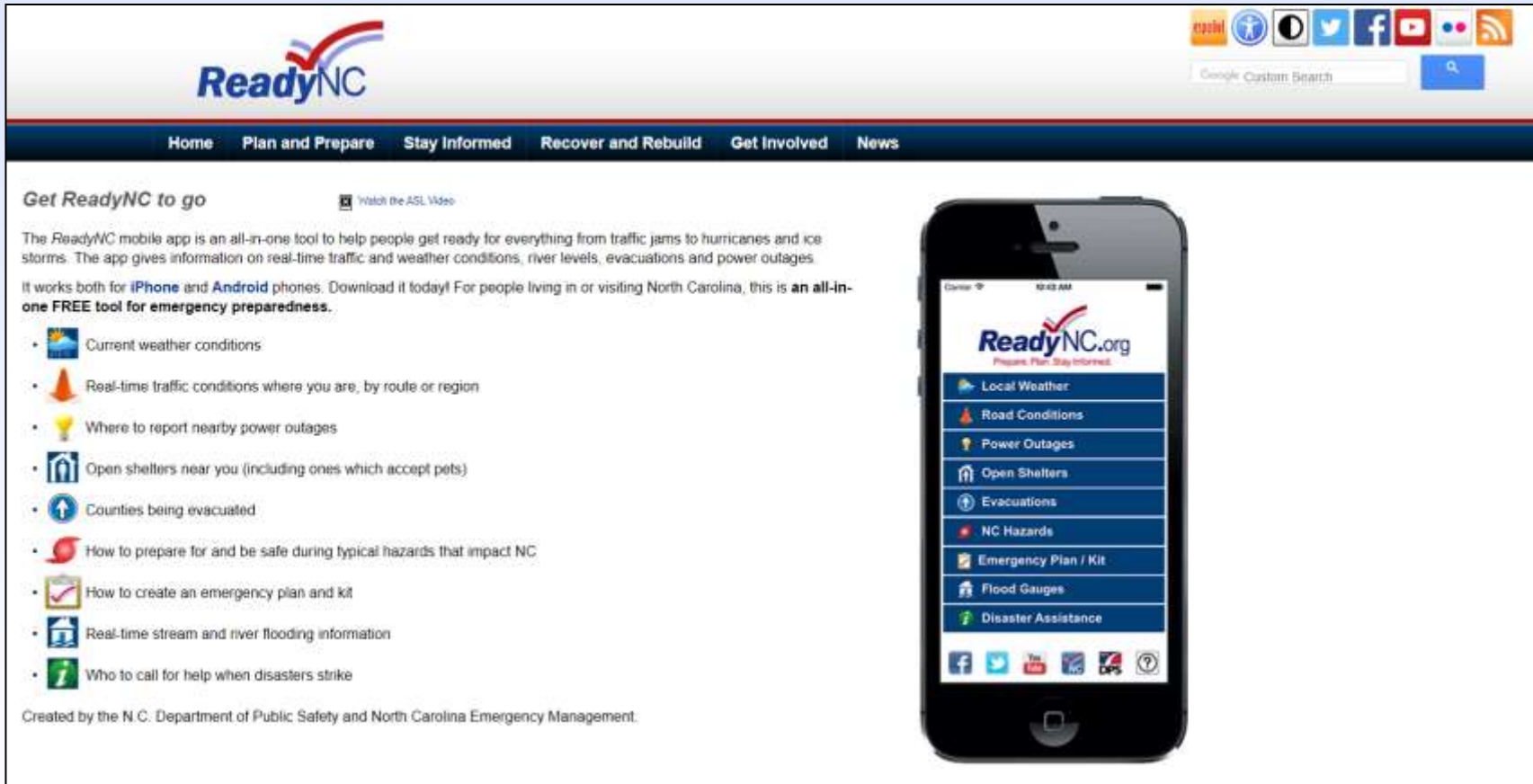




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ReadyNC Application



ReadyNC

Home Plan and Prepare Stay Informed Recover and Rebuild Get Involved News


Get ReadyNC to go

Watch the ASL Video

The ReadyNC mobile app is an all-in-one tool to help people get ready for everything from traffic jams to hurricanes and ice storms. The app gives information on real-time traffic and weather conditions, river levels, evacuations and power outages. It works both for **iPhone** and **Android** phones. Download it today! For people living in or visiting North Carolina, this is an **all-in-one FREE tool for emergency preparedness**.

- Current weather conditions
- Real-time traffic conditions where you are, by route or region
- Where to report nearby power outages
- Open shelters near you (including ones which accept pets)
- Counties being evacuated
- How to prepare for and be safe during typical hazards that impact NC
- How to create an emergency plan and kit
- Real-time stream and river flooding information
- Who to call for help when disasters strike

Created by the N.C. Department of Public Safety and North Carolina Emergency Management.



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Road Conditions



Power Outages



Open Shelters



Evacuations



NC Hazards



Emergency Plan/Kit



Flood Gauges



Disaster Assistance

Where to Document High Water Marks



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Access to Restricted Areas

- Provide the NCSS office with a list of names that will be participating in marking and documenting HWMs
- North Carolina Emergency Management will provide the information to the local officials
 - Safety First
 - ReadyNC.org



High Water Mark Video

- <https://www.youtube.com/watch?v=BFHOVrQj7gE>



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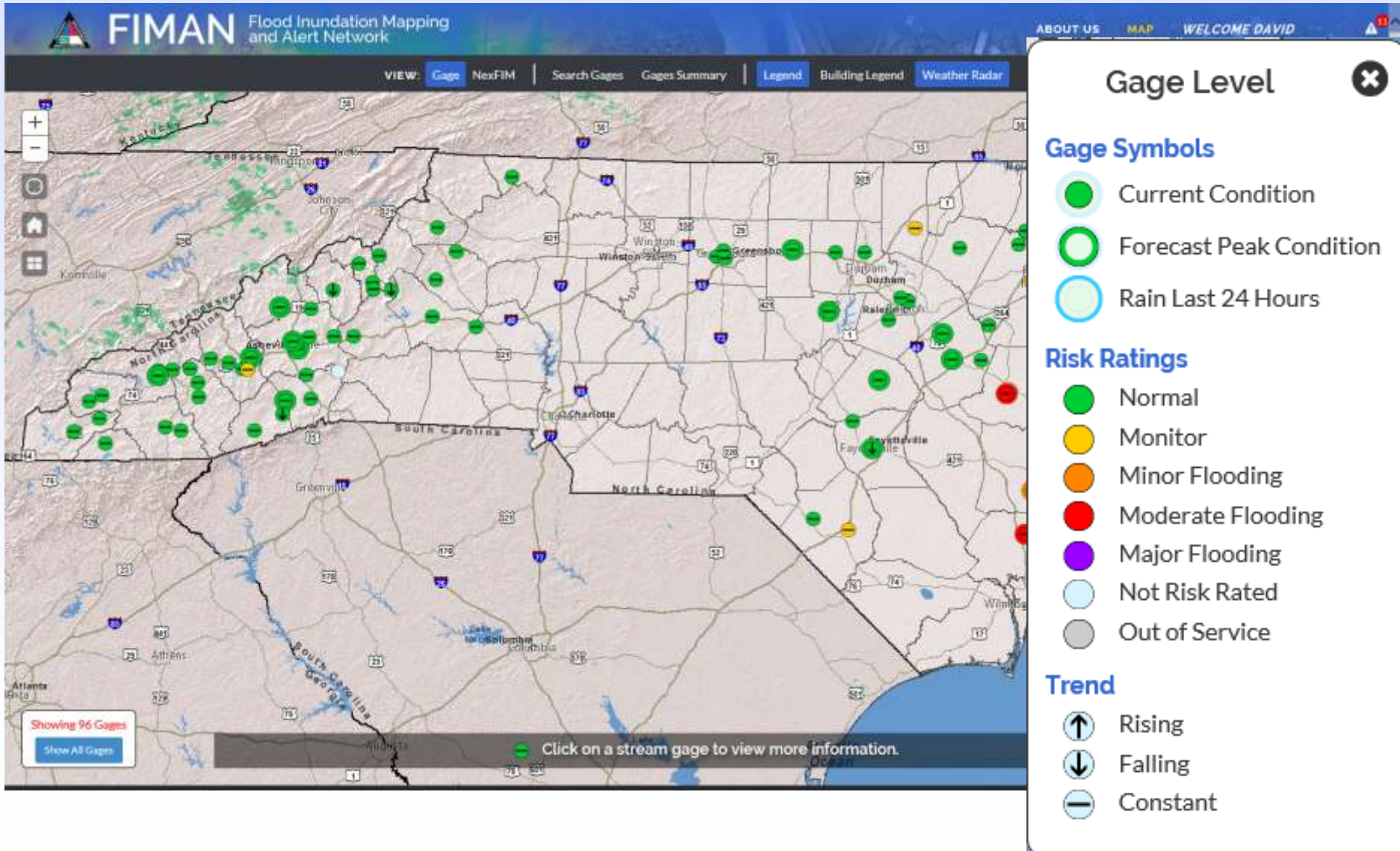
Flood Inundation Mapping Alert Network (FIMAN)



