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

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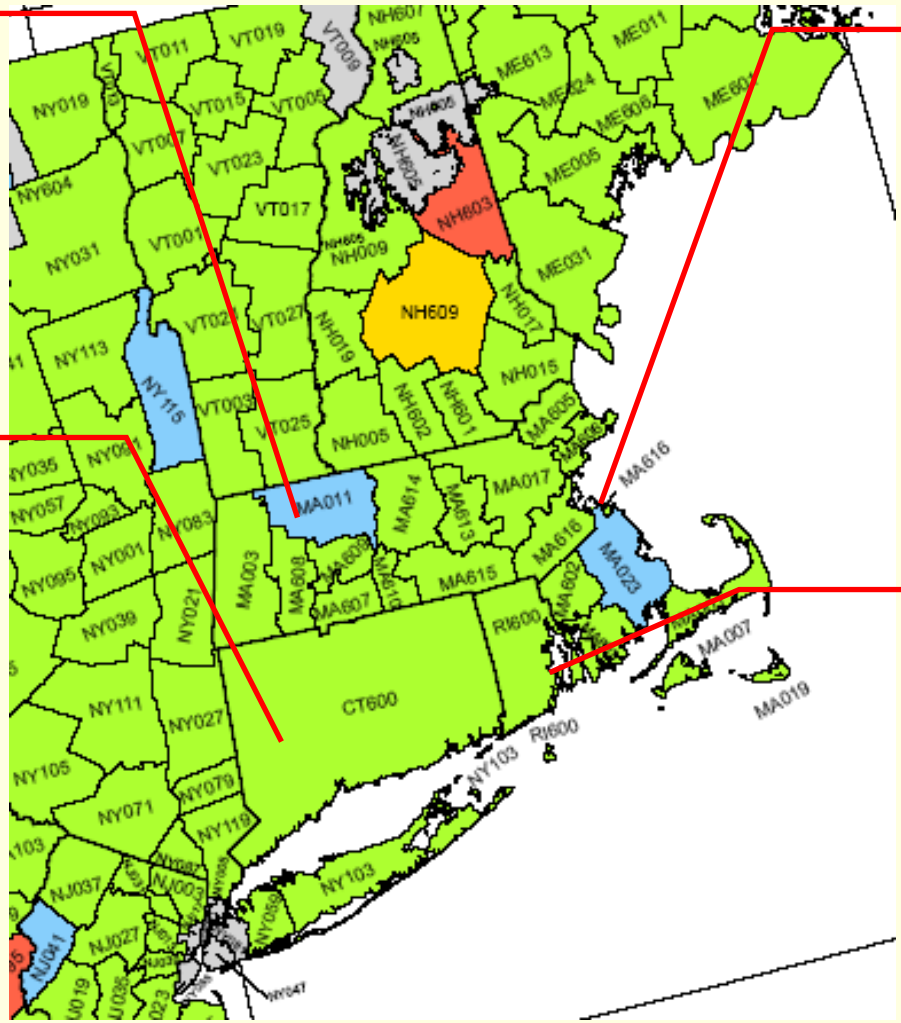
RI USDA NRCS

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

Digital Soils Data – CT, MA, RI

Franklin County – Field work still in progress.

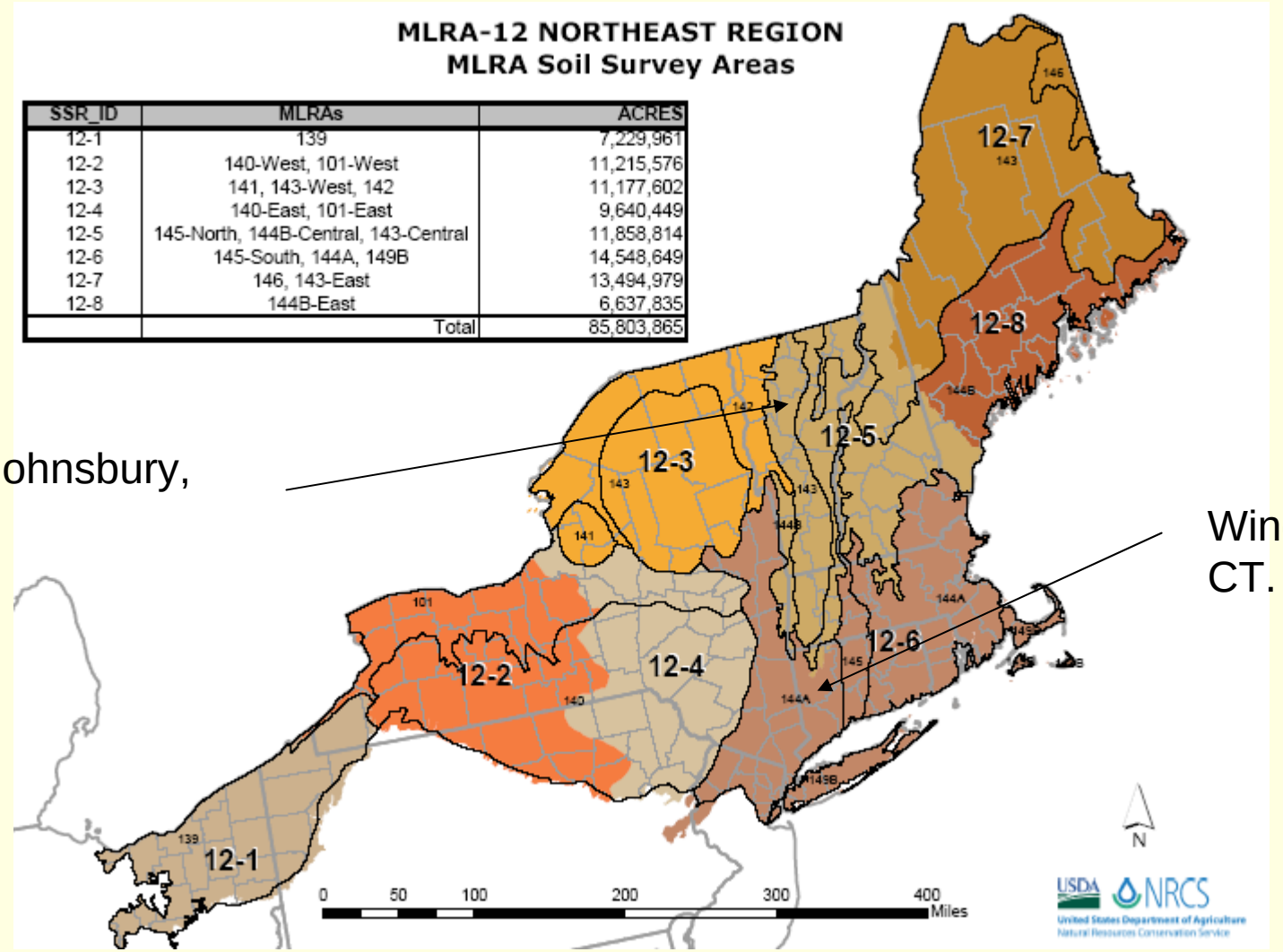
Statewide survey (CT600) – some new interps/ratings.



