LONG ISLAND SOUND STUDY

A PARTNERSHIP TO RESTORE AND PROTECT THE SOUND

# Overview of
# **Nitrogen Reduction Strategy**
# for Long Island Sound

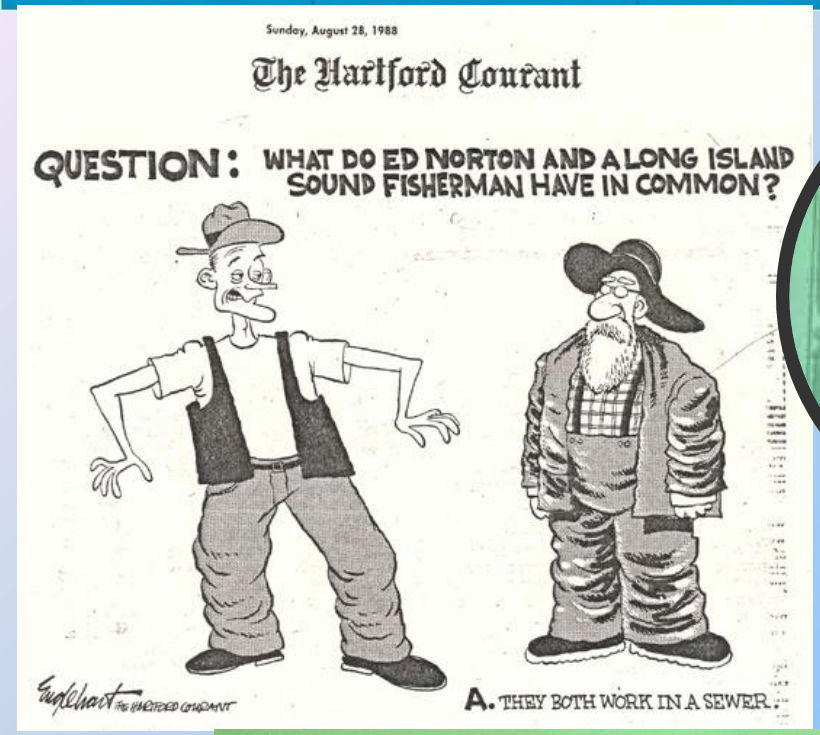
Mark Tedesco
Environmental Protection Agency

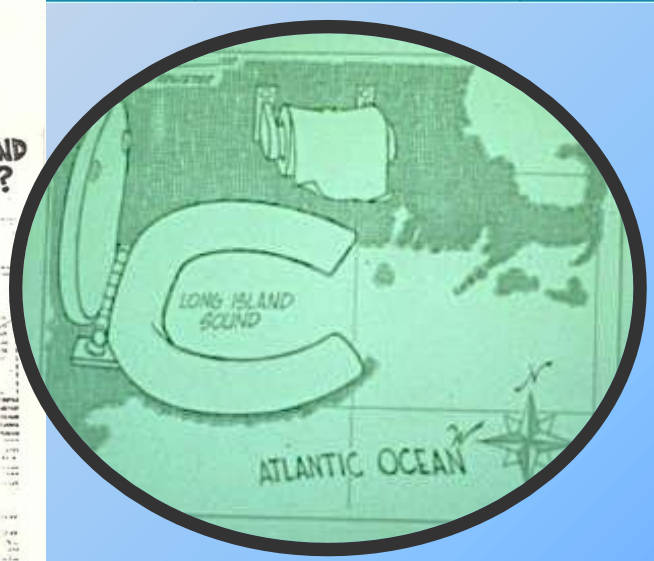
*Photo: Little Gull Island, Long Island Sound, NY*

# The need for science in ecosystem recovery has increased

Fish kill, 1980s

East River Sewage Plume entering western Long Island Sound, 1940s




# Where we started


# Long Island Sound Study Partnership

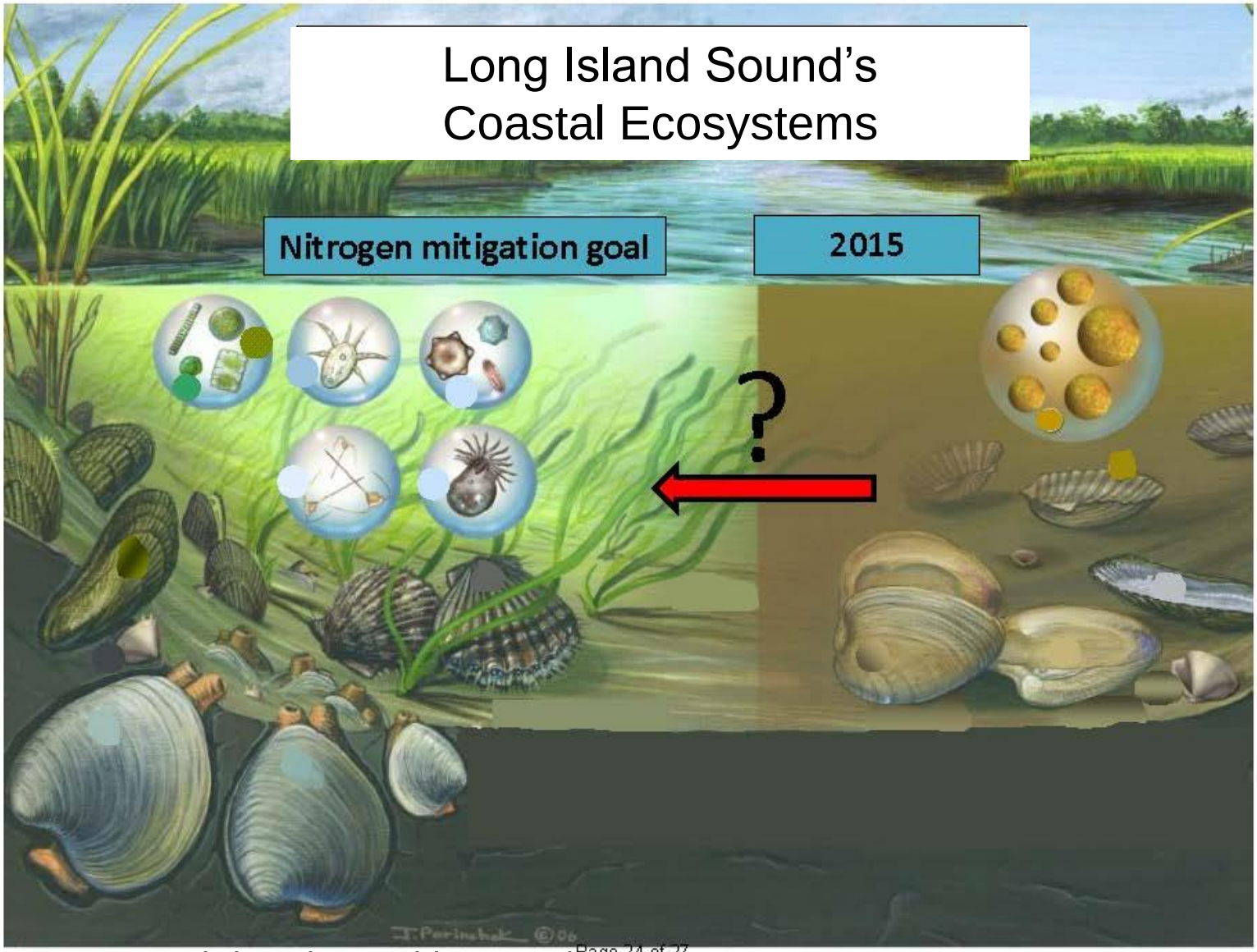
long island sound study

## Sponsors

US EPA

CT Department of Energy and Environmental Protection

NYS Department of Environmental Conservation






Source: Dr. Christopher Gobler, SBU/SOMAS


# NITROGEN LOAD

Symbols courtesy of the Integration and Application Network, University of Maryland Center for Environmental Science (ian.umces.edu/symbols/)

