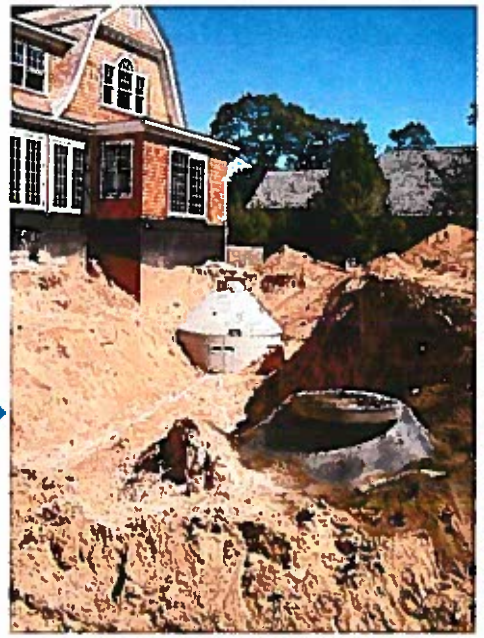
Peconic Estuary PROGRAM

Nitrogen in Long Island's Estuaries

Dr. Joyce Novak
Peconic Estuary Program Director

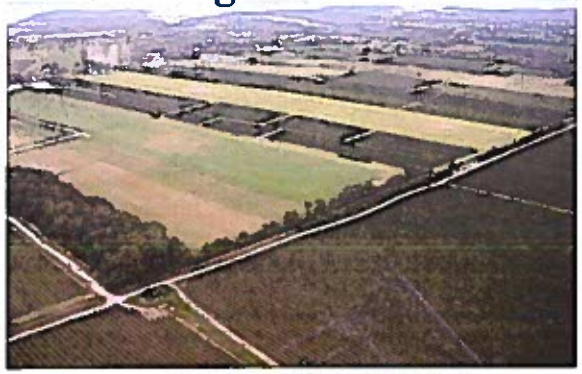
Sources of Nitrogen

Cesspools



Septic Systems

Agriculture



Residential Fertilizer

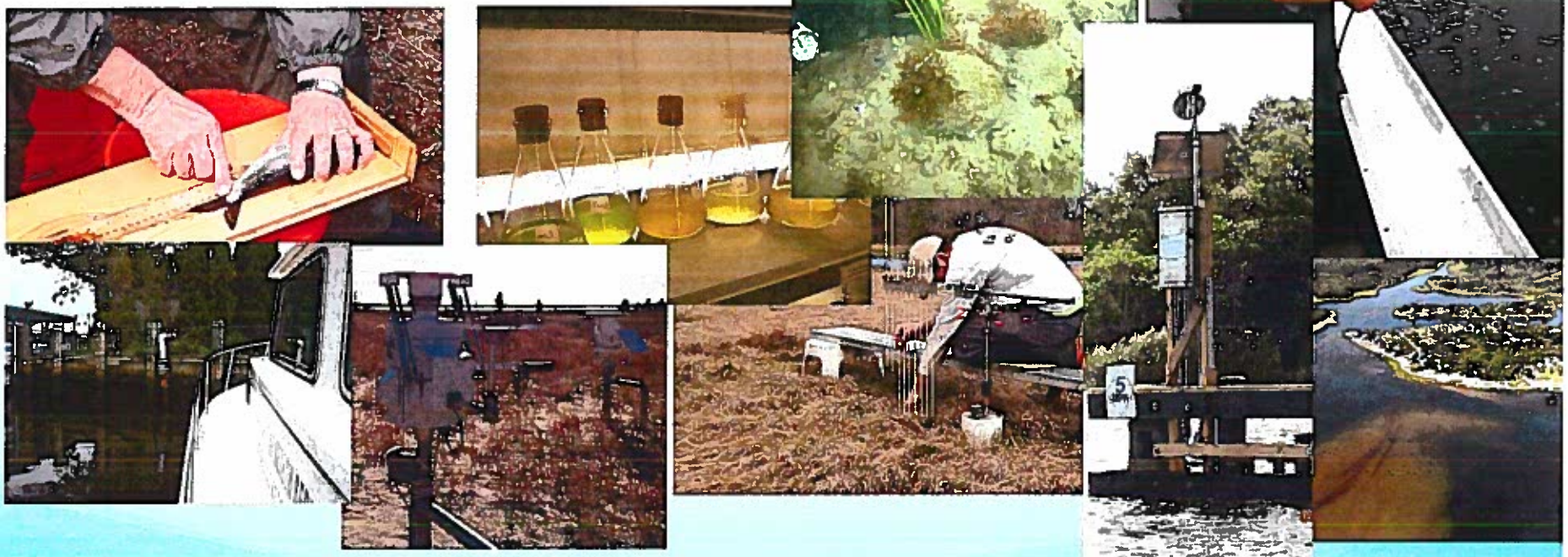
Animal Waste

Sewage Treatment Plants

Stormwater

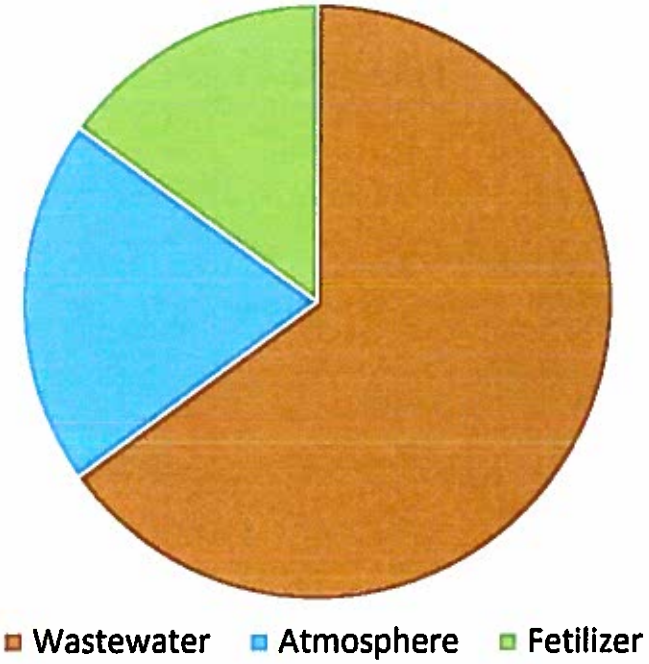
What do Estuary Programs research about Water Quality?

