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Golden Gate National Recreation Area

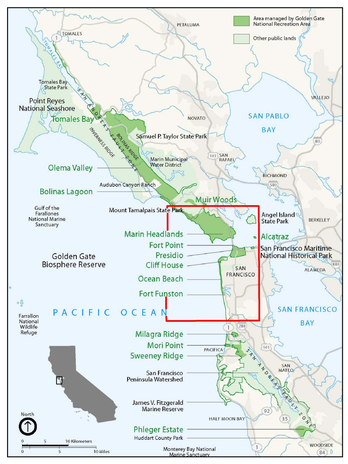
Seabed Classification Map Series

Map 5 of 5: Potential Marine Benthic Habitats

The purpose of a Potential Marine Benthic Habitat Map is to identify and characterize areas of the seafloor, based on morphology and substrate type, which may or may not be used as habitat by an organism or assemblage of organisms. Each species that inhabits the waters surrounding San Francisco Bay have their own ecological niche that is strongly dependent on various environmental factors. Several of those factors, such as depth, morphology, and physical characteristics of the sediment, are presented here as information that contributes to our understanding of an organism's potential needs. Other biophysical factors, such as predator-prey relationships, water temperature, salinity, and nutrients, are just as important in determining an organism's habitat, yet these exist within ephemeral spatial and temporal scales that cannot be represented by a two-dimensional map. Nonetheless, our efforts to comprehend the complex environment beneath the surface of the ocean must first begin at the bottom; an exposed benthic landscape categorized and described in detail.

Map Information

Map Scale - 1:24,000
Datum - WGS 1984
Projection - UTM Zone 10
Kilometers: 0 0.5 1 2
Miles: 0 0.5 1 1.5



Key to Habitat Substrate Types

Unconsolidated Sediments

Ss_u, Es_u	Unconsolidated sediment
Es(m)_u/r	Unconsolidated rippled sediment (mud)
Es(m)h_u	Depression (mud)
Es(s/m)_u/r	Unconsolidated rippled sediment (sand/mud)
Es(s/m)_h	Hummocky sediment (sand/mud)
Es(s/m)m_u	Mound or linear ridge (sand/mud)
Es(s/m)h_s	Current scoured depression (sand/mud)
Es(s/m)g_s	Current scoured gully (sand/mud)
Es(s/m)s	Scarp (sand/mud)
Ss(s)_u/r, Es(s)_u/r	Unconsolidated rippled sediment (sand)
Es(s)h_s	Current scoured depression (sand)
Es(s)h_u	Depression (sand)
Es(s)s	Scarp (sand)
Es(s)s_s/u	Current-scoured scarp (sand)
Ss(s/g)_u/r, Es(s/g)_u/r	Unconsolidated rippled sediment (sand/gravel)
Ss(s/g)h_u	Current scoured depression (sand/gravel)
Ss(s/g)_h/u	Hummocky sediment (sand/gravel)
Es(s/g)h_s	Current scoured depression (sand/gravel)
Ss(s/g)m_u, Es(s/g)m_u	Mound or linear ridge (sand/gravel)

Sediment Waves

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)

Anthropogenically Disturbed Sediments

Es(s/m)_a-dg	Dredge grooves (sand/mud)
Es(s/m)_a-dp	Dredge potholes (sand/mud)
Es(s/m)_a-f	Prop scours (sand/mud)
Es(s/m)h_s/a-w	Current scour around a shipwreck (sand/mud)
Es(s)_a-dg	Dredge grooves (sand)
Es(s)_a-dp	Dredge potholes (sand)
Es(s)h_s/a-w	Current scour around a shipwreck (sand)
Ss(s)g_a-dg	Dredged channel (sand)
Es(s/g)_a-f	Prop scours (sand/gravel)
Ss(s/g)h_s/a-p	Current scoured depressions around pipeline (sand/gravel)
Es(s/g)_a-dg	Dredge grooves (sand/gravel)
Es(s/g)_a-dp	Dredge potholes (sand/gravel)
Ss(m/s/g)_b/h/a-dd, Es(m/s/g)_b/h/a-dd	Hummocky dredge disturbances or disposal materials

Mixed Hard/Soft Substrate

Sme_c/u, Eme_c/u	Sediment covered bedrock
Sm/g_b/s, Em/g_b/s	Scoured bedrock with local cover of bimodal coarse-grained sediment
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)
Em(b/c)/p_c/u	Boulders or pinnacles surrounded by unconsolidated sediment

Hard Substrate

Shd_c/d, Ehd_c/d	Deformed sedimentary bedrock outcrop
Shd_c/d/s, Ehd_c/d/s	Deformed sedimentary bedrock outcrop, current scoured
Shc_g	Granitic bedrock
Sh(b)/p, Eh(b)/p	Pinnacle, boulder, or boulder field
Sh(b)/p/l	Landslide debris consisting of boulders and/or pinnacles
Eh(b)_a	Boulder-size rubble blasted from top of bedrock outcrops

Hard Anthropogenic Features

Sh_a-g, Eh_a-g	Groin, jetty, or rip-rap
Sh_a-p	Pipeline
Eh_a-s	Dock pilings
Eh_a-w	Shipwreck

Offshore Data Sources

Key to Data Sources

Bathymetry and Backscatter

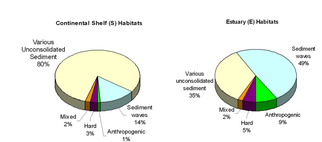
- CSCC 2m multibeam
- USGS/CSCC 1m multibeam
- CSCC 1m multibeam
- USGS single-beam jetski
- No Data

CSCC = California State Coastal Conservancy
USGS = United States Geological Survey

Sediment Samples

- USGS usSEABED
- USGS June 2005
- USGS Winter 2008
- USGS Fall 2008

Summary of Habitat Substrate Types



	Total Mapped Area (km^2)			% of Total			% of Megahabitat	
	Shelf	Estuary	All	Shelf	Estuary	All	Shelf	Estuary
All habitats	316.71	34.94	351.64	90.1%	9.9%	100.0%	100.0%	100.0%
Specific Habitats								
Hard	8.42	2.12	10.54	2.4%	0.6%	3.0%	2.7%	6.1%
Anthropogenic	0.05	0.26	0.31	0.0%	0.1%	0.1%	0.0%	0.7%
Other	8.36	1.86	10.23	2.4%	0.5%	2.9%	2.6%	5.3%
Soft unconsol	301.60	32.19	333.79	85.8%	9.2%	94.9%	95.2%	92.1%
Anthropogenic	3.13	2.79	5.92	0.9%	0.8%	1.7%	1.0%	8.0%
Sediment waves	43.98	17.14	61.12	12.5%	4.9%	17.4%	13.9%	49.1%
Other	254.49	12.26	266.75	72.4%	3.5%	75.9%	80.4%	35.1%
Mixed	6.69	0.63	7.32	1.9%	0.2%	2.1%	2.1%	1.8%

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

Golden Gate

National Recreation Area