USGS
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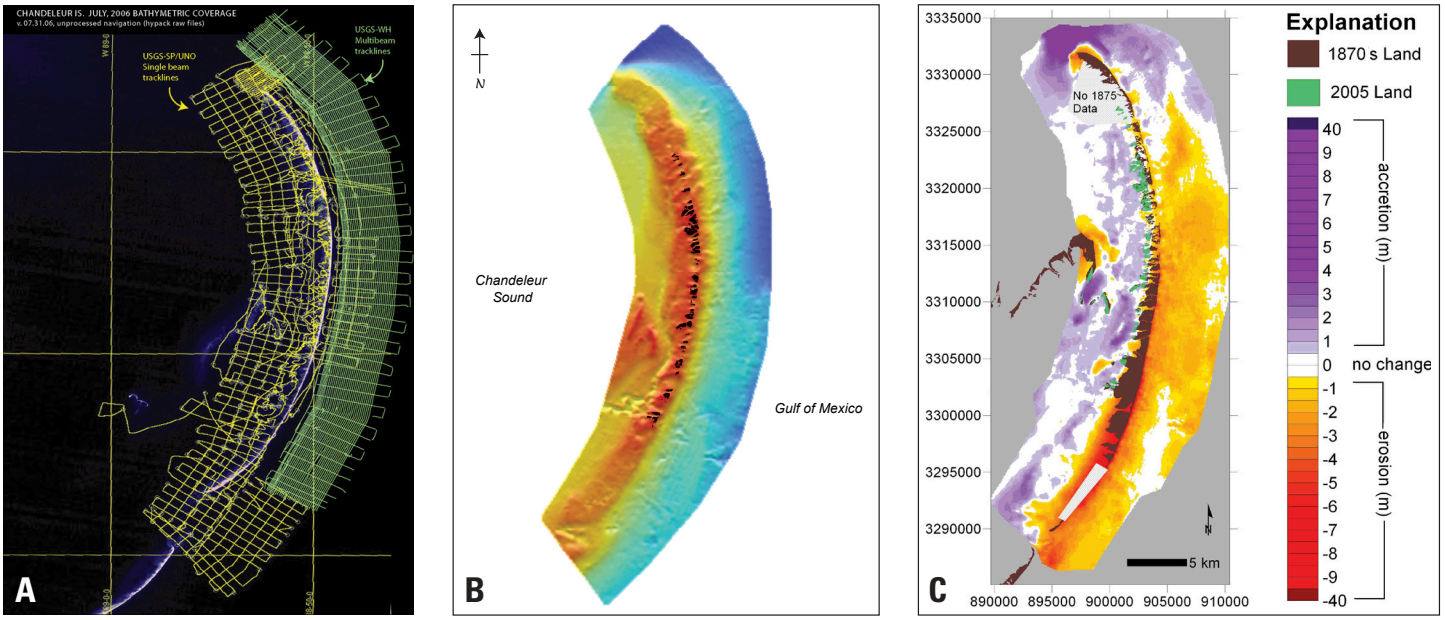
Science Supporting Gulf of Mexico Oil-Spill Response, Mitigation, and Restoration Activities

Assessment • Monitoring • Mapping • Coordination



USGS expertise, data, and mapping products like these provide important decision-support information for first responders, emergency managers, planners, resource managers, and policy makers. Examples above include (A) a dense network of seismic-trackline data locations that are used to create (B) shaded bathymetric maps. By collecting these data, scientists can calculate and track changes, trends, and impacts over time. An example of a map showing where seafloor change has occurred between 1870 and 2005 is shown in (C).

The St. Petersburg Coastal and Marine Science Center of the U.S. Geological Survey (USGS) investigates physical processes related to coastal and marine environments and societal implications related to natural hazards, resource sustainability, and environmental change.

Immediately after the *Deepwater Horizon* event, the USGS began responding to data requests, directing response personnel, and providing coastal and shelf geophysical data to coastal-resource managers. The USGS provided oil-spill responders with up-to-date coastal bathymetry, geologic data, and maps characterizing vulnerability and levels of risk from potential spill impacts in Louisiana, Mississippi, and Alabama. Baseline conditions prior to any spill impacts were documented through programs that included shoreline sampling and sediment coring from east Texas to the east coast of Florida and aerial photography of many environmentally sensitive Gulf coastal areas. The USGS responded to numerous verbal and written data requests from Federal, State, and local partners and academic institutions with USGS scientific staff participating in the Coast Guard Unified Commands (UC) and Operational Science Advisory Teams (OSAT). The USGS conducted technical review of reports and plans for many response activities. Oil-spill responders, managers, and personnel on the ground, including partners such as the National Park Service, Gulf Islands National Seashore, Chandeleur Islands Refuge, and State agencies, continue to rely on USGS products.

