

Our World Depends on Us.

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nature.ny

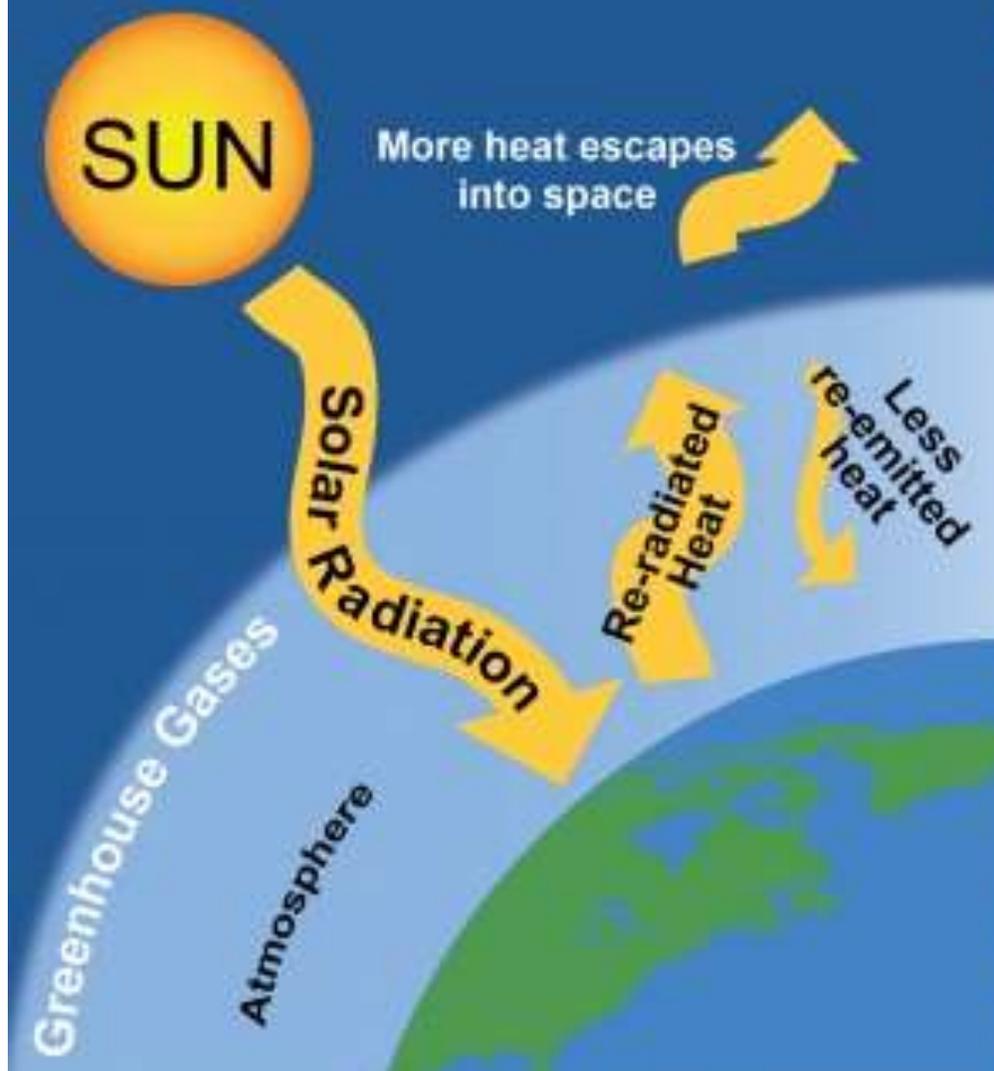


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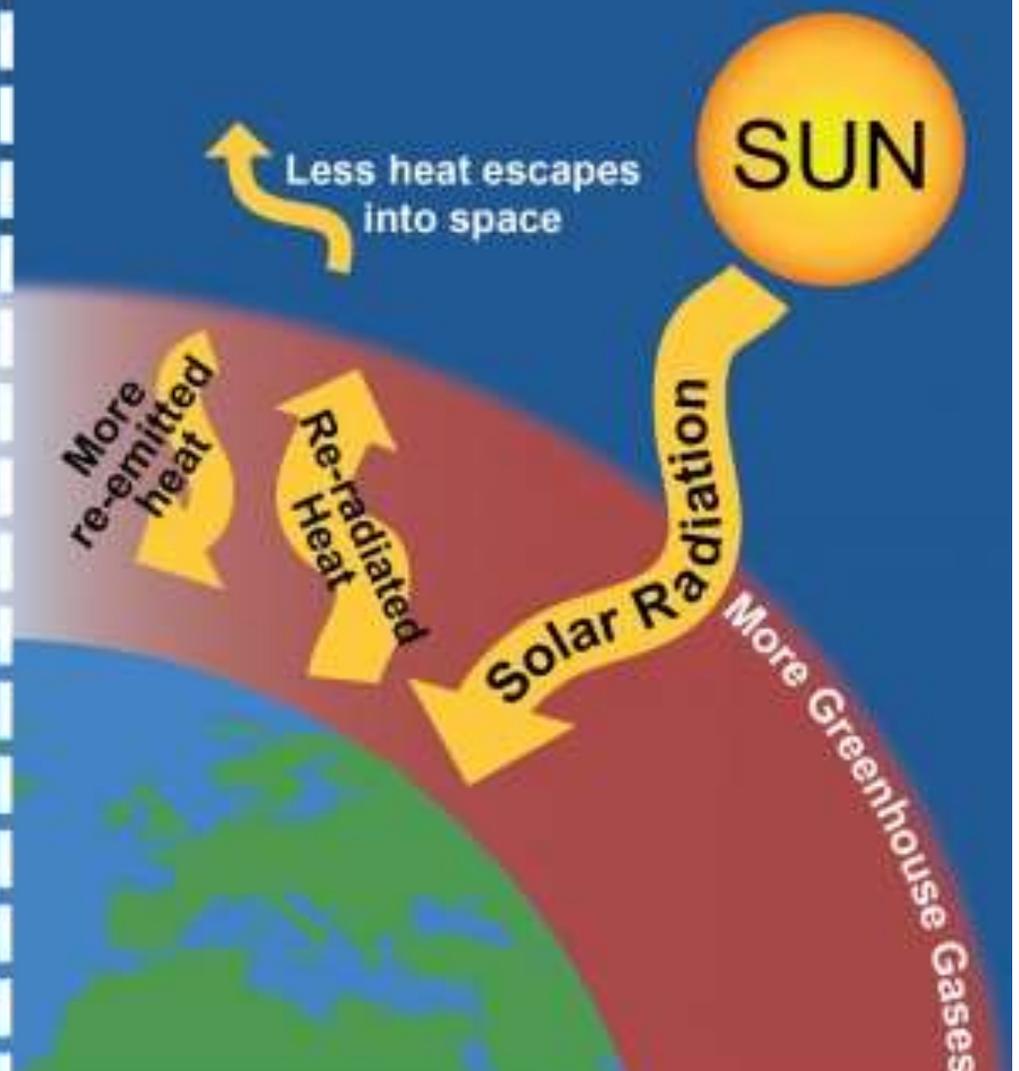
**Despite the challenges
our planet faces,
We believe that
nature and humanity will thrive together**



Natural Greenhouse Effect



Human Enhanced Greenhouse Effect



Weather Becomes More Extreme

NEW YORK CLIMATE RISK REALITY

THREE TRILLION DOLLARS

of NY Coastal Property at Risk

**Every Single New York
Citizen**

Lives in a county affected by at least one
weather disaster since 2010



Sea Level Rises



Department of Environmental Conservation

6 NYCRR Part 490, Projected Sea-level Rise

HIGH PROJECTION FOR SEA-LEVEL RISE IN NEW YORK STATE

Mid-Hudson Region New York City Long Island

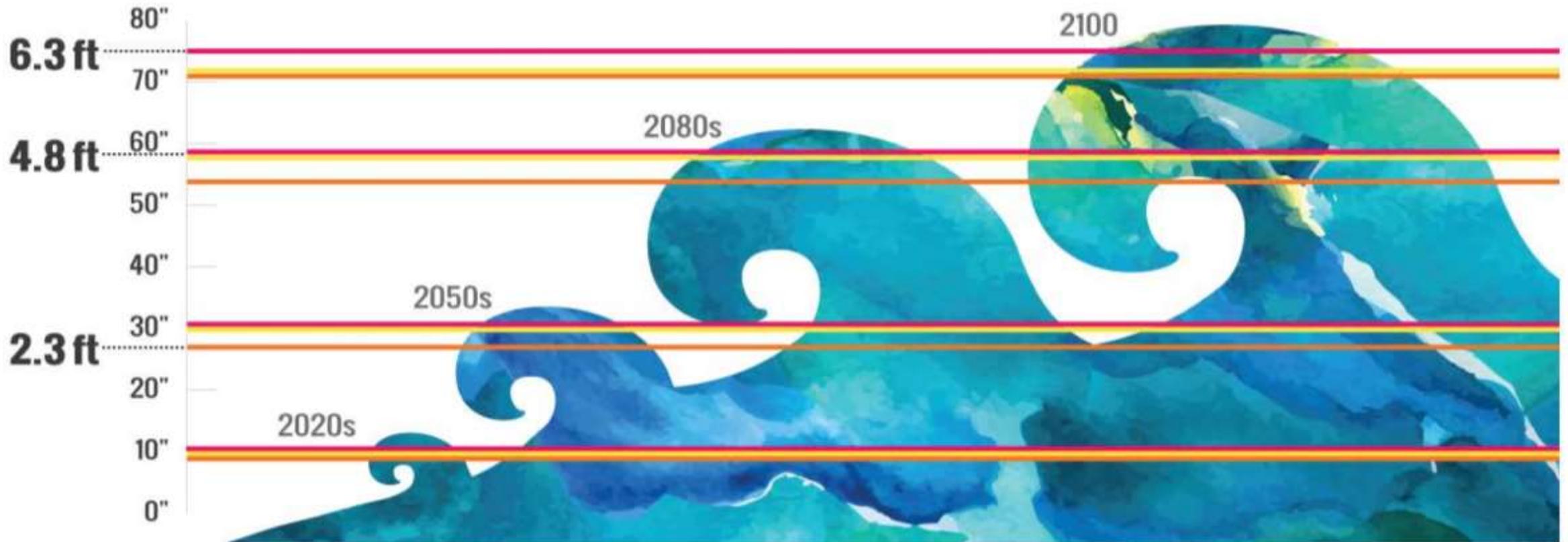




Photo: Mike Busch, Great South Bay Images

New York Homes At Risk For Chronic Flooding

RATE OF GLOBAL SEA LEVEL RISE



HIGHEST RISK

Queens
Hempstead
Babylon
Islip
Brookhaven
Southampton

BY THE YEAR 2045



15,486 homes



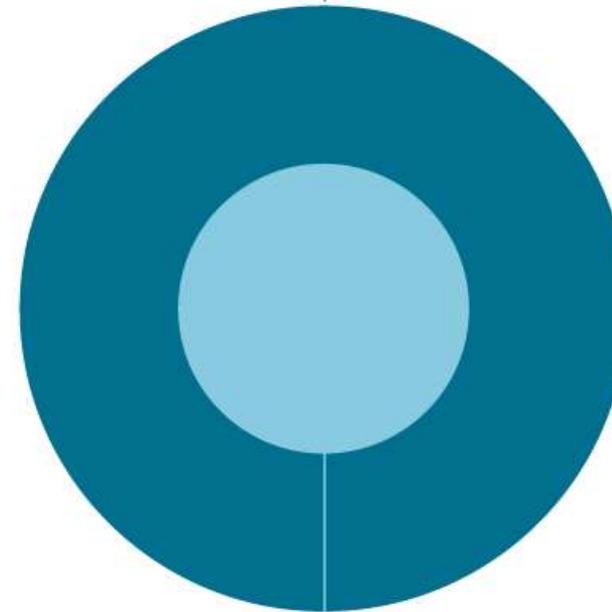
4,639 homes

**Moderate global sea level rise projected for 2035*

BY THE YEAR 2100



143,134 homes



68,491 homes

Not just flooding, but erosion is a related risk



MITIGATION: Actions that address the root causes of climate change such as reducing greenhouse gas emissions

Ex. renewable energy

ADAPTATION: Actions that seek to lower the risks posed by the consequences of climatic changes.

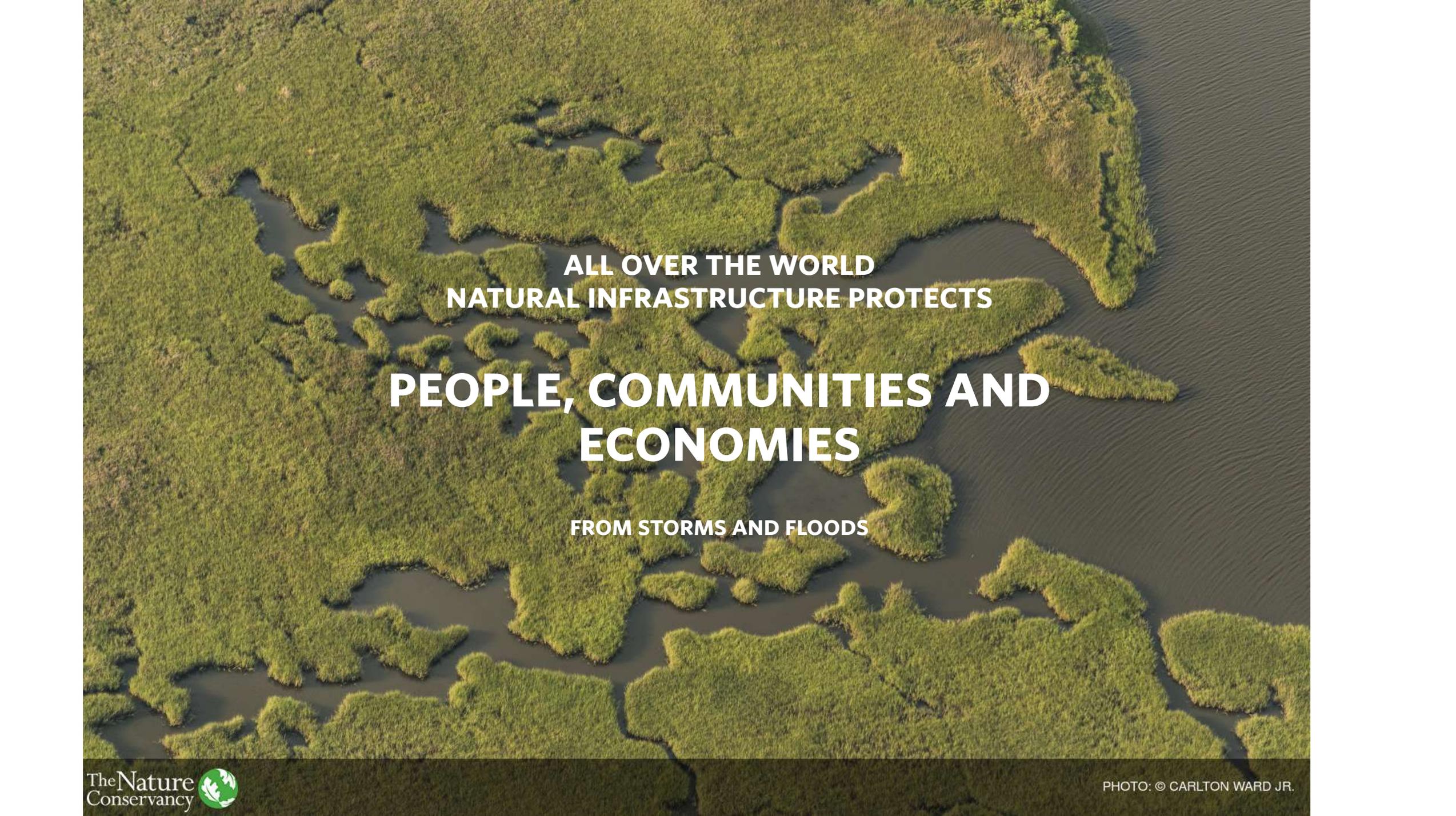
Ex. elevate buildings

Coastal Resilience

A coastal landscape featuring a sandy beach in the foreground, a small pond with several dark logs floating in it, and tall grasses along the shoreline. The background shows a wide expanse of water under a cloudy sky.

WHAT DOES THAT MEAN?

