

# Coastal and Marine Ecological Classification Standard (CMECS)

NatureServe  
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## COASTAL AND MARINE ECOLOGICAL CLASSIFICATION STANDARD

VERSION III  
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- Workshops: Marathon, 1999; Charleston 2003, 2007

# Objectives

- *Develop a national standard for consistent descriptions of coastal and marine ecological features.*
- *Include biological, geological, physical, and chemical aspects of the seascape.*
- *Be compatible with FGDC wetland standard and FGDC vegetation standard.*
- *Meet inventory, restoration, monitoring, and protection information needs.*

# Guiding Principles

- *Meet National, Regional and Local Needs*
- *Build on Existing Work*
- *Create a Comprehensive Ecological Classification*
- *Meet Mapping Needs*
- *Allow for a Dynamic Content Standard*
- *Provide Flexibility to Meet Individual Needs*
- *Document Terminology*

# CMECS Domain

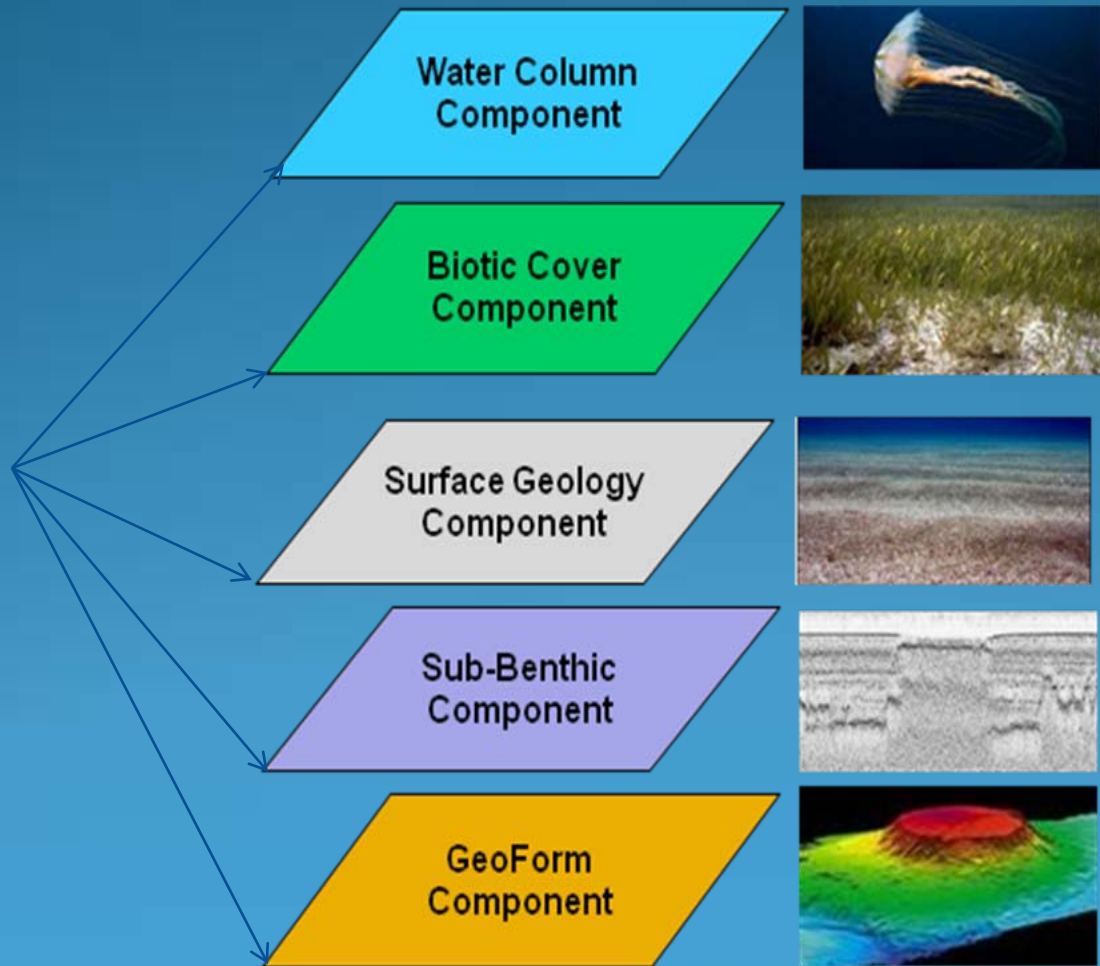
**Landward:** tidal splash zone of the coasts, intertidal euhaline and brackish wetlands, and deepwaters of the Great Lakes.