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Home Screen / Current Severity



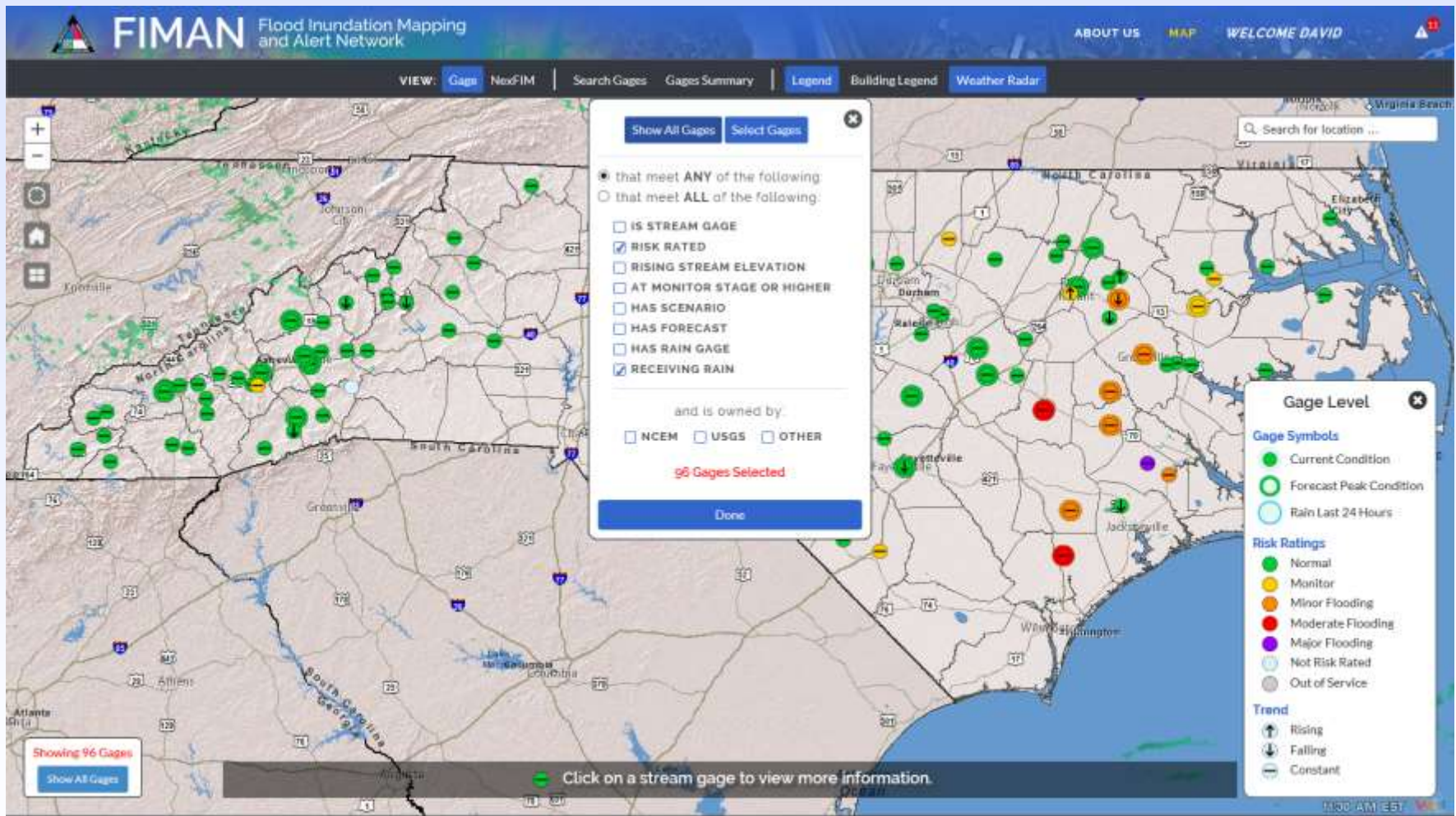
Weather Radar Loop



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Search by Type, Owner, Etc



Search by Name, Keyword

The screenshot displays the FIMAN web application interface. At the top left is the FIMAN logo and the text "Flood Inundation Mapping and Alert Network". Navigation links include "ABOUT US", "MAP", and "WELCOME DAVID". A menu bar shows "VIEW: Gage", "NexFIM", "Search Gages", "Gages Summary", "Legend", "Building Legend", and "Weather Radar". The main map area shows a geographical view of North Carolina with numerous gage locations marked by colored circles. A search overlay titled "Search Gages by Name" is active, featuring a search bar with "Neuse" entered and a list of results: "Neuse River near Clayton", "Neuse River at Smithfield", "Neuse R. at Oriental Town Pier", "Neuse River at Kinston", and "Neuse River near Goldsboro". A "Showing 96 Gages" indicator is visible in the bottom left of the map area.



