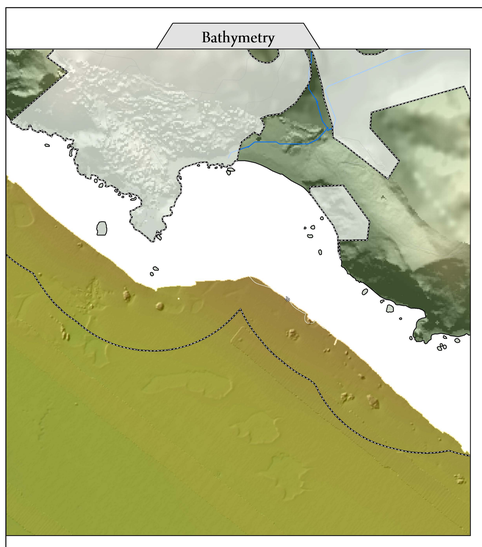
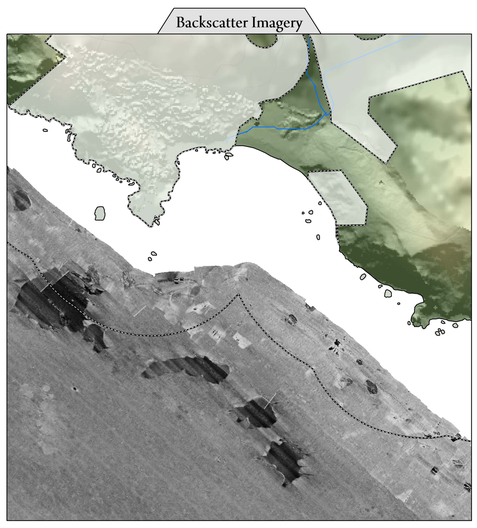
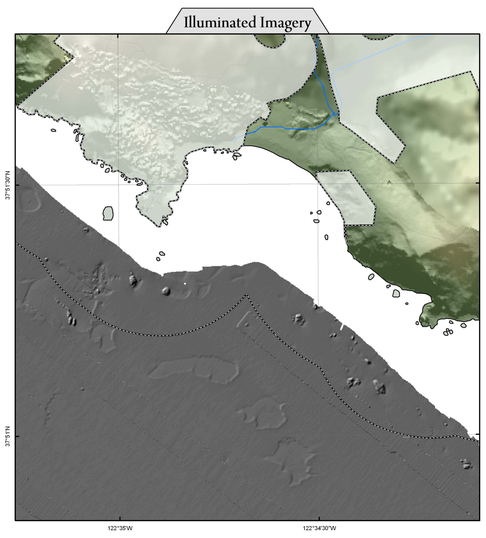
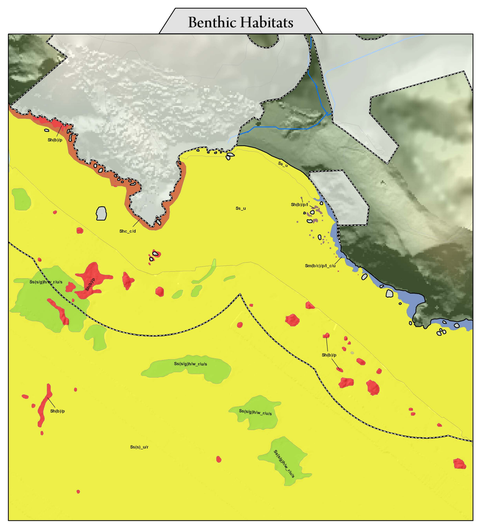
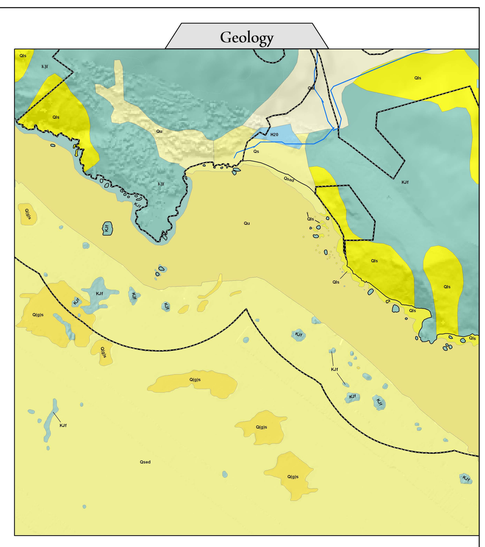


