A person wearing a light-colored jacket and blue pants stands in a field, holding a map or document. In the foreground, a long metal leveling staff is laid out on the ground. To the left, there is a yellow and blue surveying instrument, possibly a level or theodolite. The background shows a field of tall grass under a dark sky.

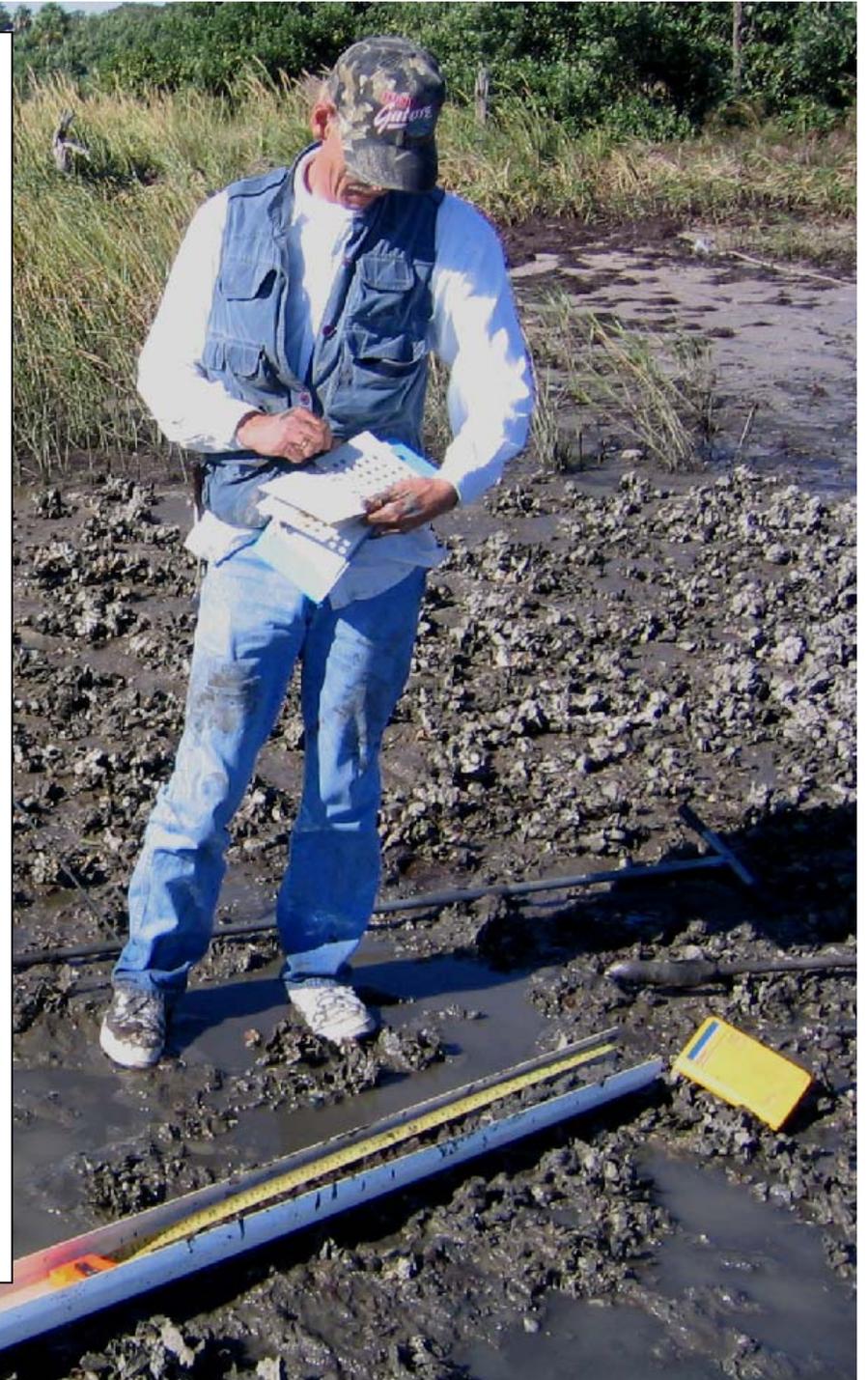
2008 Southern Regional Cooperative Soil Survey Conference

Ad Hoc Committee on
Subaqueous Soil Interpretations
July 14, 2008

Soil scientists are now investigating aquatic bottoms.

USDA-NRCS aims to survey these areas.

This is a conceptual and practical challenge.



Members:

- L. Rex Ellis, Research Assistant Professor, University of Florida, Gainesville, FL
- Susan Casby-Horton, Soil Scientist/Geomorphologist (Retired), NRCS, Temple, TX
- Gerald Crenwelge, Soil Scientist, NRCS, Lubbock, TX
- Jerry Daigle, State Soil Scientist, NRCS, Alexandria, LA
- Wayne Gabriel, SDQS, NRCS, Temple, TX
- Wade Hurt, National Leader for Hydric Soils (Retired), NRCS, Gainesville, FL
- Eddie Seidensticker, Soil Conservationist, NRCS, Baytown, TX
- Joe Schuster, Co-Owner, Ecological Resource Consultants, Panama City Beach, FL
- Leslie Sturmer, Multi-county Aquaculture Extension Agent, University of Florida, Cedar Key, FL
- Bob Virnstein, Environmental Scientist VI, St. Johns River Water Management District, Palatka, FL
- Jon Wiedenfeld, Soil Scientist, NRCS, Rosenberg, TX

Charges:

1. Identify at least 3 subaqueous soils interpretations and the soil properties that are required to make these interpretations.
2. Develop a list of actual/potential customers who need these interpretations.
3. Define vision/process to develop Ecological Site Descriptions (ESD) for subaqueous soil map unit components.

Charge 2: Customers

- Researchers (Universities, Federal Agencies)
- Aquaculture (e.g. shellfish)
- Engineers
- Surveyors
- Estuarine Managers
- Non-Profit Organizations
- Coastal-Zone Environmental Consultants
- State Agencies
- Federal Agencies (EPA, NOAA, USACE, USFWS, USGS)

Charge 1: Interpretations

- Potential for SAV Restoration
- Wildlife Management (related to specific vertebrates and invertebrates)
- Habitat for Migratory Waterfowl
- Habitat for Wading and Diving Shore Birds
- Habitat and Nursery Ground for Commercially Important Vertebrates (Fish)
- Habitat and Nursery Ground for Commercially Important Invertebrates (Shrimp, Crab, Clam)
- Management for Sustainable Oyster Production
- Habitat for Wading and Diving Shore Birds
- Effects of Boating Activities on SAV
- Effects of Nutrient Loading on SAV
- Shoreline Erodibility
- Dredge Material Management

Charge 1: Interpretations

- Particle Size Distribution: presumably sand, silt, clay, by pipette along with sand sub-fractions.
- Carbon Content: organic and inorganic fractions either by weight loss after combustion or using a TC analyzer and acidification.
- Sulfides: various sulfide measurements can be made, such as moist incubation, total sulfur, acid volatile sulfides, etc. Each method provides specific information about sulfur.
- Bathymetry: important in determining water depth, soil landscapes and landforms, elevation, geography (which controls tidal amplitude), and potential exposure on high tide or water depth on low tide.

Charge 1: Interpretations

- Vegetative Cover: It should be noted whether the soils actively support or have the potential to support SAV. The SAV potential of subaqueous soils is difficult to assess.
- Bulk Density / n value: n value is determined by hand, while bulk density would be measured by coring and weighing the soil.
- Soil Color: field determination using a Munsell ® color book.

Charge 3: ESD

- Too soon!

Conceptual Challenge:

how to understand aquatic bottoms from a soils perspective.

From a research end, we've been addressing this issue. It will happen. We need to collaborate with others to enhance our understanding of aquatic environments.

Practical Challenge:

how does the USDA-NRCS do Soil Survey
in these areas?

Acres?

