

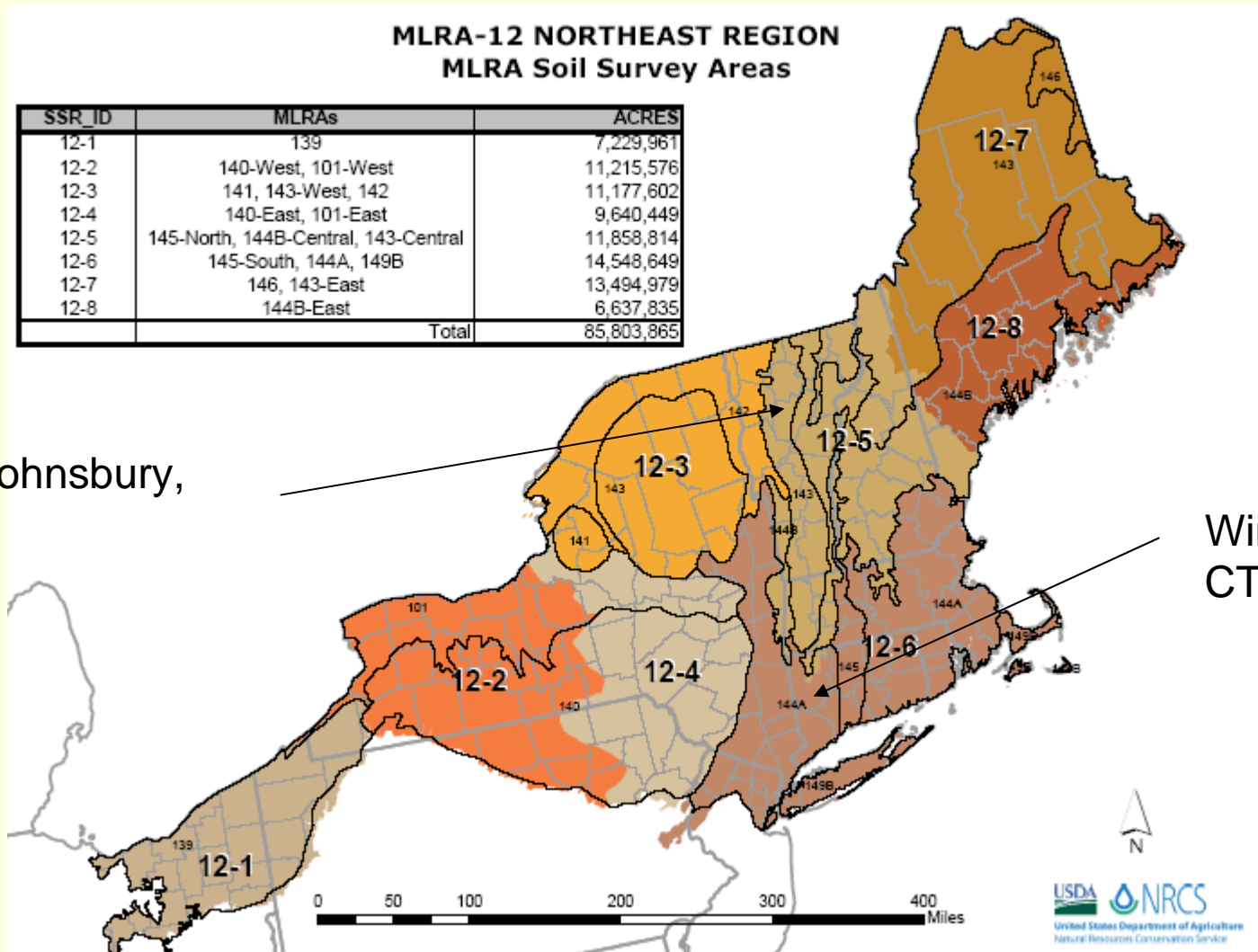


NCSS Soil Survey Updates & Intro to Coastal Zone and Subaqueous Soil Data

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RI USDA NRCS

<http://nesoil.com/sas> and www.mapcoast.org

Soil Survey Reorganization by MLRA



Sources of Soils Data

State GIS Portals

- MassGIS, RIGIS, Magic.
- Benefits: Includes additional attribute info.
- Available in SPC projection so can be used with other data and imagery.
- Online Mapping.

NRCS “Official Data”

- Soil Data Mart – download site and online reports.
- Web Soil Survey – Online mapping and interpretive maps, custom soil survey reports.
- Data Gateway – download imagery, hydro, topos.

Hydric Soil Data

Hydric Soil List from SDM

- Provides a list of map units that have at least 1 component that meets the hydric criteria.
- List can change based on update soil data.

