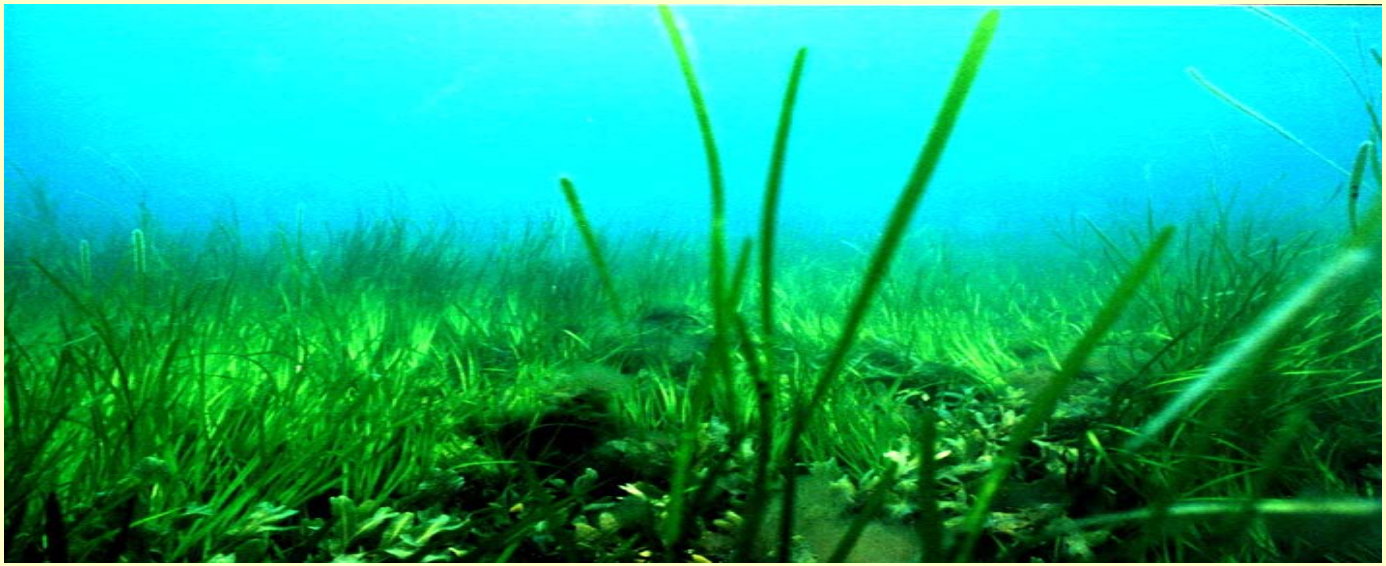


Introduction to Subaqueous Soils and MapCoast.

James D. Turenne
Assistant State Soil Scientist
Rhode Island (The Ocean State)
USDA-NRCS

Subaqueous History

- 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

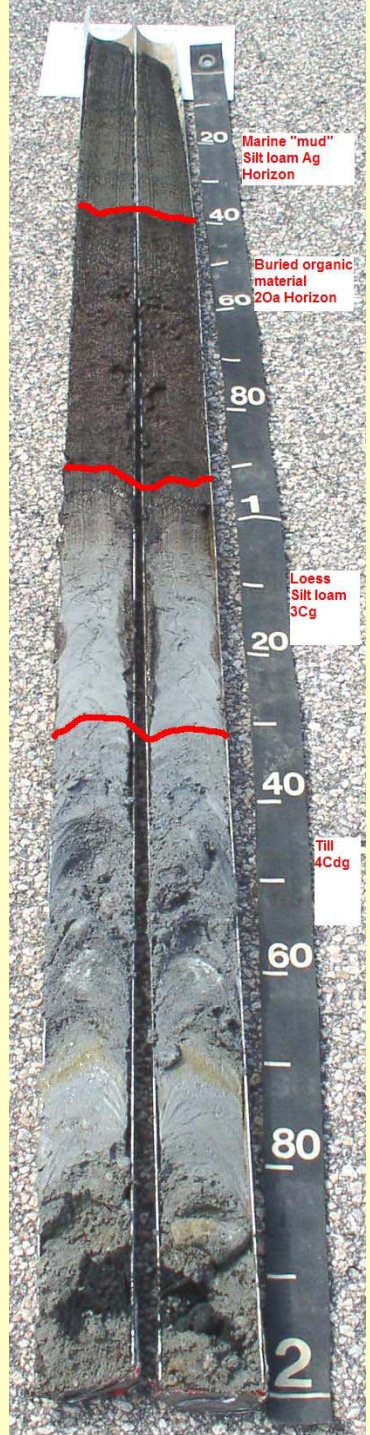
- 2003 – National Workshop on SAS – Delaware.
- 2004 – RI forms MapCoast, Stolt sabbatical.
- 2005 Glossary of Landscape Terms, other areas begin mapping.
- 2006-present – Proposal to amend Taxonomy & NASIS.

Is it Soil or Sediment?

Qualifying Criteria:

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

Eel Grass

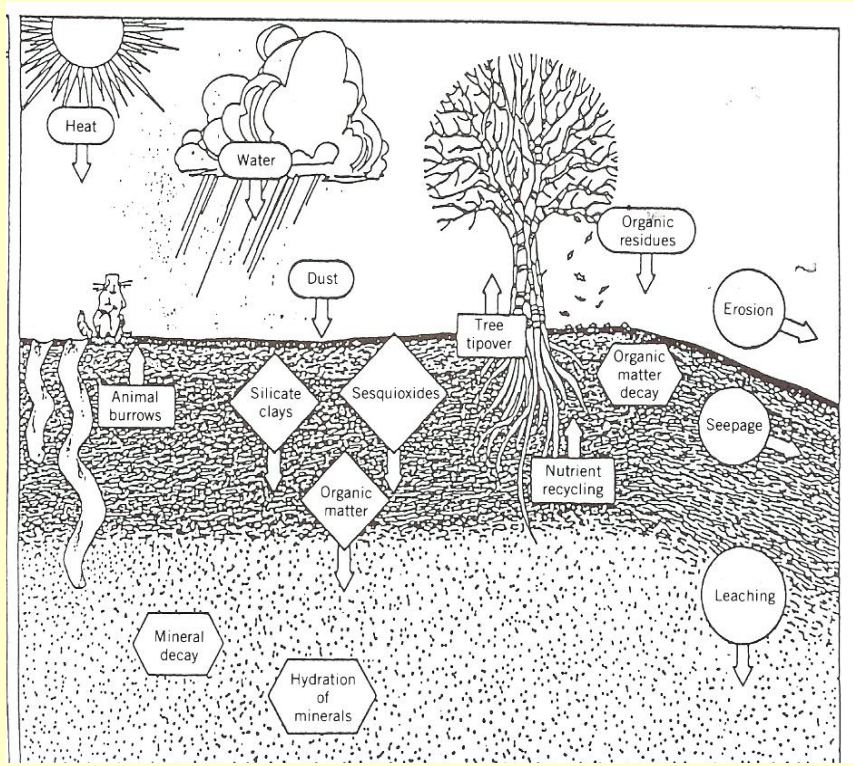


Soil Core from Pt. Judith Pond, RI - Billington Soil Series

Definition of Soil

Soil…is a natural body that occurs on the land surface, …and is characterized by [either]

1. Horizons, or layers, that are distinguishable from the initial material as a result of <u>additions, losses, transfers, and transformations</u> of energy and matter or
2. The ability to support rooted plants in a natural environment.



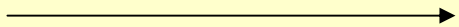
Definition of Soil

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

Subaqueous Soil Formation

Combination of Jenny's soil forming factors and Folger's sediment genesis factors:

Ss = f(C, O, B, F, P, T, W, CE)

Ss = subaqueous soil

C = Climate/temp.

