

[ OCT 22 – OCT 30, 2012 ]

# HURRICANE SANDY

**ES**

Category  
(extratropical storm)

**8.6**

Inches of Rain

**39**

Miles per hour of  
Max Wind Speed

**3-5**

Feet of Storm Surge  
(max)\*

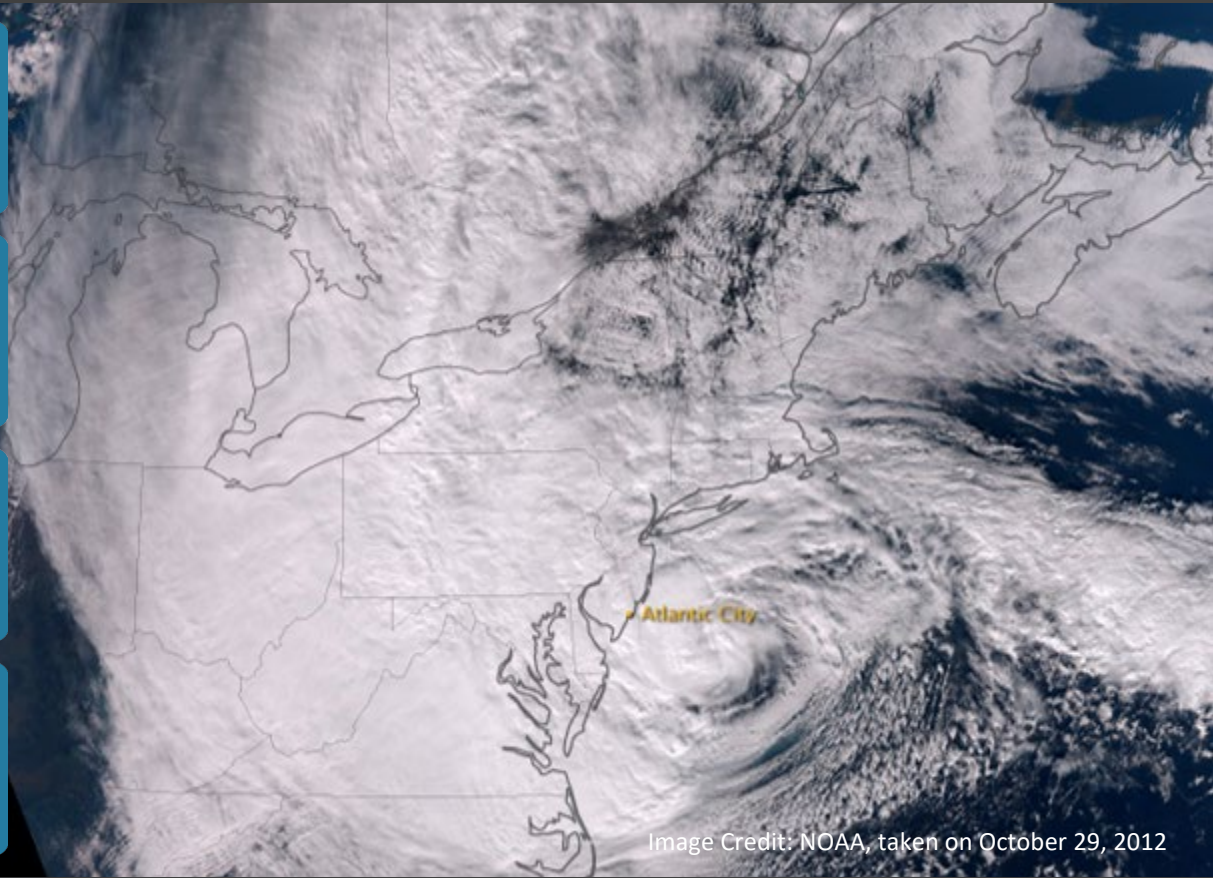


Image Credit: NOAA, taken on October 29, 2012

## Monitoring the Impact of Hurricane Sandy at "Delaware NERR"



wind

+



flooding rain

+



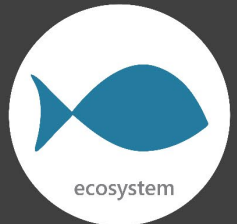
storm surge

+



tides

+

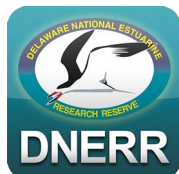


ecosystem

Hurricane Sandy was the deadliest, most destructive, and strongest hurricane of the 2012 Atlantic season. Sandy made landfall near Atlantic City, New Jersey on Oct. 29. An unusual combination of hurricane conditions and cold fronts made Sandy particularly damaging. Lower Delaware experienced heavy rainfall, high winds, and flooding. NOAA estimates Sandy caused at least \$80 billion (adjusted for 2022) in damages, making it the fourth costliest hurricane in U.S. history.