Hydric Soils					
State of Rhode Island: Bristol, Kent, Newport, Providence, and Washington Counties					
Map symbol and map unit name	Component	Percent of map unit	Landform	Hydric rating	Hydric criteria
Aa: Adrian muck	Adrian	90	Swamps	Yes	1, 4
	Carlisle	3	Swamps	Yes	1, 3, 4
	Ridgebury	2	Depressions, Drainageways	Yes	2B3
	Scarboro	2	Depressions, Drainageways, Terraces	Yes	2B3
	Whitman	2	Depressions, Drainageways	Yes	2B3
Ra: Pol	Raypol	1	Outwash plains	Yes	2B3
	Matunuck	1	Tidal marshes	Yes	2B2, 3
Bc: Birchwood sandy loam	Stissing	1	Depressions	Yes	2B3
Co: Carlisle muck	Carlisle	90	Swamps	Yes	1, 3, 4
	Adrian	3	Swamps	Yes	1, 4
	Scarboro	2	Depressions, Drainageways,	Yes	2B3

Please select the map units that you would like to report on:

Map Unit Symbol	Map Unit Name
<input type="checkbox"/>	Aa Adrian muck
<input type="checkbox"/>	AFA Agawam fine sandy loam, 0 to 3 percent slopes
<input type="checkbox"/>	AFB Agawam fine sandy loam, 3 to 8 percent slopes
<input type="checkbox"/>	Ba Beaches
<input type="checkbox"/>	Bc Birchwood sandy loam
<input type="checkbox"/>	BHA Bridgehampton silt loam, 0 to 3 percent slopes
<input type="checkbox"/>	BHB Bridgehampton silt loam, 3 to 8 percent slopes
<input type="checkbox"/>	BmA Bridgehampton silt loam, till substratum, 0 to 3 percent slopes
<input type="checkbox"/>	BmB Bridgehampton silt loam, till substratum, 3 to 8 percent slopes
<input type="checkbox"/>	BnB Bridgehampton-Charlton complex, very stony, 0 to 8 percent slopes
<input type="checkbox"/>	BnC Bridgehampton-Charlton complex, very stony, 8 to 15 percent slopes
<input type="checkbox"/>	BoC Bridgehampton-Charlton complex, extremely stony, 3 to 15 percent slopes
<input type="checkbox"/>	BrA Broadbrook silt loam, 0 to 3 percent slopes
<input type="checkbox"/>	BrB Broadbrook silt loam, 3 to 8 percent slopes

Select All

Selection Help

Clear Selections

Please select the report that you would like to generate:

Hydric Soils

Include Minor Soils

Include Description

Rich Text Format

Hydric Soil Data

Using WSS

1. Define AOI.
2. Click the Soil Map.
3. Click Soil Data Explorer
4. Suitabilities and Limitations for use.
5. Land Classification
6. Hydric Soils – view rating

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
220A	Boxford silt loam, 0 to 3 percent slopes	Partially Hydric	7.6	1.6%
220B	Boxford silt loam, 3 to 8 percent slopes	Partially Hydric	72.1	15.2%
250A	Pollux fine sandy loam, 0 to 3 percent slopes	Partially Hydric	14.9	3.1%
250B	Pollux fine sandy loam, 3 to 8 percent slopes	Partially Hydric	3.5	0.7%
255A	Windsor loamy sand, 0 to 3 percent slopes	Unknown Hydric	1.8	0.4%
255B	Windsor loamy sand, 3 to 8 percent slopes	Unknown Hydric	6.8	1.4%
256A	Deerfield loamy fine sand, 0 to 5 percent slopes	Not Hydric	13.3	2.8%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
220A	Boxford silt loam, 0 to 3 percent slopes	Partially Hydric	7.6	1.6%
220B	Boxford silt loam, 3 to 8 percent slopes	Partially Hydric	72.1	15.2%
250A	Pollux fine sandy loam, 0 to 3 percent slopes	Partially Hydric	14.9	3.1%
250B	Pollux fine sandy loam, 3 to 8 percent slopes	Partially Hydric	3.5	0.7%
255A	Windsor loamy sand, 0 to 3 percent slopes	Unknown Hydric	1.8	0.4%
255B	Windsor loamy sand, 3 to 8 percent slopes	Unknown Hydric	6.8	1.4%
256A	Deerfield loamy fine sand, 0 to 5 percent slopes	Not Hydric	13.3	2.8%

Introduction to Subaqueous Soils

- Traditional soil survey conducted on land. Not a lot of work in wetlands and tidal marshes until the 70's.
- In 1993 – “Submerged Soils: A New Frontier in Soil Survey” by George Demas published in Soil Survey Horizons.
- Most early work in Chesapeake Bay Region – Maryland/Delaware.
- George pioneered the concept of Subaqueous Soils differentiating them from sediment.
- 2001 – Bradley-Stolt RI SAS Thesis.

