CZSS and Our Future

"You don't know where to go unless you know where you've come from" –Jan Mackinnon

Barret M. Wessel, Martin C. Rabenhorst

University of Maryland

DEPARTMENT OF ENVIRONMENTAL
SCIENCE & TECHNOLOGY
College of Agriculture & Natural Resources
www.enst.umd.edu

Rhode River

A 1000 acre subestuary of the Chesapeake Bay

Existing sediment map is unsuitable for recent aquaculture programs

Smithsonian Environmental Research Center wanted a higher quality map

Our proposal/objectives

* Delineate landforms from bathymetric maps
* Select transects and describe soil cores
* Develop pedogenic models for Chesapeake Bay

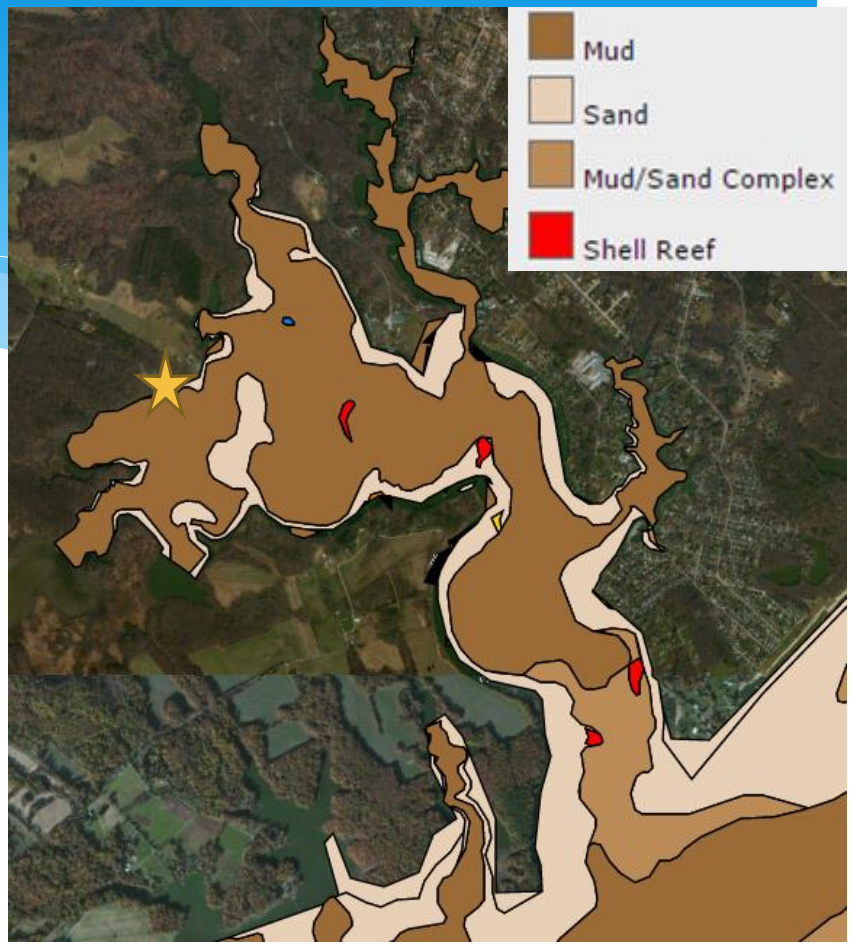
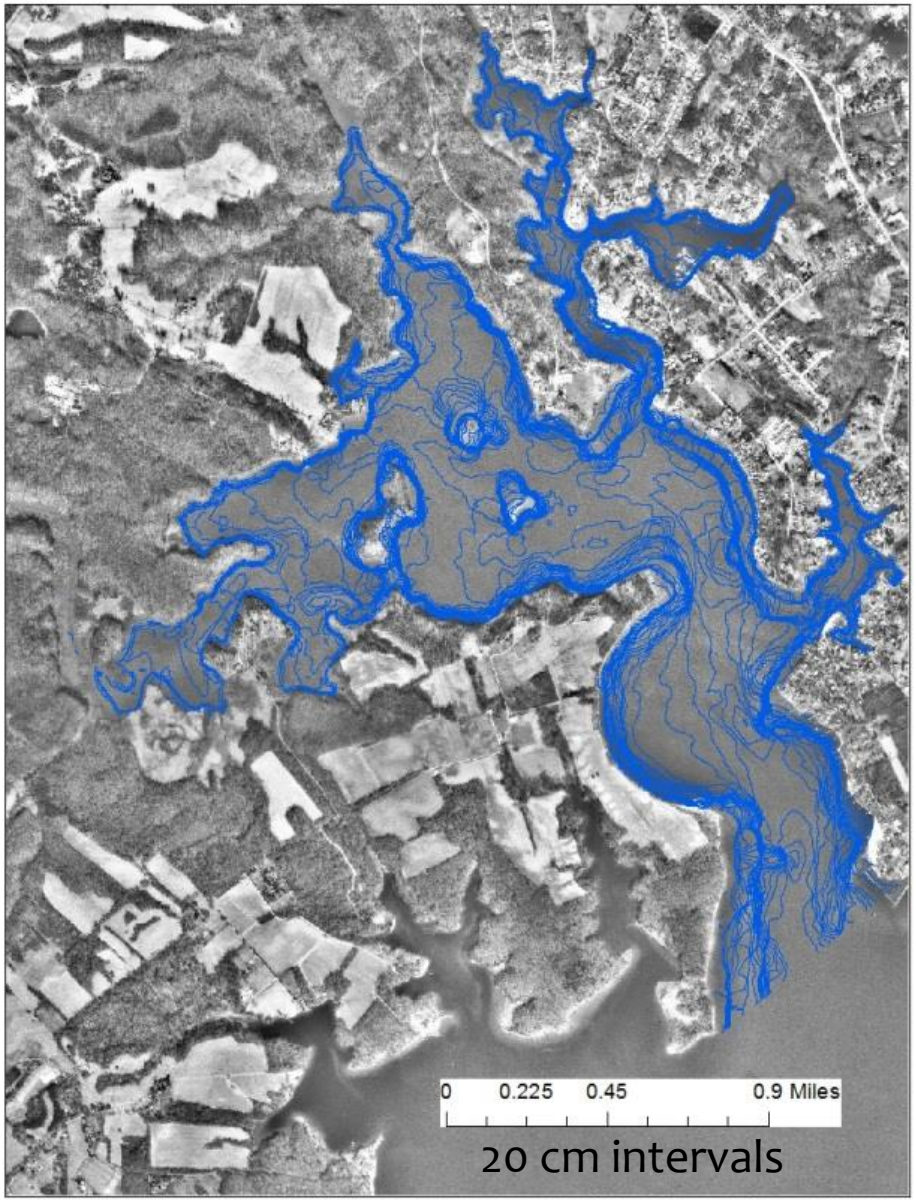
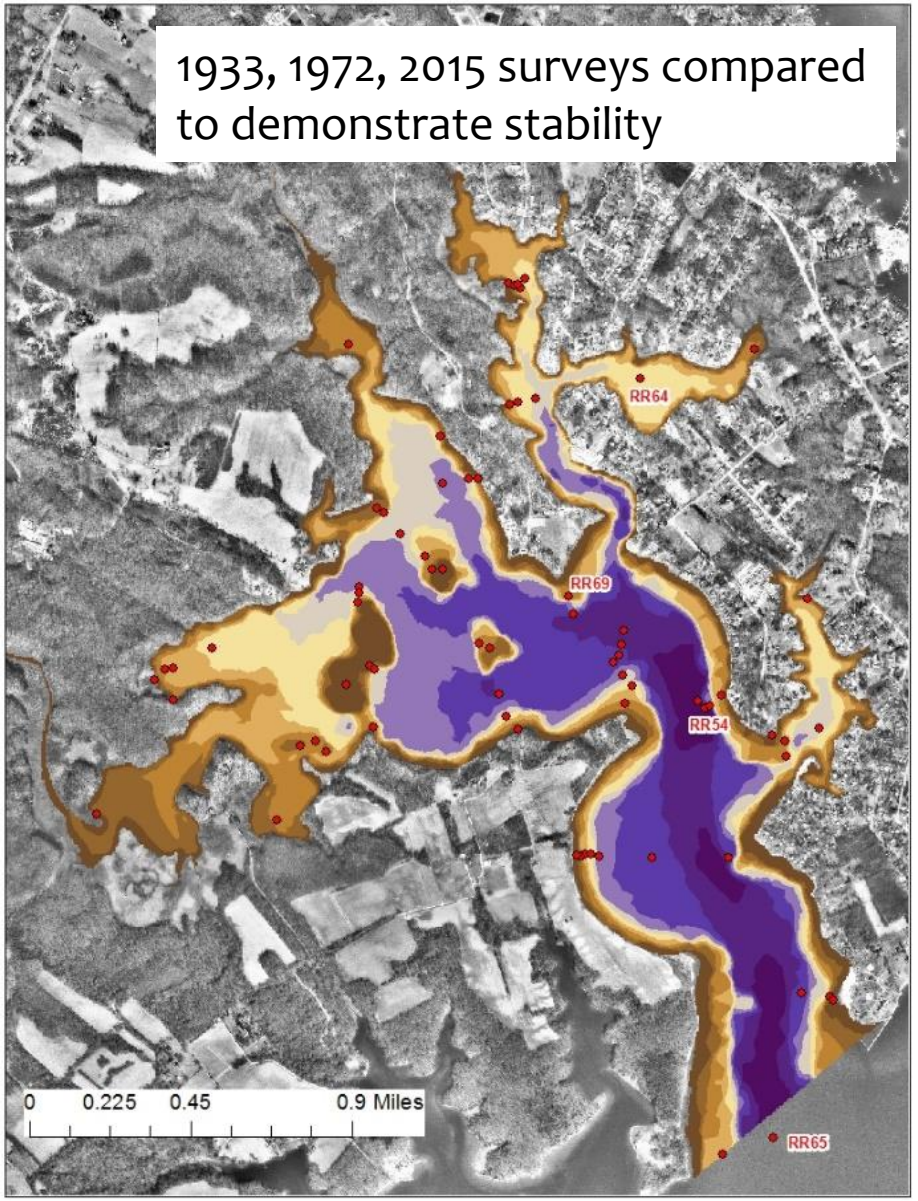