- **Clean Water**
- **Dynamic Sediment**
- **Room to Move**
- **Full Tidal Range**
- **Thriving Communities**



**ALL OVER THE WORLD
NATURAL INFRASTRUCTURE PROTECTS
PEOPLE, COMMUNITIES AND
ECONOMIES**

FROM STORMS AND FLOODS



Image: Delaware Center for the Inland Bays



During Hurricane Sandy, wetlands prevented **\$625,000,000** in flood damages in New York and New Jersey.

Wetlands in front of properties reduce their annual flood losses by an average of 16%, and up to 70% in some locations.



Flood Adaptation Hierarchy

Protect Undeveloped Floodplains

Un-develop and Restore Floodplains

Passive Risk Reduction

Active Risk Reduction

Nature-based Engineered Risk Reduction

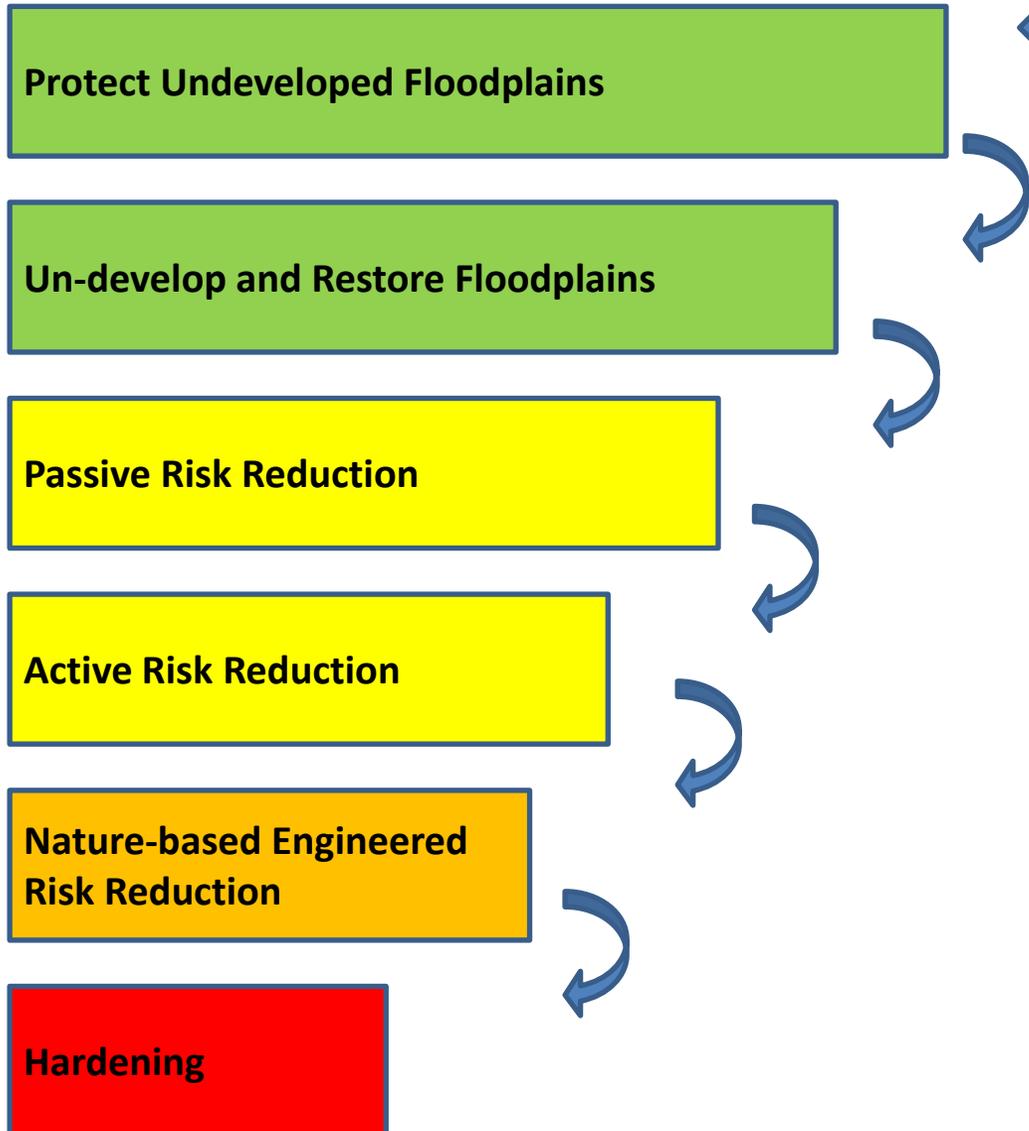
Hardening

← Start Here



¹Coastal Zone Management Subgroup of the first IPCC climate change assessment report (Dronkers et al. 1990)

Flood Adaptation Hierarchy



Start Here

Smart choices are:

Big picture, long term.

Facilitate this through:

- Incentives,
- Regulations,
- Planning



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Save the Sound[®]

Action for our region's environment.

STORMWATER: A GROWING CONCERN

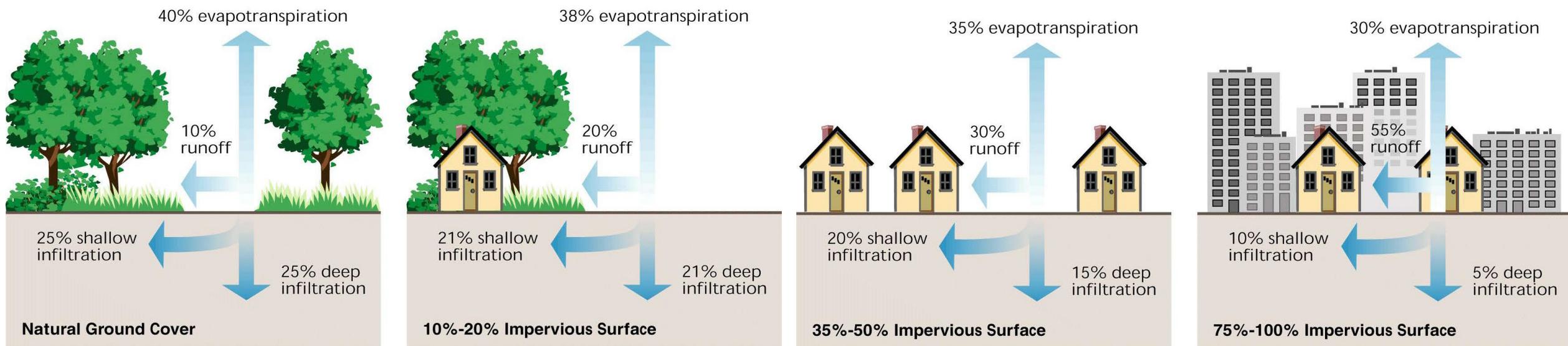
Tracy Brown

Regional Director, Water Protection

Save the Sound



RAIN/SNOW OR STORMWATER?



10% Runoff = Stormwater



55% Runoff = Stormwater

IMPERVIOUS SURFACE : www.SoundHealthExplorer.org



SWIMMABLE



FISHABLE



LIVABLE

EXPLORE

ABOUT

TAKE ACTION

DONATE



LEARN ABOUT GRADES

Search...

+ INDICATORS

- MAP LAYERS

- Open Water
- Bays and Harbors
- Wastewater Treatment Plants
- Combined Sewer Outflows
- Boat Launches
- Kayak Launches
- Environmental Justice Areas
- Watershed
- Coastal Watersheds
- Impervious Surfaces

≥ 0% ≥ 5% ≥ 10% ≥ 15% ≥ 20%

≥ 25%

Areas covered by impenetrable materials such as asphalt, stone or rooftops.

Connecticut Shellfish



2008

2009

2010

2011

2012

2013

2014

2015

2016

2017

2018

2019



13in

18in

10in

21in

16in

18in

14in

10in

6in

10in

8in

16in

Wednesday, April 21, 20...

Wed 5:27 PM (Local tir

Wed 5:27 PM (Clock 1)



CONCERN #1 : WATER QUALITY

Conveyance System for Pollution

Fecal Bacteria

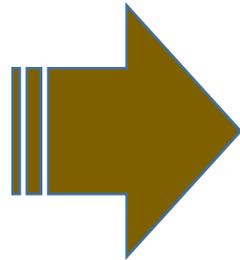
Nutrients (i.e. nitrogen)

Pesticides

Trash & Litter

Heavy Metals

Toxins (i.e. motor oil)





CONCERN #2 : WATER QUANTITY (FLOODING)



Climate Change =

Increasing rain event frequency and intensity in our region

- **More flooding**
- **More SSOs, CSOs**



STORMWATER LAWS & REGULATIONS



National Pollution Discharge Elimination System (NPDES)

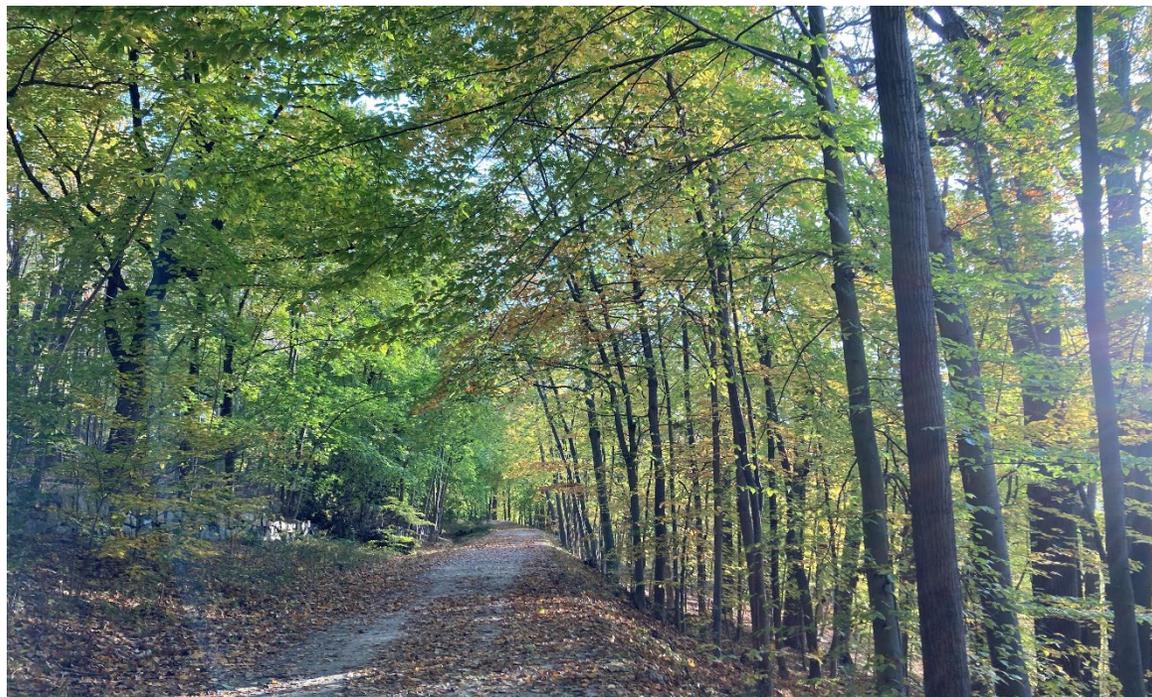
- Nonpoint Source Pollutant
- MS4 Permit (Municipal Separate Storm Sewer System)
- Impaired Waters 303(d) list for stormwater
- TMDL (Total Maximum Daily Load)



STORMWATER MANAGEMENT STRATEGIES



PROTECT GREEN SPACES



Land Conservation

Plant Stream & Coastal Buffers





REDUCE IMPERMEABLE SURFACES



**Sunken Meadow State Park:
18 acres of parking lot retrofitted with
Green Infrastructure by Save the Sound**



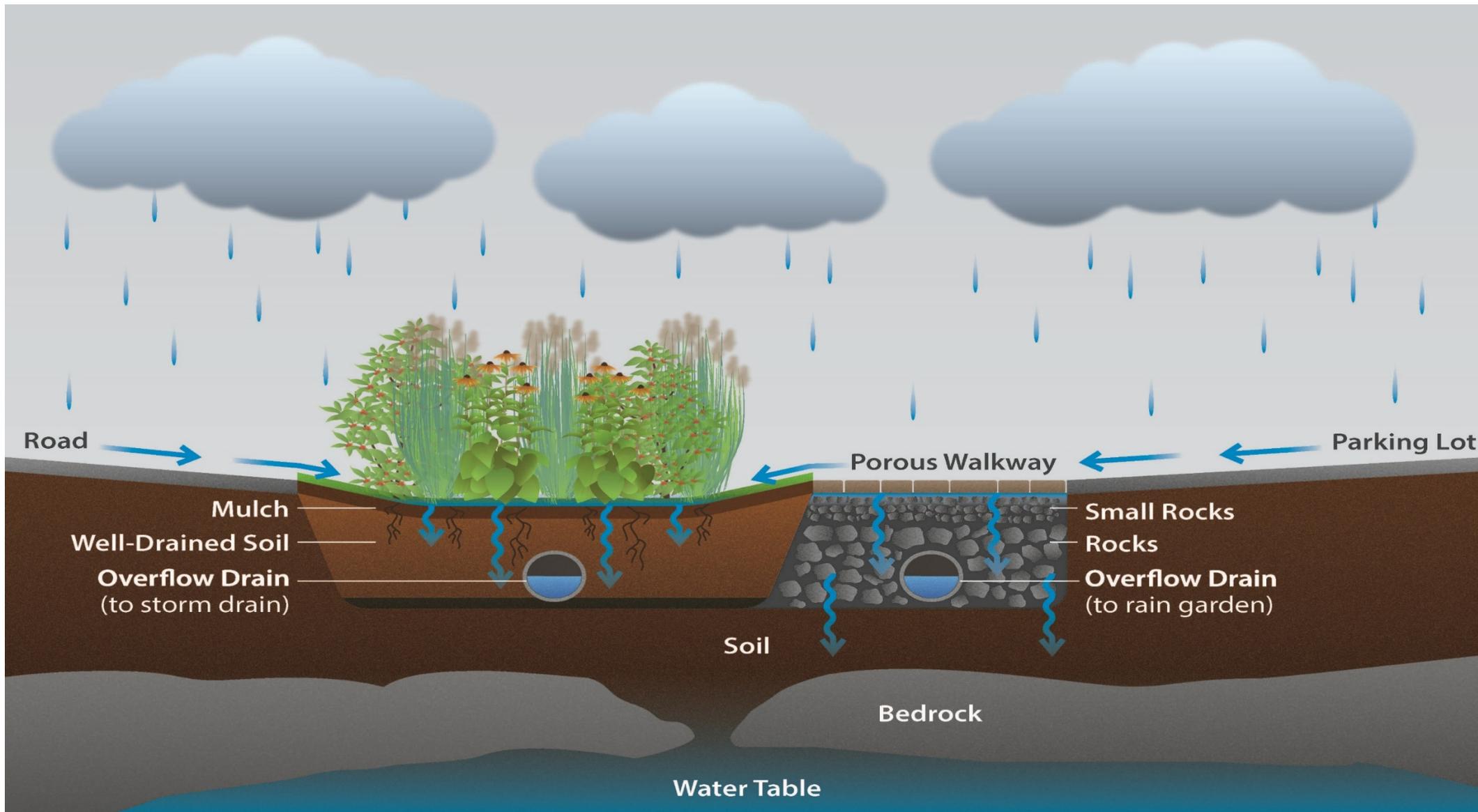
GREEN (NOT GREY) INFRASTRUCTURE: SLOW THE FLOW



Bioswales, Rain Gardens, Green Roofs



GREEN INFRASTRUCTURE





SLOW, STORE AND REUSE



Rain Barrels



Dry Wells



EDUCATE & ENGAGEMENT THE PUBLIC





Save the Sound[®]

Action for our region's environment.



