Wetland Monitoring, Assessment, and Restoration Program Development in Rhode Island 2018

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Wetlands Scientist

RI Natural History Survey

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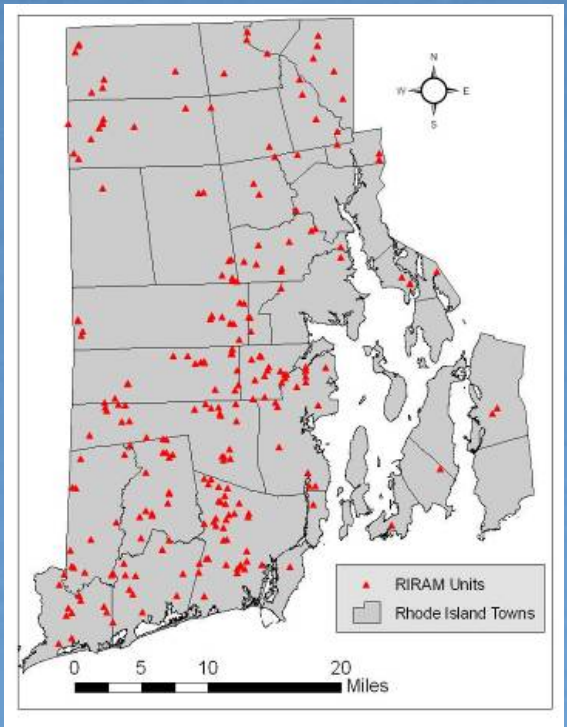
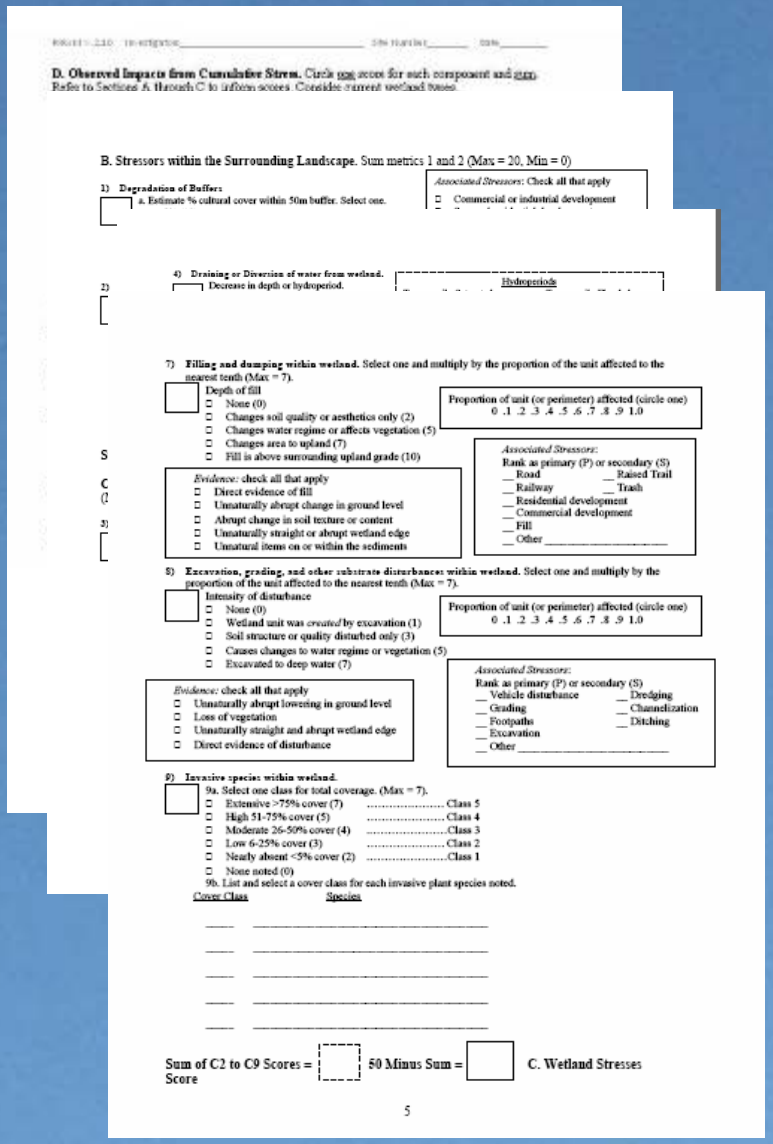
Background
Focus on Freshwater Wetland Assessment

- 2006 Wetland Monitoring and Assessment Plan
- Developed Level 2 Rapid Assessment Method
- Developed Landscape (L1) and Intensive (L3) Methods
- Developed across >300 sites over 9 field seasons



Rhode Island Rapid Assessment Method (RIRAM) Level 2



D. Observed Impacts from Cumulative Stress. Circle one score for each component and sum.
Refer to Sections A through C to inform scores. Consider current wetland biases.

B. Stressors within the Surrounding Landscape. Sum metrics 1 and 2 (Max = 20, Min = 0)

1) **Degradation of Buffers**
a. Estimate % cultural cover within 50m buffer. Select one.

Associated Stressors: Check all that apply
- ☐ Commercial or industrial development

4) **Draining or Diversion of water from wetland.**
Decrease in depth or hydroperiod.

Hydroperiods

7) **Filling and dumping within wetland.** Select one and multiply by the proportion of the unit affected to the nearest tenth (Max = 7).

Depth of fill
- ☐ None (0)
- ☐ Changes soil quality or aesthetics only (2)
- ☐ Changes water regime or affects vegetation (5)
- ☐ Changes area to upland (7)
- ☐ Fill is above surrounding upland grade (10)

Proportion of unit (or perimeter) affected (circle one)
0 .1 .2 .3 .4 .5 .6 .7 .8 .9 1.0

Evidence: check all that apply
- ☐ Direct evidence of fill
- ☐ Unnaturally abrupt change in ground level
- ☐ Abrupt change in soil texture or content
- ☐ Unnaturally straight or abrupt wetland edge
- ☐ Unnatural items on or within the sediments

Associated Stressors:
Rank as primary (P) or secondary (S)
- __ Road
- __ Raised Trail
- __ Railway
- __ Trash
- __ Residential development
- __ Commercial development
- __ Fill
- __ Other _____

8) **Excavation, grading, and other substrate disturbances within wetland.** Select one and multiply by the proportion of the unit affected to the nearest tenth (Max = 7).