Image Credit:
https://www.extension.umd.edu/sites/default/files/_docs/programs/aquaculture/K%20Greenhawk.pdf

Maryland Aquaculture Siting Tool

Contours and samples

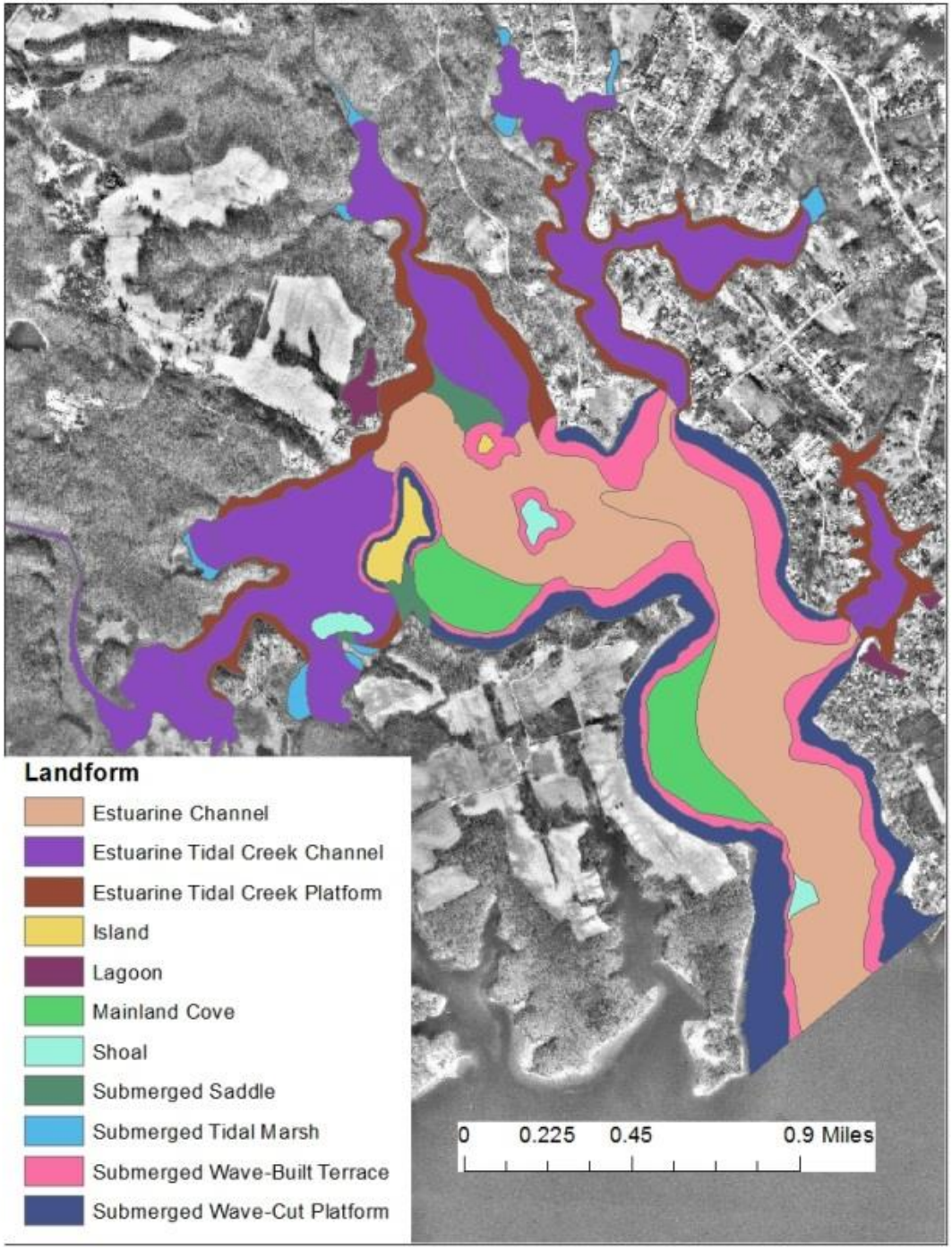




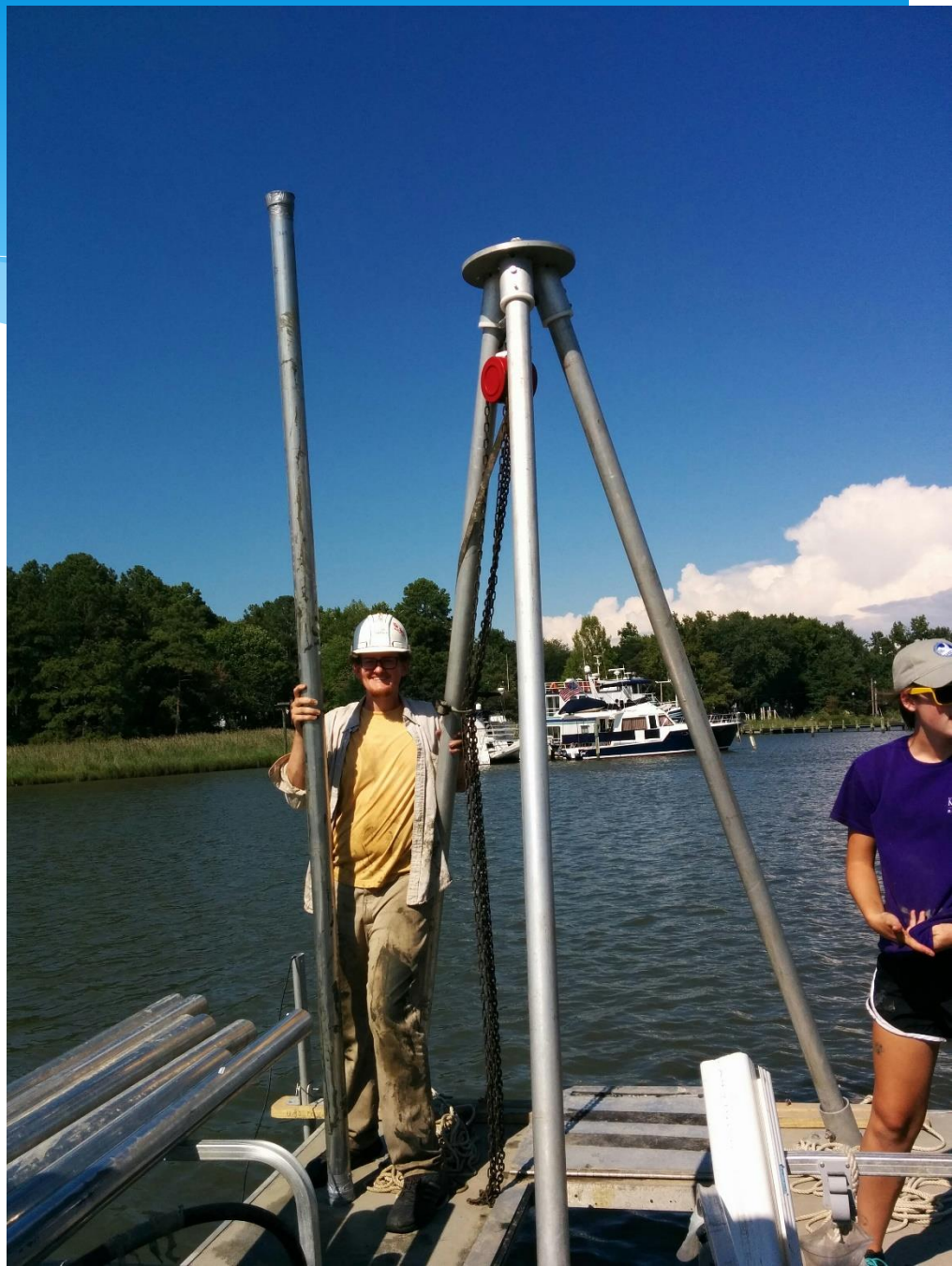
Landforms Delineated

11 different landform types were identified

- Adjacent landforms
- Water depth