The effects of Sandy were observed at the Delaware NERR (DNERR) Research Reserve through the System-Wide Monitoring Program (SWMP), which tracks short-term variability and long-term change of weather and water quality in the areas surrounding Dover and Kent County, Delaware.

**STORM  
STORIES**



NATIONAL  
ESTUARINE  
RESEARCH  
RESERVE  
SYSTEM

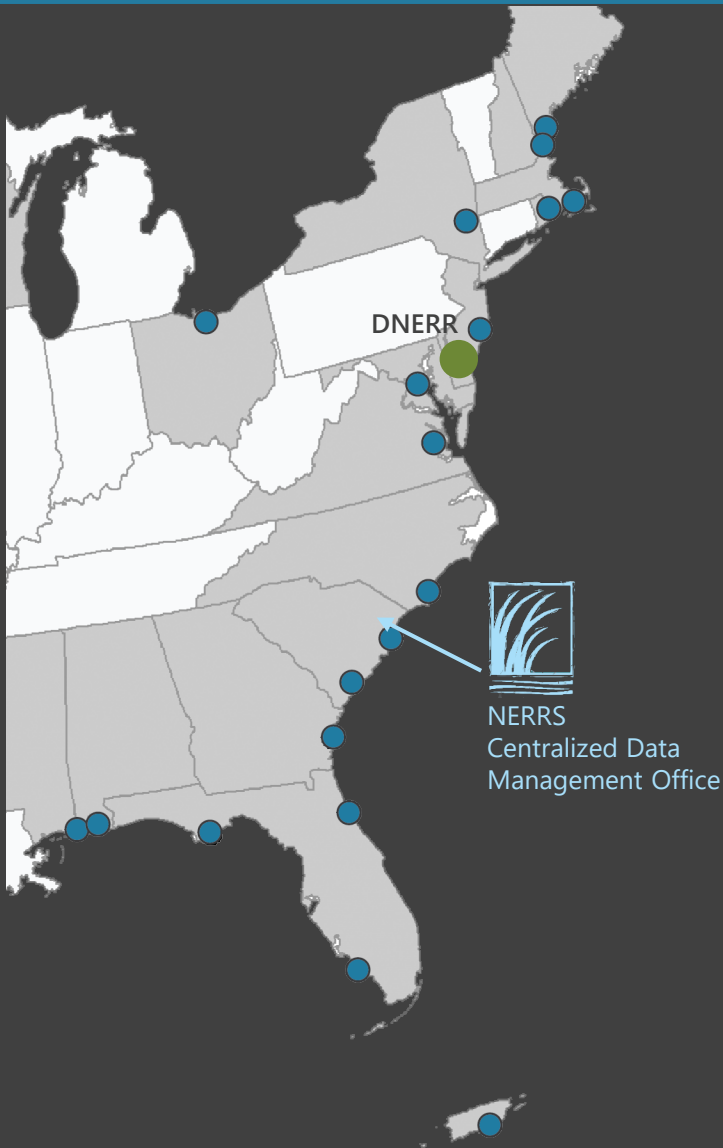


**National Estuarine  
Research Reserve System  
Science Collaborative**

Data shown are based on the DNERR weather monitoring site  
Based on National Ocean Service (NOS) stations  
Created on April 25, 2022

# DNERR

Delaware NERR (DNERR) is one of 29 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

