



Long Island Sound Study

A Partnership to Restore and Protect the Sound



Cold Spring Harbor
Credit: Sarah Schaefer-Brown

Long Island Sound Coastal Resilience Forum

Monday, October 28, 2024



Save the Date

Long Island Sound Coastal Resilience Forums

Nassau County Forum: Monday, October 28, 2024
Sands Point Preserve, Sands Point, NY

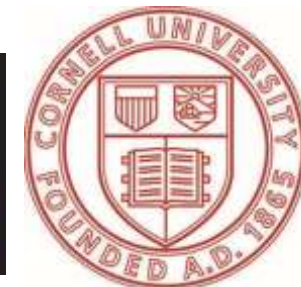
Suffolk County Forum: Tuesday, October 29, 2024
Dorothy P. Flint 4-H Camp, Riverhead, NY

These forums will bring together state and local decision makers, municipal staff, and other interested parties working to address flooding, shoreline erosion and other coastal issues. The goal of these forums is to share information on best practices, discuss challenges, identify opportunities to increase resilience, and enhance coordination across communities.

This year's forums include a field trip to a shoreline resilience project site!

Register here: <https://www.lisresilience.org/upcoming-trainings-and-events/>

Hosted by New York Sea Grant and Long Island Sound Study in partnership with Nassau and Suffolk Soil and Water Conservation Districts, Sands Point Preserve Conservancy, Maidstone Landing, and Cornell Cooperative Extension of Nassau County.



9:45 AM **Welcome & Introductions**

10:00 AM **Planning for Sea Level Rise & Other Climate Threats**

10:40 AM **Creating Resilient Shorelines**

12:30 PM **Lunch**

1:30 PM **Field Trip - Resilience projects at Sands Point Preserve**

3:30 PM **Return from Field Trip/Depart**



Comprehensive Conservation & Management Plan

The *draft* 2025 Plan is available for public comment until November 22, 2024.

The Plan addresses:



Clean water and healthy watersheds



Thriving habitat and abundant wildlife



Informed and engaged public

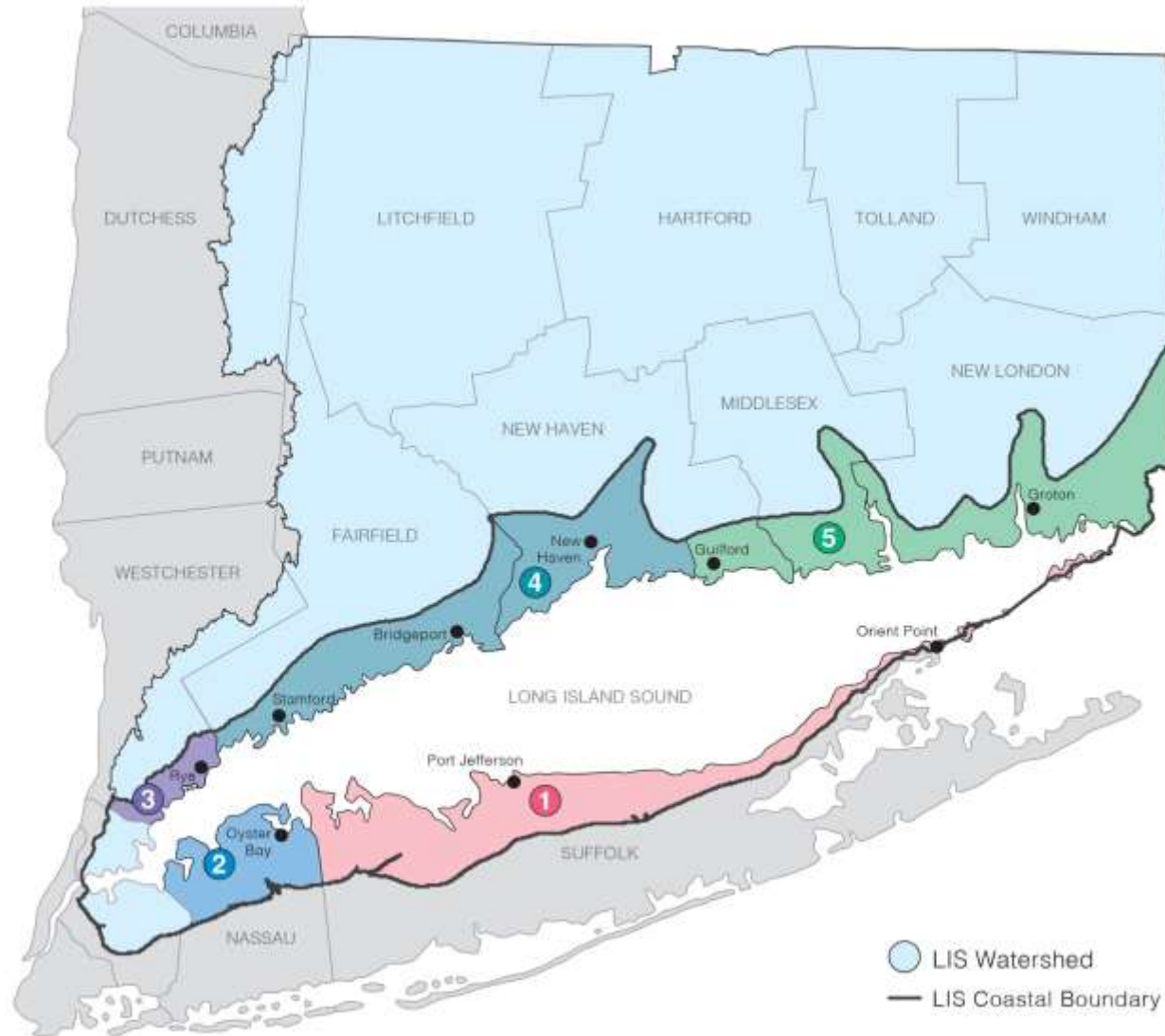


Sustainable and resilient communities

Learn more at:

<https://longislandsoundstudy.net/about/ccmp-revision-updates/>

The SRC Extension Professionals Team



- 1** Suffolk County
Elizabeth Hornstein
- 2** Nassau County
Sarah Schaefer-Brown
- 3** Westchester County
Sara Powell
- 4** Western CT
Deb Visco Abibou
- 5** Eastern CT
Sarah Schechter

A Sustainable and Resilient Long Island Sound Community is one which can anticipate and overcome disturbances, while achieving well-being for all.





Long Island Sound Study
A Partnership to Restore and Protect the Sound

Planning for Sea Level Rise & Other Climate Threats



Manhasset Bay

Finding climate resources should be easy

The Long Island Sound Resilience Resource Hub is here to help your community. Learn about environmental challenges, planning solutions, and how to implement and sustain projects now.

Select your Planning Phase, Location, and/or Topic of interest to access a filtered selection of our curated resources and tools.

Planning Phase

Select a Planning Phase



Location

Select a Location



Topic

Select a Topic



Get Started

Steps to Community Resilience Planning



LEARN

Identify
Risks



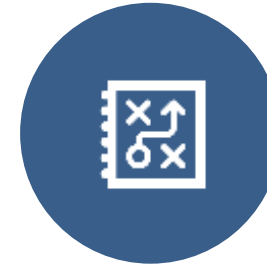
PLAN

Identify
Strategies to
Mitigate Risks



IMPLEMENT

Secure Funding
to Implement
Strategies



SUSTAIN

Maintain,
Evaluate, and
Adapt

A Guide to Resilience Planning

Use the PERSISTS criteria below to help identify, prioritize, and implement high-impact projects

PERSISTS Framework adapted and adopted from Connecticut Institute for Resilience and Climate Adaptation. (2020). Resilient Connecticut Planning Framework.

P

Permittable

E

Equitable

R

Realistic

S

Safe

I

Innovative

S

Scientific

T

Transferable

S

Sustainable

Resilience Planning Guide

PERSISTS* Decision Support Criteria can help prioritize projects

Permissible – Can get all necessary permits and/or permissions

Equitable – Considers input from and impacts to vulnerable populations

Realistic – Has community support and can be realistically achieved

Safe – Enhances or maintains the wellbeing of communities

Innovative – Process has considered innovative options including nature-based solutions

Scientific – Incorporates the best available science

Transferable – Can serve as model for other communities

Sustainable – Socially, economically, and ecologically sustainable

*Adapted and adopted from Connecticut Institute for Resilience and Climate Adaptation. (2020). [*Resilient Connecticut Planning Framework*](#).

Case Studies

Case Studies

Learn about other climate change resiliency projects in the Long Island Sound.



Funding Database



Filters

Select one or more of the filters below to find relevant tools and resources for your needs

Status

Select a Status

Planning Phase

Select a Planning Phase

Location

Funding

Open: Due on Nov 1, 2024

6 days
remaining to apply

Up to \$8,000 (Planning); Up to \$50,000 (Implementation)

Climate Smart Land Stewardship Grant Program

The Climate Smart Land Stewardship Grants is a new fund for land trusts offered by the Connecticut Land Conservation Council (CLCC) with support from the Connecticut Department of Agriculture. This program will award...

Connecticut State

Habitat

Land Use

Planning

View Details

Assistance Programs

LIS Resilience Planning Support Program

Focus: **Planning and Project Scoping**

Eligible Applicants: Municipalities, Nonprofits, Community Organizations

Next round will be released December 2024

LIS Resilience Grant Writing Assistance Program

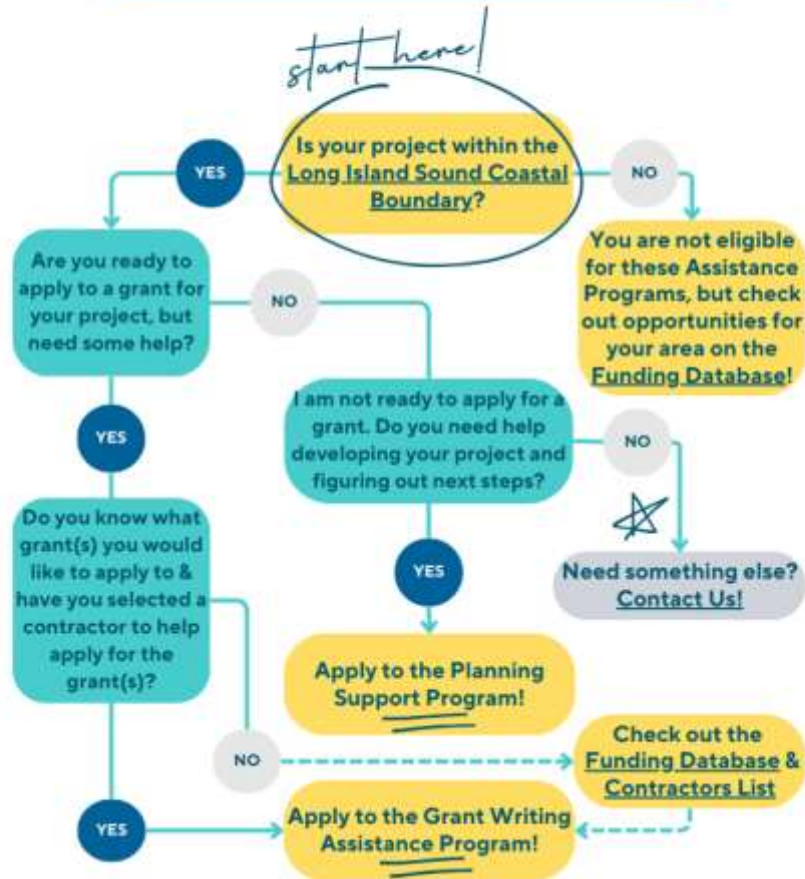
Focus: **Grant Preparation and Writing**

Eligible Applicants: Municipalities, Nonprofits, Community Organizations

Rolling: Open until all available funding has been allocated

What Assistance Program is right for me?

Click on the image to interact



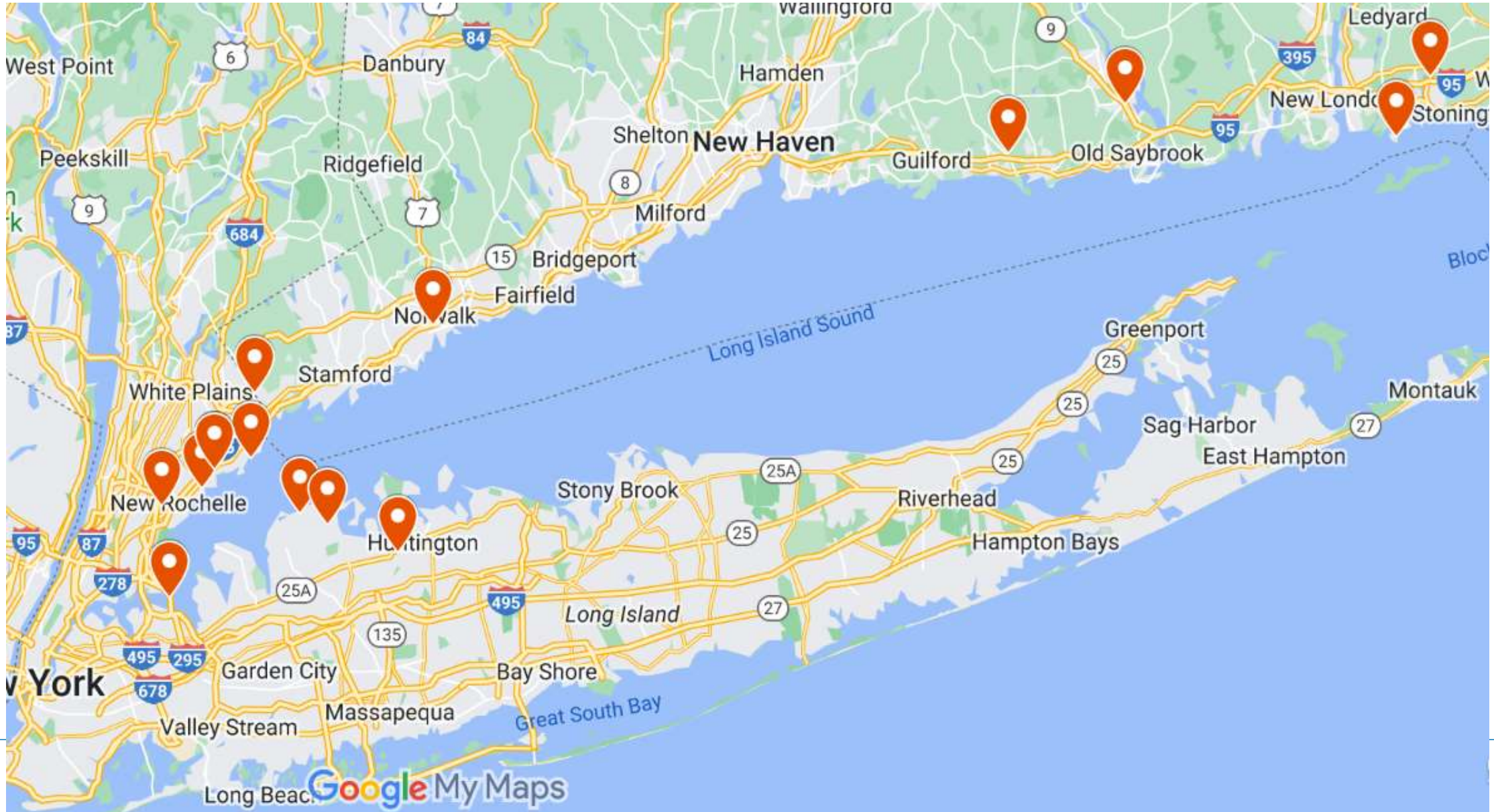


Cornell Cooperative Extension of Nassau County

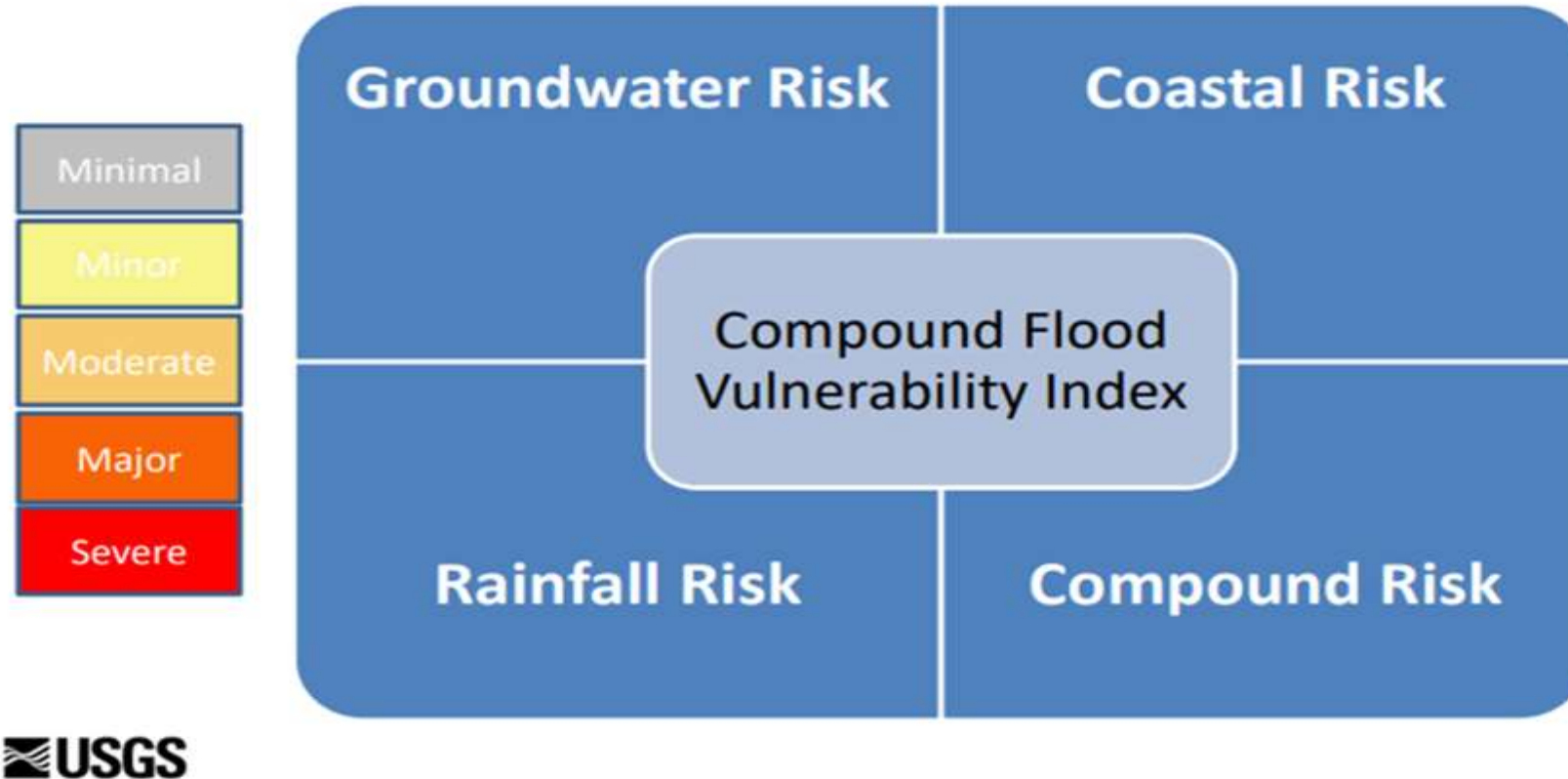
ReWild Long Island



Planning Support Program - 15 projects!



Compound Flood Mapper for Long Island Sound - Coming Soon!



MyCoast NY mycoast.org/ny



NY Sea Grant has launched MyCoast NY, an online portal for collecting and analyzing photos of flooding and storm damage. When a photo report is submitted, it is automatically linked to the closest weather, river, and tidal gauge data to help provide context to the photo.

- **High Water:** Tracking (any type of) flooding across the state. This includes riverine, coastal, and shallow flooding (pluvial), such as flooding due to stormwater overflows and poor urban drainage.
- **Storm Reporter:** Documenting storm damage across the state.

Flooding & Erosion Basics / Adapting to Flood & Erosion Risk Fact Sheets



A Start Guide for Addressing Flooding and Erosion in Long Island Coastal Communities (bit.ly/StartGuideLongIsland)

Adapting to Flood and Erosion Risk

Coastal adaptation is taking action to minimize risk from flooding and erosion. Communities that adapt become more resilient to storms, sea level rise, and other environmental impacts.

STEPS TO RESILIENCE

The U.S. Climate Resilience Toolkit, developed through a partnership of federal agencies and organizations led by NOAA, describes a general 6-step process that can lead to adaptation actions. This general process can be combined with existing programs and planning in New York State such as Climate Smart Communities, Local Waterfront Revitalization Program, Hazard Mitigation Planning, Stormwater Phase 2: MS4 Program, and the Community Rating System. The steps are summarized below. Consult the U.S. Climate Resilience Toolkit website for more information (<https://toolkit.climate.gov>)

1) **Getting Started.** Identify a climate champion. An effective champion, whether inside government or a member of the community at large, works with a planning team to assess climate risk and makes recommendations on how to address it. Often, this leader is an elected official, a sustainability coordinator, or someone who works in a local government office. Other steps to get started include: build a representative team, consult existing planning documents, commit to centering equity in your plan, check alignment of your developing goals with community values, and announce your efforts to the public.

2) **Understand Exposure.** Consider the things your community cares about and determine what weather and climate-related hazards have occurred in the past and what hazards might occur in the future while considering climate change. Refer to the New York State Climate Impacts Assessment for a comprehensive look at how climate change is impacting New York (<https://nysclimateimpacts.org>).

3) **Assess Vulnerability and Risks.** Some groups handle this step themselves; others hire professionals to help them conduct vulnerability and risk assessments. In New York State, there are a range of existing tools and planning processes that can assess vulnerabilities and risks. Check out Climate Smart Communities Action P7: Vulnerability Assessment to learn more. (bit.ly/NYS CSCPE7VulnerabilityAssessment)

Resilience is the capacity of a community, or natural environment to prepare for, withstand, respond to, and recover more quickly from a disruption, such as flooding and extreme storms.

Climate Smart Communities (CSC) Program: New York State's Climate Smart Communities is both a community certification system and a grant program. The program includes both mitigation (for greenhouse gas reduction) and adaptation actions. The adaptation actions can be taken to move a community towards flood resiliency and when combined with the mitigation actions, can help achieve certification at the bronze, silver, or gold level. Technical support is available to help communities achieve actions. (<https://climatesmart.ny.gov>)

Vulnerable Populations: Vulnerable people do not have the material or social resources to respond or recover from hazardous events and often include the elderly, children, people with disabilities, and families in poverty. Certain neighborhoods within a community may be more vulnerable and less resilient due to socioeconomic factors and legacies of disinvestment. Extra efforts should be taken to engage and invest in these communities to reduce risk to climate and weather hazards.



A Start Guide for Addressing Flooding and Erosion in Long Island Coastal Communities (bit.ly/StartGuideLongIsland)

Flooding and Erosion Basics

Long Island is truly an island, surrounded by seawater. Its shorelines are continually impacted by the movement of sand by both wind and waves. The processes that Long Island's shorelines are experiencing are, of course, natural; however, when they impinge on our buildings, roads, and other infrastructure, people and places are put at risk. In order to prepare for, and adapt to, coastal risks, we all need to understand and assess the physical forces and how they are affecting coastal features.

