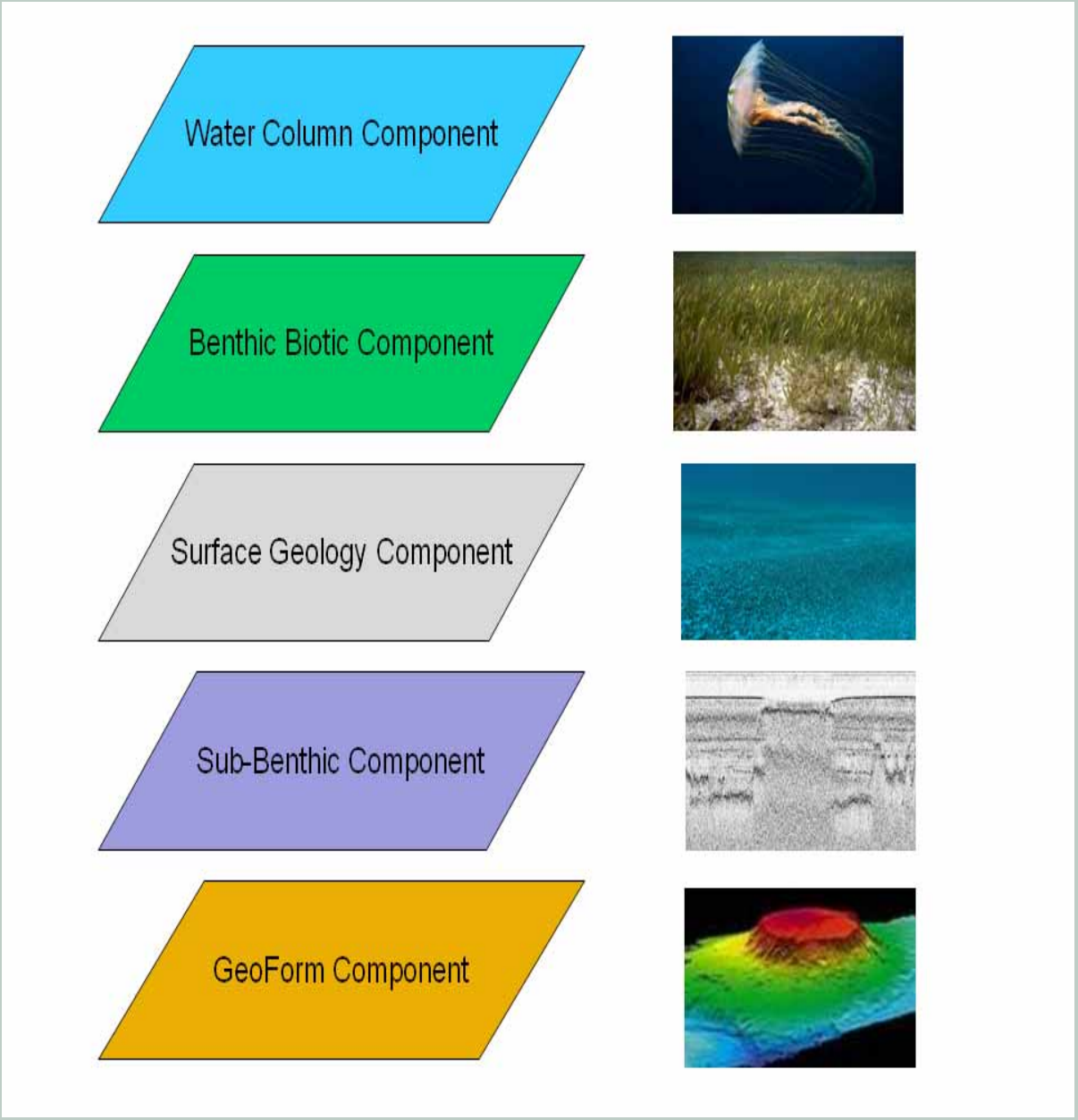
How Prepared Is California To Apply CMECS?

- CSMP products
- CSMP schedule
- CMECS classification
  - Surface Geology Component
  - Geoform Component



1) Color shaded bathymetric relief (*CSU Monterey Bay lead*)

2) Gray-scale shaded bathymetric relief (*CSU Monterey Bay lead*)

3) Gray-scale backscatter (*CSU Monterey Bay lead*)

4) Data Integration and Visualization (*USGS lead*)

5) Seafloor character (*USGS lead*)

6) Ground-truth surveying data and imagery (*USGS lead*)

7) Seafloor Benthic Habitat (Moss *Landing Marine Lab lead*)

8) Compilation of seismic-reflection data *(USGS lead)*

9) Local and regional shallow subsurface geology and structure (*USGS lead*)

10) Onshore/offshore geology map (*USGS onshore lead; CGS offshore lead*)