# Long Island Sound Total Maximum Daily Load

A Total Maximum Daily Load Analysis to Achieve Water Quality Standards for Dissolved Oxygen in Long Island Sound

December 2000

Prepared in Conformance with Section 303(d) of the Clean Water Act and the Long Island Sound Study

Prepared by:

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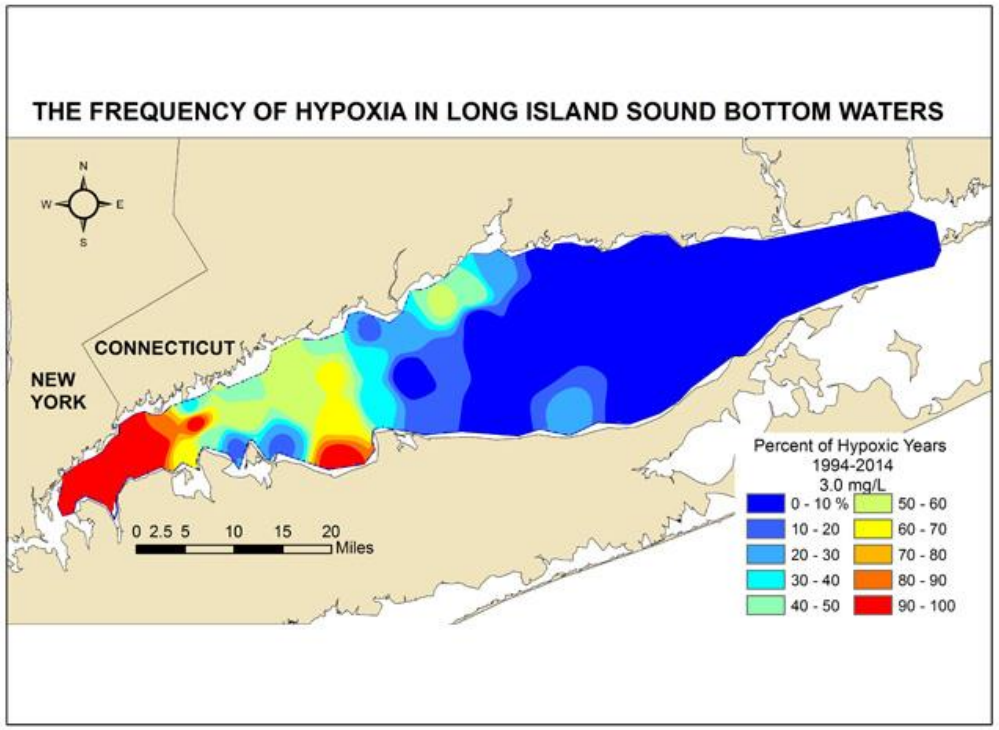

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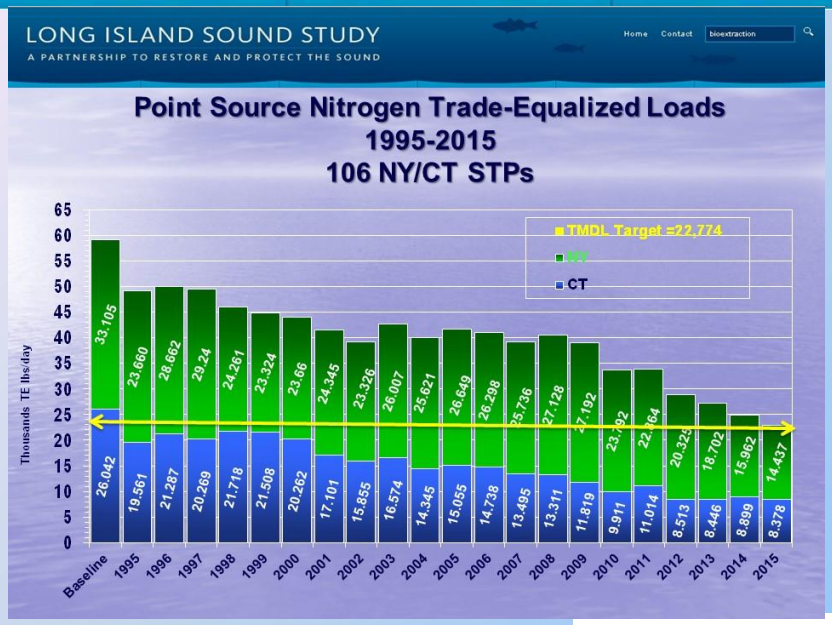
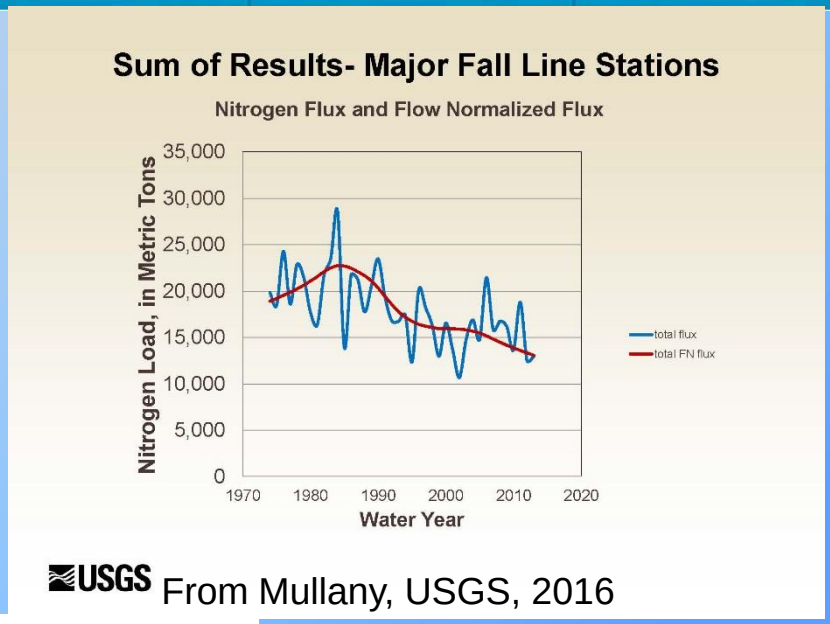
# Success: Nitrogen Control