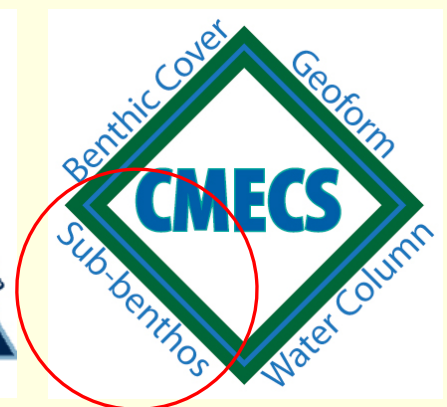
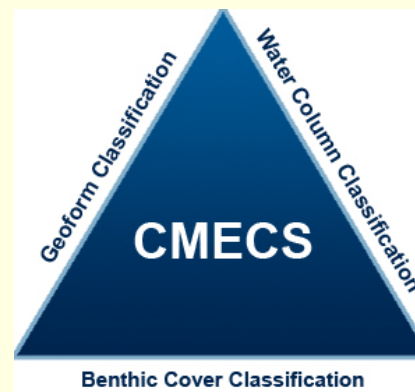


George Demas

http://en.wikipedia.org/wiki/George_Demas

History (cont).

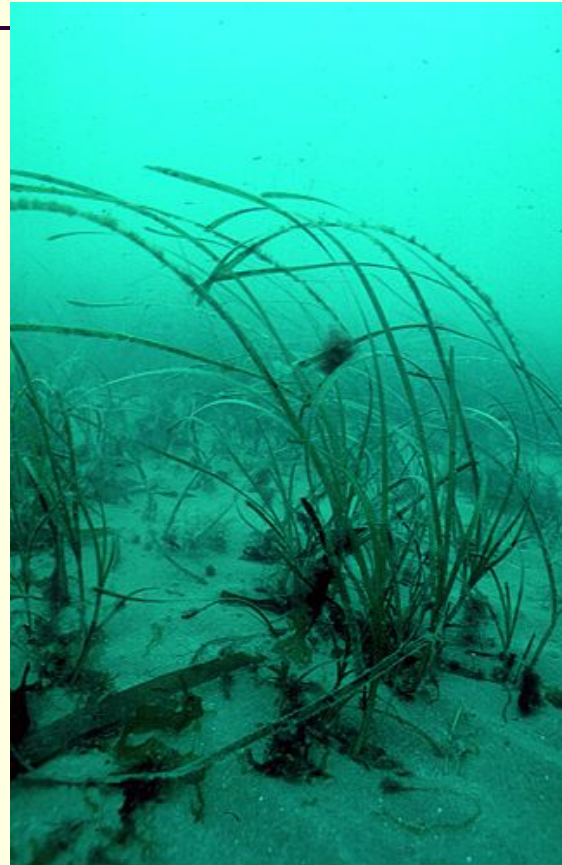
- 2003 – National Workshop on SAS – Delaware.
- 2004 – MapCoast Partnership formed in RI, Dr. Stolt sabbatical to inventory SAS work in U.S.
- 2005 Glossary of Landscape Terms, other areas begin mapping.
- 2006 Proposal to amend Taxonomy (Wassents) & NASIS (data elements to build interps).
- 2007 to Present: continued studies, outreach (RAE, Geotools, ASA), papers, CMECS →



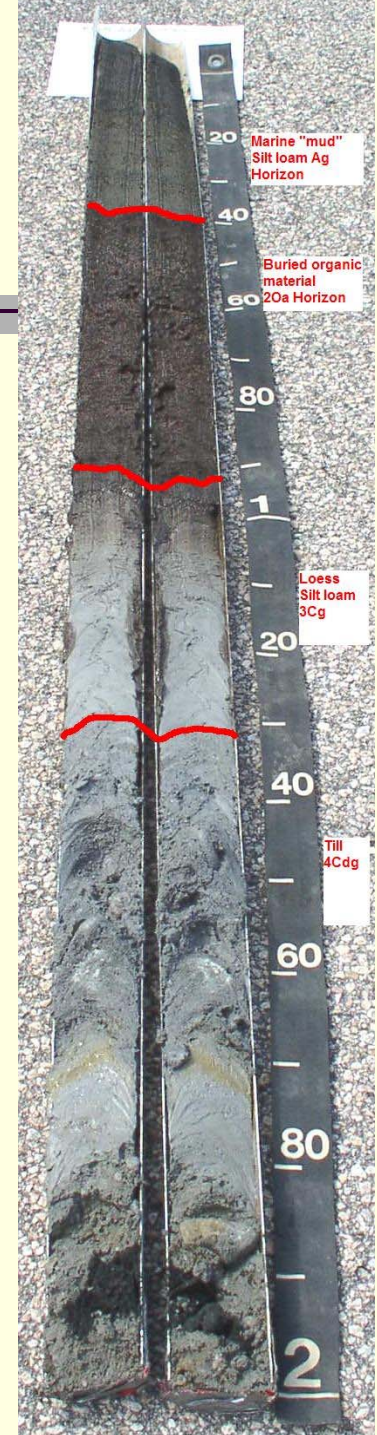
Is it Soil or Sediment?

Qualifying Criteria:

1. Supplies nutrients to plants
2. Forms horizons in place



Eel Grass (rooted)



Soil Core from Pt. Judith Pond, RI - Billington Soil Series

Soil Formation: Soil Horizons

- Organic and mineral (A and C) horizons.
- Predominantly dealing with AC type soils (Entisols).
- Numerous buried A and O horizons.
- Some subaqueous and submerged soils have buried B horizons (aeric).

