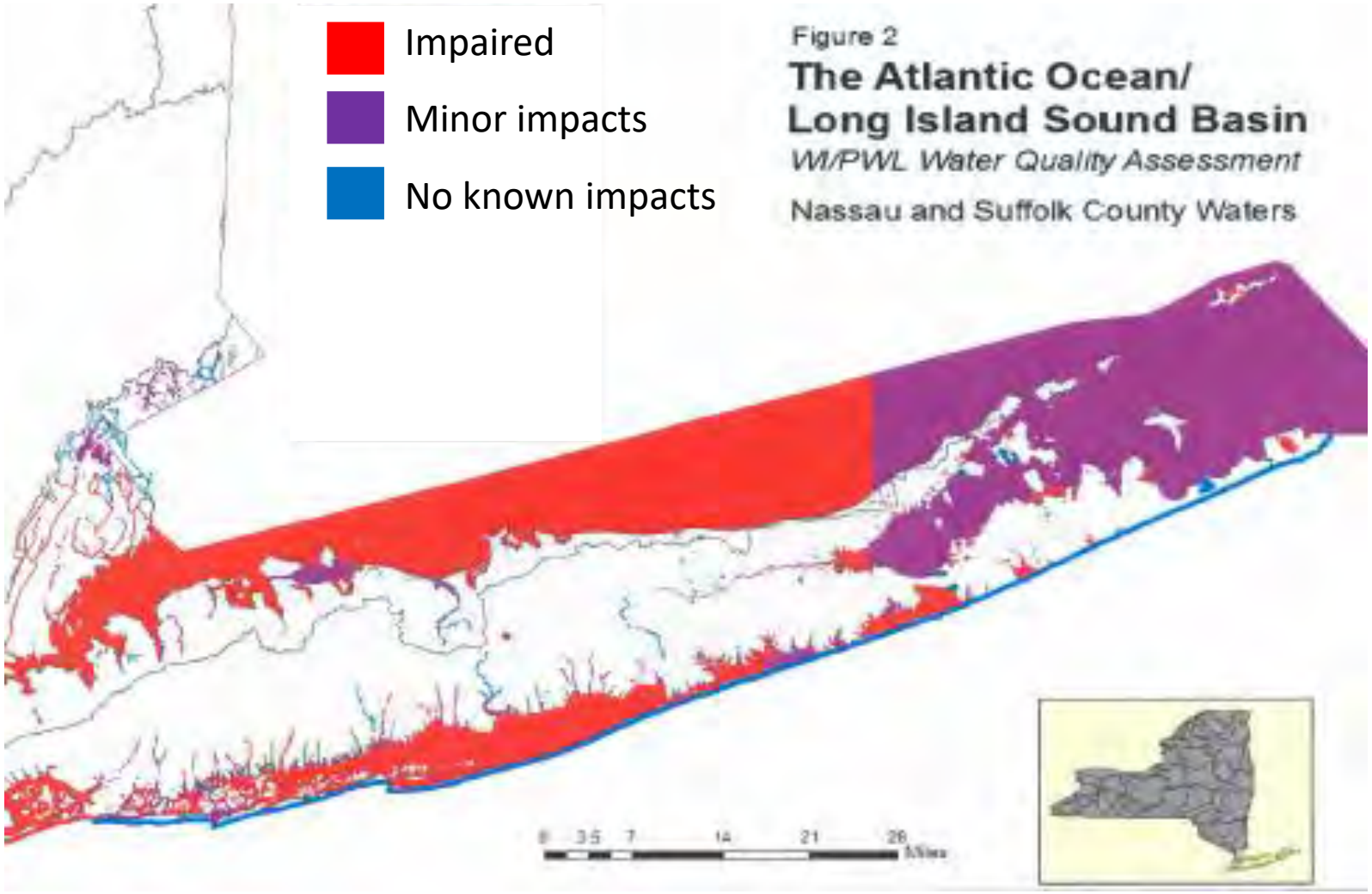
Quantifying nitrogen loading from land to sea in Nassau County