Intensity of disturbance
- ☐ None (0)
- ☐ Wetland unit was *created* by excavation (1)
- ☐ Soil structure or quality disturbed only (3)
- ☐ Causes changes to water regime or vegetation (5)
- ☐ Excavated to deep water (7)

Proportion of unit (or perimeter) affected (circle one)
0 .1 .2 .3 .4 .5 .6 .7 .8 .9 1.0

Evidence: check all that apply
- ☐ Unnaturally abrupt lowering in ground level
- ☐ Loss of vegetation
- ☐ Unnaturally straight and abrupt wetland edge
- ☐ Direct evidence of disturbance

Associated Stressors:
Rank as primary (P) or secondary (S)
- __ Vehicle disturbance
- __ Dredging
- __ Grading
- __ Channelization
- __ Footpaths
- __ Ditching
- __ Excavation
- __ Other _____

9) **Invasive species within wetland.**
9a. Select one class for total coverage. (Max = 7).
- ☐ Extensive >75% cover (7) ..... Class 5
- ☐ High 51-75% cover (5) ..... Class 4
- ☐ Moderate 26-50% cover (4) ..... Class 3
- ☐ Low 6-25% cover (3) ..... Class 2
- ☐ Nearly absent <5% cover (2) ..... Class 1
- ☐ None noted (0)

9b. List and select a cover class for each invasive plant species noted.

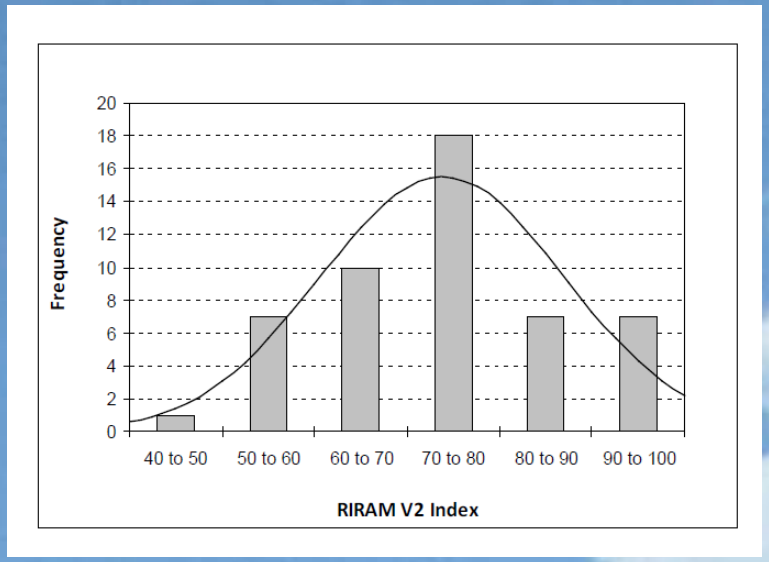
Cover Class | Species

____ _____
____ _____
____ _____
____ _____
____ _____

Sum of C2 to C9 Scores = ☐ 50 Minus Sum = ☐ C. Wetland Stresses Score

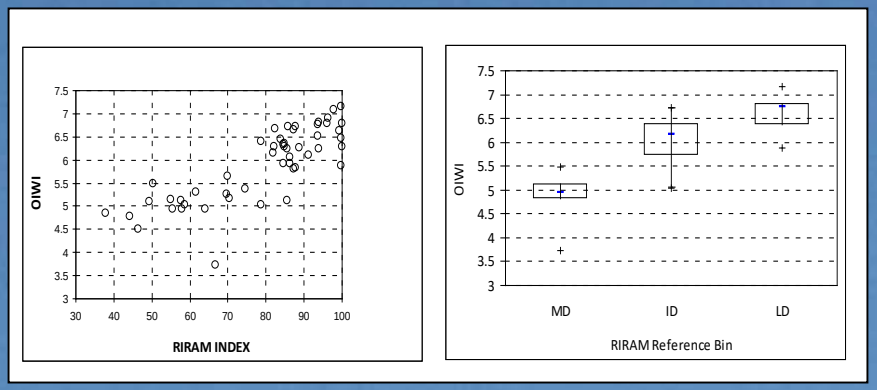
5

- Expressly characterizes relative condition (not Fs & Vs)
- Meets recommended criteria for establishing reference conditions
- Generates a value that can be used to categorize sites by condition

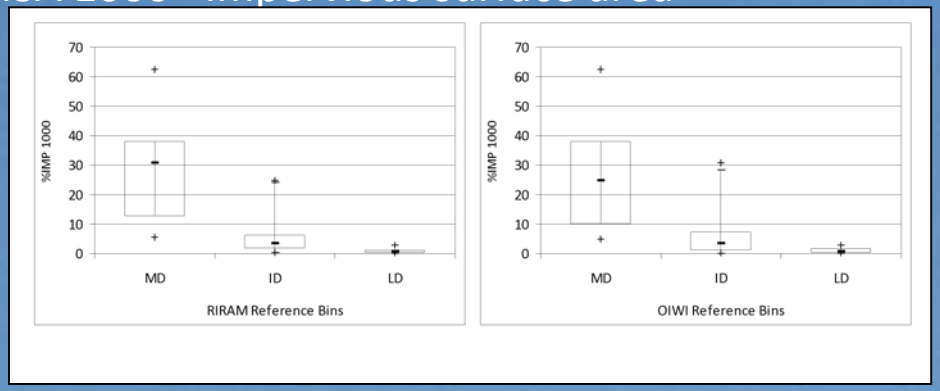


In 2010, we began developing and validating biological (L3) and landscape (L1) indicators

- Odonata Index of Wetland Integrity (*OIWI*)

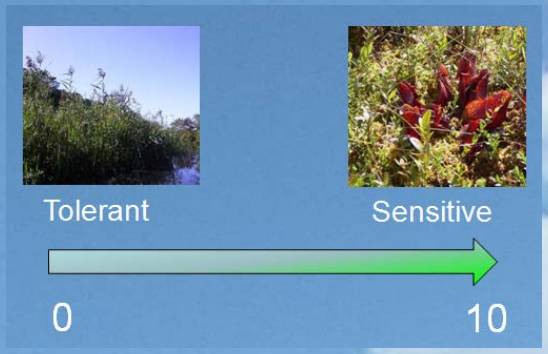


- ISA 1000' Impervious surface area



- Floristic Quality Assessment (FQA)