Ag

Cg

Ab

2C1

2C2



Bottom Line: Shallow Water Environments can best be studied as SOIL!

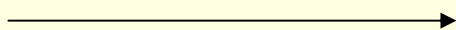
Definition of Soil

The upper limit of soil is the boundary between soil and air [or] **shallow water**...[not] too deep (typically more than 2.5 m*) for the growth of rooted plants.

Added to Soil Taxonomy in 1999 as a result of work in Maryland/Delaware.

** Arbitrary depth set as a cut-off for soil survey, RI extends this to 5m.*

Cowardin Wetlands Classification



in these Systems. The boundary between wetland and deepwater habitat in the Riverine and Lacustrine Systems lies at a depth of 2 m (6.6 feet) below low water; however, if emergents, shrubs, or trees grow beyond this depth at any time, their deepwater edge is the boundary.

The 2-m lower limit for inland wetlands was selected because it represents the maximum depth to which emergent plants normally grow (Welch 1952; Zhadin and Gerd

Significance and Value of Subaqueous Soil Inventory

- Sediment characteristics presented to a greater depth (2 m), rather than a “surficial” approach.
- Provides a comprehensive classification scheme (Soil Taxonomy, SSM) for shallow water environments.
- Could provide a major or missing data set for SAV restoration, estuarine protection, planning and management.
- NRCS responsibility to map and inventory soils.

Who's doing What?

ME-
UME

NH – NRCS,
UNH

NY -
NRCS

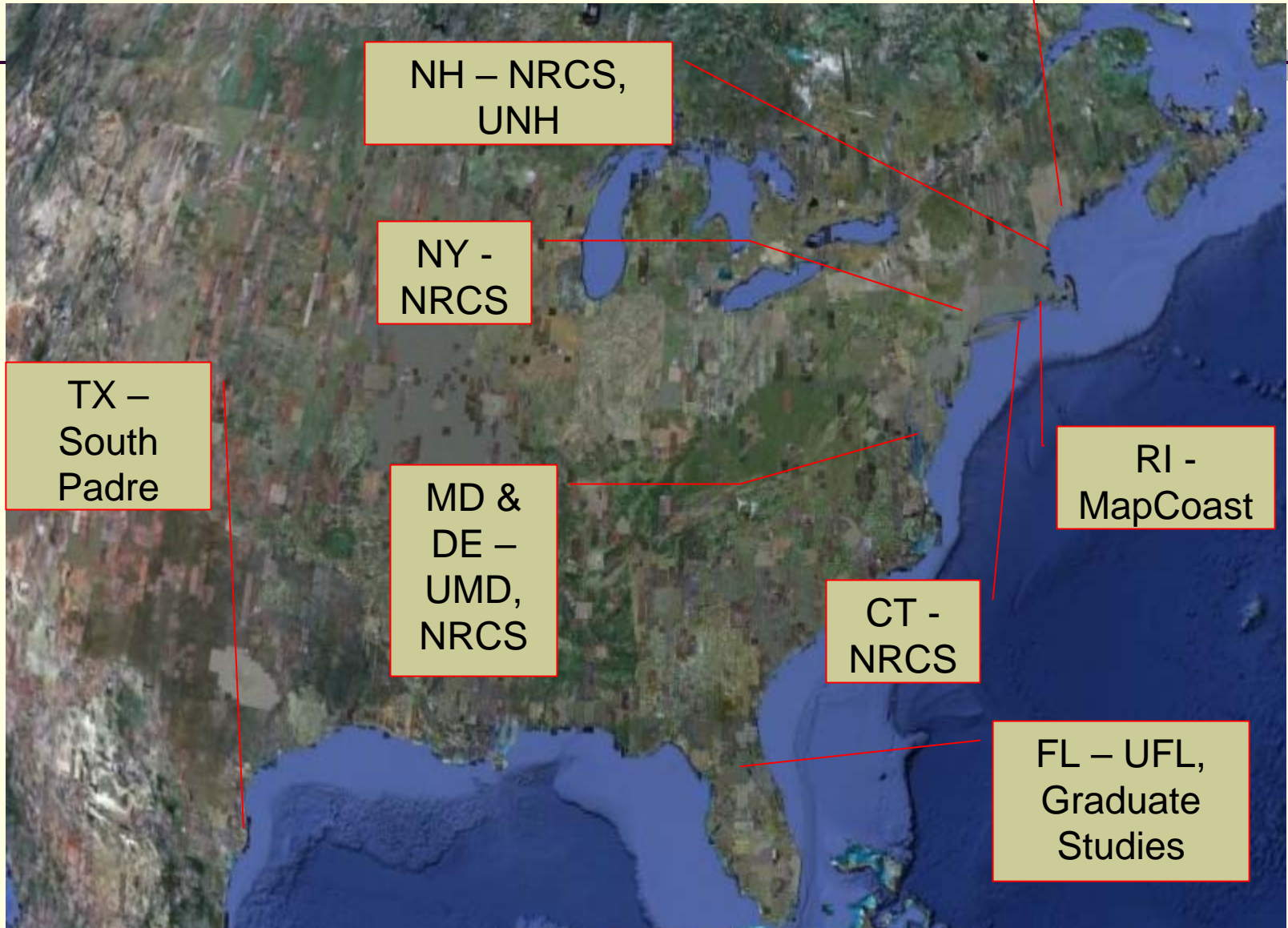
TX –
South
Padre

MD &
DE –
UMD,
NRCS

CT -
NRCS

RI -
MapCoast

FL – UFL,
Graduate
Studies



Why (So What?)