Plymouth County – field work completed – contact Wareham Office.

State-wide survey, archived surveys and DVD ROM.

Soil Survey Reorganization by MLRA



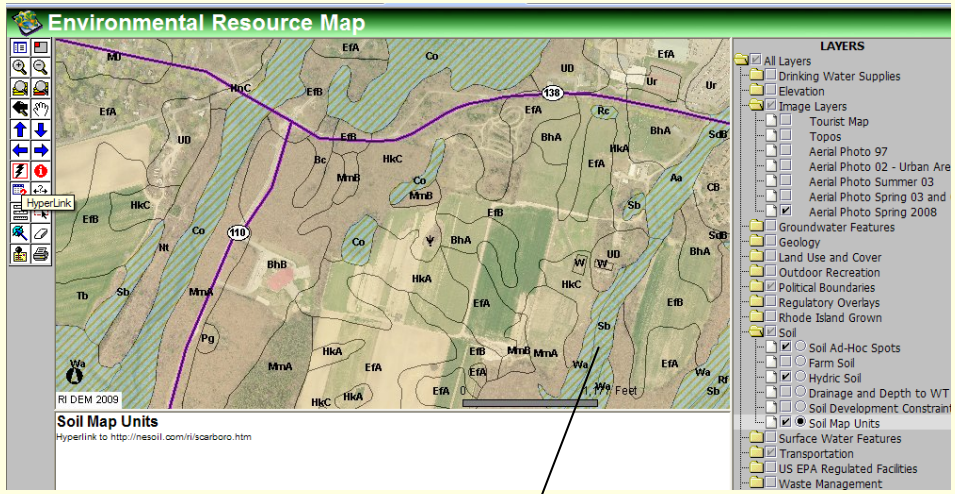
St. Johnsbury, VT.

Windsor, CT.

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.



Soil Map Unit Description from the RI Soil Survey Report

Sb—Scarboro mucky sandy loam.

Link to Official Soil Series Description for Scarboro Soils

This nearly level, very poorly drained soil is in depressions and drainageways of terraces and outwash plains. Slopes range from 0 to 3 percent but are dominantly less than 1 percent. Areas are irregular in shape and range mostly from 2 to 50 acres.

Typically the surface layer is very dark grayish brown mucky sandy loam about 6 inches thick. The substratum extends to a depth of 60 inches or more. The upper part is gray, mottled loamy sand. The lower part is light brownish gray, mottled coarse sand.

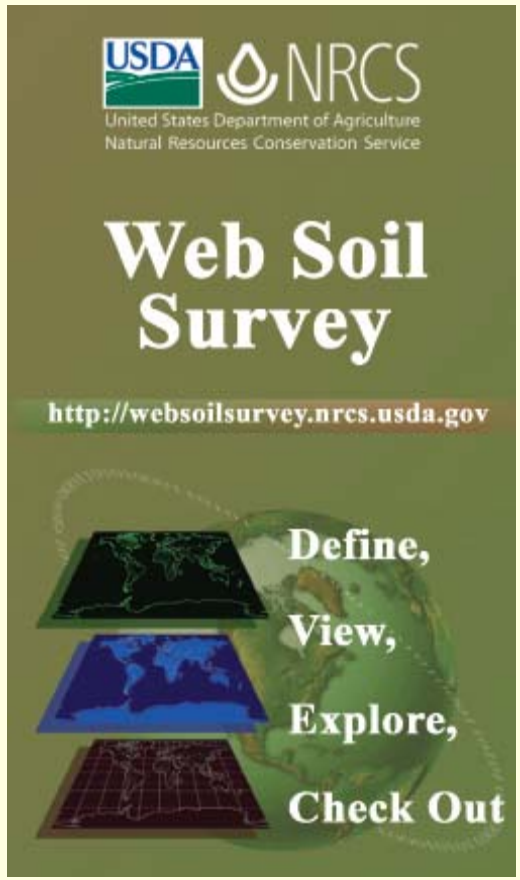
Included with this soil in mapping are small areas of moderately well drained Sudbury and Ninigret soils and poorly drained Raypol and Walpole soils. Included areas make up about 10 percent of this map unit.

