Working Towards a Sustainable Remediation of Georgica Pond

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School *of* Marine and
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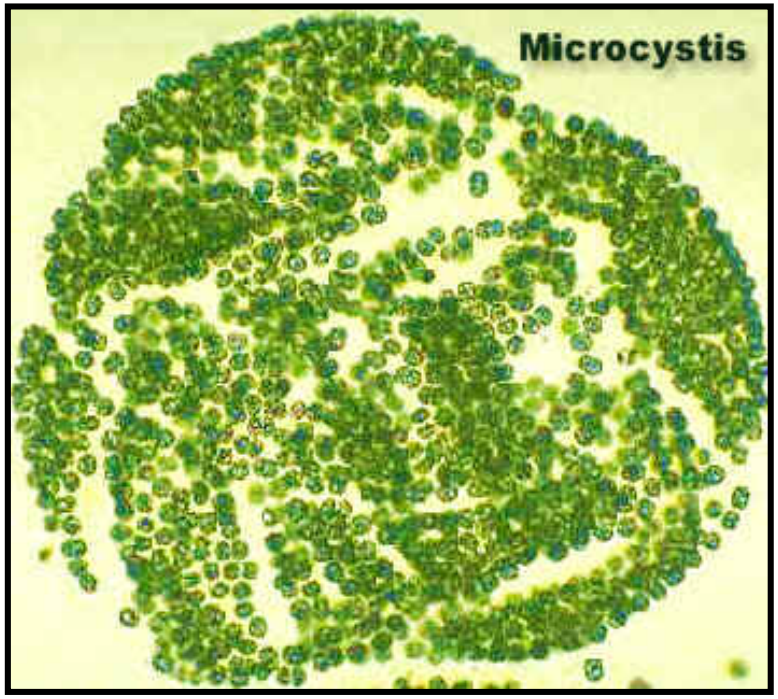
What's ailing Georgica Pond?

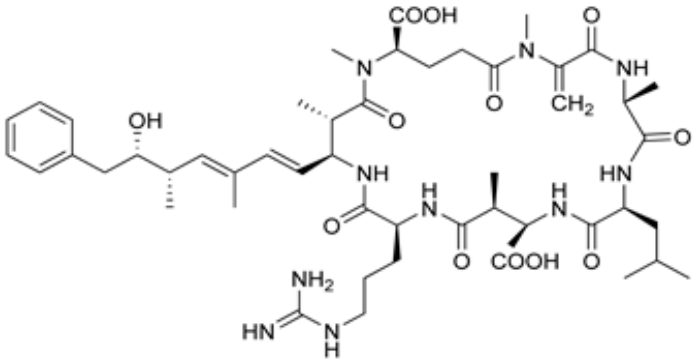
Macroalgae blooms

Blue-green algal / cyanobacterial blooms

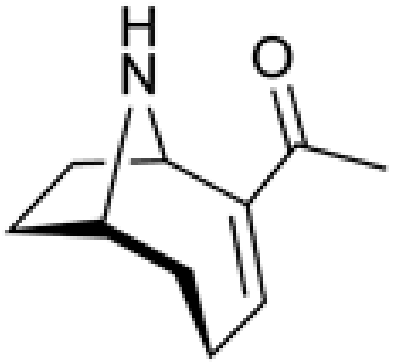
Freshwater cyanobacteria and their toxins



Microcystin – gastrointestinal toxin



Anatoxin-a – neurotoxin



FEATURED

A Toxic Blue-Green Algae Bloom Has Killed 4 Dogs In Texas' Lady Bird Lake This Summer

Special to the Herald Aug 13, 2019 Updated Aug 13, 2019

13 WTHR

Colorado dog suspected of dying from blue-green algae after swimming in pond

Dogs play in a pond at a Colorado dog park. (Photo: KUSA)

13 WTHR.COM STAFF

PUBLISHED: AUG 15TH, 2019 - 7:01AM (EDT) UPDATED: AUG 15TH, 2019 - 7:12AM (EDT)

NEWS

3 NC dogs die following swim in pond with blue-green algae

BY AUGUST 12, 2019 11:01 AM

ABC11 reports that three dogs died after swimming in a Wilmington, NC pond containing blue-green algae.

Dog dies nearly instantly after swim at popular metro Atlanta lake

By: Audrey Washington

Updated: Aug 12, 2019 - 6:41 PM

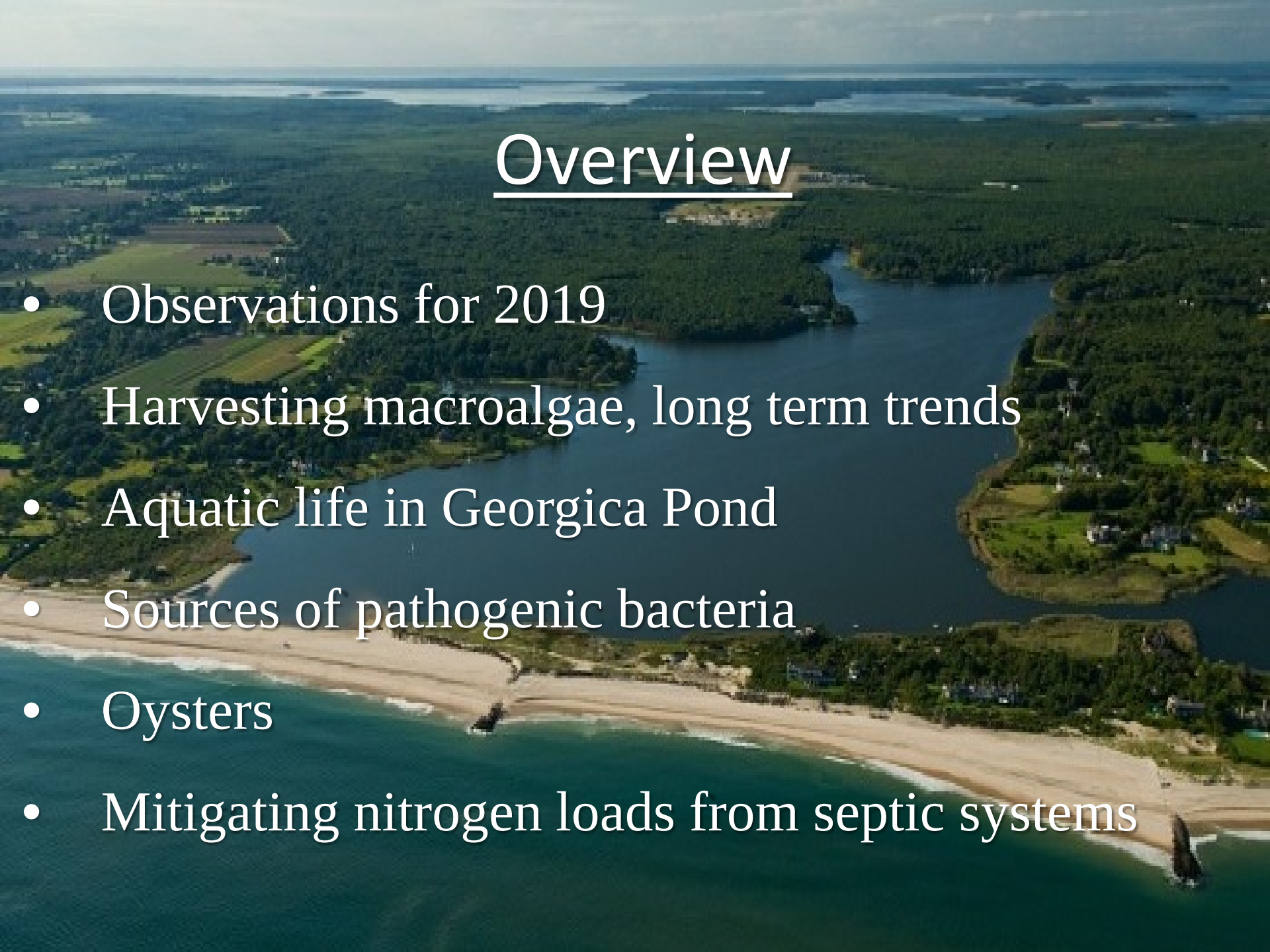
Low oxygen, death of wildlife






What's ailing Georgica Pond?

- Blooms of macroalgae
- Blooms of toxic cyanobacteria
- Hypoxia, anoxia
- Kills of fish, eels, birds, dogs
- Pathogenic bacteria

