Rhode Island's Salt Marsh RAMP Restoration, Assessment, and Monitoring Program

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December 4, 2024

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RHODE ISLAND
NATURAL HISTORY SURVEY
Providing Ecosystem Science and Information

Wetland program development
Condition assessment methods
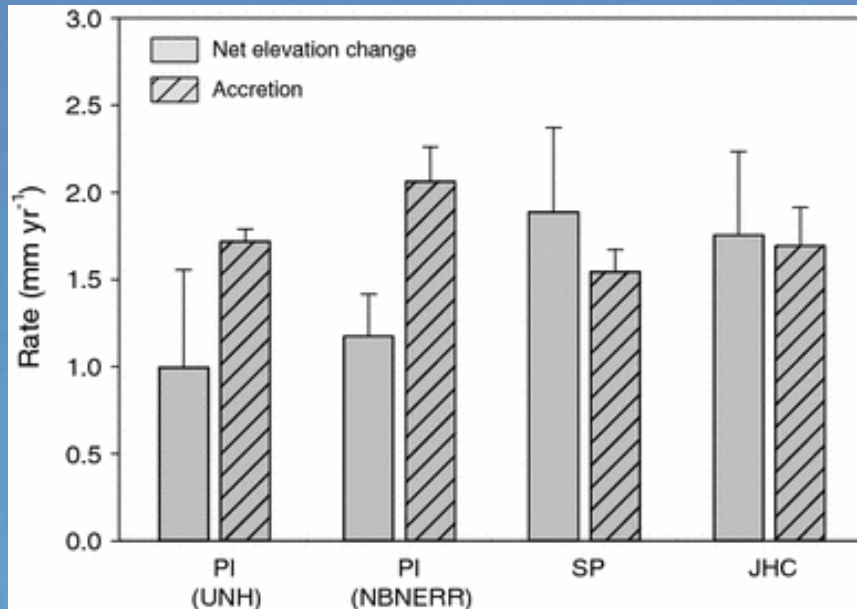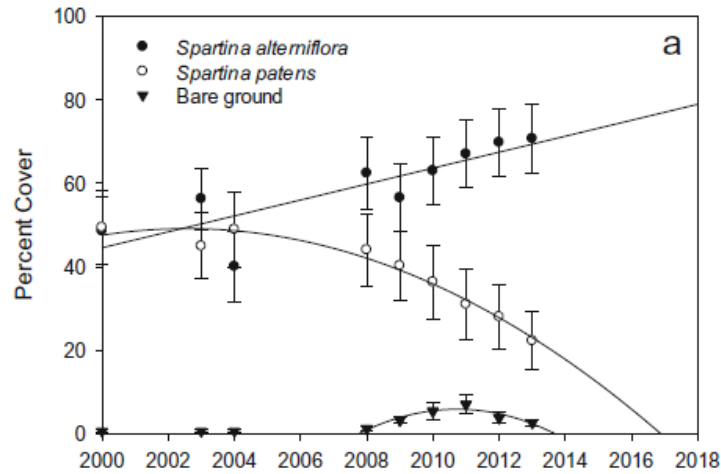Research and monitoring
Salt marsh restoration planning and assessment

The Problem: Rapid Degradation and Loss

Long-term Monitoring

Raposa et al. 2017, Raposa et al. 2016
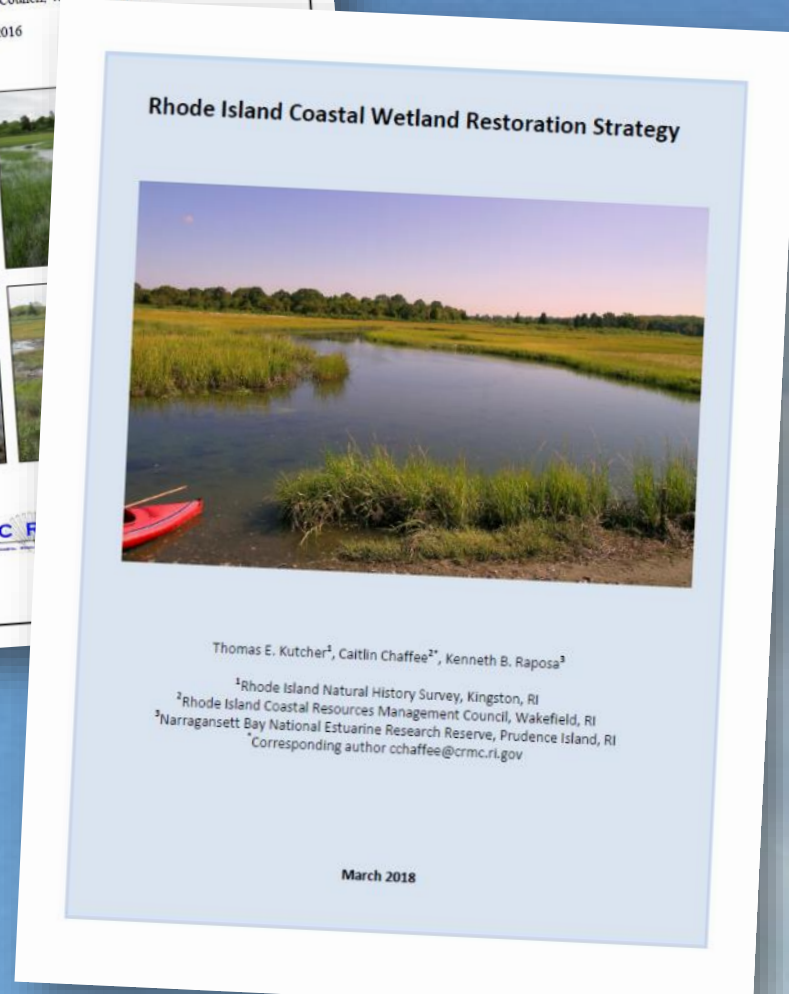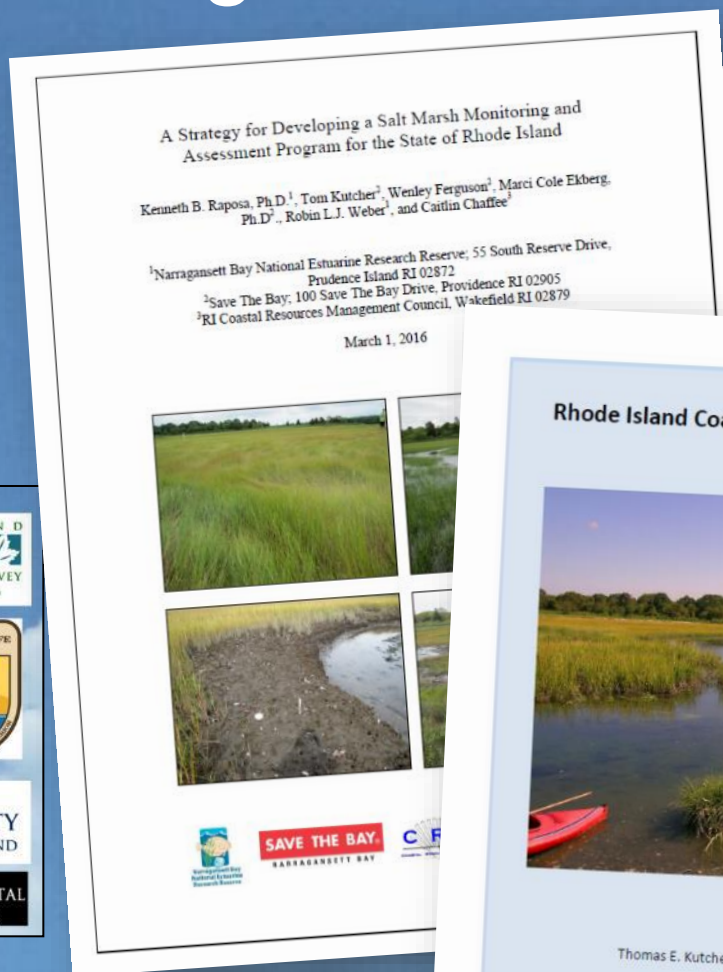
Salt Marsh Management and Planning