1. Shallow water is where it is at!
2. Existing maps/data is scarce often mapped as “No Data” on sediment maps (and Google Ocean).
3. Millions are spent on coastal restoration projects, success/failure depends on scientific data and maps.
4. Need for mapping identified in 2004 U.S. Commission on Ocean Policy Report.
5. RI NRCS has a “Working Waters” Strategic Plan.

REED SECURED FEDERAL FUNDING FOR RHODE ISLAND FOR FISCAL YEAR 2006

Natural Resources Conservation Service (NRCS) Soil Survey Management Office: \$100,000

The Natural Resources Conservation Service (NRCS) will receive \$100,000 to develop coastal and underwater soil mapping techniques, classification, and soil analysis, as well as provide ongoing training. [\[Click to go back to the top of the page.\]](#)

Pawtuxet Cove Federal Navigation Project Maintenance Dredging: \$1,440,000
Cranston/Warwick

The Army Corps of Engineers will receive \$1,440,000 to remove 90,000 cubic yards of material to restore the 6-foot entrance channel, turning basin and anchorage area in Pawtuxet Cove. The Pawtuxet Cove Federal Navigation Project is an important waterway for vessel traffic serving both the cities of Cranston and Warwick. [\[Click to go back to the top of the page.\]](#)

Narrow River Aquatic Ecosystem Restoration Project: \$150,000
Narragansett/South Kingstown

The Army Corps of Engineers will receive \$150,000 in federal funding to continue a feasibility study of a project to restore estuarine habitats along the Narrow River in Narragansett and South Kingstown. The Army Corps of Engineers has prepared a Preliminary Restoration Plan to reduce tidal restriction between Narrow River and Rhode Island Sound. [\[Click to go back to the top of the page.\]](#)

Roger Williams University Center for Aquaculture Development (CAD): \$1,000,000
Bristol

Roger Williams University (RWU) in Bristol will receive \$1,000,000 to support the establishment of a Center for Aquaculture Development (CAD). The CAD will be established within the University's successful Center for Economic and Environmental Development which has an active aquaculture research program and operates the only shellfish hatchery in Rhode Island. [\[Click to go back to the top of the page.\]](#)

East Providence Waterfront Storm Water Management Analysis: \$250,000

The City of East Providence will receive \$250,000 to analyze and develop an innovative storm water management plan for its newly revitalized waterfront. [\[Click to go back to the top of the page.\]](#)

Billicks Point Cove Federal Navigation Project Maintenance Dredging: \$630,000
East Providence/Barrington

The Army Corps of Engineers will receive \$630,000 to remove 20,000 cubic yards of dredged material to restore the project's 8-foot entrance channel, the 6-foot inner channel, and the 6-foot mooring and turning basins. [\[Click to go back to the top of the page.\]](#)

Charlestown Breachway navigation study: \$90,000
Charlestown

The Army Corps of Engineers will receive \$90,000 to complete a navigation study and initiate and complete the project design for the Charlestown Breachway and Inlet. There is growing concern for navigation safety through the breachway, which connects Ninigret Pond to Rhode Island Sound. The Army Corps of Engineers is considering a project to remove large boulders on the ocean side of the breachway as well as some dredging of the natural channel further inland. The Corps will already be dredging in Ninigret Pond for habitat purposes under the South Coast Habitat Restoration Project, minimizing the cost of the project. [\[Click to go back to the top of the page.\]](#)

Boyp's Marsh (Town Pond) Salt Marsh Restoration: \$900,000
Providence

The Rhode Island Coastal Resources Management Council will receive \$900,000 to continue construction of the Boyp's Marsh (Town Pond) restoration project. The project will restore up to 23 acres of salt marsh in a wildlife sanctuary at Town Pond by removing dredged material associated with a Federal navigation project. [\[Click to go back to the top of the page.\]](#)

Brush Neck Cove habitat restoration: \$150,000
Warwick

The Army Corps of Engineers and the Rhode Island Coastal Resources Management Council will receive \$150,000 to continue to develop a feasibility study for Brush Neck Cove in Greenwich Bay. [\[Click to go back to the top of the page.\]](#)

Alilus Cove Environmental Restoration: \$300,000
Barrington

The Rhode Island Coastal Resources Management Council will receive \$300,000 to continue the restoration of degraded coastal wetlands at Alilus Cove in Barrington. This project will restore coastal habitat and salt marsh by improving tidal flushing through [\[Click to go back to the top of the page.\]](#)