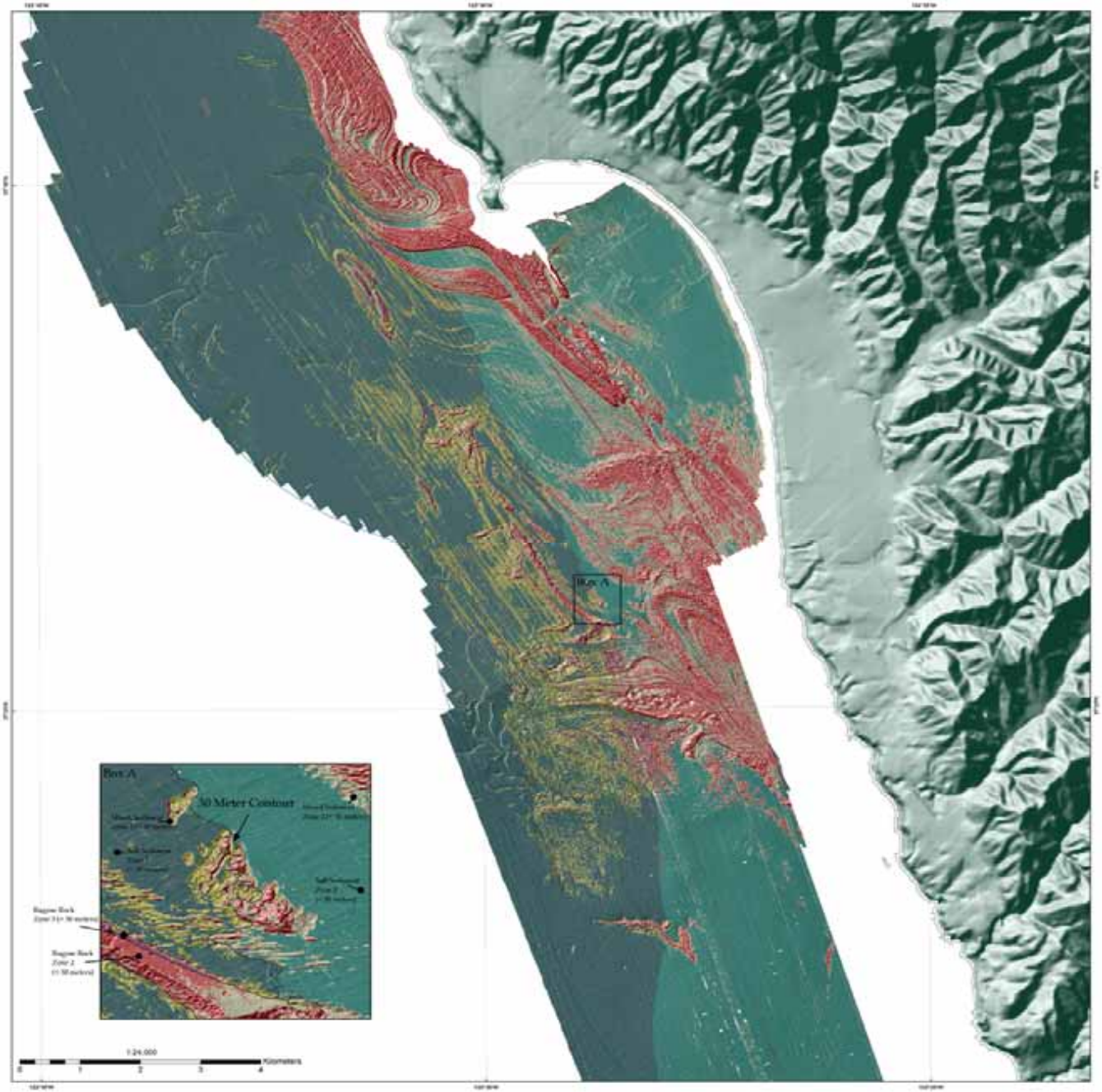
California MLPA Minimum Benthic Habitat Classes

Seafloor Habitats

- Rocky reefs
- Intertidal zones
- Sandy or soft ocean bottoms
- Underwater pinnacles
- Submarine canyons

Depth Zones

- Intertidal
- Intertidal to 30m
- 30 to 100m
- 100 to 200m
- 200m and deeper



Central California Mapping Project

Half Moon Bay Sheet

DRAFT

October, 2007

Map Information

N
W
E
S

Datum – WGS 1984
Projection – UTM Zone 10

3-mile limit

Seafloor Character Map

Zone 2 - shoreline to 30 meters water depth	Zone 3 - 30 meters to 100 meters water depth
Soft Sediment	Soft Sediment
Mixed Sand, Gravel and Rock	Mixed Sand, Gravel and Rock
Rugose Rock	Rugose Rock

This seafloor character map was produced using video supervised maximum likelihood classification of the bathymetry and intensity of return signals from sonar systems. A summary of the video data collected for the purpose of supervising the classification is shown on Plate Sheet #6. Derivative roughness (typically, intensity variability, homogeneity and entropy) and bathymetric slope were used as variants in the classification. This substrate dataset has been divided into the California Marine Life Protection Act depth zones mapped on this area, zone 2 extending to 30 meters and 3 (30 to 100 meters). This interpretation is draped over shaded relief bathymetry shown in Plate Sheet #2.

Soft sediment, three separate components of same area total, comprises 71% of the region, or 104 sq km (40 square kilometers) in depth zone 2 and 74 sq km in zone 3. Mixed sand, gravel and rock, where sediment typically forms a thin veneer over bedrock, comprises 16% of the area mapped, or 23 sq km - 15 sq km in zone 2 and 8 sq km in zone 3. Rugose (complex, rough) rock comprises the final 13%, or 20 sq km of the region - 16 sq km in zone 2 and 4 sq km in zone 3.