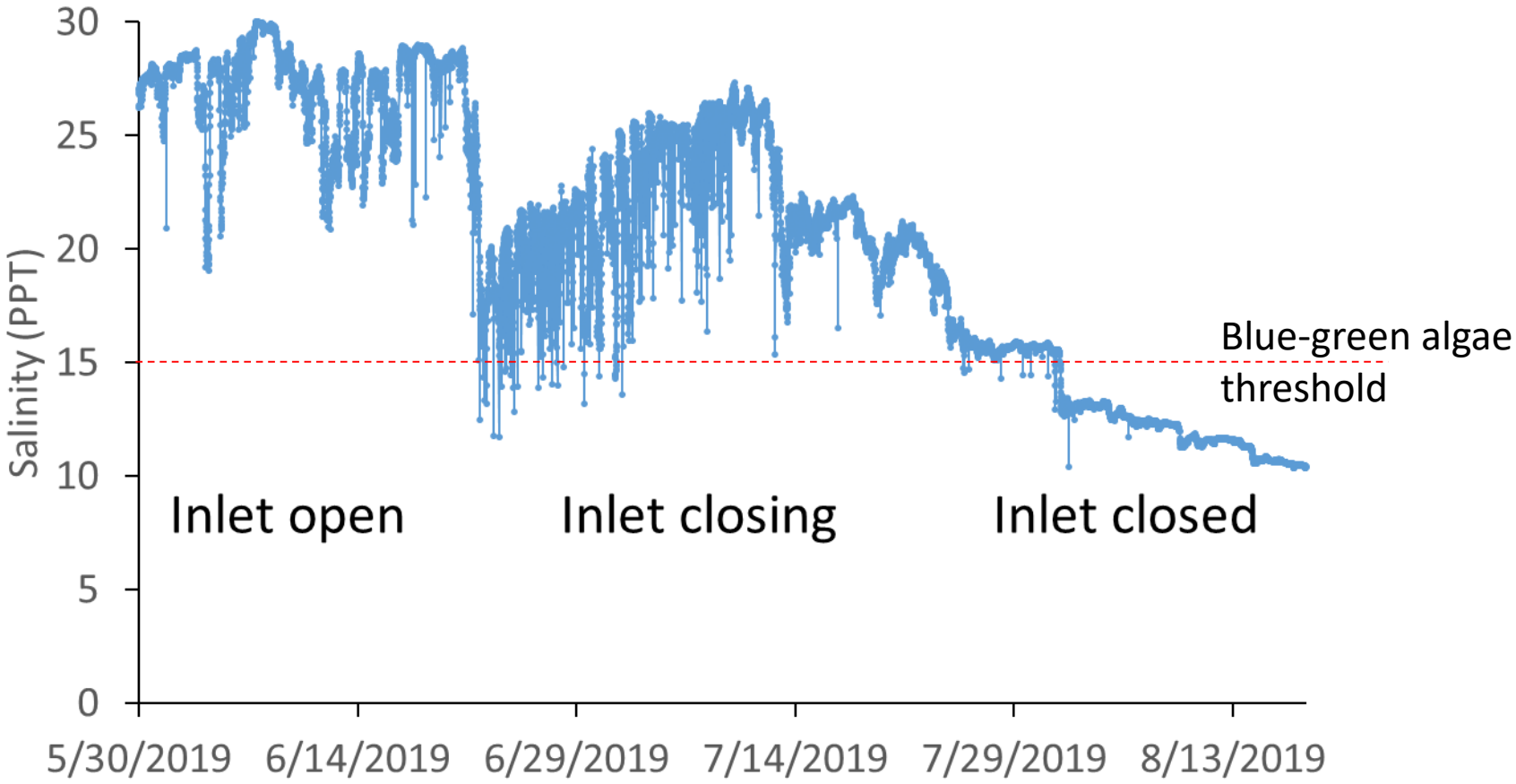


Overview

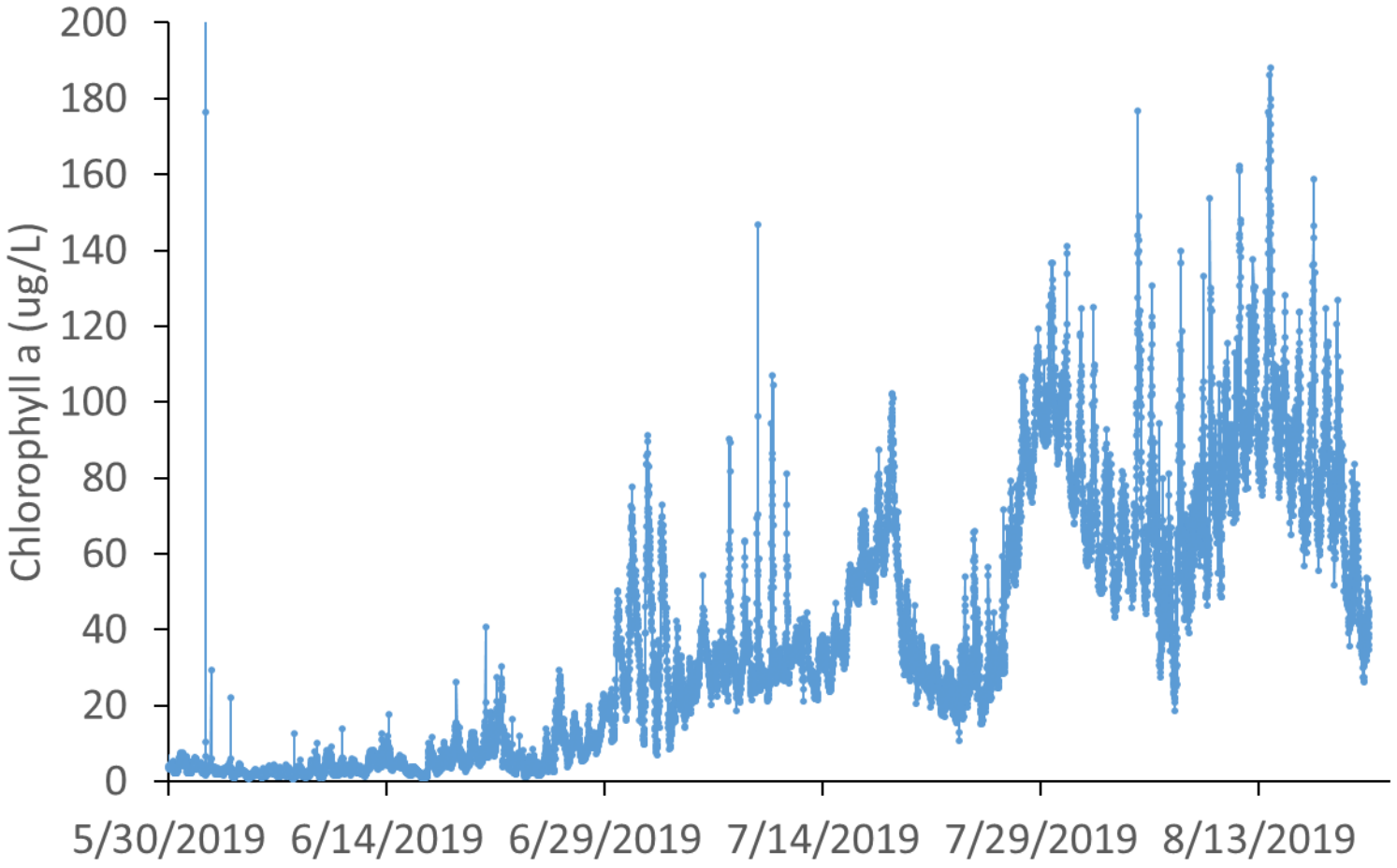
- Observations for 2019
- Harvesting macroalgae, long term trends
- Aquatic life in Georgica Pond
- Sources of pathogenic bacteria
- Oysters
- Mitigating nitrogen loads from septic systems

Record setting cut opening: Oct 2018 – July 2019

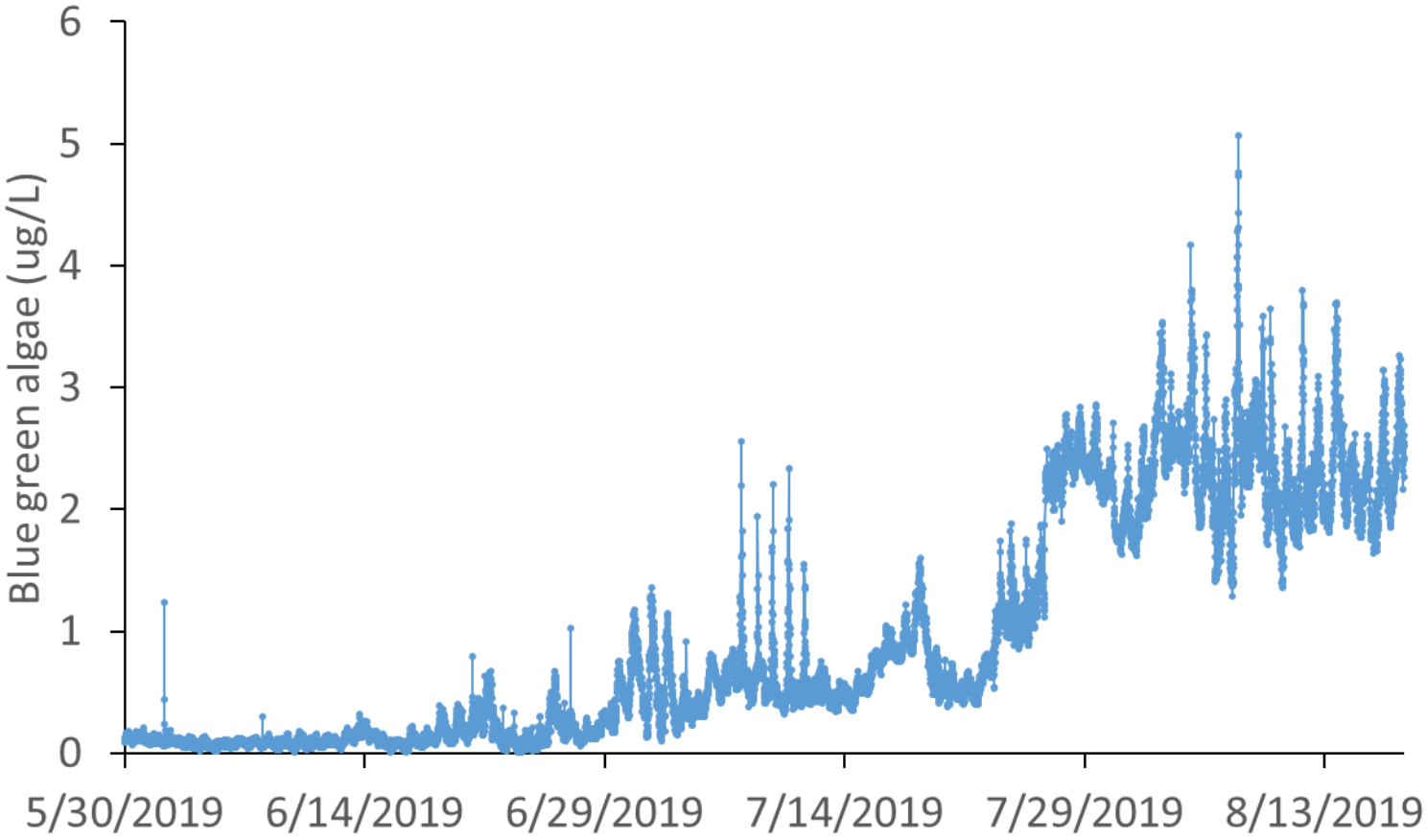
Salinity, 2019



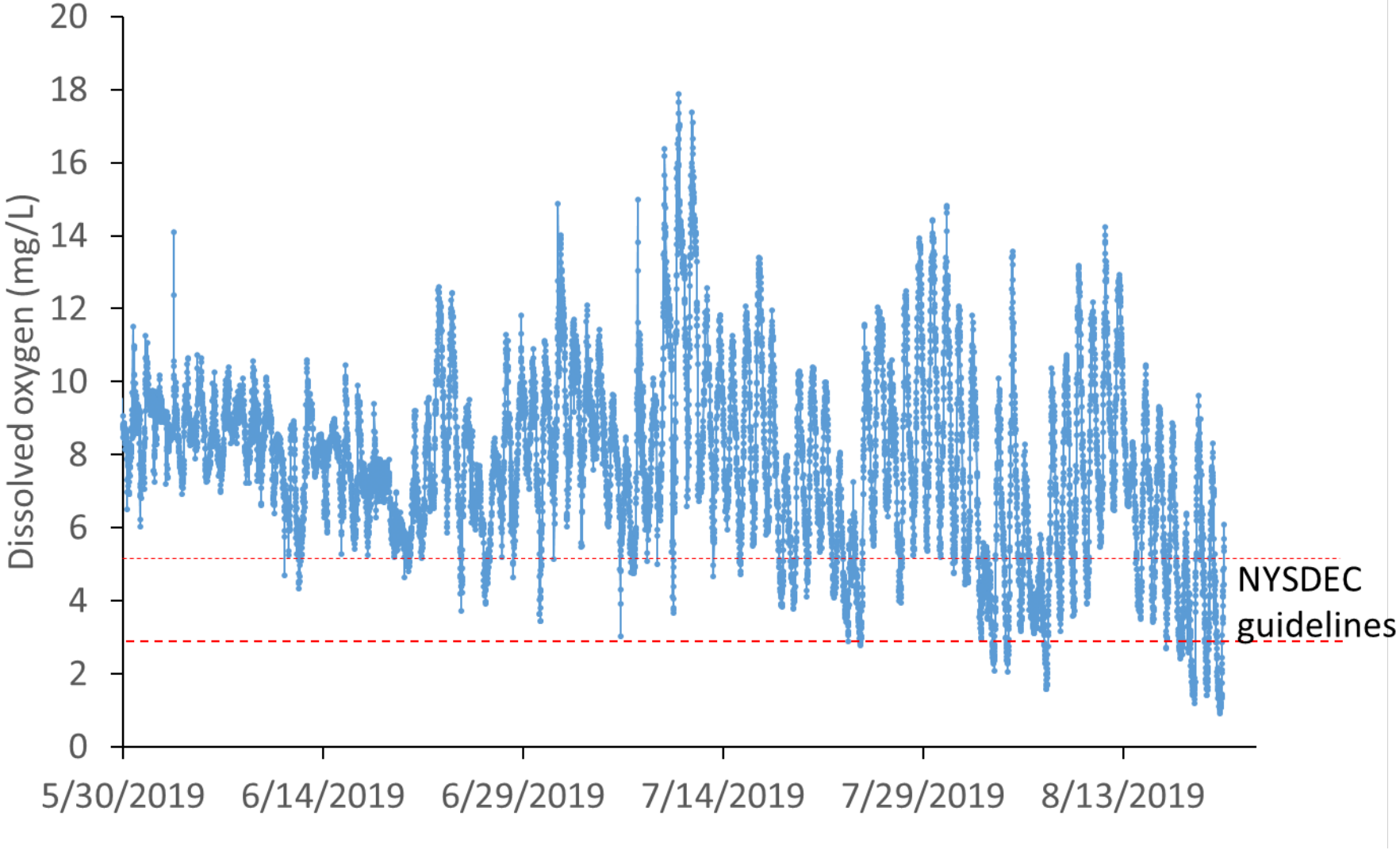
Chlorophyll a, 2019



Blue green algae, 2019



Dissolved oxygen, 2019



Georgica Pond macroalgae

Excessive nutrient loading in Pond

Macroalgae bloom

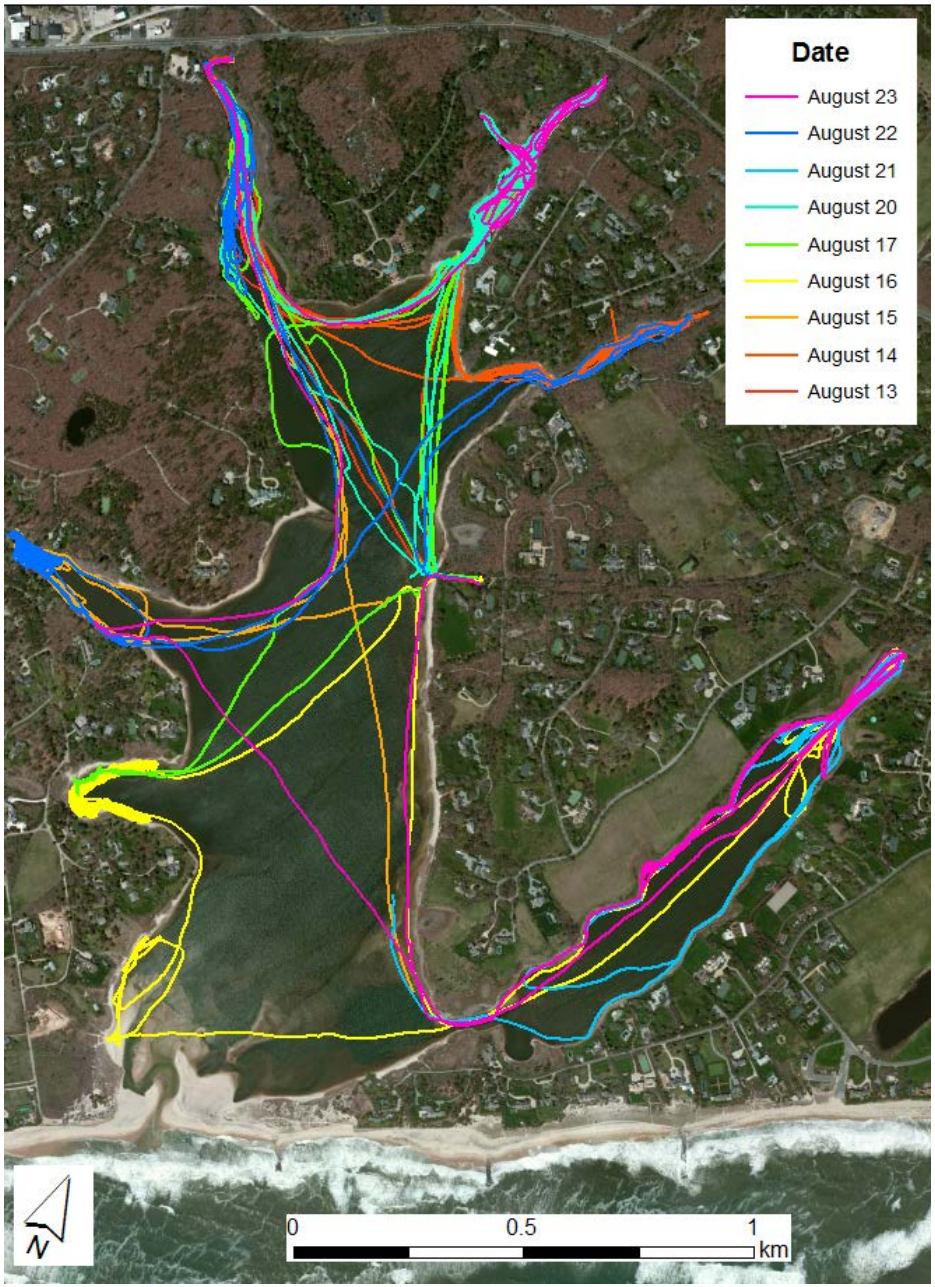
Collapsing macroalgal bloom regenerates nutrients