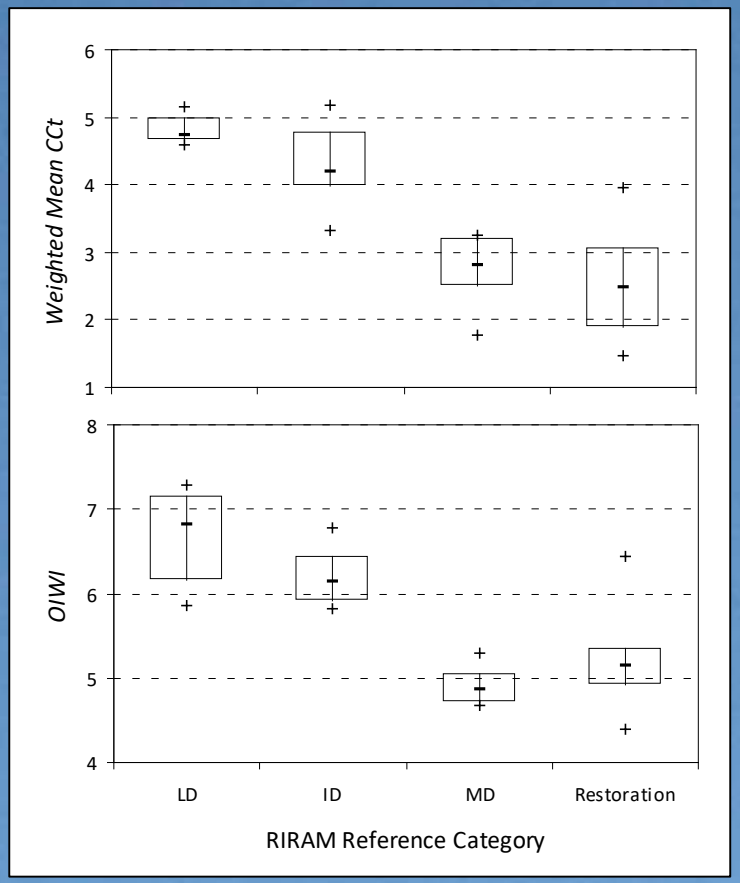
	OIWI 187	RIRAM	%ISA
FQAI	0.24	-0.08	-0.09 NS
MCCn	0.75	0.70	-0.70
MCC	0.82	0.81	-0.84
WMCC	0.82	0.85	-0.86
%N	0.81	0.89	-0.89
WMCC 2+3	0.79	0.83	-0.82



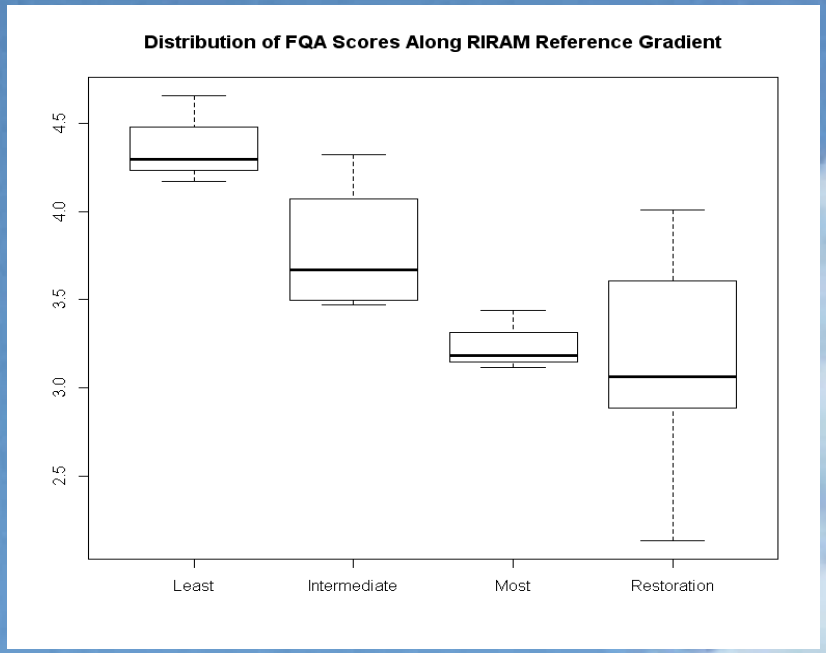
2011 and 2013 Applied RIRAM and FQA to wetland units restored from (1) filling or (2) clearing

Supports proactive restoration

Found FQA to indicate restoration condition in both types



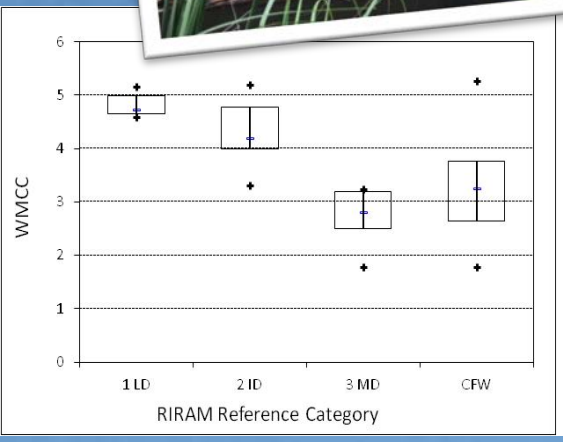
1. Kutcher (2012)

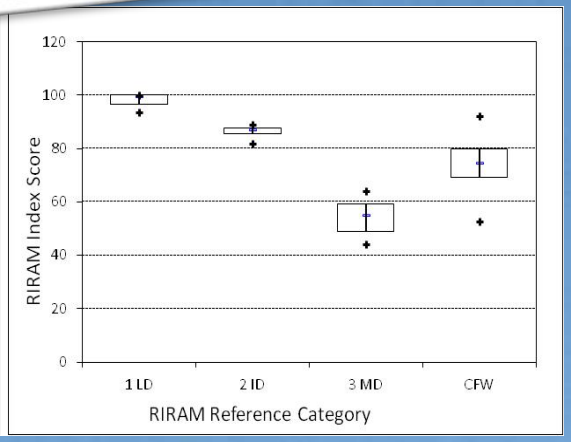


2. Peach-Lang (2014)

Freshwater wetlands near the coast

- Looked at 16 wetlands last year with RIRAM and FQA
- RIRAM modified to reflect evidence of climate change factors
- Subject to many of the same factors as inland FW wetlands
- Higher presence and cover of PHAU at coastal sites, particularly those subject to salt intrusion or coastal overwash
- FQA not consistent across fresh and brackish systems

