HURRICANE IAN

1
Category

4.6
Inches of Rain

51
Miles per hour
of Max Wind Speed

5-7
Feet of Storm Surge
(max)

Image Credit: NOAA, taken on September 30, 2022

Monitoring the Impact of Hurricane Ian at **North Inlet - Winyah Bay NERR**
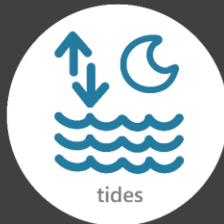
wind + flooding rain + storm surge + tides + ecosystem

Hurricane Ian made landfall on September 30th at North Island in Winyah Bay as a Category 1 storm. Ian had already pummeled the Gulf coast of Florida as a Category 4 hurricane and passed over Florida to the Atlantic before regaining strength and taking aim at the Carolinas. The storm brought severe coastal flooding and erosion across the Grand Strand region due to 5-7 feet of storm surge.

The effects of Ian were observed at the North Inlet - Winyah Bay (NI-WB) 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 Georgetown, South Carolina.

STORM STORIES

NORTH INLET – WINYAH BAY NATIONAL ESTUARINE RESEARCH RESERVE

UNIVERSITY OF **South Carolina**

NOAA

National Estuarine Research Reserve System Science Collaborative

Data shown are based on the NI-WB NERR weather monitoring site

Created on December 16, 2022

NI-WB

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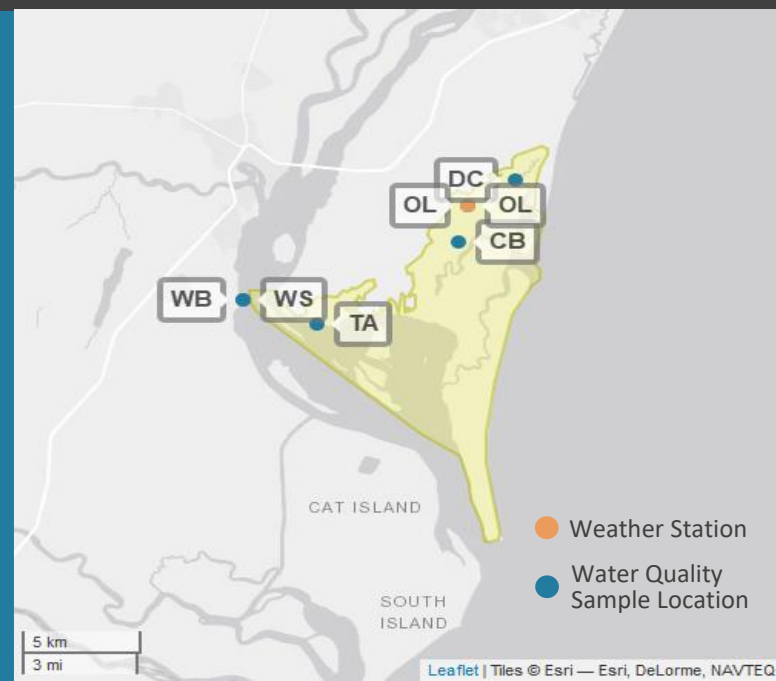
Data from the extensive monitoring network are delivered to the **Centralized Data Management Office (CDMO)**. Near real-time SWMP data are now available to via smartphone or tablet at: **www.nerrsdata.org/mobile**