**Up River/Estuary:** tidally influenced areas where salinity is greater than 0.5 PSU (Practical Salinity Units) for all or part of the year.

**Seaward:** to the deep ocean, including all continental and ocean waters.

# CMECS Components

**Aquatic Setting**



## Terrestrial Counterparts

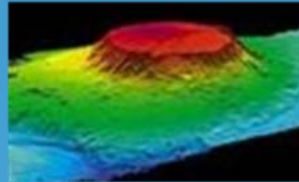
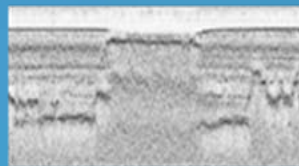
None

Vegetation Cover

Surficial Geology

Soils

Physiographic Provinces  
& Landforms



# Aquatic Setting

- System
  - Nearshore
  - Neritic
  - Oceanic
  - Estuarine
  - Freshwater -Influenced
  - Lacustrine
- Subsystem
  - Subtidal
  - Intertidal
  
  - Littoral
  - Limnetic



# Surface Geology Component (SGC)

- Describes the geological composition and environment of the upper few centimeters of benthic or coastal substrate, describing also the structural (non-living) aspects of biogenic substrates such as coral reefs.
- Consistent with FGDC Wetland Standard Classes and Subclasses
- Hierarchical: Class, Subclass, (Group)
  - Class: Unconsolidated bottom
  - Subclasses: Cobble/Gravel, Sands, Muds, Organic, Shell, Mixed Sediments, Reef Rubble



# Biotic Cover Component (BCC)

- Describes the biological composition and cover of the coastal and marine benthos
- Hierarchical: Class, Subclass, Biotic Group, Biotope
- Derived from FGDC Wetland Standard Classes and Subclasses – with some modifications
- Example:
  - Class: Aquatic Bed
  - Subclass: Rooted Vascular Vegetation
  - Biotic Group: *Cymodocea-Thalassia* Seagrass Bed
  - Biotope: *Thalassia testudinum* Seagrass Bed



# BCC Classes and Subclasses

- Faunal Reef (mollusc and worm reefs)
- Coral Reef (stony corals and calcareous algae)
- Faunal Bed (sessile and mobile epifauna, infauna)
- Aquatic Bed (macroalgae, rooted vascular, microbial)
- Emergent Wetland (emergent salt marshes)
- Scrub-Shrub Wetland (shrub salt marshes, shrub mangroves)
- Forested Wetland (tall mangroves)

# Biotic Groups and Biotope

Class: Faunal Bed    Subclass: Sessile Epifauna

Biotic Group	Biotope
Attached Anemones	<i>Metridium</i> communities
Burrowing Anemones	<i>Cerianthus</i> communities, <i>Edwardsia</i> communities
Barnacles	<i>Chthamalus</i> communities, <i>Balanus</i> communities
Coral Garden	Mixed soft coral communities, gorgonian communities
Sponge Bed	<i>Microciona</i> communities, <i>Hyalonema</i> communities
Hydroids	<i>Sertularia</i> communities, <i>Tubularia</i> communities
Bryozoans	<i>Bugula</i> communities, <i>Celleporaria</i> communities
Tunicate Bed	<i>Didemnum</i> communities, <i>Molgula</i> communities

# Geoform Component (GFC)

- Describes the major geomorphic or structural characteristics of the coast and seafloor at various scales
- Derived from Greene et al. with modifications
- Non-hierarchical – multi-classifier approach
  - Physiographic Province – major components of seafloor geomorphology along the continuum from the spreading center to the coast. (e.g., fracture zone, abyssal plain, continental rise, continental shelf).
  - Geoform - seafloor structures that range in size from 100's of kilometers to less than a meter (e.g., delta, embayment, channel).
  - Anthropogenic Geoform - human made structures (berm, harbor, artificial reef).