O = Organisms

B = Bathymetry

F = Flow Regime

P = Parent Material

T = Time

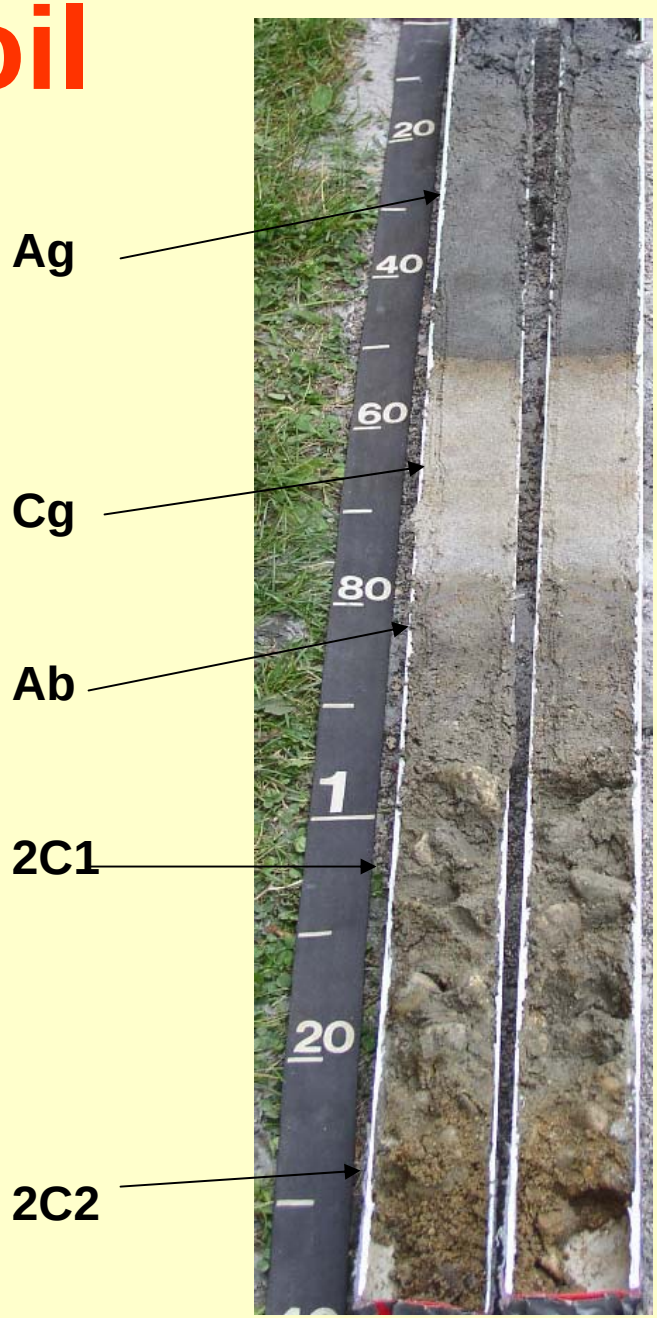
W = Water column attributes

CE = Catastrophic events

Demas, Rabenhorst. 2001Factors of Subaqueous Soil Formation.

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.



Soil Formation: Additions/Losses/Transfers

Additions

- Additions of mineral sediments – alluvial deposits.
- Biological additions – shells, organisms.
- Anthropogenic additions – dredge material, mechanical disturbance.

Losses

- Erosion losses – wave and storm losses, tidal currents.
- Decomposition of organic matter.

Transfers

- Diffusion – hi to low concentrations.
- Bioturbation.

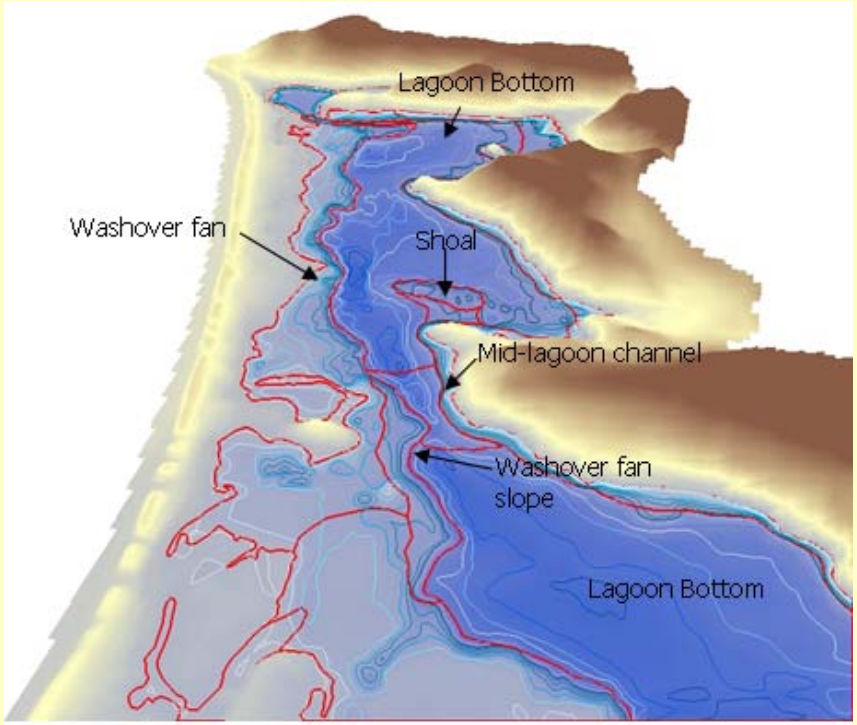
Bottom Line: Shallow Water Environments can best be studied as SOIL!

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 sediments.
- Could provide a major or missing data set for SAV restoration, estuarine protection, planning and management.
- NRCS responsibility to inventory soils.

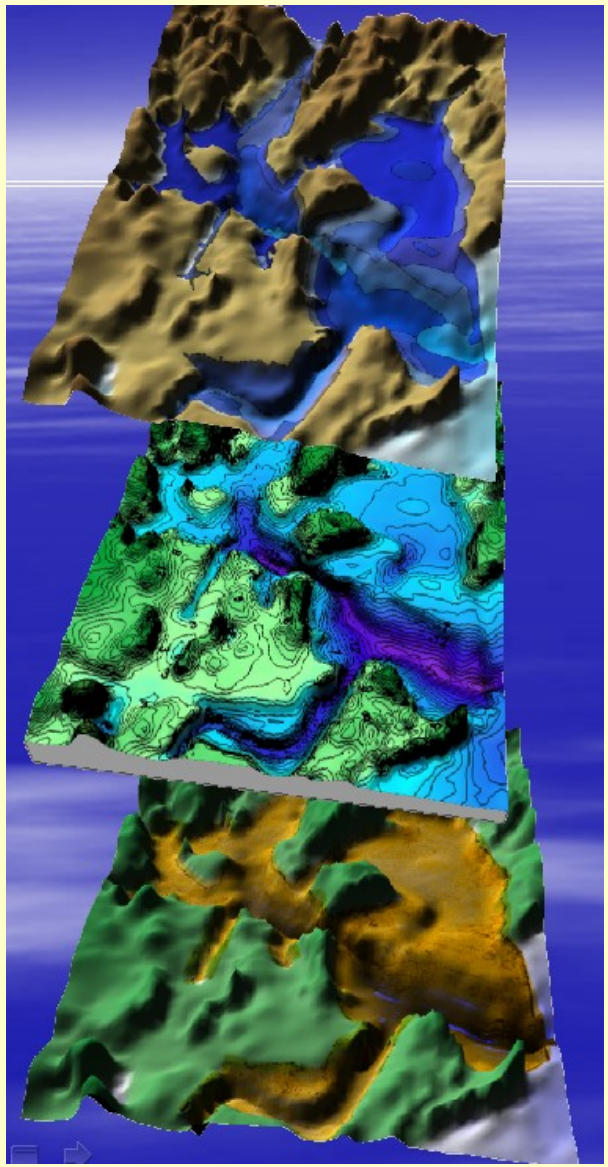
Subaqueous Mapping Procedure

- **Need to develop a bathymetric map which is used for subaqueous landform identification.**
- **Can use existing NOAA charts (order 3 mapping) or create detailed bathymetry using fathometer and survey equipment.**
- **Remote sensing including LIDAR, Side Scan Sonar, SPI, Subbottom, GPR (freshwater only), RTK GPS.**