Ten Mile River Fisheries Restoration: \$250,000

The Rhode Island Coastal Resources Management Council will receive \$250,000 to support the restoration of fish runs in the Ten Mile River, which runs in eastern Rhode Island and southeastern Massachusetts. The construction of dams over the last 200 years has prevented fish passage to upstream spawning habitat. Restoring the fish run to the lower Ten Mile River would provide a wide range of benefits to the freshwater and marine fishery and to the surrounding communities. The bill also includes \$14,000 for inspection of Completed Works by the Army Corps of Engineers, \$300,000 for Project Condition Surveys, and \$25,000 for the Fox Point Hurricane Barrier to upgrade its 40-year old electrical system. [\[Click to go back to the top of the page.\]](#)

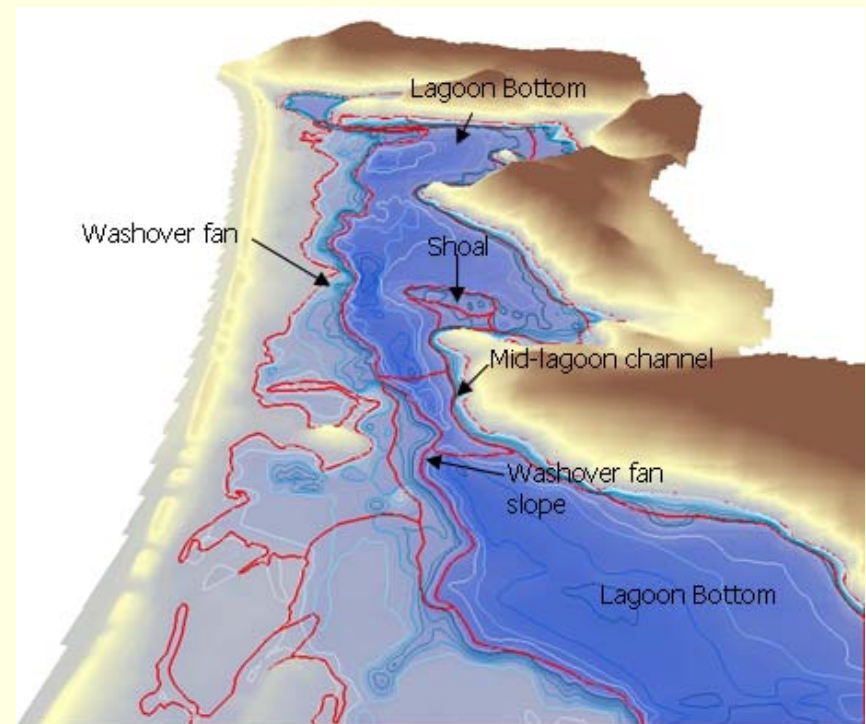
New England Lobster Disease Research: \$3 million
University Of Rhode Island

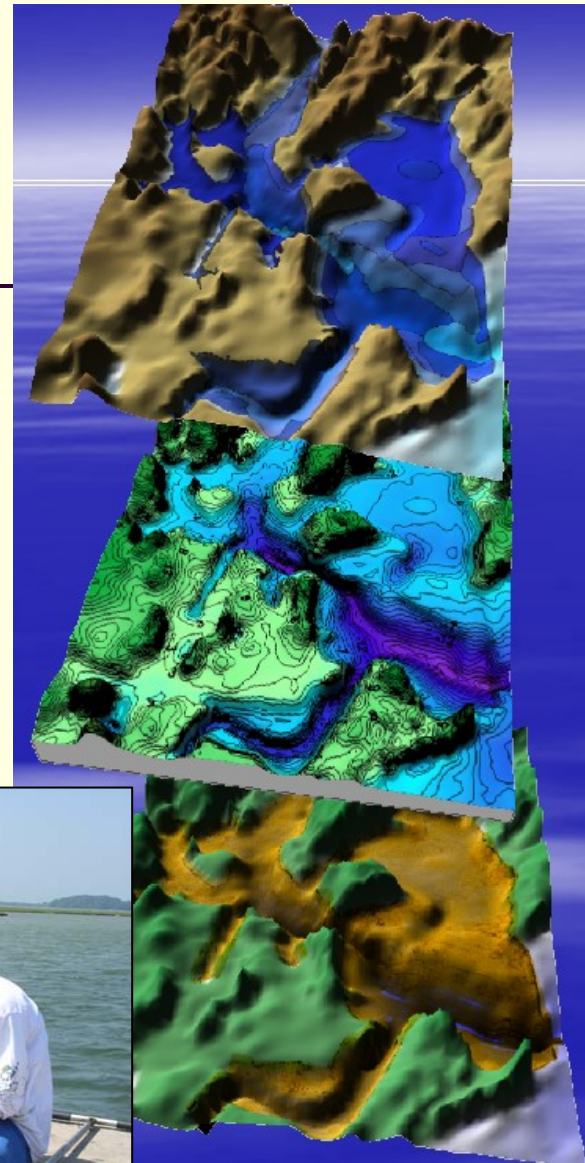
The National Sea Grant College Program will receive \$3 million to establish a

