BOEM OCEAN SCIENCE

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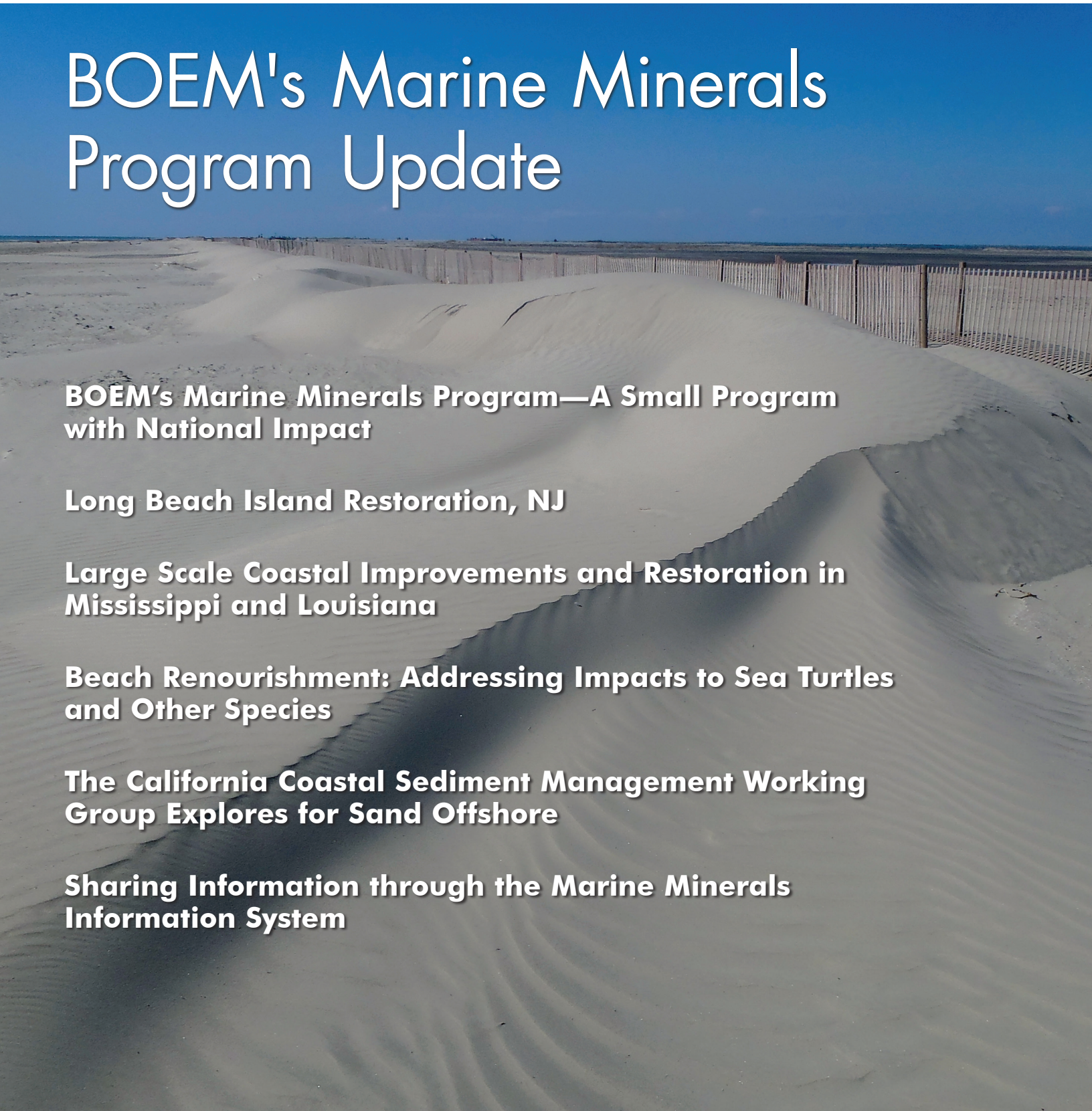
VOLUME 15 ISSUE 1 • AUGUST/SEPTEMBER/OCTOBER/NOVEMBER 2017

BOEM's Marine Minerals Program Update



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BOEM OCEAN SCIENCE is published quarterly by the Bureau of Ocean Energy Management to communicate recent ocean science, technological information, and issues of interest related to offshore energy recovery, marine minerals, and ocean stewardship.

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ON THE COVER
Sand fence installed during the Pelican Island beach renourishment project. Photo by Michael Miner, BOEM.

All photos courtesy of the Bureau of Ocean Energy Management unless otherwise noted.

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Frequently Used Abbreviations

MMIS	Marine Minerals Information System
MMP	Marine Minerals Program
OCS	Outer Continental Shelf

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Check out the Bureau of Ocean Energy Management website at **www.boem.gov**.

The Acting Director's Message

This edition of *BOEM Ocean Science* focuses on our Marine Minerals Program and the important role it plays, not just for the 18 coastal states involved with the program through coastal restoration projects, cooperative agreements, or research, but also for our Nation. Erosion—both continual and episodic (i.e., storm events)—of our beaches, dunes, barrier islands, and coastal wetlands is a serious problem that affects natural resources, energy development, national defense, and public infrastructure, as well as economically important tourism.

The bureau is participating in the Department of the Interior Federal Disaster Recovery Coordination effort for Hurricanes Harvey and Irma which struck Texas and the Atlantic coast respectively in September 2017, as local, state, and federal agencies assess the needs and response planning. BOEM staff deployed to Texas, and to Puerto Rico in the aftermath of Hurricane Maria, to help with the recovery. BOEM's Marine Minerals Program strives to enhance the resilience of coastal communities by leasing sand and gravel for beach, dune, and wetland restoration, and shore protection projects. It protects valuable public infrastructure and expands our knowledge through biological, geological, and physical studies of the ocean.