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Search Using Your Location

The screenshot displays the FIMAN web application interface. At the top, the logo for FIMAN (Flood Inundation Mapping and Alert Network) is visible, along with navigation links for 'ABOUT US', 'MAP', and 'WELCOME DAVID'. Below the header, a menu bar includes 'VIEW: Gage', 'NexFIM', 'Search Gages', 'Gages Summary', 'Legend', 'Building Legend', and 'Weather Radar'. The main area features a map of North Carolina with various gages marked by colored circles. A search panel on the right, titled 'Gages Near Me', allows users to search for gages within a specific radius. The search radius is currently set to 45 miles, and the results show 22 gages within this radius. The results list includes:

- Neuse River near Goldsboro
- Neuse River at Kinston
- Contentnea Creek at Hookerton
- Tar River at Greenville
- Tar River at Tarboro
- Roanoke River at Williamston
- Tar River at Us 301 Bypass at Rocky Mount

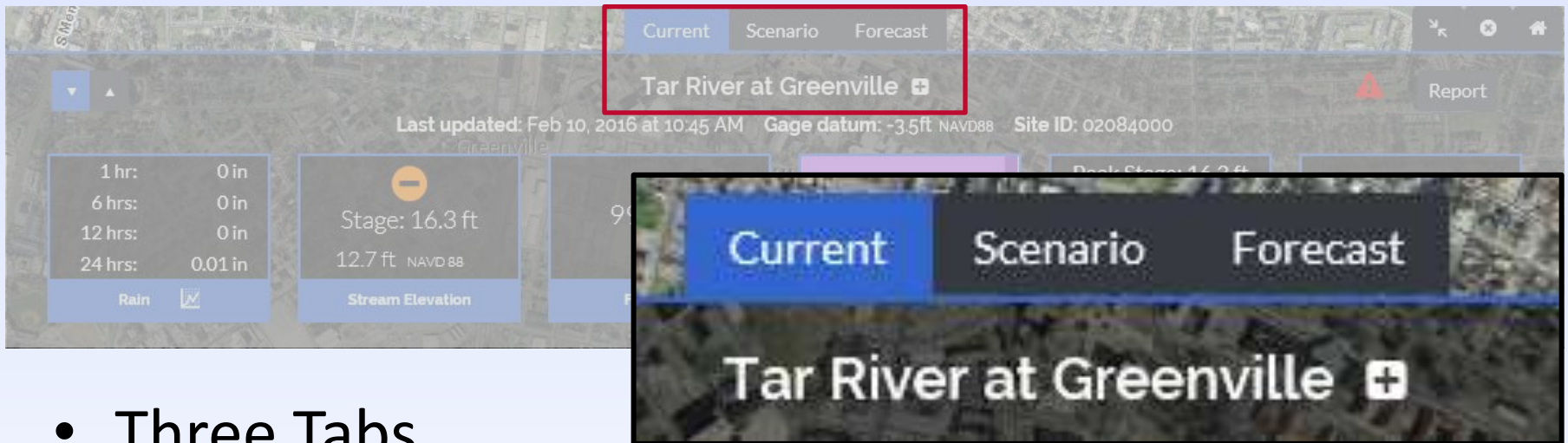
At the bottom of the map, there is a button that says 'Showing 96 Gages' and 'Show All Gages', and a text prompt: 'Click on a stream gage to view more information.'



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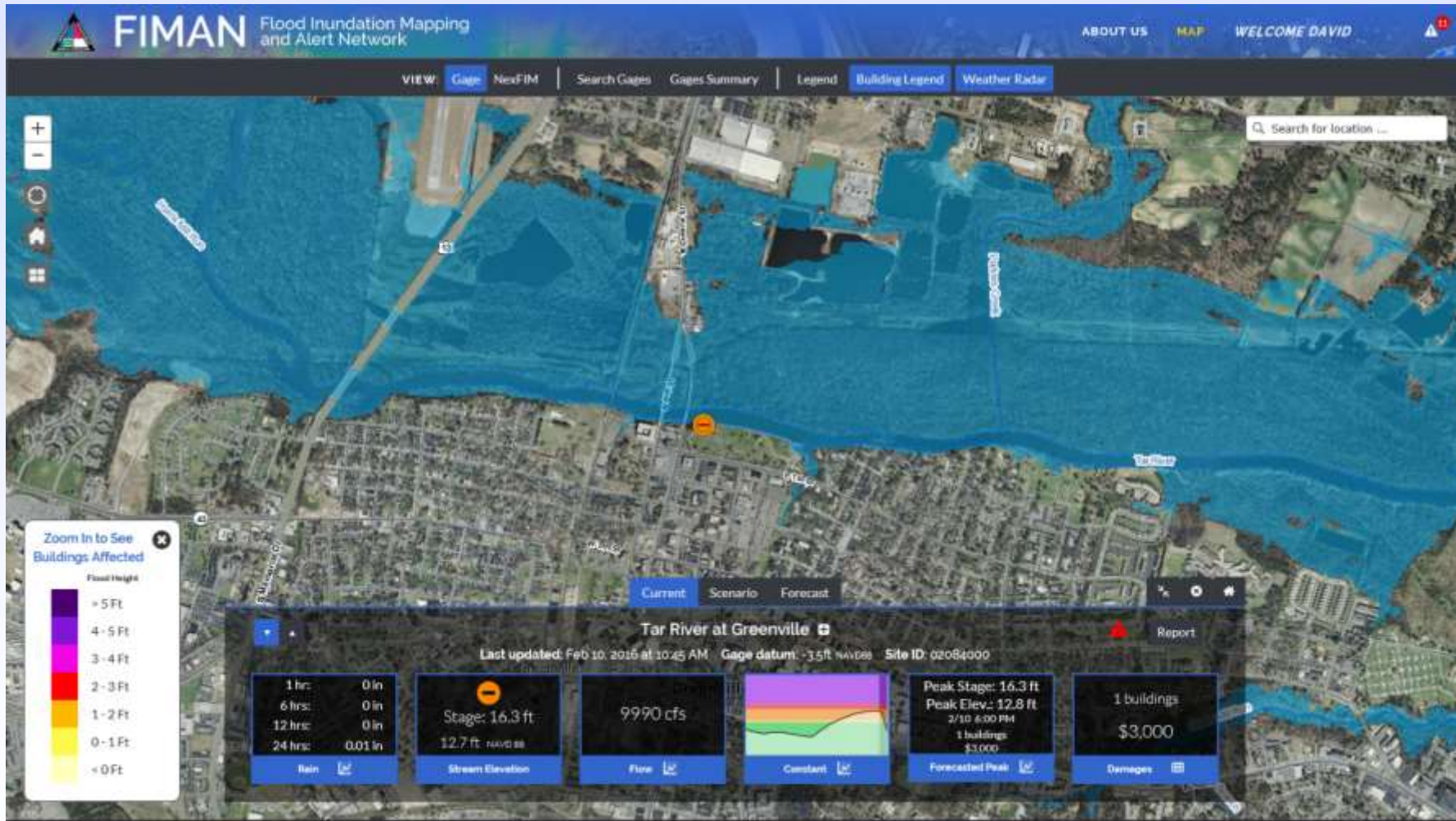


Gage View - Dashboard Concept



- Three Tabs
 - **Current:** Provides most recent inundation extent
 - **Scenario:** Planning tool for visualization and impact
 - **Forecast:** Shows timeline using NWS forecast data
- Info Widgets
 - Interactive for rainfall, stage, flow, forecast, impacts