	Total		zone 2 (0 to 30 meters)	% in zone 2	zone 3 (30 to 100 meters)	% in zone 3
	square km	square miles				
Soft sediment	178	69	104	58	74	42
Mixed sand, gravel and rock	23	9	15	67	8	33
Rugose rock	20	8	16	80	4	20
Total	221	86	135	61	86	39

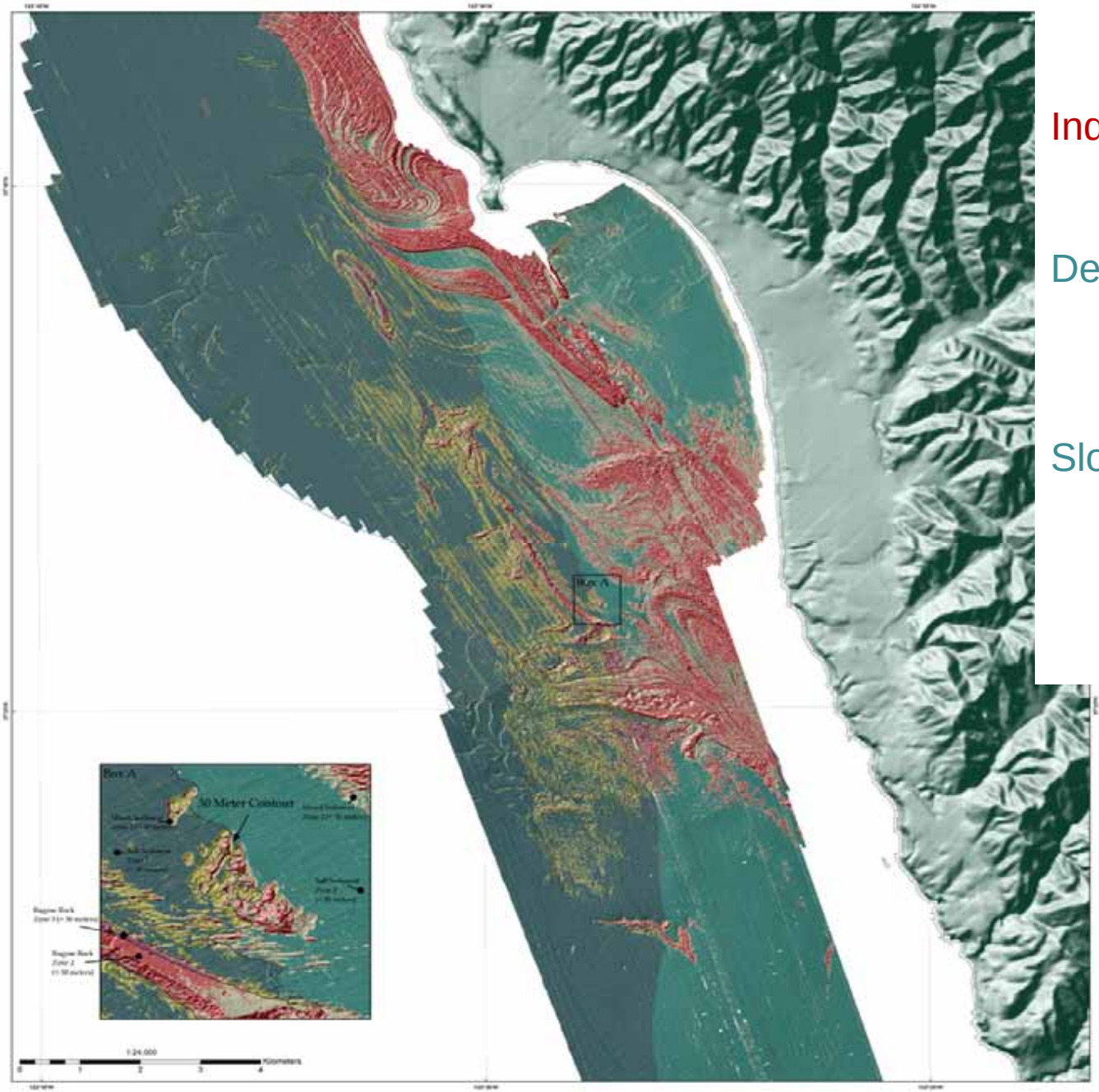
NOTE: Regions lacking one of the component datasets could not be classified. These regions are shown as either white, for regions which were not classified due to lack of bathymetry data, or grey for regions which were not classified due to lack of backscatter data.

Coastal Conservancy

USGS
science for a changing world

FUGRO

CGS



Rugosity Classes:

- Smooth
- Rugose

Induration Classes:

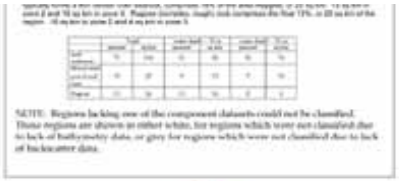
- Soft
- Hard

Depth Classes:

- 0 - 30m
- 30 - 100m
- 100 - 200m

Slope Zones:

- 0 - 5 degrees
- 5 - 30 degrees
- 30 - 60 degrees
- 60 - 90 degrees

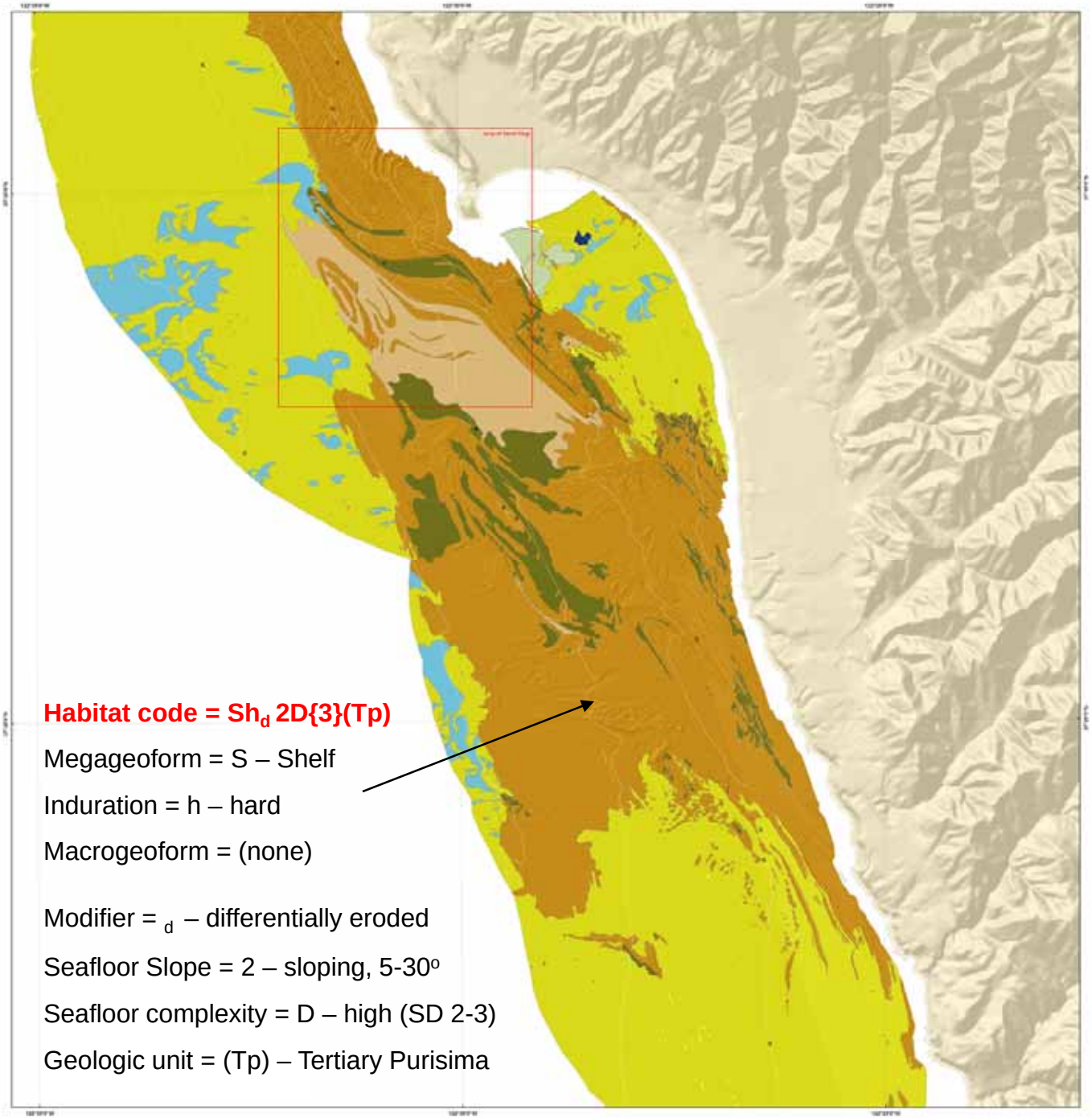


Coastal Conservancy

USGS
science for a changing world

FUGRO

CGS



Habitat code = Sh_d 2D{3}(Tp)

Megageoform = S – Shelf

Induration = h – hard

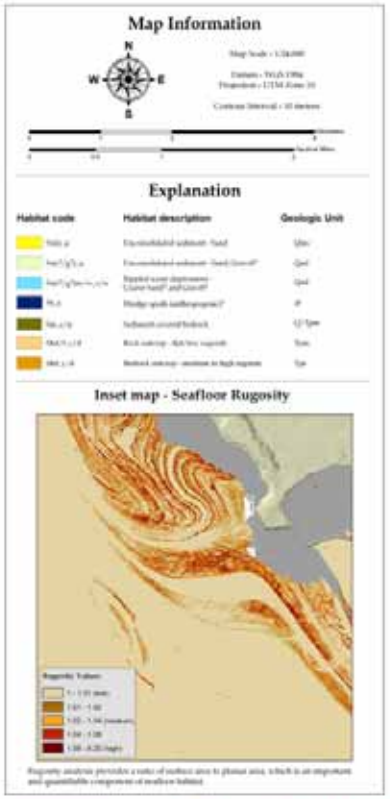
Macrogeoform = (none)