A 2016 report from the National Ocean Economics Program (NOEP) at Middlebury Institute of International Studies in Monterey, CA provides some interesting information on our coastal economy. According to NOEP, more than 80 percent of the Nation's population lives in coastal states if you include the states surrounding the Great Lakes. Counties adjacent to the shore account for about 43 percent of U.S. GDP, yet represent 17 percent of the Nation's landmass, including Alaska. Those numbers are meaningful. More people continue to choose to live in coastal states where dependence on ocean resources is greatest. Overall U.S. population grew by almost 40 million people from 2000 to 2015; almost 80 percent of the growth occurred in coastal states. That's a substantial increase of 32 million people in coastal states in just 15 years.

BOEM considers the value of resource development in dollars and cents, but also recognizes intangible values such as the enjoyment we find from swimming, fishing, sailing, and walking along a beach or coastal trail. The value of our coastal restoration projects extends to protecting national defense infrastructure and contributing to the scientific research conducted off our coast as well.

Whether you are an economist who loves numbers or someone who enjoys walking on the beach, I hope you will enjoy reading about how this program benefits the Nation.

–Walter D. Cruickshank

Our Coastal Economy - 2016 NOEP Report

- 80% of the Nation's population lives in coastal states
- 43% of U.S. GDP is in shore-adjacent counties
- 17% of the Nation's landmass is in shore-adjacent counties

For More Information

U.S. Coastal Population Data

http://www.oceaneconomics.org/Demographics/

BOEM's Marine Minerals Program—A Small Program with National Impact

Have you visited the beach this year? Perhaps Sandbridge, near Virginia Beach, or Long Beach Island, NJ? Kitty Hawk, NC, or Jacksonville beaches in Florida? Maybe you watched pelicans or went fishing at Caminada Headland, LA. If you did, then you probably set foot on a beach or enjoyed coastal habitat restored with sand from the federal Outer Continental Shelf (OCS) leased by the Bureau of Ocean Energy Management's (BOEM) Marine Minerals Program (MMP).

In addition to helping to safeguard our coastlines and beaches, the MMP also protects valuable infrastructure. For example, Caminada is a barrier island separating the Gulf of Mexico from Port Fourchon, LA, which connects offshore oil production to 50 percent of U.S. refining capacity. In Virginia, beach reconstruction at NASA's Wallops Flight Facility protects launch pads for rockets carrying scientific payloads. OCS sand protects Naval Air Station Oceana at Virginia Beach and Patrick Air Force Base on Florida's Space Coast.

The OCS Lands Act and associated laws authorize BOEM to lease sediment resources from the OCS for shore protection, beach nourishment, and wetlands restoration for public works projects. The bureau conducts studies and employs vigorous environmental oversight to understand and mitigate potential impacts from the removal of OCS sediment. BOEM is the only federal agency authorized to convey marine minerals from the OCS. The program also responds to commercial requests for OCS minerals, such as gold, manganese, or other hard minerals, through competitive leasing procedures.

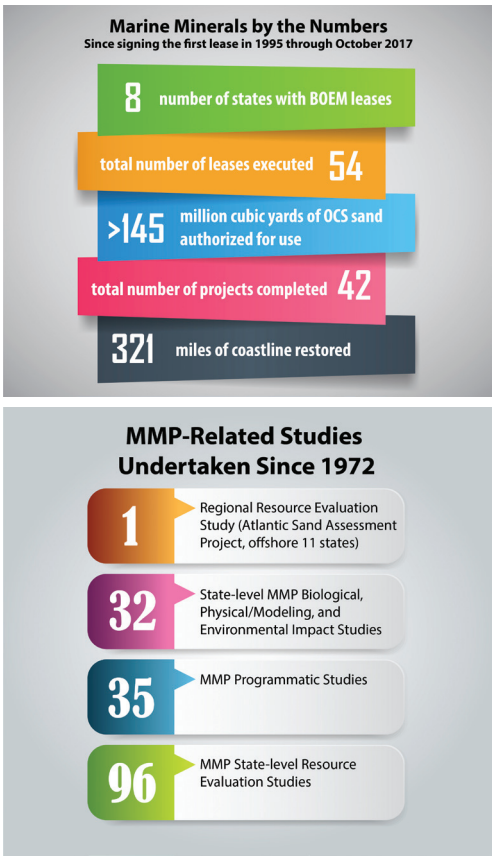
As the landlord responsible for OCS sediment resources, the need and importance of the critical resources we manage has never been clearer. Resilient coastal communities are important to our national economy, national security, coastal habitat, and way of life. BOEM's contribution is increasingly more often, literally, the foundation to building and maintaining resilience.

Priorities

Known reserves of OCS sediment resources have become increasingly scarce due to ever-increasing requests for sand and for higher volumes, resulting from depletion of nearshore and inland sand, major storm impacts, and sea level rise. Multiple-use conflicts sometimes develop from overlapping interest in and uses for OCS sediment resources. A proactive MMP is pursuing three priorities to meet future challenges.

Creating a National Offshore Sand Inventory

Fundamental to being a good steward of a resource is knowing how much resource you have. Hence, our first priority is to create a National Offshore Sand Inventory. Marine Minerals geological, geophysical, and environmental information collected over the past two decades is providing the foundation, while recent and ongoing data collection is helping us understand the scope. All of this data is captured in the Marine Minerals Information System (MMIS) which we expect to launch and share in 2018 to support proactive planning for expected and emergency needs. The MMIS will allow users to generate reports, maps, and diagrams.

