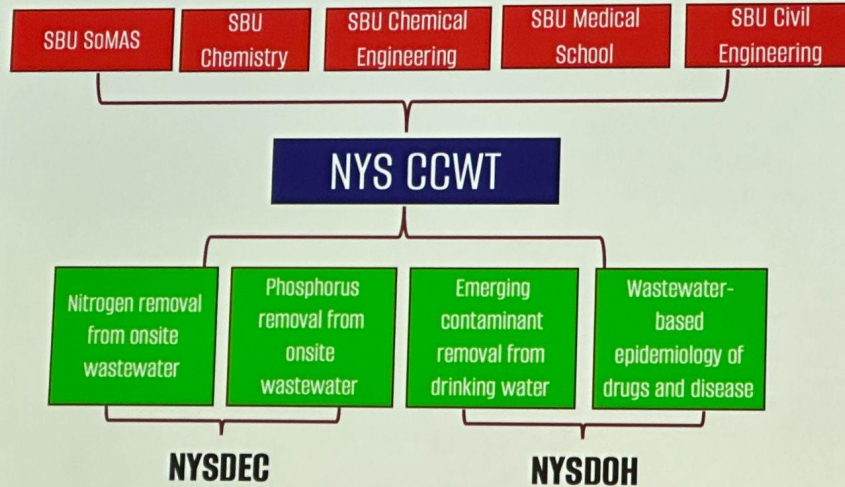


NY State Center for Clean Water Technology's (CCWT) Clean Water Symposium

CCOM's Slideshow

Welcome and Opening Remarks

NYS CENTER FOR CLEAN WATER TECHNOLOGY



- More than 30 members across Stony Brook University including research scientists, faculty collaborators, post-doctoral scholars, research technicians, and graduate students.

- Three distinct line items in the NYS budget
- Additional support from federal, local, and philanthropic sources.

Partners

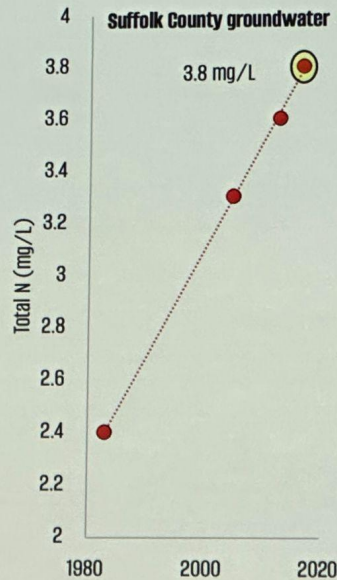
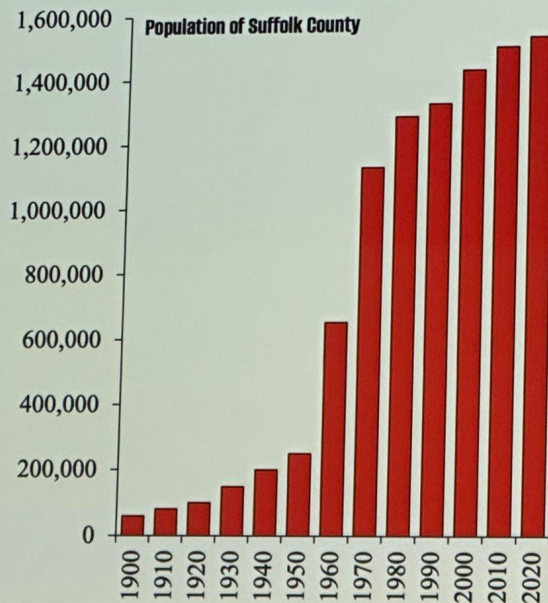


Department
of Health



and many more...