Flooding and erosion are ubiquitous along Long Island's shorelines. Their impacts can be the result of one of many forces, or can be a compounded issue. The following describes the causes of flooding and erosion so that shoreline managers can understand the impacts and choose an appropriate mitigation strategy.



Flooded parking lot in Northport, NY. Credit: Trustee Dave Weber via MyCoastNY

CAUSES OF COASTAL FLOODING ON LONG ISLAND

Coastal flooding occurs when low-lying land is submerged by seawater.

Tidal

Long Island experiences two high tides and two low tides within a 24-hour period. Tides occur as a result of the gravitational pull of both the sun and the moon on the Earth. When the sun, moon, and Earth are aligned, the pull is the strongest and results in extreme tidal ranges including higher-than-normal high tides and lower-than-normal low tides. Shorelines are more likely to experience tidal flooding during spring tides, which align with the occurrences of new and full moons, or twice every month.

Storm surge

Long Island is impacted by both East Coast Winter Storms (nor'easters) and tropical systems (hurricanes), which both bring storm surges to the shorelines. These low-pressure system storms produce an abnormal rise in water levels that is pushed towards the shore by strong winds. As the storm interacts with the shoreline, the surge moves onshore, resulting in flooding.

Sea level rise

Sea levels around Long Island have been rising since the end of the last Ice Age; however, since the Industrial Revolution, sea levels have been rising at an accelerated pace. Global sea level rise is predominantly a result of land-based ice melt entering the oceans and the thermal expansion of seawater as it warms. Other factors can contribute to the local rate of sea level rise, such as land subsidence or groundwater pumping. Due to sea level rise, Long Island is experiencing more flooding during normal high tides, unrelated to storm events; this chronic flooding is expected to become more common and get worse as sea levels continue to rise.

Bluff Sign & Post Card



Protecting Coastal Bluffs of Long Island

DID YOU KNOW?
The bluffs along Long Island's shorelines were deposited by advancing and retreating glaciers during the last ice age over 18,000 years ago. Composed of loose sediments that range from very small clays to large boulders, the bluffs are vulnerable to erosive forces such as wind, waves, and other influences. We must do our part to protect these unique bluffs!

HEAVY OBJECTS
Objects like fences, pools, and decks place weight onto the bluff, leading to failure.

GROUNDWATER
Over-saturation from sprinklers or storms can lead to bluff dumping.

VEGETATIVE BUFFER
Leave space at the top of the bluff to absorb runoff and reduce weight.

NATIVE PLANTS
Native plants help stabilize bluff sediments.


CONSERVATION
Bluffs play an important role in natural resilience.

FOOT TRAFFIC
Humans and animals can trample protective plants and disturb sediments.

CLIMBING
To prevent erosion, do not climb bluffs. Access beaches using public access points.

ENJOY THE BEACH
Observe the bluff from a distance.

VEHICLES
Driving too close to the bluff can destroy plants and cause erosion.

CREATED BY
 

IN PARTNERSHIP WITH
 

September 27th, October 4th & October 18th



DEC 10-11, 2024

3rd Annual LISS Sustainable and Resilient Communities Workshop



Long Island Sound Study
A Partnership to Restore and Protect the Sound



SAVE THE DATE

More details coming soon!



Long Island Sound Study
A Partnership to Restore and Protect the Sound

Questions?



Oyster Bay



Department of
Environmental
Conservation

Office of Climate Change Updates

Long Island Sound Coastal Resilience Forum - Nassau County
October 28, 2024

Lauren Steinberg
Climate Policy Analyst
DEC Office of Climate Change
Lauren.Steinberg@dec.ny.gov

Updates

- 6 NYCRR Part 490 Projected Sea-level Rise -*2024 update*
- NYS Extreme Heat Action Plan
- NYS climate change adaptation and resilience planning
- Environmental Bond Act

6 NYCRR Part 490 Projected Sea-Level Rise

2024 update

6NYCRR Part 490, Projected Sea-level Rise

Community Risk and Resiliency Act (2014)

as amended by the Climate Leadership and Community Protection Act (2019)

- DEC to adopt science-based sea level rise projections.
- Part 490 was adopted in 2017.
- An amended Part 490 was adopted in September 2024.
- Part 490 establishes projections of sea-level rise but does not impose any requirements on any entity.

Adopted 6NYCRR Part 490, Projected Sea-level Rise, 2024

	Region	Long Island						New York City/Lower Hudson						Mid-Hudson					
	Descriptor	Low	Low-medium	Medium	High-medium	High	Rapid Ice Melt	Low	Low-medium	Medium	High-medium	High	Rapid Ice Melt	Low	Low-medium	Medium	High-medium	High	Rapid Ice Melt
Time Interval	2030s	7	8	10	12	14	NA	6	7	9	11	13	NA	5	7	8	10	12	NA
	2050s	13	15	18	21	25	NA	12	14	16	19	23	NA	11	12	14	17	21	NA
	2080s	23	26	32	41	48	83	21	25	30	39	45	83	18	21	26	35	41	83
	2100	27	32	39	54	69	114	25	30	36	50	65	114	21	25	32	46	60	114
	2150	42	50	63	94	185	NA	38	47	59	89	177	NA	32	41	52	82	171	NA

Inches of rise relative to 1995-2014 baseline

Percentage Differences 6NYCRR Part 490, 2024/2017

Time Interval	Region	Long Island						New York City/Lower Hudson						Mid-Hudson					
	Descriptor	Low	Low-medium	Medium	High-medium	High	Rapid Ice Melt	Low	Low-medium	Medium	High-medium	High	Rapid Ice Melt	Low	Low-medium	Medium	High-medium	High	Rapid Ice Melt
2030s		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2050s		63%	36%	13%	0%	-17%	NA	50%	27%	0%	-10%	-23%	NA	120%	33%	0%	-11%	-22%	NA
2080s		77%	44%	10%	5%	-17%	NA	62%	39%	3%	0%	-22%	NA	80%	50%	4%	-3%	-24%	NA
2100		80%	52%	15%	15%	-4%	NA	67%	36%	0%	0%	-13%	NA	91%	39%	0%	0%	-15%	NA
2150		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

New York State Adaptation and Resilience Plan *(NYSARP)*

SOTS Commitment

“Governor Hochul will direct DEC, NYSERDA, and DOS, in coordination with all relevant state agencies, to develop a **comprehensive climate change adaptation and resilience plan** to ensure state entities and localities can equitably adapt to climate change, including assessing impacts on disadvantaged communities, ecosystems, infrastructure, and vulnerable economic sectors.

This statewide planning effort will **supplement ongoing work to collect information and develop the resources** needed to support the design and implementation of cost-effective strategies to reduce current and future climate risks – leveraging federal dollars and Environmental Bond Act investments to undertake dam removals, repairs to aging flood control structures, and advance green infrastructure projects.”

Precedent Examples

California

- Unifies existing adaptation efforts under common framework

Colorado

- Regional approach to adaptation planning

Massachusetts

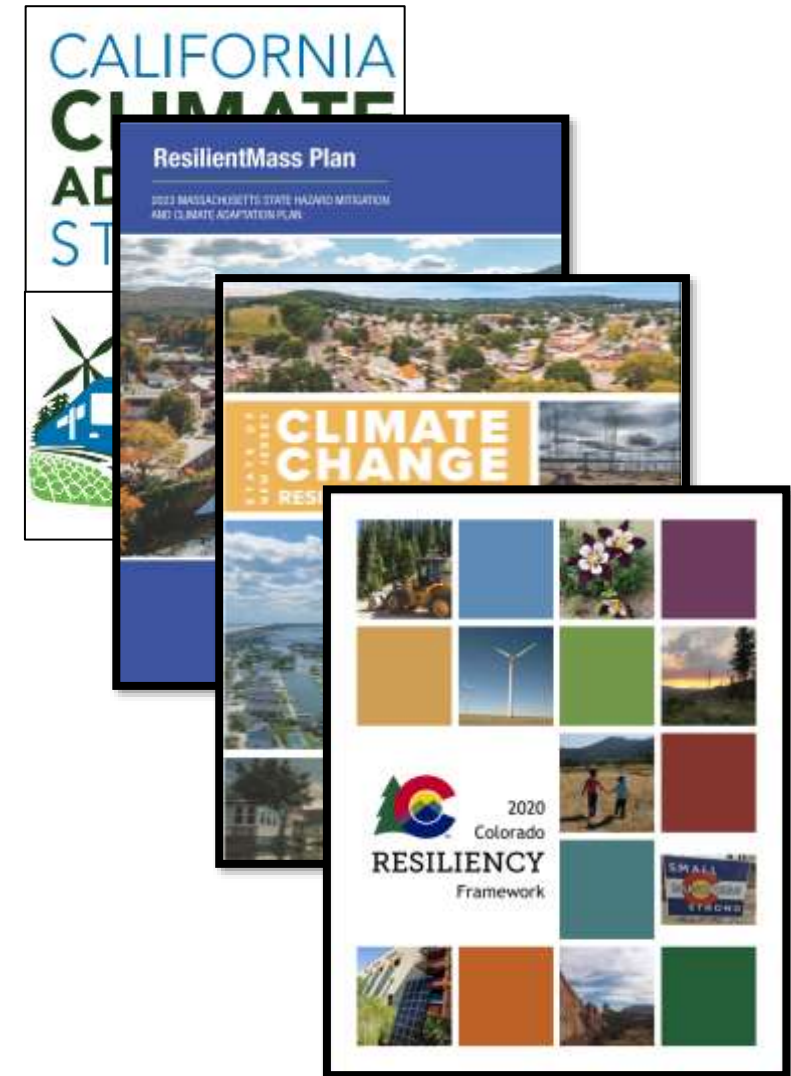
- Layers onto existing hazard mitigation planning process

New Jersey

- Planning under a common framework and governance

European Union

- Coordinates and standardizes resources for local adaptation



New York State Extreme Heat Action Plan

EXTREME HEAT ACTION PLAN

LEARN MORE
on.ny.gov/extremeheat

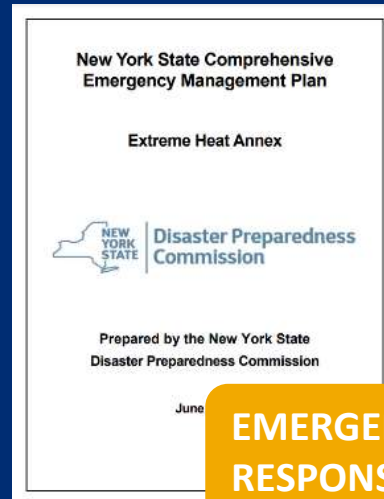


Putting Adaptation into Action

- Missions, goals, and principles
- 49 strategies in four action tracks
- Short- and mid-range goals
- Implementation and evaluation



extreme-heat@dec.ny.gov



**EMERGENCY
RESPONSE**


**EXTREME HEAT
IN NYS REPORT**

**The Clean Water, Clean Air & Green
Jobs
Environmental Bond
Act**

A Historic \$4.2 Billion

Specifically, the Environmental Bond Act authorizes

- **\$1.5 billion** for climate change mitigation;
- **\$1.1 billion** for restoration and flood risk reduction*;
- **\$650 million** for water quality improvement and resilient infrastructure*;
- **\$650 million** for open space land conservation and recreation; and
- ***\$300 million** for other projects not specifically allocated in the Act.



**What is the
Bond Act?**



Environmental Bond Act

- Funding dispersed through 23 programs across several state agencies.
- Eligibility guidelines for program funding released for public comment.

Funding Committed \$515 million



- ✓ **\$200 million** – EFC WIIA and IMG
- ✓ **\$20 million** – EFC Green Resiliency Grant Program* (\$20 million CWCAGJ Bond Act and \$40 million CWIA)



- ✓ **\$100 million** – Decarbonization Empire State Plaza
- ✓ **\$32 million** – DEC Nursery Modernization and FMAP Tracking Database



- ✓ **\$68.1 million** – OPRHP Sojourner Truth State Park
- ✓ **\$78.1 million** – OPRHP Lake Sebago State Park
- ✓ **\$13.1 million** – DEC Adirondack Rail Trail and Saranac Lake Depot
- ✓ **\$4 million** – HRVG Albany-Hudson Electric Trail

Grant Programs currently scoring \$475 million



- ✓ **\$20 million** - DEC WQIP Municipal Stormwater Projects



- ✓ **\$10 million** – DEC Climate Smart Communities
- ✓ **\$100 million** – NYSERDA Cleaner Green Schools
- ✓ **\$300 million** – NYSERDA Zero-emission school buses and charging
 - ✓ *Approximately \$35 Million in approved applications to date*



- ✓ **\$20 million** - WQIP – Removal or Repair of Municipal Dams
- ✓ **\$10 million** - WQIP – Fish and Wildlife Habitat Acquisition, Restoration and Enhancement Projects
- ✓ **\$15 million** - WQIP – Enhancing Aquatic Connectivity through Dam Removal and Culvert Replacement



Services New

ENVIRONMENTAL BOND ACT

FUNDING

Clean Water, Clean Air Green Jobs Environment Bond Act

Investing \$4.2 Billion in New York's Environment and Communities

[FUND A PROJECT](#) →

[RESOURCES FOR RESILIENCE](#) →



Stay Updated

Funding Finder

Filter Results

Q Search:

Eligible Applicants contains:

Project Type contains:

Regional Coverage is any of:

Displaying 93 funding opportunities

- [Eligible Applicants Definitions](#)
- [Project Type Definitions](#)
- [Project Phase Definitions](#)

Non-Agricultural Nonpoint Source Planning Grant Program
 Funding Source: NYS Department of Environmental Conservation (DEC)
 Region: New York State
 Project Type: Wastewater; Green Infrastructure; Nature Based Solutions; Shoreline Projects/Streambank Stabilization; In-Waterbody Controls; Ecological Restoration; Culverts; Nonpoint Source; Resilience; Water Quality
 Project Phase: Planning and Design
 Eligible Applicants: Local Government Entity; Soil and Water Conservation Districts

Drinking Water Source Protection Program (DWSP2)
 Funding Source: NYS Department of Environmental Conservation (DEC) and Department of Health (DOH)
 Region: New York State
 Project Type: Drinking Water; Water Infrastructure
 Project Phase: Planning and Design
 Eligible Applicants: Local Government Entity

High Hazard Dam Rehabilitation Grant
 Funding Source: NYS Department of Environmental Conservation (DEC)
 Region: New York State
 Project Type: Dam Removal
 Project Phase: Planning and Design
 Eligible Applicants: Local Government Entity

ENVIRONMENTAL BOND ACT FUNDING PROJECTS PRIORITIES RESOURCES NEWS

Resources for Resilience

Community Assistance Teams

[Community Assistance Teams](#), administered by the Environmental Facilities Corporation (EFC) help municipalities address their clean water infrastructure needs. Teams host regional events and connect communities with experts who can help them undertake their critical water infrastructure projects. These Teams also provide on-site or virtual consultations to help communities across the state jump-start planning, submit funding applications, and see their projects through to completion.

Resilient NY program

[The Resilient NY Program](#), administered by the Department of Environmental Conservation (DEC) improves community resiliency to extreme weather events that result in flooding and ice jam formations. Resilient NY studies will identify the causes of flooding within each watershed, and develop, evaluate, and recommend effective and ecologically sustainable flood and ice jam hazard-mitigation projects. Proposed flood mitigation projects will be identified and evaluated using hydrologic and hydraulic modeling to quantitatively determine which proposed recommendations will likely result in the greatest flood reduction benefits. In addition, the flood resiliency studies will incorporate the latest climate change forecasts and assess ice jam hazards where they have been identified as a threat to public health and safety.

Sustainable Shorelines / Nature Based Shorelines

- Inter-agency workgroup implementing delivery of funds
- Release of eligibility guidelines for public comment
- Bond Act entities launch grant opportunities

Next Steps: Implement and Update

Stay updated:
environmentalbondact.ny.gov
BondAct@dec.ny.gov



Clean Water,
Clean Air & Green Jobs
Environmental Bond Act

Thank You

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Connect with us:

DEC: www.dec.ny.gov

Community Risk and Resiliency Act:
<https://dec.ny.gov/environmental-protection/climate-change/new-york-response/crra>

Climate Smart Communities:
<https://climatesmart.ny.gov/>

Facebook: www.facebook.com/NYSDEC

X (Twitter): <https://x.com/NYSDEC>

Flickr: www.flickr.com/photos/nysdec



Long Island Sound Study
A Partnership to Restore and Protect the Sound

Creating Resilient Shorelines



View of LIS from Sands Point Preserve

"Wetland Type" Map for East Creek Map at 2055, High SLR

Wetland Type:

- Low Tidal
- Low Marsh
- High Marsh
- Freshwater Non-Tidal
- Freshwater Tidal Marsh
- Flooded Developed Dry Land

[definitions](#)

This map shows a map of marsh types predicted for a given date and SLR scenario. Low SLR would be 38 cm by 2100, Medium: 91cm by 2100, and High: 190 cm by 2100. (Base year is 2002)

[East Creek fact sheet](#)

Blue Tax Boundaries are Public Land

[no colors](#)

Black Tax Boundaries are Private Land

Nassau County Tax Parcels 2019, 2022, County of Nassau, Dept. of Information Technology

Sites to Show...

[hide legend](#)

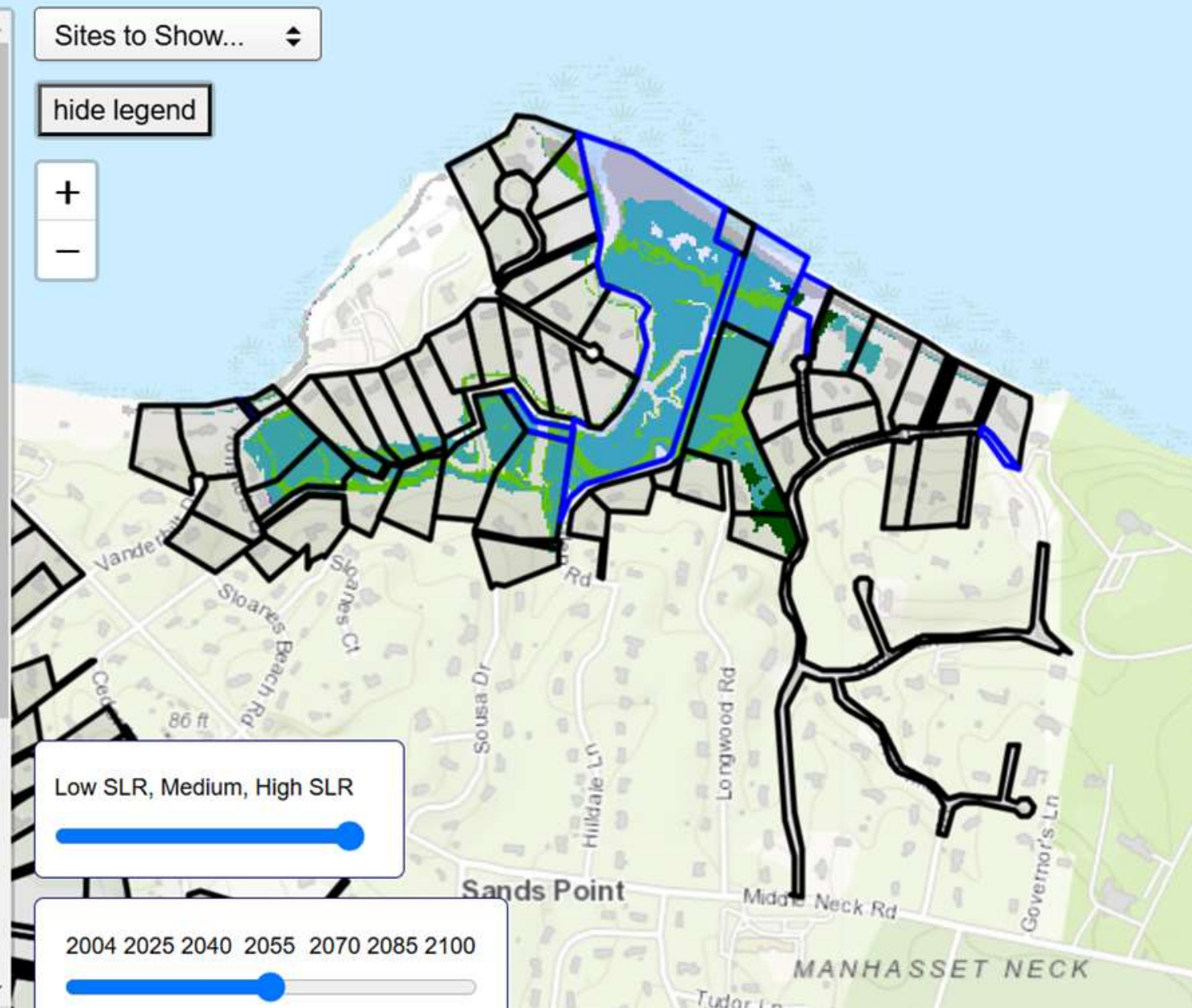
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Low SLR, Medium, High SLR



2004 2025 2040 2055 2070 2085 2100



LISS Marsh Viewer - East Creek

"Wetland Type" Map for East Creek Map at 2100, High SLR

Wetland Type:

- Low Tidal
- Low Marsh
- High Marsh
- Freshwater Non-Tidal
- Freshwater Tidal Marsh
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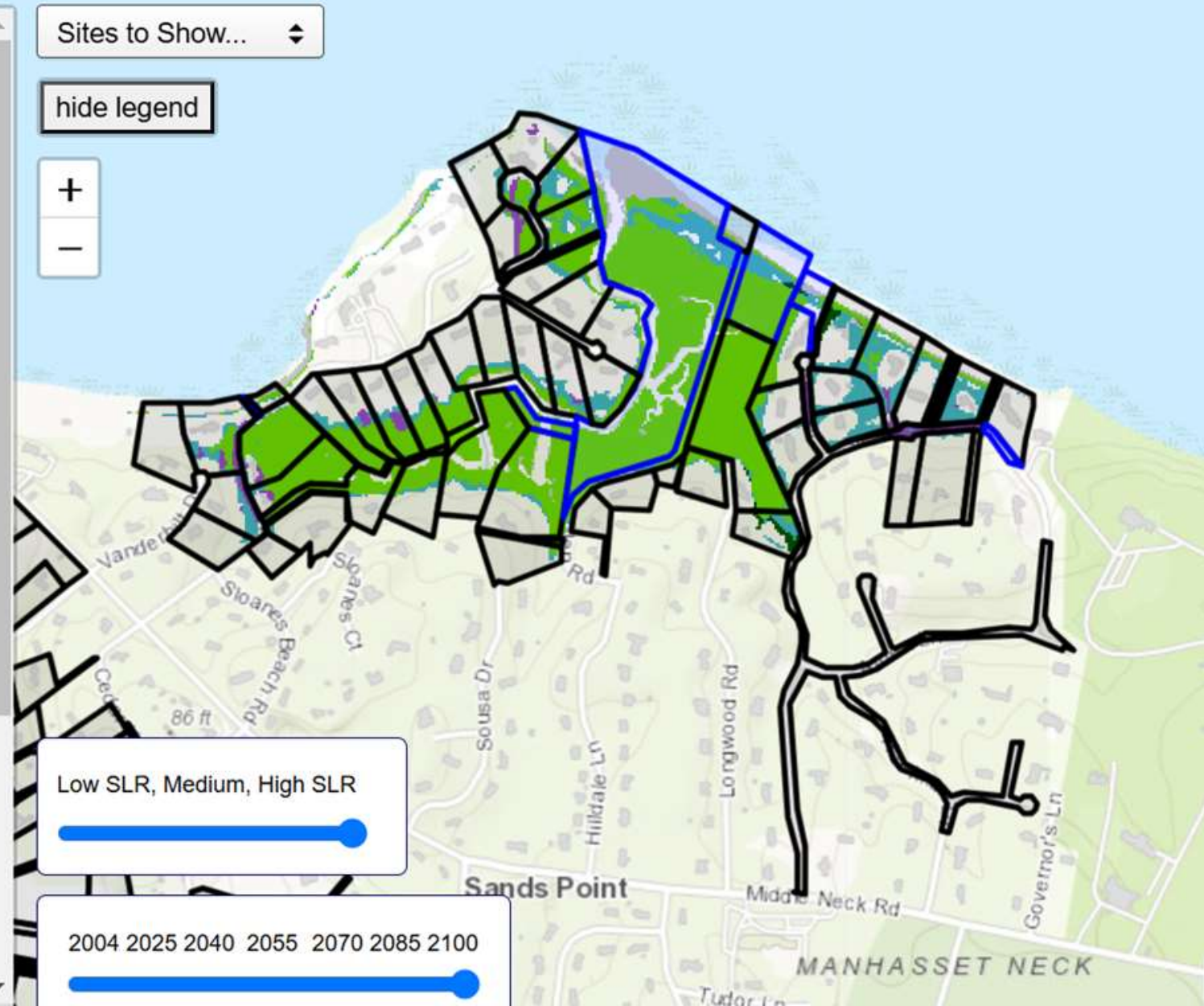
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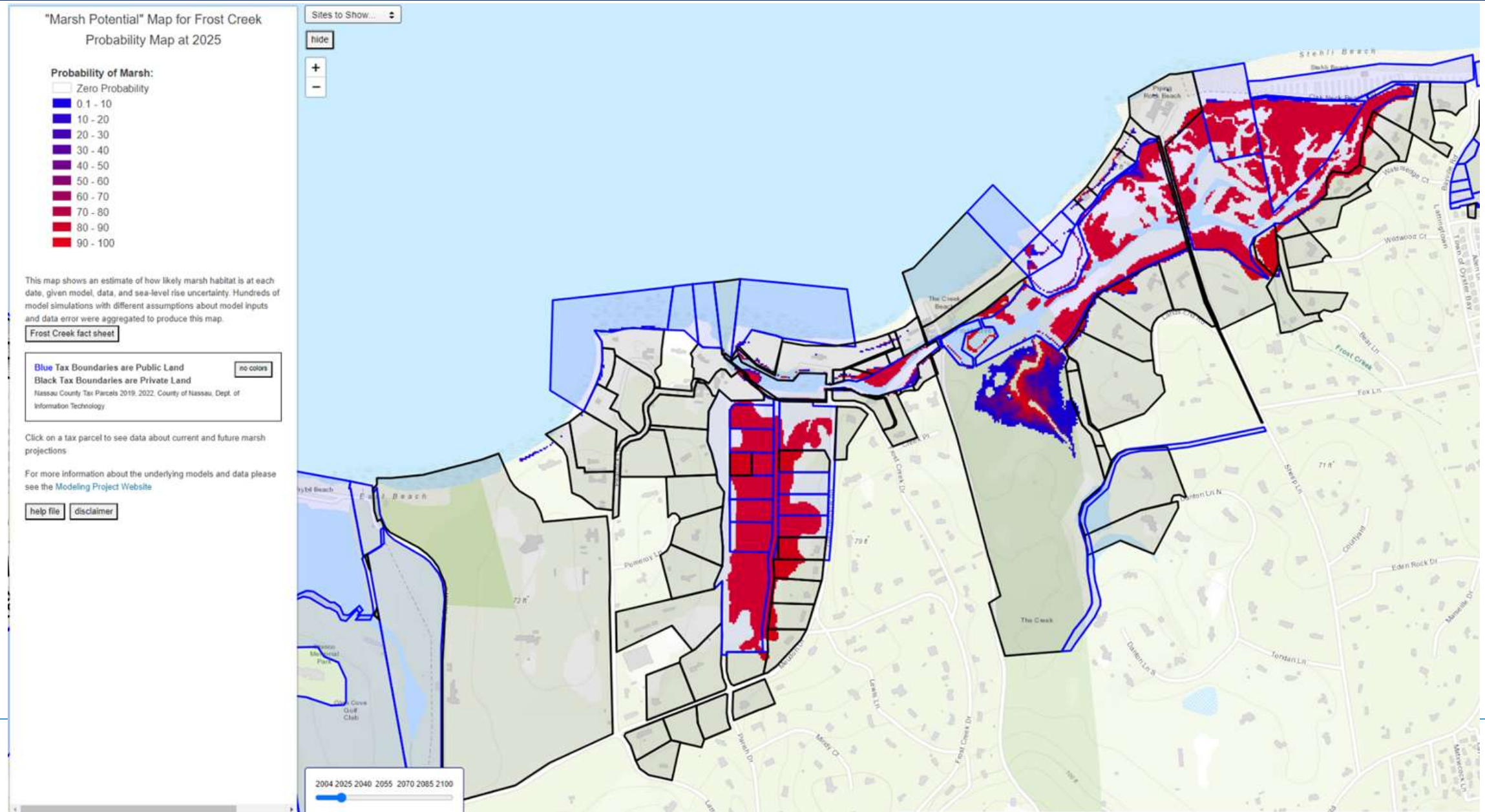
Low SLR, Medium, High SLR



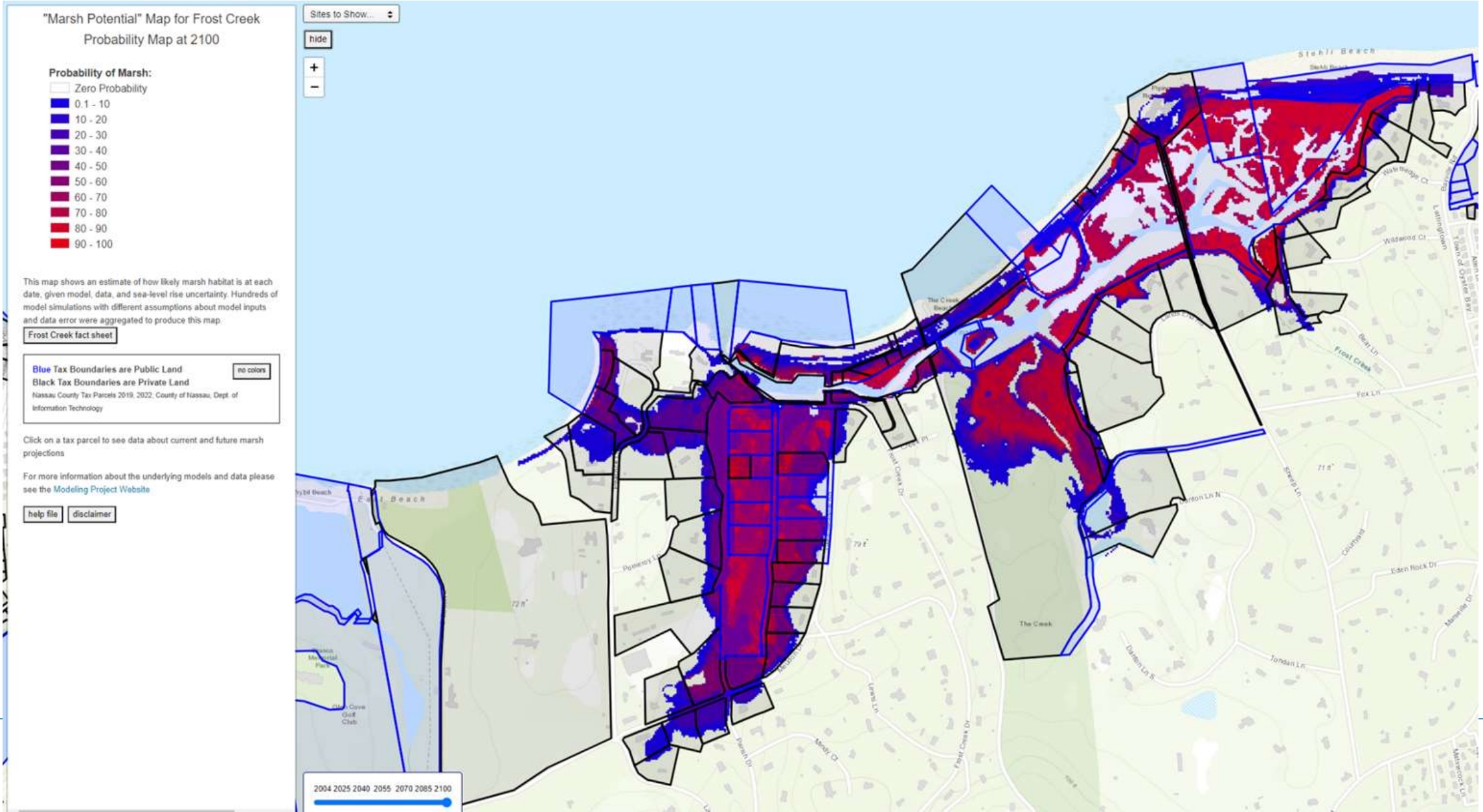
2004 2025 2040 2055 2070 2085 2100



LISS Marsh Viewer - Frost Creek



LISS Marsh Viewer - Frost Creek



MARSH CONSERVATION PLANNING FOR OYSTER BAY AND COLD SPRING HARBOR NY



NEIWPCC

December 22, 2023

MARSH CONSERVATION PLANNING FOR STONY BROOK HARBOR NY AND WEST MEADOW CREEK NY



NEIWPCC

December, 2023



Conserving & Restoring Marsh Habitat using the LIS Marsh Viewer

**VICTORIA O'NEILL, COASTAL
RESILIENCE, AUDUBON CT/NY**

Sunken Meadow State Park salt marsh. Photo: Victoria O'Neill/Audubon



Crab Meadow Marsh. Photo: USFWS

Historic Threats to Salt Marshes:

- Coastal development
 - Filling in of marshes
 - Change to hydrology
- Invasive plants
- Human disturbance
 - Nutrient input



Saltmarsh Sparrow. Photo: Gordon/Audubon Photography Awards



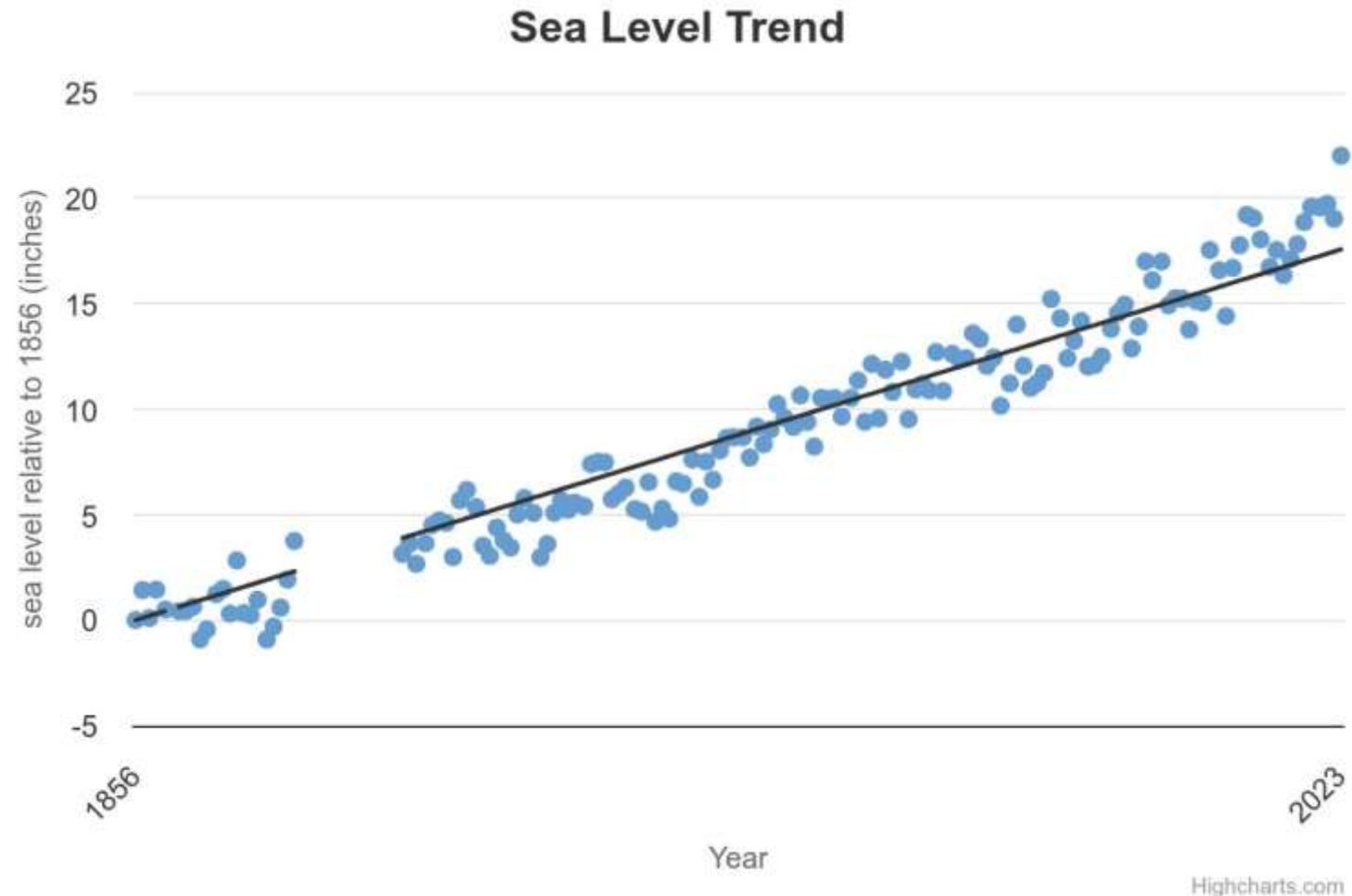
Saltmarsh Snowy Egret.. Photo: Chuck Wood/Audubon Photography Awards

Current Threats to Salt Marshes:

- Sea Level Rise

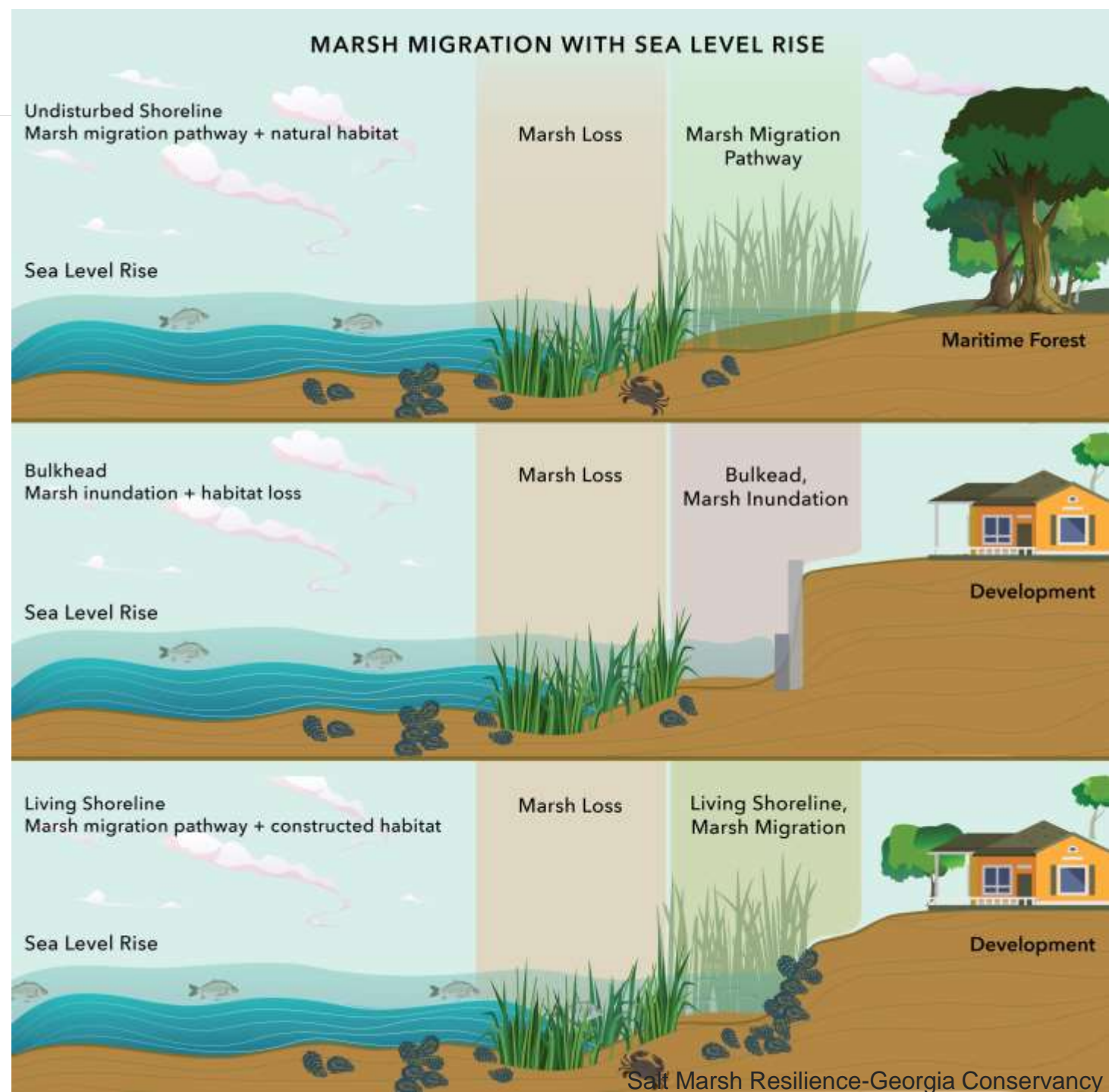
CT Institute for Resilience & Climate Adaptation (CIRCA):
CT should plan for up to **20 inches of sea level rise by 2050.**

6 NYCRR Part 490, Projected
Sea-level Rise: NY should
prepare for up to **25 inches of
sea level rise by 2050.**



What is Marsh Migration?

The natural processes of marshes to respond to increased inundation by migrating inland and colonizing areas that were previously at higher elevations



How do you make salt marshes more resilient to SLR and accommodate for marsh migration?

- Salt Marsh Restoration
- Nature Based Solutions
- Land Protection
- Advocacy/Policy
- Community Conservation Action



What is SLAMM (Sea Level Affecting Marshes Model)

- Mathematical model that uses digital elevation data and other information to simulate the dominant processes involved in wetland conversions and shoreline modifications during long-term sea level rise.



Map of Study Area

This map displays the 67 marsh parcels that were selected for this study.

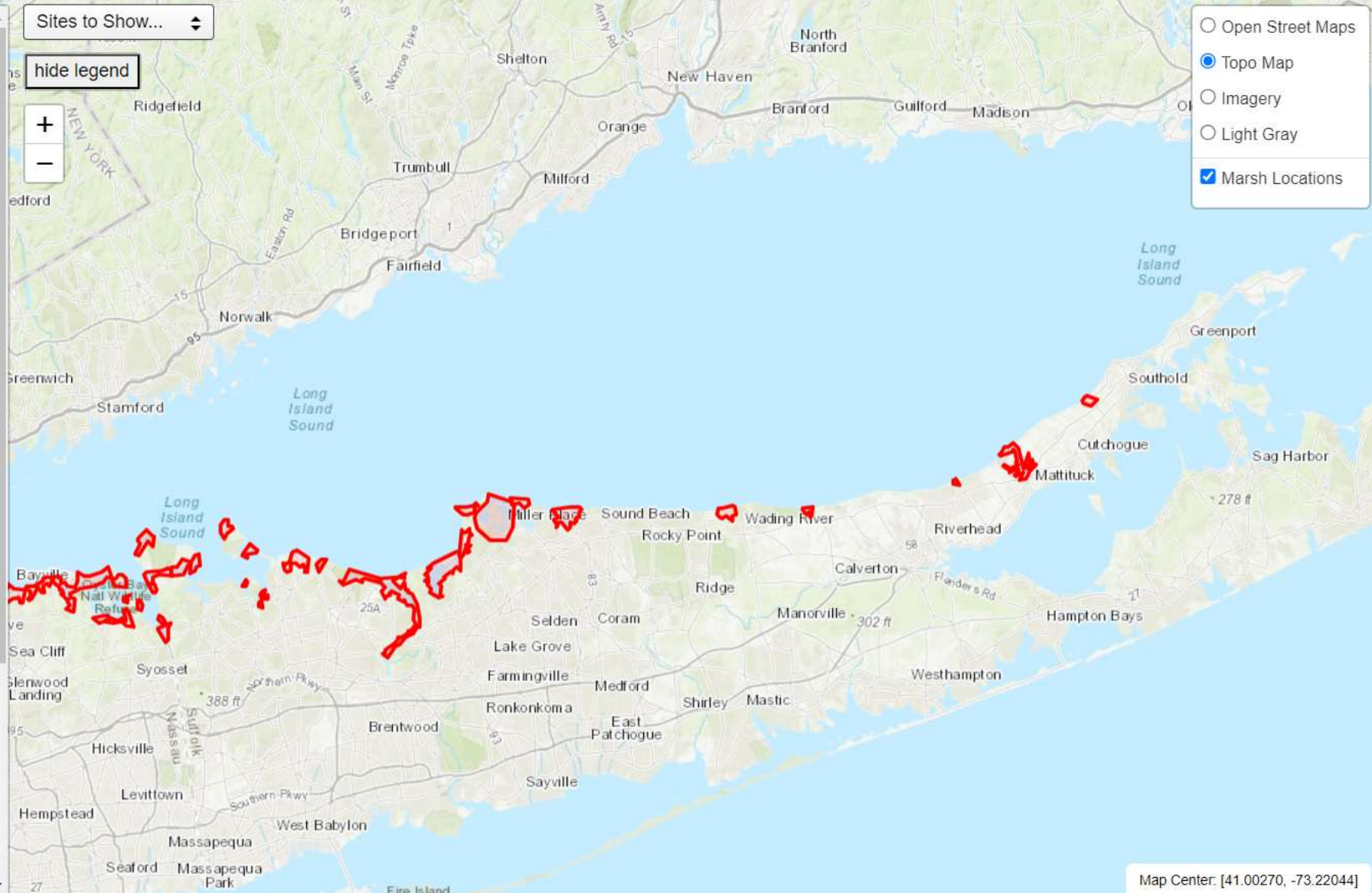
"Hover" over a marsh polygon to see its name.

"Click" on a polygon to zoom in, or select from the "Zoom to" Menu to the right. (Move closer to a site to see tax and marsh maps.)

The purpose of the interactive viewer is to illustrate the fate of significant marsh systems on Long Island Sound under future Sea-Level Rise projections. Model results are combined with tax-parcel information and information about marsh ecosystem services are integrated to assist conservation groups in defining and assessing various land-management alternatives.