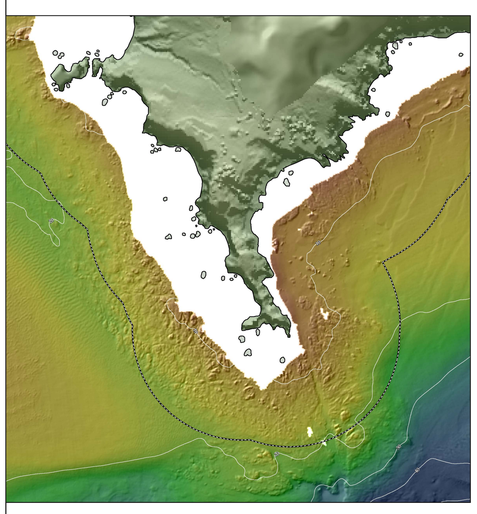


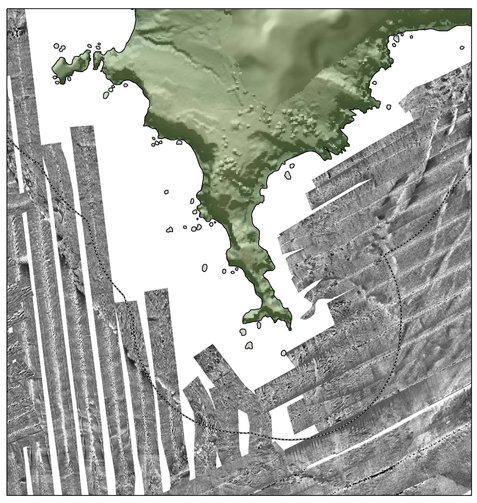


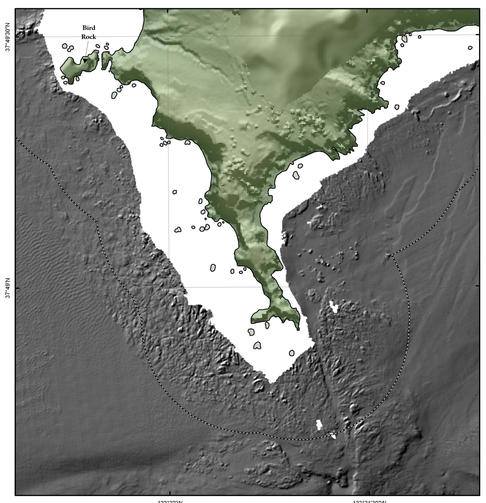


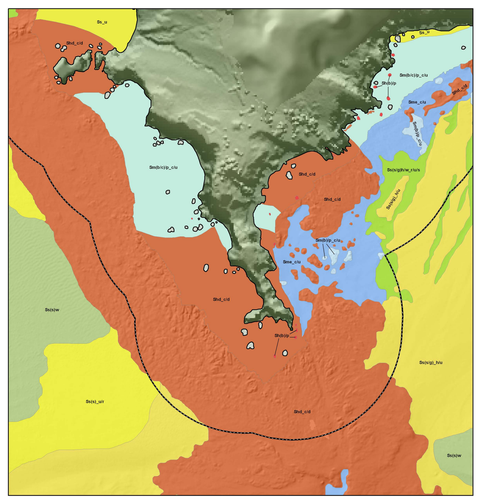


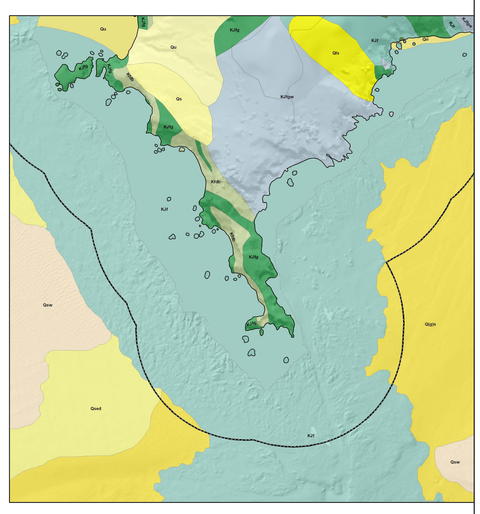
Inset #1: Muir Beach



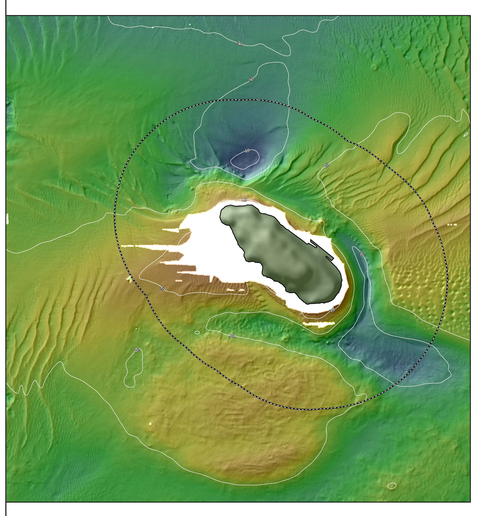


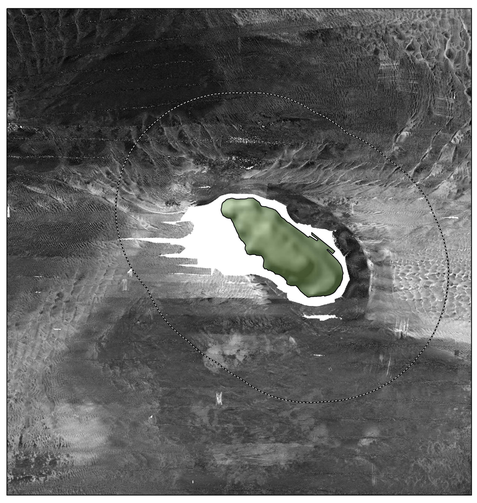


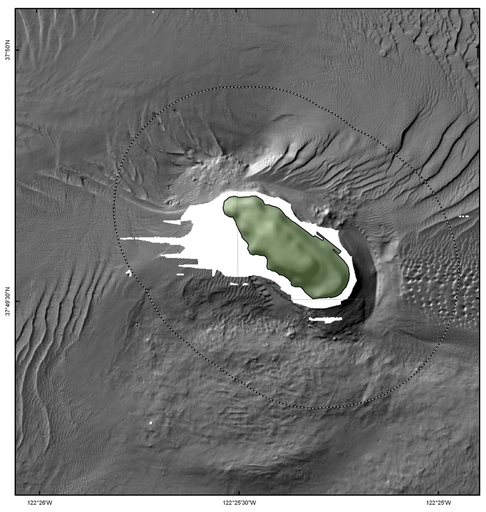


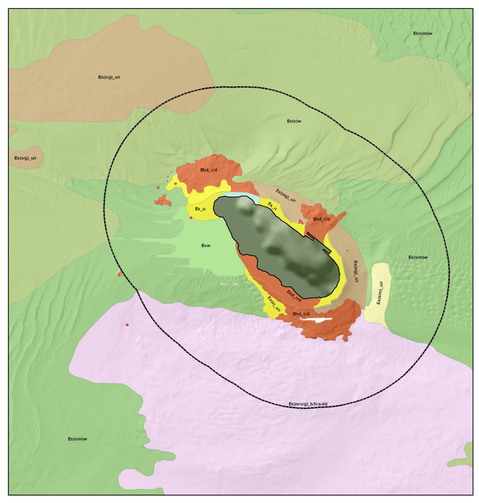


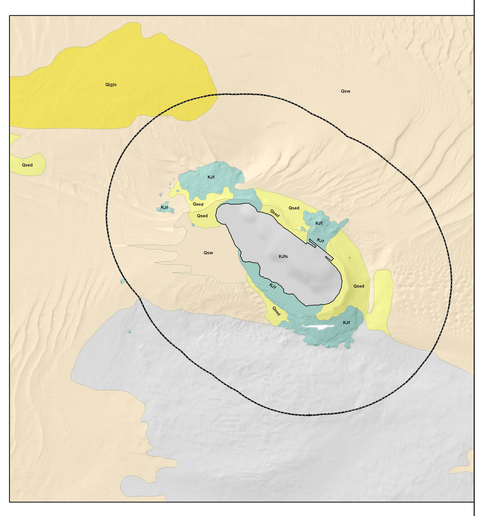
Inset #2: Point Bonita



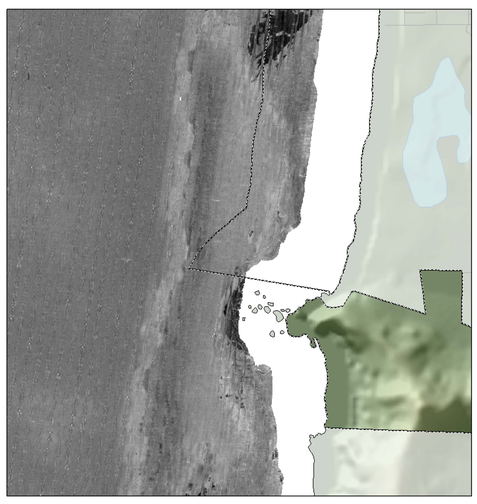


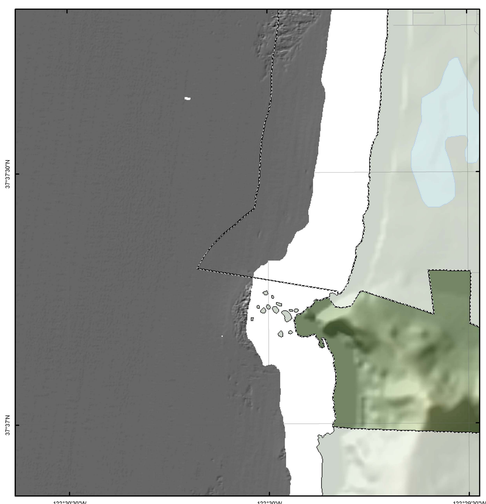


