

**DESCRIPTION OF MAP UNITS**

**DEPTH ZONE 2—INTERTIDAL TO 30 METERS WATER DEPTH**

**SLOPE CLASS 1—0 TO 5 DEGREES**

- Fine to medium-grained smooth sediment**—Low backscatter, low rugosity; typically mud to medium-grained sand; often rippled and (or) burrowed
- Mixed smooth sediment and rock**—Moderate to very high backscatter, low rugosity; typically coarse-grained sand, gravel, cobbles, and bedrock
- Rock and boulder, rugose**—High backscatter, high rugosity; typically boulders and rugose bedrock to coarse-grained sediment, with varying amounts of shell hash in scour depressions

**SLOPE CLASS 2—5 TO 30 DEGREES**

- Fine to medium-grained smooth sediment**—Low backscatter, low rugosity; typically mud to medium-grained sand; often rippled and (or) burrowed
- Mixed smooth sediment and rock**—Moderate to very high backscatter, low rugosity; typically coarse-grained sand, gravel, cobbles, and bedrock
- Rock and boulder, rugose**—High backscatter, high rugosity; typically boulders and rugose bedrock to coarse-grained sediment, with varying amounts of shell hash in scour depressions

**DEPTH ZONE 3—30 METERS TO 100 METERS WATER DEPTH**

**SLOPE CLASS 1—0 TO 5 DEGREES**

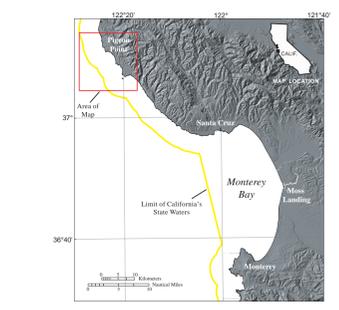
- Fine to medium-grained smooth sediment**—Low backscatter, low rugosity; typically mud to medium-grained sand; often rippled and (or) burrowed
- Mixed smooth sediment and rock**—Moderate to very high backscatter, low rugosity; typically coarse-grained sand, gravel, cobbles, and bedrock
- Rock and boulder, rugose**—High backscatter, high rugosity; typically boulders and rugose bedrock to coarse-grained sediment, with varying amounts of shell hash in scour depressions

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**EXPLANATION OF MAP SYMBOLS**

- Area of "no data"—Areas near shoreline not mapped owing to insufficient high-resolution seafloor mapping data; areas beyond 3 nautical-mile limit of California's State Waters were not mapped as part of California Seafloor Mapping Program
- 3-nautical-mile limit of California's State Waters
- Bathymetric contour (in meters)—Derived from modified 2-m-resolution bathymetry grid. Contour interval: 10 m



(2.9 km) is in Depth Zone 3. Rock and boulder, rugose (rock and boulder outcrops having high surficial complexity) makes up 13.7 percent (18.1 km<sup>2</sup>) of the map area; 10.2 percent (13.5 km<sup>2</sup>) is in Depth Zone 2, and 5.5 percent (6.4 km<sup>2</sup>) is in Depth Zone 3. Medium- to coarse-grained sediment (in scour depressions consisting of material that is coarser than the surrounding seafloor) makes up 1.5 percent (2.0 km<sup>2</sup>) of the map area; 0.3 percent (0.4 km<sup>2</sup>) is in Depth Zone 2, and 1.2 percent (1.6 km<sup>2</sup>) is in Depth Zone 3 (table 1).

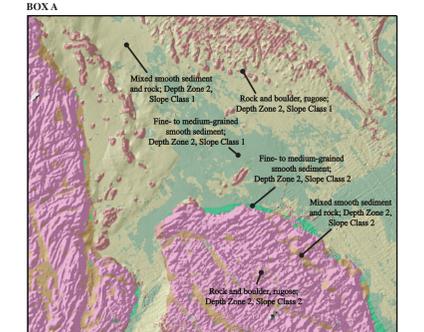
**Table 1.** Coverage of classified seafloor, in square kilometers (sq km) and percent of total area, broken into California Marine Life Protection Act Depth Zones 2 and 3.