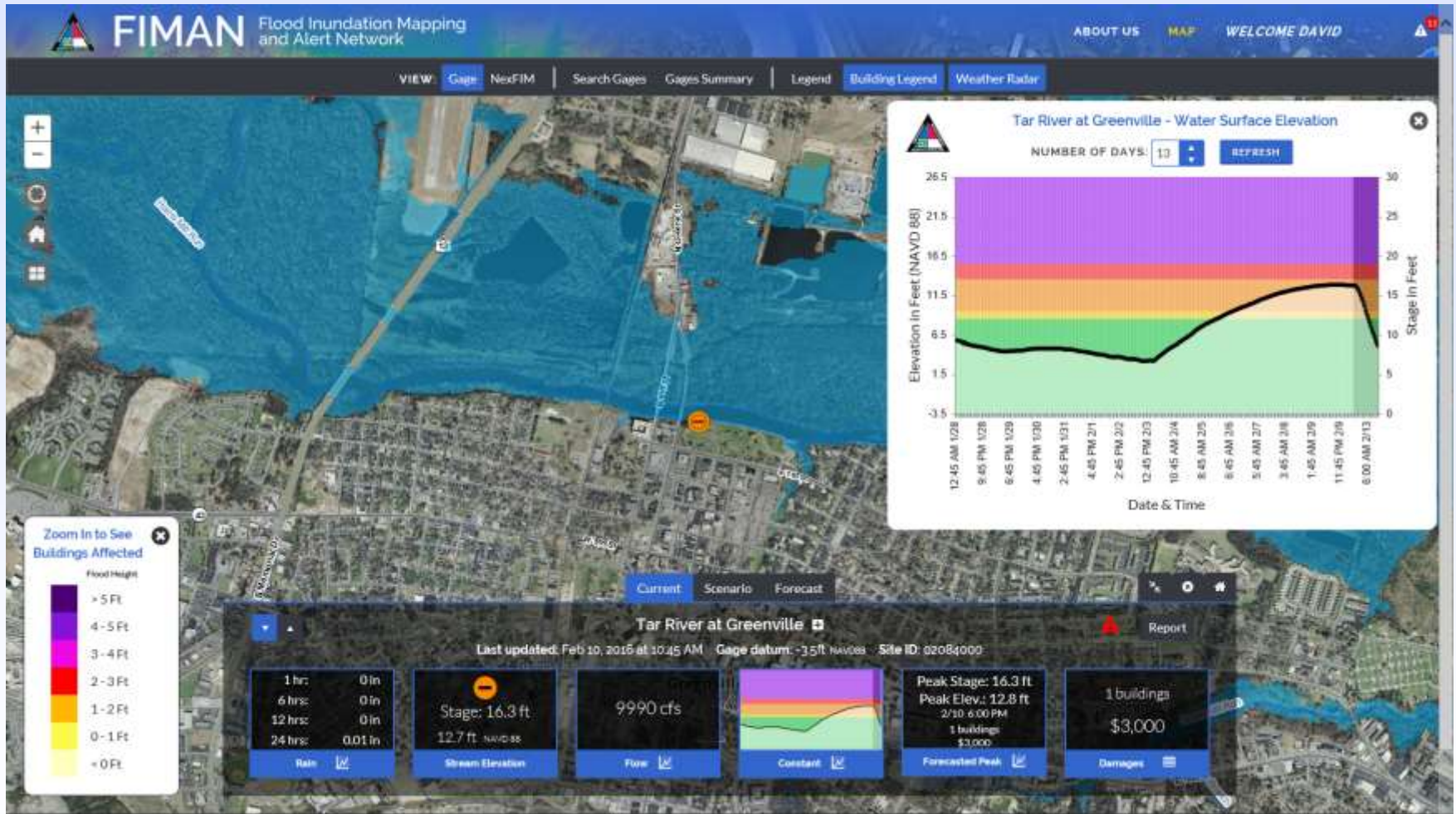
Current Inundation Level and Map



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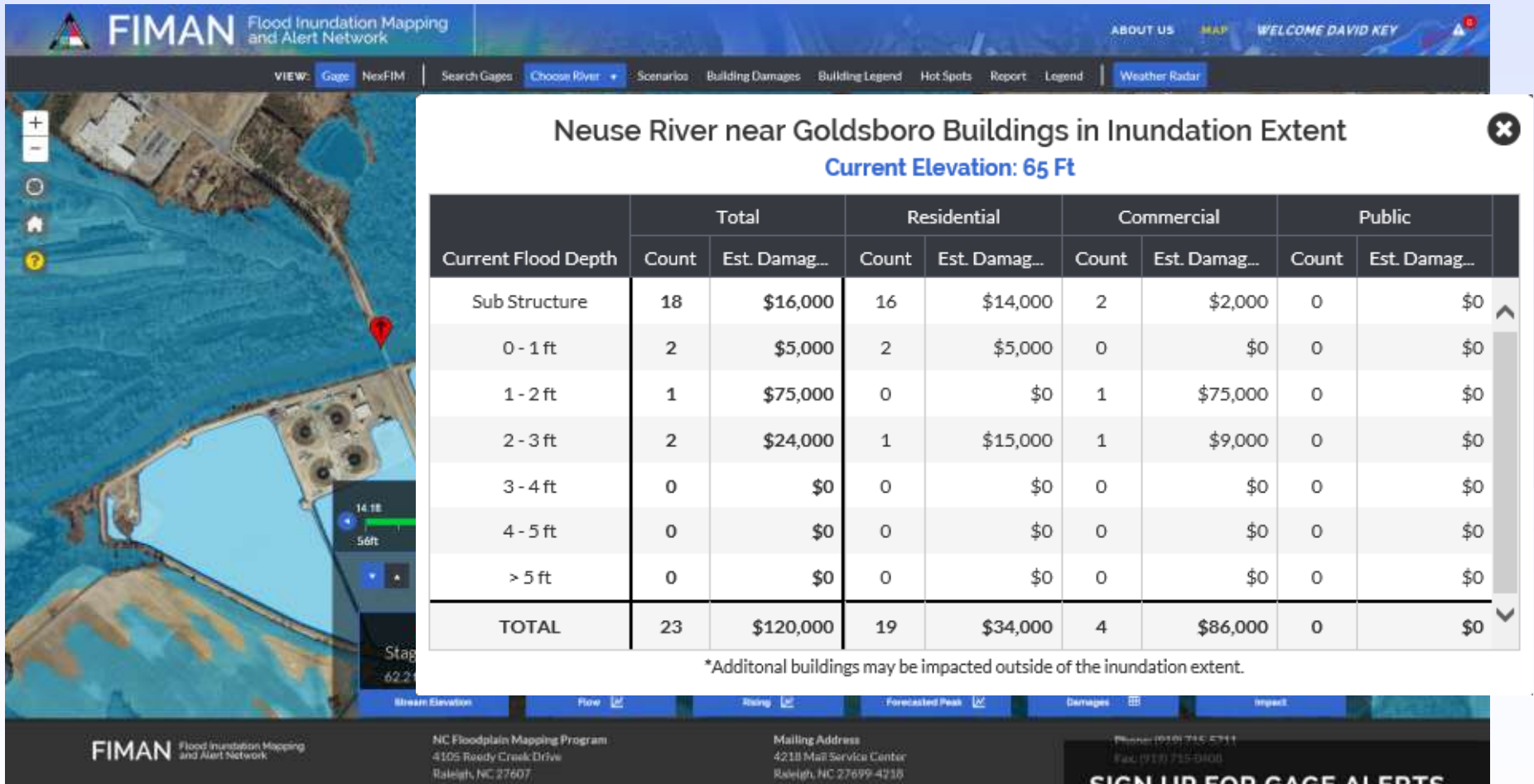
Gage Stage Charts + Forecast