The permeability of this soil is moderately rapid in the surface layer and rapid or very rapid in the substratum. Available water capacity is moderate, and runoff is slow. This soil has a seasonal high water table at or near the surface from late fall through midsummer. A few small areas are subject to flooding. The soil is very strongly acid through medium acid.

The seasonal high water table makes this soil unsuitable for community development or cultivated crops.

Sources of Soils Data

- NRCS “Official Data”
- Soil Data Mart – download site and online reports.
- Web Soil Survey – Online mapping and interpretive maps, custom soil survey reports.
- Available for all surveyed areas in U.S.
- Data Gateway – download imagery, hydro, topos.



Hydric Soil Data

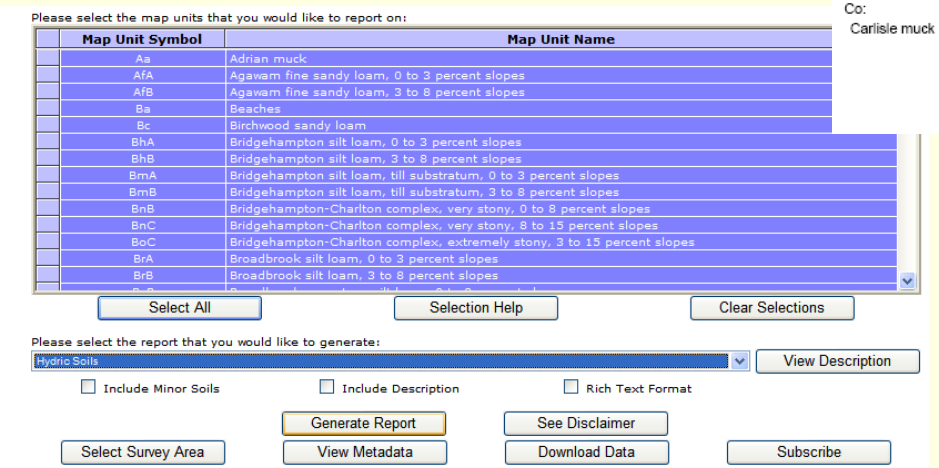
Hydric Soil List from SDM

- 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

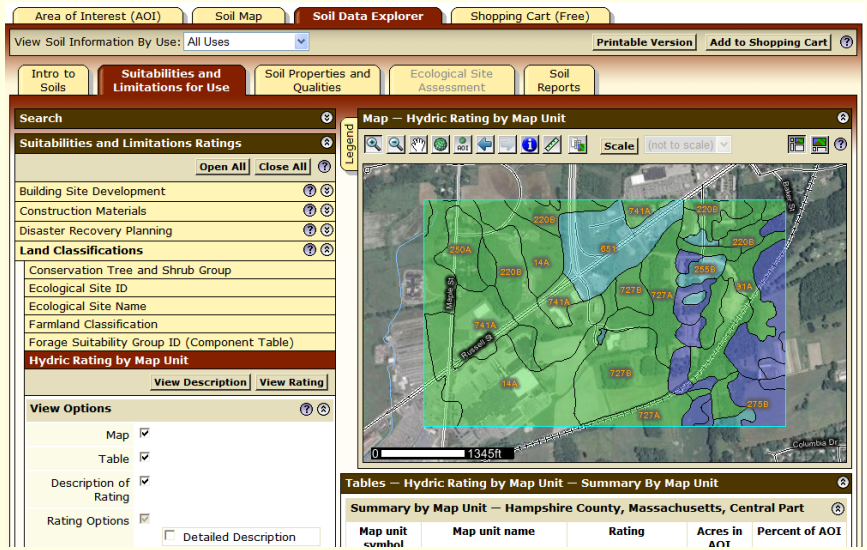
Map symbol and map unit name	Component	Percent of map unit	Landform	Hydric rating	Hydric criteria
Aa:					
Adrian muck	Adrian	90	Swamps	Yes	1, 4
	Carlisle	3	Swamps	Yes	1, 3, 4
	Ridgebury	2	Depressions, Drainageways	Yes	2B3
	Scarboro	2	Depressions, Drainageways, Terraces	Yes	2B3
	Whitman	2	Depressions, Drainageways	Yes	2B3
	Raypol	1	Outwash plains	Yes	2B3
Ba:					
Beaches	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



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



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

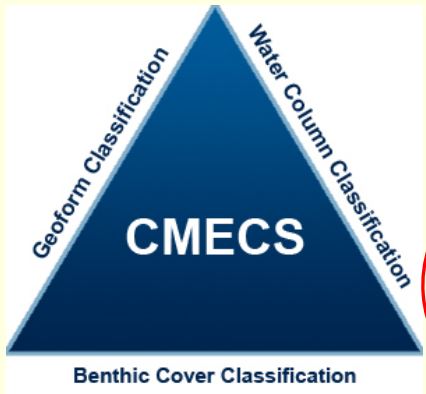
- Traditional soil survey conducted on land. Not a lot of work in wetlands and tidal marshes until the 70's.
- In 1993 – "Submerged Soils: A New Frontier in Soil Survey" by George Demas published in Soil Survey Horizons.
- Most early work in Chesapeake Bay Region – Maryland/Delaware.
- George pioneered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

George Demas

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

Intro (cont).