Subaqueous Soil Mapping Procedure

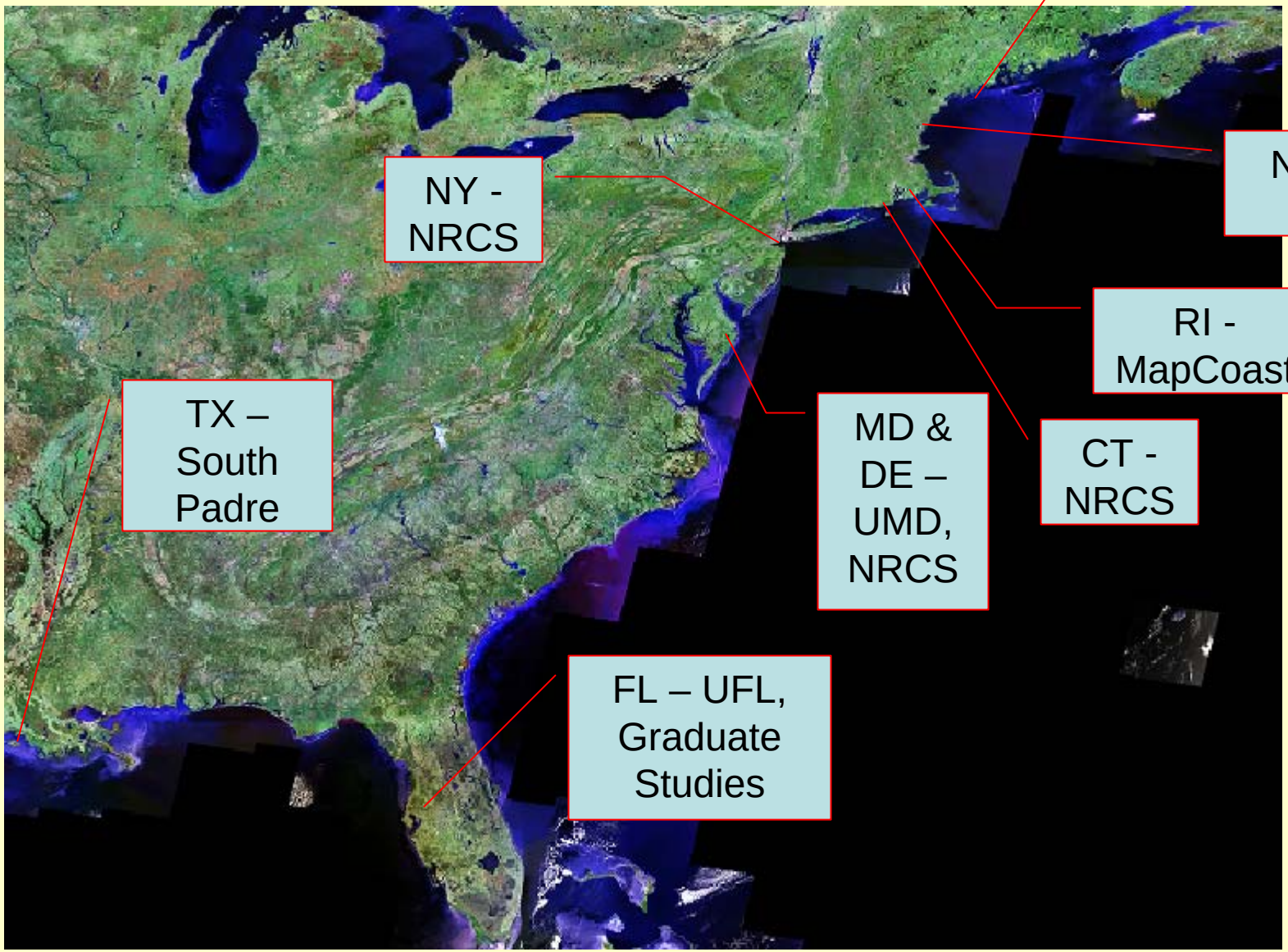
- Develop subaqueous soil series and map unit Legend.
- Identify and delineate landforms to determine soil map unit breaks.
- Map the area using standard NCSS procedure. Bucket augers and McCauley peat corers are used to investigate morphology.
- Vibracore techniques are used for deep and detailed observations.
- Determine map unit composition, inclusions, ROC, and other information – compile map.

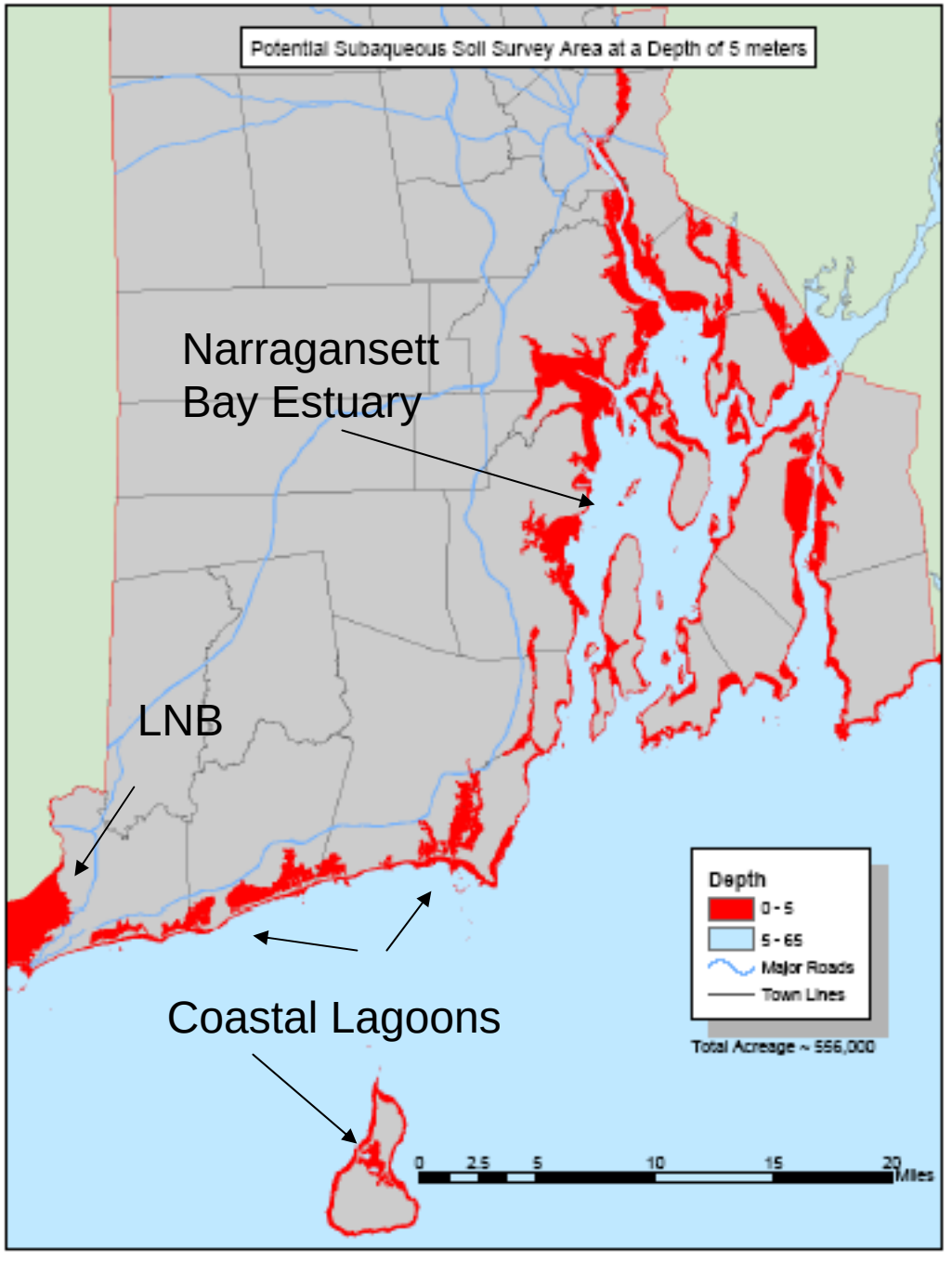


Problems/Considerations

- Difficult mapping conditions and procedure (augering in water, describing profiles, etc.).
- Need inter-discipline collaboration (coastal geology, marine ecology, biologist, etc.).
- Alluvial soils are very variable and subject to change (seasonal and long term).
- Seasonal mapping (bathymetry year round).
- Safety concerns (weather, tide, boating, environmental).
- *Requires some additional equipment, storage space, and maintenance*.

Who's doing What?





Rhode Island Stats:

Size = 4 million hectares.
Shoreline = 560 km.
Relief = 248 m to sea level.
Population = 1 million (mostly along shoreline).
Geology/Soils: Bedrock is mainly Proterazoic to Paleozoic, late Wisconsinan glacial till/fluvial, soils are mostly Inceptisols, Entisols, and Histosols.
Subaqueous Soils: Approximately 300,000 acres (areas <5m and coastal soils).

