Coastal Zone Soil Survey Interpretations

Natural Resources Conservation Service

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Helping People Help the Land

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Soil survey interpretations predict soil behavior for specified soil uses…

Soil interpretations use soil properties or qualities that directly influence a specified use or management of the soil, including:

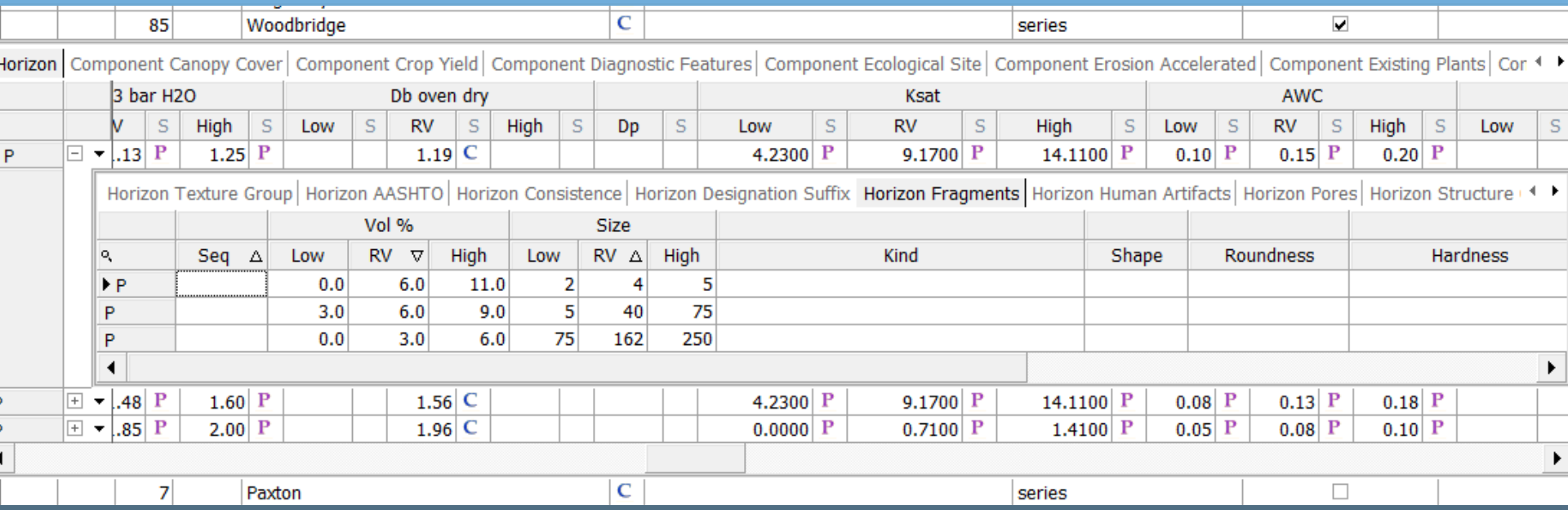
(1) site features, such as slope gradient (water depth);

(2) individual horizon features, such as particle size;

(3) characteristics that pertain to soil as a whole, such as depth to a restrictive layer.

-National Soil Survey Handbook

Site, horizon, soil data collected – NASIS database



		85		Woodbridge	C		series	☑	

Horizon | Component Canopy Cover | Component Crop Yield | Component Diagnostic Features | Component Ecological Site | Component Erosion Accelerated | Component Existing Plants | Cor

		3 bar H2O				Db oven dry						Ksat					AWC					
		V	S	High	S	Low	S	RV	S	High	S	Dp	S	Low	S	RV	S	High	S	Low	S	RV	S	High	S	Low	S
P	⊟ ▾	.13	P	1.25	P			1.19	C					4.2300	P	9.1700	P	14.1100	P	0.10	P	0.15	P	0.20	P		

Horizon Texture Group | Horizon AASHTO | Horizon Consistence | Horizon Designation Suffix | Horizon Fragments | Horizon Human Artifacts | Horizon Pores | Horizon Structure

		Vol %			Size					
	Seq △	Low	RV ▽	High	Low	RV △	High	Kind	Shape	Roundness	Hardness
▸ P		0.0	6.0	11.0	2	4	5				
P		3.0	6.0	9.0	5	40	75				
P		0.0	3.0	6.0	75	162	250				

	⊞ ▾	.48	P	1.60	P			1.56	C					4.2300	P	9.1700	P	14.1100	P	0.08	P	0.13	P	0.18	P		
	⊞ ▾	.85	P	2.00	P			1.96	C					0.0000	P	0.7100	P	1.4100	P	0.05	P	0.08	P	0.10	P		

		7		Paxton	C		series	☐	

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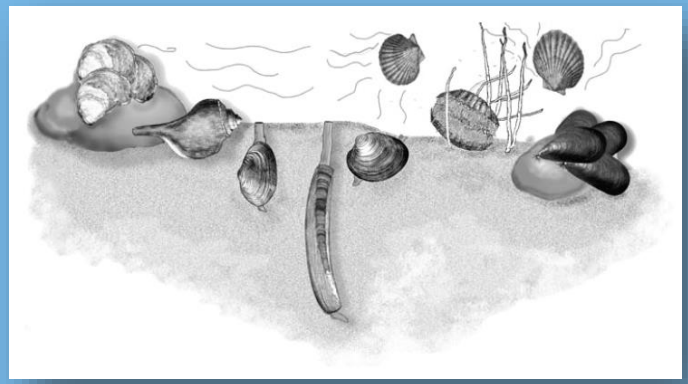
Memorandum of understanding for soil survey states which interpretations will be made for a soil survey area.

- Think about interpretations needed before soil mapping is done
- New interpretations can be developed even after data is collected

Soil based interpretations:



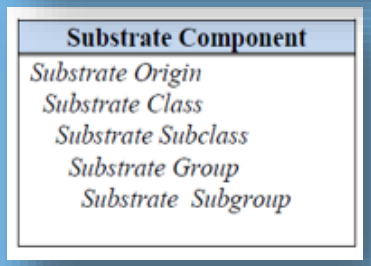
- Soil Suitability for Eelgrass Restoration
- Soil Suitability for Hard Clam Habitat
- Soil Suitability for Eastern Oyster Habitat Restoration
- Soil Suitability for Eelgrass Restoration
- Moorings – Deadweight and Mushroom Anchors
- Land Utilization of Dredge Materials
- Soil Potential for Coastal Acidification
- Shoreline Erodibility
- USDA to CMECS substrate component
- EPA ESI Shoreline Cleanup (oil spills)
- Tidal Marsh Protection and Creation
- Crab Habitat
- Horseshoe Crab Habitat
- Lobster Habitat
- Diamondback Terrapin Nesting Areas
- Wading Shore Birds and Migratory Waterfowl
- Navigational Channel Creation/Maintenance
- Dune and Beach Maintenance/Replenishment
- Blue Carbon Assessment – Carbon Sequestration
- Dock Development and Maintenance
- Living Shorelines