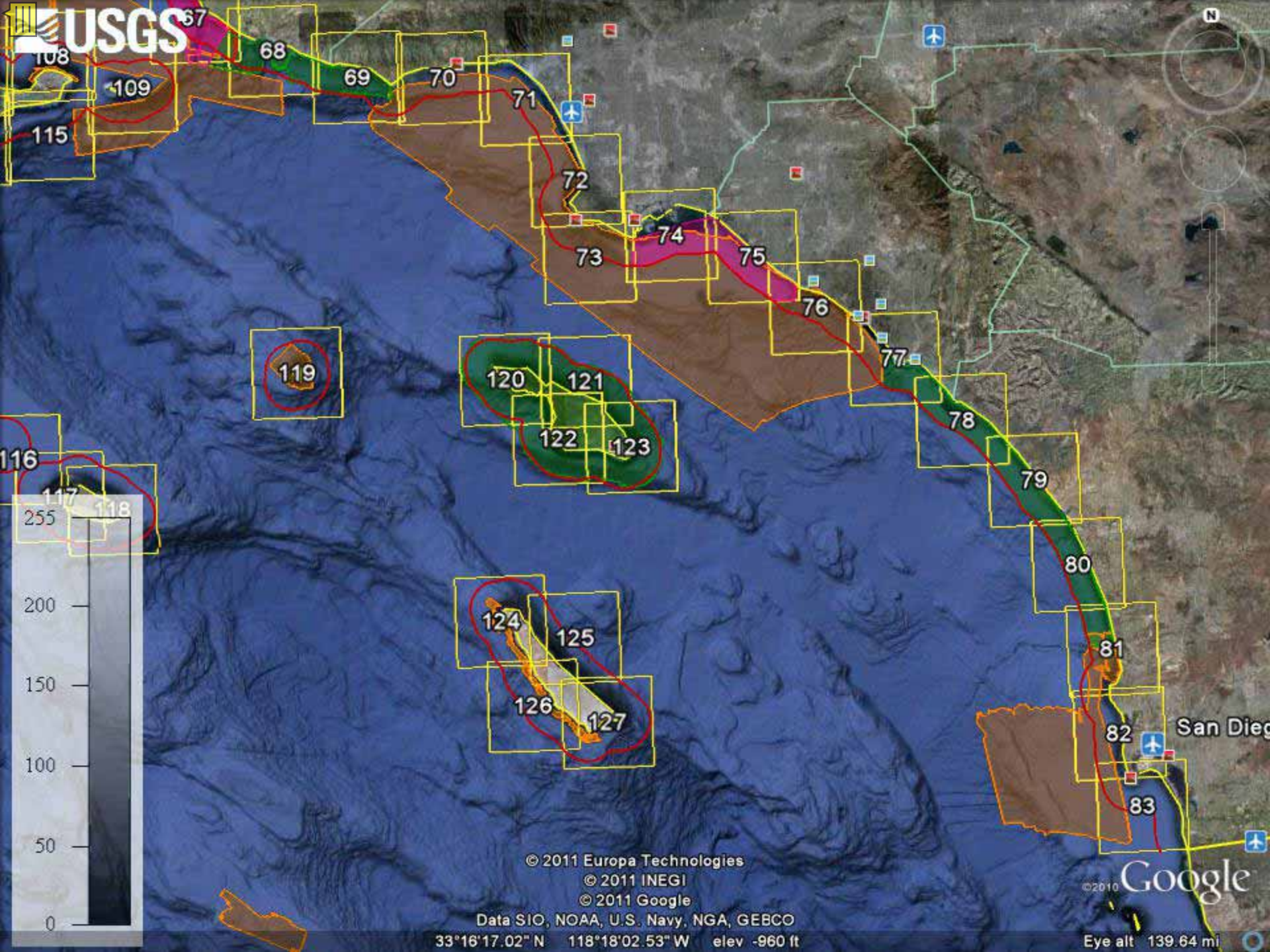
Modifier = $_d$ – differentially eroded

Seafloor Slope = 2 – sloping, 5-30^o

Seafloor complexity = D – high (SD 2-3)