RI NRCS Subaqueous Timeline

- 1996 – Complete SSURGO soils available for terrestrial RI.
- 2000 – 2001 Bradley, Stolt subaqueous soil survey thesis Ninigret Pond, RI.
- 2002 – 2003 RI NRCS Adopts “Working Waters” Strategy – $1 million eelgrass funds, major emphasis in coastal issues.
- 2003 Gap in RI soil data identified – no subaqueous soil data to incorporate into site selection models – Action Plan: Establish a Center for Excellence in SAS.
- 2003 – National Workshop on SAS, RI gets new A.S.S.S. (yours truly) – given top priority by State Conservationist to establish a Center for SAS in RI.

2003 Develop strategy:

a. Internal = proposal for an MLRA project office for coastal and subaqueous soils for MO-12.

b. External = work with URI to organize an end-users conference to obtain input from our customers.

=

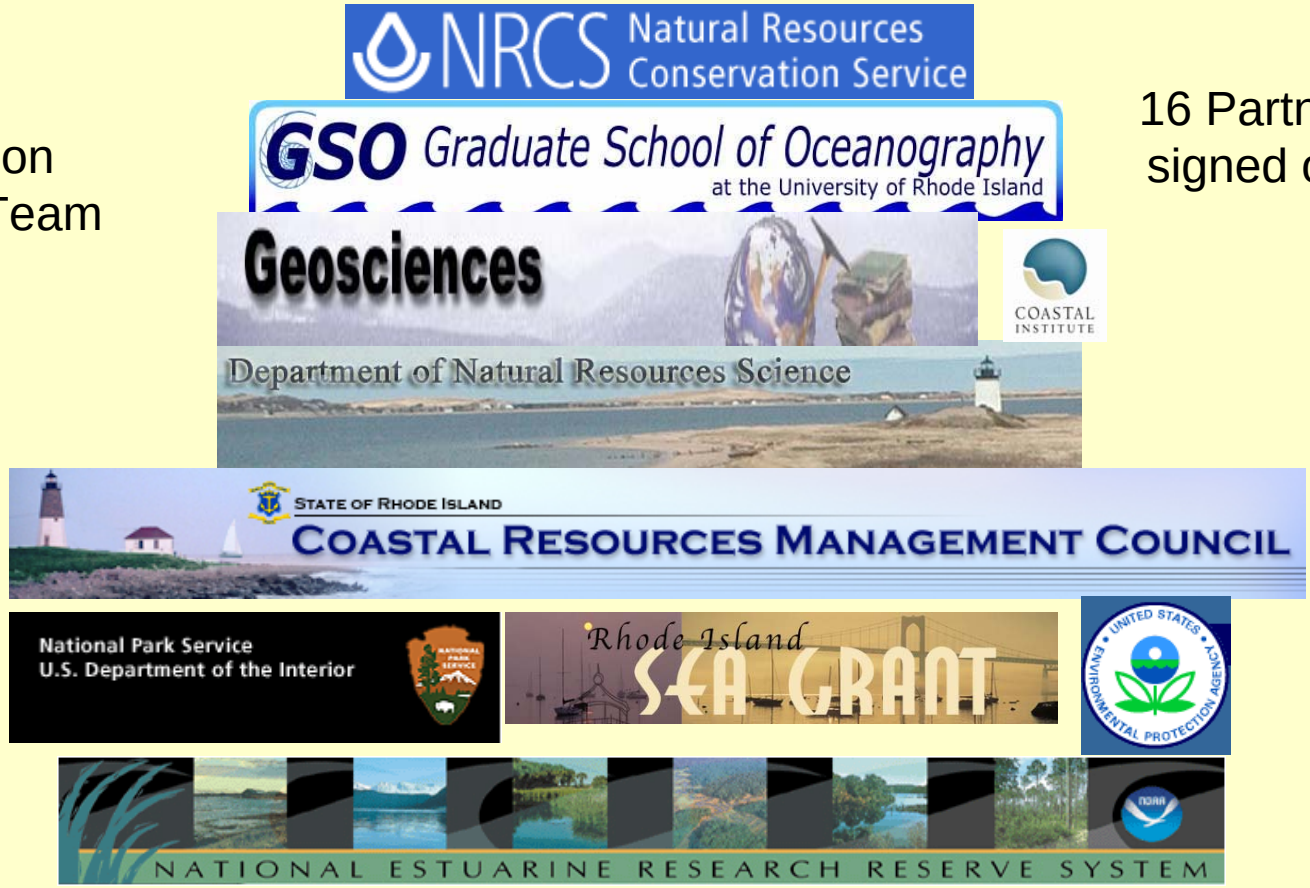
MapCoast is Born!

www.mapcoast.org

The MapCoast Partnership - *A timely alignment of people, ideas, needs and goals*

Mapping Partnership for Coastal Soils and Sediment

12 Person Steering Team



16 Partners have signed our MOU

Common Ground

MapCoast understands the need to develop a **common hierarchal system** of coastal soil and sediment classification that encompasses **all disciplines** including biology, wetlands, geology and pedology.

Common Objectives

- Develop mapping **standards** and **protocols** to produce accurate and useful maps.
- Build multiple **interpretations** of the data to service the coastal resource management community.
- Ensure that data collected will be made **available** to all users.
- Work will be conducted in a **cooperative** manner.
- Partners will **share** resources, technology, and knowledge.
- Provide **training** and **educate** users about the soils and sediment data and maps.

Our Work

- 2004 – User Conference – 70 people, break-out session to develop list of user needs (Synthesis Document).
- Develop Mapping Protocol.
- Use to map Ninigret

Appendix B – Breakout Group Summary

Information Currently Used (paper and electronic maps):

- Bathymetry
- Elevation (topography)
- Ortho-imagery
- GIS data such as soil survey, wetlands, Eelgrass beds, transportations, land use, and habitat maps

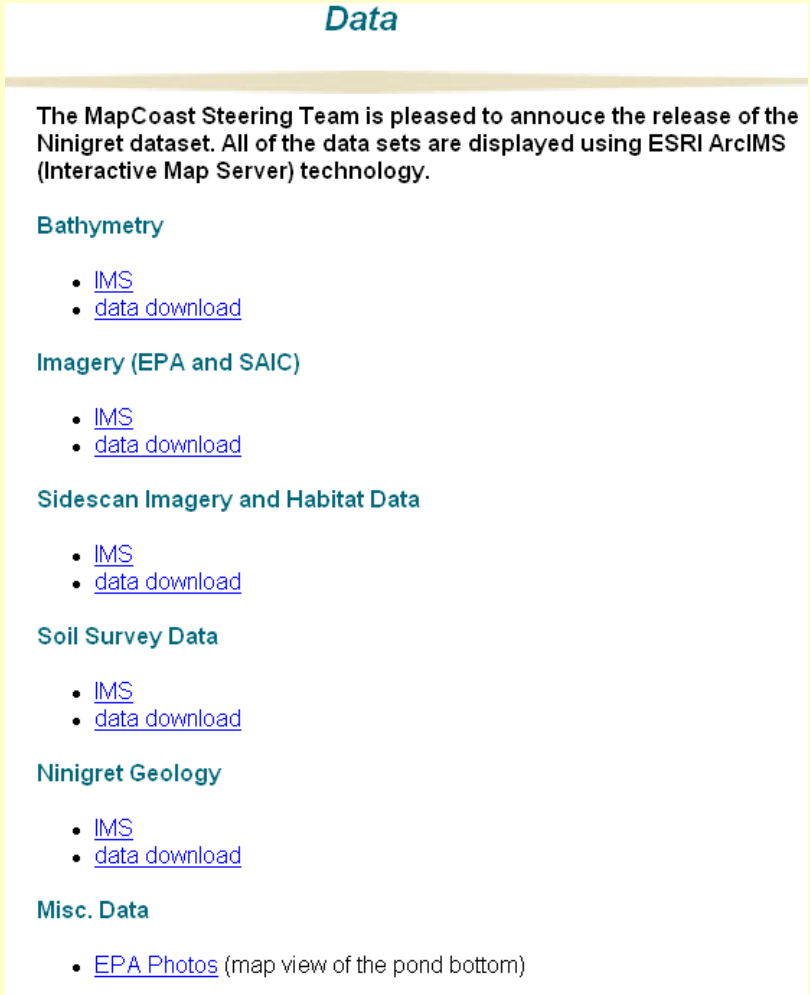
Data Needed	Information Needed	Uses, Benefits, and Other Comments
Bathymetry	Dredging information, esp. recently dredged areas	Archaeological uses
	High-resolution digital terrain model	Bathymetric and topographic
	Minimum 2 foot contours	Emergency planning – sea-level rise, FEMA, etc
Chemical and Physical Properties	Chemical and physical analysis of soil and sediment	Grain size distribution, sulfides, salinity throughout cores. Potential turbidity of dredged sediments
	Metals in sediment and bioavailability	Health issues, locating toxins
	Oxic/Anoxic layer	Where does it occur?
	Soil biochemistry, salinity	Salinity drives habitat types
	Water clarity, temperature, nutrients	
Cultural Resources	Drowned village locations	From historic sea level elevation data

MapCoast - 2005

- Field team merge on Ninigret - collect cores, bathy, RTK, side-scan, subbottom, SPI, video, map soil – analyze the data, develop GIS data.
- End season – Feature Segment local news.
- Host 2nd User Conference

2006 – Our Data

- 3rd User Conference – support for MapCoast (Senate, NRCS, State).
- Unveiling of our Ninigret Data.
- Uses of the Data.
- More input from users.