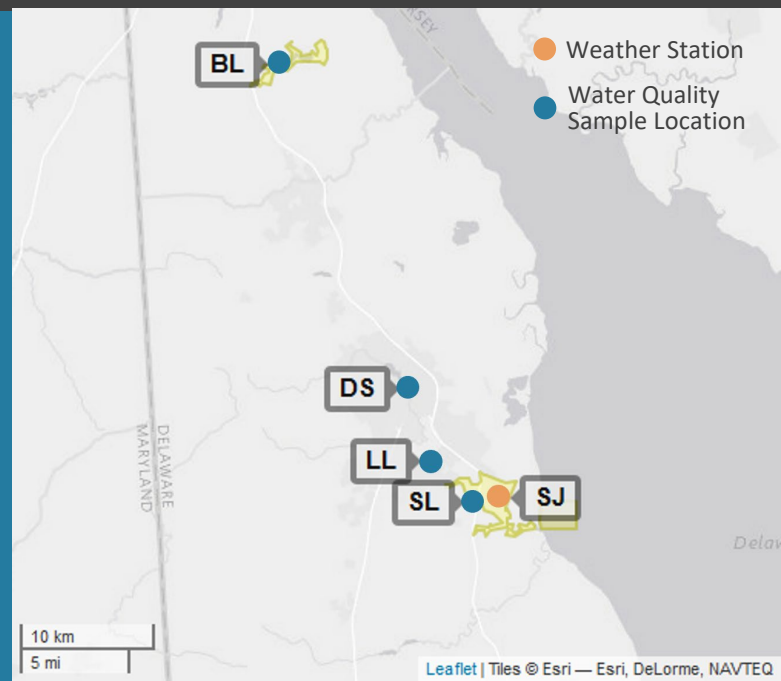
The **System Wide Monitoring Program (SWMP)** tracks weather and water quality as a storm happens and the impacts that follow. Scientific instruments (i.e., data sondes and sensors) are deployed at Reserves along the Atlantic and Gulf of Mexico coastal areas collecting data on the condition of our estuaries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

## DNERR Storm Monitoring

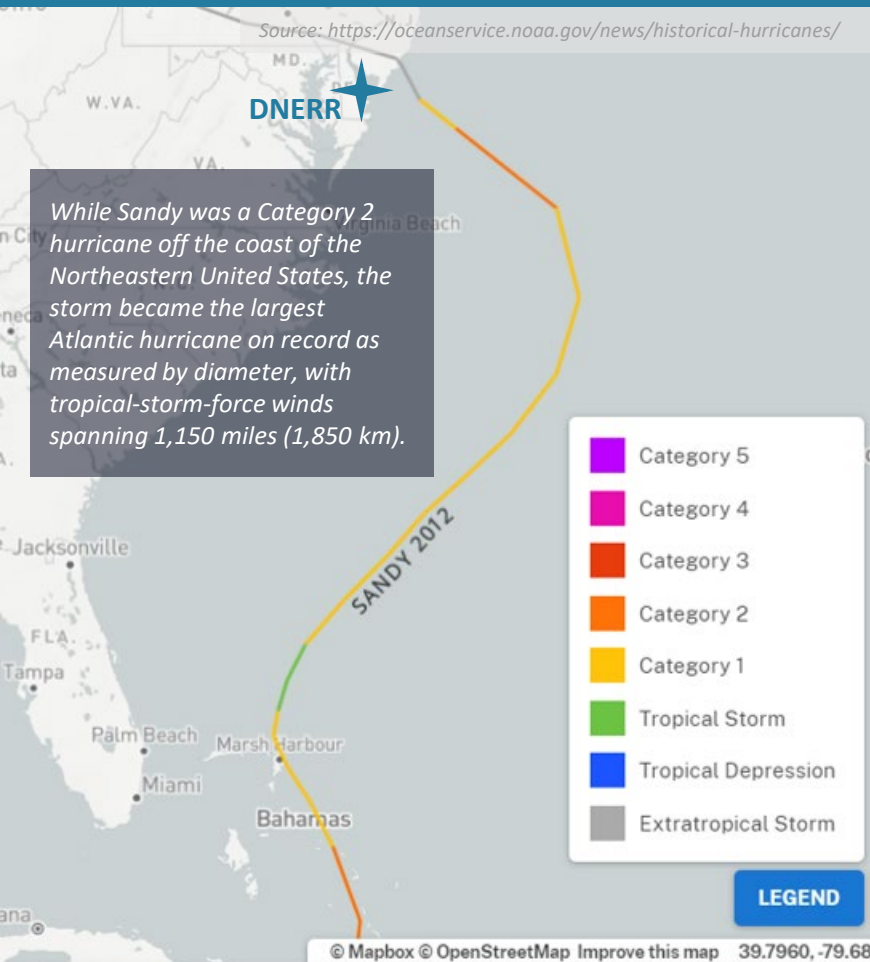
DNERR operates a weather station located in Saint Jones River (SJ) and maintains four continuous, long-term water quality stations at Blackbird Landing (BL), Division Stree (DS), Lebanon Landing (LL), and Scotton Landing (SL) locations.