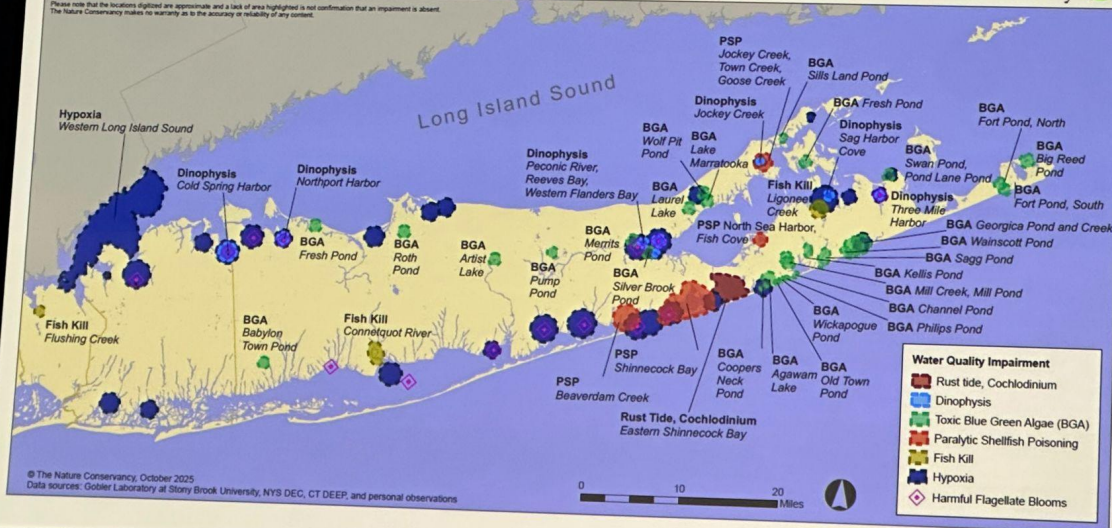
Expanding population, nitrogen levels



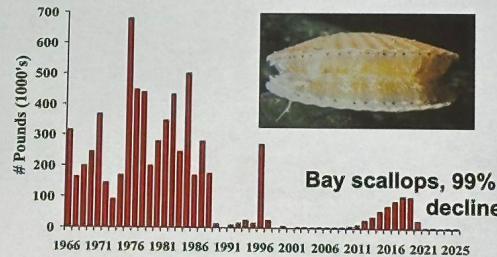
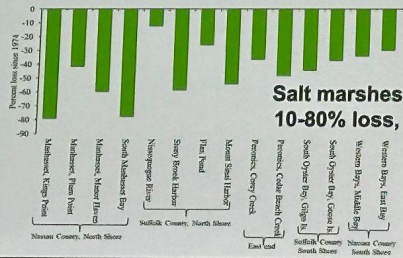
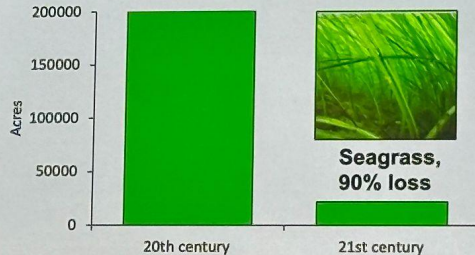
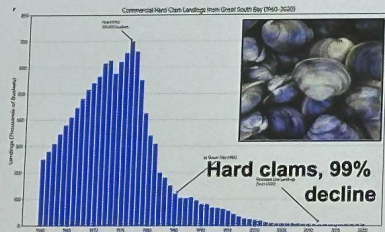


Long Island Water Quality Impairments Summer 2025

Please note that the locations displayed are approximate and a lack of area highlighted is not confirmation that an impairment is absent.
The Nature Conservancy makes no warranty as to the accuracy or reliability of any content.

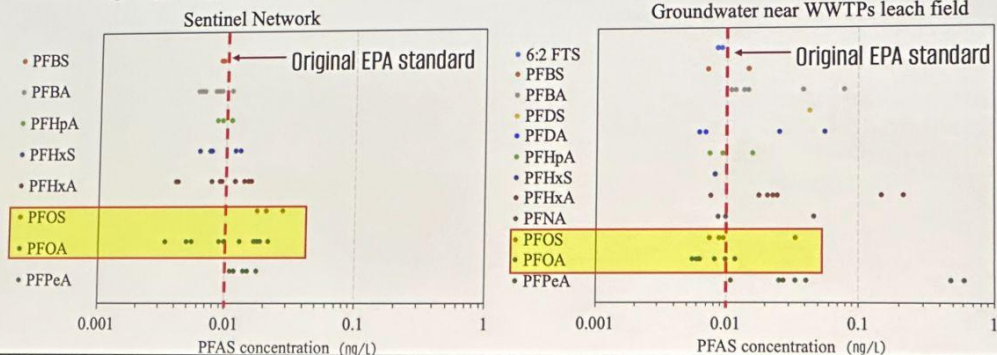


LOSS OF MARINE HABITATS AND FISHERIES ASSOCIATED WITH NITROGEN OVERLOADING



USGS STUDY OF LONG ISLAND GROUNDWATER

- New US EPA standard: 4 ng/L for PFOA and PFOS
- USGS sentinel network: upper glacial aquifer PFAS: **3.4 to 93 ng/L** in 26 out of 37
- WWTP groundwater network: downgradient of decentralized WWTPs discharging to groundwater: **5 to 620 ng/L**



US EPA ADMINISTRATOR, LEE ZELDIN, COMES TO CCWT TO LEARN HOW WE ARE REMOVING AND DESTROYING PFAS

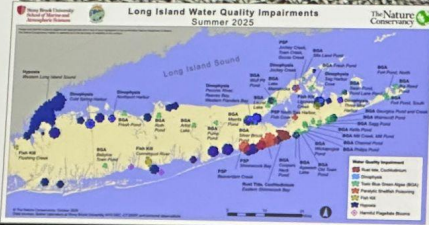
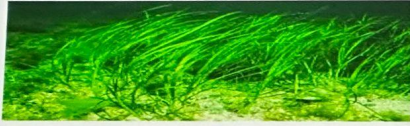


MAJOR ACCOMPLISHMENTS SINCE OUR FOUNDING

- **80+ publications** in international peer reviewed journals since 2016.
- **Millions of dollars in external funding** from federal, local, and philanthropic sources.
- Identified the most effective and cost efficient method for **removing 1,4-dioxane from LI drinking water** during pilot testing of seven technologies at four locations across Nassau and Suffolk County; now standard treatment.
- Developed and refined onsite septic systems (**NRBs**) that has achieved the **highest nitrogen removal and emerging contaminant removal in Suffolk County**.
- Developed and refined an onsite septic system (Nitriflex) that **may be the most cost effective innovative and alternative septic system Suffolk County**.
- Developed and refined multiple onsite septic systems that can achieve **99% phosphorus removal**.

Mitigating Nitrogen Pollution from Onsite Wastewater and Groundwater

Dr. Stuart Waugh: Nitrogen Removing Biofilters, Source Separation



Impacts of excess nitrogen on marine ecosystems

- Nitrogen overloading of estuaries & lakes causes algal blooms including Harmful algal blooms
- Loss of eelgrass and ecosystem biodiversity
- Low oxygen & fish kills
- Collapse in shellfisheries in Suffolk County
- Loss of salt marshes.