Stony Brook University

Many impairments associated with ***nitrogen overload***



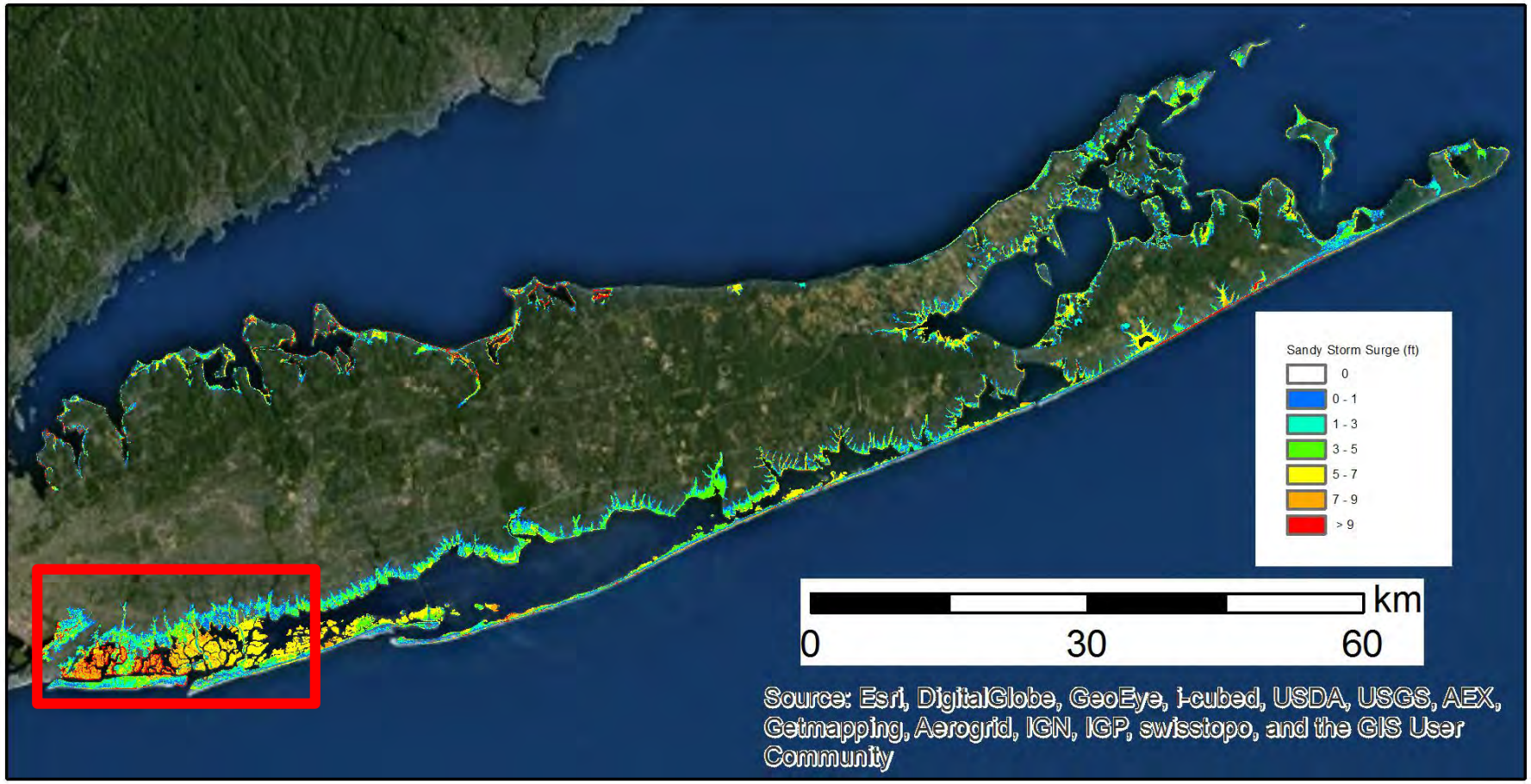
marsh ecosystems

Salt marshes protect coastlines

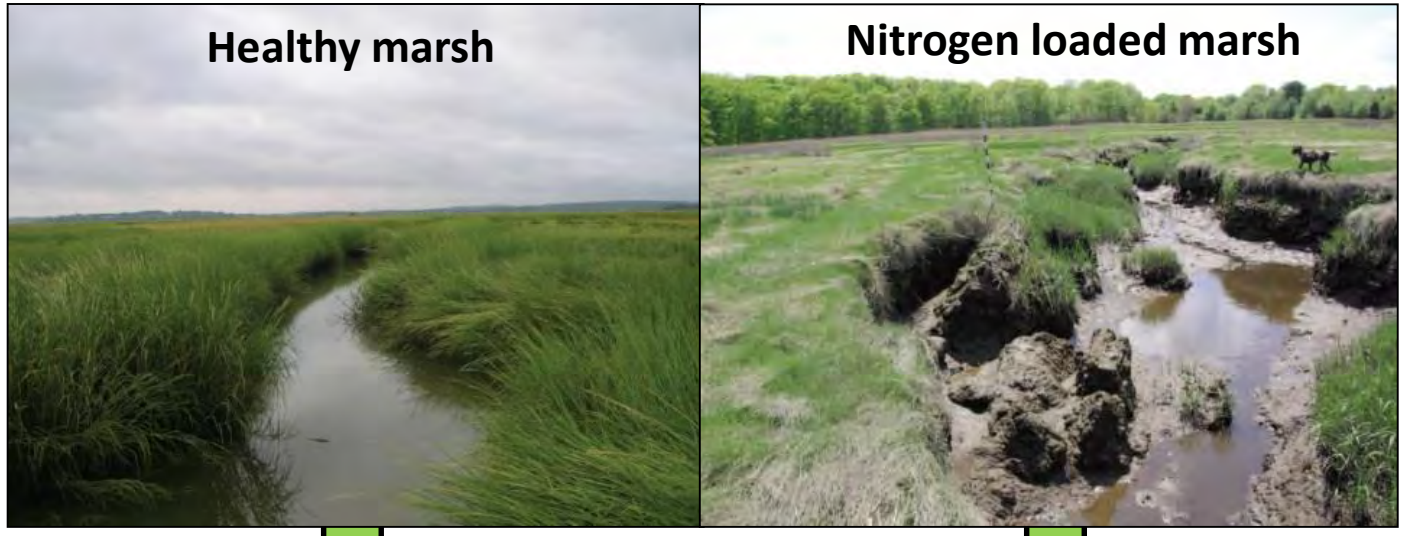
Salt marshes protect coastlines

Flooding during Hurricane Sandy

NYS RISE
Resiliency Institute for Storms & Emergencies



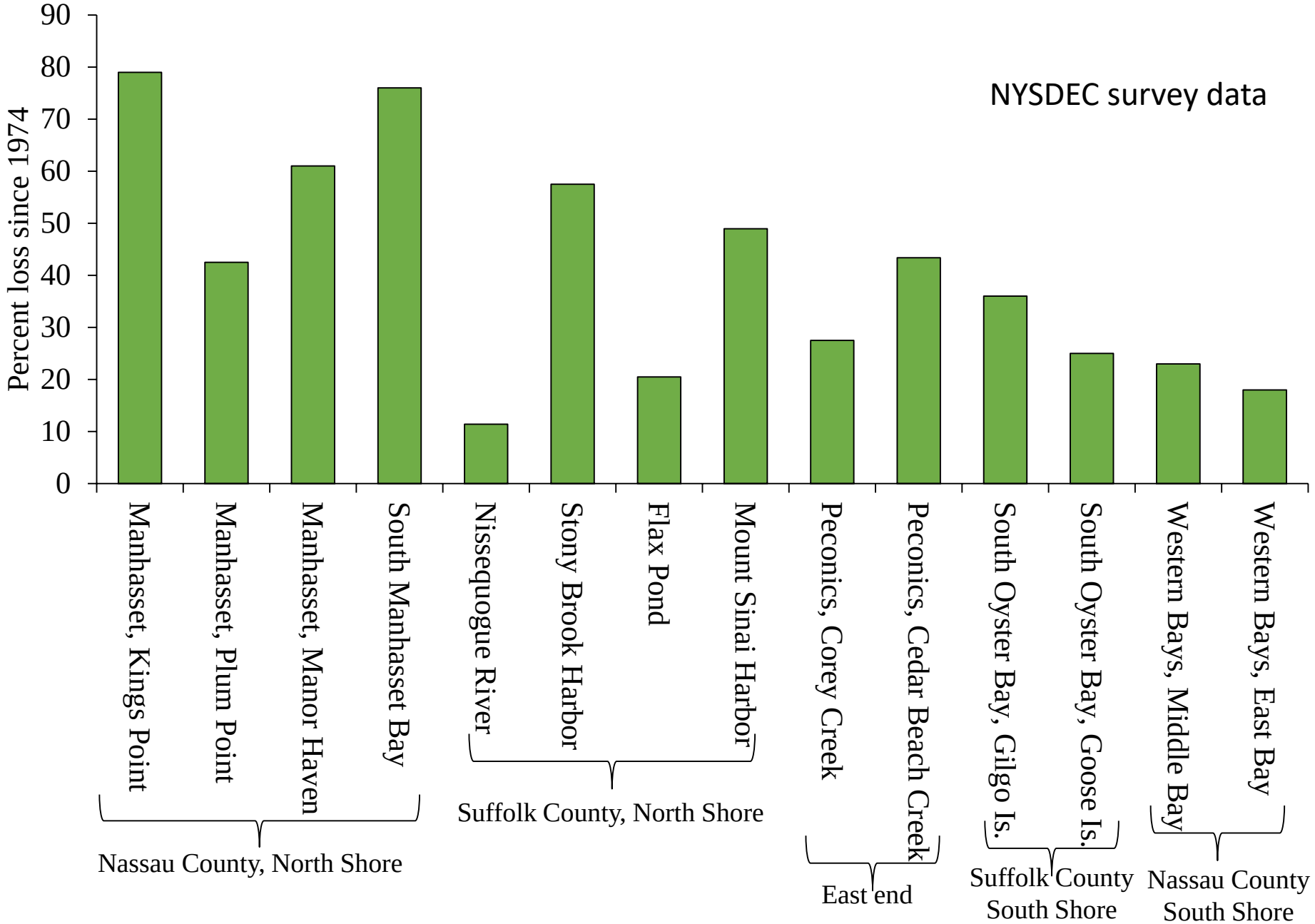
“Coastal eutrophication as a driver of salt marsh loss”, Deegan et al 2012, Nature



Dense, strong roots

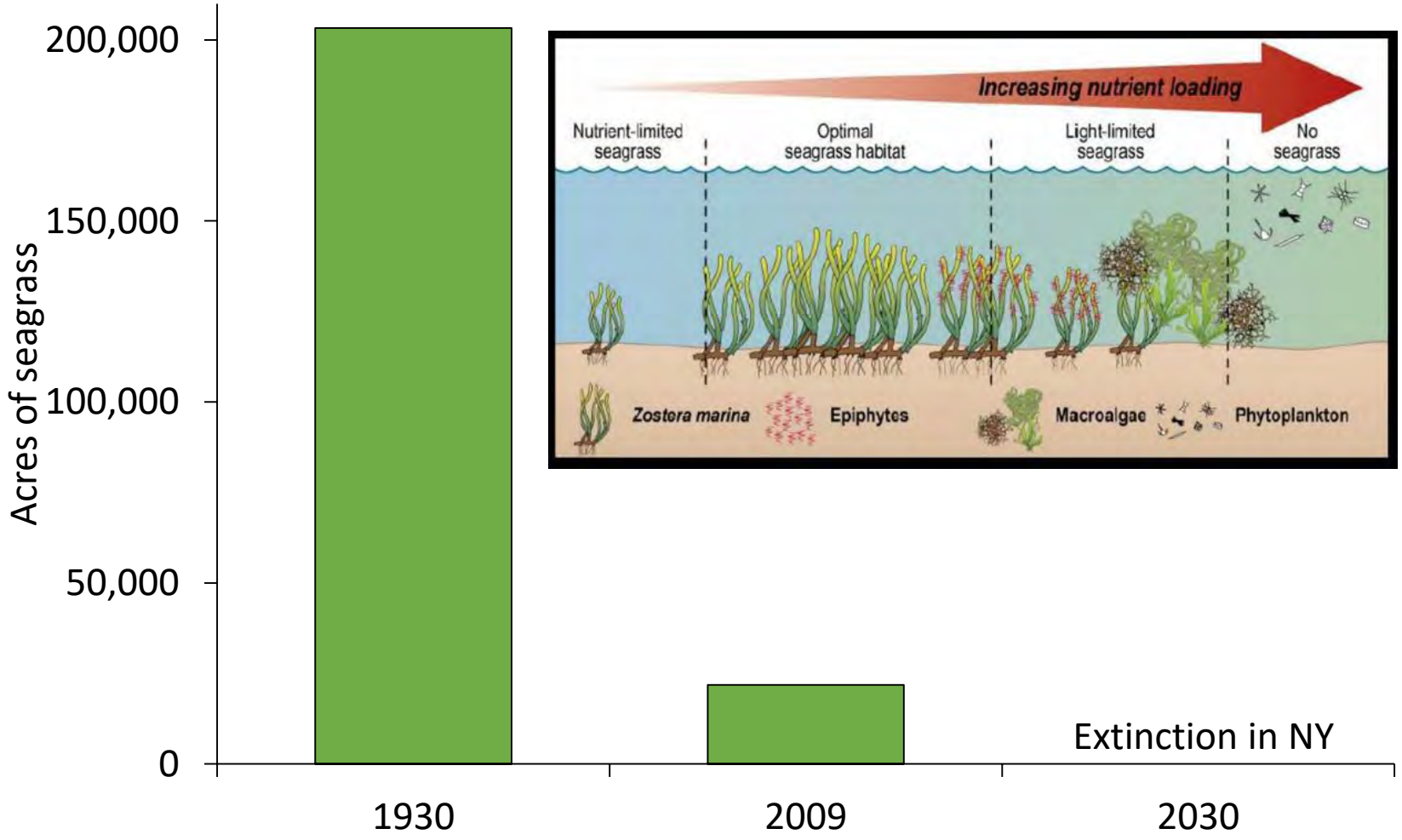
Nutrient weakened, roots

Loss of wetlands on Long Island, since 1974

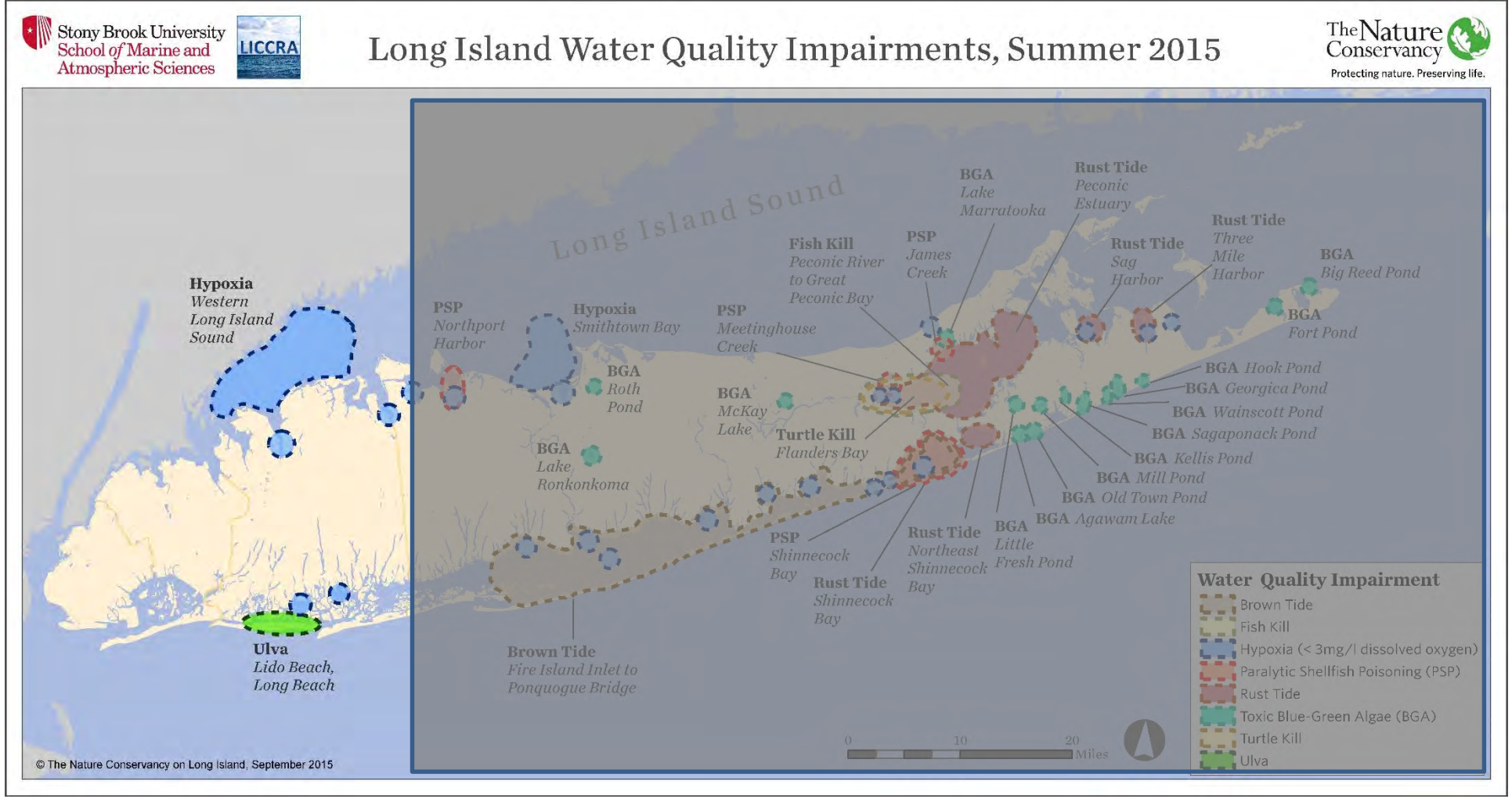


Seagrass: Critical habitat for fish and shellfish

NYS seagrass, 1930 - 2030



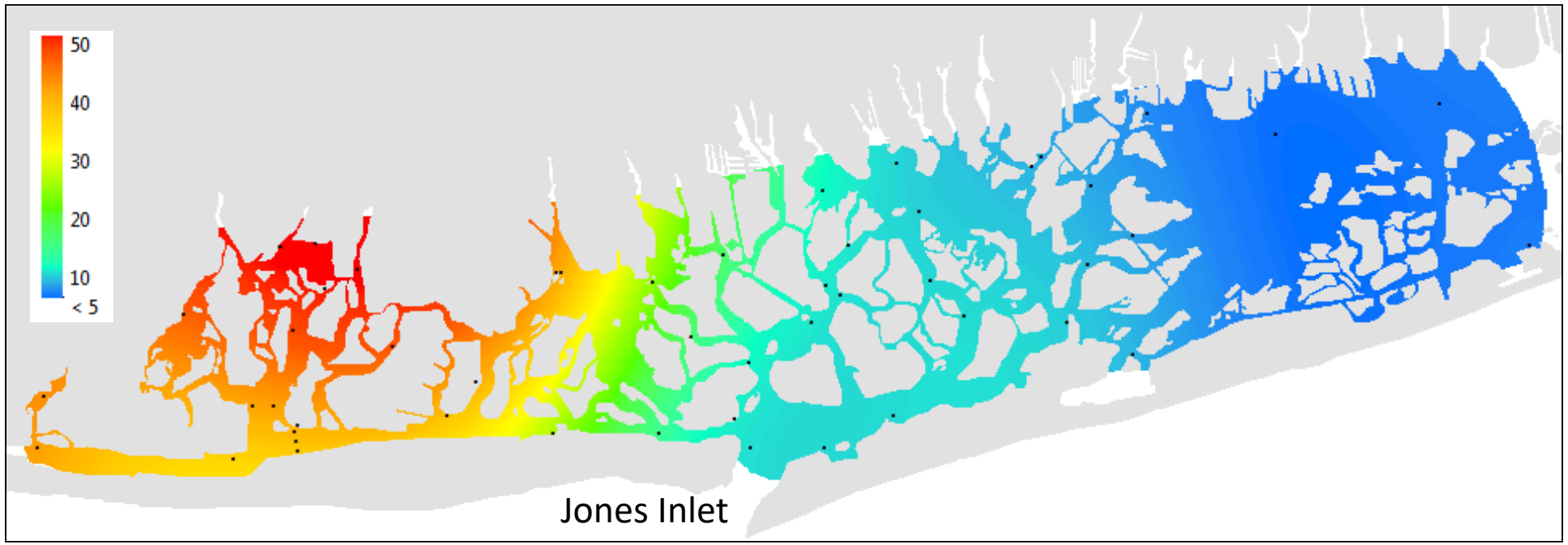
NYSDEC Seagrass Taskforce Final Report, 2010; Suffolk County assessment, 2014