Data

The MapCoast Steering Team is pleased to annouce the release of the Ninigret dataset. All of the data sets are displayed using ESRI ArcIMS (Interactive Map Server) technology.

Bathymetry

- IMS
- data download

Imagery (EPA and SAIC)

- IMS
- data download

Sidescan Imagery and Habitat Data

- IMS
- data download

Soil Survey Data

- IMS
- data download

Ninigret Geology

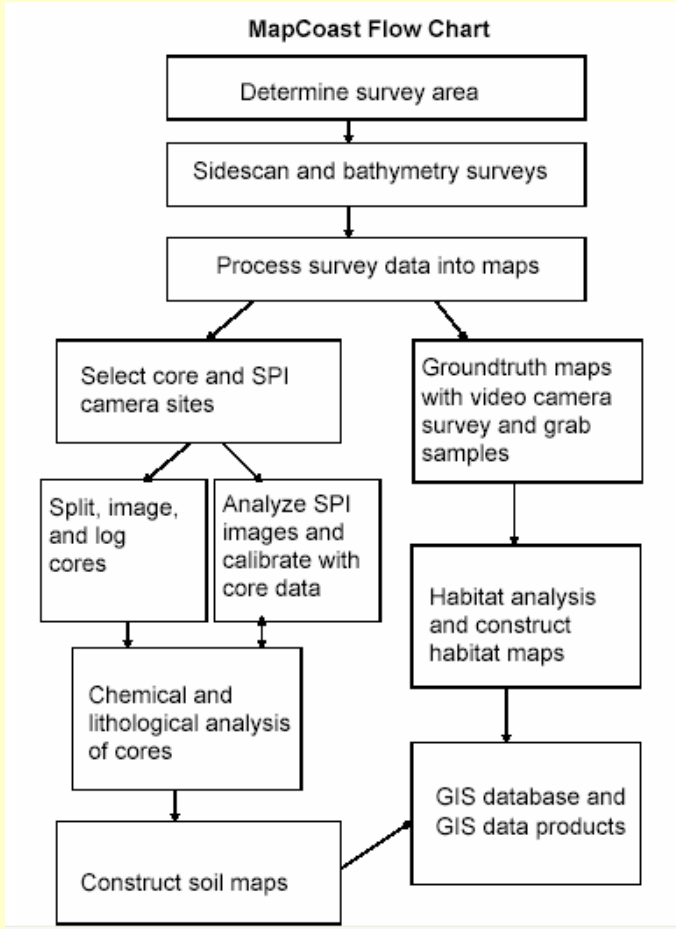
- IMS
- data download

Misc. Data

- EPA Photos (map view of the pond bottom)

Mapping Protocol

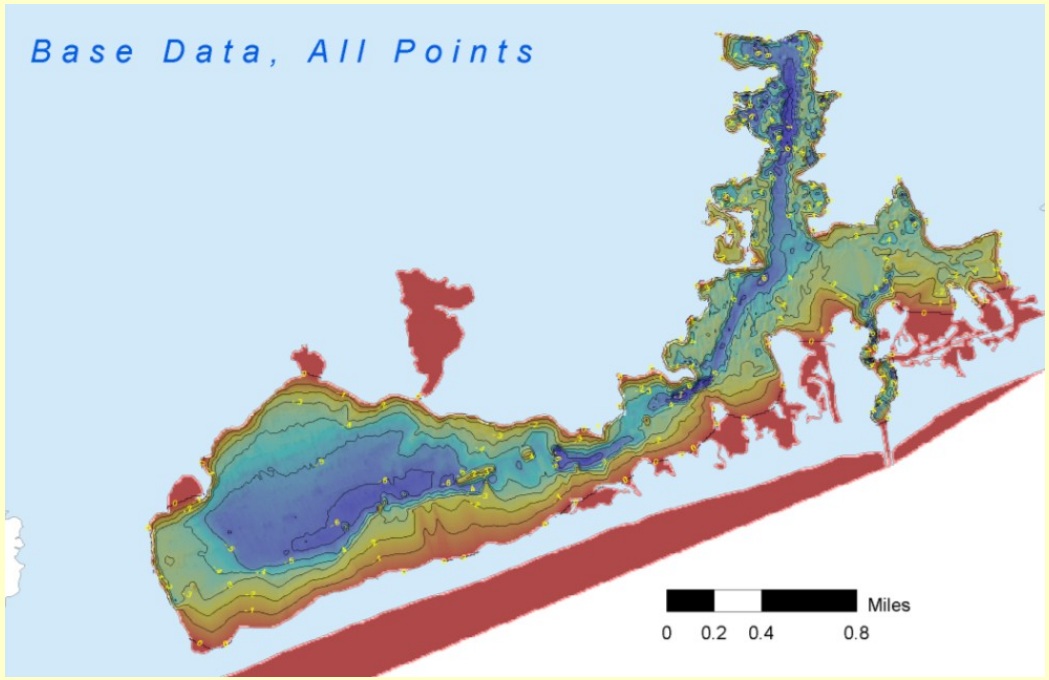
MapCoast has developed a protocol to map and provide interpretive data our users outline in our user conference. A field team (subaqueous SWAT team) has been assembled to collect the data, produce maps and metadata, and provide the data.



Bathymetry –
number 1 data need!

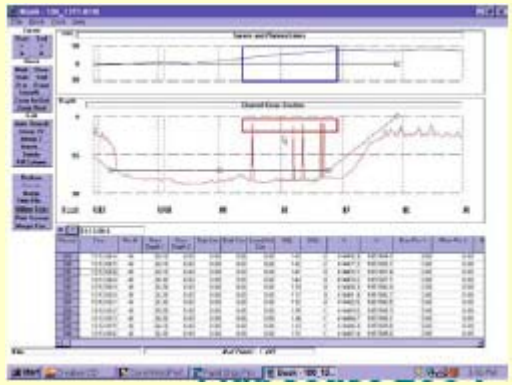
Goal: Accurate, seamless, detailed terrain model that includes bathymetry and topography.

- Field verified, measured accuracy, common datum (NAVD 88), Raster grid format (30 foot pixel).

