

Water, water, everywhere:

learning from past floods,
responding to current ones
and preparing for the future

Janet Barclay

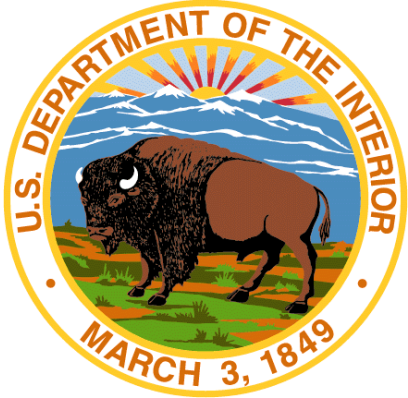
Research Hydrologist
U.S. Geological Survey

May 28, 2026

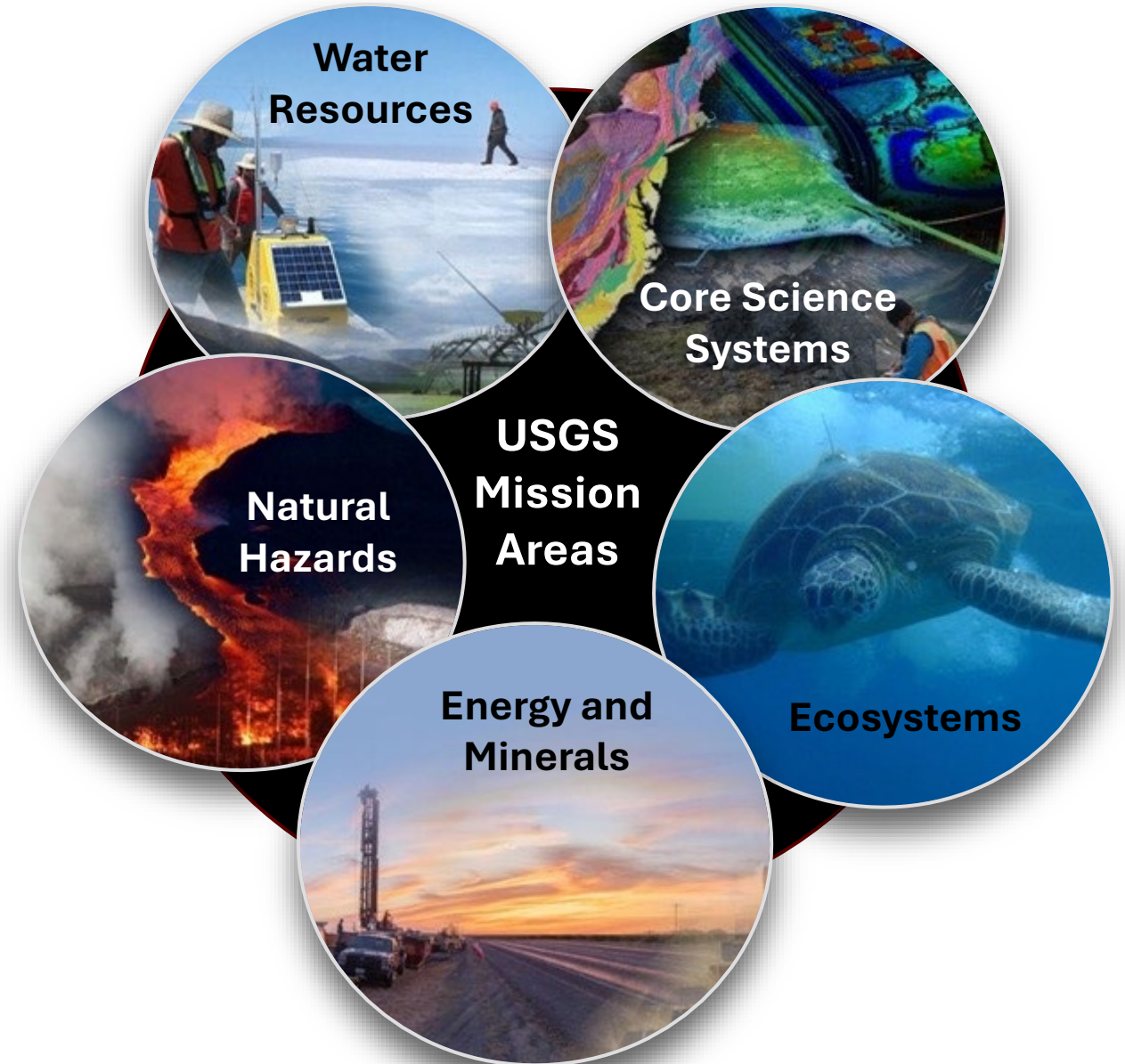
Gulf of Maine Council

Flooding on the East Branch
of the Penobscot River in
Grindstone, Maine,
December 2023.
Photo credit: USGS





The USGS mission is to monitor, analyze, and predict current and evolving dynamics of complex human and natural Earth-system interactions and to deliver actionable information at scales and timeframes relevant to decision makers.



New England Water Science Center



Ice jam flooding, March 1936

(\$25 million in damages, 1936 dollars)

<https://www.islandinstitute.org/working-waterfront/ice-made-historic-floods-worse/>



Rain on snow, April 1987

(\$100 million in damages, 1987 dollars)



*Gardiner Savings Bank
Hallowell, Maine
Photo Credit: Robert
Young, NWS
<https://www.weather.gov/safety/flood-states-me>*

Rain on snow, April 2008

(600 people evacuated, 140 homes flooded)



*Flooding of International Bridge connecting Fort Kent,
Maine to New Brunswick, Canada
Photo credit: Andrew Cloutier, USGS
<https://www.weather.gov/safety/flood-states-me>*