Coastal Soil and Sediment Mapping Helps us Better Manage, Protect, and Restore our States Underwater Marine Landscape

Subaqueous Mapping Procedure

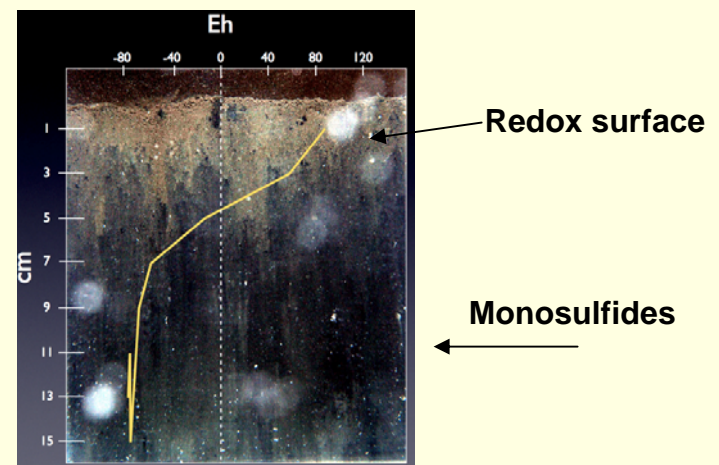
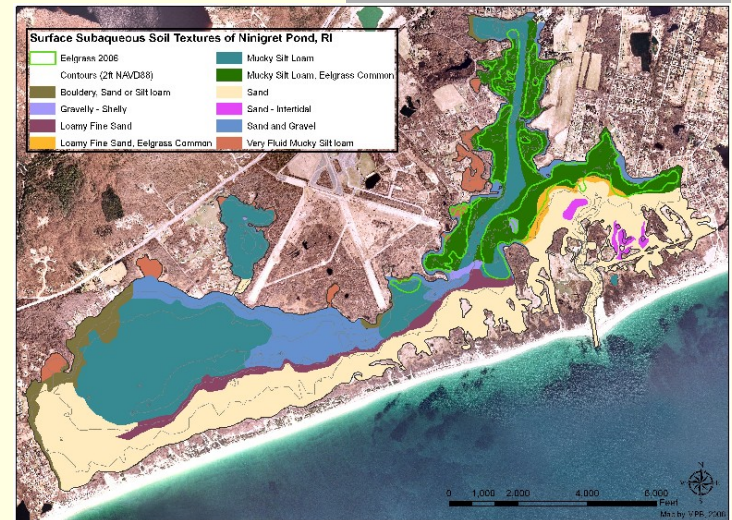
- Need to develop a bathymetric map which is used for subaqueous landform identification.
- Remote sensing including LIDAR, Side Scan Sonar, SPI, Subbottom, GPR (freshwater only), RTK GPS.
- Develop a soil-landscape relation.
- Ground-truth and collect soil descriptions to define the map unit.
- Collect complete soil cores to describe and sample – use vibracore and traditional tools.
- Develop soil series, map units, chemical and physical data – soil interpretations.





Uses of SAS data for Wetland Restoration Efforts

- Baseline soil data – PSA, OC, Sulfides, pH, fluidity, metals, historic info.
- Interpretations: Acid sulfate weathering (dredge), Eelgrass potential, bottom type for aquaculture/shellfish restoration, accretion rates.
- Missing data set in eelgrass transplant model.
- Invasive species control (fresh-water soils).
- Climate issues – carbon pools, sea-level rise.
- Water quality/health (DO/Redox).



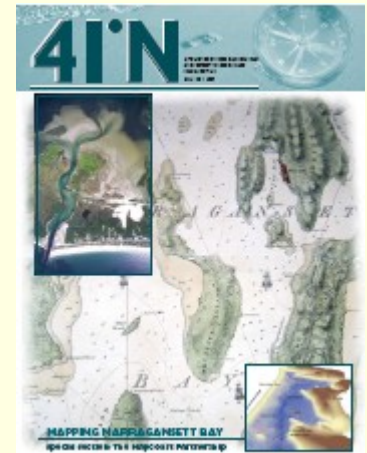
Interpretations

- SAV Restoration
- Crab Habitat
- Clam Stocking
- Management for Sustainable Production - Shellfish
- Nutrient Reduction
- Benthic Preservation Site Identification
- Wildlife Management
- Critical Habitats for Wading Shore Birds
- Nurseries and Spawning areas
- Habitat Protection for Horseshoe Crabs
- Dredging Island Creation
- Tidal Marsh Protection and Creation
- Bathymetric Map
- Navigational Channel Creation/ Maintenance
- Effects of Dredging on Benthic Ecology
- Off Site Disposal of Dredge Spoil
- Acid-Sulfate Weathering Hazards
- Dune Maintenance/Replenishment
- Accretion rates.
- Heavy metals/Health Issues.
- Archaeological – pre-historic landscapes.
- Energy production – wind farm siting.
- Baseline data.
- Habitat Mapping
- Classification of soils.
- Wetland delineation
- Coastal Soil Data



RI Mapping Partnership for Coastal Soils and Sediment – www.mapcoast.org

- Formed in 2004, 16 member partnership with goal of developing a database of soils in RI Coastal Zone.
- Multidisciplinary group – soil scientist, geologists, GIS specialists, benthic marine scientist working together to develop mapping protocol and classification system encompassing all disciplines.
- Outreach on use and need for this data.