U.S. Department of the Interior
U.S. Geological Survey

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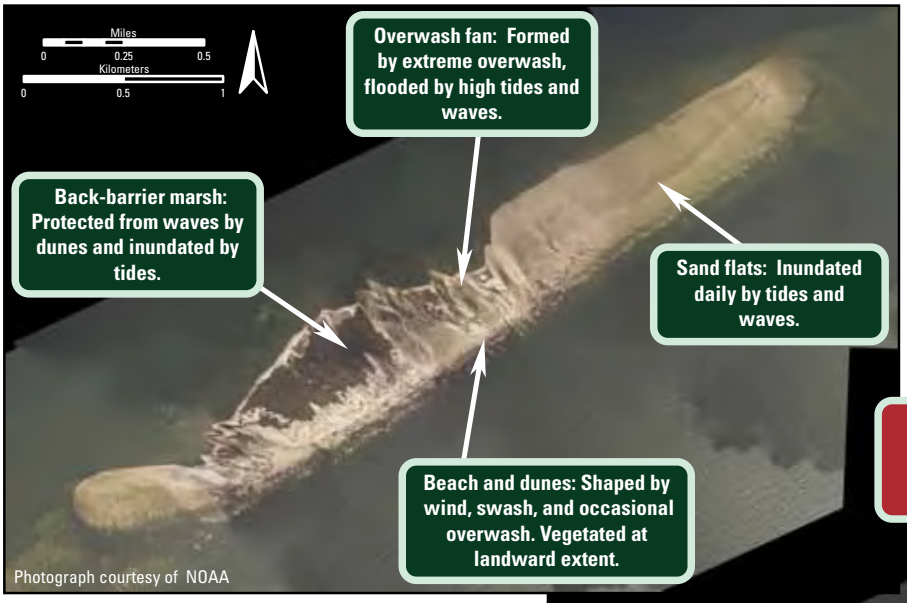
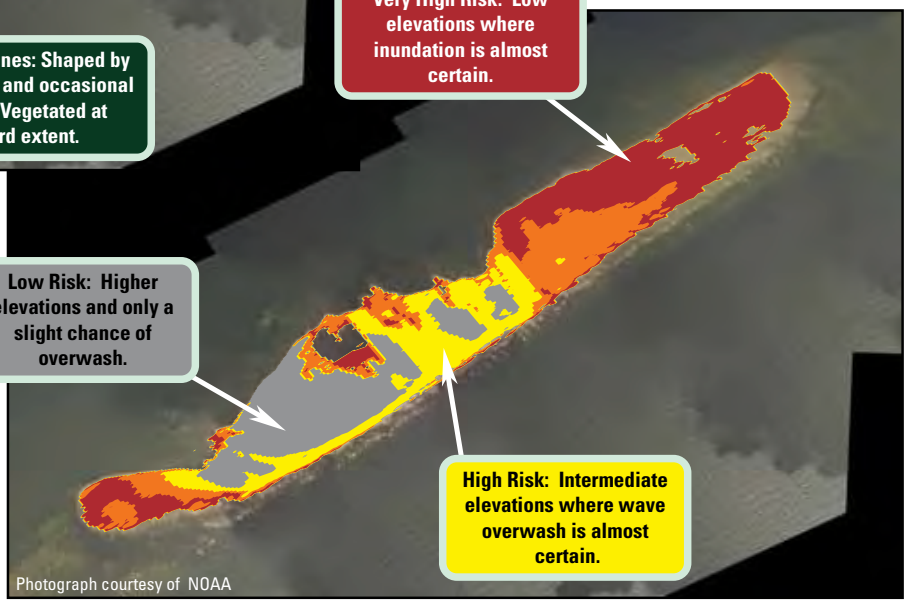
Assessing the Effects of Sand-Barrier Berm Construction

The USGS conducted investigations to evaluate the impacts of constructing a sand-barrier berm to prevent oil from migrating into Louisiana marshes. To better clarify the response of the landscape to the berm, the USGS worked with the U.S. Fish and Wildlife Service and the U.S. Army Corps of Engineers to evaluate timing and dimensions of berm construction, availability of sand resources, impacts from waves and changes to coastal morphology, changes in water velocity through inlets, and salinity gradients in coastal areas. This comprehensive scientific support gave decisionmakers the tools needed for timely response and information critical for the permitting process.