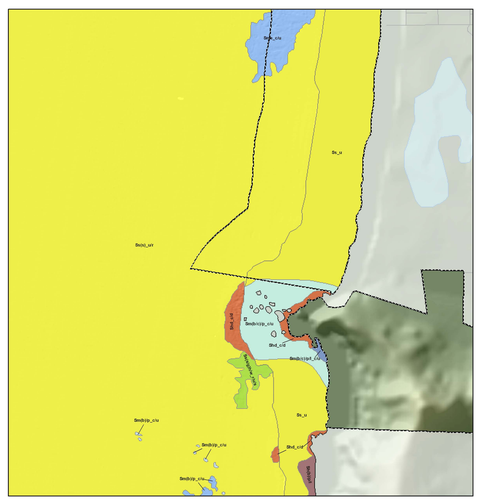


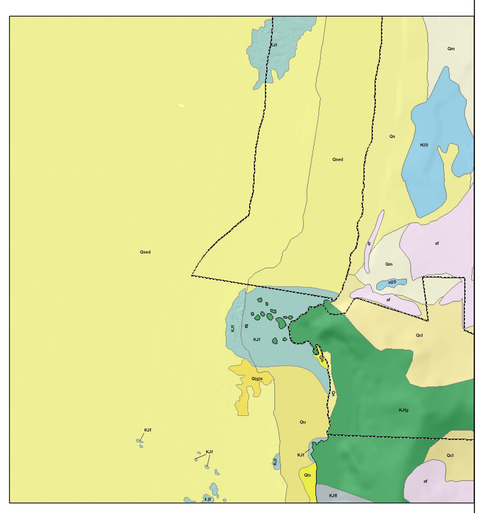


Inset #3: Alcatraz Island

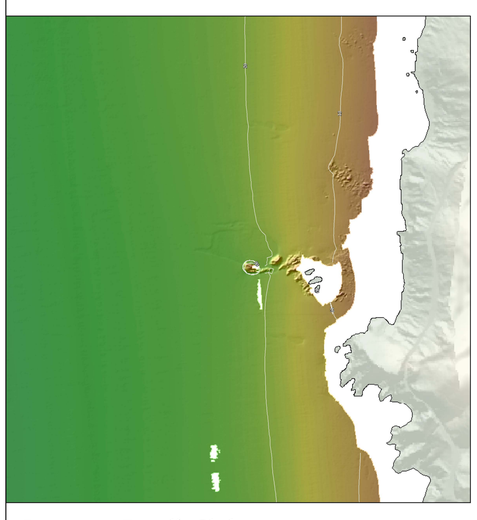


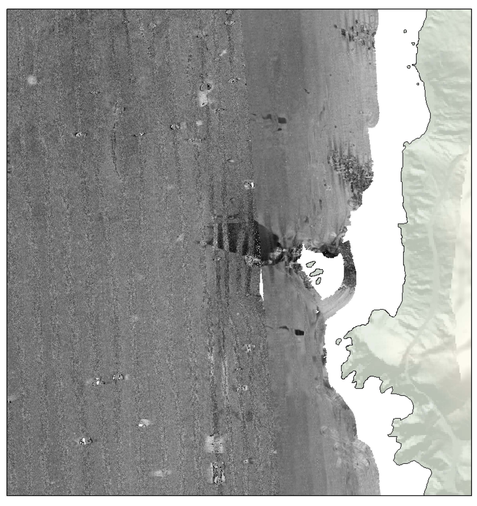


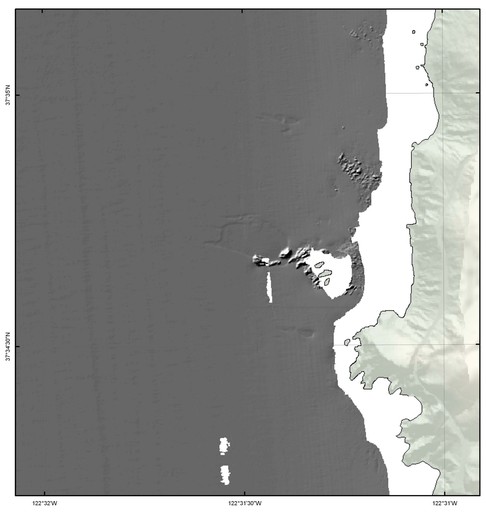


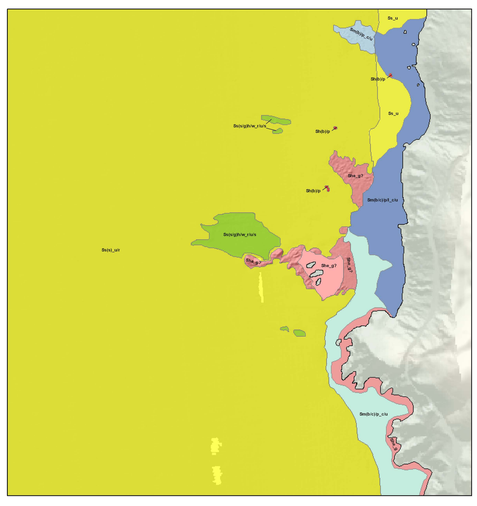


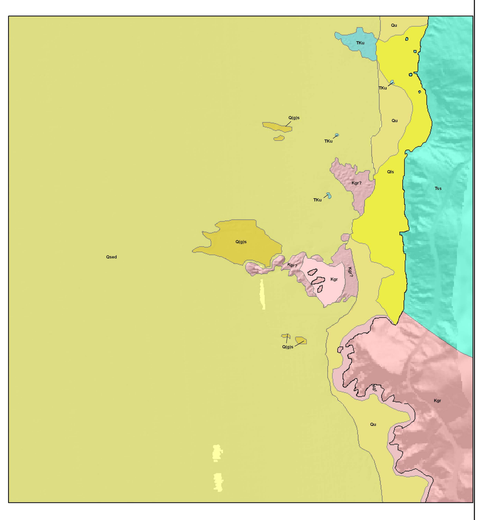
Inset #4: Mori Point



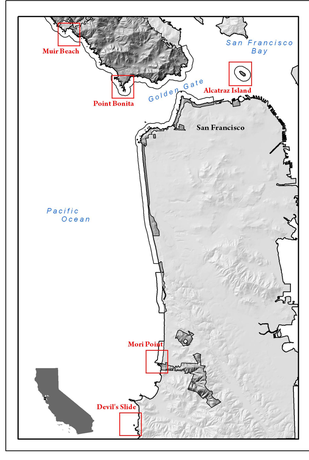








Inset #5: Devil's Slide



Map Information

Map Scale - 1:7500

Datum - WGS 1984

Projection - UTM Zone 10

N W E S

0 0.16 0.33 0.5 Miles

0 250 500 1000 Meters

GGNRA Boundary (includes both onshore and offshore areas)

Backscatter Intensity Scale

High Intensity

Low Intensity

Bathymetric DEM Depths

0 meters (0 feet)

115 meters (380 feet)

Muir Beach has long been a favorite destination for residents and tourists in the San Francisco Bay Area. The beach is wedged between rocky points to form a pocket beach whose heads provide habitat for groundfishes and sessile invertebrates. To the north, the rocky coast is composed of rocks of the Franciscan Complex, and offshore, eroded boulders and pinnacles can be found in an otherwise flat seafloor comprised of mobile sediment (predominantly sand) and mobile scour depressions floored with gravel.

Point Bonita, part of Fort Cronkhite, has a lighthouse and foghorn, which for years provided the main navigational aid for sailors and fishermen navigating the entrance to the Golden Gate. The promontory consists of cliffs, caves, crags and extensive hard complex offshore rocky exposures of fractured and differentially eroded Franciscan Complex greenstone. This substrate ty pe provides good habitat for rockfish and other bottom fishes.