- **Nutrients, Pathogens, Toxics, Algae Blooms**
- **Atmospheric Deposition:** Nitrogen and Mercury
- **Eelgrass, River Herring, Wetlands**
- **Nitrogen and Pathogen Loading**



In the words of Dr Gobler (2016)…

Where is the nitrogen coming from?



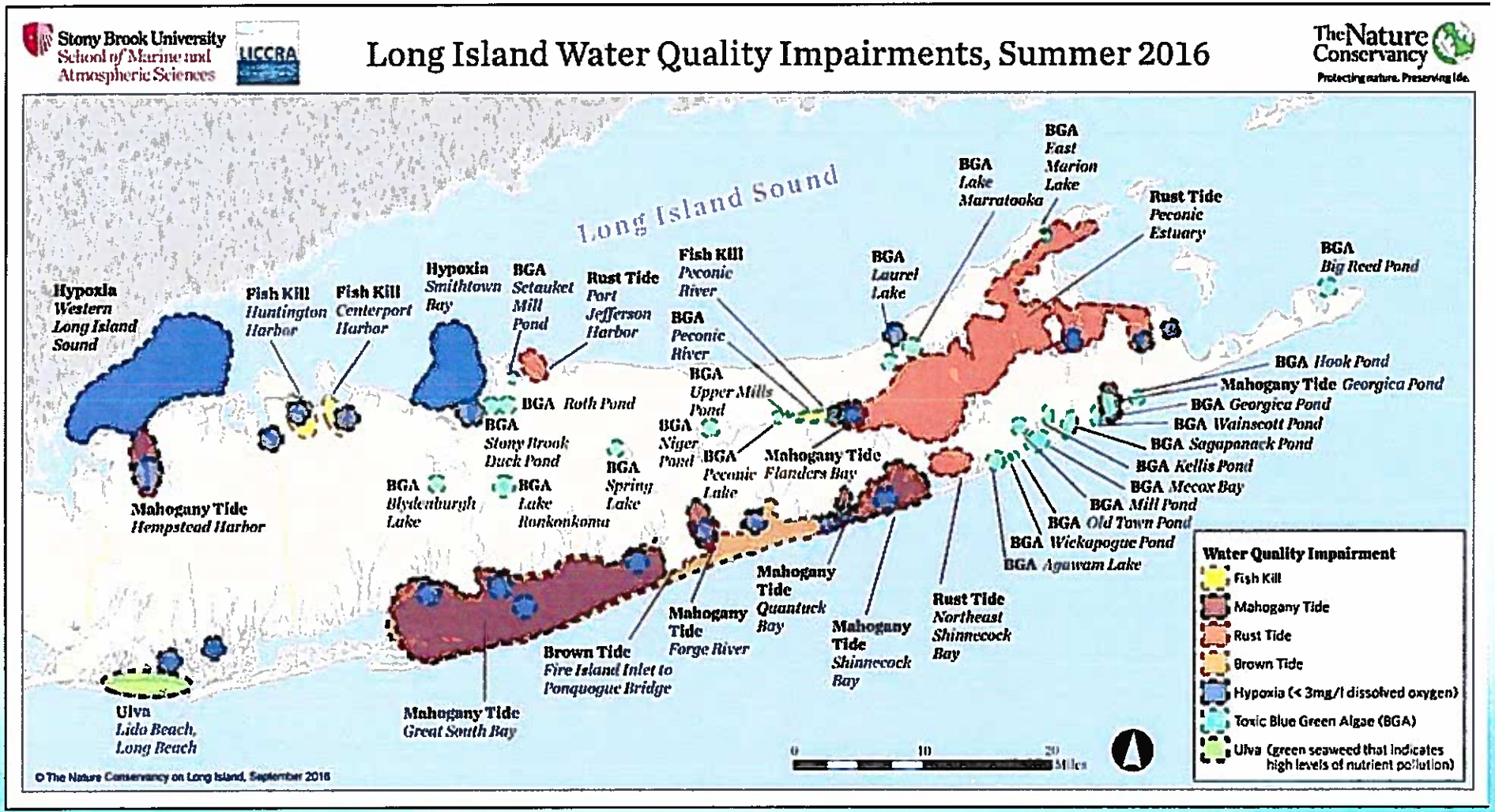
Great South Bay, Moriches Bay, Shinnecock Bay, Peconic Bay, North shore harbors of Nassau and Suffolk County, Kinney and Valiela, 2011; Stinnette, 2014, Lloyd, 2014, 2016