Rhode Island Salt-marsh Restoration, Assessment, and Monitoring Program (RAMP)

- Multi-agency partnership to promote salt marsh conservation and restoration

Ecosystem and Community Resiliency Team (ECR)

- DEM program focused on coastal habitat restoration

A Strategy for Developing a Salt Marsh Monitoring and Assessment Program for the State of Rhode Island

Kenneth B. Raposa, Ph.D.[1], Tom Kutcher[2], Wenley Ferguson[2], Marci Cole Ekberg, Ph.D[2]., Robin L.J. Weber[1], and Caitlin Chaffee[3]

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March 1, 2016

Rhode Island Coastal Wetland Restoration Strategy

Thomas E. Kutcher[1], Caitlin Chaffee[2*], Kenneth B. Raposa[3]

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March 2018

MarshRAM and the Index of Marsh Integrity (IMI)
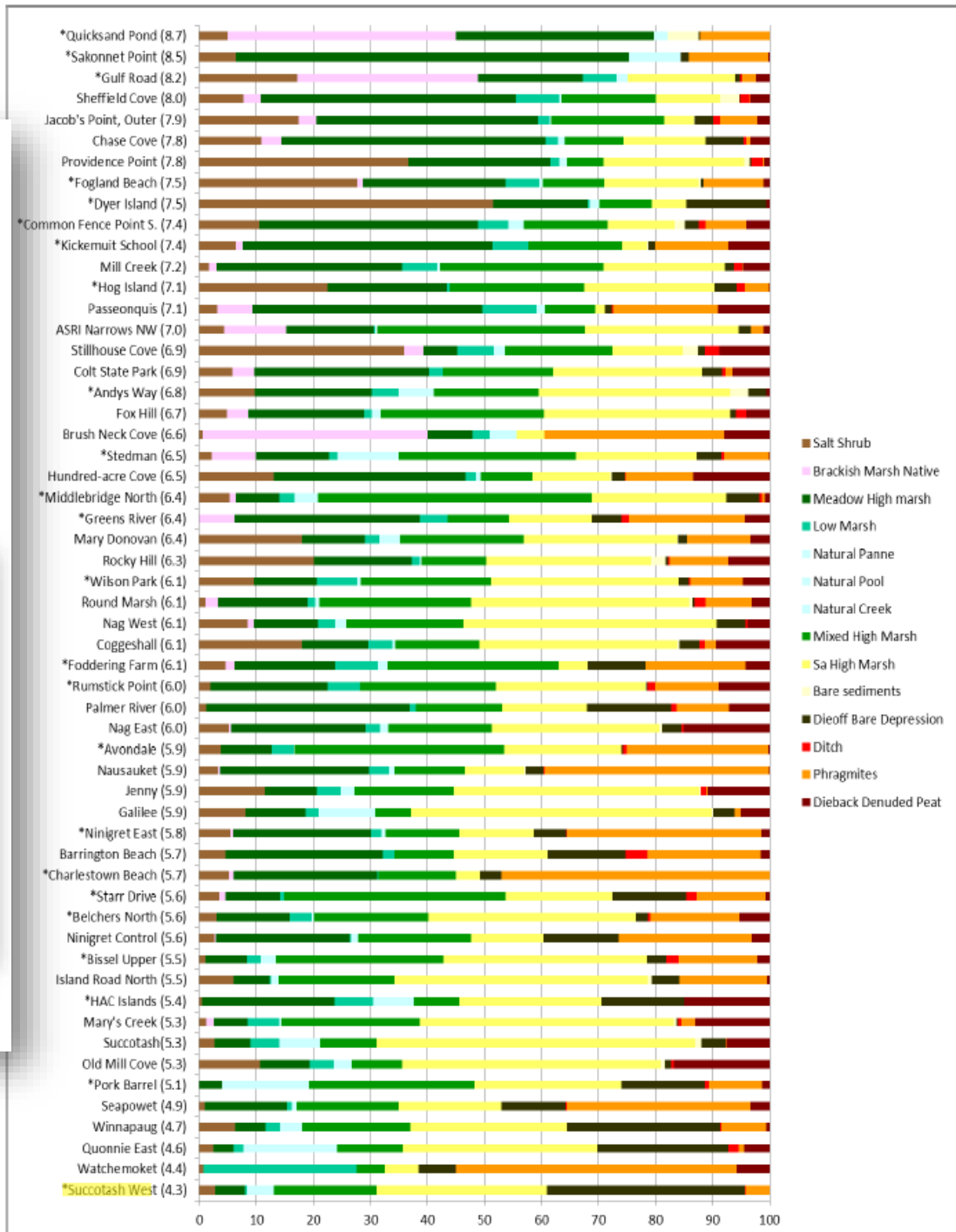
Rapid Assessment and Prioritization