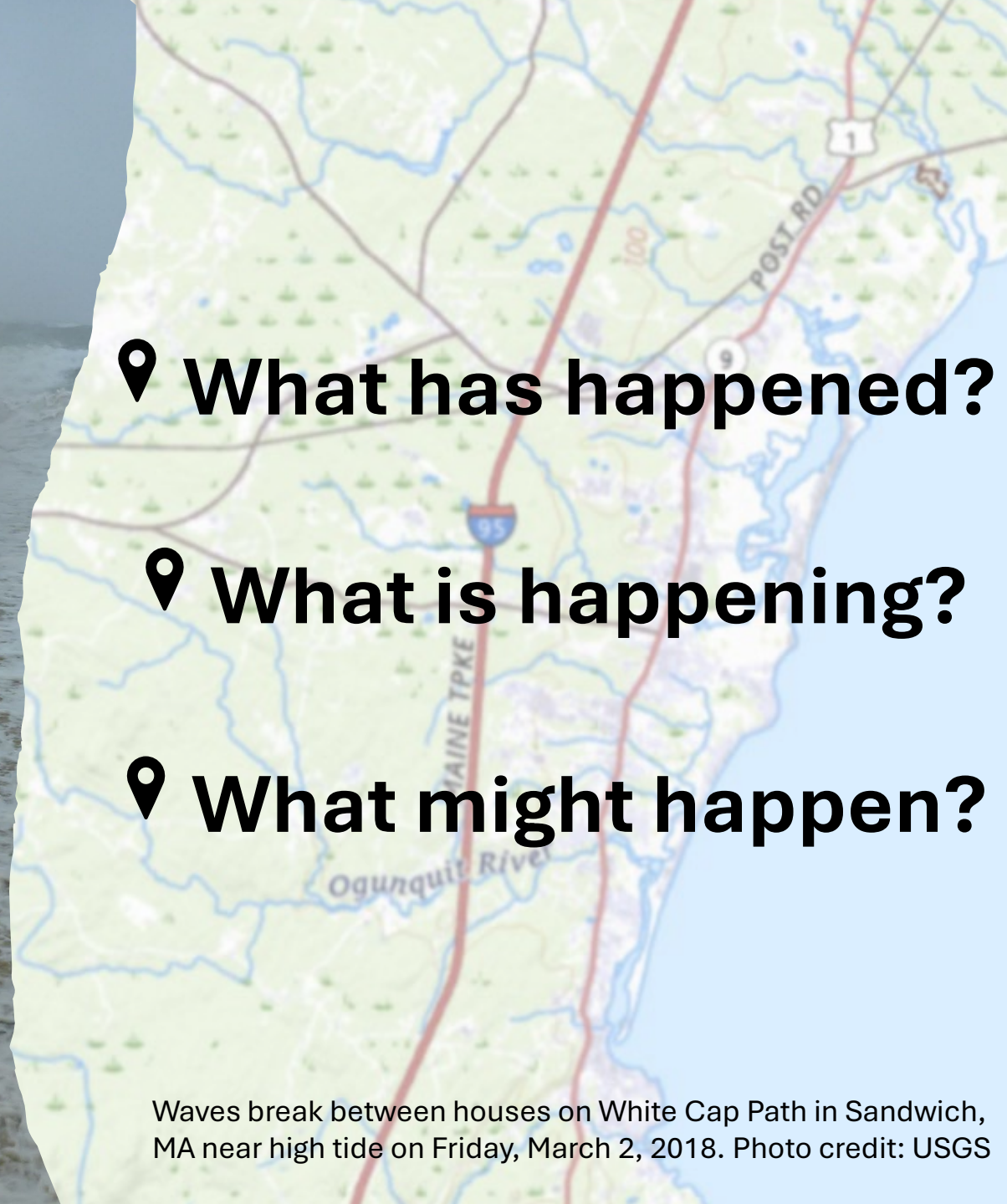
Historic high tide / coastal storms, January 2024

(\$70 million, 2024 dollars)



*York Beach, ME
Photo Credit: York
Police Department*

<https://wjla.com/news/nation-world/record-breaking-floods-leave-trail-of-destruction-along-maine-coast-swallows-squalls-fishing-boat-flooding-water-damage-erosion-landmarks-portland-cape-elizabeth-casco-bay>



📍 **What has happened?**

📍 **What is happening?**

📍 **What might happen?**

WHAT HAPPENED?

High water marks document the extent of flooding.

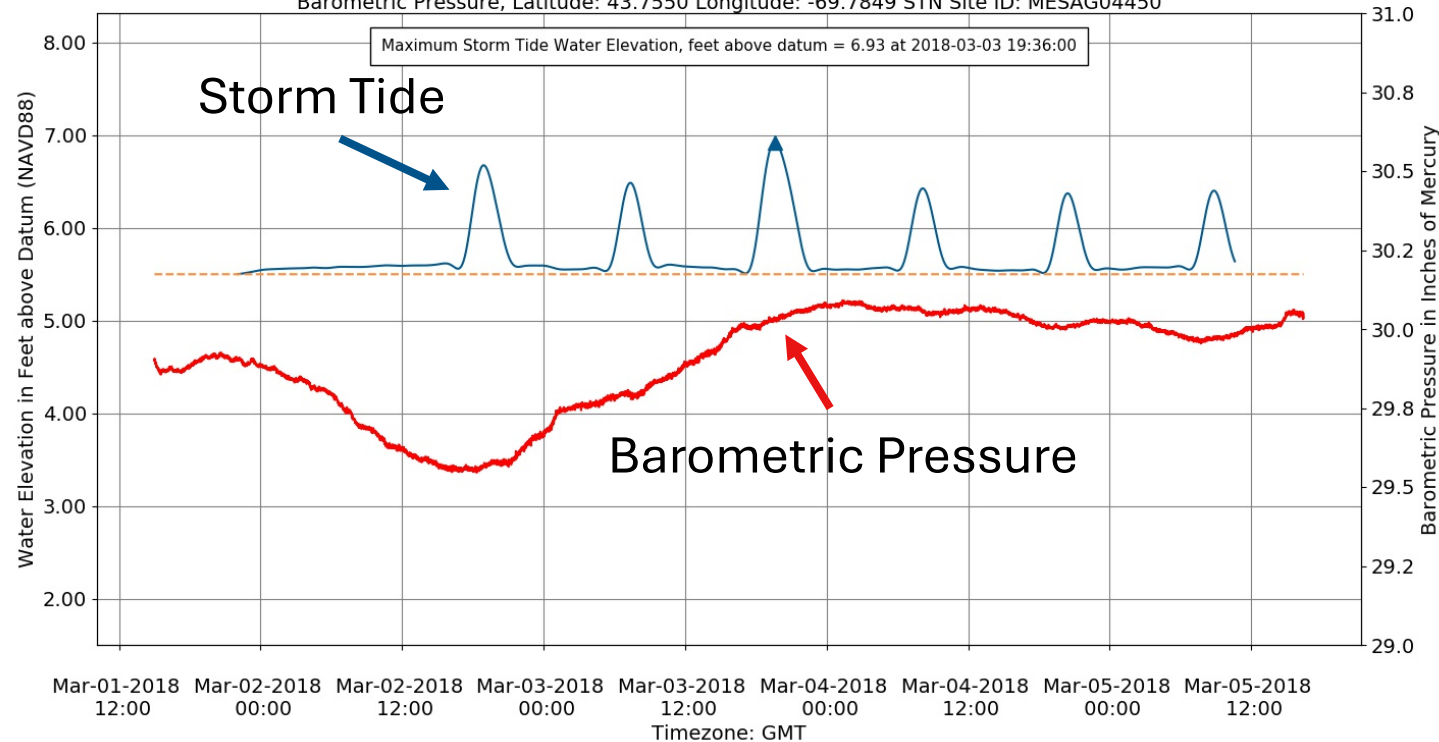


WHAT HAPPENED?