For more information about the underlying models and data please see the [Modeling Project Website](#)

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Sunken Meadow Marsh. Photo: Vicky O'Neill, Audubon NY



Sunken Meadow Marsh. Photo: Olivia Olynciw, Audubon NY

Audubon NY Salt Marsh Restoration Projects

Sunken Meadow Salt Marsh Restoration Projects-Kings Park, NY

- LISS Stewardship Site, ACJV Saltmarsh Sparrow priority site
- Partners: NYS Parks, Save the Sound, NYNHP
- Restore ~78 acres
- 2020 LISFF: completed 60% design
- 2023 LISFF: 100% design & permitting anticipated spring 2025

Audubon NY Salt Marsh Restoration Projects

Crab Meadow Salt Marsh Restoration Project-Fort Salonga, NY

- LISS Stewardship Site, ACJV Saltmarsh Sparrow priority site, Crab Meadow Hydrology & Stewardship Plan priority
- Partners: Town of Huntington, USFWS
- Restore ~250 acres
- 2023 USFWS: completed baseline marsh data collection
- 2024 USFWS Coastal Program funding: initial feasibility studies

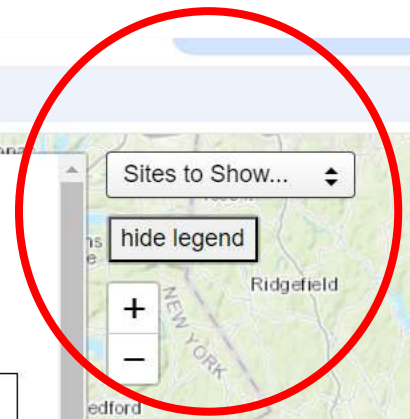


Crab Meadow Marsh. Photo: Vicky O'Neill, Audubon NY



Crab Meadow Marsh. Photo: Vicky O'Neill, Audubon NY

Long Island Sound Marsh Viewer



- Open Street Maps
- Topo Map
- Imagery
- Light Gray
- Marsh Locations

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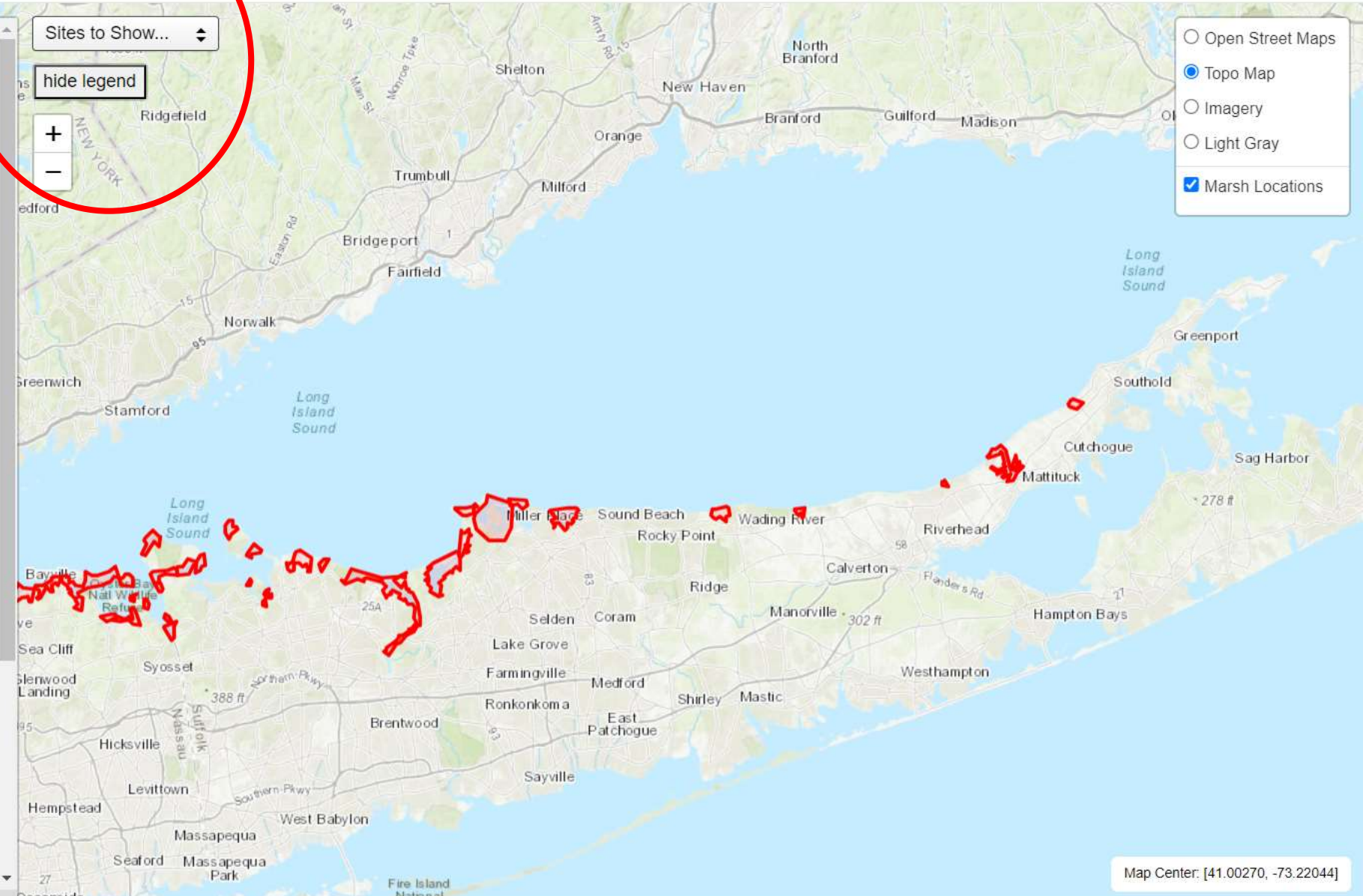
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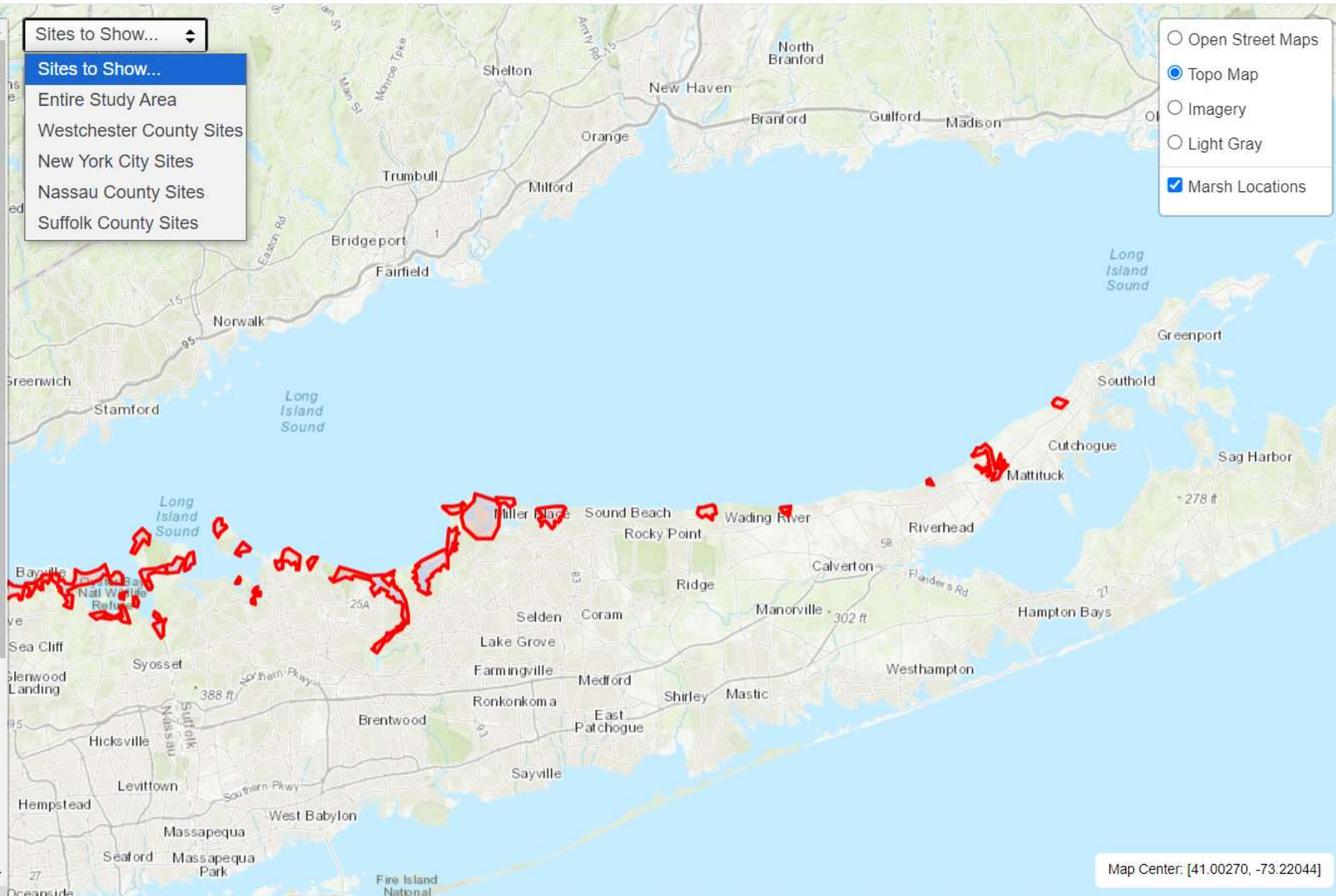
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- Sites to Show... (dropdown)
- Sites to Show... (selected)
- Entire Study Area
- Westchester County Sites
- New York City Sites
- Nassau County Sites
- Suffolk County Sites

- Open Street Maps
- Topo Map
- Imagery
- Light Gray
- Marsh Locations



Map Center: [41.00270, -73.22044]

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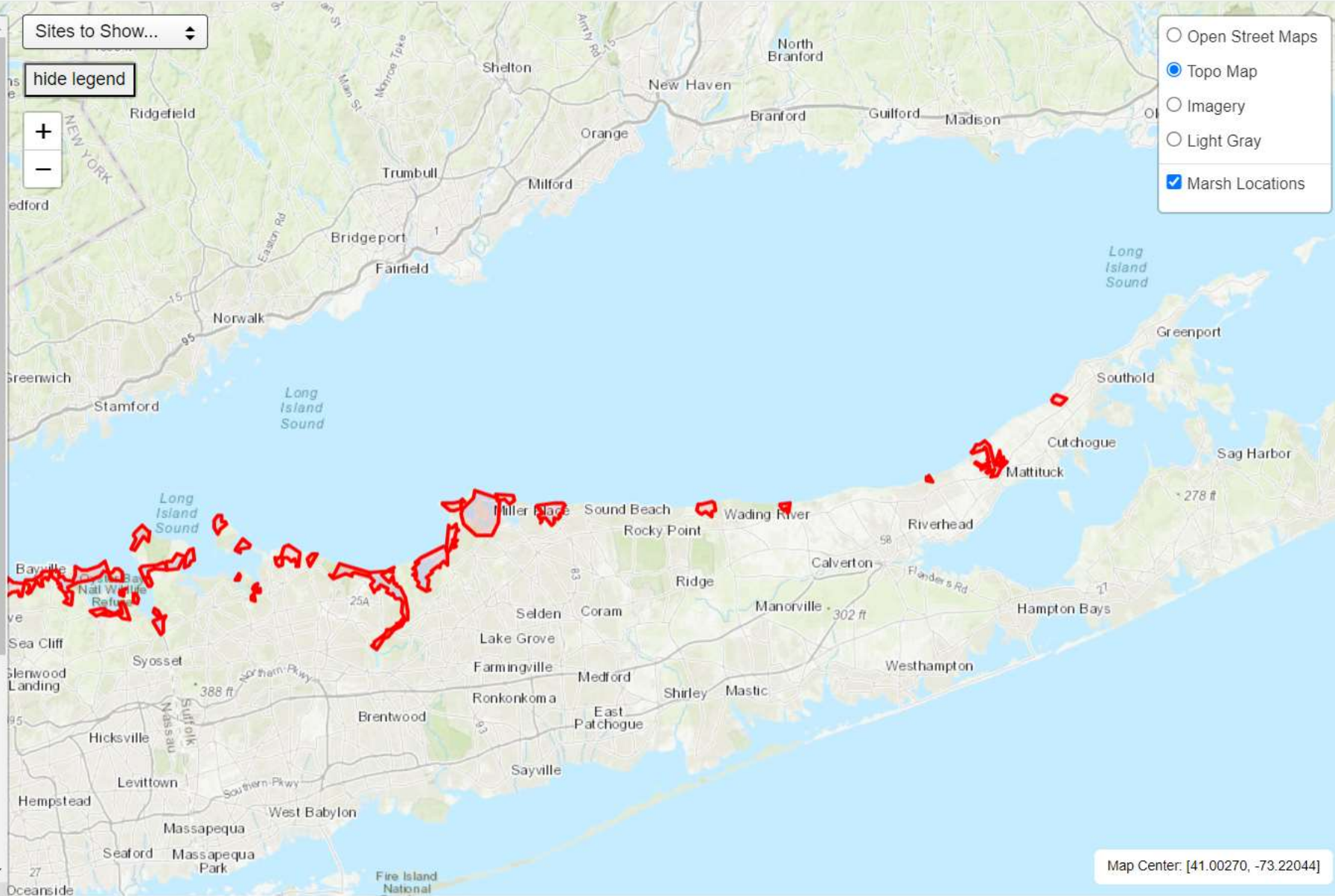


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- Open Street Maps
- Topo Map
- Imagery
- Light Gray
- Marsh Locations



Map Center: [41.00270, -73.22044]

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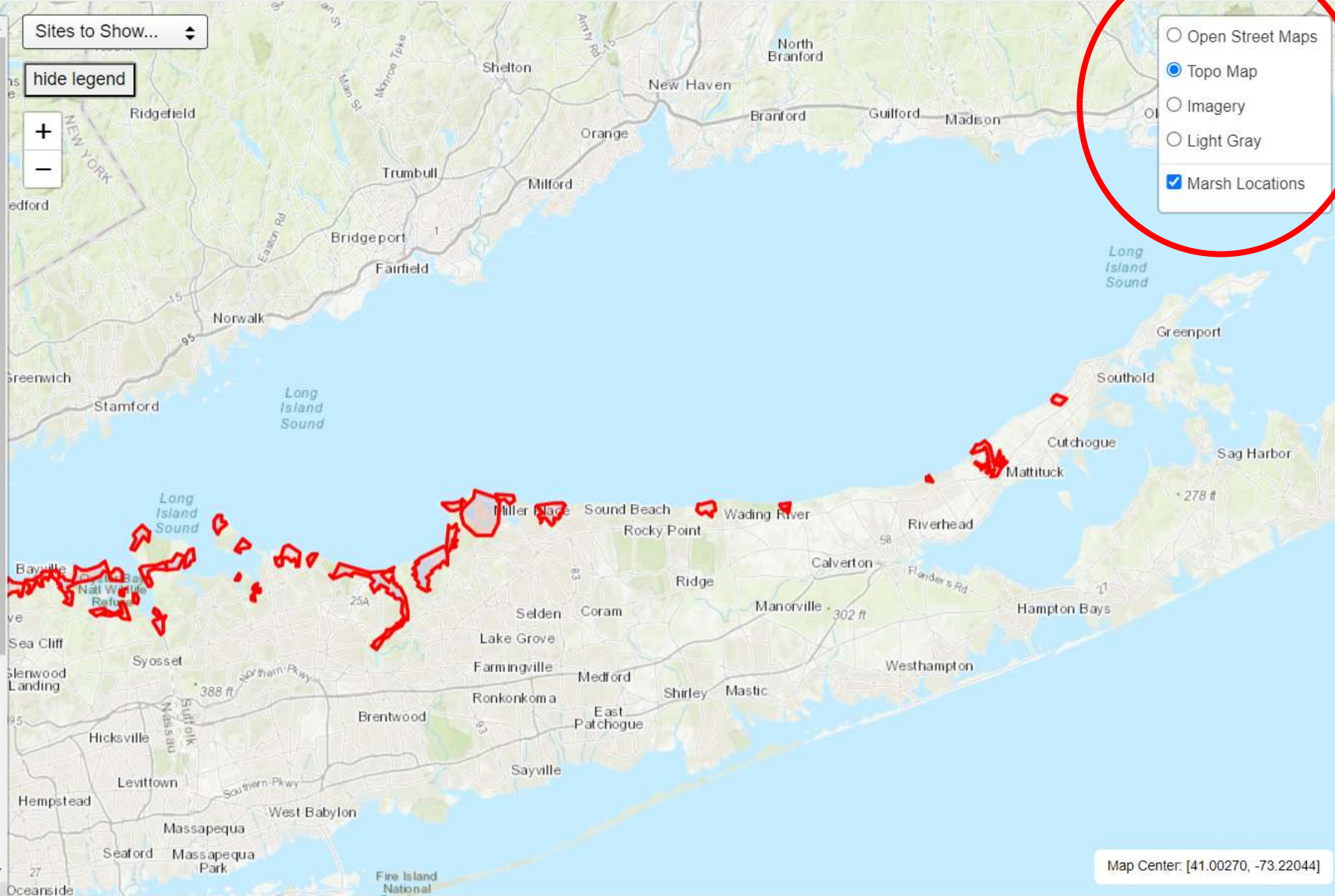
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Map Center: [41.00270, -73.22044]

"Wetland Type" Map for Sunken Meadow Map at 2055, Medium SLR

Wetland Type:

- Low Tidal
- Low Marsh
- High Marsh
- Freshwater Non-Tidal
- Freshwater Tidal Marsh
- Flooded Developed Dry Land

[definitions](#)

This map shows a map of marsh types predicted for a given date and SLR scenario. Low SLR would be 38 cm by 2100, Medium: 91cm by 2100, and High: 190 cm by 2100. (Base year is 2002)

[Sunken Meadow fact sheet](#)

Blue Tax Boundaries are Public Land
Black Tax Boundaries are Private Land

[no colors](#)

Suffolk County Real Property Tax Service Agency "AREIS and Tax Map"
Copyright 2019, 2022, County of Suffolk, N.Y.

Click on a tax parcel to see data about current and future marsh projections

For more information about the underlying models and data please see the [Modeling Project Website](#)

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- Open Street Maps
- Topo Map
- Imagery
- Light Gray
- Tax Boundaries

- Probability
- Marsh-Type
- No Overlay

Low SLR, Medium, High SLR



2004 2025 2040 2055 2070 2085 2100



Map Center: [40.90890, -73.26501]

"Wetland Type" Map for Sunken Meadow Map at 2055, Medium SLR

Wetland Type:

- Low Tidal
- Low Marsh
- High Marsh
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Low SLR, Medium, High SLR

2004 2025 2040 2055 2070 2085 2100

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"Wetland Type" Map for Sunken Meadow Map at 2070, Medium SLR

Wetland Type:

- Low Tidal
- Low Marsh
- High Marsh
- Freshwater Non-Tidal
- Freshwater Tidal Marsh
- Flooded Developed Dry Land

Wetland Type:

- Low Tidal is composed of non-vegetated tidal flats and beaches.
- Low Marsh consists of regularly-flooded (daily-flooded) salt marsh
- High Marsh includes irregularly-flooded salt marsh and transitional marshes
- Freshwater Non Tidal are non-saline wetlands such as swamps and inland fresh marshes
- Freshwater Tidal Marshes consist of tidal fresh marshes and tidal swamps
- Flooded Developed lands subject to monthly flooding

Click this message to dismiss

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- No Overlay

Low SLR, Medium, High SLR

2004 2025 2040 2055 2070 2085 2100

Map Center: [40.90807, -73.26994]

"Wetland Type" Map for Sunken Meadow Map at 2070, Medium SLR

Wetland Type:

- Low Tidal
- Low Marsh
- High Marsh
- Freshwater Non-Tidal
- Freshwater Tidal Marsh
- Flooded Developed Dry Land

[definitions](#)

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Low SLR, Medium, High SLR

2004 2025 2040 2055 2070 2085 2100

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Low SLR, Medium, High SLR



2004 2025 2040 2055 2070 2085 2100



Owner: DORENE G SCHNEIDER

141 SUNKEN MEADOW RD, FORT SALONGA NY 11768; Tax ID (SBL):0800004000200008003

Total Acres: 6.7	Current	2055	2100
Fate of Current Existing Marsh Area (acres)	0.97	0.97	0.93
New Marsh in Undeveloped Dry Land (acres)	0	0.52	1.67
New Marsh in Developed Dry Land (acres)	0	0	0
Total Marsh "Expected Value" (acres)	0.97	1.49	2.59

Marsh Ecosystem Service Value (0-100): **23.55**

[definitions](#)

- Open Street Maps
- Topo Map
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- Probability
- Marsh-Type
- No Overlay

Map Center: [40.90771, -73.26922]

"Wetland Type" Map for Sunken Meadow Map at 2055, Medium SLR

Wetland Type:

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- Low Marsh
- High Marsh
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Low SLR, Medium, High SLR

2004 2025 2040 2055 2070 2085 2100

Map Center: [40.90890, -73.26501]

Future marsh migration at Sunken Meadow Park/Creek

PROJECTED INUNDATION AND LANDCOVER CHANGES DUE TO SEA LEVEL RISE

Currently (as of 2004, the most recent land cover data available), the Sunken Meadow State Park and Sunken Meadow Creek study area in Kings Park, NY includes approximately 133 acres of wetlands (marshes and unvegetated flats), of which 98 acres are vegetated marshes, while the rest are beaches and fresh water non tidal. Under most possible sea level rise (SLR) scenarios, the majority of current marsh coverage is predicted to keep up with sea level. These marsh lands currently have high elevations compared to sea levels so they can withstand some sea-level rise. However:

- Areas of high-elevation marshes are predicted to be replaced by lower (more saline) marsh, resulting in a change in habitat type within the marsh;
- Increasing areas of marsh may be lost to wetland flats and/or open water; and
- Dryland areas are predicted to be increasingly regularly inundated.



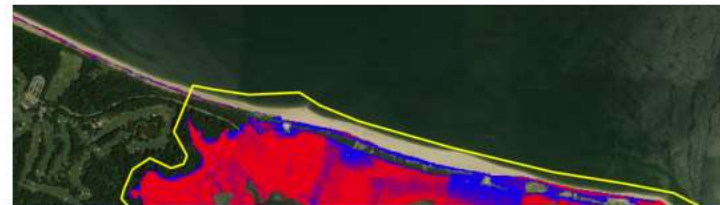
Figure 1. Satellite image of Sunken Meadow area with current marsh coverage (Sources: NWI; Satellite imagery from Google).

A total of 18 tax parcels, in and adjacent to the wetland area, may be affected by increased inundation. The State of New York is the main landowner of the public land currently occupied by marsh, but many privately owned parcels could be affected by increased inundation.