- 3D shape
- Slope and Aspect



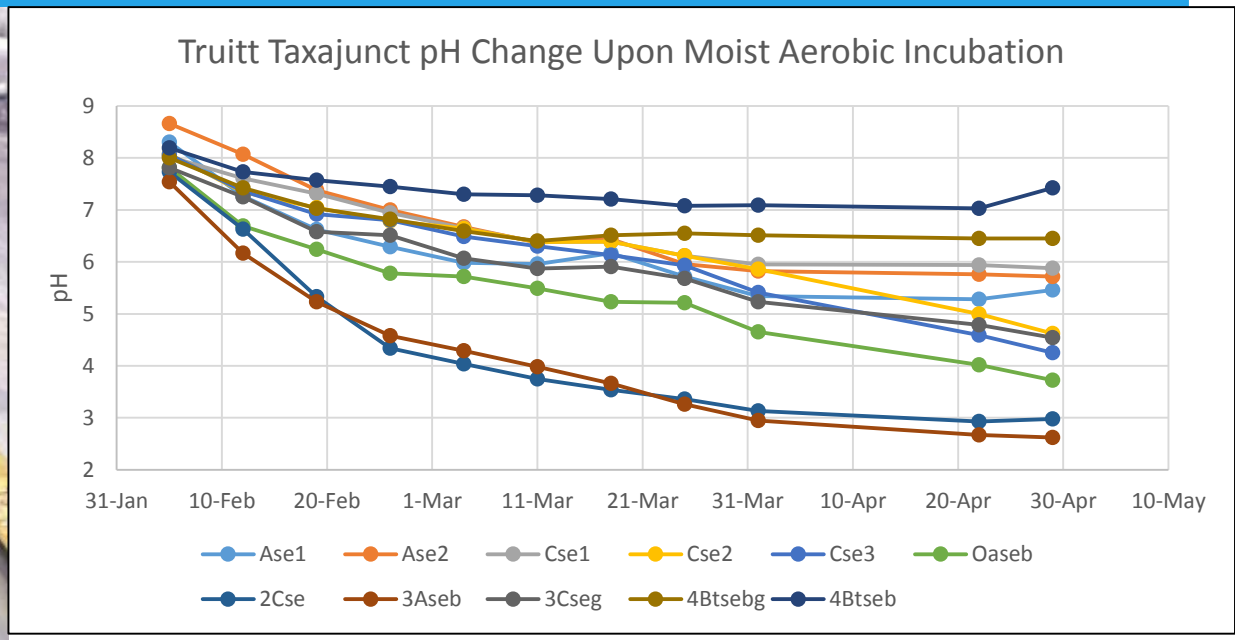
Coring



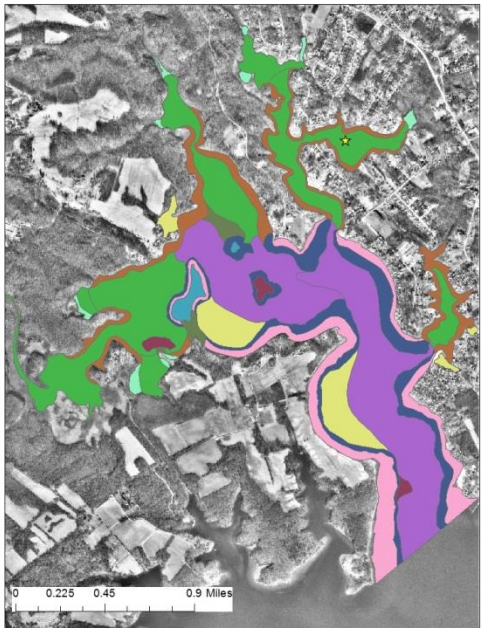
Core Data Analyses

* Horizonation
* Color, odor, field texture, PSA, EC
* Moist aerobic incubation
  * Pyrite oxidize to form sulfuric acid
  * Hypersulfidic and hyposulfidic (used in Australia)
* Redox features - surprises