Thank You!

www.SaveTheSound.org



@savethesoundct

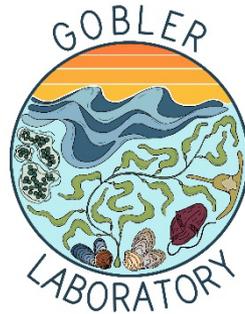


@cfe.savethesound



@savethesound

Role of rising nitrogen in groundwater in effecting water quality and human health



Stony Brook
University

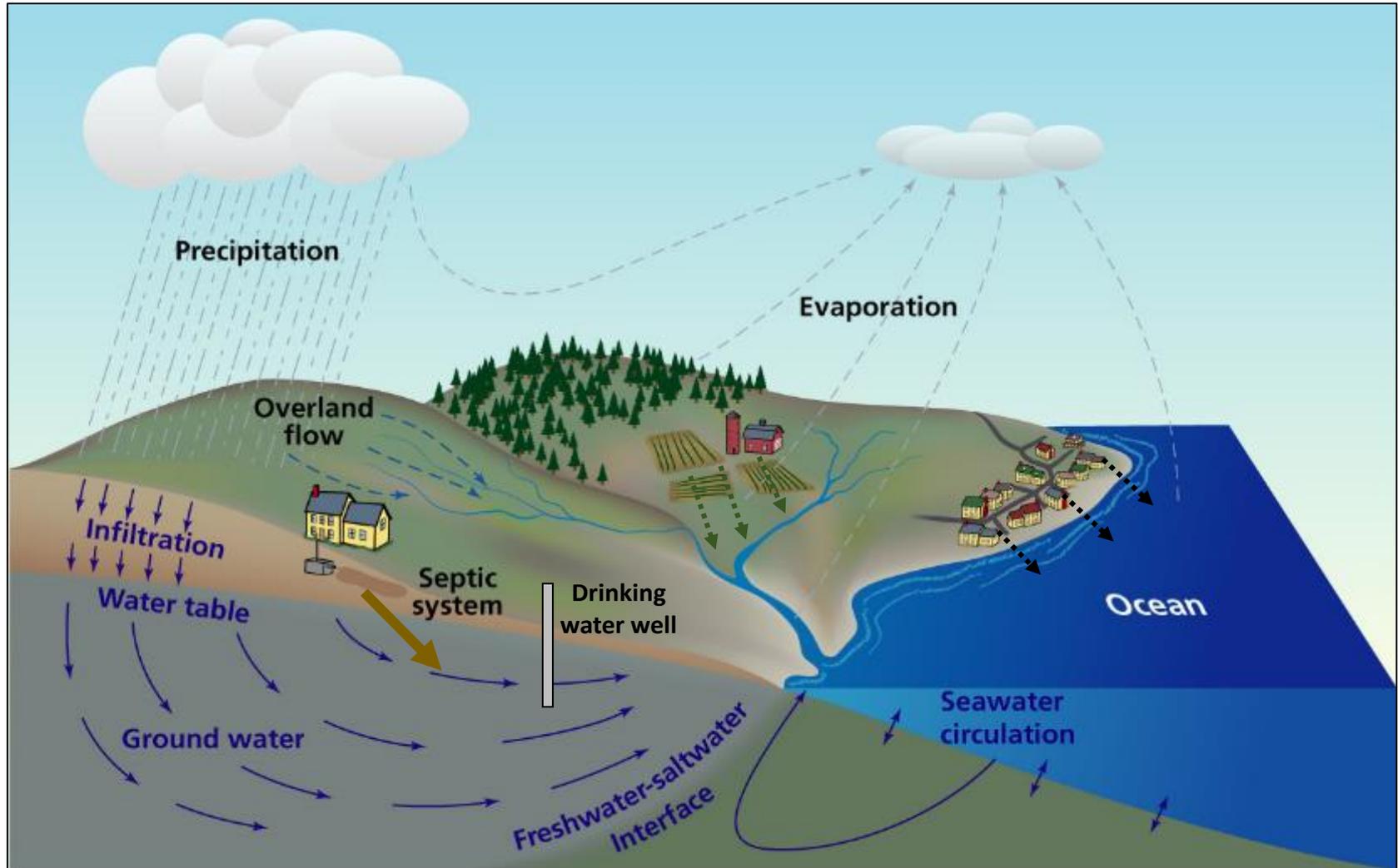


Chris Gobler

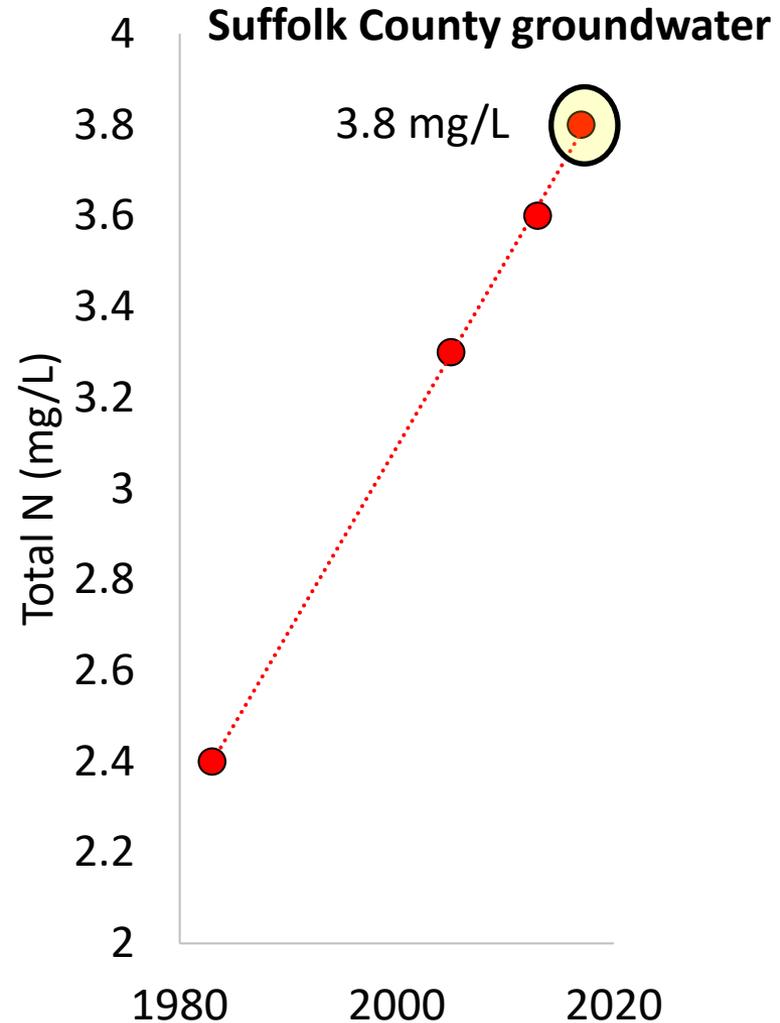
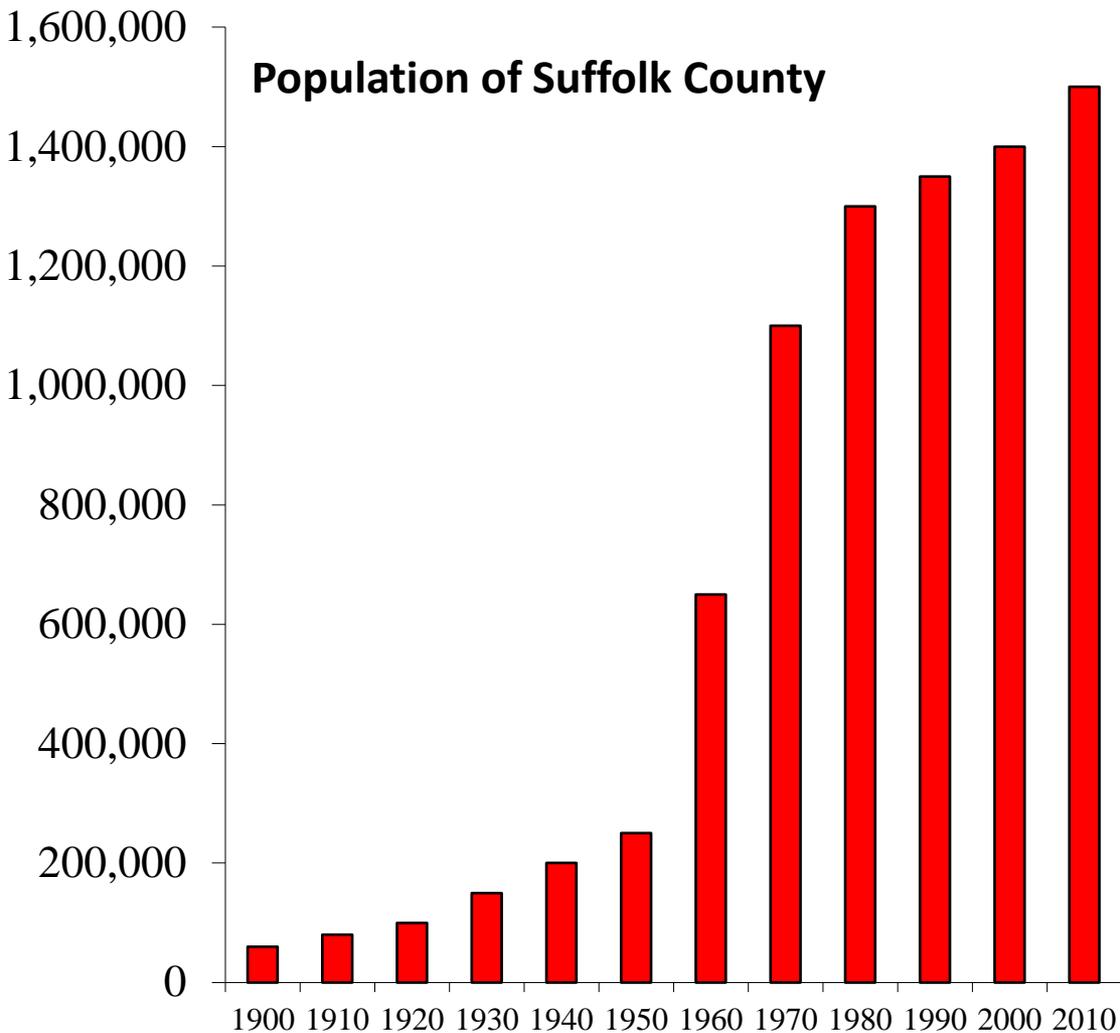


All of Long Island is a watershed-

Materials from land are washed into our sole source aquifer and surface waters.

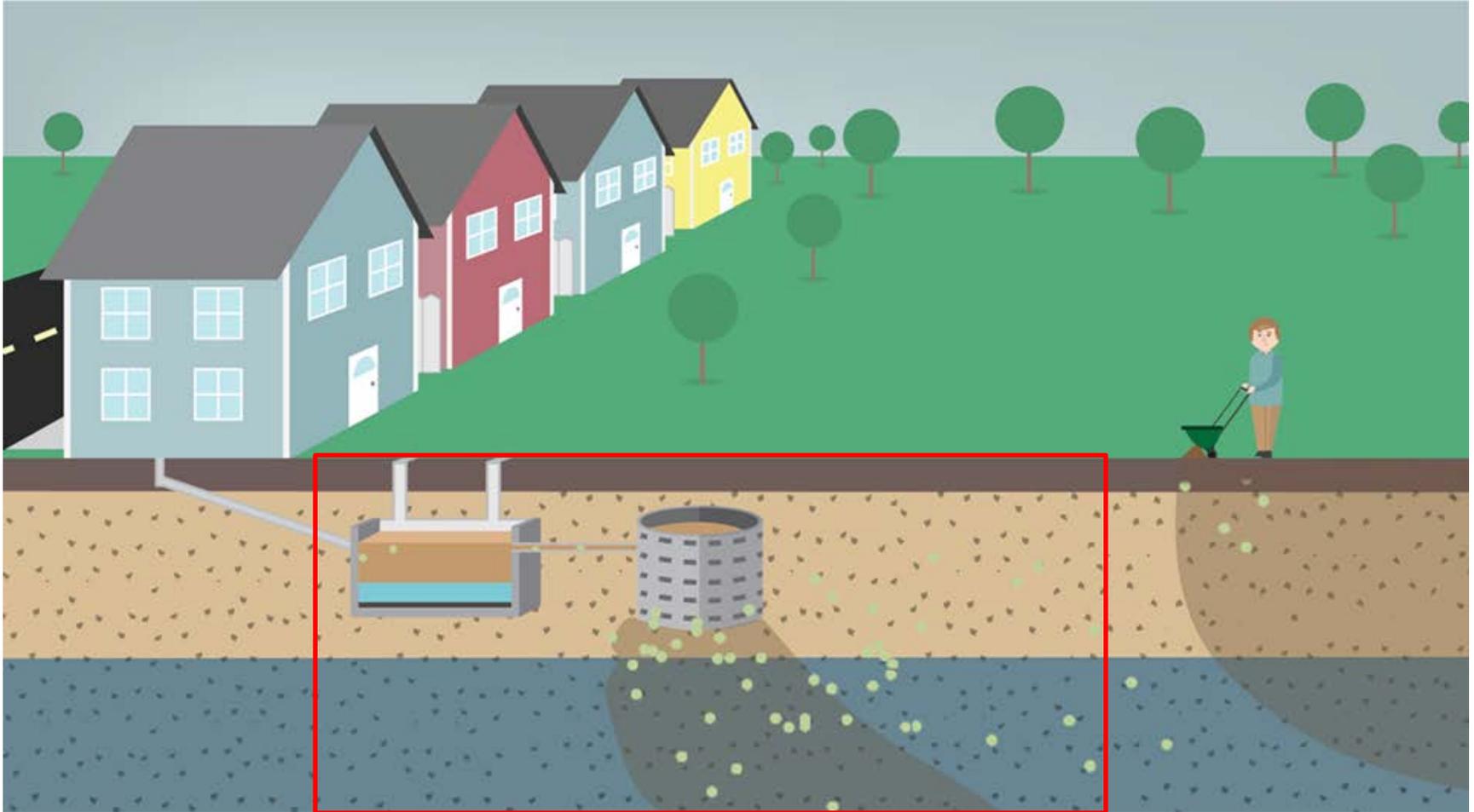


Expanding population, nitrogen levels



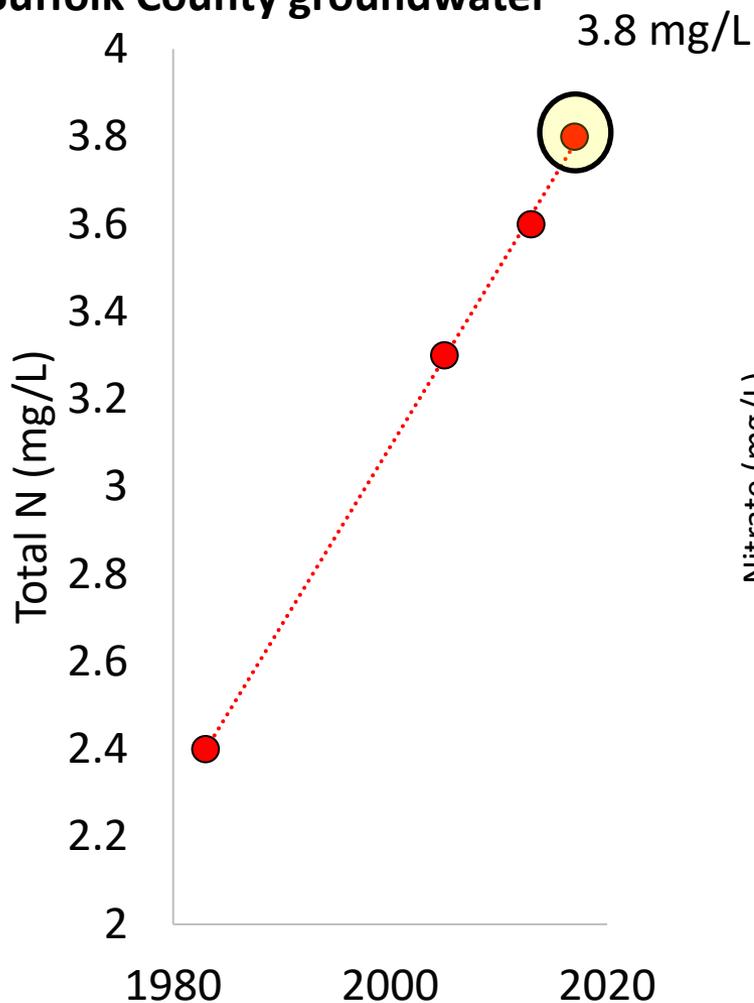
Most nitrogen loading from wastewater

(Kinney and Valiela, 2011; Lloyd 2014, 2016; Gobler and Stinette, 2016; SCSWP, 2020; NCSWP, 2020)