Blue-green algae use released nutrients; hypoxia

2016 - 2018: NYSDEC permitted harvesting of macroalgae funded by FoGP

FRIENDS OF GEORGICA POND FOUNDATION

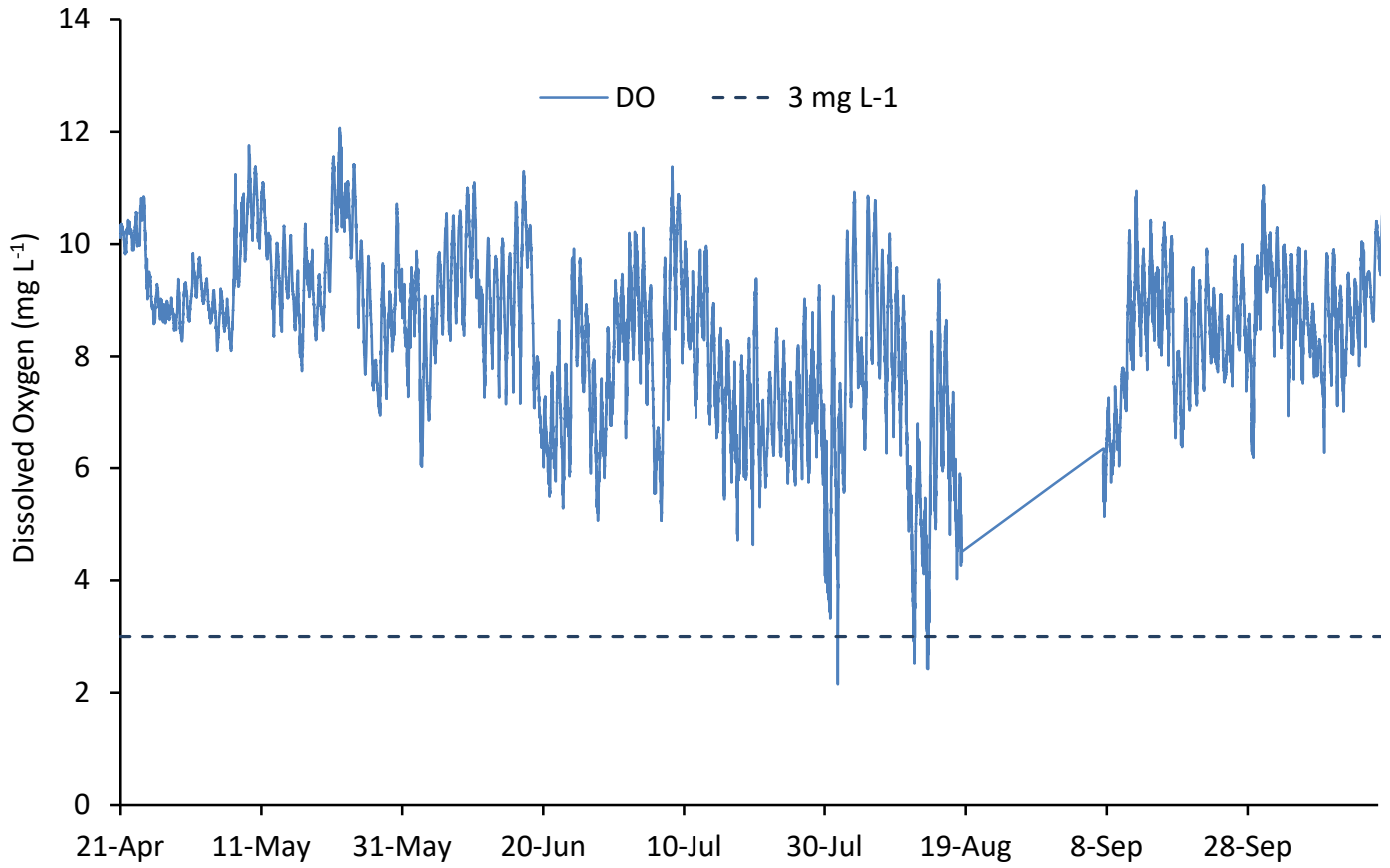
Tracks of harvester, 2018



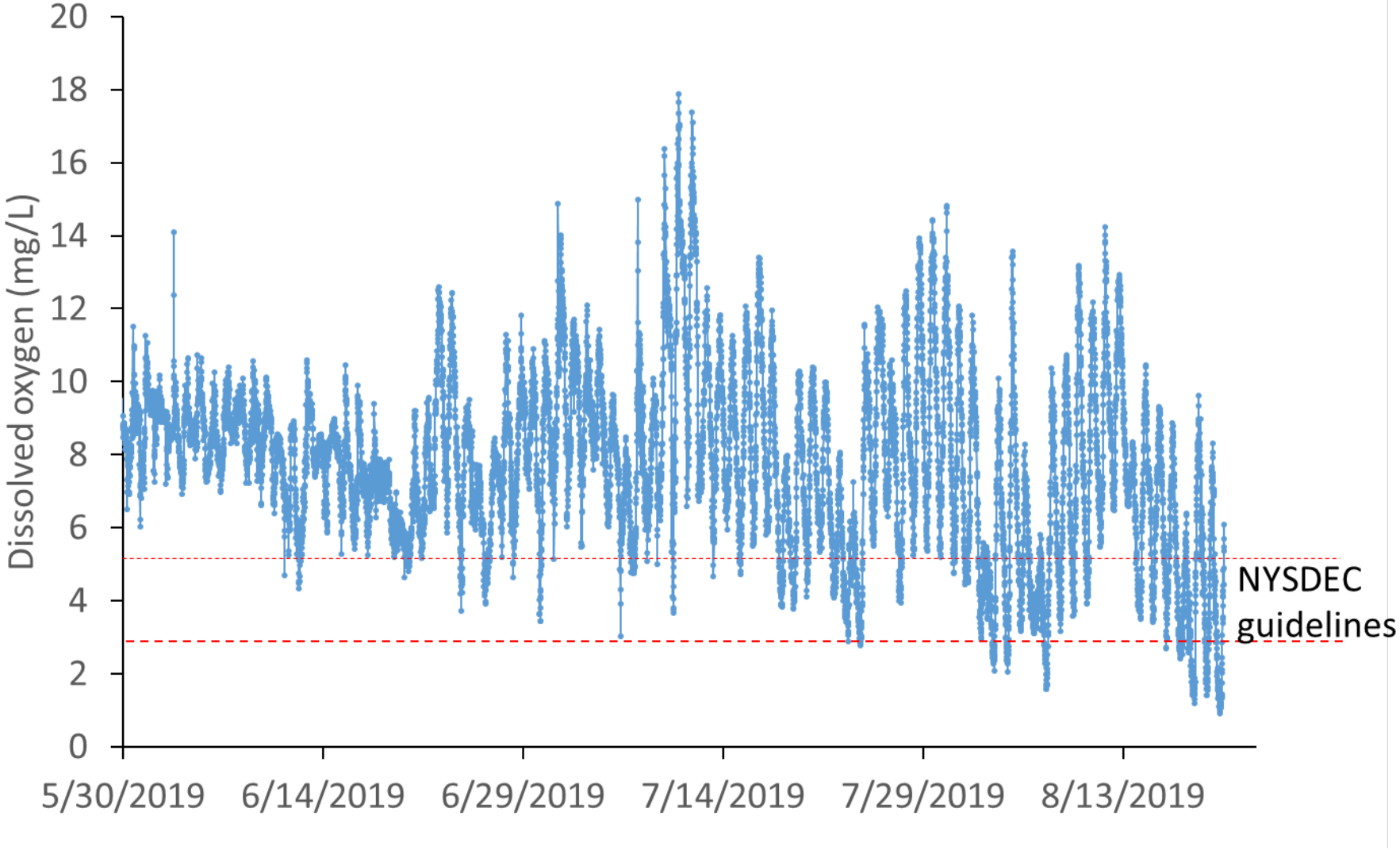
Macroalgal harvest, 2018

- **Daily harvest June - September: >90,000 lbs of macroalgae removed** (32000 - 55,000 lbs in 2016 - 2017)
- 20% of summer N and P load (lower in years prior)
- ***Did it make a difference?***