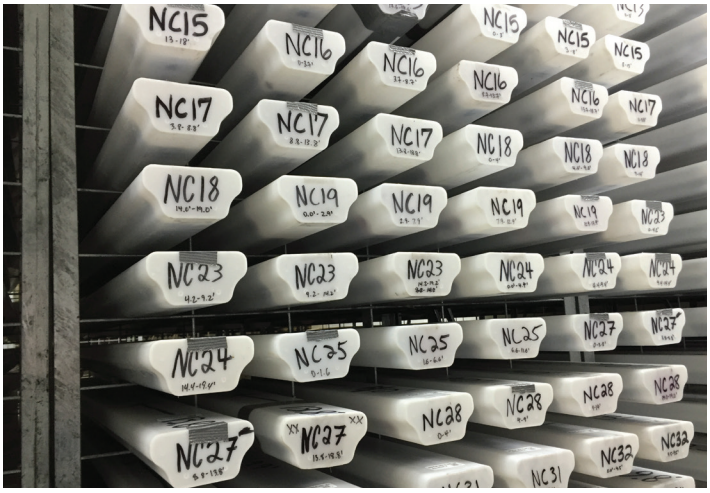


One example of this data is from the Atlantic Sand Assessment Project (ASAP). While the ASAP was the MMP's most ambitious data collection effort to date, comprising a study area between three and eight nautical miles offshore from Massachusetts to Florida, it involved less than one percent of the potential sand resource area for the Atlantic coast. OCS resource data for the Gulf of Mexico and Pacific will be added to the MMIS.

The ASAP collected more than 250 sediment cores and 100 grab samples that provide critical information on the sediment distribution and makeup (sediment layer thickness and composition, organic material content, and overall compatibility with beach sands). Important not only for identifying potential OCS sediment resources, the core analysis is a bonanza for coastal researchers and managers involved in planning, decision-making, and emergency response. The

broader scientific community also gains a greater knowledge of the ocean and sediments as a result.

The ASAP physical core samples and data analysis are available through the Lamont-Doherty Core Observatory's System for Earth Sample Registration (SESAR) at http://www.geosamples.org/ (type in "set name/igsn" and "BOEM" to search the collection). The full set of ASAP metadata will be accessible through Lamont's main database, the Index to Marine and Lacustrine Geological Samples (IMGLS), housed in the National Centers for Environmental Information archives.



The Lamont Doherty Core Storage Facility, Oct. 2016. Photo by Marjorie Weisskohl, BOEM

Strengthening Partnerships

Our second priority is to continue strengthening our partnerships which date from the 1980s and provided the original foundation for the National Offshore Sand Inventory. Hurricanes Katrina and Sandy spurred BOEM to accelerate research and focus more on regional collaboration and communication. To better explain our processes for negotiated noncompetitive agreements with our partners, BOEM published new regulations (30 CFR 583) that clarify requirements.

BOEM has partnered with other federal and state government agencies in Louisiana and non-governmental organizations to restore Caminada Headland with OCS sand and funds from the *Deepwater Horizon* Natural Resources Damage Assessment.

BOEM's Hurricane Sandy funding enabled us to expand our regional Sand Management Working Groups along the Atlantic coast to evaluate immediate and long-term needs. Through BOEM cooperative agreements, states updated maps and databases of offshore resources and shared their projections for future sand needs. Our expanded outreach includes coordination with fisheries groups, nonprofit organizations, and tribes. Sand Management Working Groups also engage Gulf stakeholders.

Recently signed Memoranda of Understanding with the U.S. Army Corps of Engineers and another with the Association of American State Geologists promote cooperation, coordination, and information sharing (See p.12).

Sign commemorating the completion of the Caminada Headland Beach and Dune Restoration Project in Dec. 2016. BOEM partners for this project (left to right): Weeks Marine; Louisiana Department of Wildlife and Fisheries; Greater Lafourche Port Commission; National Fish and Wildlife Foundation; Louisiana Coastal Protection and Restoration Authority; Coastal Impact Assistance Program, Louisiana; Barataria-Terrebonne National Estuary Program; RES; U.S. Army Corps of Engineers (Mobile District); Coastal Engineering Consultants; Soil Erosion Consultants, LLC. Photo by Jessica Mallindine, BOEM.

Environmental and Sand Resource Studies

Our third priority is to continue conducting studies that are integral to monitoring and mitigating potential impacts from dredging. Several studies on sea turtles, fish tagging, and evaluating sand resources are featured in the articles that follow.

Preparing for the Future:

Understanding the resource we have the honor to manage is fundamental to planning for the future of our shorelines, our wetlands, and our coastal infrastructure. Creating the National Sand Inventory, building the Marine Minerals Information System, strengthening our partnerships, as well as continuing to study and understand the potential and impacts of OCS sand use are critical to the Nation's coastal wellbeing.

–Renee Orr, Chief, Office of Strategic Resources

For More Information

BOEM's Marine Minerals Program
https://www.boem.gov/Marine-Minerals-Program/

ASAP
https://www.boem.gov/Marine-Minerals-Program-offshore-sand-resources/

New Code of Federal Regulations (30 CFR 583)
http://www.boem.gov/82-FR-45962/

BOEM's Hurricane Sandy Fact Sheet
https://www.boem.gov/Fact-Sheet-Hurricane-Sandy/

Atlantic Projects

BOEM's Marine Minerals Program (MMP) helps coastal communities recover from major storm events that erode beaches and threaten infrastructure, but it also helps towns proactively prepare before these storms hit. Along the Atlantic coast, 32 projects in six states have been completed, with those numbers continually increasing.

In the wake of Hurricane Sandy, which made landfall in October 2012, BOEM received more than $16.3 million to address critical needs for Outer Continental Shelf (OCS) sand and gravel throughout the Atlantic coastal areas. This included supporting state-led coastal efforts to plan for resilience, and identifying potential resources 3–8 nautical miles (nmi.) (5.5–14.8 kilometers [km]) offshore from Massachusetts to Miami, Florida, through the Atlantic Sand Assessment Project (ASAP). After the hurricane, BOEM conveyed OCS sand resources to Sandbridge Beach and Wallops Island, VA; Brevard County, FL; and Long Beach Island, NJ. Since Hurricane Matthew struck in October 2016, BOEM supported coastal and habitat restoration projects for Martin and Brevard counties, FL and Dare County, NC.

BOEM continues to support other Atlantic coast communities before and after storms. Dunes are often created or fortified to protect homes, streets, and infrastructure during storm events. The creation of habitat may also provide more area for coastal species, some of which are protected, to rest, forage, or reproduce. The MMP strives to meet the needs of various stakeholders while considering the environmental impacts of rebuilding Atlantic beaches.