Why is too Much Nitrogen Harmful?

Excess inputs of nitrogen have caused an imbalance in the estuary

- which results in recurrent algae blooms and
- drops in dissolved oxygen which contributes to
- Fishkills (2015 in the Peconics).
- This excess nitrogen is also suspected of contributing to a decline in eelgrass beds and other critical habitats

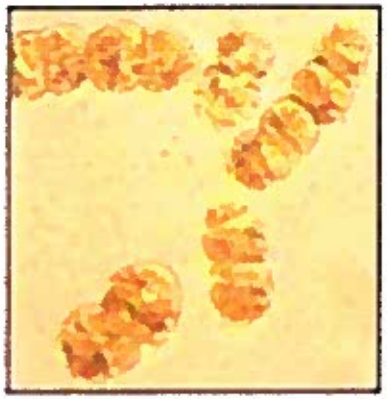
Harmful Algae Blooms



Source: The Nature Conservancy; Cartographer: Lloyd, S. (2016).

What is ALGAE?

- Plants!
  - Non- flowering, seaweeds and single celled organisms



Cochlodinium

Rust Tide
Scallop
demise

Ulva

High Nutrients
(ex: NITROGEN)

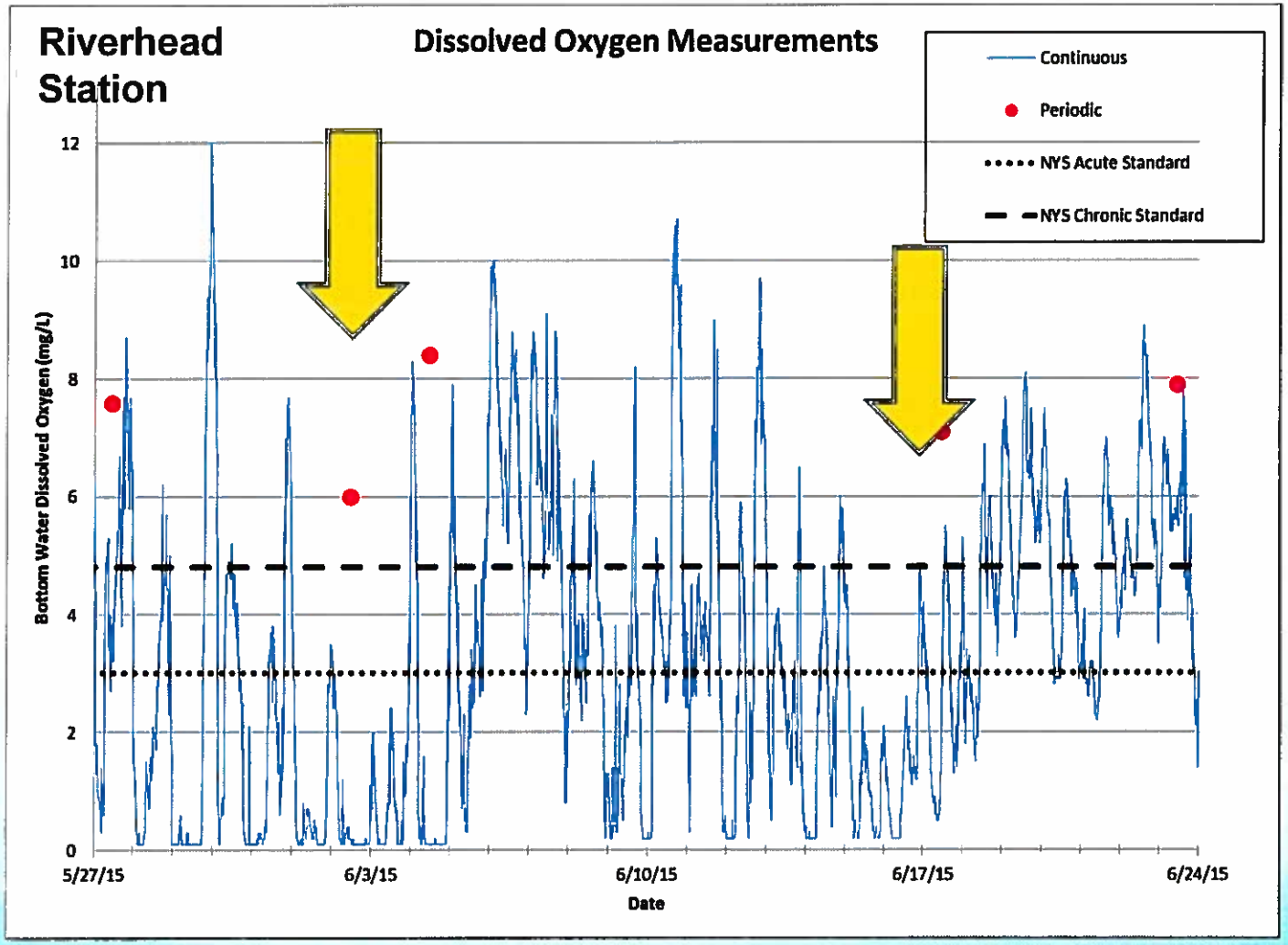
Alexandrium

PSP

Dinophysis

DSP

IMPACTS:
Low Oxygen



Data source: USGS Continuous Monitoring Station at Riverhead, NY: and SCDHS. (2015). Surface water quality monitoring data provided by the SCDHS Office of Ecology.

he Surface

***Alexandrium* red**

po

Alexandrium

Dead fish floated in the Peconic River in Riverhead, N.Y., this week, victims of an algal bloom.