General observations about NRBs

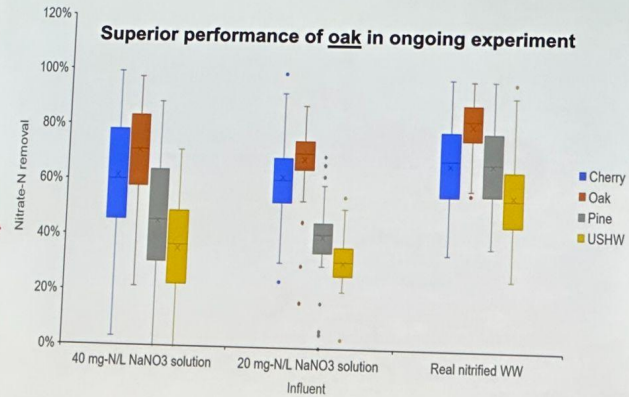


Mostly local sand, local woodchips and local labor so
Safe to say technology is

MADE IN SUFFOLK COUNTY

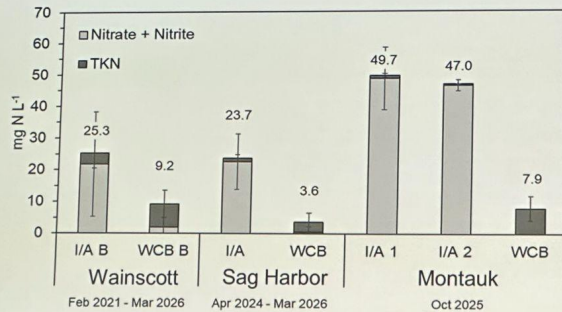


What woodchips work best?



Woodchip boxes coupled to commercial IA OWTS

- Technology achieves objective of TN in final effluent < 10 mg-N L⁻¹.
- Normal drain fields do not achieve N removal
- Presently collaborating w/ global manufacturer to install and test optimized woodchip box.



IV. Urine Diversion, Nutrient Recovery & Reuse: Advantages

In General

- Remove nitrogen from sites where IA OWTS treatment difficult (e.g. bath house at beach)
- Urine separation is highly efficient at removing large fraction of nutrients relative to wastewater volume
- Urine = ~ 1% of municipal wastewater volume but contains ~ 85% and ~ 55% its nitrogen and phosphorous (Larsen & Gujer 1996 *EST*).
- Save valuable clean water for purposes other than flushing a toilet

In Suffolk County

- Readily available source of segregated urine from public restrooms at NYS Parks
- Long Island has sole source drinking water aquifers (Magothy and Lloyd aquifers)
- Reduce importation of nitrogen in synthetic fertilizers
 - NYS Department of Agriculture reported Suffolk County applied 36,621 tons of fertilizer in 2009 (Kelly 2009). This fertilizer contained 3,847 tons of nitrogen
 - for perspective: at 10 lbs- nitrogen per person per year and 1.5 million SC residents, SC generates 7,500 tons of nitrogen (> 50% N in SC's wastewater)
- Substantial turfgrass industry and lawn care market on Long Island

NYS CCWT Nutrient Recapture Program

Direct urine application is not for everyone



Pasteurization/disinfection

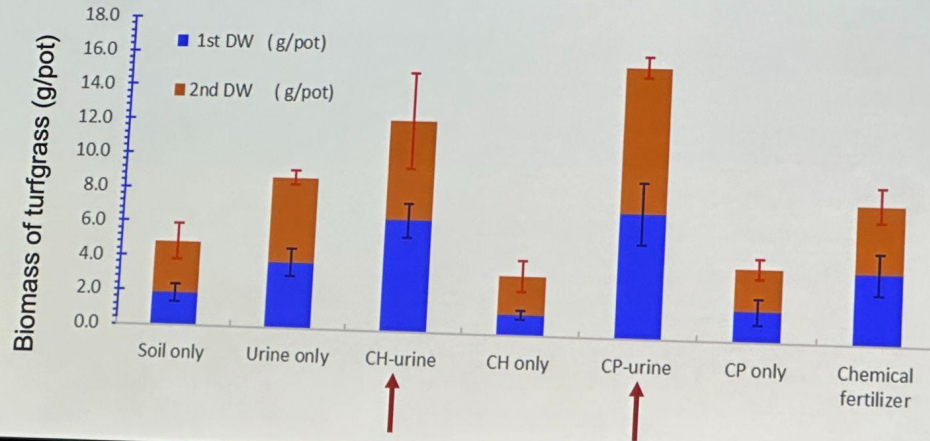


Nutrient capture:
Mixing sterilized urine
w/ different zeolites

Urine Amend Zeolite Product



Urine-treated zeolites (CH, CP) gave yields double of commercial fertilizers



Thomas Varley: Wastewater Research and Innovation
Facility & Nitriflex Technology

Technology Evaluation Program (TEP)

- Developed in collaboration with SCDHS & NYSDEC it establishes a program to allow companies seeking to bring new I/A OWTS technologies to market an alternate path for achieving Suffolk County Article 19 "Pilot Phase Status" by installing their systems at the WRIF following the TEP protocols.
- Program addresses sample/test requirements and frequency, performance evaluation criteria, base and stress flows, and an unbiased opinion of the system's operation and maintenance requirements.

Advantages of the WRIF as Local Test Center

- Helps to develop an on-site wastewater treatment industry, thus increasing competition that lowers costs for homeowners and businesses.
- Attract, test, and evaluate new technologies in Suffolk County - unbiased, data-driven, science and technical evaluation, and a review of system inventor's claims for low O&M.
- Creates a national test center and thus recognizes New York State and Suffolk County as a leader in ground and surface water protection.

SUFFOLK COUNTY'S INNOVATIVE/ALTERNATIVE ONSITE WASTEWATER TREATMENT PROGRAM

- Total Nitrogen discharge standard =19 mg/L
- Non-mandatory except for new construction & major renovation
- I/A systems require large excavation and full system replacement

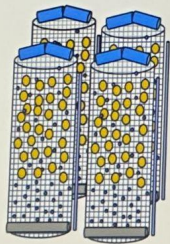


**BUT ... HOMEOWNERS HESITATE TO UPGRADE DUE
TO SYSTEM COSTS & PROPERTY DISRUPTION**



NITRIFLEX™ SYSTEM

Retrofit any septic tank into a low-nitrogen system that outperforms current I/A technologies for a fraction of the cost.