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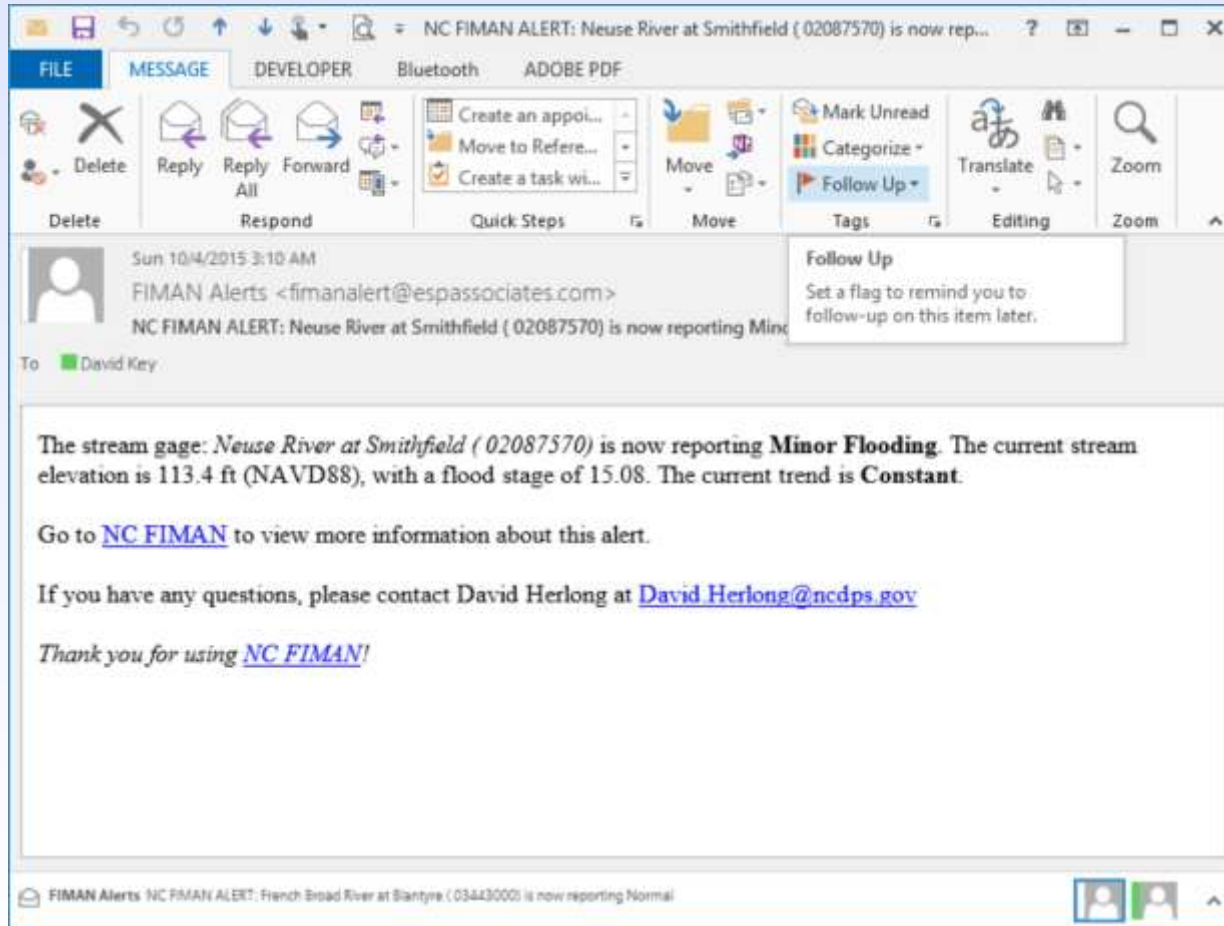
Real Time Flood Impacts



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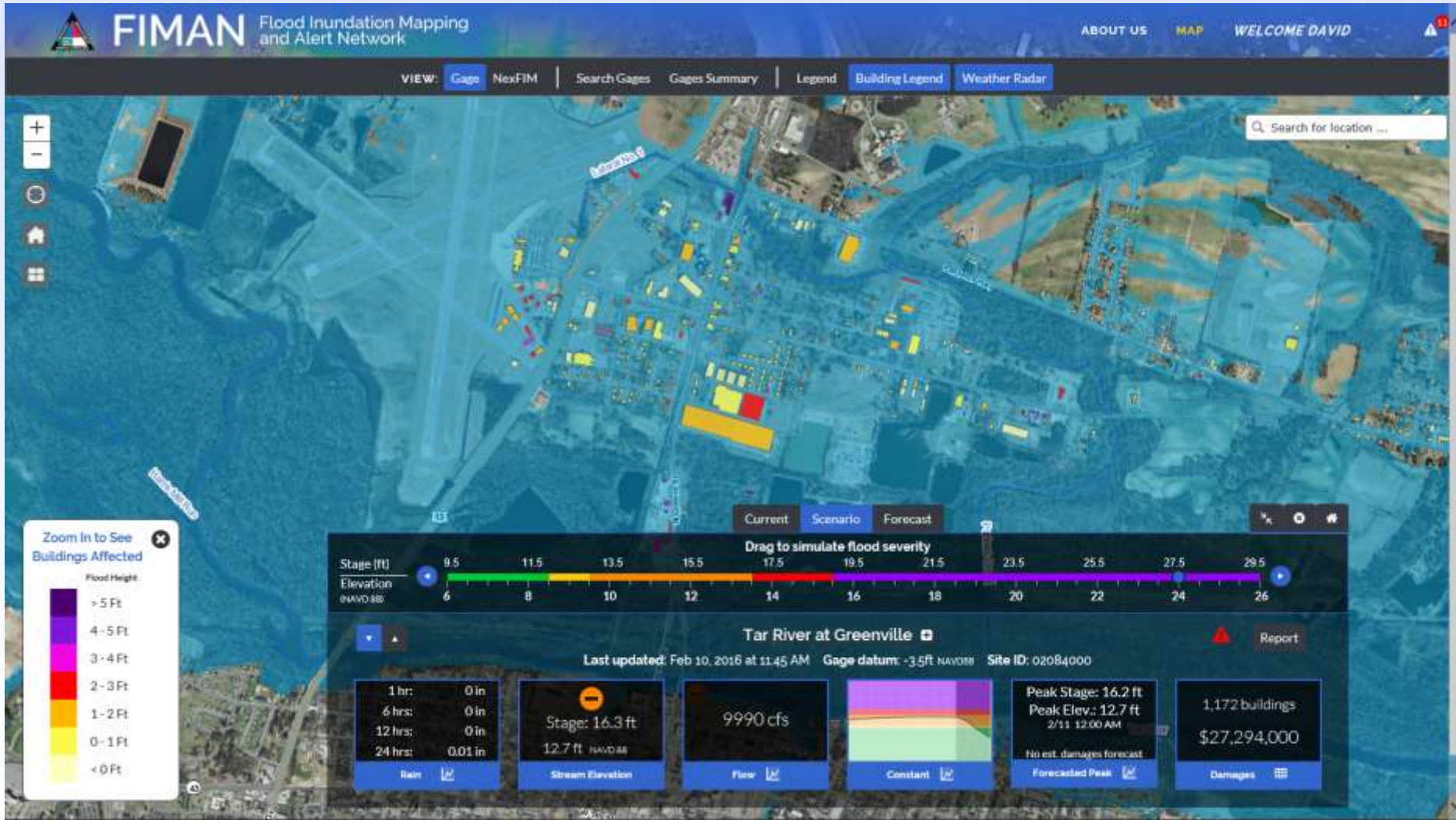
Real Time Email Alerts