USGS From Mullany, USGS, 2016

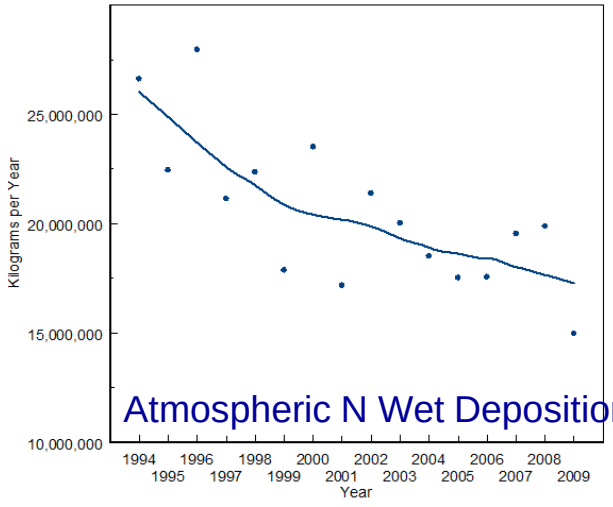
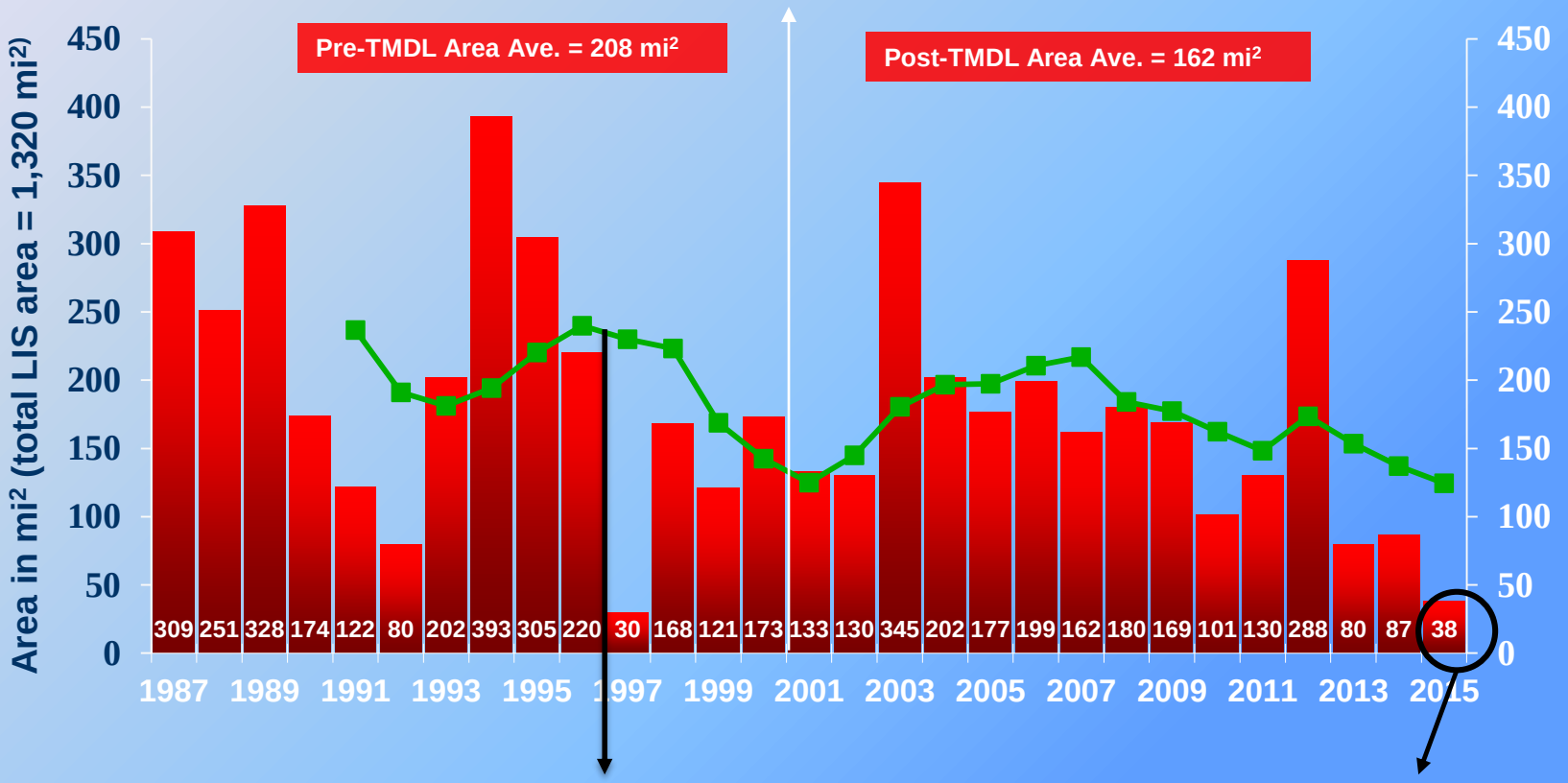



Figure x. Atmospheric wet deposition of inorganic nitrogen averaged for the Long Island Sound Watershed, 1994-2009.

# Maximum Area of Hypoxia (≤ 3 mg/l)

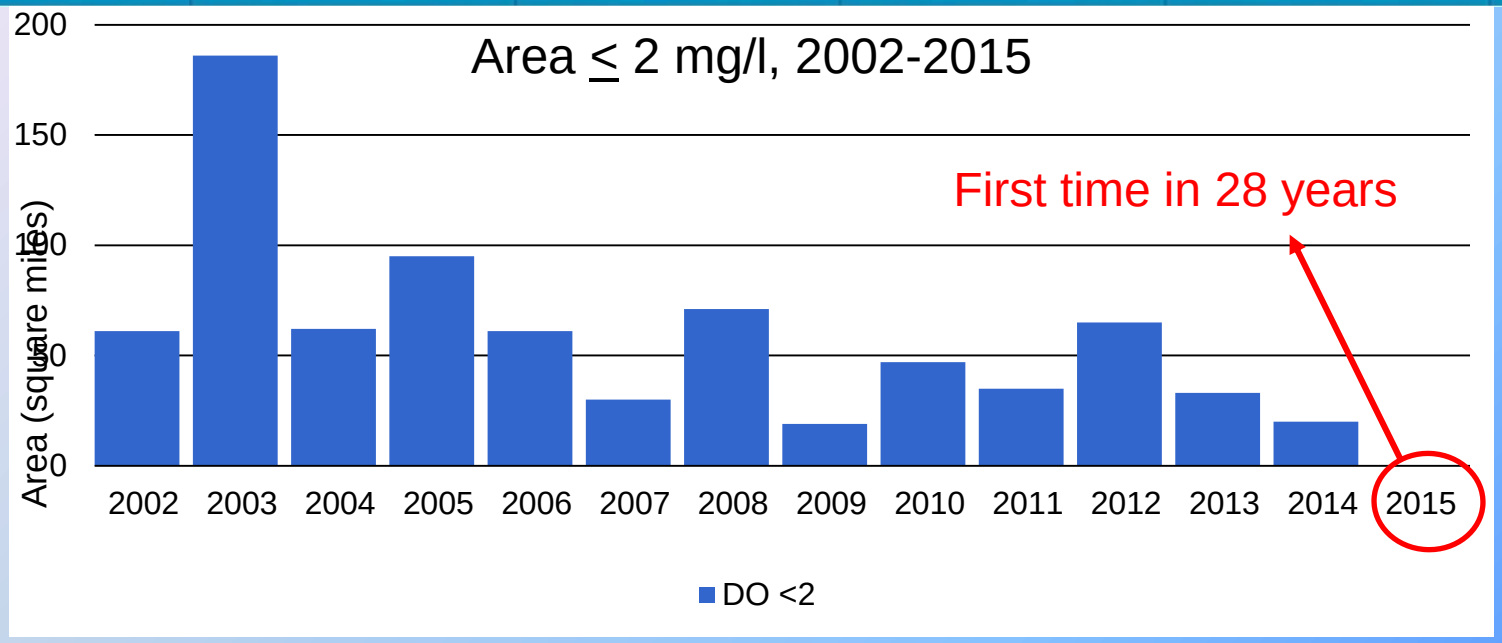
1987-2015 (June-September)