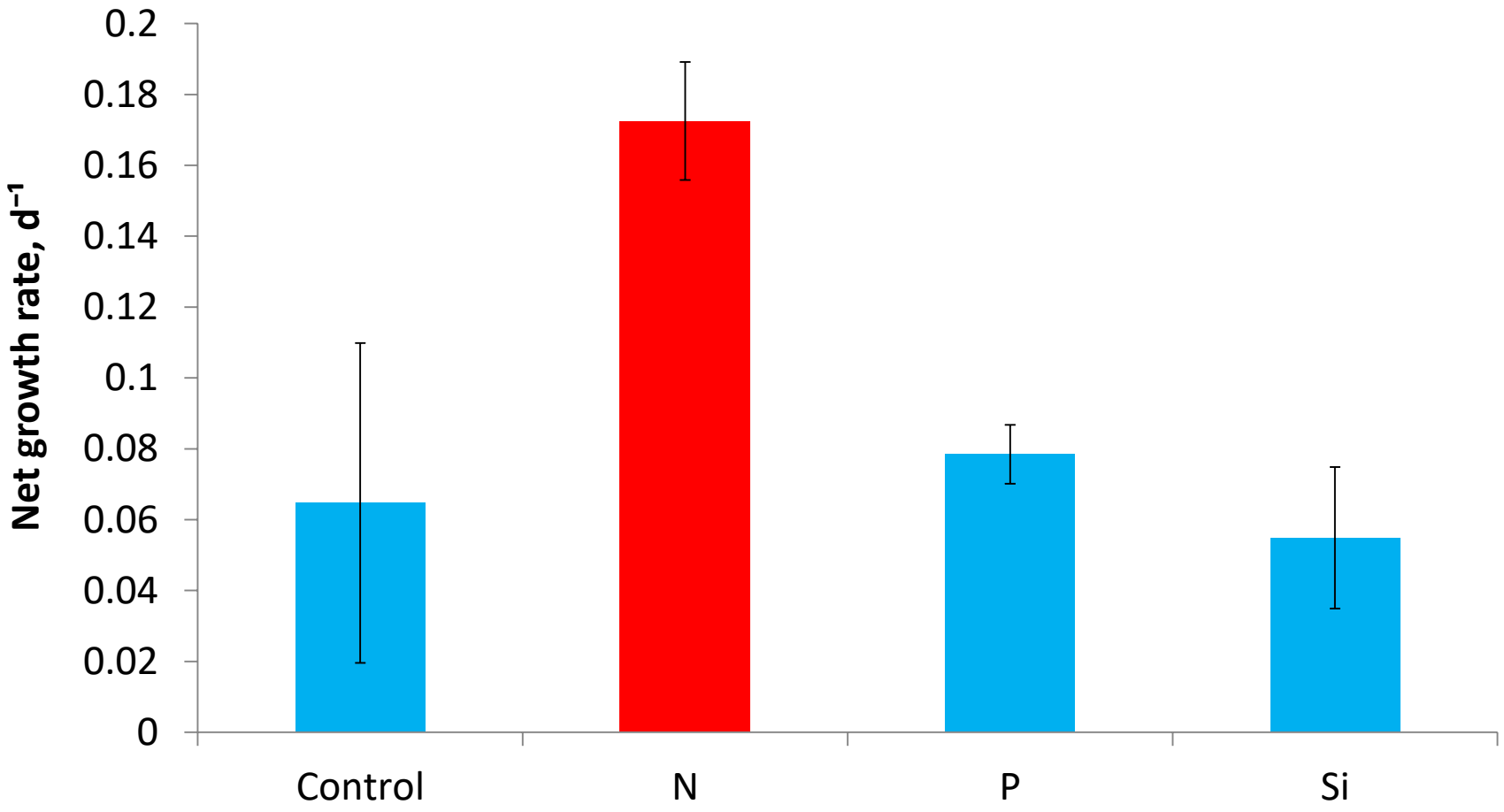
Nitrogen promotes in the water impairments: algal blooms, low oxygen

Point Lookout, seaweed bloom: unsightly, contributes to low oxygen, low pH

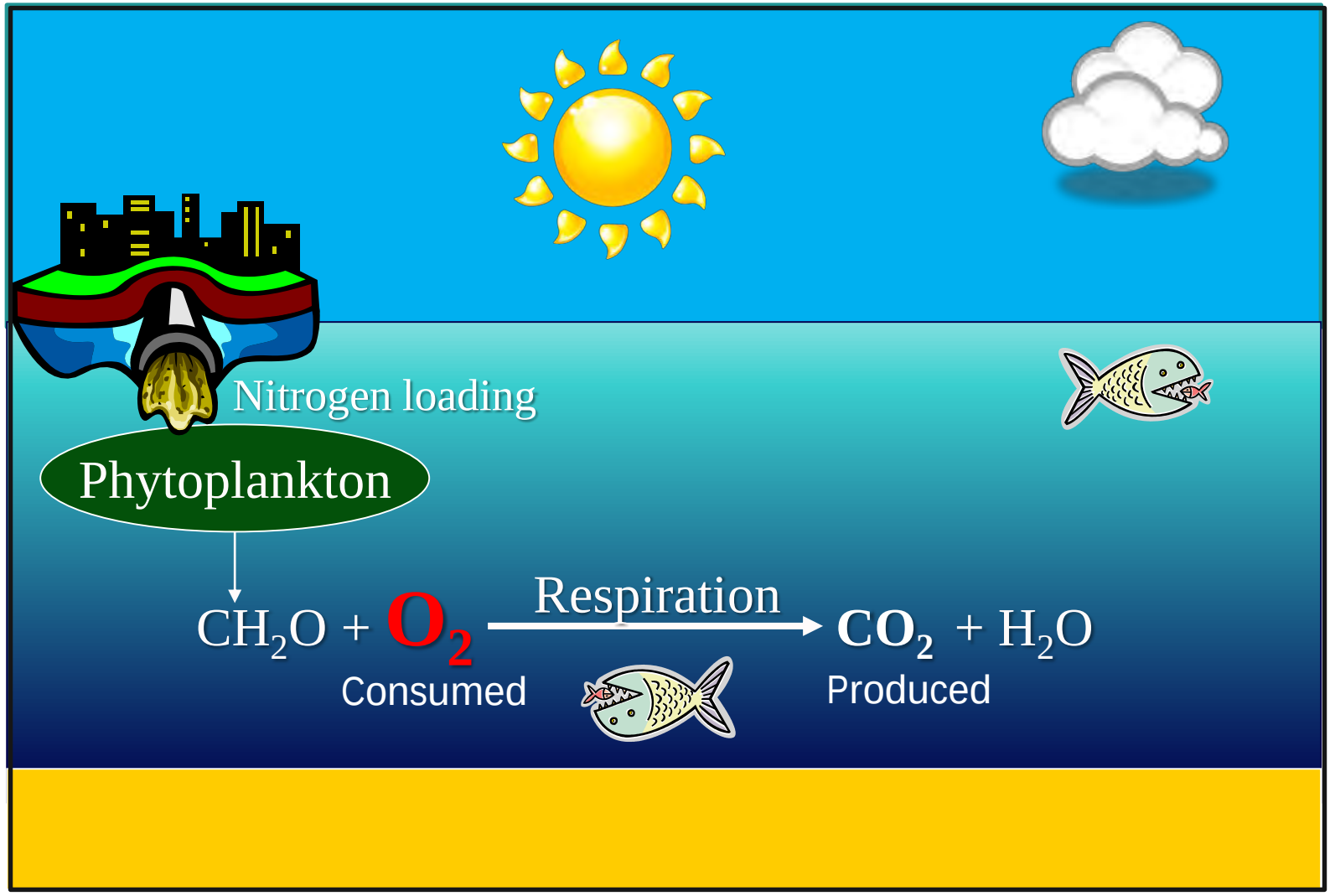
Percent bottom coverage of *Ulva* sp. in Western Bays in the Fall of 2011.



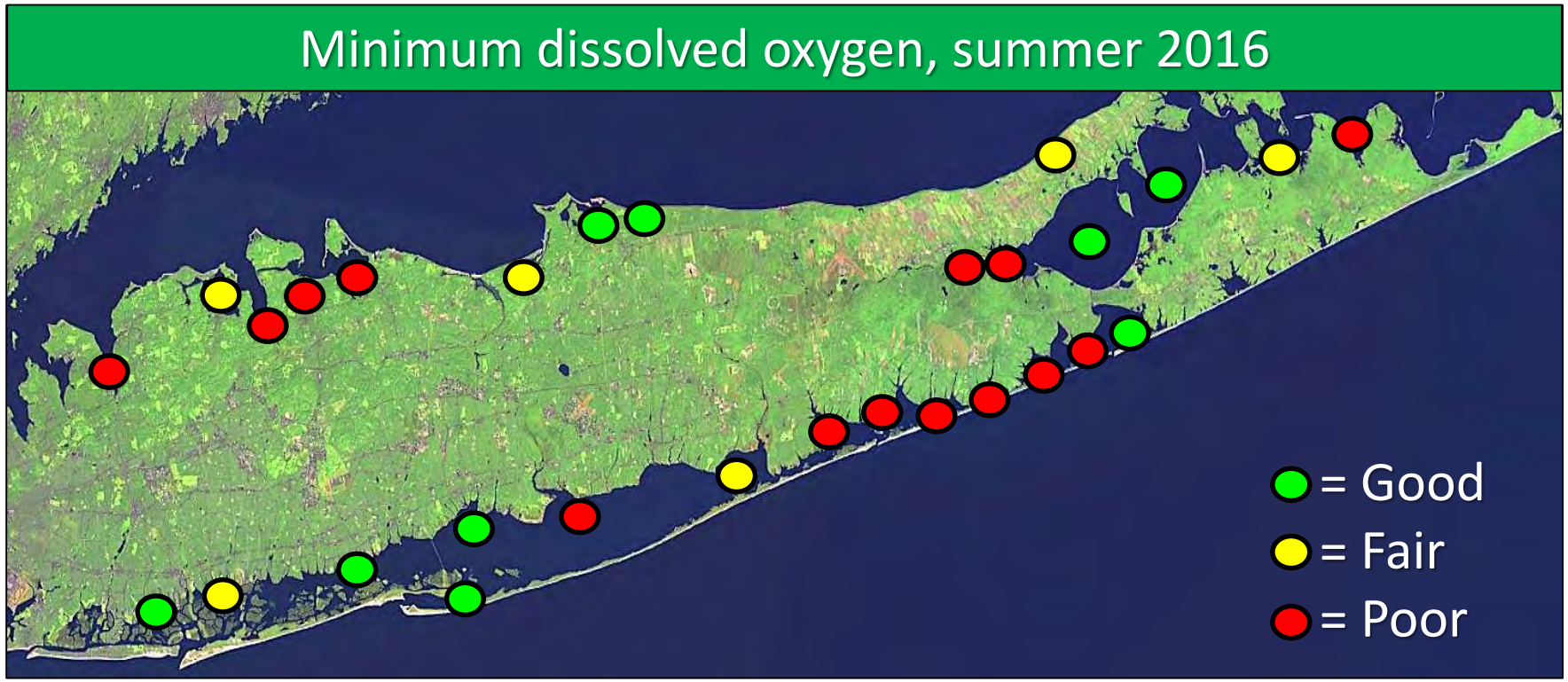
Effects of nutrients on the growth of *Ulva* in the Western Bays