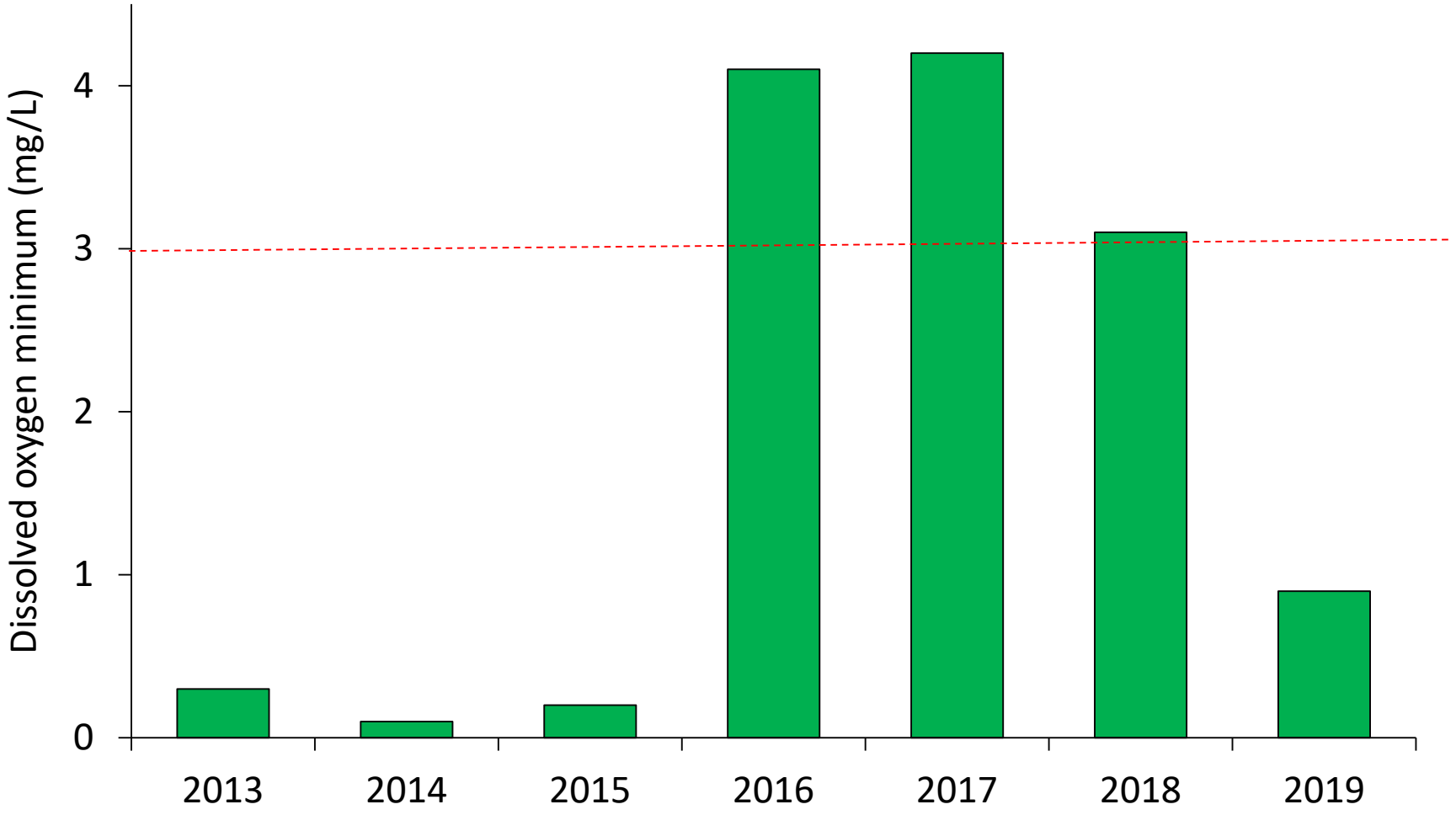
Dissolved oxygen, 2018



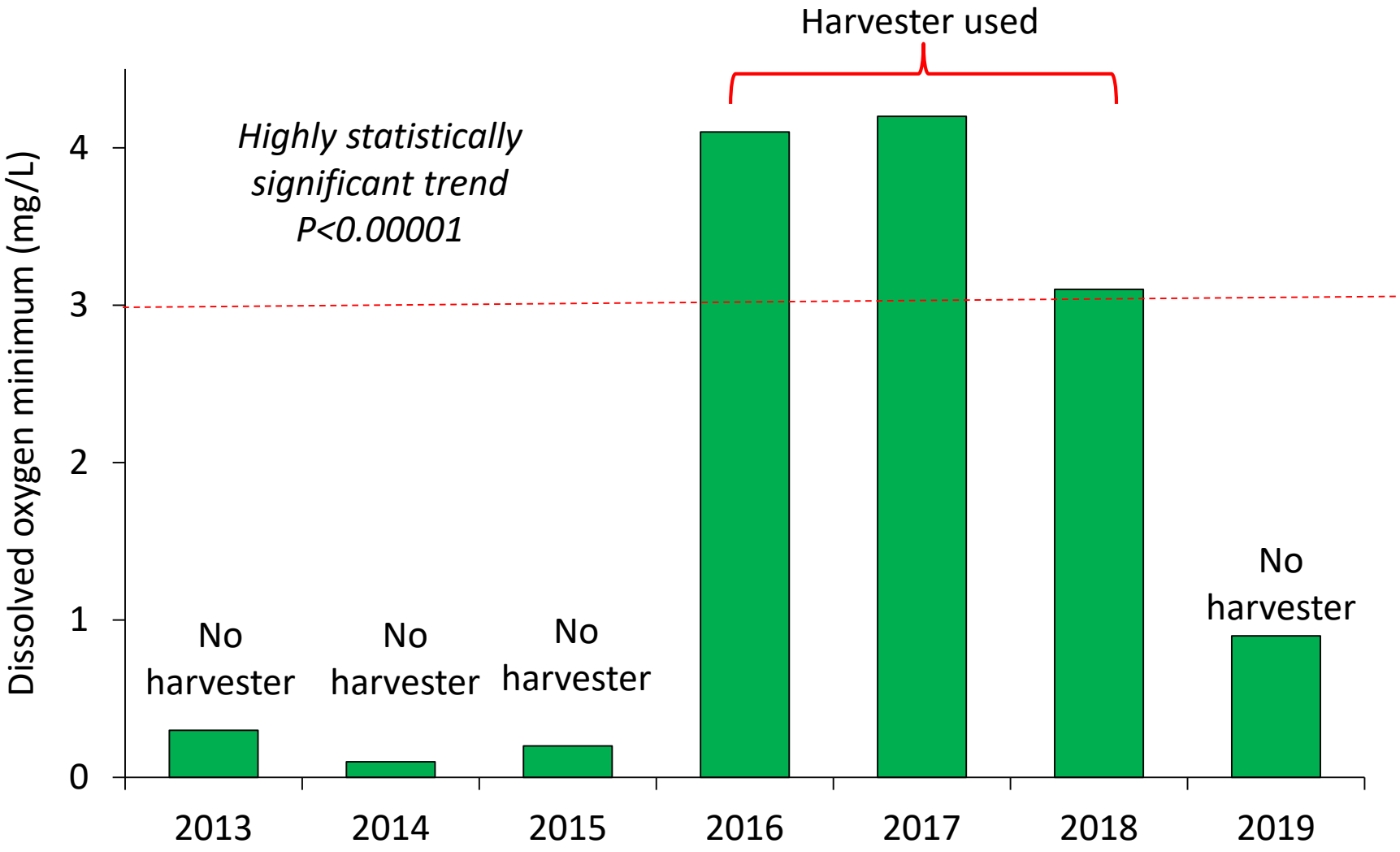
Dissolved oxygen, 2019



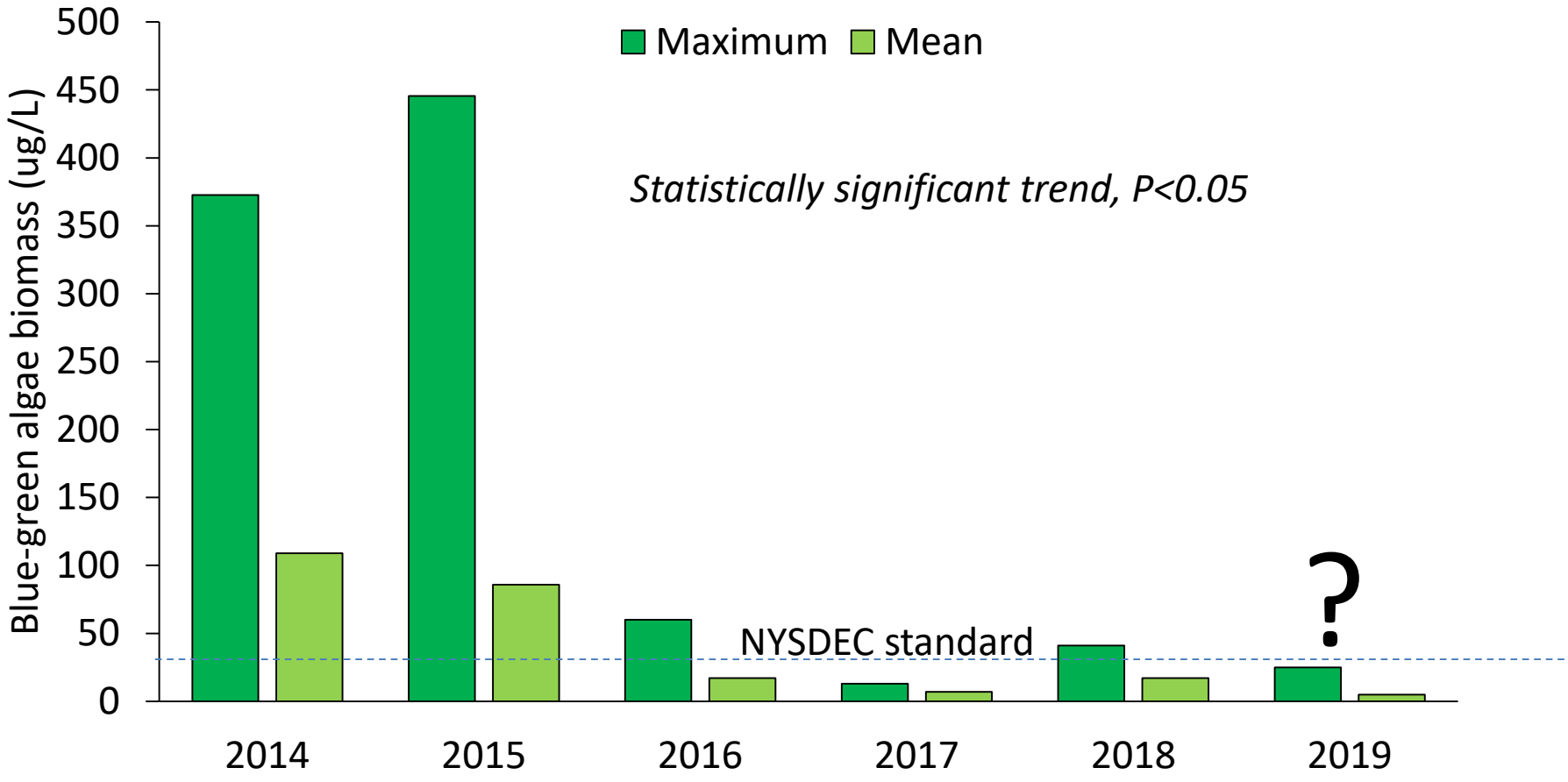
Dissolved oxygen minimum by year



Dissolved oxygen minimum by year



Blue-green algae blooms



WHAT LIVES IN GEORGICA POND?