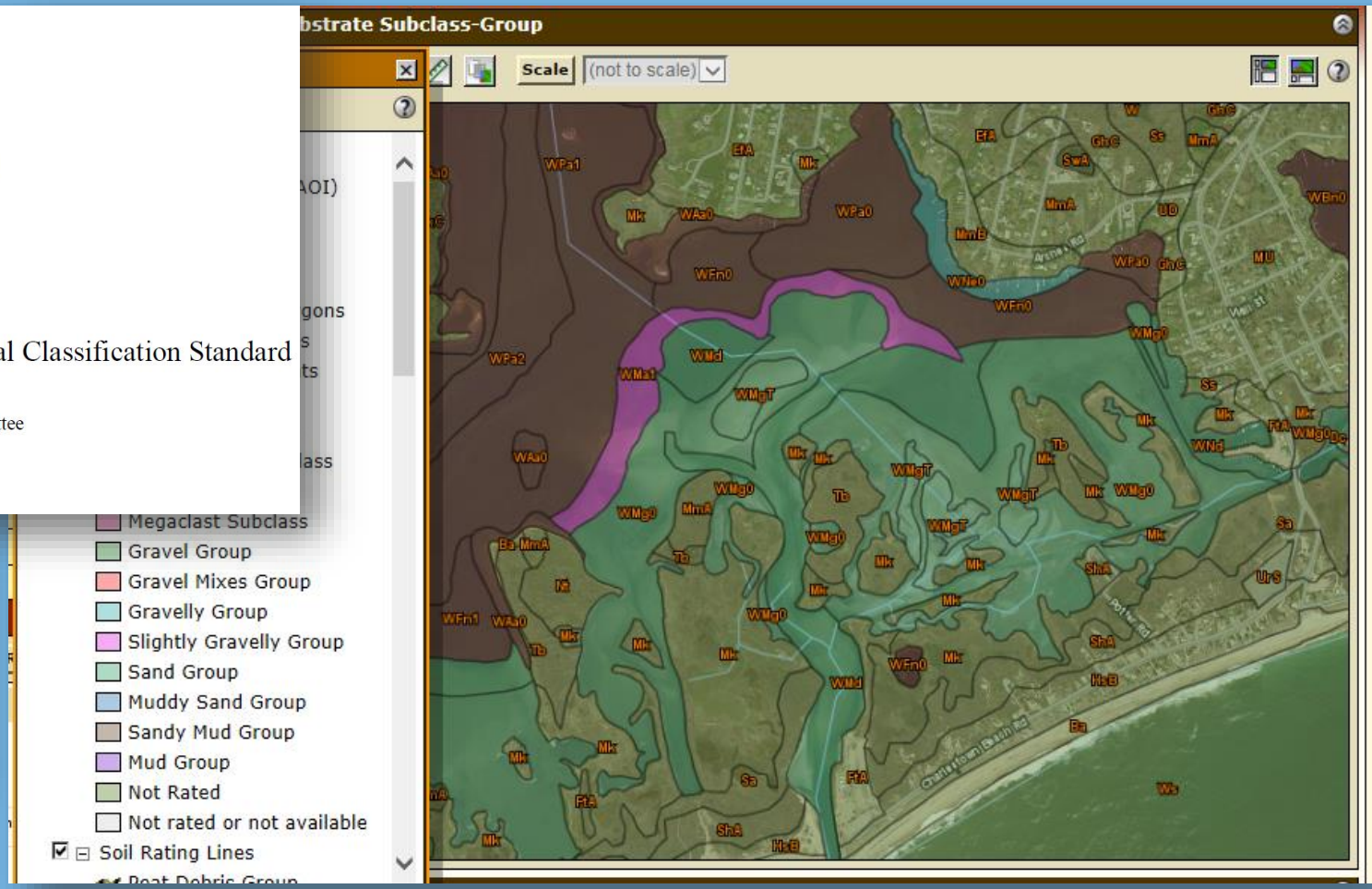
Currently available in Web Soil Survey:

Subaqueous Soils

- CMECS Substrate Class
- CMECS Substrate Origin
- CMECS Substrate Subclass
- CMECS Substrate Subclass-Group
- CMECS Substrate Subclass-Group-Subgroup
- Eastern Oyster Habitat Restoration Suitability
- Eelgrass Restoration Suitability
- Land Utilization of Dredged Materials
- Mooring Anchor - Deadweight
- Mooring Anchor - Mushroom
- Northern Quahog (Hard Clam) Habitat Suitability

Coastal and Marine Ecological Classification Standard (CMECS)

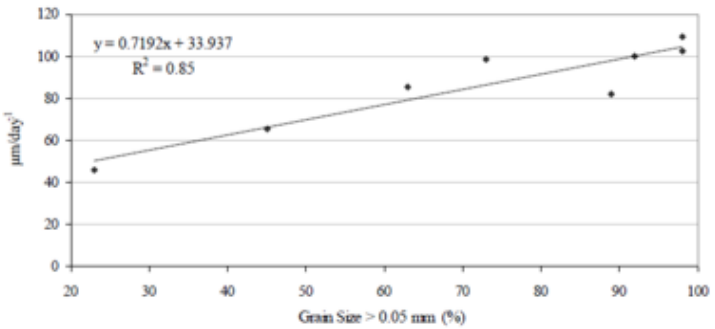




Substrate is defined in CMECS as the non-living materials that form an aquatic bottom or seafloor, or that provide a surface (e.g., floating objects, buoys) for growth of attached biota. Substrate may be composed of any substance, natural or manmade.

USDA United States Department of Agriculture

Eastern Oyster Habitat Restoration Suitability



Relationship of sand content to oyster growth (Salisbury, 2010). Soils with increasing silt-clay contents showed a relative reduction in growth

	High Suitability	Moderate Suitability	Low Suitability	Not Suitable	References
Water Depth	0.5 to 3 meters	3 to 5 meters	0 to 0.5 meters or > 5 meters		Hines and Brown (2012); Nau (2007)
Soil Particle Size: percent clay and/or silt (surface horizon)	< 10 %	10 to 90 %	> 90%		Starke et al. (2011); Rhoads and Young (1970); Shumway (1996); Marshall, (1954); Salisbury (2010); Still (2016)
Soil Particle Size: percent sand (surface horizon)	> 80 %	10 to 80%	< 10%		Starke et al. (2011); Rhoads and Young (1970); Shumway (1996); Marshall, (1954); Salisbury (2010); Still (2016)
Rock Fragments (includes shell fragments) (surface horizon)	>=15 %	0.1 to <15 %	None		Starke et al. (2011)
Rock Fragment Phases	rocky, very rocky, or bouldery phase				Starke et al. (2011)
Presence of Reduced Monosulfides (surface horizon)	No		Yes		Salisbury (2010); Still, (2016); de Zwaan A, and JMF Babarro (2001)
Oxidized pH (surface horizon)	pH >4		pH 4 or less		Salisbury (2010); Still, (2016); de Zwaan A, and JMF Babarro (2001)
Soil Reaction Class: pH (surface horizon)	pH 6.8 to 8.8	pH 6.0 to 7.5 and pH 8.8 to 9.0	pH < 6.0 and pH > 9.0		Galtsoff (1964); Sellers and Stanley (1984); Kennedy et al. (1996)
Electrical Conductivity 1:5 by Volume				<0.2 dS/m	Thayer et al. (2005); Starke et al. (2011); Begget et al. (2014); Soil Survey Staff (2014)