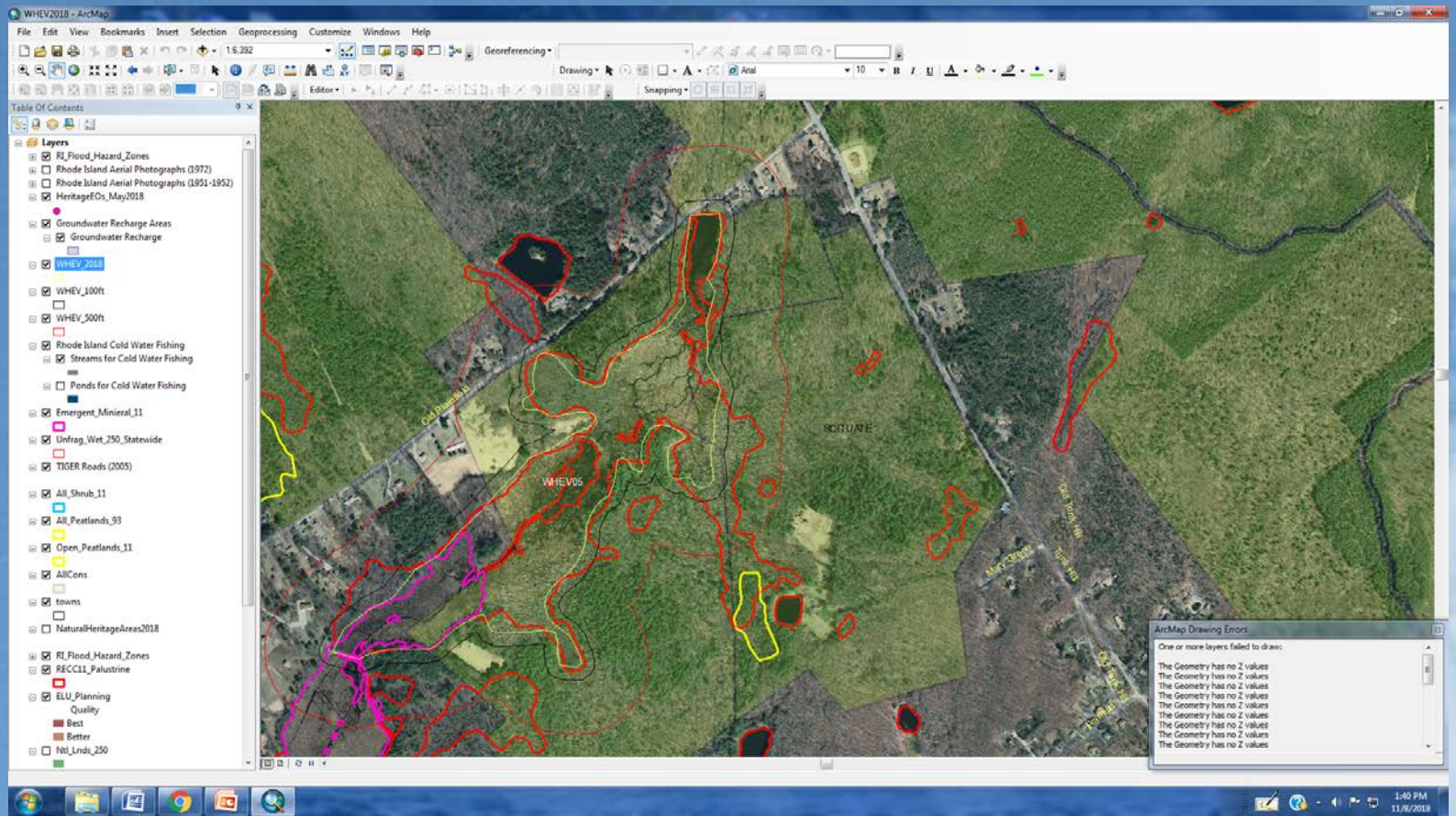




"Coastal managers should therefore strongly consider the insidious threat of *Phragmites* invasion into coastal freshwater wetlands in all decisions regarding coastal development, coastal restoration, and climate change response."

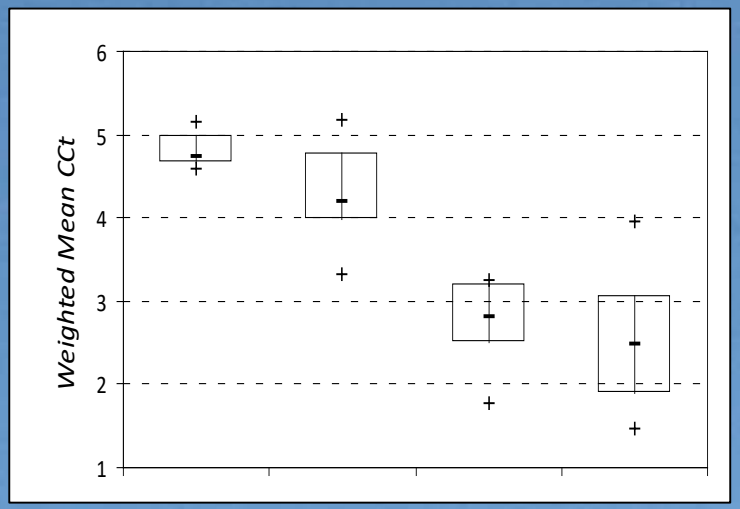
Freshwater Wetlands of High Ecological Value

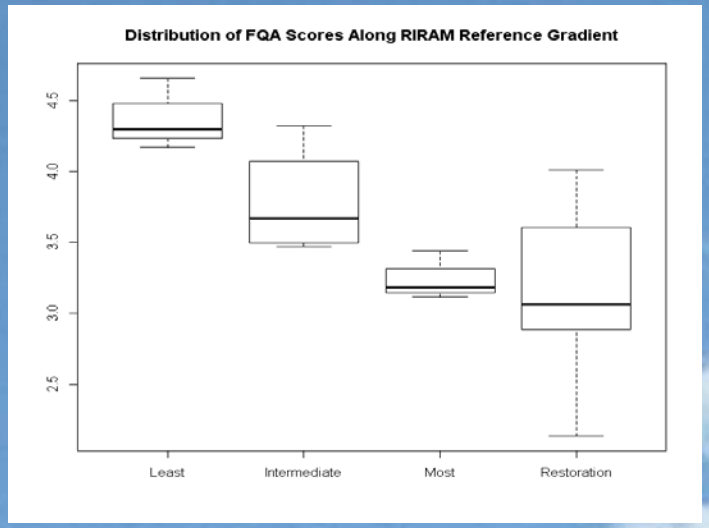
- Drafted protocol with state, federal, and academic partners
  - Size, fragmentation, uniqueness, diversity, support of wildlife, setting, etc.
- Developed a statewide GIS dataset of unfragmented wetlands
- The protocol and datasets will support State watershed planning
- Assessed 20 WHEV in 2018, data are still being processed