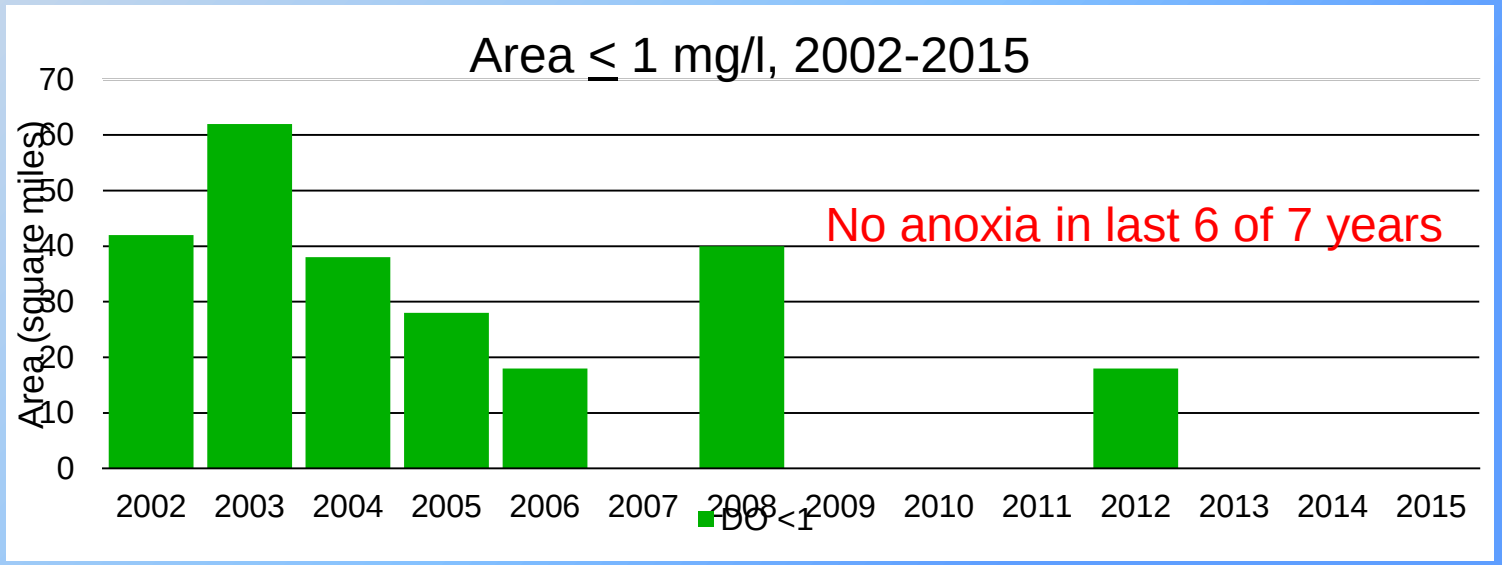



Five-year rolling average

Second smallest area in 28 years

# Reduced severity



# Eelgrass is Expanding

Historical eelgrass distribution by Town (black dot)


Current eelgrass (in orange)

- Increase of 4.5% in eelgrass 2009-2012, 29% between 2002-2012

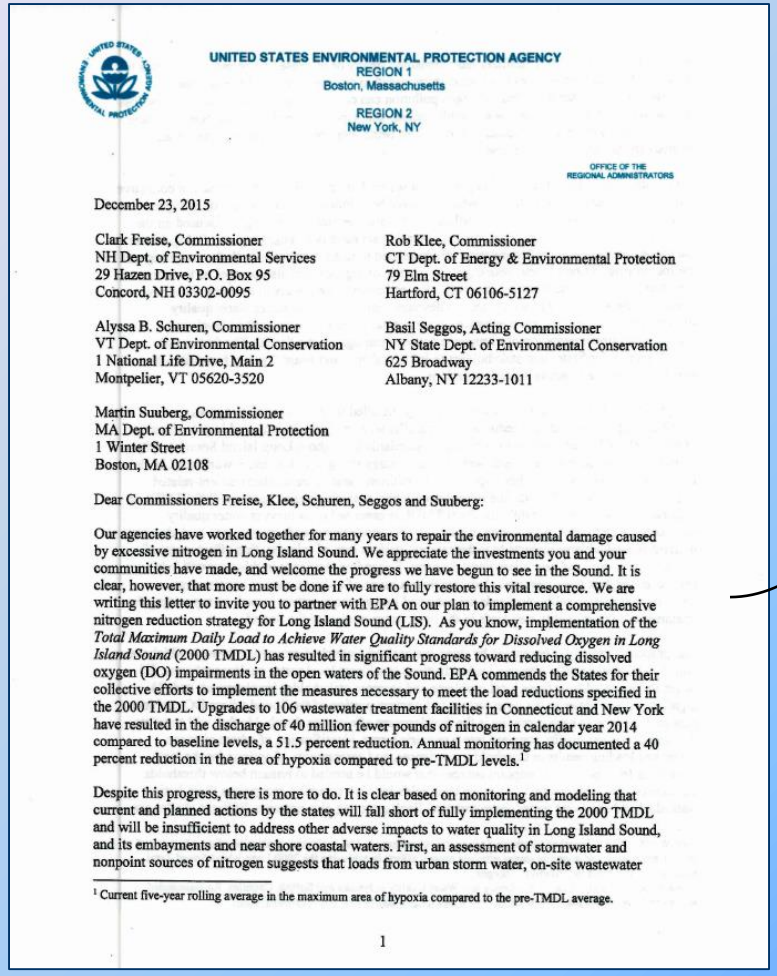
LIS Eelgrass Survey, US Fish & Wildlife Service

# Tackling the Unfinished Agenda

- Current monitoring and modeling indicate that planned actions by the states will fall short of fully implementing the TMDL
  - Further progress needed on nonpoint allocations (storm water, on-site treatment systems, turf fertilizer)
  - Alternatives to nitrogen reduction (aeration, bioextraction) not implemented to scale
- Nitrogen pollution is also contributing to harmful algal blooms, loss of tidal wetlands and eelgrass, coastal acidification, and embayment hypoxia

# Nitrogen Reduction Strategy

## 12/23/15 letter transmitting strategy to five states



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 1
Boston, Massachusetts

REGION 2
New York, NY

OFFICE OF THE
REGIONAL ADMINISTRATORS

December 23, 2015

Clark Freise, Commissioner
NH Dept. of Environmental Services
29 Hazen Drive, P.O. Box 95
Concord, NH 03302-0095

Rob Klee, Commissioner
CT Dept. of Energy & Environmental Protection
79 Elm Street
Hartford, CT 06106-5127

Alyssa B. Schuren, Commissioner
VT Dept. of Environmental Conservation
1 National Life Drive, Main 2
Montpelier, VT 05620-3520

Basil Seggos, Acting Commissioner
NY State Dept. of Environmental Conservation
625 Broadway
Albany, NY 12233-1011

Martin Suuberg, Commissioner
MA Dept. of Environmental Protection
1 Winter Street
Boston, MA 02108

Dear Commissioners Freise, Klee, Schuren, Seggos and Suuberg:

Our agencies have worked together for many years to repair the environmental damage caused by excessive nitrogen in Long Island Sound. We appreciate the investments you and your communities have made, and welcome the progress we have begun to see in the Sound. It is clear, however, that more must be done if we are to fully restore this vital resource. We are writing this letter to invite you to partner with EPA on our plan to implement a comprehensive nitrogen reduction strategy for Long Island Sound (LIS). As you know, implementation of the *Total Maximum Daily Load to Achieve Water Quality Standards for Dissolved Oxygen in Long Island Sound* (2000 TMDL) has resulted in significant progress toward reducing dissolved oxygen (DO) impairments in the open waters of the Sound. EPA commends the States for their collective efforts to implement the measures necessary to meet the load reductions specified in the 2000 TMDL. Upgrades to 106 wastewater treatment facilities in Connecticut and New York have resulted in the discharge of 40 million fewer pounds of nitrogen in calendar year 2014 compared to baseline levels, a 51.5 percent reduction. Annual monitoring has documented a 40 percent reduction in the area of hypoxia compared to pre-TMDL levels.[1]

Despite this progress, there is more to do. It is clear based on monitoring and modeling that current and planned actions by the states will fall short of fully implementing the 2000 TMDL and will be insufficient to address other adverse impacts to water quality in Long Island Sound, and its embayments and near shore coastal waters. First, an assessment of stormwater and nonpoint sources of nitrogen suggests that loads from urban storm water, on-site wastewater

[1] Current five-year rolling average in the maximum area of hypoxia compared to the pre-TMDL average.

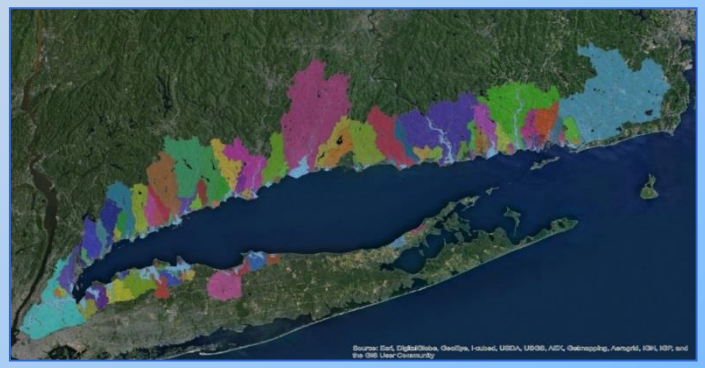
1

"Aggressively continue progress on nitrogen reductions, in parallel with the States' continued implementation of the 2000 TMDL, and achieve water quality standards throughout Long Island Sound and its embayments and near shore coastal waters."

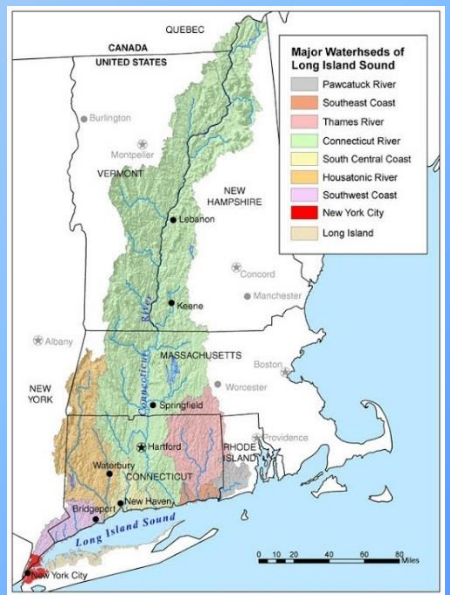
# Nitrogen Reduction Strategy

Customize the application of nitrogen thresholds to develop targets for each of three watershed groupings:

Coastal watersheds that directly drain to embayments or nearshore waters

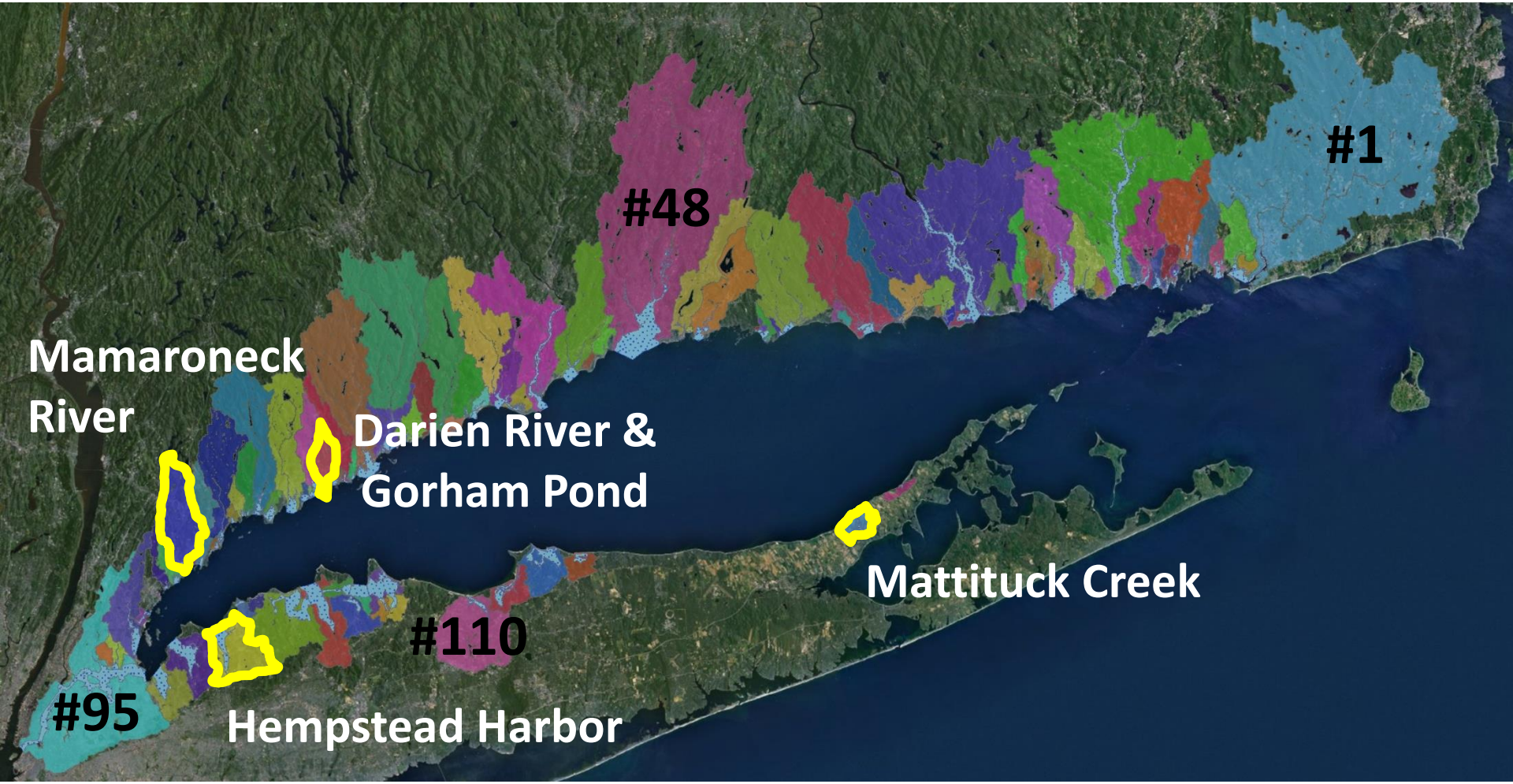


Tributary watersheds that drain inland reaches

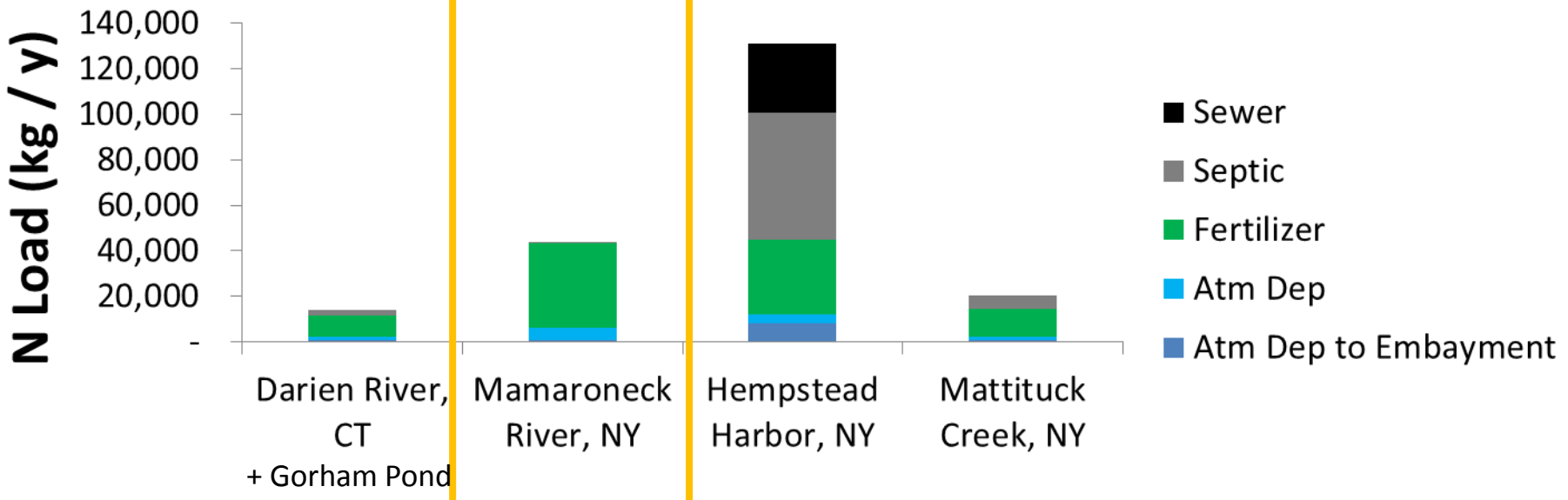



WLIS coastal watersheds with large, direct discharging WWTFs

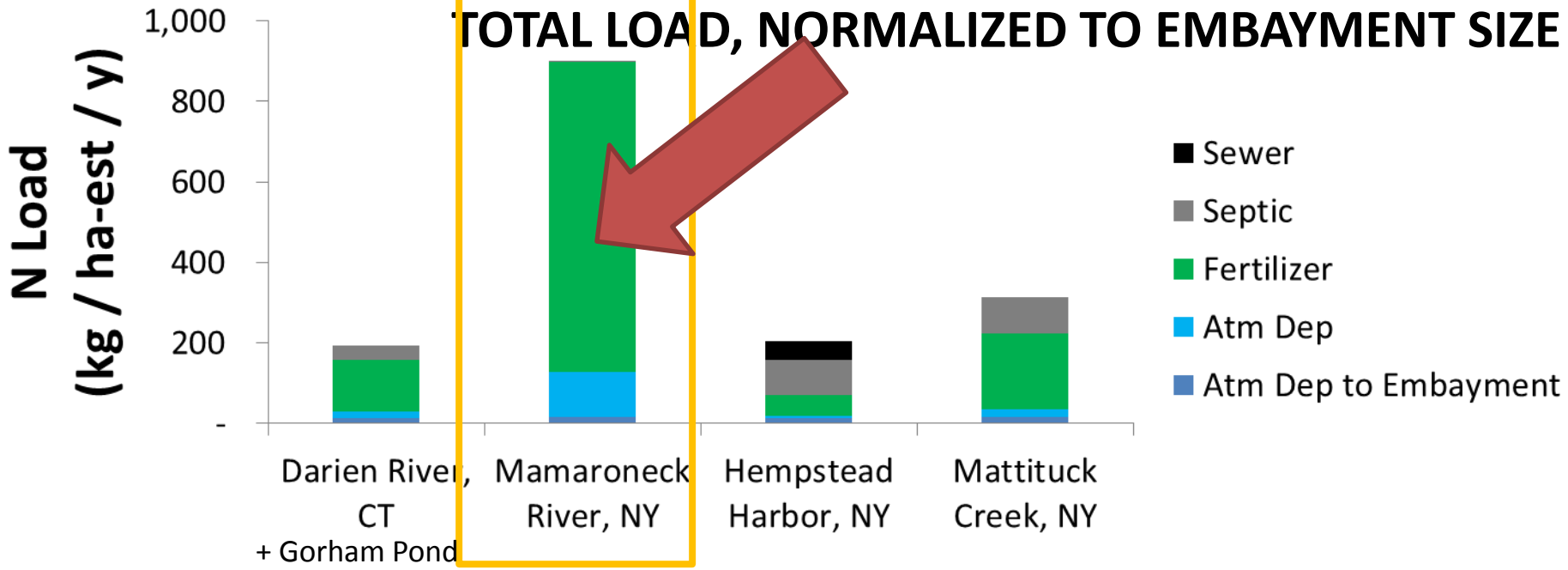
# focus in on 4 embayments



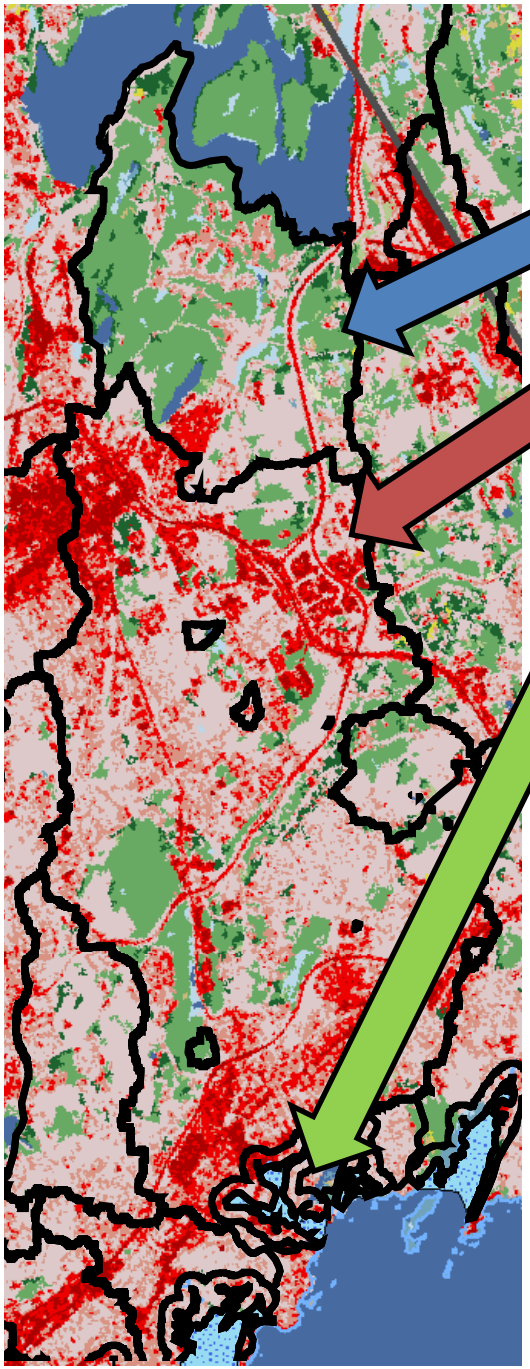