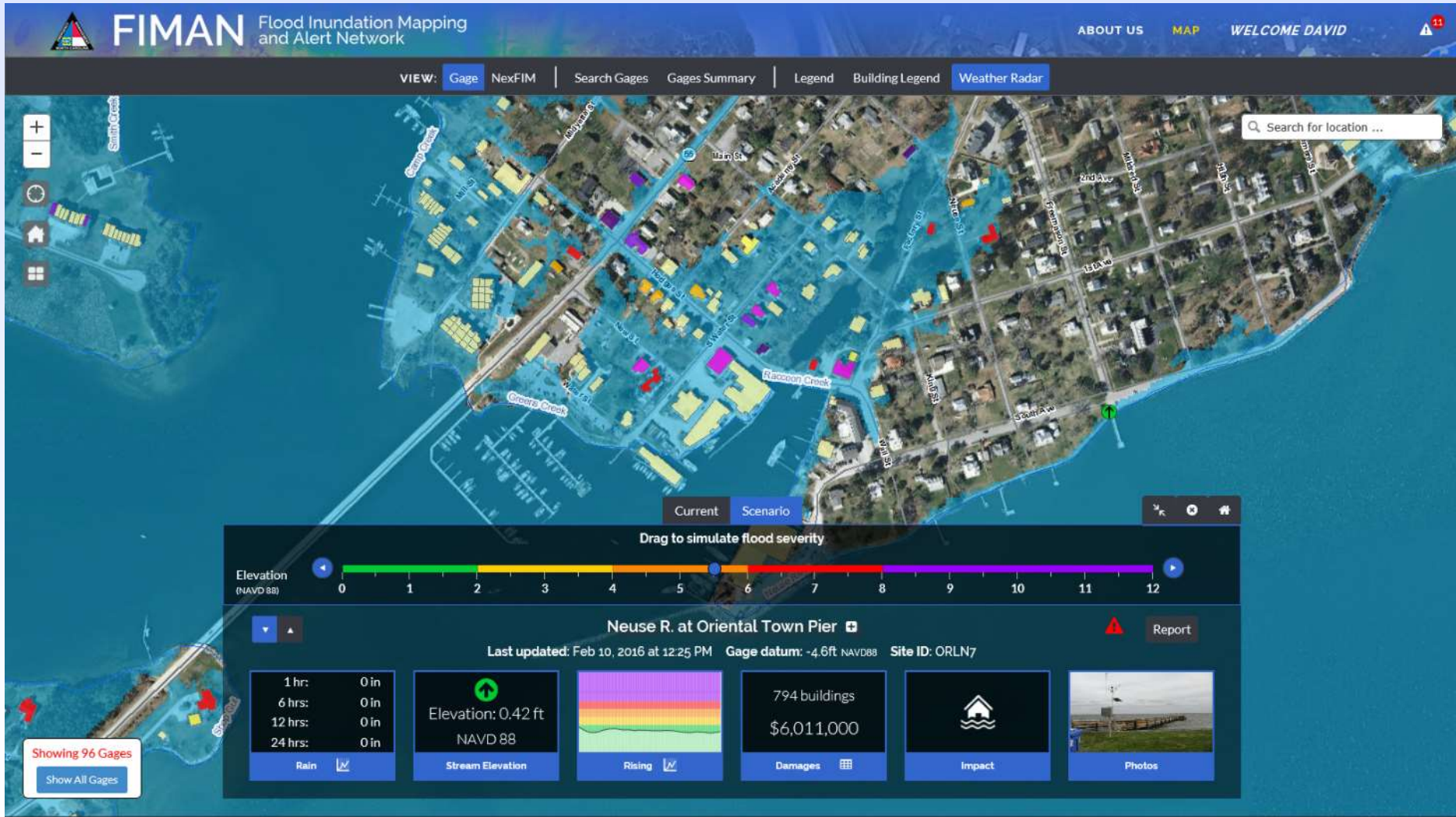
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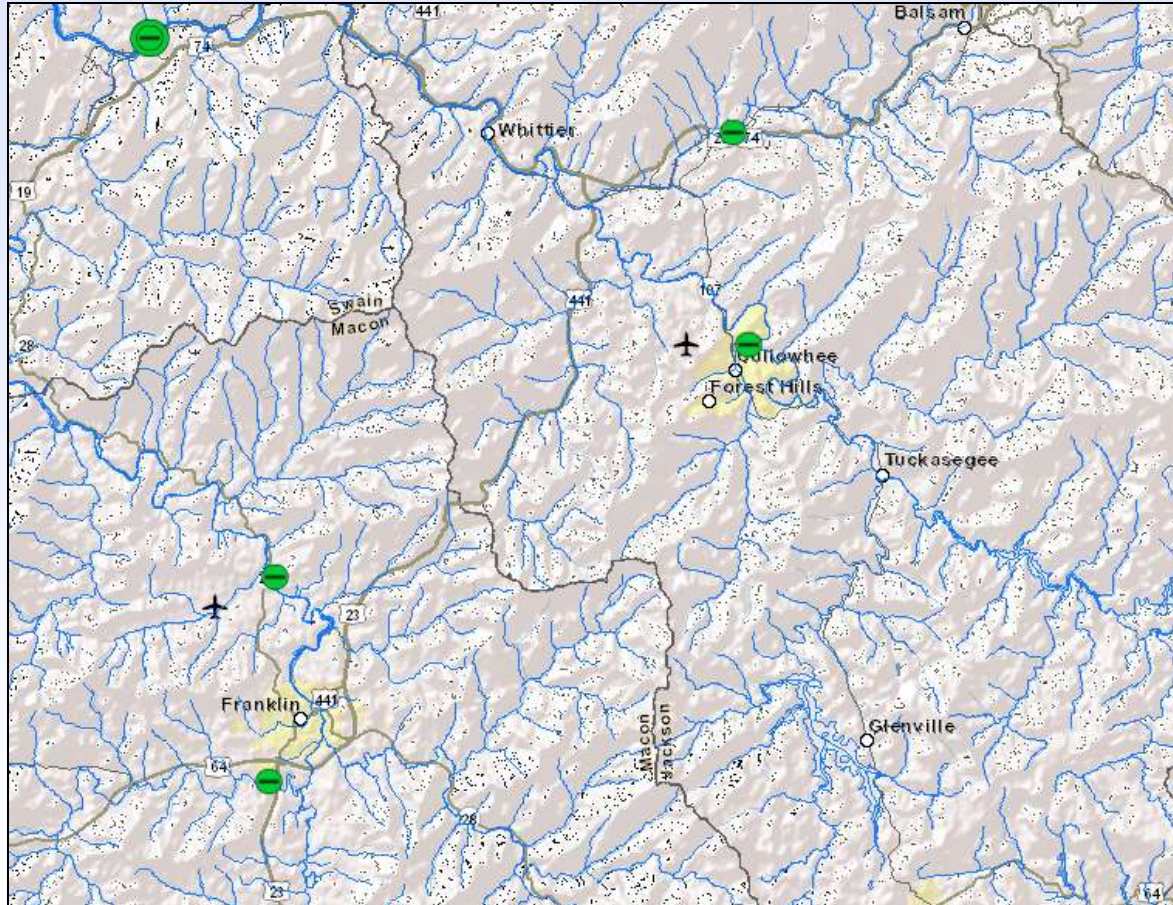
Flood Scenario Mode