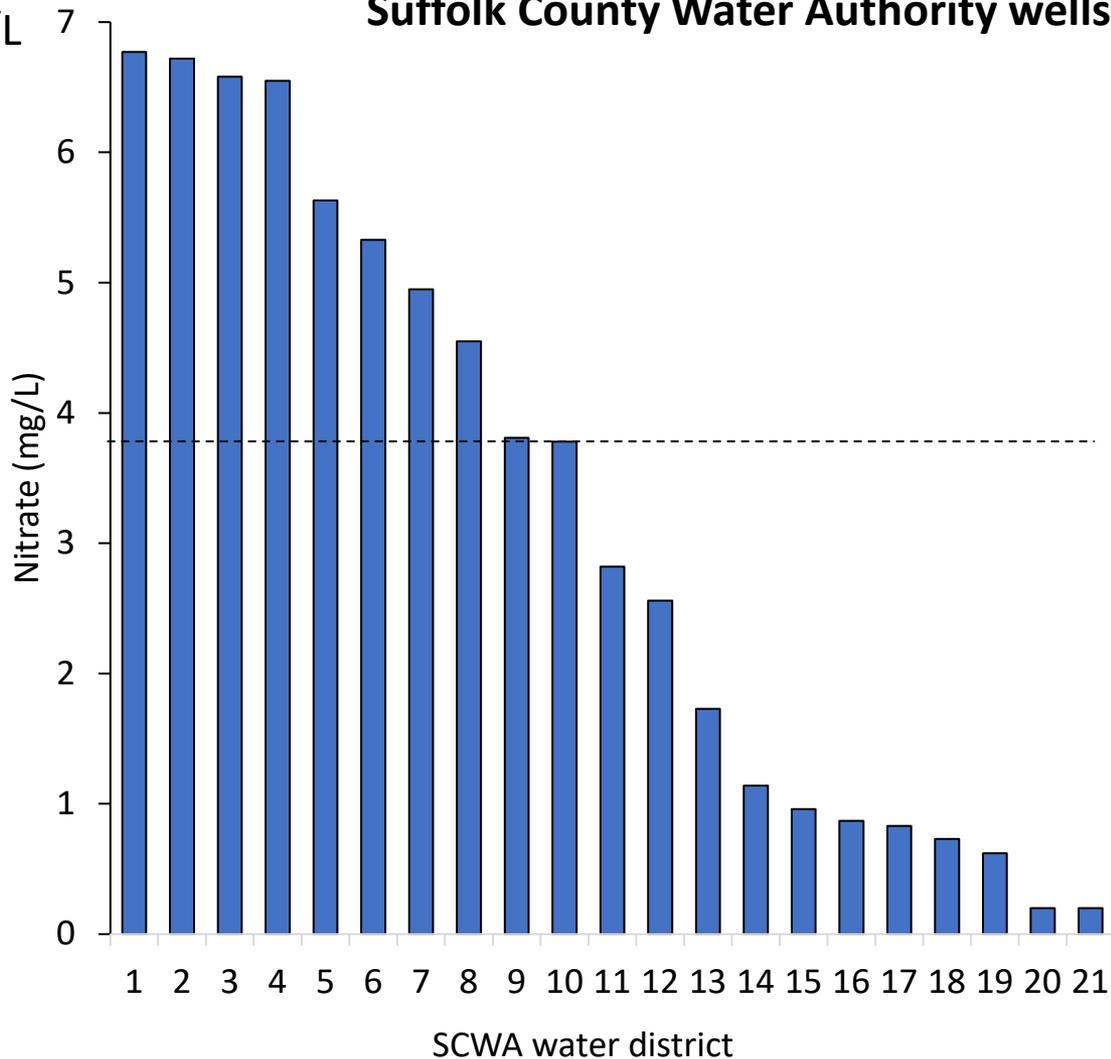


The public health threat of high nitrate in drinking water

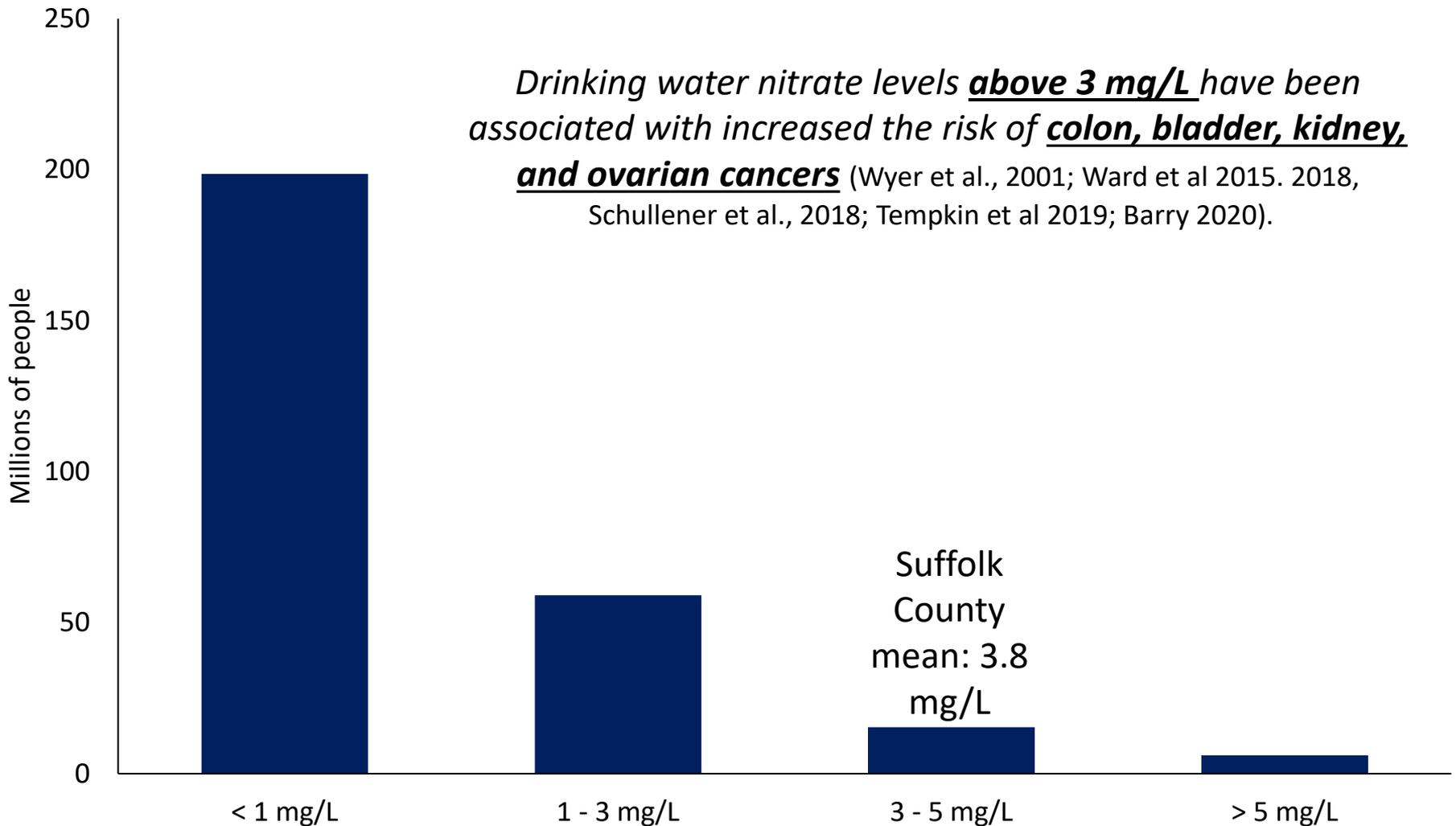
Suffolk County groundwater



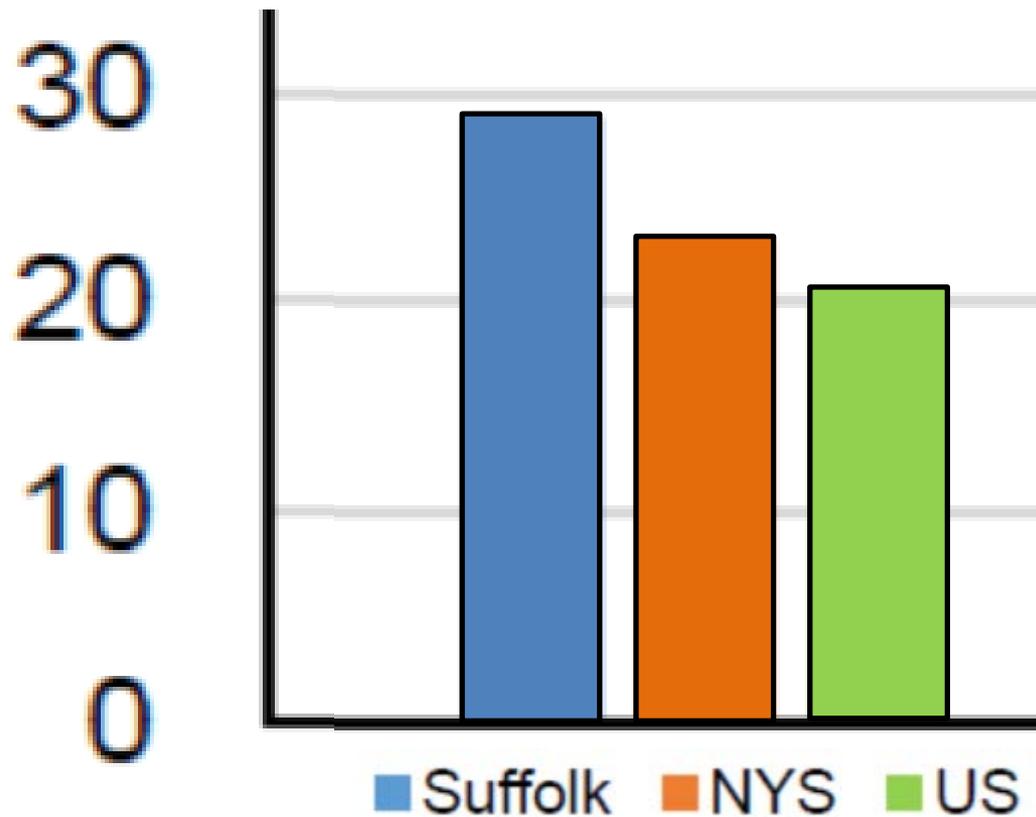
Suffolk County Water Authority wells



Suffolk County public water is in the top 5% of nitrate levels in the US

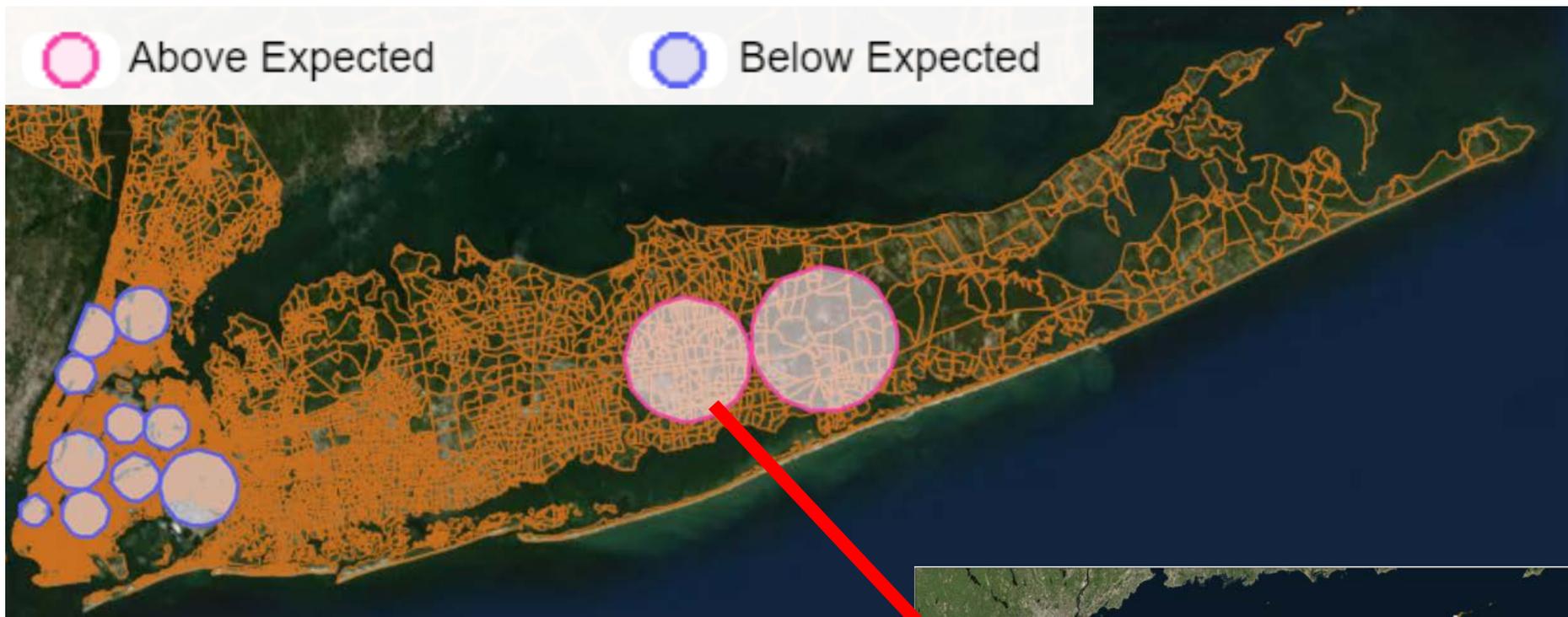


Bladder cancer cases (per 100,000), Suffolk v NY v US

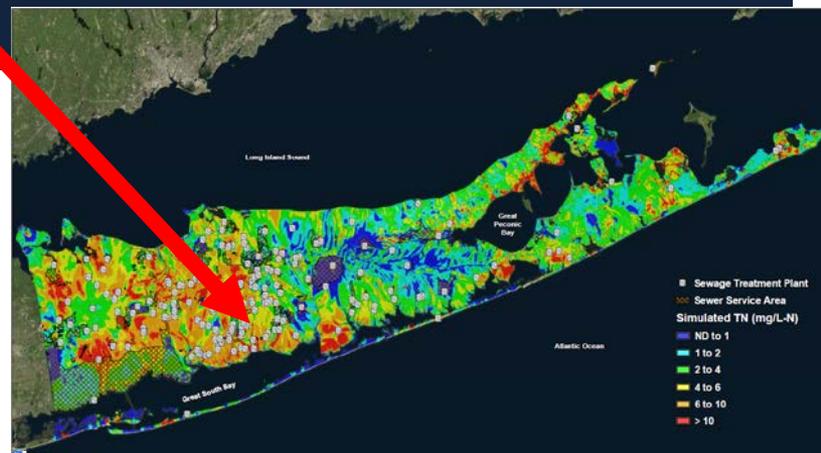


Bladder cancer

NYSDOH data, 2012-2016

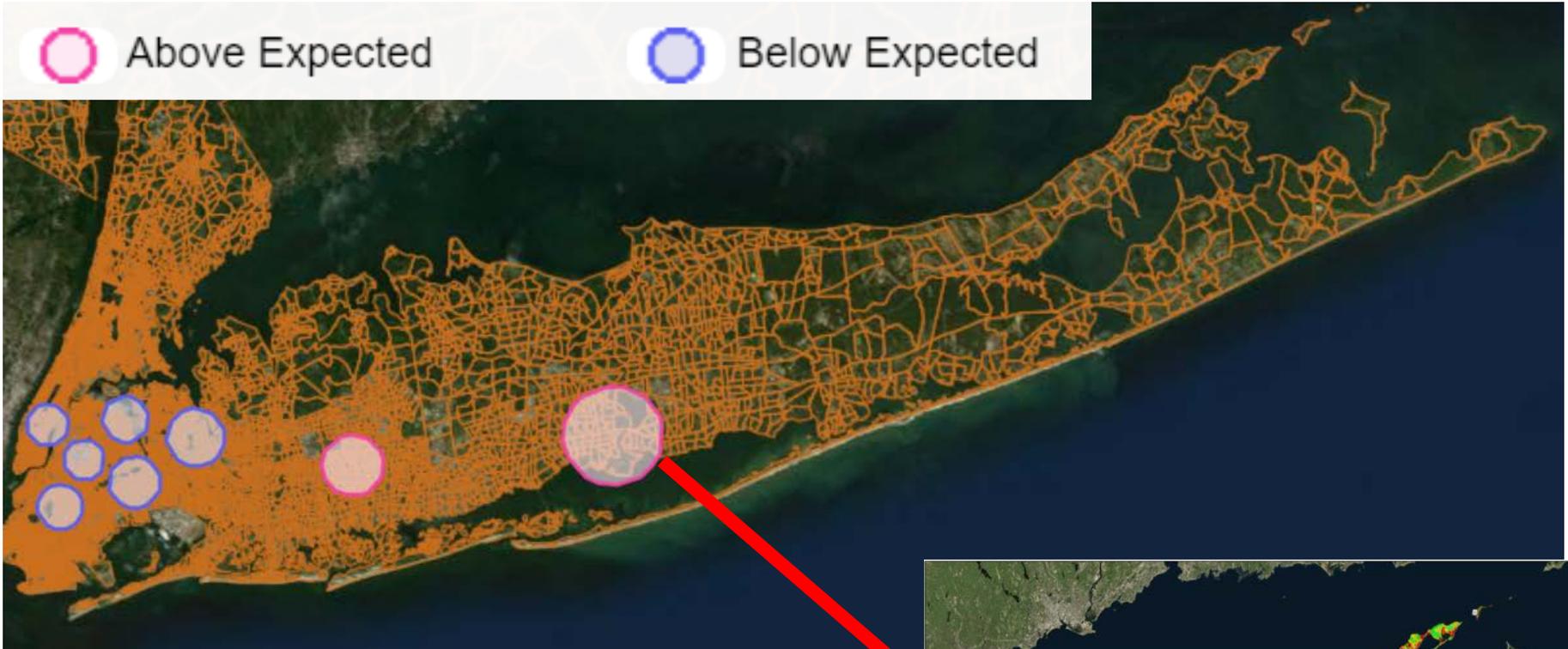


High nitrate in drinking water associated with bladder cancer (Weyer et al., 2001; Zegers, 2006; Espejo-Herrera, 2015; Jones 2016; Ward et al 2005, 2018).

