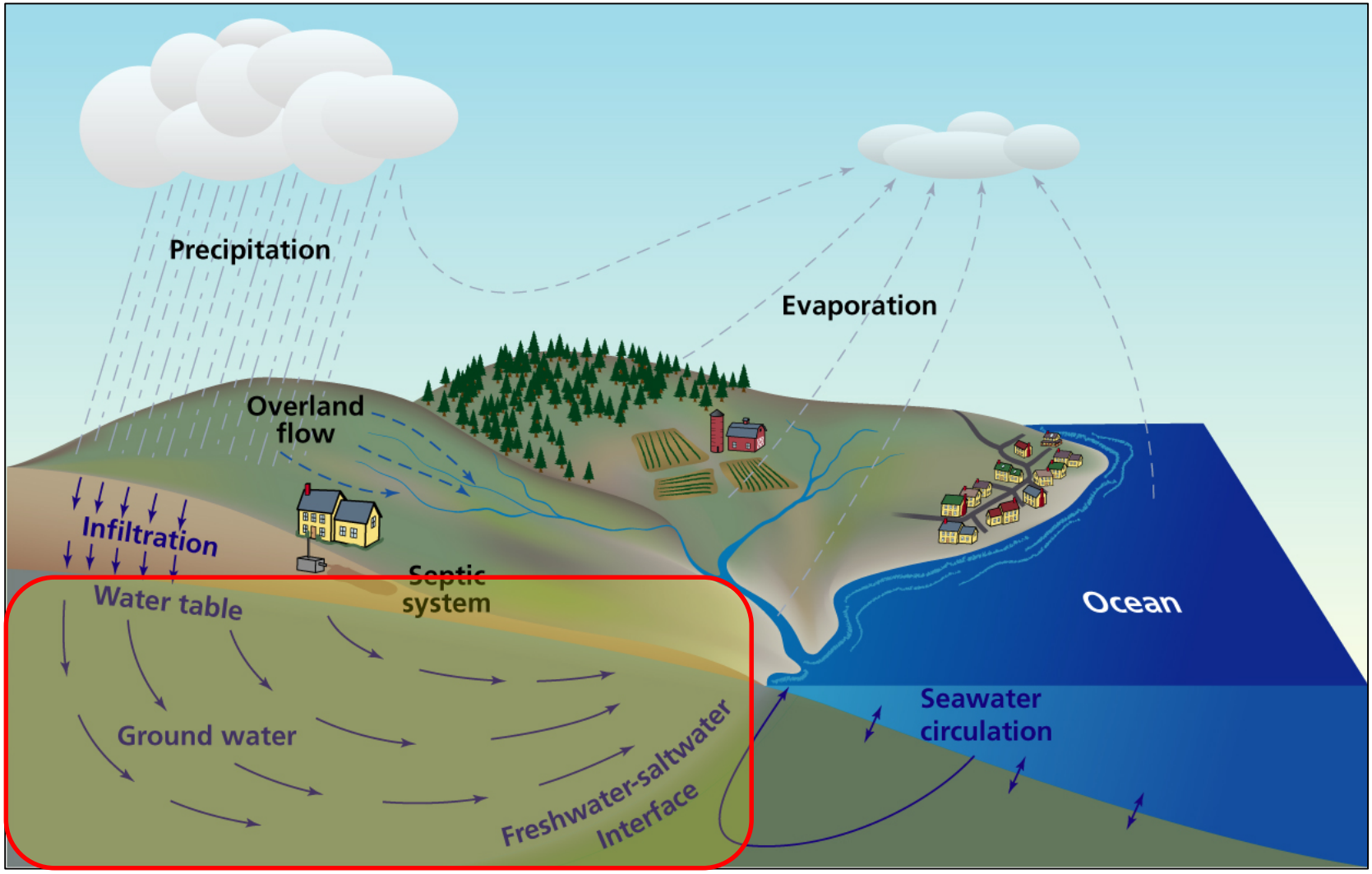
Defining water quality in Suffolk County

Stony Brook University

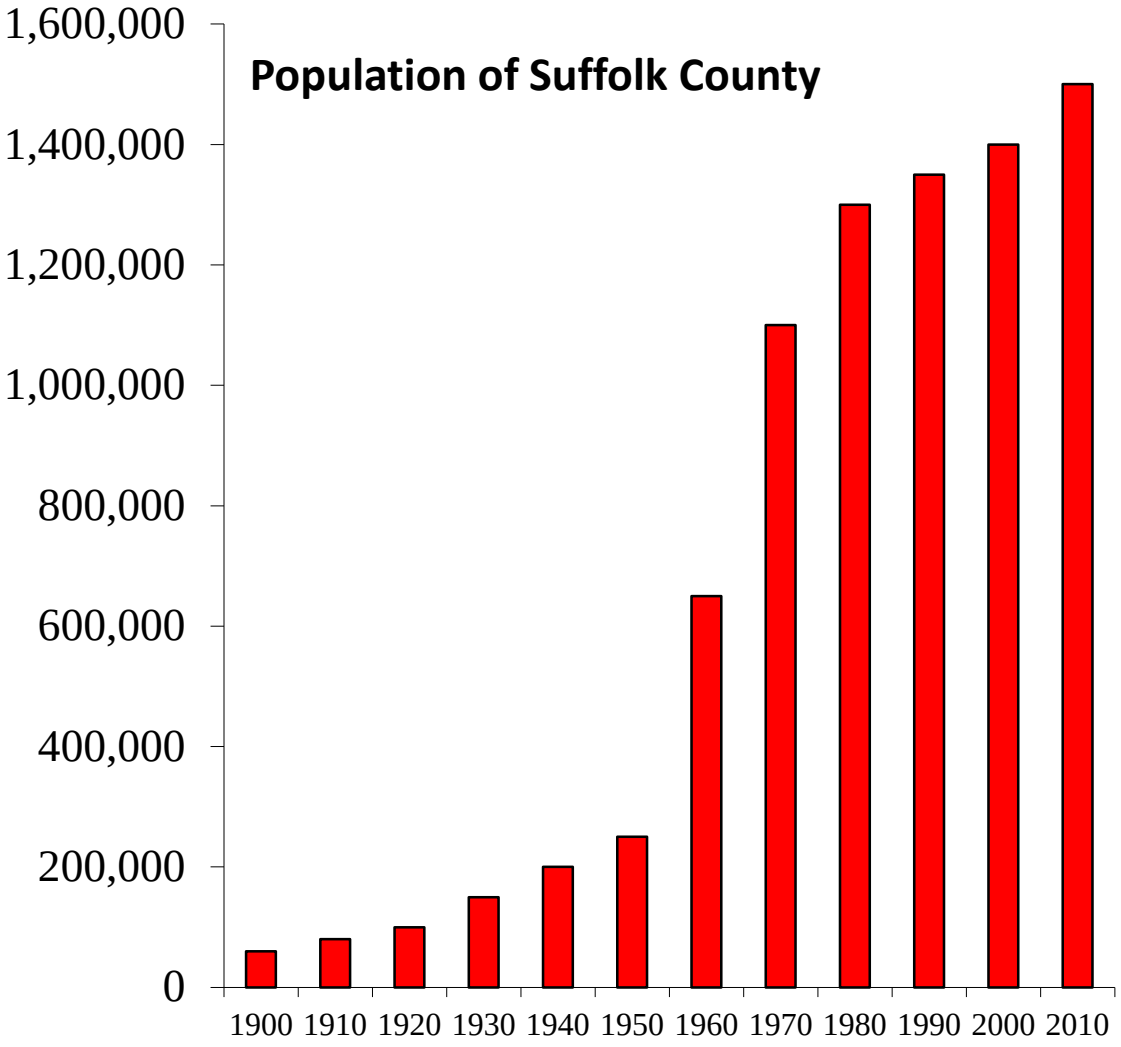
Christopher J. Gobler

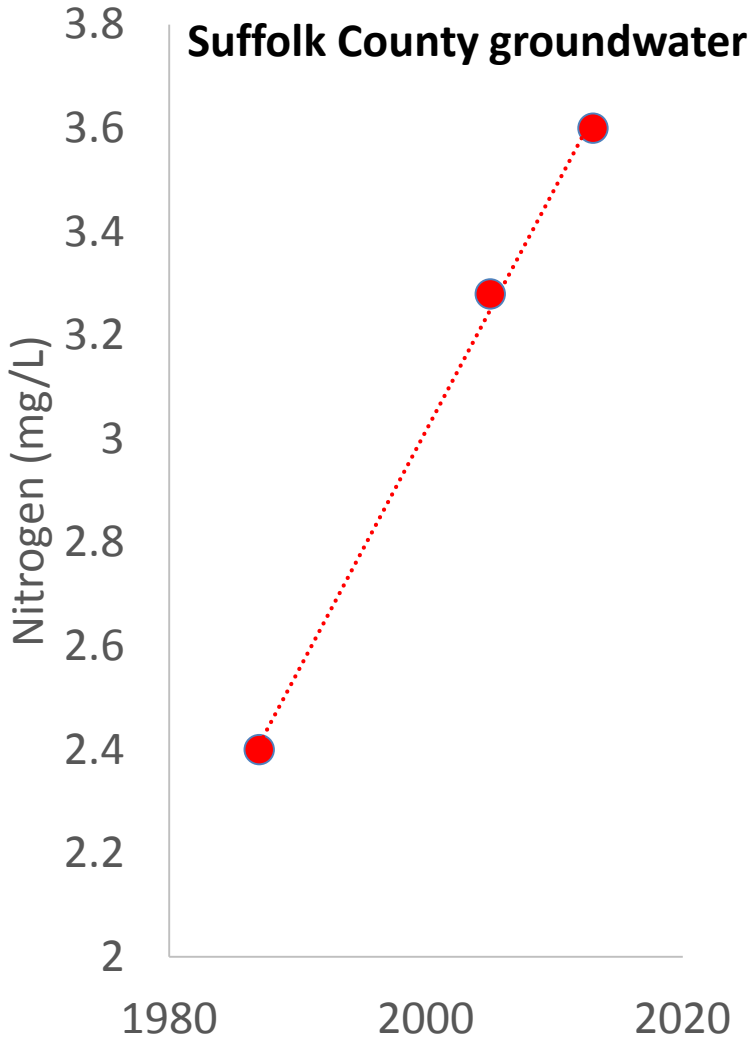
All of Long Island is a watershed -

Materials on land eventually enter our groundwater and surface water.



Expanding population, nitrogen levels

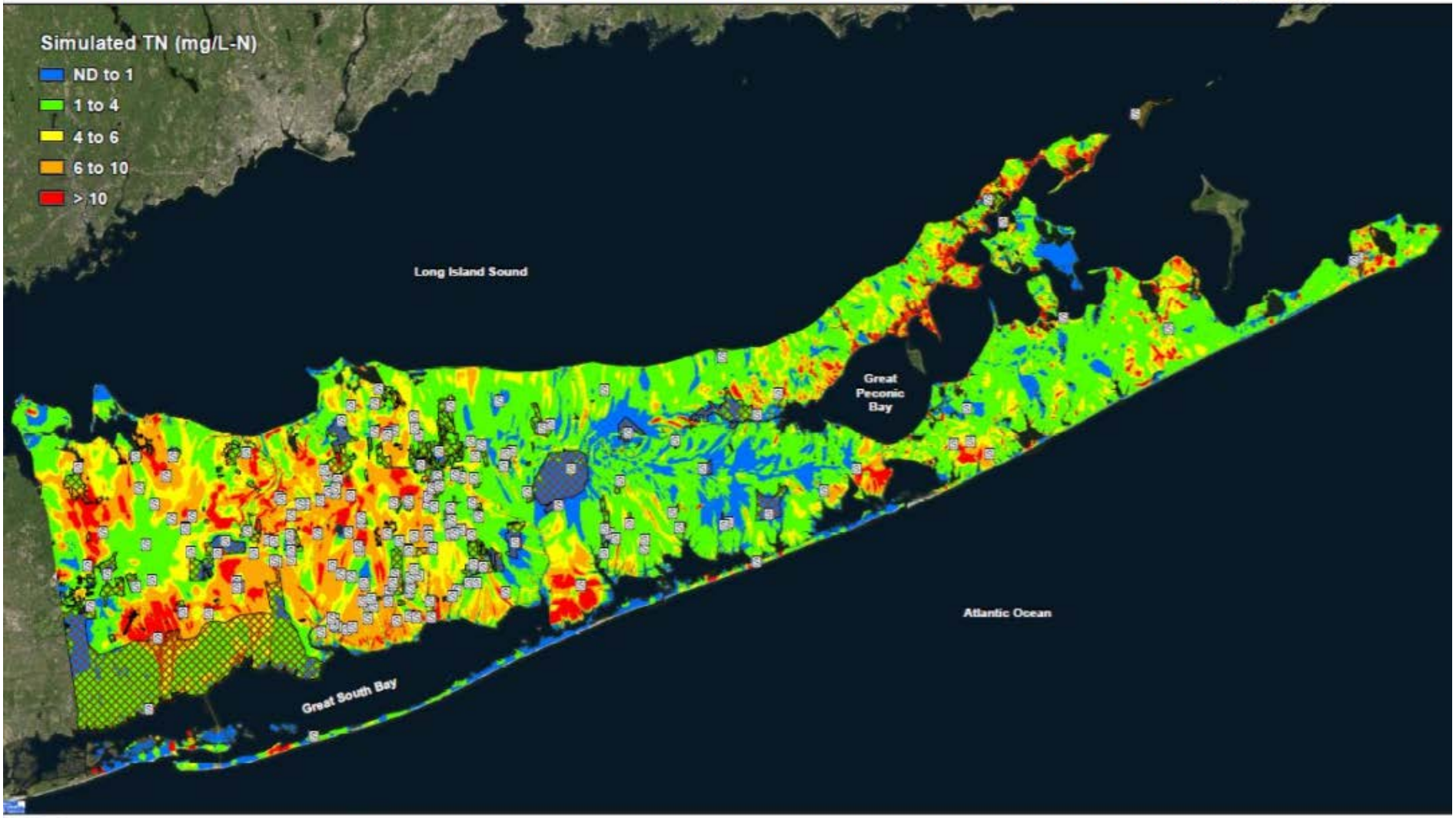




More people = more nitrogen

Most nitrogen loading from wastewater (Kinney and Valiela, 2011; Lloyd 2014, 2016; Gobler and Stinette, 2016; CDM-Smith, in prep)

