



Classifiers for Applying the Coastal and Marine Ecological Classification System (CMECS)

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Marine and Coastal Spatial Data Subcommittee

Federal Geographic Data Committee

<https://iocm.noaa.gov/cmecs/index.html>

<https://my.usgs.gov/confluence/display/CMECSIG/CMECS+Community+Forum+Home>

Background and Purpose	1
Classifiers for the Biogeographic Setting	2
Classifiers for the Aquatic Setting.....	2
Classifiers for the Water Column Component.....	3
Classifiers for the Geoform Component.....	6
Classifiers for the Substrate Component.....	6
Classifiers for the Biotic Component	7

Background and Purpose

Classifiers are aspects of the landscape or characteristics of biotic and abiotic features that allow one to describe their observations using any classification system. In CMECS, many classifiers are fairly intuitive (e.g., height of woody vegetation) and can be assessed without difficulty. In other cases specialized instrumentation may be needed. Because classifiers, and the precision necessary to measure them with confidence, have a strong influence on data collection technology, sampling processes, and analysis methods, users are encouraged to consider them early in the project design phase. In some cases ancillary data will be the source of information on a particular classifier: for example, a charted mean lower low water line as

the boundary between inter- and subtidal zones. In these cases the source of the ancillary data should be captured in the metadata.

The following sections present specific classifiers for units in each of the CMECS settings and components. The sections below are organized by component and level within each component. The classifiers under each heading refer to parameters necessary to distinguish a particular unit from others at the same level, NOT how to further refine a category based on units at the next lower level. This information is provided to assist project teams in planning and conducting data collection and mapping.

Classifiers for the Biogeographic Setting

Classifiers applicable to all units

- Geographic location of the observation

Classifiers for the Aquatic Setting

Classifiers applicable to all units

- Distance from shore

Additional classifiers for specific Systems, Subsystems, and Tidal Zones

System – Estuarine; Marine

- Salinity
- Degree of enclosure
- Position relative to linear boundary across the mouth of an estuary
- Position relative to head of tide and splash zone
- Connection to oceanic waters (y/n)

System – Lacustrine

- Great Lakes geography (y/n)
- Percent coverage by trees, shrubs, and persistent emergent vegetation
- Position relative to lacustrine shoreline at riverine–lacustrine boundary

Subsystem – Coastal/Open Water; Riverine

- Depth (measured relative to Mean Lower Low Water (MLLW) and Mean Higher High Water (MHHW))
- Salinity

Subsystem – Nearshore; Oceanic

- Depth
- Position relative to continental shelf break.

Subsystem – Littoral/Limnetic

- Depth relative to MLLW
- Presence of persistent and non-persistent emergent vegetation

Tidal Zone – Supratidal; Intertidal; Subtidal

- Position relative to MLLW and MHHW elevation contours
- Position relative to splash/spray boundary

Classifiers for the Water Column Component

Classifiers for specific subcomponents

Layer Subcomponent – All

- Aquatic Setting System and Subsystem
- Depth
- Position relative to the pycnocline

Salinity Subcomponent – All

- Salinity

Temperature Subcomponent – All

- Temperature

Hydroform Classes – All

- Water movement
- Physical (spatial) relationship to adjacent waters

Additional classifiers for specific Hydroform Classes

Hydroform Class – Wave

- Water movement pattern at the surface

Hydroform – All

- Density (Temperature, Salinity, Physical state)
- Water movement (circulation) pattern, including vertical movement

Additional classifiers for specific Hydroforms

Hydroform – Turbidity Flow; Storm Surge; Surface Wind Wave; Tsunami; Wave-driven Current; Wind-driven Current; Tidal Front; Tidal Flow; Ekman Flow; Buoyancy Flow; Anthropogenic Wave; Inertial Current; Langmuir Circulation; Fumarole and Hydrothermal Plumes