EXPLANATION
— Storm Tide (Lowpass Filtered) Water Elevation
- - - Minimum Recordable Water Elevation
— Barometric Pressure
▲ Maximum Storm Tide Water Elevation

Storm Tide Water Elevation, Latitude: 43.9222 Longitude: -69.9553 STN Site ID: MECUM04452
Barometric Pressure, Latitude: 43.7550 Longitude: -69.7849 STN Site ID: MESAG04450



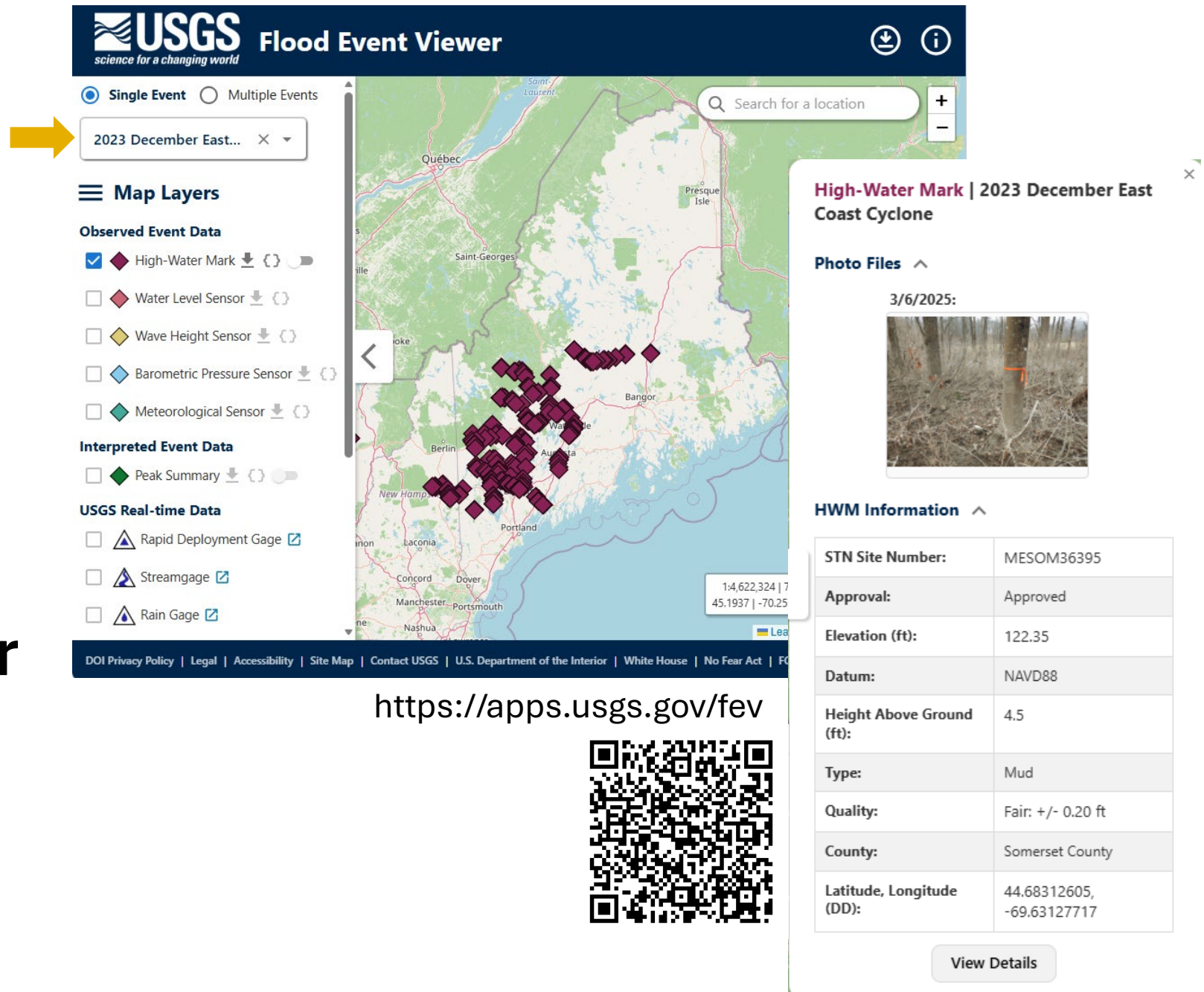
March 1 – 5, 2018

Sensors deployed in advance of potential flooding provide additional detail.



WHAT HAPPENED?

High water marks and storm sensor data are publicly available in the Flood Event Viewer



WHAT HAPPENED?

Post-flood interpretations provide context for resource managers and the general public



Prepared in cooperation with the Federal Emergency Management Agency

Documentation and Mapping of Flooding from the January and March 2018 Nor'easters in Coastal New England

<https://www.usgs.gov/centers/new-england-water-science-center/science/flood-documentation-and-inundation-mapping-january>