# Water Column Component (WCC)

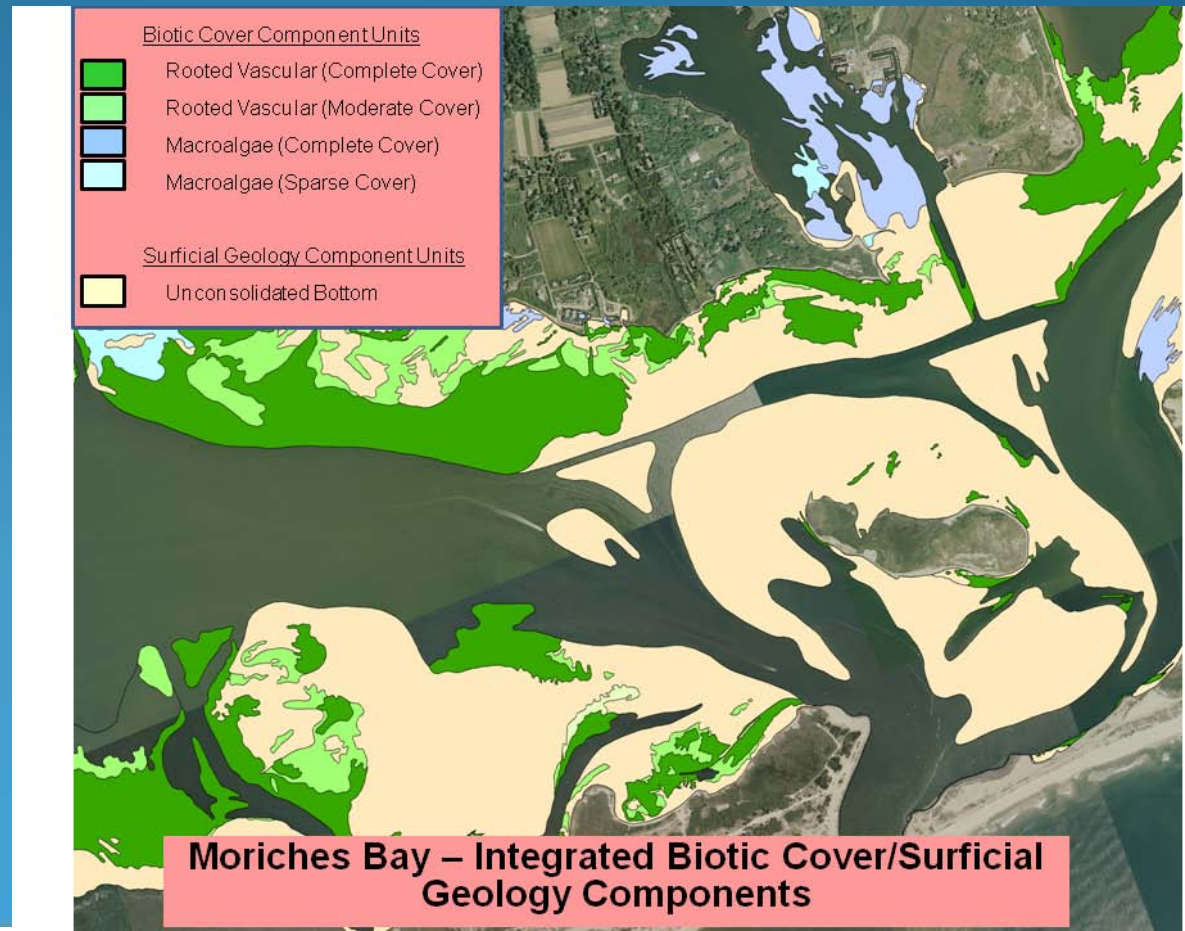
- Describes the structures, patterns and processes of the water column
- Non-hierarchical multi-classifier approach
- Example – Northern Krill Aggregation
  - System: Oceanic
  - Depth zone (Epipelagic)
  - Hydroform (Upwelling)
  - Salinity (Euhaline)
  - Temperature (Cold)
  - Biotic Group (Euphausiid aggregation )
  - Biotope (*Meganyctiphanes norwegica* biotope)

# Sub-benthic Component (SBC)

- Describes characteristics of the sediments and soils below the surface with depth, providing more detailed information on the composition of the entire sediment column.
- Upper 15 cm: texture , composition, infauna etc. Sampled using remote sensing equipment (*e.g.*, acoustic sensors, video and/or still imagery) and grab and/or core samples.
- Below 15 cm: traditional geologic or pedologic (soil) systems. Including particle size, color, chemical composition, and biogenic features . Core samples (*e.g.*, vibracore, boreholes).