ONLINE VIEWER

For more detailed information about each tax parcel, please visit our on-line viewer

<http://warrenpinnacle.com/LIMaps/>



"Wetland Type" Map for Sunken Meadow Map at 2025, Medium SLR

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[definitions](#)

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Low SLR, Medium, High SLR

2004 2025 2040 2055 2070 2085 2100

Map Center: [40.90871, -73.26939]

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Low SLR, Medium, High SLR
[Slider]

2004 2025 2040 2055 2070 2085 2100
[Slider]

Map Center: [40.90871, -73.26939]

"Wetland Type" Map for Sunken Meadow Map at 2100, High SLR

Wetland Type:

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Low SLR, Medium, High SLR

2004 2025 2040 2055 2070 2085 2100

Map Center: [40.90871, -73.26939]

"Marsh Potential" Map for Sunken Meadow Probability Map at 2025

Probability of Marsh:

- Zero Probability
- 0.1 - 10
- 10 - 20
- 20 - 30
- 30 - 40
- 40 - 50
- 50 - 60
- 60 - 70
- 70 - 80
- 80 - 90
- 90 - 100

This map shows an estimate of how likely marsh habitat is at each date, given model, data, and sea-level rise uncertainty. Hundreds of model simulations with different assumptions about model inputs and data error were aggregated to produce this map. [Sunken Meadow fact sheet](#)

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2004 2025 2040 2055 2070 2085 2100

Map Center: [40.90871, -73.26939]

"Marsh Potential" Map for Sunken Meadow Probability Map at 2055

Probability of Marsh:

- Zero Probability
- 0.1 - 10
- 10 - 20
- 20 - 30
- 30 - 40
- 40 - 50
- 50 - 60
- 60 - 70
- 70 - 80
- 80 - 90
- 90 - 100

This map shows an estimate of how likely marsh habitat is at each date, given model, data, and sea-level rise uncertainty. Hundreds of model simulations with different assumptions about model inputs and data error were aggregated to produce this map. [Sunken Meadow fact sheet](#)

Blue Tax Boundaries are Public Land
Black Tax Boundaries are Private Land
 Suffolk County Real Property Tax Service Agency "AREIS and Tax Map"
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Click on a tax parcel to see data about current and future marsh projections

Sites to Show...

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- Open Street Maps
 - Topo Map
 - Imagery
 - Light Gray
 - Tax Boundaries
-
- Probability
 - Marsh-Type
 - No Overlay

2004 2025 2040 2055 2070 2085 2100

Map Center: [40.90871, -73.26939]

"Marsh Potential" Map for Sunken Meadow Probability Map at 2100

Probability of Marsh:

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2004 2025 2040 2055 2070 2085 2100

Map Center: [40.90871, -73.26939]

"Wetland Type" Map for Crab Meadow Map at 2025, Medium SLR

Wetland Type:

- Low Tidal
- Low Marsh
- High Marsh
- Freshwater Non-Tidal
- Freshwater Tidal Marsh
- Flooded Developed Dry Land

[definitions](#)

This map shows a map of marsh types predicted for a given date and SLR scenario. Low SLR would be 38 cm by 2100, Medium: 91cm by 2100, and High: 190 cm by 2100. (Base year is 2002)

[Crab Meadow fact sheet](#)

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Low SLR, Medium, High SLR



2004 2025 2040 2055 2070 2085 2100



Map Center: [40.91935, -73.32774]

"Wetland Type" Map for Crab Meadow Map at 2055, Medium SLR

Wetland Type:

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- Low Marsh
- High Marsh
- Freshwater Non-Tidal
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2004 2025 2040 2055 2070 2085 2100



Map Center: [40.91935, -73.32774]

"Wetland Type" Map for Crab Meadow Map at 2070, Medium SLR

Wetland Type:

- Low Tidal
- Low Marsh
- High Marsh
- Freshwater Non-Tidal
- Freshwater Tidal Marsh
- Flooded Developed Dry Land

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"Wetland Type" Map for Crab Meadow Map at 2025, High SLR

Wetland Type:

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What can LIS Marsh Viewer do for you?

- **View the fate of 67 Long Island Sound marsh parcels**
- **Identify property owners**
- **Determine marsh type conversion**
- **Determine flooded infrastructure**
- **Planning for various SLR scenarios and timeframes**
- **Access individual site marsh migration fact sheets**



Victoria O'Neill

Director of Coastal Resilience

Audubon CT/NY

victoria.oneill@audubon.org

516-922-3200 Ext 8



Long Island Sound Study
A Partnership to Restore and Protect the Sound

Questions?



St. John's Marsh in Cold Spring Harbor

Coastal Technologies Corp (CTC) is a Long Island based company that has engineered and patented a wide range of coastal resilience and restoration products designed to achieve vital environmental goals alone or in combination with other methods.

CTC has collaborated with governmental agencies such as US Fish & Wildlife, NYC DEP, USDA and NGOs such as Ducks Unlimited, the Coalition to Restore Coastal Louisiana and the Sands Point Preserve Conservancy. Pilots and research trials have been conducted with academic partners including MIT, CUNY, Cornell Cooperative Extension and others.

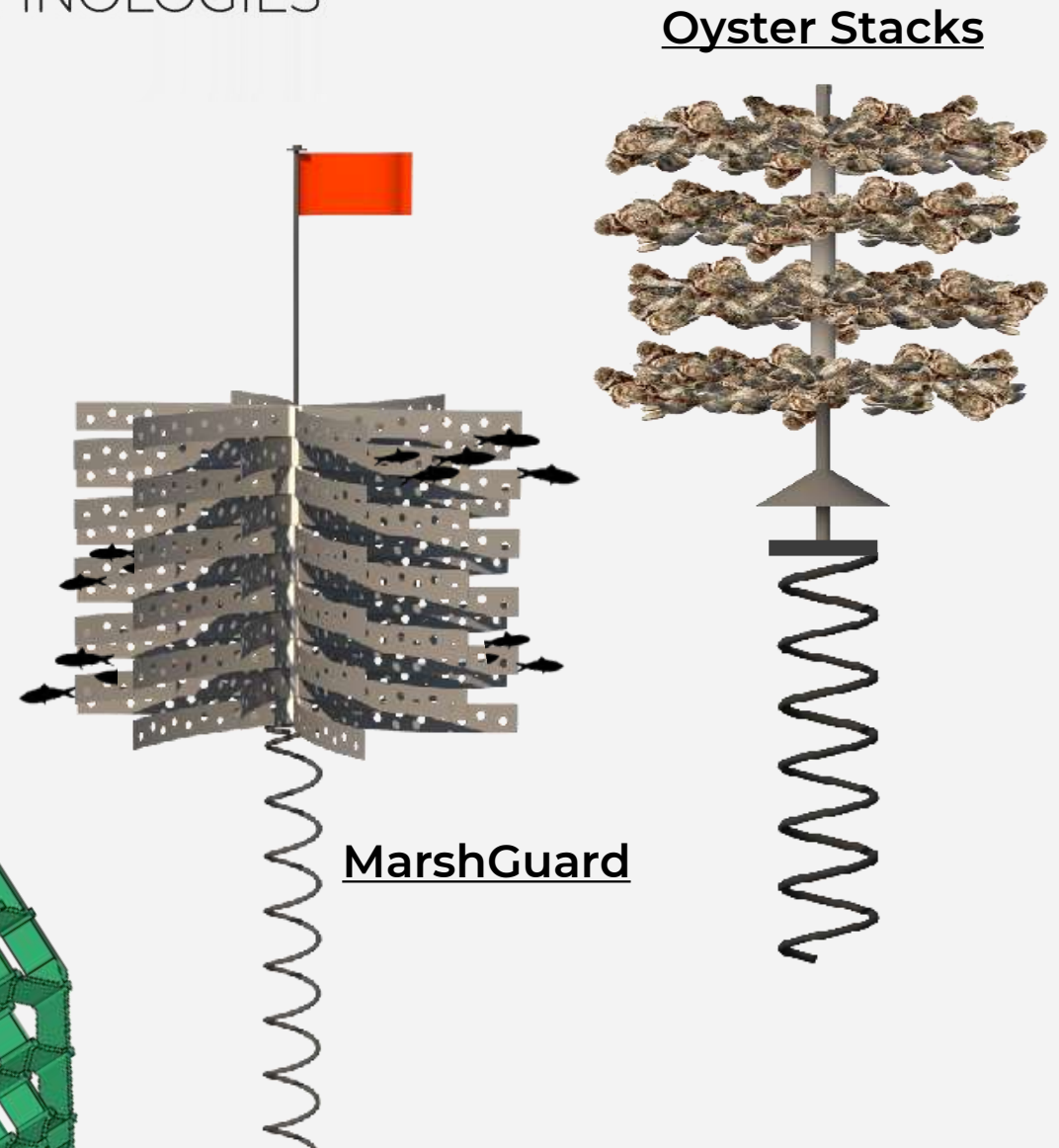
The *Cliff Stabilizer*, *MarshGuard* and *Oyster Stacks* systems are available commercially.

Specification & Data sheets are provided upon request.



Patented in the USA
Patent Pending Internationally in
Europe, Britain, China, Japan, Mexico,
Australia, Korea, Canada & 192 Countries

Cliff Stabilizer



Oyster Stacks™ System

- *Oyster Stacks* creates unequal reef habitat while preventing the causes of oyster mortality, such as predation, subsidence & siltation.
- Reef can be produced quickly and economically.
- Scalability is unlimited. No sourcing of used shell or curing is required.
- Devices contains natural and inert materials.
- They are easily installed and fully adjustable in-the-field.
- The slate plates are extremely attractive for natural oyster recruitment or tank setting.
- Devices can function as “seeding armatures” to form permanent oyster reef structures, or can be deployed as temporary, removable and reusable reef.
- *Oyster Stacks* can be “set” and relocated to areas where establishment of new oyster populations are desired.



Flax Pond Marine Lab Pilot: June 25th to October 25th

- *Oyster Stacks* successfully recruited free-swimming oyster larvae. Each plate contained hundreds of oysters. *The oysters on a single Oyster Stacks device can filter up to 30,000 gallons of water per day.*
- Photo shows 4 months of intertidal growth. Growth was “exceptional”.
- No predation, siltation or subsidence were observed.



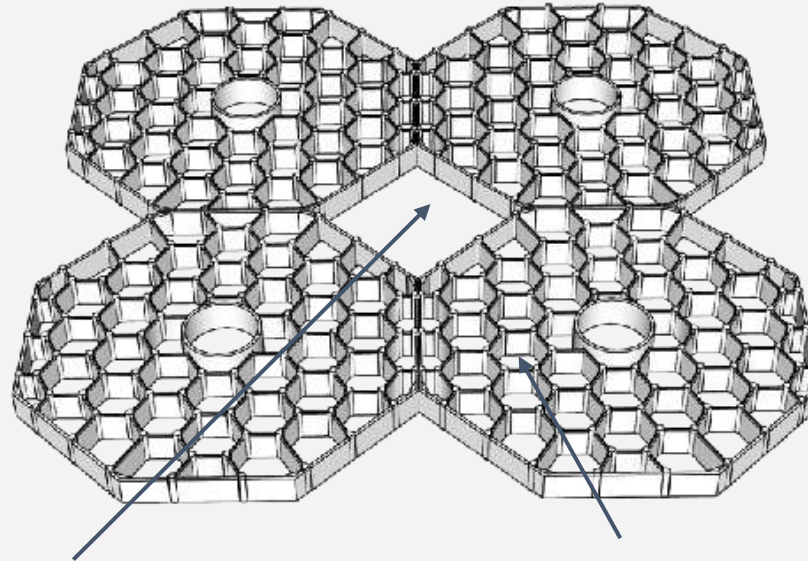
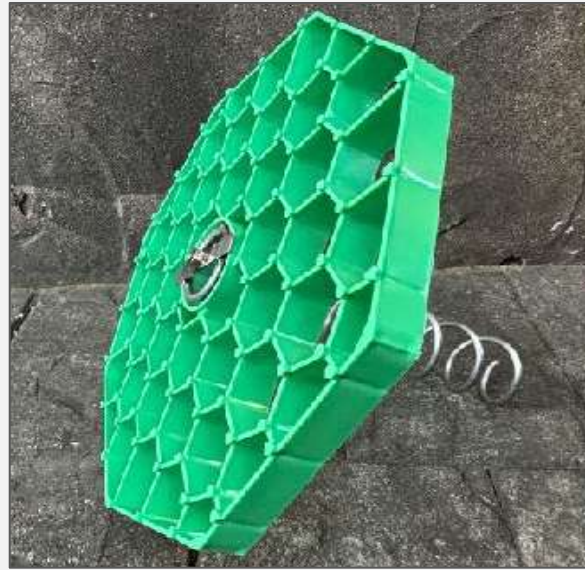
Ribbed Mussel Pilot: NYC DEP Bergen Basin CSO Bioremediation

- *Oyster Stacks* were modified to recruit ribbed mussels for combined raw sewage outflow bioremediation in NYC.
- Mussels filter finer particles including pathogens and contaminants oysters cannot.
- Data/Results to be available Spring 2025



Cliff Stabilizer™ System

- *Cliff Stabilizer* devices are engineered to stabilize and vegetate bluff faces, shores, river banks, berms, road cuts, etc. that are subject to rapid erosion.
- The devices lock-down sediments instantly halting erosion.
- The grid's cubbies and spaces shelter and hold plugs, bareroot, container shrubs and seeds against the escarpment.
- The plants, protected from erosive forces have time to establish root systems, to permanently stabilize these slope.
- Installation is simple and devices are removable after plants have established to be used again.
- *Cliff Stabilizer* are marine-grade HDPE and will last for multiple applications.



The "open squares" are planted with container shrubs and woody vegetation

The "cubbies" are planted with grasses & smaller herbaceous vegetation



Nissequogue LI Private Bluff Resilience Project: “Before”

- This private coastal bluff was eroding approx 1’ foot per year.
- Deep gullies lined the bluff face.
- Erosion caused large alluvial fans to accumulate at the base.
- Strong storms could erode several feet at a time.
- Patio deck had already fallen down the escarpment.
- Invasive mugwort provided little stabilization or habitat
- A plan utilizing traditional methods & pitch would have resulted in 31’ feet of lost cliff-top property.

Crown Collapse

Gullies & Rills

Invasive Mugwort

Eroded Sediments



Nissequogue LI Private Bluff Resilience Project: “After”

- 35,500 sq feet of bluff has been stabilized.
- Over 4 dozen native plants have been deployed
- The densest, most diverse ecosystem on LI has been created.
- The Spring growing season will set forth a growth that will have species both competing & cooperating resulting in greater vigor. This is illustrated by the findings of the *“Miyawaki Method”*.
- Additional, the staircase footings are also secured by the plants.



Results and Benefits:

- The *Cliff Stabilizer* installation and plantings were completed in under 4 weeks, halting decades of bluff loss.
- The devices will be removed in 18-24 months for a “once-and-done” stabilization.
- 20’ feet of cliff-top land was preserved from an earlier less-steep design.
- Over 4 dozen native, bluff-evolved plants were deployed. A productive “*vertical garden*” was created enriching the client’s lifestyle and enjoyment of nature.
- The neighboring bluffs remains vulnerable. A single step causes landslides of sandy sediment, while the stabilized bluff can be walked on with no issues.
 - The significant plant mass will continually absorb excess nutrients before they can enter the LI Sound.

Nutrient Runoff Absorption & Sequestering:

- Nitrogen - 2 tons
- Phosphorus - .5 tons
- Carbon - 27 tons



Long Island Native Species: Plugs, Containers & Seed Blends

- The native plant species guide used at the Nissequogue Bluff Project was developed in collaboration with the *Cape May USDA Plant Material Service* and the *Ernst Conservation Seed Company*.
- The *USDA* facility's mission is the identification and commercialization of new coastal resilience plant materials.
- CTC encourages and has made the "Seed Blends" freely available for purchase from *Ernst Conservation Seeds*.
- The *Upper Blend* includes more wildflowers designed to crowd out invasives. The *Lower Blend* is more salt tolerant.
- The mixes are known as:
 - "Coastal Technologies Upper Bluff Mix - CTC_00101"
 - "Coastal Technologies Lower Bluff Mix - CTC_00102"

Plugs - Bluff Face
Coastal Sweet Pepperbush (<i>Clethra alnifolia</i>)
Arrowwood Viburnum (<i>Viburnum dentatum</i>)
Coastal Panicgrass (<i>Panicum amarum</i>)
Saltmeadow Cordgrass (<i>Spartina patens</i>)
Purple Lovegrass (<i>Eragrostis spectabilis</i>)
American Beach Grass (<i>Ammophila breviligulata</i>)
High Tide Switchgrass (<i>Panicum virgatum</i>)
Little Bluestem (<i>Schizachyrium littorale</i>)
Saltmarsh rush (<i>Juncus gerardii</i>)
Saltmarsh bulrush (<i>Scirpus robustus</i>)
Containers - Bluff Face
Red Chokeberry (<i>Aronia arbutifolia</i>)
Sweet-fern (<i>Comptonia peregrina</i>)
Virginia Rose (<i>Rosa Virginiana</i>)
Beach Plum (<i>Prunus maritima</i>)
Bayberry (<i>Morella pensylvanica</i>) (<i>Myrica</i>)
Creeping Juniper (<i>Juniperus horizontalis</i>)
Seaside Goldenrod (<i>Solidago sempervirens</i>)
Groundsel tree (<i>Baccharis halimifolia</i>)
Bearberry (<i>Arctostaphylos uva-ursi</i>)
Bigleaf marsh-elder (<i>Iva frutescens</i>)
Shining Sumac (<i>Rhus copallinum</i>)
Virginia Creeper (<i>Parthenocissus quinquefolia</i>)
Lowbush Blueberry (<i>Vaccinium angustifolium</i>)
Salt Tolerant Trees - Toe Protection
Gray Dogwood (<i>Cornus racemosa</i>)
Pitch Pine tree (<i>Pinus rigida</i>)
Bear Oak (<i>Quercus ilicifolia</i>)
Eastern Red Cedar (<i>Juniperus virginiana</i>)
Red Pine (<i>Pinus resinosa</i>)

Upper Bluff Seed Mix
Autumn Bentgrass (<i>Agrostis perennans</i>)
Butterfly Milkweed (<i>Asclepias tuberosa</i>)
Smooth Aster (<i>Aster laevis</i>)
Calico Aster (<i>Aster lateriflorus</i>)
Heath Aster (<i>Aster pilosus</i>)
Purple Coneflower (<i>Echinacea purpurea</i>)
Purple Lovegrass (<i>Eragrostis spectabilis</i>)
Ox-Eye Sunflower (<i>Heliopsis helianthoides</i>)
Round Head Bushclover (<i>Lespedeza capitata</i>)
Wild Bergamot (<i>Monarda fistulosa</i>)
Deertongue (<i>Panicum clandestinum</i>)
Tall White Beardtongue (<i>Penstemon digitalis</i>)
Hoary Mountain Mint (<i>Pycnanthemum incanum</i>)
Narrow Leaf Mt. Mint (<i>Pycnanthemum tenuifolium</i>)
Black Eyed Susan (<i>Rudbeckia hirta</i>)
Little Bluestem (<i>Schizachyrium scoparium</i>)
Early Goldenrod (<i>Solidago juncea</i>)
Gray Goldenrod (<i>Solidago nemoralis</i>)
Rough Dropseed (<i>Sporobolus asper</i>)
Sand Dropseed (<i>Sporobolus cryptandrus</i>)
Lower Bluff Seed Mix
Autumn Bentgrass (<i>Agrostis perennans</i>)
Purple Lovegrass (<i>Eragrostis spectabilis</i>)
Deertongue (<i>Panicum clandestinum</i>)
Little Bluestem (<i>Schizachyrium scoparium</i>)
Rough Dropseed (<i>Sporobolus asper</i>)
Sand Dropseed (<i>Sporobolus cryptandrus</i>)

Upcoming: Port Jefferson Village East Beach Bluff 2025

- Pilot will be conducted on a 1,950 sq feet site riddled with deep gullies.
- Stabilization is scheduled for Spring 2025



MarshGuard™ System

- *MarshGuards* are engineered with flexible protrusions that absorb the energy of water currents.
- A small pilot of MarshGuards were deployed to protect vulnerable bulrush plugs at Lake Pontchartrain.
- Previous plantings had been uprooted by waves and boat wakes.
- The restoration functioned to heal a shore blowout caused by Hurricane Ida.
- US Fish & Wildlife asked “How many days will the install take?” The devices were installed in under 10 minutes.



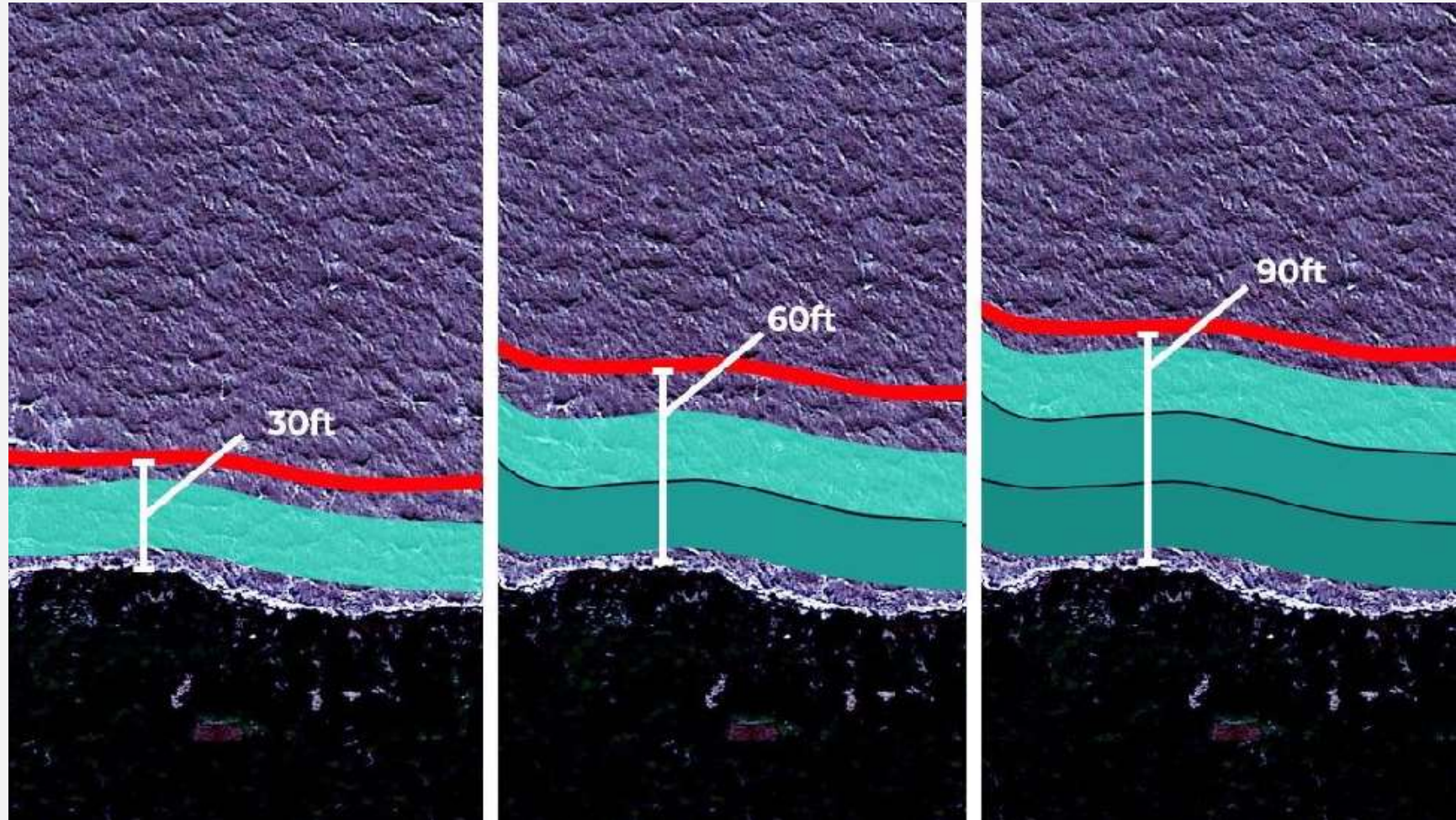
Passive Sediment Deposition & Mosquito Ditch Filling

- *MarshGuard* promotes deposition & reduce wave and boat wave erosion in living shoreline restoration projects which are plagued by high plant loss.
- Testing for passive wetland mosquito ditch filling in Staten Island and New Jersey is being conducted by US Fish & Wildlife, NYC DEP and Ducks Unlimited.
- Devices are reusable and easily adjustable in-the-field.