Excessive nitrogen loading can leads to low

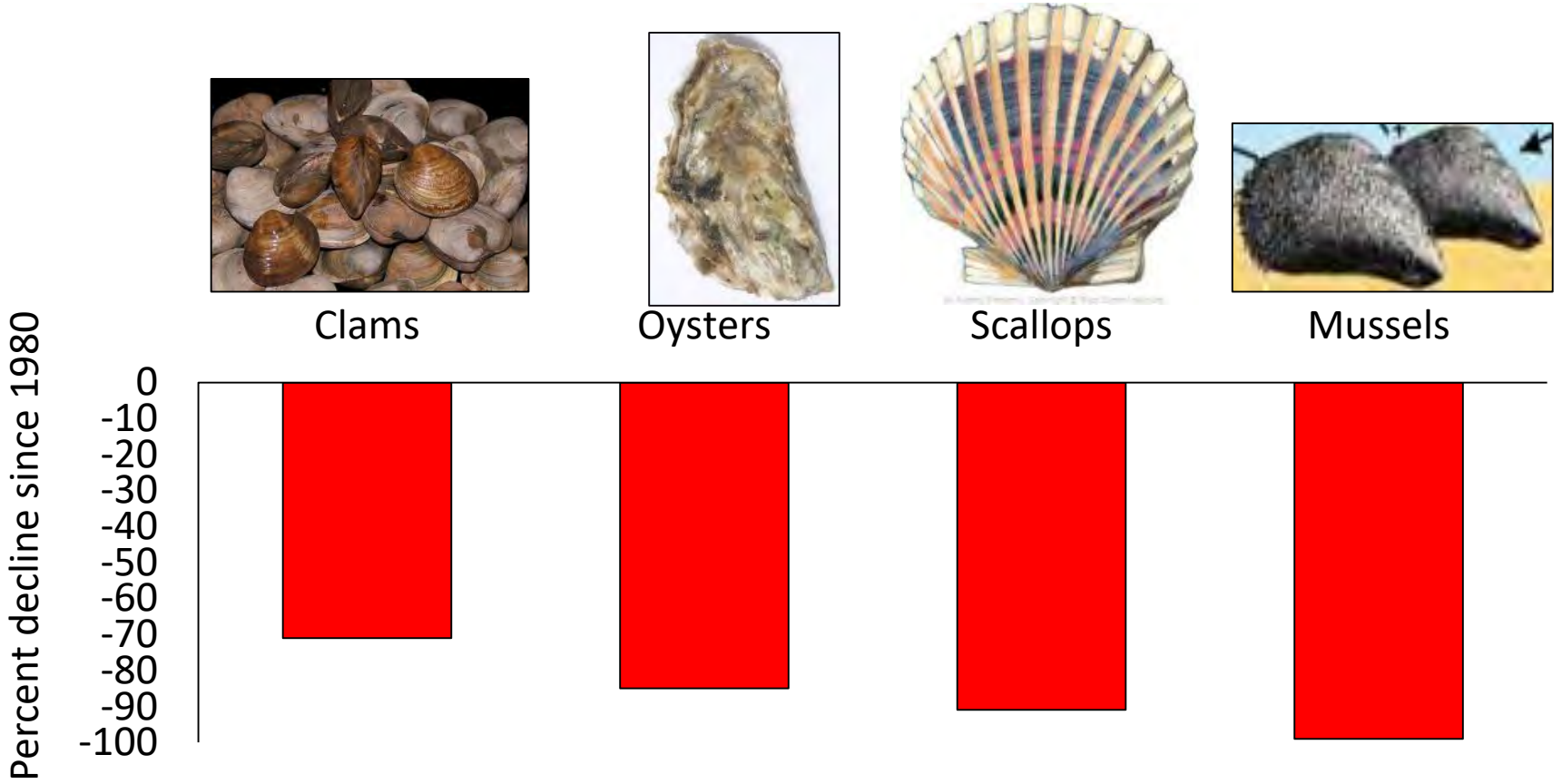


"More algae and warm temperatures during summer make bacteria **hyperventilate**"



Good: DO minimum > 5 mg/L
Fair: DO minimum 3 – 5 mg/L
Poor: DO minimum < 3 mg/L

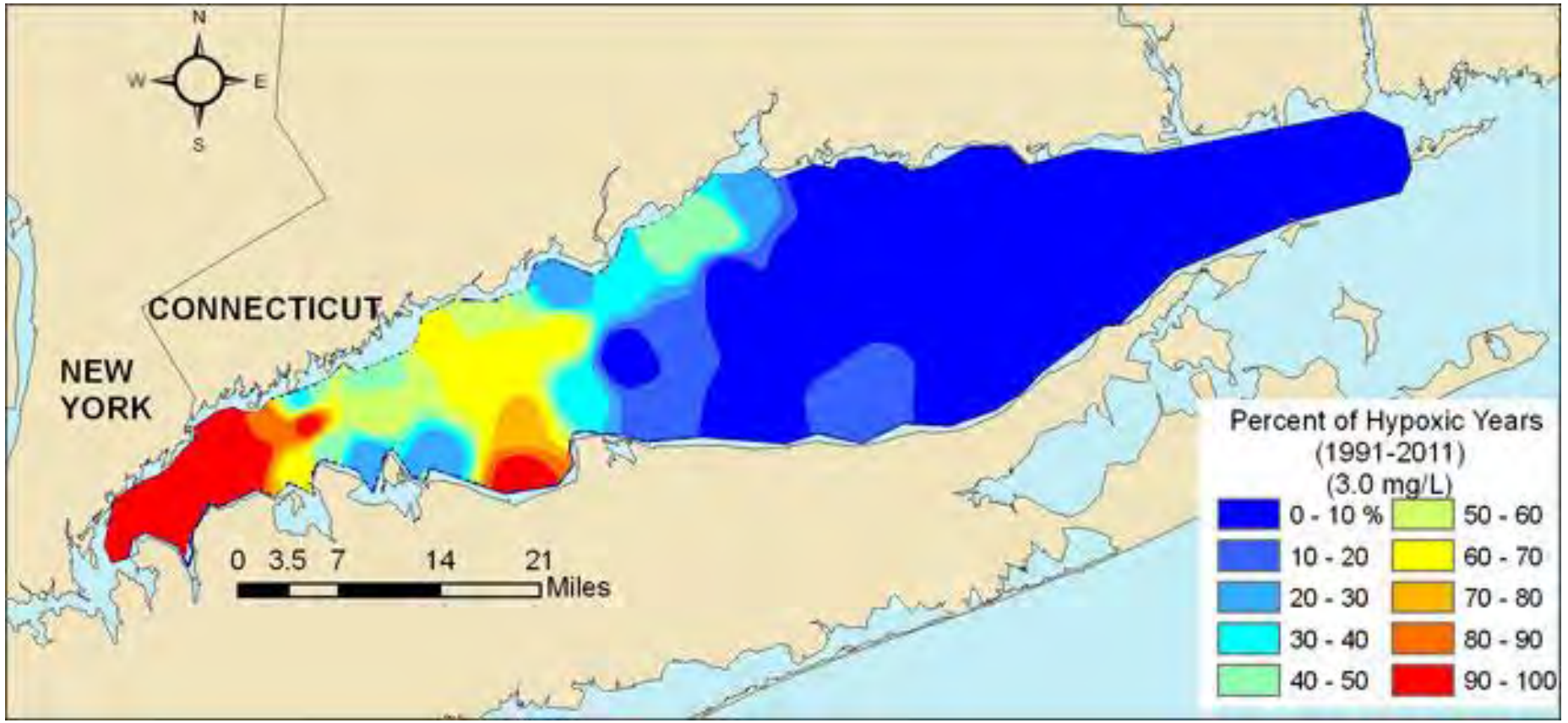
NYS landings of shellfish, 1980 – 2010



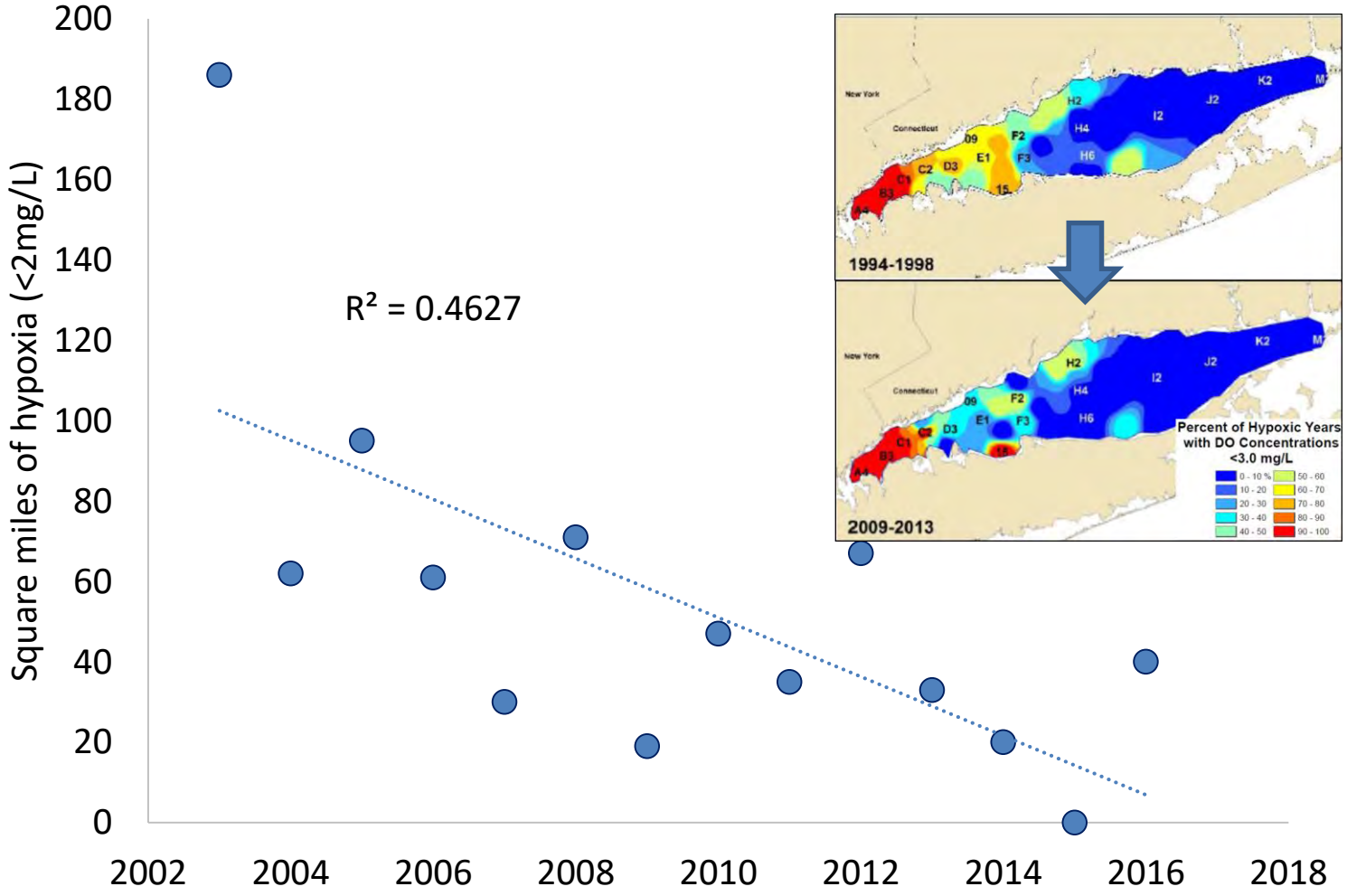
Losses due to **nitrogen driven** harmful algal blooms, seagrass loss, and water quality degradation.

Has nitrogen mitigation helped hypoxia in Long Island Sound?

- Goal to reduce N loads by 58.5%
- In 2014, close to reaching this goal.
- Ecosystem response?