- 2003 – National Workshop on SAS – Delaware.
- 2004 – MapCoast Partnership fored 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

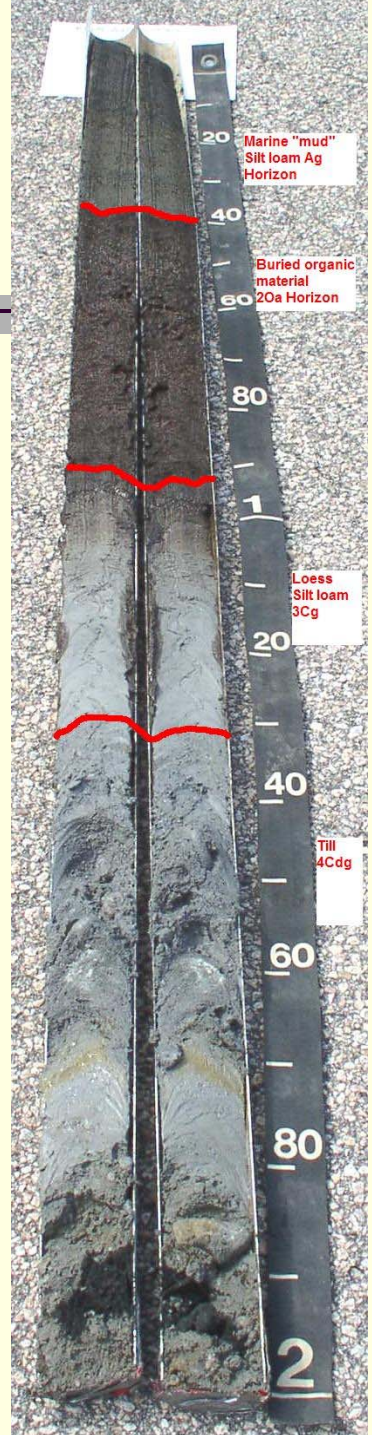


Is it Soil or Sediment?

Qualifying Criteria:

1. **Supplies nutrients to plants**
2. **Forms horizons in place (additions, losses, transfers, transformations)**

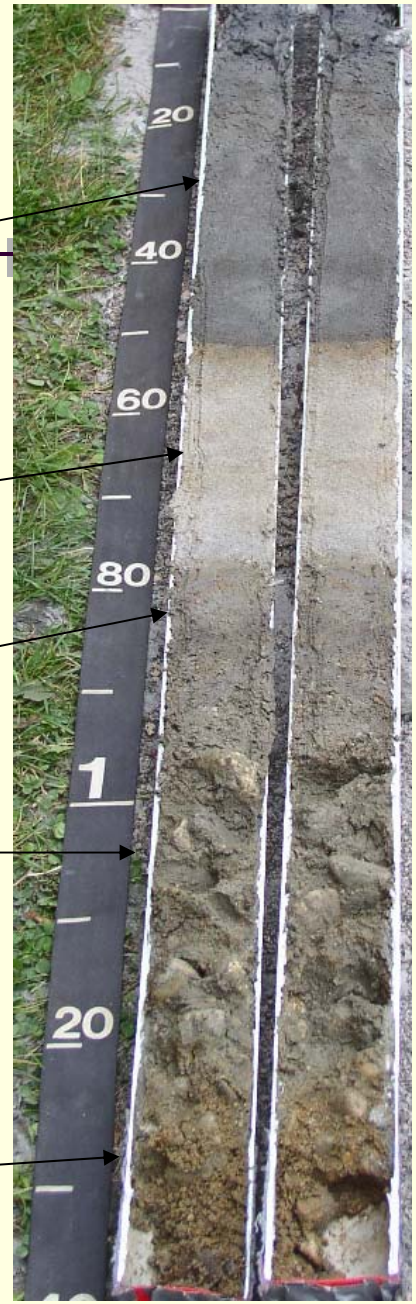
Eel Grass (rooted)



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).



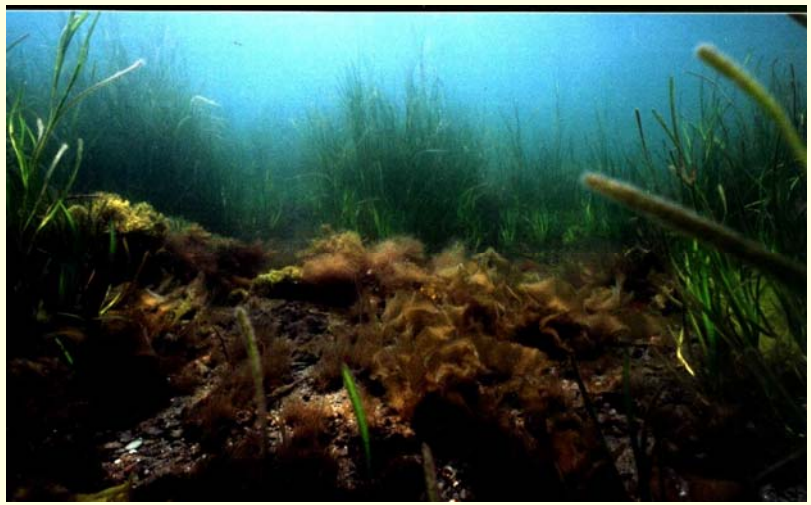
Bottom Line: Shallow Water Environments can best be studied as SOIL!

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.