- Energy source, such as tidal or wind movement

Hydroform – Coastal Upwelling Front; Surf Zone; Shelf-break Front; Boundary Current; Current Meander; Deep Boundary Current; Coastally Trapped Wave; Internal Wave; Surface Wave; Background Mesoscale Field

- Relationship to adjacent waters or land/bottom features

Hydroform – Equatorial Wave; Non-equatorial wave; Seiche

- Geographic location

Hydroform Type – All

- Density (Temperature, Salinity)
- Circulation pattern, including vertical movement

Additional classifiers for specific Hydroform Types

Hydroform Type – Abyssal Deep Circulation; Bathyl Deep Circulation

- Depth zone

Hydroform Type – Partially Mixed Domain; Well-Mixed Domain

- Water column mixing

Hydroform Type – North Equatorial Surface Current; South Equatorial Surface Current; Western Boundary Current; Eastern Boundary Current

- Geographic location

Hydroform Type – Cold Core Ring; Warm Core Ring; Reverse Estuarine Flow; Longshore Current; Rip Current; Detached Hydrothermal Plume; River/Estuary Plume ; Fjord Circulation; Rip Current; Undertow; Internal Kelvin Wave; External Kelvin Wave; Shelf Wave; Topographic Wave

- Relationship to adjacent waters or land/bottom features

Hydroform Type – Drift Ice; Fast Ice; Frazil or Grease Ice; Ice Field; Ice Floe; Pack Ice; Pancake Ice; Polyna

- Character of ice

Hydroform Type – Diurnal Tidal Flow; Mixed Semi-Diurnal Tidal Flow; Semi-Tidal Flow

- Temporal regime/persistence

Hydroform Type – Ekman Upwelling; Ekman Downwelling

- Energy source

Biogeochemical Feature – Individual Features

- Amount of chlorophyll
- Amount of oxygen
- Amount of nutrient constituents
- pH
- Presence of organic material (in sizes ranging from detritus to large woody debris)
- Light availability
- Proximity to surface or benthos
- Amount of suspended material

Classifiers for the Geoform Component

Classifiers applicable to all units

- Spatial extent (either in area or distance)
- Morphology (shape) including height, width, depth, length, slope, relief and surface pattern
- Process by which the feature was formed
- Spatial relationship/orientation to specific adjacent, encompassing, or incorporated coastal or ocean features such as inlets, basins, islands, and continental landmasses that provide context to others

Additional classifiers for specific Tectonic Settings and Geoforms

Tectonic Setting Subcomponent – Convergent/Divergent Active Continental Margin

- Prevailing plate movement direction
- Level of seismic activity

Tectonic Setting Subcomponent – Fracture Zone

- Presence of faults oriented normal to spreading center

Geoform Subcomponent – Anthropogenic Origin

- Purpose and prevailing use of the feature
Association, both spatial and functional, with certain terrestrial features

Classifiers for the Substrate Component

Classifiers applicable to all units

- General origin of substrate material (geologic, biogenic, anthropogenic)
- Dominant particle size

Additional classifiers for specific Classes, Subclasses, and Groups

Substrate Class – All

- Level of substrate consolidation

- Composition of the substrate material (mineral, algal, coral, worm, shell, organic, metal, etc.)

Substrate Subclass/Group/Subgroup – Geologic and Anthropogenic Substrates

- Ratio of particle grain size fractions

Substrate Subclass/Group/Subgroup – Biogenic Substrates

- Taxonomic origin of substrate material (e.g., woody, Halimeda, Rhodolith, Serpulid) for Biogenic Substrate

Classifiers for the Biotic Component

Classifiers applicable to all Setting units

Biotic Setting – All

- Association with the substrate (y/n)

Classifiers applicable to all Class units

Biotic Class – All

- Dominance of fauna vs. autotroph vs. microbe

Additional classifiers for specific Classes

Biotic Class – Reef Biota

- Dominance of biogenic reef substrate vs. geologic substrate (for faunal classes)
- Dominance of live vs. dead reef-forming corals