Simulated Upper Glacial Nitrogen After 200 years



Simulated Nitrogen Concentration within the Upper Glacial Aquifer after 200 Years
Suffolk County Subwatersheds Wastewater Plan

Planetary Boundaries

after Johan Rockström, Stockholm Resilience Centre et al. 2009

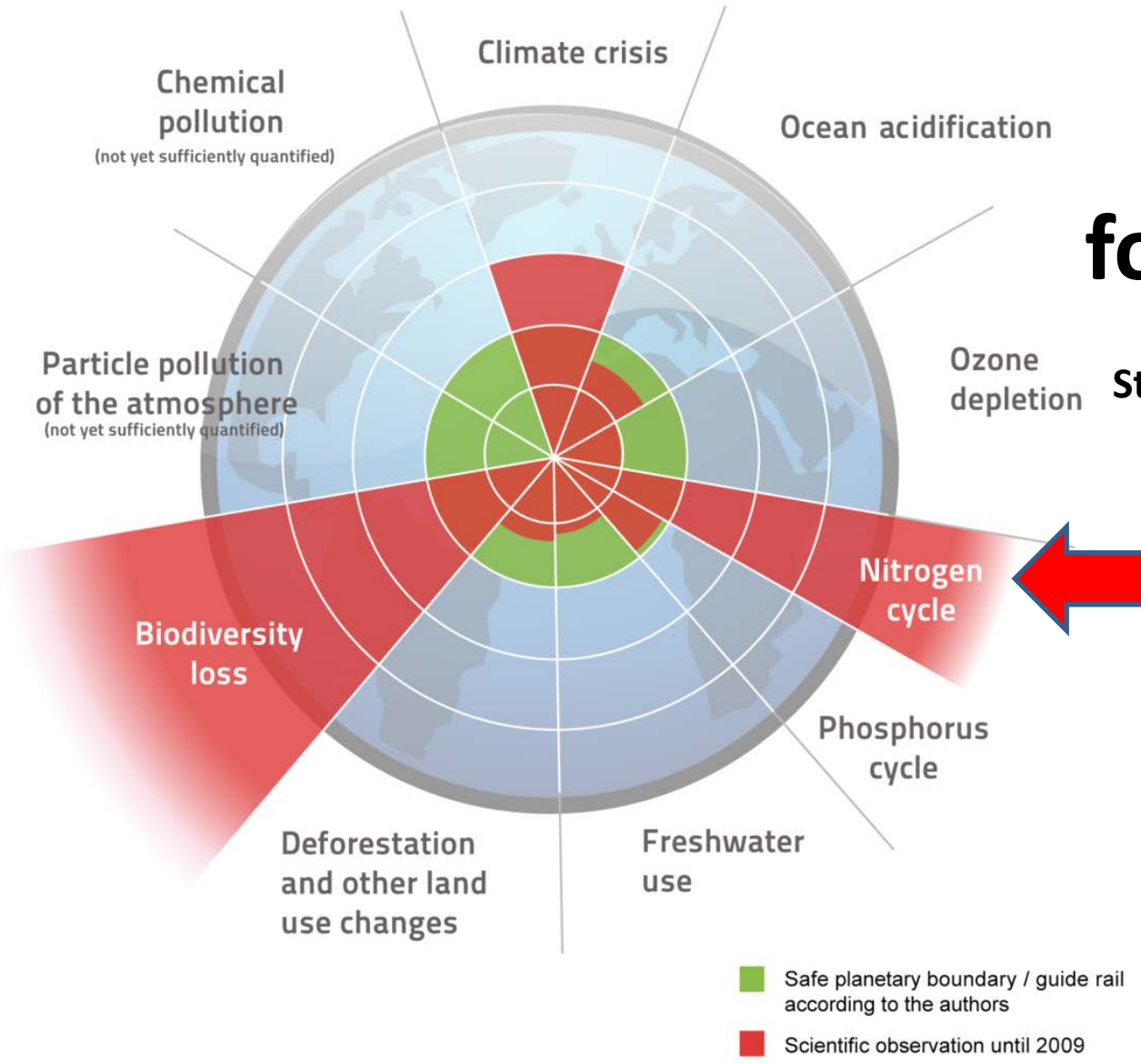


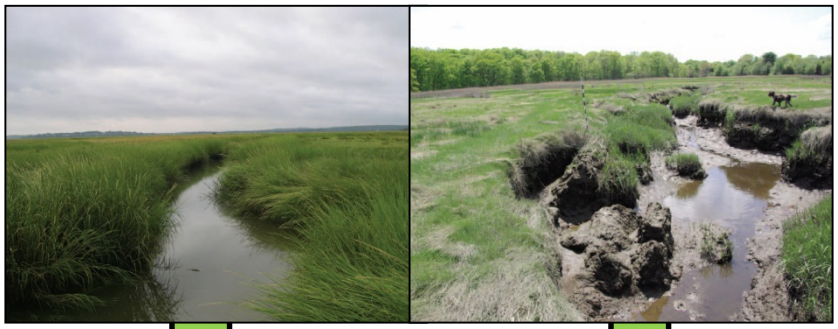
Illustration: Felix Müller (www.zukunft-selbermachen.de) Licence: CC-BY-SA 4.0

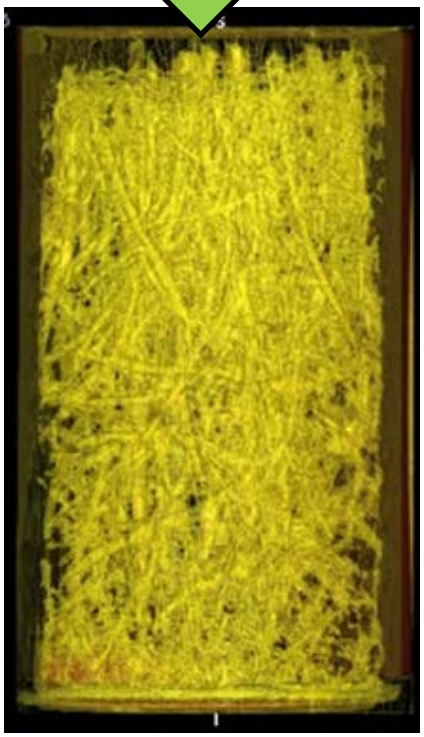
"A Safe Operating Space for Humanity"

-Rockstrom et al 2015; Stockholm Resilience Centre, Stockholm University

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

Healthy marsh **Nutrient weakened**





Healthy roots **Nutrient weakened**

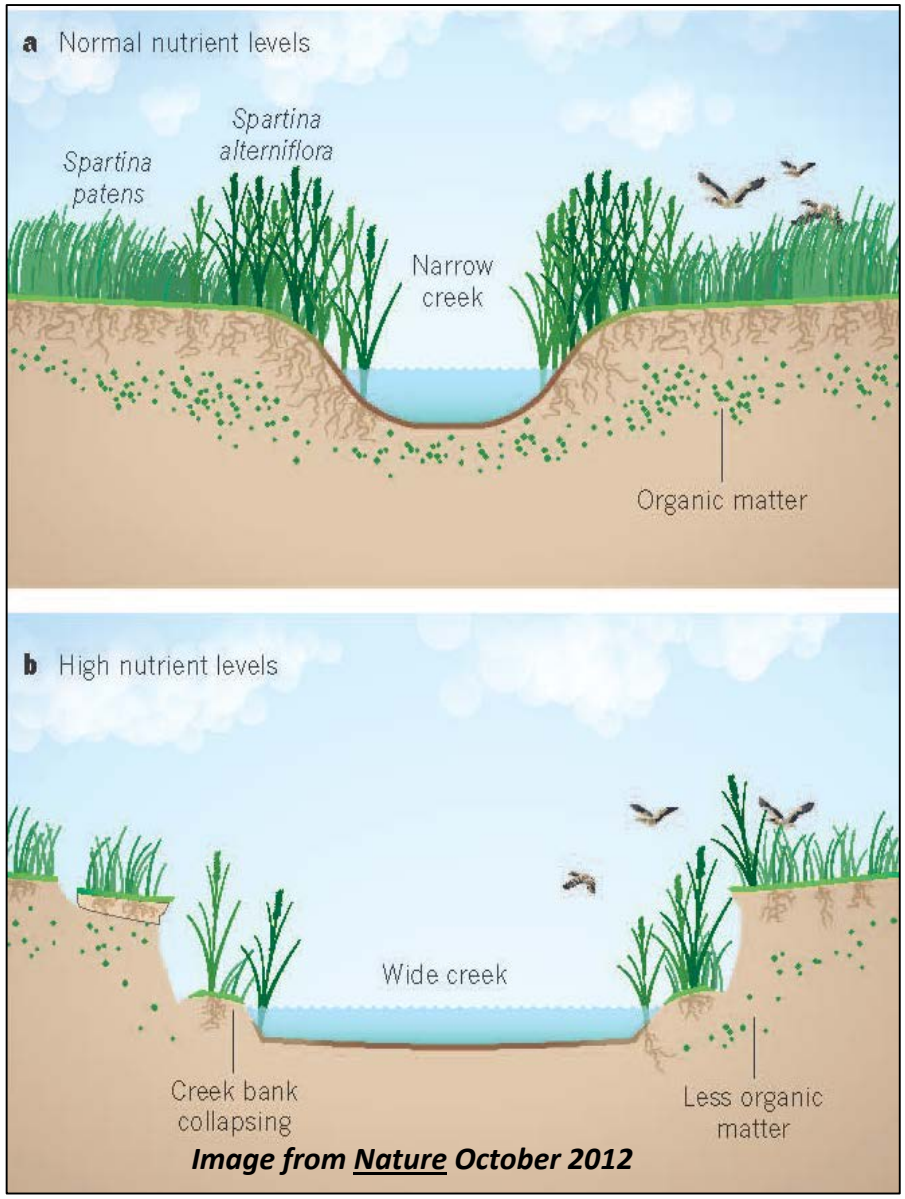
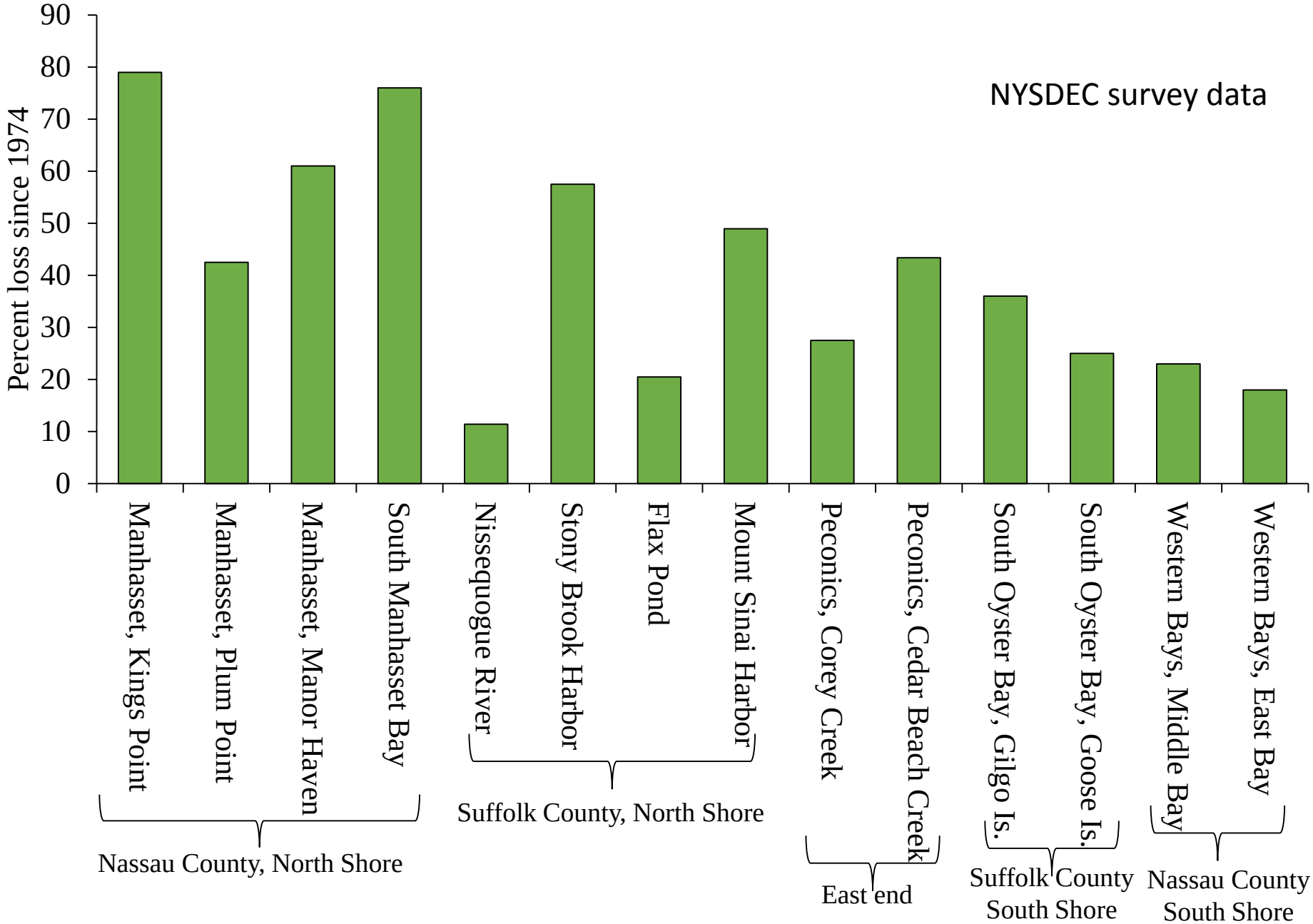