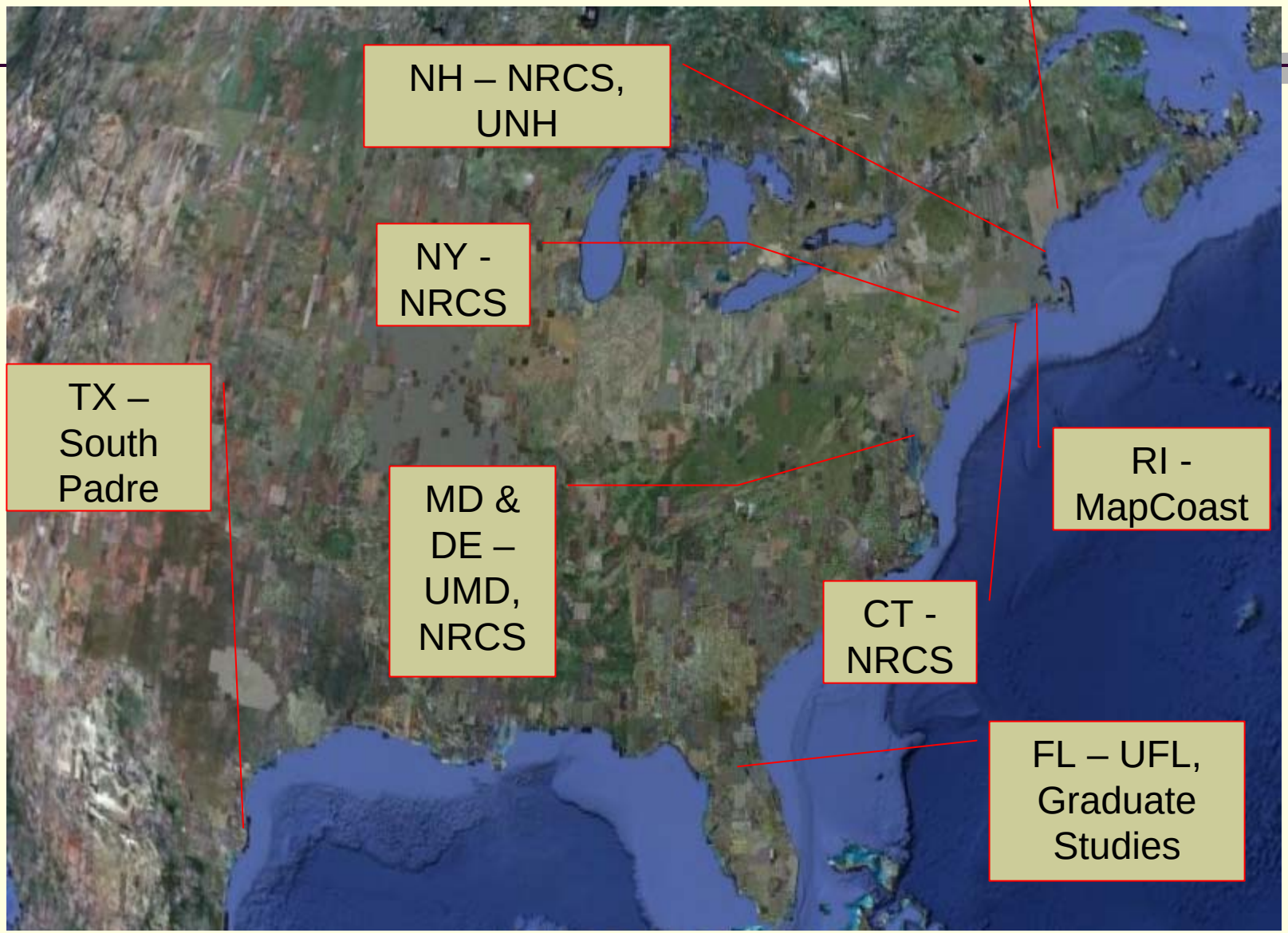
**Arbitrary depth set as a cut-off for soil survey, RI extends this to 5m.*



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.
- Provides 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?



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.]

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

The Army Corps of Engineers will receive $630,000 to remove 50,000 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 farther 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.]

Boyd's Marsh (Town Pond) Salt Marsh Restoration: $500,000
Portsmouth

The Rhode Island Coastal Resources Management Council will receive $300,000 to continue construction of the Boyd'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.]

Allins 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 Allins Cove in Barrington. This project will restore coastal habitat and salt marsh by improving tidal flushing through

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, $360,000 for Project Condition Surveys, and $525,000 for the Fox Point Hurricane Barrier to upgrade its 40-year old electrical system. [Click to go back to the top of the page.]

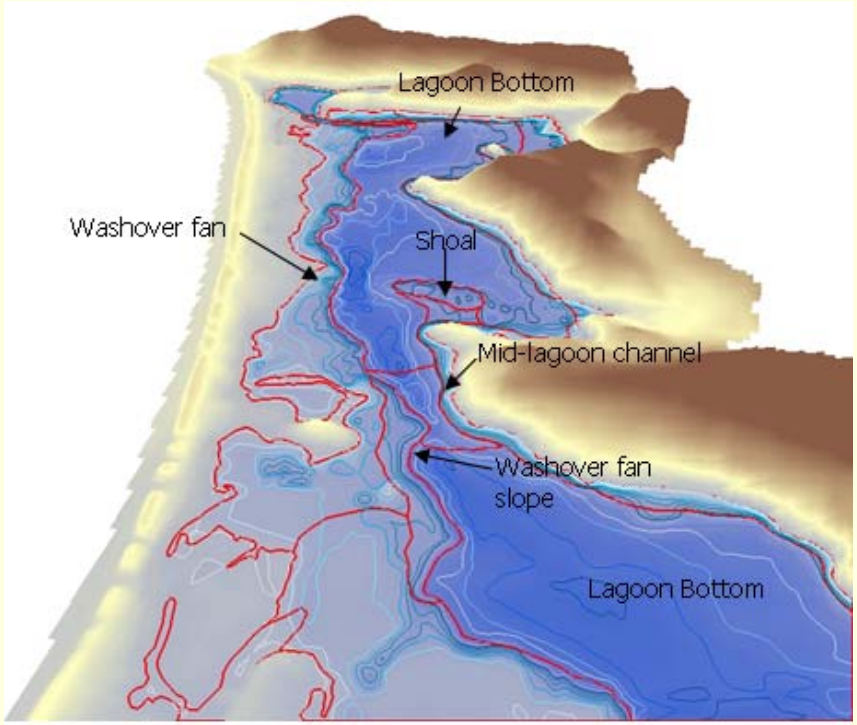
New England Lobster Disease Research: $3 million
University Of Rhode Island