Coastal Libraries



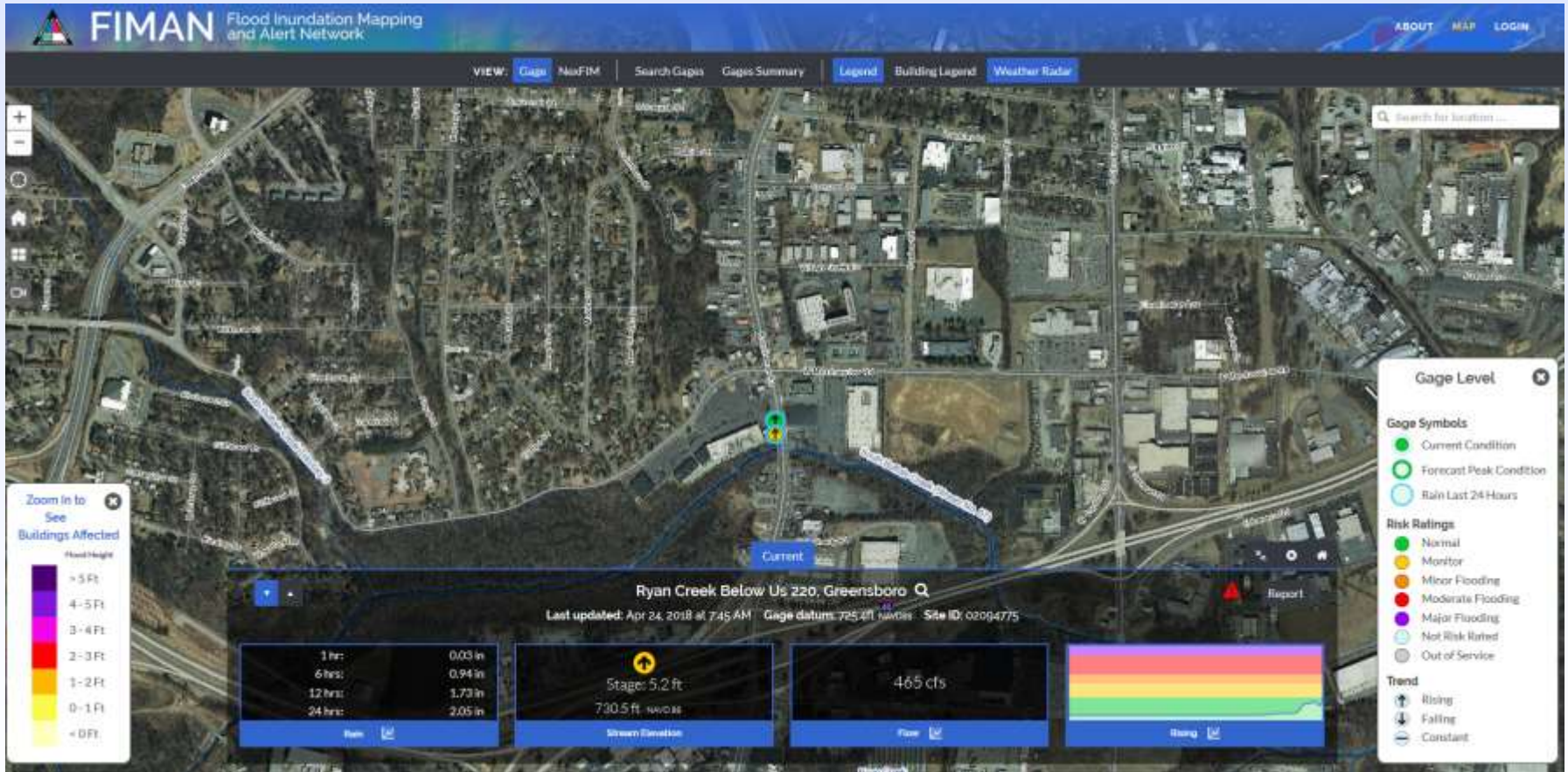
FIMAN Sylva Area



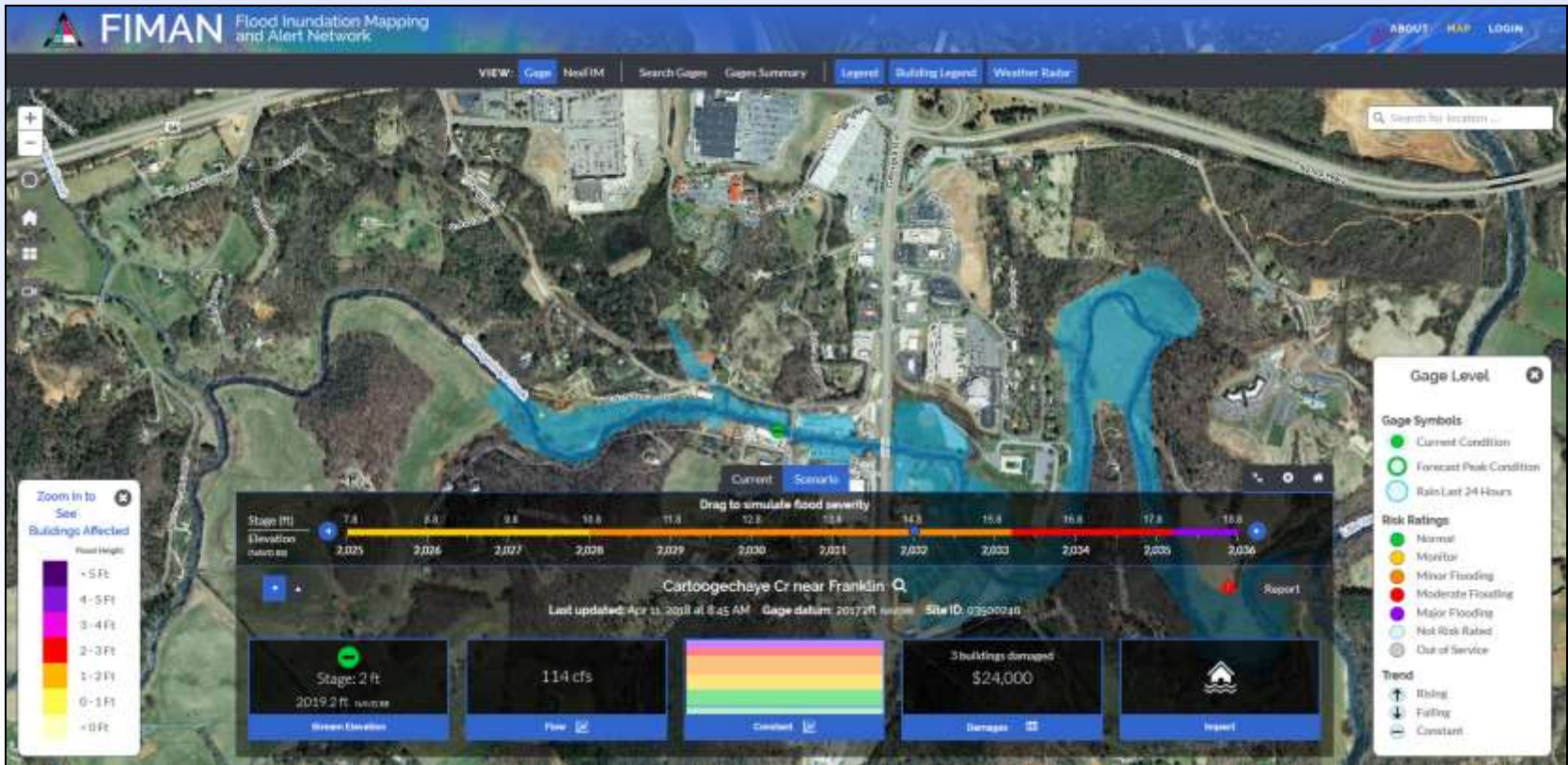
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Ryan Creek