Geologic unit = (Tp) – Tertiary Purisima




USGS
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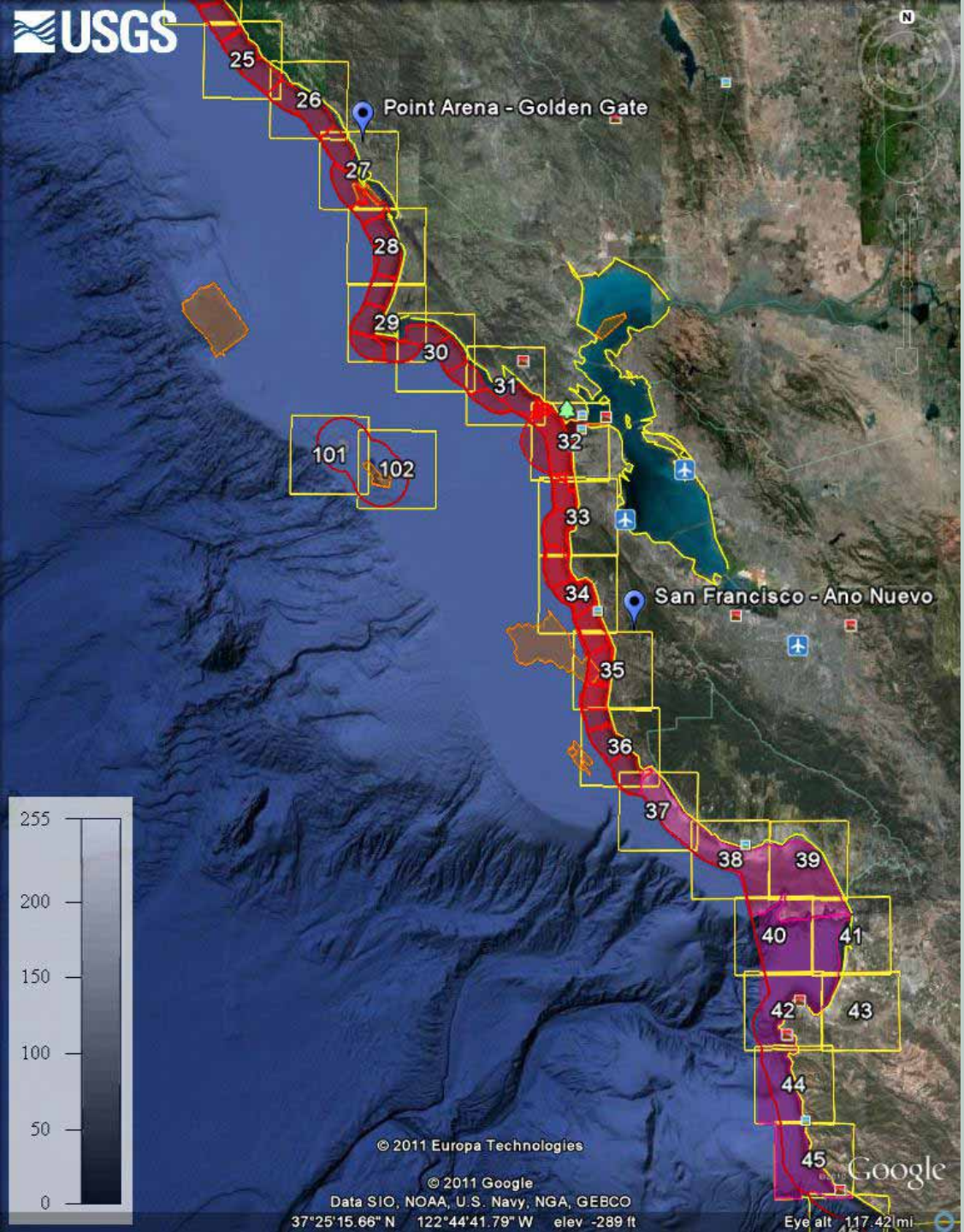
San Dieg
© 2011 Europa Technologies
© 2011 INEGI
© 2011 Google
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
33°16'17.02" N 118°18'02.53" W elev -960 ft
©2010 Google
Eye alt 139.64 mi



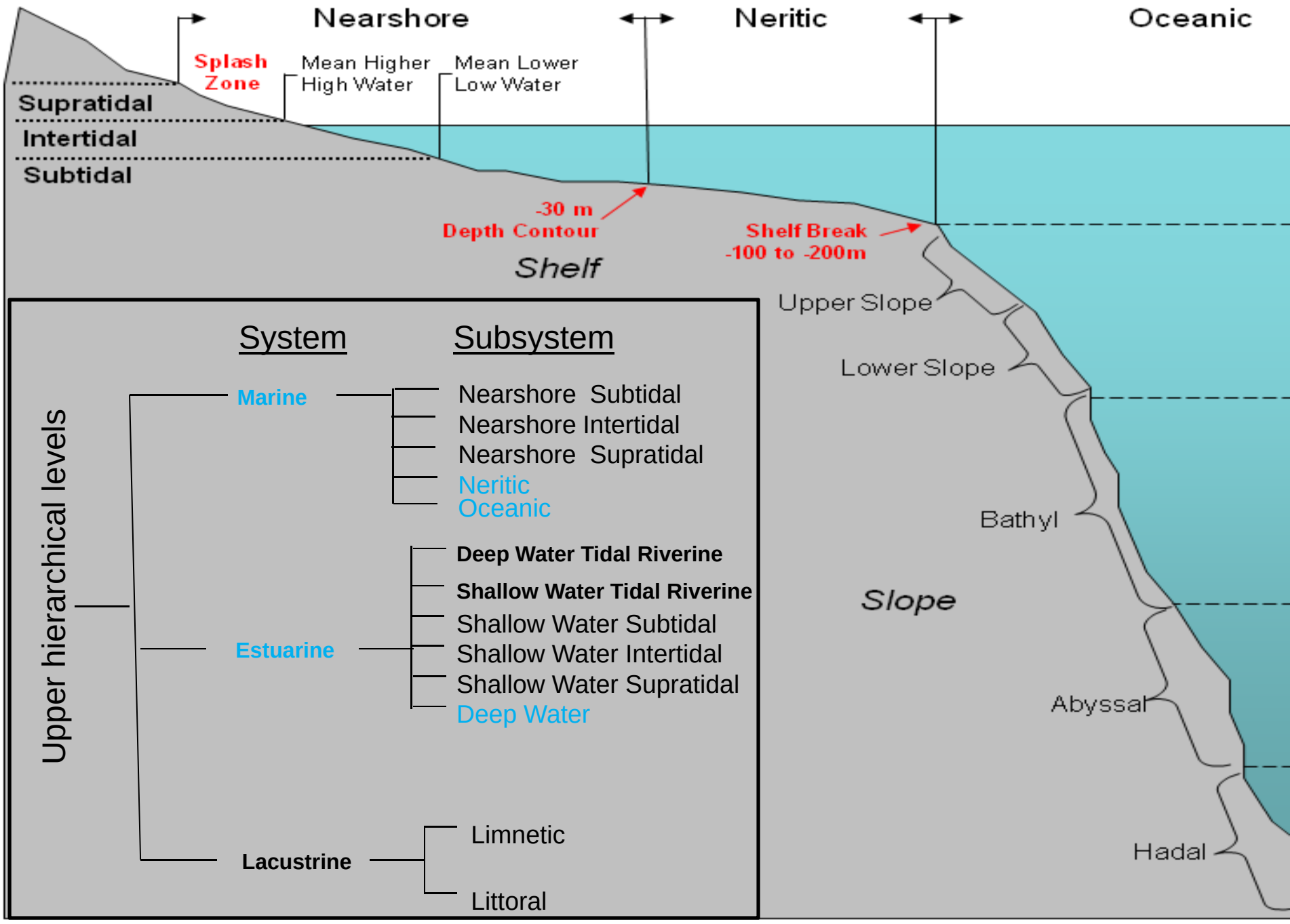
Scientific Investigation Map Production Schedule