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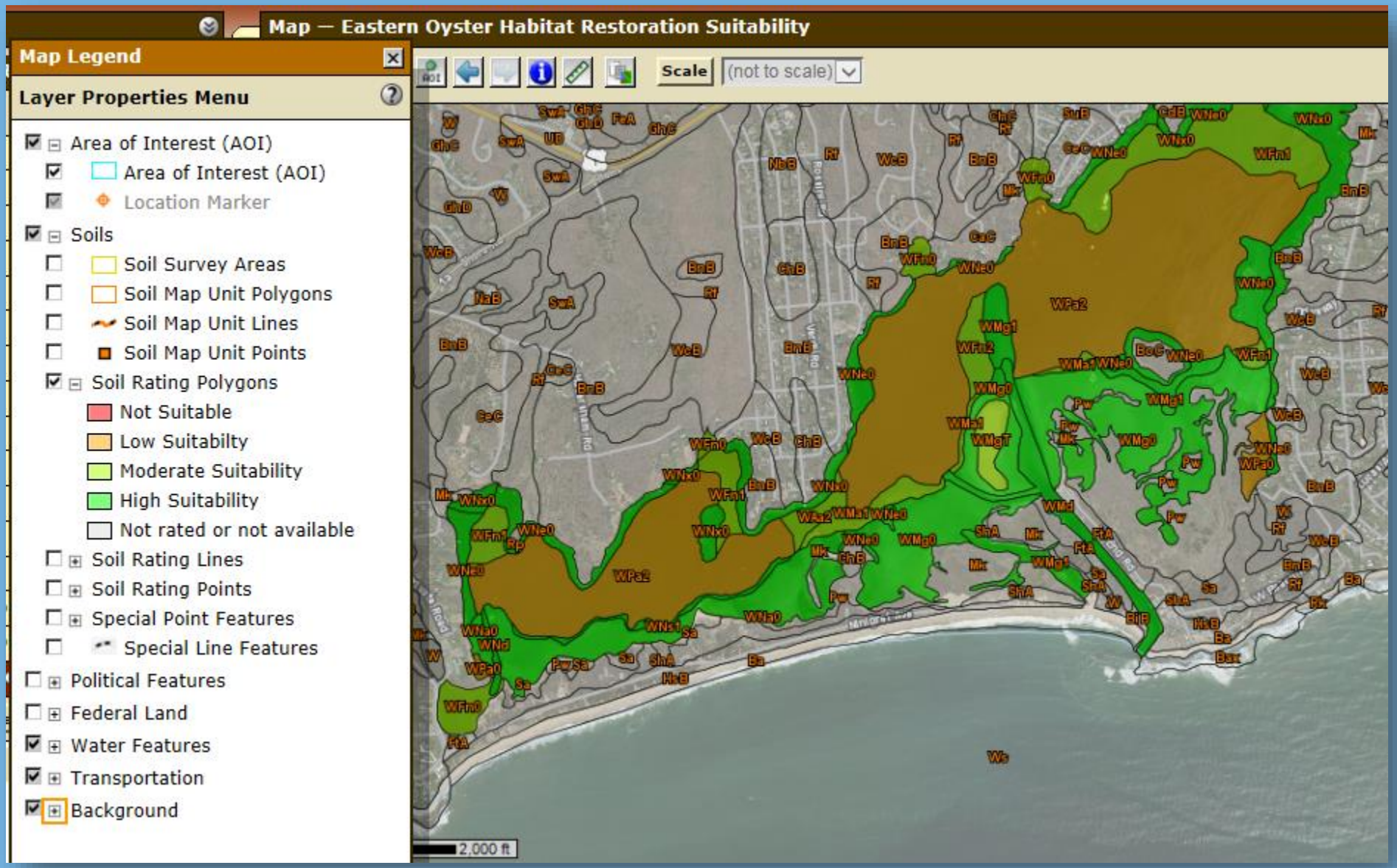
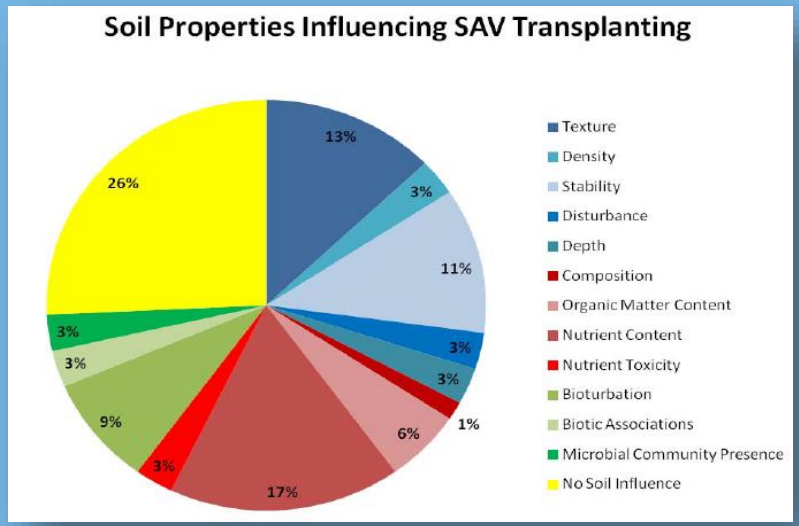

Map — Eastern Oyster Habitat Restoration Suitability
Map Legend
Layer Properties Menu
Area of Interest (AOI)
Area of Interest (AOI)
Location Marker
Soils
Soil Survey Areas
Soil Map Unit Polygons
Soil Map Unit Lines
Soil Map Unit Points
Soil Rating Polygons
Not Suitable
Low Suitabilty
Moderate Suitability
High Suitability
Not rated or not available
Soil Rating Lines
Soil Rating Points
Special Point Features
Special Line Features
Political Features
Federal Land
Water Features
Transportation
Background
Scale
(not to scale)
2,000 ft

Eelgrass (*Zostera marina*) Restoration Suitability



	High Suitability	Moderate Suitability	Low Suitability	Not Suitable	References
Water Depth	0.5 to 2 meters	>2 to 9 meters	< 0.5 and >9 meters		Bradley and Stolt, 2005
Silt and Clay (weighted average from 0 to 30 cm from the soil surface)	< 70 percent	>70 percent			Seagrass LI, 2012; Koch, 2001; Short et al. (2000)
Rock Fragments greater than 75 millimeters diameter (cobbles and stones) (weighted average from 0 to 30 cm from the soil surface)	<5 percent	5 to 35 percent	>35 percent		Kenworthy and Fonseca (1977); Short et al. (1987, 1993)
Rock Fragments on the surface greater than 75 millimeters diameter (percentage of surface covered)	<0.01 percent	0.01 to 0.1 percent	>0.1 percent		Soil Survey Manual; Kenworthy and Fonseca (1977); Short et al. (1987, 1993)
Soil Organic Matter (average weighted from 0 to 30 cm from the soil surface)	< 5 percent	5 to 8 percent	>8 percent		Seagrass LI, 2012; Koch, 2001
Reduced Monosulfides Presence (0 to 30 cm from the soil surface)	No	Yes			Hasler-Sheetal et al., 2015; Goodman et al., 1995; Dooley et al. 2013
Oxidized pH (0 to 30 cm from the soil surface)	pH >4	pH 4 or less			Hasler-Sheetal et al., 2015; Goodman et al., 1995; Dooley et al. 2013
Electrical Conductivity 1:5 method (weighted average from 0 to 30 cm from the soil surface)				< 0.2 dS/m	CCEMP, 2012; Soil Survey Staff, 2014