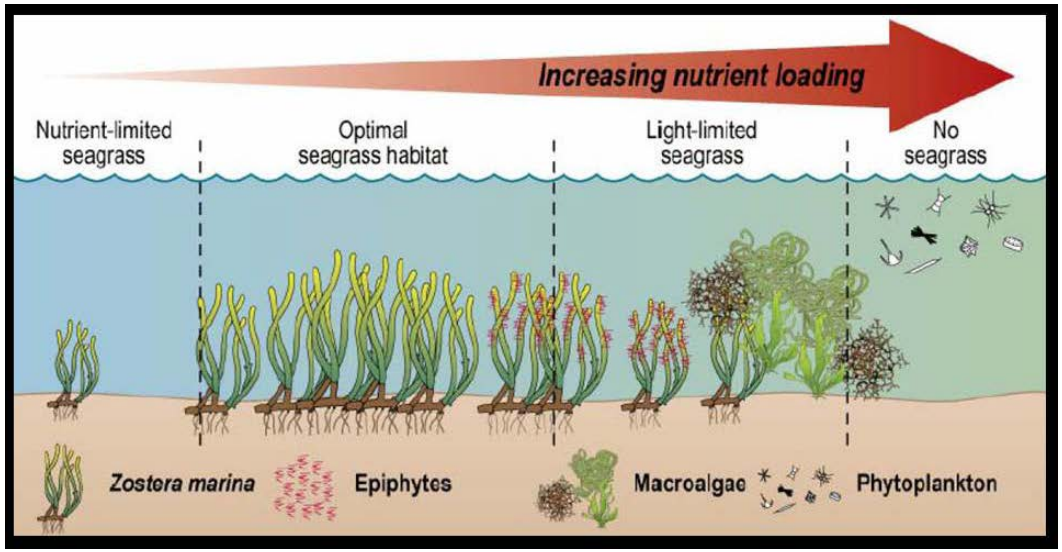
Image from Nature October 2012

Loss of wetlands on Long Island, since 1974



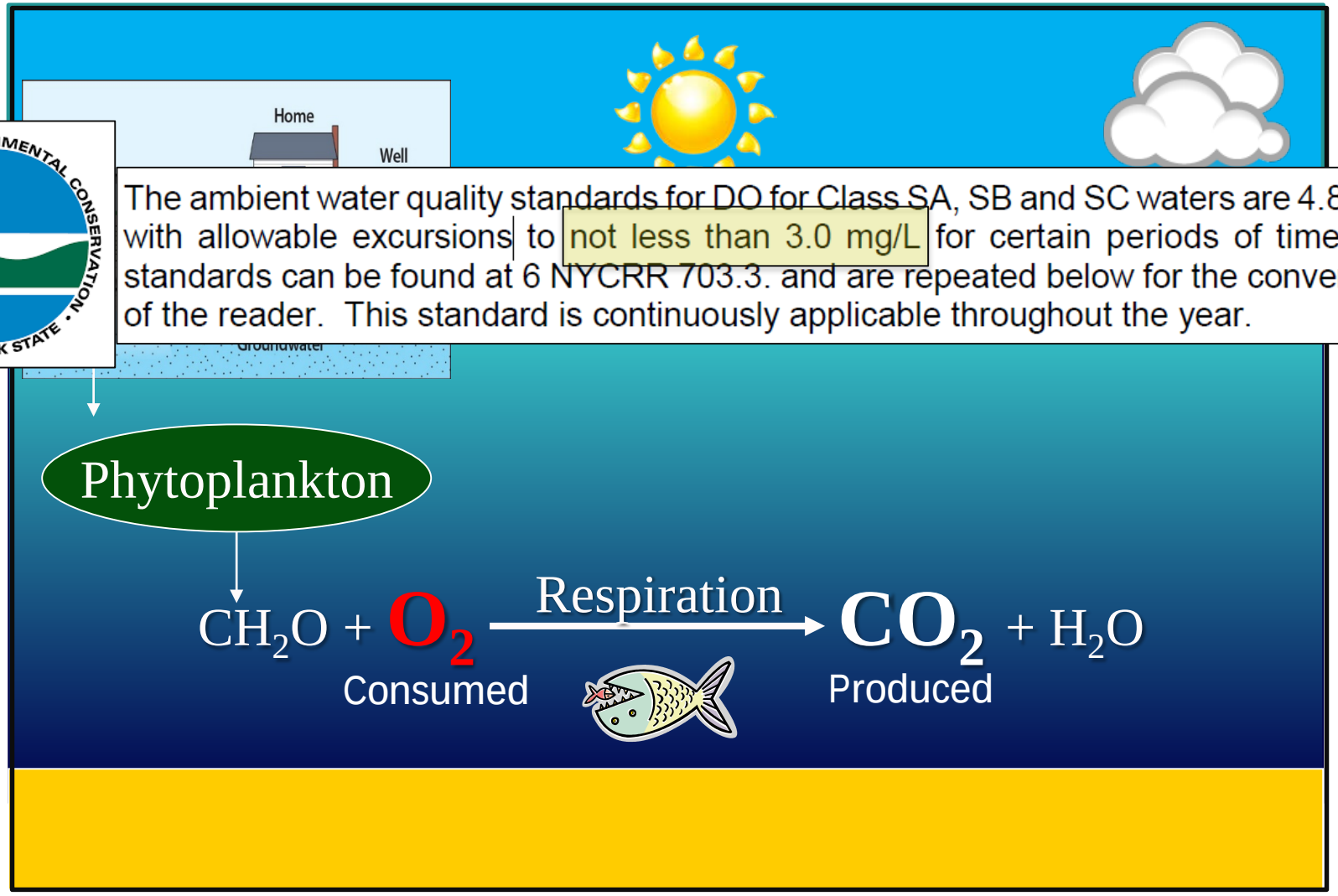
Seagrass: Critical habitat for fish and shellfish

NYS seagrass, 1930 - 2030



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

Excessive N loading leads to low oxygen

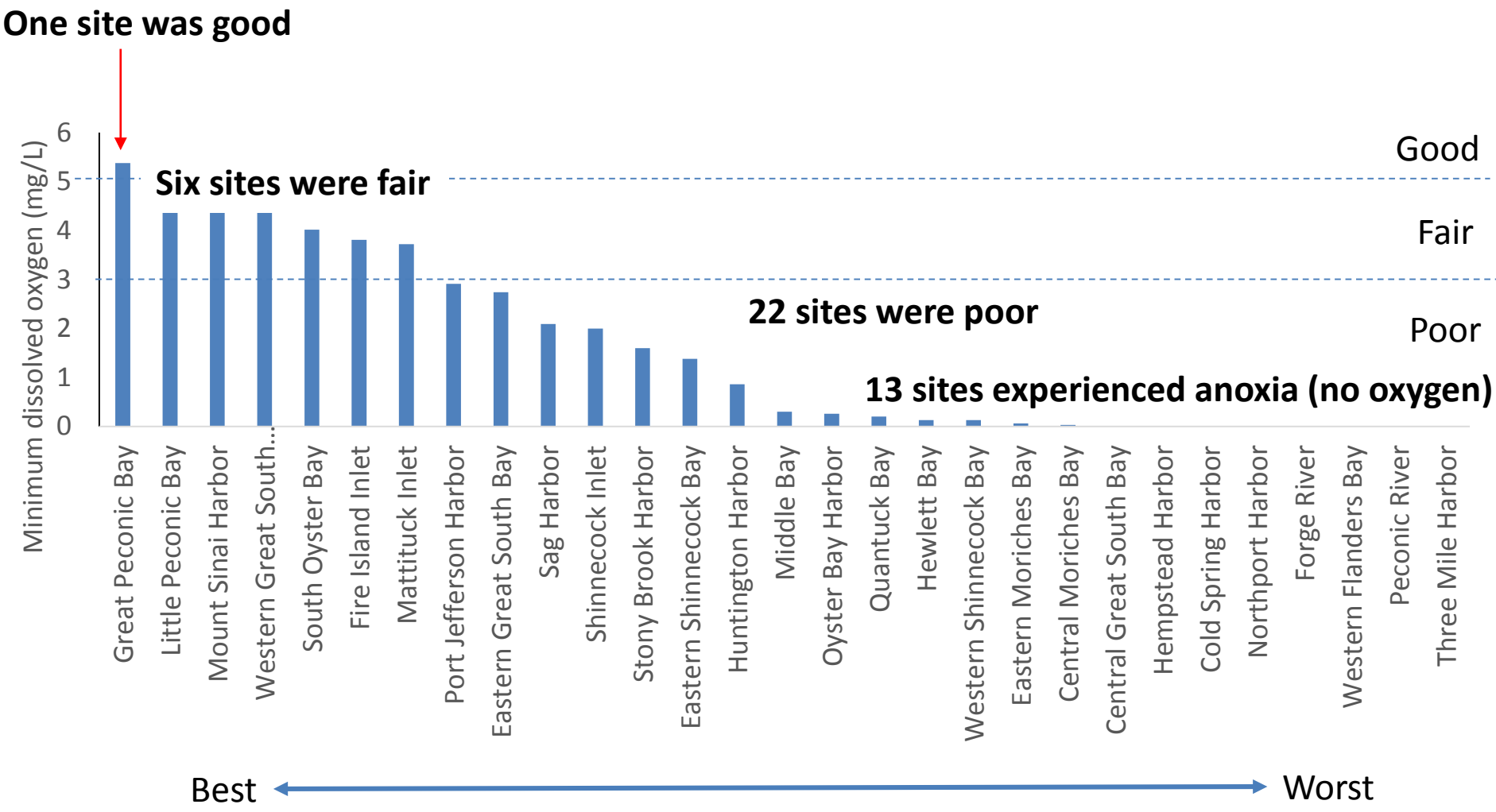


"More algae and warm temperatures during summer make bacteria **hyperventilate**"

The day – night cycle of hypoxia / low oxygen

Day	Night
Photosynthesis produces oxygen Respiration consumes oxygen Oxygen high	No photosynthesis Respiration consumes oxygen Oxygen low
Sediment	Sediment