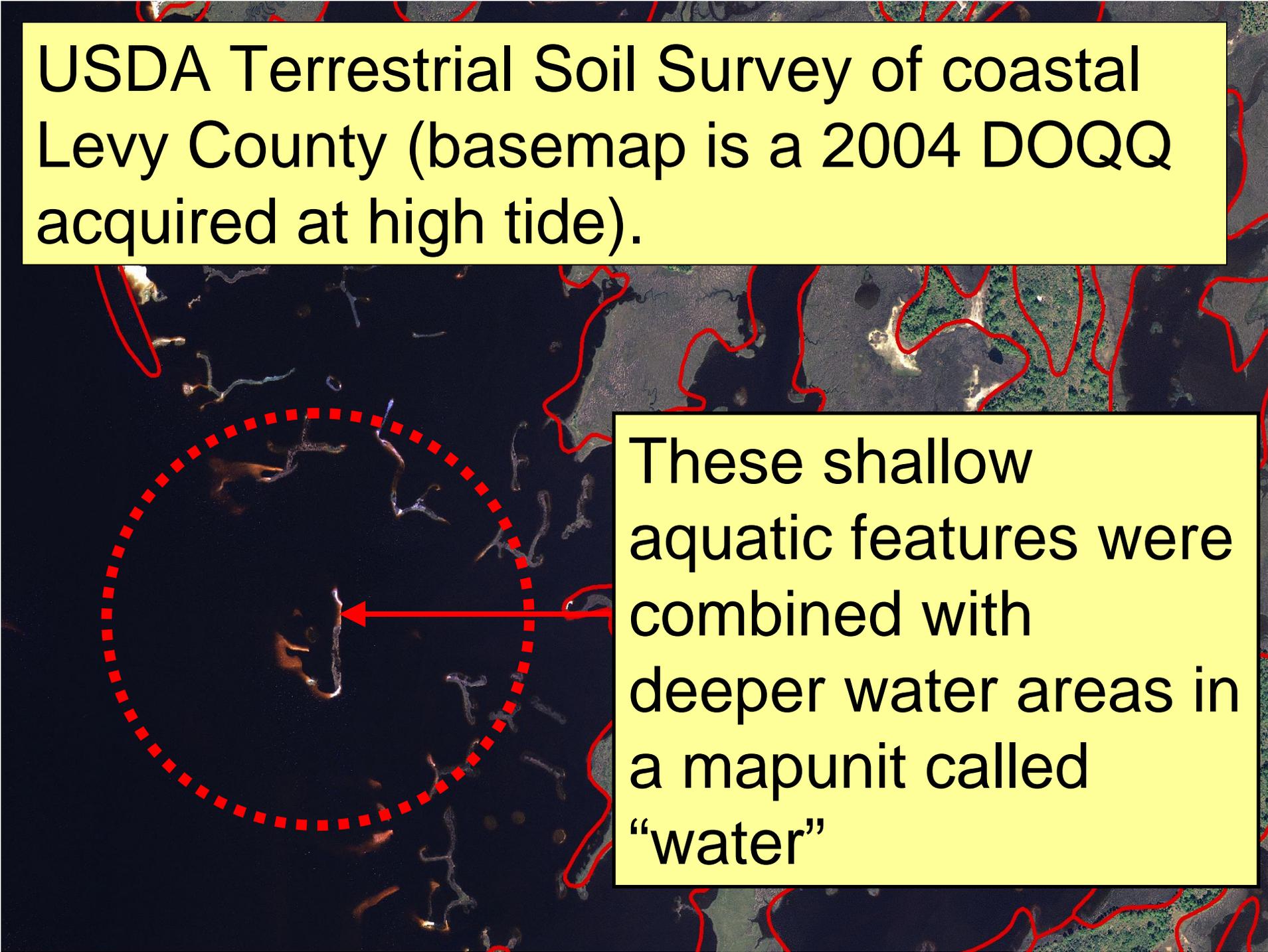
Permission?

Scope?

Mission?

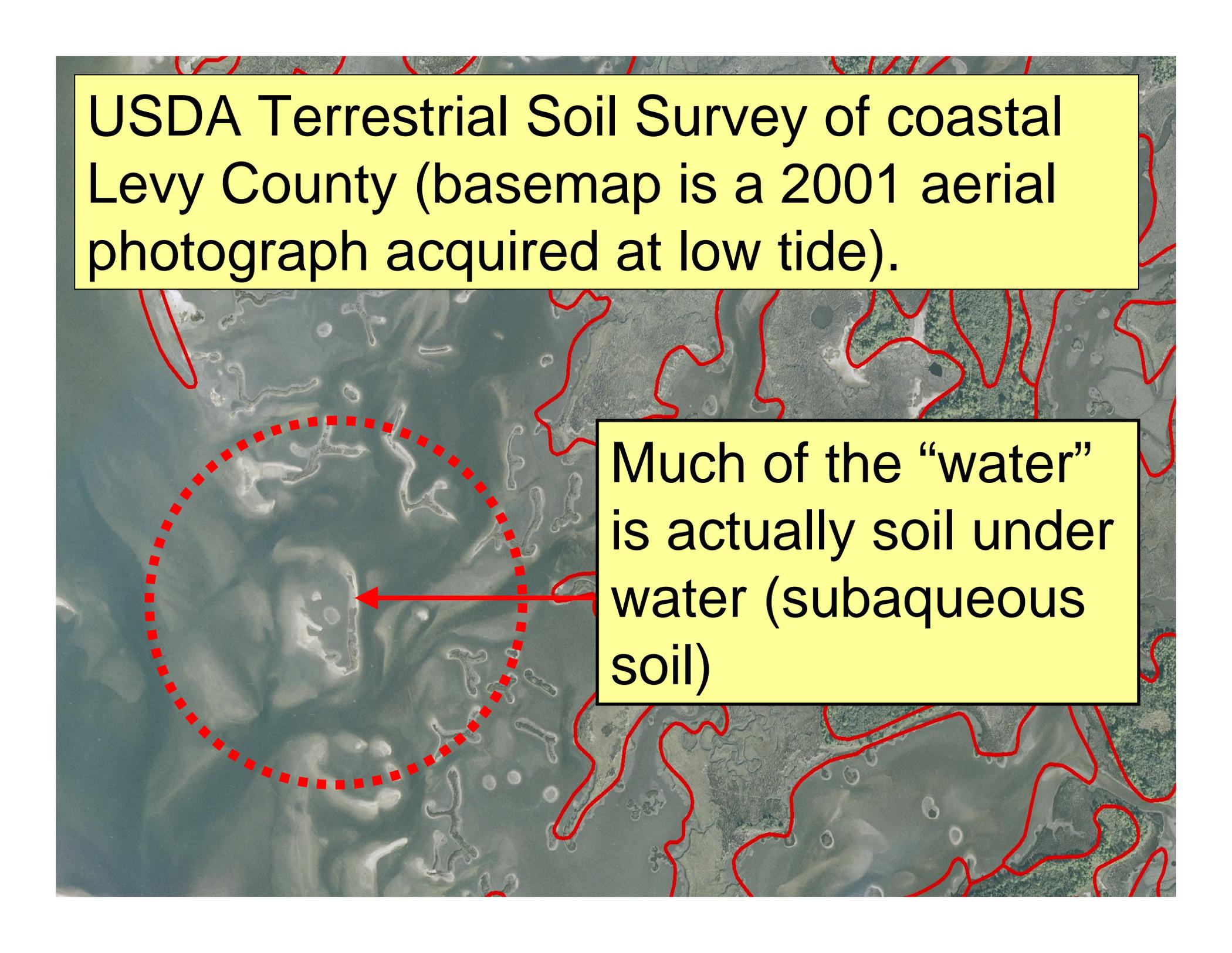
Scale?

Integration?



USDA Terrestrial Soil Survey of coastal
Levy County (basemap is a 2004 DOQQ
acquired at high tide).

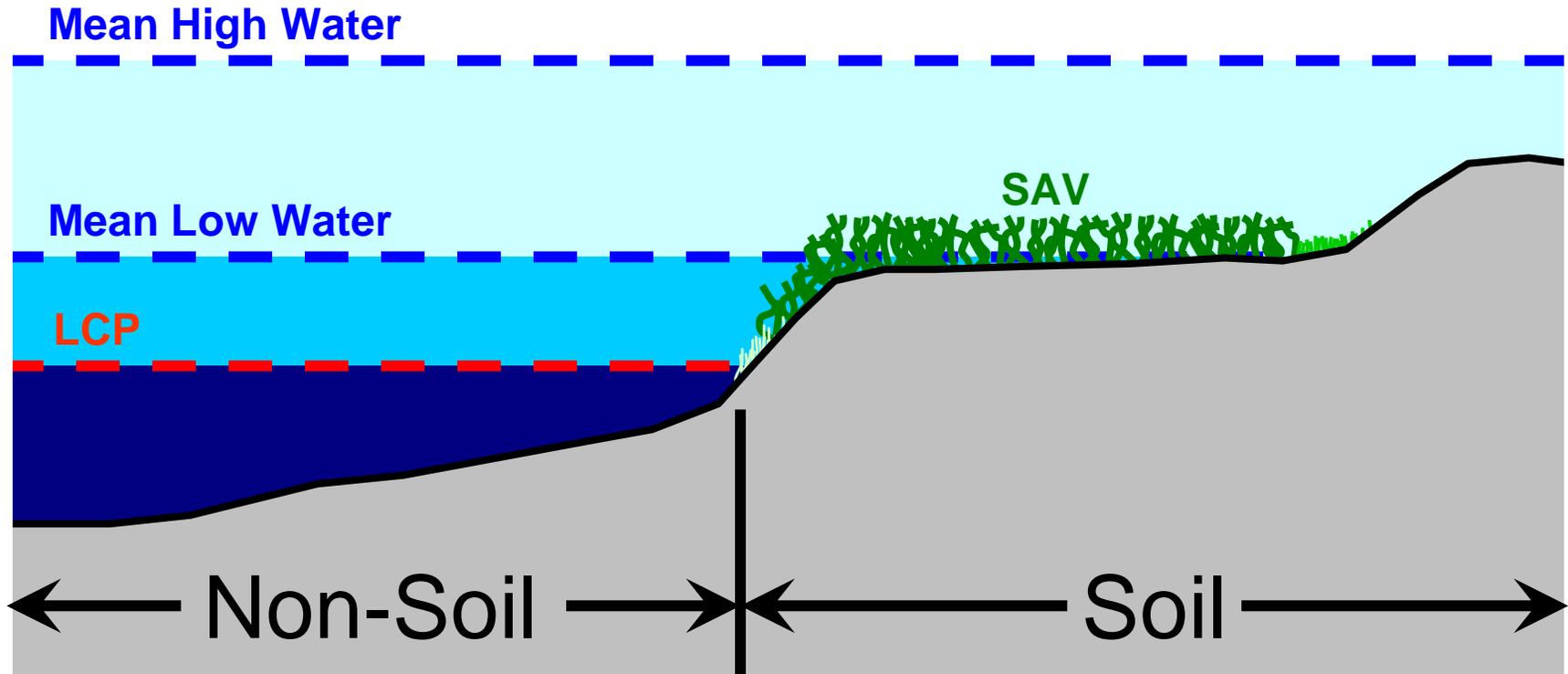
These shallow
aquatic features were
combined with
deeper water areas in
a mapunit called
“water”