Building out a reference gradient for freshwater wetlands

- Setting RIRAM and FQA index values for least disturbed wetlands (10 sites)
- Testing FQA across unique wetland types (20 peat wetlands next year)
- Testing for affects of private versus public ownership using RIRAM





In 2016 we incorporated coastal wetlands

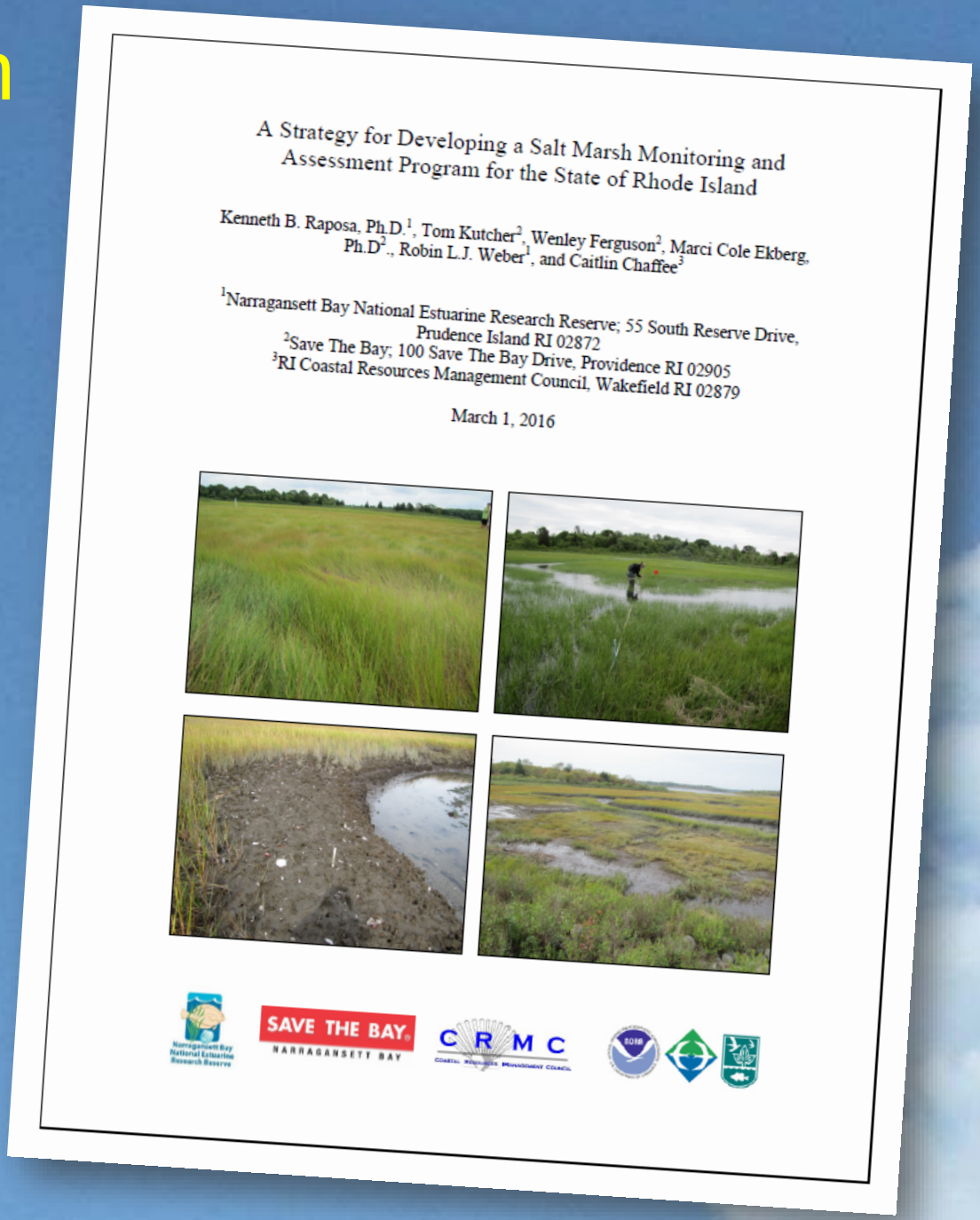
monitoring, assessment, and restoration planning

2016 Salt Marsh Monitoring and Assessment Strategy

Three level approach

- Landscape
- Rapid Assessment
- Intensive

Fairly detailed / prescriptive



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]

