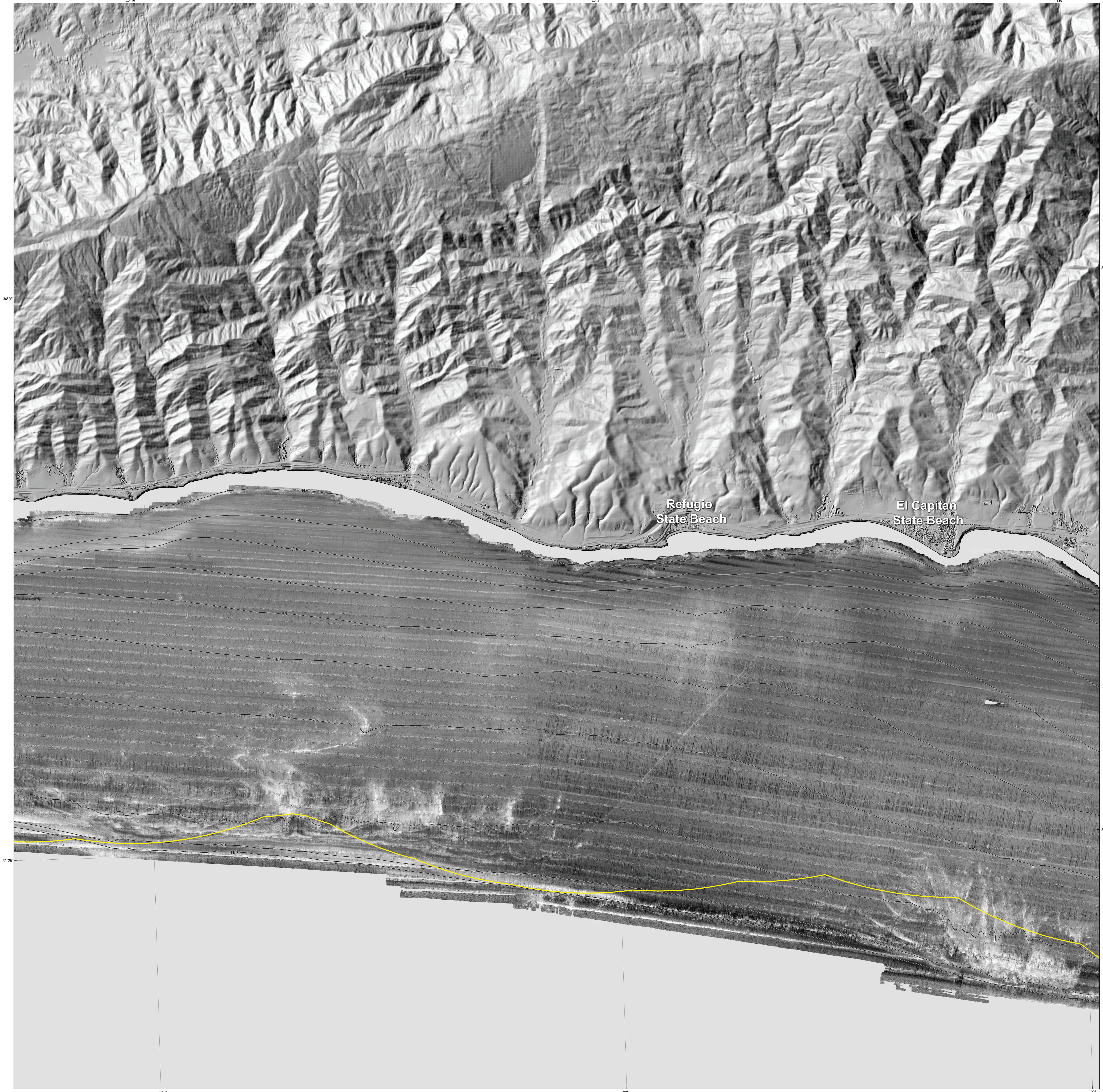

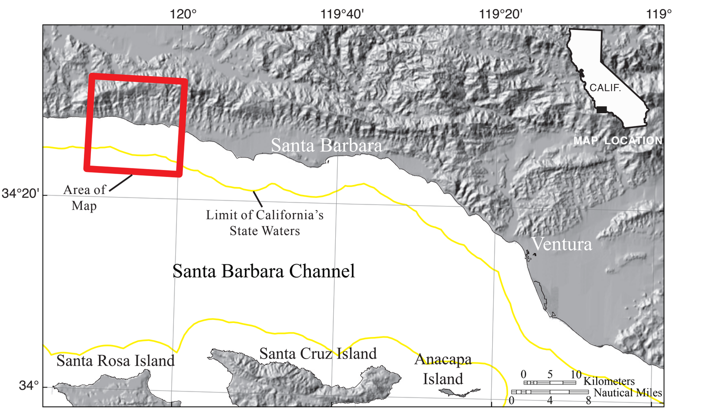

DISCUSSION

This acoustic-backscatter map of the Offshore of Refugio Beach map area in southern California was generated from backscatter data collected by the U.S. Geological Survey (USGS) (fig. 1). The USGS mapped this region in 2008, using a 234.5-kHz SEA (AP) Ltd. SWATHplus-M phase-differencing sidescan sonar that collected acoustic-backscatter data from about the 10-m isobath to beyond the 3-nautical-mile limit of California's State Waters.

During the USGS mapping mission, GPS data with real-time-kinematic corrections were combined with measurements of vessel motion (heave, pitch, and roll) in a CodaOctopus F180 attitude-and-position system to produce a high-precision vessel-attitude packet. This packet was transmitted to the acquisition software in real time and combined with instantaneous sound-velocity measurements at the transducer head before each ping. The returned samples were projected to the seafloor using a ray-tracing algorithm that works with previously measured sound-velocity profiles. Statistical filters were applied to discriminate seafloor returns (soundings and backscatter intensity) from unintended targets in the water column. The backscatter data were postprocessed using USGS software (D.P. Finlayson, written commun., 2011) that normalizes for time-varying signal loss and beam-directivity differences. Thus, the raw 16-bit backscatter data were gain-normalized to enhance the backscatter of the SWATHplus system. The resulting normalized-amplitude values were rescaled to 16-bit and gridded into GeoJPEGs using GRID Processor Software, then imported into a geographic information system (GIS) and converted to GRIDs.