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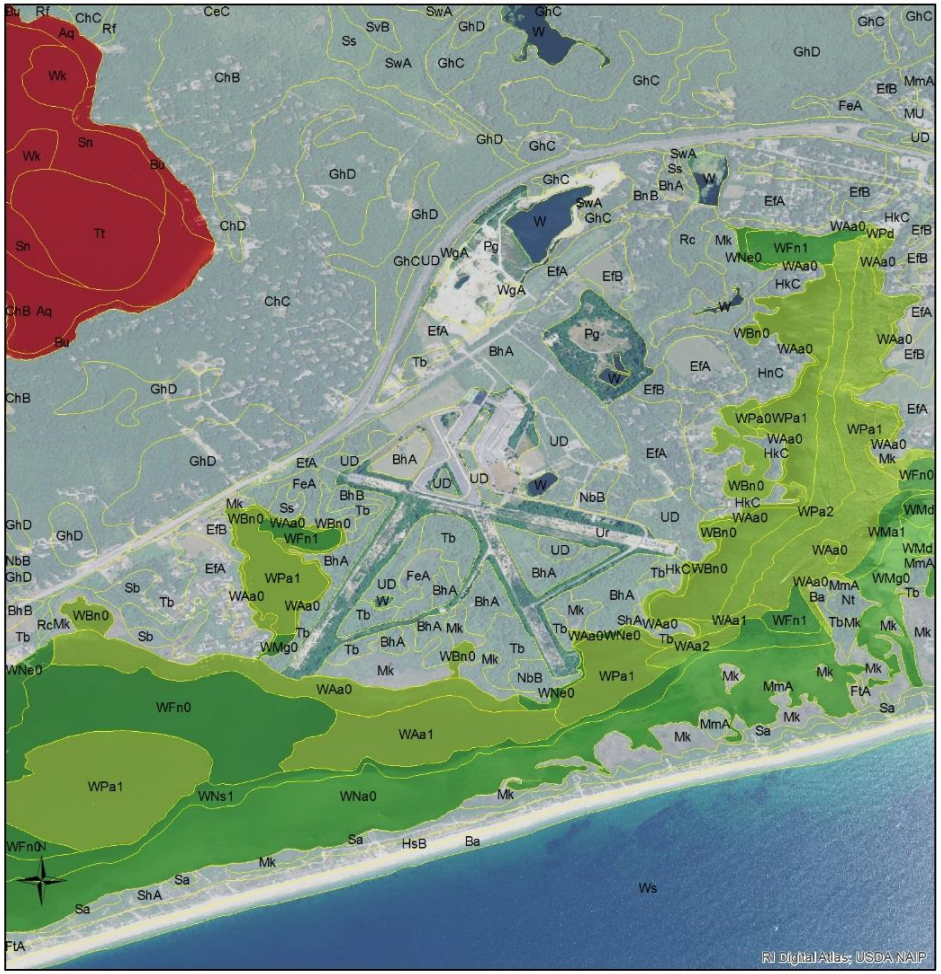
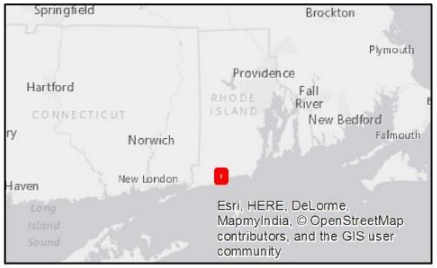
Map symbol and soil name	SAS - Eelgrass Restoration Suitability
WMa1: Marshneck, 1 to 2 meters water depth----------	0.800 (0.765-1.000) High Suitability 0.000 (0.000-1.000) Sulfides present (Sulfides present to No sulfides present) 0.000 (0.000-1.000) Oxidized pH <=4 (Oxidized pH <=4 to Oxidized pH >4)
WMd: Massapog, 0 to 1 meter water depth----------	1.000 (0.600-1.000) High Suitability (Moderate Suitability to High Suitability)
WMg0: Massapog, 0 to 1 meter water depth----------	1.000 (0.600-1.000) High Suitability (Moderate Suitability to High Suitability)
WMg1: Massapog, 1 to 2 meter water depth----------	1.000 (0.800-1.000) High Suitability
WMgT: Massapog, intertidal-----	0.800 (0.600-1.000) High Suitability (Moderate Suitability to High Suitability) 0.000 (0.000-1.000) Too shallow or too deep (Too shallow or too deep to Adaquate water depth)
WNa0: Nagunt, 0 to 1 meter water depth----------	1.000 (0.600-1.000) High Suitability (Moderate Suitability to High Suitability)





Eelgrass Restoration Suitability Ratings

Legend

Map Unit Polygons - RI

Eelgrass Restoration Suitability

- High Suitability
- Moderate Suitability
- Not rated
- Not Suitable

0 0.25 0.5 Miles

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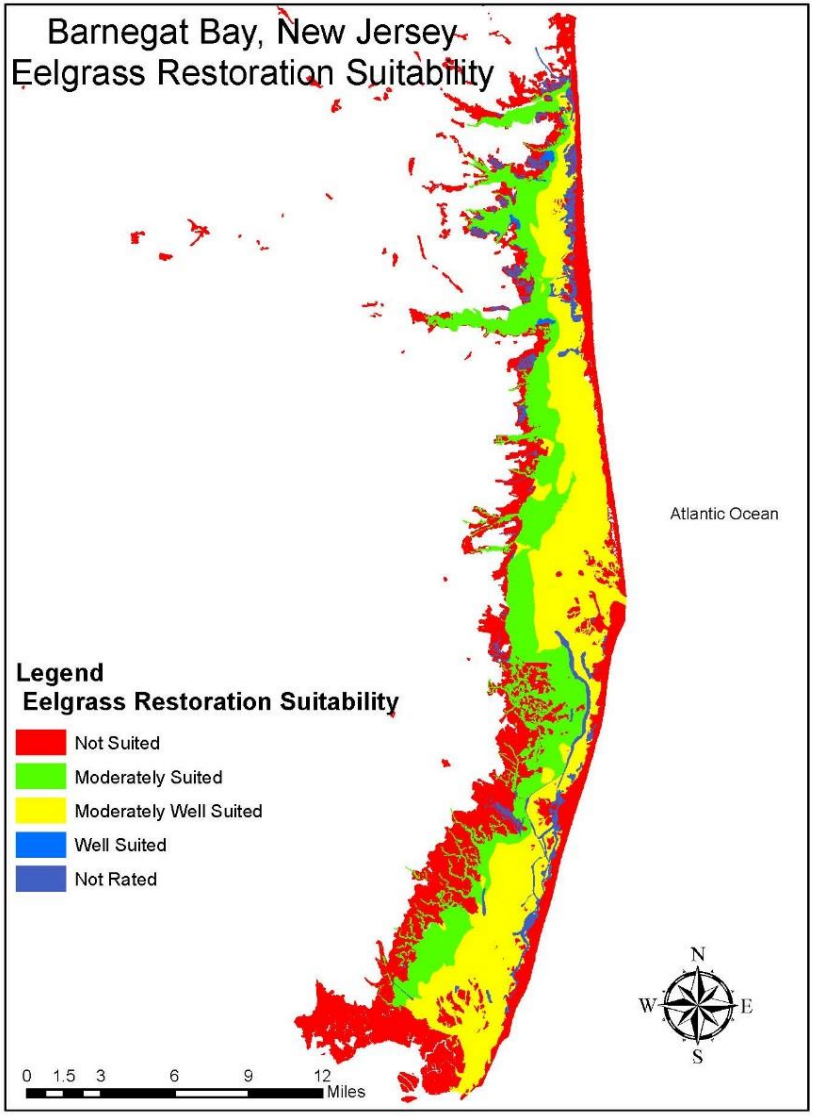
Barnegat Bay, New Jersey
Eelgrass Restoration Suitability
Atlantic Ocean
Legend
Eelgrass Restoration Suitability
Not Suited
Moderately Suited
Moderately Well Suited
Well Suited
Not Rated
N
W
E
S
0 1.5 3 6 9 12
Miles

