

ESTUARY TRENDS IN WEATHER & WATER QUALITY

Resilient estuaries and coastal watersheds:
Where human and natural communities thrive.

Tivoli Bays Component Site



Hudson River National Estuarine Research Reserve (NERR)

The Hudson River Estuary stretches 153 miles and is profoundly influenced by the ocean's tides. The Hudson River valley has been a cradle of human development for thousands of years. The tidal river connects the communities of the valley economically, culturally, and ecologically. The Hudson River Research Reserve spans the middle 100 miles of the Hudson River Estuary and is comprised of four sites: Stockport Flats, Tivoli Bays, Iona Island, and Piermont Marsh. A diversity of habits exist here, covering freshwater and brackish tidal wetlands and uplands. For more information go to:

<https://www.hrnerr.org/>

2019 HIGHLIGHTS

.....
It was drier - precipitation was below average compared to the long-term historical average

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Dissolved oxygen was consistent with long-term trends in Stony Creek and Saw Kill, but decreased at both Tivoli North and Tivoli South

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Orthophosphate was consistent with historic long-term trends at Tivoli North, Tivoli South, and Stony Creek, but decreased at Saw Kill.

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Nitrate was consistent with long-term trends at both Tivoli North and Tivoli South, but decreased in Stony Creek and Saw Kill.

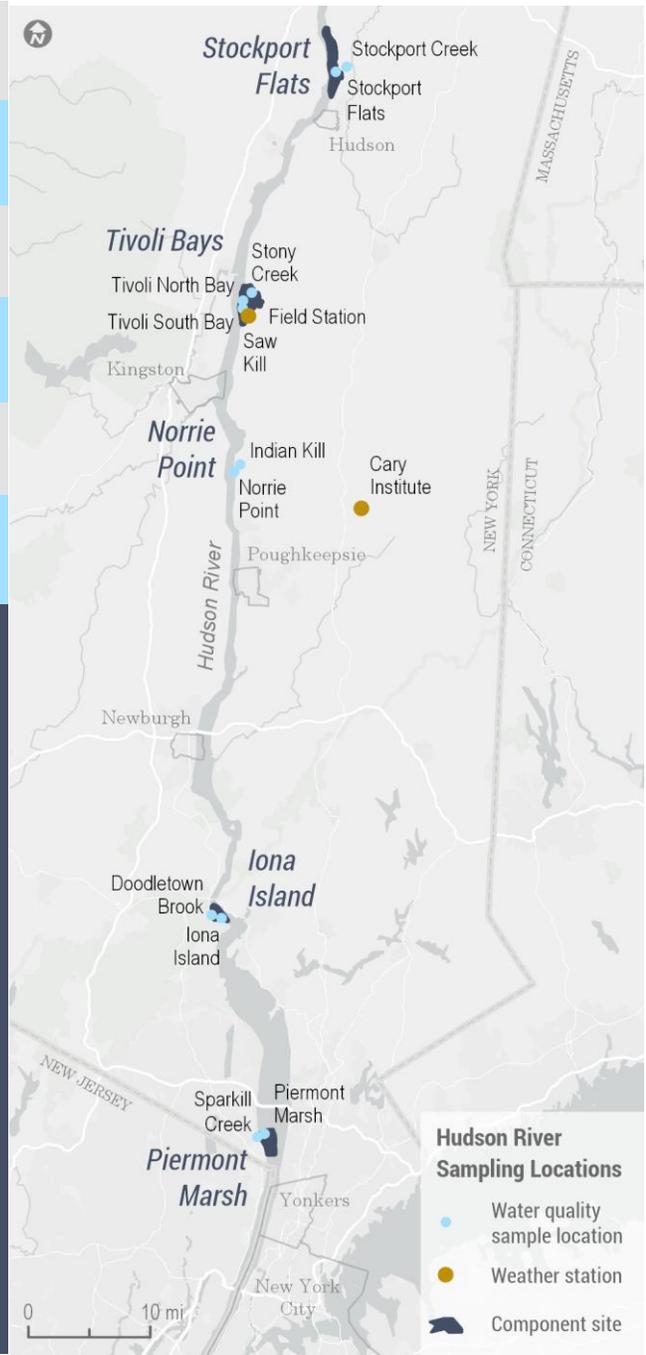


Water quality issues influence human and environmental health. The more we monitor our water, the better we will be able to recognize and prevent problems.



HOW ARE THE TIVOLI BAYS CHANGING?