## TOTAL LOAD

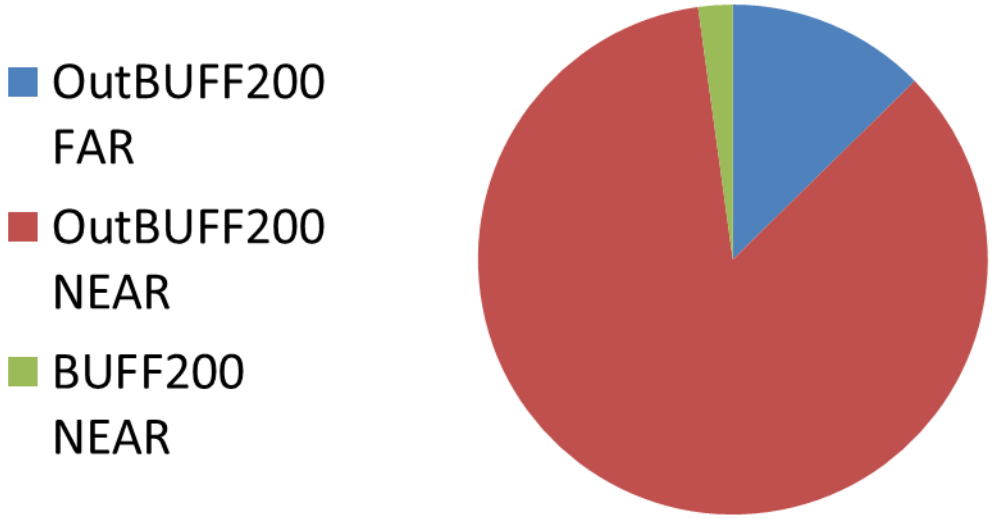


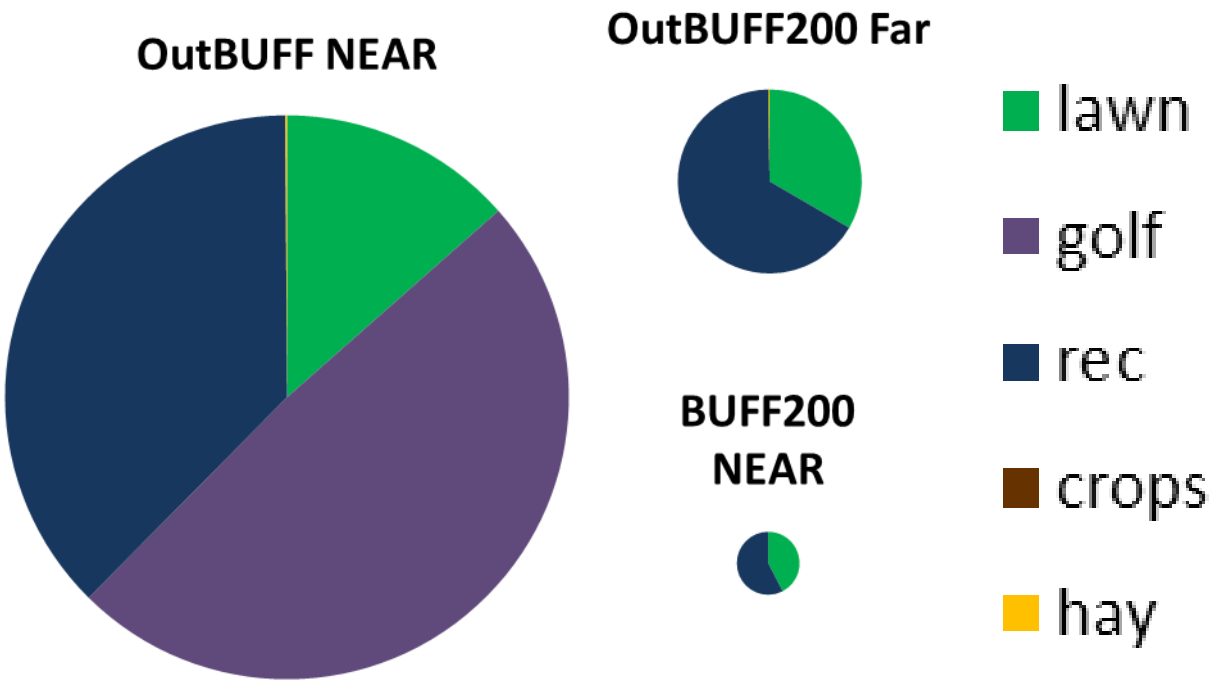

## TOTAL LOAD, NORMALIZED TO EMBAYMENT SIZE



# FERTILIZER CONTRIBUTION – Mamaroneck River

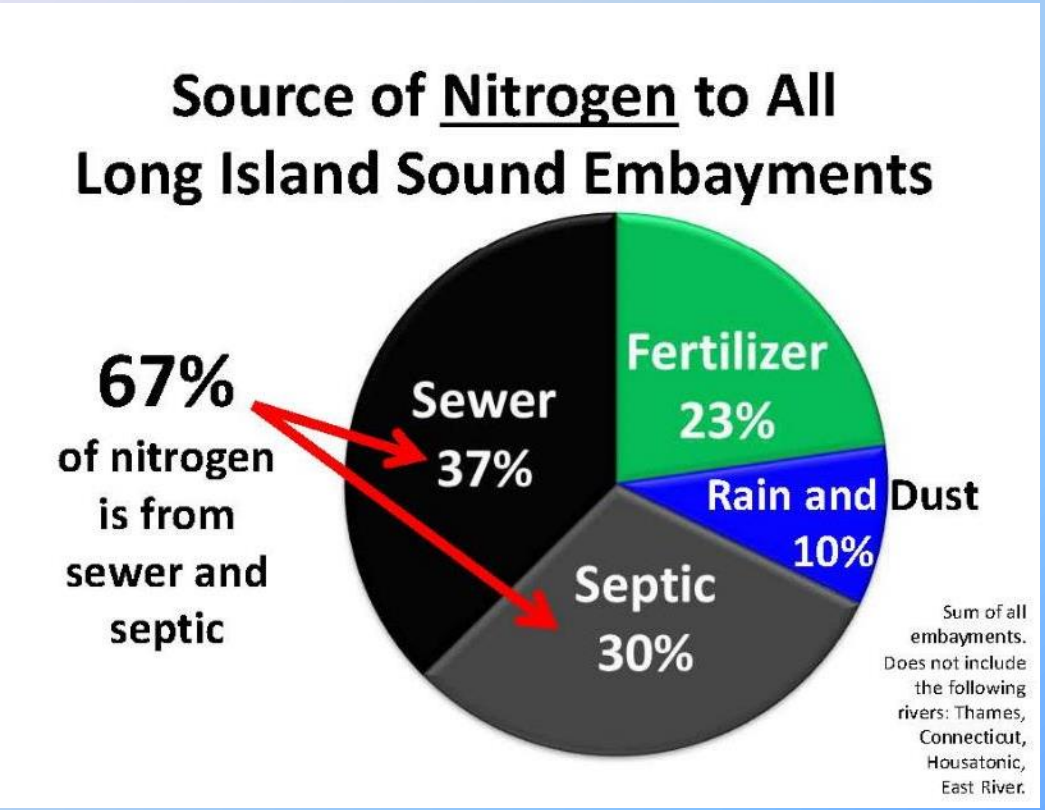





NLCD 2011 – roughly; red = heavily developed, pink = open space, green = natural vegetation, blue = water

# Applying Thresholds




Nitrogen load by source to LIS embayments (Vaudrey et al.).