Brian Harkin for The New York Times

IMPACTS:
Loss of Critical Habitat

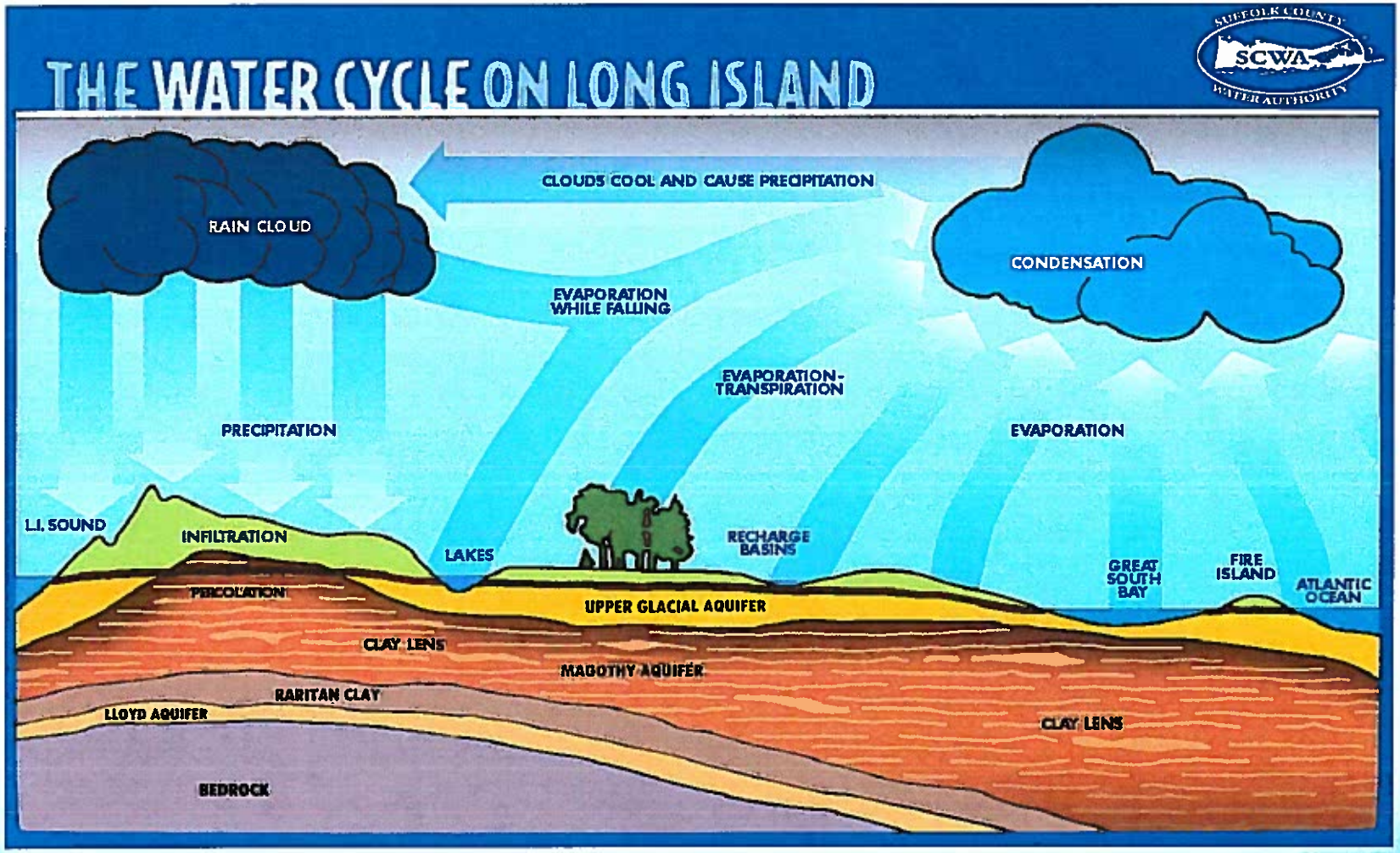
Source: Gobler, 2016

- Eel grass is critical for marine life
- Nitrogen accelerates the loss of eel grass habitat on Long Island

- Salt Marsh is critical for a wide variety of marine and bird life