Migration Potential

Integrity	Value	High		Moderate		Low	
High	High	M5	R2	M4	R3	M2	R4
High	Mod	M4	R1	M3	R2	M1	R3
High	Low	M3	R1	M2	R1	M1	R2
Mod	High	M5	R3	M4	R4	M2	R5
Mod	Mod	M4	R2	M3	R3	M1	R4
Mod	Low	M3	R1	M2	R2	M1	R3
Low	High	M5	R4	M4	R5	M2	R5
Low	Mod	M5	R3	M4	R4	M2	R5
Low	Low	M4	R2	M3	R3	M1	R4

M=Migration Priority
R=Restoration Priority
5=Highest Priority
4=Higher Priority
3=Mod Priority
2=Lower Priority
1=Lowest Priority

Integrity = IMI Score:

Low < 5.7	Mod = 5.7 < 7.0	High ≥ 7.0

Value = Ecosystem Functions and Services Index:

Low < 16	Mod = 16 - 19	High ≥ 20

Migration Potential Definitions

High: High Replacement Ratio or High Migration Area

Moderate: Moderate Replacement Ratio and Moderate or Low Migration Area, or Moderate Migration Area and Moderate or Low Replacement Ratio

Low: Low Replacement Ratio and Low Migration Area

Migration Area:

Low < 1ha	Mod = 1 < 4ha	High ≥ 4ha

Replacement Ratio:

Low < 20%	Mod = 20 < 70%	High ≥ 70%

Site Assessment Table

SITE CODE	Integrity (IMI)	Disturbance	Functions and Services	Migration Area (ha)	Replacement Ratio	Buffer	Impoundment	Ditching	Nutrients	Fill	Erosion	Crabs	Die-off	Mowing	Phragmites
Quicksand Pond	LD	Low	A	3.6	78%			XX							XX
Sakonnet Point	LD	Mod	B	1.7	60%	XX	X	XX	XX	XX			X	X	XX
Gulf Road	LD	Low	A	0.5	37%			X	XXX	X	XX				X
Sheffield Cove	LD	Mod	A	1.5	92%	X		XX		XX	XXX				X
Jacob's Point, Outer	LD	High	A	0.5	6%	XX		XX	XX	XX	XX	XX	X		XX
Chase Cove	LD	Mod	A	4.1	80%		X	XX	X	X	XXX	XX	X		X
Providence Point	LD	Low	B	2.5	53%			XX			X	X	X		X
Fogland Beach	LD	Low	B	1.3	32%	XX			XX	X		X	X		X
Dyer Island	LD	Low	A	2.5	111%							XX			
Common Fence Point S.	LD	Mod	A	2.2	37%	XX		XX	XX	X	XX	XX	X	X	X
Kickemuit School	LD	High	A	2.6	63%			XX	XX	X	XXX	XXX	X		XX
	LD	Mod	B	1.4	29%			XX	X		XXX	XX			X
	LD	Low	A	3.1	93%			XX	XX			X	X	X	X
	LD	Mod	B	2.3	75%	X		X	XXX		XXX	XX		X	XX
	LD	Mod	AA	1.7	73%	X		X	XX	X	XXX		X	X	X
	ID	High	A	8.2	39%	X		XXX	XX	X	XXX	XXX	X	X	X
	ID	Low	AA	4.4	35%			X	X			X	X		X
	ID	Low	A	3.9	25%	X		X		X	XX	X	X		X
	ID	Low	B	3.2	114%				XXX		XX		X		XX
	ID	Low	AA	3.3	20%			XX	X	X			XX		X
	ID	Mod	AA	1.3	20%			X	XXX		XXX	XXX	X	X	X
	ID	Mod	AA	3.8	74%		X	XX	X		X	X	XX		X
	ID	High	A	0.4	18%			XX	XX	X	XXX	XXX	X	X	XX
	ID	Mod	A	5.4	15%	X		X	XXX	X	XX	XXX	X	X	X
	ID	Mod	AA	5.0	29%	XX	XX	X	XX	X	X	X	X	X	X
	ID	Mod	AA	2.6	55%	X	X	XX	XX	X	XXX	XX	X		X
	ID	Mod	A	11.7	37%	X	X	XX	XX	X	XX	X	X		X
	ID	Mod	A	2.9	22%			XX		X	XXX	XXX	X	X	X
	ID	Mod	A	7.7	38%			XX	X		XXX	XXX	X		X
	ID	Mod	A	0.5	28%		X		X		XX	XXX	XX		XX
	ID	High	A	1.4	11%	X		XXX	XX	X	XXX	XXX	X	X	X
	ID	Mod	AA	5.2	27%			XX	XX		XXX	XXX	XX		X
	ID	Mod	AA	3.9	18%	X		XX	X	X	XXX	XXX	X	X	X
	ID	Mod	A	3.1	67%	XX	X	XX	XXX	XX	X		X		XX
	ID	Mod	B	1.0	13%	X		XX	XX			X	X		X
	ID	Mod	B	3.8	30%	X		XXX		X	XXX	XXX			X
	ID	Mod	B	1.4	13%	XX		X		0	XXX		X	X	X
	ID	Low	A	4.4	63%			X	XX		XX		X		XX
	ID	Mod	AA	1.1	18%	X	X	XX	XXX	XX		X	XX		XX
	ID	Low	B	1.9	136%	X			XX				X		XX
	MD	High	AA	5.4	60%		XX	XX	XX	X	XX	X	XX	X	XX
	MD	Mod	A	4.0	35%			XX	XX		XX	XXX	XX		XX
	MD	Mod	A	0.0	0%				XX		XXX		XX		XX
	MD	Mod	B	2.4	128%	X	XX	XX	XXX	X	X	X	X		XX
	MD	Mod	B	0.4	29%	XXX			XXX	XX	XX		X		XX
	MD	Mod	A	0.0	0%				X		XXX	XXX	XX		X
	MD	High	B	0.0	0%	XXX			XX	XX	XXX	XXX	XXX	X	X
Succotash East	MD	High	AA	6.5	16%	XX	X	X	XX	XX	XX	XXX	X		X
Old Mill Cove	MD	High	B	2.0	73%	X		X	XXX	XX	XXX	XXX	XX		X
Pork Barrel	MD	Mod	A	0.8	18%	X		XX	XX	X	XXX	X	XX	X	X
Seapowet	MD	High	AA	12.6	14%	XX	X	XX	XX		XXX	XXX	XX	X	XX
Winnapaug	MD	Mod	A	0.0	0%	X		X	XX	X	XX		XX		X
Quonnie East	MD	High	AA	5.3	19%			XXX	XX	XX	XXX	XX	XX		X
Watchemoket	MD	High	B	0.8	136%	XX	X		XXX	XX	XX	XX	XX		XXX
Succotash West	MD	Low	AA	3.0	33%	XX		X	X	X				XX	X