- **Precipitation** is decreasing
- **Air Temperature** is not changing
- **Water Temperature** is increasing
- **Chloride** is increasing
- **Sulfate** is decreasing



Trends in Weather & Water Quality

Tivoli Bays Component Site

Location ID	Location Name	Air Temp	Rainfall
FS	Field Station	•	↓

Location ID	Location Name	Water Temp	Salinity	Dissolved Oxygen	Chloride	Sulfate
SK	Saw Kill	↑	↑	•	↑	↓
SC	Stony Creek	↑	↑	•	↑	↓
TN	Tivoli North	↑	↑	↓	↑	↓
TS	Tivoli South	↑	↑	↓	↑	↓

Location ID	Location Name	Ortho-phosphate	Ammonium	Nitrate	Chlorophyll -a	Pheophytin -a
SK	Saw Kill	↓	•	↓	•	•
SC	Stony Creek	•	•	↓	•	•
TN	Tivoli North	•	↑	•	↓	•
TS	Tivoli South	•	↑	•	↓	•

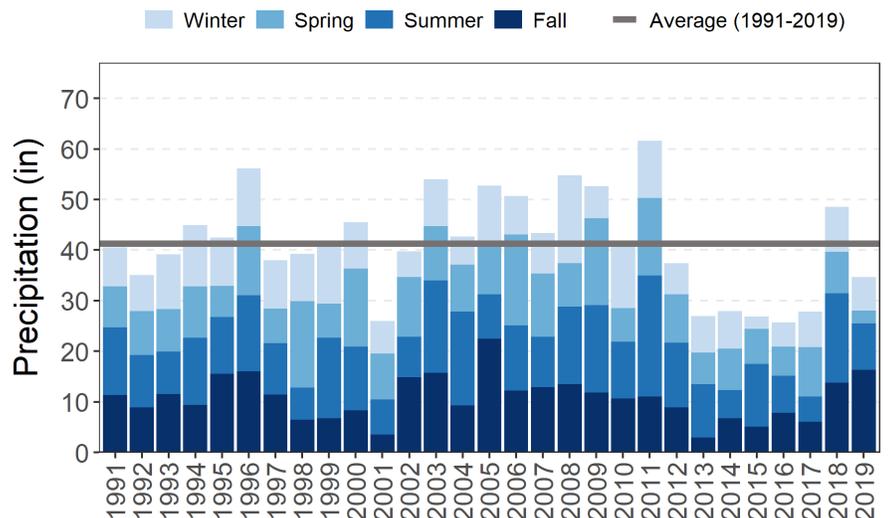
All data collected from 1991-2019

Weather Can Have A Major Impact On Water Quality

Weather data helps scientists and managers understand water circulation patterns, plant growth, shellfish and fish distribution, storm frequency and intensity, and much more...

In 2019, precipitation during the fall season was high (~17 in.) compared to the historic fall trend, but for the year, precipitation was less than the long-term historical average.

Field Station (FS)

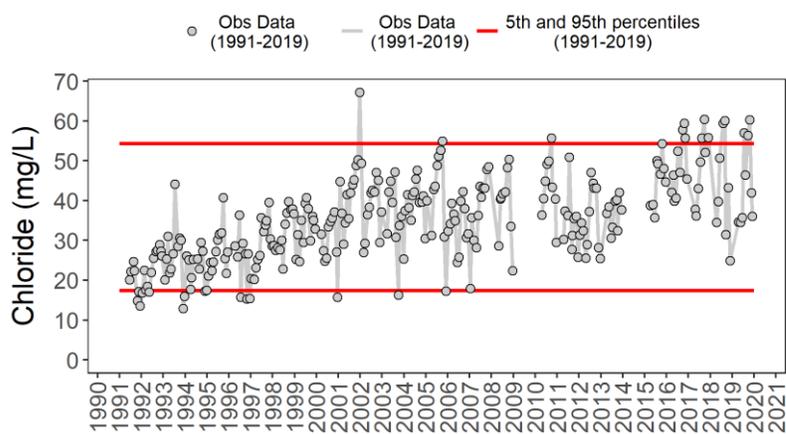


Do HRNERR data show climate change impacts?

The impacts of climate change, particularly sea level rise, are projected to be more extreme in the Mid-Atlantic region of the United States than in other areas of the world. HRNERR data do not show an increasing trend in air temperature, but do show an increase in water temperature. In 2017, HRNERR installed a tide station at Turkey Point (near the Tivoli Bays). Data from this station will be used to monitor changes in water level over time. Long-term data sets are extremely useful tools for monitoring future impacts of climate change to local ecosystems.