- Salt marsh filters terrestrial pollutants
- LAND PROTECTION
- Increased Nitrogen suppresses roots and accelerates salt marsh disappearance on Long Island

Fishing, Tourism, Recreation and Resiliency Impacts

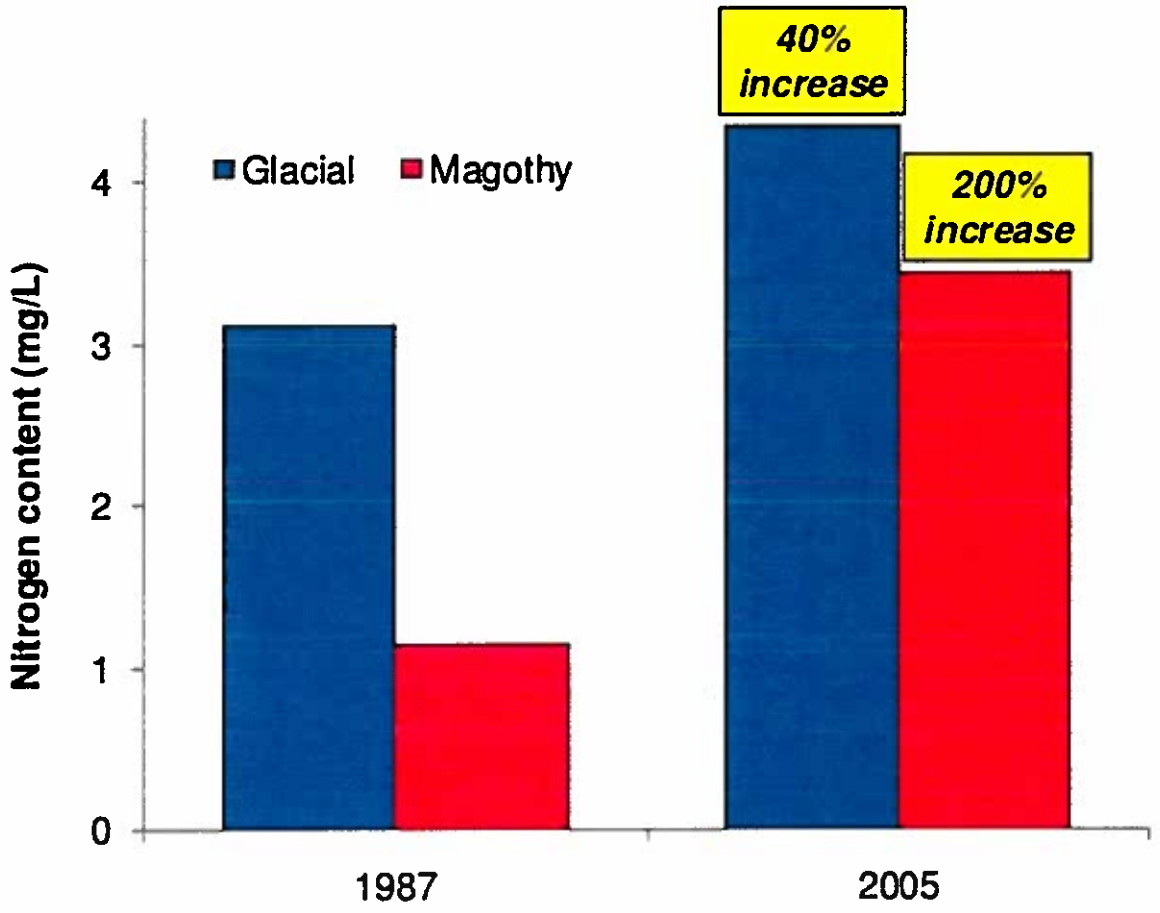
...But how does it affect me?