Biotic Class – Faunal Bed

- Dominance of fauna vs. abiotic substrate

Biotic Class – Moss and Lichen Communities; Aquatic Vegetation Bed; Emergent Wetland

- Supratidal vs. emergent vs. submerged (presence of biomass above MHHW)

Biotic Class – Scrub-Shrub Wetland; Forested Wetland

- Height of woody vegetation

Classifiers for specific Subclasses

Biotic Subclass – Crustacean, Molluscan, and Worm Holoplankton; Crustacean, Coral, Echinoderm, Fish, Molluscan, and Worm Meroplankton; Coccolithophore, Diatom, and Dinoflagellate Phytoplankton

- Biological taxon
- Life stage (mature vs. immature)

Biotic Subclass – Films and Strands; Microbial Foam, Microbial Aggregation; Structure-Forming Microbes; Mat/Film Forming Microbes

- Predominant growth/aggregation

Biotic Subclass – Deepwater/Coldwater and Shallow/Mesophotic Coral Reef Biota

- Depth

Biotic Subclass – Mollusk, Worm, and Glass Sponge Reef Biota

- Biological taxon

Biotic Subclasses – Attached Fauna; Soft Sediment Fauna

- Substrate preference of fauna (hard or soft substrate)

Biotic Subclass – Inferred Fauna

- Presence of tracks/trails, mounds, or other features related to faunal movement or bioturbation.

Biotic Subclass – Benthic Macroalgae; Aquatic Vascular Vegetation

- Physiognomy of dominant autotrophs (e.g., vascular vs. non-vascular)

Biotic Subclass – Emergent Tidal Marsh

- Dominance of halophytic herbaceous vegetation
- Tidal zone (intertidal)
- Presence of tidal influence
- Prevailing salinity

Biotic Subclass – Tidal Scrub-Shrub Wetland; Forest/Woodland

- Percent tree cover (< or \geq 10%)
- Presence of tidal influence

Biotic Subclass – Freshwater Tidal and Marine Lichens; Freshwater Tidal Moss

- Physiognomy of dominant autotrophs (e.g., vascular vs. non-vascular)
- Presence of tidal influence

- Prevailing salinity

Biotic Subclass – Tidal Scrub-Shrub Wetland; Forest/Woodland

- Percent tree cover (< or \geq 10%)
- Presence of tidal influence

Biotic Subclass – Vegetated Tidal Flats

- Presence of tidal influence
- Spatial association with specific Geoforms (Flat, Panne)
- Dominance of herbaceous vegetation in low percent cover values.

Classifiers for specific Groups

Biotic Group – Amphipod, Copepod, Krill, Decapod, Fish Larval, Ctenophore, Jellyfish, Salp, Siphonophore, Pteropod, Veliger, Foraminiferan, Radiolarian, Chaetognath, Polychaete, Larval Worm, Chlorophyte, Chrysophyte, Coccolithophore, Cryptophyte, Cyanophyte, Diatom, and Dinoflagellate Aggregations

- Dominance of specific biota due to local spawning or movement into an area

Biotic Group – Chlorophyte, Chrysophyte, Coccolithophore, Cryptophyte, Cyanophyte, Diatom, and Dinoflagellate Blooms

- Presence of very large numbers/concentrations of specific phytoplankton in an area resulting from greatly increased reproduction

Biotic Group – Chlorophyte, Chrysophyte, Coccolithophore, Cryptophyte, Cyanophyte, Diatom, and Dinoflagellate Maximum Layers

- Presence of large numbers/concentrations of specific phytoplankton in a relatively thin layer within the water column

Biotic Group – Decapod Larval, Coral Spawning/Larval, Coral Larval, Mixed Echinoderm Larval, Fish Spawning/Larval, Fish Larval, Larval Worm/Spawning, and Larval Worm Aggregations

- Presence of large numbers/concentrations of individual animals due to local spawning or movement into an area
- Life stage of individuals (larvae vs. adults)

Biotic Group – Algal Rafts; Algal Particles

- Size, concentration, and cohesion of individual algal plants and plant parts

Biotic Group – Floating/Suspended Freshwater and Brackish Vegetation; Freshwater and Brackish Tidal Aquatic Vegetation; Brackish Marsh; Freshwater Tidal Marsh; Brackish, Freshwater, Saltwater Tidal Scrub-Shrub; Brackish, Freshwater, Saltwater Tidal Forest/Woodland

- Prevailing salinity
- Physiology of flora

Biotic Group – Deepwater/Coldwater Stony Coral Reef; Deepwater/Coldwater Stylasterid Coral Reef

- Dominance of deepwater azooxanthellate or stylasterid corals

Biotic Group – Colonized Deepwater/Coldwater Reef; Colonized Shallow/Mesophotic Reef

- Dominance of non-reef-building corals

Biotic Group – Branching, Columnar, Encrusting, Foliose, Massive, Plate, Table, Turbinate Coral Reef; Calcareous, Canopy-forming, Coralline/Crustose, Filamentous, Leathery/Leafy, Mesh/Bubble, Sheet, and Turf Algal Bed

- Dominant growth morphology

Biotic Group – Glass Sponge, Gastropod, Mussel, Oyster, Sabellariid, and Serpulid Reefs; Attached Anemones; Barnacles; Attached Basket Stars; Attached Brachiopods; Brittle Stars on Hard or Mixed Substrates; Attached Bryozoans; Chitons; Attached Corals; Attached Crinoids; Sessile Gastropods; Attached Holothurians; Attached Hydroids; Attached Mussels; Attached Oysters; Attached Sponges; Attached Starfish; Attached Tunicates; Attached Sea Urchins; Soft Sediment Basket Stars; Soft Sediment Bryozoans; Cephalochordates; Soft Sediment Crinoids; Clam, Echiurid, Holothurian, Hydroid, Mussel, Oyster, Pennatulid, Sand Dollar, Scallop, Sponge, Starfish, Tunicate, and Sea Urchin Beds; Xenophyophores; Stromatolites; Microphytobenthos; Bacterial Mat/Film; Bacterial Decay; Seagrass Bed; Tidal Mangrove Forest

- Biological taxa (corals, gastropods, seagrasses, mangroves, etc.)

Biotic Group – Mineral and Wood Boring Fauna; Attached Tube-Building Fauna; Tunneling Megafauna; Burrowing Anemones; Large Deep-Burrowing Fauna; Small Surface-Burrowing Fauna; Larger Tube-Building Fauna, Small Tube-Building Fauna

- Dominant faunal behavior/environment (mineral boring, wood boring, tube building, burrowing)

Biotic Group – Mixed Crustacean Larvae; Mixed Echinoderm Larval Aggregation; Mixed Zooplankton Aggregation; Mixed Shallow/Mesophotic Coral Reef; Diverse Colonizers; Diverse Soft Sediment Epifauna; Oligozoic Biota

- Biotic diversity/complexity (none in the case of Oligozoic biota)

Biotic Group – Vent Microbes; Vegetated Freshwater Tidal Mudflat; Vegetated Salt Flat and Panne; Vent/Seep Communities

- Spatial association with specific Geoforms (Vent)

Biotic Group – Freshwater Submerged and Regularly Flooded Tidal Lichen Zone; Freshwater Irregularly Flooded Tidal Lichen Zone; Marine Intertidal Lichen Zone; Marine Supratidal Lichen Zone; Submerged Freshwater Tidal Moss; Emergent Freshwater Tidal Moss; High Salt Marsh; Low and Intermediate Salt Marsh;

- Location in tidal zone

Biotic Group – Egg Masses; Fecal Mounds; Pelletized, Fluid Surface Layer; Tracks and Trails

- Type of bioturbation or faunal evidence

Biotic Group – Mobile Crustaceans, and Mollusks on Hard or Mixed Substrate

- Ability to leave an observation area within a time span of one day

Classifiers applicable to all Community units

Biotic Community – All

- Taxonomy of dominant organism or association of organisms