–Deena A. Hansen, Office of Environmental Programs

Long Beach Island Restoration, NJ

BOEM executed an agreement on July 1, 2014 and an amendment on June 30, 2017 with the U.S. Army Corps of Engineers (USACE), Philadelphia District, and the New Jersey Department of Environmental Protection (NJDEP) for the use of OCS sand to complete construction of the ongoing Storm Damage Reduction project on Long Beach Island, New Jersey.

Under this agreement, BOEM authorizes the USACE to excavate up to 10 million cubic yards of sand from Federally managed waters approximately 3–4 mi. (4.8–6.4 km) offshore Long Beach Island. The sand was placed along 16 miles of shoreline between Barnegat Inlet and Little Egg Inlet in the previously unconstructed portions of the project. This work built upon previous beachfill operations that utilized sand sources from New Jersey state waters. Initial construction was completed in November 2016 with additional construction under the amendment in the fall of 2017.

This project was authorized for construction by the Water Resources Development Act of 2000 (WRDA 2000), and was partially constructed before Hurricane Sandy affected the New Jersey shoreline. Under the Disaster Relief Appropriations Act of 2013, Congress authorized the USACE to complete the construction of the project and appropriated the additional funding. Subsequent activities were authorized under P.L. 84-99 for emergency management activities to complete Congressionally approved and appropriated emergency repairs of the project from impacts sustained during the storms Jonas and Joaquin.

The beachfill construction is designed to reduce storm damages to property and infrastructure that are vulnerable to the impacts of hurricanes, nor'easters, and long term erosion. In addition, the project maintains recreational opportunities and wildlife habitat along the Long Beach Island beach areas.

–Jeffrey Reidenauer, Marine Minerals Branch Chief and Jeffrey Waldner, Marine Minerals Branch

Beach construction underway at Long Beach Island, Oct. 2015. Photo by Marjorie Weisskohl, BOEM

The Long Beach Island project completed in November 2016. Photo by the U.S. Army Corps of Engineers.

Canaveral Shoals Case Study: Understanding the Ecological Function of Shoals for Fish

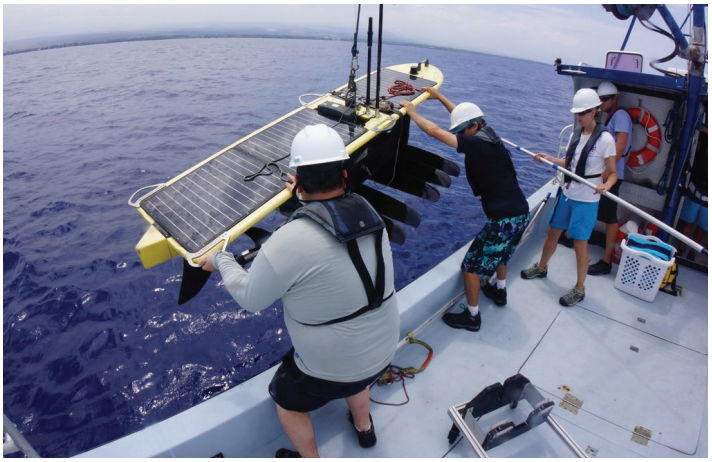
Following Hurricane Sandy, research funding became available to examine impacts associated with dredging activities along offshore sand shoals. The coast of Brevard County, Florida, suffered shoreline loss during the storm and recuperated with an emergency renourishment project. BOEM funded a study to examine the impacts of this dredging on the cape-associated shoals off Cape Canaveral by performing baseline bathymetric surveys and collecting faunal measurements (fish and invertebrates). Most important is the need for a better understanding of the impact of dredging to commercially and recreationally important fish, as well as an understanding of the ecological recovery time. BOEM is investigating how ocean fauna, invertebrates to large fish, use offshore sand shoals, and how the ecological functions of those shoals might change after dredging. The end product of this study includes a model that can be utilized on other projects to examine ecosystem level impacts from offshore dredging operations.

Since the project began in 2013, a combined 632 fish have been acoustically tagged in the Canaveral Shoals study area. This includes several commercially desirable species such as red drum, as well as larger bodied fishes such as sharks. The fish are implanted with a small tagging device that sends out an acoustic signal. The signal is received by one of the 34 receivers BOEM installed in the area or one of the 28 receivers that already existed in the region. This detection allows BOEM to track the fish movements before, during, and after a dredge event. In addition, 96 of the tagged fish have been detected at other acoustic arrays outside of the region (south FL, GA, SC, NC, and VA) documenting north-south migration patterns.

Recently, BOEM purchased an autonomous wave glider to expand the footprint of the fish tracking project. The addition of a wave glider to this monitoring effort significantly increases the utility of the data obtained from BOEM's acoustic array infrastructure. The existing fixed acoustic array relies on the passage of fishes within a receiver's range of detection (typically 300–1000 meters [984–3,280 feet]). The addition of a glider allows fish detection to be an active process and increases the number and extent of detections. These detections will add to a long-term dataset tracking recovery and natural movements in offshore habitats. The examination of long-term recovery is necessary for improved regional management of offshore habitat availability for federally managed fish species. Existing project-specific, post-construction monitoring is not of sufficient duration or temporal resolution to fully understand the association of fish species with these cape-associated shoal complexes. This project, initiated in 2013, is projected to continue for six years, ending in 2019, and will provide this invaluable long-term dataset.