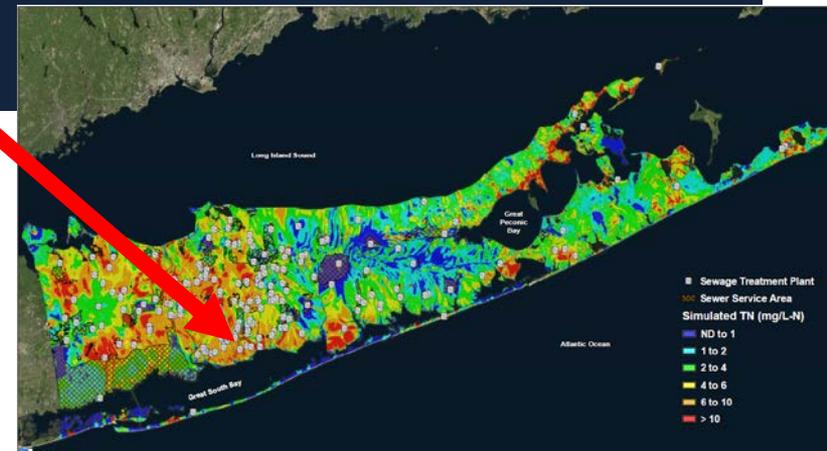


Kidney cancer

NYSDOH data, 2012-2016



High nitrate in drinking water associated with kidney cancer (Ward et al., 2007; Jones 2017; Ward et al 2005, 2018; Tempkin et al. 2019).

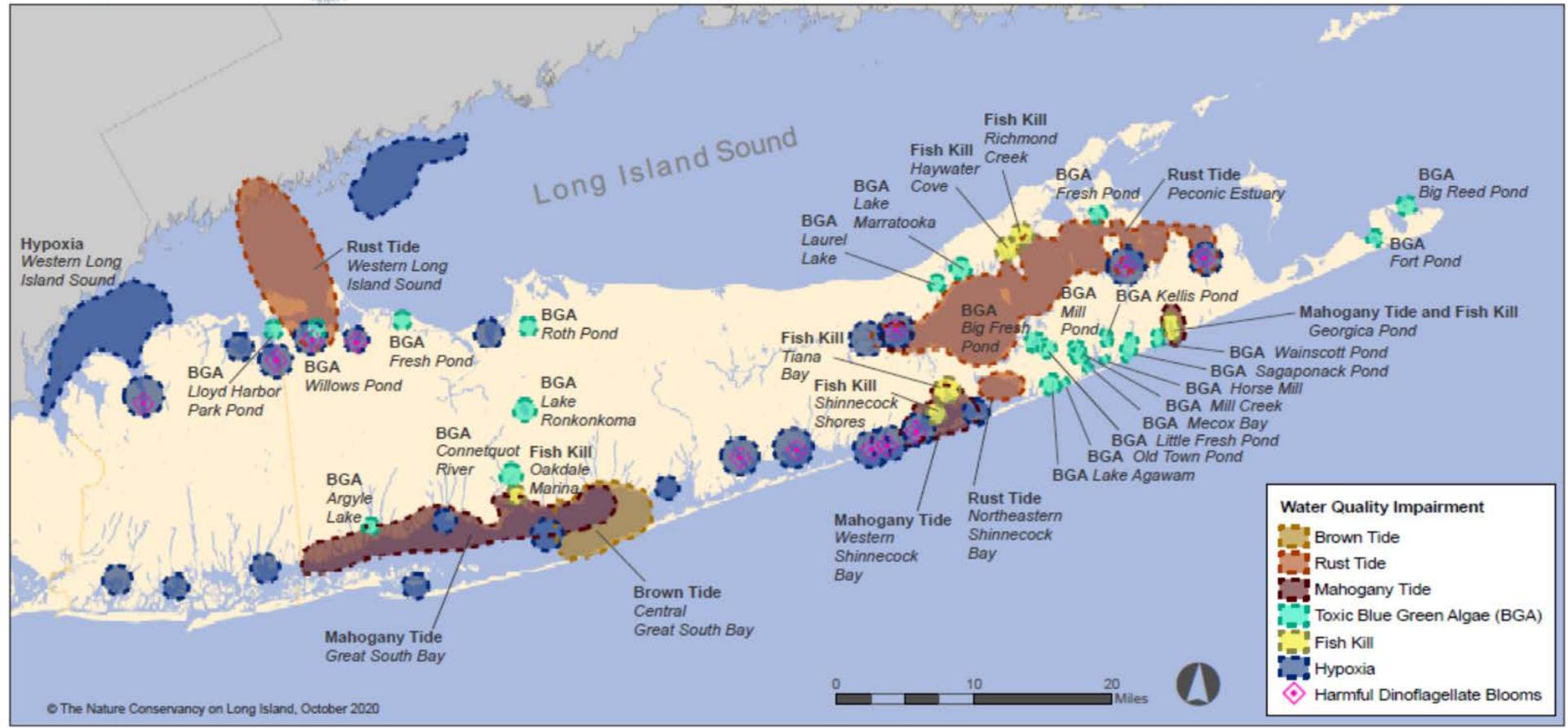


Nitrate in drinking water and health of Long Islanders

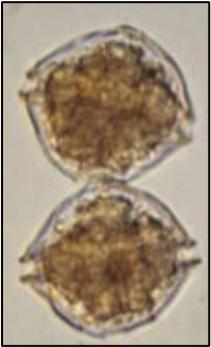
- Suffolk County has higher nitrate levels in its drinking water greater than 95% of U.S.
- Multiple epidemiological studies have found statistically elevated cancer risks at nitrate levels equal to or lower than the mean level in Suffolk County.
- There are elevated rates of bladder and kidney cancer in communities with high nitrate in drinking water and normal lung cancer rates.



Long Island Water Quality Impairments Summer 2020



Harmful algal blooms across Long Island



PSP



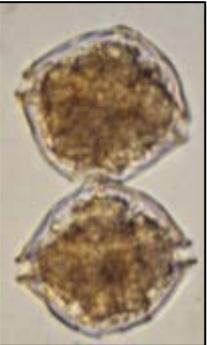
Toxic blue green algae



DSP



Harmful algal blooms across Long Island



PSP



Toxic blue green algae



DSP



Brown tide



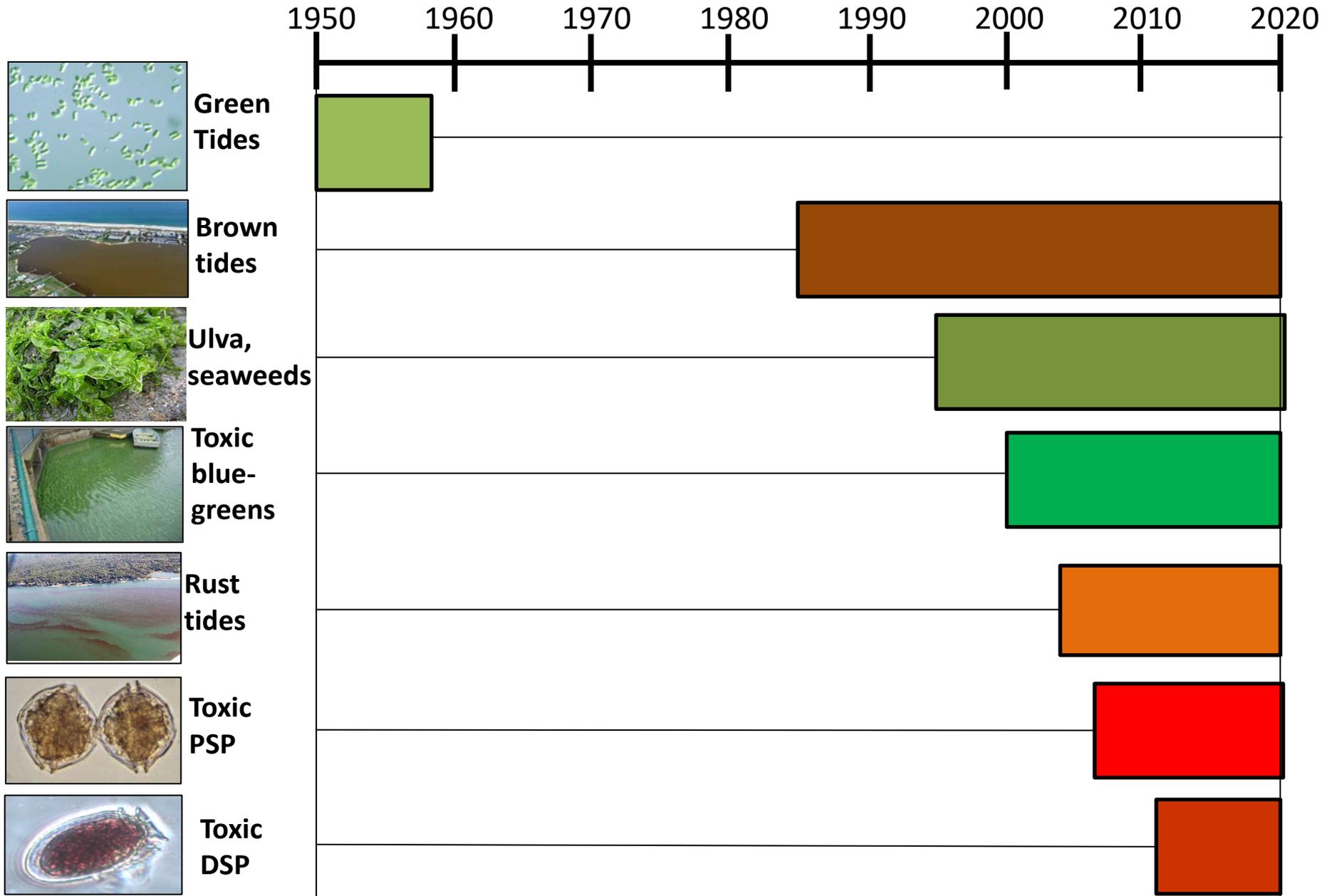
Seaweeds



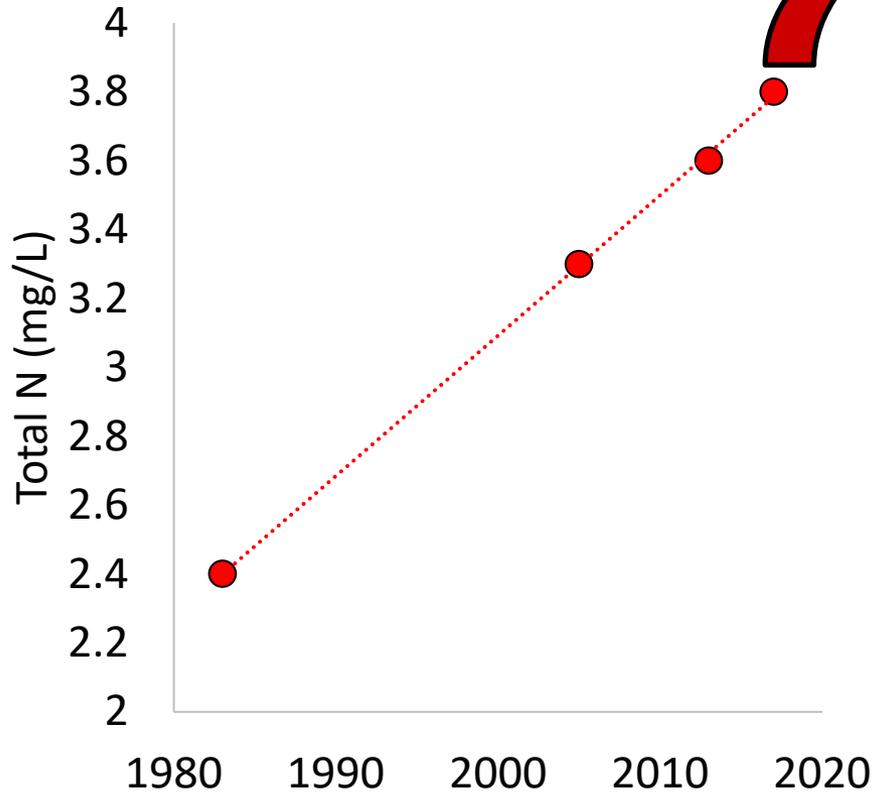
Rust Tide



History of HABs on Long Island



More nitrogen makes harmful algae on Long Island grow faster and/or more toxic



Studies: Hattenrath et al 2010; Gobler et al 2011, 2012; Gobler and Sunda 2012; Harke and Gobler 2013, 2015; Hattenrath-Lehmann et al 2015A&B; Gobler et al 2016; Harke et al 2016.

Blue-green algal blooms



Hundreds of elephants may have died from toxic algae, officials say

Debora Patta · 6 days ago



After months of concern and speculation, the Botswana government on Monday said that the [sudden deaths of more than 330 elephants](#) in northwestern Botswana earlier this summer may have occurred because they drank water contaminated by a toxic blue-green algae.