Salt Marsh Restoration Prioritization

Site	Migration	Other Restoration	IMI Bin	Functions and Services	Migration Area (ha)	Replacement Ratio	Buffer	Impoundment	Ditching	Nutrients	Fill	Erosion	Crabs	Die-off	Mowing	Phragmites
Starr Drive	5	4	MD	AA	5.4	60%		XX	XX	XX	X	XX	X	XX	X	XX
Quonnie East	5	4	MD	AA	5.3	19%			XXX	XX	XX	XXX	XX	XX		X
Seapowet	5	4	MD	AA	12.6	14%	XX	X	XX	X		XXX	XXX	XX	X	XX
Middlebridge North	5	3	ID	AA	3.8	74%		X	XX	X		X	X	XX		X
Andys Way	5	3	ID	AA	4.4	35%			X	X			X	XX		X
Palmer River	5	3	ID	AA	5.2	27%			XX	XX		XXX	XXX	XX		X
Succotash East	5	3	MD	A	6.5	16%	XX	X	X	XX	XX	XXX	XXX	XX		X
ASRI Narrows NW	5	2	LD	A	1.7	73%		X	X	XX	X	X	X	XX	X	X
Succotash West	4	5	MD	AA	3.0	33%	XX		X	X	X			XX		X
Wilson Park	4	4	ID	AA	2.6	55%	X	X	XX	XX	X	XXX	XX	XX		X
Belchers North	4	4	MD	A	4.0	35%			XX	XX		XX	XXX	XX		XX
Rocky Hill	4	4	ID	AA	5.0	29%	XX	XX	XX	XX		XXX	XXX	XX	X	XX
Nag West	4	4	ID	AA	2.9	22%			XX		X	XXX	XXX	XX		X
Hundred-acre Cove NE	4	4	ID	AA	1.3	20%			X	XXX		XXX	XXX	XX		X
Stedman	4	4	ID	AA	3.3	20%			XX	X	X			XX		X
Barrington Beach	4	4	ID	AA	1.1	18%	X	X	XX	XXX	XX		X	XX		XX
Nag East	4	4	ID	AA	3.9	18%	X		XX	X	XX	XXX	XXX	XX	X	X
Watchemoket	4	2	MD	B	0.8	136%	XX	X		XXX	XX	XX	XX			XXX
Bissel Upper	4	2	MD	B	2.4	128%	X	XX	XX	XX	X	X	X	XX		XX
Brush Neck Cove	4	2	ID	A	3.2	114%				XXX		XX		X		XX
Old Mill Cove	4	2	MD	B	2.0	73%		X	X	XXX	XX	XXX	XXX	XX		X
Ninigret East	4	2	ID	A	4.4	63%			X	X		XX		X		XX
Coggeshall	4	2	ID	A	7.7	38%			XX	X		XXX	XXX	XX		X
Round Marsh	4	2	ID	A	11.7	37%	X		XX	X	X	X	X	XX		X
Mary Donovan	4	2	ID	A	5.4	15%	X		X	XXX	XX	XX	XXX	XX		X
Colt State Park	4	2	ID	A	8.2	39%	X		XXX	XX	X	XXX	XXX	XX	X	X
Dyer Island	4	1	LD	A	2.5	111%								XX		
Hog Island	4	1	LD	A	3.1	93%			XX	XX				X	X	X
Sheffield Cove	4	1	LD	A	1.5	92%	X		XX		XX	XXX				X
Chase Cove	4	1	LD	A	4.1	80%		X	XX	X	X	XX	XX	X		X
Quicksand Pond	4	1	LD	A	3.6	78%				XX						XX
Passeonquis	4	1	LD	A	2.3	75%	X		X	XXX				X	X	X
Pork Barrel	2	5	MD	A	0.8	18%	X		XX	XX	X	XX	XX	XX	X	X
Winnapaug	2	5	MD	A	0.0	0%	X		X	XX	X	XX		XX		X
HAC Islands	2	5	MD	A	0.0	0%			X			XXX	XXX	XX		X
Ninigret Control	2	5	MD	A	0.0	0%			XX			XX		XX		X
Mary's Creek	1	4	MD	B	0.0	0%	XXX		XX	XX	XXX	XXX	XX	XX		X
Avondale	3	3	ID	A	3.1	67%	XX	X	XX	XXX	XX	X		X		XX
Jenny	3	3	ID	A	3.8	30%			XXX		X	XXX			X	X
Island Road North	3	3	MD	B	0.4	29%	XXX			XXX	XX	XX		X		XX
Foddering Farm	3	3	ID	A	0.5	28%		X		X		XX	XXX	XX		X
Fox Hill	3	3	ID	A	3.9	25%	X		X		X	XX				X
Greens River	3	3	ID	A	0.4	18%			XX	XX	X	XXX	XX	XX		XX
Rumstick Point	3	3	ID	A	1.4	11%	X		XXX	XX	X	XXX	XXX	XX		XX
Kickemuit School	3	2	LD	A	2.6	63%			XX	XX	X	XX	XX	XX		XX
Common Fence Point S.	3	2	LD	A	2.2	37%			XX	XX		XX		XX		XX
Gulf Road	3	2	LD	A	0.5	37%			X	XXX	X	XX		XX		XX
Charlestown Beach	3	1	ID	B	1.9	136%	X		XX					X		XX
Providence Point	3	1	LD	B	2.5	53%			XX			X	X	X		X
Galilee Outer	2	2	ID	B	1.4	13%	XX		X		XXX	XXX		XX		X
Sakonnet Point	2	1	LD	B	1.7	60%	XX		XX	XX				XX		XX
Fogland Beach	2	1	LD	B	1.3	32%	XX			XX	X		X	XX		XX
Mill Creek	2	1	LD	B	1.4	29%			XX			XXX	XX			XX
Nausauket	1	3	ID	B	1.0	13%	X		XX				X	XX		XX
Jacob's Point Outer	1	3	LD	B	0.5	6%	XX		XX	XX	XX	XX	XX	XX		XX