The infamous prison makes ***Alcatraz Island*** one of the GGNRA's most popular tourist destinations, but the bay floor surrounding the island is diverse and spectacular. Alcatraz Island resembles a ship, like those that ply the Bay around it, pointing to the northwest and breaking the bottom tidal flow like a wake. Large sediment waves spread like a bow wake along the starboard (the island's northeast side) with borrow pits produced by dredging off the stern. The island, comprised of Cretaceous sedimentary rock, provides an isolated refuge of rocky habitat for striped bass and other species of fish.

Mori Point is a relatively isolated headland within GGNRA located just minutes away from the populated San Francisco Peninsula. This point, comprised of rocks of the Franciscan Complex, projects westward and separates a sandy nearshore region. A rock wave-cut platform extends offshore where emergent rocky islets and differentially eroded bedrock outcrops exist. This bedrock projection provides an isolated habitat for rockfish and other bottom dwelling fish in an otherwise flat sandy seafloor.

Devil's Slide is an area of steep cliffs of Franciscan melange comprised of serpentine, metavolcanic, and graywackes that tumble into the Pacific Ocean below. The landslide debris produces a dynamic mixed marine benthic habitat that is constantly being altered through the addition of new landslide materials, winnowing by storms and currents, and the intrusion of sands transported by the longshore drift.

Golden Gate National Recreation Area

Seabed Classification Map Series

Areas of Interest

Map produced by H. Gary Greene[1], Eric Niven[1], Charlie Endris[1], and Bryan Dieter[1], with contributions from Patrick Barnard[2] and Eleyne Phillips[3]

2009

EDITOR: H. GARY GREENE

[1]Center for Habitat Studies, Moss Landing Marine Labs, Moss Landing, CA
[2]US Geological Survey, Pacific Science Center, Santa Cruz, CA
[3]US Geological Survey, Menlo Park, CA

Geologic Units

a	Anthropogenically modified seafloor (spoils, dredge sites, scours)	
af	Artificial fill or disturbance	
Qm	Quaternary - Holocene - Estuarine and marine muds	
Qls	Quaternary - Holocene - Landslide deposits	
Qcl	Quaternary - Holocene - Colluvium (unsorted boulders, gravel, sand)	
Qal	Quaternary - Holocene - Alluvial deposits	
Qu	Quaternary - Holocene - Undifferentiated sedimentary deposits	
Q[g]s	Quaternary - Holocene - Sand (>95%) w/ gravel	
Qsw	Quaternary - Holocene - Sediment waves	
Qsed	Quaternary - Holocene - Marine sediment	
Tss	Paleocene - Unnamed sandstone, shale, & conglomerate	
Kgr	Cretaceous granite - Salinian Complex - Montara Mountain	
Klf	Cretaceous - Jurassic - Franciscan Complex rocks, undifferentiated	
KJfs	Sandstone and/or shale	
KJfg	Greenstone	
KJfgw	Greywacke	
Kdb	Diabase (crops out at Point Bonita)	

Habitat Types

Ss_u Es_u	Unconsolidated sediment
Es(s/m)_u/r	Unconsolidated rippled sediment (sand/mud)
Ss(s)_u/r Es(s)_u/r	Unconsolidated rippled sediment (sand)
Ss(s/g)_u/r Es(s/g)_u/r	Unconsolidated rippled sediment (sand/gravel)
Ss(s/g)_h/u	Hummocky sediment (sand/gravel)
Esw	Sediment waves
Es(s/m)w	Sediment waves (sand/mud)
Ss(s)w Es(s)w	Sediment waves (sand)
Es(s/g)w	Sediment waves (sand/gravel)
Ss(s/g)h/w_r/u/s	Rippled scour depression (sand/gravel)
Sme_c/u Eme_c/u	Sediment covered bedrock
Sm(b)/p_c/u	Mixed zone of boulders, cobbles, and unconsolidated sediment (inferred)
Sm(b/c)/p/l_c/u	Mixed zone of boulders, cobbles, and unconsolidated sediment (inferred)
Shd_c/d Ehd_c/d	Deformed sedimentary bedrock outcrop
She_g	Granitic bedrock
Sb(b)/p Eb(b)/p	Pinnacle, boulder, or boulder field
Sb(b)/p/l	Landslide debris consisting of boulders and/or pinnacles

Map produced by the Center for Habitat Studies at Moss Landing Marine Laboratories, in conjunction with the U.S. Geological Survey (USGS) and the National Park Service

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Golden Gate

National Recreation Area