# Modifiers

- A consistent set of variables used to further describe a standard unit and allow users customize their application of the classification in a standardized way
- Examples:
  - Energy Level
  - Percent Cover
  - Slope
  - Rugosity



# Coding

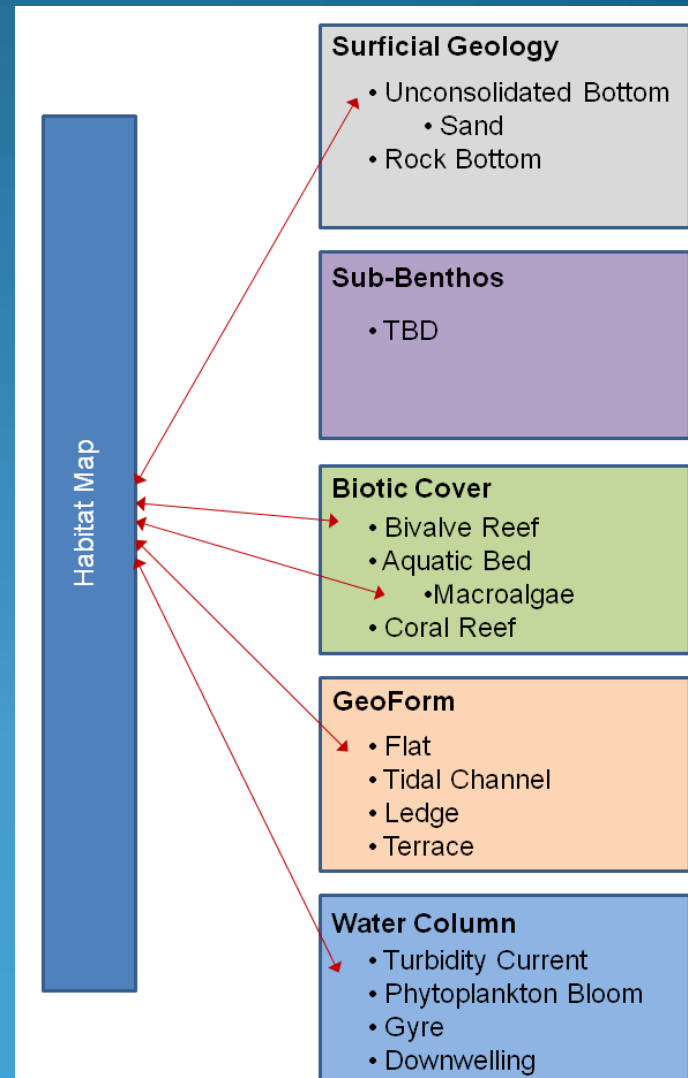
- System.Subsystem\_
- s:Surface Geology Class.Subclass.Group.Modifier\_
- b:Biotic Class.Subclass.Group.*Biotope*.Modifier\_
- u:Sub-Benthic Class.Subclass.Group.Modifier\_
- g:Physiographic Province.Geoform<sub>1</sub>.Geoform<sub>2</sub>.Anthrogeoform.Modifier\_
- w:Water Column Hydroform.Biotic Group.*Biotope*.Modifier
- Estuarine *Zostera marina* seagrass bed on sand substrate, unclear if the area is intertidal or subtidal  
ES.0\_s:UB.2\_b:AB.3.zs.*Zost mari*