2011 – Blocks 62-67

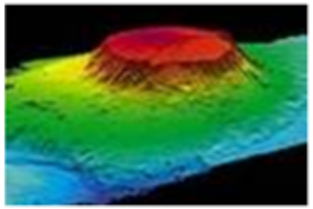
2012 – Blocks 31-35

2013 – Blocks 25-30

2014 – Blocks 36-42


Nearshore
Neritic
Oceanic
Splash Zone
Mean Higher High Water
Mean Lower Low Water
Supratidal
Intertidal
Subtidal
-30 m Depth Contour
Shelf Break -100 to -200m
Shelf
Upper Slope
Lower Slope
Bathyl
Slope
Abyssal
Hadal
System
Subsystem
Upper hierarchical levels
Marine
Nearshore Subtidal
Nearshore Intertidal
Nearshore Supratidal
Neritic
Oceanic
Estuarine
Deep Water Tidal Riverine
Shallow Water Tidal Riverine
Shallow Water Subtidal
Shallow Water Intertidal
Shallow Water Supratidal
Deep Water
Lacustrine
Limnetic
Littoral

GeoForm Component



The geological setting and associated features of the land/seascape.
-describes the structure of the physical environment across multiple scales

-addresses five aspects of the coastal and seafloor morphology: Coastal Region, Physiographic Setting, Geoform, Subform, and Anthropogenic Geoform.

-adopts most of the structures described by Greene et al. (2007), but expands the options to include a larger number of coastal and nearshore features.

Heirarchy:
•Coastal regions based on terrestrial standards (3.5 in California)

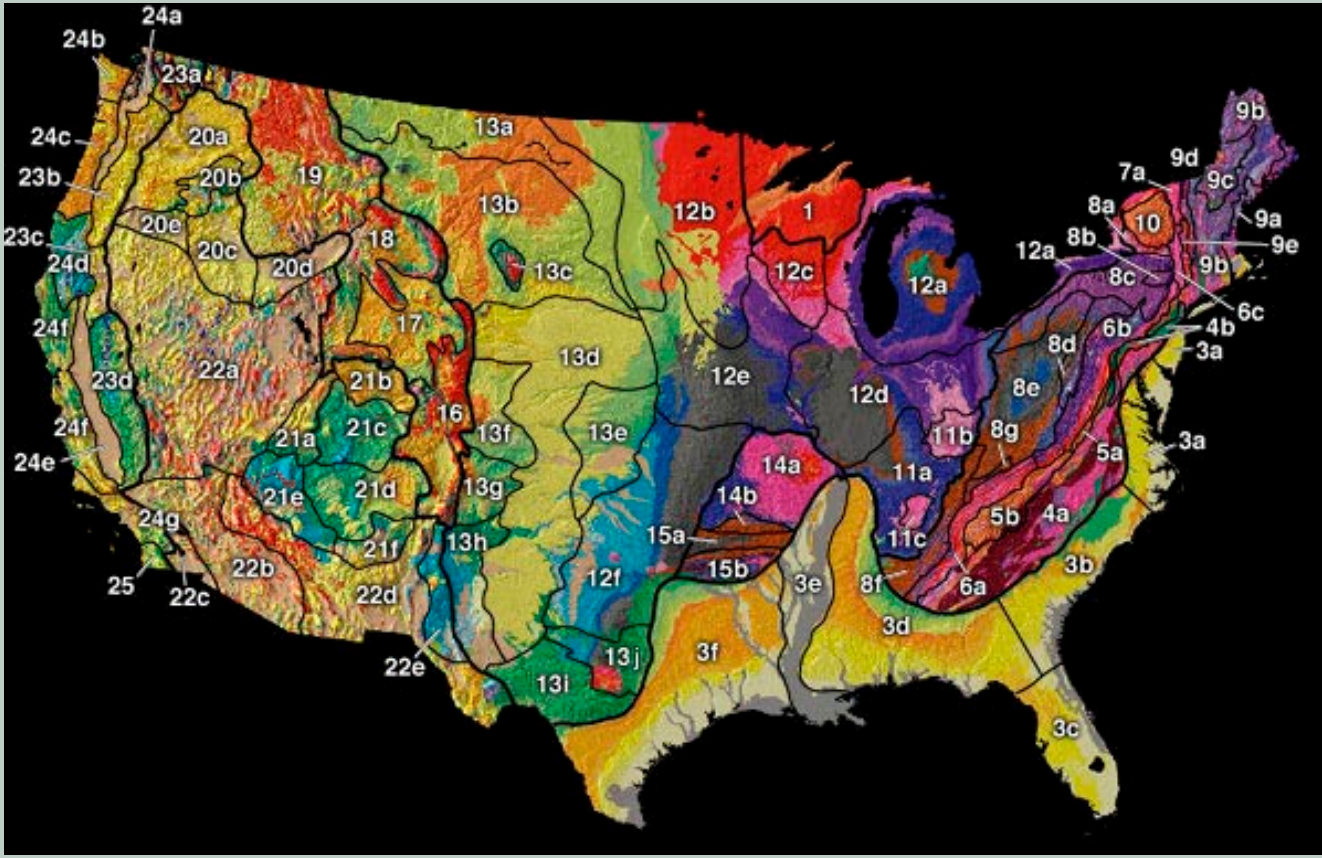
•Physiographic settings (Greene megahabitat >100km) shelf, abyssal plain…