i

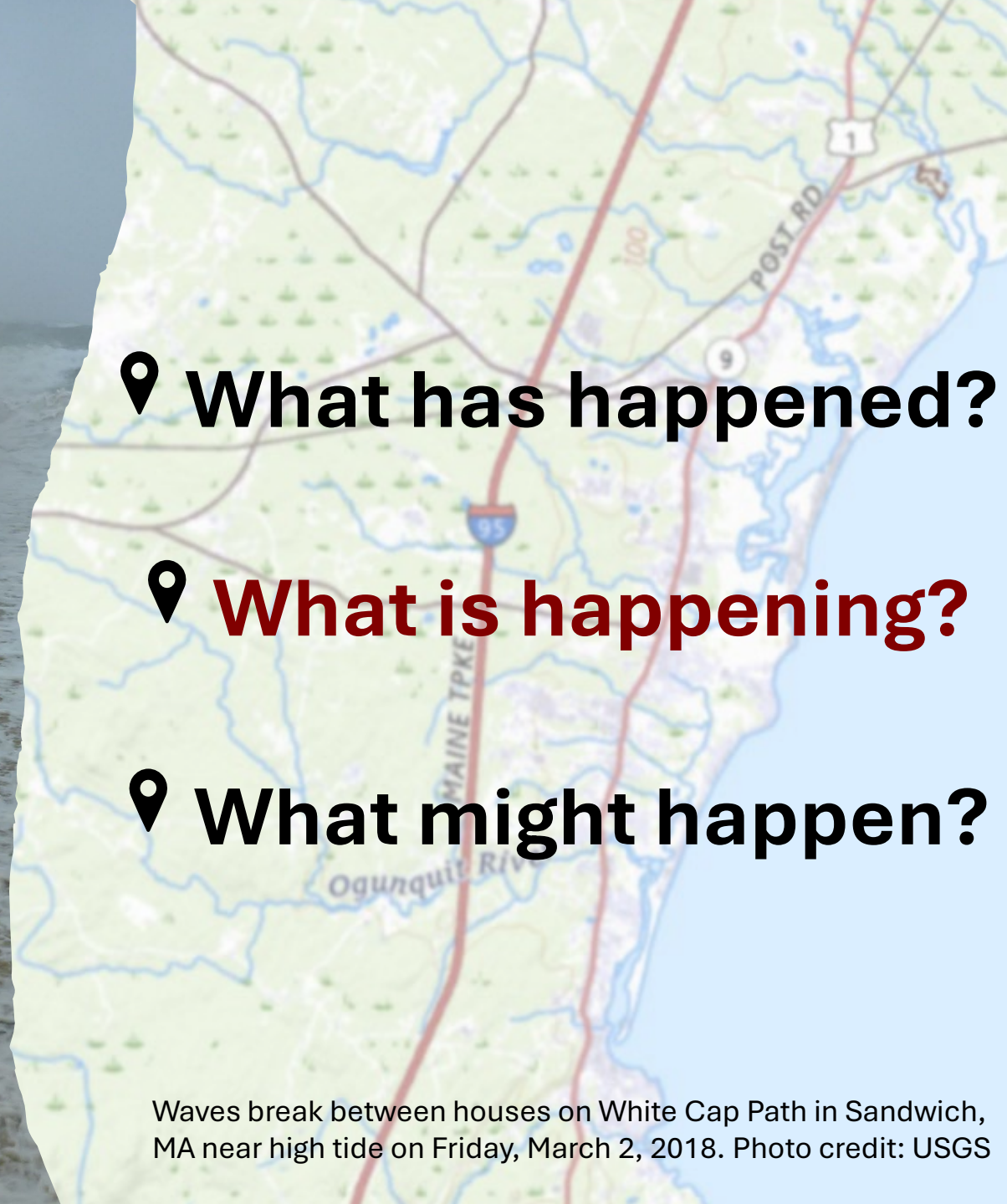
January and March 2018 Nor'easters

Flood documentation and mapping of two large storm events in coastal Massachusetts

A geonarrative by the U.S. Geological Survey

November 19, 2021





📍 **What has happened?**

📍 **What is happening?**

📍 **What might happen?**

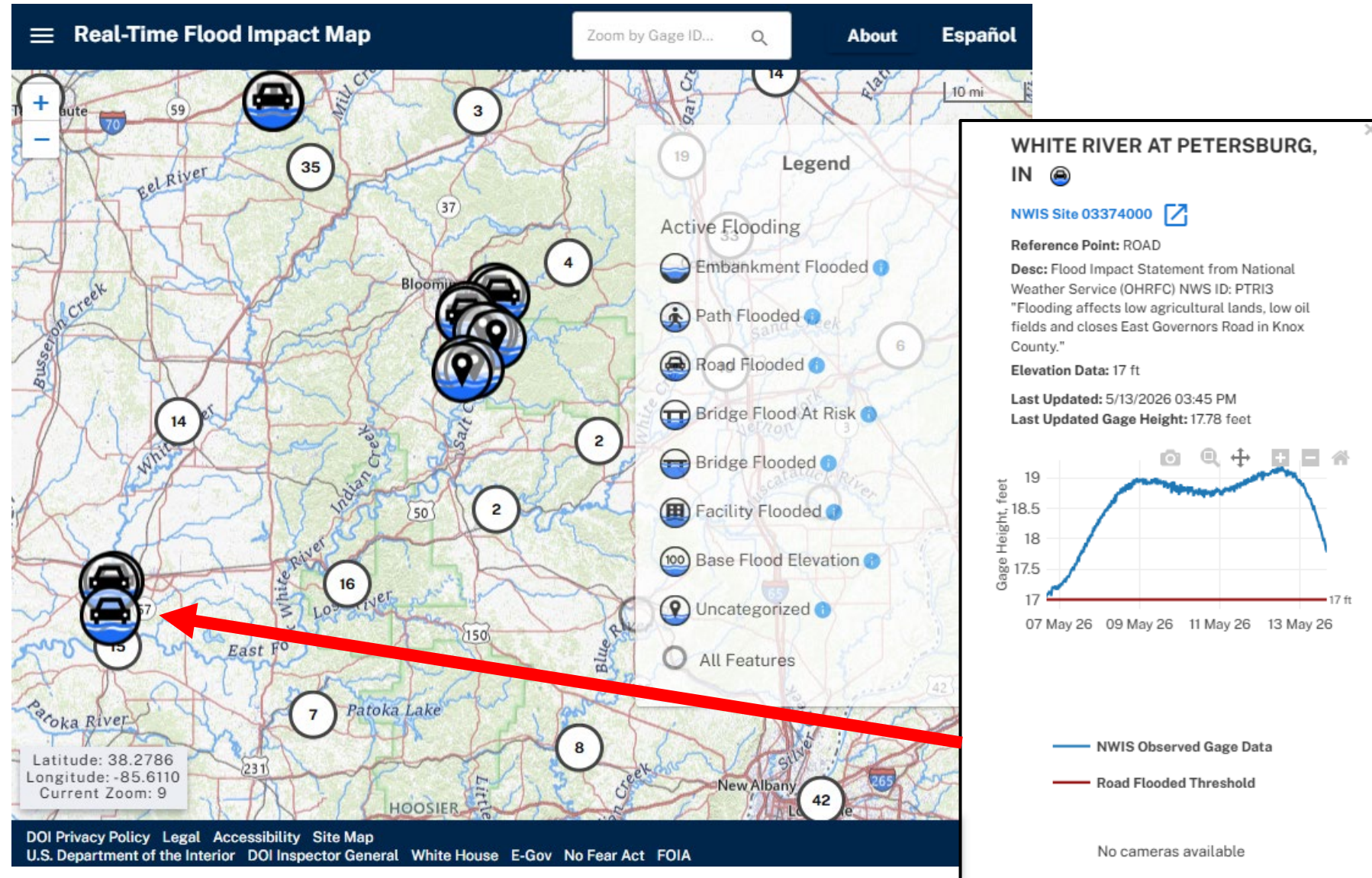
WHAT IS HAPPENING?