Land Utilization of Dredge Materials

Criteria	Limited	Not limited
Reduced monosulfide presence (0 to 200 centimeters)	Reduced monosulfides present in the soil profile	No reduced monosulfides in the entire soil profile
Oxidized pH (0 to 200 centimeters)	Oxidized pH <=4 in any horizon within the soil profile	Oxidized pH >4 in the entire soil profile

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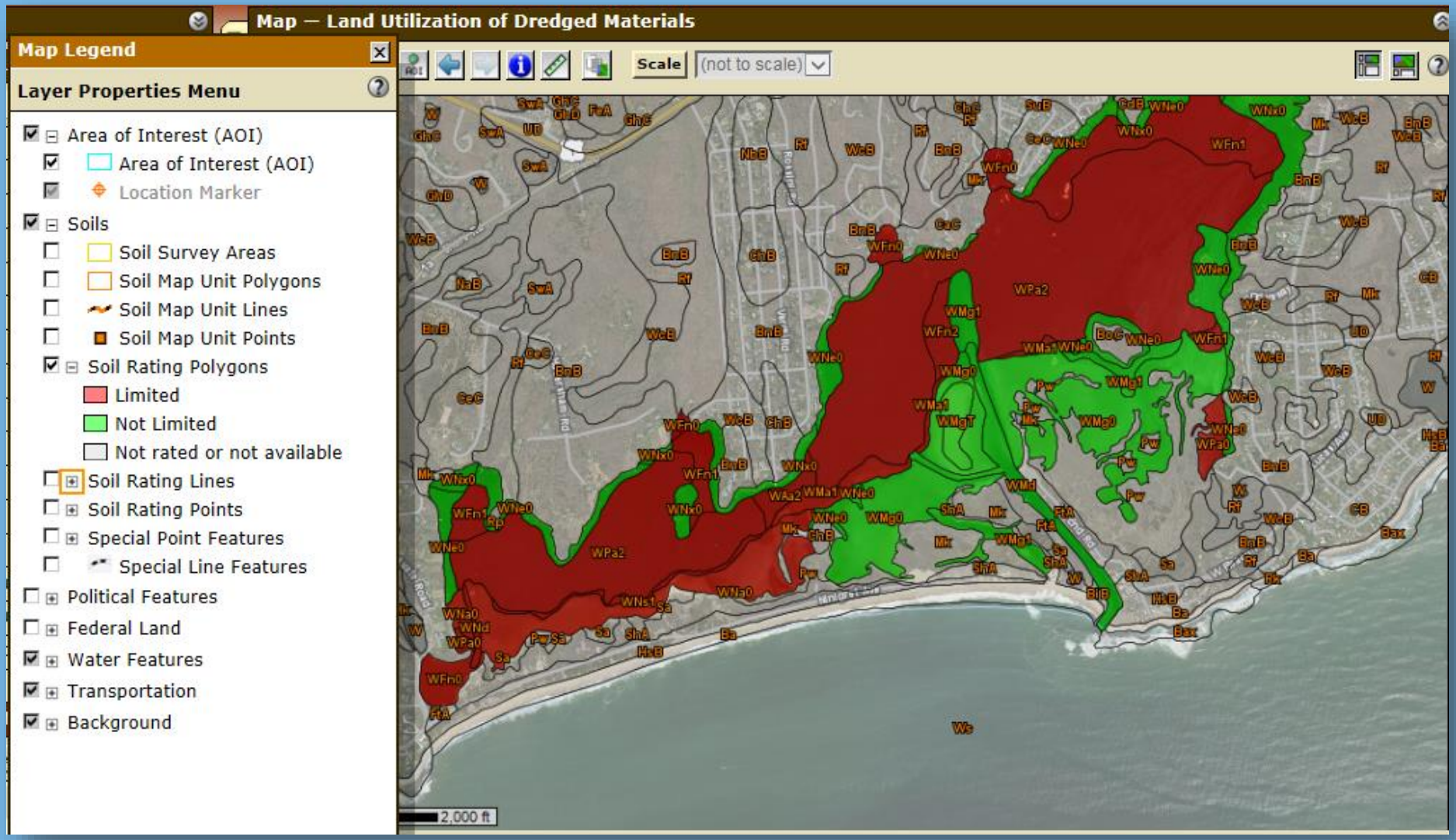
Map — Land Utilization of Dredged Materials
Map Legend
Layer Properties Menu
Area of Interest (AOI)
Area of Interest (AOI)
Location Marker
Soils
Soil Survey Areas
Soil Map Unit Polygons
Soil Map Unit Lines
Soil Map Unit Points
Soil Rating Polygons
Limited
Not Limited
Not rated or not available
Soil Rating Lines
Soil Rating Points
Special Point Features
Special Line Features
Political Features
Federal Land
Water Features
Transportation
Background
Scale
(not to scale)
2,000 ft

Moorings

Map Symbol and Soil Name	Mooring Type	
	Mushroom Anchor	Deadweight
301		
Beaches	--------	--------
Udipsamments	--------	--------
800		
Wamphassuc	Not Limited	Very Limited soft bottom
Wequetequock	Not Limited	Very Limited soft bottom
810 Napatree	Very Limited hard bottom	Not Limited