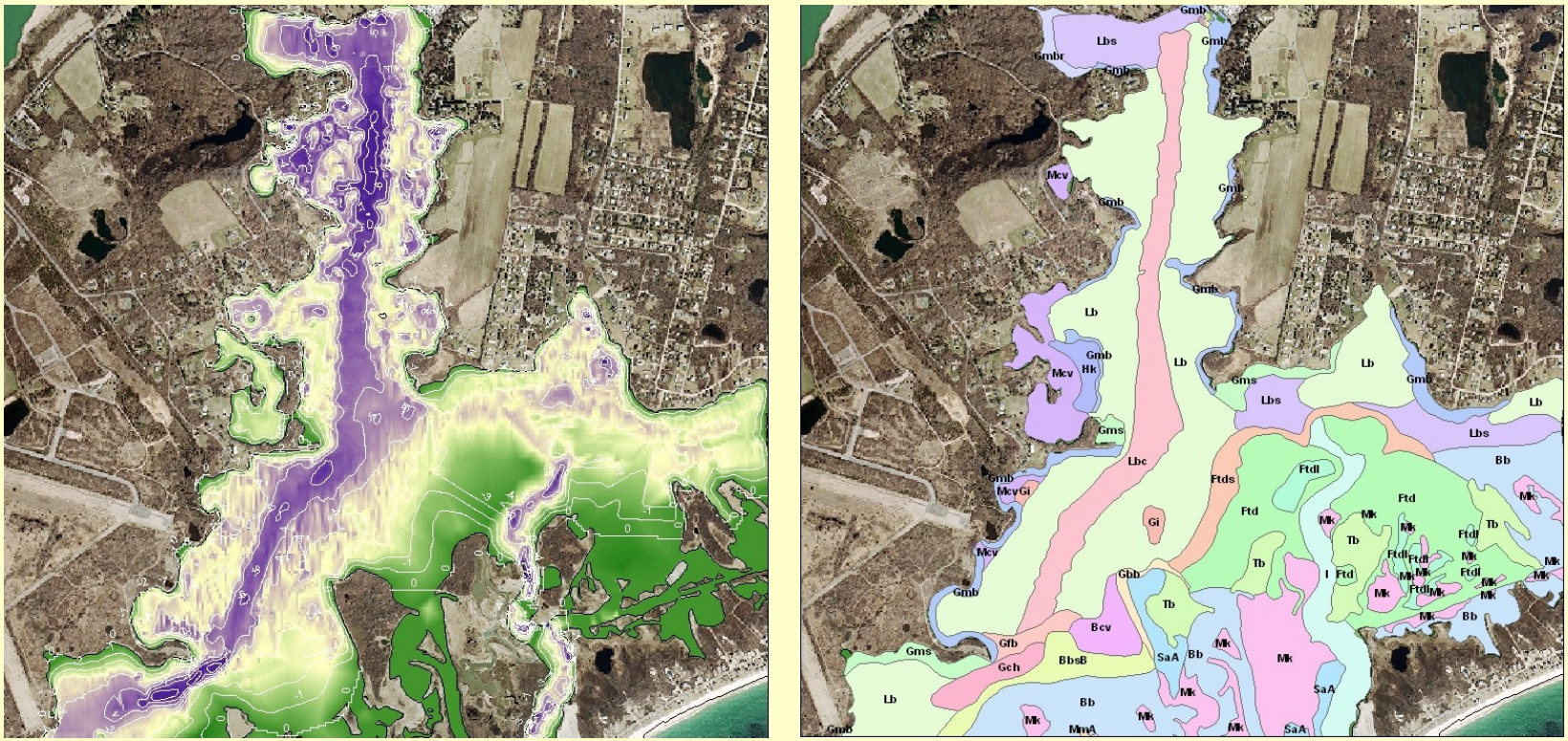


Bathy Methods -

Detailed steps can be found on MapCoast Website.



The Product - *All Elevation Data in NAVD-88, NAD83 Datum*

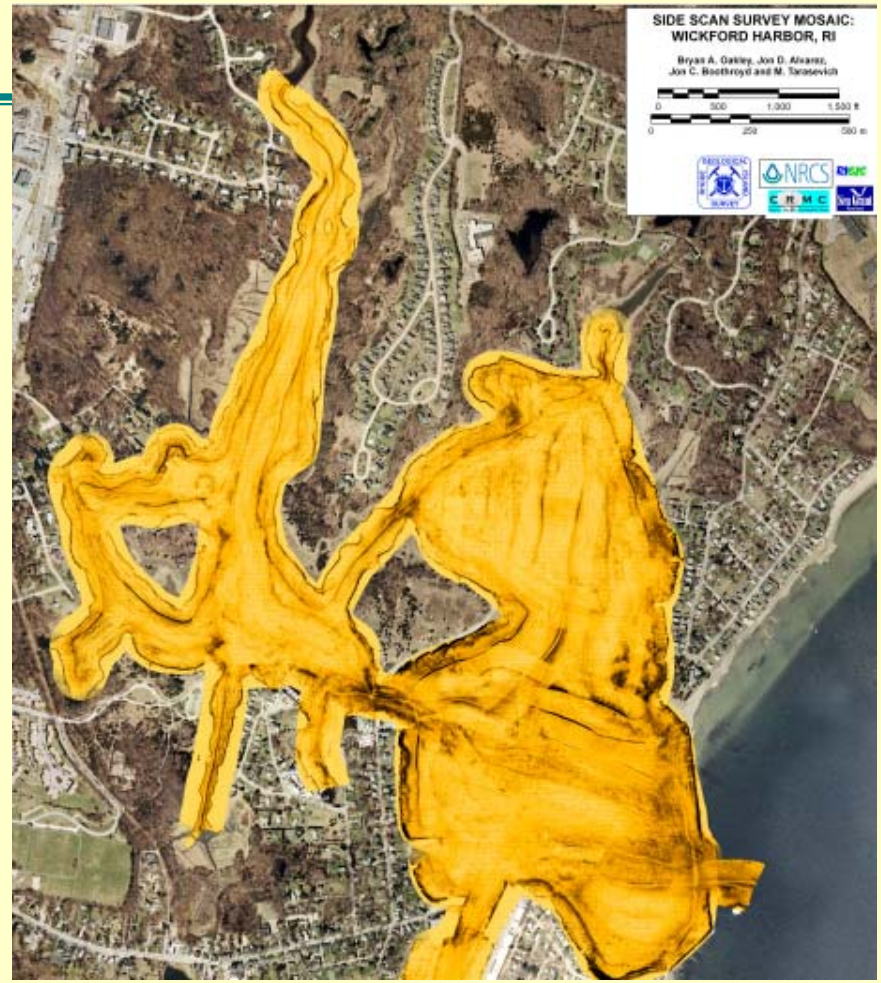


Point data and raster grids available on web

Remote Sensing Data used to construct Soil, Geology, and Habitat maps.

The MapCoast field crew also employs the following technology to map underwater features:

- Side-scan sonar (acoustic map).
- Subbottom – structures down to 70 feet.
- High Resolution Imagery (number 2 data request).
- SPI Imagery.
- Still and video images of the bottom.
- GPR and EMI for Coastal Soils.



Side-scan sonar map of Wickford Harbor

Subaqueous Soil Mapping

- Bathy and other data is integrated to draw landscape units and soil mapping units (bouldery phases, intertidal units, etc.).
- Field investigations consists of collecting point observations of selected areas with hand tools (auger, McCauley, rods).
- Points are geo-referenced, described on boat, entered into tablet in a spread sheet.

Coring - *Selected (representative) areas are then cored using a vibracore or hammer core.*

Rossfelder Vibracore – obtains a 4 in diameter PVC core – any depth.

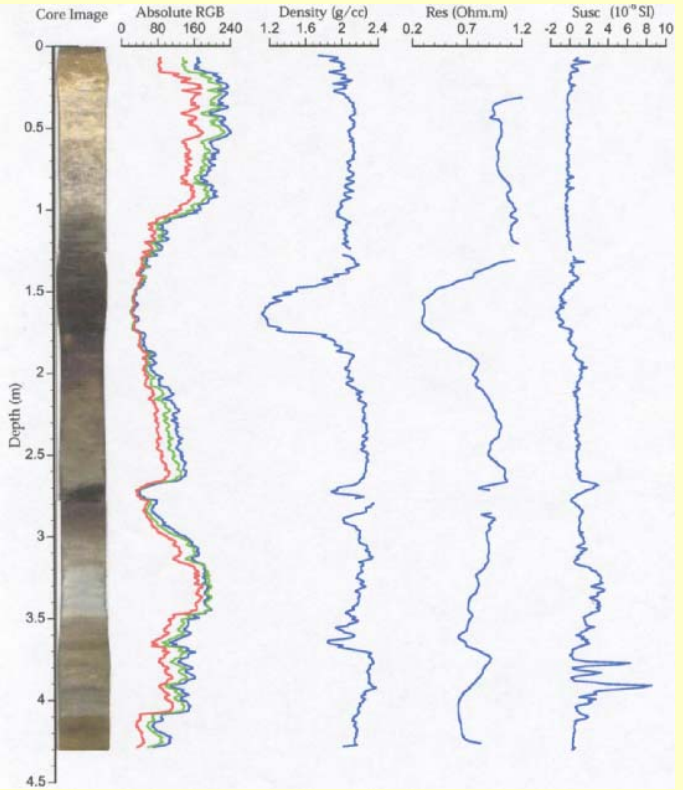
Biologic core for highly fluid soils (4” Polycarbonate tube).

Core Cutting and Describing –

cores are stored at 4C.

Cores are cut and a full description is taken. One section is sampled and imaged, the other is stored as an archive sample forever.