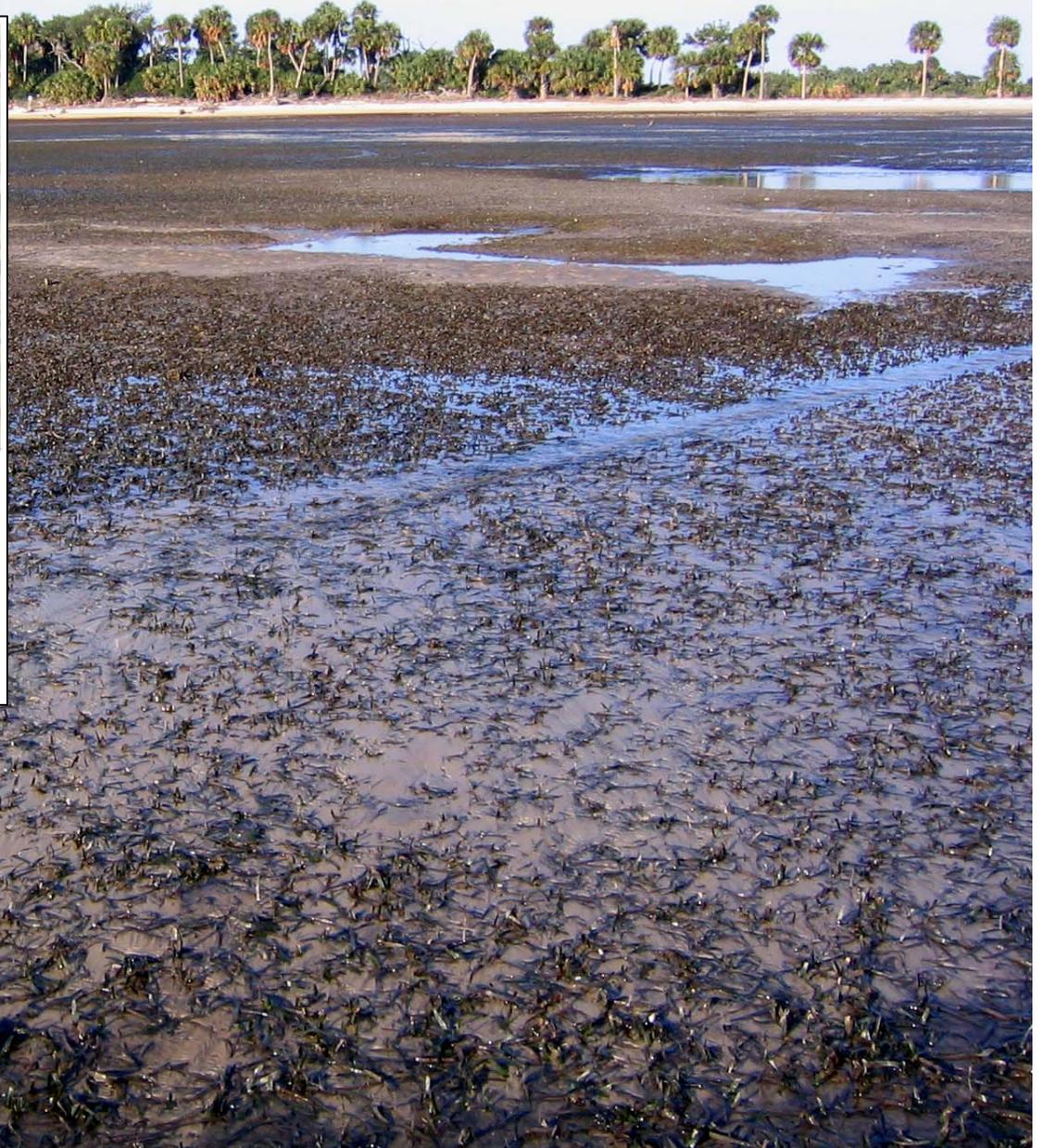
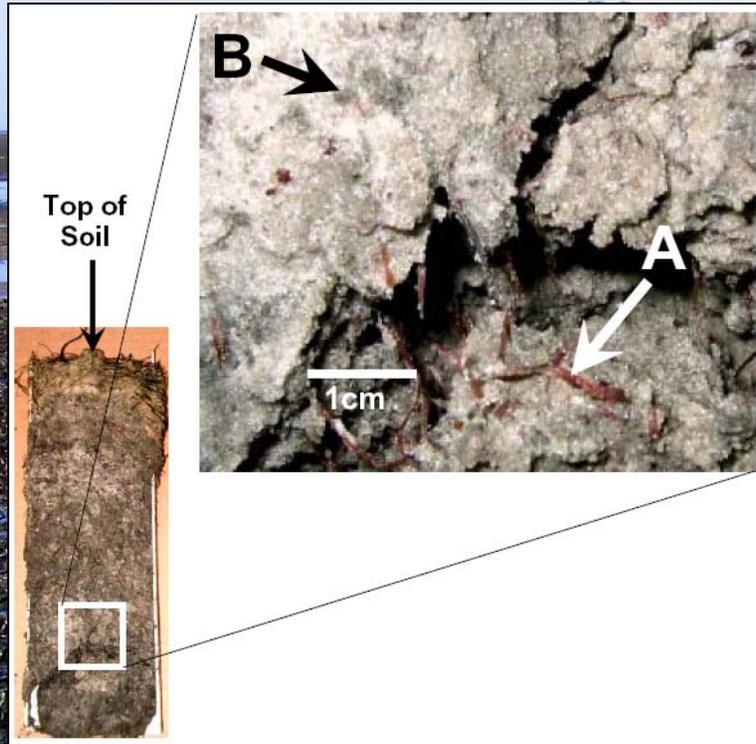
USDA Terrestrial Soil Survey of coastal
Levy County (basemap is a 2001 aerial
photograph acquired at low tide).

Much of the “water”
is actually soil under
water (subaqueous
soil)