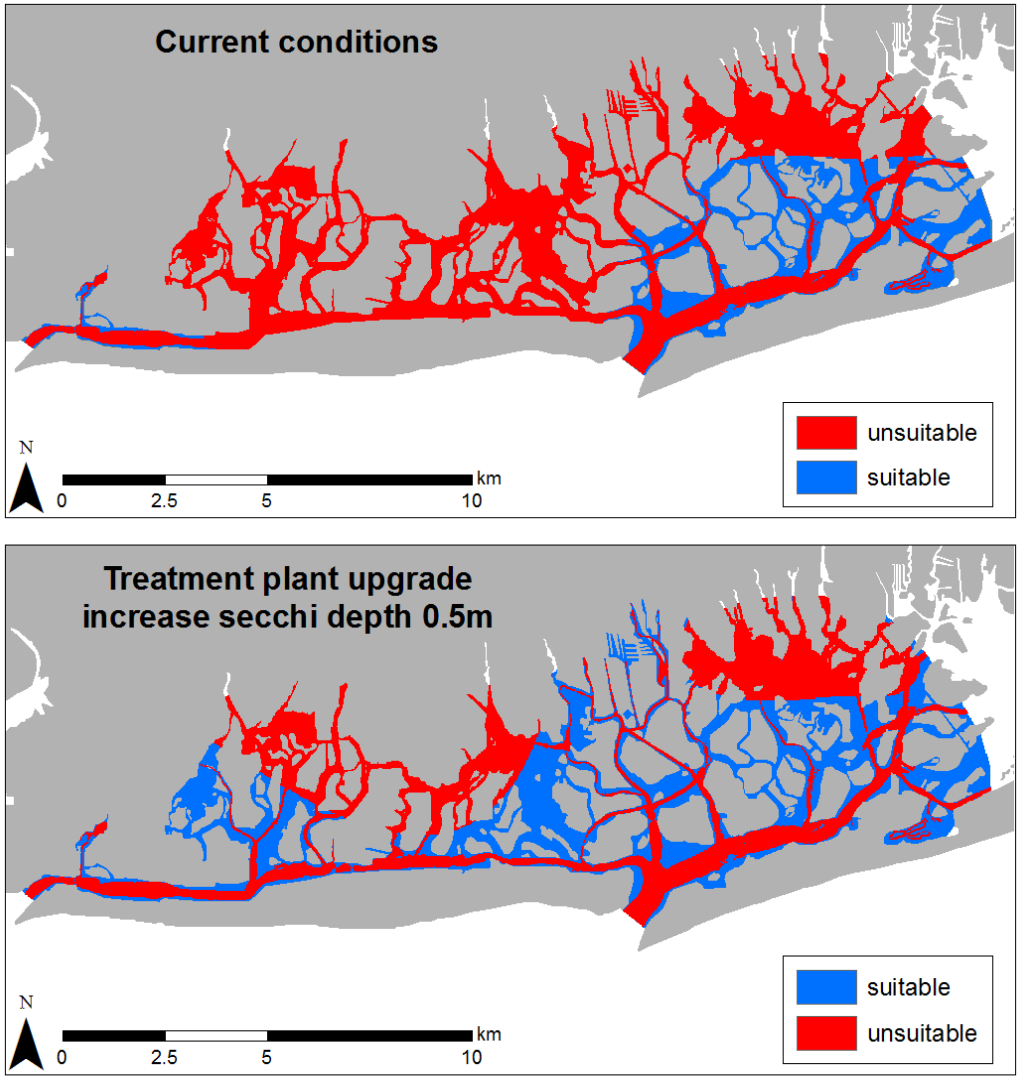


Reduction in Long Island Sound hypoxic area with 60% nitrogen reduction



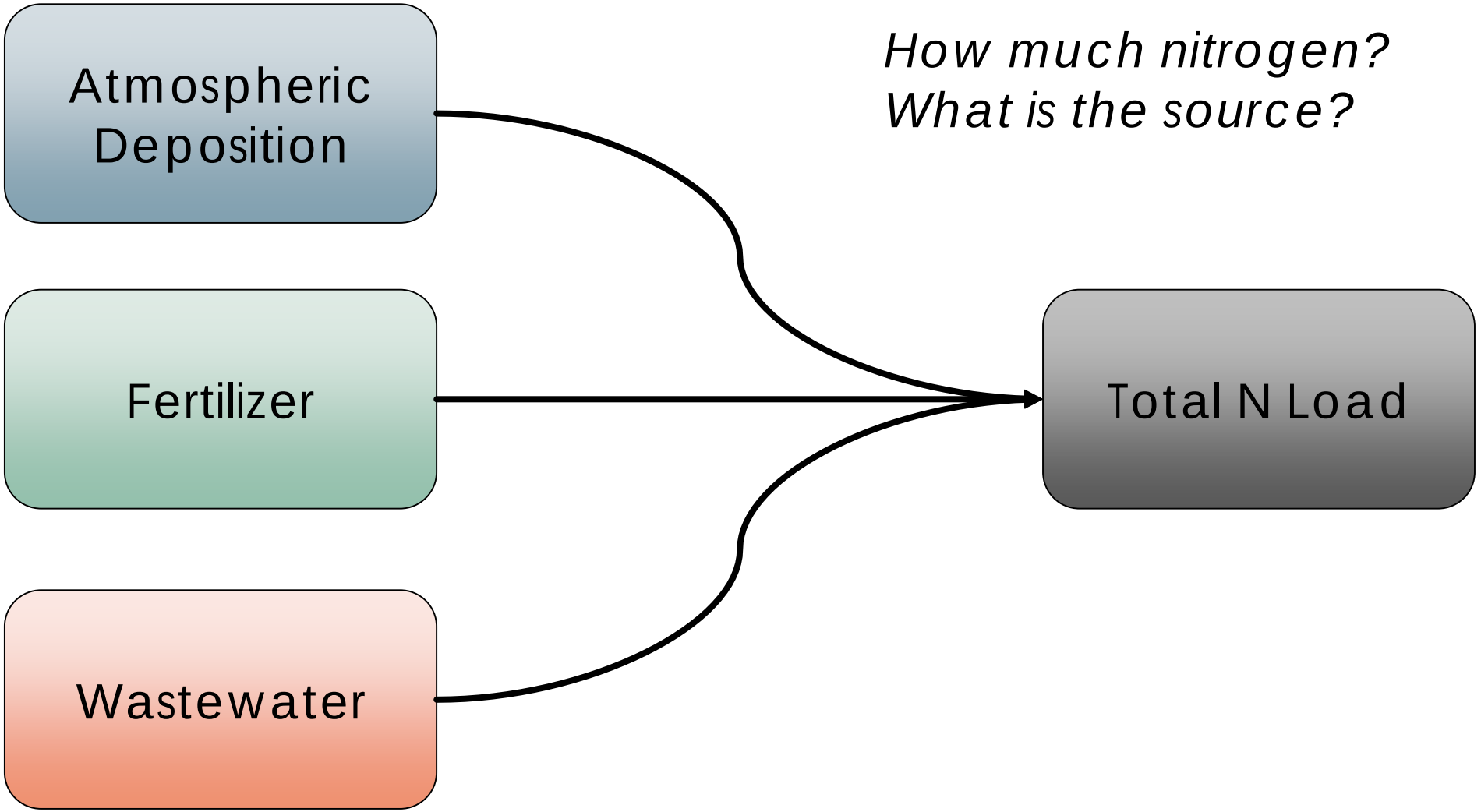
Planned re-routing of Bay Park sewage to Cedar Creek ocean outfall

Potential recovery of seagrass in Western Bays

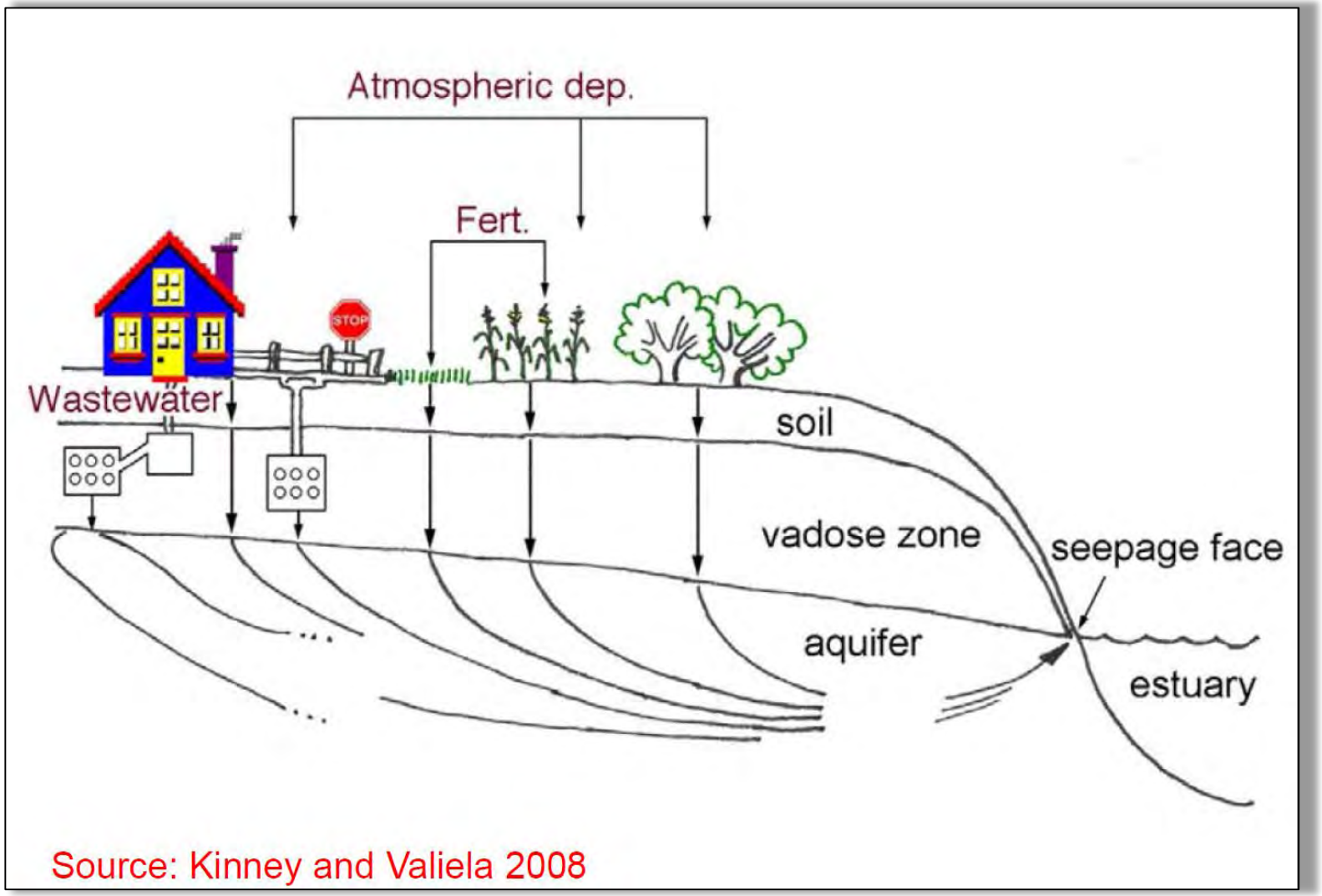


Potential gain of nearly 3,000 acres of seagrass with sewage abatement.