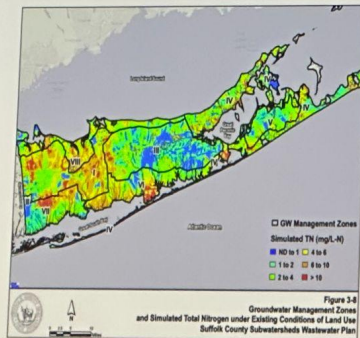


- **Reuses existing infrastructure** less property disruption & reduced cost
- High performance **<15 mg/L Nitrogen**
- **Lightweight pod design** inserted through manhole for easy install & maintenance
- **Complete Retrofit package ready to install**
 - Multiple pods w/ advanced Biochip media
 - High efficiency, quiet aerator
 - Fine bubble diffuser
 - Pre-assembled aeration manifold, valves and tubing
 - PVC airlift assembly

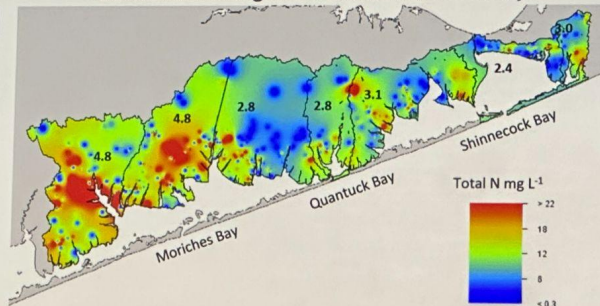
Dr. Nils Volkenborn: Permeable Reactive Barriers

LEGACY NITROGEN

- Over the past decades we have been loading Long Island's aquifers with Nitrogen.



Groundwater nitrogen concentrations, Eastern Bays



data: Suffolk County

PRB PROJECT ROADMAP

Document to help municipal engineers and planners, NGOs & property owners to

- Assess where legacy nitrogen might be impacting surface waters
- Assess if a PRB is an appropriate and feasible mitigation option
- Provide insights and resources for PRB siting, design, installation, and performance monitoring



Permeable Reactive Barriers (PRB) Project Roadmap

REMOVING LEGACY NITROGEN FROM GROUNDWATER ON LONG ISLAND WITH PERMEABLE REACTIVE BARRIERS:
A ROADMAP TO PROJECT PLANNING AND IMPLEMENTATION

Kathy Hochul, Governor | Amanda Leffler, Commissioner

	Goals	Possible deal breakers
➤ Step 1 Online Site Screening	1 Identification of a potentially suitable site that warrants further investigation using the Long Island Sound Water Quality Index (LISQWI) and other data.	1 Property owner doesn't agree to PRB installation. 2 Insufficient information to proceed with PRB installation.
➤ Step 2 Initial Site Investigation	1 Preliminary assessment of groundwater quality and site characteristics.	1 Groundwater quality is too poor to justify PRB installation. 2 The identified site is not a groundwater plume.
➤ Step 3 Feasibility Assessment	1 Data collection to confirm that the site is suitable and viable for PRB design.	1 Design in the identified conditions. If not, the site may not be suitable for PRB or a PRB may not be the most effective remedy.
➤ Step 4 Comprehensive Site Characterization	1 Assessment of cost benefits, spatial distribution, and other factors.	1 Comprehensive analysis indicates a PRB installation is not the most effective remedy for the site.
➤ Step 5 Feasibility Study	1 PRB design report that includes details on the selected PRB type, dimensions, placement, media, construction, operation, costs, and nitrogen load reduction.	1 Groundwater quality is too poor to justify PRB installation.
➤ Step 6 PRB Design		
➤ Step 7 Permitting		
➤ Step 8 PRB Installation		
➤ Step 9 Performance Monitoring	1 Confirmation of system effectiveness and sustainability.	



Jennifer A. Juengst: Regulatory Update

Update on Suffolk County Grant Application



Clean Water Symposium - June 12, 2026

Presented by Jennifer A. Juengst, Deputy County Executive, Office of the Suffolk County Executive



Dr. Chris Gobler: Phosphorus Impacts & OWTS Challenges



toxins University

Article

Toxins 2013, 5, 1597–1628;

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. Landsberg², Melissa Miller^{3,4}, Kevin Krel⁴ and Tegan K. Taylor³

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

Toxins 2015, 7(4), 1374–1395;

[Open Access](#) [Review](#)

One Health and Cyanobacteria in Freshwater Systems: Animal Illnesses and Deaths Are Sentinel Events for Human Health Risks

by Elizabeth D. Hilborn^{1,*} and Val R. Beasley²

¹ National Health and Environmental Effects Research Laboratory, Office of Research and Development, United States [Environmental Protection Agency](#), Research Triangle Park, NC 27711, USA

² Department of Veterinary and Biomedical Sciences, College of Agricultural Sciences, the Pennsylvania State University, University Park, PA 16802, USA

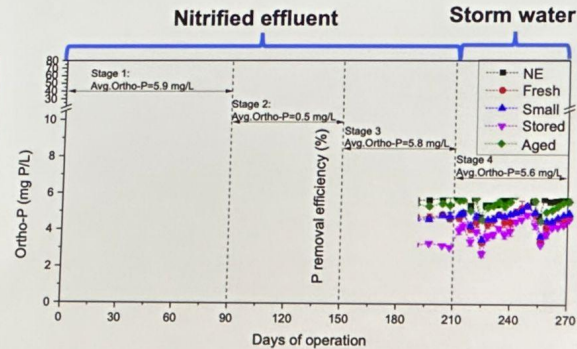


Hundreds cases: “The canine cyanotoxin poisoning events reviewed here likely represent a small fraction of cases that occur throughout the U.S. each year.” – CDC

“Illnesses or deaths among livestock, dogs and fish are sentinel events for the presence of harmful cyanobacteria that may impact human health.” -EPA

FAR
BEYOND

P attenuation & mobilization in denitrification unit



- P removal: **Stored > Fresh > Aged** woodchip
- P release : **Aged > fresh & stored** woodchip