NI-WB

NERRS
Centralized Data
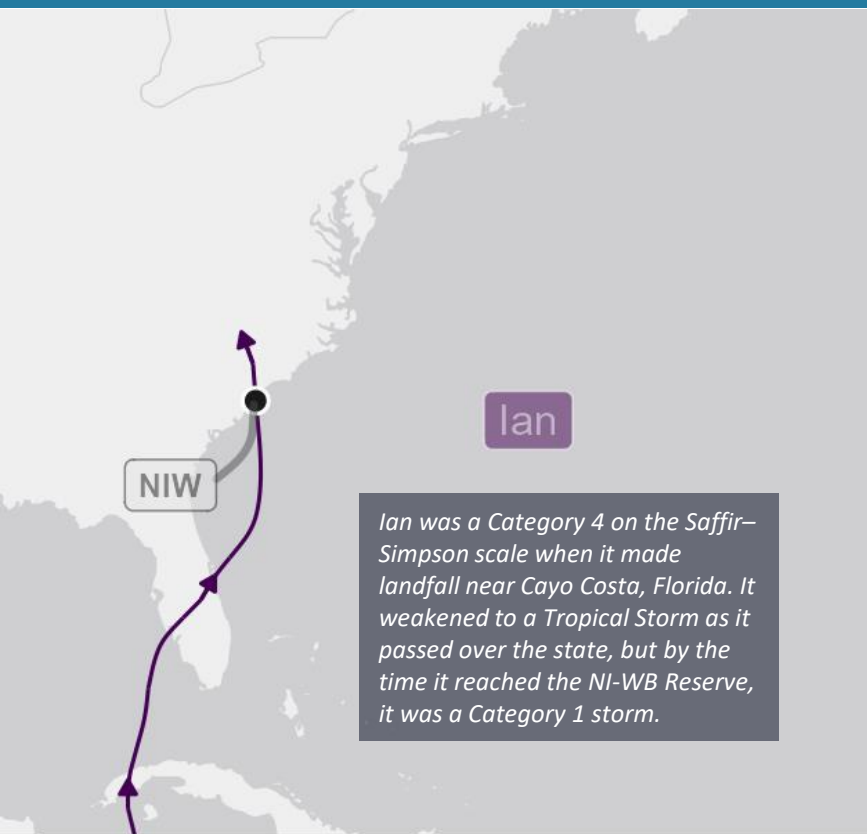Management Office
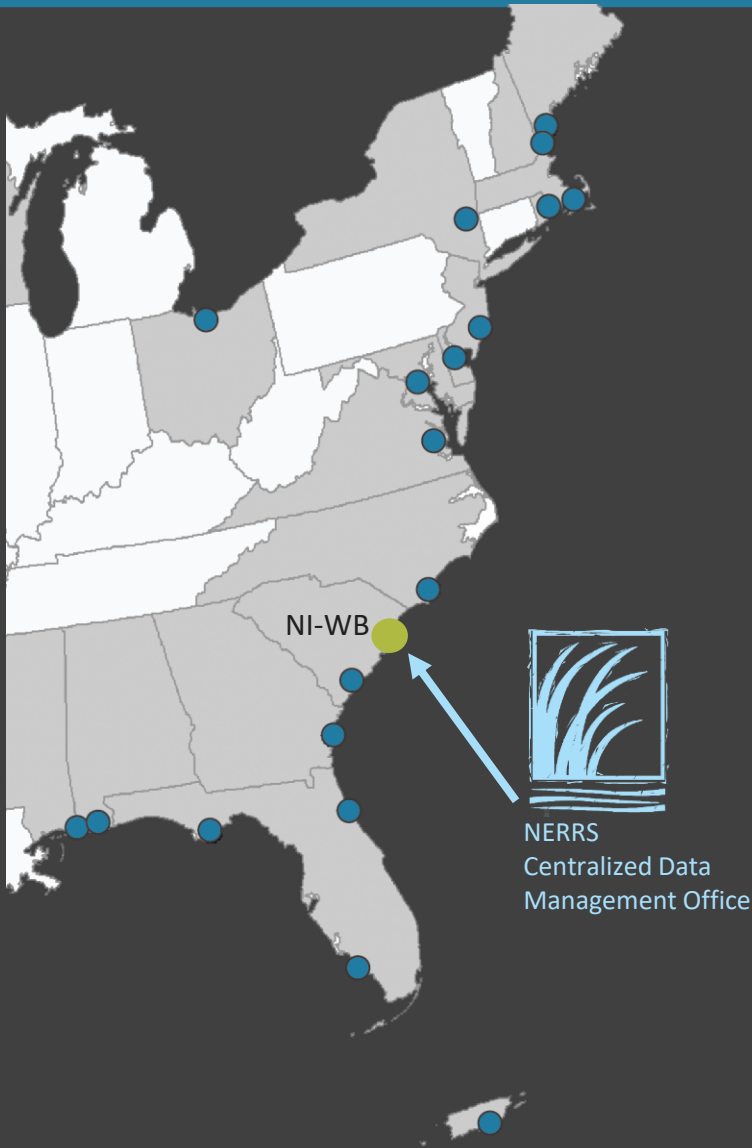
NI-WB Storm Monitoring

NI-WB operates a weather station located at Oyster Landing (OL) and maintains six continuous, long-term water quality stations at Oyster Landing (OL), Debidue Creek (DC), Clambank (CB), Thousand Acre (TA), Winyah Bay Bottom (WB), and Winyah Bay Surface (WS) locations.