Article

Canine Cyanotoxin Poisonings in the United States (1920s–2012): Review of Suspected and Confirmed Cases from Three Data Sources

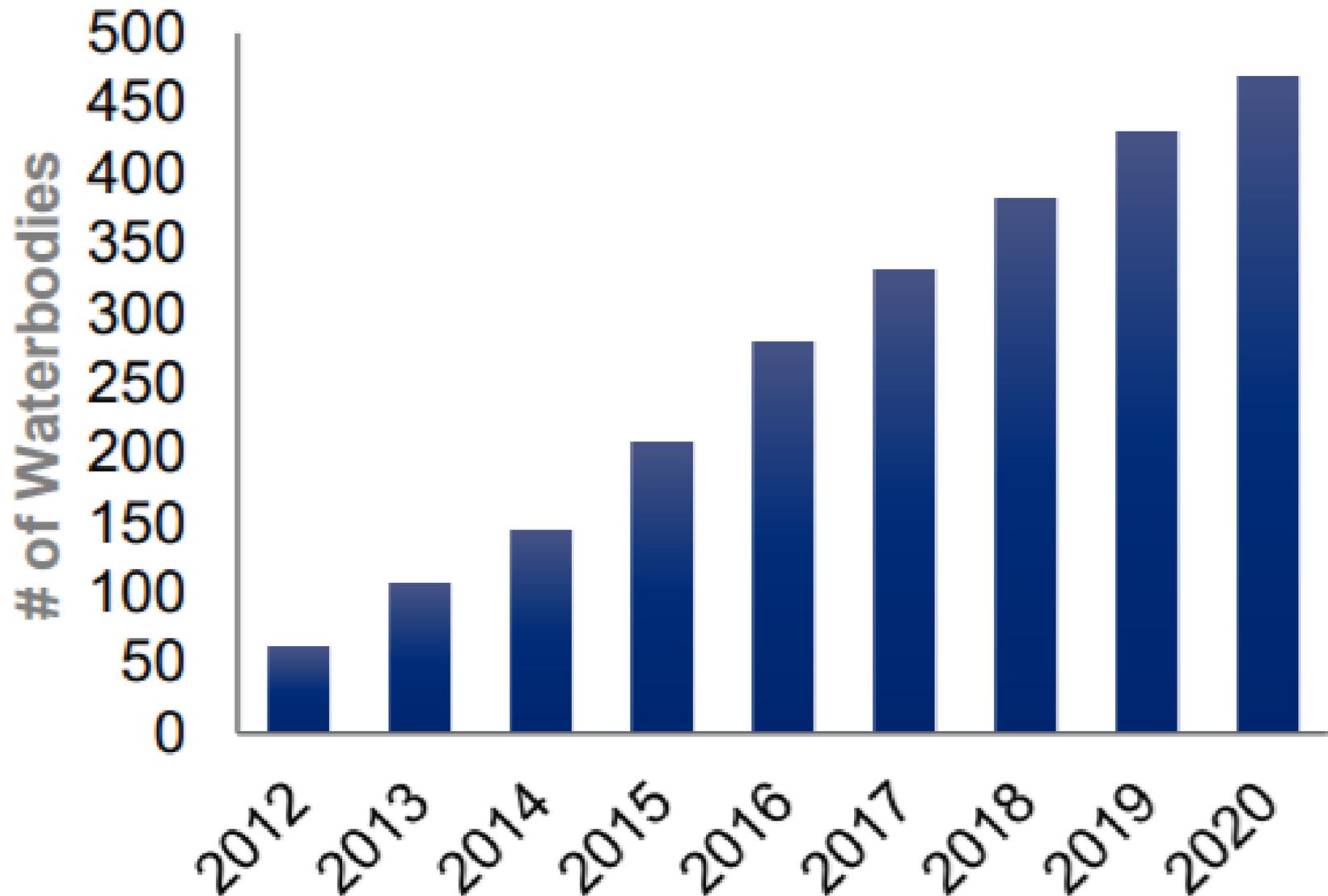


Lorraine C. Backer ^{1,*}, Jan H. Landsberg ², Melissa Miller ^{3,4}, Kevin Keel ⁴ and Tegwin K. Taylor ³

¹ National Center for Environmental Health, [Centers for Disease Control and Prevention](#), 4770 Buford Highway NE, MS F-60, Chamblee, GA 30341, USA

~400 confirmed cases: “The canine cyanotoxin poisoning events reviewed here likely represent a **small fraction** of cases that occur throughout the U.S. each year.” - CDC

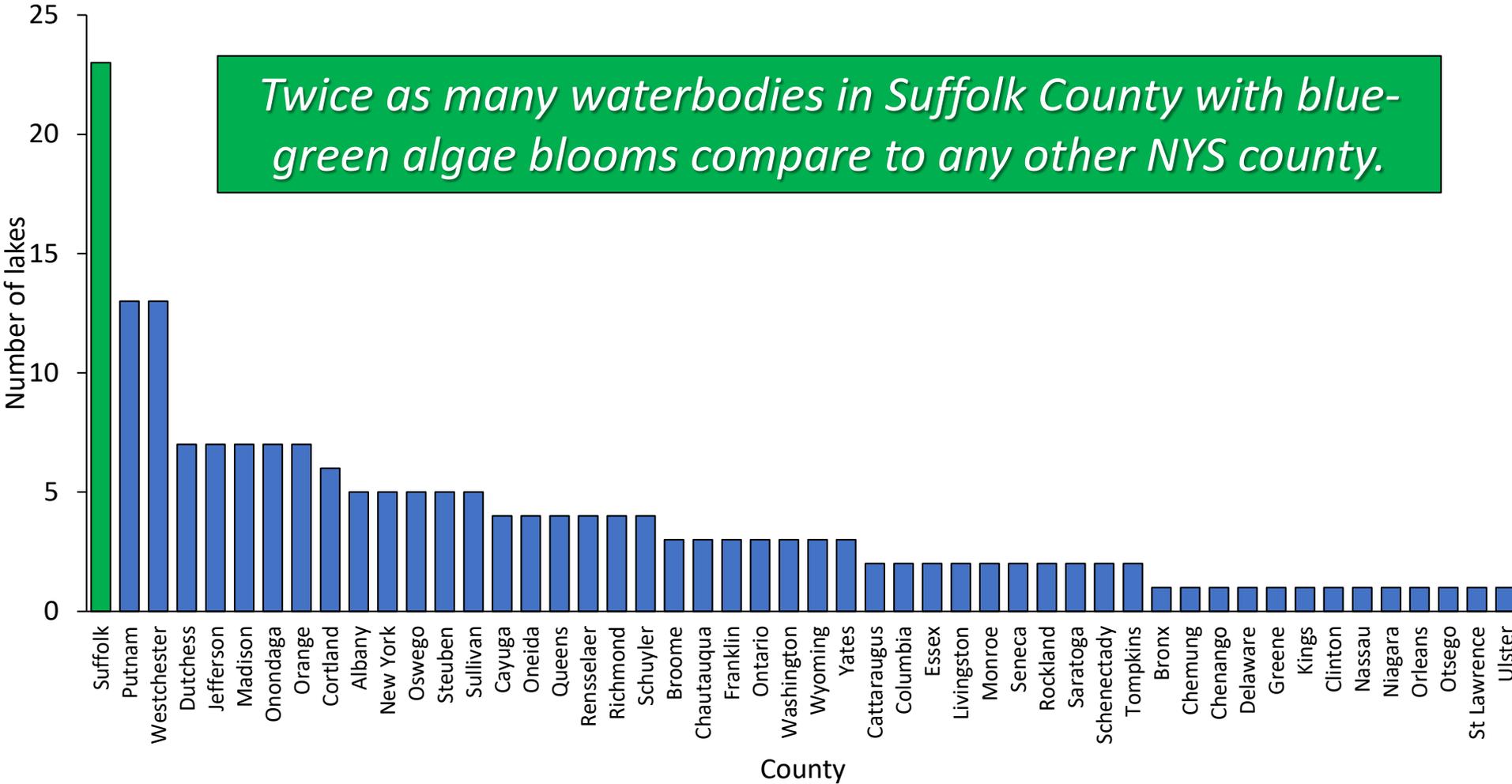
Blue-green algae blooms, NYS



Number of waterbodies with blue-green algal blooms per county, 2020

50 of 62 counties with blooms

Twice as many waterbodies in Suffolk County with blue-green algae blooms compare to any other NYS county.





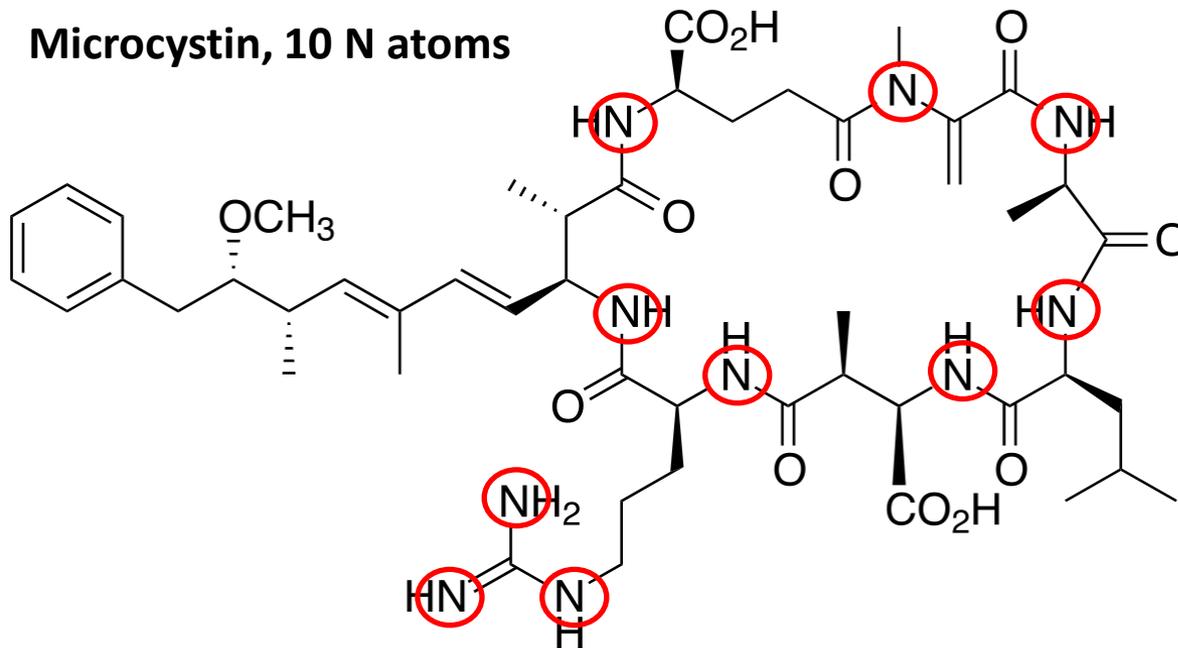
Review

The dual role of nitrogen supply in controlling the growth and toxicity of cyanobacterial blooms



Christopher J. Gobler^{a,*}, JoAnn M. Burkholder^{b,1}, Timothy W. Davis^{c,1},
Matthew J. Harke^{a,1}, Tom Johengen^{d,1}, Craig A. Stow^{c,1}, Dedmer B. Van de Waal^{e,1}

Microcystin, 10 N atoms



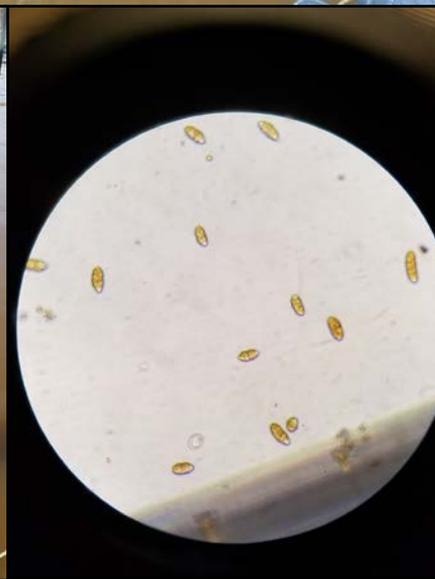
Cochlodinium rust tides



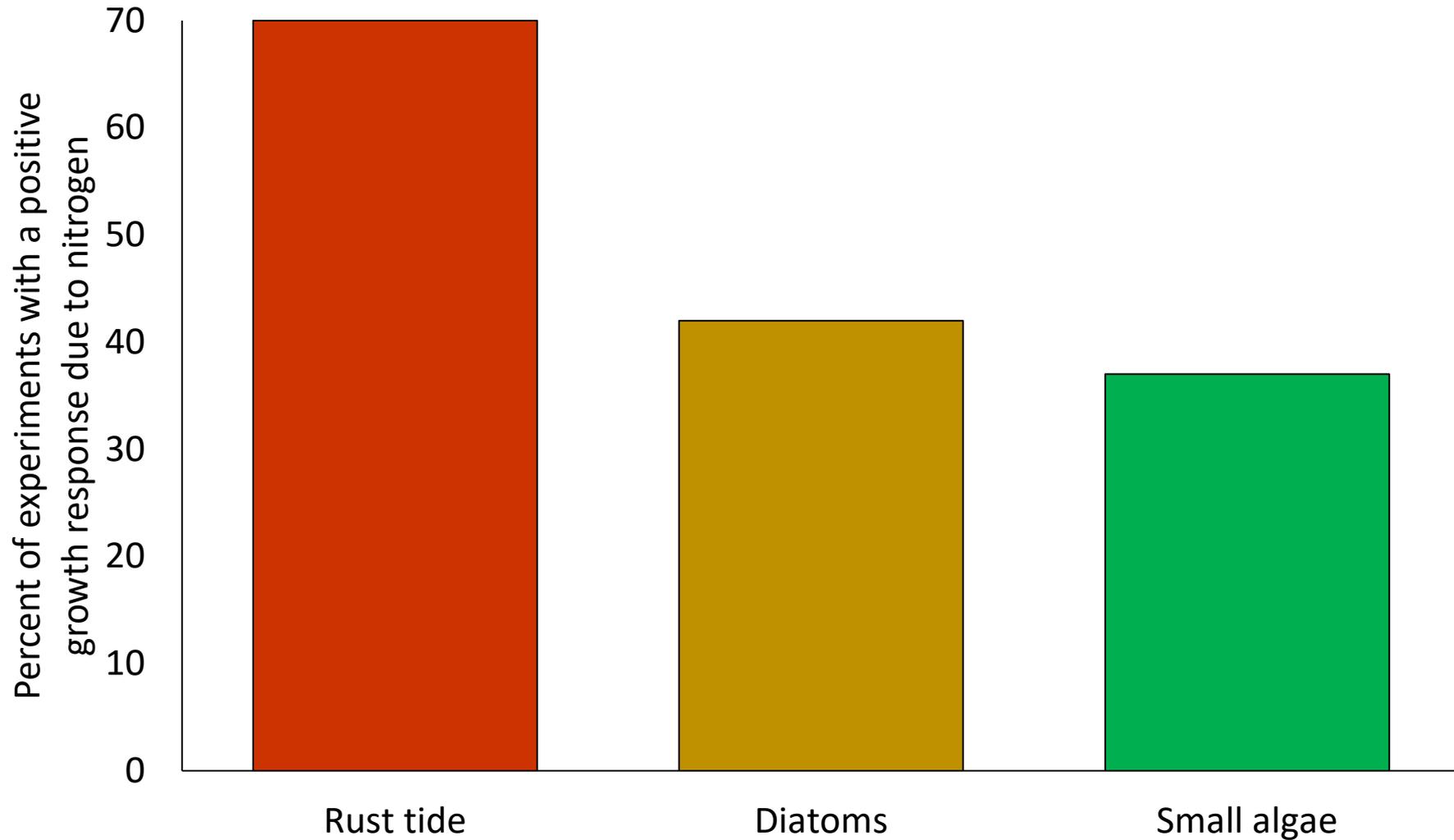
Cochlodinium blooms in NY, 2004 – 2020: Ichthyotoxic
(Gobler et al 2008; Tang and Gobler 2009)



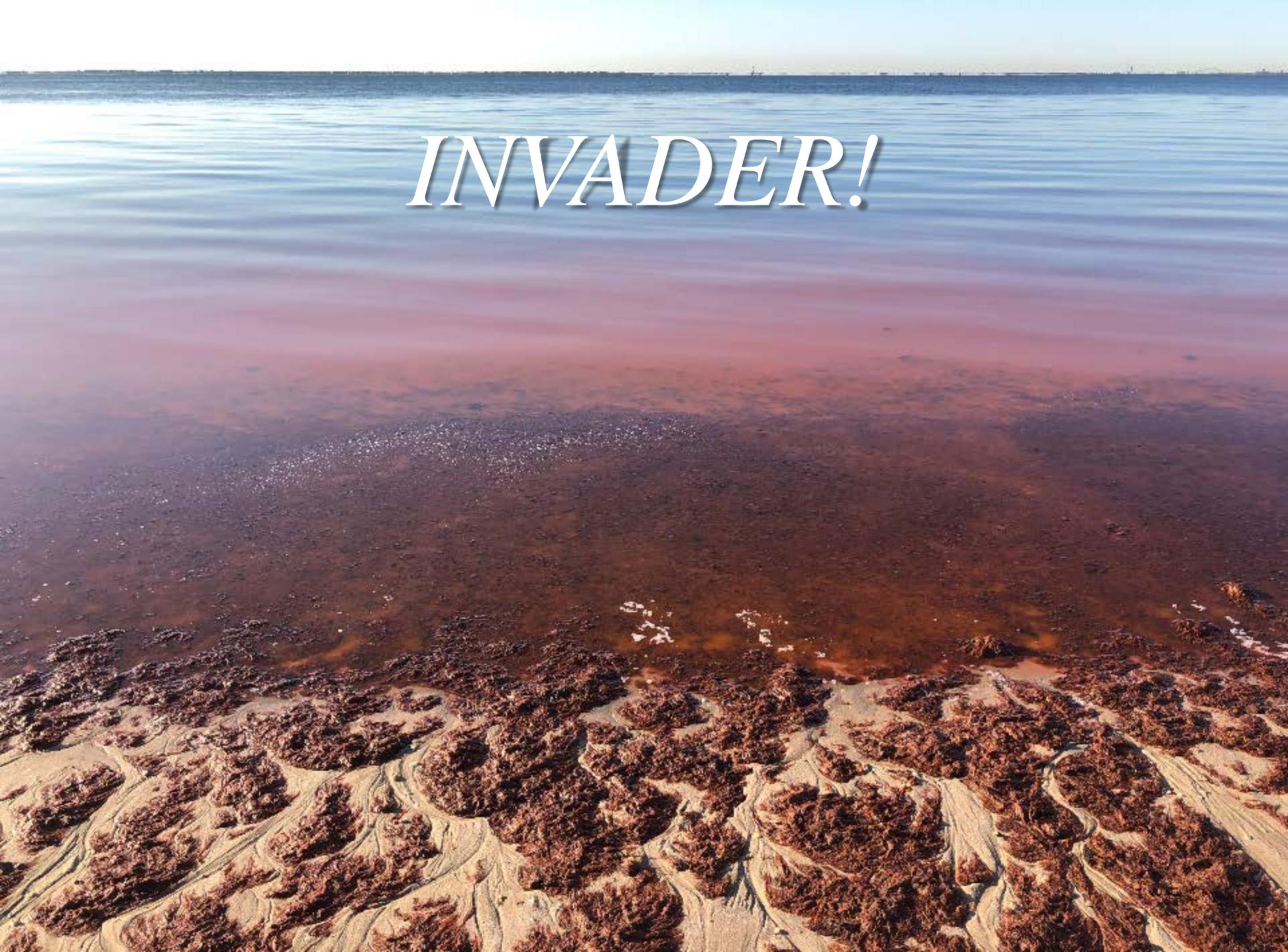
Rust tide oyster kill, Southampton, August 2020



