

Coastal and Marine Ecological Classification Standard (CMECS)

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Methods and Technology
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Why CMECS?

- Currently over 100 systems used for classifying benthic habitats *
- Few systems used by more than one party/advocate
- Most systems tied to a particular technology
- Most coastal/marine mapping done on a local or state level
- No existing marine or pelagic standard beyond Cowardin

* *Diaz, Solan & Valente, 2004—Journal of Environmental Management*



What Is CMECS?

What CMECS is:

- A catalog of terms
- A framework for organizing observational information

What CMECS is not:

- A mapping protocol
- An analytical method for comparing ecosystem units



CMECS Characteristics

- Accommodates biological, geological, chemical, and physical data in single structure
- Complies with Federal Geographic Data Committee standards and other accepted approaches
- Is sensor-independent and suitable for multiple applications

Facilitates data sharing and integration

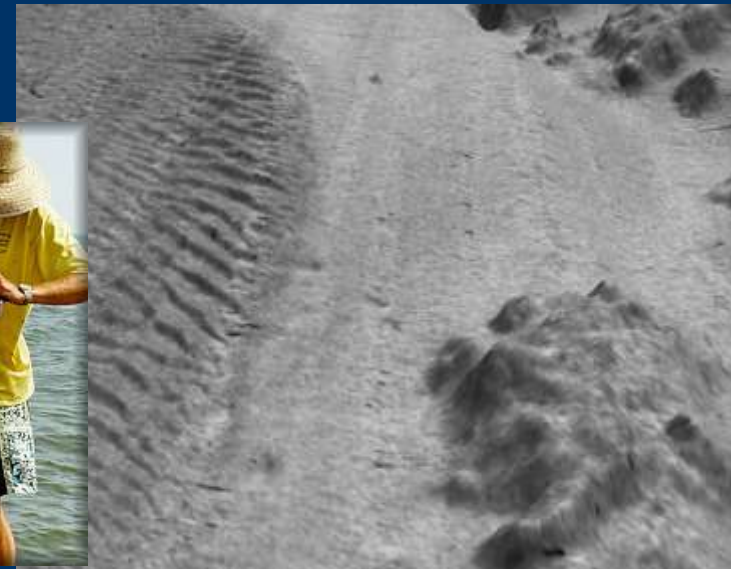
Where Would You Use CMECS?

All waters, substrates, biotic communities, and structural features of the coastal and marine realms extending:

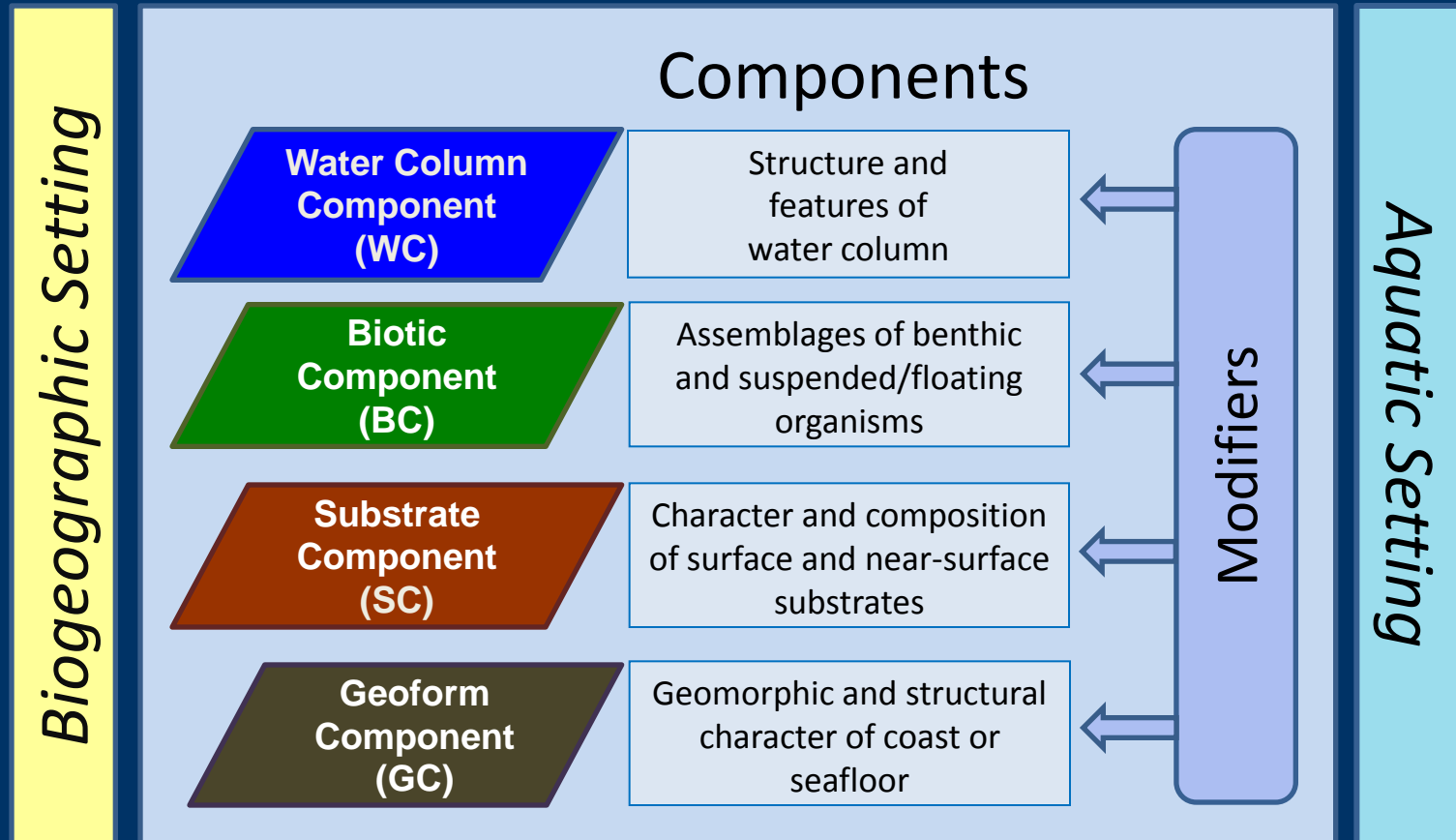
- **Landward** – To tidal splash zone of coasts, intertidal and brackish wetlands, and deep waters of Great Lakes
- **Up river or estuary** – To head of tide, where tide is ≥ 0.2 ft (0.06 m) for at least part of month
- **Seaward** – To deep ocean, including all continental and oceanic waters and bottom areas