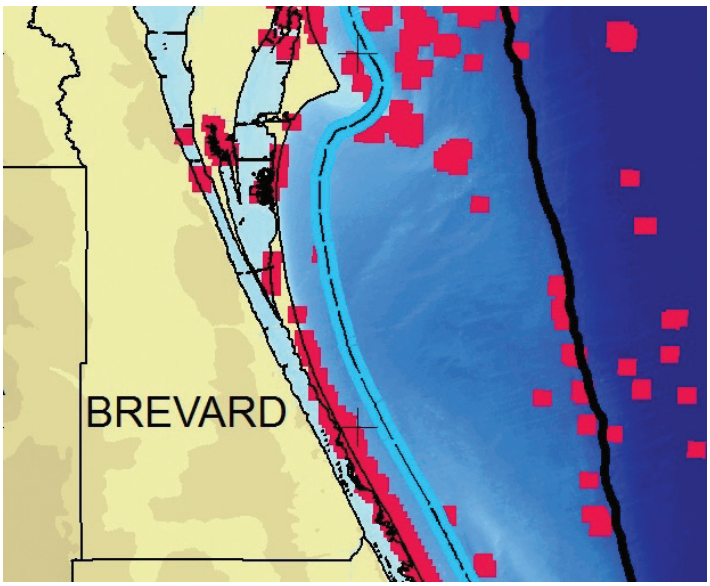
–Jennifer Bucatari, Division of Environmental Assessment

Sandbar shark with yellow external tag for tracking. Photo by Eric Reyer.



Launching (top) and in-water training (bottom) with BOEM's autonomous wave glider used for tracking fish movement. Photos by Liquid Robotics.

Searching for Sand with a Laptop



Location of high-rugosity areas (red) near Cape Canaveral, FL. Heavy black line indicates 30-m (98-ft.) water depth. High-rugosity areas are often associated with large sand deposits.

As nearshore sand sources are depleted, sand search efforts move further offshore into the Federal OCS. These searches are planned by experts who rely on existing sediment core and geophysical data. BOEM's Marine Minerals Branch (MMB) recently developed an inexpensive method that uses freely available bathymetric data to help focus the sand search efforts, ultimately reducing costly ship time. The method was published in the Fall 2017 issue of the Shore and Beach journal ("Searching for Sand in Florida: Exploiting Seafloor Morphology as a Reconnaissance Tool," Paul O. Knorr).

Mounded sand accumulates at a maximum angle of about 33° on dry land. However, like a saturated sandcastle, sand loses its cohesiveness when submerged, flattening like a pancake. Submerged sand shoals typically have a slope between 1° and 7°. Rugosity, a measure of the pattern of changing elevation, highlights areas where the depth rapidly changes. Because areas with sand accumulations have a higher slope and rugosity than the surrounding seafloor, rugosity maps can be used during the planning process to identify areas with a high sand resource potential.

–Paul O. Knorr, Marine Minerals Branch

Tiny Fish, Big Impact

Giant bluefin tuna, endangered roseate terns, and the fishermen of the northeast seafood industry—these are just a few of the many resources whose lives depend on a small silvery fish known as the sand lance. As its name implies, the sand lance's life is entirely dependent on sand. That's why BOEM's Marine Minerals Program (MMP) is looking to better understand the potential impacts of sand mining on this little, but vital, fish. To make things more challenging, sand lance distribution is highly variable and dependent on a myriad of factors. Just as quickly as they may show up in great abundance, they can completely vanish. The sudden explosion of frenzied feeding activity by tuna, whales, and birds suddenly stops as the food source disappears. From where do sand lance come? Where do they go? If sand is needed for beach nourishment projects in the northeast, how can we proactively plan future dredging activities to ensure impacts are minimized? Does dredging a portion of their sandy bottom habitat significantly impact their life cycle requirements? These are the types of questions BOEM is investigating in the "Productivity and Ecology of Sand Habitats (PESH)" study.

To do this, we're bringing together diverse partners to better understand how sand dredging for coastal restoration projects in the Northeast could impact the fishing and tourism industries and the animals they depend on.

Understanding this important fish means gaining insight into its life cycle requirements and association with sand. As a component of this study, models will be used to inform where sand lance will be disbursed following hatching. This type of information will allow us to determine if a specific sand shoal habitat serves as a source or sink, and directly inform future sand resource planning decisions.

Sand lance. Photo by Dann Blackwood, USGS.

It's a big ocean and scientists can't be everywhere at once. That's why the PESH project is reaching out to boaters, whale watchers, and fishermen to expand our data collection using a device called the OpenCTD. This is an open-source oceanographic instrument that measures water quality and produces water column profiles (open-source means that the plans and source files are freely available and anyone can build, modify, or adapt the instrument to his or her needs without worrying about patents or intellectual property). OpenCTD collects data on salinity, temperature, and depth, helping to ensure we have as much information as possible to feed ecological models.

By working together with the fishing and tourism industries, the PESH project is helping BOEM understand how potential sand mining affects a tiny sand-dependent fish that people depend on.

–Jake Levenson, Division of Environmental Assessment

Large Scale Coastal Improvements and Restoration in Mississippi and Louisiana

Following Hurricane Katrina in 2005 and the *Deepwater Horizon* oil spill in 2010, Gulf of Mexico residents recognized a need for the Gulf Coast to be more resilient against damage from future storms and other offshore activities, and to restore coastal habitats and living resources. In response to this need, the Mississippi Coastal Improvements Program (MsCIP) Comprehensive Barrier Island Restoration and the Natural Resource Damage Assessment (NRDA) Calliou Lake Headlands Restoration (Whiskey Island) projects were designed to strengthen the Mississippi and Louisiana coastlines, respectively. Using a combined total of up to 33 million cubic yards of OCS sediment, these two projects are the largest island restoration projects in U.S. history.

The U.S. Army Corps of Engineers (USACE), Mobile District, prepared the MsCIP Comprehensive Plan which created a path forward to restore portions of the Gulf Islands National Seashore in Mississippi. The USACE, in coordination with BOEM, selected OCS locations with a total volume of 19.6 million cubic yards of available sand. Once completed, this will be the largest volume of OCS sand conveyed by the MMP and will be the largest coastal restoration project constructed to date in the U.S.