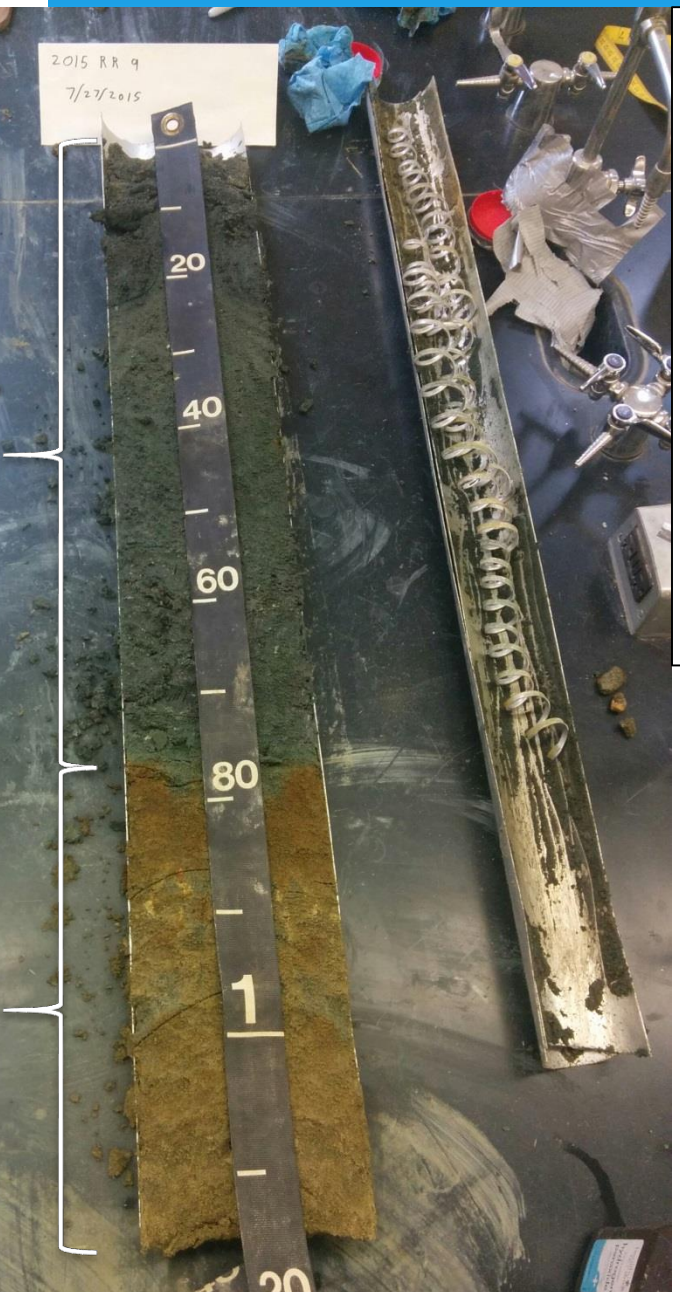
Submerged & Buried Marsh Surface Soils

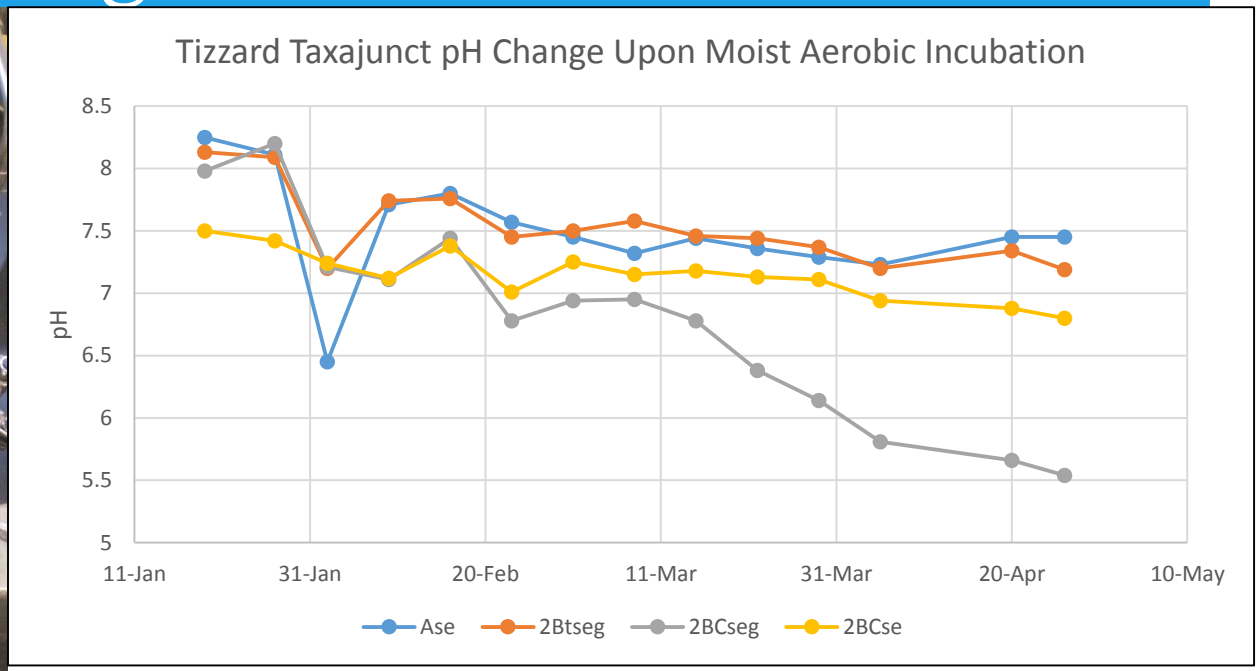


* Sapric Sulfiwassists, Thapto-Histic subgroups
* Sequences of marsh accretion
* Complex profile, sea level changes and discontinuities
* Hypersulfidic in and around buried A and O horizons