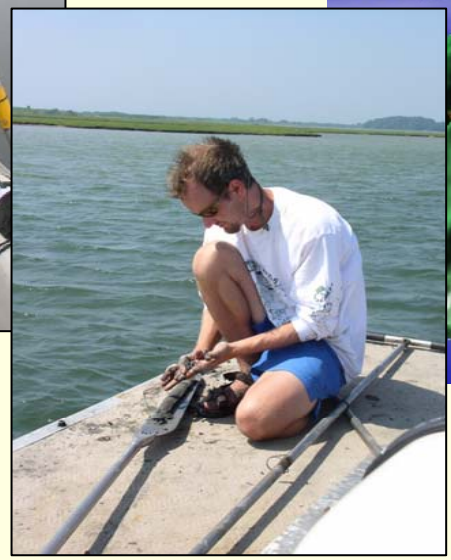
The National Sea Grant College Program will receive $3 million to establish a

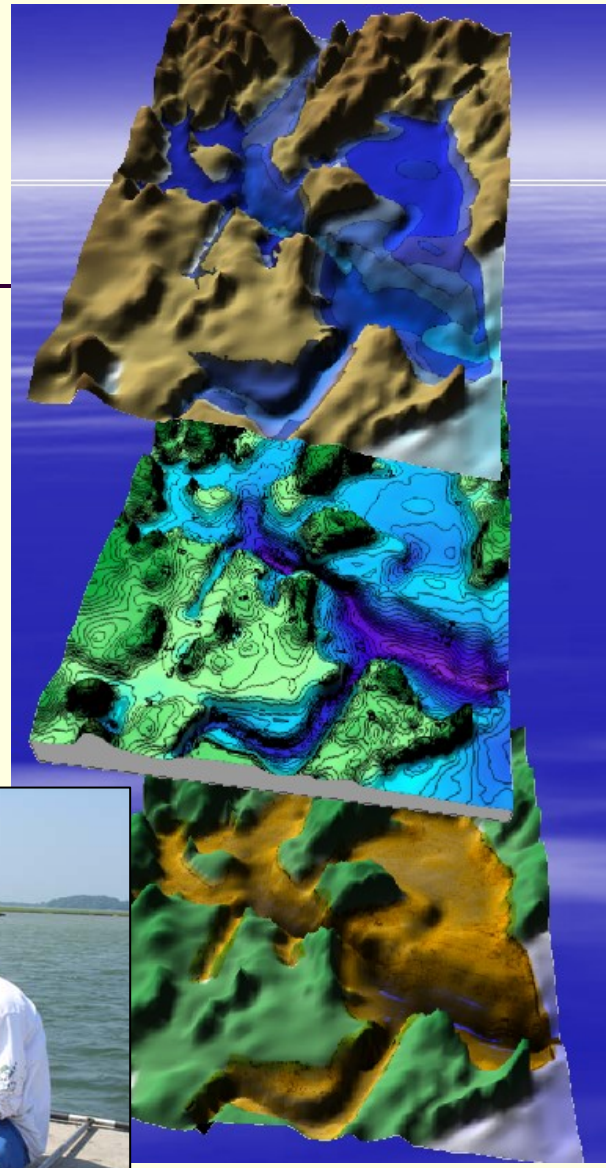
Coastal Soil and Sediment Mapping Helps us Better Manage, Protect, and Restore our States Underwater Marine Landscape

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 model.
- 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.

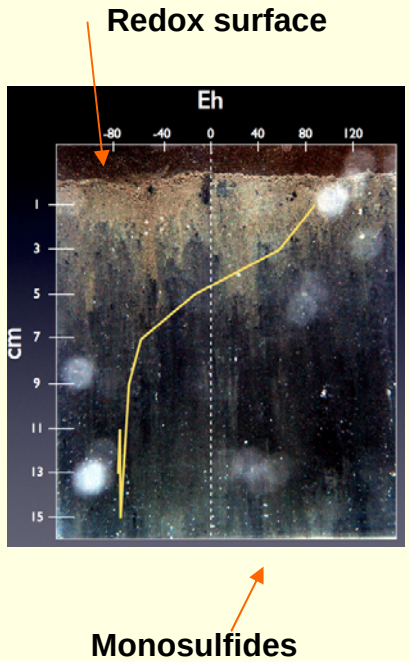






Soil Interpretations

- SAV Restoration
- Crab Habitat
- Aquaculture/shellfish restoration
- Management for Sustainable Production - Shellfish
- Nutrient Reduction/Health/Water Quality
- 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 sitting.
- Baseline data.
- Habitat Mapping
- Classification of soils.
- Wetland delineation
- Coastal Soil Data



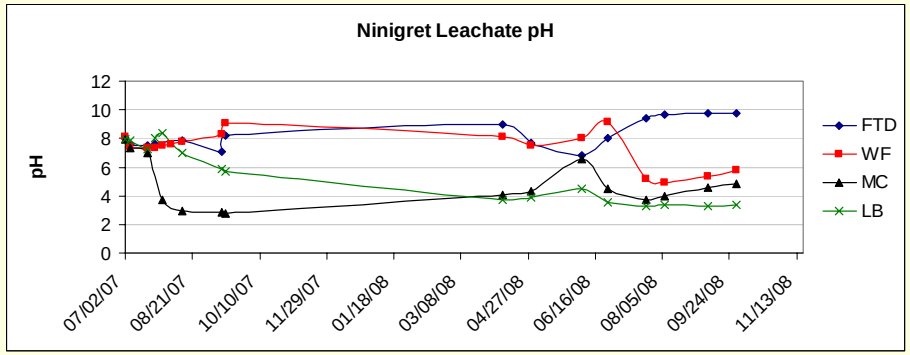
Examples of Restoration Uses

Dredging/Disposal

Problem: Soils with sulfididic material become exposed to air – pH drops due to formation of sulfuric acid.