Source Data Accomodated by CMECS

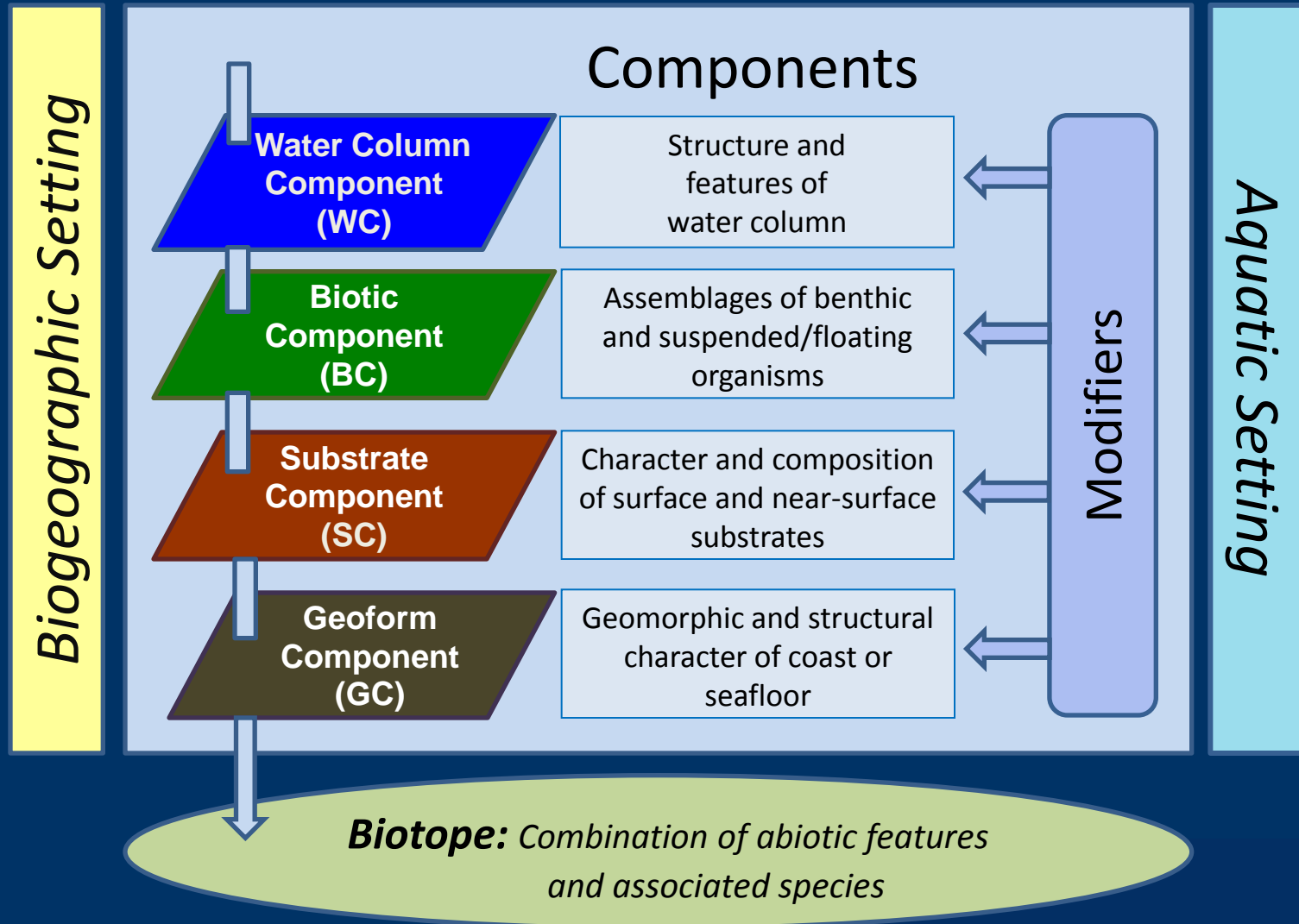
- Multi-spectral Imagery
- Acoustic Backscatter
- Grabs/Cores
- Satellite Oceanographic Data
- LIDAR Elevation and Intensity
- Videography
- Bathymetric DEMs
- Buoy Data
- CTD Samples
- ADCP