Submerged Aquatic Vegetation

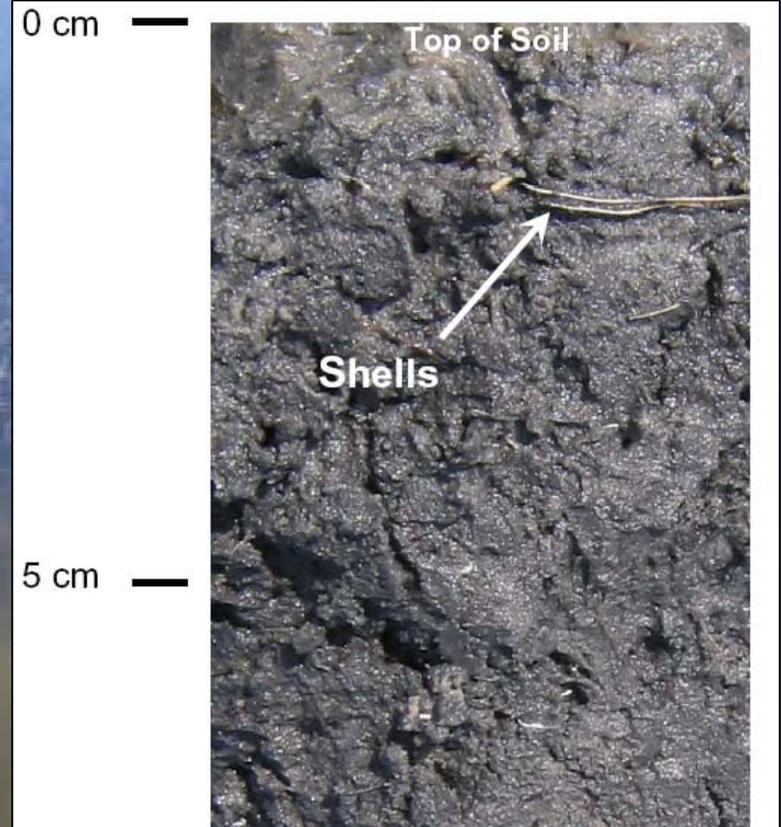


Soils and Vegetation



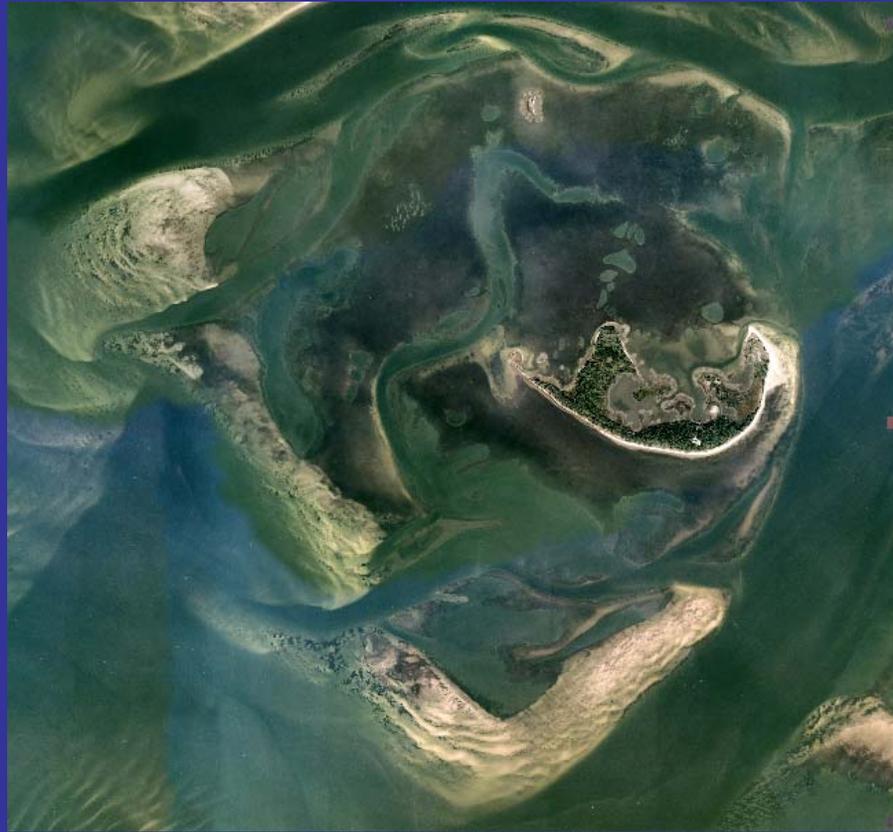
Shallow (0.5 m)
grassflat

Edge of grassflat

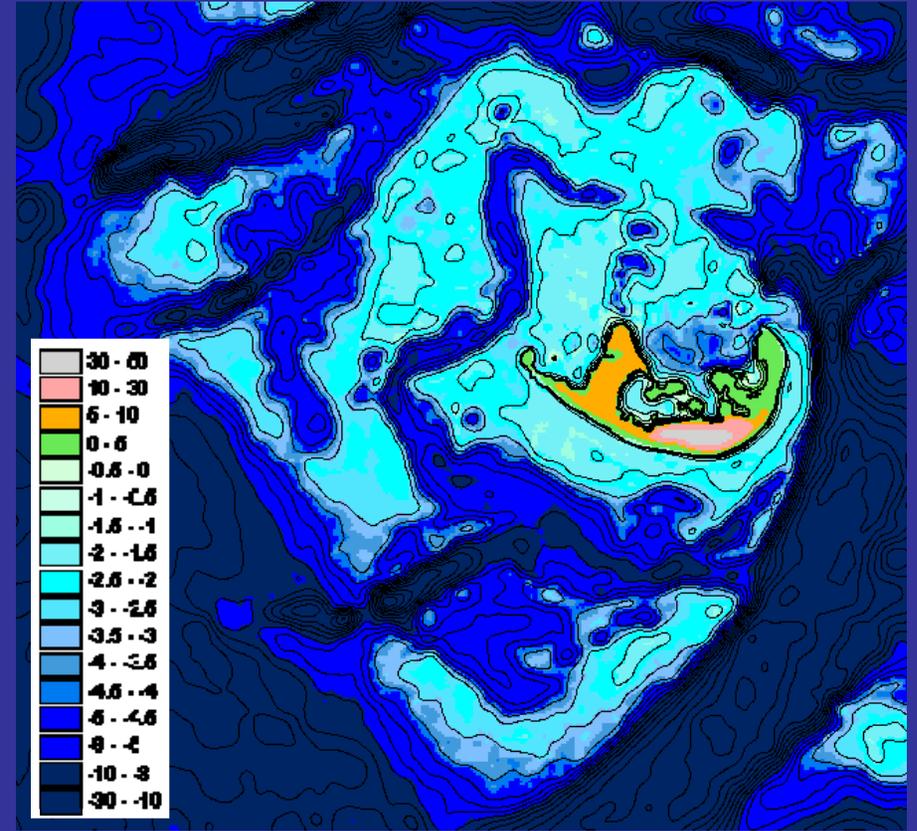


Deep (2 m)
unvegetated
area

Aerial and topographic basemaps



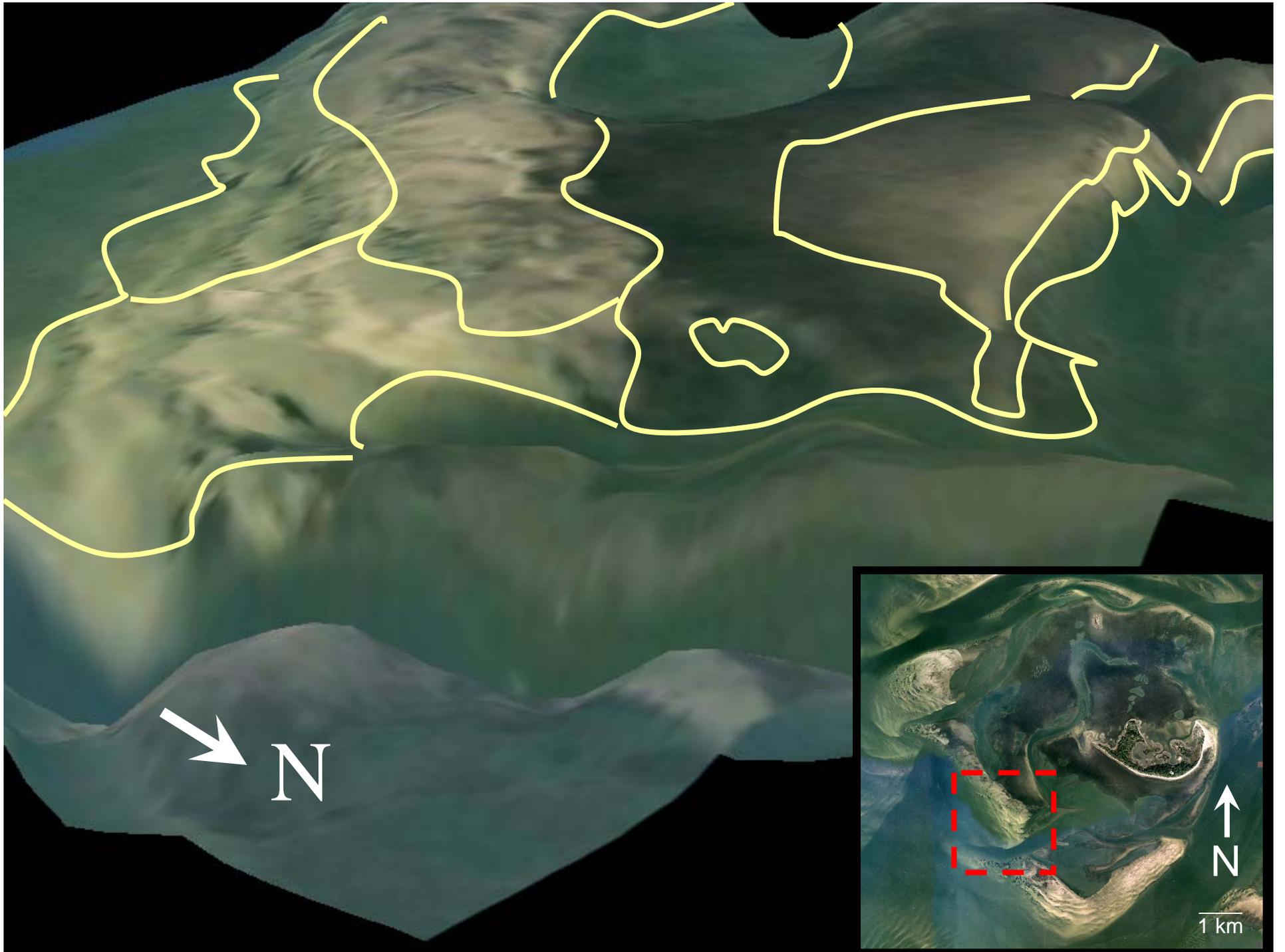
Vegetation