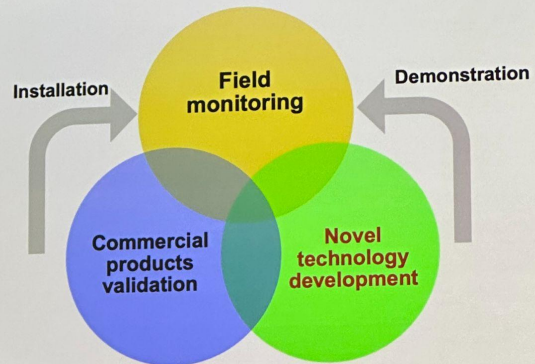
Commercial products for P removal from OWTS

No.	Product	Technology classification	Company Geological location
1	Polonite® filter	Filter media	Poland/Sweden
2	Filtralite®		Norway
3	Phosphex™		Canada
4	Phosphorid™		USA
5	Phos-4-Fade™		USA
6	Waterloo EC-P™	Electrochemical	Canada
7	DpEC		Canada
8	CRX series		Japan
9	Rewatec Solido Smart +P	Metal salts dosing (similar to WWTP)	UK
10	Busse		USA
11	BioBarrier®		USA

NYS CCWT actively testing

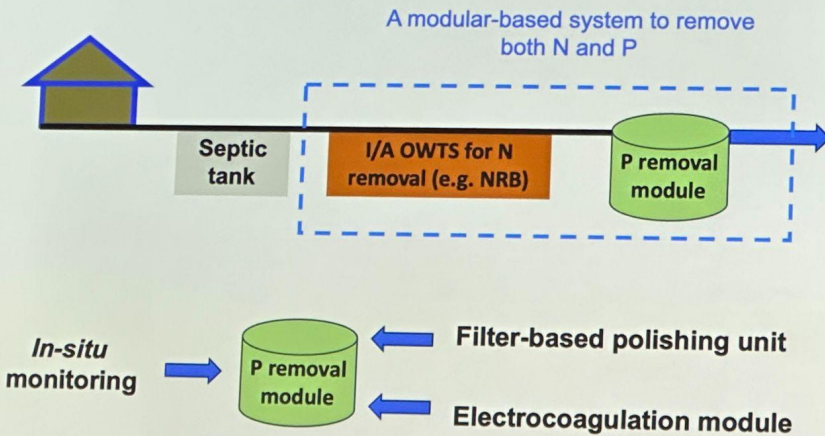
Dr. Xinwei Mao: CCWT Research and Development

CCWT Research & Development Areas



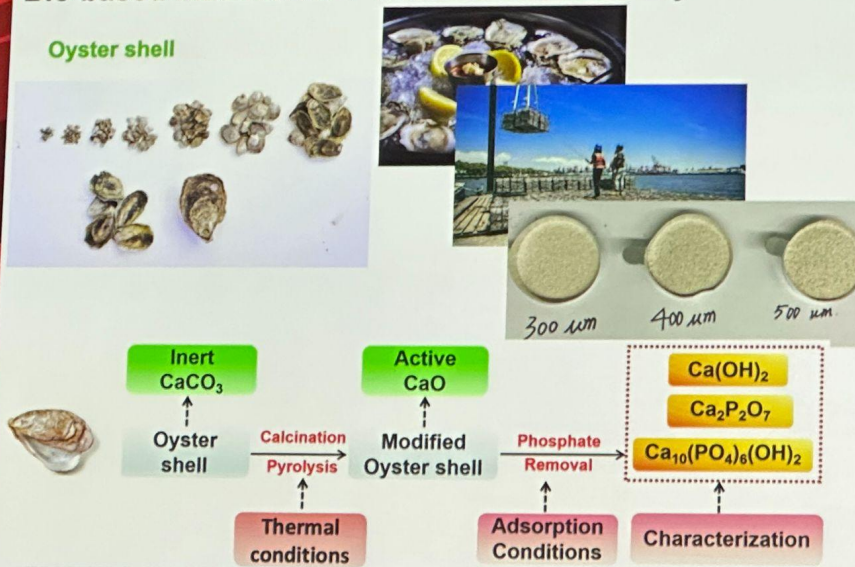
FAR
BEYOND

Integrate Phosphorus polishing module to OWTS



Bio-based material for P removal and recovery

Oyster shell



FAR
BEYOND

Take home message...

Accomplishment To Date

- Developed field-validated P fate and transport model (Lake Como)
- Quantified P removal in NRBs across nitrification/denitrification cycles
- Identified optimal P removal media: e.g. commercial sorbents (Polonite®)
- Validated electrochemical and filter-based P removal technologies
- Developed *in situ* P sensors for ppm–ppb level monitoring

Moving Forward

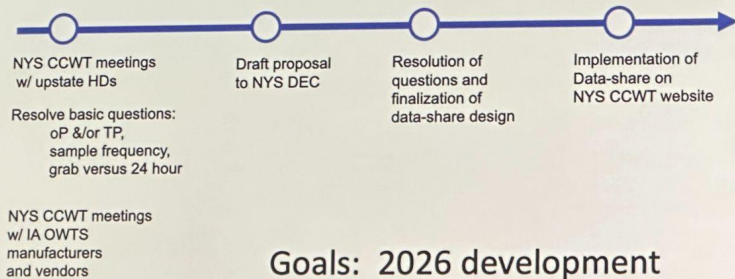
- **Expand P fate and transport modeling across diverse soil types**
(e.g., nearshore sandy soils at Lake Ronkonkoma)
- **Deploy field-scale filter and electrochemical systems**
(e.g. Lake Ronkonkoma; Suffolk County Park; Lake Como)
- **Advance co-contaminant removal strategies**
(e.g. phosphorus + CECs using a combination of E/C and adsorption)
- **Launch a Phosphorus Data Sharing Program**
(supporting regional monitoring and decision-making)

Walter Dawydiak: CCWT Implementation

Lake Ronkonkoma - Phosphorus Filters SC WQRP Grant

- Funding: \$200,000 Suffolk County WQRP (1/4%)
 - Matched by \$200,000 CCWT.
- Install 2 Phosphorus Filters
 - Module to accommodate and test mineral filter (Lake Ronkonkoma County Park public restroom setting)
 - Electrochemical Filter (residence)
 - Pre- and post-installation monitoring plan and report

Data-share timeline



Goals: 2026 development
2027 Implementation

Gwendolyn Wynkoop: Regulatory Update

Criteria Derivation and Documentation

Current Nutrient Criteria

- Narrative water quality standard for nutrients (6 NYCRR 703.2)
 - "None in amounts that will result in growths of algae, weeds and slimes that will impair the waters for their best usages."