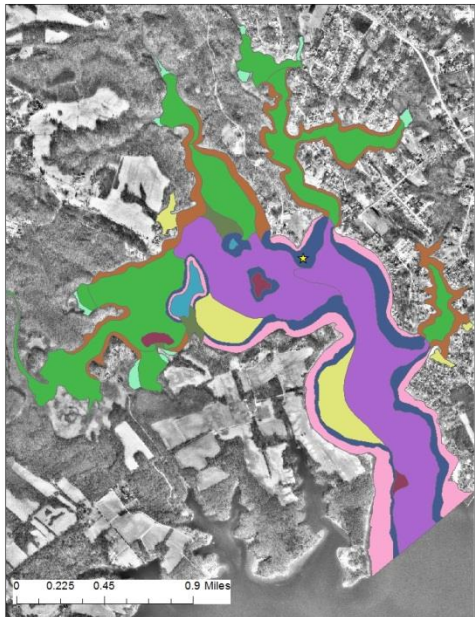


Submerged Platform Soils

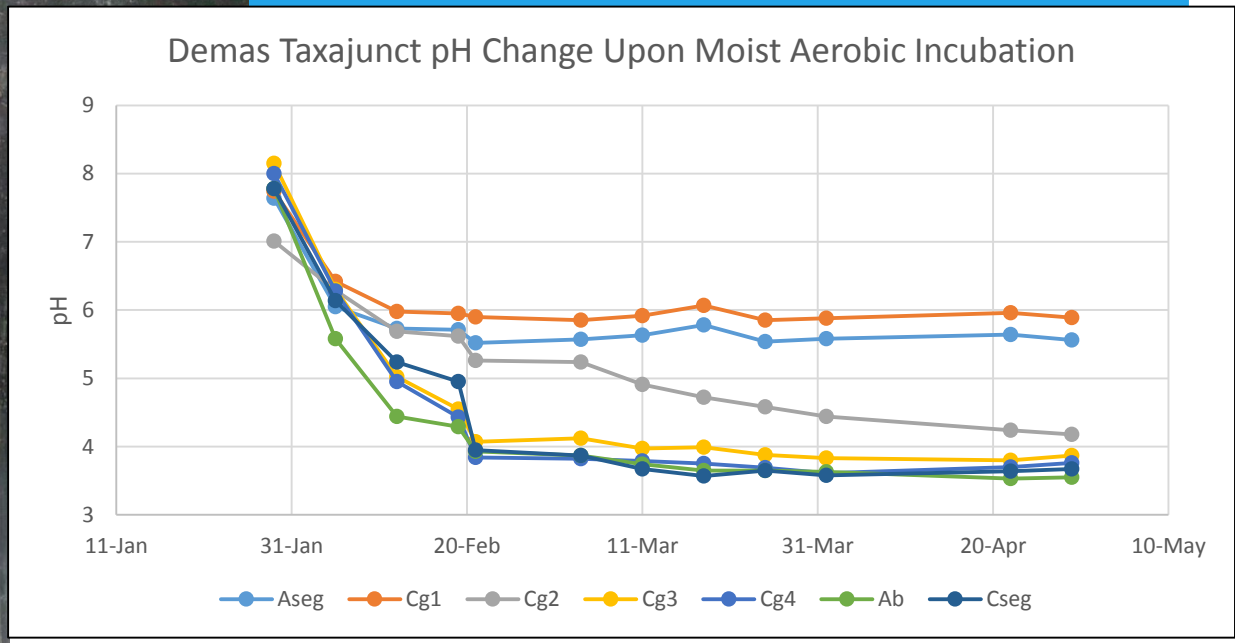




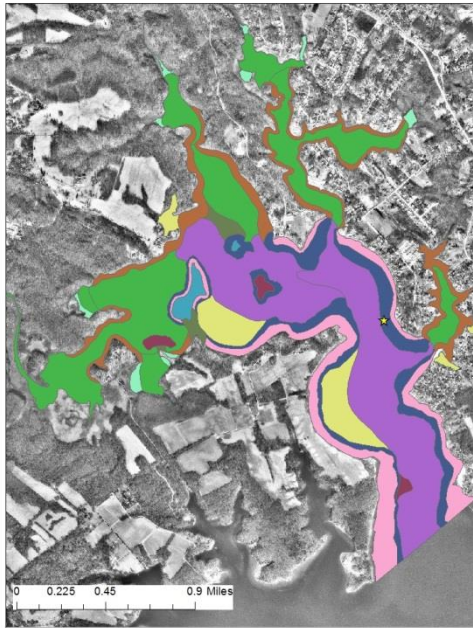
* Typic Fluviwassents
* Scour-lag sandy textures over paleosols
* Sands over sandy clays and clay loams-discontinuity!
* Eventually enters unoxidized zone
* Paleosols can be hypersulfidic



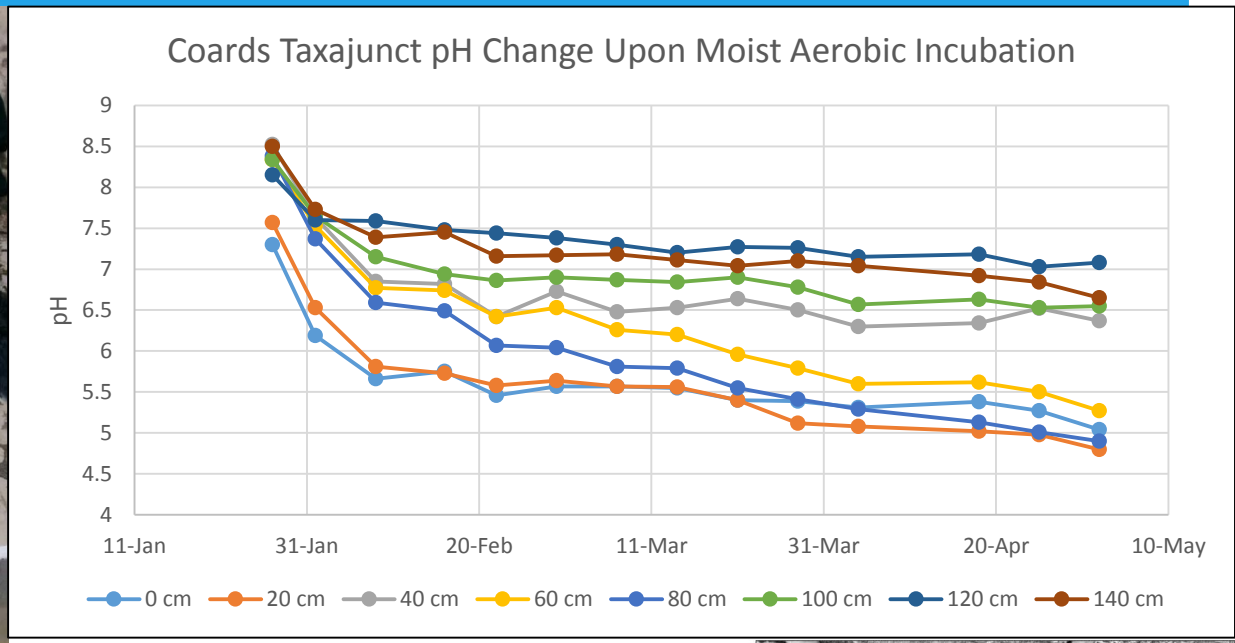
Wave Built Terrace Soils



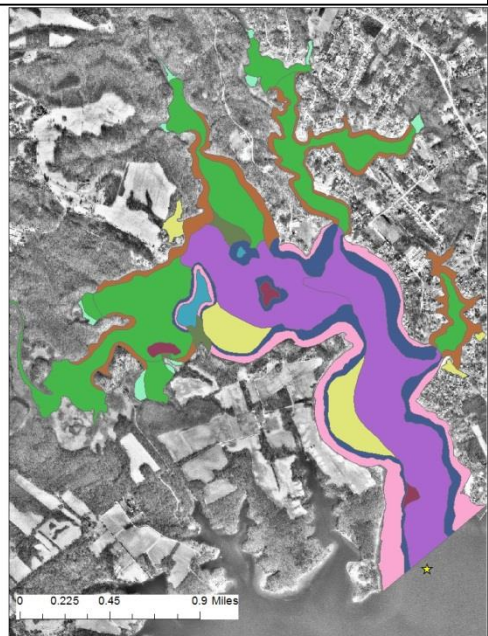
* Fluventic/Sulfic Psammowassents or Sulfic Fluviwassents
* Nonfluid sands and loamy sands
* Hyposulfidic, may be hypersulfidic in and around buried A and O horizons