Core Imaging – *Geotek Core Analyzer and Niton XRF*



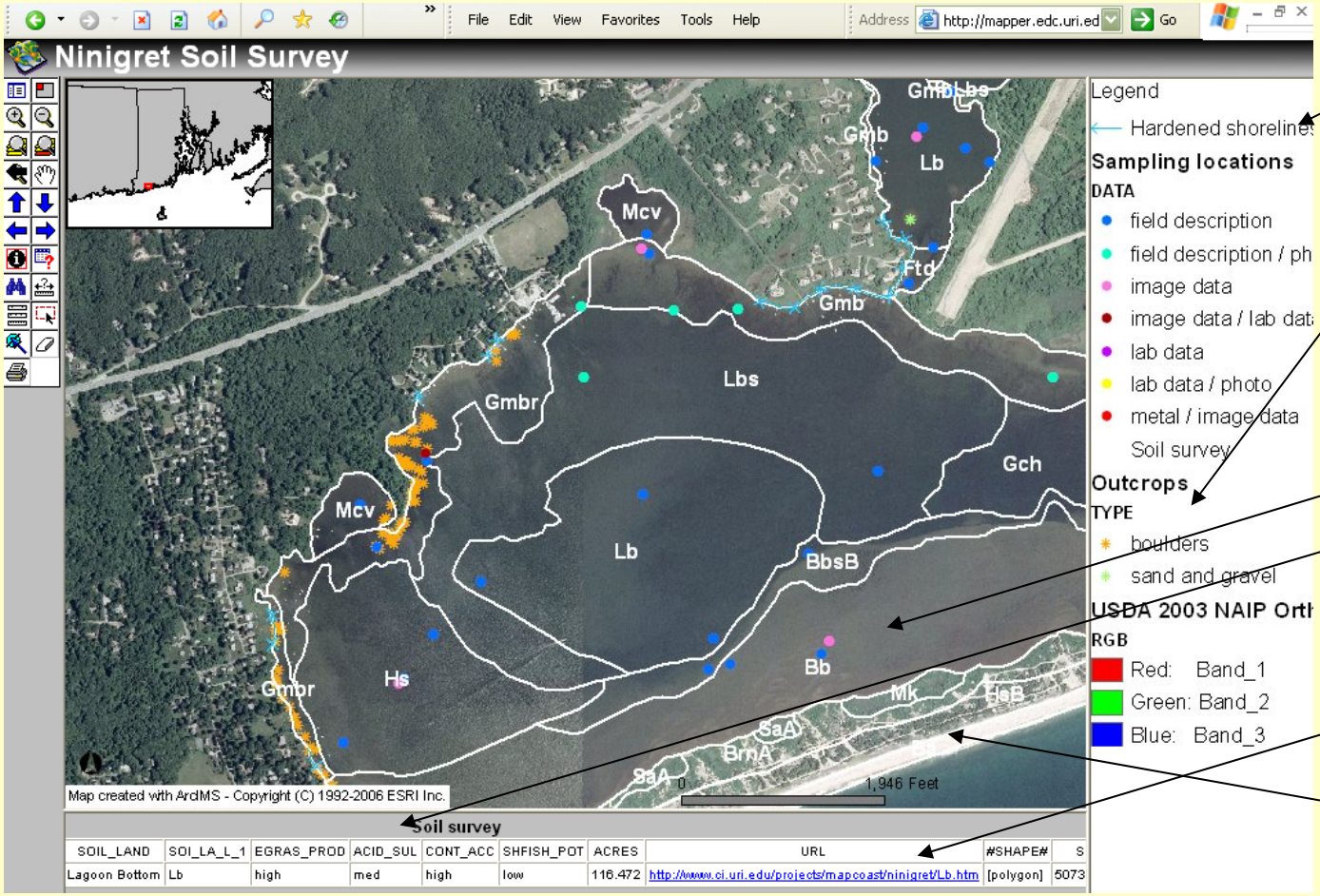
X-Ray Flourcence

-Heavy metal data 15 elements.

Rapid data collection.

-High resolution image, RGB color, Density, Magnetic data, resistivity.

Soil Landscape Units → Soil Map



Lines – shoreline protection, etc.

Points – AdHoc spot symbols.

Polygons – spatial info with attribute data

Links

Coastal soils

Interpretations – *Who Needs SAS*

Data (So What)?

The Narragansett Times

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RAVAGED

Nine days of wind, rain wreak havoc

The Narragansett Times • Wednesday, October 19, 2005 • Page 3-

Major dredging planned for Harbor of Refuge

Sand would replenish nearby East Matunuck State Beach

By GALEN McGOVERN

SOUTH COUNTY -- A proposal by the U.S. Army Corps of Engineers to dredge the Harbor of Refuge and east and west channels into Point Judith Pond is getting positive reaction locally. Michael Walsh, project manager with the Corps, said, "Everyone I've talked to agrees it's needed and wants this to happen."

That includes Interstate Navigation, which runs the Block Island Ferry, the state Department of Environmental Management, the Coastal Resources Management Council, the Coast Guard, commercial fisherman, the Narragansett Harbormaster and the towns of South Kingstown and Narragansett. He hasn't heard any opposition to date, Walsh said.

A total of 110,000 cubic yards will be removed, and in order to protect the spawning and juvenile migration of fish, the dredging has to be done in the fall/winter time period.

The earliest the dredging can begin is a year from now. Walsh estimates it will take two months to complete; the pricetag -- paid by the federal government -- will range from $1-$2-million.

Dredging hasn't been done in the area since 1977 and the sand is clean, so there is no worry about contaminants.

The sand will be moved to East Matunuck State Beach, selected because it is the nearest, easiest and cheapest disposal site for the clean sand. According to Steven Wright, superintendent of Parks for DEM, "the west side of the beach is predominately rocky compared to the east side. It always has been. This will absolutely be beneficial."

There may be other beaches in more dire need of replenishment, but transporting the sand is cost prohibitive. For example, if South Kingstown wanted the sand for the badly-eroded town beach in Matunuck, "that additional cost would have to be picked up by a local sponsor," according to Walsh.

Bruce Kaiser, director of Administrative Services for South Kingstown, hopes if the current is right that the South Kingstown Town Beach "might be the beneficiary of it (the sand) at some time."

The dredging is good news for all boaters, but especially for bigger craft like the commercial fishing vessels and the ferry, which could have trouble navigating the channel at low tide. When completed, the dredged channels will be 15 feet below the average of the lower low tides. "There are two low tides [every day] and one is lower. Most of the fishing vessels draft at 12 feet and they need the extra under clearance," explained Walsh.

South Kingstown has received significant complaints from recreational boaters about shoaling and shallow water in the navigation channel, according to Kaiser. The channel is not only shallow, it is narrow and this "causes boats to pass much closer" to one another which can be a safety issue, said Kaiser.

Recreational boater Skip Nelson keeps his boat at Channel Marina, around the corner from Snug Harbor. "Where I am really needs to be dredged. It's shoaling up a lot." He expressed the need for dredging the whole area around Snug Harbor and Kenport Marina.

"It would be great to let all the marinas in that end of the pond know about the dredging. Maybe they could dredge a little farther north." So far, there is no proposal to do this and the Army Corps didn't see a need for it. "But I've been wrong before," added Walsh.

Nelson said he hasn't noticed any problems with his boat near the entrance to Point Judith Pond, but his boat only drafts three and a half feet.

Walsh made it clear the Corps is experienced with working around fishing fleets. "We are always cognizant of how to get traffic out of there," he said.

The contractor for the Corps will be using a hydraulic dredge with a submerged pipeline in the navigation channel. The pipe will run over the breakwater and snake toward the beach.

The Corps haven't addressed going across private properties yet and will contact owners for access if they need it. They are currently seeking aspects of the project as well as public comments from all those interested.

Comments referencing this proposal should be submitted no later than November 10, 2005 to the U.S. Army Corps of Engineers, New England District, Programs/Project Management Division (Attn: Mr. Michael Walsh), 696 Virginia Road, Concord, MA 01742-2751. No public meeting has been scheduled as yet.

The west end of East Matunuck State Beach is extremely rocky and few people spread their blankets there in the summer. With the addition of 110,000 cubic yards of sand, that will change. At left is Matunuck Point. The marshes at the right are home to piping plovers.

Erosion forces owners to move beach house

By David Henley
Independent Staff Writer

SOUTH KINGSTOWN — While people seem willing to pay almost any price to buy beachfront property along the South Shore, one family that bought here recently is finding itself paying a bundle to get away from the ocean.