Nitrogen Loading Model (NLM) components:



Nitrogen Loading Model (NLM) Overview:



Nitrogen Loading Model (NLM) Overview:

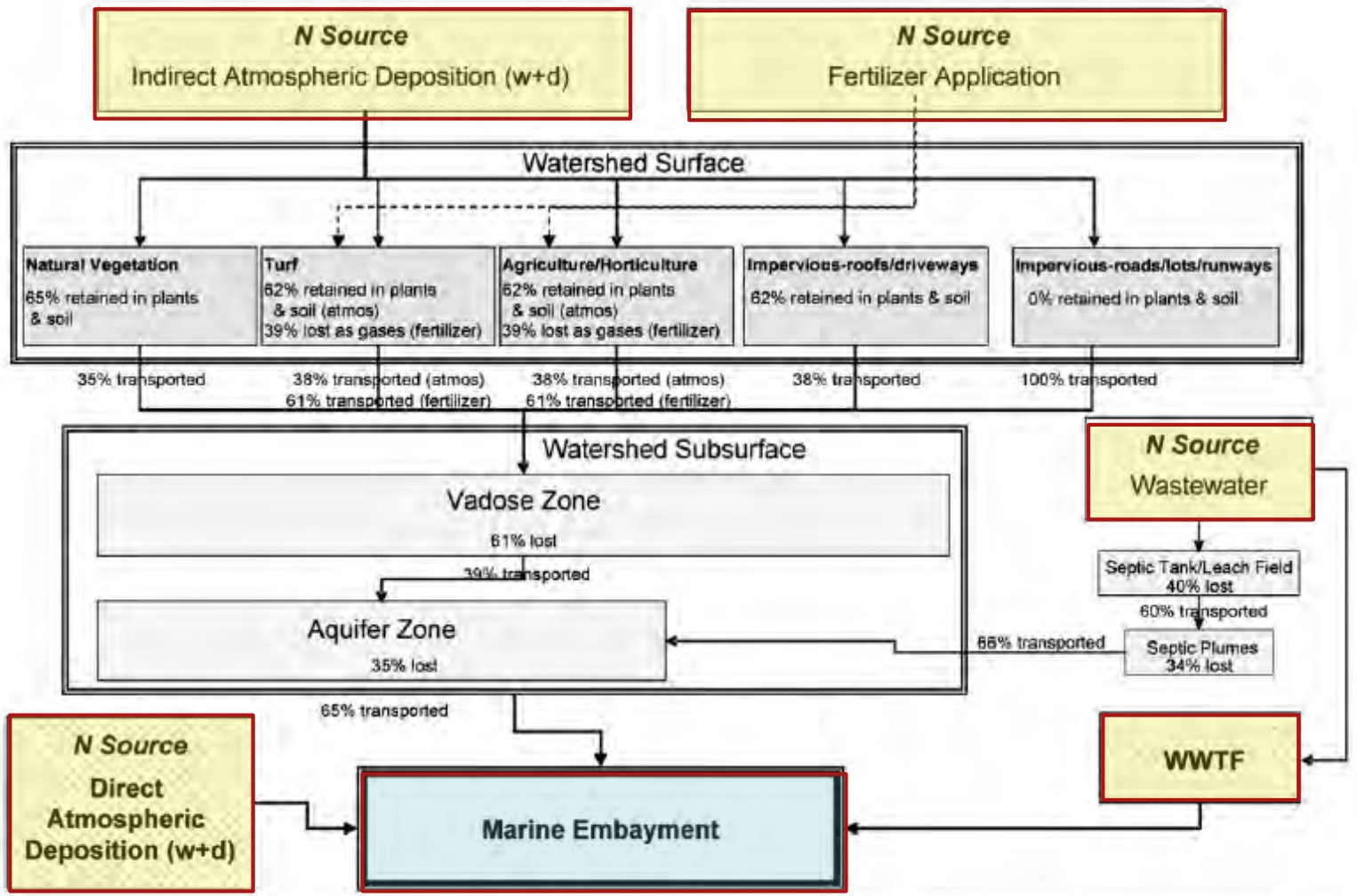
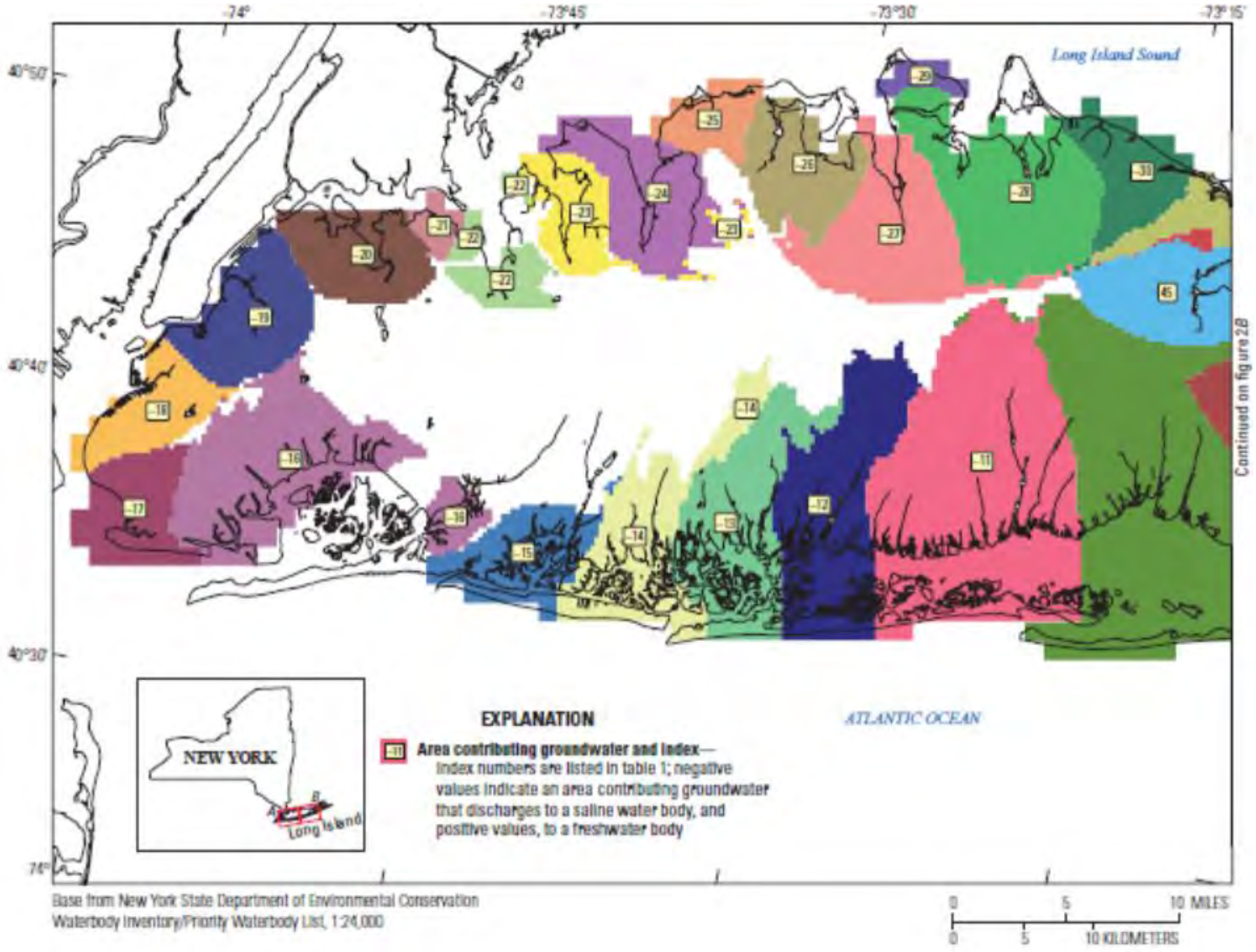


Fig. 2. Schematic of the nitrogen loading model (NLM, with direct atmospheric deposition and point source components added in stippled boxes).

13 Nassau County watersheds



Base Layers created:

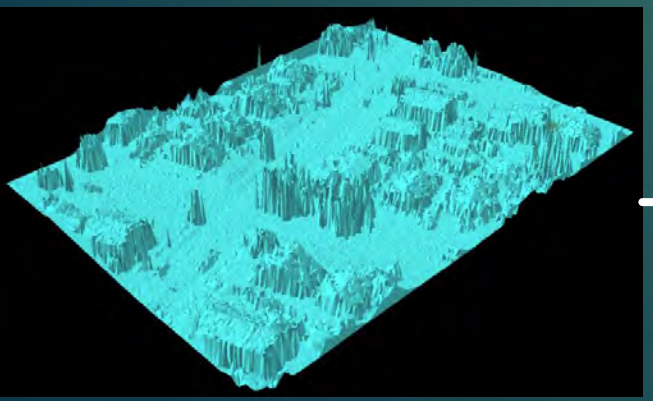
- Tax map and census identification of all properties: Lot size, number of individuals per home, size of buildings.
- Lawn raster
- Impervious raster

Lawn Raster

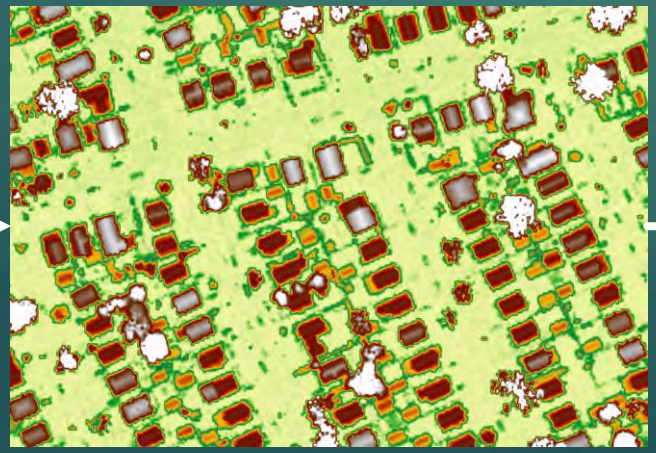
High Resolution Orthoimagery

Normalized Difference Vegetation Index > 80

LiDAR



Object Height < .1m

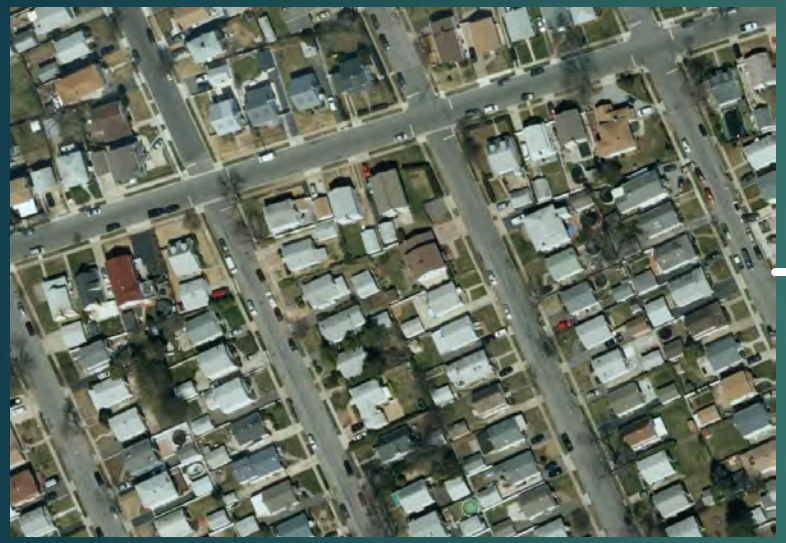


Where both are true

Lawns

Impervious Raster

High Resolution Orthoimagery

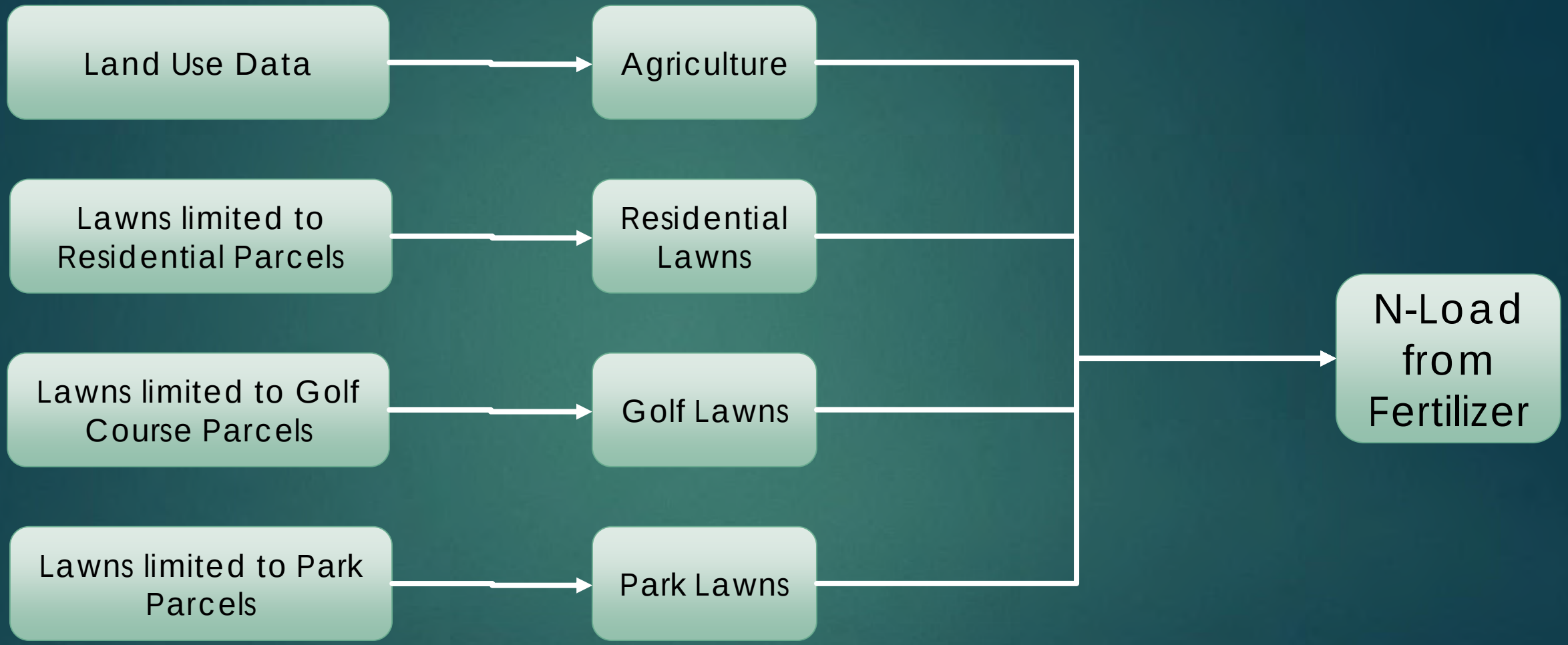


Normalized Difference Vegetation Index < 90

Impervious

Atmospheric Deposition

Fertilizer


Land Use Data
Agriculture
Lawns limited to Residential Parcels
Residential Lawns
Lawns limited to Golf Course Parcels
Golf Lawns
Lawns limited to Park Parcels
Park Lawns
N-Load from Fertilizer