DNERR is part of the SWMP. As Hurricane Sandy approached Delaware, DNERR 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

Sandy formed in the Caribbean Sea on Oct. 22. The hurricane was a Category 1 as it moved north along the Carolinas on Oct. 28, strengthened to a Category 2 as it turned toward the East Coast, and weakened to an extratropical storm when it made landfall on Oct. 29 near Atlantic City, New Jersey.



## Event Impacts



### Human Health & Safety

- Delaware experienced heavy rains and storm surges that resulted in record flooding, thousands of people lost power, and dunes were breached.



### Economic Losses

- Damage and losses due to Sandy's impacts on the U.S. totaled \$80 billion.
- Delaware's Prime Hook National Wildlife Refuge underwent a \$38 million restoration effort to repair the marsh, restore the natural water flow, repair breaks in the existing dunes, and create a marsh and beach to withstand storms and impacts of climate change.



### Ecosystem Impacts

- Aquatic life (i.e., oysters, crabs, lobster, fish, aquatic plants, phytoplankton) rely on specific levels of salinity, dissolved oxygen, and turbidity to thrive and survive. The water quality in the reserve was impacted by Sandy with significant drops in salinity levels and increases in turbidity levels for varying periods of time, potentially stressing organisms.



## Weather Data

Station	Date	Total Precipitation (in)	Average Air Temp. (deg. F)	Max Wind Speed (mph)	Average Wind Speed (mph)
Saint Jones River	10/28/2012	0.59	56.9	25.3	15.9
Saint Jones River	10/29/2012	6.79	52.3	37.6	24.8
Saint Jones River	10/30/2012	1.20	45.0	38.9	21.0
Saint Jones River	10/31/2012	0.02	44.9	15.9	7.3
Saint Jones River	11/1/2012	0.00	44.5	15.2	6.1

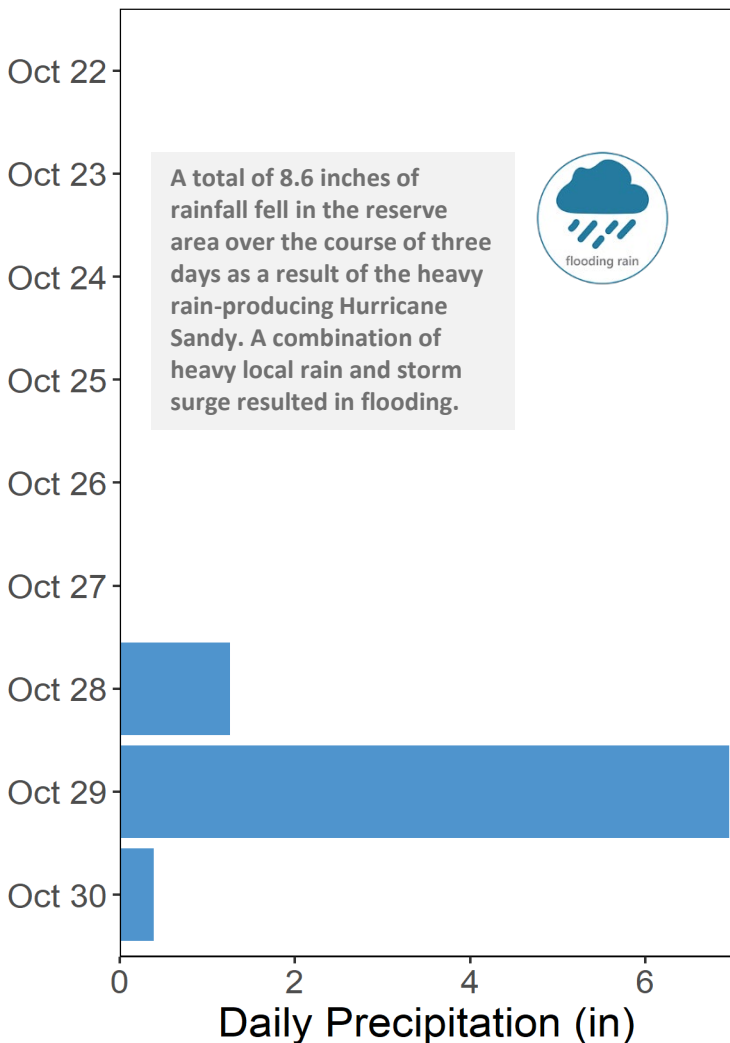
The highest local rainfall and wind measurements were recorded when Sandy approached Delaware and made landfall in Atlantic City, New Jersey.