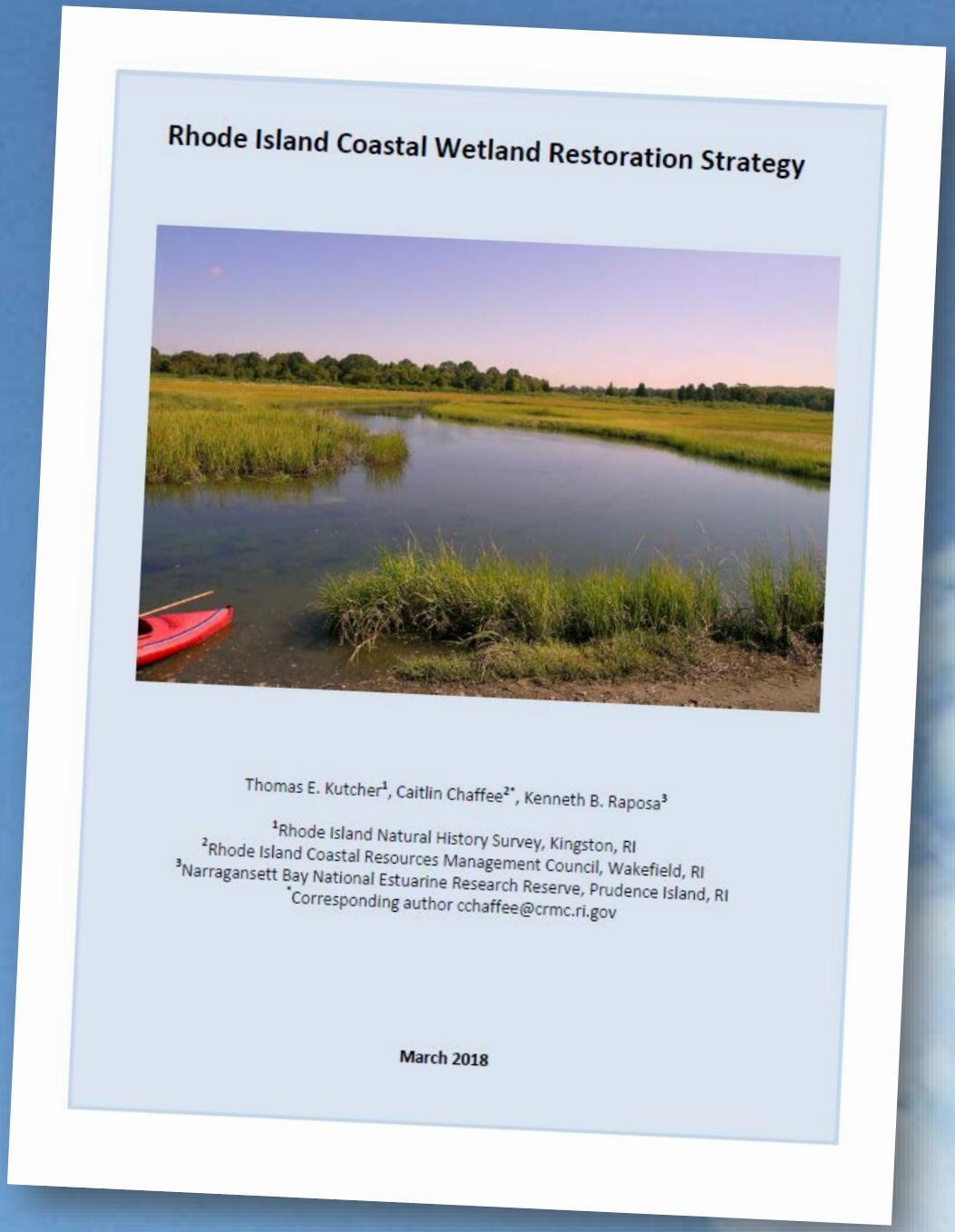
[1]Narragansett Bay National Estuarine Research Reserve; 55 South Reserve Drive, Prudence Island RI 02872
[2]Save The Bay; 100 Save The Bay Drive, Providence RI 02905
[3]RI Coastal Resources Management Council, Wakefield RI 02879

March 1, 2016

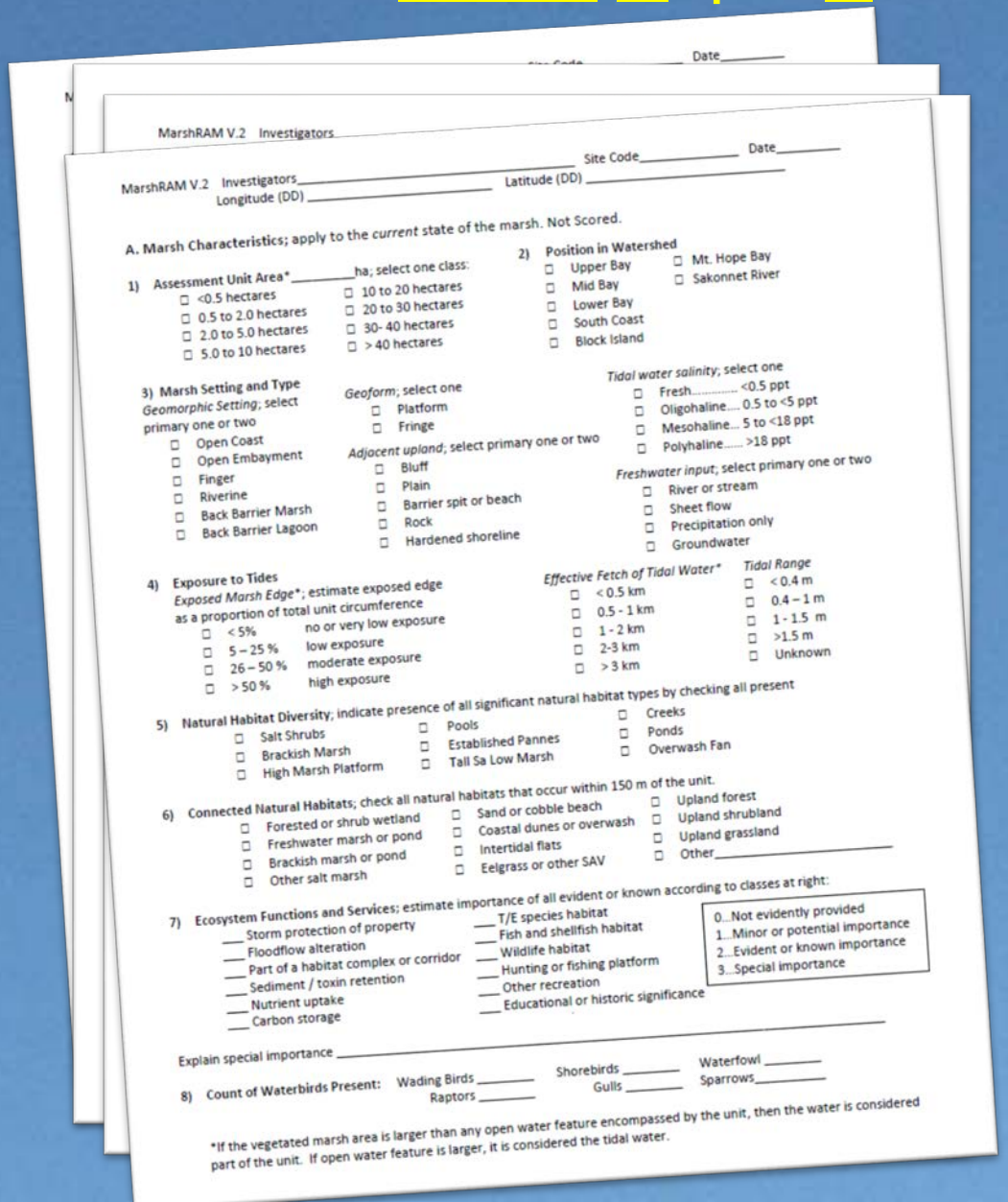
2018 Coastal Wetlands Restoration Strategy

Recommends:

- Systematic approach
- Regional F&V
- Broader Ecological Interventions



MarshRAM
Salt Marsh Rapid Assessment Method



MarshRAM V.2 Investigators _____ Site Code _____ Date _____

Longitude (DD) _____ Latitude (DD) _____

A. Marsh Characteristics; apply to the *current* state of the marsh. Not Scored.

1) Assessment Unit Area* _____ ha; select one class:

- ☐ <0.5 hectares
- ☐ 0.5 to 2.0 hectares
- ☐ 2.0 to 5.0 hectares
- ☐ 5.0 to 10 hectares
- ☐ 10 to 20 hectares
- ☐ 20 to 30 hectares
- ☐ 30- 40 hectares
- ☐ > 40 hectares

2) Position in Watershed

- ☐ Upper Bay
- ☐ Mid Bay
- ☐ Lower Bay
- ☐ South Coast
- ☐ Block Island
- ☐ Mt. Hope Bay
- ☐ Sakonnet River

3) Marsh Setting and Type

Geomorphic Setting; select primary one or two

- ☐ Open Coast
- ☐ Open Embayment
- ☐ Finger
- ☐ Riverine
- ☐ Back Barrier Marsh
- ☐ Back Barrier Lagoon

Geoform; select one

- ☐ Platform
- ☐ Fringe

Adjacent upland; select primary one or two

- ☐ Bluff
- ☐ Plain
- ☐ Barrier spit or beach
- ☐ Rock
- ☐ Hardened shoreline

Tidal water salinity; select one

- ☐ Fresh..... <0.5 ppt
- ☐ Oligohaline.... 0.5 to <5 ppt
- ☐ Mesohaline... 5 to <18 ppt
- ☐ Polyhaline..... >18 ppt

Freshwater input; select primary one or two

- ☐ River or stream
- ☐ Sheet flow
- ☐ Precipitation only
- ☐ Groundwater

4) Exposure to Tides

*Exposed Marsh Edge**; estimate exposed edge as a proportion of total unit circumference

- ☐ < 5% no or very low exposure
- ☐ 5 – 25 % low exposure
- ☐ 26 – 50 % moderate exposure
- ☐ > 50 % high exposure

*Effective Fetch of Tidal Water**

- ☐ < 0.5 km
- ☐ 0.5 - 1 km
- ☐ 1 - 2 km
- ☐ 2-3 km
- ☐ > 3 km

Tidal Range

- ☐ < 0.4 m
- ☐ 0.4 – 1 m
- ☐ 1 - 1.5 m
- ☐ >1.5 m
- ☐ Unknown

5) Natural Habitat Diversity; indicate presence of all significant natural habitat types by checking all present

- ☐ Salt Shrubs
- ☐ Brackish Marsh
- ☐ High Marsh Platform
- ☐ Pools
- ☐ Established Pannes
- ☐ Tall Sa Low Marsh
- ☐ Creeks
- ☐ Ponds
- ☐ Overwash Fan

6) Connected Natural Habitats; check all natural habitats that occur within 150 m of the unit.

- ☐ Forested or shrub wetland
- ☐ Freshwater marsh or pond
- ☐ Brackish marsh or pond
- ☐ Other salt marsh
- ☐ Sand or cobble beach
- ☐ Coastal dunes or overwash
- ☐ Intertidal flats
- ☐ Eelgrass or other SAV
- ☐ Upland forest
- ☐ Upland shrubland
- ☐ Upland grassland
- ☐ Other _____

7) Ecosystem Functions and Services; estimate importance of all evident or known according to classes at right:

- ___ Storm protection of property
- ___ Floodflow alteration
- ___ Part of a habitat complex or corridor
- ___ Sediment / toxin retention
- ___ Nutrient uptake
- ___ Carbon storage
- ___ T/E species habitat
- ___ Fish and shellfish habitat
- ___ Wildlife habitat
- ___ Hunting or fishing platform
- ___ Other recreation
- ___ Educational or historic significance

0...Not evidently provided
1...Minor or potential importance
2...Evident or known importance
3...Special importance

Explain special importance _____

8) Count of Waterbirds Present: Wading Birds _____ Raptors _____ Shorebirds _____ Gulls _____ Waterfowl _____ Sparrows _____

*If the vegetated marsh area is larger than any open water feature encompassed by the unit, then the water is considered part of the unit. If open water feature is larger, it is considered the tidal water.

Based on NERAM, RIRAM, RISMA

- Characteristics and classification
- Perceived functions and values
- Water bird tallies
- Landscape condition, LDI-based
- In-wetland stresses and condition
- Vegetation indicator of integrity
- Rapid Marsh Migration Metric

MarshRAM: Index of Marsh Integrity (IMI)

MarshRAM V.2 Investigators______________ Site Code__________ Date________

D. Marsh Community Composition and Index of Marsh Integrity. Walking straight and evenly along each of 8 transects, tally every step traversing the listed community types.

Zone	T1		T2	
Salt Shrub				
Brackish Marsh Native				
Phragmites				
Meadow High Marsh				
Mixed High Marsh				
Sa High Marsh				
Dieoff Bare Depression				
Low Marsh				
Dieback Denuded Peat				
Natural Panne				
Natural Pool				
Natural Creek				

	CCI	Total Tally	CCI X TT	% Cover*
Salt Shrub	9			
Brackish Marsh Native	10			
Phragmites	3			
Meadow High Marsh	10			
Mixed High Marsh	7			
Sa High Marsh	5			
Dieoff Bare Depression	1			
Low Marsh	8			
Dieback Denuded Peat	0			
Natural Panne	8			
Natural Pool	6			
Natural Creek	8			
Ditch	2			
Bare Sediments	4			
	Sums:			

D. Index of Marsh Integrity

$$= \frac{\text{Sum (CCI X TT)}}{\text{Sum (Total Tally)}}$$

= ☐

Marsh Community Composition:

*For each cover type, % Cover = $\frac{\text{Total Tally}}{\text{Sum (Total Tally)}}$

MarshRAM Supports Prioritization for Restoration, Conservation, Management

Site	Watchemoket	Succotash	Mary's Creek	Jenny	Nausauket	Round Marsh	Rocky Hill	Mary Donovan	Mill Creek	Providence Point	Sheffield Cove
IMI Category	MD	MD	MD	ID	ID	ID	ID	ID	LD	LD	LD
Functions and Values	B	AA	B	A	A	AA	AA	A	B	A	A
Migration Potential	2.2	2.4	0.6	2.2	2.6	4.8	4.4	1.8	3.0	3.2	3.9
Conservation Area (ha)	0.4	3.2	0.0	1.6	1.1	8.5	3.3	1.8	1.0	1.7	0.8
Conservation Ratio	66%	8%	0%	12%	14%	27%	19%	5%	20%	34%	52%
Buffer Loss	XX	XX	XXX	XX	XX	XX	XX	XX			XX
Impoundment	X	X				X	XX				
Ditching		X	XX	XXX	XX	XX	X	X	XX	XX	XX
Nutrients	XXX	XX	XX		XX	XX	XX	XXX	X		
Fill	XX	XX	XXX	X		X	X	X			XX
Edge Erosion	XX	XX	XXX	XXX		XX	X	XX	XXX	X	XXX
Crab Burrows	XX	XXX	XXX	XXX	X	X	X	XXX	XX	X	
Die-off		X	XX		X	X	X	X		X	
Mowing / Soils			X	X			X	X			
Phragmites	XXX	X	X	X	XX	X	X	X	X	X	X