Information
about current
flooding enables
residents and
managers to
make informed
decisions

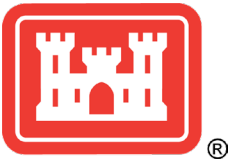
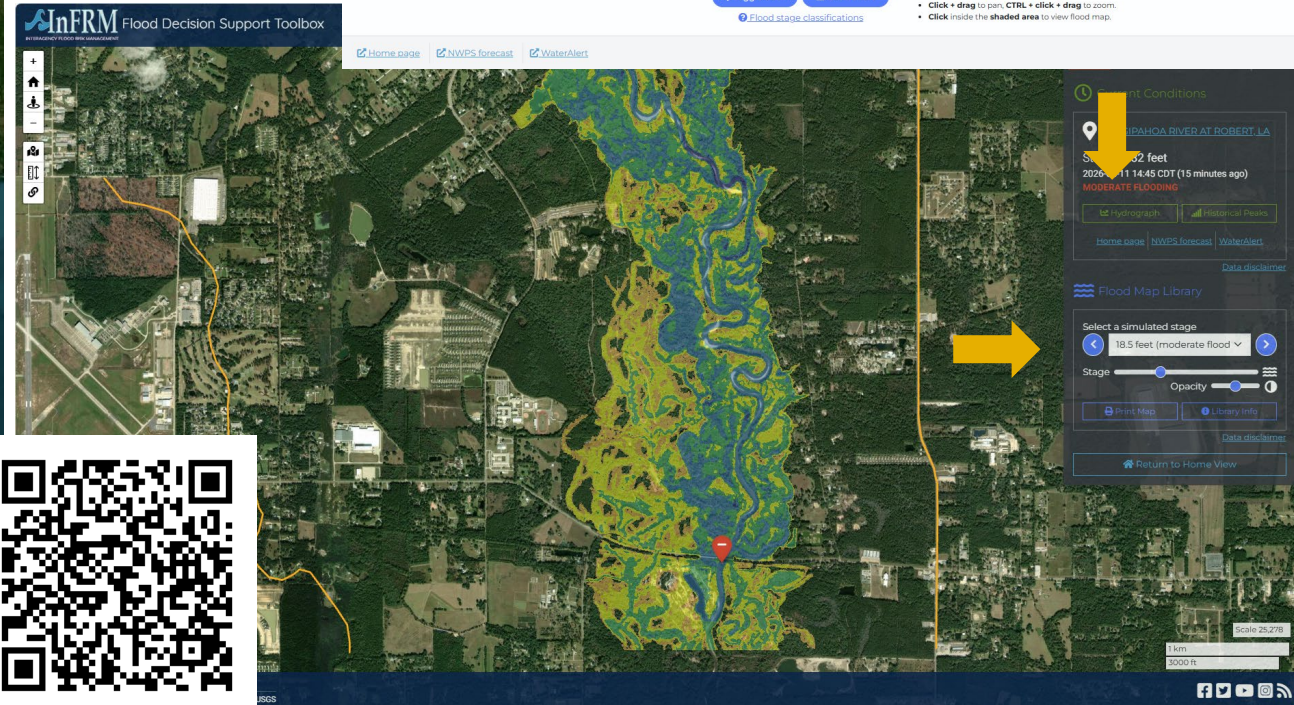
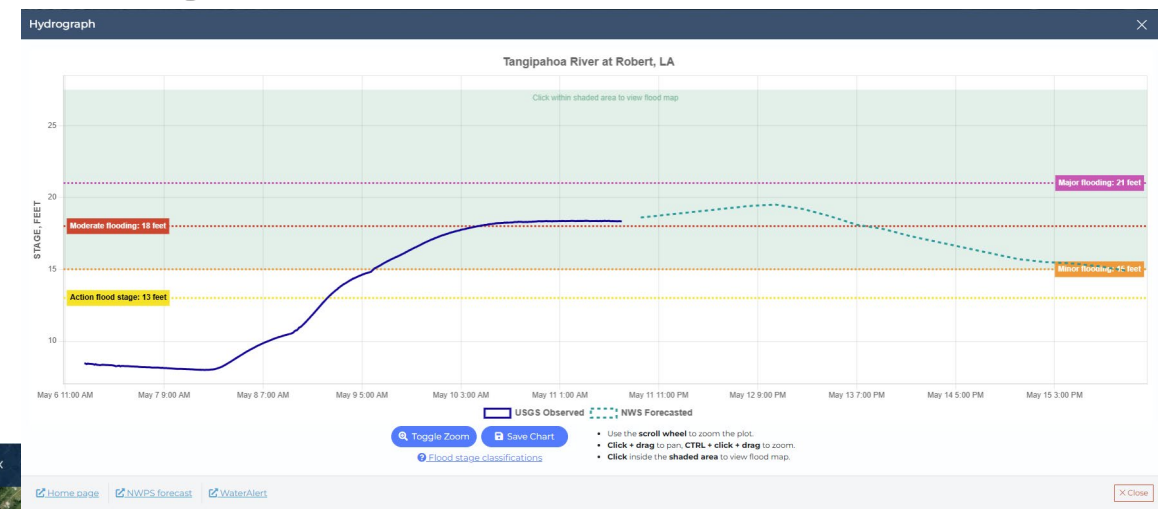


<https://apps.usgs.gov/rfti-map>

Flood Impacts in Indiana on
May 13, 2026



WHAT IS HAPPENING? Near-term forecasts provide decision makers with advance warning of potential hazards



<https://webapps.usgs.gov/infrm/fdst/>

WHAT IS HAPPENING?