As Hurricane Ian approached South Carolina, NI-WB NERR monitored 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.

DC
OL
OL
CB
WB
WS
TA

CAT ISLAND

SOUTH
ISLAND

● Weather Station

● Water Quality
Sample Location

5 km
3 mi

Leaflet | Tiles © Esri — Esri, DeLorme, NAVTEQ

Storm Track

Hurricane Ian made landfall on North Island near Georgetown, SC on September 30. After passing over Florida, it regained strength and turned toward South Carolina. The storm track predictions changed rapidly as the storm approached. Initial models predicted the storm would make landfall in North Florida, then Georgia or the SC lowcounty, but the track continued shifting north, eventually passing over NI-WB NERR and moving up through central North Carolina.

NIW

Ian

Ian was a Category 4 on the Saffir–Simpson scale when it made landfall near Cayo Costa, Florida. It weakened to a Tropical Storm as it passed over the state, but by the time it reached the NI-WB Reserve, it was a Category 1 storm.

Event Impacts

Human Health & Safety

– In South Carolina, 17 homes were destroyed and 232 homes experienced major damage

– Over 170,000 people lost power throughout the state

– Flooding resulted in lack of access to and from communities, complicating recovery and response efforts

Economic Losses

– Damage and losses due to Ian's impacts in South Carolina exceeded $25 million, including over $13 million to buildings in North Myrtle Beach

– Storm erosion can undo costly beach renourishment projects

Ecosystem Impacts

– Salt marsh ecosystems experienced resuspension and redistribution of sediments that may have been a short lived stressor for aquatic organisms

– Wrack, the decaying stems of salt marsh cordgrass, is floated and deposited in new areas during storms. Wrack affects plant growth as a source of nutrients, but may also smother areas of marsh
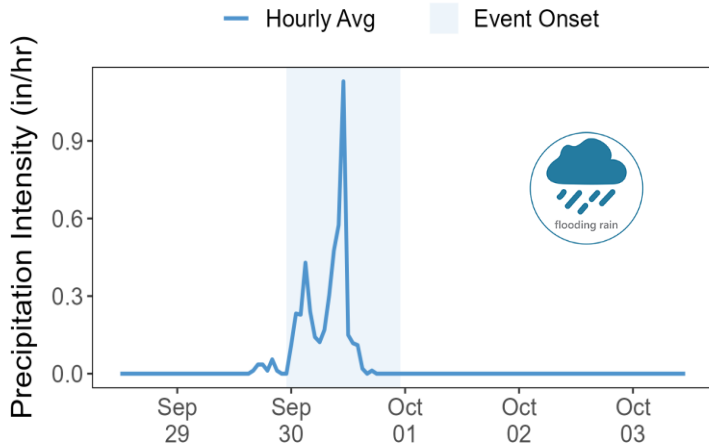
Weather Data

Station	Date	Total Precipitation (in)	Relative Humidity (%)	Max Wind Speed (mph)	Barometric Pressure (atm)
Oyster Landing	9/28/2022	0.00	52.2	21.9	30.1
Oyster Landing	9/29/2022	0.08	59.6	49.9	30.0
Oyster Landing	9/30/2022	4.65	92.4	50.6	29.6
Oyster Landing	10/1/2022	0.00	84.0	27.7	29.7
Oyster Landing	10/2/2022	0.00	79.6	15.4	29.9

The highest rainfall and wind measurements were recorded when Ian made landfall on North Island, near the mouth of Winyah Bay.