Level 3 Salt Marsh Monitoring
Long-Term Sentinel Sites

Tom, who has been mixing concrete to hold the stake in place, stands and stretches. This is hard physical work, and we are tired, wet, and filthy. He gazes out over the waving marsh grasses. "I grew up by the salt marsh. We could play football on the marsh in those days."

Tom concretes the stake into place, while Kenny spreads powdered rock called feldspar.

"You couldn't do that now," Kenny says matter-of-factly. We look down at the soggy peat below us. It ripples beneath us with each strike of the post hammer. "Especially here—this marsh is so degraded."

- Draws heavily from NERRS SWMP protocols
- 6 to 8 sentinel sites where long-term monitoring will occur
- Focused on SLR
  - 20+ Vegetation plots, cover, stem counts, biomass
  - 2-3 SETs
  - HOBO water level loggers
  - Soil sheer strength
  - Soil salinity
  - Nekton monitoring
  - Crab monitoring
  - Marsh Migration rate
  - Bird monitoring

Narragansett Bay
National Estuarine Research Reserve

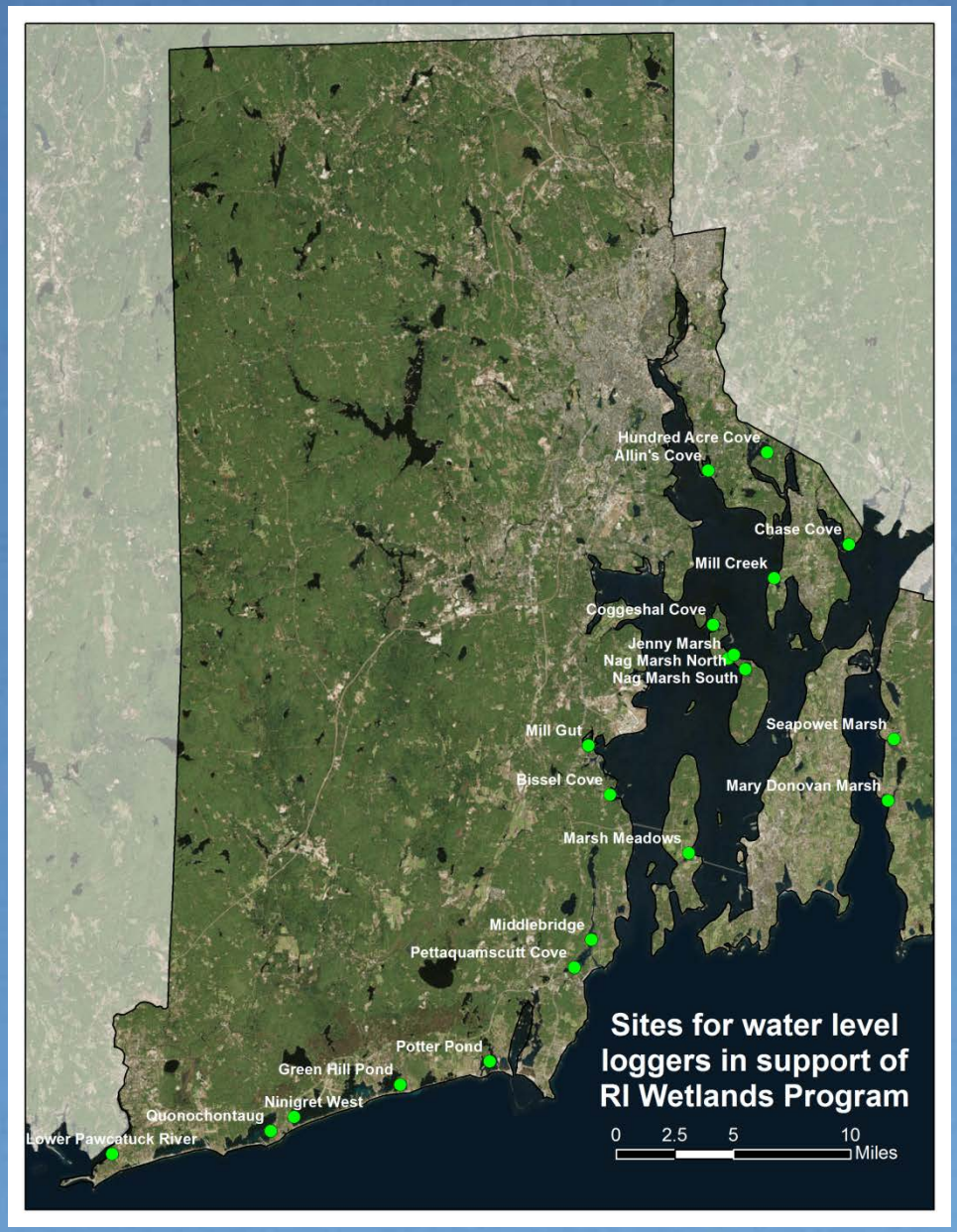
The Nature Conservancy
Protecting nature. Preserving life.

Level 1
Marsh Habitat Classification

Narragansett Bay
National Estuarine Research Reserve

- eCognition-based
- Overall Accuracy = 83%

Other Coastal Wetlands Work



- Collecting tide frame data at 20 sub-embayments, supports prioritization

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- Development of restoration monitoring for salt marshes
  - Looking at 8-12 mature restoration projects using new and existing tools

CRMC
COASTAL RESOURCES MANAGEMENT COUNCIL

RHODE ISLAND NATURAL HISTORY SURVEY
Providing Ecosystem Science and Information

Narragansett Bay National Estuarine Research Reserve

Goal: Program that builds partnerships and pursues standardization of data and protocols in the state, and beyond

For more information visit:

http://www.dem.ri.gov/programs/water/wetlands/monitoring.php

http://www.crmc.ri.gov/habitatrestoration.html

Or contact me:

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Thanks