Near-term coastal forecasts indicate the timing and likely severity of impacts to dunes

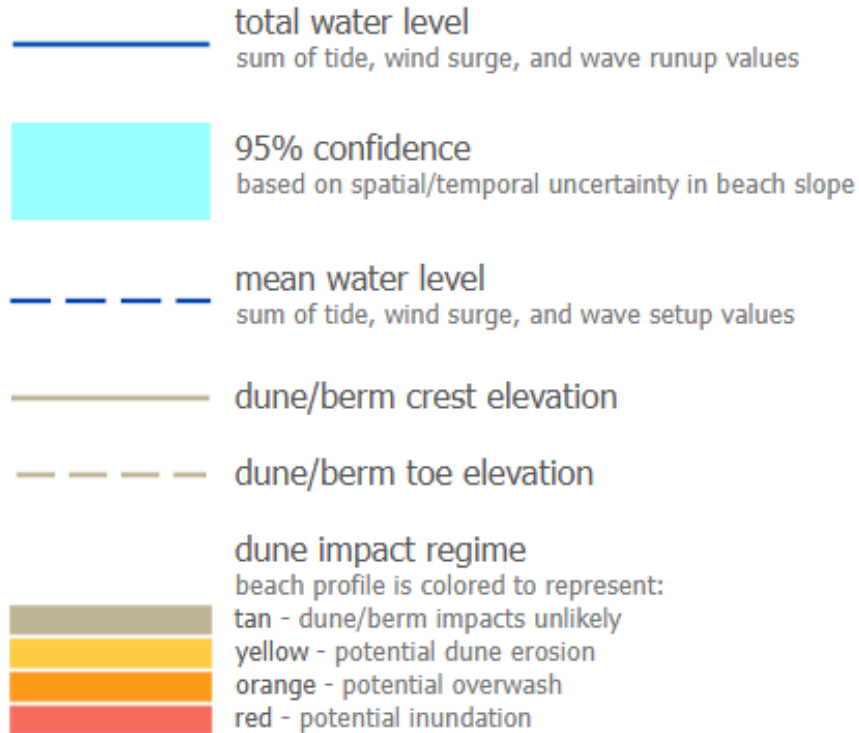


<https://coastal.er.usgs.gov/hurricanes/research/twlviewer/>



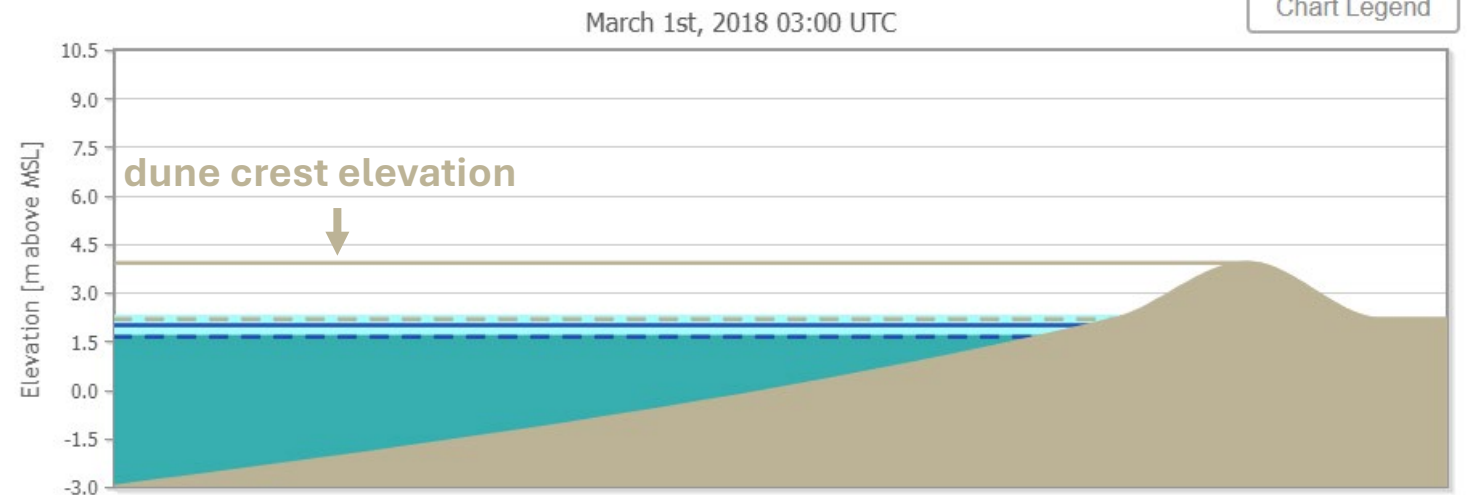
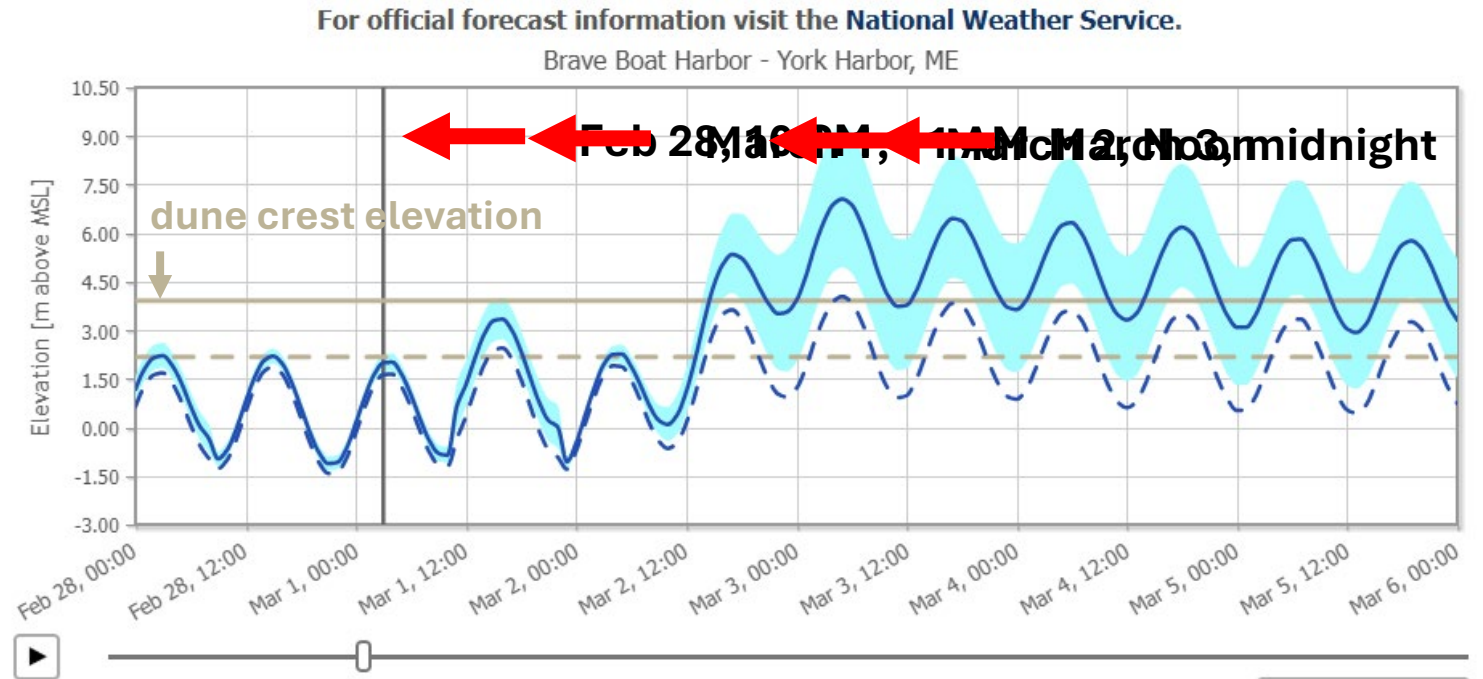
WHAT IS HAPPENING?