Blue crab


American
eel


White perch


Fluke


Three-spine stickleback


Four-spine stickleback


Atlantic silverside

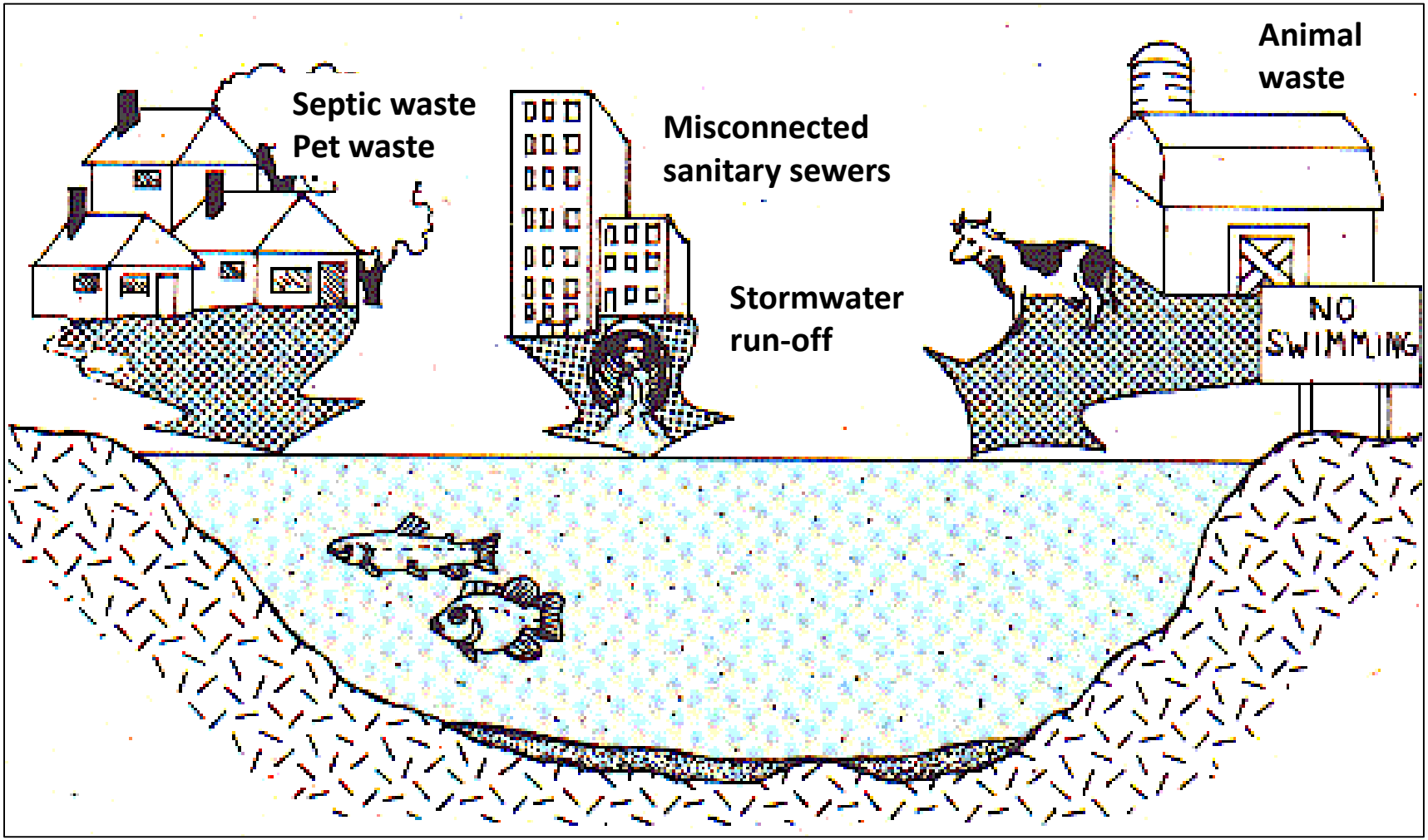

Mummichug


Banded killifish

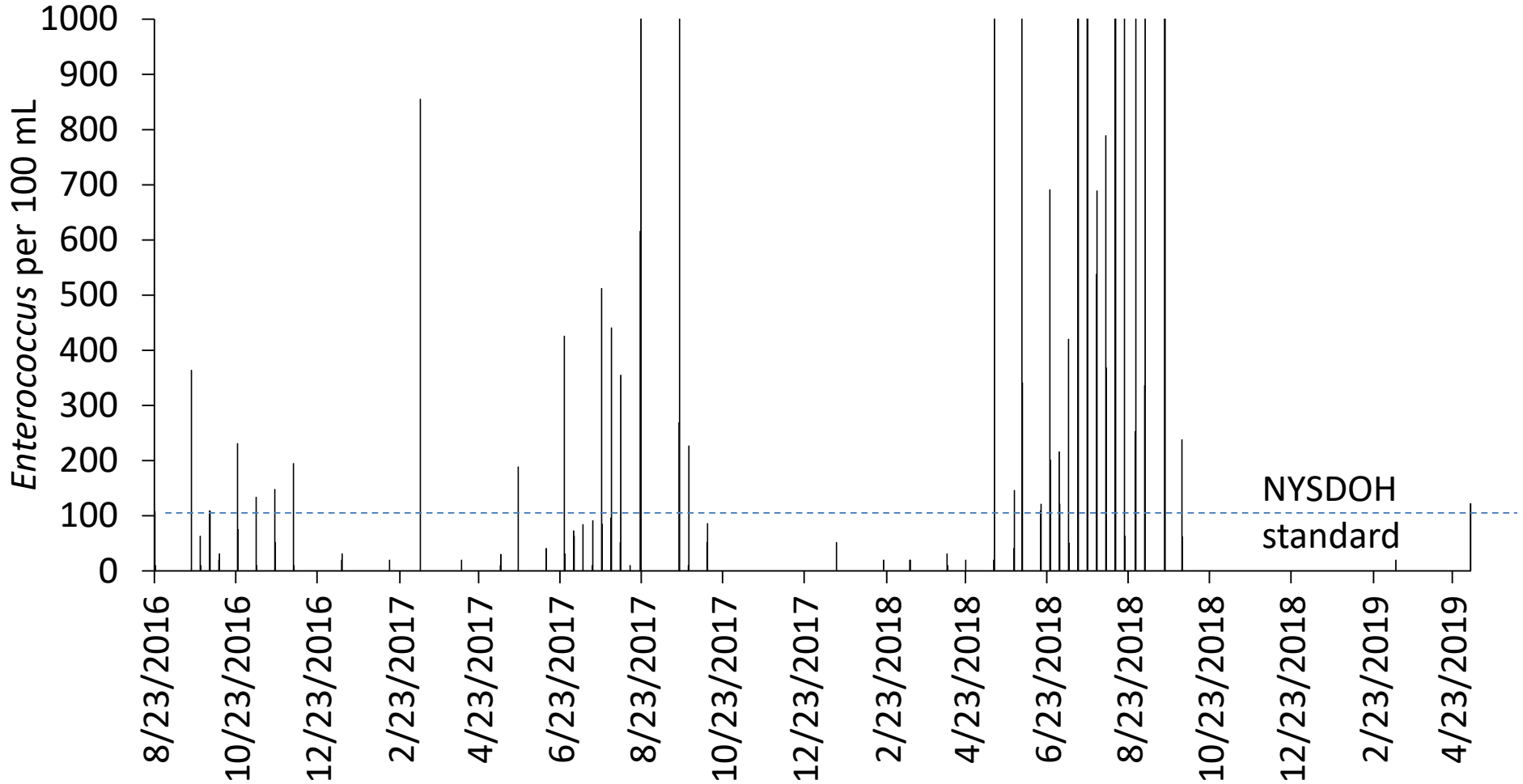
<u>Not shown</u>:

Grass Shrimp
Gamarid Amphipod
Polychaete Worm
Minute Hydrobia
Isopod
Caddisfly Larve and Pupae
Damselfly Nymphs
Snapping turtle

Pathogenic bacteria



Enterococcus bacteria, Georgica Cove, Talmage Creek, Surfrider data

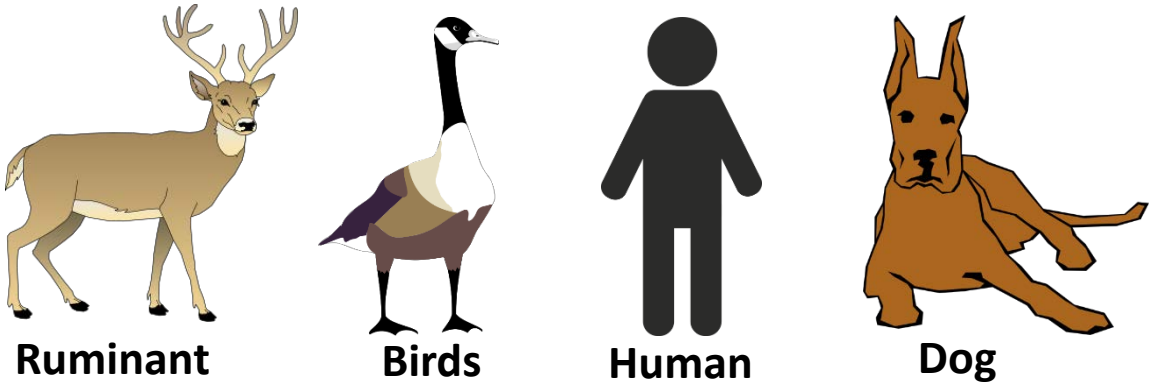


Microbial Source Tracking

- Identify the source of fecal pollution in a watershed
- Provides basis for management strategies and efficient resource allocation

Fecal Bacteria:
Bacteroides

Target Host Organisms:



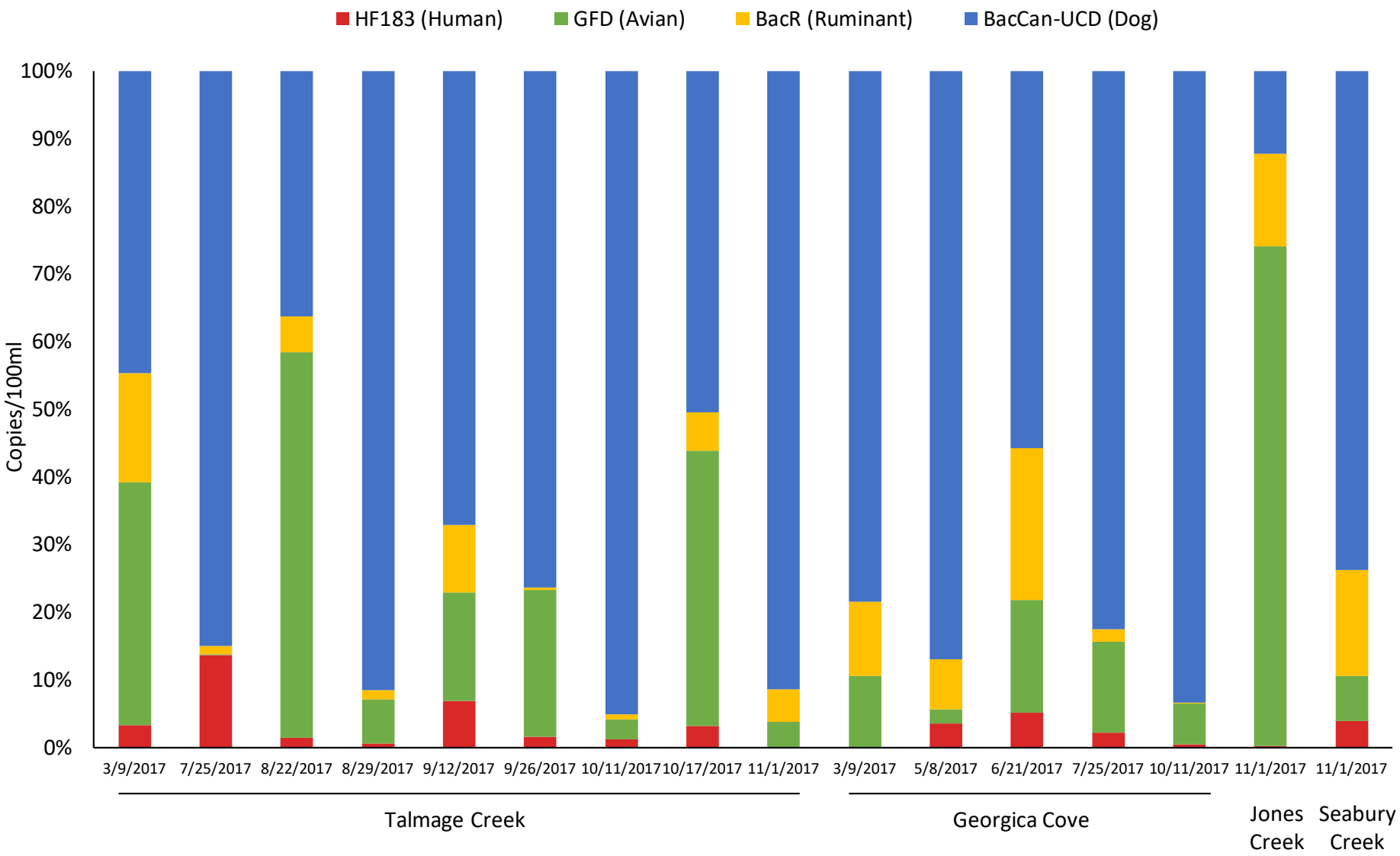
Genetic Markers:

FRIENDS OF GEORGICA POND FOUNDATION

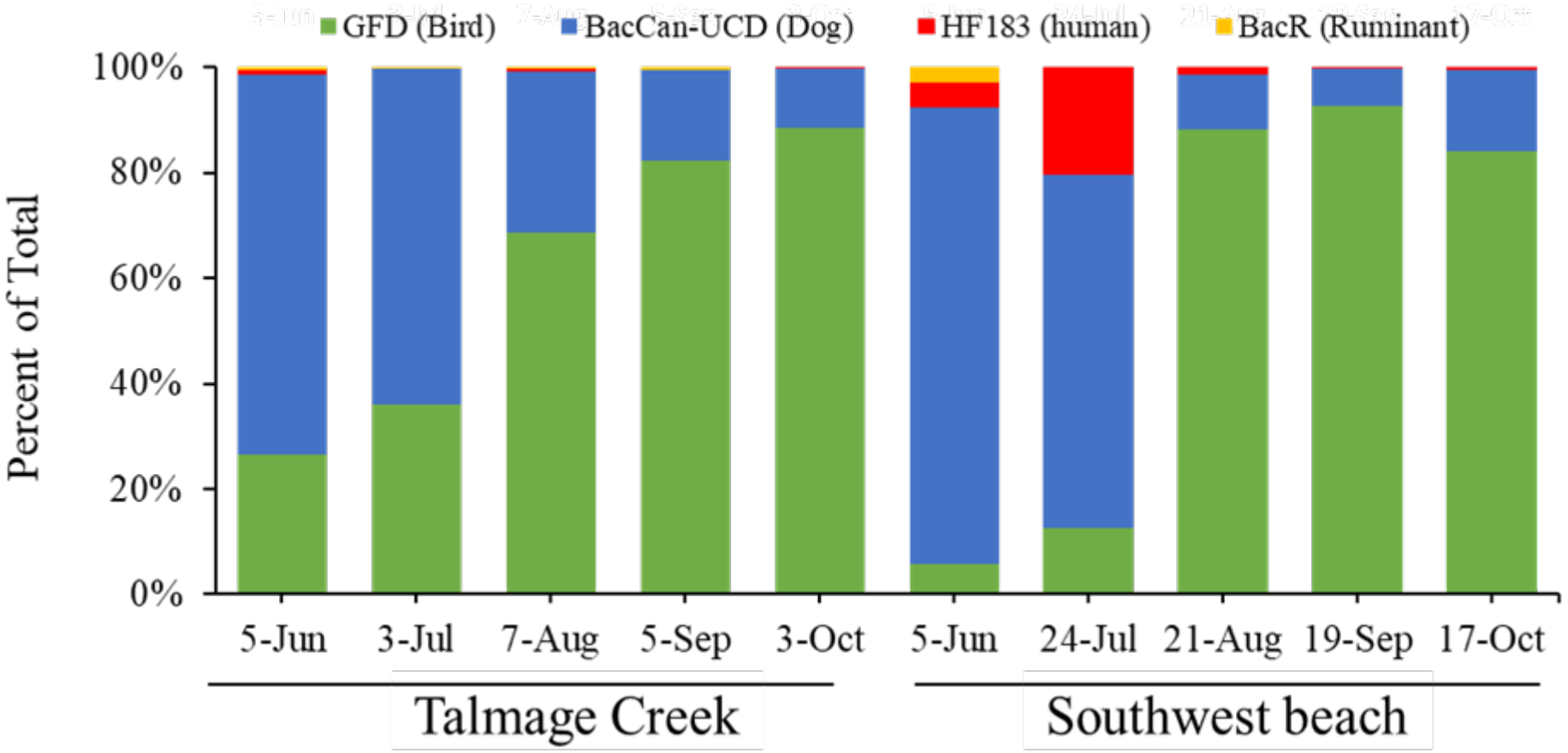
Georgica Pond with sampling sites in Talmage Creek, Seabury Creek, Jones Creek, and Georgica Cove.

