

# HURRICANE IRMA

**TS**

Category  
(tropical storm)

**10**

Inches of Rain

**65**

Miles per hour  
of Max Wind Gusts

**5.9**

Feet of Storm Surge  
(max)\*



Image Credit: NASA NOAA GOES, taken on September 9, 2017

## Monitoring the Impact of Hurricane Irma at "GTM NERR"



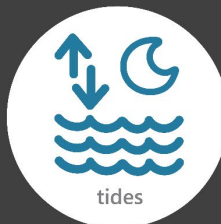
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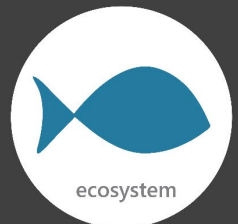
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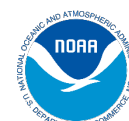
On Sept. 11th, Irma passed between Tampa and Orlando as a category 1 storm. It then "weakened" to a tropical storm about 20 miles west of Gainesville. By the afternoon, its center moved over south Georgia just west of Valdosta. Even though Irma made landfall along the southwestern coast of Florida, the hurricane's large wind field produced significant storm surge flooding along the northeastern coast of Florida.

The effects of Irma were observed at the **Guana Tolomato Matanzas (GTM) Research Reserve** through the **System-Wide Monitoring Program (SWMP)**, which tracks short-term variability and long-term change in weather and water quality in the areas surrounding St. Augustine and St. Johns County, Florida.

**STORM  
STORIES**



NATIONAL  
ESTUARINE  
RESEARCH  
RESERVE  
SYSTEM



**National Estuarine  
Research Reserve System  
Science Collaborative**

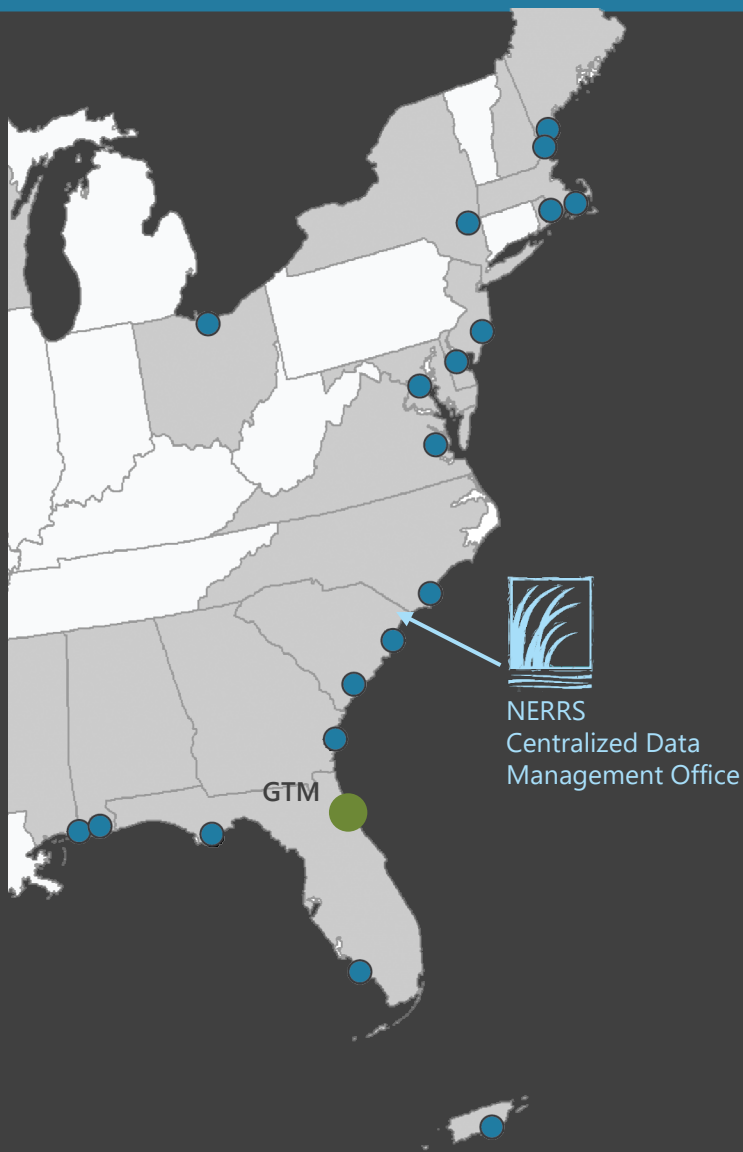
Data shown are based on the GTM weather monitoring site

\*Data based on the Dames Point NOS site

Created on May 31, 2022

# GTM

Guana Tolomato Matanzas (GTM) is one of 30 sites in the National Estuarine Research Reserve Systems (NERRS). Each site is a state-federal partnership that combines research, monitoring, and education to advance the understanding and management of estuarine environments.