# Mapping CMECS

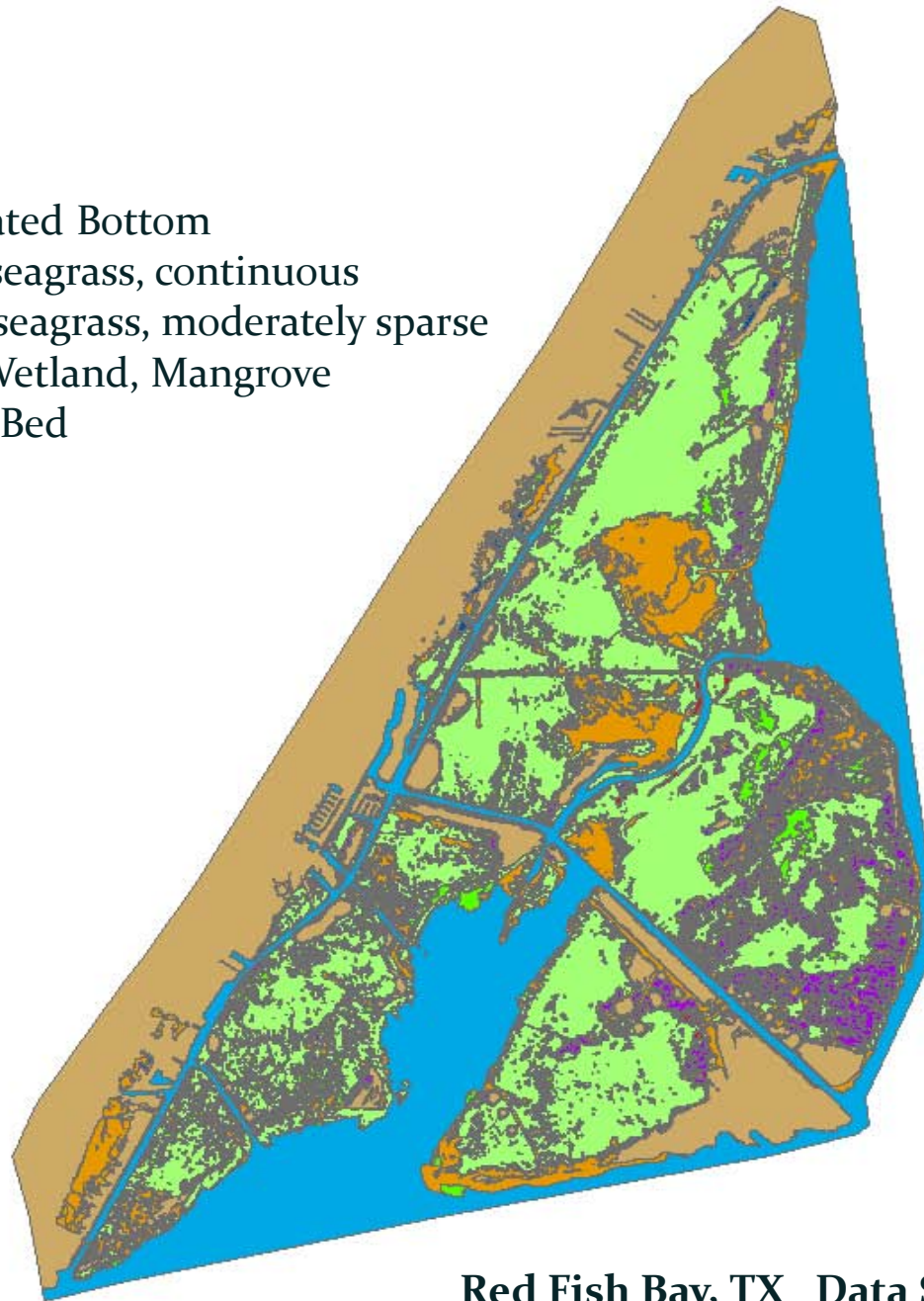
- Driven by user objectives.
- CMECS is technology agnostic. Level of specificity depends on a users objectives and the source data.
- Various components can be mapped alone or together based on user objectives.
- Map scale and geographic scale is user driven. No predefined minimum mapping unit.
- CMECS recognizes spatially and temporally variable units. Frequency of mapped “snapshots” depends on user needs. Modifiers can be used to indicate ephemeral units.

# Mapping CMECS

- Can draw from several components to create one map
- SGC and BCC units can be combined to create complete benthic cover maps.



ES = Estuarine  
1 = Subtidal  
s:US = Unconsolidated Bottom  
b: AB.3.o.o.dens = seagrass, continuous  
b: AB.3.o.o.mdsp= seagrass, moderately sparse  
b:FO.1 = Forested Wetland, Mangrove  
b: FB.1.ob = Oyster Bed



Legend

- Water
- ES.1\_s:US
- ES.1\_b:AB.3.o.o.mdsp
- ES.1\_b:AB.3.o.o.dens
- ES.1\_b:FO.1
- ES.1\_b:FB.1.ob
- Land