•Geoforms (Greene mesohabitat <100km) alluvial fans, atolls, channels…

•Subforms (Greene meso- or macrohabitats) parts of a geoform, canyon wall, canyon flank…

US Physiographic Provinces

PACIFIC MOUNTAIN SYSTEM
Cascade-Sierra Mountains
Northern Cascade Mountains
Middle Cascade Mountains
Southern Cascade Mountains
Sierra Nevada
Pacific Border province Puget Trough
Olympic Mountains
Oregon Coast Range
Klamath Mountains
California Trough
California Coast Ranges (24f)
Los Angeles Ranges (24g)
Lower California province (25)



http://tapestry.usgs.gov/physiogr/physio.html

Surface Geology Component

Describes the geological composition and environment of the upper layer of the hard substrate and the upper 15 cm of soft substrate as well as the structural (non-living) aspects of biogenic substrates such as coral reefs.

Hierarchical: Class, Subclass, Group

Class: Rock Substrate
- Subclass: Bedrock (>50%)
- Subclass: Pavement (>50% bedrock and other hard bottom)

Class: Unconsolidated Substrate
- Subclass: Fine Unconsolidated Substrate
  - Groups : Sand, Silt, Clay, Fine Mixes, Coarse Mixes
- Subclass: Coarse unconsolidated substrate
  - Groups: Fragments, Shells/Corals

Class: Faunal Reef Substrate

Class: Coral Reef Substrate

CMECS Seafloor Geology Component	Greene macrohabitat And Seafloor Character Map
Class: Rock Substrate Subclass: Bedrock Group: none	Greene (bedrock) and induration class (hard) SFC rugose-hard?
Class: Rock Substrate Subclass: Pavement Group:?	Greene (mixed?) and induration hard SFC smooth-hard?

CMECS Unconsolidated Class	Greene
Class: Unconsolidated Substrate Subclass: Fragments(Pebble)	Modifier: unconsolidated microhabitat: Pebble
Class: Unconsolidated Substrate Subclass: Sand	Modifier: unconsolidated microhabitat: Pebble
Class: Unconsolidated Substrate Subclass: Mixes Group: Fine Mixes	Modifier: unconsolidated Microhabitat: Mixed Sediments

CMECS Modifier	Greene Modifier - Processes
Energy Regime: High: area regularly experiences strong currents (> 3 knots), large oceanic swells, or breaking waves	Modifier: currents –winnowing
Class: Unconsolidated Substrate Subclass: Sand	Modifier: unconsolidated microhabitat: Pebble
Class: Unconsolidated Substrate Subclass: Mixes Group: Fine Mixes	Modifier: unconsolidated Microhabitat: Mixed Sediments

Seafloor Character

Seafloor Geology Component

CA

CMECS

Greene Habitat

Geoform Component

Seafloor Character

Rugosity:
- Smooth
- Rugose

Induration:
- Soft
- Hard

Depth:
- 0 - 30m
- 30 - 100
- 100 - 200

Slope:
- 0 – 5 degrees
- 5 - 30
- 30 - 60
- 60 - 90

CMECS Modifiers

Rugosity:
- Very low 1-1.25
- Low
- Moderate
- High
- Very high > 2

Induration: none

Physiographic setting:
- Nearshore
- Neritic
- Oceanic

Slope:
- 0 - 5 degrees
- 5 - 30
- 30 - 45
- 45 - 90
- >90

Greene code translation to CMECS

Ssc(w)/g/l_s/u3 : Shelf, soft, Canyon wall with gullies, landslide-scoured, un-consolidated, steeply sloping.

Shelf – Physiographic setting

Soft – no induration classes

Canyon wall – Geoform and a subform

Landslide (scoured) – process modifier? multiple subforms?

Unconsolidated – Class

Steeply sloping - Modifier

How ready is CSMP to implement CMECS?

- Seafloor Character Raster is best not included in a CMECS translation effort
- Geoforms match Greene meso-megahabitat well but a few Greene mesohabitats might be lost if we don't use multiple subforms
- Surface Geologic Components don't match Greene as well and processes information especially would be lost.