## Locally Relevant, Nationally Significant

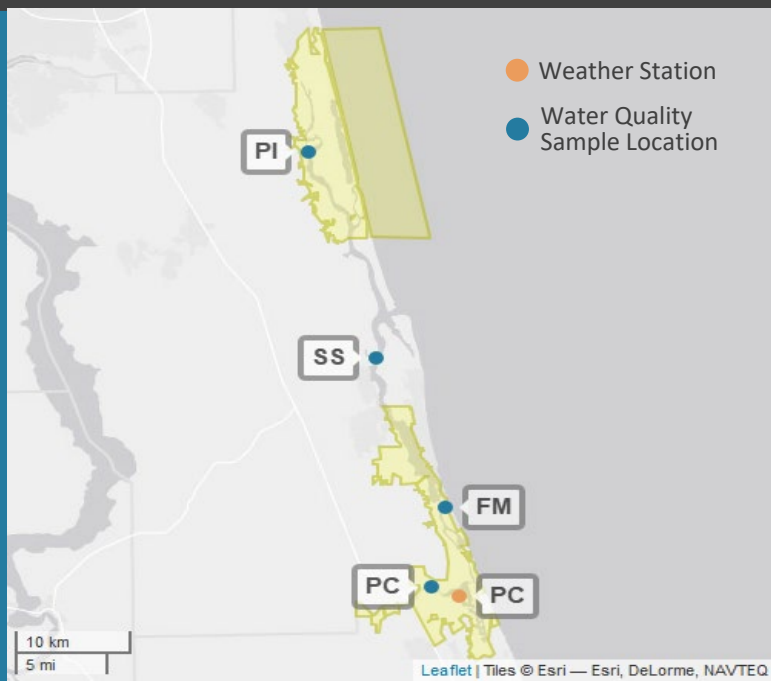
The **System Wide Monitoring Program (SWMP)** tracks weather and water quality as a storm happens and the impacts that follow. Scientific instruments (i.e., data sondes and sensors) are deployed at Reserves along the Atlantic and Gulf of Mexico coastal areas collecting data on the condition of our estuaries 24/7 to help protect people and places.

Data from the extensive monitoring network are delivered to the **Centralized Data Management Office (CDMO)**. Near real-time SWMP data are now available to via smartphone or tablet at: [www.nerrsdata.org/mobile](http://www.nerrsdata.org/mobile)

## GTM Storm Monitoring

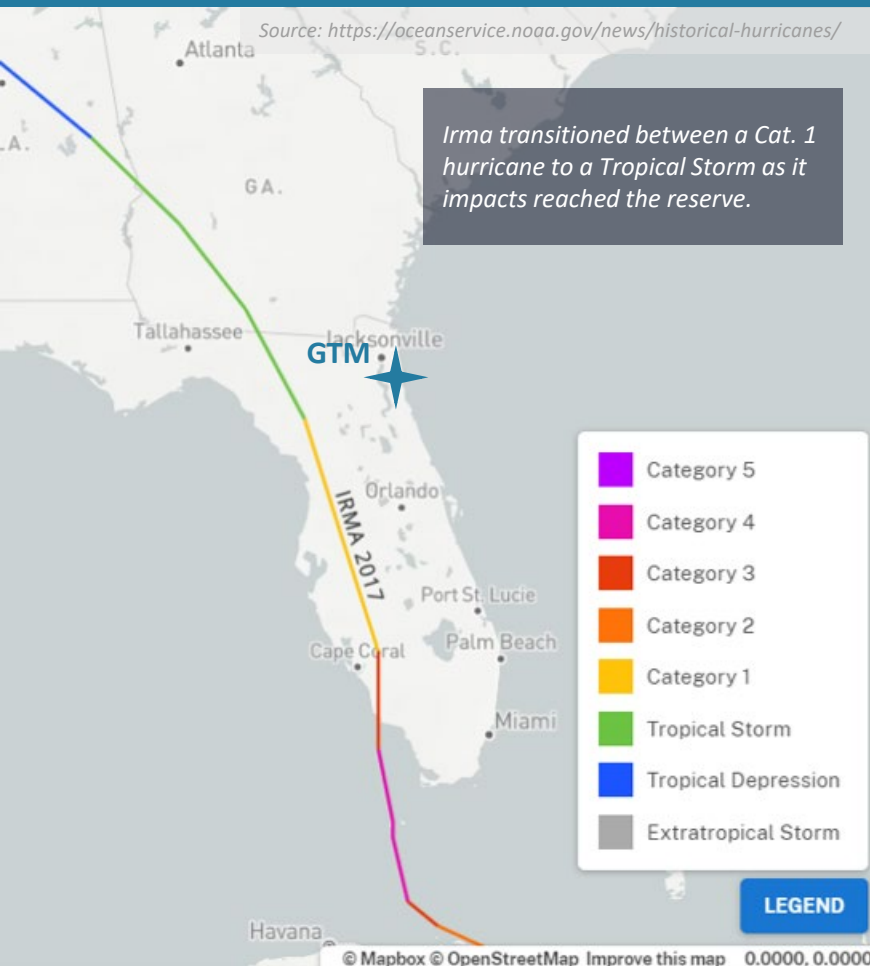
GTM NERR operates a weather station located at Pellicer Creek (PC) and maintains four continuous, long-term water quality stations at Pine Island (PI), San Sebastian (SS), Fort Matanzas (FM), and Pellicer Creek (PC) locations.