Red Fish Bay, TX Data Source: Side Scan

# Mobile Bay, AL

## Grab samples

ES = Estuarine

1 = Subtidal

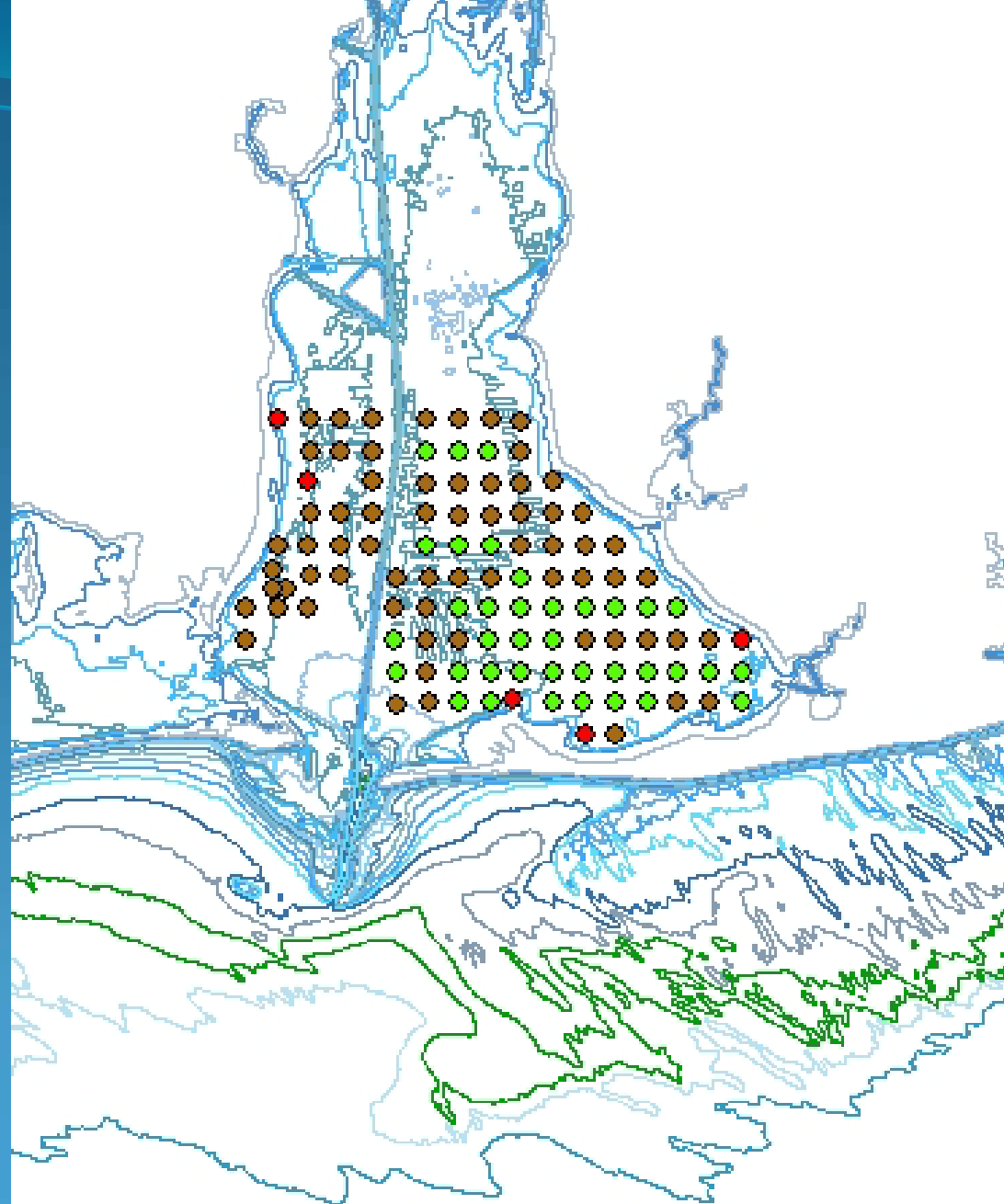
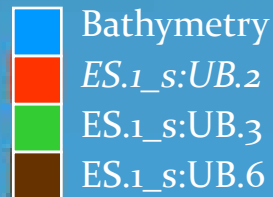
UB = Unconsolidated Bottom