Minimum dissolved oxygen, summer 2017

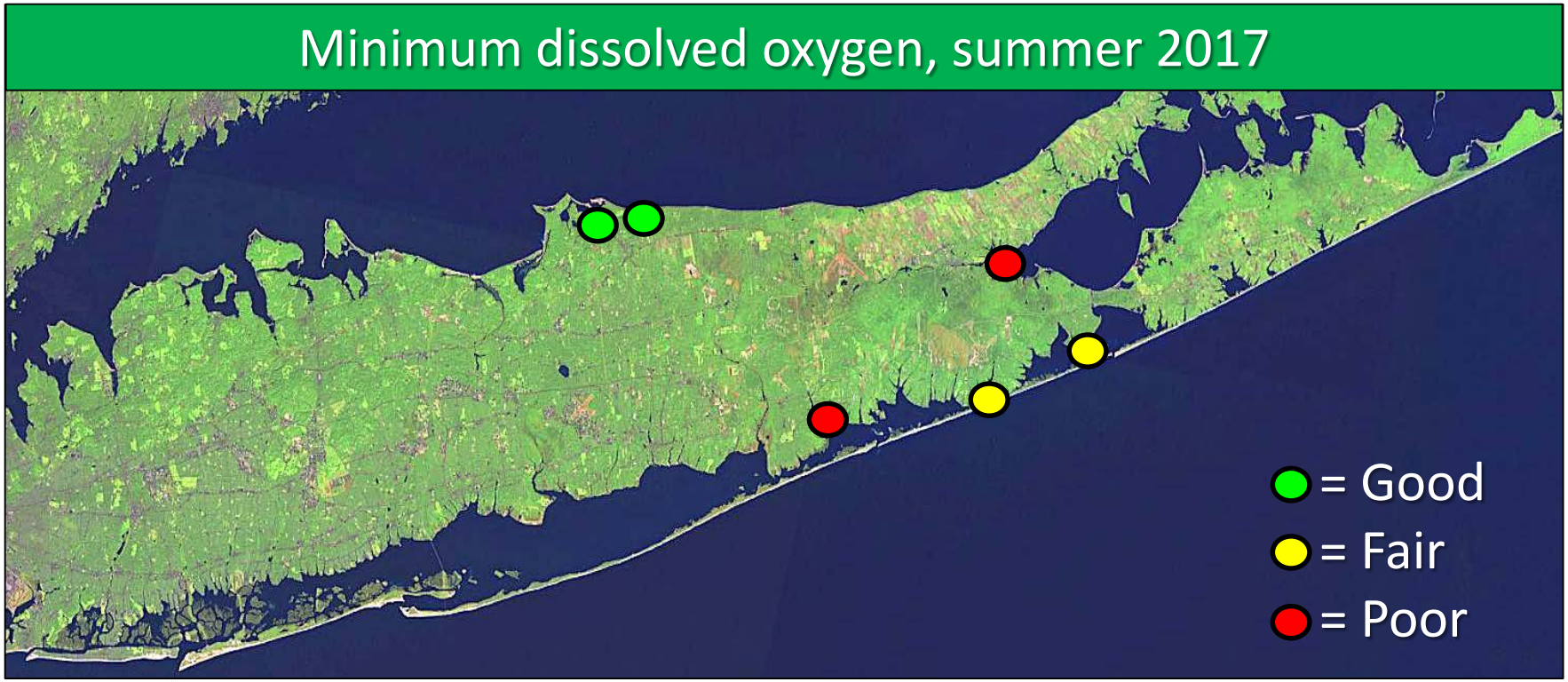


Good, fair, poor based on NYSDEC standards

Does low DO matter? August experiment

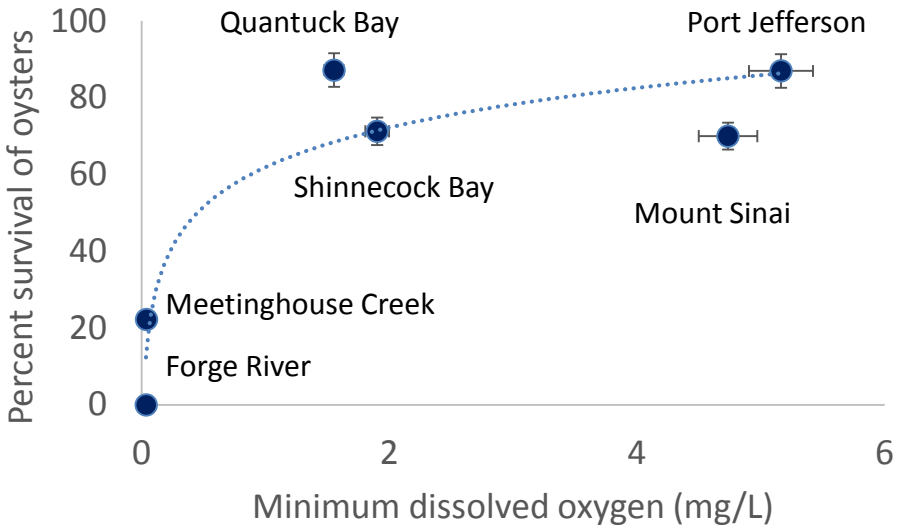
Eastern oyster

Hard clam



Does low DO matter? August experiment

- Oyster survival; R^2=0.88, p<0.01



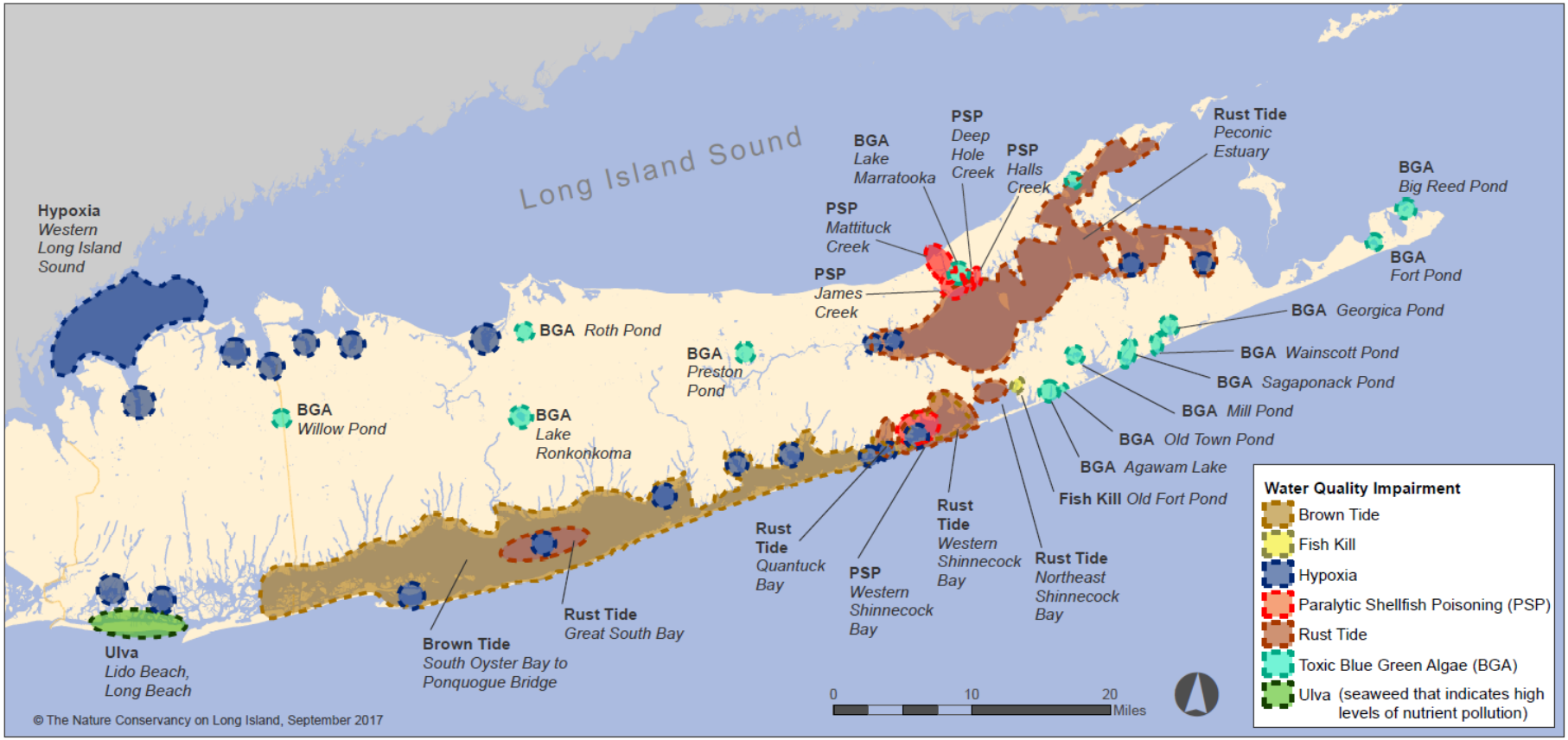
  - Similar trend found for hard c
  - Remember low DO also mear

Stony Brook University
School of Marine and Atmospheric Sciences

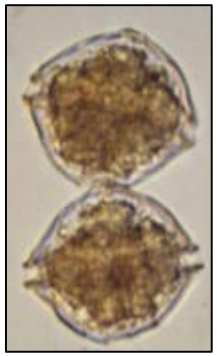
LICCRA

Long Island Water Quality Impairments
Summer 2017

The Nature Conservancy
Protecting nature. Preserving life.

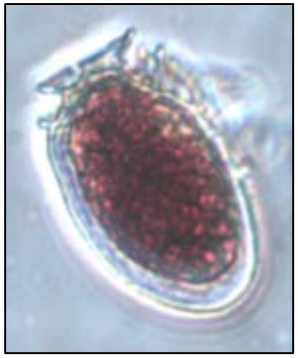


Harmful algal blooms across Long Island



PSP

Toxic blue green algae



DSP

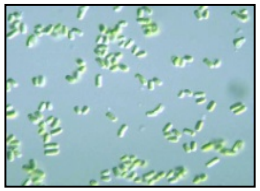
Brown tide

Seaweeds

Rust Tide

History of Harmful Algae on Long Island

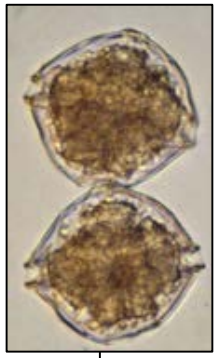
1951 – 1954, Green tides, Chlorophytes



1954 – 1985, 30-yr HAB free

1985 - First brown tide caused by *Aureococcus*

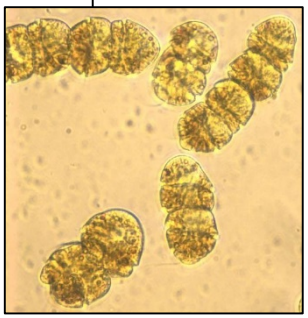
2006- First PSP event caused by *Alexandrium*



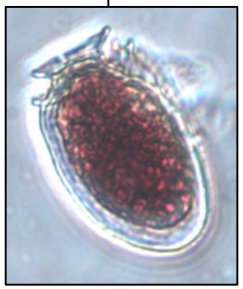
1951 Closure of Moriches Inlet, duck farms common

1954 Moriches Inlet opened, green tides end

2003- First toxic blue green algae bloom

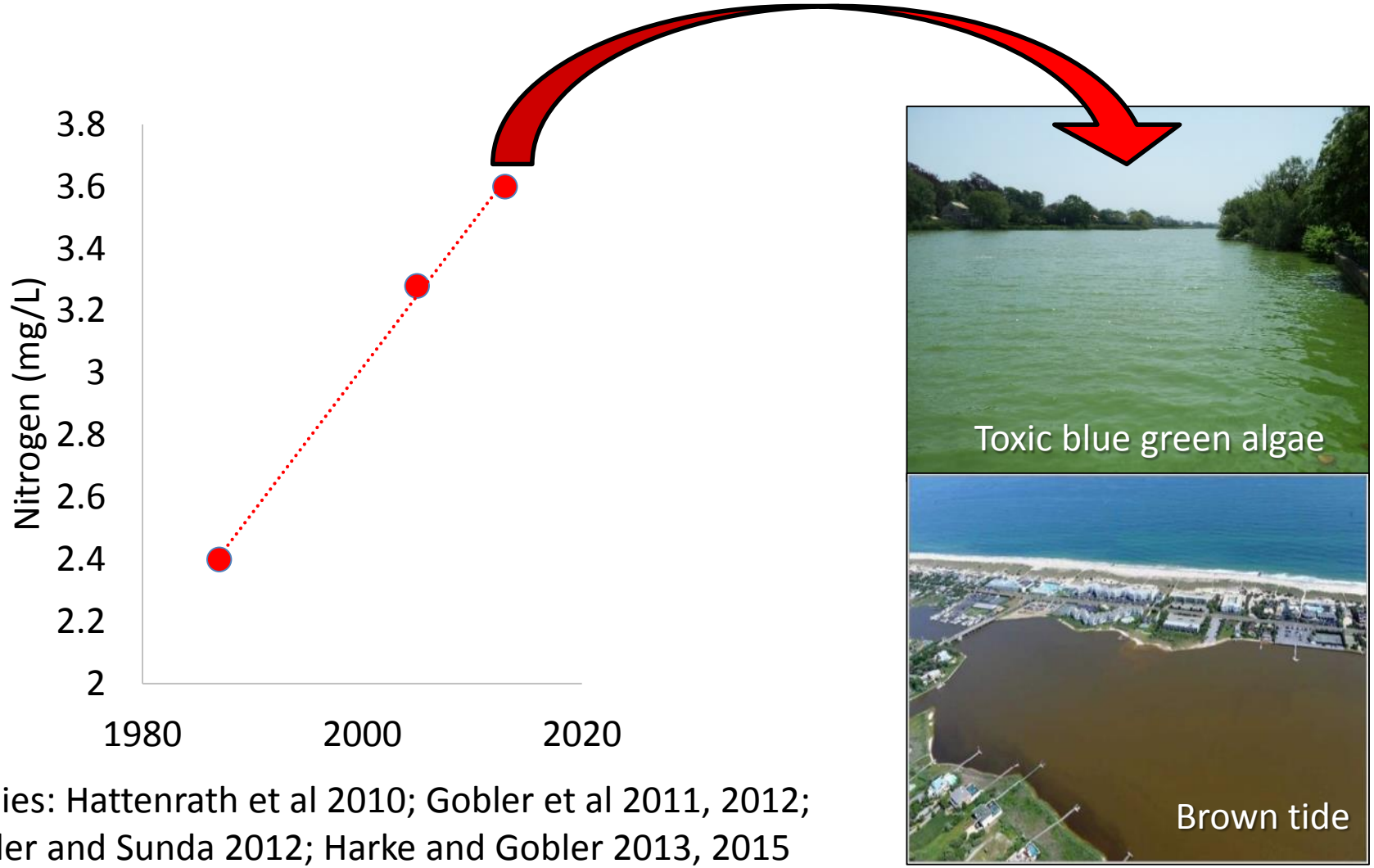


2004 - First rust tide caused by *Cochlodinium*



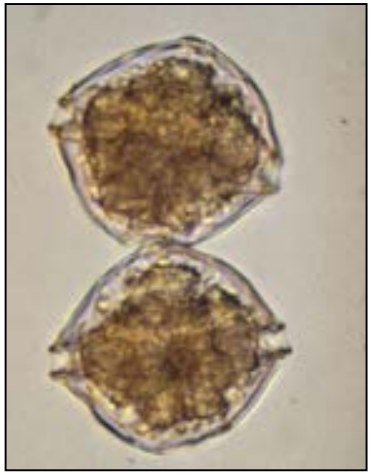
2008 - First DSP caused by *Dinophysis*

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

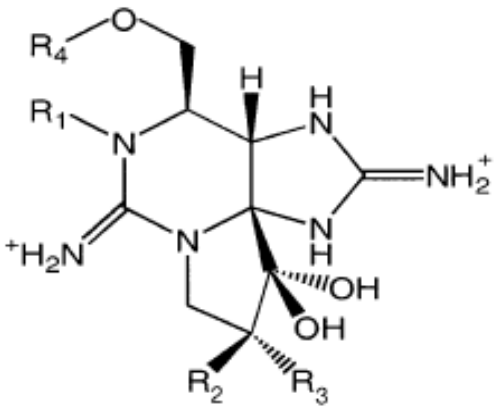


Studies: Hattenrath et al 2010; Gobler et al 2011, 2012; Gobler and Sunda 2012; Harke and Gobler 2013, 2015 Hattenrath-Lehmann et al 2015A&B; Gobler et el 2016; Harke et al 2016.

Alexandrium red tides and paralytic shellfish poisoning (PSP) on Long Island

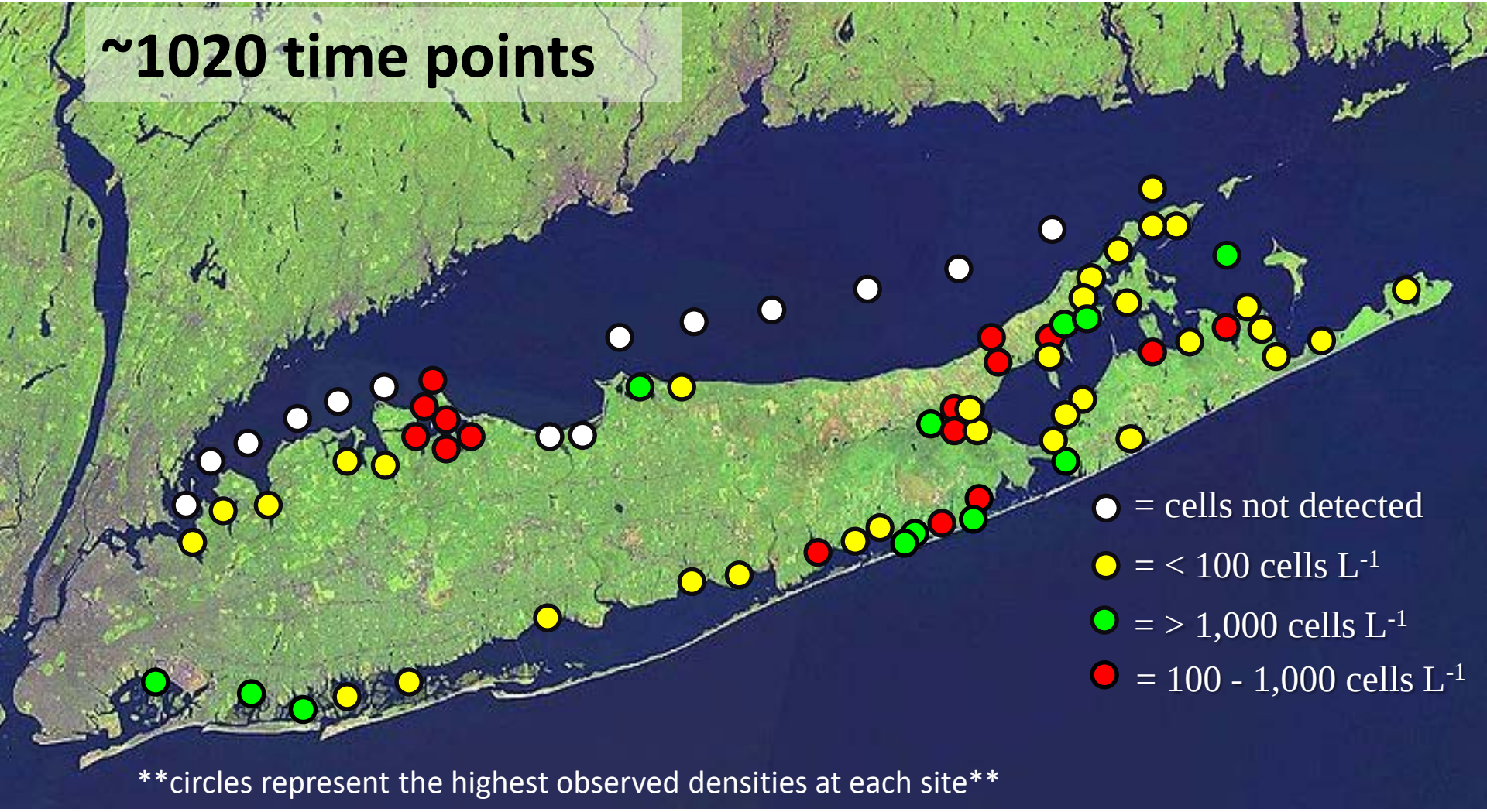


Alexandrium



Saxitoxin

PSP-producing *Alexandrium* across LI: 2007-2017



- *Alexandrium* found at 62 of 76 sites sampled (82%)