GTM NERR is part of the SWMP. As Hurricane Irma approached Florida, GTM NERR monitored the weather and water quality, collecting data every 15 minutes for the following parameters: air temperature, relative humidity, atmospheric pressure, rainfall, wind speed and direction, water temperature, depth, salinity, dissolved oxygen, turbidity, and pH.



# Storm Track

On Sep. 9 Irma turned northwestward towards Florida and made landfall in Cudjoe Key on Sep. 10 as a Cat. 4. Irma weakened to a Cat. 3 before making landfall again at Marco Island. Irma accelerated inland to the north-northwest, weakening to a Cat. 1 on Sep. 11, passing east of Tampa and weakened to a tropical storm as it entered Georgia.



## Event Impacts



### Human Health & Safety

- Flooding occurred on most rivers in northern Florida. The St. John's River set record flood stages at many locations in Duval County, causing major flooding in the Jacksonville metropolitan area, where hundreds of people were rescued.



### Economic Losses

- NOAA NCEI estimates that the total cost of Irma was \$80 billion (adjusted for 2022), making Irma the 6th most destructive hurricane to affect the United States.



### Ecosystem Impacts

- Aquatic life, like oysters, crabs, shrimp, fish, phytoplankton, etc. rely on specific levels of salinity and dissolved oxygen to thrive and survive. The weather impacts from Irma caused significant drops in the levels of salinity and dissolved oxygen for varying periods of time, potentially stressing organisms.



## Weather Data

Station	Date	Total Precipitation (in)	Average Intensity Precipitation (in/hr)	Max Wind Speed (mph)	Average Wind Speed (mph)
Pellicer Creek	9/8/2017	0.38	0.016	19.0	14.6
Pellicer Creek	9/9/2017	0.91	0.038	25.7	20.6
Pellicer Creek	9/10/2017	2.27	0.094	39.8	27.7
Pellicer Creek	9/11/2017	6.49	0.270	65.1	38.7
Pellicer Creek	9/12/2017	0.03	0.001	19.5	9.9

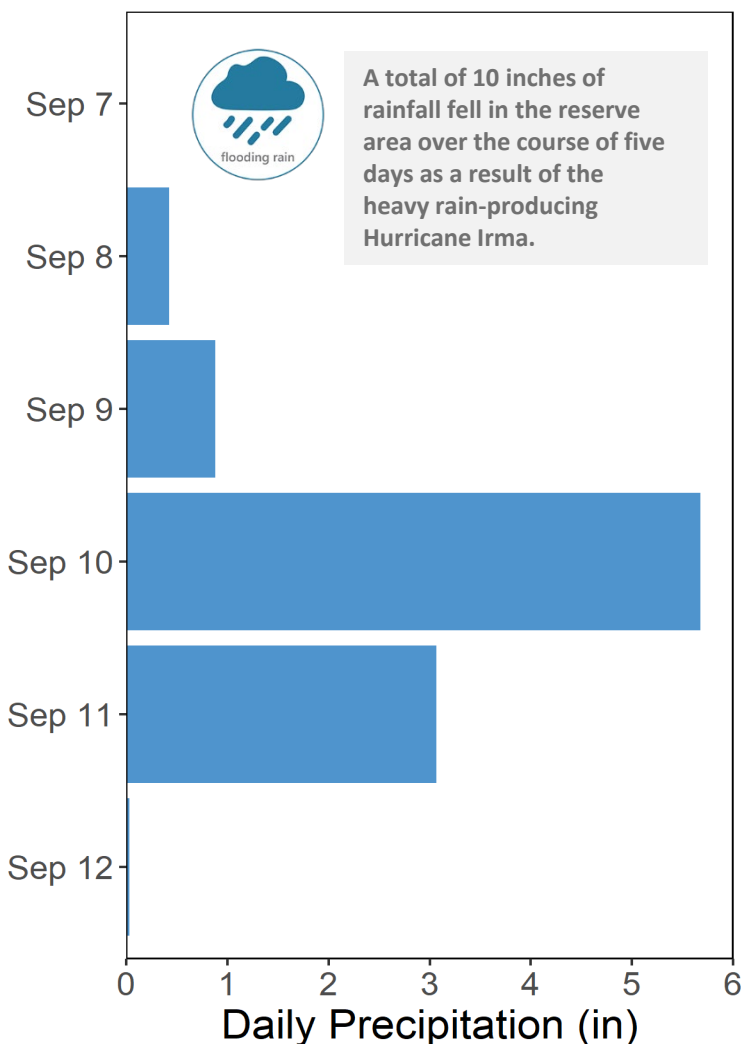
The highest local rainfall and wind measurements were recorded at the reserve when Irma moved inland and north-northwest across Florida on Sep. 11.