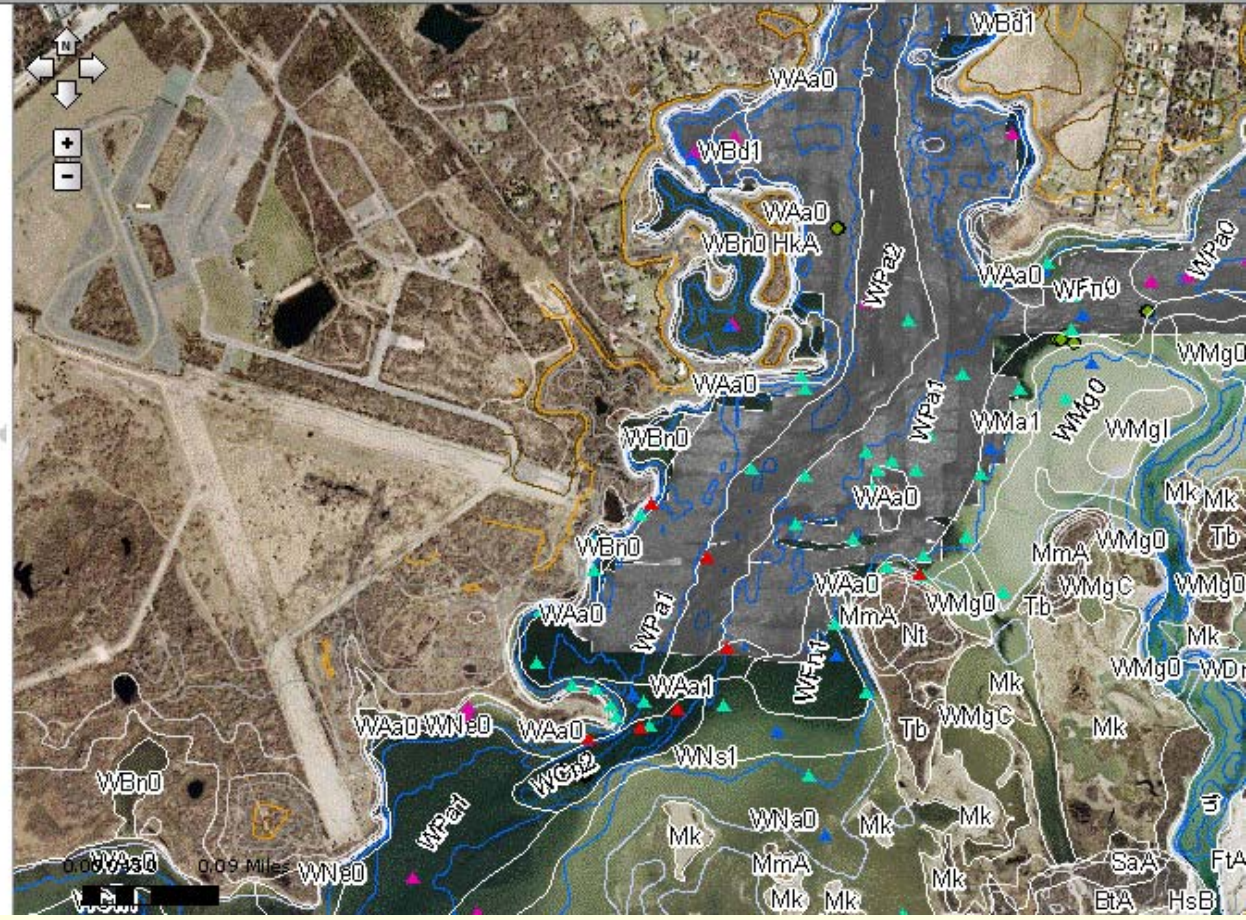


SWAT Team Armed with Technology

- Side-scan sonar.
- Acoustic Devices
- RTK GPS.
- EMI/GPR
- SPI Camera
- Video
- YSI Meter

MapCoast Data Layers 2008

- Results**
- Map Contents**
- Subaqueous Soil Sampling Locations
 - Outcrops
 - Hardened Shorelines
 - Eelgrass Data (click to expand list)
 - Ninigret Data (click to expand list)
 - Bottom Types (from sidescan)
 - Shoreline
 - Subaqueous soils
 - Coastal Soils
 - SPI Locations
 - Geology
 - Contours (2ft)
 - Seamless Bathy
 - Sidescan 15cm-1
 - Sidescan 15 cm-2
 - Sidescan 15 cm-3
 - Point Judith Data (click to expand)
 - Quonochontaug Data (click to expand list)
 - Wickford Data (click to expand list)
 - Rhode Island Soil Survey
 - 2002-04 T...



Questions?



Wow a
Pishagqua
Soil