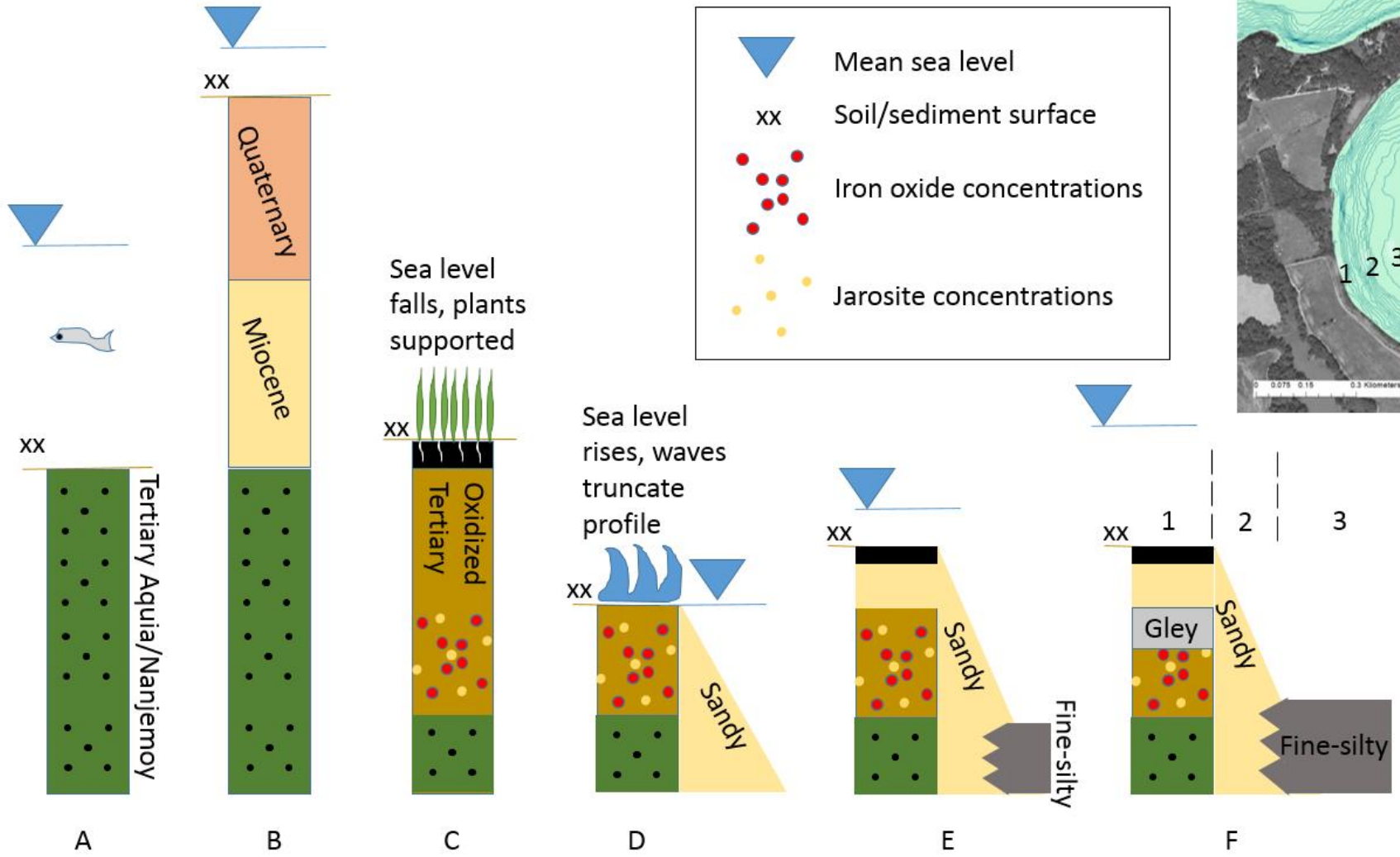
Estuarine Channel & Tidal Creek Soils



* Grossic Hydrowassents
* Moderately to highly fluid
* Silty clays and silty clay loams
* Acidifies, but not hypersulfidic