Proposed Approach

- TOGS 1.1.1 (Addendum) – Ambient Water Quality Standards and Guidance Values
- TOGS 1.3.6 (Update) – Phosphorus Removal for Wastewater Discharges
- 3 factsheets on GV derivation, including response variables
 - Aquatic Life in Flowing Waters
 - Aquatic Life in Ponded Waters
 - Human Health in Flowing and Ponded Waters
- Response variables
 - Chlorophyll-a and Benthic Invertebrates
 - Quantify the observed effects of TP pollution and confirm exceedance of the narrative nutrient standard

Nonpoint Source Pollution – Phosphorus

- Addressed through:
 - Clean Water Plans (e.g., TMDLs, 9 Element Watershed Plans, HAB Action Plans)
 - Implemented projects through various funding opportunities (e.g., WQIP, AEM, AgNPS, etc.)
 - Nutrient runoff law
 - When fertilizing your lawn, do not:
 - Use lawn fertilizer containing phosphorus unless you are establishing a new lawn, or a soil test shows that your lawn does not have enough phosphorus.
 - Apply any lawn fertilizer December 1 – April 1.
 - Apply fertilizer on sidewalks, driveways, or other impervious surfaces.
 - Apply lawn fertilizer within 20 feet of a waterbody, unless there is at least a 10-foot buffer of shrubs, trees, or other plants between the area you are fertilizing and the water, or fertilizer can be applied no closer than 3 feet from the water using a device with a spreader guard, deflector shield, or drop spreader.

DEC's Holistic Approach to HABs

1. Watershed Management
 - Monitoring, phosphorus guidance values, Clean Water Planning, and pollutant reduction strategies to address long-term controllable causes
2. Funding projects to reduce occurrence of HABs - \$614 million to nutrient reduction projects
 - Water Quality Improvement Project Program (WQIP)
 - Non-point Source Planning and Mapping Grant (NPG)
3. Research HABs and their causes - \$14 million for research
 - Focus on prevention, mitigation, monitoring, and modeling to understand causes - NYSDEC [HAB Research Guide](#)
4. In-Waterbody Mitigation
 - Development, implementation, and evaluation to help control bloom size and formation

NYSDEC HAB Roadmap

The HAB Roadmap provides a strategic guide for DEC, the public, and other researchers to further the statewide mission to address HABs and their impacts on water quality.

- Six focus areas covering important aspects of managing HABs:

1. Monitoring and Assessment
2. Water Quality Standards/Regulatory Thresholds
3. Planning and Implementation
4. General and In-Waterbody Mitigation Research
5. Permitting In-Waterbody Mitigation Practices
6. Public Outreach and Reporting



Water Quality Improvement Project (WQIP) Program

Types of projects:

- Implementation

Projects are required to:

- Improve water quality or habitat;
- Promote flood risk reduction; restoration, and enhanced flood and climate resiliency; or
- Protect a drinking water source

2026 Application period:
now through July 31, 2026

Max award: \$100,000 - \$15 million per project (dependent on project type)

Match requirement:

- 25% of requested funds/award

Eligible applicants: (dependent on project type)

- Municipalities (ECL §56-0101)
- Soil and water conservation districts
- Not-for-profit corporations



Non-agricultural Nonpoint Source and MS4 Planning Grant (NPG)

Types of Projects:

- Planning/design for future implementation projects
- Mapping MS4 systems
- MS4 Stormwater Management Planning

Projects are required to include:

- Initial planning of non-agricultural nonpoint source, climate resiliency and dam safety projects;
- Regulated MS4 mapping; or
- Regulated MS4 stormwater management program development

2026 Application period:
now through July 31, 2026

Max award amount: \$50,000- \$400,000
per project (dependent on project type)

Match requirement:

- 10% of requested funds/award

Eligible applicants:

(dependent on project type)

- Municipalities (ECL §56-0101)
- Soil and water conservation districts



Lokesh Padhye: PFAS Removal Technologies & Future Directions



PFAS

Difluorinated compounds

Poly-fluorinated carbon chain "tail"

Functional group

Per-fluorinated - PFOS

Difluorinated compounds

Poly-fluorinated carbon chain "tail"

Functional group

Poly-fluorinated - 6:2 Fluorotelomer sulfonic acid (6:2FTSA)

Industry

Consumer Products

Waste Infrastructure

AFFF

Environment

Human Exposure

Transfer to Infants

- Breast milk
- Cord blood

Sunderland, E. M.; Hu, X. C.; Dassuncao, C.; Tokranov, A. K.; Wagner, C. C.; Allen, J. G. A Review of the Pathways of Human Exposure to Poly- and Perfluoroalkyl Substances (PFASs) and Present Understanding of Health Effects. *J. Expo. Sci. Environ. Epidemiol.* 2019, 29 (2), 131–147.