CMECS Structure

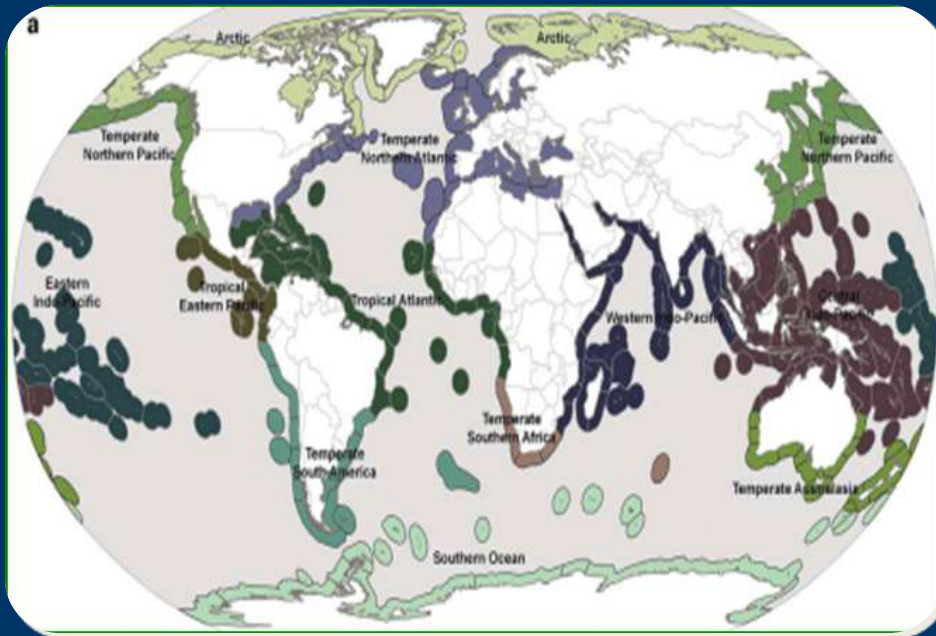


CMECS Structure



Biogeographic Setting

Defined by climate, geological setting, evolutionary history, and existing biota



Three hierarchical levels:

- Realm
- Province
- Ecoregion

Aquatic Setting

Defined by salinity, proximity to the coast, and tidal regime



Three hierarchical levels:

- System
- Subsystem
- Tidal Zone

Biotic Component

Composition of floating, suspended, attached, and soft sediment biota



Four hierarchical levels:

- Class
- Subclass
- Biotic Group
- Biotic Community

Substrate Component

Composition of upper layer of hard substrate or upper 15 centimeters of soft substrate



Four hierarchical levels:

- Class
- Subclass
- Substrate Group
- Substrate Subgroup

Geoform Component

Major geomorphic features of coast and seafloor at various scales



Three subcomponents:

- Tectonic Setting
- Physiographic Setting
- Geoforms (Levels 1 and 2)