Wetland Shoreline Building: Array Repositioning Method

- *MarshGuard* devices can be deployed as a movable array.
- The array mitigates wave & boat edge erosion, protecting vulnerable plantings until root systems can stabilize.
- A *MarshGuard* array slows currents causing sediment to fall out of suspension, increasing sediment elevation.
- As the array is moved, the new elevated area can be planted with the next phase of plantings.
- This method allows shoreline to be progressively built back to desired goals.



Upcoming: West Meadow MarshGuard Project & Educational Program 2025





These systems offer new abilities to fortify and restore our shores & bluffs.

For further information about CTC technologies and product availability please contact:

Nick Thatos, CEO

nicholas@coastalprotectiontechnologies.com

George Thatos, Co-Founder

george@coastalprotectiontechnologies.com

Website: coastalprotectiontechnologies.com

Thank you!!



Long Island Sound Study
A Partnership to Restore and Protect the Sound

Questions?



Sands Point Cliff Stabilizer
Credit: CTC



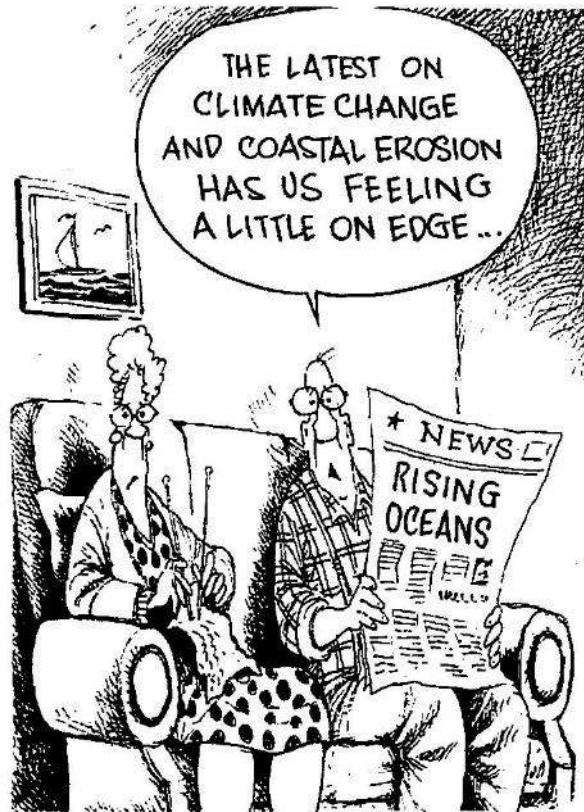
Using an Integrated Planting Approach to Stabilizing Coastal Bluffs

Presenter: Christopher Miller, Manager/Plant Specialist

Natural
Resources
Conservation
Service

nrcs.usda.gov/

Climate Change Anxiety!



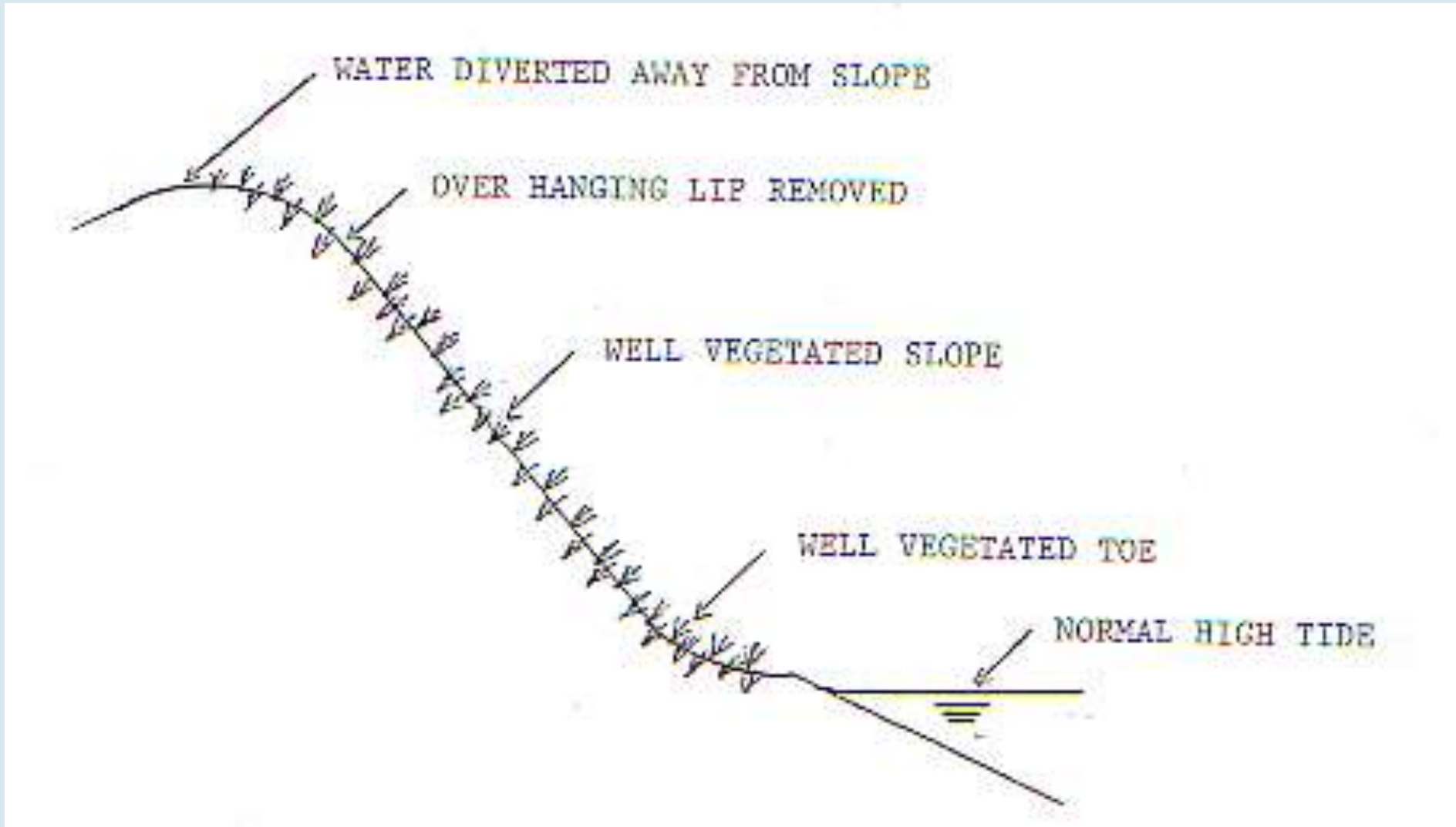
DAVE GRANLUND © www.davegranlund.com



Plant Adaptation-What makes a Resilient Coastal Plant?

1. Ability to rebound from scour or damage. (Stump sprouting, root suckering, rhizomes).
2. Ability to tolerate fresh/saltwater flooding for extended periods as well as alternating wet/dry conditions.
3. Heat/drought tolerance
4. Spread rapidly by seed or rhizomes
5. Adaptable to varying environmental (some shade/full sun) and soil conditions. (acid, low nutrient, low organic matter soils)

Bluff Treatment-Idealized Approach



Traditional Approach



- Use of a turfgrass mix with erosion control fabric
 - Not the best approach for long term sustainability of the site.



Stabilization with American Beachgrass



A Hands-Off Approach?



Integrated Approach for Slope Stabilization

- The integrated approach incorporates using a combination of seed as well as woody and herbaceous plant material in various forms.
 - Unrooted cuttings (willow, shrub dogwood, cottonwood, Viburnum, Elderberry)
 - Bare root seedlings/culms
 - Deep plugs/tubelings
 - containerized

Soil Bioengineering

- **Soil Bioengineering**: The practice of utilizing plant materials alone in such a way as to perform a structural function of stabilization
- **Biotechnical Stabilization**: Utilizing a combination of plants, geotextile fabrics, synthetic products, and/or structural measures for stabilization.

Unrooted Cuttings

- 1/4"-3/8" diameter
- 8"-12" length
- Perform better in moist soils
- May be planted through erosion control fabric



Rooted (bare root) plants

- field dug, bare root
- 3/8" at root collar
- Root gel (Terrasorb) increases survival in higher, drier bank zones



Tubelings



Deep
plug



Containerized Plants

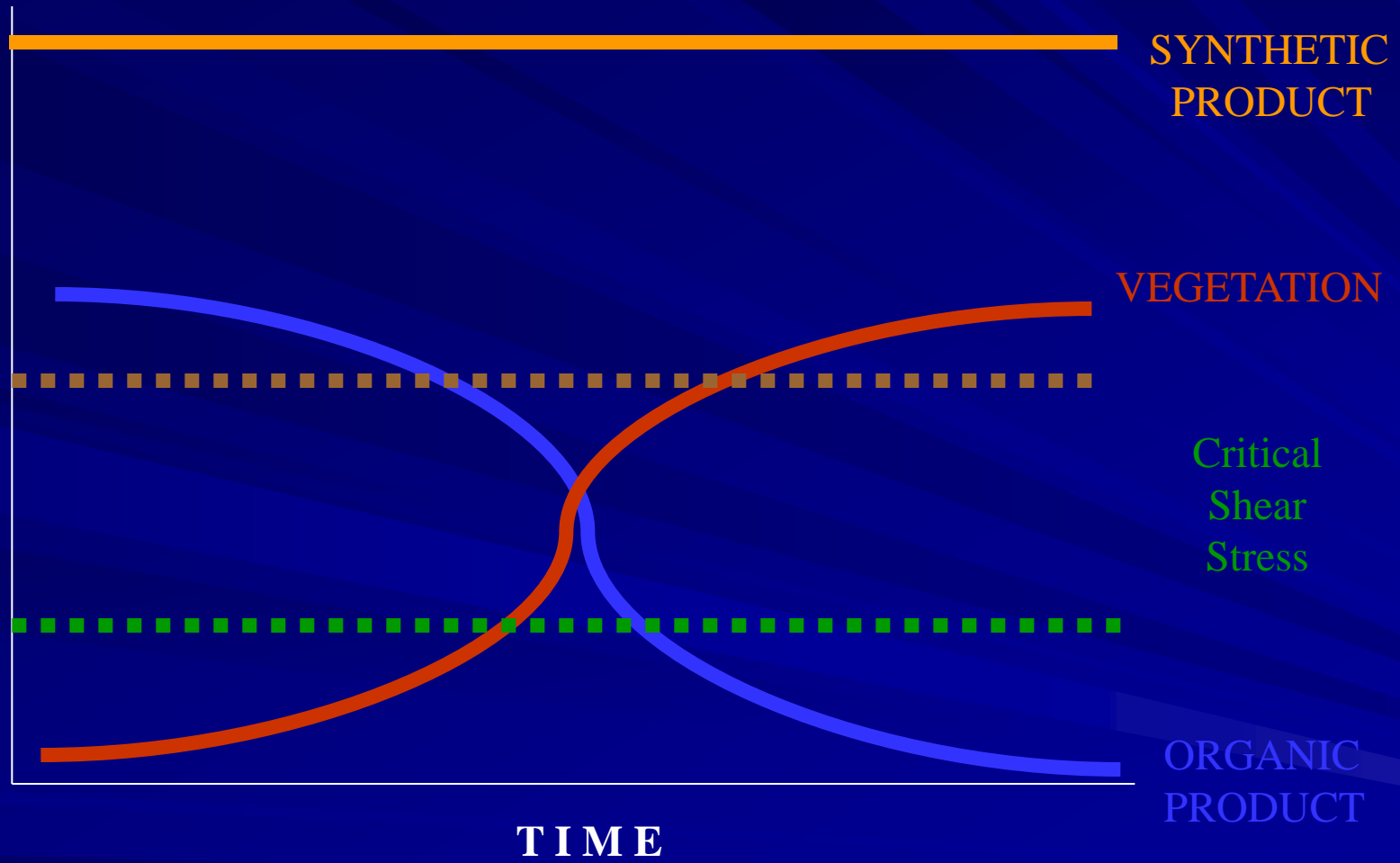


Soil Bioengineering

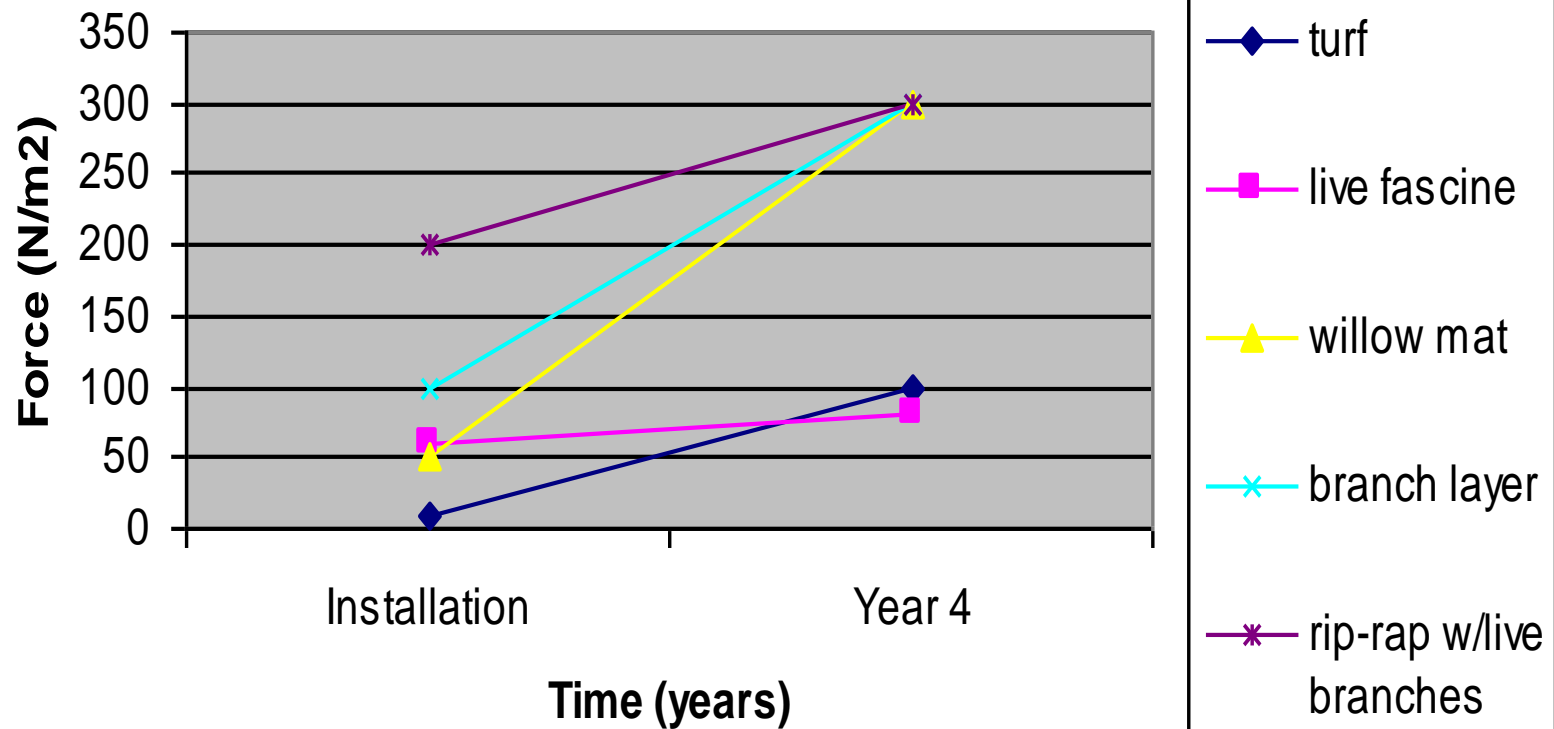


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Shear Stress Tolerance



Use of Native Plants for Stabilization

Long Island, NY Native Bluff & Shore Species: Plugs & Containers

Grass & Herbaceous Plugs - Bluff Face	Shrub Containers - Bluff Face	Shade Tolerant Vine - Under Stairway
Coastal Sweet Pepperbush (<i>Clethra alnifolia</i>)	Red Chokeberry (<i>Aronia arbutifolia</i>)	Virginia Creeper (<i>Parthenocissus quinquefolia</i>)
Arrowwood Viburnum (<i>Viburnum dentatum</i>)	Sweet-fern (<i>Comptonia peregrina</i>)	
Coastal Panicgrass (<i>Panicum amarum</i>)	Virginia Rose (<i>Rosa Virginiana</i>)	Salt Tolerant Trees - Toe Protection
Saltmeadow Cordgrass (<i>Spartina patens</i>)	Beach Plum (<i>Prunus maritima</i>)	Gray Dogwood (<i>Cornus racemosa</i>)
Purple Lovegrass (<i>Eragrostis spectabilis</i>)	Bayberry (<i>Morella pensylvanica</i>) (<i>Myrica</i>)	Pitch Pine tree (<i>Pinus rigida</i>)
American Beach Grass (<i>Ammophila breviligulata</i>)	Creeping Juniper (<i>Juniperus horizontalis</i>)	Bear Oak (<i>Quercus ilicifolia</i>)
High Tide Switchgrass (<i>Panicum virgatum</i>)	Seaside Goldenrod (<i>Solidago sempervirens</i>)	Eastern Red Cedar (<i>Juniperus virginiana</i>)
Little Bluestem (<i>Schizachyrium littorale</i>)	Groundsel tree (<i>Baccharis halimifolia</i>)	Red Pine (<i>Pinus resinosa</i>)
Saltmarsh rush (<i>Juncus gerardii</i>)	Bearberry (<i>Arctostaphylos uva-ursi</i>)	
Saltmarsh bulrush (<i>Scirpus robustus</i>)	Bigleaf marsh-elder (<i>Iva frutescens</i>)	
	Shining Sumac (<i>Rhus copallinum</i>)	

- The strategy of highly diverse over-planting allows competition to naturally select the species that can best occupy each environment micro-niche.
- Over-planting spurs vigorous growth through both competition and mutualism. This is illustrated by "**Miyawaki Reforestation**" principals.
- Grasses and herbaceous plugs provide fast root stabilization and are the initial colonizers.
- Shrubs will form longer lasting rooting colonization and provide the richest ecosystem habitat.
- Vine species will be deployed under stairwells where shade would prevent most bluff species from establishment.
- Small salt-tolerant scrub tree species will be deployed at the bluff toe to provide resilience from wave notch erosion

Coastal Bluff Stabilization

Full Sun/Drought tolerant Herbaceous Species

- American beachgrass (*Ammophila breveligulata*)
- Coastal panicgrass (*Panicum amarulum*)
- Switchgrass (*Panicum virgatum*)
- Saltmeadow cordgrass (*Spartina patens*)
- Coastal little bluestem (*Schizachyrium scoparium* var. *littorale*)



Coastal Resilient - Grasses

Root Architecture



Ammophila-beachgrass



Spartina spp.
cordgrass



Source: Structures for Coastal Resilience, Harvard School of Design.

Climate Resilient-Wildflowers/ Forbs

- *Asclepias incarnata, syriaca, tuberosa*, milkweeds
- *Euthamia graminifolia*, Grass-leaved goldenrod
- *Monarda fistulosa*, Wild Bergamot
- *Pycnanthemum muticum/tenuifolium* Broad/
narrow-leaved mountain mint
- *Rudbeckia laciniata*, Green-headed coneflower
- *Solidago rugosa*, Wrinkleleaf goldenrod
- *Solidago sempervirens*, Seaside goldenrod
- *Symphotrichum lanceolatum, pilosum, puniceum*
Lance-leaved American Aster

Secondary Dunes/Steep Coastal Slopes

- High diversity leads to high resilience
- Secondary dunes/slopes can support more species, so in a healthy dune there should be a diverse mix of native species e.g.
 - Saltmeadow cordgrass (*Spartina patens*)
 - Coastal panicgrass (*Panicum amarum* var. *amarulum*)
 - Coastal little bluestem (*Schizachyrium littorale*)
 - Seaside goldenrod (*Solidago sempervirens*)
 - Trailing wild bean (*Strophostyles helvola*)
 - Beach pea (*Lathyrus japonicus*)



Long Island, NY Native Seeding Species: Hand Sown/Hydroseeding

Annuals, Biennials & Perennials - Grasses, Herbeaceous & Wildflowers	
Upper Bluff Mix	
Autumn Bentgrass (<i>Agrostis perennans</i>)	Black Eyed Susan (<i>Rudbeckia hirta</i>)
Butterfly Milkweed (<i>Asclepias tuberosa</i>)	Little Bluestem (<i>Schizachyrium scoparium</i>)
Smooth Aster (<i>Aster laevis</i>)	Early Goldenrod (<i>Solidago juncea</i>)
Calico Aster (<i>Aster lateriflorus</i>)	Gray Goldenrod (<i>Solidago nemoralis</i>)
Heath Aster (<i>Aster pilosus</i>)	Rough Dropseed (<i>Sporobolus asper</i>)
Purple Coneflower (<i>Echinacea purpurea</i>)	Sand Dropseed (<i>Sporobolus cryptandrus</i>)
Purple Lovegrass (<i>Eragrostis spectabilis</i>)	
Ox-Eye Sunflower (<i>Heliopsis helianthoides</i>)	Lower Bluff Mix
Round Headed Bushclover (<i>Lespedeza capitata</i>)	Autumn Bentgrass (<i>Agrostis perennans</i>)
Wild Bergamot (<i>Monarda fistulosa</i>)	Purple Lovegrass (<i>Eragrostis spectabilis</i>)
Deertongue (<i>Panicum clandestinum</i>)	Deertongue (<i>Panicum clandestinum</i>)
Tall White Beardtongue (<i>Penstemon digitalis</i>)	Little Bluestem (<i>Schizachyrium scoparium</i>)
Hoary Mountain Mint (<i>Pycnanthemum incanum</i>)	Rough Dropseed (<i>Sporobolus asper</i>)
Narrow Leaved Mountain Mint (<i>Pycnanthemum tenuifolium</i>)	Sand Dropseed (<i>Sporobolus cryptandrus</i>)
<p>These seed mixes will become available for purchase at Ernst Seed Company, for any use, and will be labeled as <i>CTC Upper Bluff</i> and <i>CTC Lower Bluff</i> blends. It is 100% native and excludes even “naturalized” foreign species.</p>	

- “Seeding” the bluff creates a reservoir which will remain viable for decades.
- This limits invasive weeds by filling the small spaces that weeds exploit to take hold. Invasives, such as mugwort, have shallow roots and crowd out stabilizing species.
- The vast diversity provides hosting for bee, moth and butterfly larvae and sustenance for birds, insects, etc.
- Wildflower roots weave into other root systems and provide greater resilience and a mutualistic ecosystem.
- The habitat created by over 4 dozen native species will be the most diverse ever restored on any coastal bluff.