Data reporting time periods for Hurricane Irma: 9/7/2017 - 9/11/2017



# RAINFALL

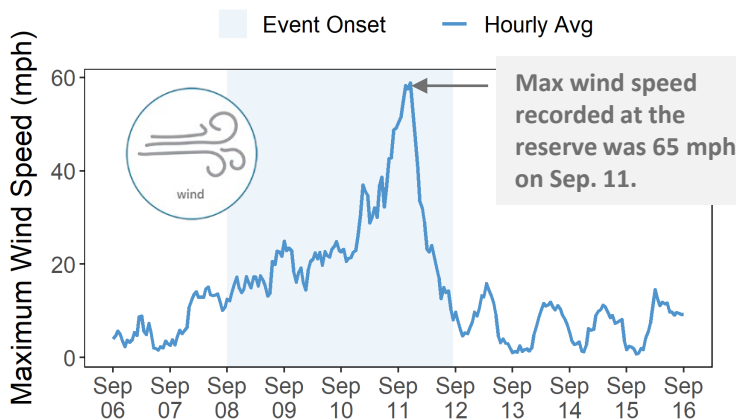
## Pellicer Creek (PC)



**Rainfall measurements** at the weather station from Sep. 7 through Sep 12.

# WIND SPEED

## Pellicer Creek (PC)



**Maximum Wind Speed readings** at the weather station from Sep. 6 through Sep. 16.

Irma brought heavy rains, high winds, storm surge, and freshwater flooding to Florida.



Heavy rains and high winds impacted northeastern Florida with 10 total inches rainfall and a max wind speed of 65 mph recorded at the Pellicer Creek weather station. The Matanzas River south of St. Augustine recorded a wave-filtered water level of 6.65 ft NAVD88 (4.8 ft MHHW), and the USGS surveyed several high water marks of 2 to 4 ft above ground level in that area. The highest was a mark of 3.3 ft above ground level near Vilano Beach. Even though Irma made landfall along the southwestern coast of Florida, the hurricane's large wind field produced significant storm surge flooding along the northeastern coast of Florida.

In northern Florida, flooding was the biggest issue. Rivers that reached major or record flood stage caused significant flooding in the Jacksonville area. Floodwaters filled the city's streets and reached up to 5 ft deep in some locations reaching record-breaking levels in some locations. Overall Irma was responsible for one of the worst flooding events in the city's 225+ year history. The northeastern portion of the state also experienced hurricane-force wind gusts and embedded tornadoes that caused structural damage to homes and businesses. There was also widespread tree and power line damage across the area.



# Water Quality Data

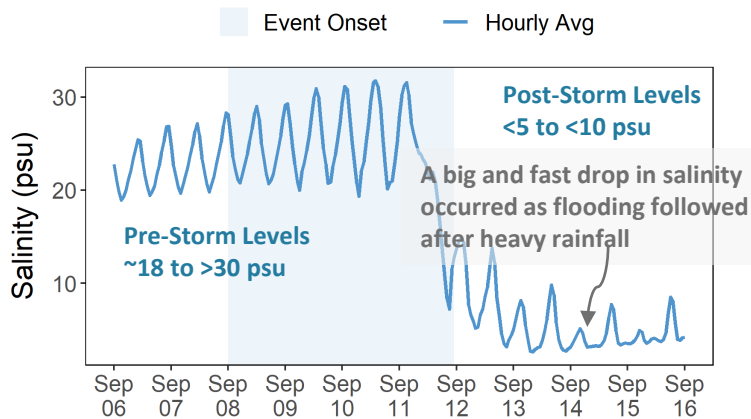
On Sep. 12, salinity levels quickly dropped at Pellicer Creek in response to the heavy rains and flooding that resulted as Irma passed over the north-northwest part of the state on Sep. 11.