Data reporting time periods for Hurricane Ian: 9/28/22 - 10/2/22

RAINFALL INTENSITY

Oyster Landing (OL)

—— Hourly Avg ▪ Event Onset

y-axis: Precipitation Intensity (in/hr) — 0.0, 0.3, 0.6, 0.9
x-axis: Sep 29, Sep 30, Oct 01, Oct 02, Oct 03

Rainfall measurements at the Oyster Landing weather station from Sept. 29 through October 3rd

WIND AND BAROMETRIC PRESSURE

Oyster Landing (OL)

—— Hourly Avg ▪ Event Onset

y-axis: Maximum Wind Speed (mph) — 0, 10, 20, 30, 40, 50
x-axis: Sep 29, Sep 30, Oct 01, Oct 02, Oct 03

Max wind speed recorded at the Reserve was 51 mph

Maximum Wind Speed at the Oyster Landing weather station from Sept. 29 through October 3rd

Oyster Landing (OL)

—— Hourly Avg ▪ Event Onset

y-axis: Barometric Pressure (inHg) — 29.00, 29.25, 29.50, 29.75, 30.00
x-axis: Sep 29, Sep 30, Oct 01, Oct 02, Oct 03

Barometric Pressure at the Oyster Landing weather station from Sept. 29 through October 3rd

Image credit: Janet Morgan/myhorrynews.com

Ian caused major damage to coastal structures such as piers and causeways

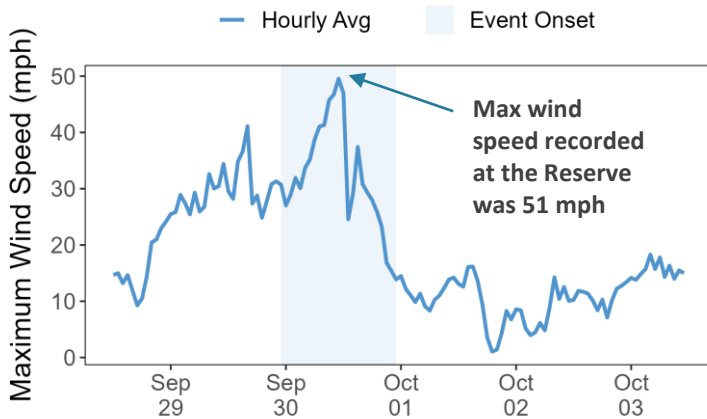Image credit: Pawleys Island Police Department

Impacts from Ian were felt along the South Carolina coast. Although initially projected to make landfall further south, Ian's track eventually passed right over the NI-WB NERR. Wind speeds spiked as the storm passed over, but wind was not a major source of damage locally. Total rainfall was moderate, but flooding was exacerbated by storm surge which backed up coastal drainage systems.

In the Grand Strand and Waccamaw Neck, 5-7 feet of storm surge brought significant coastal flooding. Dunes were scoured away, piers collapsed into the ocean, and beachfront structures were inundated with saltwater. Barrier island communities such as Pawleys Island saw causeways and roads go underwater, creating issues with access for rescue. After the storm, sand and debris had to be cleared before access could be restored. Waves broke through dunes along communities such as Garden City, flooding homes and businesses and creating dangerous transportation conditions.

Local emergency services performed several rescues of people who were trapped in buildings or cut off from access roads. Significant cleanup efforts were required to restore services in some areas.
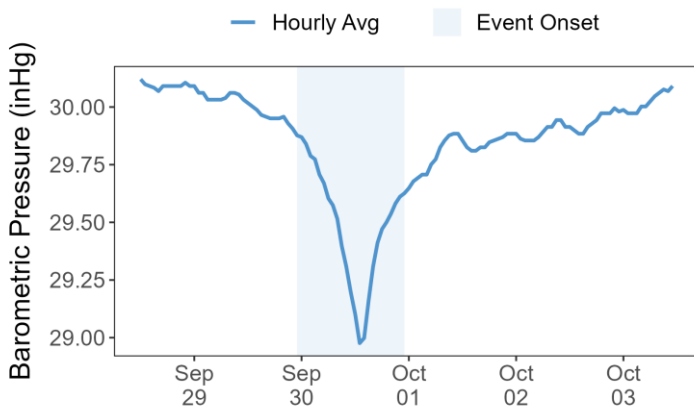
Water Quality Data