Diversified Planting



Native Warm Season Grass Species

High Tide Switchgrass



'Atlantic' Coastal Panicgrass



Southampton Prairie Cordgrass



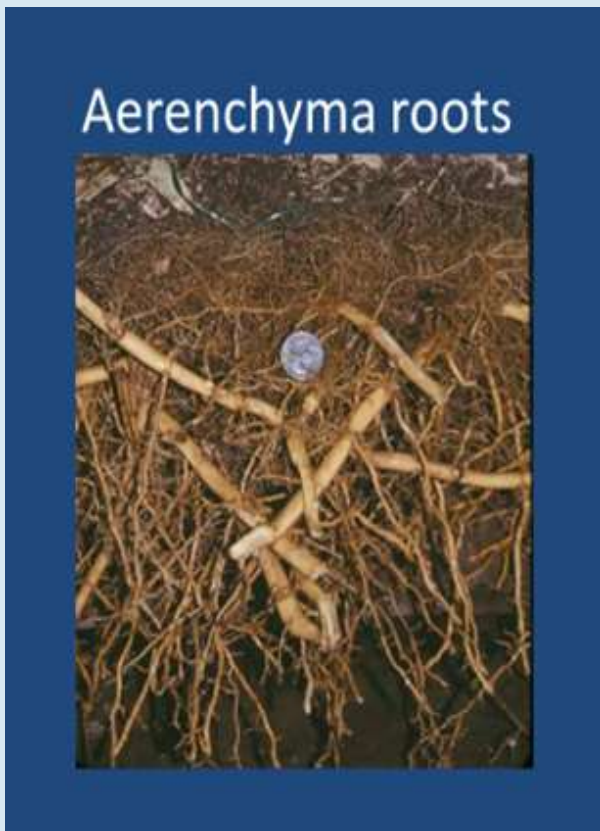
Eastern gamagrass

Native Warm Season Grasses

- Switchgrass plug root development within 3 months.
- Tolerate periods of drought well.
- Deep root system allows for soil/bank reinforcement



Eastern Gamagrass



Willow



Switchgrass



It's ALL in the ROOTS!

Anaerobic adapted roots

Photos courtesy of Dr. Ken Staver, UMD-Wye Research and Education Center

STRUCTURES OF COASTAL RESILIENCE

Rockefeller Foundation Funded After Superstorm Sandy

Narragansett Bay Team-Harvard School of Design

Think out of the “box” for Natural Based Designs

One potential solution “Attenuation Forest”

Utilize trees and shrubs that create a dense rhizomatic substrate with copse-like (thicket, grove) arrangement that creates a layer of growth that will attenuate and mitigate storm surge.

Disturbance creates injury which encourages more new sprouting/coppicing (root suckering/stump sprouting)

Resilient Salt Tolerant Trees and Shrubs

Tree Species

Acer negundo-boxelder
Acer saccharinum- silver maple
Liquidambar styraciflua-sweet gum
Populus deltoides- E. cottonwood
Prunus virginiana-chokeberry
Quercus nigra-water oak
Quercus palustris- pin oak
Quercus phellos-willow oak
Robinia pseudoacacia-black locust
Salix nigra-black willow
Sassafras albidum-sassafras

Shrub Species

Amelanchier canadensis-serviceberry
Amorpha fruticosa – indigo bush
Baccharis halimifolia- groundsel
Clethra alnifolia-sweet pepperbush
Cornus spp.-shrub dogwood
Ilex spp.-inkberry, smooth
winterberry holly
Morella spp.-wax myrtle, bayberry
Prunus maritima-beach plum
Rosa virginiana-Virginia rose
Rhus spp.-sumac
Sambucus canadensis-elderberry
Viburnum spp.

Source: Elkin, R.L. *Beyond Restoration: Planting Coastal Infrastructure*



Woody Plant Functions Soil Bioengineering Systems

- Root reinforcement - root tensile strength mechanically reinforces soil.
- Soil moisture depletion - remove excess soil water through evapotranspiration.
- Buttressing and Arching - anchored & embedded stems/roots counteract downslope shear forces.
- Flexible stems deflect erosive energy



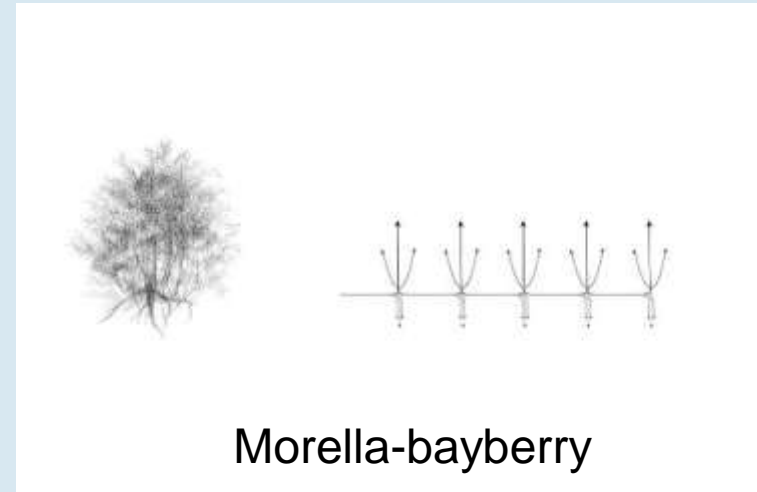
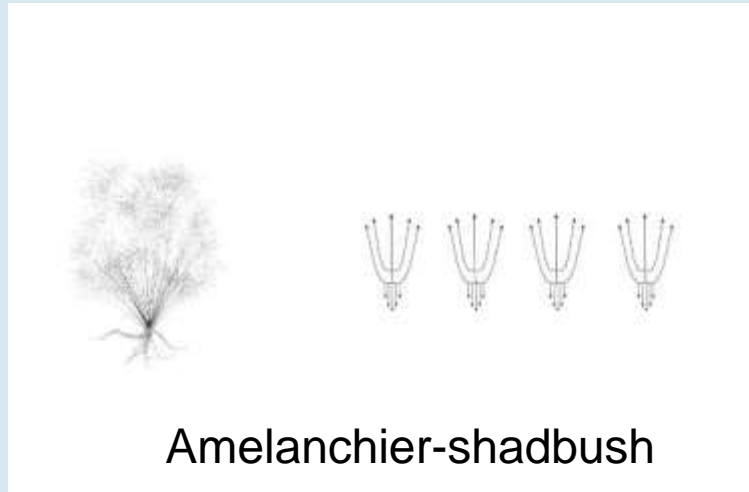
'Ruby' redosier dogwood
(*Cornus serecia*)

**Developed because of its
prolific layering ability.**



Coastal Resilient Trees and Shrubs

Root Architecture



Source: Structures for Coastal Resilience, Harvard School of Design.

Dwarf Sumac (*Rhus copallina*)





Bayberry

BEACH PLUM: This long-lived native species thrives in environments with salt, drought and frequent disturbances, where their neighbors are often short lived.



Beach Plum fruit



Groundsel Bush



Sweetfern (Comptonia peregrina)



Maritime Forests/Shrublands

Threatened and Fragmented Plant Community

A. Highly recommended and preferred by migratory songbirds:

Common Name	Scientific Name	Nutrient Content ¹			Antioxidant Properties ²			
		Fat	Carbs	Energy	Antho.*	Vit E ^b	Phenols	TAC ^c
Arrowwood Viburnum	<i>Viburnum dentatum</i>	*High	High	High	High	High	High	High
Virginia Creeper	<i>Parthenocissus quinquefolia</i>	Med	High	High	Med	Low	High	High
Gray Dogwood	<i>Cornus racemosa</i>	High	Med	High	Low	N/A	Med	Low
Silky Dogwood	<i>Cornus amomum</i>	Low	High	Med	Med	N/A	Med	Low
Red Osier Dogwood	<i>Cornus sericea</i>	*Med	Med	High	Low	N/A	Med	Low

B. Recommended and eaten by many migratory songbirds:

Serviceberry	<i>Amelanchier spp.</i>	*Low	High	Med
Common Elderberry	<i>Sambucus canadensis</i>	Low	High	Med
Spicebush	<i>Lindera benzoin</i>	High	Low	High
Pokeweed	<i>Phytolacca americana</i>	Low	High	Low
Flowering Dogwood	<i>Cornus florida</i>	Med	Med	High
Chokecherry	<i>Prunus virginiana</i>	*Low	High	Low
Highbush Blueberry	<i>Vaccinium corymbosum</i>	*Low	High	Low

Antioxidants and Birds

Birds during migration experience oxidative stress when they burn fats to fuel their flights. Fruits with *high antioxidant capacity* can help to alleviate these stresses.



Vitamin E and *phenols in fruits*, especially colored compounds called *anthocyanins* that give fruits their bright purple-maroon coloration, are good dietary sources of antioxidants for birds.

Suggested citation: Smith, S. B. and S. R. McWilliams. 2015. Recommended plantings for migratory songbird habitat management. Rochester, NY: Rochester Institute of Technology and University of Rhode Island. 2 p.

Additional Desirable Shrub Species

C. Recommended and eaten by a few migratory songbirds and overwintering birds:

Northern Bayberry	<i>Myrica pennsylvanica</i>	*High	High	High
Winterberry	<i>Ilex verticillata</i>	*Low	High	Med
Black Chokeberry	<i>Aronia melanocarpa</i>	Low	High	Med
Mapleleaf Viburnum	<i>Viburnum acerifolium</i>	*Low	Low	Med
Nannyberry	<i>Viburnum lentago</i>	*Low	Med	Low

Suggested citation: Smith, S. B. and S. R. McWilliams. 2015. Recommended plantings for migratory songbird habitat management. Rochester, NY: Rochester Institute of Technology and University of Rhode Island. 2 p.

BMPs for Coastal Resilience

- Select plant species that are tolerant to salinity changes and increased temperature.
- Planting flood and salt tolerant plants inland from wetland systems to prolong viability to rising waters and increased flood frequency (in tidal systems).
- Maintain and enhance diversity of plantings to help with changing salinity and flooding conditions.
- Source: Maryland's Adaptation Website: www.dnr.state.md.us/climatechange



Long Island Sound Study
A Partnership to Restore and Protect the Sound

Questions?



Sands Point Preserve

Nature Based Solutions for Coastal Resiliency





What is Ecological Restoration?

- Invasive Species Removal
- Native Plant Community Restoration
- Stormwater Management

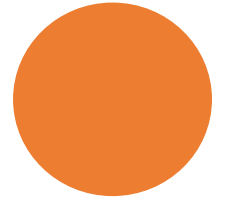
Addition By Subtraction

- Invasive plants crowd out natives and destroy ecosystems
- Connection to impaired watersheds and eroding hillsides



Wildlife Sweeps and Selective Editing

- Identify and remove invasive species of concern—not “clearing of overgrowth”
- Spread out in a grid formation and search for wildlife signs
- Nests, burrows, coarse woody debris
- Spot the machines



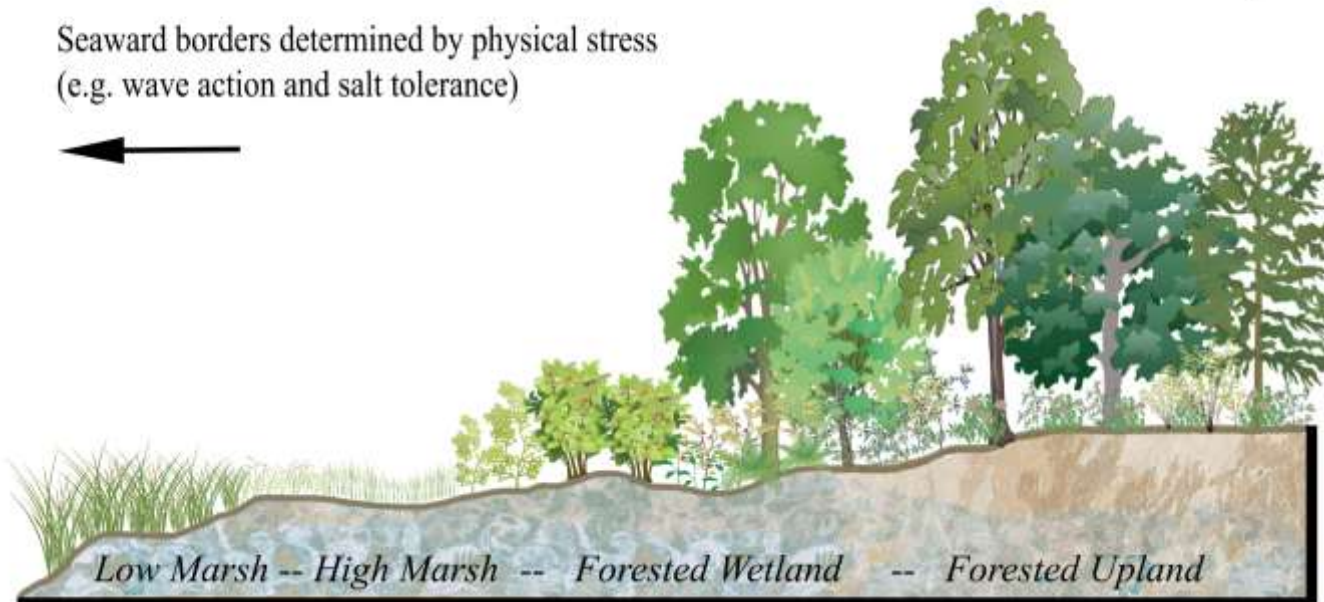
Planting Native Plant Communities



Seaward borders determined by physical stress
(e.g. wave action and salt tolerance)



Landward borders determined by competition
(e.g. flood and shade tolerance)



- Choosing the Best Plants for the Site
- NY Natural Heritage Program Ecological Communities of NYS

Controlled Wild

- Making a planting look purposeful
- Competition to prevent flopping
 - 9 inches on center
- Layering



Stewarding Wild Areas

- Dense plantings of co-associated species
- A garden is never done
 - Sleep, creep, leap!



Planting Density

- 4'-6' on center planting
 - Community development vs. individual plant health
- Encouraging the development of the mycorrhizal network



Managing Your Stormwater

- Plants over precast
- Aboveground storage vs. belowground storage
- Defining the contributing area
- Runoff coefficients
- Trees as the powerhouse



The Fallacy of the Toe Wall

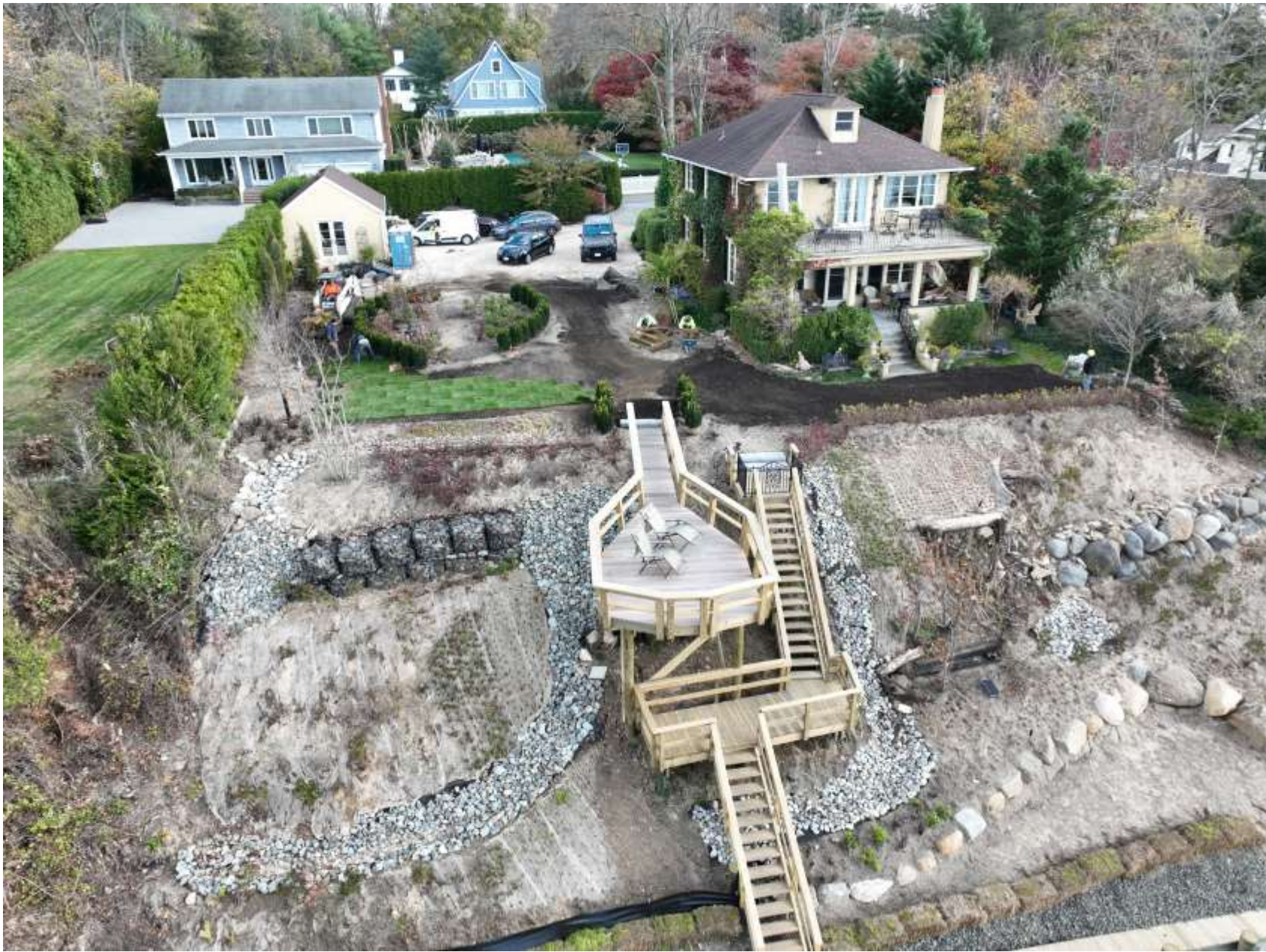
- Building sandcastles





Preserving the View (of an eroding shoreline...)

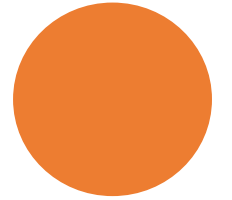
- Unintentional self-sabotage
- Framing the view as a compromise



Redundancy is Key

Bringing Nature Home

- A neat garden is a lifeless garden
 - Leave the leaves and don't deadhead!
- If you have room for one, you have room for three
- Many of your neighbors would actually be into this...





ENBIORGANIC :

SANDS POINT PRESERVE (STARTED 8/1/24)

Within a month of discharging into the pond, we measured a startling 50%-60% reduction of polluting nutrients in the water and pond sediment

Spadefoot is the exclusive licensee of Enbiorganic in NY State



Sands Pt-September 19, 2024



Sands Pt-September 23, 2024

Thank you!

Contact us:
Frank@Spadefootny.com





Long Island Sound Study
A Partnership to Restore and Protect the Sound

Questions?



UU Shelter Rock Native Plant Garden

Long Island Sound
Nassau Coastal
Resilience Forum
2024 Update



Agenda

1

District Overview

2

Nassau County S.E.P.T.I.C.

3

Part C funding Opportunity

4

Questions



Nassau County Soil & Water Conservation District

- WHO WE ARE
 - Soil and Water Conservation districts are local units of government that develop, manage, and direct natural resource programs at the community level. The Nassau County Soil and Water Conservation District has been in existence since 1977, providing county residents with assistance, educational programs and services for over 45 years.
 - Our purpose is to protect, preserve, restore, and enhance natural resources through education and technical assistance, and provide programs and technical services to all Nassau County residents and municipalities.
 - Located at Nassau Hall in Muttontown Preserve, but provide County-wide conservation services



MUTTONTOWN PRESERVE TRAIL MAP

- HIKING TRAILS**
- King Zog's Loop (2.6 mi) / Numbered Trail Post / Unnumbered Trail Post
 - Christie's Field Loop (1.5 mi) / Numbered Trail Post
 - Upland Woods Trail (0.7 mi) / Numbered Trail Post
 - Goldenrod Field Trail (0.9 mi) / Numbered Trail Post

- MAP LEGEND**
- Package Very Dense / Foliage Dense
 - Open With Scattered Trees / Thick Undergrowth
 - Open Woods / Open Land
 - Footpath / Small Footpath / Paved Trail / Dirt Road
 - Paved Road / Fence / Stone Wall / Contour Line
 - Hill / Large Depression / Farm Line / Earth Bank / Dry Ditch
 - Pit / Depression / Dirt Pile / Boulder / Small Boulder
 - Rain / Building / Pond
 - Tree / Root Stock / Cairn / Man Made Object
 - Seasonal Marsh / Vernal Pool
 - Compost / Hiking Enclosure / Parking Lot

BRUCE A. BLAKEMAN
NASSAU COUNTY EXECUTIVE



Nassau's S.E.P.T.I.C. Program – Overview



- Administered by the District on behalf of Nassau County
- Launched in May of 2021
- Provides State and County financial incentives of up to \$20,000 to applicants looking to replace existing septic systems and cesspools with nitrogen-reducing technologies

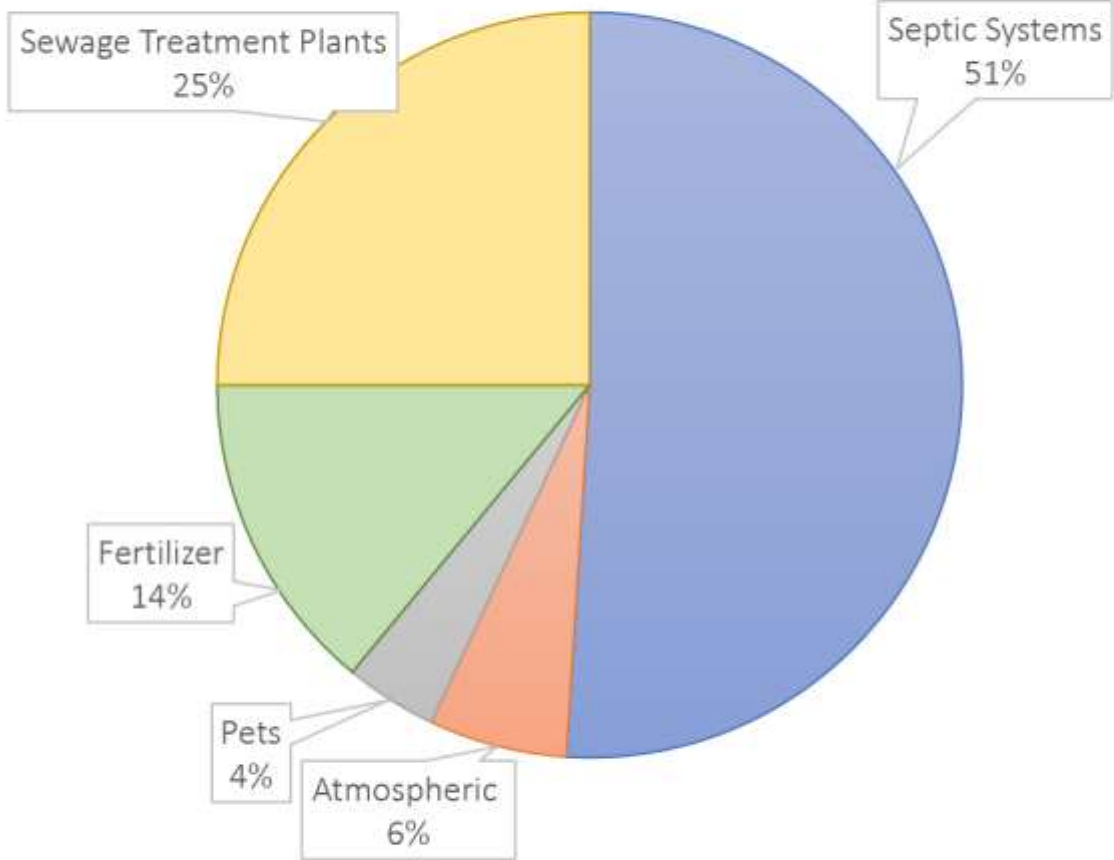
Join the Nassau County Septic Replacement Program

Help keep Long Island waterways clean by replacing your conventional or failing septic system with a new innovative advanced onsite wastewater treatment system. Eligible Applicants will receive a **\$20,000** reimbursement for installing a nitrogen reducing septic system on their property.