Funds from the *Deepwater Horizon* NRDA Early Restoration program are helping to restore Louisiana barrier islands. BOEM authorized the Louisiana Coastal Protection and Restoration Authority to use Federal OCS sediment to restore the beach, dune, and marsh habitat on Whiskey Island, reintroduce sand to the Isle Dernieres barrier island chain, and maintain the estuarine gradient within the Barataria-Terrebonne National Estuary. The project will use up to 13.4 million cubic yards of high-quality sand from Ship Shoal located 9 mi. (14.5 km) offshore in Federal waters. Dredging began in April 2017 with sediment pumped through a temporary pipeline to construct approximately 1,100 acres of barrier island habitat. Besides the unique habitat barrier islands provide, they are important in protecting wetlands from storm impacts and are crucial in maintaining a healthy coastal ecosystem.

–Jessica Mallindine and Michael D. Miner,
Gulf of Mexico MMP

Caminada Headland Restoration Project

BOEM recently celebrated the completion of the Caminada Headland Restoration project which restored a 13-mile (20.9-km) stretch of beach and dune from the Belle Pass outlet of Bayou Lafourche eastward to Caminada Pass at the end of Elmer's Island in Louisiana. As the single largest ecosystem restoration for the State of Louisiana on one of North America's most rapidly eroding shorelines, this project leased 11.3 million cubic yards of sand, though only 8.4 million cubic yards were used. The headland restoration was split into two phases beginning in 2012. The first phase restored approximately 6 mi. (9.6 km) of beach and 373.5 acres of habitat on the western end of the island. The second phase restored about 7 mi. (11.2 km) of beach and 686 acres on the eastern portion. The new beach covers an area equivalent to approximately 1,047 football fields. Sand dredged and barged from Ship Shoal to Caminada was used to re-establish nearly 800 acres of critical habitat for shorebirds, such as the threatened piping plover and other wildlife. The barrier headland provides unique habitat and plays an important role in protecting wetlands from storm impacts; protecting locations such as Port Fourchon which provides more than 15% of the Nation's supply of oil and 90% of support to the production of the Gulf of Mexico's OCS oil reserves. It also maintains the salinity and nutrient gradients in the estuaries that many species require for survival.

While BOEM authorized the use of OCS sand resources, the project cost approximately $216 million and was funded by the state, the federal Coastal Impact Assistance Program, and the National Fish and Wildlife Foundation's Gulf Environmental Benefit Fund established in the wake of the *Deepwater Horizon* oil spill to manage funds resulting from the settlement of federal criminal charges against BP and Transocean.

–Jessica Mallindine, Gulf of Mexico MMP

For More Information

Louisiana Coastal Protection and Restoration Authority Press Release
http://coastal.la.gov/wp-content/uploads/2017/03/NEWS-RELEASE-Caminada-Beach-3_21_2017.pdf

BOEM Caminada Headlands/Deepwater Horizon Response
http://www.boem.gov/Deepwater-Horizon-BOEM-Response/

Daily Comet News
http://www.dailycomet.com/news/20170321/officials-celebrate-completion-of-caminada-headland

Beach Renourishment: Addressing Impacts to Sea Turtles and Other Species

BOEM's Marine Minerals Program (MMP) must wisely manage OCS marine mineral resources to maximize long term use while ensuring that environmental damage to the marine and coastal environment is avoided, minimized, or mitigated. Studies often identify and fill data gaps of project-related impacts analyzed in National Environmental Policy Act (NEPA) documents and consultations. Often, an identified gap in knowledge (for example, how fish use sand shoals) will lead to field research (like the Cape Canaveral fish tracking study on p. 12), so that the MMP can better analyze project actions (in this case, how dredging sand shoals might affect different fish species and their associated habitats). These and other examples of our applied research, described below, include a sea turtle behavior decision support tool to reduce impacts during dredging; and modeling studies to identify appropriate offshore sand and gravel resources, or to predict how different configurations of a borrow area would evolve over time. The MMP also investigates potential sediment resources on the OCS, often with the engagement of states and regional partners.

A loggerhead sea turtle waits to be tagged and relocated as part of the Dare County, NC, beach restoration project. Photo by Coastwise Consulting, Inc.

Outer Banks: Mounds of Sand and a Flotilla of Turtles…

The beaches of the Outer Banks, a 200-mile -long (328.1-km) string of barrier islands, shield North Carolina's wetlands from the Atlantic Ocean's unrelenting waves. Beautiful beaches and diverse ecology attract tourists, nesting sea turtles, and migrating birds every year. To help sustain this ecologically and economically important area, the MMP has provided access to 4,945,000 cubic yards of sand, enough to fill about a half-million large dump trucks, to nourish beaches along the Towns of Duck, Southern Shores, Kitty Hawk, and Kill Devil Hills.

The four towns, all located in Dare County, North Carolina, are rebuilding their beaches with sand dredged from two borrow areas about 5 mi. (8 km) offshore on the Federal OCS. More than 8 mi. (12.8 km) of beach, representing over half of the 15 mi. (24.1 km) of oceanfront shoreline, will be nourished as part of a long-term nourishment program. This beach nourishment seeks to shield critical infrastructure, mitigate erosion, and sustain habitats that support birds and animals, most notably sea turtles.

According to the North Carolina Wildlife Resources Commission, the leatherback (*Dermochelys coriacea*), Kemp's ridley (*Lepidochelys kempii*), green (*Chelonia mydas*), and loggerhead sea turtles (*Carretta carretta*) have been documented nesting along the Northern Outer Banks. Although dredging and beach construction may potentially impact sea turtles, without the nourishment, long-term erosion is likely to reduce sea turtle nesting habitat over the next two decades.

BOEM consults with the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service to develop mitigation and minimization measures to ensure no jeopardy to species, including relocation trawling. The Dare County relocation trawling efforts successfully relocated more than 70 sea turtles away from the dredging area. BOEM is also partnering with NMFS and the project sponsor, Dare County, to place satellite tags on relocated turtles to better understand their movements on and around offshore sand resources.