Marine Biotoxin Closure
Shinnecock Bay
Effective
May 9, 2018
Shellfish Harvest Area SS12

OLD COUNTRY RD
LEWIS RD
Pine Ne
Point
Triton
QUOGUE ST
DUNE RD
POSTLN

Biotoxin Closure
Normally Uncertified or Seasonally Uncertified

MENU TODAY'S PAPER Newsday

LONG ISLAND SPORTS ENTERTAINMENT NEWS THINGS TO DO OPINION

LONG ISLAND / SUFFOLK

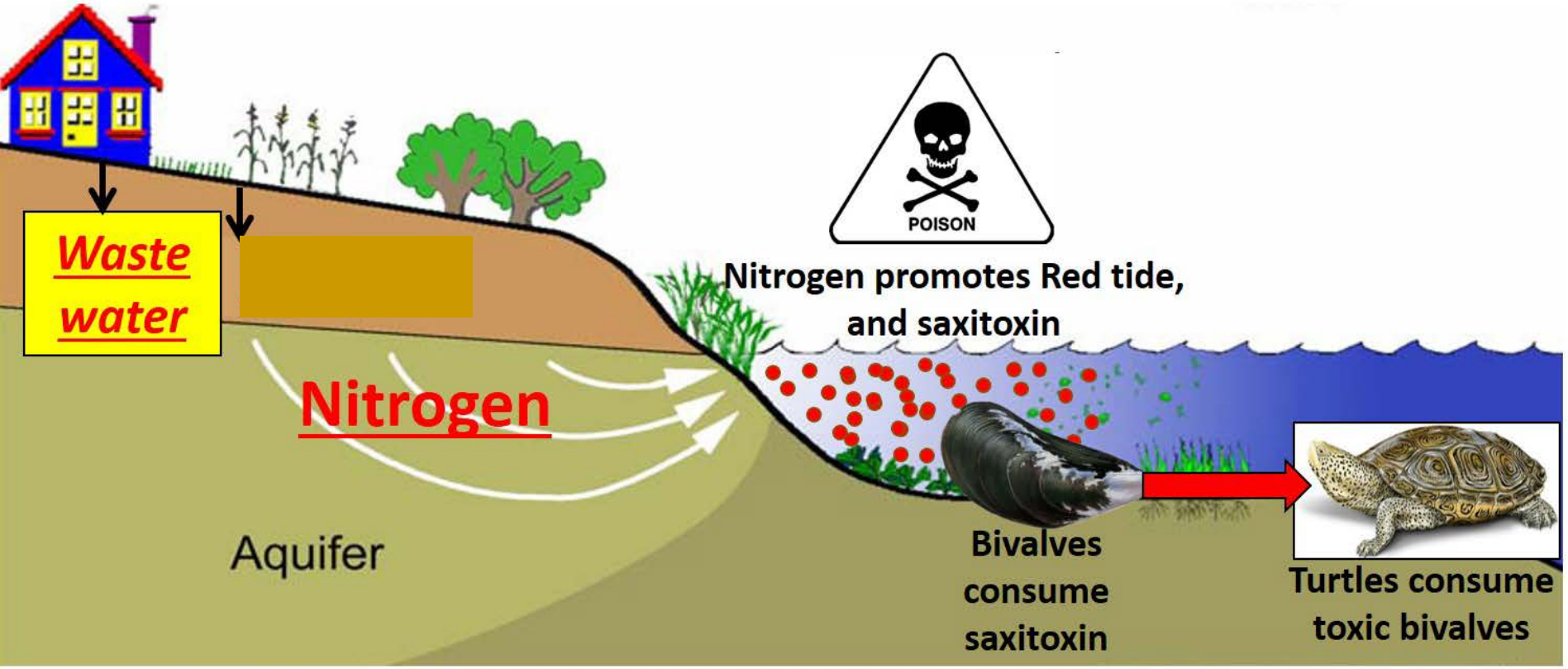
DEC temporarily bans shellfish harvesting in Shinnecock Bay

The DEC detected a marine biotoxin in shellfish in Southampton's western Shinnecock Bay. Photo Credit: Newsday / Randee Daddona

By Jesse Coburn
jesse.coburn@newsday.com @jesse_coburn
Updated May 9, 2018 7:33 PM

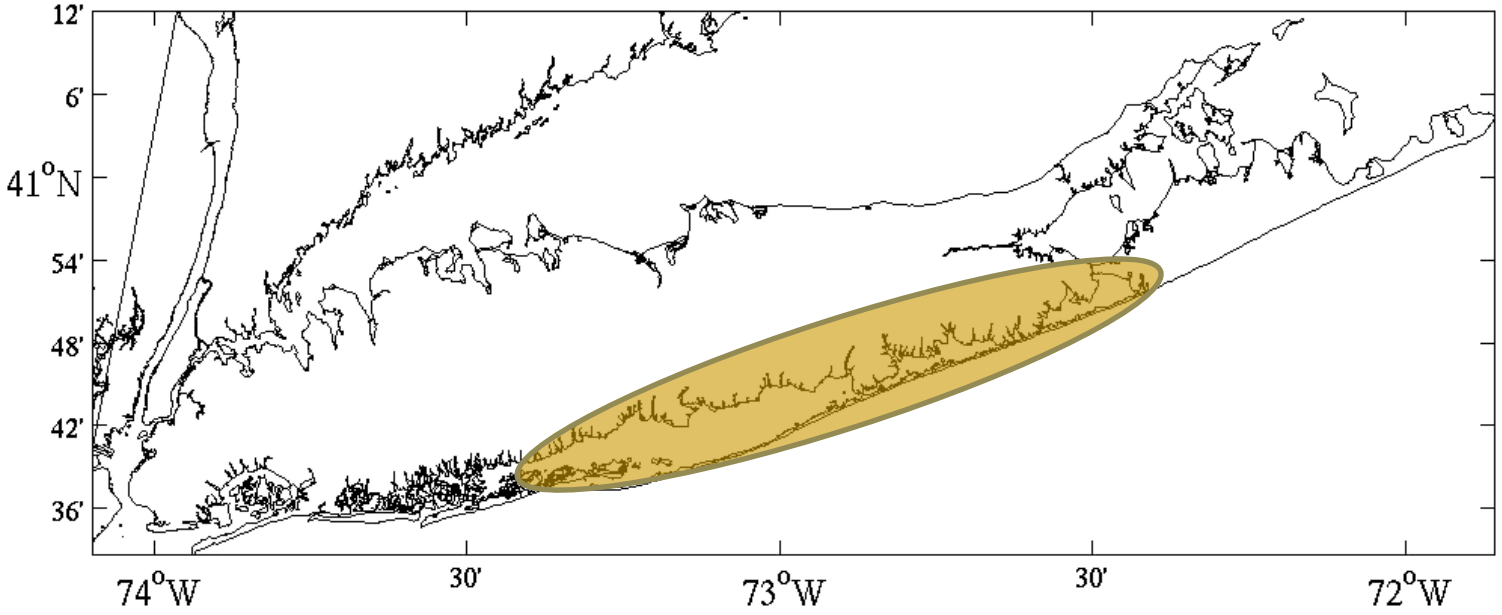
Linking land-derived nitrogen to PSP and turtle deaths

(Hattenrath et al 2010; Hattenrath-Lehemann et al 2017)

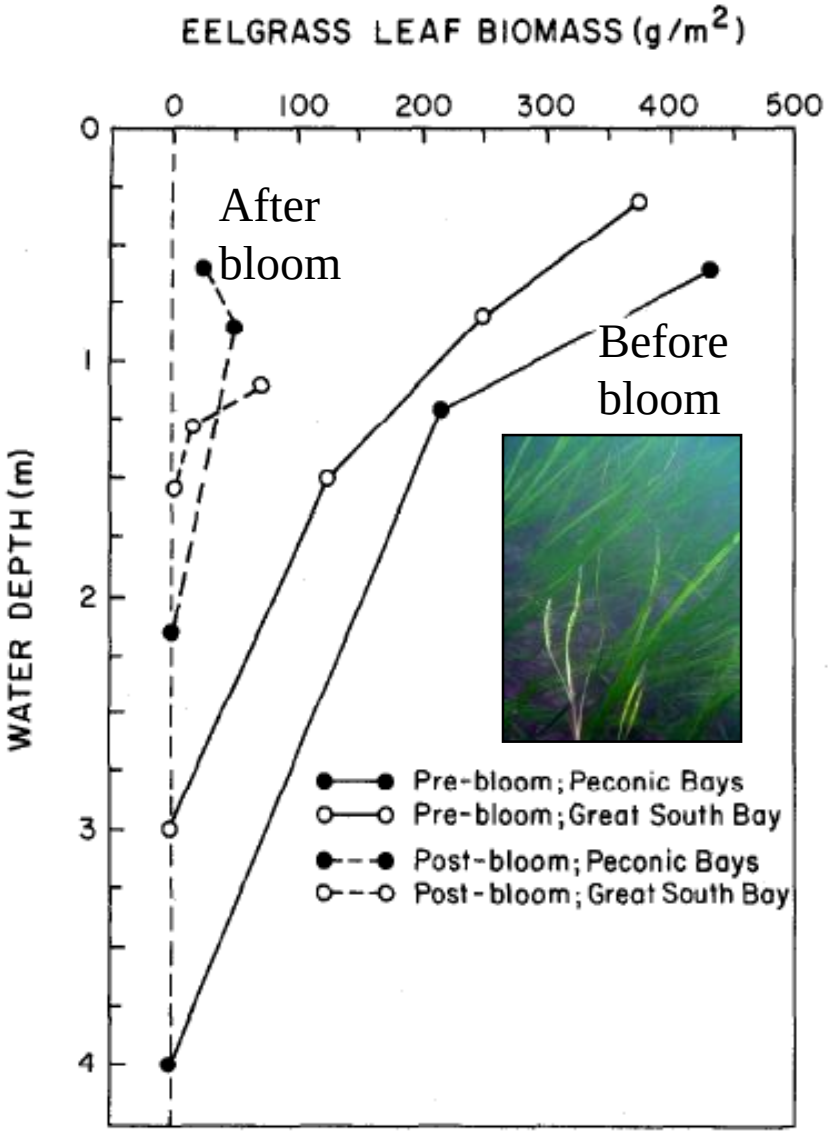


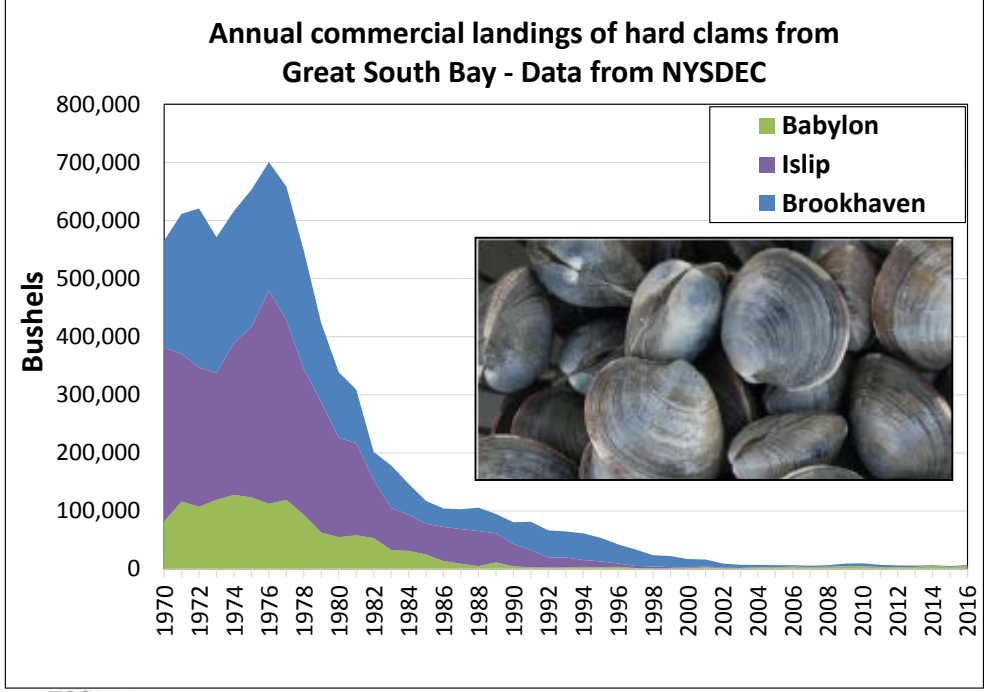
- Hattenrath et al 2010: Nitogen promtes PSP events
- Hattenrath-Lehemann et al 2017: PST in shellfish in 2015 was likely high enough to cause or contribute to the mortality terrapin turtles.