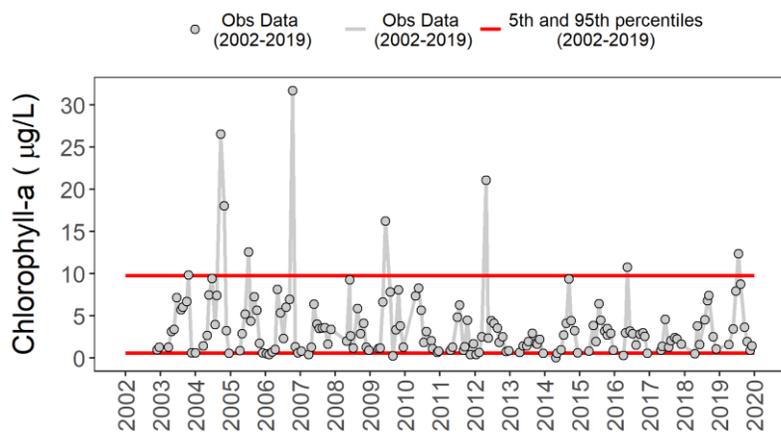
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Saw Kill (SK)



Chloride has been accumulating in Hudson River tributaries. Potential causes include road salt, septic wastes, and water softeners. Life in the tributaries could be adversely affected.

Tivoli North Bay (TN)



Chlorophyll-a measures algal growth. Harmful algal blooms (HABs) can be discrete in space and time. Levels increased in the summer at Norrie Point, but a bloom was not apparent to the north (Tivoli Bays) or south (Iona Island).



Estuarine organisms, including, mammals, birds, fish, and crustaceans, have different tolerances and responses to the impacts of climate change. Shifts in temperature and water level could alter estuarine habitats. The types and locations of aquatic plants could change. These changes could impact how organisms use habitats for protection, food sources, and breeding grounds.

Water Quality is a MAJOR Driver of Ecosystem Change

What happens on the land affects the quality of the water and the health of the plants and animals that live in the estuary.

Why Estuaries Matter

Economic Impacts



Coastal shoreline counties provided 53 million jobs and contributed \$7.4 trillion (nearly 44%) of the nation's gross domestic product in 2012.

Community Benefits



Estuaries protect coastal communities by reducing flooding and storm surge impacts, enhancing water quality, and providing commercial and recreational benefits.

Healthy Ecosystems



Up to two-thirds of the nation's commercial fish and shellfish spend some part of their life cycle in an estuary or depend on this resource for food.

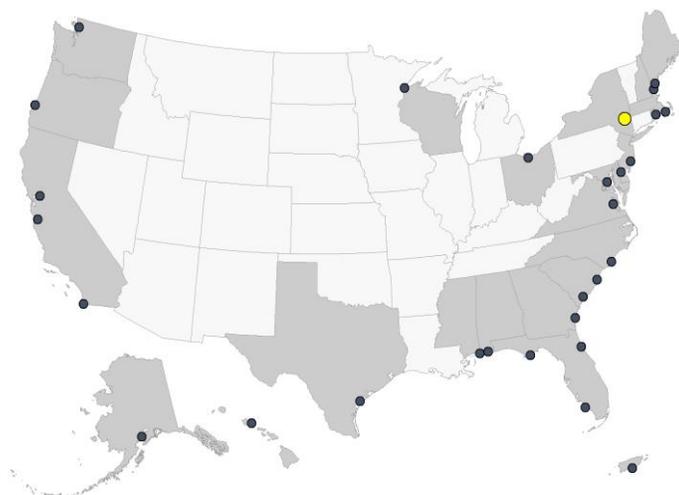
Habitat Diversity



Habitat types include shallow open waters, freshwater/salt marshes, swamps, sandy beaches, mud/sand flats, rocky shores, oyster reefs, mangrove forests, river deltas, tidal pools and seagrasses.

Tracking The Health of Our Estuaries 24/7

The **NERRS** is a partnership program between NOAA and the coastal states to manage designated reserves. More than 1.3 million acres of estuarine land and water are protected. Each reserve is managed on a daily basis by a lead state agency or university with input from local partners. 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/>



NERRS is a network of 29 coastal reserves established for long-term research, education and stewardship.

More Information...

For Citizen Science

Access data at the System Wide Monitoring Program (SWMP) Graphing Application website: <https://coast.noaa.gov/swmp/>

For Scientists

Access data at the Central Data Management Office (CDMO) website: <http://www.nerrsdata.org/>

Have Questions?

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Hudson River NERR - providing the science needed for today and tomorrow