Station	Date	Depth Maximum (ft)	Salinity Minimum (psu)	Salinity Maximum (psu)	Dissolved Oxygen Minimum (mg/L)	Dissolved Oxygen Maximum (mg/L)
Pine Island	9/8/2017	13.48	20.1	29.2	3.6	5.3
Pine Island	9/9/2017	14.07	19.5	31.1	5.1	6.0
Pine Island	9/10/2017	14.83	18.3	31.9	5.8	6.5
Pine Island	9/11/2017	16.40	12.6	31.8	6.4	6.8
Pine Island	9/12/2017	13.52	4.7	14.9	4.2	6.2

Data reporting time periods for Hurricane Irma: 9/7/2017 - 9/11/2017

## SALINITY

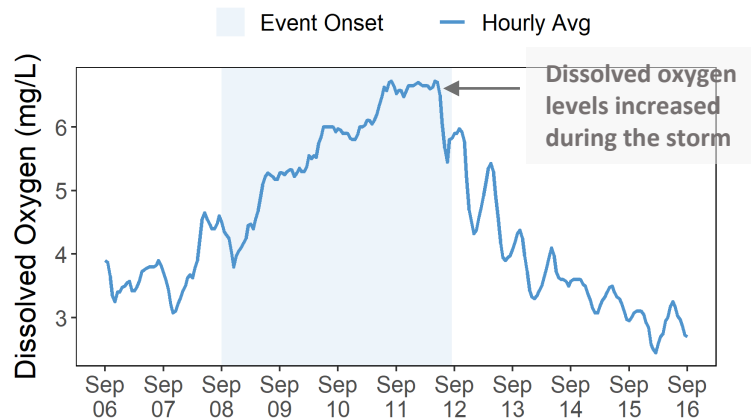
### Pine Island (PI)



Salinity levels from Sep. 6 through Sep 16.

## DISSOLVED OXYGEN

### Pine Island (PI)



Dissolved Oxygen levels from Sep. 6 through Sep. 16.

Salinity and dissolved oxygen levels recorded at Pellicer Creek show initial and post-storm impacts on water quality. Salinity levels quickly dropped from the heavy rains and flooding and remained at lower levels for for several days after the hurricane had passed. Dissolved oxygen levels increased during the storm's impact and then returned to lower levels within a few short days.

Dramatic changes in salinity can cause stress to some aquatic organisms depending on the species and how long the levels deviate from what is normal. Water quality stresses can impact survival and future populations.



Oyster reef in the Matanzas River south of St. Augustine, Florida.



# About NERRS

Established in 1972, the NERRS is a network of 29 ecologically significant, locally treasured estuarine places in 23 states and Puerto Rico. Each Reserve is a partnership between NOAA and a state agency or university. Most of the 1.3+ million acres of estuary lands and waters that Reserves help to protect and steward are open to the public. Reserves work with local decision makers, states, universities, nonprofits, and others to set natural resource management priorities and address them through research, environmental monitoring, education, training, and stewardship.

The health of every reserve is continuously monitored by the System Wide Monitoring Program (SWMP). SWMP is a robust, long-term, and versatile monitoring program that uses the NERRS network to intensively study estuarine reference sites for evaluating ecosystem function and change. Reserve-generated data and information are available to local citizens and decision makers. For more information, go to: <https://coast.noaa.gov/nerrs/>



## CONTACT

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## DATA

Visit [www.nerrsdata.org](http://www.nerrsdata.org) to view and download weather and water quality data from GTM NERR.



## EXPLORE

Interested in learning more? Visit [www.gtmnerr.org](http://www.gtmnerr.org). For video, news updates, and online storm data and prediction visualization tools, check out our Storm Story Map at [www.stormstorymap.url](http://www.stormstorymap.url).



## National Estuarine Research Reserves Protect People & Places

*This work is/was sponsored by the National Estuarine Research Reserve System Science Collaborative, which supports collaborative research that addresses coastal management problems important to the reserves. The Science Collaborative is funded by the National Oceanic and Atmospheric Administration and managed by the University of Michigan Water Center (NA19NOS4190058).*

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