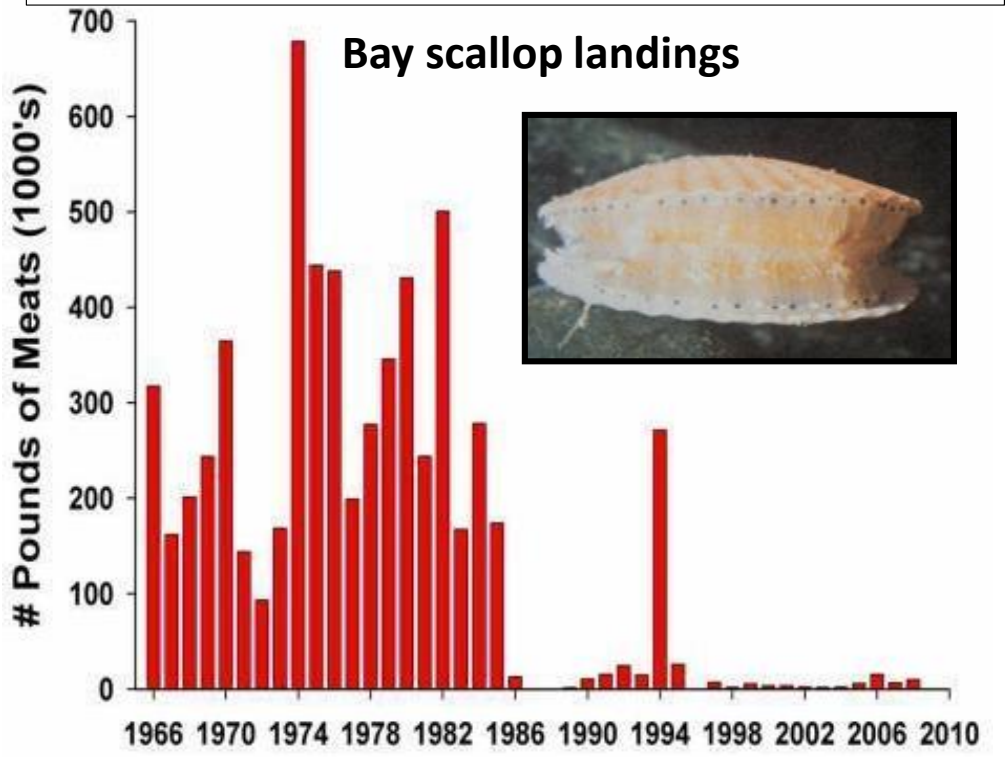
Brown tides caused by *Aureococcus*



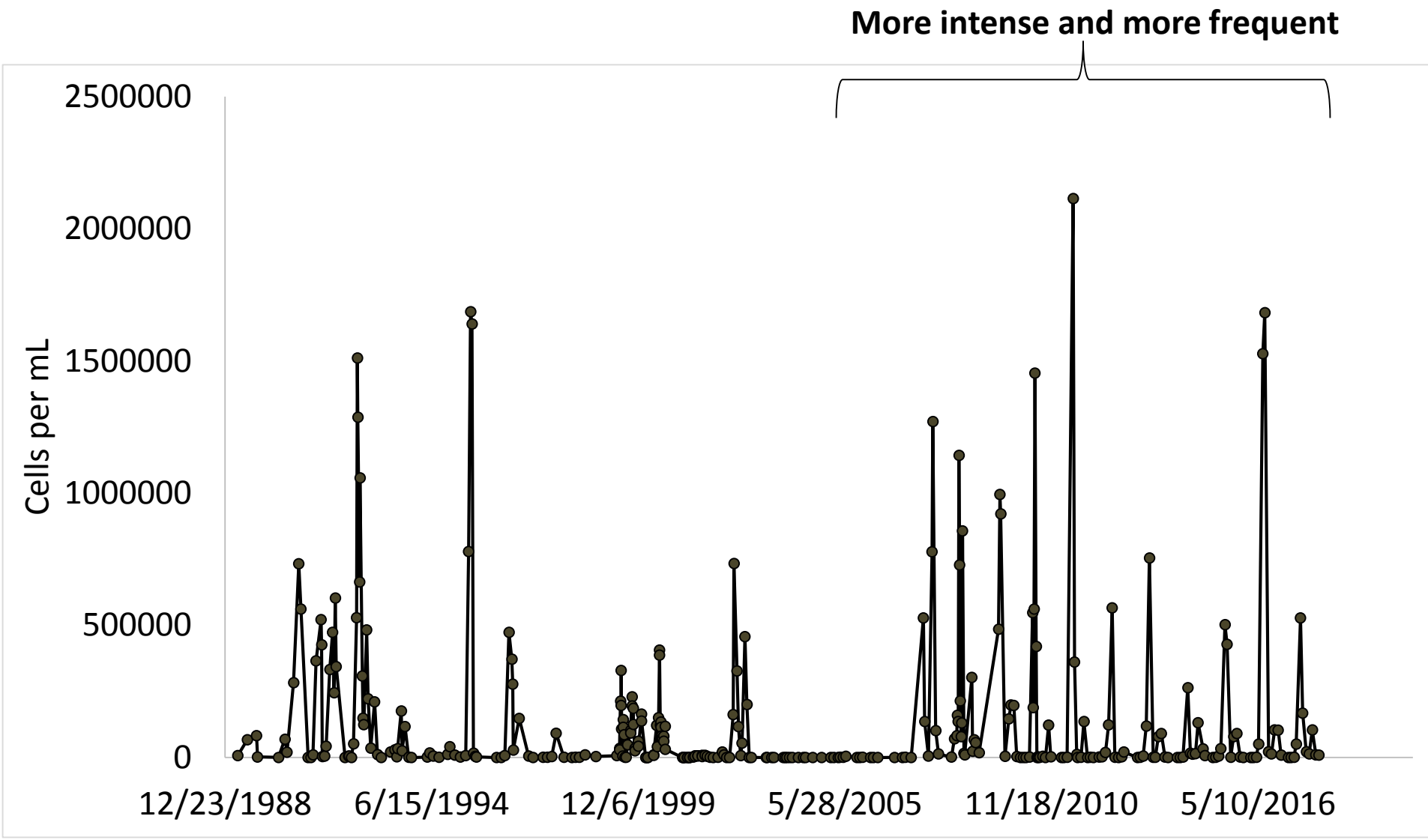
Impacts of brown tides in USA





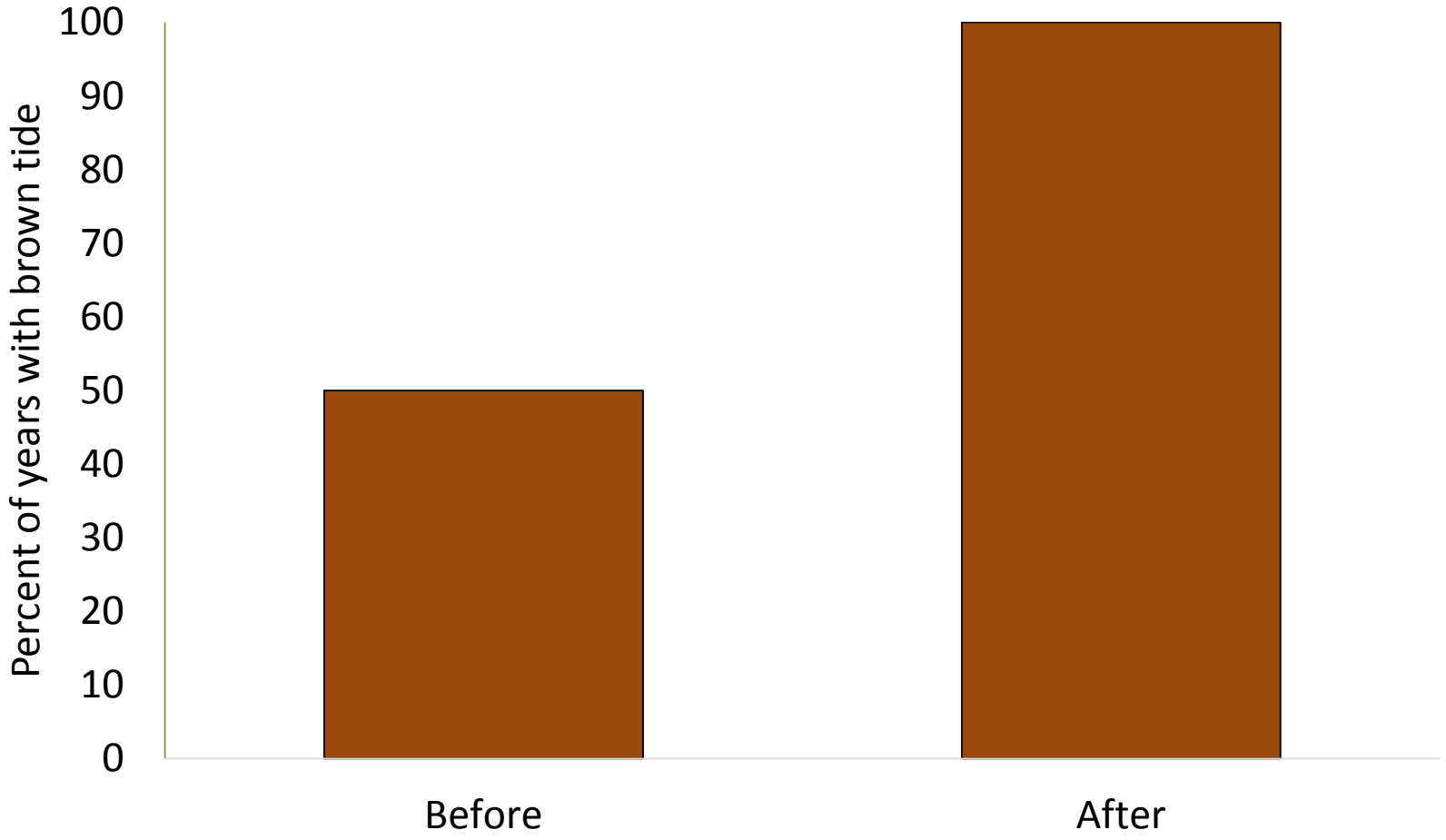


Brown tides, Moriches-Shinnecock

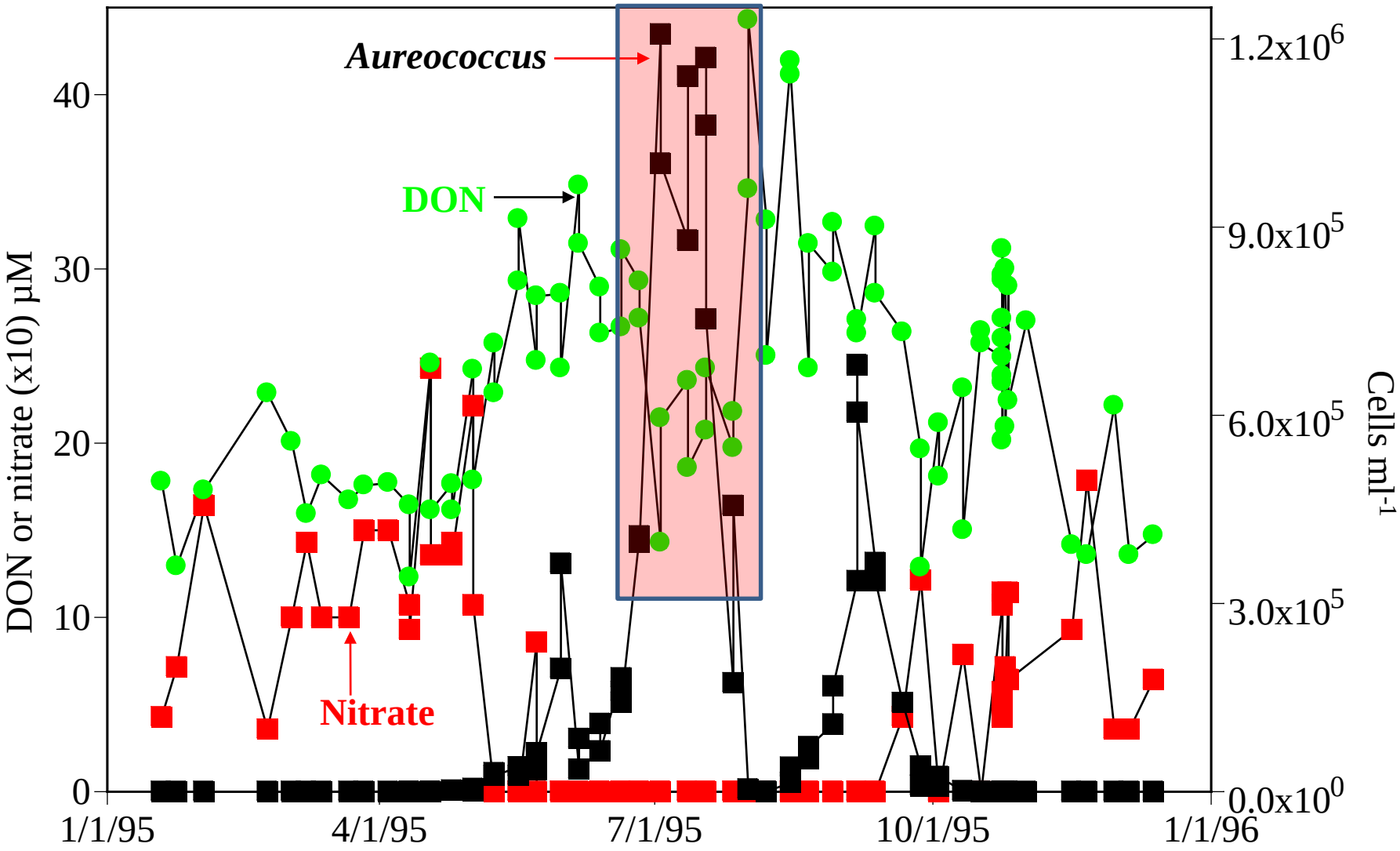


Frequency of brown tide before and after New Inlet in Great South Bay

2013-2017 were first five consecutive years of brown tide in GSB, ever.