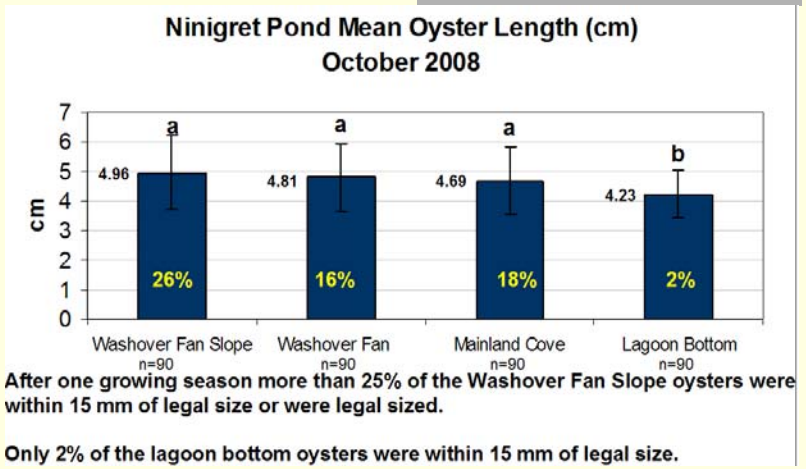
Research: Salisbury/Stolt Dredge Disposal Mesocosm Study.

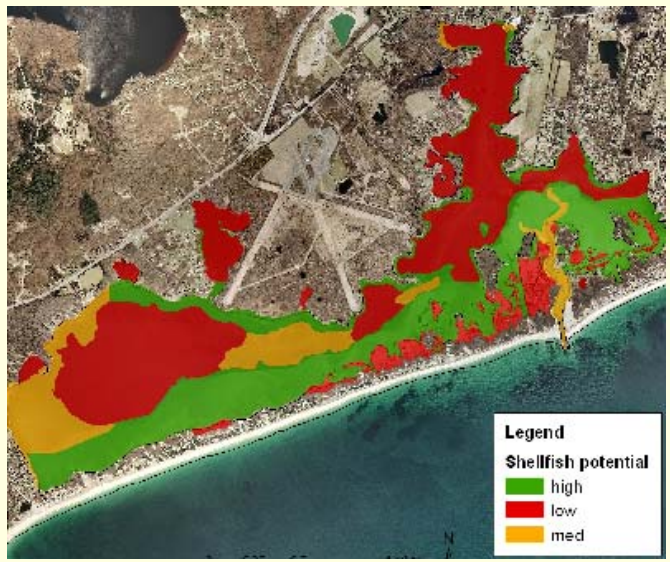
Interpretation: Acid sulfate weathering potential for land disposal of dredge.



Eelgrass, Shellfish, Aquaculture

- Problem: restoration projects (eelgrass, scallop, oyster) are very costly – transplant success depends on info about bottom type, existing SAV, chemical properties, bathy, etc.
- Research: Ongoing- URI
- Uses of SAS: Soil, acoustic, habitat maps provide locations for transplant, historic data.





Coastal Zone (beach, dune, marsh)

Invasives (phrag), tidal restrictions, erosion, replenishment, restoration.

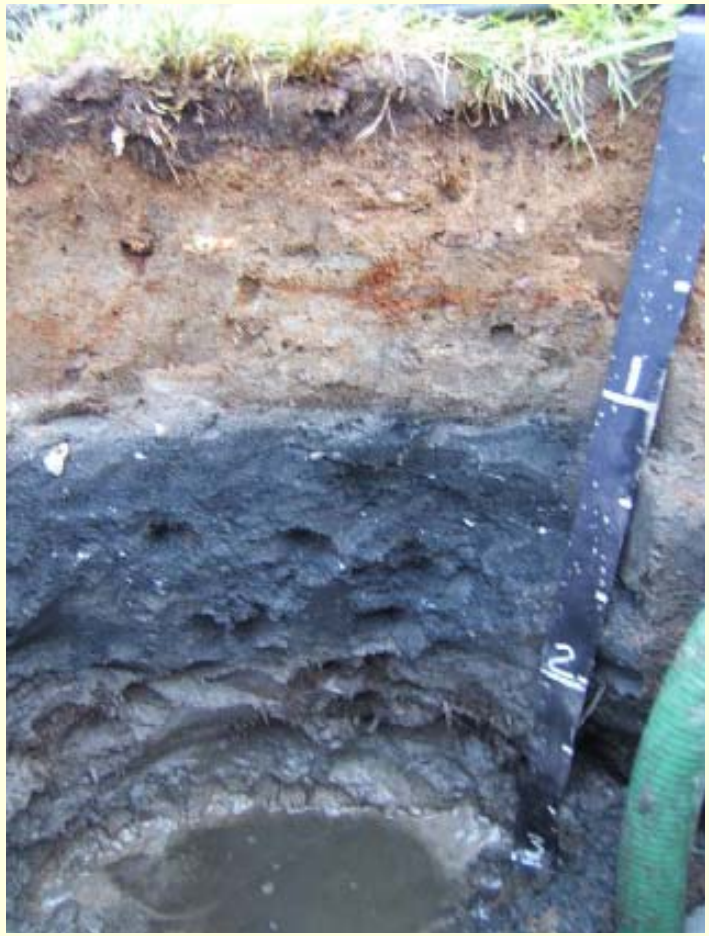
1. Detail mapping/data.
2. Tools – GPR, EMI, RTK, YSI, gauges.
3. Research – Anthropogenic soils, water table, nutrient, carbon.