Geoform Component

Subcomponent Concept

Tectonic Setting	Physiographic Setting	Geoform Origin	Geoform	Level 1	Level 2	Geoform Type	Level 1	Level 2	
Abyssal Plain	Abyssal/Submarine Fan	Geologic	Apron	x					
Convergent Active Continental Margin	Barrier Reef		Bank	x					
Divergent Active Continental Margin	Bight		Bar		x	x	Bay Mouth Bar	x	
Fracture Zone	Borderland						Longshore Bar	x	
Spreading Center	Continental/Island Rise						Point Bar		x
Mid-Ocean Ridge	Continental/Island Shelf						Relict Longshore Bar		x
Passive Continental Margin	Continental/Island Shore Complex		Basin	x					
Transform Continental Margin	Continental/Island Slope		Beach		x	x	Barrier Beach	x	x
Tectonic Trench	Embayment/Bay						Mainland Beach	x	x
	Fjord						Pocket Beach		x
	Inland/Enclosed Sea						Tide-Modified Beach	x	x
	Lagoonal Estuary						Tide-Dominated Beach	x	x
	Major River Delta						Wave-Dominated Beach	x	x
	Marine Basin Floor		Beach Berm	x	x				
	Ocean Bank/Plateau		Boulder Field	x					
	Riverine Estuary		Cave		x				
	Shelf Basin		Channel		x	x	Pass/Lagoon Channel		x
	Shelf Break						Sand Channel		x
	Sound						Slough	x	
	Submarine Canyon						Tidal Channel/Creek	x	x
	Trench		Cone	x	x				
			Cove		x	x	Barrier Cove	x	x
							Mainland Cove	x	x

Water Column Component

Structures, layers, and character of water column



Five subcomponents:

- Water Column Layer
- Salinity Regime
- Temperature Regime
- Hydroforms
- Biogeochemical Features

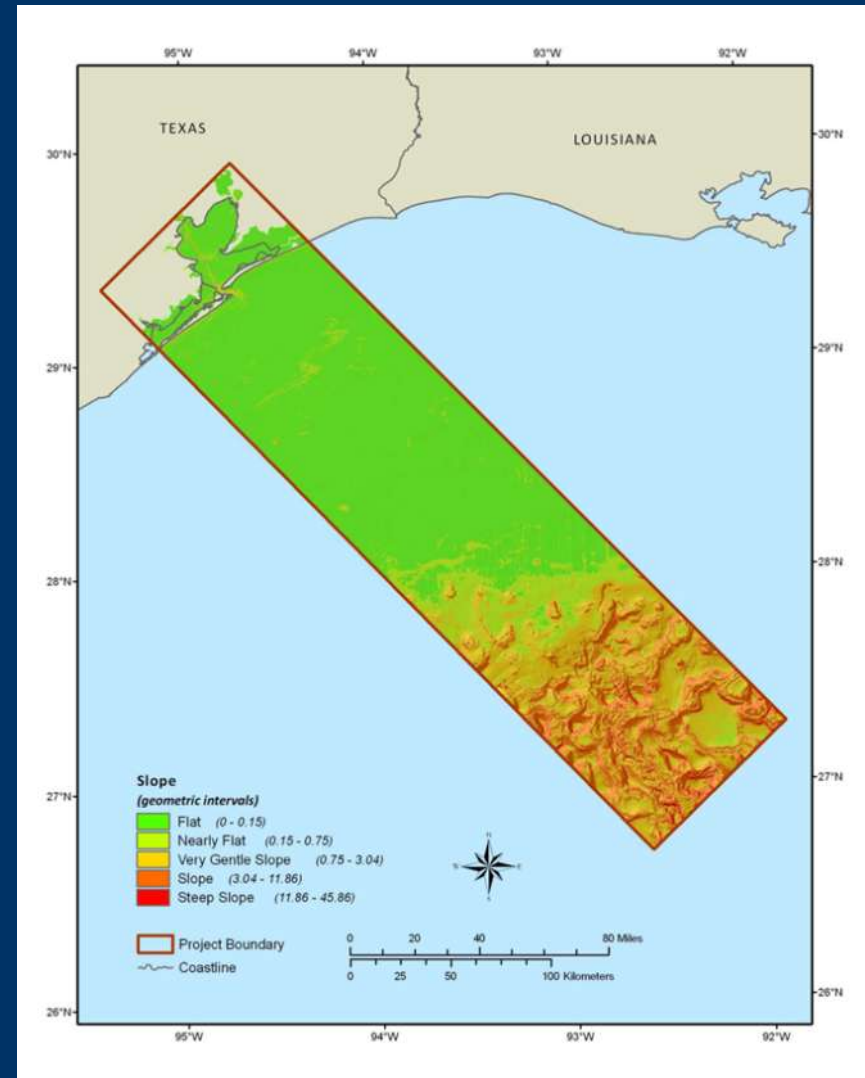


Modifiers

34 additional variables used to further describe standard units

Examples:

- Energy Level
- Percent Cover
- Slope
- Rugosity



Attributing Observations and Mapping

- **Scale or Minimum Mapping Unit defined by user**
- **Spatial Dominance for primary attribution**
- **Co-occurring Elements for additional constituents**
- **Provisional Units proposed by users**
- **Ephemeral Units**

No requirement to use units or components for which you don't have data

No requirement to remove more detailed information



Underwater Video Example

Biogeographic Setting:

Northern Gulf of Mexico

Aquatic Setting:

Marine Nearshore Subtidal

Biotic Component (BC):

Class: Aquatic Vegetation Bed

Subclass: Rooted Vascular Vegetation

Biotic Group: Seagrass Bed

Biotic Community: *Thalassia Seagrass*

Co-Occurring Element: Leathery or Leafy Macroalgae

Substrate Component (SC):

Class: Unconsolidated Mineral Substrate

Subclass: Fine Unconsolidated Substrate

Group: Sand

Geoform Component (GC):

Physiographic Setting: Coastal Complex

Level 1 Geoform: Lagoon

Water Column Component (WC): *Not used*



Gulf of Mexico
Image: C. Moses

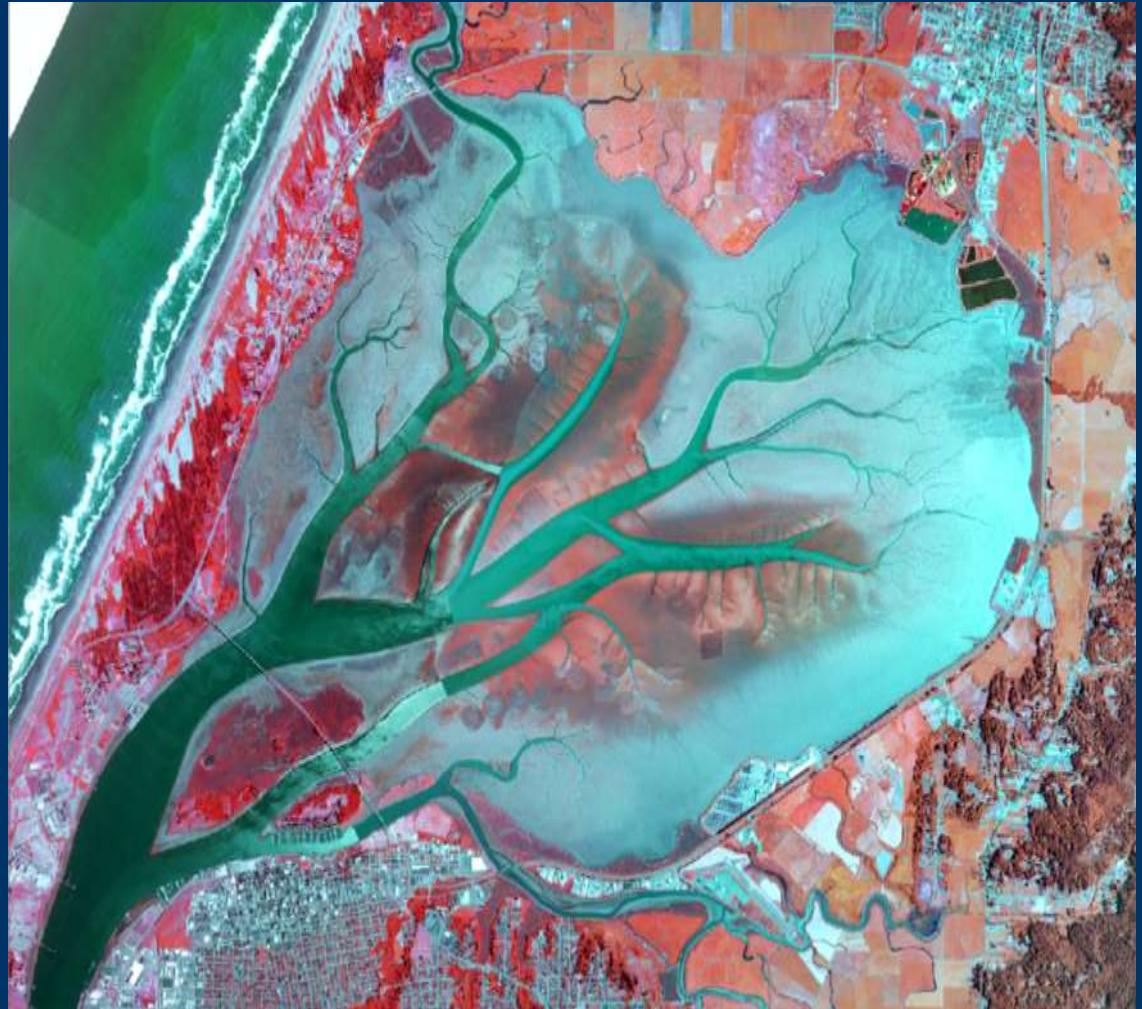


NOAA Coastal Services Center
LINKING PEOPLE, INFORMATION, AND TECHNOLOGY

Landscape Mapping Example

Source Data

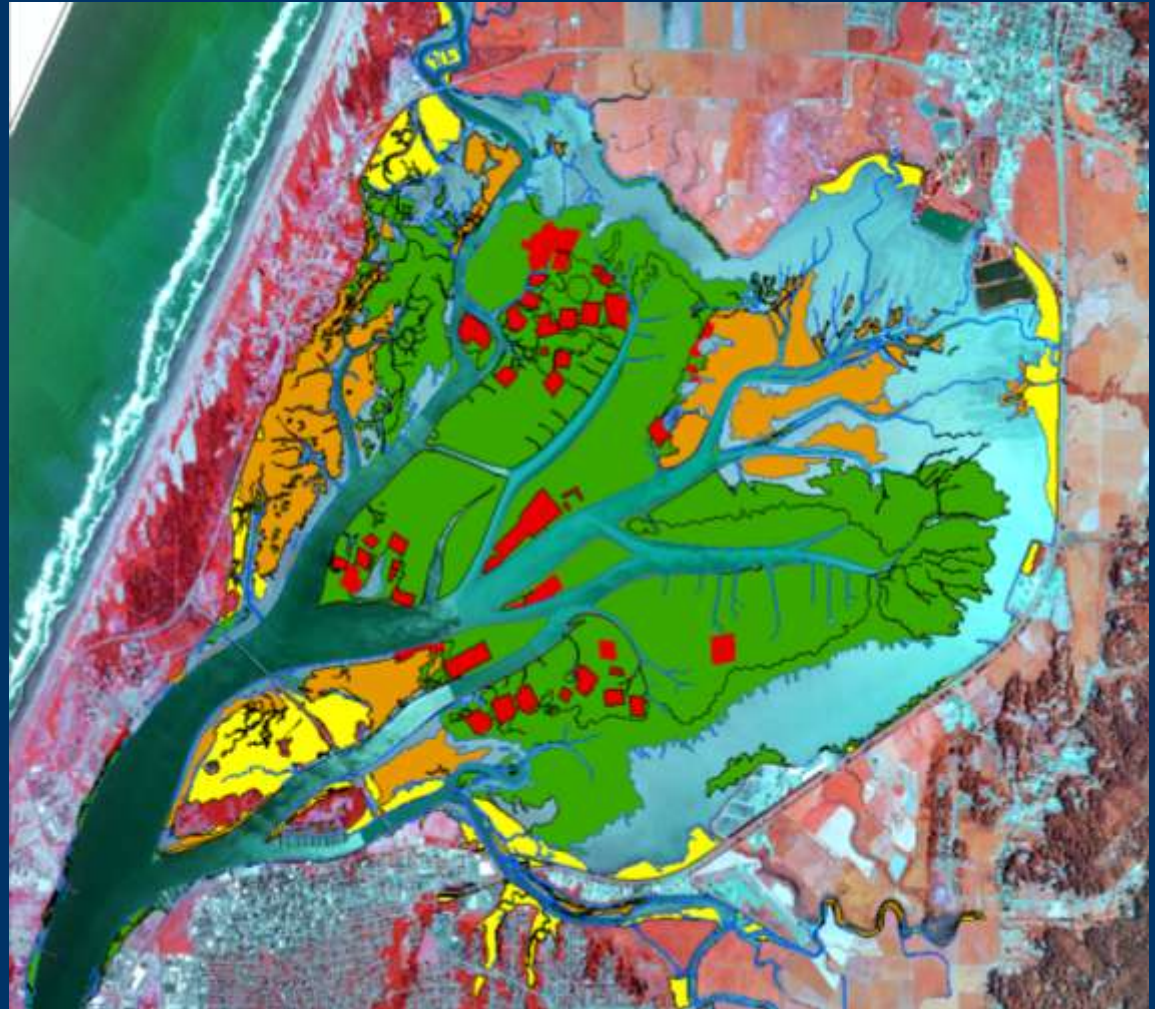
- Aerial Multi-spectral Imagery (DMC)
- Collected 27 June 2009
- Flown 09:35-10:24 PDT
- 4-band (B,G,R,Nir)
- 12-bit Dynamic Range
- 0.5m Spatial Resolution
- UTM Zone 10, NAD83