Organic Nutrients and brown tide



Brown tide – nitrogen link

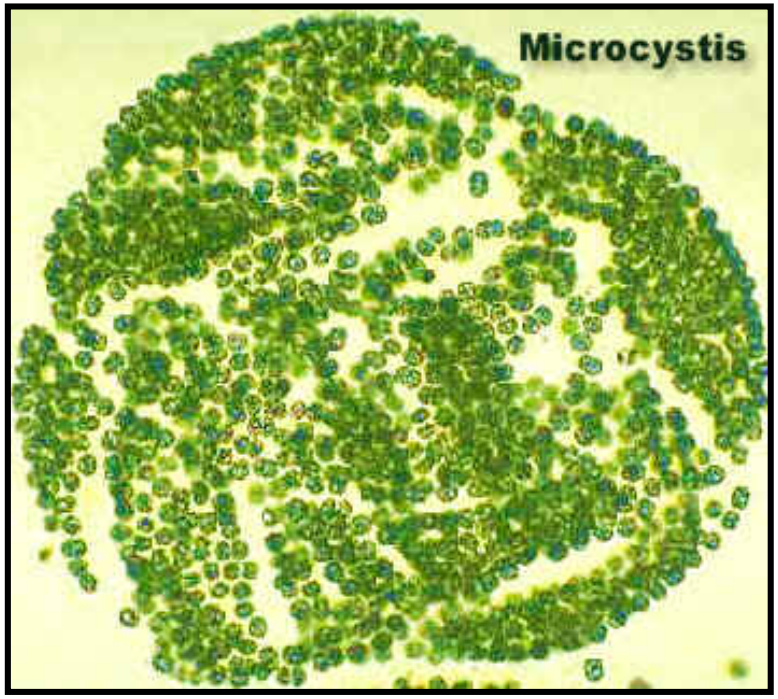
Excessive nitrogen loading to bays

Spring macro- or micro-algae bloom

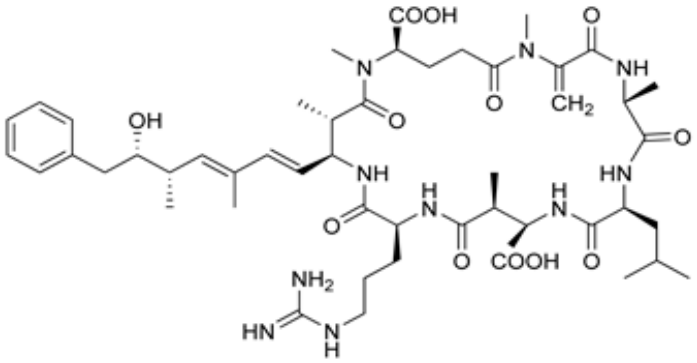
Initial algal bloom decays as waters warm releasing organic nitrogen

Brown tide fueled by organic nitrogen

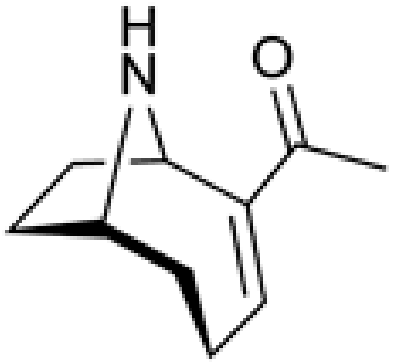
Freshwater cyanobacteria and their toxins



Microcystin – gastrointestinal toxin



Anatoxin-a – neurotoxin



OXFORD JOURNALS CONTACT US MY BASKET MY ACCOUNT

Carcinogenesis
Integrative Cancer Research

Detection of microcystins, a blue-green algal hepatotoxin, in drinking water sampled in Haimen and Fusui, endemic areas of primary liver cancer in China, by highly sensitive immunoassay

Yoshio Ueno[1,6], Satoshi Nagata[1], Tomoaki Tsutsumi[1], Akihiro Hasegawa[1], Mariyo F. Watanabe[2], Ho-Dong Park[3], Gong-Chao Chen[4], Gang Chen[5] and Shun-Zhang Yu[5]

« Previous | Next Article »
Table of Contents

This Article

Search this journal: GO
Advanced »

Current Issue

Carcinogenesis (1996) 17 (6): 1317-1321.
doi: 10.1093/carcin/17.6.1317

August 2014 35 (8)

» Abstract *Free*
Full Text (PDF) *Free*

Journal of Cancer Research and Clinical Oncology
June 1992, Volume 118, Issue 6, pp 420–424

Liver tumor promotion by the cyanobacterial cyclic peptide toxin microcystin-LR

BIOMEDICAL AND ENVIRONMENTAL SCIENCES 15, 166-171 (2002)

Relationship Between Microcystin in Drinking Water and Colorectal Cancer[1]

Toxins **2013**, *5*, 1597-1628; doi:10.3390/toxins5091597

OPEN ACCESS

toxins

ISSN 2072-6651

www.mdpi.com/journal/toxins

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

NYSDEC blue green algae page

Blooms across NYS tracked weekly May - Nov

NEW YORK STATE

Services News Government

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

A+ Translate || Printer-friendly || A-Z Subject Index || Enter search word

- Outdoor Activities
- Animals, Plants, Aquatic Life
- Chemical and Pollution Control
  - Water
    - Water Quality Information
      - Blue-Green Harmful Algal Blooms
        - What is a Blue-green Harmful Algal Bloom?
        - Photo Gallery of Green and Blue-green Algae
        - Blue-Green Algal Bloom Notices
        - Information about Blue-green Algae HABs for Individuals and Communities
        - Archived Blue-green Algal Bloom Notices
        - FAQs About Blue-green Algae
- Energy and Climate
- Lands and Waters
- Education
- Permit, License, Registration
- Public Involvement and News
- Regulations and Enforcement
- Publications, Forms, Maps
- About DEC

Home » Chemical and Pollution Control » Water » Water Quality Information » Blue-Green Harmful Algal Blooms

Blue-Green Harmful Algal Blooms

No harmful algae blooms that have been identified in the waters of western Lake Erie have affected New York State drinking water and bathing beaches. Monitoring and surveillance of the New York portions of Lake Erie, as well as the Niagara River and Lake Ontario, have revealed no such blooms. More information about HABs can be found on this page; an overview of HABs and drinking water concerns, including concerns about Lake Erie (PDF, 170 KB) is available.

What is a Harmful Algal Bloom (HAB)?

Most algae are harmless and are an important part of the food web. Algae are naturally present in slow moving streams, lakes, marine waters and ponds in low numbers. Certain types can become abundant and form blooms under the right conditions. Some algae can produce toxins that can be harmful to people and animals. These are collectively called harmful algal blooms (HABs).

Avoid Algae Blooms

Algae blooms most frequently occur in nutrient-rich waters, particularly during hot, calm weather.

Because it is hard to tell a harmful algae bloom from other algae blooms, we recommend avoiding contact with any floating rafts, scums, and discolored water. Find out what waterbodies have a blue-green algal bloom notice.

Freshwater Blue-green Algal Blooms

Blue-green algae, technically known as **cyanobacteria**, are naturally present in lakes and streams in low numbers. Blue-green algae can form HABs that discolor the water or produce floating rafts or scums on the surface of the water. These can cause health risks to people and animals when they are exposed to them.

Blue-green algae blooms may have the appearance of spilled green paint.

Blue-green algae blooms can occur in freshwater lakes and ponds and can reduce the recreational value of a waterbody, due to unpleasant appearances and odors, and can cause a variety of ecological problems, such as reduced oxygen levels. They also have the potential to form harmful (toxic) blue-green algal blooms, although the factors that cause blue-green algae to produce toxins are not well understood.

Harmful blue-green algae blooms can cause health effects when people and animals come in contact with them. Symptoms can include nausea, vomiting, diarrhea, skin or throat irritation, allergic reactions or breathing difficulties. Blue-green algae can also produce toxins that affect the liver and nervous systems when water is consumed in sufficient quantities.

More information about blue-green algae and blue-green harmful algal blooms effect on lakes.

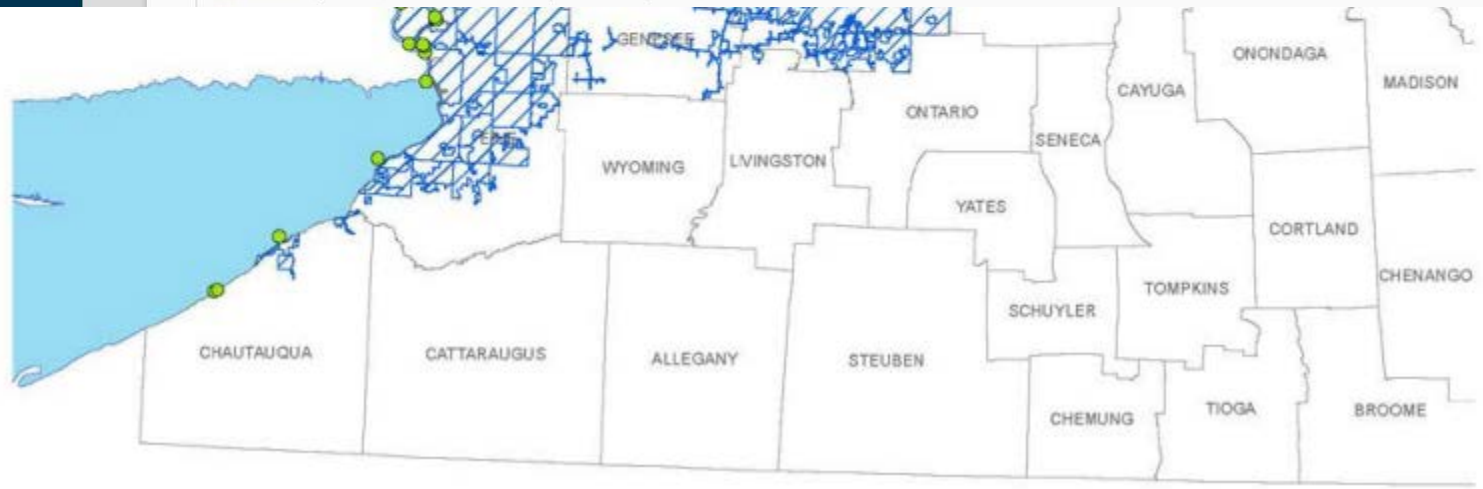
Marine Algal Blooms

Democrat & Chronicle
PART OF THE USA TODAY NETWORK

Search

Blue-green algae blooms reported in 7 Finger Lakes, including Skaneateles

Steve Orr, @SOrr1 Published 6:58 p.m. ET Sept. 15, 2017



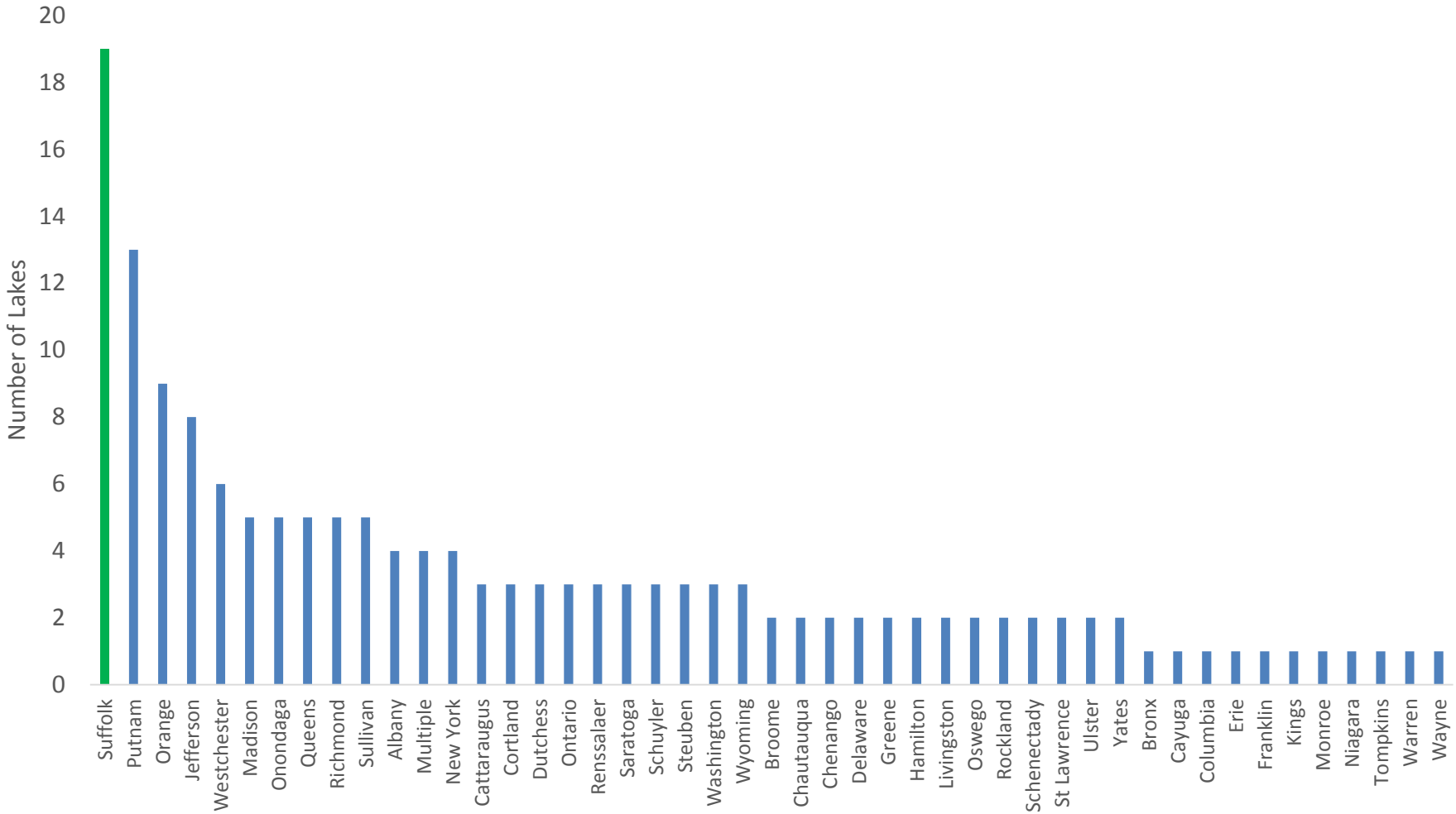
Where are blue green algal blooms most common?