Retired IBM sales executive Warren Williams and his wife, Betty, paid $1.4 million six years ago for property at 1155 Charlestown Beach Road, with a beach house so remote you need a four-wheel drive to get to it. The two-story house stands out on the dunes east of the Charlestown town line, commanding a majestic view of Block Island to the south and Green Hill Pond to the north. They also bought 11 surrounding lots, a total of around 12 acres of dunes and spartina.

They had no idea how quickly they would need that extra land.

"We knew of course that erosion was going to be a problem, and even expected that we would someday have to move the house back, but we thought that project was a good 10 or 15 years out," Williams said from his home in Wilton, Conn., Tuesday. "The previous owner had installed what they call dune guard fencing, and it seemed to do a pretty good job for about six years. Then after one storm last December our contractor called and said the fence was above ground, that the footings were exposed. I was thinking about calling the company that installed it to see if they could save it when we had another event and my contractor said it was gone."

Without the fence, the dunes in front of the house quickly succumbed to the sea. December's storm ate away dozens of feet of property.

"I made the decision to move the house within 10 minutes of seeing the devastation those storms caused in December," Williams said.

The move, including house renovations and a new septic system, will cost the couple nearly $1 million.

After buying the 30-year-old

Owners/A4

PHOTO: DAVID HENSLEY

Owners Warren and Betty Williams already had begun renovating this summer house on Charlestown Beach Road when storms eroded the dunes in front of the house. They have decided to move the house 200 feet away from the shore, a move that will gain them only 50 years, according to a state geologist.

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 ay for vessel traffic serving both the cities of Cranston and Warwick. [Cl o go b e top of the page.]

Narrow River Aquatic Ecosystem Restora ect: $150,000
Narragansett/South Kingstown

The Army Corps s w ceive ,000 in feder nd nt a feasibility study f o rest tuari itats along th rro r in Narragansett ar t Kingstown ps of Engineer pr a Preliminary Res to red tion between ow and Rhode Island Sound. [C o the t th .]

Roger Williams University e r A tu velopment (CAD): $1,000,000
Bristol

Roger Williams (RWU) in Bristol will receive $1,000,000 to support the establishment of a C r Aquaculture Development (CAD). The CAD will be established within the University's s ccessful 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 Po habitat purposes under the South Coast Habitat Restoration Project, minimizin f the project.[Click to go b e top of the page.]

Boyd's Town alt Marsh Re ,000
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The R and Reso anag Cou rece ,000 to ontin ructi Boyd (Town estor roject. oject will estore 3 acr mar wildlife ry a ond b ing redge ial as wit al navi roje k to g the top of he pa

rush ve ha orati
Warwi

The A rps o eers and the Rhode Island Coastal Resources Management ound eceive $150,000 to continue to develop a feasibility study for Brush Neck ove i reenwich 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 removal of dredged material associated with a Federal navigation project.[Click to go back to

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 cooperative research program to study the causes of lobster disease and the decline in the lobster fishery in New England waters. [Click to go back to the top of the page.]

$9 Milion

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

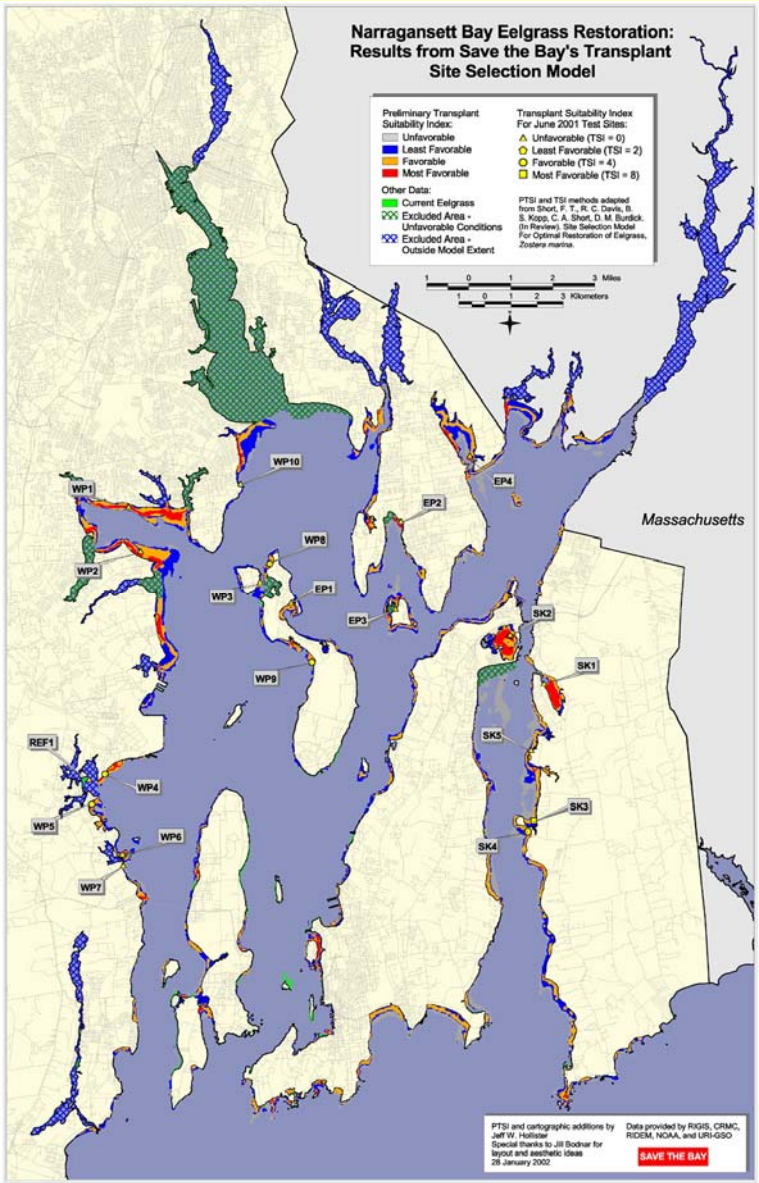
Appendix B – Breakout Group Summary (Con't)

Data Needed	Information Needed	Uses, Benefits, and Other Comments
Elevation	Tidal data – Mean High Water and Mean Low Water	Beach access, regulatory applications (property lines), drowned village locations
GIS and Cartographic Information	Rock outcrops and depth to bedrock	Engineering structures, pylon and bulkhead construction
	Hardened shorelines	Regulatory uses, habitat evaluation, erosion hazards. Rock outcrops may be locations of former villages
	Land use change	Identify former wetlands and drainage
Imagery	Ortho images flow every 2-3 years	Map resolution as high as possible (025 acre minimum)
	Rectified, digital historic imagery	Archived photos and data
	Side-scan sonar and bottom analysis	Location of shipwrecks
	Thermal imagery	Fresh water movement into estuary
Regulatory	Location of docks and moorings	Cumulative impact on and relation to Eelgrass growth
	Structure permits, including structural information	Detailed attributes of structures
Soil and Sediment Data	Bed configuration	Use to assess current flow information
	Classification and distribution of subaqueous soils	
	Coastal erosion hazards – changing coastline	Accretion rates and relation to sea level rise
	Interpretations of classified soils	Environmental interpretations, health and water quality benefits
	Mapping of filled areas and structures	Re-mapping of old soil survey
	Mapping to beyond 25 meters	
	Soil permeability	Septic systems, risk assessment; include slopes, near shore soils, upland soils

Numerous other Interpretation Needs:

- Accretion rates.
-Heavy Metals / Health Issues.
-Freshwater Inputs.
-Archeological – prehistoric landscapes.
-Baseline Data – chemical, spatial, habitat.
-Classification of the soils.
-Coastal soils information.

Restoration



Eelgrass Suitability Mapping: Critical Variables

Site Selection Model

Wave Exposure (exposure & current speed)

Soil Characteristics (texture, sulfide, organic matter)

Bioturbator Abundance

Temperature

Bathymetry (Critical Depth)

Missing!

MapCoast Future Plans

- Await for word on Coastal Zone Soil Survey Initiative funding = RI Center for Subaqueous Soils.
- 2007 – 2008 NOAA funding to develop mapping protocol and procedure for subaqueous soil mapping – publish paper.
- Work on building interpretations, classification system, integrate other disciplines and their data (shellfish folks, benthic, etc.).
- Continue mapping and data collection – improve process and dissemination. Expand into freshwater mapping.

www.mapcoast.org or nesoil.com/sas

Questions?


Hmm…
How did I manage to get stuck in this soil?
USDA NRCS
Sun
TRACKER