	Total		Depth Zone 2 (water depth < 30 m)		Depth Zone 3 (water depth > 30-100 m)	
	percent	sq km	percent of total	sq km	percent of total	sq km
Fine to medium-grained smooth sediment	79.1	104.8	15.4	20.4	63.7	84.4
Mixed smooth sediment and rock	5.7	7.5	3.5	4.6	2.2	2.9
Rock and boulder, rugose	13.7	18.1	10.2	13.5	3.5	4.6
Medium- to coarse-grained sediment	1.5	2.0	0.3	0.4	1.2	1.6

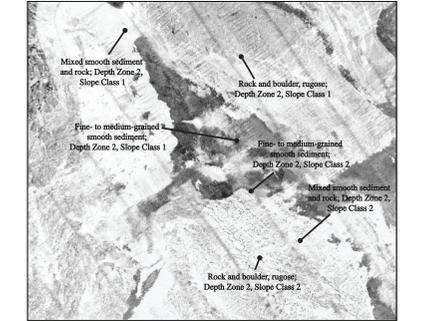
**DISCUSSION**

This seafloor-character map of the offshore of Pigeon Point map area in central California was produced using video-supervised, maximum-likelihood classification of the bathymetry and backscatter (intensity of return) signals from sonar systems (a summary of the video data collected for the purpose of supervising the classification is shown on sheet 6). Rugosity (a GIS-derived characterization of roughness) and backscatter intensity were used as variants in the classification. The interpreted classifications were then draped over shaded-relief bathymetry (see sheet 2). The substrate classes mapped in this area have been divided into the following California Marine Life Protection Act depth zones: Depth Zone 2 (intertidal to 30 m), and Depth Zone 3 (30 to 100 m). In addition, the following slope classes are represented on this map (Coastal and Marine Ecological Classification Standard slope zones are shown in parentheses): Slope Class 1 (0° to 5° (flat)), Slope Class 2 (5° to 30° (steeply sloping)), Depth Zone 1 (intertidal), Depth Zones 4 and 5 (greater than 100 m), and Slope Classes 3 to 5, greater than 30° (steeply sloping to overhanging), are not present in this map area.

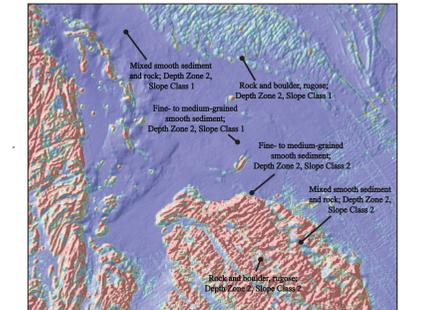
Fine- to medium-grained smooth sediment (sand and mud) makes up 79.1 percent (104.8 km<sup>2</sup>) of the map area; 15.4 percent (20.4 km<sup>2</sup>) is in Depth Zone 2, and 63.7 percent (84.4 km<sup>2</sup>) is in Depth Zone 3. Mixed smooth sediment (sand and gravel) and rock (that is, sediment typically forming a veneer over bedrock, or rock outcrops having little to no relief) make up 5.7 percent (7.5 km<sup>2</sup>) of the map area; 3.5 percent (4.6 km<sup>2</sup>) is in Depth Zone 2, and 2.2 percent



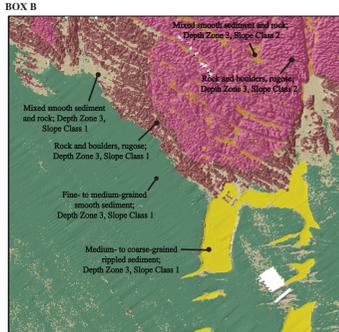
**Figure 1.** Detailed view of substrate classes mapped offshore of Año Nuevo State Park (see Box A, on map, for location). Depth Zone 2 (intertidal to 30 m), Slope Class 1 (0°–5°), and Slope Class 2 (5°–30°). Fine- to medium-grained smooth sediment is shown in shades of green; mixed smooth sediment and rock is shown in shades of tan; and rock is shown in shades of pink.