- Collaborate with the states
- Prioritize watersheds
- Identify watershed reductions to attain thresholds
- Allocate among sources
- Phase in point source controls considering progress in reducing nonpoint sources
- Continue to monitor, model, and research to better understand how LIS responds to N reductions

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# Compatible with NY State Draft Scope Long Island Nitrogen Action Plan

5

## Potential Nitrogen Endpoints

1. Cape Cod (0.3 – 0.4 mg TN/l)
2. 208 Study (0.35 mg TN/l Eelgrass, 0.4 mg TN/l No Eelgrass)
3. EPA Rating System (Excellent 0.3 mg TN/l, Good 0.3 to 0.39 mg TN/l)
4. National Estuary Program (DIN, DIP, Chlorophyll a, Clarity, and DO index)

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation



That migration of nitrogen in groundwater is impairing surface water embayments at a crisis levels.

Surface waters require nutrients, such as nitrogen, to support healthy ecosystems. However, excessive nitrogen can limit or preclude opportunities for swimming and fishing, and destroy habitat which in turn harms aquatic life, and reduces storm resiliency. Swimming is harmed by when high levels of nitrogen in waters produce nuisance algal blooms and increase aquatic weed growth.

Nitrogen and resulting plant growth and die off can draw oxygen from the water and produce "dead zones" where dissolved oxygen levels are so low that aquatic life cannot survive. This condition is referred to as hypoxia. Shallow, well-mixed estuaries are less susceptible to this phenomenon because wave action and circulation patterns supply the waters with plentiful oxygen. Excessive nitrogen fueled algae growth also shades submerged aquatic vegetation (SAV) reducing their ability to photosynthesize. Excessive nitrogen is also a key contributor in wetland degradation. Low dissolved oxygen, reduced SAVs, and wetland degradation lead to many areas having poor marine habitats that do not adequately support fin fish and shellfish populations. Degraded marine wetlands and aquatic vegetation reduces coastal areas natural storm buffering capacity, thereby reducing resiliency. .

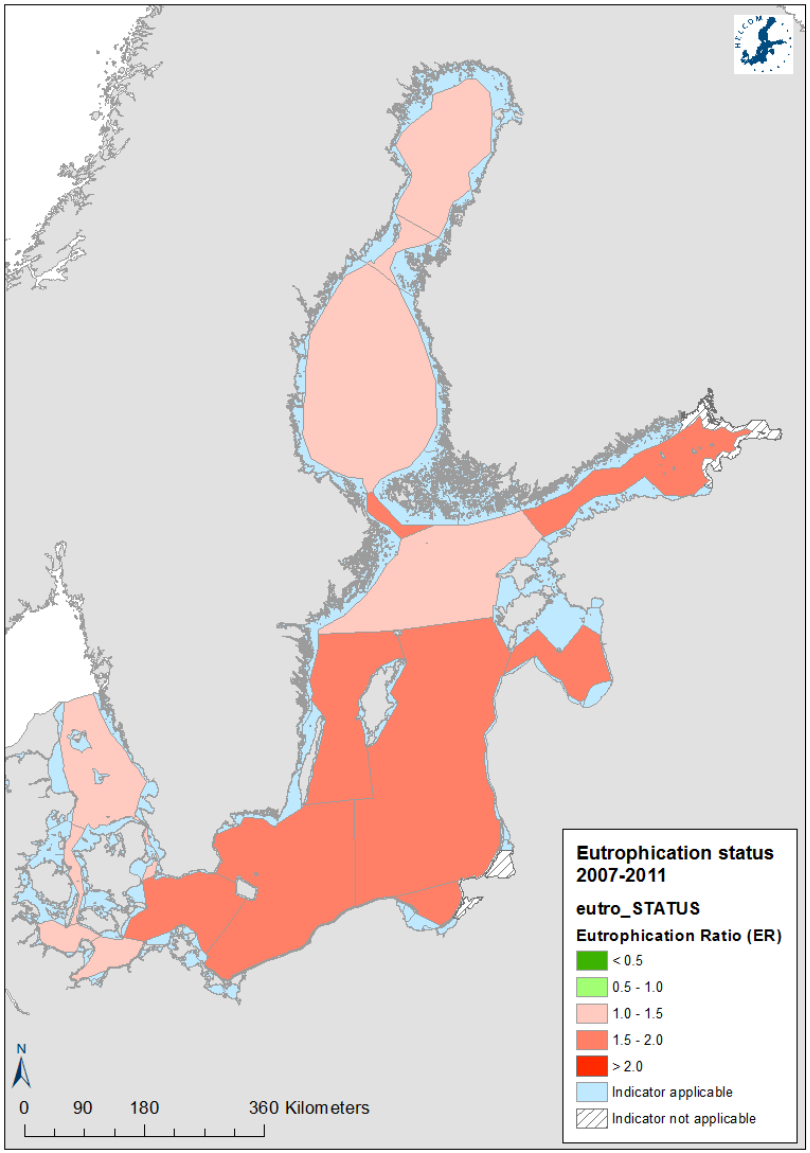
Recognition of the role of nitrogen in the destruction of water resources and commensurate effects on economic viability on Long Island has grown recent years. LINAP will integrate many local initiatives, and evaluate additional alternative solutions to address water quality degradation on Long Island.

### 1.2 GOAL STATEMENT

The goals of the Long Island Nitrogen Action Plan (LINAP) include:

1. Assess Nitrogen Pollution in Long Island Waters
2. Identify sources of nitrogen and impacted water bodies
3. Establish nitrogen reduction endpoints
    1. Identifying ecological endpoints (desirable conditions in surface waters) for individual estuaries or embayments around Long Island to restore/protect estuarine health and function as well as groundwater resources.
    2. Establishing estuarine or embayment specific nitrogen loading targets based on:
        a. preliminary rapid assessments for immediate reduction actions
        b. development of more specific reduction targets based on higher precision estuarine modeling for meeting ecological endpoints
4. Develop implementation plan to achieve reduction endpoints.
    a) Developing sub-watershed plans including:
        a. Action plans which contain near term actions that will reduce nitrogen pollution to groundwater and surface waters

# Baltic Sea Action Plan




## Goal: Restore "Good" Ecological Status

Eutrophication Indicators

- DIN, DIP
- Chlorophyll a
- Secchi Depth
- DO
- (Benthic Index)

Thresholds Baltic Sea Eutrophication Indicators

- Set thresholds for each indicator
- Combine scores into 5-point (A-F) scale to set status

# Next Steps

- Encourage public participation
- Collaborate with the states & partners
- Integrate with Long Island Nitrogen Action Plan and Connecticut efforts
- Refine & begin implementation of strategy
  - Technical analysis by watershed grouping
- Apply in priority watersheds