HINT: LONG ISLAND USES A SOLE SOURCE AQUIFER

Changes in Groundwater Nitrogen Levels

18 year change in groundwater nitrogen levels



Suffolk County Comprehensive Water Resources management plan, 2010

On Shelter Island

- West Neck Bay – Septic Improvement?
  - Preliminary results of the Sub-Watershed Plan indicate this to be a possible priority waterbody
- Coecles Harbor Eelgrass
  - Conservation Moorings (not Nitrogen but still important for sea grass)
- Shell Beach Re-vegetation – PEP funded Conceptual Design
- Water Re-use at Shelter Island WWTP – to Golf Course?
- What are the priorities of the Shelter Island Residents?

Habitat and Living Resources

ISSUE:

The Peconic Estuary is home to some of the most valuable and rare habitats in the world!

Unfortunately, ever increasing development pressure and human activities have negatively impacted the natural habitats and the diversity of life in the region.

What are the threats?

Physical alterations to the environment such as navigational channel dredging, filling of wetlands, hardening of the shoreline and clearing of land for roads and buildings all directly impact the habitats and living resources within and around the estuary. These physical alterations, along with pollution, invasive species, and climate change, have led to the loss and degradation of critical habitats.

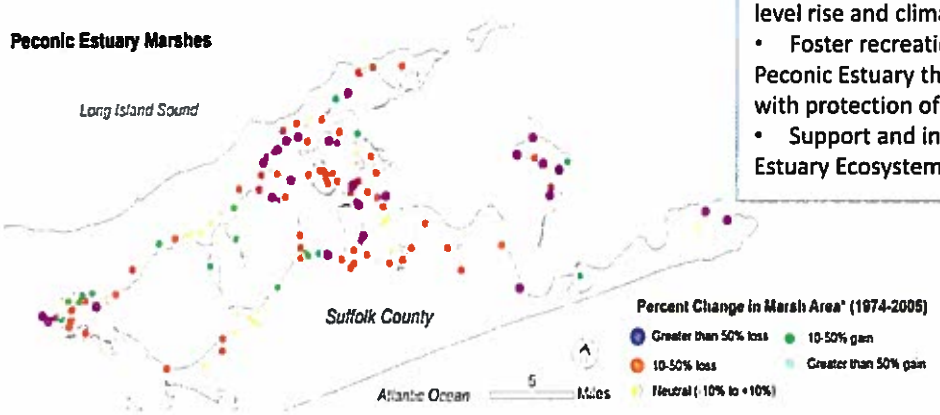
ACTIONS/STRATEGIES:

- Implement 2017 Habitat Restoration Pan to protect and restore priority habitats (Eelgrass, Tidal Wetlands and Diadromous Fish Habitat).
- Implement Updated Critical Lands Protection Strategy.
- Construct Ecosystem model of Peconic Estuary to better understand system-wide dynamics.
- Create "stewardship areas" to protect/manage ecologically and recreationally important habitats/species.
- Promote boating and fishing practices that are sustainable and protective of critical habitats.
- Work with Suffolk County and NYSDEC to identify suitable areas for aquaculture in the Peconic Estuary and implement the Aquaculture Plan.