The acoustic-backscatter imagery was displayed in a GIS to create this map on which brighter tones indicate higher backscatter intensity, and darker tones indicate lower backscatter intensity. The intensity represents a complex interaction between the acoustic pulse and the seafloor, as well as characteristics within the shallow subsurface, providing a general indication of seafloor texture and sediment type. Backscatter intensity depends on the acoustic source level; the frequency used to image the seafloor; the grazing angle; the composition and character of the seafloor, including grain size, water content, bulk density, and seafloor roughness; and some biological cover. Harder and rougher bottom types such as rocky outcrops or coarse sediment typically return stronger intensities (high backscatter, lighter tones), whereas softer bottom types such as fine sediment return weaker intensities (low backscatter, darker tones).

The onshore-area image was generated by applying an illumination having an azimuth of 300° and from 45° above the horizon to coastal airborne topographic-lidar data, as well as to publicly available, 3-m-resolution, interferometric synthetic aperture radar (ifSAR) data, available from National Oceanic and Atmospheric Administration (NOAA) Coastal Service Center's Digital Coast, at http://csc-s-maps-q.csc.noaa.gov/dataviewer/viewer.html (last accessed November 2012).

EXPLANATION

Backscatter intensity

High

Low

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

20 **Bathymetric contour (in meters)**—Derived from modified 10-m-resolution bathymetry grid. Contour interval: 10 m