Wastewater

of People
2010 Census

Cesspools within
200m of shore

# of People
2010 Census

Cesspools outside
200m of shore

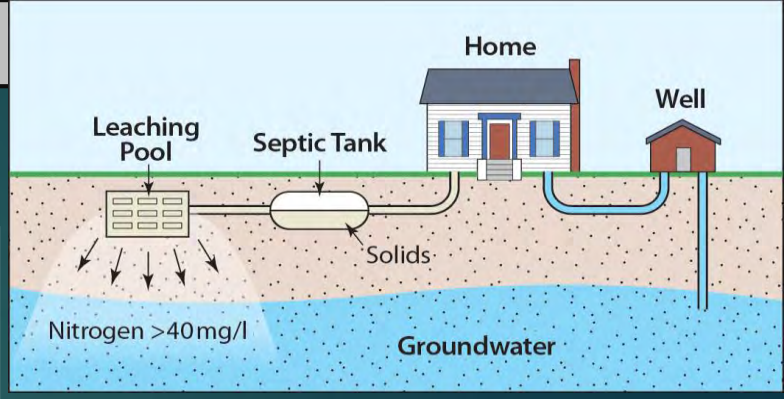
# of People
2010 Census

Septic systems within
200m of shore

# of People
2010 Census

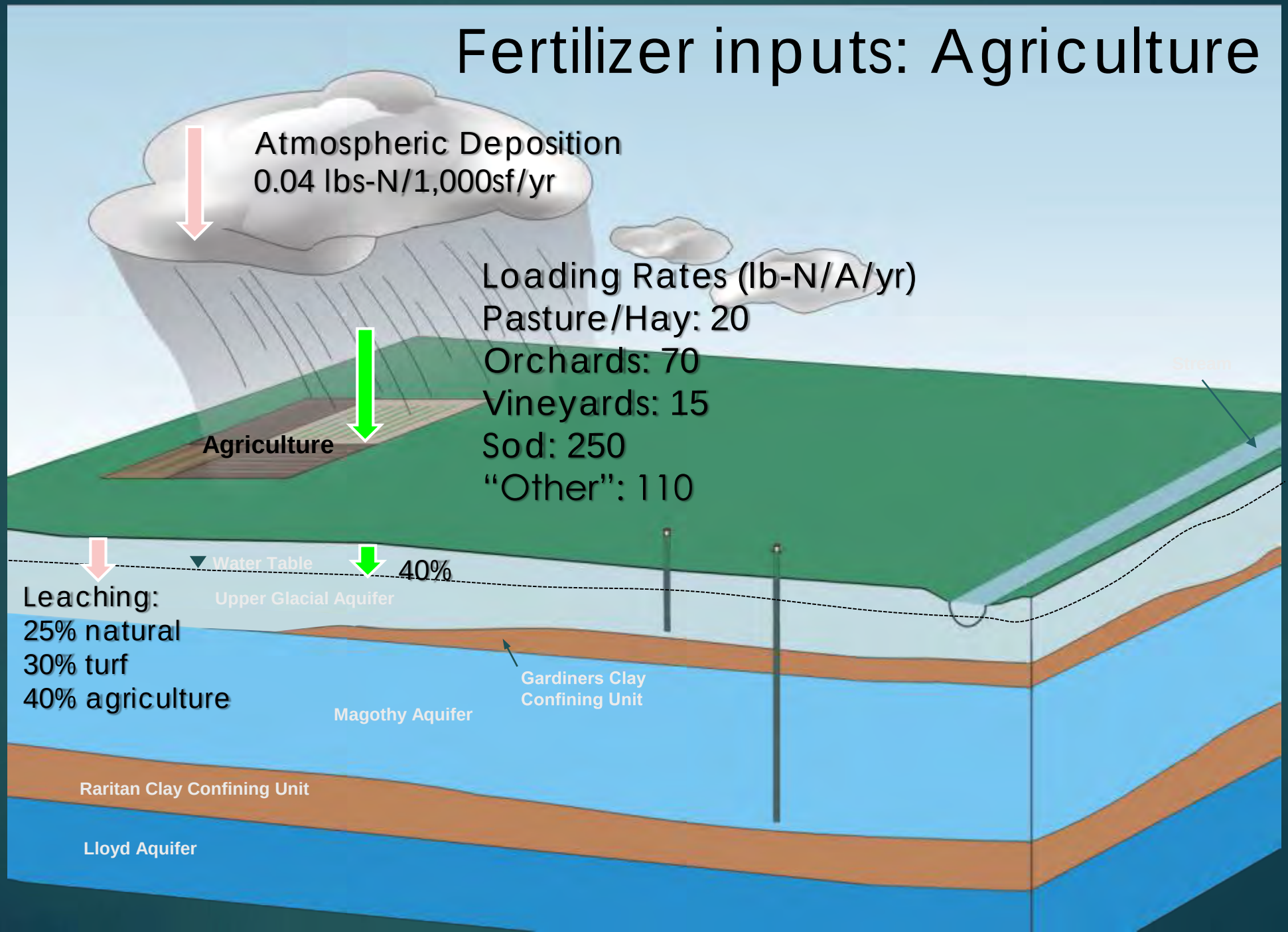
Septic systems outside
200m of shore

Sewer Plants N Output

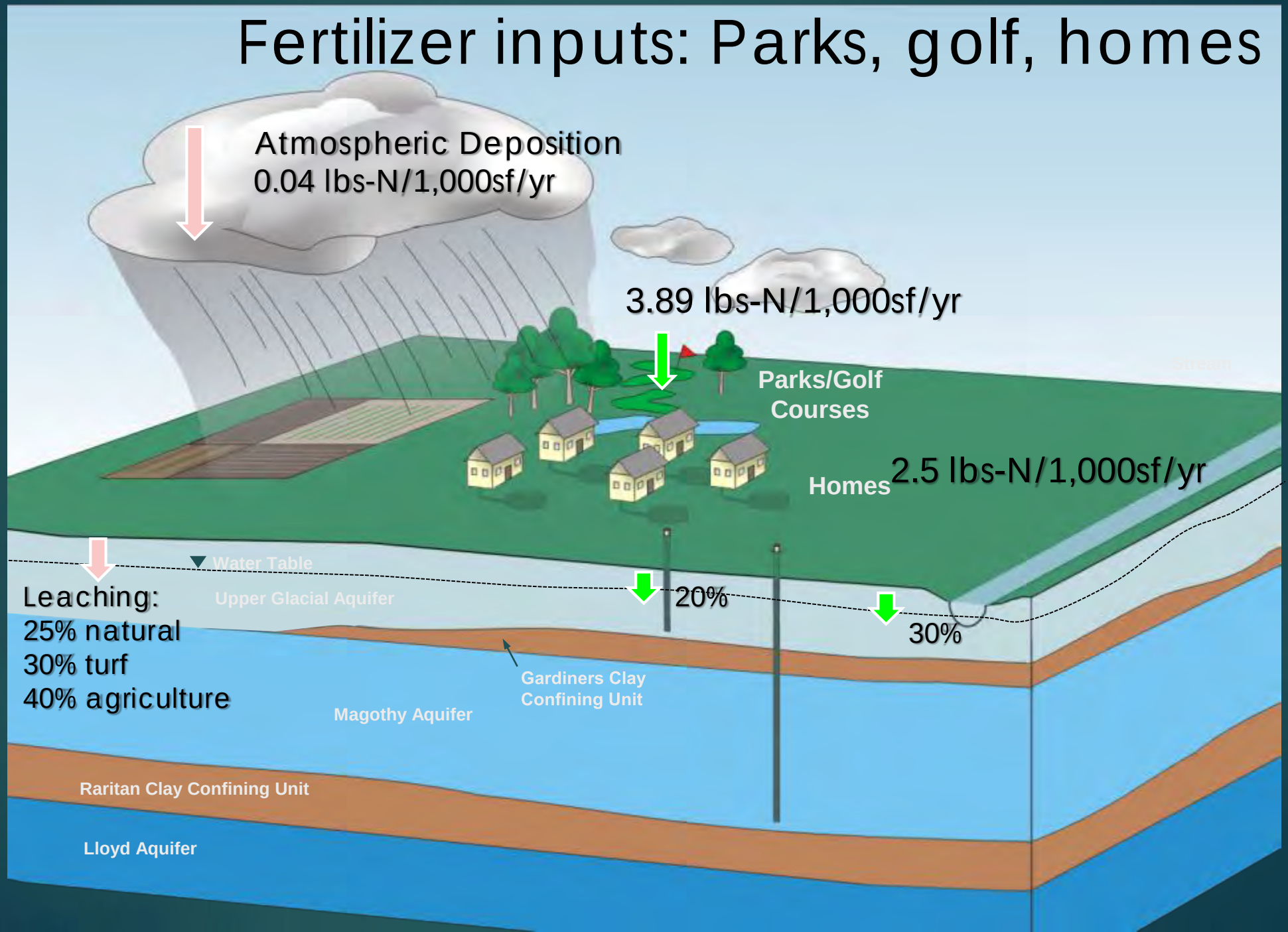


N-Load
from
Wastewater

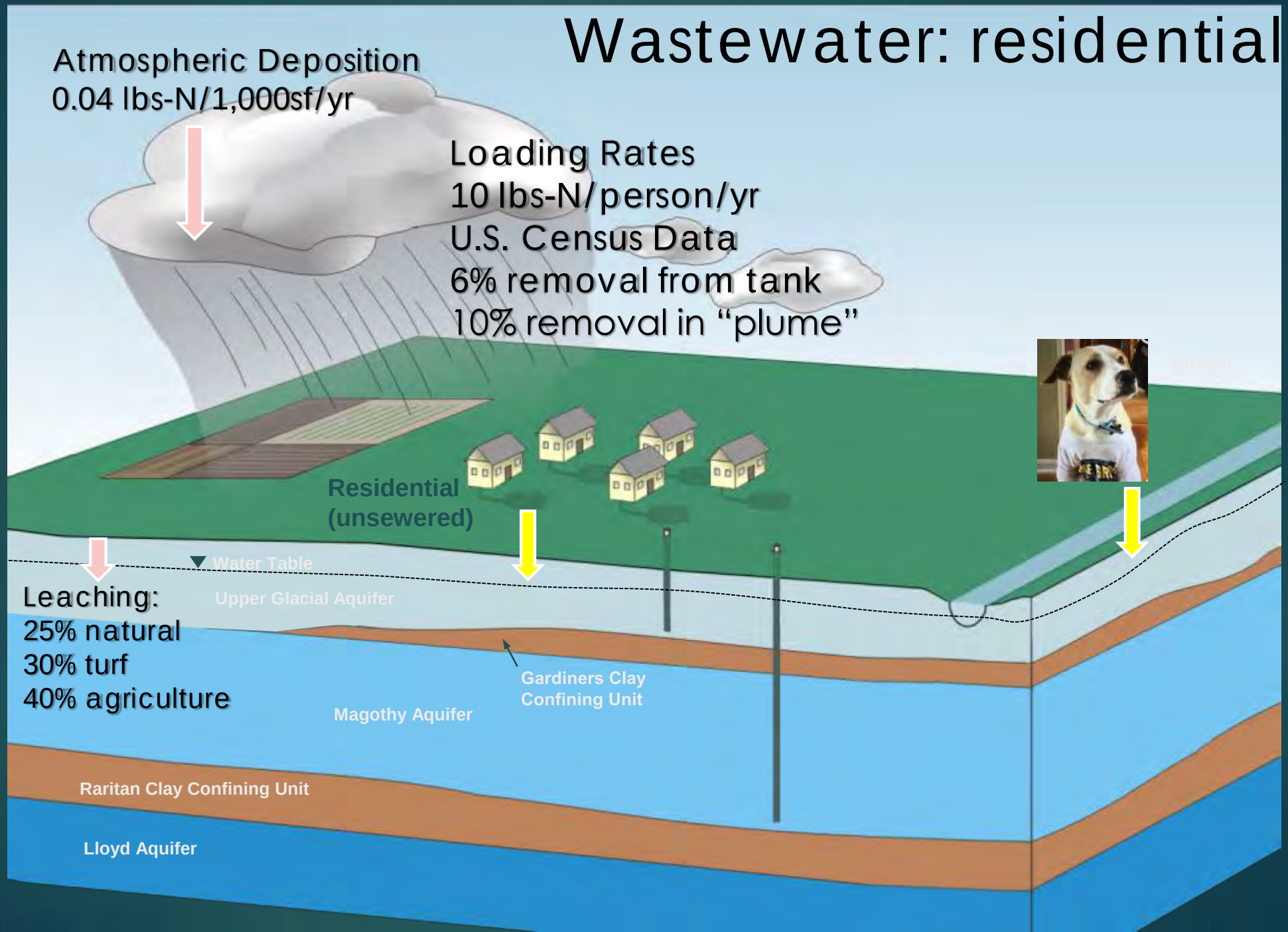
Fertilizer inputs: Agriculture



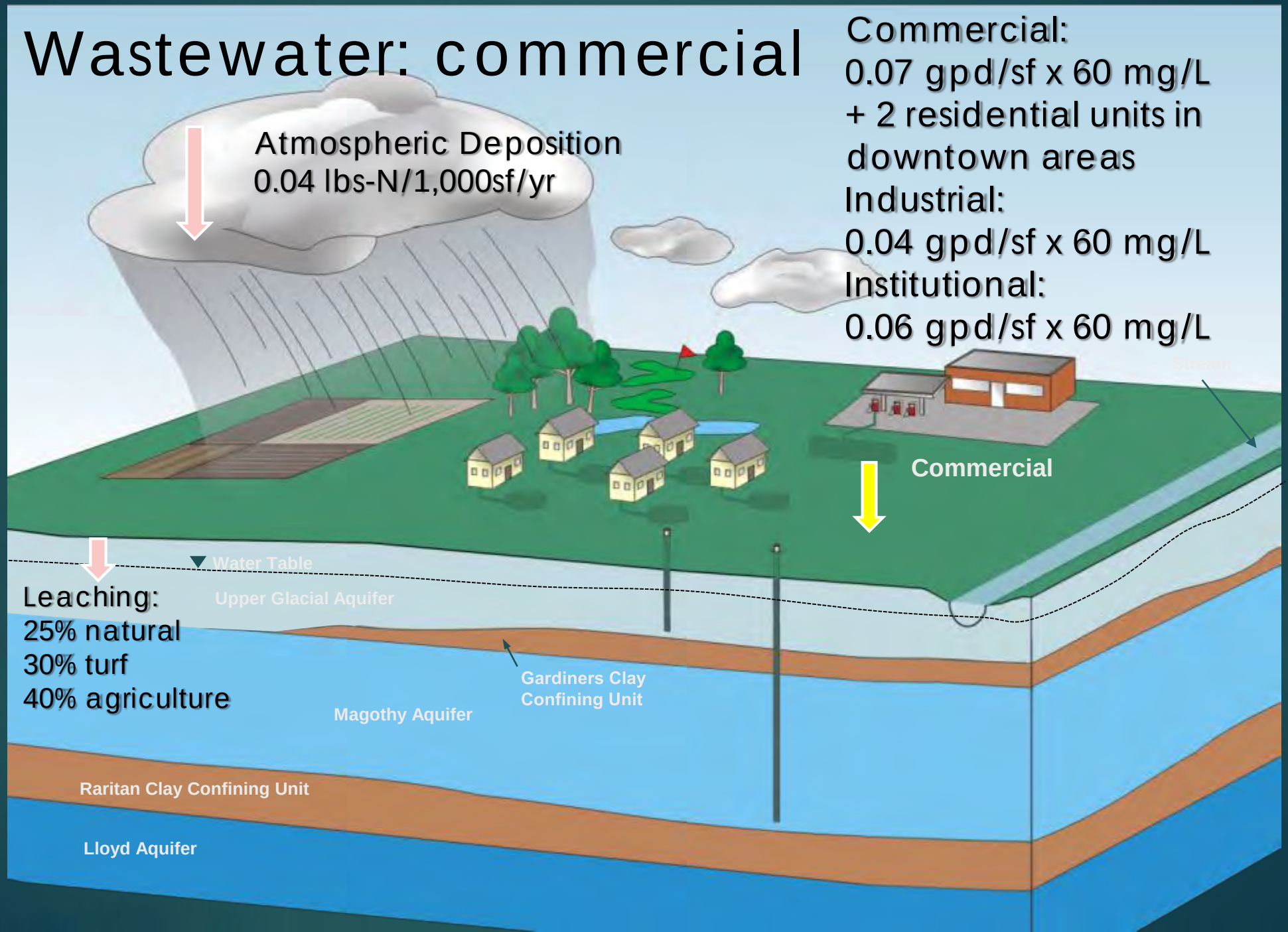
Fertilizer inputs: Parks, golf, homes



Wastewater: residential

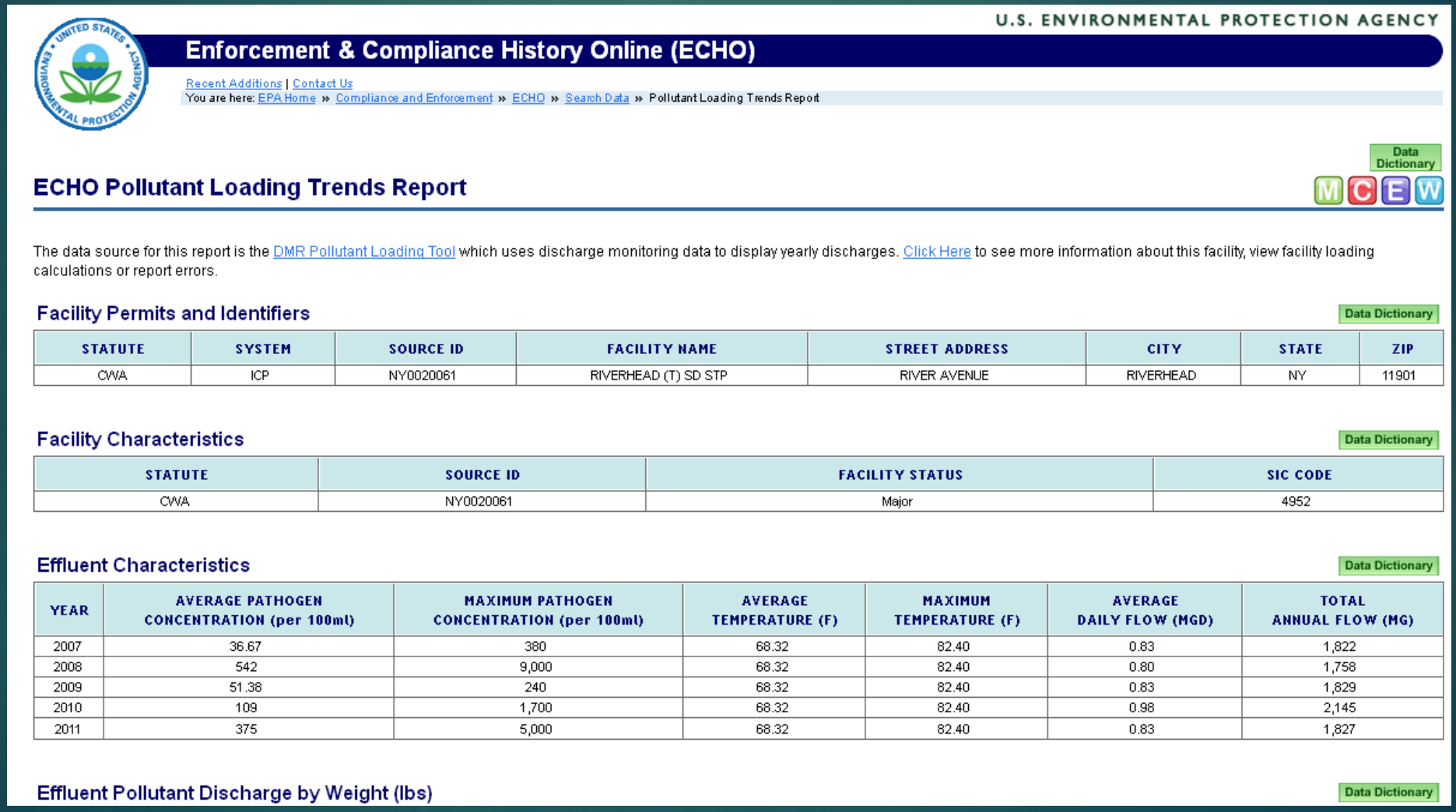


Wastewater: commercial



Sewage treatment plants:

Wastewater (treatment facilities): Flow and concentration data for sewage treatment plants subwatersheds. Averaged across years. Source NYSDEC or EPA- ECHO.



U.S. ENVIRONMENTAL PROTECTION AGENCY

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You are here: EPA Home » Compliance and Enforcement » ECHO » Search Data » Pollutant Loading Trends Report

Data Dictionary

ECHO Pollutant Loading Trends Report

The data source for this report is the DMR Pollutant Loading Tool which uses discharge monitoring data to display yearly discharges. Click Here to see more information about this facility, view facility loading calculations or report errors.

Facility Permits and Identifiers

Data Dictionary