Time Series and Beach Profile Legend



Dune elevations may not be representative of current beach conditions

<https://coastal.er.usgs.gov/hurricanes/research/twlviewer/>



York Harbor, ME; Forecast date: 2/27/2018, 7 PM



📍 **What has happened?**

📍 **What is happening?**

📍 **What might happen?**

WHAT MIGHT HAPPEN?

Cause-specific hazard maps can help managers identify, and prepare for, the most likely hazards in their community



<https://ny.water.usgs.gov/maps/compoundflooding/>

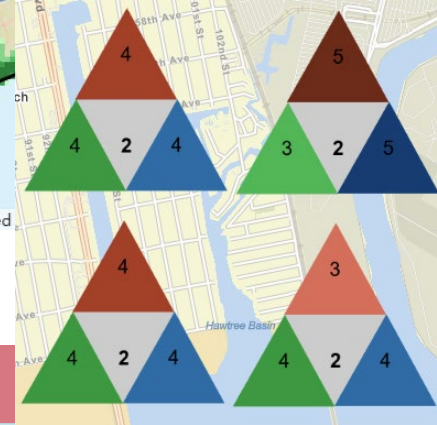
Darker colors = higher hazard scores

Wave water volume
Inundated area

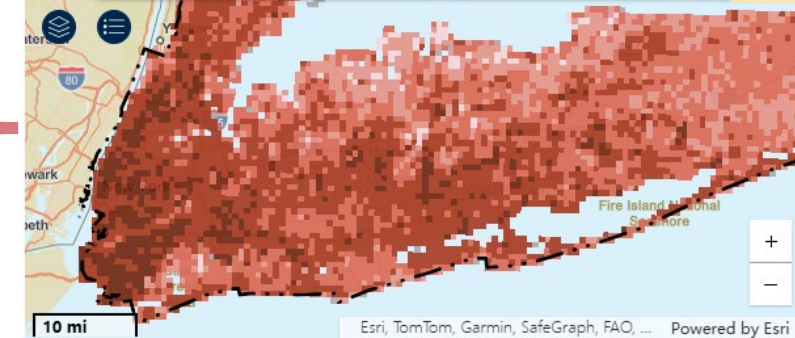
Curve number (stormwater runoff potential)
Stream density
Topographic slope
Closed depressions (ponding)
Long-term average rainfall
Short-term rainfall extremes