Landscape Mapping Example


Biotic Component

-  Emergent Marsh
-  Benthic Macroalgae
-  Seagrass Bed
-  Oyster Reef
-  Unclassified

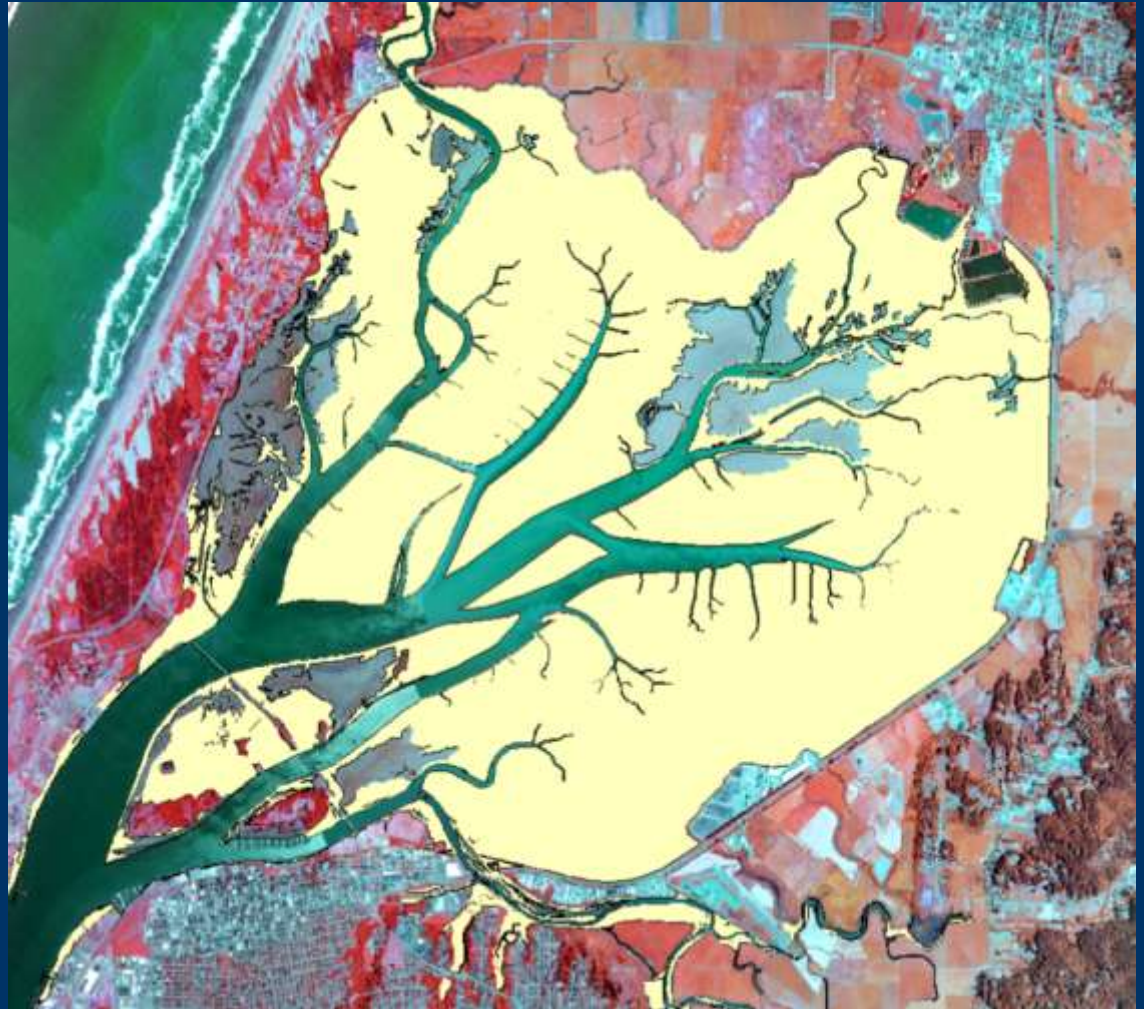


Landscape Mapping Example

Substrate Component

 Unconsolidated Substrate

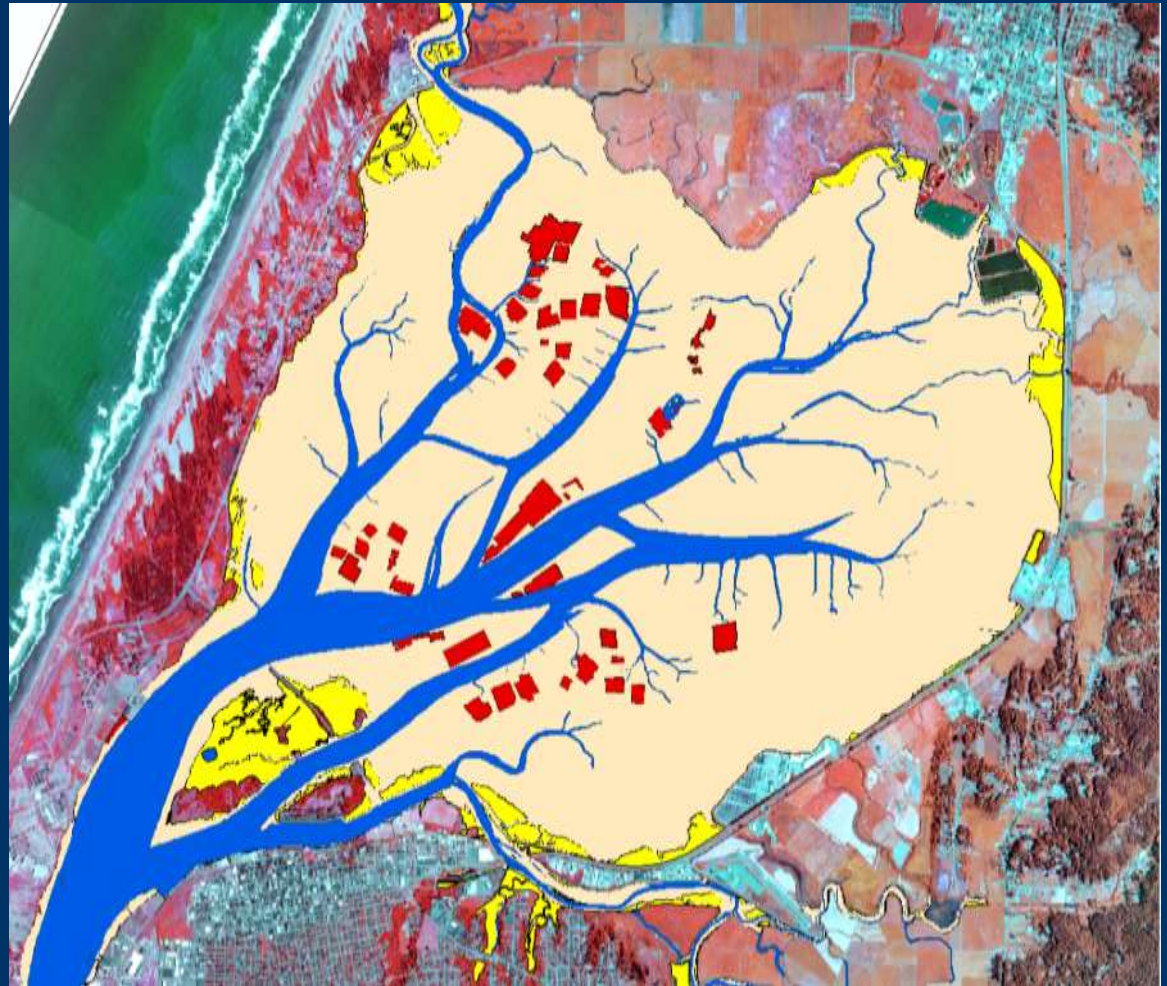
 Unclassified



Landscape Mapping Example

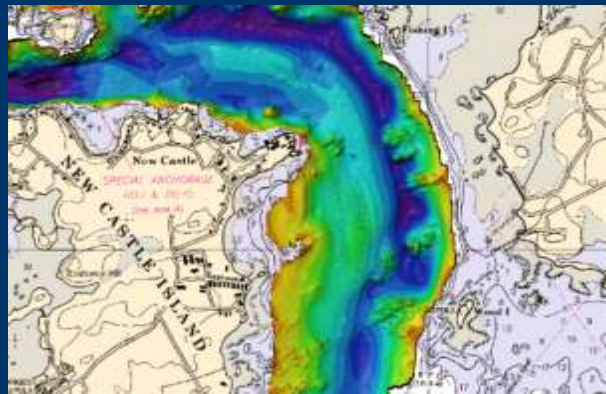
Geoform Component

-  Tidal Flat
-  Tidal Channel
-  Marsh Platform
-  Oyster Mariculture



Maintaining/Updating CMECS

- Assembling infrastructure to implement and maintain CMECS
- Comments continually being captured
- Peer review process for new units or changes
- ~ 5 year FGDC review cycle
- Sharing of provisional units



Supporting Users

- Crosswalk tools
- Sharing of application results
- Development of mapping guidance
- Development of unit codes
- Training



Resources

CMECS Web Site

www.csc.noaa.gov/cmecs

CMECS Unit Catalogue

www.cmeccatalog.org

Contact Information

nos.csc.cmecs_ig@noaa.gov





Questions?

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