Deadweight

Mushroom

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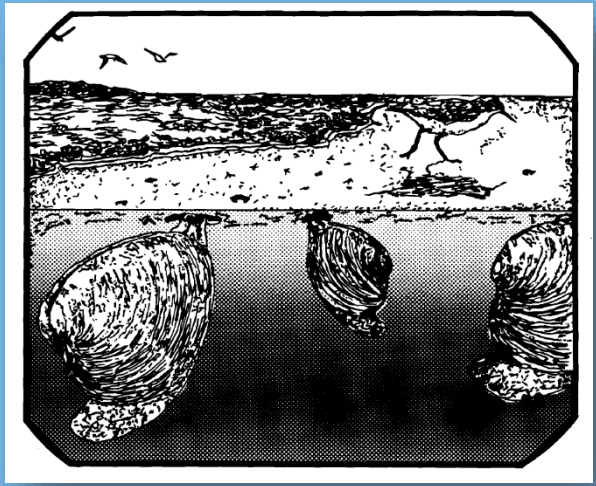
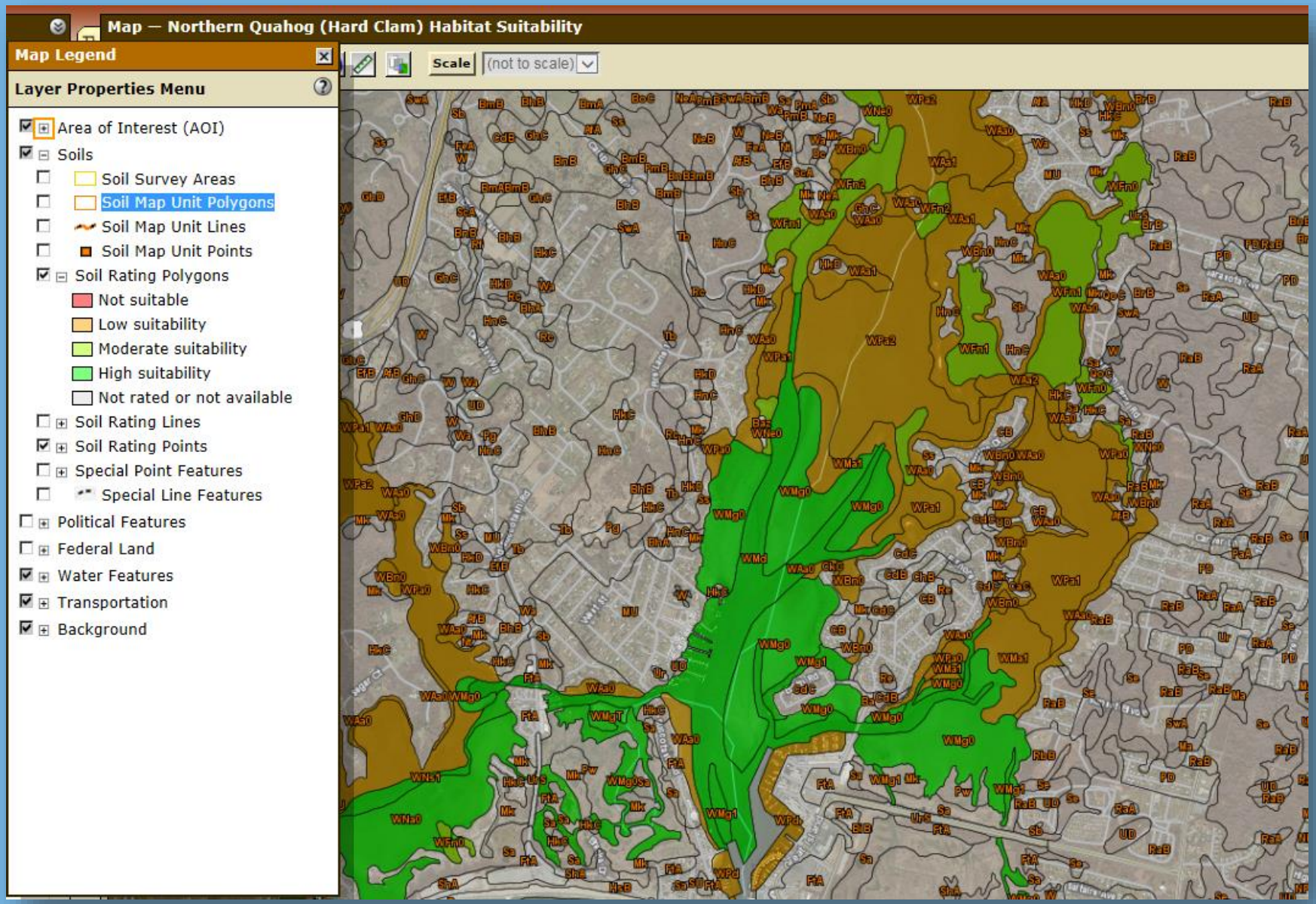
Northern Quahog or Hard Clam Habitat Suitability



	High Suitability	Moderate Suitability	Low Suitability	Not Suitable	References
Soil Particle Size: percent silts and clays (weighted average at 0 to 30 cm from the soil surface)	< 25 %	25 to 75%	> 75%		Pratt and Campbell 1956; Johnson 1977; Mulholland, 1984
Soil Particle Size: percent sands (weighted average at 0 to 30 cm from the soil surface)	> 75%	10 to 75%	< 10%		Pratt and Campbell 1956; Johnson 1977; Mulholland, 1984
Reduced Monosulfides Presence (0 to 30 cm from the soil surface)	No		Yes		Bergquist et al. 2003; de Zwaan and Babarro, 2001
Oxidized pH (0 to 30 cm from the soil surface)	pH >4		pH 4 or less		Bergquist et al. 2003; de Zwaan and Babarro, 2001
Electrical Conductivity 1:5 by Volume				< 0.2 dS/m	Davis, 1958; Soil Survey Staff, 2014
Soil Reaction Class: pH (surface layer)	pH 7.5 to pH 8.5	pH 6.8 to 7.4 pH 8.6 to 8.8	< pH 6.8; > pH 8.8		Still, 2017; Calabrese, 1972

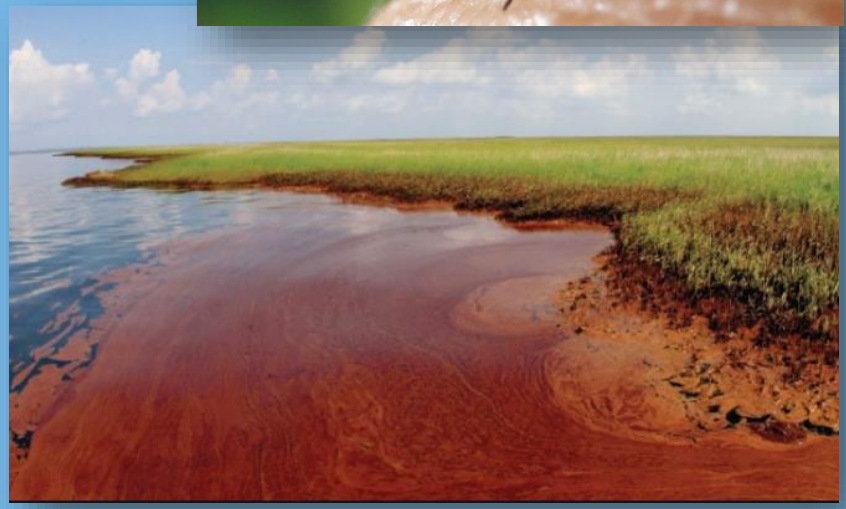

Map — Northern Quahog (Hard Clam) Habitat Suitability
Map Legend
Layer Properties Menu
Area of Interest (AOI)
Soils
Soil Survey Areas
Soil Map Unit Polygons
Soil Map Unit Lines
Soil Map Unit Points
Soil Rating Polygons
Not suitable
Low suitability
Moderate suitability
High suitability
Not rated or not available
Soil Rating Lines
Soil Rating Points
Special Point Features
Special Line Features
Political Features
Federal Land
Water Features
Transportation
Background
Scale
(not to scale)

In development:

- Shoreline erosion
- Blue carbon

Catastrophic Event Interpretations:

- Salt effects potential
- Storm surge inundation
- Chemical/oil leaching potential
- Chemical/oil remediation
- Mosquito habitat suitability
- Soil-borne pathogen risk



Shoreline Erosion

- Soils prone to mass movement along coastal, lake and river shorelines
  - Soil texture
  - Discontinuity
  - Hydraulic conductivity
  - Slope
  - Bedrock

What about blue carbon inventories of subaqueous soils?

