Coastal and Marine Ecological Classification Standard (CMECS)

Benthic Biotic and Surface Geology Components

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CMECS -- The Common Language for Marine Ecosystems

Outline

- Systems, Subsystems & Tidal Zones
- Questions
- Benthic Biotic Component
- Questions
- Surface Geology Component (in brief)
- Relationship Between the BBC & SGC
- Questions & Discussion

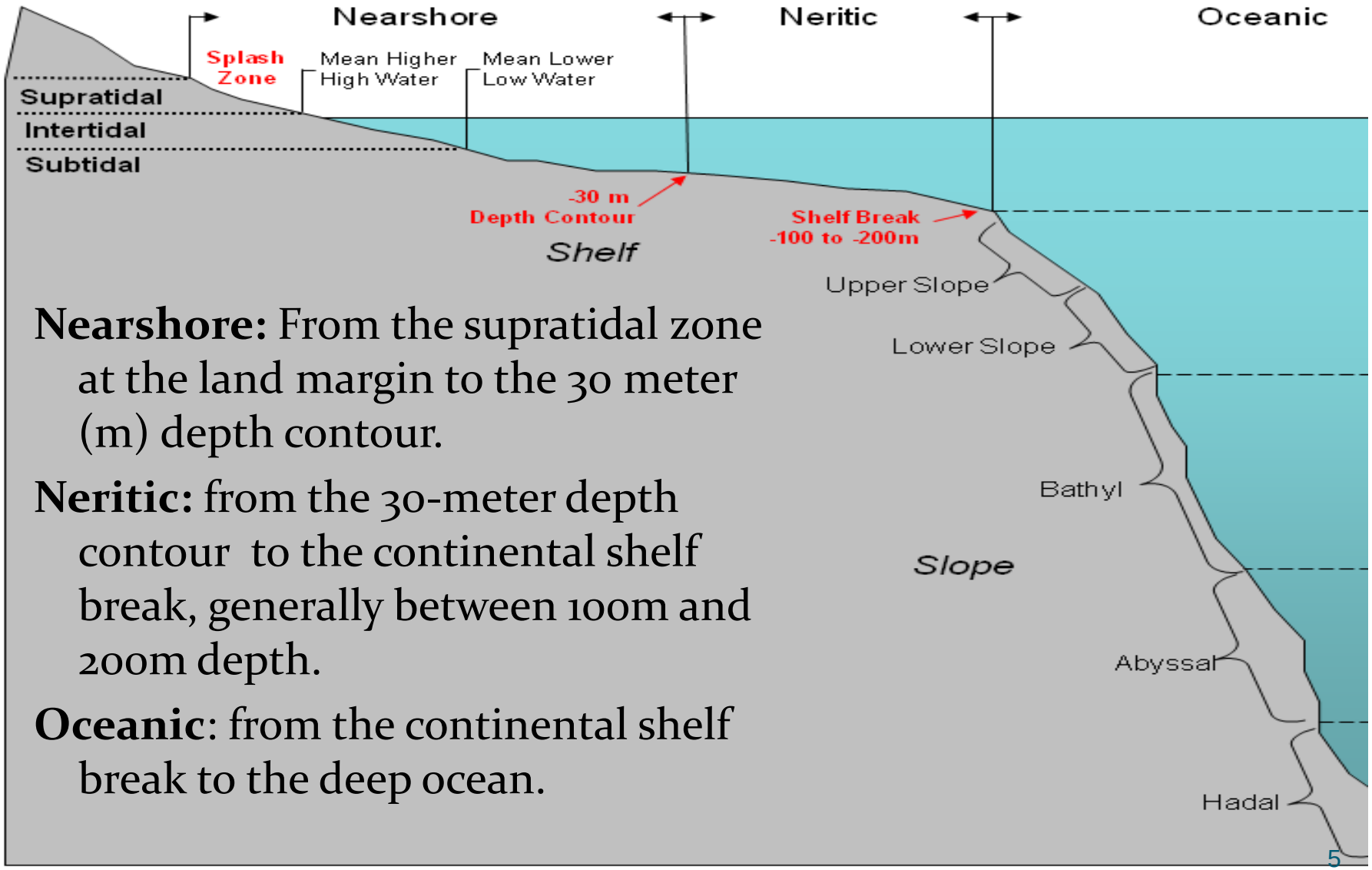
System and Subsystem

System	Subsystem	Tidal Zone
Marine	**Nearshore** **Neritic** **Oceanic**	***Intertidal*** ***Subtidal*** ***Supratidal***
Estuarine	**Shallow Water** **Deep Water** **Tidal Riverine**	
Lacustrine	**Limnetic** **Littoral**	

Marine System

- All waters from the coastline to the open ocean
- Landward limit: Extreme high water of spring tides, including the supratidal splash zone
- Estuarine limit: From the mouth of estuaries seaward
- Salinities: typically exceed 30 PSU, often with little or no dilution except outside the mouths of estuaries
- Includes:
  - Shallow coastal indentations or bays without appreciable freshwater inflow
  - Coasts protected by rocky islands
  - Freshwater plumes , seeps, lenses (identified w' modifiers)

Marine Subsystems



Nearshore: From the supratidal zone at the land margin to the 30 meter (m) depth contour.

Neritic: from the 30-meter depth contour to the continental shelf break, generally between 100m and 200m depth.

Oceanic: from the continental shelf break to the deep ocean.

Estuarine System

- Tidally influenced
- Surface hydrological connection to the sea
- Diluted by freshwater runoff from the land
- Some degree of enclosure by land

- Upstream Limit: Head of tide (point where mean range <0.2 ft)
- Seaward Limit: Imaginary line closing the mouth of the estuary at the most seaward geomorphological extent.
- Landward limit: Supratidal zone
- Salinity: 0 to >30 PSU

Estuarine Subsystems

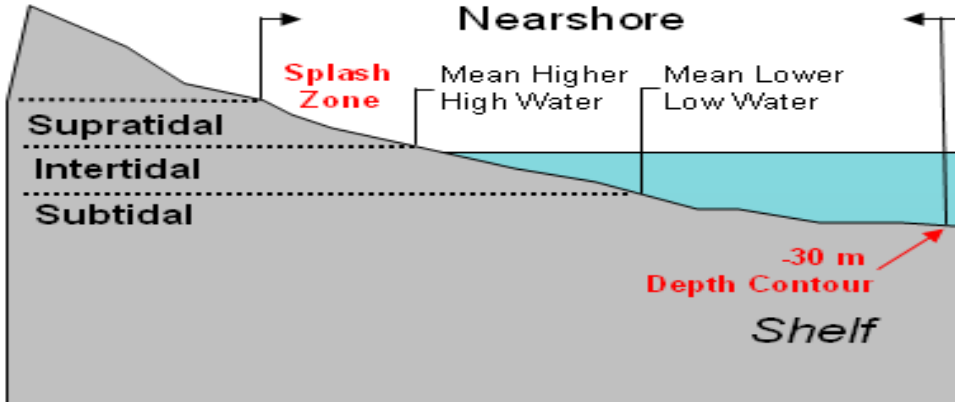
- **Estuarine Shallow Water**
  - from the supratidal zone to the 4 m depth contour
  - excluding fresh waters (<0.5 PSU) designated Tidal Riverine.
- **Estuarine Deep Water**
  - deeper than 4 m
  - excluding fresh waters (<0.5 PSU) designated Tidal Riverine.

Estuarine Subsystems cont.

- **Estuarine Tidal Riverine Shallow Water**
  - from the supratidal zone to the 4 m depth contour
  - influenced by astronomical tides
  - salinity < 0.5 PSU during the period of average annual low flow
  - extending upriver to the head of tide

- **Estuarine Tidal Riverine Deep Water**
  - deeper than 4 m depth contour
  - influenced by astronomical tides
  - salinity <0.5 PSU during the period of average annual low flow
  - extending upriver to the head of tide

Tidal Zones



Subtidal

- substrate continuously submerged
- below Mean Lower Low Water (MLLW)

Intertidal

- substrate regularly and periodically exposed and flooded by tides
- from MLLW to the extent of tidal inundation, (i.e., the extreme high water of spring tides)
- exposed regularly to the air by tidal movement

Supratidal

- areas above the extreme high water of spring tides that are affected by wave splash and overwash
- does not include areas affected only by wind-driven spray

Examples

- Marine Nearshore Supratidal
- Estuarine Shallow Water Intertidal

Questions?

Biotic Biotic Component (BBC)

- Describes the living 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



CMECS
The Common Language for Marine Ecosystems

Coastal and Marine Ecological Classification Standard

Catalog of units

Home | Search/Browse

Benthic Biotic (BBC) Component

Classes and Subclasses

Drill down to browse hierarchy. Click link for description.

- Benthic Biotic
  - Aquatic Bed
    - Lichens
    - Macroalgae
    - Microbial Mat
    - Rooted Vascular
  - Coral Reef Biota
    - Calcareous Algal Communities
    - Coral Garden on Reef Biota
    - Living Stony Coral Communities
    - Mixed Hard and Soft Corals
  - Emergent Wetland
  - Faunal Bed
    - Epifauna
    - Infauna
  - Faunal Reef (non-coral)
  - Forested Wetland
  - Scrub-Shrub Wetland

Search for

Search

Refine Name Search by Level:

- **Class**
- **Subclass**
- **Biotic Group**
- **Biotope**

What's the difference?

- Aquatic Bed
  - Vascular plants, attached macroalgae, microorganisms (and associated biota), or lichens with >10% cover.
- Faunal Bed
  - sessile or slow moving epifauna, and/or infauna
  - less than 10% cover of another structural biotic class (either Faunal Reef, Coral Reef, or Aquatic Bed).
  - Do not construct identifiable biogenic substrate.
- Faunal Reef Biota
  - living mollusks, polychaetes, or any non-coral reef-building fauna
  - construct identifiable biogenic substrate (ridge, mound or reef structures)
- Coral Reef Biota
  - biota closely associated with the structures and settings created by activities of hermatypic (reef-building) corals and/or calcareous algae
  - construct a reef (or live on one)

Aquatic Bed

- **Rooted Vascular**
  - dominated by submerged rooted vascular species such as seagrasses
- **Macroalgae**
  - dominated by macroalgae such as kelp fucoids, drift algae, or other seaweed
- **Microbial Mat**
  - Colonies of microscopic organisms that form a visible film, layer, or mat on the surface of the substrate
- **Lichens**
  - dominated by lichens that form patches or a visible pattern on the surface of the substrate

Faunal Bed

- **Infauna** Faunal Bed with epifauna cover <10%.

- **Epifauna** Faunal bed with ≥ 10% surface cover of epifauna

Faunal Reef Biota

- **Mollusk Reef Biota**
  Consolidated aggregations of living and non-living mollusks, usually bivalves or gastropods (e.g., vermetids) attached to their conspecifics.

- **Worm Reef Biota**
  Relatively stable ridge-like or mound-like aggregations of living and non-living material formed by colonization and growth of worm species (e.g., Sabellarid Reef).

Coral Reef Biota

- **Living Stony Corals**
  - Live stony corals constitute 10% or more of the living cover.
- **Coral Garden on Reef Biota**
  - predominant cover of non-reef-forming soft corals occurring on reef structures
  - Seagrass cover is less than 10%
  - Stony coral cover less than 10%
- **Mixed Hard and Soft Corals**
  - approximately equally represented by hard corals and soft corals
- **Calcareous Algal Communities**
  - dominated by calcareous algae
  - Living stony corals constitute less than 10% cover

Emergent Wetland

- **Coastal Salt Marsh**
  - dominated by emergent halophytic herbaceous vegetation along low wave energy intertidal areas and river mouths

Scrub-Shrub Wetland

- Coastal Salt Scrub
  - dominated by emergent halophytic shrubs along low wave energy intertidal areas and river mouths.
- Mangrove Shrubland
  - tidally-influenced, dense tropical or subtropical shrubland with a shore zone dominated by dwarf shrub and short true mangroves and associates

Forested Wetland

- Mangrove Forest
  - Tidally influenced, dense tropical or subtropical forest with a shore zone dominated by true mangroves and associates with a height of (generally) 6 m or taller

Biotic Groups: *the groups we know, love, and can see*

Predictable and repeating taxonomic, morphological, behavioral, functional or otherwise descriptive groupings of characteristic biota that occur as generalized patterns across a wide range

- Macroalgae Subclass: (formal and informal taxonomy)
  - Kelp Beds, Rhodolith Beds, Attached crustose algae
- Rooted Vascular Subclass: (NVC Groups)
  - Temperate Pacific Seagrass , Atlantic Temperate Eelgrass
- Living Stony Corals Subclass (morphology)
  - Massive Corals, Platy Corals, Fragile Branching Corals
- Infauna Subclass (behavior, formal and informal taxonomy)
  - Burrowing urchins, Clam bed, Small surface-burrowing fauna
- Coastal Salt Marsh Subclass (NVC Groups)
  - Temperate Pacific Tidal Salt and Brackish Marsh, N.A. Atlantic Tidal Flat and Panne

Faunal Reef Biotic Groups

- **Mollusk Reef Biota**
  - Group: Mussel Reef
  - Group: Gastropod Reef
  - Group: Oyster Reef
- **Worm Reef Biota**
  - Group: Sabellarid Reef

Biotopes

- A biotope is a repeatable assemblage consisting of a physical habitat together with its biological associations.
  - recurrent
  - relatively uniform in structure and environment
  - identified by diagnostic organisms (plants, algae, attached sessile fauna, unattached non-motile fauna, infauna, and bacterial colonies), identified at the genus or species level.
  - ideally quantitatively derived
  - named by a few diagnostic taxa (dominant or constant)
  - may be local or widespread
  - most as of yet undefined
  - vegetated biotopes follow the NVC Alliance level

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The Common Language for Marine Ecosystems

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Catalog of units

Benthic Biotic (BBC) Component

Drill down to browse hierarchy. Click link for description.

- Benthic Biotic
  - Aquatic Bed
  - Coral Reef Biota
  - Emergent Wetland
  - Faunal Bed
    - Epifauna
      - Attached Anemones
      - Barnacles
        - Balanus Communities
        - Chthamalus Communities
      - Bryozoans
      - Burrowing Anemones
        - Cerianthus Communities
        - Edwardsia Communities
      - Coral Garden Faunal Bed
      - Crinoids
        - Comanthus Communities
        - Diplocrinus Communities
      - Epifaunal Ophiuroids

Search for [ ]
Search

Refine Name Search by Level:
- [ ] **Class**
- [ ] **Subclass**
- [ ] **Biotic Group**
- [ ] **Biotope**

BBC Revisions Issues

- Revisit some of the thresholds between units and make sure all types are mutually exclusive

- Improve guidance on applying CMECS to areas with multiple dominant life forms – seagrasses over sea cucumbers.

Questions?

Surface Geology Component (SGC)

Describes the geological composition and environment of

- the upper layer of the hard substrate
- the upper 15 cm of soft substrate
- structural (non-living) aspects of biogenic substrates such as coral reefs.

SGC Classes

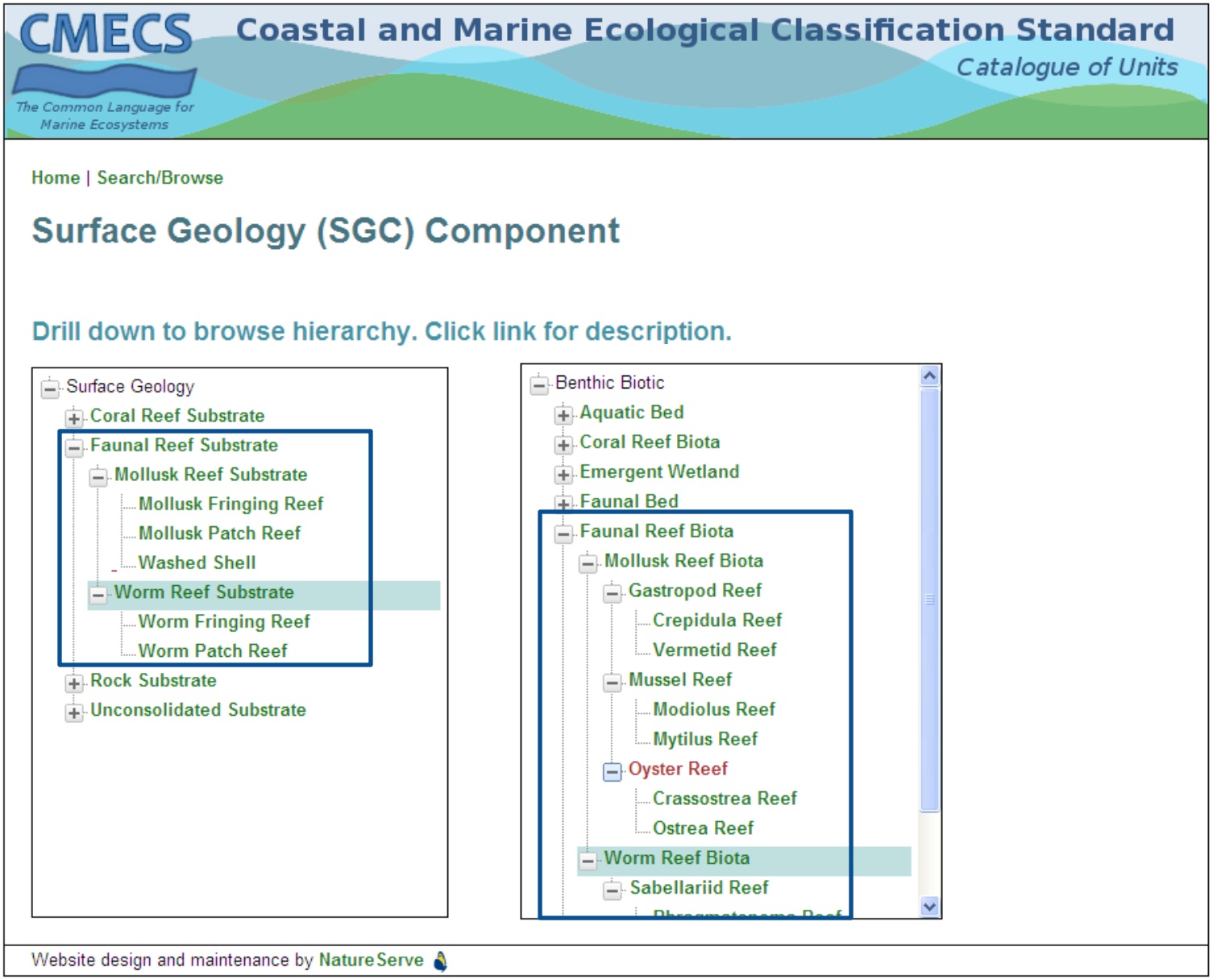
- ***Rock Substrate***
  - >50% or greater cover of bedrock or pavement.
- ***Unconsolidated Substrate***
  - <50% cover of bedrock or pavement. Particles occurring at any range of size and composition.
- ***Faunal Reef Substrate***
  - biogenic reef substrate formed by mollusks, polychaetes, or any fauna other than corals.
- ***Coral Reef Substrate***
  - biogenic reef substrate formed by Corals




Class Faunal Reef Substrate

- ***Subclass: Mollusk Reef Substrate***
  Consolidated structures built by mollusks, usually bivalves (e.g., oysters, mussels) or gastropods (e.g., vermetids)
  - Group: Fringing Reef
  - Group: Patch Reef
  - Group: Washed Shell

- ***Subclass: Worm Reef Substrate***
  Relatively stable ridge-like or mound-like aggregations formed by the colonization and growth of worm species (e.g., sabellariids).
  - Group: Fringing Reef
  - Group: Patch Reef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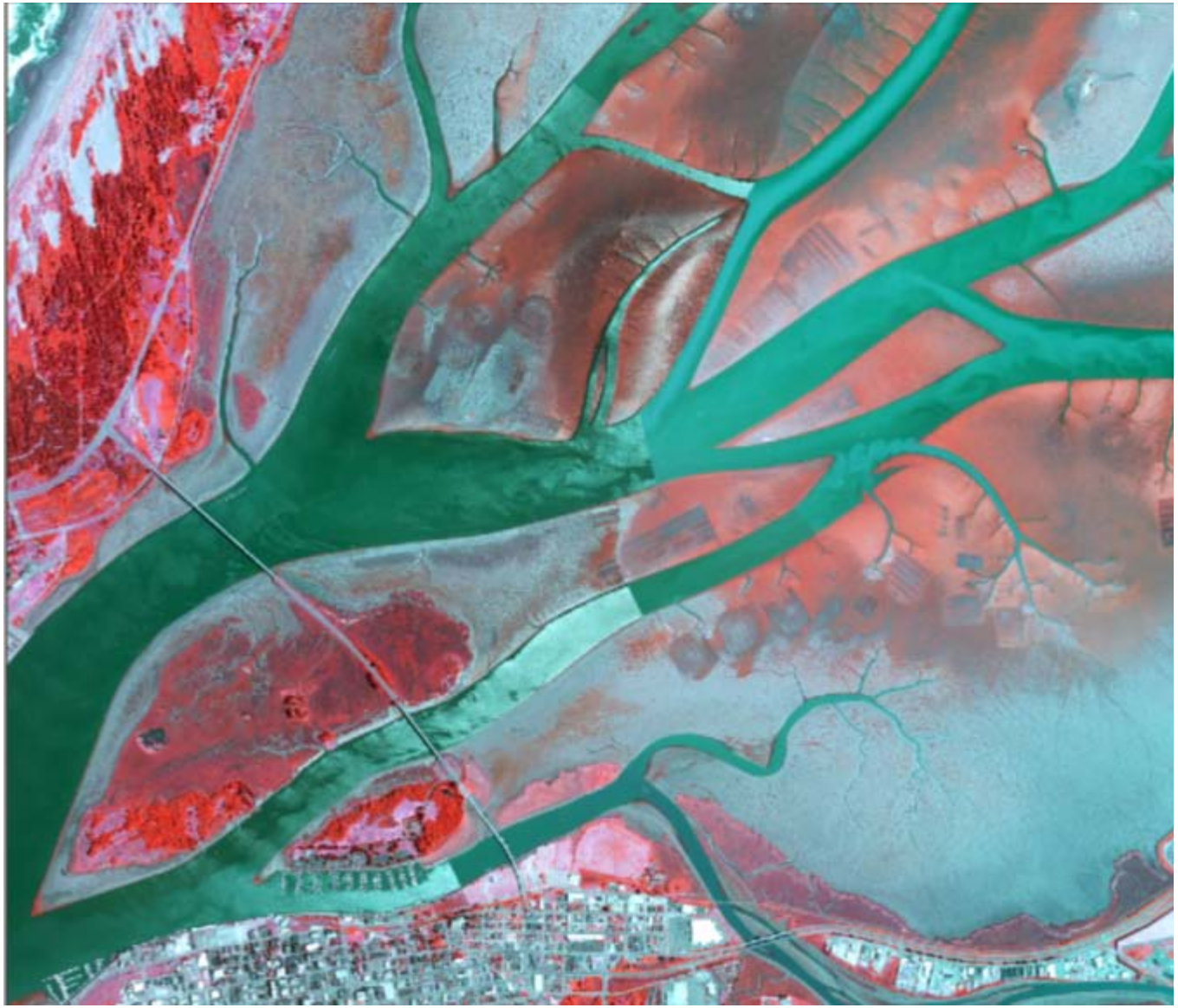
Home | Search/Browse
Surface Geology (SGC) Component
Drill down to browse hierarchy. Click link for description.
Surface Geology
Coral Reef Substrate
Faunal Reef Substrate
Mollusk Reef Substrate
Mollusk Fringing Reef
Mollusk Patch Reef
Washed Shell
Worm Reef Substrate
Worm Fringing Reef
Worm Patch Reef
Rock Substrate
Unconsolidated Substrate
Benthic Biotic
Aquatic Bed
Coral Reef Biota
Emergent Wetland
Faunal Bed
Faunal Reef Biota
Mollusk Reef Biota
Gastropod Reef
Crepidula Reef
Vermetid Reef
Mussel Reef
Modiolus Reef
Mytilus Reef
Oyster Reef
Crassostrea Reef
Ostrea Reef
Worm Reef Biota
Sabellariid Reef
Website design and maintenance by NatureServe

Relationship to Between the BBC & SGC

- NWI classification combined the BBC and SGC concepts into a single classification – allowing for “top down” cover mapping.
- Separating the BBC from the SGC allows users to understand the substrate underneath the biota
- Structures or substrate composed of non-living biogenic material go in SGC (reef organisms in BBC, underlying reef structures in SGC)
- BBC layer combined with SGC layer can be used to derive benthic cover maps

Source Data

Airborne Multi-Spectral Imagery



- ½ meter resolution
- Acquired at ~ -.7 foot tide stage

Scale ≈1:24,000

Benthic Biology Data Set – Humboldt Bay

BBC types at the Class and Subclass level

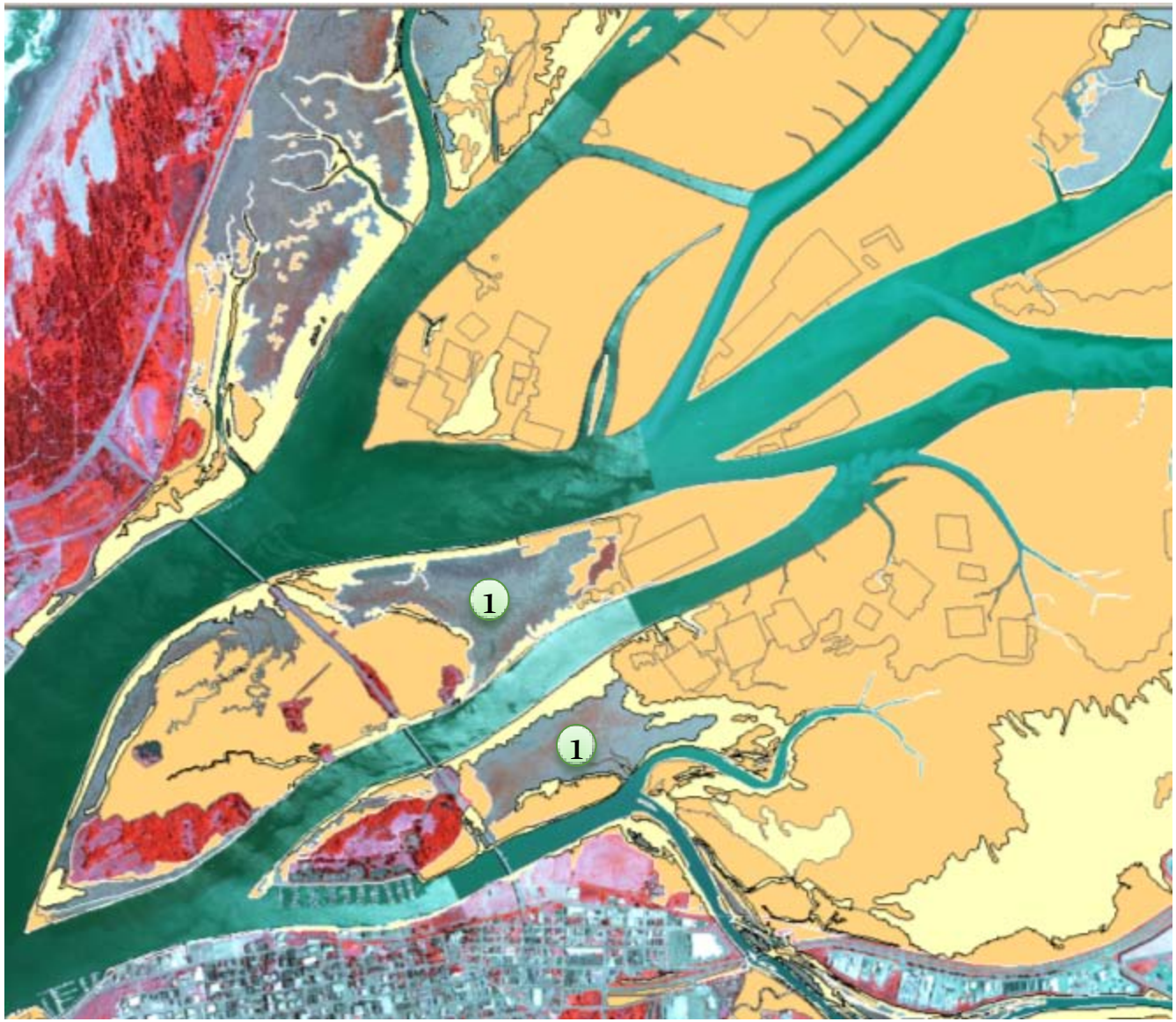
Mapped at 100m^2 minimum polygon size

- Coastal Marsh
- Rooted Vascular (patchy)
- Rooted Vascular (continuous)
- Macroalgae
- Mollusk Reef
- Biota (anthro)
- No Cover
- Unclassified

Scale ≈1:24,000

Surface Geology Data Set – Humboldt Bay

SGC types at the Class level



Mapped at 100m^2 minimum polygon size

SGC

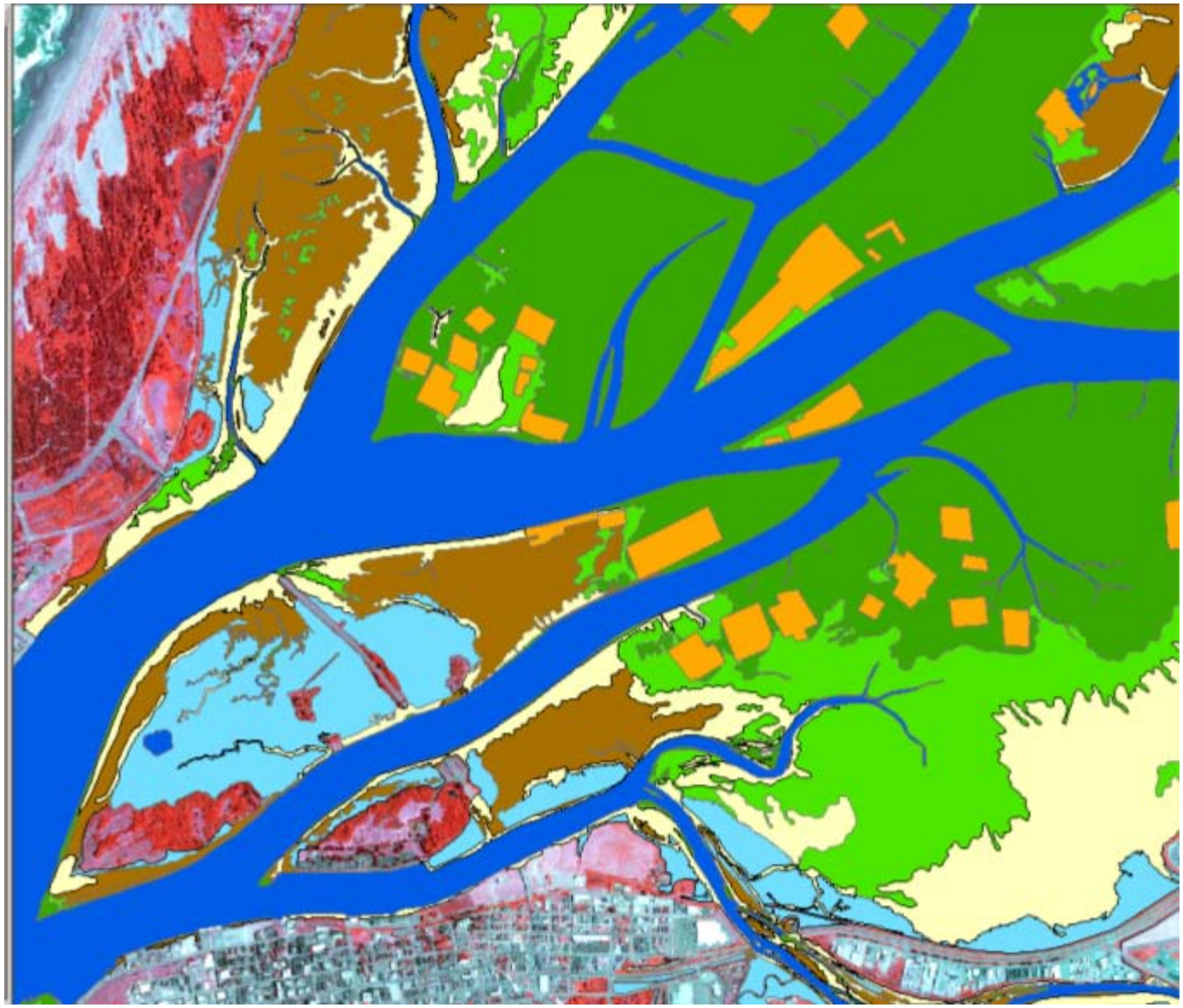
- Unconsolidated Substrate - Implied
- Unconsolidated Substrate
- Unclassified
- Mullusk Reef Substrate (anthro)

1 Mapped as Macroalgae in Integrated Data but no assumption possible about substrate

Scale ≈1:24,000

Integrated Data Set

Incorporating SGC and BBC types at the Class and Subclass level and WCC at System Level



Mapped at 100m^2 minimum polygon size

WCC

- Non-Stratified

BBC

- Coastal Marsh
- Rooted Vascular (patchy)
- Rooted Vascular (continuous)
- Macroalgae
- Mollusk Reef Biota (anthro)

SGC

- Unconsolidated Substrate

Scale ≈1:24,000

Questions?

Homework:
Review SGC and Geoforms on CMECS Catalogue
www.cmecscatalogue.org