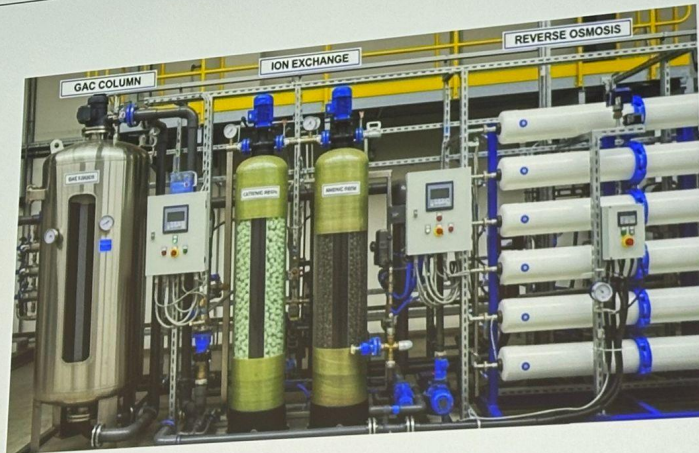
- Highly fluorinated class of synthetic chemicals
- Strong and resistant C-F bonds
- Repel oil and water, thermal stability, chemical resistance, durability → widespread use in everyday lives
- Persistent; **bioaccumulative**, toxic
- Concerns for human health and the **environment**

2

PFAS

140 Million
Americans

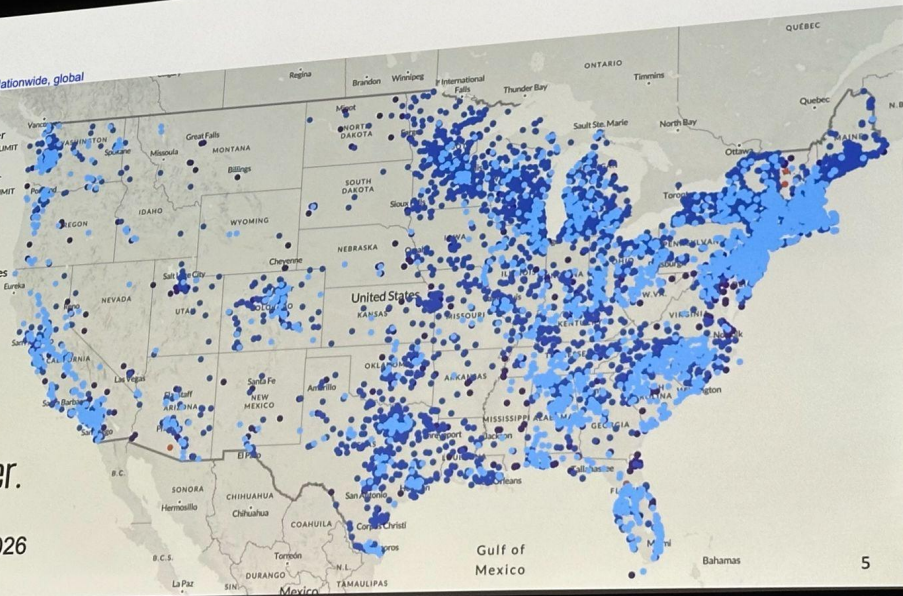
are exposed to PFAS
contamination through
drinking water
above EPA health limits



PFAS

THE PROBLEM = Nationwide, global

- On Drinking Water ABOVE PROPOSED LIMIT
- On Drinking Water BELOW PROPOSED LIMIT
- On Military Sites
- On Other Known Sites



PFAS
in the
drinking water.

Reported March 2026

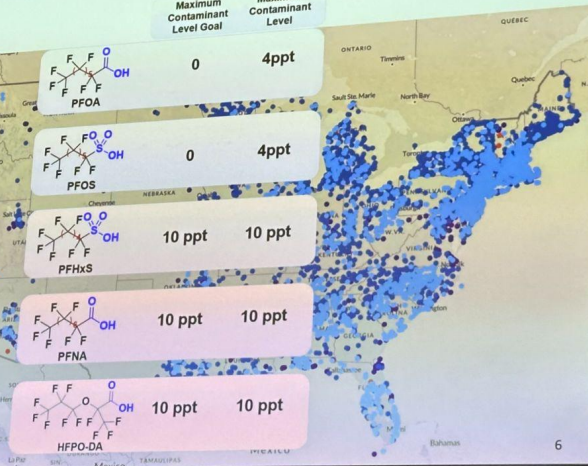
THE PROBLEM = Nationwide, global

THE PROBLEM = Nationwide, global

- On Drinking Water ABOVE PROPOSED LIMIT
- On Drinking Water BELOW PROPOSED LIMIT
- On Military Sites
- On Other Known Sites

Existing
Treatments
struggle to
achieve MCLs

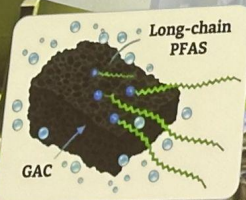
	Maximum Contaminant Level Goal	Maximum Contaminant Level
 PFOA	0	4ppt
 PFOS	0	4ppt
Chloride		
 PFHxS	10 ppt	10 ppt
 PFNA	10 ppt	10 ppt
 HFPO-DA	10 ppt	10 ppt



GAC PROBLEM

- Expensive
- Fouls Easily
- Difficult End-of-Life

Granular Activated
Carbon (GAC)
is costly yet
inefficient



\$90K
per vessel
changeout

\$18.3M
for existing
systems in
Suffolk County

\$48.3M
PFAS treatment
budget (SCWA)
plans

ADSORBENTS USING LOCAL RESOURCES

- Reuseable Natural Resources on Long Island: Kelp, Oyster Shell, Bamboo, Tree and Yard Debris, etc.
- Bamboo is an invasive plant on Long Island.
- Valorizing kelp, oyster shell, and bamboo into valuable materials: reusing Long Island's natural resources to resolve local water quality issues.