–Paul O. Knorr, Marine Minerals Branch and Jennifer Bucatari, Division of Environmental Assessment

A loggerhead sea turtle is released back into the water a safe distance from the Dare County dredging operation, June 2017. Photo by Coastwise Consulting, Inc.

ASTER—Analyzing Sea Turtle Entrainment Risk

The potential for entrainment and mortality of federally protected sea turtles is one of the significant factors that impacts how and when projects can be conducted using Trailing Suction Hopper Dredges (TSHD) to extract OCS sand resources. BOEM seeks to minimize adverse environmental effects from dredging operations by deliberately planning and implementing relevant and effective mitigation measures.

Based on an analysis of historic incidental sea turtle takes in offshore borrow areas, several factors have been linked to increased take risk, including: (1) temporal and spatial relationship of sea turtle behavior within the water column (e.g., foraging, migrating, etc.) relative to draghead operating parameters and (2) borrow area design relative to turtle deflecting draghead efficacy. Considering the full array of all risk factors within the project-specific context, targeted mitigation strategies may be more effective than conservative presence/absence dredging windows.

The purpose of the Analyzing Sea Turtle Entrainment Risk (ASTER) tool was to assemble a select group of technical experts with a broad knowledge base and understanding of the relationship of dredging entrainment risk relative to sea turtle distribution and behavior, dredge operational parameters, and the implementation of existing mitigation measures. Technical insight was used to inform the development of a standardized geographically and temporally based decision support tool for practitioners to use in the Atlantic and Gulf regions to assess project-specific dredging entrainment risk within a common framework. More informed decisions may minimize impacts to sea turtle species, while also decreasing dredging costs.

–Douglas Piatkowski, Division of Environmental Assessment

For More Information

Development of a Decision Support Tool to Reduce Sea Turtle Dredging Entrainment Risk "Story Map"
http://arcg.is/298s5BO

Satellite Tagging Sea Turtles in the Gulf of Mexico

During construction of the Caminada Headland Beach and Dune Restoration project (see pg. 9), hopper dredges were used to excavate and transport sediment from the Ship Shoal OCS borrow area. Biological opinions issued by NMFS require a reduction in risk to endangered or threatened species through the use of mitigations such as preventing lethal sea turtle takes from hopper dredges by trawling in front of the dredge to capture and relocate live sea turtles away from the dredging activity. This project had an abnormally high number of sea turtles relocated, exceeding 150 individuals by the end of the first phase of activity.

Instigated by the exceptionally high number of turtles relocated, efforts have been undertaken for BOEM and USGS to collaborate to take advantage of the project-related sea turtle relocation trawling as a sampling and spatial tagging opportunity. Because the majority of sampling and tagging opportunities occur as females are nesting on beaches, trawling provides a unique opportunity to access male and juvenile turtles, of which a paucity of information exists. As a result, research has been biased towards the mature female life-stage; little is known about adult males, sub-adults, and juveniles because they must be caught in-water, which can be difficult. Trawling conducted in association with dredging provide unique access to these difficult-to-sample turtles.

Opportunistic deployment of depth-logging satellite tags on turtles captured during hopper dredge relocation trawling allows for data collection on turtle depth use, dive profiles, and movement patterns. These tags also provide the team with data on turtle use of varying thermal zones in the water column and time spent on the bottom within the vicinity of dredging activities. Because dredging occurs primarily in the bottom portion of the water column, the amount of time turtles spend near the bottom influences their dredge entrainment risk. While aboard trawlers for turtle captures, the team can also gather additional data (e.g., by-catch species) to assess available diet and benthic composition of bottom habitat for habitat modeling efforts. To this end, scientists tagged turtles with internal PIT tags, and collected blood and tissue samples (for genetic and isotope analyses) from each.

In 2016, 26 turtles were satellite-tagged at two sites, including Ship Shoal (off Louisiana) and ~4 mi. (6.4 km) offshore of Pensacola Beach (Florida). Turtles included 10 Kemp's ridleys and 2 loggerheads at the Ship Shoal site, and 14 loggerheads of varying sex and age at the Pensacola site. These data are currently being analyzed by USGS; another field season for tag deployments is scheduled for late 2017.

–Jessica Mallindine, Gulf of Mexico MMP

For More Information

Sea Turtle Tracking
http://www.seaturtle.org/tracking/index.shtml?project_id=1205

Gulf of Mexico Sediment Search Underway

The Nation's OCS sand resources are critical for the long-term success and cost-effectiveness of many shore protection and restoration projects in coastal states. By replenishing beaches with OCS sand, coastlines receive crucial resources for the maintenance of a healthy coastal ecosystem. BOEM's Marine Minerals Program (MMP) facilitates access to and manages OCS non-energy marine minerals, particularly sand and gravel, through environmentally responsible stewardship of these resources.

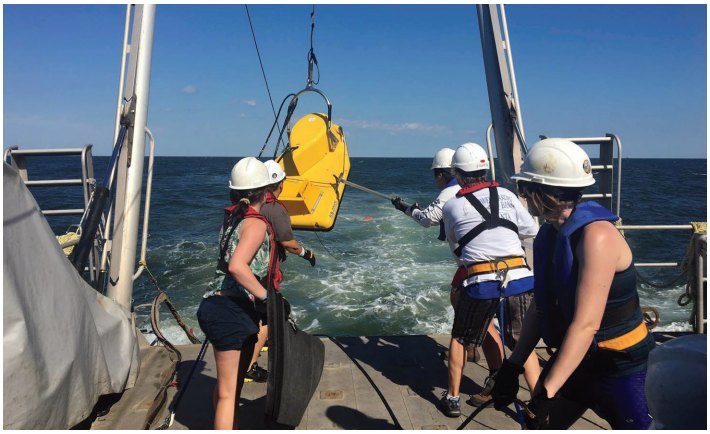
Understanding the availability, quality, and location of sand resources is imperative for the Northern Gulf of Mexico (GOM) coast's sustainability. Barrier islands, coastal marshes, and bay environments serve as popular tourism destinations; support critical infrastructure; and provide protection from the potentially devastating impacts of storms, sea level rise, and oil spills. An OCS sand budget for the Northern GOM will allow BOEM to better assess sand resources that could be used for future coastal restoration efforts.