FRIENDS OF GEORGICA POND FOUNDATION

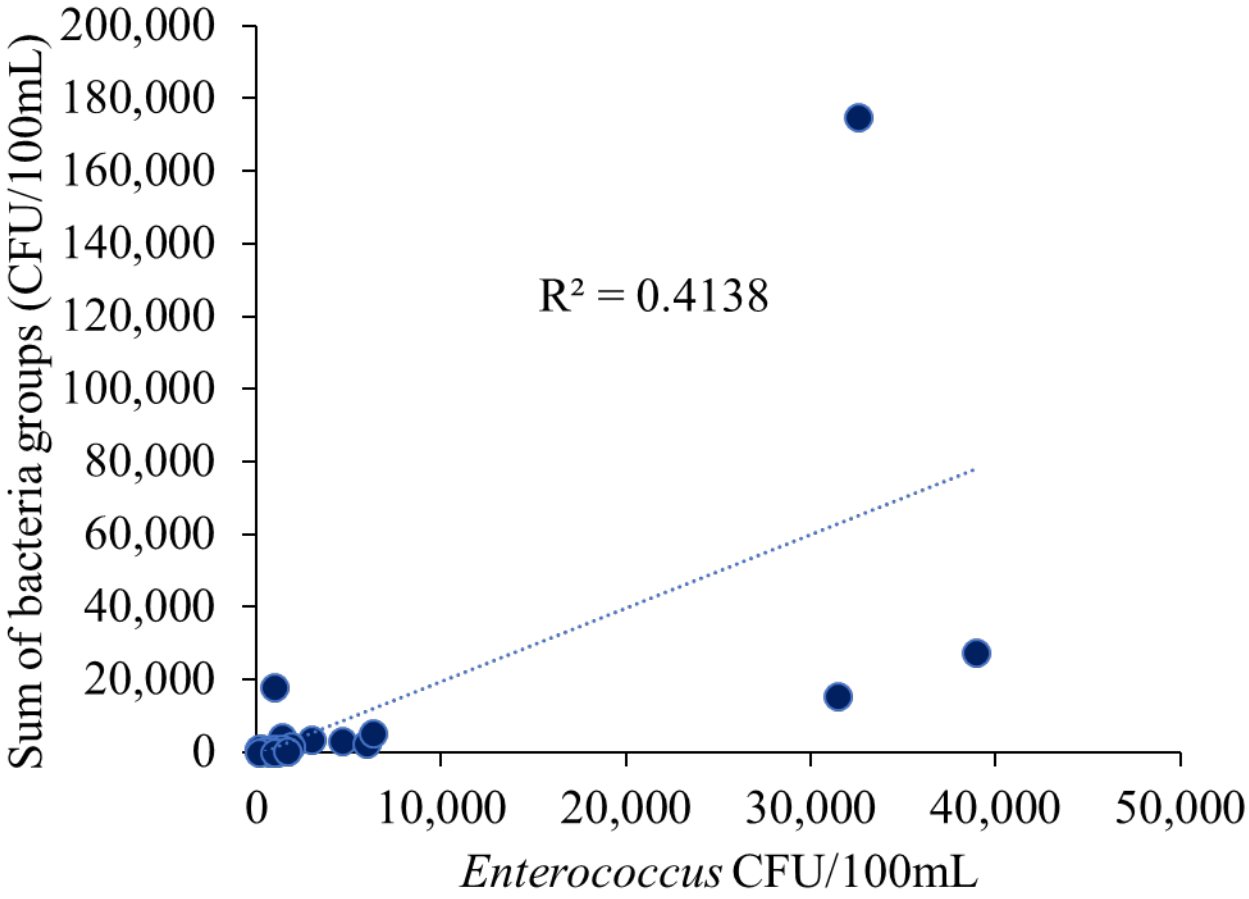
Relative abundances, 2017



Microbial source tracking, 2018



Digital PCR v plated *Enterococcus* bacteria



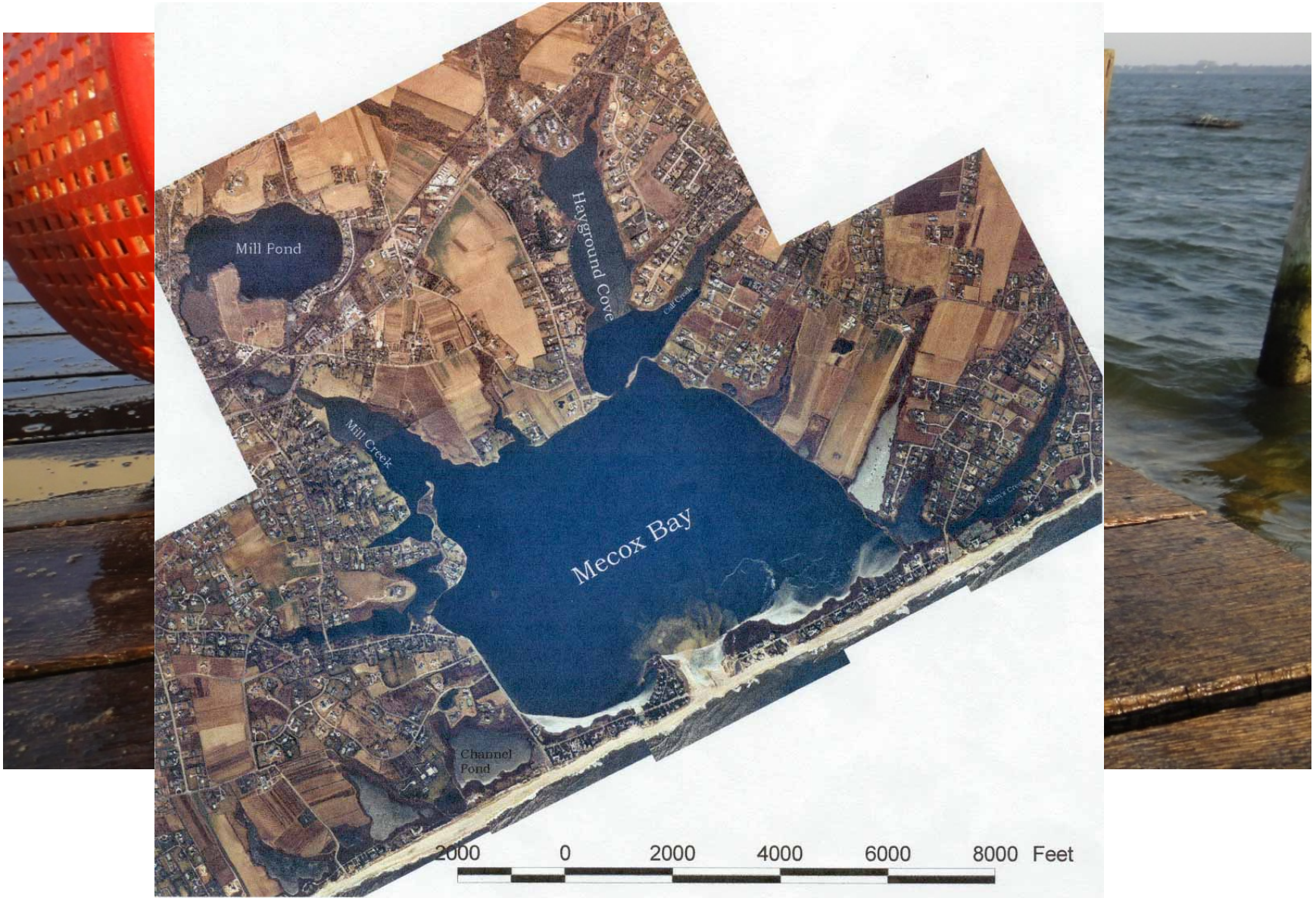
Route 27 rest area, draining to Talmage Creek

Plan to reroute run-off in progress

Georgica Cove, Cove Hollow Road

Town of East Hampton study in progress

Oysters


Mill Pond
Hayground Cove
Cat Creek
Mill Creek
Mecox Bay
Channel Pond
2000 0 2000 4000 6000 8000 Feet

Bivalves are ‘Ecosystem Engineers’

Bivalves are filter feeders, and when in large numbers can:

- Control phytoplankton abundance
- Reduce harmful algal blooms
- Improve water clarity

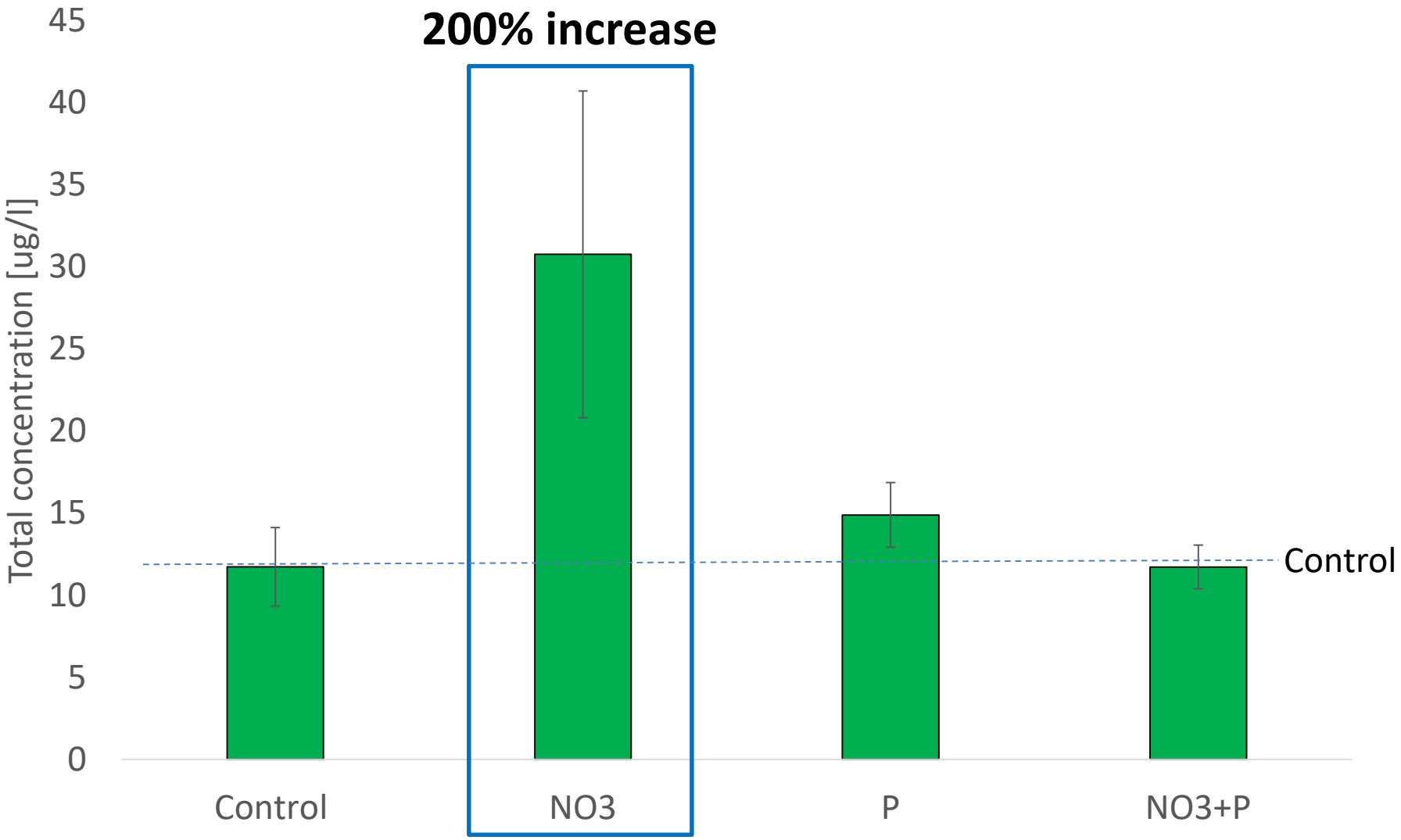
Oyster experiments, surveys

- North, central, and south
- Growth
- Survival
- Filtration
- Reproduction
- Disease
- Survey of indigenous population

Oyster grow-out, southern site

What is promoting (micro- and macro) algal blooms in Georgica Pond?