STATUTE	SYSTEM	SOURCE ID	FACILITY NAME	STREET ADDRESS	CITY	STATE	ZIP
CWA	ICP	NY0020061	RIVERHEAD (T) SD STP	RIVER AVENUE	RIVERHEAD	NY	11901

Facility Characteristics

Data Dictionary

STATUTE	SOURCE ID	FACILITY STATUS	SIC CODE
CWA	NY0020061	Major	4952

Effluent Characteristics

Data Dictionary

YEAR	AVERAGE PATHOGEN CONCENTRATION (per 100ml)	MAXIMUM PATHOGEN CONCENTRATION (per 100ml)	AVERAGE TEMPERATURE (F)	MAXIMUM TEMPERATURE (F)	AVERAGE DAILY FLOW (MGD)	TOTAL ANNUAL FLOW (MG)
2007	36.67	380	68.32	82.40	0.83	1,822
2008	542	9,000	68.32	82.40	0.80	1,758
2009	51.38	240	68.32	82.40	0.83	1,829
2010	109	1,700	68.32	82.40	0.98	2,145
2011	375	5,000	68.32	82.40	0.83	1,827

Effluent Pollutant Discharge by Weight (lbs)

Data Dictionary

Missing Data

The model is 90% done. Outstanding needs include.

- Freshwater wetlands: Publicly available shapefile is clearly wrong.
- Sewersheds for Suffolk and Queens Counties (some of the watersheds of Nassau extend into these counties).
- Outfall Locations of Sewer Plants (Not facility location)
- Roads: The shapefile available is for roads only has two categories: Local and Secondary. It would be nice to get a shapefile with more divisions, but maybe this is not necessary.

Next steps

- Apply residence times to nitrogen loading rates to determine nitrogen residence times.
- Compiled water quality data from across the north and south shore to compare to nitrogen residence times.
- Rank watersheds?