Depth to groundwater
Hydrologic soil groups
B, C, and D

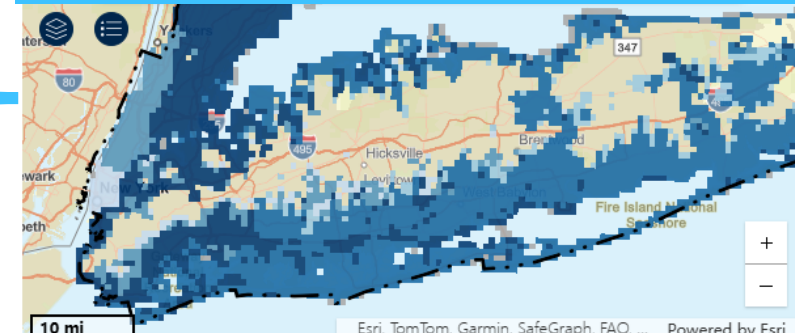
Coastal Flood Hazard



Rainfall Flood Hazard

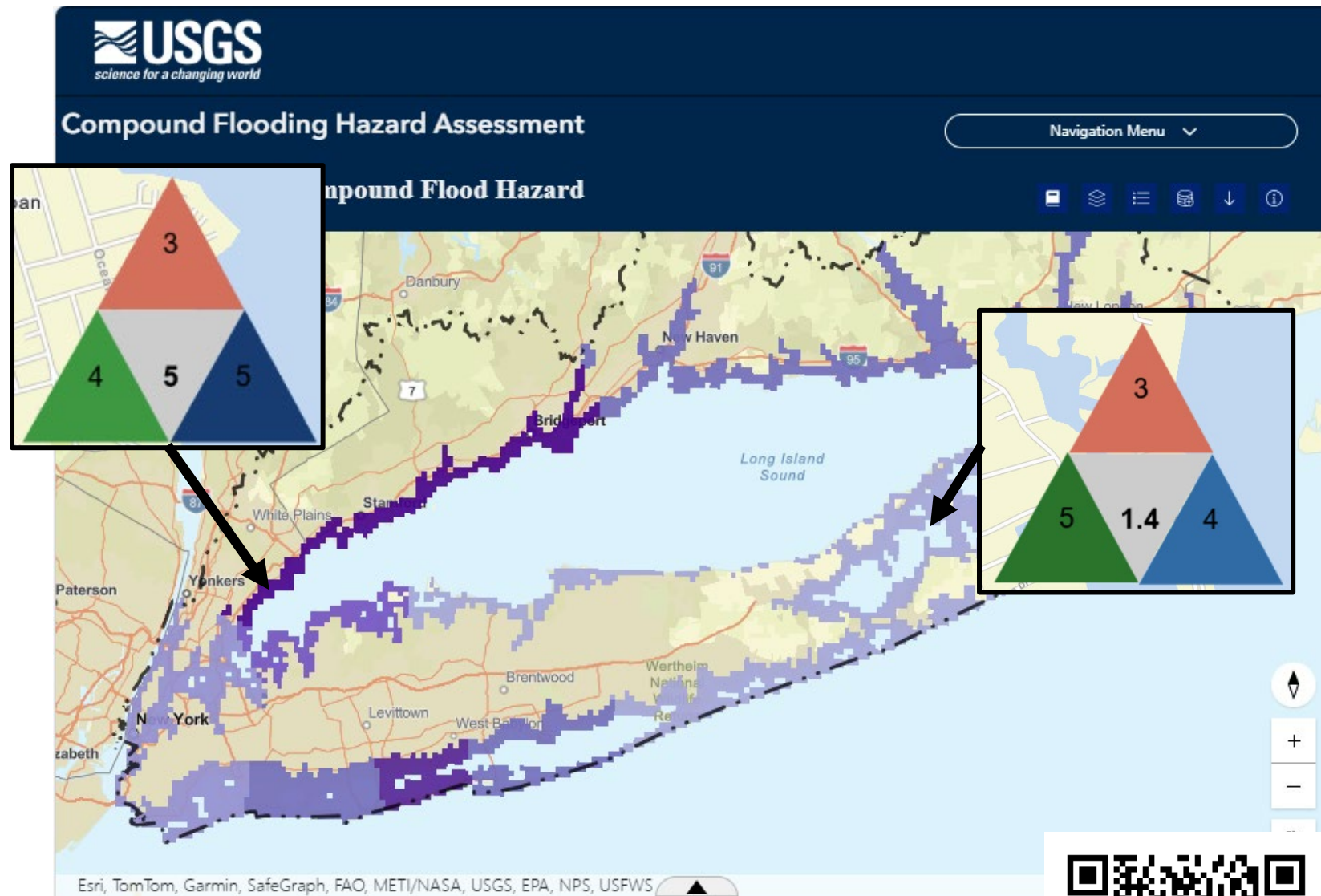


Groundwater Flood Hazard



WHAT MIGHT HAPPEN?

**Historic patterns
can give some
insight into where
flood effects are
likely to compound.**



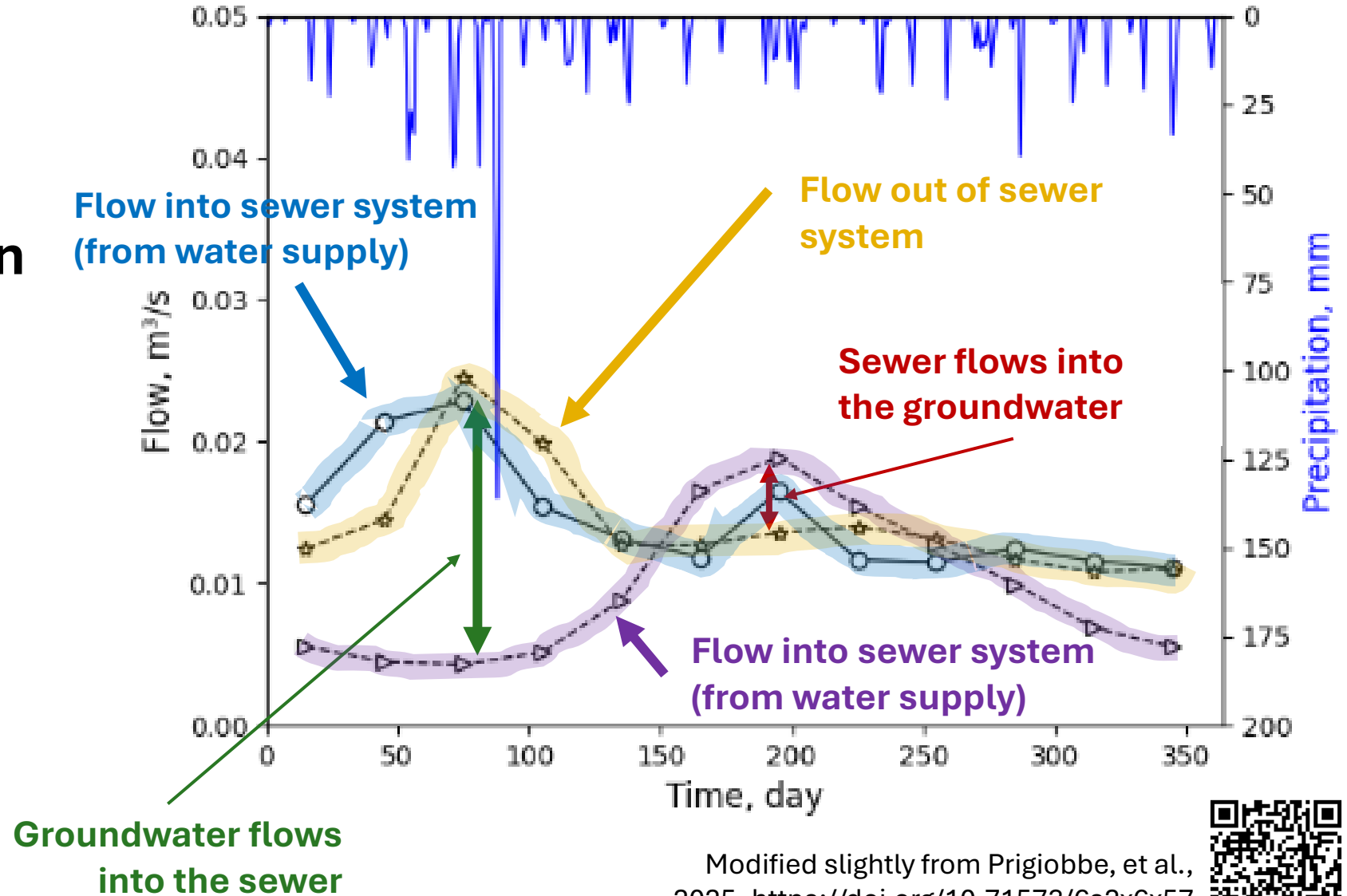
<https://ny.water.usgs.gov/maps/compoundflooding/>



WHAT MIGHT HAPPEN?

Coupled models can simulate flooding and associated impacts under a range of conditions

Coupled Sewer and Groundwater Models, Greenport, NY



Flood Information Resources

📍 **What has happened?**



**January / March 2018
Nor'easter Products**
(Report and geonarrative)



Flood Event Viewer
(High water marks and
storm water levels)



**Real-time Flood Impact
Mapper**
(Flooded roads / bridges
/ facilities)



**Southern Connecticut / Long
Island Flood Hazard Mapper**
(Cause-specific and
compound hazard maps)

📍 **What is happening?**



**Total Water Level and
Coastal Change Viewer**
(Forecasts of near-term
coastal effects)



**Interagency Flood Risk
Management App**
(Inundation maps and river
forecasts)

📍 **What might happen?**



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