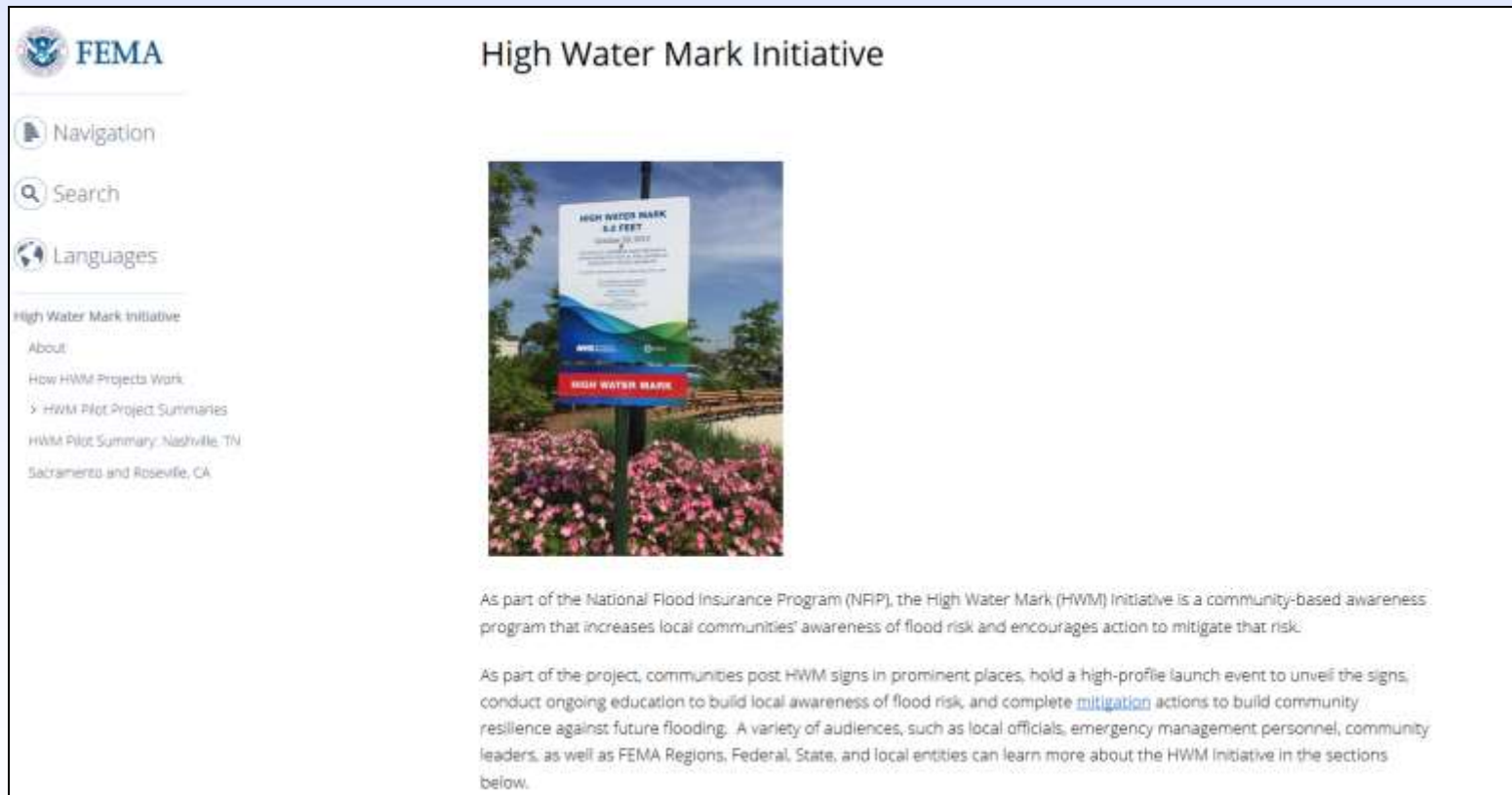
Cartoogechaye Creek near Franklin



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High Water Mark Initiative



FEMA

Navigation


Search

Languages

High Water Mark Initiative

- About
- How HWM Projects Work
- High Water Mark Pilot Project Summaries
 - High Water Mark Pilot Summary: Nashville, TN
 - Sacramento and Roseville, CA

High Water Mark Initiative



As part of the National Flood Insurance Program (NFIP), the High Water Mark (HWM) Initiative is a community-based awareness program that increases local communities' awareness of flood risk and encourages action to mitigate that risk.

As part of the project, communities post HWM signs in prominent places, hold a high-profile launch event to unveil the signs, conduct ongoing education to build local awareness of flood risk, and complete [mitigation](#) actions to build community resilience against future flooding. A variety of audiences, such as local officials, emergency management personnel, community leaders, as well as FEMA Regions, Federal, State, and local entities can learn more about the HWM Initiative in the sections below.

Certified Floodplain Surveyor (CFS) Program

- https://www.ncsurveyors.com/education/cfs_program

Certified Floodplain Surveyor (CFS) Program

This certification program educates surveyors on the forms and processes associated with floodplain properties and the submittal of Elevation Certificates. To become CFS certified, licensed surveyors must successfully complete the three-day certification seminar and exam. PDH's are awarded for the seminar, however no PDH credit is given for the exam. The specific topics covered in the course are: National Flood Insurance Program (NFIP), FIRM Maps, NFIP Regulations and Elevation Certificates, Letters of Map Correction and Letters of Map Correction Processing. There are currently over 200 CFS Certified Surveyors in the state as this certification has become more popular with recent floodplain/form changes. NCSS offers annually for surveyors seeking to add this certification to their resume.

CFS Contacts

NC NFIP Coordinator Dan Brubaker dan.brubaker@ncdps.gov	Letter of Map Change Steve Garrett steve.garrett@ncdps.gov
NC FMP Program Director John Dorman jdorman@ncem.org	NFIP Engineering Dan Brubaker dan.brubaker@ncdps.gov
NCFMP Program Manager Tonda Shelton tselton@ncem.org	NFIP Outreach & Training Randy Mundt randy.mundt@ncdps.gov
Flood Risk Information System Stacey Bobbitt stacey.bobbitt@ncdps.gov	NFIP Planners Milton Carpenter (Piedmont region) milton.carpenter@ncdps.gov Terry Fox (Western region) terry.fox@ncdps.gov
GIS and LIDAR Data Hope Morgan hope.morgan@ncdps.gov	FEMA National Flood Insurance Program (NFIP) FEMA Map Help

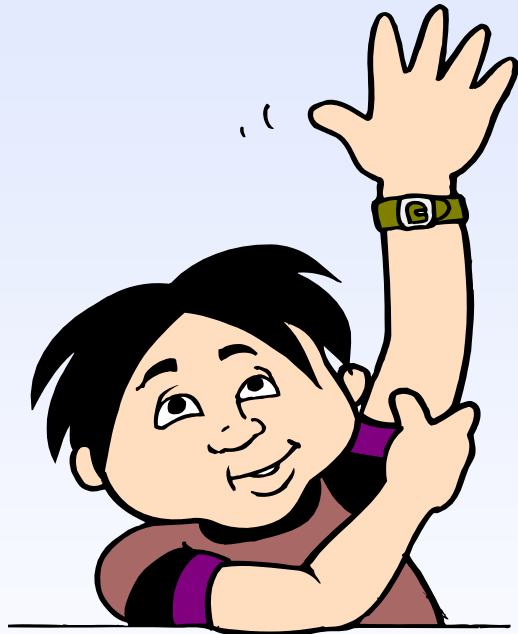
CFS Resources



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Questions?



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