LakeNet Explorer 2004

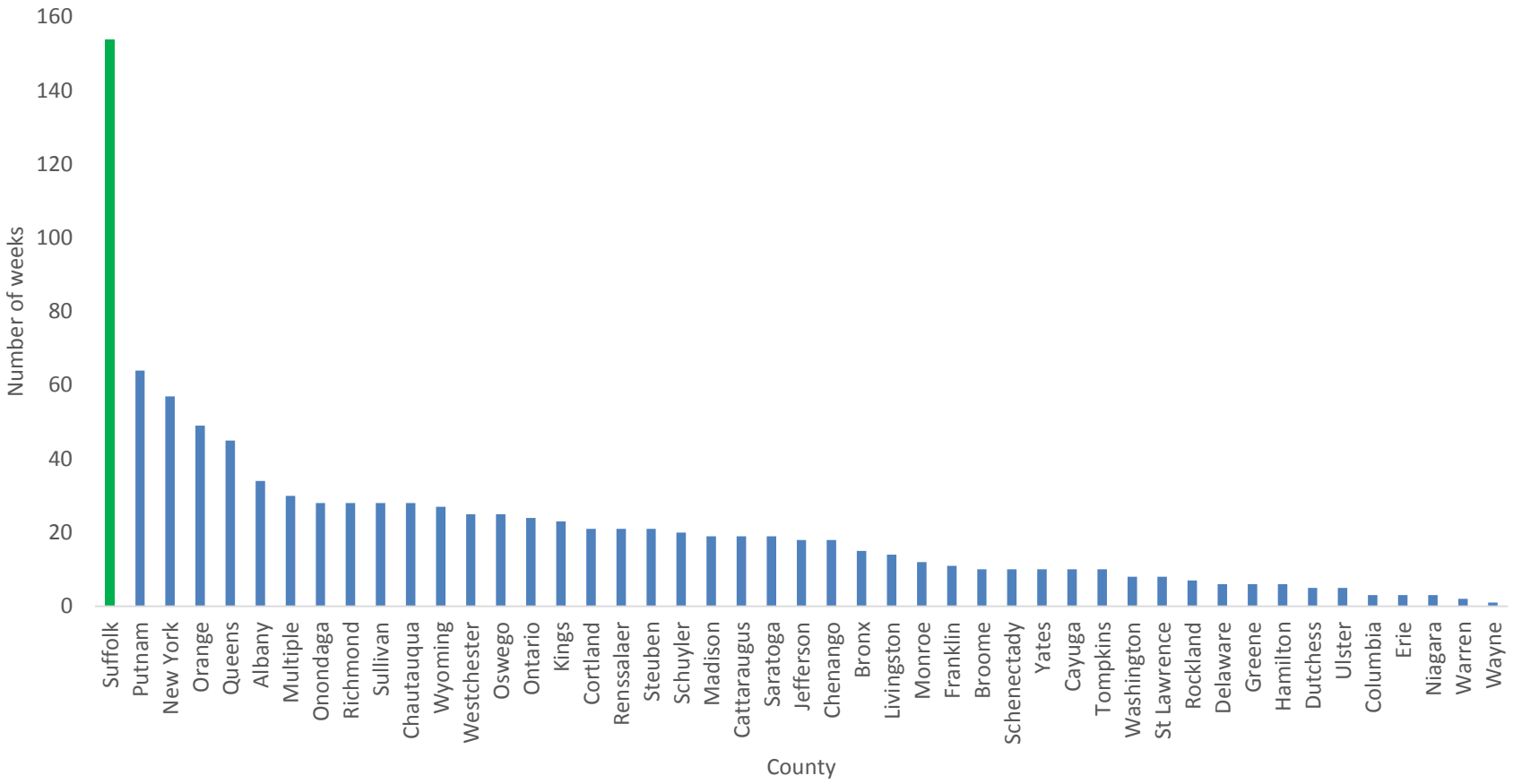
Lehner & Doll (2003); ESRI (2003)

Number of lakes listed for blue green algae by county in NYSDEC in 2017

62 Counties in NYS; 47 counties with blue green algal blooms



Number of weeks lakes listed for blue green algae per county, 2017



LONG ISLAND / SUFFOLK

Lake Ronkonkoma algae bloom prompts warning

People and pets should stay away, Suffolk County says. The lake's beach won't open for swimming until late June, the Town of Islip says.

A sign posted at Lake Ronkonkoma in 2013 warned of a previous algae bloom. Photo C

By Joan Gralla
joan.gralla@newsday.com @JoanGralla
Updated May 10, 2018 4:22 PM

MENU TODAY'S PAPER Newsday

LONG ISLAND SPORTS ENTERTAINMENT NEWS THINGS TO DO OPINION B

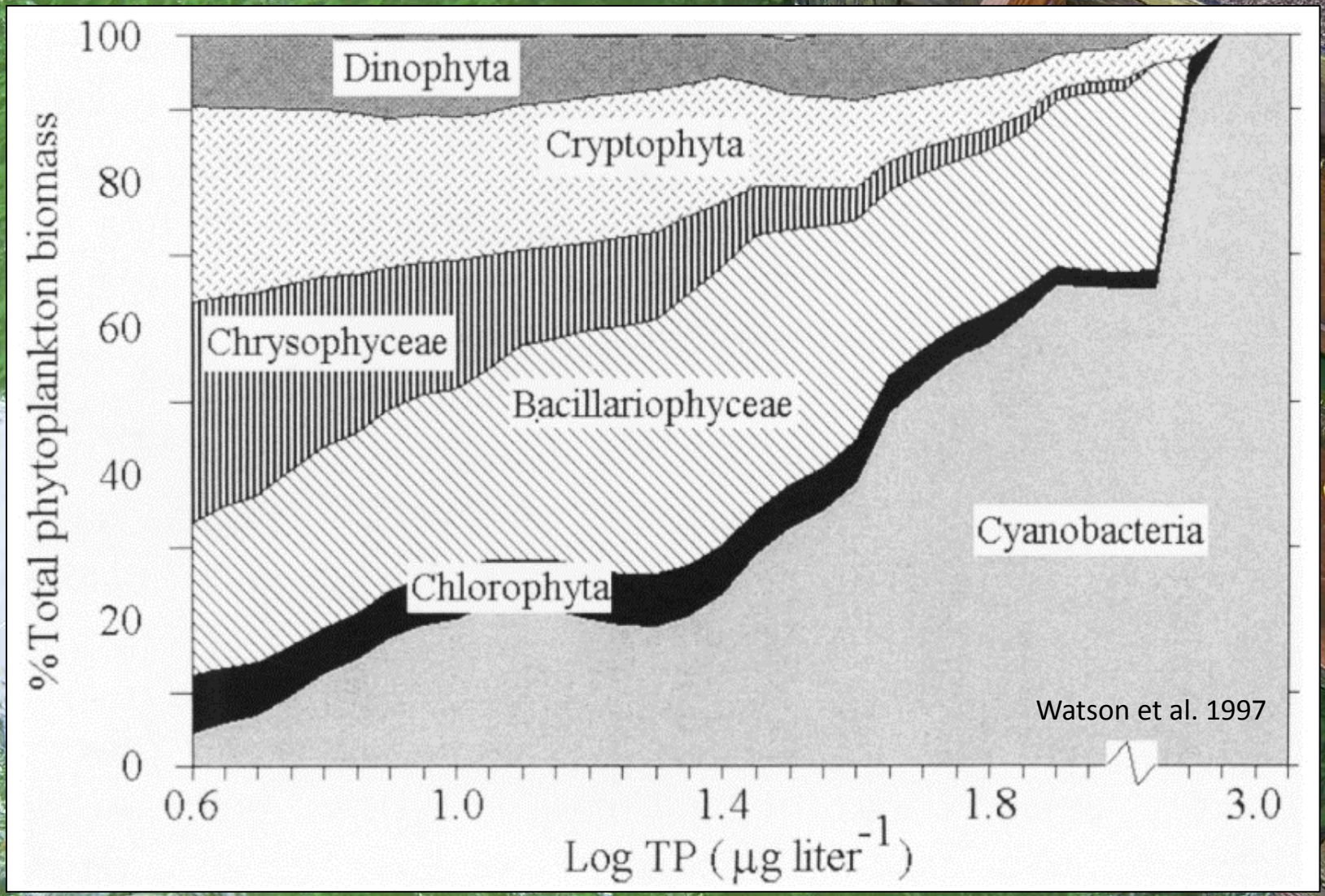
LONG ISLAND / SUFFOLK

Suffolk County issues warning about blue-green algae in Agawam Lake

On Wednesday county officials issued the same advisory for Lake Ronkonkoma, where the algae, also known as a cyanobacteria bloom, was still present as of Friday.

By Patricia Kitchen
patricia.kitchen@newsday.com @patriciakitchen
Updated May 11, 2018 9:07 PM

Phosphorus and freshwater cyanobacteria



Harmful Algae 54 (2016) 87–97

Contents lists available at ScienceDirect

Harmful Algae

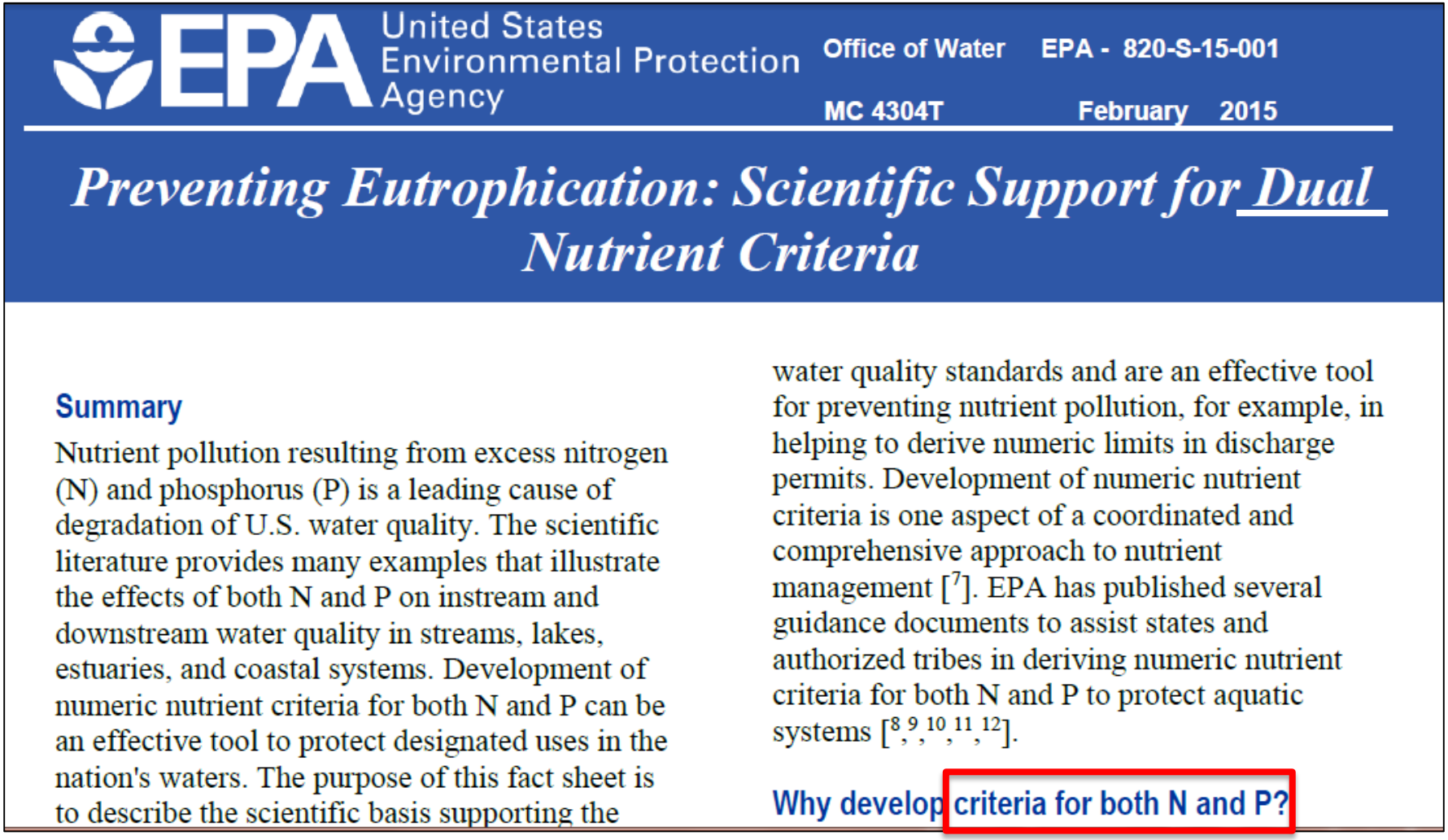
journal homepage: www.elsevier.com/locate/hal

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]

[a] School of Marine and Atmospheric Sciences, Stony Brook University, 239 Montauk Hwy, New York 11968, USA
[b] Center for Applied Aquatic Ecology, North Carolina State University, Raleigh, NC 27606, USA
[c] NOAA Great Lakes Environmental Research Laboratory, Ann Arbor, MI 48108, USA
[d] Cooperative Institute for Limnology and Ecosystems Research, University of Michigan, Ann Arbor, MI 48109, USA
[e] Department of Aquatic Ecology, Netherlands Institute of Ecology (NIOO-KNAW), Post Office Box 50, Wageningen 6700 AB, The Netherlands



United States Environmental Protection Agency

Office of Water MC 4304T

EPA - 820-S-15-001 February 2015

Preventing Eutrophication: Scientific Support for Dual Nutrient Criteria

Summary

Nutrient pollution resulting from excess nitrogen (N) and phosphorus (P) is a leading cause of degradation of U.S. water quality. The scientific literature provides many examples that illustrate the effects of both N and P on instream and downstream water quality in streams, lakes, estuaries, and coastal systems. Development of numeric nutrient criteria for both N and P can be an effective tool to protect designated uses in the nation's waters. The purpose of this fact sheet is to describe the scientific basis supporting the water quality standards and are an effective tool for preventing nutrient pollution, for example, in helping to derive numeric limits in discharge permits. Development of numeric nutrient criteria is one aspect of a coordinated and comprehensive approach to nutrient management [7]. EPA has published several guidance documents to assist states and authorized tribes in deriving numeric nutrient criteria for both N and P to protect aquatic systems [8,9,10,11,12].

Why develop criteria for both N and P?

Microcystis blooms promoted and/or made more toxic by excessive nitrogen:

Gobler et al. 2007, 2016; Davis et al 2009, 2010; O'Neil et al. 2012. Harke et al, 2013, 2015, 2016; Harke and Gobler, 2015; Van Der Waal et al 2009, 2010, 2013, 2014; dozens more

Conclusions

- Excessive nitrogen loading is on on-going threat to coastal ecosystems, economies, pets, and human health harm across Long Island.
- Most HABs in Suffolk County can be directly or indirectly linked to excessive nutrient loading
- Other drivers include the loss of shellfish and rising temperatures associated with climate change.

Effect of water clarity on home values?

	All Suffolk County Parcels			
	SAR (total)	SAR (indirect)	SAR (direct)	SEM
Independent Variables	**β**	**β**	**β**	**β**
WQ_WF	0.034***	0.02***	0.014***	0.007*
WQ_Dist_0_500	0.023***	0.014***	0.010***	-0.002
WQ_Dist_500_1000	0.008***	0.005***	0.003***	-0.004**
WQ_Dist_1000_2000	0.007***	0.004	0.003***	-0.001
R-squared	0.77			0.81
Observations (n)	20,673			
*** p<0.01, ** p<0.05, * p<0.1				

Mark Nepf, M.S. and Dr. Anthony Dvarkas, SBU

- Waterfront: **3% of value** controlled by water clarity (e.g. $150,000 on $5M home)
- 100 - 1000 m (up to half mile) from water: **1 – 2% of value**
- Associations strongest on south shore; weakest on north shore.

Stony Brook University
School *of* Marine and Atmospheric Sciences