Hydropedology Symposium: 10 Years Later and 10 Years into the Future

Estuarine Subaqueous Soil Organic Carbon Accounting: Sequestration and Storage

Christina M. Miilar
Adiza Ama Owusu Aduomih
Brett Still
Mark H. Stolt*
Dep. of Natural Resources Science
Coastal Institute–Kingston
Univ. of Rhode Island
Kingston, RI 02881

Subaqueous soils have largely been overlooked in soil C accounting studies. Recent work suggests that shallow, subtidal soils along the Atlantic Coast contain soil organic C (SOC) pools that are equal to or greater than comparable upland pools. In this study, we investigated the spatial relationships between SOC pool size and subaqueous soil landscape units in three coastal lagoons in Rhode Island and estimated SOC sequestration rates for these soils. Fifty-two pedons were sampled to 1 m and analyzed for SOC content and bulk density to calculate SOC pools. Pools varied significantly among soil landscape units and subaqueous soil Great Groups. Average SOC pools for the upper

URI research suggests that subaqueous SOC pools and sequestration rates are essentially equivalent to regional forest subaerial mineral soils.

Soil Classification (subgroup)	n	Mean SOC (Mg ha^{-1})	CV (%)	Reference
Typic Udipsamments	20	110	15	Davis et al., 2004
Typic Dystrudepts	29	136	29	Davis et al., 2004
Aeric Endoaquepts	20	187	31	Davis et al., 2004
Aeric Endoaquepts	29	246	39	Ricker et al., 2013
Typic Haplosaprists	30	586	20	Davis et al., 2004
Fluventic Psammowassents	9	47	43	This Study
Sulfic Psammowassents	5	57	82	This Study
Typic Fluviwassents	5	109	50	This Study
Haplic Sulfiwassents	10	123	43	This Study
Typic Sulfiwassents	5	141	42	This Study
Fluventic Sulfiwassents	5	196	28	This Study
Thapto-Histic Sulfiwassents	3	494	35	This Study

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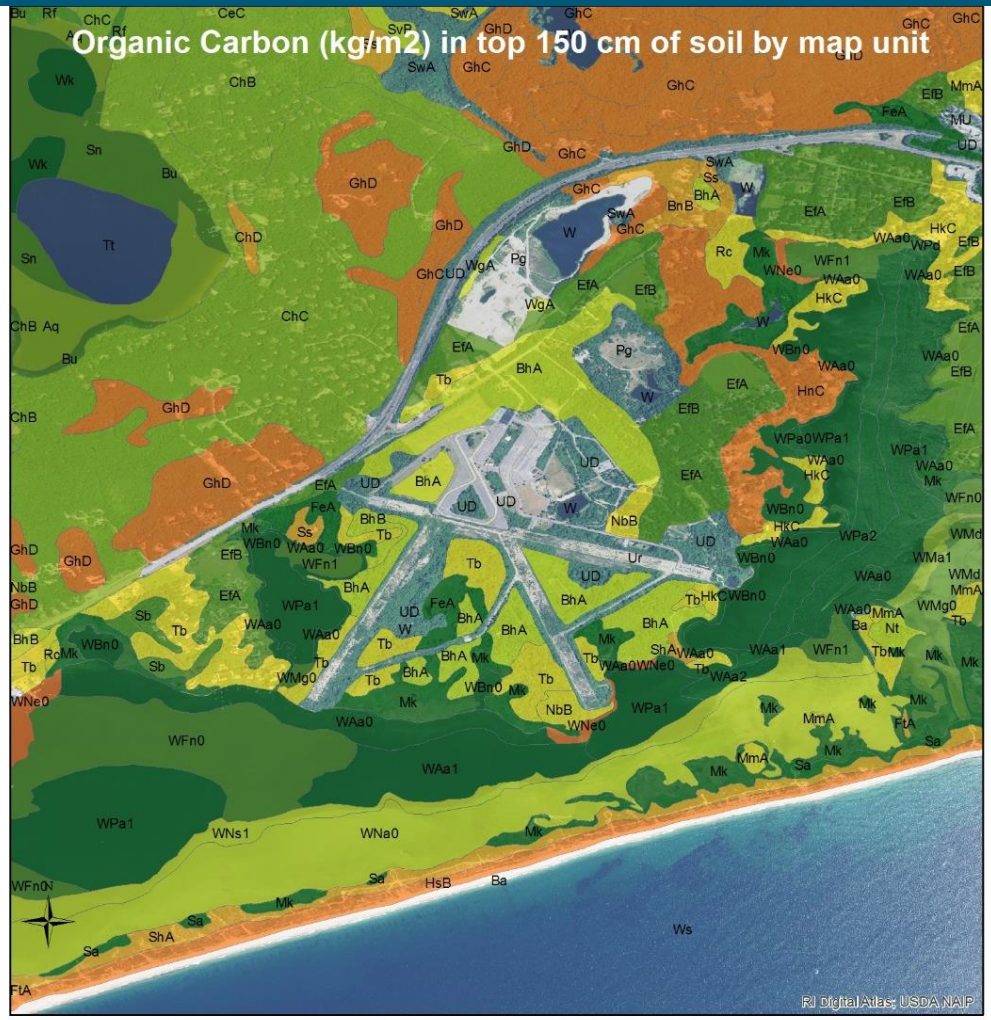
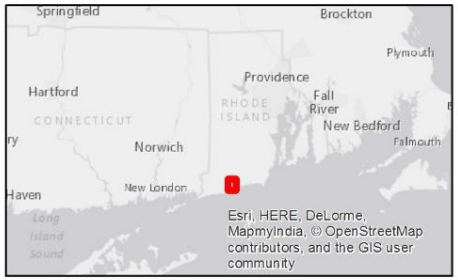
Organic Carbon (kg/m2) in top 150 cm of soil by map unit





Legend

Organic Carbon (kg/m2 0-150cm)

- 0
- 1 - 3
- 4 - 6
- 7 - 9
- 10 - 12
- 13 - 14
- 15 - 26
- 27 - 90

0 0.25 0.5 0.75 1 Miles

Date: 3/24/2017

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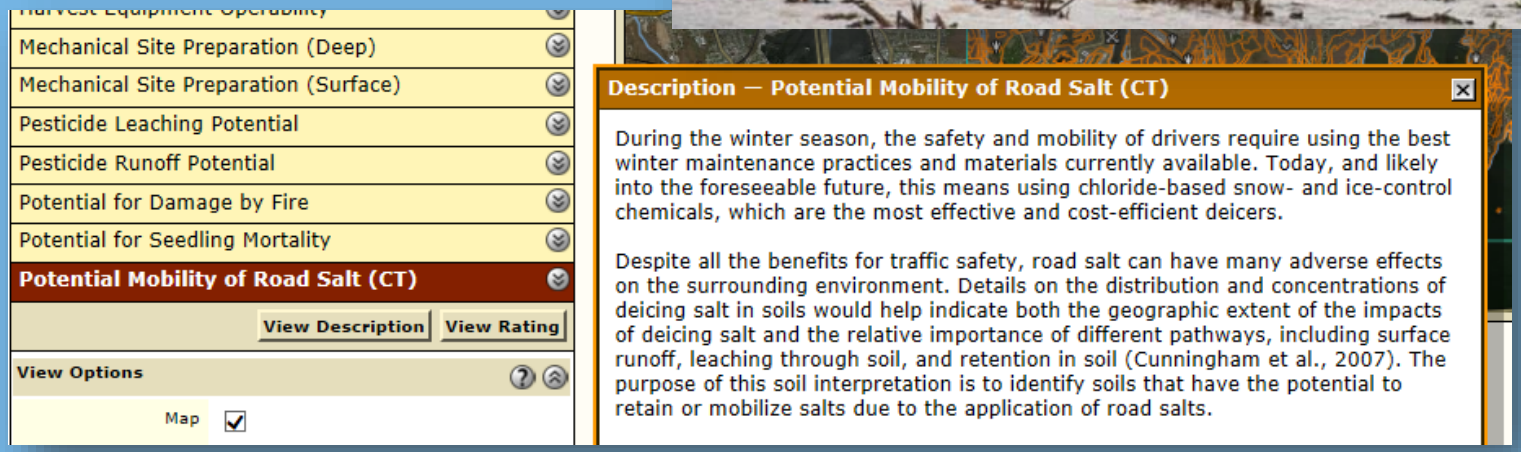
Soil salinization risk