5 = Highest Priority   4 = Higher Priority   3 = Moderate Priority   2 = Lower Priority   1 = Lowest Priority

Saltmarsh Restoration Priorities for the Saltmarsh Sparrow

Rhode Island

Last Updated May 10, 2024
Saltmarsh Sparrow: Ray Hennessy

Atlantic Coast Joint Venture (FWS) 2024

Saltmarsh Restoration Priorities | Rhode Island

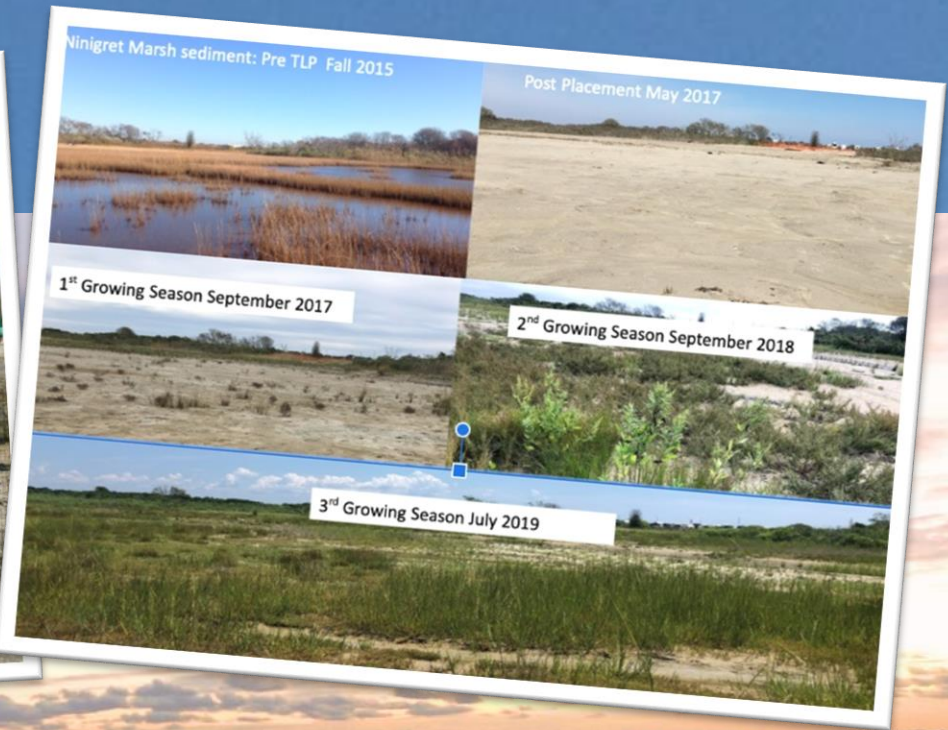## Succotash Marsh Management Area - 99 acres (40 ha)

Marsh RAM Assessment Data
- Elevation: Low (0.30 NAVD88)
- Disturbance: High
- Index of Marsh Integrity: Most Degraded (5.3)
- Migration Potential: Highest Priority
- High quality high marsh – estimated at 6.2% currently (6 acres)
- Estimated marsh loss = 23.6% (High) between 1972 and 2020

Existing Sparrow Data
Saltmarsh Sparrow detected at this site, breeding has not been confirmed. The vast majority of sparrows occur on the west side (Potter Pond). RIDEM conducted marsh wide EPA walking transects here in 2022. Contact Sam Miller from RIDEM for more information.

Informed Restoration Efforts

Ninigret Marsh sediment: Pre TLP Fall 2015

Post Placement May 2017

1st Growing Season September 2017

2nd Growing Season September 2018

3rd Growing Season July 2019

RI CRMC

Assessing Restoration Outcomes

Journal of Environmental Management 338 (2023) 117832

Contents lists available at ScienceDirect

Journal of Environmental Management

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

Research article

Assessing long-term outcomes of tidal restoration in New England salt marshes

Thomas E. Kutcher [a,*], Kenneth B. Raposa [b]

[a] Rhode Island Natural History Survey, University of Rhode Island, Kingston, RI, USA
[b] Narragansett Bay National Estuarine Research Reserve, Prudence Island, RI, USA

Laying it on thick: Ecosystem effects of sediment placement on a microtidal Rhode Island salt marsh

Kenneth B. Raposa[1]*, Michael Bradley[2], Caitlin Chaffee[1], Nick Ernst[3], Wenley Ferguson[4], Thomas E. Kutcher[5], Richard A. McKinney[6], Kenneth M. Miller[7], Scott Rasmussen[8], Elizabeth Tymkiw[9] and Cathleen Wigand[6]