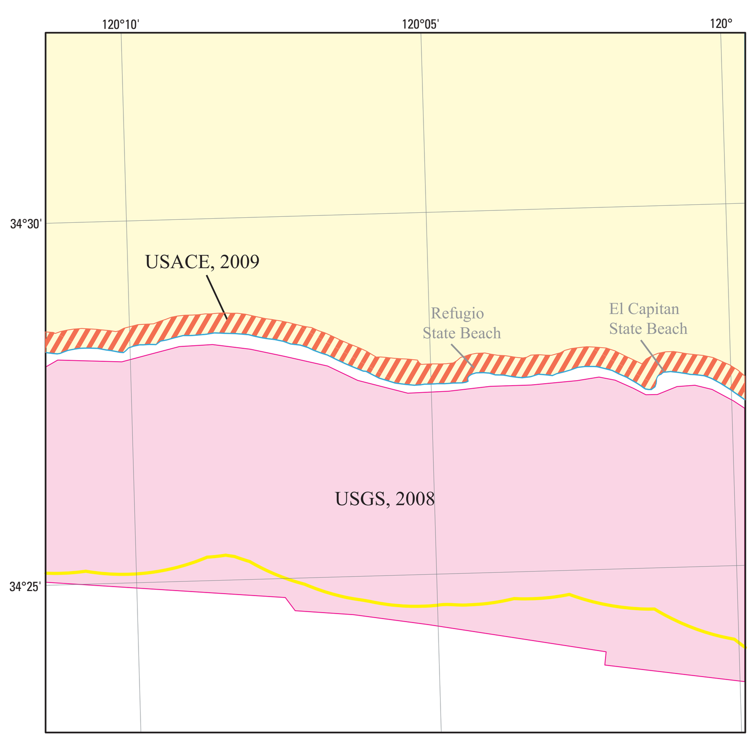

Figure 1. Map showing areas of bathymetric-sidescan surveys (pink shading), topographic-lidar surveys (orange diagonal lines), and publicly available interferometric synthetic aperture radar (ifSAR) topography (yellow shading). Also shown are data-collecting agencies (USACE, U.S. Army Corps of Engineers; USGS, U.S. Geological Survey) and dates of surveys if known.

Coastal Conservancy

CALIFORNIA OCEAN PROTECTION COUNCIL

NOAA

US Army Corps of Engineers

SEAFLOOR MAPPING LAB CSU MONTEREY BAY

Onshore elevation data from NOAA Coastal Services Center (data collected by EarthData International in 2002-2003) and from U.S. Army Corps of Engineers (data collected by Fugro Pelagos in 2009). California's State Waters limit from NOAA Office of Coast Survey

Universal Transverse Mercator projection, Zone 10N

NOT INTENDED FOR NAVIGATIONAL USE

TRUE NORTH
MAGNETIC NORTH
12½°
APPROXIMATE MEAN DECLINATION, 2015

SCALE 1:24 000

1 1/2 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

BATHYMETRIC CONTOUR INTERVAL 10 METERS

ONE MILE = 0.869 NAUTICAL MILES

CALIF.
MAP LOCATION

Acoustic-backscatter imagery collected by U.S. Geological Survey in 2008 (reprocessed by Peter Dartnell, 2012). Bathymetric contours by Andrew C. Ritchie, 2011

GIS database and digital cartography by Nadine E. Golden and Eleyne L. Phillips

Edited by Sarah E. Nagorsen

Manuscript approved for publication February 4, 2015

Acoustic Backscatter, Offshore of Refugio Beach Map Area, California

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2015

ISSN 2329-132X (online)
http://dx.doi.org/10.3133/sim3319

For sale by U.S. Geological Survey, Information Services, Box 25286, Federal Center, Denver, CO 80225, 1–888–ASK–USGS

Digital files available at http://pubs.usgs.gov/sim/3319/

Suggested Citation: Dartnell, P., Phillips, E.L., and Finlayson, D.P., 2015, Acoustic backscatter, Offshore of Refugio Beach map area, California, *sheet 3 in* Johnson, S.Y., Dartnell, P., Cochrane, G.R., Golden, N.E., Phillips, E.L., Ritchie, A.C., Krigsman, L.M., Dieter, B.E., Conrad, J.E., Greene, H.G., Seitz, G.G., Endris, C.A., Sliter, R.W., Wong, F.L., Erdey, M.D., Gutierrez, C.I., Yoklavich, M.M., East, A.E., and Hart, P.E. (S.Y. Johnson and S.A. Cochran, eds.), California State Waters Map Series—Offshore of Refugio Beach, California: U.S. Geological Survey Scientific Investigations Map 3319, pamphlet 42 p., 11 sheets, scale 1:24,000, *http://dx.doi.org/10.3133/sim3319*.