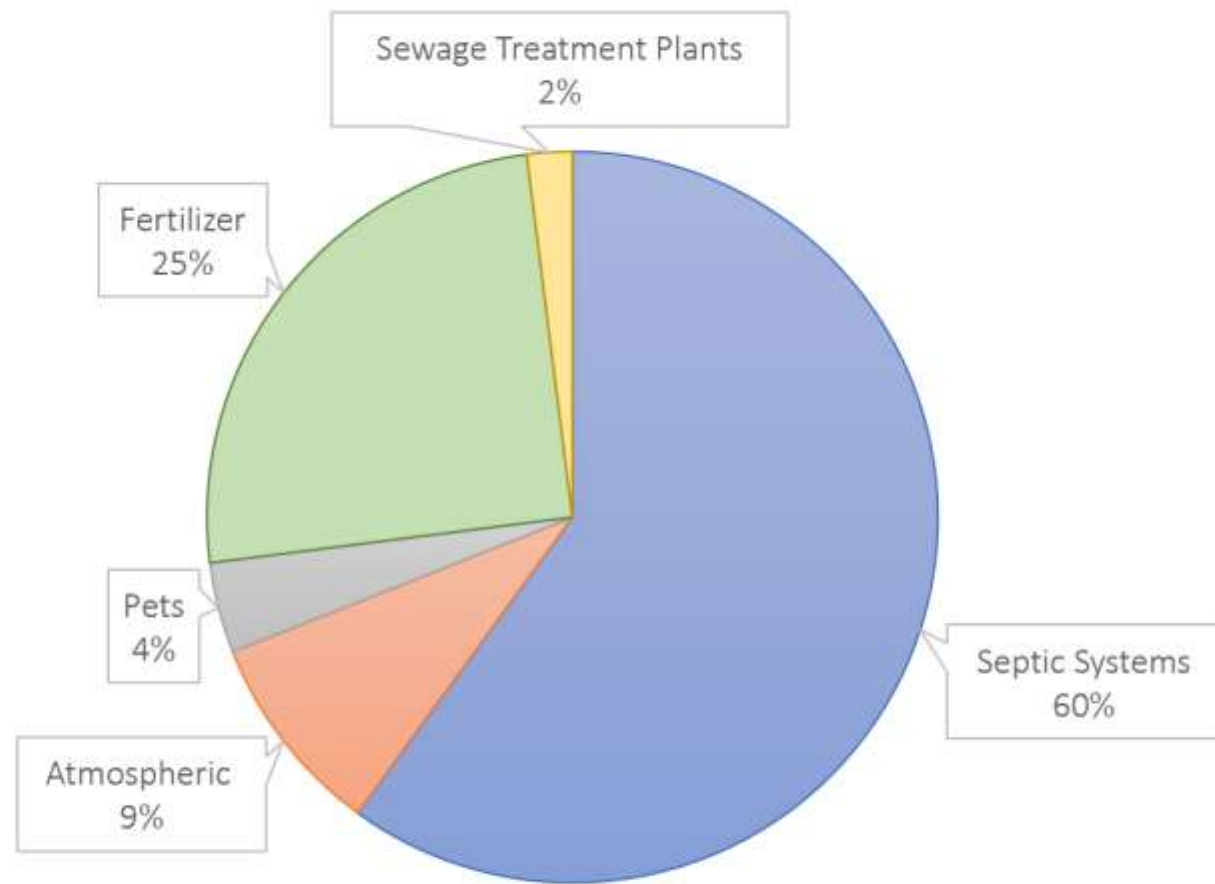
[Click here to learn more about the program](#)



Distribution of Nitrogen to North Shore of Long Island



*Hempstead Harbor, Manhasset Bay,
and Little Neck Bay*



*Cold Spring Harbor, Oyster Bay,
and Long Island Sound*

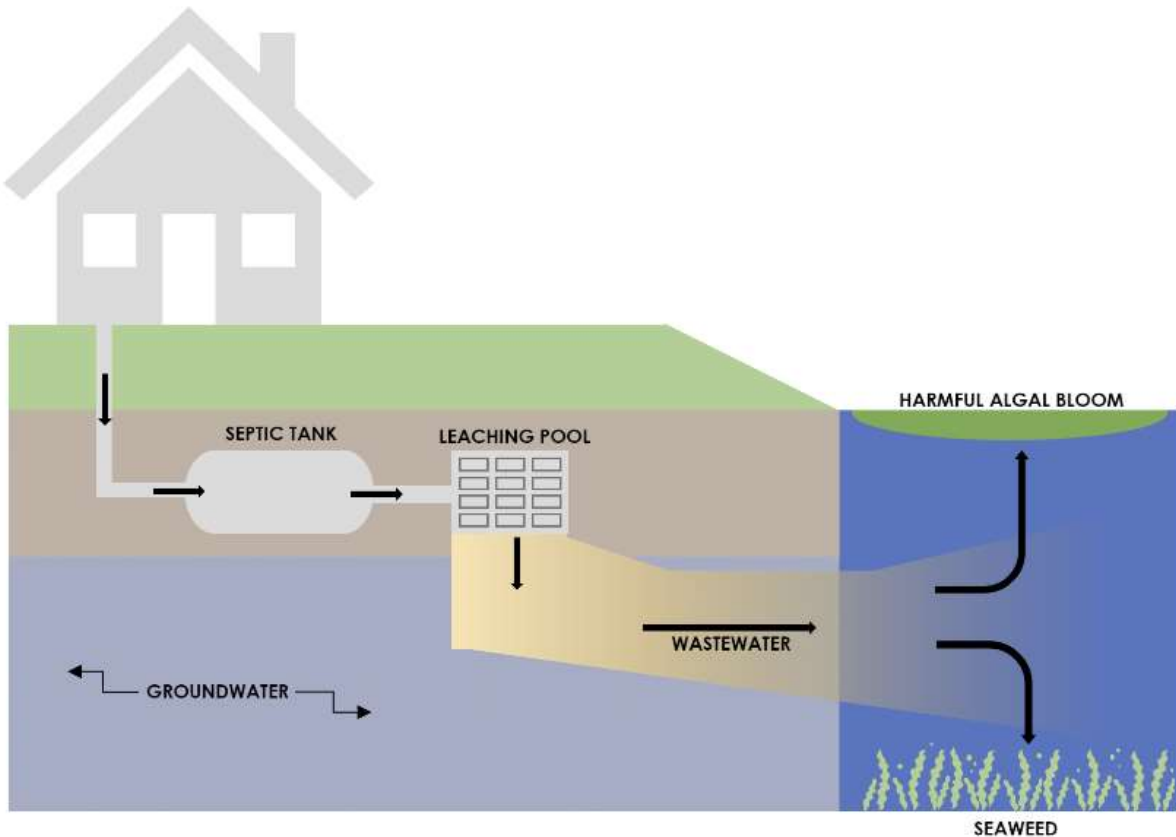


Effects of Excess Nitrogen on the Long Island Sound

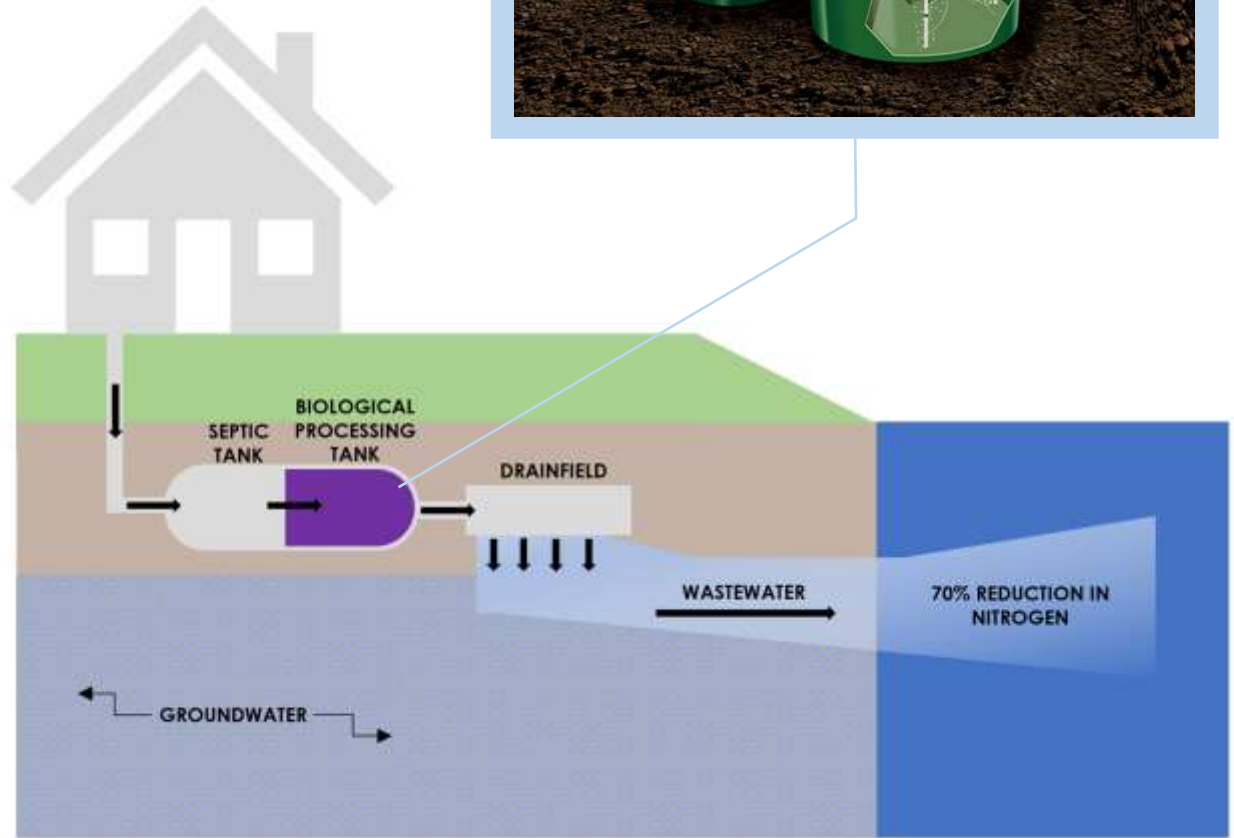
- Fish Kills
- Harmful Algae Blooms (HAB)
 - Beach Closures
- Invasive Seaweed
- Paralytic Shellfish Poisoning (PSP)
- Beach Closures
- Reduced Resiliency of coastal wetlands
 - Degradation of coastal habitats
 - Reduction in Stormwater filtration
 - Increased risk of coastal erosion



“Innovative Advanced (I/A) OWTS” can reduce nitrogen outputs into groundwater by up to 70%.



CONVENTIONAL SEPTIC TANK



NITROGEN-REDUCING IA SEPTIC TANK

Nassau's S.E.P.T.I.C. Program – Technologies with General Use Acceptance



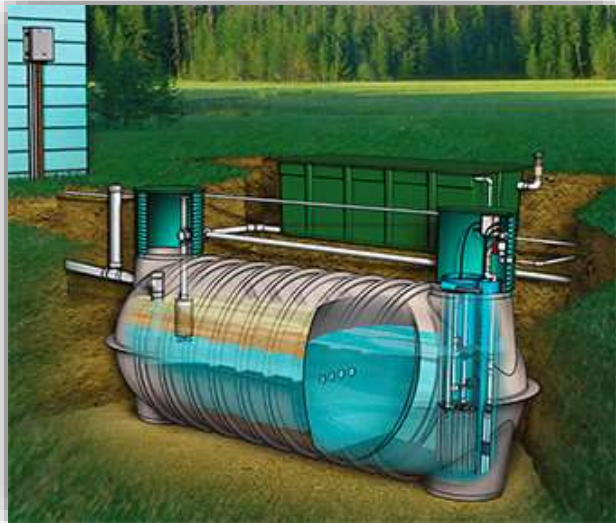
Hydro-Action AN Series

Joe Densieski
Wastewater Works Inc.
139 Reeves Avenue
Riverhead, NY 11901
www.wastewaterworksinc.com
wastewaterworks@gmail.com



Fuji Clean CEN Series

Bryan McGowin
Advanced Wastewater Solutions,
LLC
PO Box 1622 Southampton, NY
11969
(631) 259-3353
<https://www.awsli.com>
bmcgowin@gmail.com



Orengo Advantex AX-20

Lee Essay
Nugent & Potter
1557 County Road 39
Southampton, NY 11968
Lee@nugentpotter.com
<http://nugentpotter.com>
(631) 283-1103

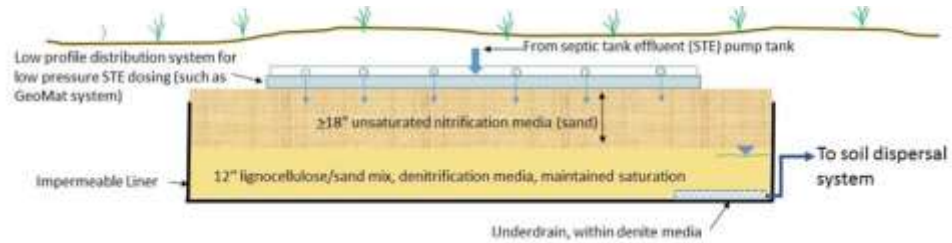


SeptiTech STAAR

John Lindahl
SeptiTech Long Island
27 Service Rd A
Calverton, NY 11933
(631-)284-9893
jlindahl@clearriver.us
<https://septitechli.com>

Nassau's S.E.P.T.I.C. Program – Technologies with General Use Acceptance

Provisional Acceptance *(can be installed with no limits or restrictions)*



Nitrogen Reducing Biofilter

Frank M. Russo, P.E.

Associate Director for Wastewater Initiatives

NYS Center for Clean Water Technology at Stony Brook University

<https://www.stonybrook.edu/commcms/cleanwater>



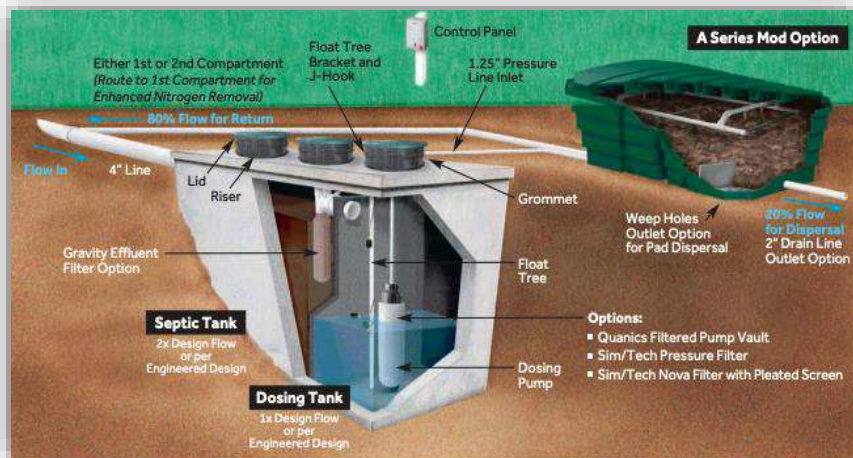
Norweco HydroKinetic

Norweco of New York

norwecony@gmail.com

(516) 710-7967

Technologies Piloting Use Acceptance *(Limited to 12 Installations)*



Anua - BioCoir Coconut Fiber Biofilter
(A Series & IM Series)

Colin Bishop, CEO

Anua

www.anua-us.org

T: 928.433.3220

colin.bishop@anua-us.com



A Series



IM Series

Average S.E.P.T.I.C. Installation Costs



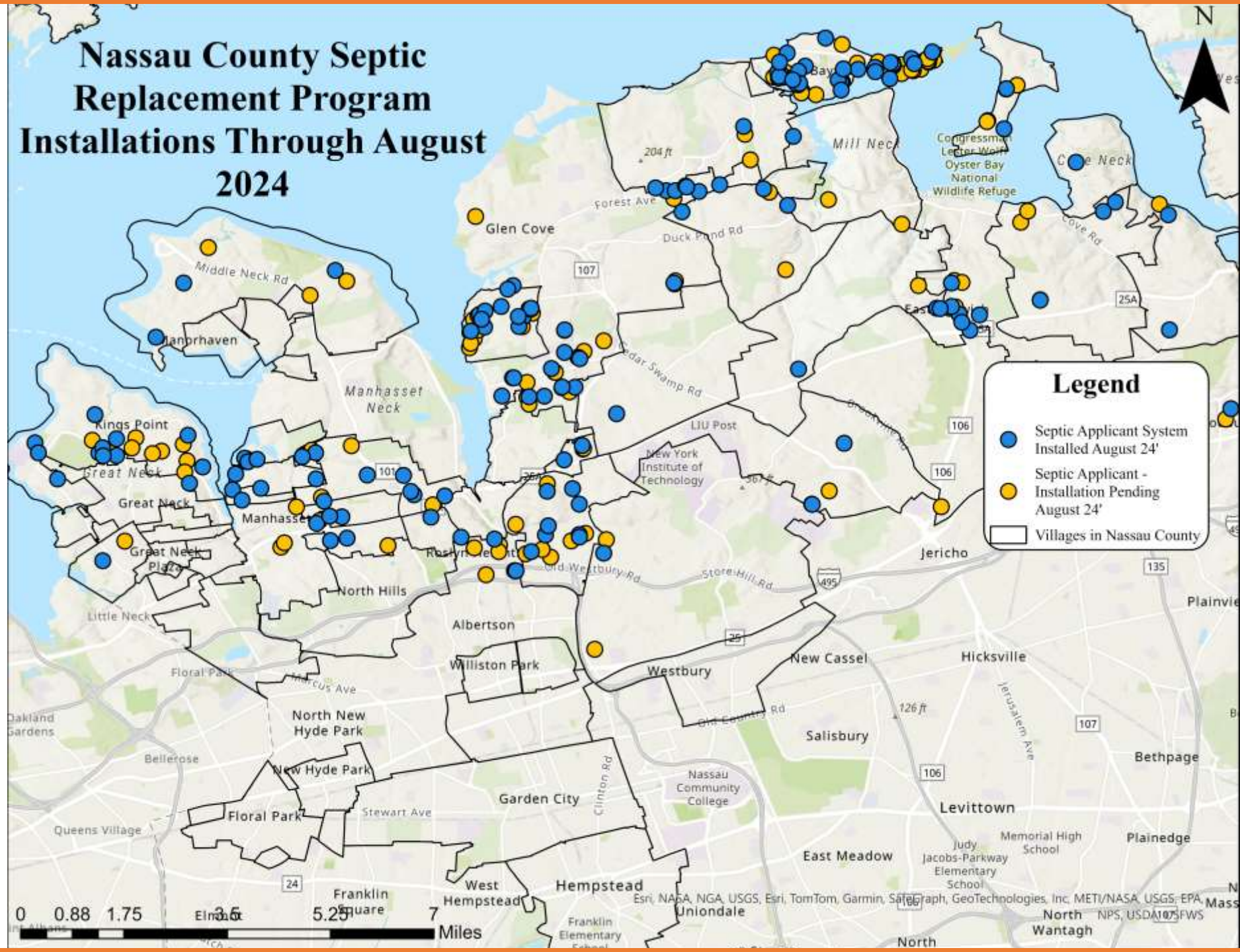
Average Cost - \$29,559.50

NOTE:

- This reflects only eligible reimbursable costs
- Grants are meant to offset and incentivize IA systems over conventional systems and cesspools
- Applicant should expect out-of-pocket expenses



Nassau County Septic Replacement Program Installations Through August 2024



Nassau's S.E.P.T.I.C. Program – Testimonial


- Conventional septic system would have cost a minimum of \$16,000.00
- The total Design, Material, and Installation costs of the FujiClean CEN Series Clean-Water septic system was \$21,867.31.
- The Property Owner received \$20,000 in combined grants from Nassau County and New York State
- 'out-of-pocket' cost to Property Owner was \$1,867.31



Testimonial

'Our system is better than we could have hoped, and we have peace of mind knowing we are doing our part in keeping Bayville's water clean'

★★★★★



NCSWCD – Part C Funding



- Projects must meet one or more of the follow criteria in Nassau County:
 - Conserve or improve soils
 - Improve water quality of our groundwater and/or surface water
 - Control and prevent soil erosion and/or prevent floodwater and sediment damages
 - Conservation, development, utilization, and disposal of water
 - Preserve, increase, or improve natural resources including trees and plants
 - Control or eliminate invasive plants or wildlife
 - Control and abate NPS water pollution
 - Preserve wildlife

Part C Funding



Partners

- School Groups
- Local Community Organizations
- Towns and Villages
- Local Municipalities

Awards Amounts

- Between \$2K and \$15K per project, depending on the year
- Awards are distributed on a reimbursement basis

Timeline

- RFP released in February, Proposals due in March, Awards announced in April
- Successful Projects have one calendar year for completion
- Quarterly and Final Reports Required



The Reintroduction of Fire at the Hempstead Plains

Long Island's last remaining Tallgrass Prairie, including over 200 plant species, 14 of which are considered rare species.

This project covered a 5-acre section of grassland dominated by little blue stem and goldenrods, and a 1-acre plot in which the globally endangered, fire-dependent Sandplain *Gerardia* grows.

A Day In The Life of an Estuary

This program focuses on environmental education, community engagement, and water-quality monitoring. Data collected is then shared around NYS

Students will collect water samples, monitor tides, and use a seine net to capture and document native species.





Hydroseeding at Cedarmere Preserve

This Project covered a total area of 20,000 ft sq. Invasive species removal of hundreds of trees such as Norway maple, Tree of heaven, and Japanese maple.

Hydroseeding with native grasses and flowers was used to help control invasive ground cover plants such as English ivy.



Questions?





Long Island Sound Study

A Partnership to Restore and Protect the Sound



Hempstead Harbor



Thank you!

Please provide feedback to help us plan our events in the future.



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Lunch

Joining us for the field trip?

We will begin our walking tour of the Sands Point Preserve resilience projects in the Great Hall (here) at 1:30 pm.