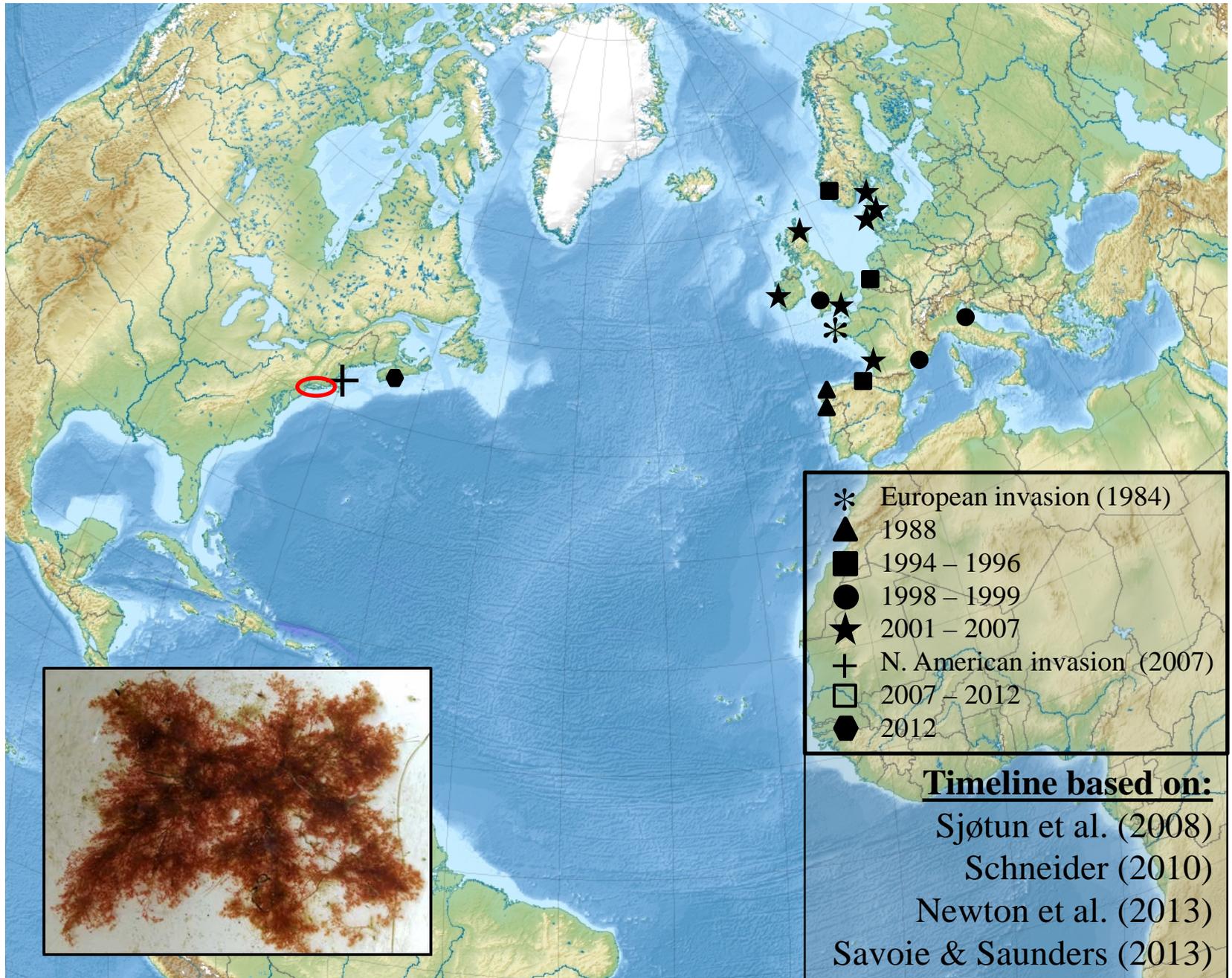
Rust tide and nitrogen



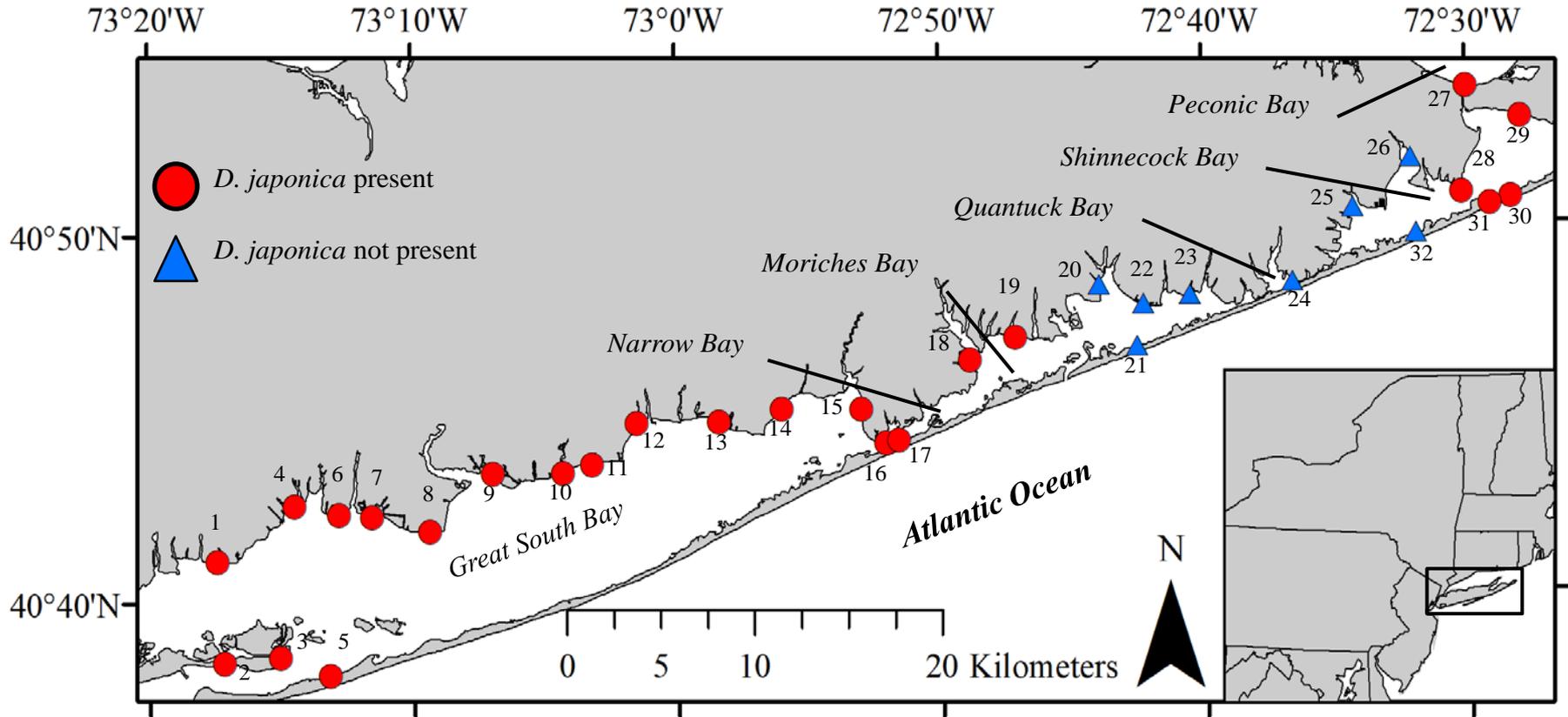
INVADER!



Invasion by *Dasysiphonia japonica*



Spread of *Dasysiphonia* across south shore





Overgrowth of seaweeds: an international public health concern

- High concentrations of hydrogen sulfide leading to **potentially fatal hypoxic pulmonary, neurological, and cardiovascular lesions**.
- Subchronic and chronic exposures can cause **airway irritation, headaches, vestibular syndrome, memory loss, and modification of learning abilities**.
- In 2018, nearly **10,000 emergency room cases** of acute exposure among which three patients were admitted to intensive care



Figure: Sargassum on a beach in Le Diamant, Martinique

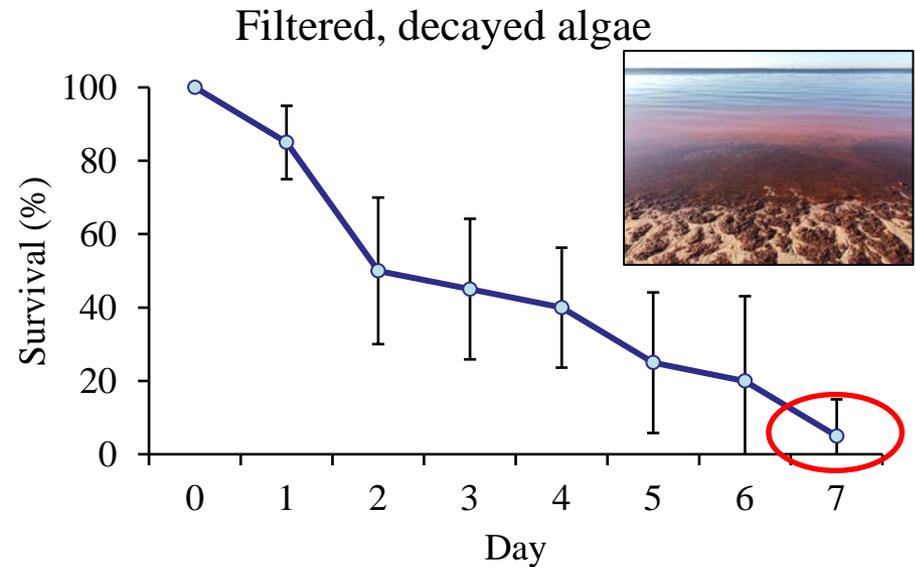
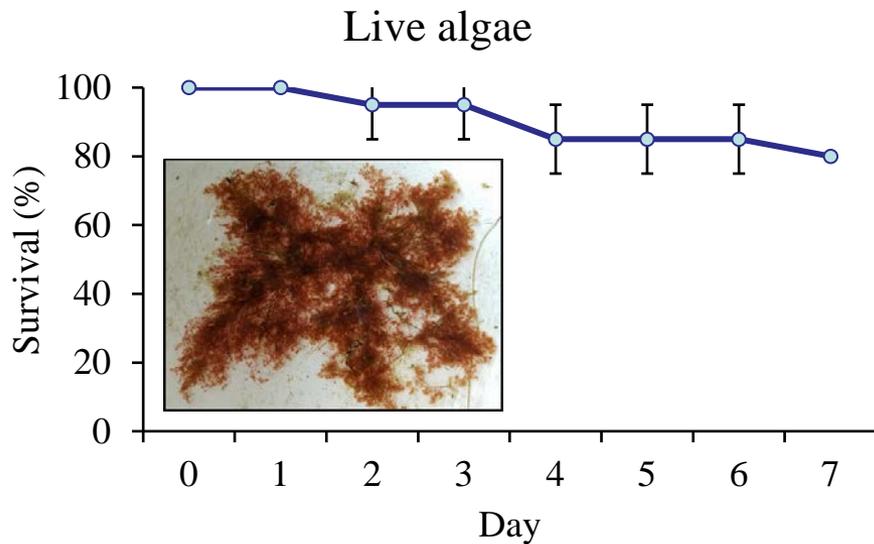
www.thelancet.com Vol 392 December 22/29, 2018

Lancet, #2 medical journal in the world

An aerial photograph of a wide, muddy beach. The sand is a rich, dark brown color, and the water is a deep, dark blue. The beach is covered in small, white foam patches, likely from waves breaking. The text is overlaid in the center of the image.