Salinity dropped after the initial storm surge due to rainfall running off the land and into North Inlet. It gradually returned to baseline after the storm.
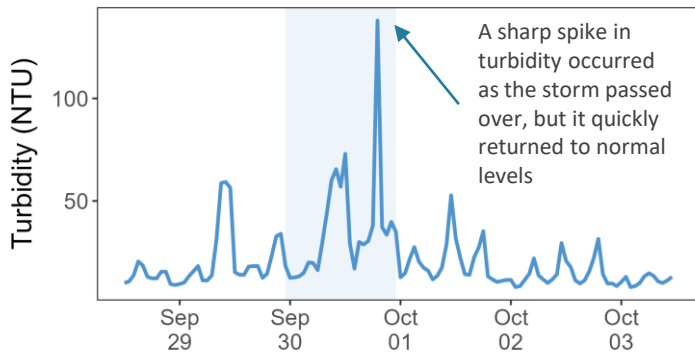
Station	Date	Turbidity Maximum (NTU)	Salinity Minimum (psu)	Salinity Maximum (psu)	Dissolved Oxygen Minimum (mg/L)
Oyster Landing	9/28/2022	26	35.5	37.0	3.1
Oyster Landing	9/29/2022	129	35.7	37.0	4.2
Oyster Landing	9/30/2022	82	31.0	36.6	5.6
Oyster Landing	10/1/2022	423	24.8	35.4	4.4
Oyster Landing	10/2/2022	36	26.1	35.4	3.2

Data reporting time periods for Hurricane Ian: 9/28/22 - 10/2/22

TURBIDITY

Oyster Landing (OL)

— Hourly Avg   Event Onset

A sharp spike in turbidity occurred as the storm passed over, but it quickly returned to normal levels
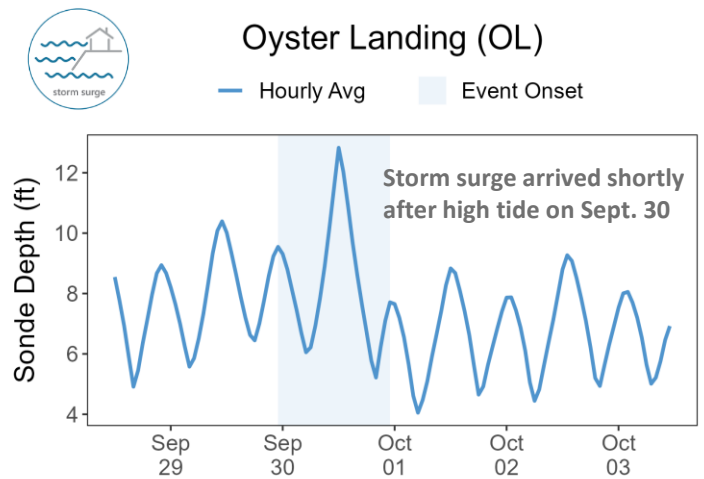
Turbidity measurements at the Oyster Landing water quality station from Sept. 29 through Oct. 4

DEPTH

Oyster Landing (OL)

— Hourly Avg   Event Onset

Storm surge arrived shortly after high tide on Sept. 30

Sonde Depth at the Oyster Landing water quality station from Sept. 29 through Oct. 4th

Turbidity and Depth measurements show the storm surge pushing into North Inlet on September 30th. The spike in turbidity reflects the wave energy of the storm which churned up the marsh bottom, resuspending and redistributing sediments. Turbidity can be a stressor for aquatic organisms, but the spike in turbidity quickly returned to baseline and is unlikely to have harmed marsh creatures.

Storm surge flooded the high marsh and maritime forest ecosystems surrounding North Inlet. These ecosystems are less tolerant of flooding and salt than the marsh itself, but the flooding did not persist for long. These ecosystems appear resilient to the short-lived disturbance of the storm.

Image credit: Pawleys Island Police Department

Coastal infrastructure is vulnerable to hazards such as storm surge. Healthy ecosystems provide protective services for coastal communities.

About NERRS

Established in 1972, the NERRS is a network of 30 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/**

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DATA

Visit **www.nerrsdata.org** to view and download weather and water quality data from North Inlet - Winyah Bay Reserve.

EXPLORE

Interested in learning more? Visit **http://www.northinlet.sc.edu/**
For video, news updates, online storm data and prediction visualization tools, check out our Storm Story Map at:
http://bit.ly/3Tnc2nw

National Estuarine Research Reserves Protect People & Places

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