Coastal and Marine Ecological Classification Standard (CMECS)

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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

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 $\geq 0.2$ 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

Components

Water Column Component (WC)
- Structure and features of water column

Biotic Component (BC)
- Assemblages of benthic and suspended/floating organisms

Substrate Component (SC)
- Character and composition of surface and near-surface substrates

Geoform Component (GC)
- Geomorphic and structural character of coast or seafloor

Modifiers

Biogeographic Setting

Aquatic Setting
Biogeographic Setting

Biotope: Combination of abiotic features and associated species

CMECS Structure

Components

- Water Column Component (WC): Structure and features of water column
- Biotic Component (BC): Assemblages of benthic and suspended/floating organisms
- Substrate Component (SC): Character and composition of surface and near-surface substrates
- Geoform Component (GC): Geomorphologic and structural character of coast or seafloor

Modifiers

Aquatic Setting
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

<table>
<thead>
<tr>
<th>Tectonic Setting</th>
<th>Physiographic Setting</th>
<th>Geoform Origin</th>
<th>Geoform</th>
<th>Level 1</th>
<th>Level 2</th>
<th>Geoform Type</th>
<th>Level 1</th>
<th>Level 2</th>
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<tbody>
<tr>
<td>Abyssal Plain</td>
<td>Abyssal/Submarine Fan</td>
<td>Geologic</td>
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<td>Barrier Reef</td>
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<td>Bank</td>
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<td>Bar</td>
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<td>Bay Mouth Bar</td>
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<td>x</td>
<td>Barrier Beach</td>
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<td>Tectonic Trench</td>
<td>Embayment/Bay</td>
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<td>Inland/Enclosed Sea</td>
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<td>Shelf Basin</td>
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<td>Beach Berm</td>
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<td>Pass/Lagoon Channel</td>
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<td>Barrier Cove</td>
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</table>

The table lists various geoform components and their associated subcomponents, categorized by tectonic and physiographic settings.
Water Column Component

Structures, layers, and character of water column

Five subcomponents:

• Water Column Layer
• Salinity Regime
• Temperature Regime
• Hydroforms
• Biogeochemical Features
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*
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
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.cmecscatalog.org

Contact Information
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Questions?

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