2 = > 50% Sand

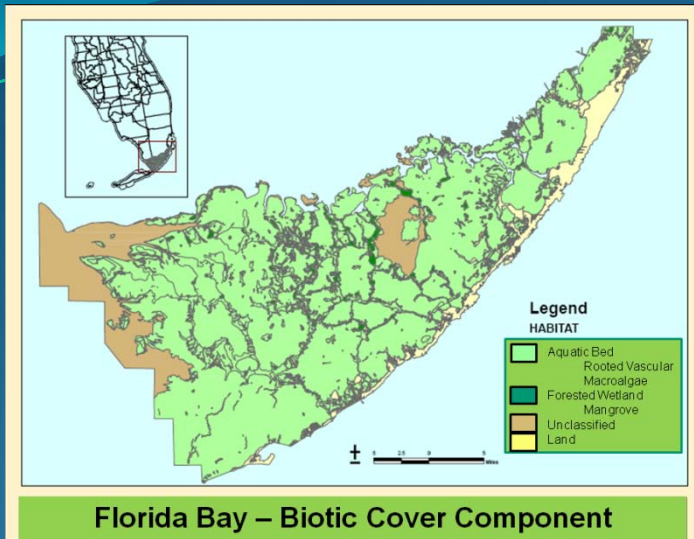
3 = > 50% Mud/Silt

6 = Mixed

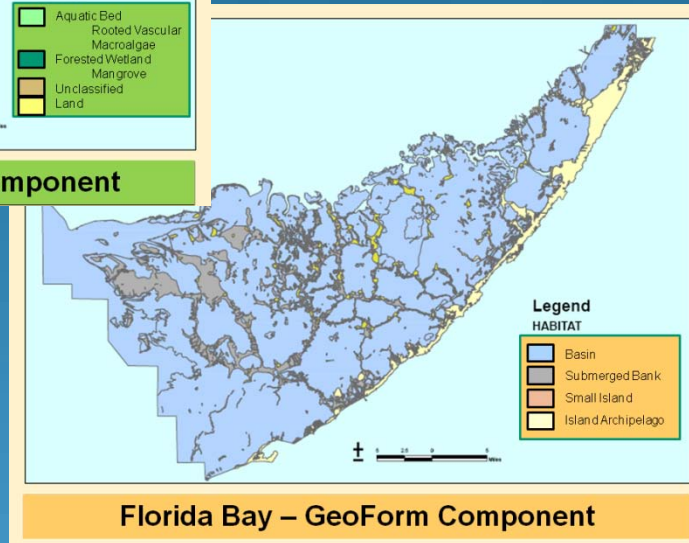
### Legend



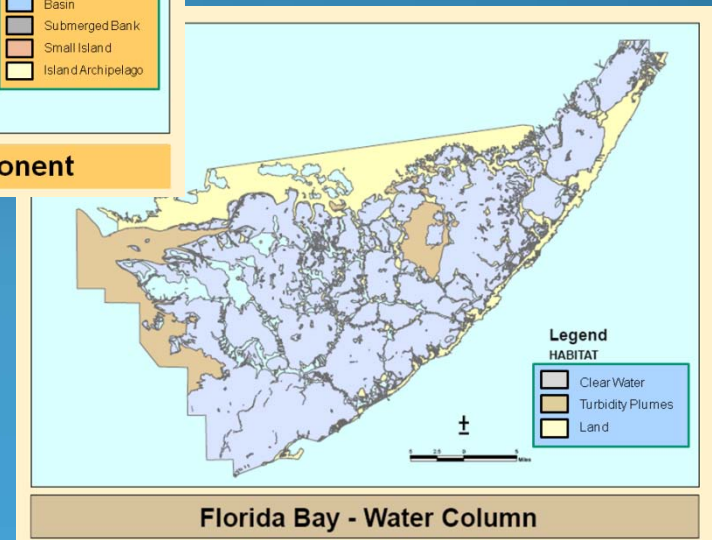
# Mapping CMECS



- Can develop complete coverage for each separate component.



Applied CMECS units to existing map developed by Florida Marine Research Institute (FMRI, 2002) originally classified using “SCHEME” system.



# Status

- ✓ Surface Geology Component: Complete to Subclass level. Some review of reef types needed.
- ✓ Biotic Cover Component: Framework complete. Biotic Group is draft, Biotopes need development.
- \* Geoform Component: Framework complete. Values need additional review and smoothing.
- \* Water Column Component: Framework being reviewed and refined.
- ✎ Sub-Benthic Component: In the initial stages. Watch this space.

# Federal Geographic Data Committee

- CMECS has been proposed as a FGDC classification standard
- On step 5 of a 12 step review and approval process
- Identified a work group of about 20 members from across agencies, academia, NGO's, geographies, areas of expertise
- Work group will serve as reviewing body, will provide additional content, and will be charged with processing public comment.
- First meeting is next week.

# Questions?