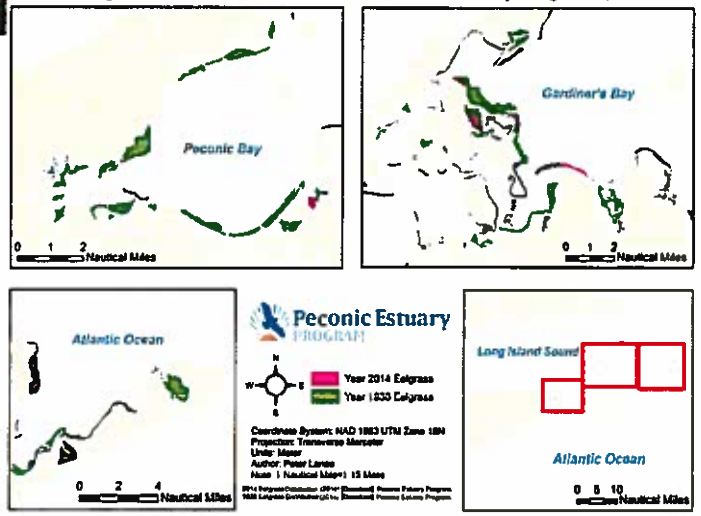
GOALS:

- Protect and restore Peconic Estuary habitats to support ecosystem function, taking into account sea level rise and climate change.
- Foster recreational and commercial uses of the Peconic Estuary that are sustainable and compatible with protection of biodiversity.
- Support and increase research on the Peconic Estuary Ecosystem.

Peconic Estuary Marshes



Seagrass Distribution in 1930 vs. 2014 in the Peconic Estuary, Long Island, NY



Public Engagement and Stewardship

ISSUE:

Did you know that an estuary is the most productive ecosystem in the world?

As citizens of Long Island, we are fortunate to claim such a valuable system like the Peconic Estuary as a part of our community. Whether it be harvesting natural resources for economic gain or enjoying recreational activities at the bays and beaches, people depend on this valuable system.

Just as much as we use it, however, we also need to protect it - and that requires balance.

People may not be aware that some of their daily actions cause harm to the estuary. They may not know the environmental issues at hand and may lack an understanding of the science behind these concepts.

Without awareness, it is difficult to move forward with efforts in favor of the health of our estuary.

ACTIONS/STRATEGIES:

Create Ambassadors!
Bring together our Citizens' Advisory Committee and other NGOs to develop a plan to spread our message

Social media, outreach events, newsletters!
Educate about the estuary and the connection between a healthy watershed, public health, and thriving coastal economies by using outreach techniques

People can aid water quality with "Peconic Friendly Yards"!
Utilize social science research to create behavioral change campaigns and capture results through surveys

Widen our audience!
Increase engagement with targeted groups like minority/non-English speaking communities and local watershed associations

Horseshoe Crab, Terrapin, and Alewife Monitoring!
Encourage volunteers to contribute to conservation science through our citizen science programs

GOALS:

Our goal is to inform our community through education and outreach so that we can create a citizenry that is willing to support, promote, and actively participate in measures to protect and restore the estuary system.

We can do this by engaging and building partnerships with ...

Non-governmental organizations
Citizen's organizations
Elected officials
Non-English speaking communities
Environmental groups
Citizens of all ages

Climate Change and Resiliency

ISSUE:

Climate change is impacting the Peconic Estuary

Why is Climate Change important?

1. INCREASING WATER AND AIR TEMPERATURES will impact the Peconic Estuary wetlands and wildlife.
2. INCREASED PRECIPITATION rates will input more storm- water to the Estuary.
3. SEA LEVEL RISE will impact our groundwater and alter existing conditions in the Peconic.

What is the impact on the Peconic Estuary?

- Warming waters = SPECIES SHIFTS which alter conditions for recreational and commercial usage.
- Rising water temperatures contribute to the DECLINE OF EELGRASS.
- Rising seas will DROWN TIDAL WETLANDS if they cannot migrate landward.
- Warmer waters will affect ALGAE PRODUCTION and could = more, longer, or new BROWN/RED/RUST/BLUE-GREEN TIDES.

Source: NOAA (https://coast.noaa.gov/slr Vulnerability Assessment for Suffolk County

GOALS:

Provide tools to local governments and other stakeholders to mitigate and adapt to climate change.