^A

^C1

^2Cg

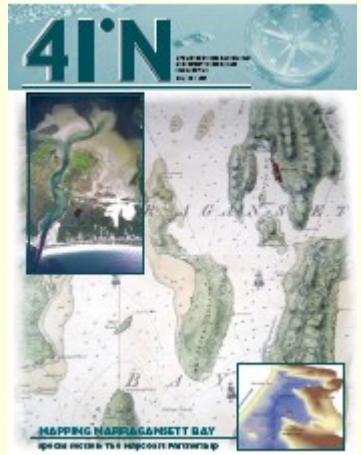
^3Oab

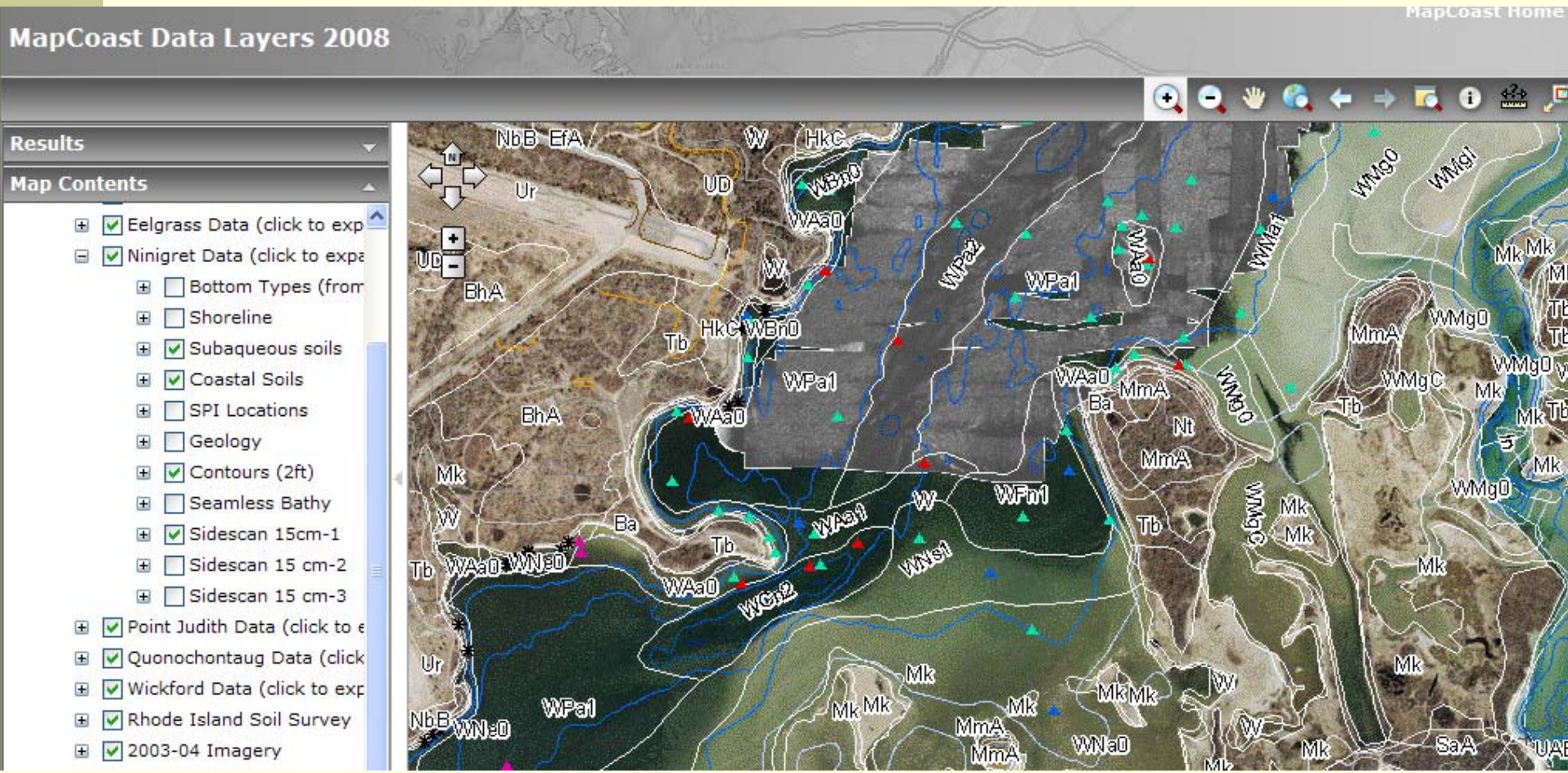


Fortress Soil – Dredge HTM over Marsh

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. Pool of tech tools!
- Outreach on use and need for this data.




MapCoast Data Layers 2008
MapCoast Home
Results
Map Contents
Eelgrass Data (click to exp
Ninigret Data (click to expa
Bottom Types (from
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 e
Quonochontaug Data (click
Wickford Data (click to exp
Rhode Island Soil Survey
2003-04 Imagery

Questions?

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).