*What are the effects
on marine life?*

Larval fish survival (*M. berylina*), live and decayed *Dasysiphonia*

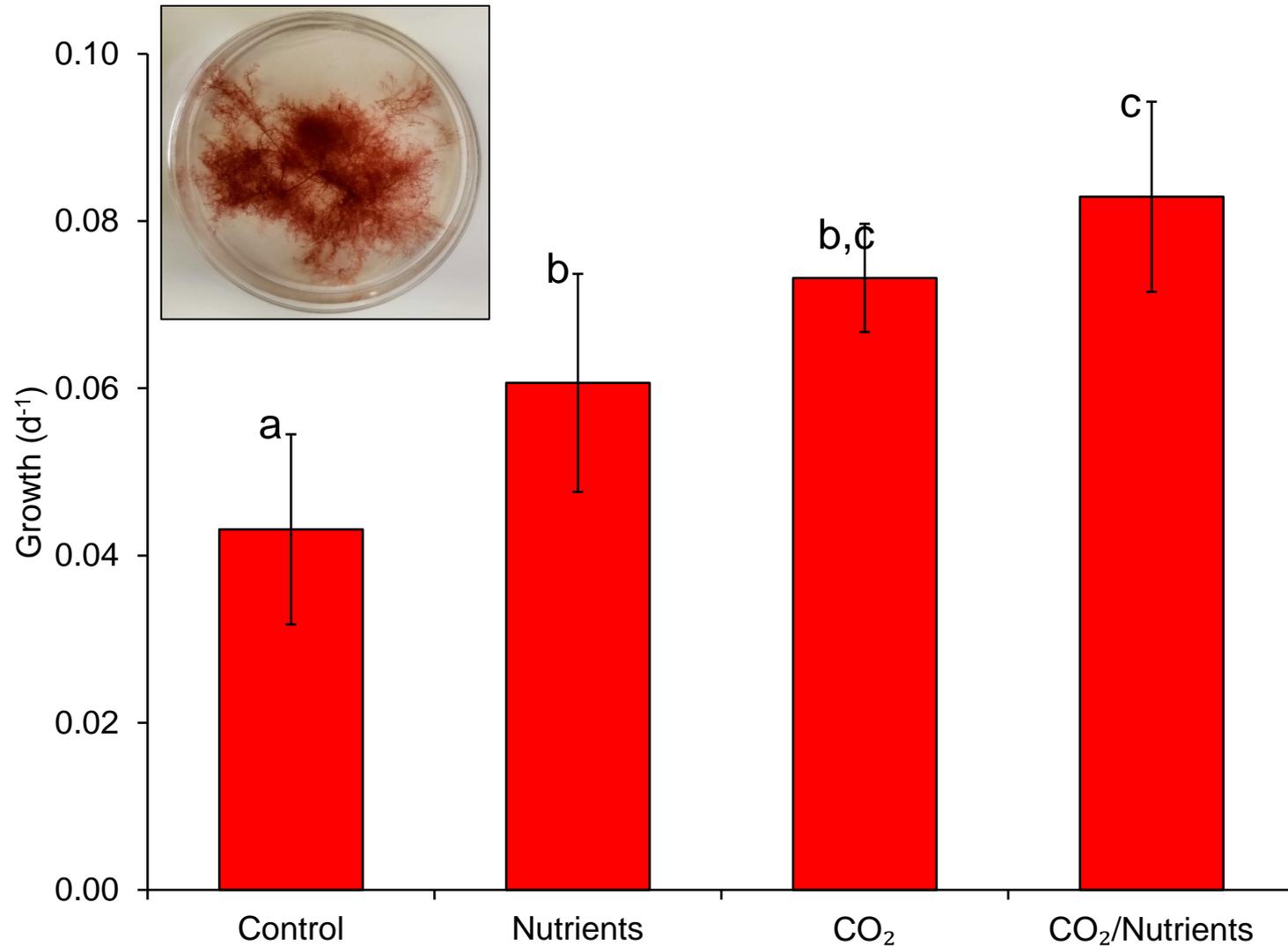


*Experiment bubbled; DO high; ammonia levels non-toxic

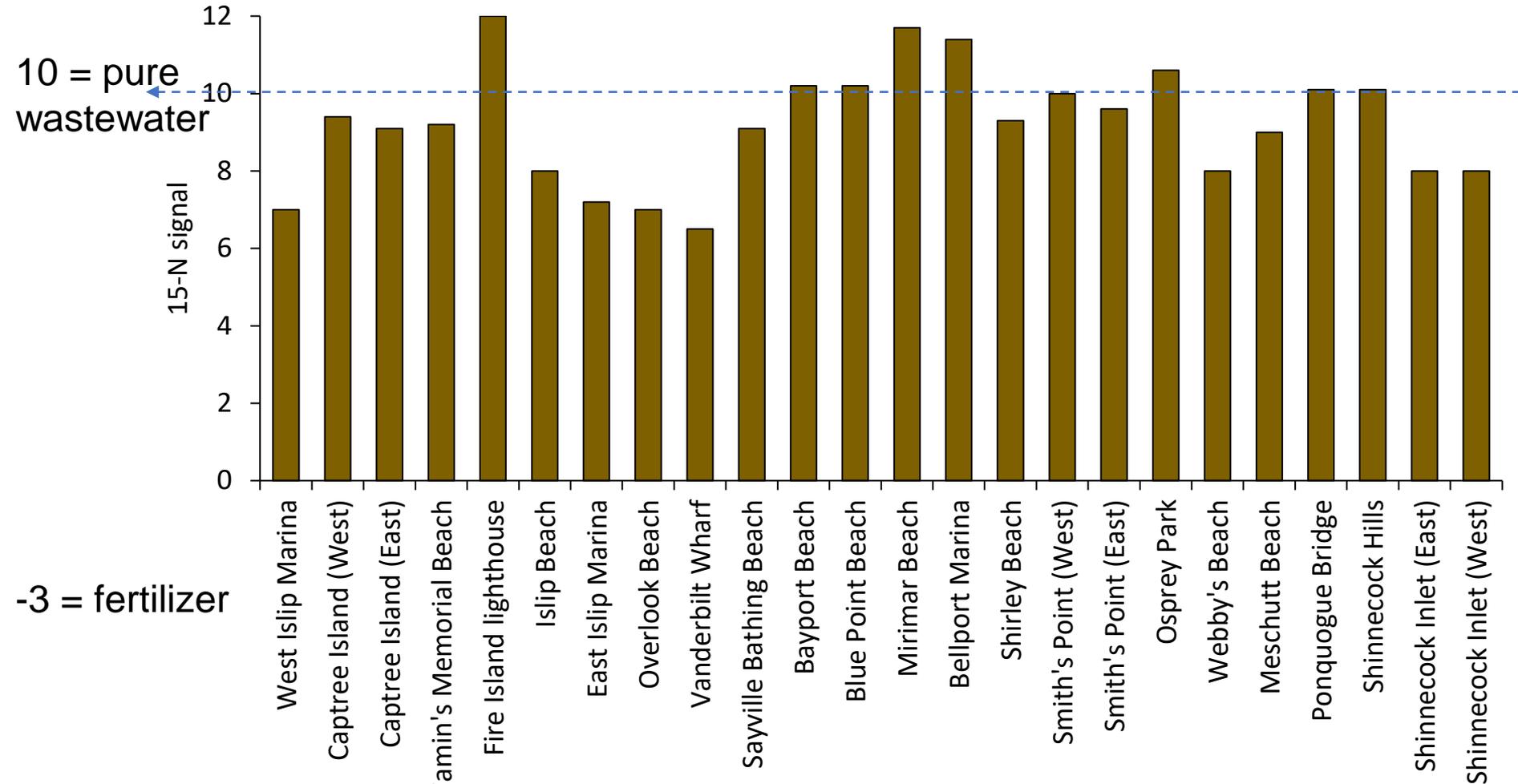
An aerial photograph of a beach showing a distinct color gradient. The water on the right is a deep blue, transitioning through a purple and magenta band to a wide expanse of reddish-brown sand on the left. The sand is textured with small pebbles and shells. The text "Why is it here?" is overlaid in the center in a white, italicized font.

Why is it here?

Growth of *Dasysiphonia* exposed to elevated CO₂ concentrations with and without nutrient additions



Tissue content proves the invasive algae is *fueled by wastewater-derived nitrogen*



The Anthropocene

- There is a scientific consensus that Earth has entered the Anthropocene, a new era whereby ***the activities of humans have become the dominant influence on climate and the environment, overwhelming the forces of nature*** (Dirzo et al., 2014; Lewis et al., 2015; Steffen et al., 2015).
- Management of our local ecosystems must be seen through this global lens.

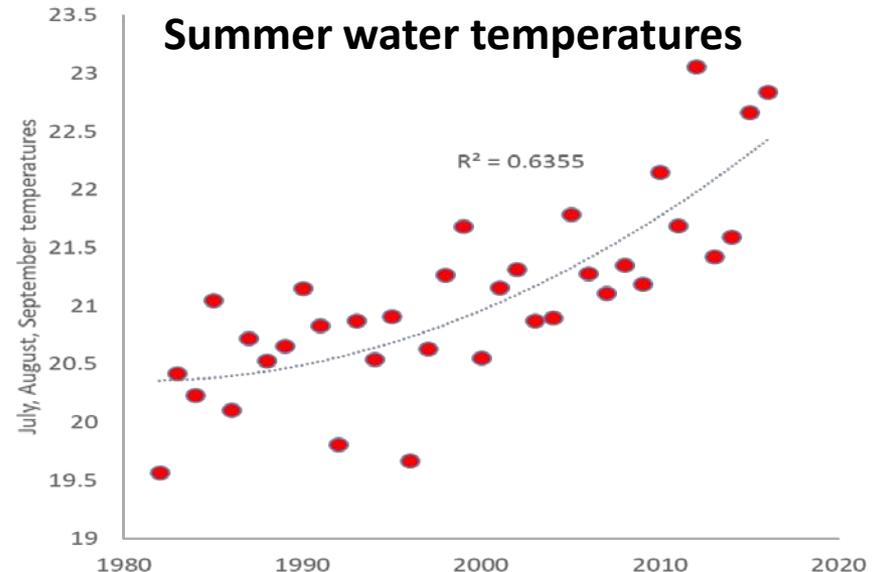
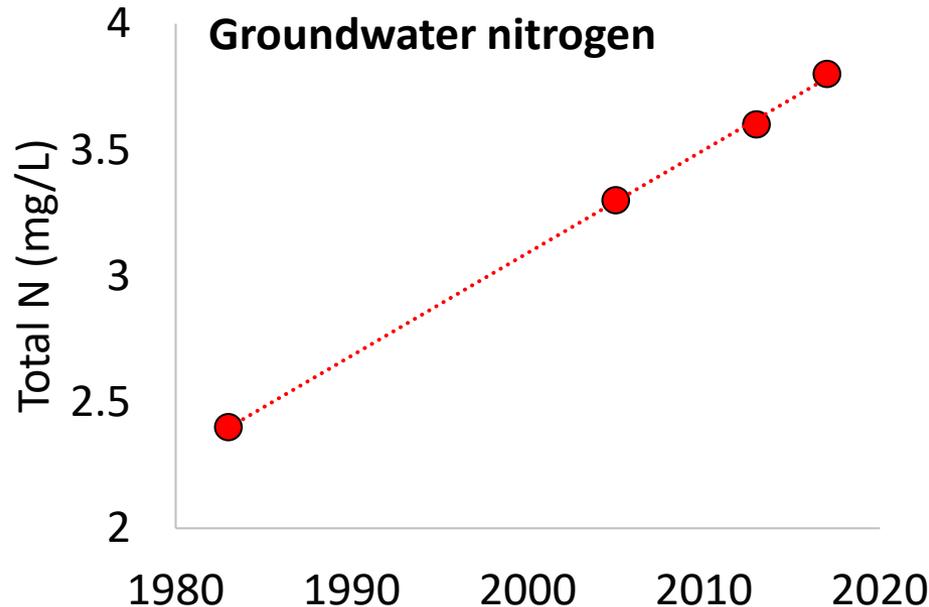


35-year trend, summer water temperature (Jul – Sep; satellite-based) around Long Island



The fierce urgency of now...

- “We are now faced with the fact that *tomorrow is today*. We are confronted with the *fierce urgency of now*. In this unfolding conundrum of life and history, there *is* such a thing as being too late. This is no time for apathy or complacency. This is a time for vigorous and positive action.”
— Martin Luther King Jr.



Conclusions

- Excessive nitrogen loading from wastewater is an on-going threat to coastal ecosystems, economies, pets, and human health across Long Island.
- Climate change is accelerating and effects on marine ecosystems are becoming increasingly obvious.

Thank you for your attention

Long Island Water Quality Issues

April 2021



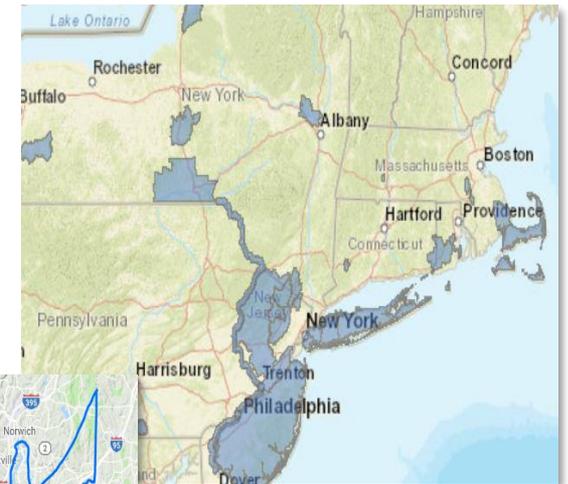
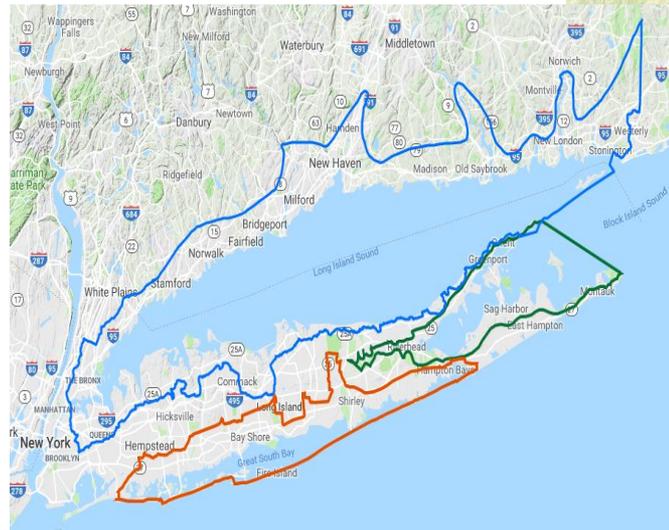
Groundwater and Surface Water

Groundwater - Sole Source Aquifer

- Designated by US EPA
- Upper Glacial Magothy and Lloyd

Surface Water – Three Estuaries

- Long Island Sound
- Peconic
- South Shore



Groundwater Water Quality Issues

Conventional contaminants

- industrial – various chemicals
- Wastewater – nitrogen
- Aquifers –
 - Upper Glacial – for the most part, not suitable for potable use,
 - Magothy – Suitable for potable use – some locations are impacted
 - Lloyd – most pristine – thousands of years old – salt water intrusion.

Emerging Contaminants

- 1, 4 Dioxane
- Perfluorooctanesulfonic acid ("PFOS")



Surface Water Quality Issues

Eutrophication – over enrichment of nutrient – Nitrogen

Problem – low dissolved oxygen, fish kills, etc.

Major source of nitrogen - wastewater

Harmful Algal Bloom –

- Brown Tide,
- Red Tide,
- Blue-green Algae

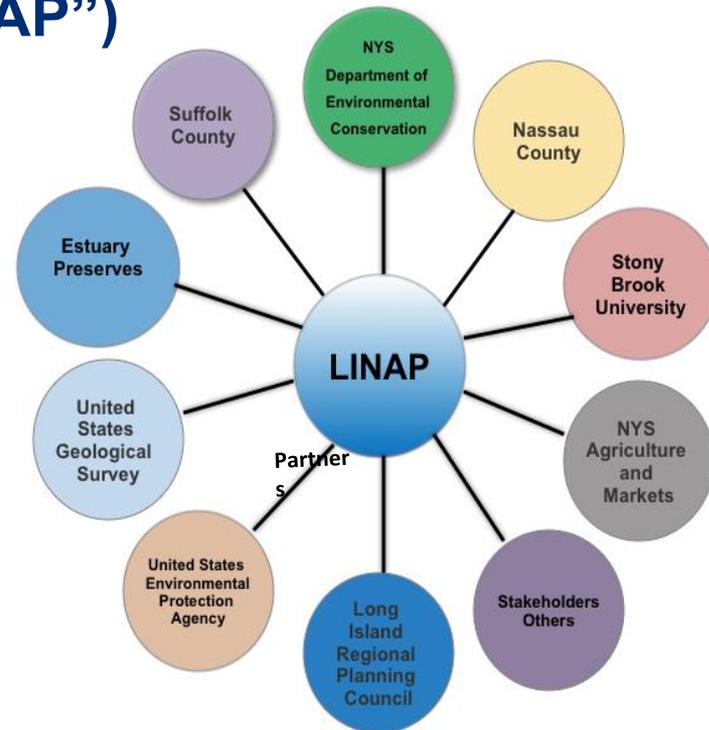


The Long Island Nitrogen Action Plan ("LINAP")

A broad, multi-year initiative to reduce nitrogen impacts on water quality

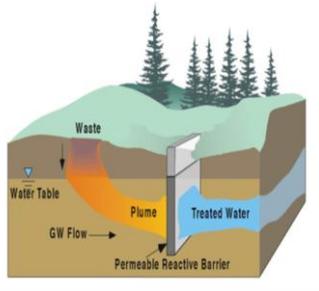
Goals:

- Assess nitrogen pollution in LI waters
- Identify sources of nitrogen to surface and ground waters
- Establish nitrogen reduction endpoints
- Develop implementation plans to achieve reductions



Current Initiatives

- Sewer Extensions
- Septic System Replacement
- Water Reuse
- Hydromodification Feasibility Study
- Groundwater Intercept Technologies
- Nutrient Bioextraction
- Fertilizer Management
- Nitrogen Smart Communities
- Education and Outreach
- Western Bays Water Quality Monitoring
- Subwatershed planning



Nassau & Suffolk Counties

Nassau

- Bay Park
- Biological Nitrogen Removal
- Cedar Creek Diversion
- Long Beach
- Nine Element Plan
- Septic Replacement

Suffolk

- Subwatersheds Wastewater Plan
- Article 6 changes
- Countywide Wastewater Management District
- Septic Improvement Program (I/A Systems)



Center for Clean Water Technologies Stony Brook University

- Research Facility for Innovative Onsite Wastewater Treatment
- Nitrogen Removing Biofilters
- Constructed Wetlands
- Permeable Reactive Barrier
- Research on water treatment technologies



Funding

- Wastewater Treatment Improvement
- Nonagricultural Nonpoint Source Abatement and Control
- Land Acquisition for Source Water Protection
- Salt Storage
- Aquatic Connectivity Restoration
- Municipal Separate Storm Sewer Systems (MS4)

Where to Go for More Information on LINAP

- Visit the LINAP website to view important documents
<http://www.dec.ny.gov/lands/103654.html>
At DEC website, search on 'LINAP' in the search function in the green banner
- Join the LINAP e-Newsletter to hear about updates and new developments
https://public.govdelivery.com/accounts/NYSDEC/subscriber/new?topic_id=NYSDEC_174
Also in the blue DEC Delivers box on the LINAP website in first bullet
- Water Quality Improvement Project Program – Funding
<https://www.dec.ny.gov/pubs/4774.html>
- Questions still not answered? Send us an email
Llwaterquality@dec.ny.gov

Thank You!

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