Landforms



Landscape Units



500 0 500 Meters



The Soil Continuum

Terrestrial



Subaqueous

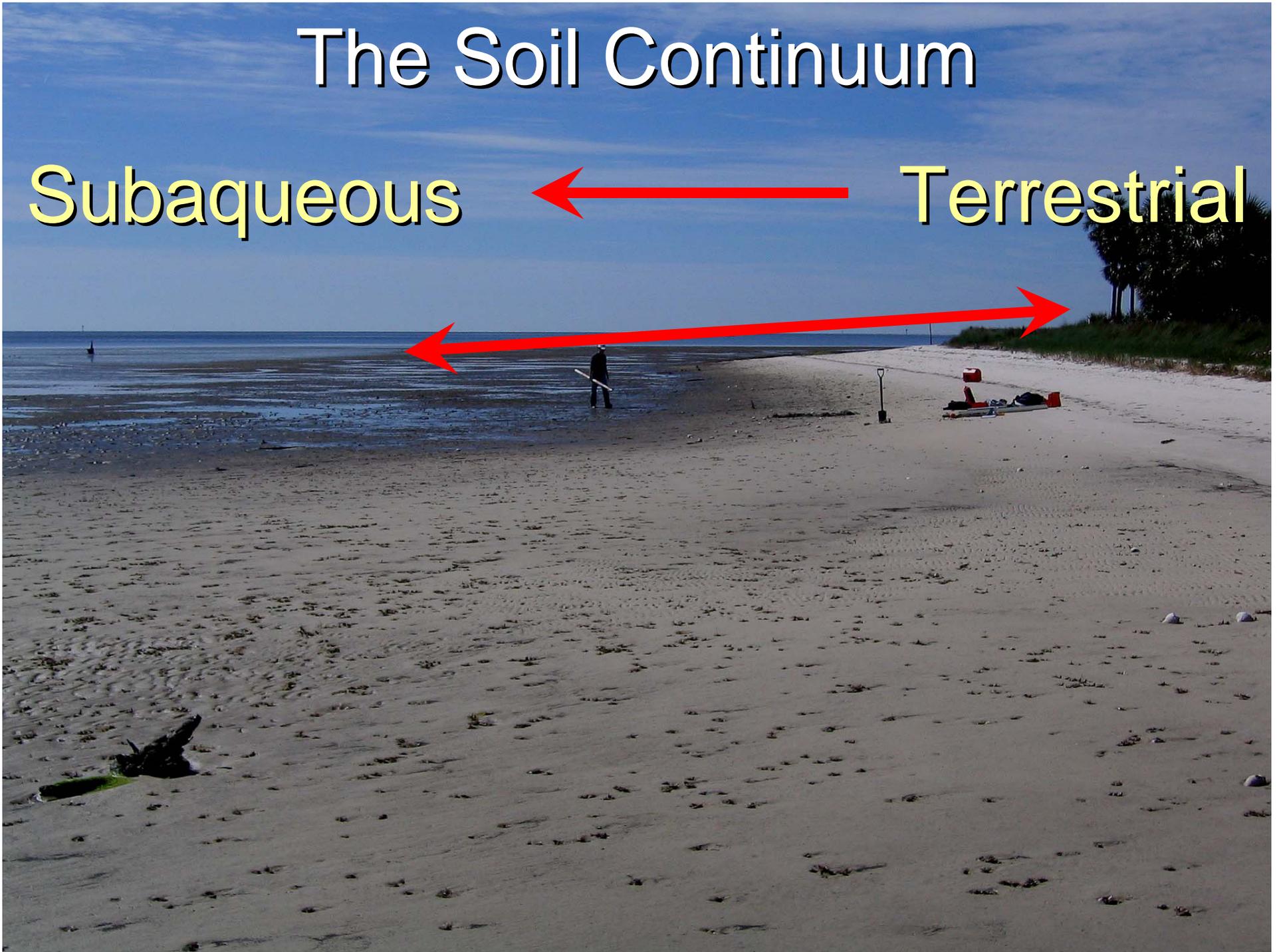


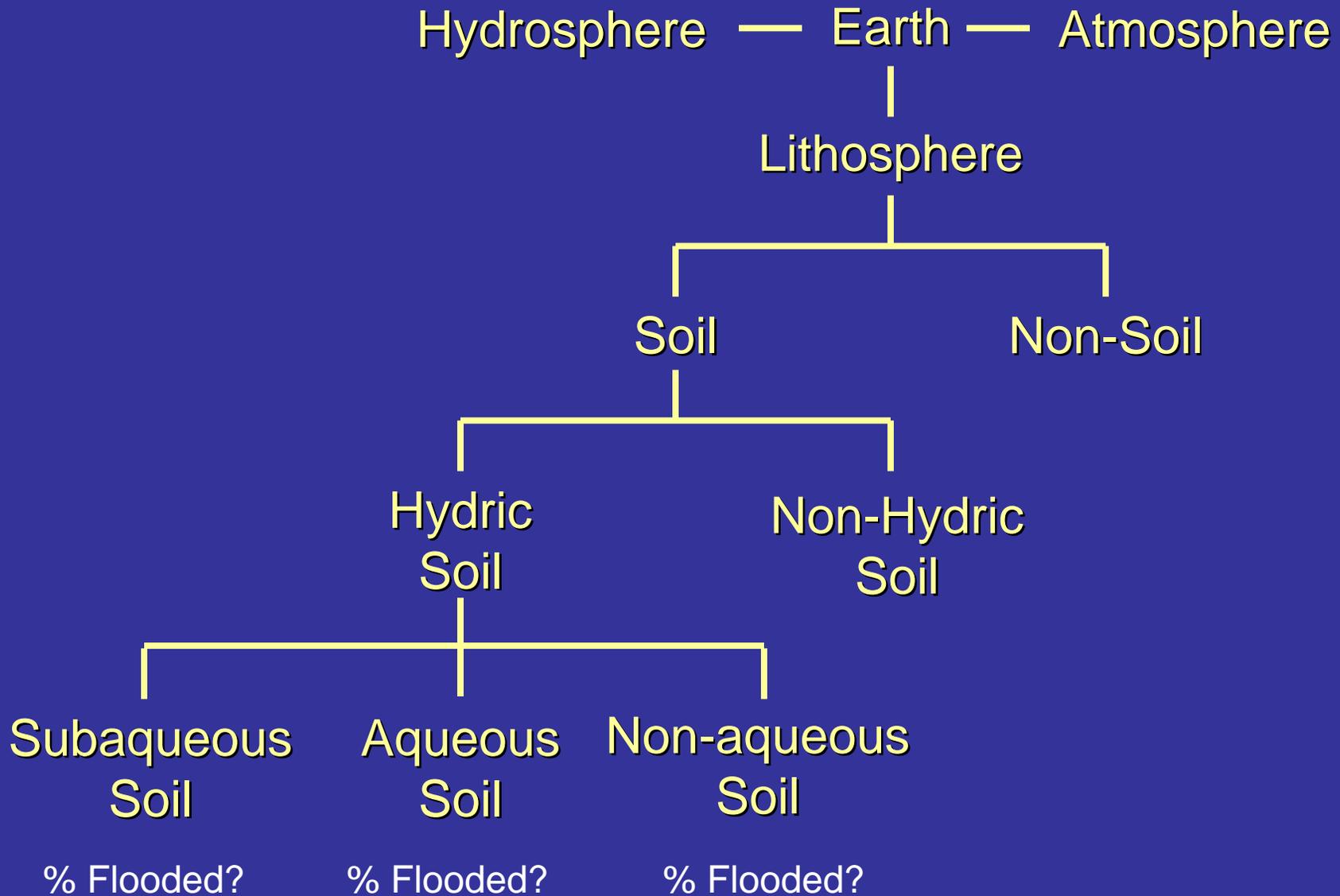
The Soil Continuum

Subaqueous



Terrestrial





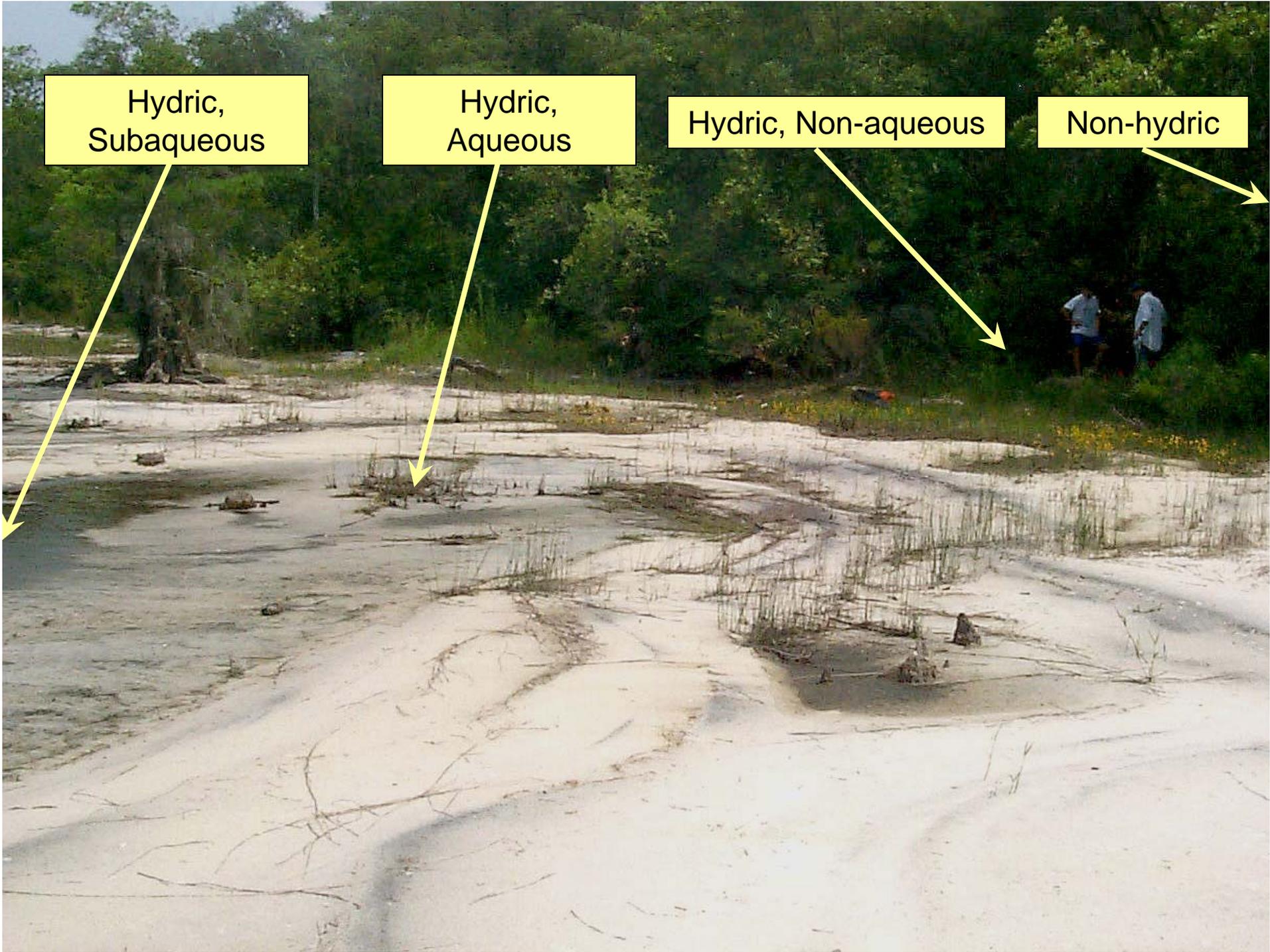
Little Surface Area Change of Lake Magnolia and Sand Hill Lake