Data reporting time periods for Hurricane Sandy: 10/28/2012 - 11/1/2012



# RAINFALL

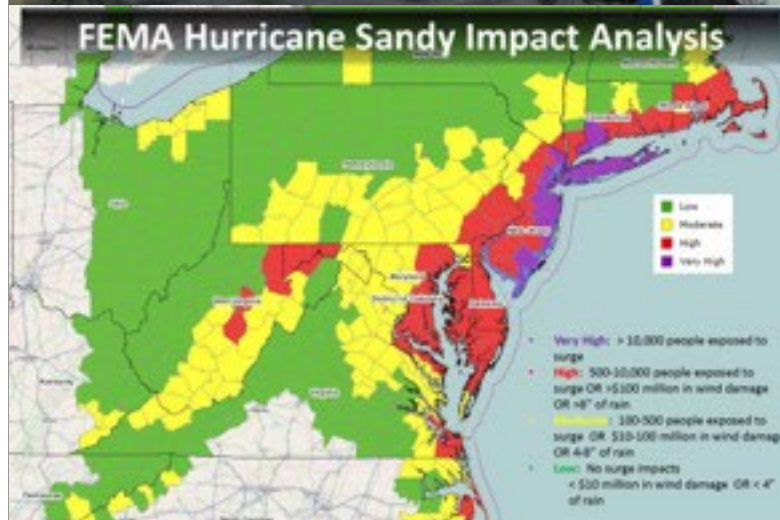
## Saint Jones River (SJ)



**Rainfall measurements** at the St. Jones River weather station from Oct. 22 through Oct. 30.

Florence brought heavy rains and freshwater and storm surge flooding to Delaware.

Photo from Eric Blake, National Hurricane Center (NHC), taken in Sussex County.

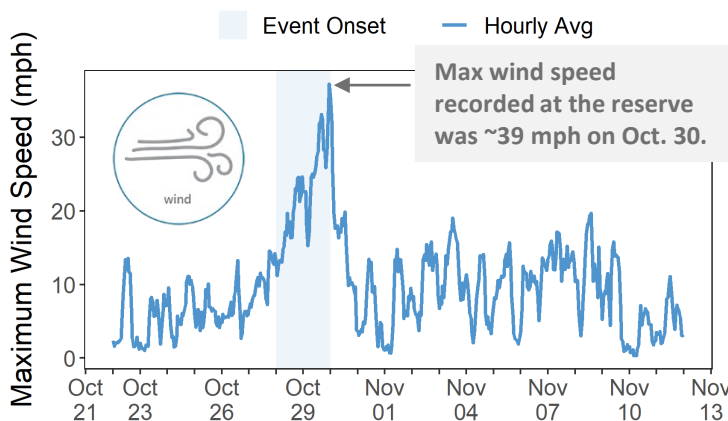


Impacts to Delaware from Hurricane Sandy resulted in property damage, street flooding, power outages, dune breaches, and beach erosion. Heavy rains fell over Delaware with 8.6 total inches of rainfall recorded at the St. Jones River weather station. The combined effect of storm surge and a full moon high tide produced max inundation levels of 3-5 ft in areas along the coastline. The highest storm surges recorded by the National Ocean Service (NOS) gauges in Delaware were 5.99 ft above normal tide levels at Delaware City and 5.80 ft at Reedy Point. The maximum wind speed recorded at the St. Jones River weather station was 39 mph.