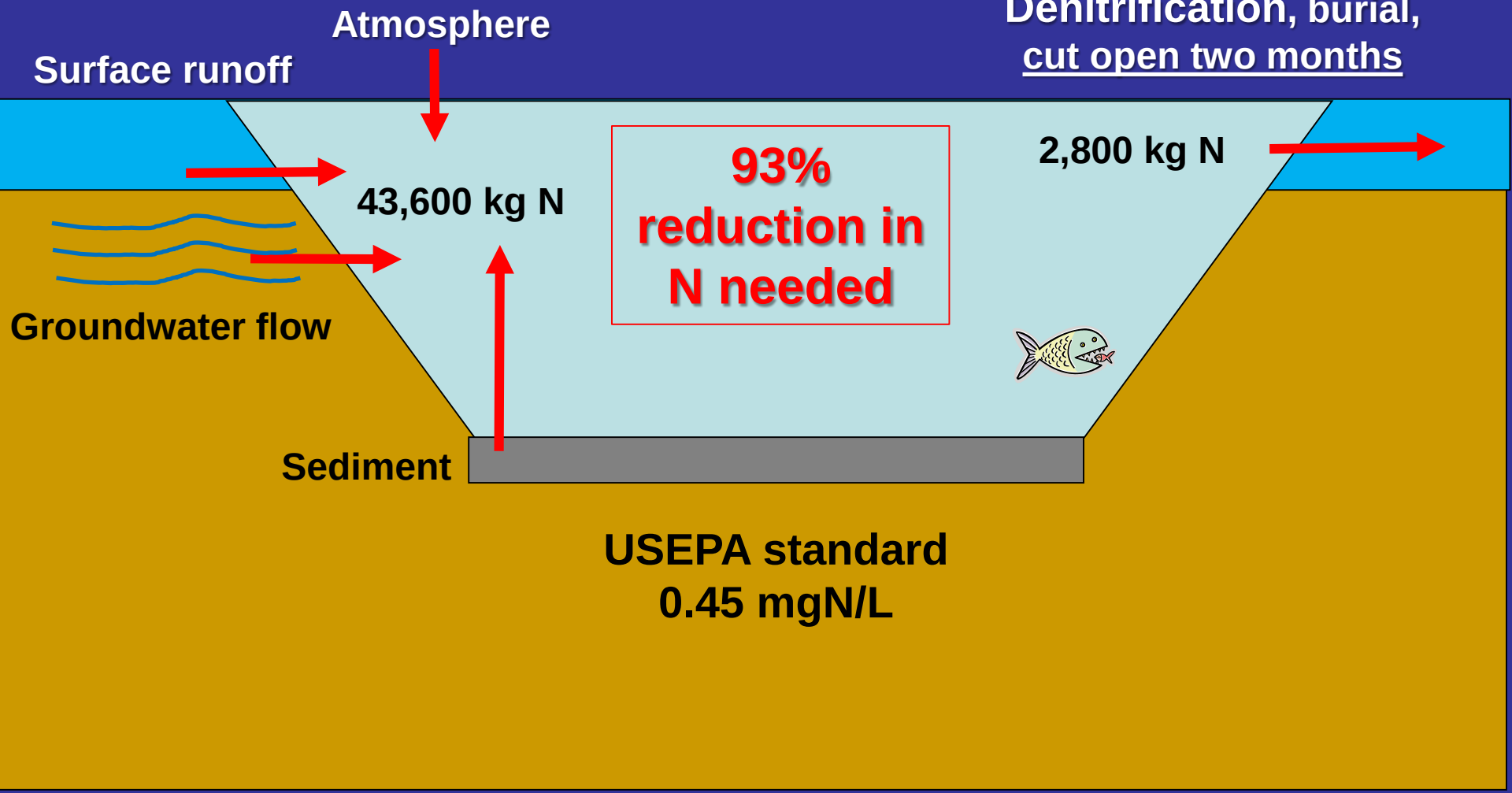
Nutrients controlling blue-green algae



Total maximum daily load, nitrogen

Inputs:

Exports:



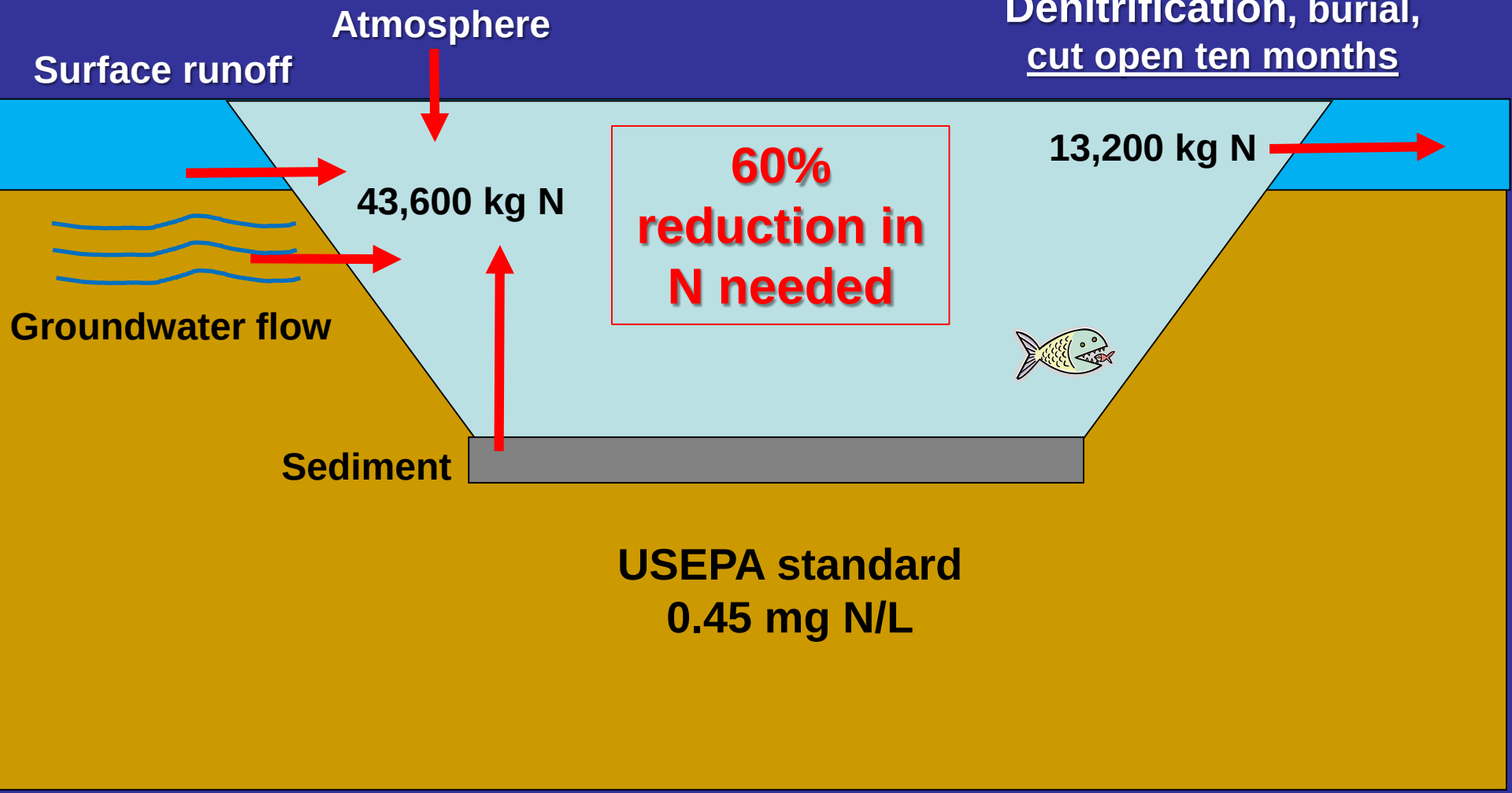
Record setting cut opening: Oct 2018 – July 2019

The East Hampton Town Trustees closed the pond from March 5-28 for dredging purposes

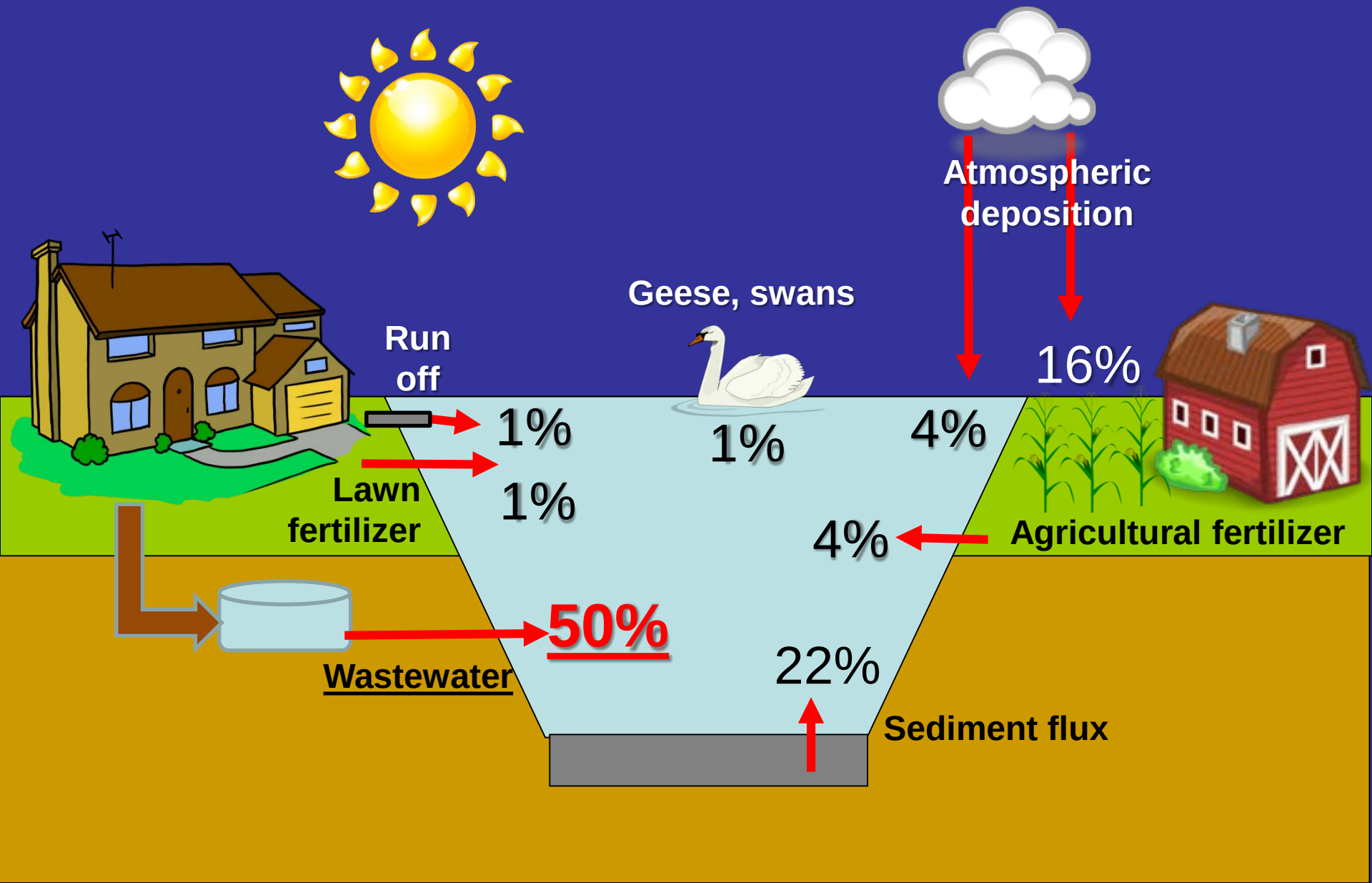
Total maximum daily load, nitrogen

Inputs:

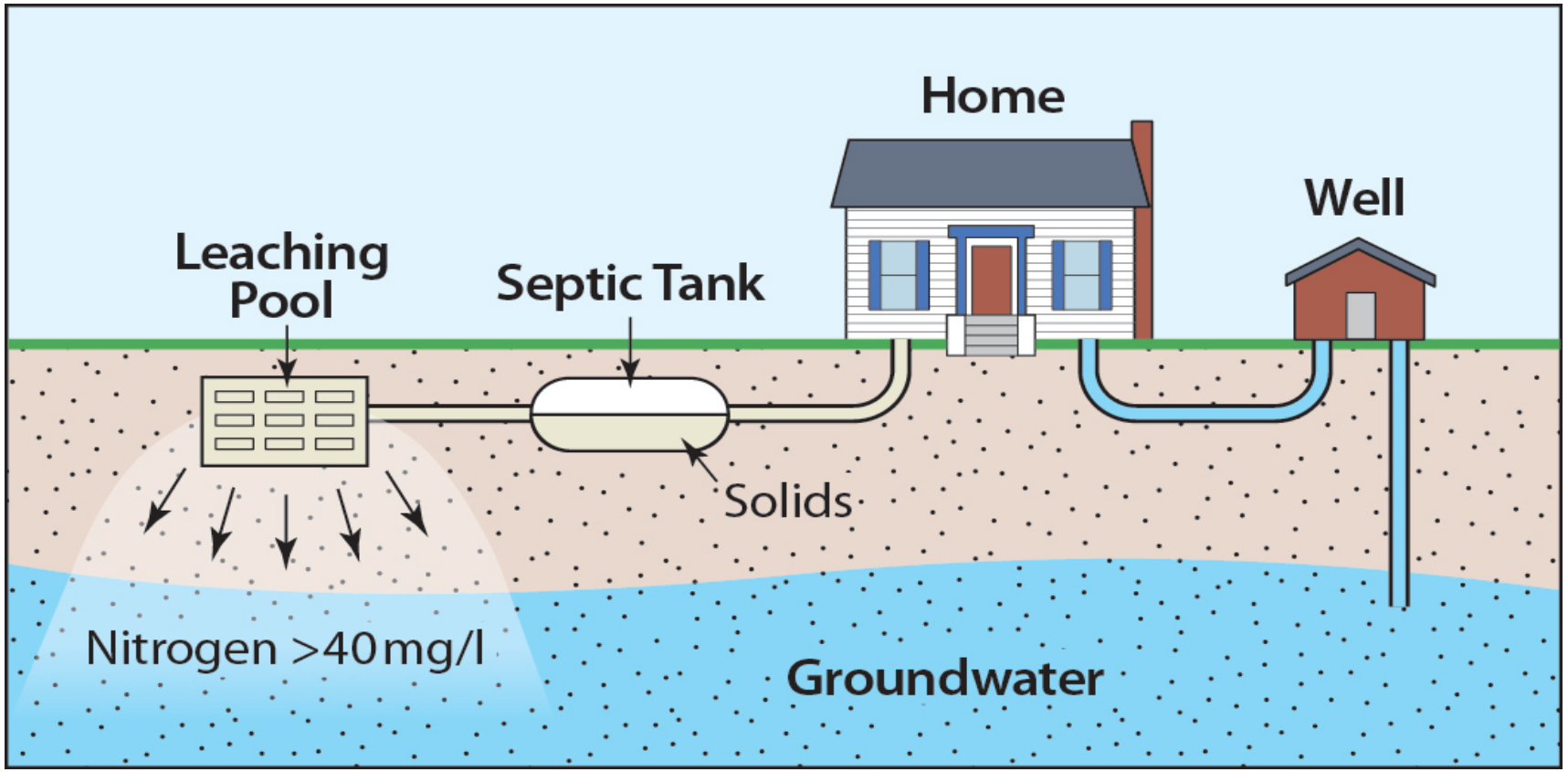
Exports:



Nitrogen loading model



Long Island household wastewater system



SANITARY CODE ARTICLE 19

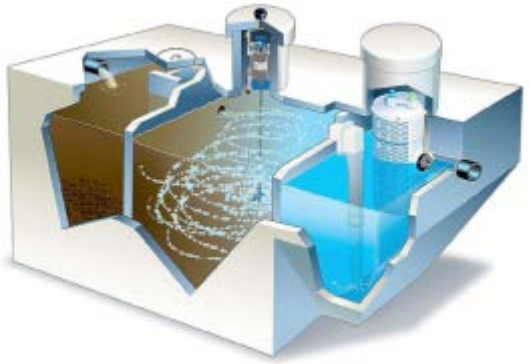
MANAGEMENT OF INNOVATIVE AND ALTERNATIVE ONSITE WASTEWATER TREATMENT SYSTEMS

Bill signing August 10, 2016

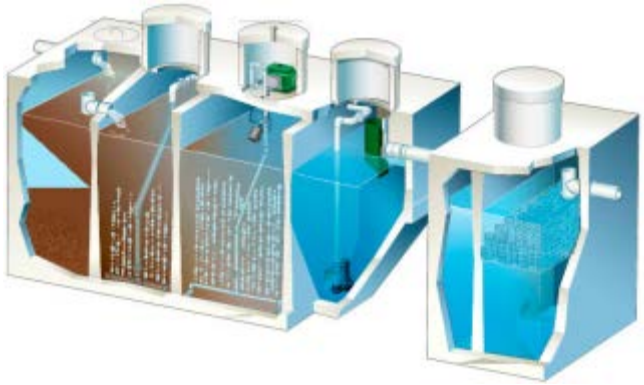
PROVISIONALLY APPROVED I/A OWTS: Reduce N below 19 mg/L

Hydro-Action

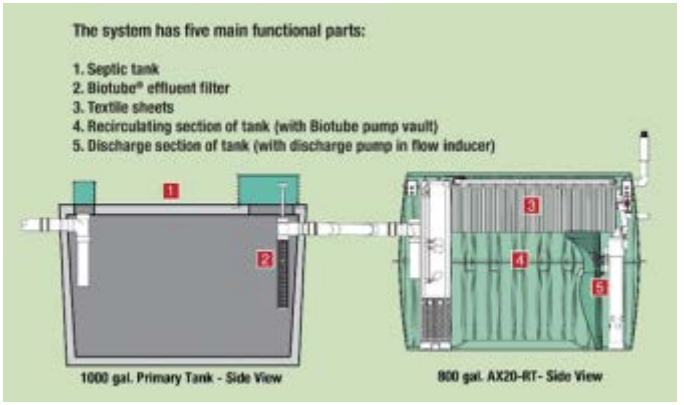
Fuji Clean System



Norweco Singlair TNT



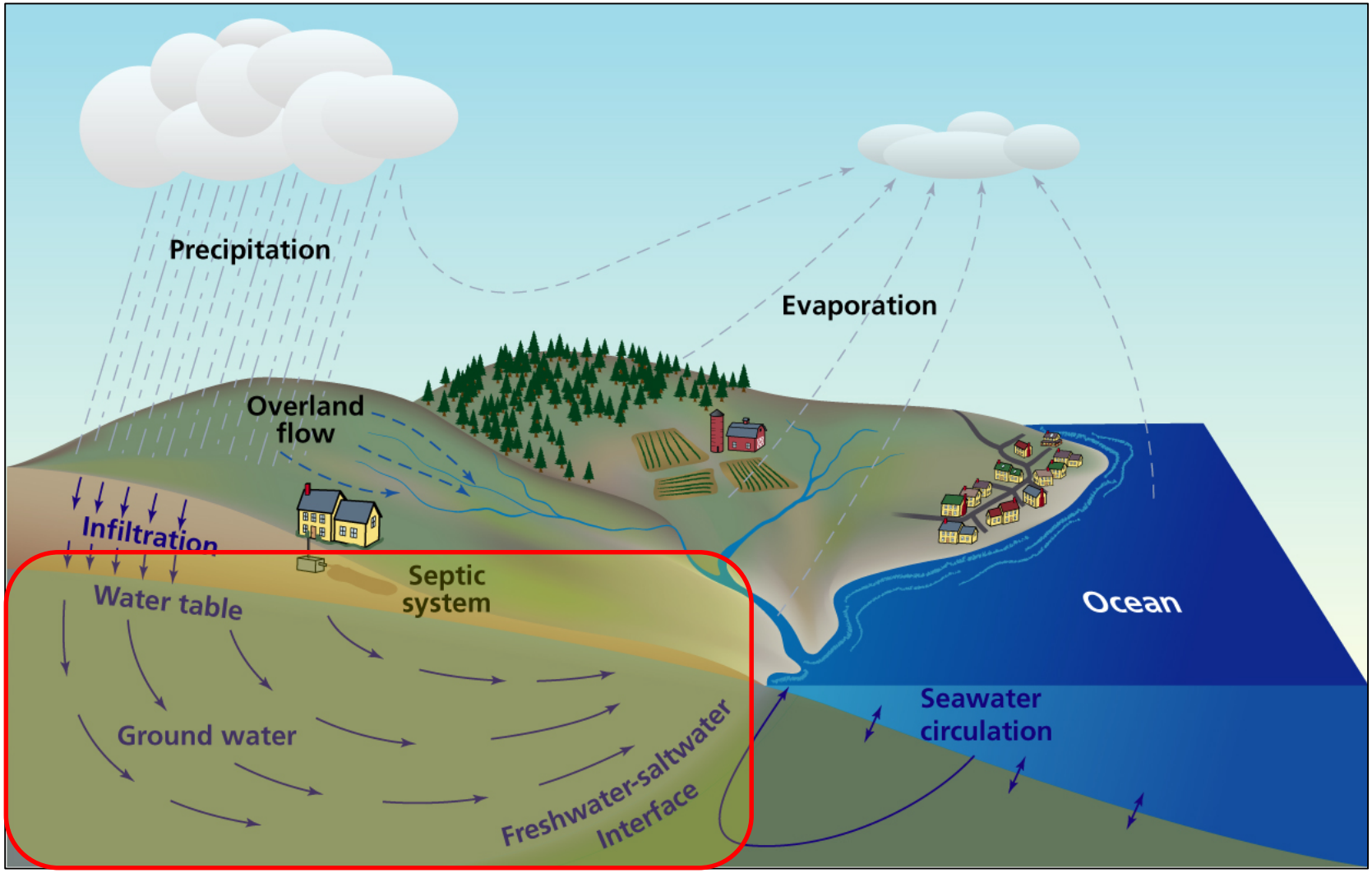
Norweco Hydrokinetic



Orenco Advantex AX-RT

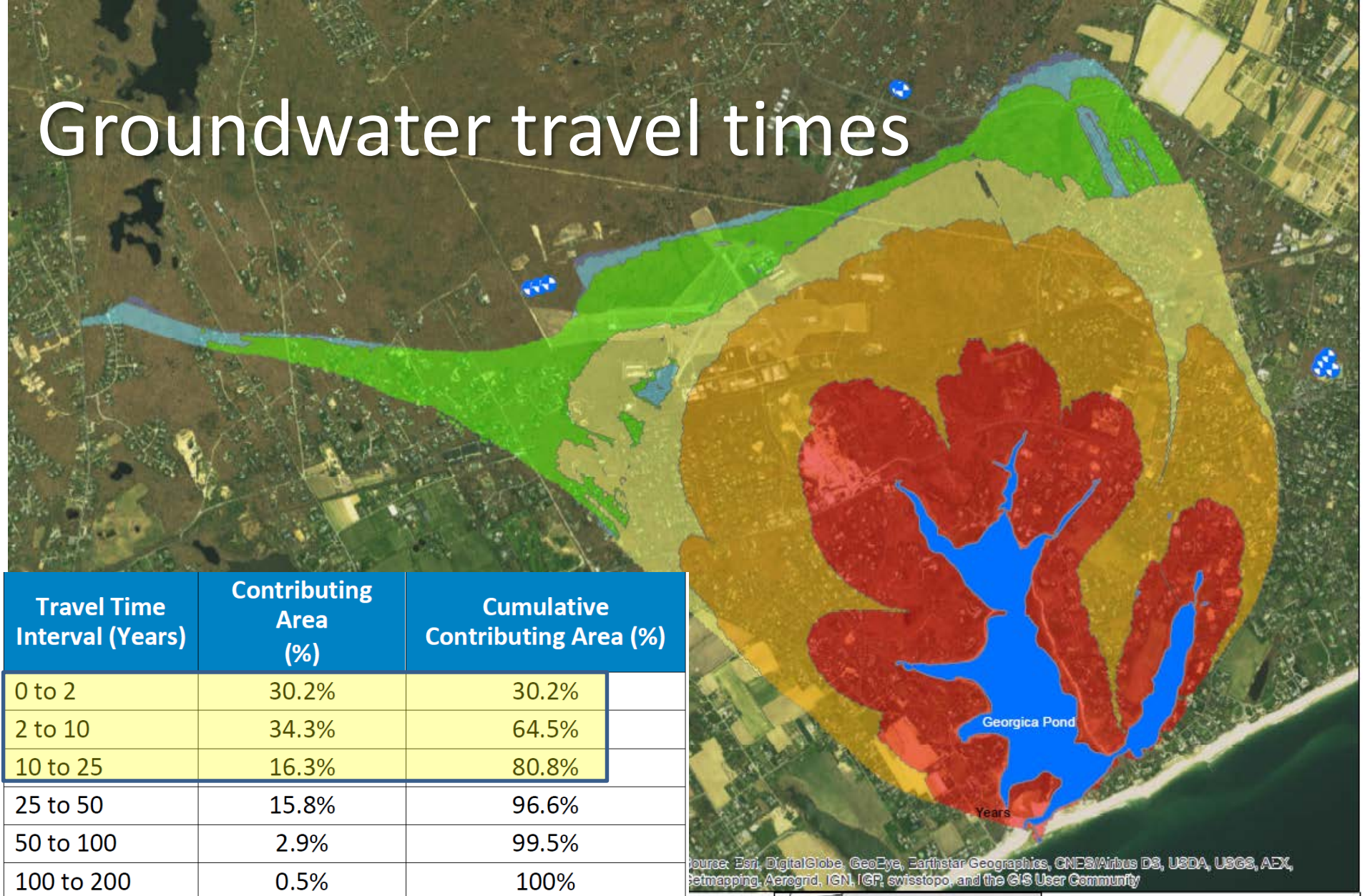
Watershed -

Materials on land eventually enter our groundwater and surface water.



Groundwater travel times

Travel Time Interval (Years)	Contributing Area (%)	Cumulative Contributing Area (%)
0 to 2	30.2%	30.2%
2 to 10	34.3%	64.5%
10 to 25	16.3%	80.8%
25 to 50	15.8%	96.6%
50 to 100	2.9%	99.5%
100 to 200	0.5%	100%



Community Supply Well

Travel Time (Yrs)

- 0 to 2
- 2 to 10
- 10 to 25
- 25 to 50
- 50 to 100
- 100 to 200
- Georgica Pond

N

0 1,250 2,500 Ft

Subwatersheds Wastewater Plan
Groundwater Contributing Area
1701-0145: Georgica Pond
November 2016

Conclusions:

- Georgica Pond suffers from algal blooms, blue-green algae, low oxygen, and fish kills.
- Harvesting macroalgae has been coincident with improved conditions.
- Stormwater run-off are delivering pathogenic bacteria from small mammals and birds into Georgica Pond.
- Algal blooms are promoted by excessive nitrogen.
- Most of the nitrogen entering Georgica Pond comes from wastewater.
- Improving the removal of nitrogen from wastewater is the central long term solution.
- Long-term, significantly improved water quality can occur in < 10 years if actions are taken now.

Acknowledgements:

Sincere gratitude for:
Leadership of the Friends of Georgica Pond.
Generosity of Perelman Foundation & Georgica Pond homeowners
Commitment of the East Hampton Town Trustees, Town of East Hampton, and Village of East Hampton

Thank you to Mark Lusty, Jennifer Janikowiak, Craig Schnone, Michael Doall, Marissa Vasquez, and Ryan Wallace, for field sampling, laboratory work, and analytical support.

Thank you for your attention.

FRIENDS OF GEORGICA POND FOUNDATION

Stony Brook University
School *of* Marine and Atmospheric Sciences