Soil-landscape model

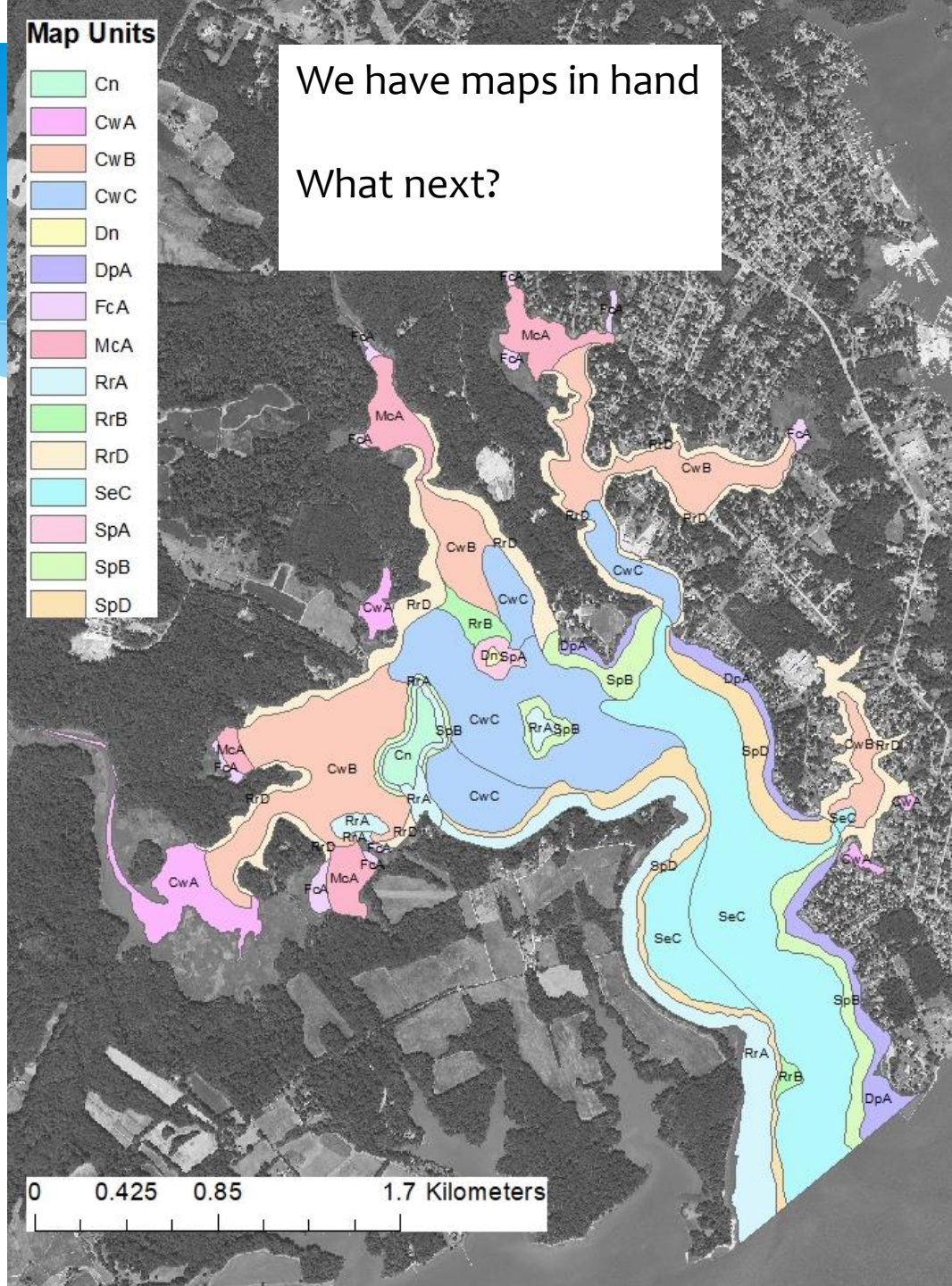


Soil Map Units

7 new soil series proposed
15 map units
57 delineations

Map units named for dominant series and depth phase
A: 0-1 m
B: 1-2.5 m
C: 2.5-4.5 M
D: 0-3 m

Conclusion:
The soil-landscape paradigm works, and it provides plenty of information that people could use



Could use

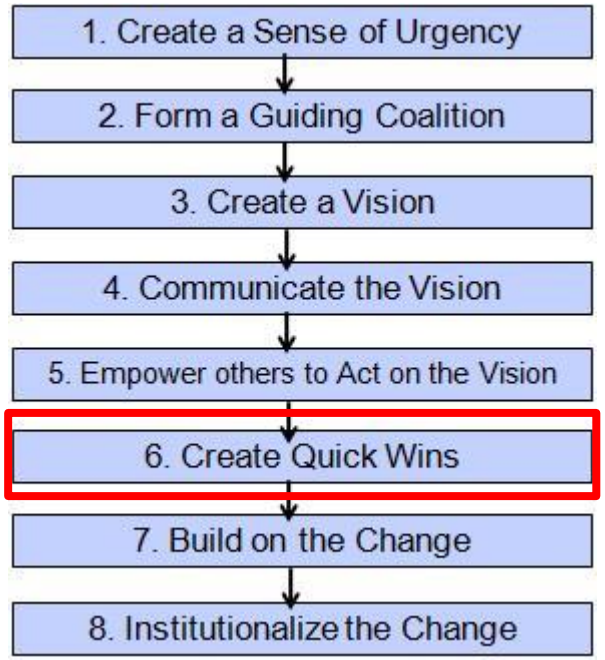
* But they don't, and that's the challenge in Maryland
* We have a growing aquaculture industry in the state as watermen use it for supplemental income, but they place their leases using traditional methods
* Social network analysis by Adriane Michaelis has identified no NRCS or soils professionals who influence Maryland watermen
* End users are just as important as good bathymetry!

Working Waterfronts

* Areas of the waterfront that provide access to the water for water dependent businesses including commercial fishers and aquaculturists
* Generally contain maritime infrastructure
  * Once lost to development, does not return
* Identified and protected in many coastal states
* Maine: 20 miles out of 5,300
* A way to prioritize CZSS activities
* Priority topobathy request for Big Annemessex River near Crisfield, MD
* Framework offers new partners: SHPOs, local marine museums, related community organizations

Kotter's Change Model

* Quick wins
* Business partners
* Opportunity to work with Extension
* Fast payoff
* Advance the science while fostering its application



Coastal and subaqueous soils symposium

* Mapping/soils and estuarine/coastal restoration
* Soils Across Latitudes International Soils Meeting
  * Soil Science Society of America
  * Mexican Society of Soil Science
  * Canadian Society of Soil Science
* Sponsored by Wetland Soils and Pedology divisions
* San Diego, CA January 6-9, 2019
* Registration and abstracts open May 15th
* www.sacmeetings.org

Barret Wessel bwessel@umd.edu
Chelsea Duball cduball@uwyo.edu

Soils Across Latitudes

Acknowledgements

J. Pat Megonigal, SERC
Lance Yonkos, UMD ENST
Brian Needelman, UMD ENST
Sujay Kaushal, UMD GEOL
Philippe Hensel, NOAA
Phil King, NRCS
Rob Tunstead, NRCS
Don Webster, UMD Extension
Mutt Meritt, UMCES
My crew: Jaclyn Fiola, Kristi Persing, David Vespe, Amanda Daly

This material is based upon work supported by the Natural Resources Conservation Service **Cooperative Agreement 69-3B19-4-004** and by the National Science Foundation Graduate Research Fellowship Program under Grant No. **DGE 1322106**.