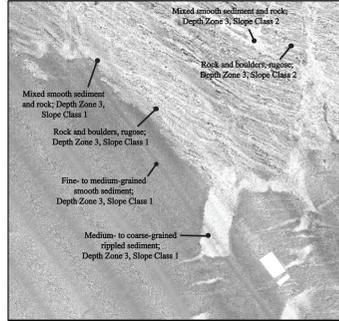
**Figure 2.** Acoustic backscatter image (see sheet 3) draped over shaded-relief bathymetry (see sheet 2) for same area as Figure 1 (Box A on map). Brighter areas indicate coarse-grained, rough, or hard seafloor; darker areas indicate unconsolidated (loosely packed) sediment. Parallel light and dark lines are data-processing artifacts. Interpreted substrate classes from Figure 1 included for comparison.



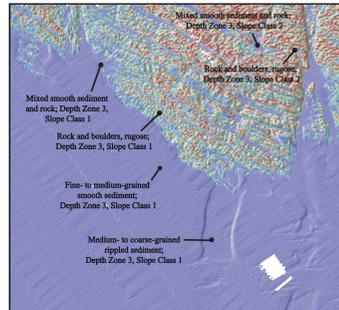
**Figure 3.** Rugosity (characterization of roughness derived from bathymetry) draped over shaded-relief bathymetry (see sheet 2) for same area as Figure 1 (Box A on map). Rugosity values are displayed in muted "rainbow" color spectrum that ranges from purple (low rugosity) through green (medium rugosity) to red (high rugosity). Interpreted substrate classes from Figure 1 included for comparison.



**Figure 4.** Detailed view of substrate classes mapped offshore of Año Nuevo State Park (see Box B, on map, for location). Depth Zone 3 (30 to 100 m), Slope Class 1 (0°–5°), and Slope Class 2 (5°–30°). Fine- to medium-grained smooth sediment is shown in shades of green; mixed smooth sediment and rock is shown in shades of tan; rock is shown in shades of pink; and medium- to coarse-grained sediment is shown in shades of yellow.

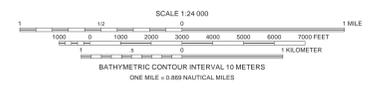


**Figure 5.** Acoustic backscatter image (see sheet 3) draped over shaded-relief bathymetry (see sheet 2) for same area as Figure 4 (Box B on map). Brighter areas indicate coarse-grained, rough, or hard seafloor; darker areas indicate unconsolidated (loosely packed) sediment. Parallel light and dark lines are data-processing artifacts. Interpreted substrate classes from Figure 4 included for comparison.



**Figure 6.** Rugosity (characterization of roughness derived from bathymetry) draped over shaded-relief bathymetry (see sheet 2) for same area as Figure 4 (Box B on map). Rugosity values are displayed in muted "rainbow" color spectrum that ranges from purple (low rugosity) through green (medium rugosity) to red (high rugosity). Interpreted substrate classes from Figure 4 included for comparison.

Onshore elevation data from California Coastal Conservancy (available from National Oceanic and Atmospheric Administration (NOAA) Coastal Service Center's Digital Coast at <http://www.noaa.gov/digitalcoast>) and from U.S. Geological Survey's National Elevation Dataset (available at <http://ned.srs.gov/>). Offshore shaded-relief bathymetry from map on sheet 2; this report, California's State Waters limit from NOAA Office of Coast Survey.



Seafloor character mapped by Mercedes D. Erdey, 2013.  
Bathymetric contours by Mercedes D. Erdey, 2014.  
GIS symbols and digital cartography by Mercedes D. Erdey.  
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**Seafloor Character, Offshore of Pigeon Point Map Area, California**  
By Mercedes D. Erdey and Guy R. Cochrane  
2015

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