Sandy is often described as an anomaly as several factors were at play, including the rare track, the large size of the storm, a higher-than-usual full moon high tide, and a cold front that resulted in a hybrid of two storm systems. For many, it was a call to action to take a hard look at the vulnerability of coastal communities and the reality that coastal storms are intensifying, and that sea-level rise and climate change will only heighten the risk in the future.

# WIND SPEED

## Saint Jones River (SJ)



**Maximum Wind Speed readings** at the St. Jones River weather station from Oct. 22 through Oct. 30.



# Water Quality Data

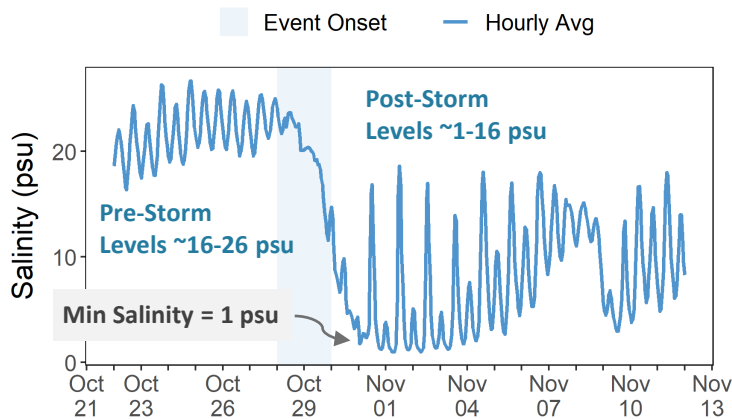
Salinity levels quickly dropped at Scotton Landing (SL) as Sandy passed through the reserve and then remained low as freshwater flooding came to the area over several days.

Station	Date	Turbidity Maximum (NTU)	Salinity Minimum (psu)	Salinity Maximum (psu)	Dissolved Oxygen Minimum (mg/L)	Dissolved Oxygen Maximum (mg/L)
Scotton Landing	10/28/2012	258	21.7	25.1	4.4	7.2
Scotton Landing	10/29/2012	405	13.8	22.7	5.5	8.0
Scotton Landing	10/30/2012	57	4.1	14.9	6.4	7.4
Scotton Landing	10/31/2012	65	1.4	17.1	6.0	7.6
Scotton Landing	11/1/2012	57	1.0	18.8	6.1	7.7

Data reporting time periods for Hurricane Sandy: 10/28/2012 - 11/1/2012

## SALINITY

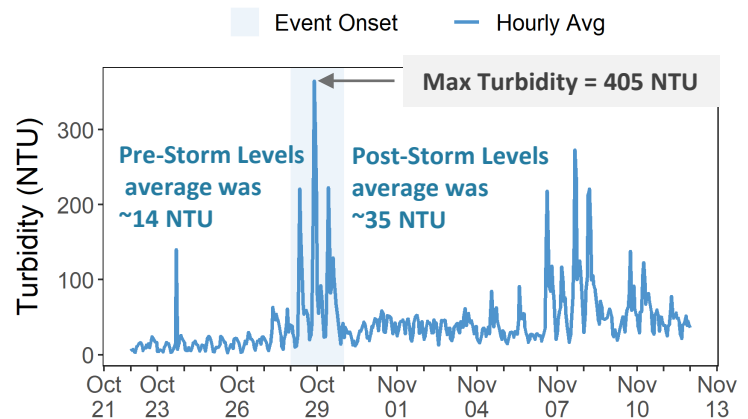
### Scotton Landing (SL)



Salinity levels from Oct. 22 to Nov. 12.

## TURBIDITY

### Scotton Landing (SL)



Turbidity levels from Oct. 22 to Nov. 12.

Salinity and Turbidity levels that were recorded at the Scotton Landing (SL) station show initial and post-storm impacts on water quality in this area. Salinity levels quickly dropped at the onset of the storm and recovered slightly as the storm moved on but remained lower than normal for an extended period of time. Turbidity levels (i.e., particles suspended or dissolved in water like sediment such as clay and silt) show a sharp increase at the storm onset but recover shortly as the storm moved on.

Dramatic changes in water quality such as salinity and turbidity 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.



*Understanding plant and animal species habitat preferences is critical to understanding populations.*



# 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 Delaware NERR.



## EXPLORE

Interested in learning more? Visit <https://dnrec.alpha.delaware.gov/coastal-programs/research-reserve/>. For video, news updates, 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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