4
Years



Drastic Surface Area Change of Lake Brooklyn



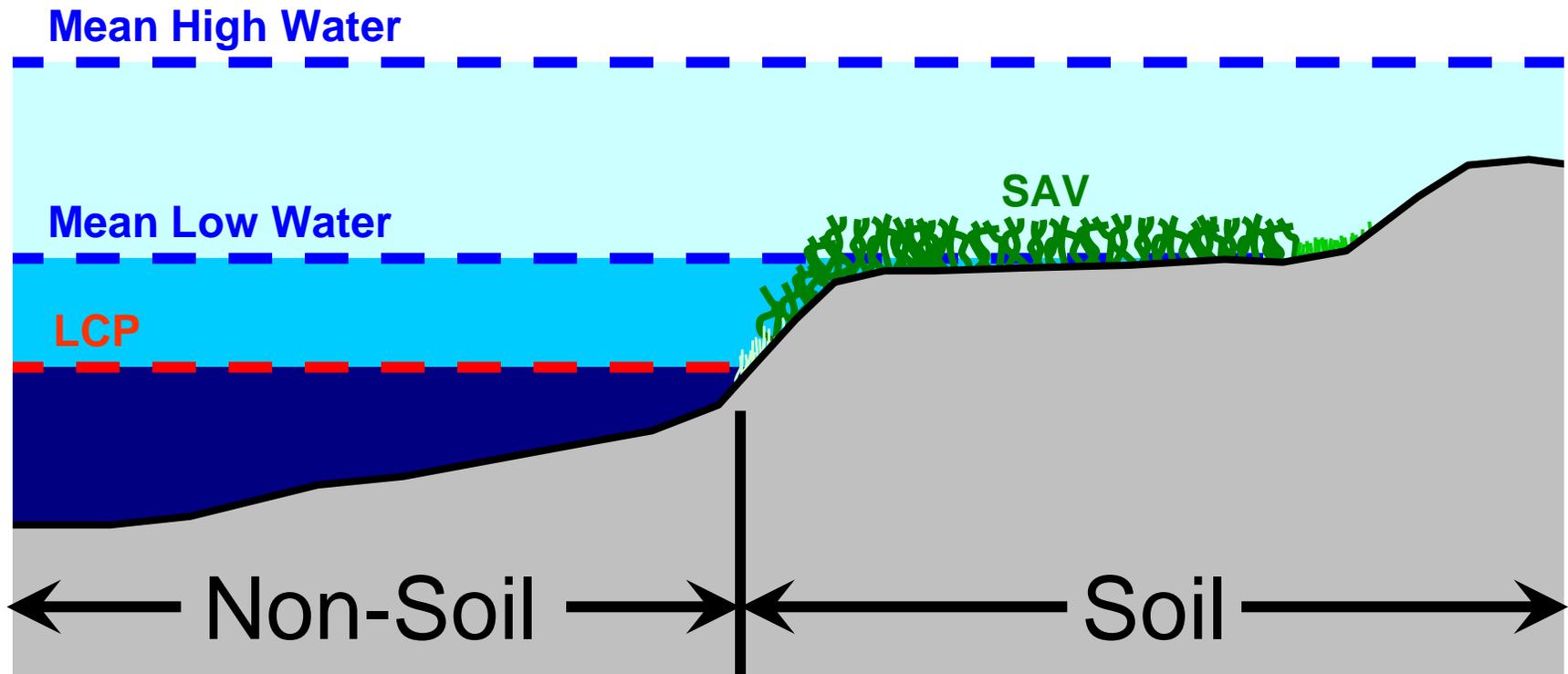
Hydric,
Subaqueous

Hydric,
Aqueous

Hydric, Non-aqueous

Non-hydric

Definition of Soil



“*Soil* in this text is a natural body comprised of solids (minerals and organic matter), liquid, and gases that occurs on the land surface, occupies space, and is characterized by one or both of the following: horizons, or layers, that are distinguishable from the initial material as a result of additions, losses, transfers, and transformations of energy and matter *or* the ability to support rooted plants in a natural environment.

This definition is expanded from the previous version of *Soil Taxonomy* to include soils in areas of Antarctica where pedogenesis occurs but where the climate is too harsh to support the higher plant forms.

The upper limit of soil is the boundary between soil and air, shallow water, live plants, or plant materials that have not begun to decompose. Areas are not considered to have soil if the surface is permanently covered by water too deep (typically more than 2.5 m) for the growth of rooted plants. The horizontal boundaries of soil are areas where the soil grades to deep water, barren areas, rock, or ice. In some places the separation between soil and nonsoil is so gradual that clear distinctions cannot be made.”