NEWS
How kelp farms, an 'environmental powerhouse,' can help mitigate climate change



Kelp Biochar



Source:
<https://www.theguardian.com/lifeandstyle/2021/mar/06/how-to-use-oysters-to-improve-your-soil>



Bamboo Patch

Bamboo Biochar Product



WASTE-TO-VALUE (WAVE) CENTER OF EXCELLENCE Transformation Processes

Inputs:
Organic Wastes



Food Waste

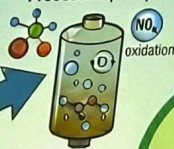


Yard Debris



Wastewater
Sludge

**Nitro-Oxidation
Processes (NOP)**



**Creation
of
Products**

Pyrolysis



Outputs:
Revenue-Generating
Products & Environmental Benefits

Contaminant Sorbents



Removes PFAS & contaminants from water

**Biochar
Soil Amendments**



Restores soils, increases agricultural
productivity, prevents crop contamination

Concrete Additive



Sustainable concrete
production, sequesters
carbon

Vision:
Circular Economy



Clean
Water

Contaminant
free food

Healthy
Public

**Converting
waste into
clean food
and water**

**NYS
CENTER FOR
CLEAN WATER
TECHNOLOGY**

In Collaboration with Dr. Ben Hsiao, SWFT Labs, and the Regional Partners

Kevin Shaffer: Beyond Treatment, PFAS Monitoring

PFAS OF INTEREST

Legacy PFAS

- PFOS
- PFOA

Persistent PFAS

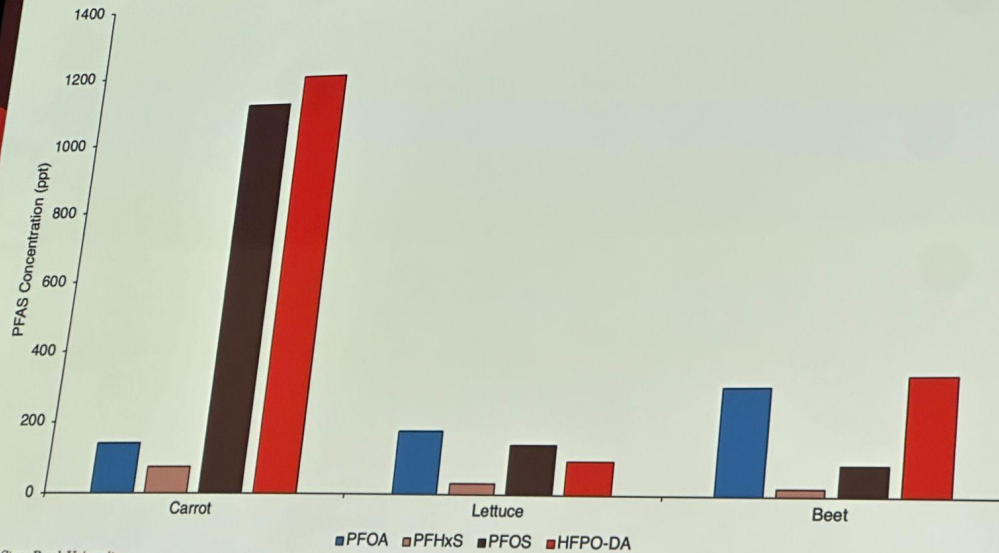
- PFHxS
- PFNA

Emerging PFAS

- GenX (HFPO-DA)

These PFAS are commonly monitored due to past regulatory attention and ongoing environmental concerns.

PFAS IN LONG ISLAND PRODUCE



Tim Kilcommons: SCWA's Efforts to Address Emerging Contaminants

Who is SCWA...

- The Suffolk County Water Authority is one of the largest **groundwater suppliers** in the country. We've been at the cutting edge of the drinking water industry for more than **75 years**.
- SCWA is a **not-for-profit independent public-benefit corporation** operating under the Public Authorities Law of the State of New York.
 - That means we operate without taxpayer or investor dollars. Everything we get from our ratepayers is invested back into our system.
- SCWA serves approximately **1.2 million** Suffolk County residents.



SCWA Statistics

- 640 total wells at 243 pump stations.
- 70 Storage Tanks with 73.7 Million Gallons (MG) of storage.
- Avg Daily Pumpage: 220 MG.
- Avg Peak Pumpage: 455 MG.
- 36,323 fire hydrants & 6,085 miles of main



SCWA Water Quality Testing Laboratory

- SCWA's state-of-the-art water quality testing laboratory is the **largest groundwater laboratory in the country**.
- Test samples are taken at the wellhead, at various stages of treatment **and** within the distribution system for bacteria and a wide range of inorganic and organic chemicals.
- Analyzed **95,668** samples last year for 195,316 tests.
- Tested for **390** compounds (**231 more than** required by regulators).
- Testing at a **higher frequency** than required by SCDHS.
- SCWA's in-house standards for water quality are often **tougher than** state or federal regulations.



SCWA Response to Emerging Contaminants to Date:

- *R&D*: internal piloting, collaborations with Stony Brook CCWT, NJIT, UNC Charlotte, Reactivated Carbon Contract
- *Treatment Currently In Service*:
 - 165 GAC or IX Resin Systems for PFAS compounds
 - 19 AOP Systems for 1,4 Dioxane Treatment
- *Underway*: 15 AOP systems on order, 20 GAC systems out for bid with site work already commencing, 9 treatment buildings to be bid
- *Future*: 91 more AOP and GAC systems to come
- *Grants*: \$42M in grant funding to date

Scott Alderman: PFAS/PFOS Regulatory Update

CURRENT STATUS

- The PFAS Rule continues to face legal challenges.
- Two rules have been sent to the Office of Management and Budget (OMB) for review. OMB completed their review in May.
- DOH participated in a briefing with EPA on May 18, 2027 that outlined the contents of the proposed rules.
- Retain MCL of PFOA and PFOS at 4.0 ppt.
- Rescind MCLs for PFHxS, PFNA, HFPO-DA and the HI.
- Provide framework to extend the deadline for corrective action for PFOA and PFOS until 2031.



From left to right:
Jennifer Juengst,
Kay Tyler, and
Tom Varley at the
symposium