http://pubs.usgs.gov/of/2010/1108/





Low Risk:
No inundation or overwash

High Risk (waves):
Flooded by overwash

Very High Risk (surge):
Flooded by surge and tides

Very High Risk (tides):
Flooded by high tides

Identifying Risk of Oil Deposition, Inundation, and Overwash to Barrier Islands

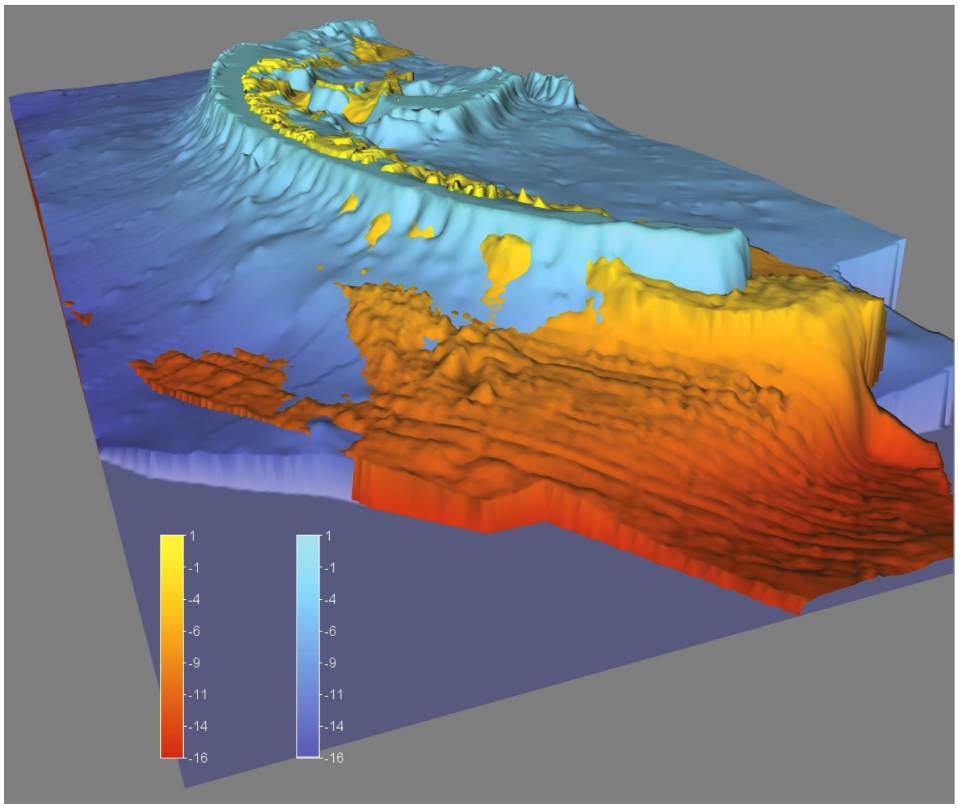
USGS scientists identified barrier islands in the northern Gulf of Mexico most vulnerable to oil deposition by comparing island and coastal topography to modeled water levels. Due to the shallow continental shelf and low-lying barrier islands, potential exists for water to move across the full width of the islands in certain locations and to transport oil into the back bays and marshes. The USGS created maps to show barrier-island areas most vulnerable to inundation and overwash. These maps can be used to estimate the possible extent of oil deposition and to inform planners and decisionmakers.

http://www.usgs.gov/oilspill/docs/BarrierIsland_DWH.pdf *http://www.usgs.gov/oilspill/scenario/default.asp*

Mapping and Geospatial Data Products of Coastal and Marine Environments

The USGS creates a wide range of mapping and data products, including lidar topography, bathymetry, and high-resolution aerial imagery of barrier islands, nearshore benthic habitats, and coastal wetlands. Scientific partners, planners, and resource managers involved in ongoing oil-related research rely on these data products to monitor critical coastal habitat, capture storm impacts, and estimate elevation changes to respond to and plan oil-spill activities effectively. High-resolution imagery of the Chandeleur Islands provided critical background information to resource managers.

http://ngom.usgs.gov/dsp/



Digital elevation model of coastal Louisiana, looking south along the Chandeleur Island chain (yellow), shows offshore sediment progradation northward between 1870 and 2005 as the barrier islands migrate due to longshore transport. Courtesy of Mike Miner, University of New Orleans.