- Identify soils that would retain salts after inundation event



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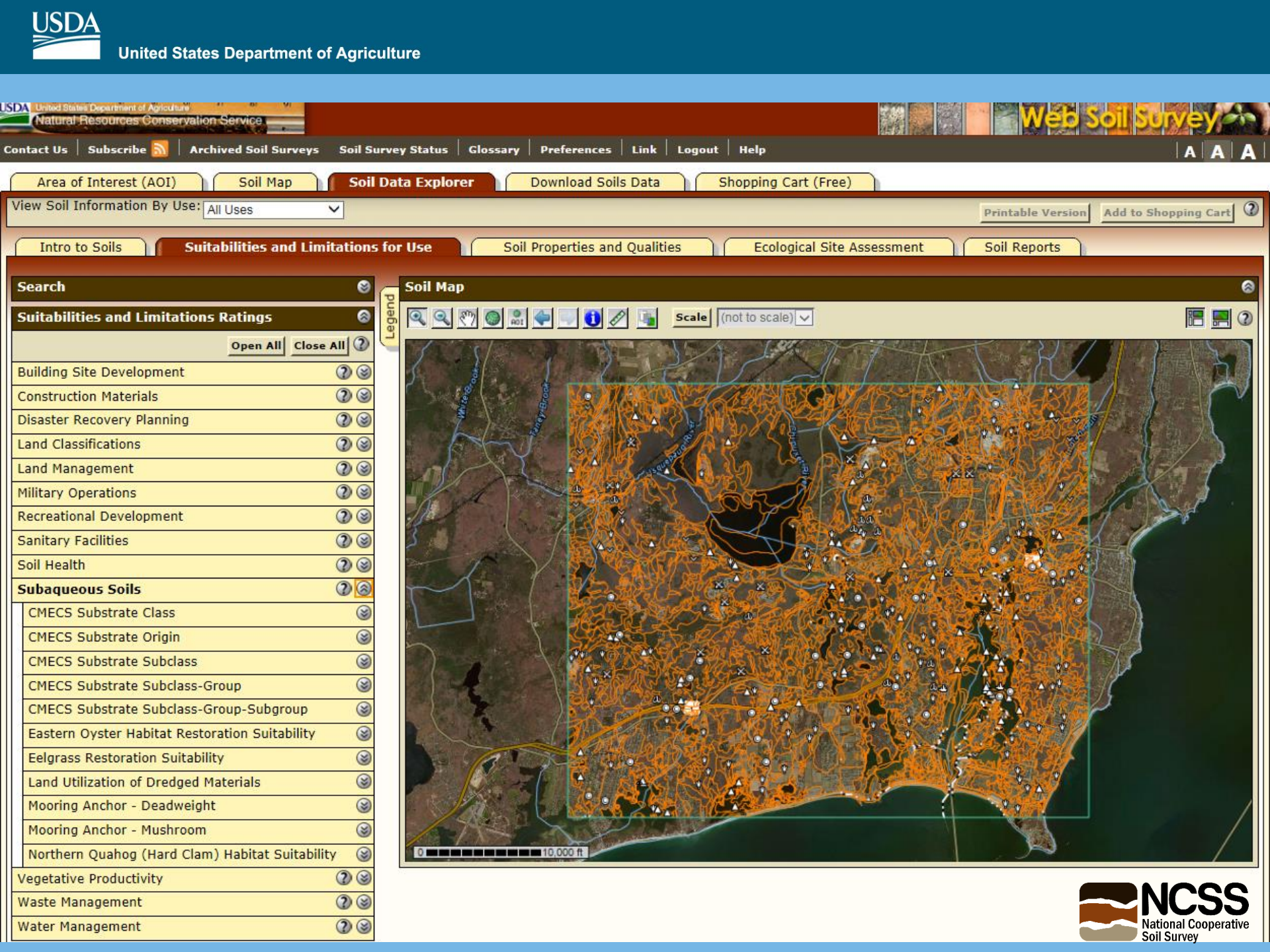
Browse by Subject
Soils Home
National Cooperative Soil Survey (NCSS)
Archived Soil Surveys
Status Maps
Official Soil Series Descriptions (OSD)
Soil Series Extent Mapping Tool
Soil Data Mart
Geospatial Data Gateway
eFOTG
The simple yet powerful way to access and use soil data.
START WSS
Welcome to Web Soil Survey (WSS)
Web Soil Survey (WSS) provides soil data and information produced by the National Cooperative Soil Survey. It is operated by the USDA Natural Resources Conservation Service (NRCS) and provides access to the largest natural resource information system in the world. NRCS has soil maps and data available online for more than 95 percent of the nation's counties and anticipates having 100 percent in the near future. The site is updated and maintained online as the single authoritative source of soil survey information.
Three Basic Steps
1
Define
I Want To...
Start Web Soil Survey (WSS)
Know the requirements for running Web Soil Survey
Know whether my web browser works with Web Soil Survey
Know the Web Soil Survey hours of operation
Find what areas of the U.S. have soil data
Announcements/Events
Web Soil Survey 2.0 has been released! View description of new features.


USDA
United States Department of Agriculture
Natural Resources Conservation Service
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A A A
Area of Interest (AOI) | Soil Map | Soil Data Explorer | Download Soils Data | Shopping Cart (Free)
View Soil Information By Use: All Uses
Printable Version | Add to Shopping Cart
Intro to Soils | Suitabilities and Limitations for Use | Soil Properties and Qualities | Ecological Site Assessment | Soil Reports
Search
Suitabilities and Limitations Ratings
Open All | Close All
Building Site Development
Construction Materials
Disaster Recovery Planning
Land Classifications
Land Management
Military Operations
Recreational Development
Sanitary Facilities
Soil Health
Subaqueous Soils
CMECS Substrate Class
CMECS Substrate Origin
CMECS Substrate Subclass
CMECS Substrate Subclass-Group
CMECS Substrate Subclass-Group-Subgroup
Eastern Oyster Habitat Restoration Suitability
Eelgrass Restoration Suitability
Land Utilization of Dredged Materials
Mooring Anchor - Deadweight
Mooring Anchor - Mushroom
Northern Quahog (Hard Clam) Habitat Suitability
Vegetative Productivity
Waste Management
Water Management
Legend
Soil Map
Scale (not to scale)
0 10,000 ft
NCSS
National Cooperative Soil Survey

Interpretation needs from this meeting: