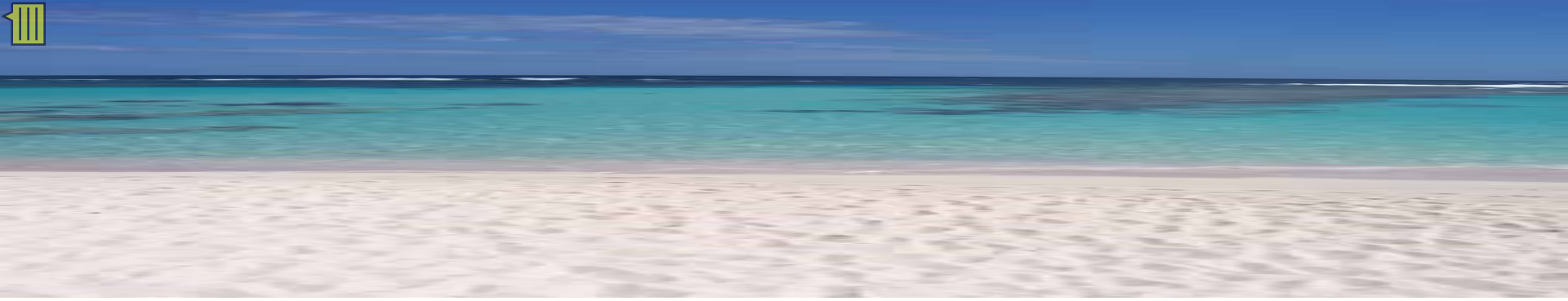


Coastal and Marine Ecological Classification Standard (CMECS)

WCC and Mapping

Kathy Goodin, NatureServe

March 22, 2011

CMECS -- The Common Language for Marine Ecosystems

Outline

- WCC
- Questions
- Mapping Issues
- ShoreZone Example
- Discussion

Water Column Component (WCC)

- Describes the structures, patterns and processes of the water column

- Three Subcomponents
  - Depth zones
  - Hydroforms and subforms
  - Biotic Groups & Biotopes

- Modifers
  - salinity, temperature, etc.

CMECS

The Common Language for Marine Ecosystems

Coastal and Marine Ecological Classification Standard

Catalogue of Units

Water Column (WCC) Component

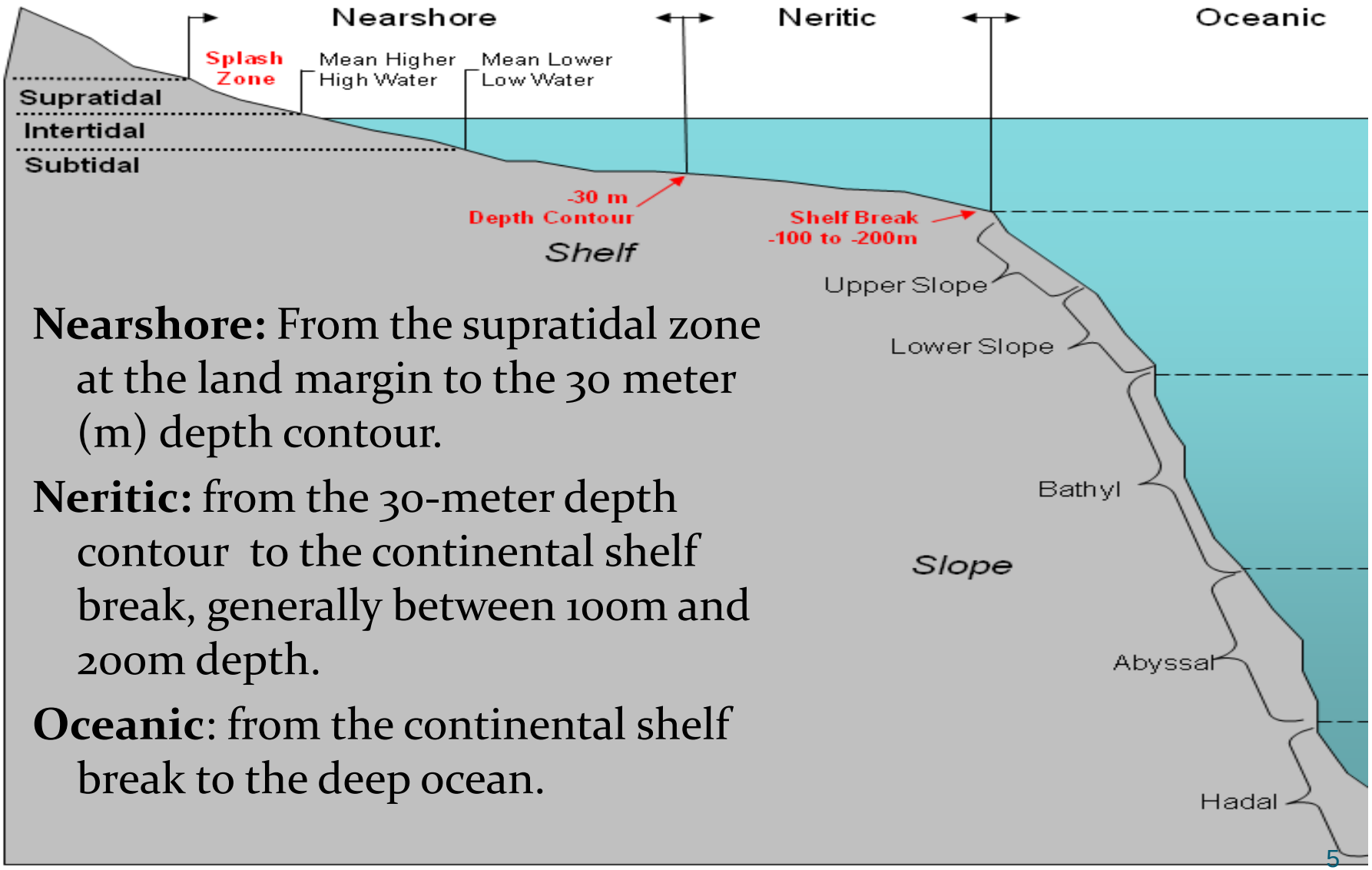
Drill down to browse hierarchy. Click link for description.

- WCC Depth Zone
  - Marine Nearshore (Subsystem)
    - Marine Nearshore Shallow Zone
    - Marine Nearshore Deep Zone
  - Marine Neritic (Subsystem)
    - Marine Neritic Shallow Zone
    - Marine Neritic Deep Zone
  - Marine Oceanic (Subsystem)
    - Marine Oceanic Epipelagic Zone
    - Marine Oceanic Mesopelagic Zone
    - Marine Oceanic Bathylpelagic Zone
    - Marine Oceanic Abyssopelagic Zone
    - Marine Oceanic Hadalpelagic Zone
  - Estuarine Shallow Water (Subsystem)
  - Estuarine Deep Water (Subsystem)

- WCC Hydroform
  - Current
  - Downwelling
  - Eddy
    - Cold Core Ring
    - Mesoscale eddy
    - Warm Core Ring
  - Frontal Boundary
  - Gyre
  - Horizontal Layer
  - Ice
  - Intrusion
    - Freshwater Plume
    - Fumerole
    - Hydrothermal Plume
    - Seep
    - Turbidity Plume
  - Surf Zone
  - Upwelling

- WCC Biotic Group
  - Demersal Fish (Schools)
  - Floating Microbial Mat
  - Floating Vascular Vegetation
  - Floating/Drift Macroalgae
  - Jellyfish Aggregations (Smacks)
  - Kelp Forest (Water Surrounding Stipe and Blades)
  - Pelagic Fish (Schools)
  - Phytoplankton Bloom
  - Seagrass Meadow (Water Surrounding Grass Blades)
  - Surf Foam/Surface Foam
  - Vent Community
  - Whale Aggregations (Pods)
  - Zooplankton Aggregation

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.

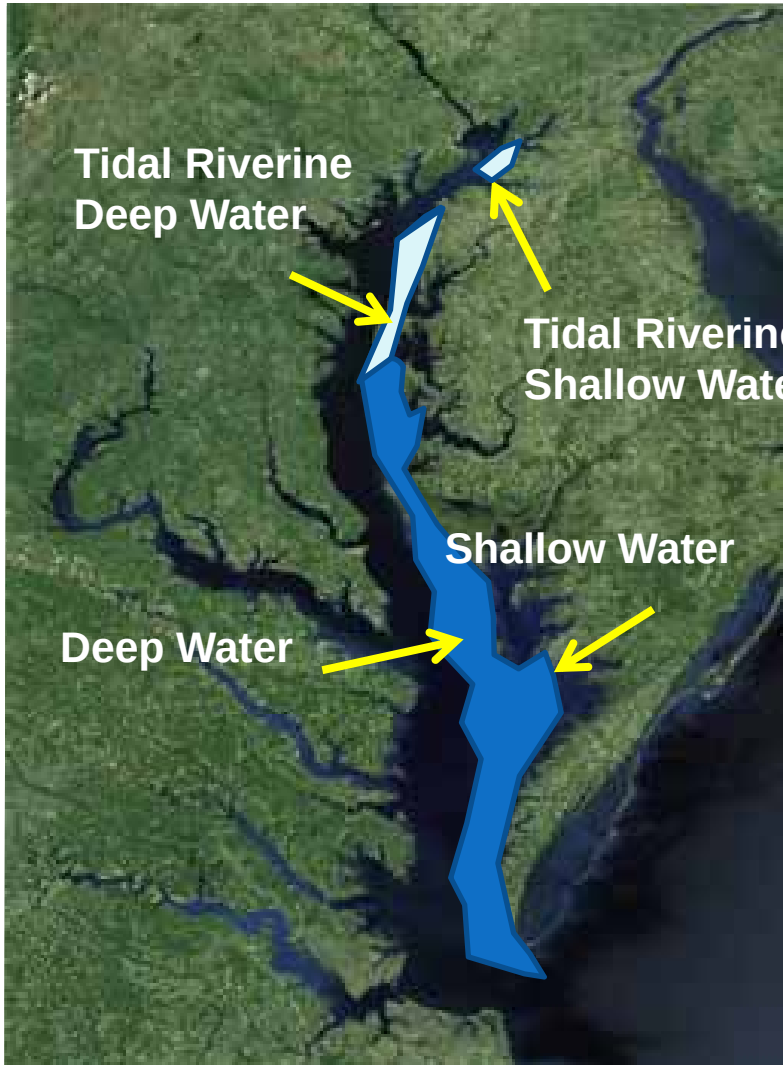
Oceanic: from the continental shelf break to the deep ocean.

Estuarine 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.

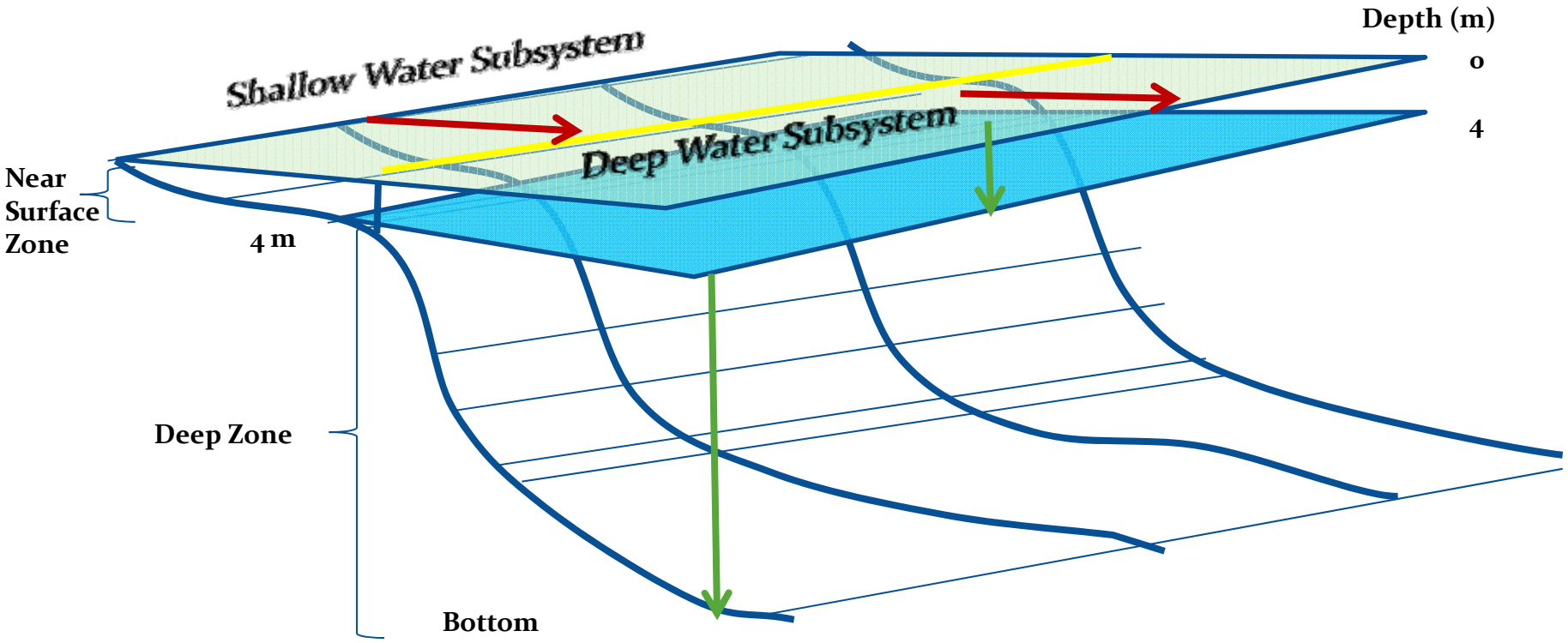
- **Estuarine Tidal Riverine Shallow Water**
  - from the supratidal zone to the 4 m depth contour
  - influenced by astronomical tides
  - salinity < 0.5 PSU during the period of average annual low flow
  - extending upriver to the head of tide

- **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



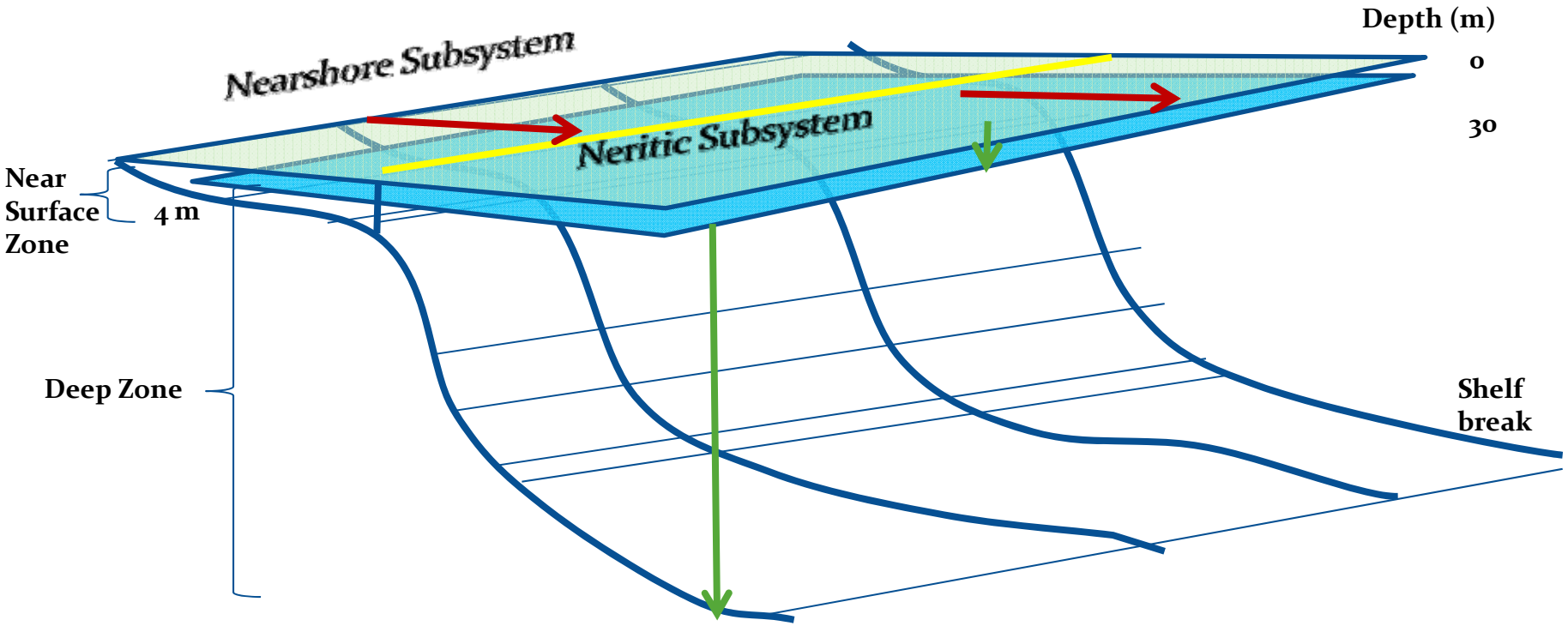
Water Column Component Structure

Estuarine Subsystems And Strata



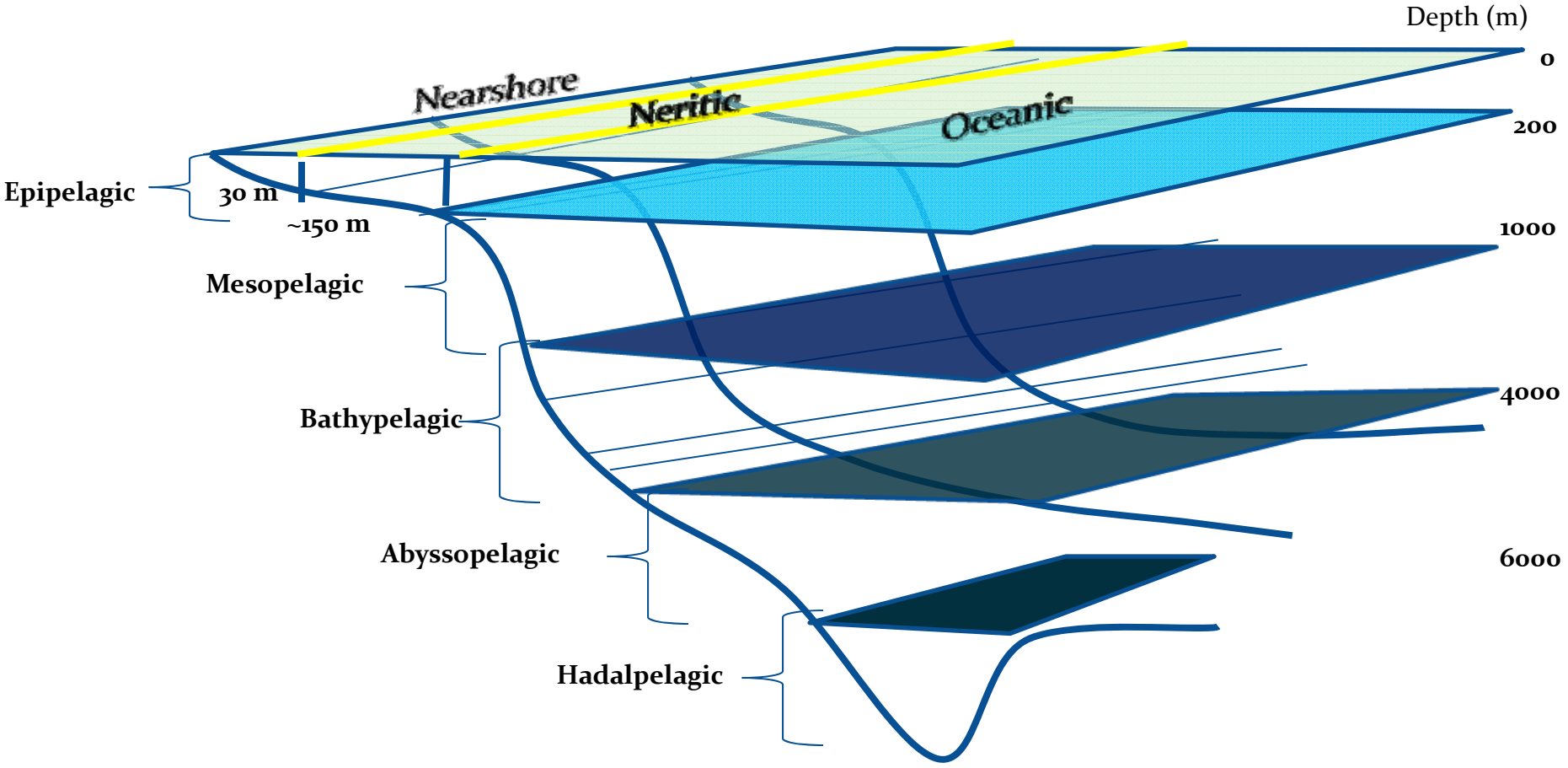
Water Column Component Structure

Nearshore & Neritic Subsystems & Strata



Water Column Component Structure

Oceanic Strata



Water Column Strata

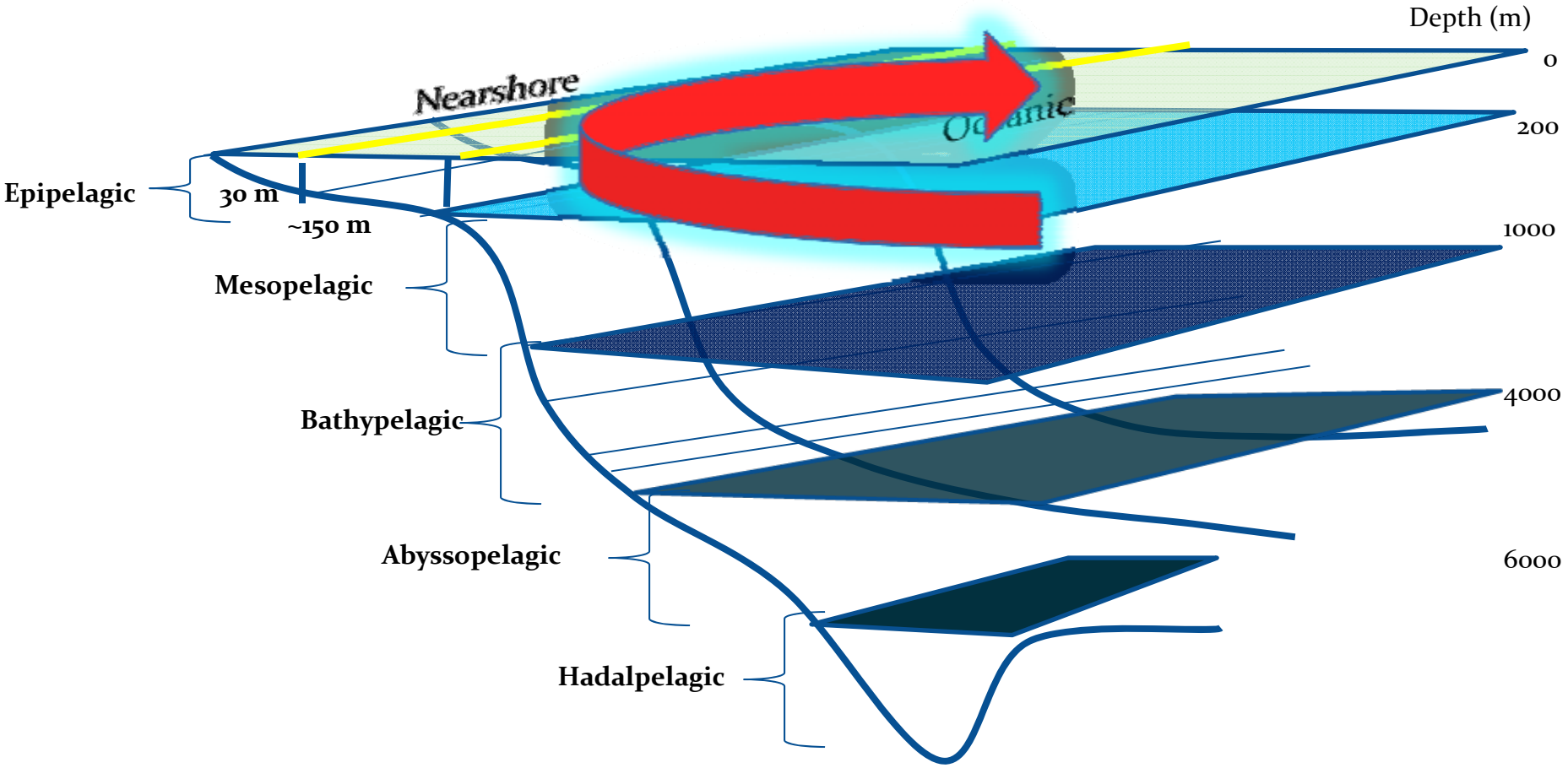
Estuarine	*Estuarine Tidal Riverine Shallow Water Near Surface Zone*
	Estuarine Tidal Riverine Deep Water Near Surface Zone
	Estuarine Tidal Riverine Deep Water Deep Zone
	Estuarine Shallow Water Near Surface Zone
	Estuarine Deep Water Near Surface Zone
	Estuarine Deep Water Deep Zone
Marine	*Nearshore Near Surface Zone*
	Nearshore Deep Zone
	Neritic Near Surface Zone
	Neritic Deep Zone
	Epipelagic Zone
	Mesopelagic Zone
	Bathypelagic Zone
	Abyssopelagic Zone
	Hadalpelagic Zone

Hydroforms and Subforms

- Coherent, definable hydromorphic structure with identifiable boundaries and characteristic physical properties
  - Plumes
  - Gyres
  - Eddies
  - Currents
- They vary extensively in size, volume, areal extent, persistence, and ecological significance.

Water Column Component Structure

Hydroforms and Subforms



Proposed Rearrangement

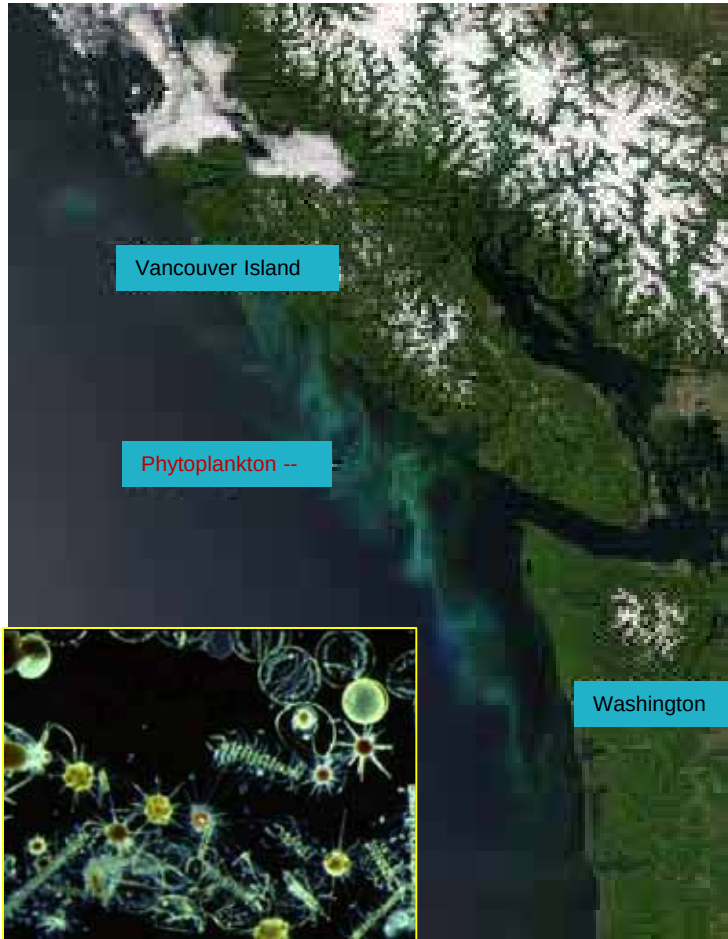
NEARSHORE

- Current
  - Wind-driven
  - Tidal front and gyre
  - Buoyancy flow (river plumes, winter water masses)
  - Wave-driven current (longshore, rip currents, undertows)
- Wave
  - Surface wind waves
  - Surface swell
  - Internal waves
  - Surf zone
  - Edge waves
  - Storm surge
  - Tsunami
- Tide
  - Tidal range
  - Tidal type (semi-diurnal, diurnal, mixed)

WCC Biotic Group

Floating or suspended aggregations of biota defined by the dominant life form or informal taxonomic or functional groupings. Patterns and distributions are determined by and associated with water column structure and dynamics and the physico-chemical components of the water column.

- *Phytoplankton Bloom*
- *Zooplankton Aggregation*
- *Floating Microbial Mat*
- *Floating/Drift Macroalgae*
- *Floating Vascular Vegetation*
- *Jellyfish Aggregations (Smacks)*
- *Vent Community*
- *Surf Foam/Surface Foam*
- *Whale Aggregations (Pods)?*
- *Pelagic Fish (Schools)?*
- *Demersal Fish (Schools)?*
- ~~*Seagrass Meadow (Water Surrounding Grass Blades)*~~
- ~~*Kelp Forest (Water Surrounding Stipe and Blades)*~~



WCC Biotope

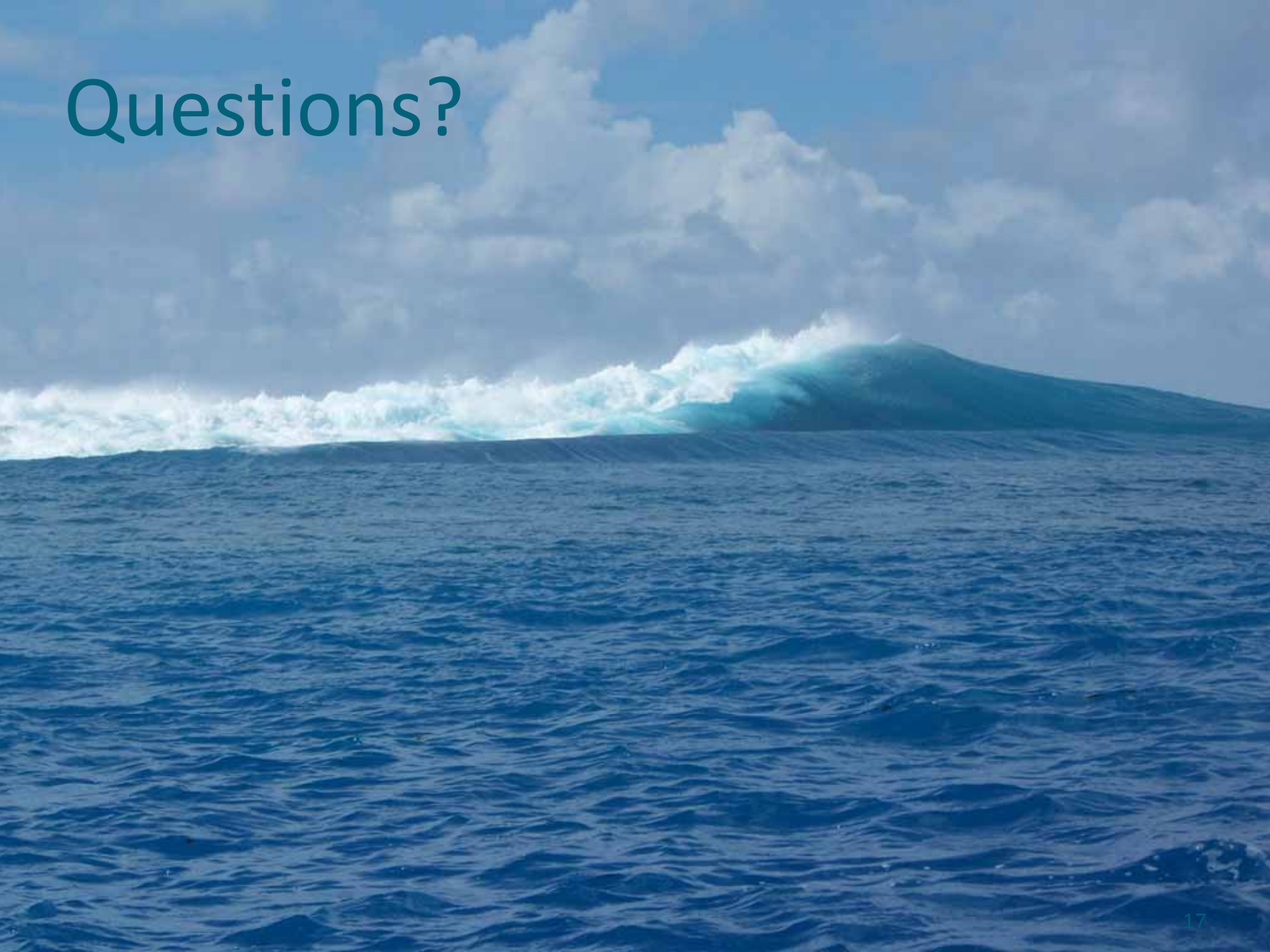
Floating or suspended aggregations of biota defined by the dominant organism (usually identified to genus or species). Biotope patterns and distributions are determined by and associated with water column structure and dynamics and the physico-chemical components of the water column.

- TBD

WCC Modifiers

- Salinity (fresh, oligohaline, mesohaline, polyhaline, euhaline, hyperhaline)
- Oxygen (Anoxic, hypoxic, oxic, oxygen saturated, oxygen supersaturated)
- Temperature (Frozen, Superchilled, Cold, Temperate, Warm, Hot)
- Turbidity Type, Provenance
- Energy Type, Intensity, Direction
- Light Attenuation Provenance, Agent
- Productivity – Phytoplankton & Macrovegetation
- Primary Water Source
- And more….

Questions?



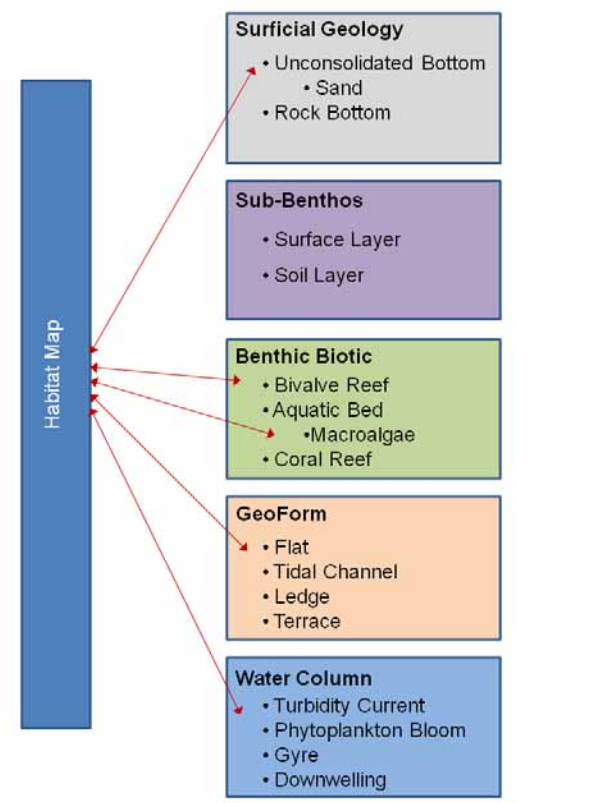
Mapping Principles

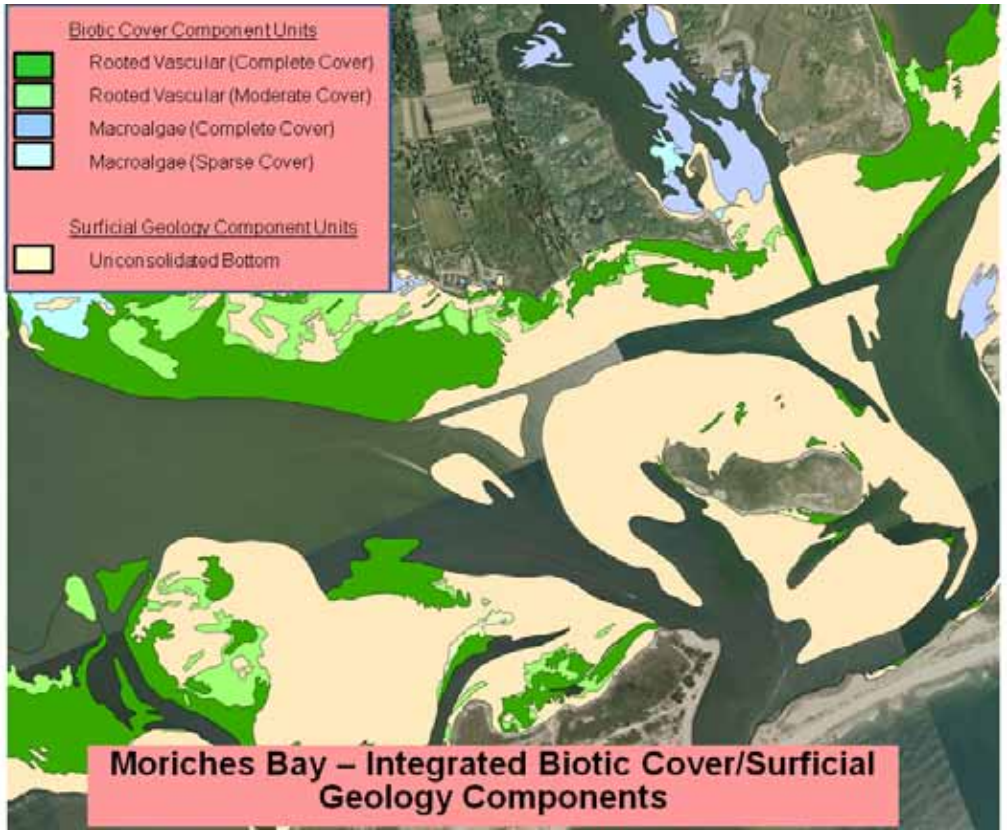
- Map Scale and Minimum Mapping Unit are user driven
  - May decide to lower the mmu for important types with small footprints
- Map to the CMECS level or component that works for your project
  - Can mix and match components and levels on the maps
  - If you can't map a unit accurately, go up a level or two in the hierarchy
- Use the sensors and tools that meet objectives.
  - Be cautious combining data collected with different sampling techniques
- Secondary Elements can help with heterogeneous polygons, but are not required
- Temporal variability is tricky, but not untenable
  - Decide what dynamic units are important to capture and adjust time series data collection and visualizations to the periodicity of the unit
  - Use "temporal persistence" modifier to indicate temporally variable units that aren't the focus of the project.
- Coding
  - Individual units have been assigned codes – based on NWI for BBC and SGC Classes and Subclasses
  - Code assembly is currently up to the user to develop or ignore.
  - Waiting on mapping guidance document.
- Habitat maps are derived products
  - It's up to the user to integrate the CMECS units in a way that makes ecological sense.

Approaches to Mapping CMECS

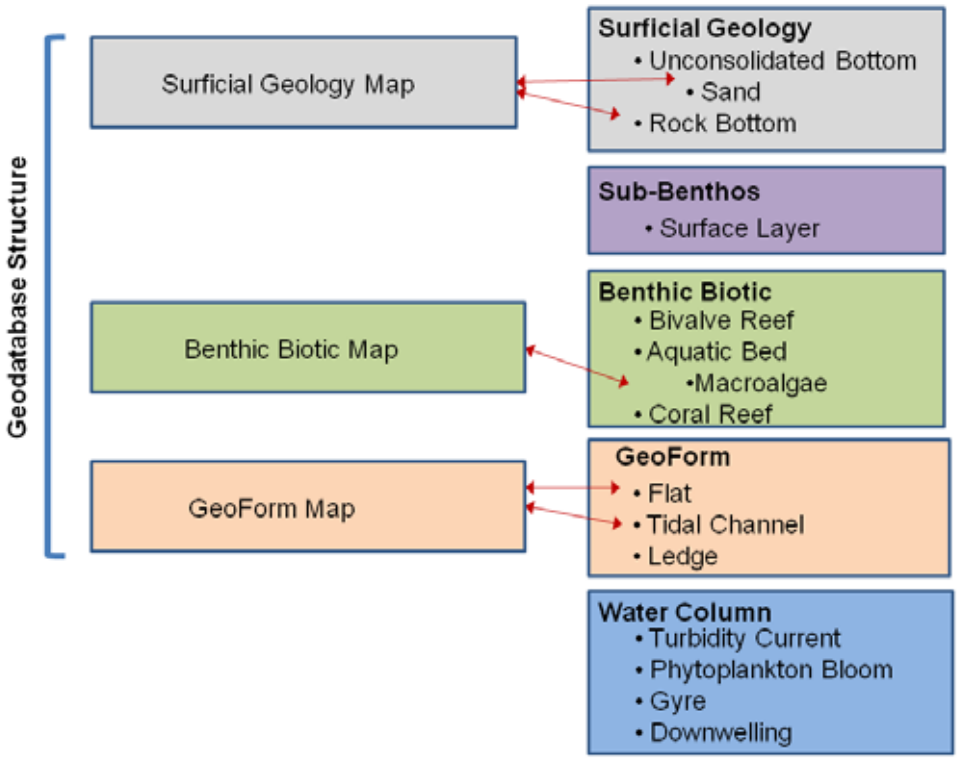
- CMECS Units are ecological building blocks
- Derived products illustrate their meaning
- Two Mapping Approaches
  - Pick and choose
  - Separate Coverages
- Objective and source data driven

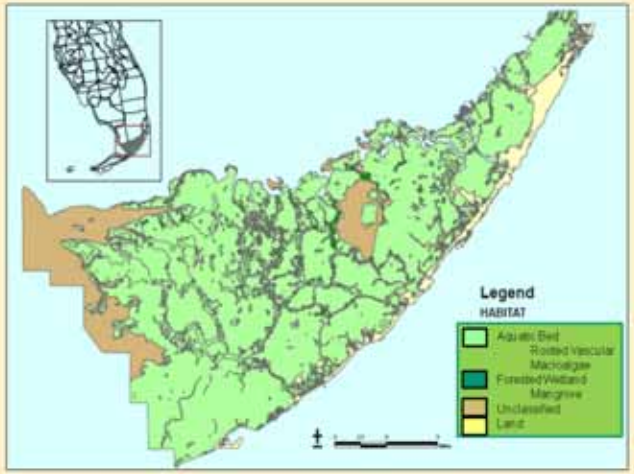
Pick and Choose Approach



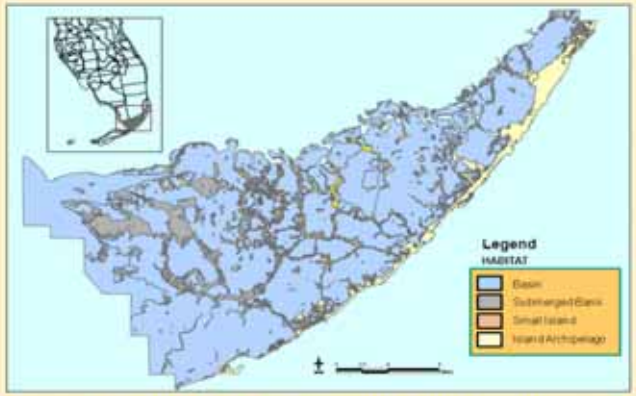


Separate Coverage Approach

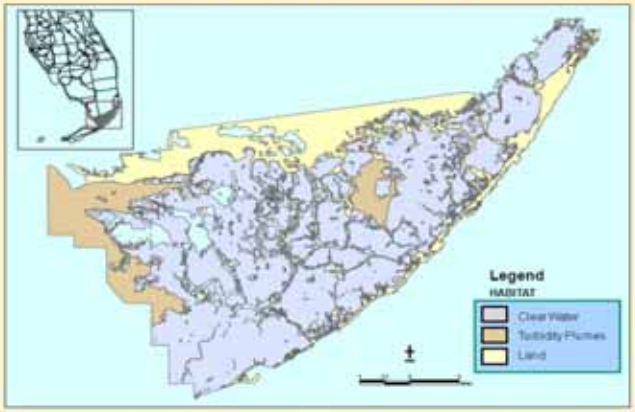




Florida Bay – Biotic Cover Component



Florida Bay – GeoForm Component



Florida Bay - Water Column

Secondary Element Modifiers: A solution to mapping heterogeneous polygons

- Secondary elements can be used as modifiers for identification of features in a map unit that are mixed into a primary classification unit at a level below the classification threshold.
  - A polygon with 5% cover of cobbles on top of a dominant cover of sand and you (or the biota) care about the cobbles
  - A polygon where two biotic groups are present, one dominant, the other not, but both are worth noting
  - A polygon where two geoforms are present. Dependent on the minimum mapping unit and project objectives

Solutions to Heterogeneous Polygons

- 90 - 100% of particles >2 mm
- boulders dominant coarse fraction
- sand dominant fine fraction
  - Class: Unconsolidated Substrate
  - Subclass: Coarse Unconsolidated Substrate
  - Group: Fragments (Boulders)
  - Secondary Element: Sand

Secondary Element Modifiers

- 35 - 90% of particles are larger than 2 mm
- boulders are the dominant coarse fraction
- sand is the dominant fine fraction
  - Class: Unconsolidated Substrate
  - Subclass: Unconsolidated Fine Sediments
  - Group: Sand (Fine sand)
  - Secondary Element: Boulders (moderate)

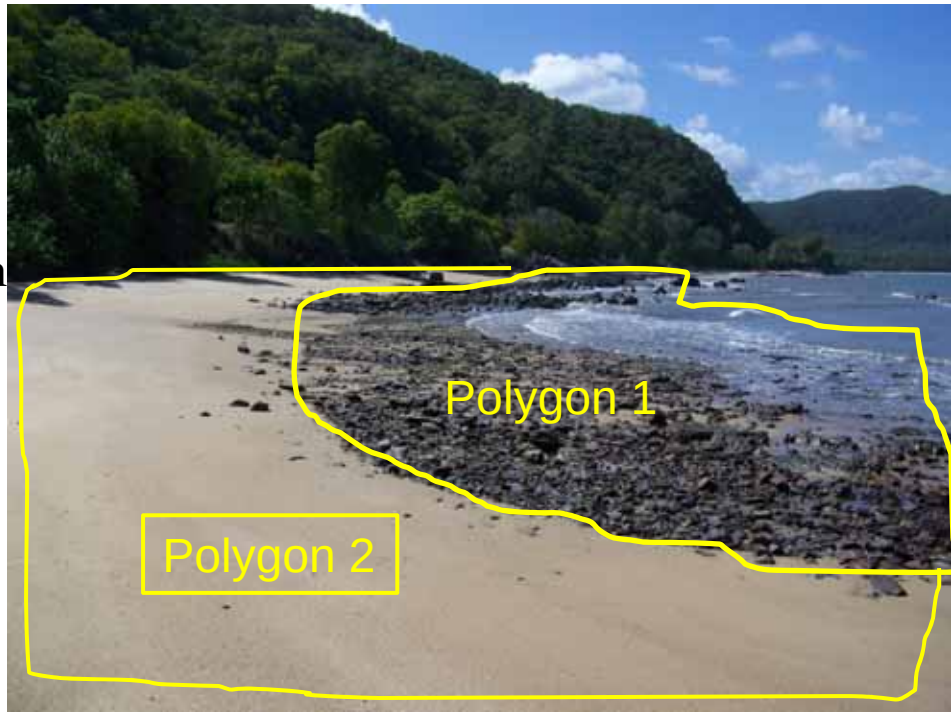
If you care about turtles…

- 35 - 90% of particles are larger than 2 mm
- boulders are the dominant coarse fraction
- sand is the dominant fine fraction
  - Class: Unconsolidated Substrate
  - Subclass: Unconsolidated Fine Sediments
  - Group: Sand (Fine sand)
  - Secondary Element: Boulders (moderate)

If you care about the birds….

- **Polygon 1**
- 90 - 100% of particles >2 mm
- boulders dominant coarse fraction
- sand dominant fine fraction
  - Class: Unconsolidated Substrate
  - Subclass: Coarse Unconsolidated Substrate
  - Group: Fragments (Boulders)
  - Secondary Element: Sand

- **Polygon 2**
- 35 - 90% of particles are larger than 2 mm
- sand is the dominant fine fraction
  - Class: Unconsolidated Substrate
  - Subclass: Unconsolidated Fine Sediments
  - Group: Sand (Fine sand)



ShoreZone Example

Discussion