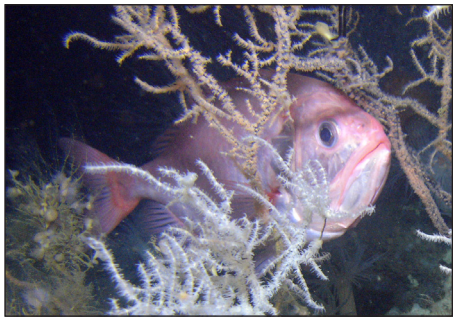
Monitoring Seafloor Habitats for Oil-Spill Impacts

The USGS developed the Along-Track Reef-Imaging System (ATRIS) to support mapping activities and ground-truthing of acoustic, lidar, and satellite imagery of submerged coastal environments. Shallow and deep configurations of ATRIS allow scientists to characterize benthic habitats in water depths ranging from 2 to 25 meters. Both versions acquire high-resolution, color digital photographs of the seafloor, along with corresponding GPS and depth data. This detailed imagery enables scientists to identify substrate, habitat, and epibenthic organisms, and can be used to monitor changes over time. In May 2010, over 130,000 ATRIS images of seagrass habitat were collected along barrier islands off the coast of Mississippi to document baseline conditions prior to potential oil-spill impacts.

http://coastal.er.usgs.gov/crest/research-themes/benthic-habitat.html

Understanding the Role of Bacteria in Bioremediation

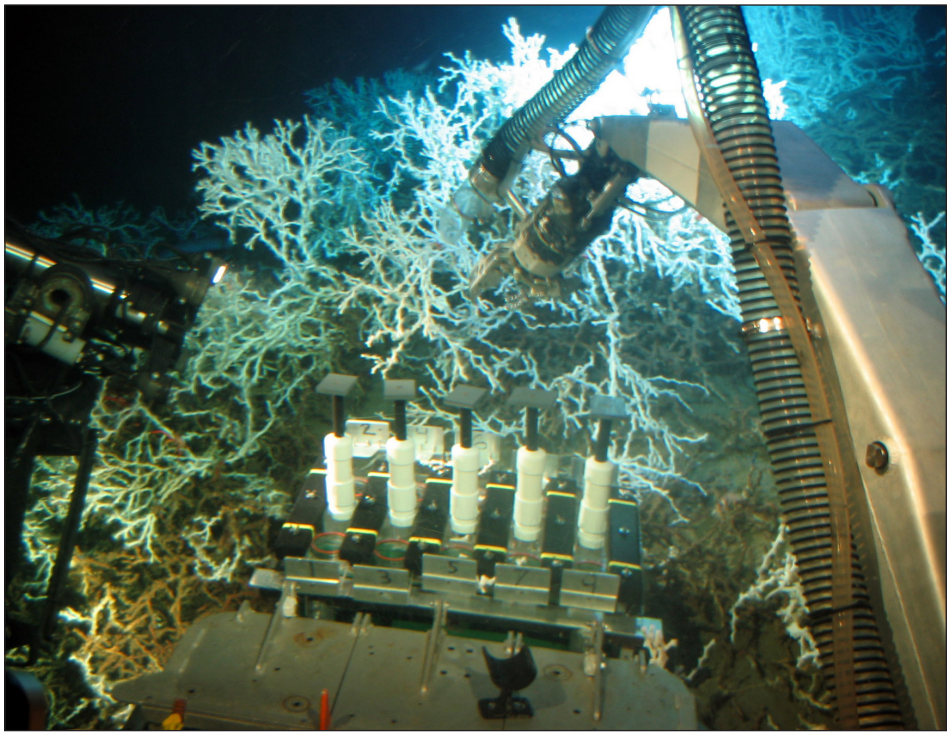
Bacterial communities may enhance or inhibit active degradation of oil into soluble products. USGS scientists are monitoring oil contamination of coastal ecosystems through geomicrobiology and the development of proactive protocols that enhance initial bioremediation processes. USGS expertise integrates multidisciplinary data from coastal areas, including coastal morphology, microbiology, nutrient, and other water-quality parameters, to understand where application of bioremediation methods will be most effective. In addition, scientists are characterizing microbes found in beach sediments from both oil-impacted and unimpacted areas to determine whether there have been significant changes in natural microbial communities.



Understanding Possible Impacts on Deep-Sea Coral Reef Ecosystems

Oil impacts on remote deep ecosystems (depths of 370 meters and below) require baseline information about ecosystem diversity and ecology. Intensive research on deep-sea coral reef ecosystems in the Gulf of Mexico just began in the last decade. USGS scientists are collecting and analyzing coral tissue, sediments at reef sites, and associated organisms to identify whether exposure to oil or dispersants impacted deep-sea coral communities.

http://fl.biology.usgs.gov/DISCOVRE/



For more information:

http://coastal.er.usgs.gov/

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