HOW?

- INCORPORATE CLIMATE CHANGE into decision making process.
- MONITOR CHANGES in the Peconic Estuary.
- EDUCATE PUBLIC about the impacts of climate change.

We can do this by engaging and building partnerships with ...

Non-governmental organizations
Citizens and Organizations
Elected officials
Non-English speaking communities
Environmental groups

ACTIONS/STRATEGIES:

Work with stakeholders to:

Work with coastal residents to make informed decisions regarding resiliency.

Promote smart development and land use planning.

Assist in the development of resiliency strategies which consider coastal wetland requirements as part of future development.

Help to develop a stormwater management strategy for the Peconic Estuary watershed.

Implement 2017 Habitat Restoration Plan and Updated Critical Lands Protection Strategy to increase coastal resiliency – Encourage living shorelines and wetland restoration/protection.

Develop a Monitoring Program to track how the estuary is changing and provide early warning signs of climate impacts.

Water Quality

Priority Issues: Nitrogen Pollution, Harmful Algal Blooms, & Pathogen Pollution

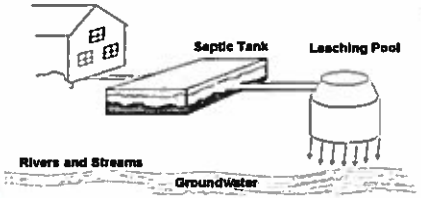
ISSUE:

The Peconic Estuary waters support fish, shellfish, recreation and tourism industries. The quality of the water is closely tied to health of marine life, habitat and our East End economy!

There is a close connection between human actions on land and the health of the Peconic Estuary. Water quality can be impacted by the amount and types of natural and human-made pollutants that are carried by water over the land surface or through the groundwater to the Peconic River and Bays.

Nitrogen is in air, water, and soil, it is an essential nutrient for growth of algae and aquatic plants, which provide food and habitat for fish, shellfish and wildlife. However, too much nitrogen from **fertilizer & human and animal waste** can cause harm to the Peconic Estuary water quality. **Excess nitrogen in our groundwater and surface waters is the most serious issue affecting water quality in the Peconic Estuary.**

Human and animal waste contains **pathogens** (bacteria and viruses). If too much pathogens get into the water, the water becomes **unsafe for swimming and unsafe for harvesting and eating shellfish.**



Harmful Algal Blooms

Unhealthy habitats for wildlife and plants in the estuary waters

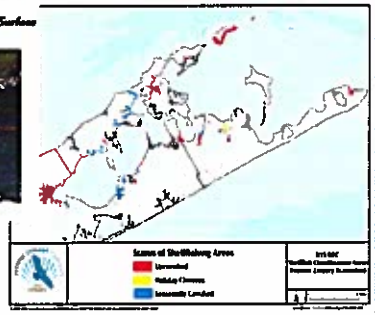
- Not enough oxygen in water.
- Block sunlight from reaching growing plant life, like eelgrass.
- Can produce toxins that cause severe illness or death in humans, wildlife, or fish.

Unsafe waters for people to swim in and to eat shellfish from

Closed bathing beaches and shellfish beds

ACTIONS/STRATEGIES:

- Work with partners to accelerate implementation of **Nitrogen reduction recommendations - Focus on reducing nitrogen loads from: septic systems/wastewater, fertilizers, stormwater runoff, and atmospheric deposition.**
- Continue to assess **innovative technologies and practices** to reduce the impact of existing contaminated groundwater on the Estuary- like bio-extraction.
- **Encourage cesspool and on-site septic upgrades** (consider climate change and sea level rise when making upgrades).
- Identify **and implement Best Management Practice projects and stormwater reduction projects** to control nitrogen and pathogen pollution.
- Continue to **educate homeowners and partners** on fertilizer use and encourage landscaping practices that reduce fertilizer use and stormwater runoff.
- Implement actions to reduce harmful algal blooms. Expand water quality monitoring for nitrogen and harmful algal blooms.
- Support research/studies to better understand pathogen sources on a subwatershed basis.
- Continue to enforce and educate on the Peconic Estuary No Discharge Zone, provide pump-out facilities.



GOALS:

Reduce nitrogen loads to the Peconic Estuary to attain a healthy and productive ecosystem.

Reduce the frequency of harmful and nuisance algal blooms that limit water bodies' uses.

Improve pathogen loading information and reduce the pathogen loads to the Peconic Estuary to attain water quality standards that will support, to the maximum extent practicable, the social and economic benefits of the estuary.