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Shallow (0.5 m)
grassflat

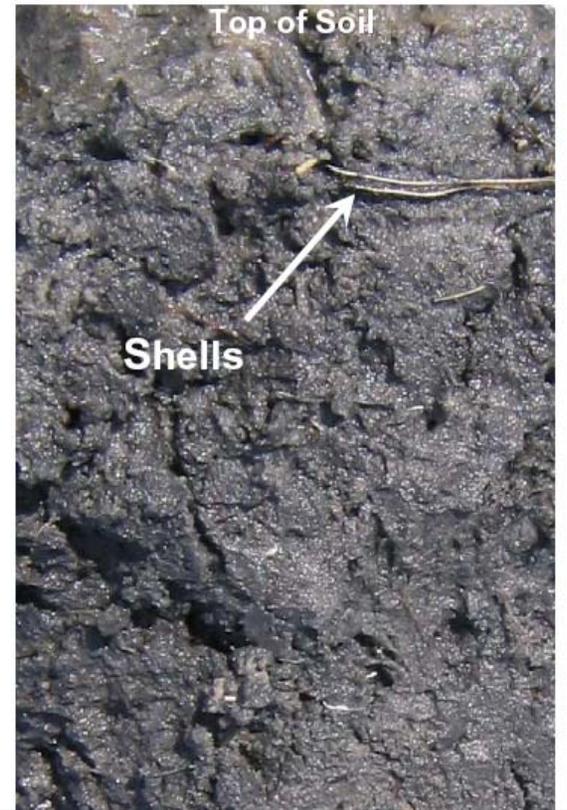
Edge of grassflat



0 cm



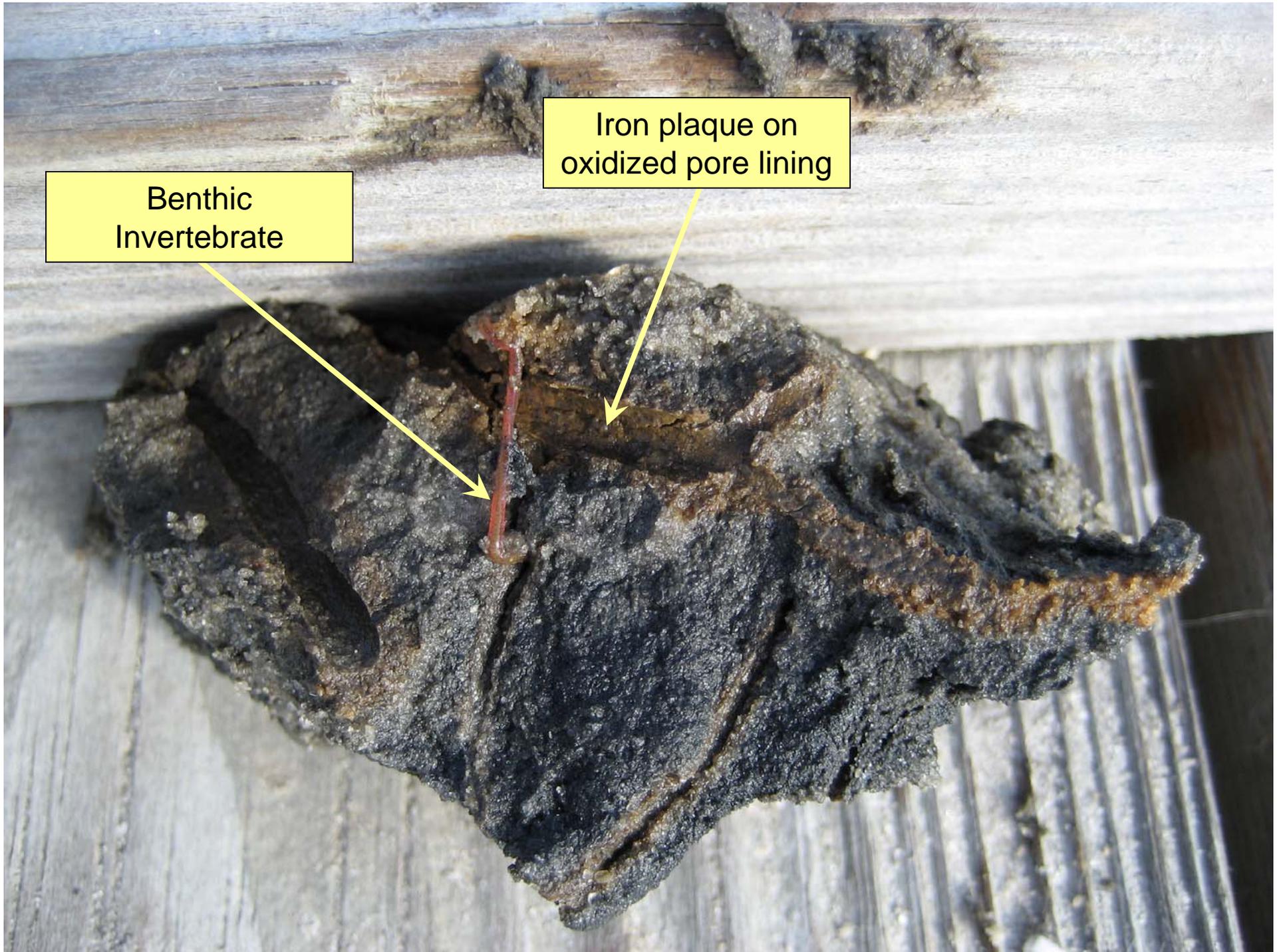
Top of Soil



5 cm



Deep (2 m)
unvegetated
area

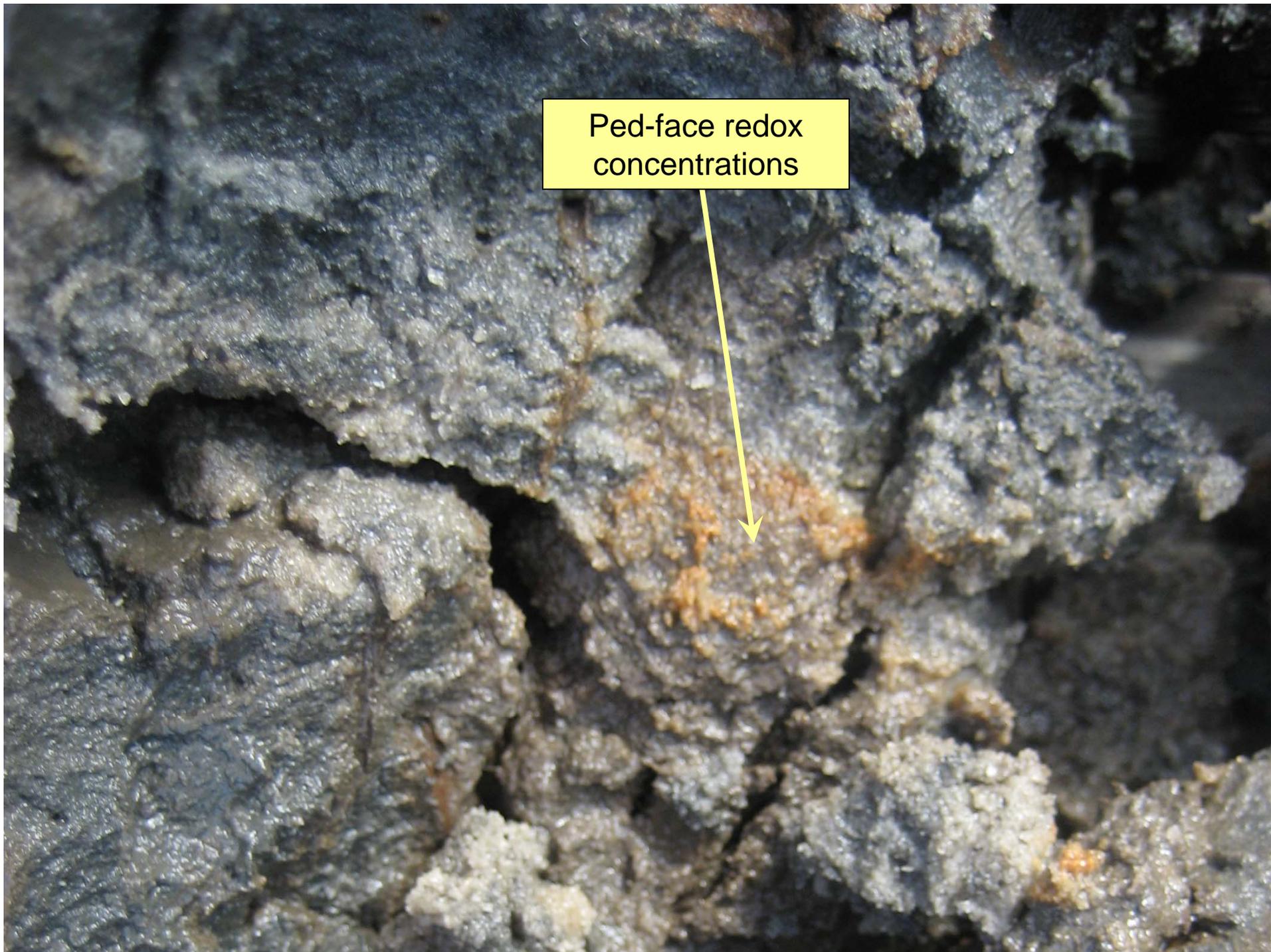


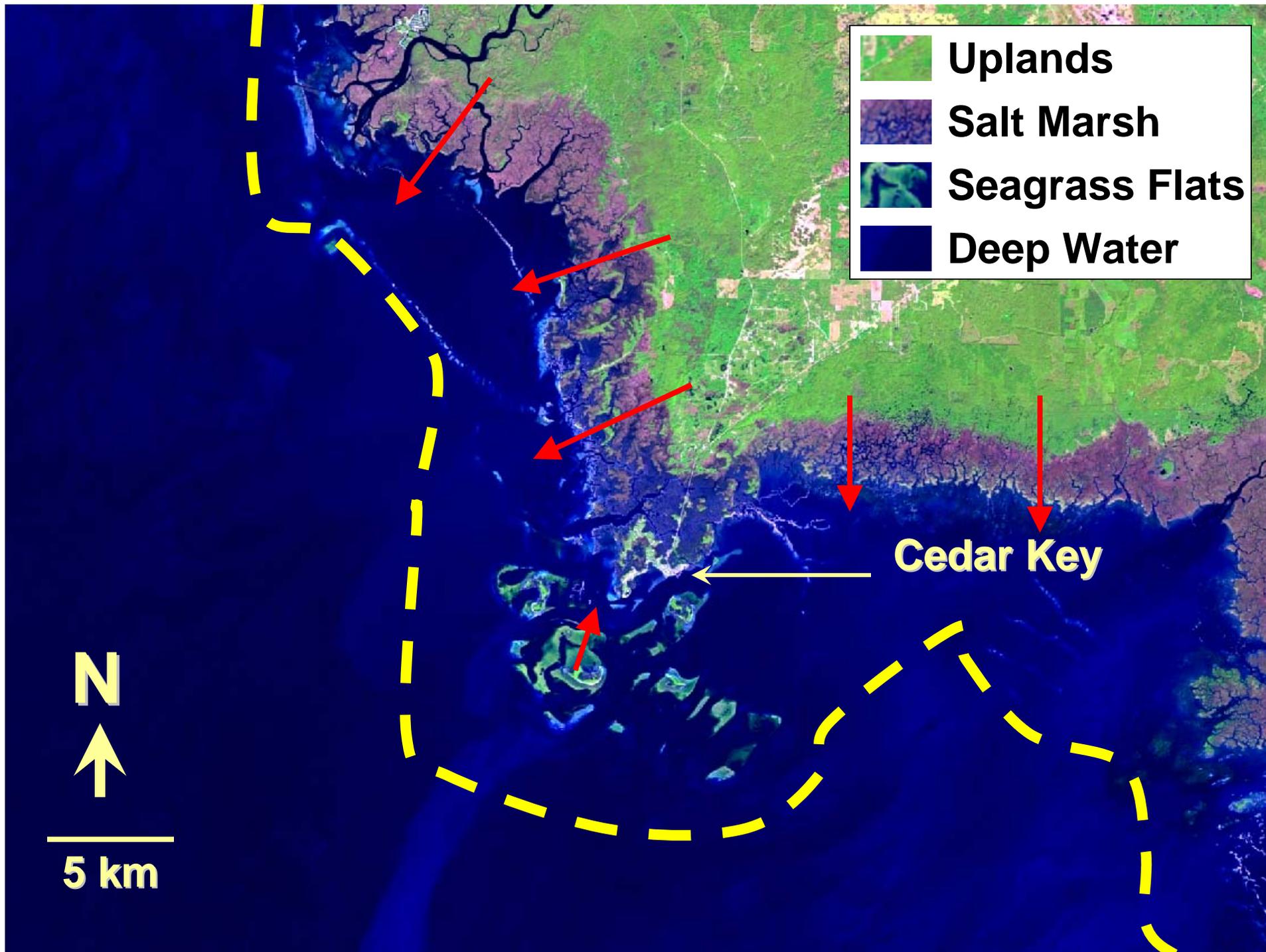
Benthic
Invertebrate

Iron plaque on
oxidized pore lining



Ped-face redox concentrations

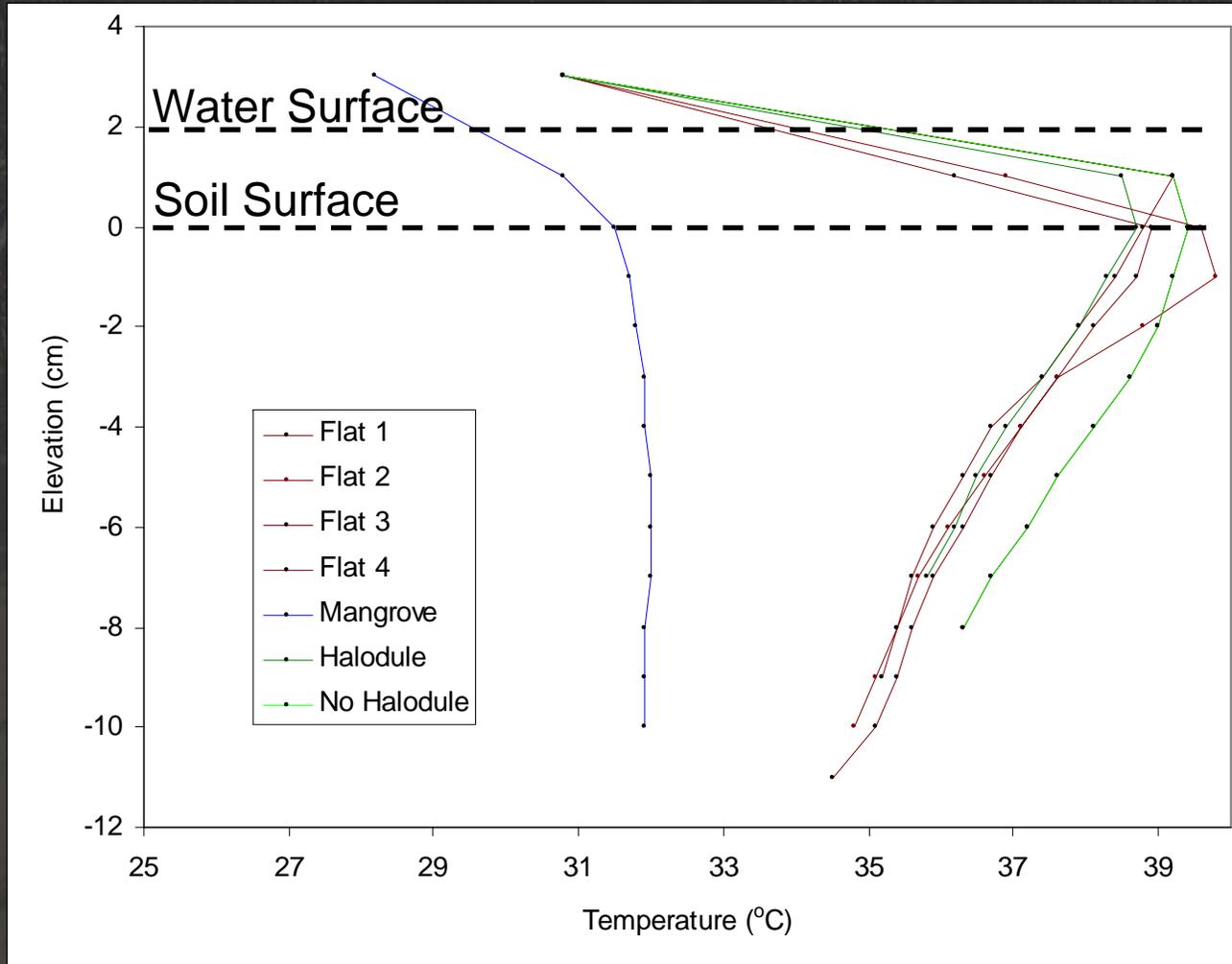




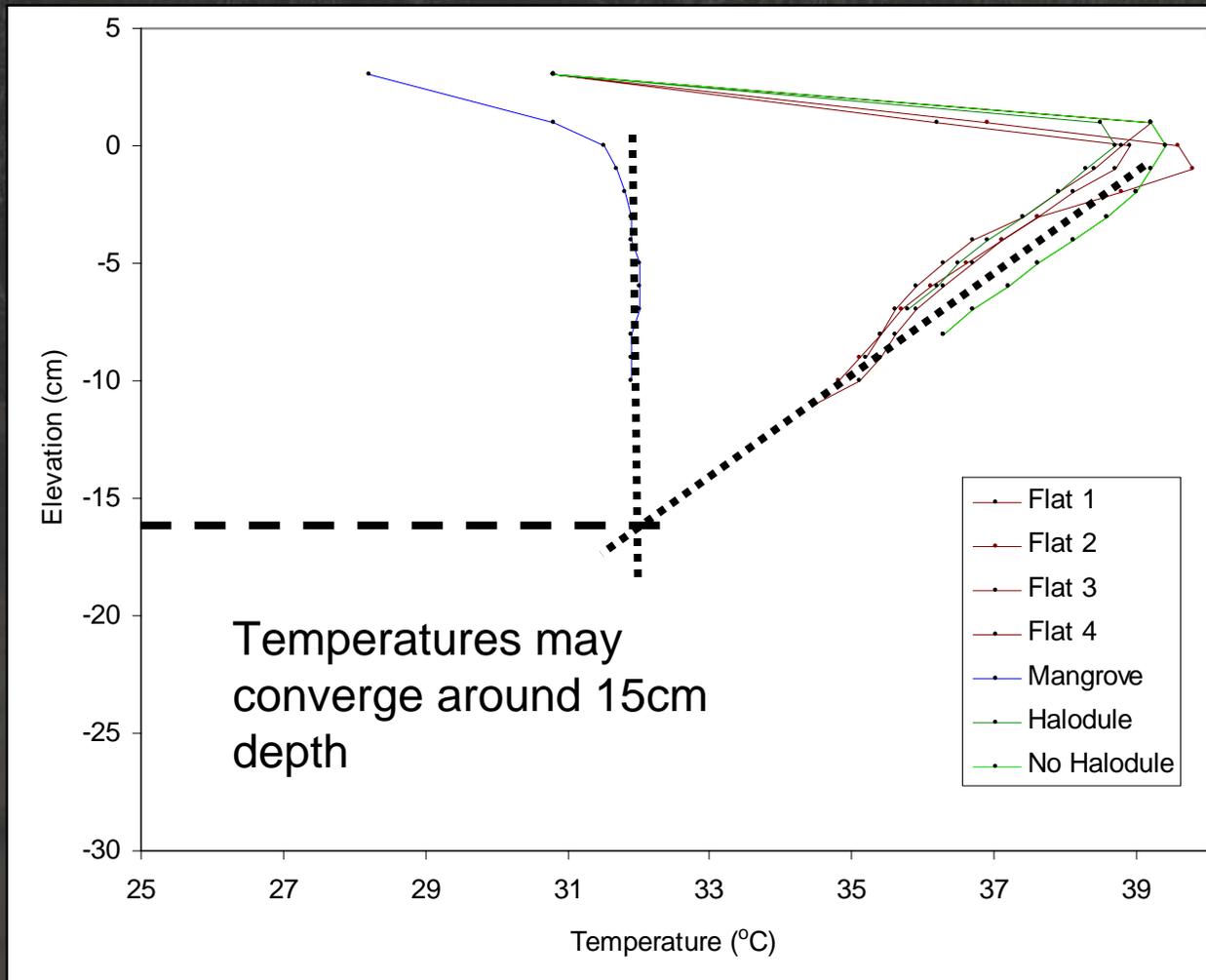
Soil Temperature



Soil Temperature



Soil Temperature



Recommendations:

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1. Continue to ID, contact, and collaborate with users. This justifies our existence in the water, drives interps, etc.
2. Define WHAT we are going to map, survey, investigate, etc.
3. National committee on Subaqueous Soils.
 - Will continue these charges and create new ones (e.g. push research and methods)
 - Collaboration between states
 - Tour various areas



A person wearing a cap and a vest is standing in a field, looking at a document. In the foreground, there is a long measuring tool (likely a leveling staff) on the ground. The background shows tall grass and a fence. The overall scene is dimly lit, suggesting dusk or dawn.

Questions?