[1]RI Department of Environmental Management, Narragansett Bay National Estuarine Research Reserve, Prudence Island, RI, United States, [2]Department of Natural Resources Science, University of Rhode Island, Kingston, RI, United States, [3]U.S. Fish and Wildlife Service, Department of Interior, Rhode Island National Wildlife Refuge Complex, Charlestown, RI, United States, [4]Save The Bay, Providence, RI, United States, [5]Rhode Island Natural History Survey, Kingston, RI, United States, [6]Atlantic Coastal Environmental Sciences Division, U.S. Environmental Protection Agency, Narragansett, RI, United States, [7]General Dynamics Information Technology, Falls Church, VA, United States, [8]Northeast Coastal and Barrier Network, National Park Service, University of RI, Kingston, RI, United States, [9]Department of Entomology and Wildlife Ecology, University of Delaware, Newark, DE, United States
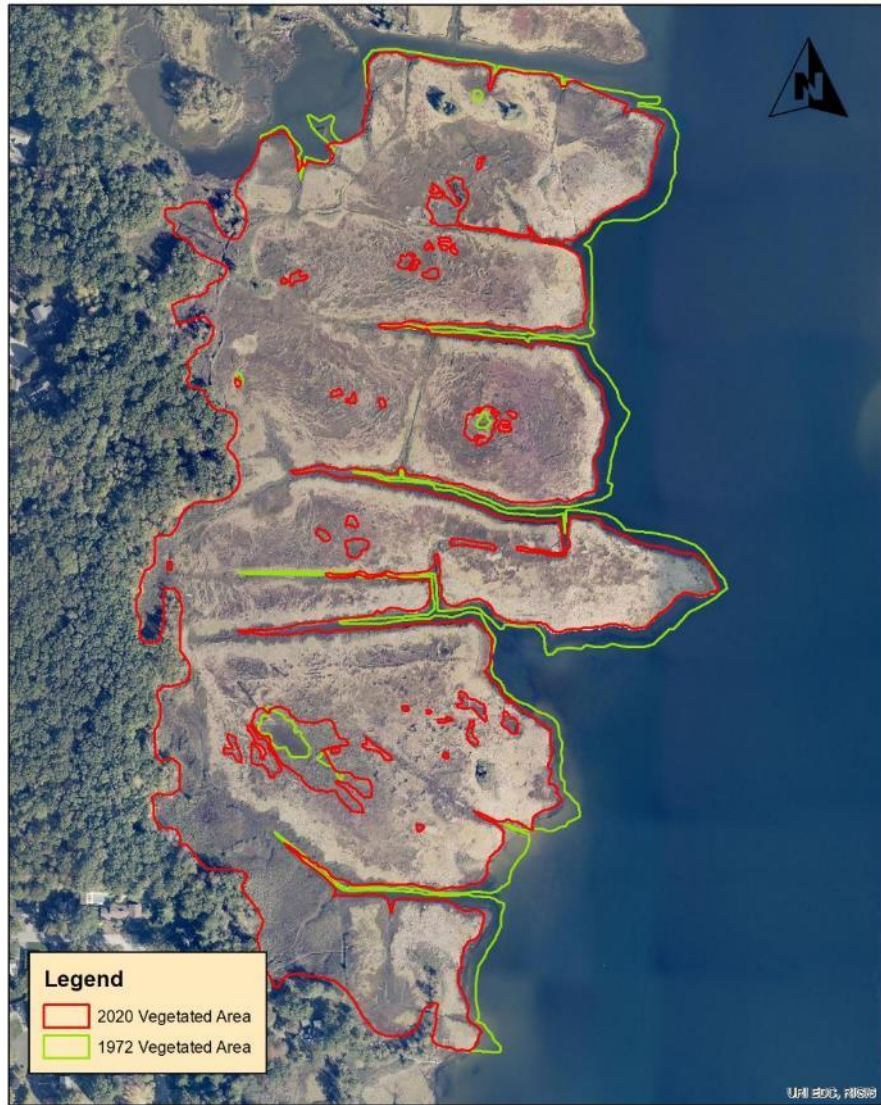
Heightened recognition of impacts to coastal salt marshes from sea-level rise has led to expanding interest in using thin-layer sediment placement (TLP) as an adaptation tool to enhance future marsh resilience. Building on successes and lessons learned from the Gulf and southeast U.S. coasts, projects are now underway in other regions, including New England where the effects of TLP on marsh ecosystems and processes are less clear. In this study, we report on early responses of a drowning, microtidal Rhode Island marsh (Ninigret Marsh, Charlestown, RI) to the application of a thick (10–48 cm) application of sandy

	DUCK	GOOS	JAIN	POTT	SAMI	SILV	WALK	ALL	Control
Unadjusted									
I. frutescens	0.0	0.0	28.1	-1.1	37.6	12.2	0.3	6.8	-2.8
S. alterniflora	34.2	-4.2	10.9	13.7	8.3	11.5	48.6	20.7	3.1
S. patens	7.3	-13.4	-27.8	-19.6	32.9	-10.5	-0.2	-7.8	-30.5
P. australis	-47.5	3.8	-34.0	-12.1	-3.6	0.8	-0.9	-14.9	0.4
Bare	34.0	2.5	11.9	24.5	-33.8	NA	-44.4	1.2	15.9
Magnitude	20.6	-9.0	14.7	-8.5	45.0	3.6	38.9	13.4	-18.2
Adjusted for Control*									
I. frutescens	1.3	4.3	32.4	0.3	38.9	16.5	4.6	9.6	
S. alterniflora	21.8	1.9	17.0	1.3	-4.1	17.6	54.7	17.6	
S. patens	47.0	7.9	-6.5	20.2	72.6	10.8	21.1	22.7	
P. australis	-47.9	3.4	-34.3	-12.5	-4.0	0.4	-1.3	-15.2	
Bare	14.8	-10.2	-0.8	5.4	-53.0	NA	-57.2	-14.7	
Magnitude	51.6	10.4	39.0	14.4	82.2	22.2	69.4	39.9	

indicators, when adjusted for the Control marsh. Considering the low sample size ($n = 7$), there was modest evidence that the aggregate adjusted *magnitude* of net vegetation recovery per marsh (Table 2) was correlated with the age of the restoration (Pearson, $r = 0.62$, $p = 0.136$), the number of restoration activities ($r = 0.62$, $p = 0.134$), and the timespan of restoration activities ($r = 0.58$, $p = 0.174$) (Table 1), although none of these findings were significant at $\alpha = 0.05$.

Reference Marshes
Upper Quartile (6.9-8.0)
Interquartile (5.5-6.9)
Lower Quartile (4.4-5.5)

Control Marsh
Coggeshall (6.1)

Restoration Marshes
SAMI (7.8)
GAIN (6.6)
POTT (5.9)
SILV (5.6)
WALK (4.9)
JAIN (4.9)
DUCK (4.5)
GOOS (3.2)

Legend: Salt Shrub, Brackish Marsh Native, Meadow High marsh, Low Marsh, Natural Panne, Natural Pool, Natural Creek, Mixed High Marsh, Sa High Marsh, Bare sediments, Dieoff Bare Depression, Ditch, Phragmites, Dieback Denuded Peat

Retrospective Change Analysis 1972-2020
Across 51 Marshes

Legend
2020 Vegetated Area
1972 Vegetated Area
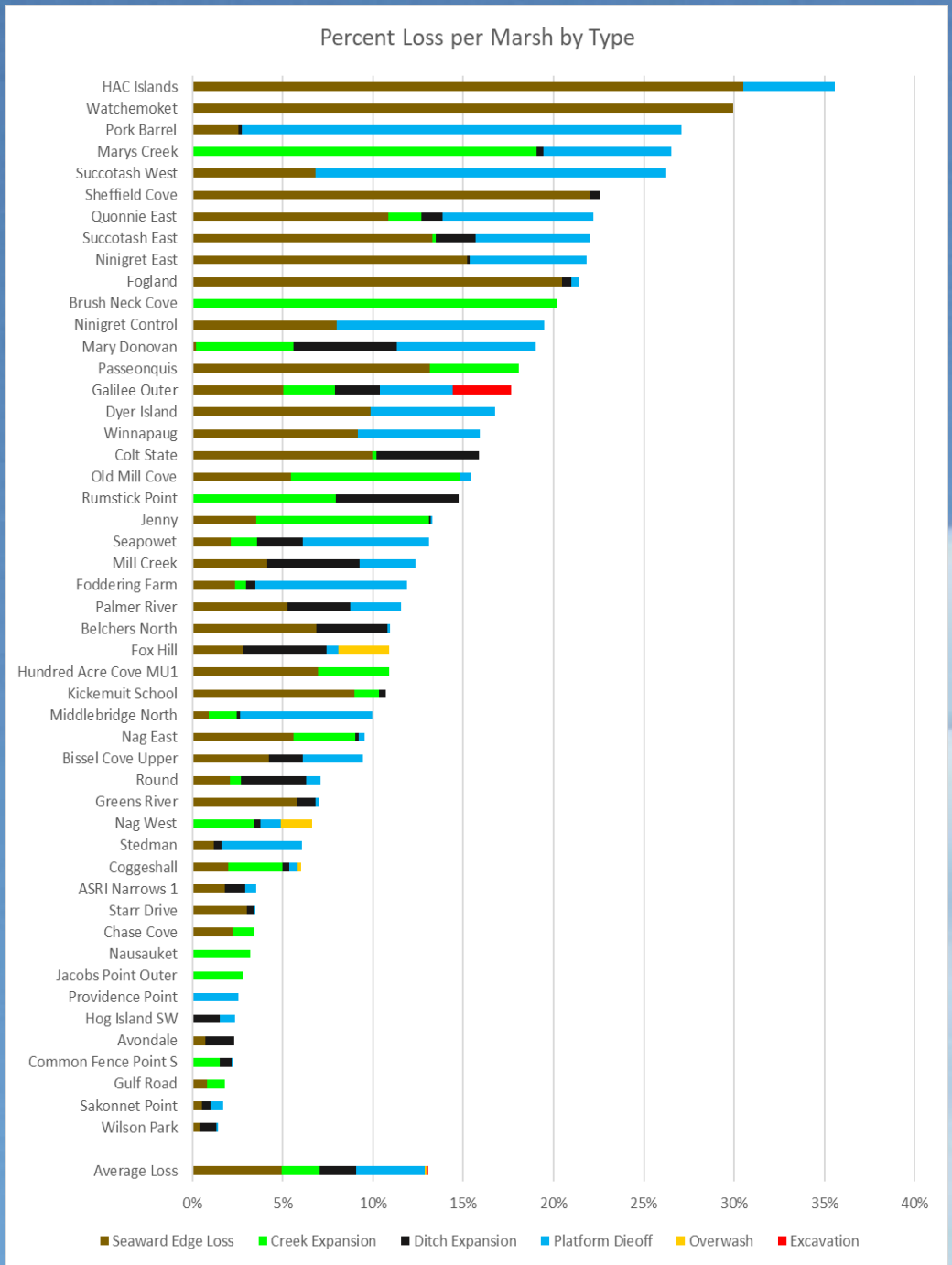
Johannis Farm

Hundred Acre Cove Islands

Retrospective Change Analysis Results
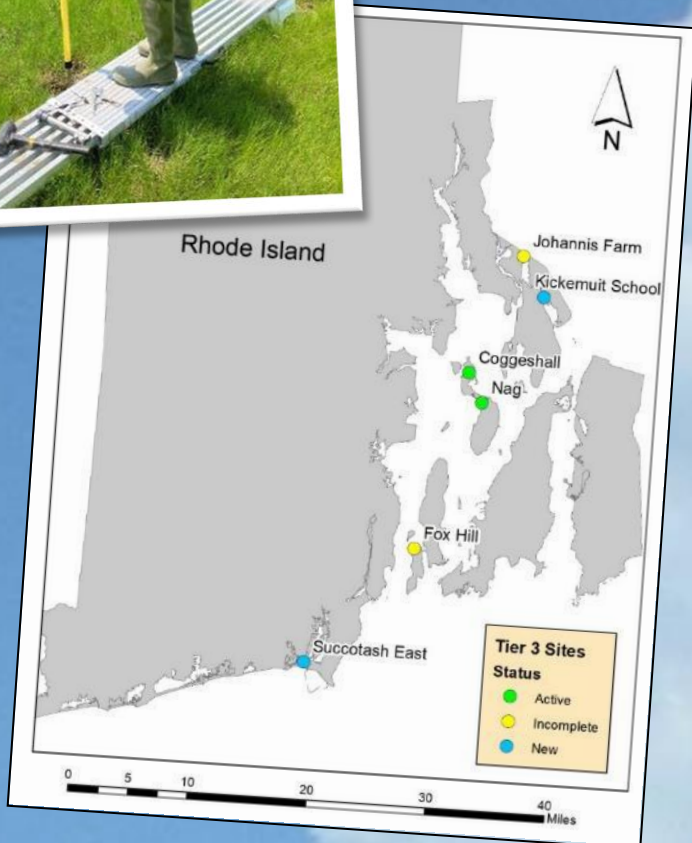
Net loss   **11.8%**
Minimum   -0.67%
Maximum   33.7%
Total Acres   146

Loss Categories
Seaward Edge   38%
Platform Dieoff   29%
Creek Expansion   16%
Ditch Expansion   16%
Overwash   0.8%
Excavation   0.5%

Percent Loss per Marsh by Type

Expansion of Salt Marsh Long-term Monitoring

Legend
- Benchmarks
- Tier_3_SETs
- T3 GW Wells
- T3_EdgeEco_Sta
- T3_Nekton_Sta
- T3_Veg_Plots
- MarshRAM_Trans

Ribbed Mussels
Crab Burrows
Bird Points

Rhode Island

Johannis Farm
Kickemuit School
Coggeshall
Nag.
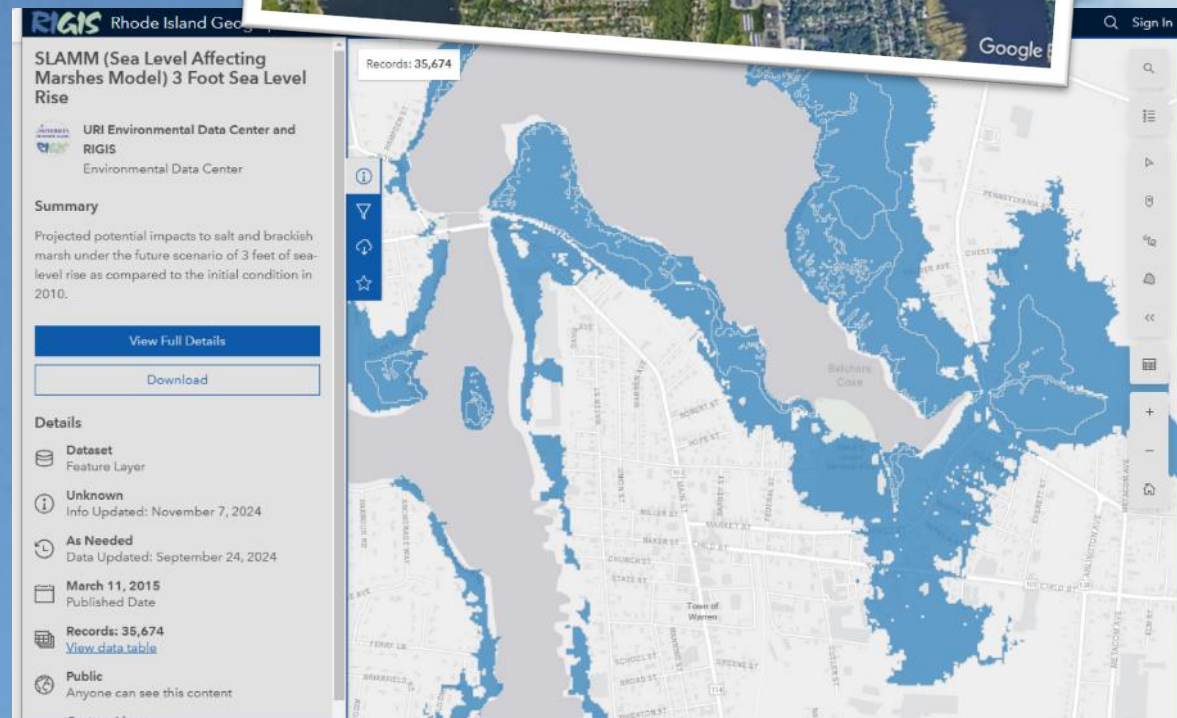Fox Hill
Succotash East

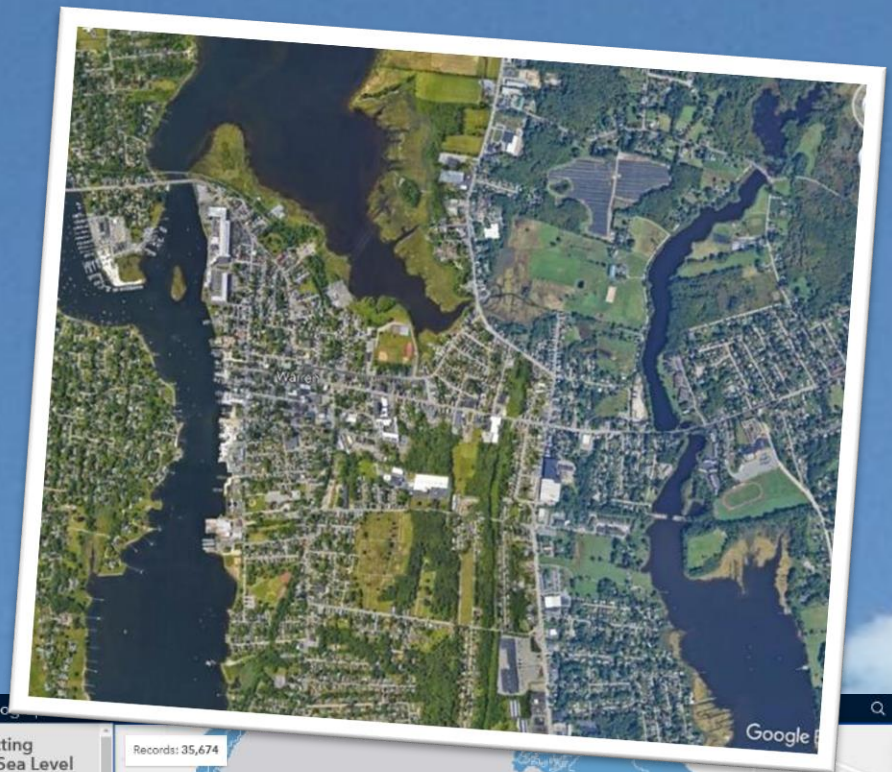Tier 3 Sites Status
- Active
- Incomplete
- New

Edge and Ecotone Monitoring

Upcoming Work

- Characterizing salt marshes in underserved communities

- Salt-marsh migration potential at the site level

For more information visit:

https://www.nbep.org/salt-marsh-ramp

Or contact me:

Tom Kutcher

Wetlands Scientist

Rhode Island Natural History Survey

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