BOEM entered into two cooperative agreements in September 2016 to assess sand resources off the Mississippi and Texas coasts. BOEM awarded The University of Southern Mississippi (USM) and The University of Texas at Austin, Institute of Geophysics (UTIG) more than $700,000 collectively to complete three-year studies.

Dr. Davin Wallace will lead the USM effort to provide a better understanding of the geologic evolution of late Quaternary deposits offshore Mississippi and to delineate and develop reserves estimates (volumes) of restoration quality sand resources for discrete sand bodies located on the OCS. The findings will provide a comprehensive assessment of available sand resources, and improve our understanding of barrier stability, shoreline response to accelerated relative sea level rise, backbarrier-sedimentation dynamics, and fluvial deltaic geomorphology on the Northern GOM Shelf.

The UTIG team, led by Dr. Jon Goff and Dr. Sean Gulik, will develop a processing workflow for geophysical data that will improve interpretive capability with applications for sand resource identification, and provide a better understanding of the geologic evolution of late Quaternary deposits on the Texas inner shelf. Both cooperative agreements are expected to be completed in 2019. Data generated will feed into BOEM's Marine Minerals Information System (see page 14).

–Bridgette Duplantis, Gulf of Mexico MMP



Collecting geophysical data in the GOM. Photo by John Goff, UTIG.

Partnerships to Promote Coastal Resiliency

BOEM's success depends on partnerships with other Federal agencies; state and local governments; organizations such as regional planning bodies, industry, and the business community; academia; non-governmental organizations; tribes; and the general public. The relationships we have built and continue to foster support national, regional, and local coastal resilience and restoration efforts. Our goal is to contribute to the Nation's environmental, economic, and recreational well-being through the completion of safe, sustainable projects.

Our partnerships take a variety of forms. For example, BOEM holds regular meetings with regional sand management working groups (SMWGs) to discuss coastal restoration issues, concerns, and challenges. SMWG members represent State and Federal agencies, researchers, non-governmental organizations, and stakeholders who are committed to promoting a resilient and sustainable approach to managing marine resources in an ecologically sound manner. SMWGs have been established for the Gulf of Mexico, New England (through the Northeast Regional Ocean Council [NRCO]), the Mid-Atlantic, Southeast Atlantic, and Florida.

The MMP has worked with coastal states since the late 1980s to identify potential sediment resources for beach nourishment and coastal restoration projects. The information generated from these efforts contributes to our task to develop a National OCS Sand Inventory. As of summer 2017, the MMP has 16 ongoing partnerships with Atlantic and GOM states.

BOEM also partners with the USACE, NOAA, USGS, and the U.S. Navy to conduct a variety of environmental studies that support our program mission through leveraging resources and addressing similar research needs.

–Jeffrey Reidenauer, Chief, Marine Minerals Branch

The California Coastal Sediment Management Working Group Explores for Sand Offshore

The California Coastal Sediment Management Workgroup (CSMW) was established by the U.S. Army Corps of Engineers (USACE) and the California Natural Resources Agency (CNRA) in 1999 to develop regional approaches to protecting, enhancing, and restoring California's coastal beaches and watersheds through Federal, State, and local cooperative efforts. The CSMW is the first state and federal partnership developed in California to encourage and sustain on-going, multi-agency coordination and information-sharing on statewide coastal sediment management issues. Given its role in managing Federal OCS sediment resources, BOEM participates in an advisory capacity in the CSMW, along with the U.S. Geological Survey (USGS), National Park Service, and the National Oceanic and Atmospheric Administration. Prior to the CSMW, the USACE, the CNRA, regional government agencies, and local coastal communities independently conducted studies, beach nourishment, harbor maintenance, habitat restoration, and other efforts. Through its advisory role, BOEM is currently working with the CSMW, USGS, and the CNRA to explore opportunities for leasing OCS sand from Federal waters for beach nourishment projects along the California coast.

The CSMW oversees the California Coastal Sediment Management Plan that seeks to identify, prioritize, and address regional sediment management needs and issues along the California coast. Such issues may include coastal erosion, recreational opportunities, environmental impacts, dredging, and sediment flow through coastal watersheds.

For More Information

California Coastal Sediment Management Workgroup

http://www.dbw.ca.gov/csmw/

California Coastal Sediment Management Plan

http://www.dbw.ca.gov/csmw/smp.aspx

California Beach Erosion Assessment Survey 2010

http://www.dbw.ca.gov/CSMW/pdf/CBEAS_Final_10252010a.pdf

California Marine Minerals Resource Assessment Study

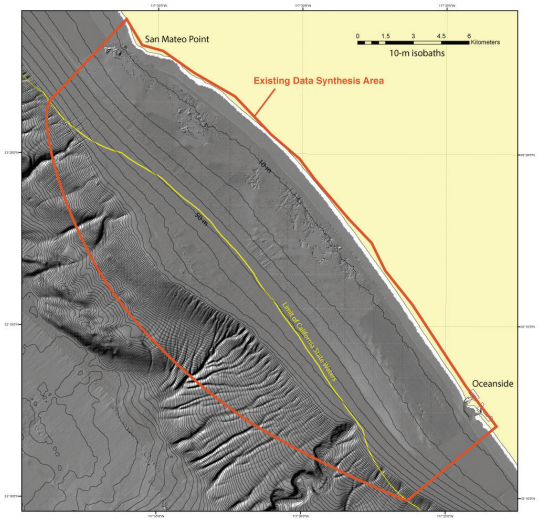
https://www.boem.gov/Ongoing-Study-Pacific-office-of-Strategic-Resources-Marine-Minerals-Program/

California Marine Minerals Resource Assessment Study

In coordination with the California Coastal Sediment Management Workgroup (CSMW), BOEM and the USGS entered into an interagency agreement in 2016 to review and synthesize existing geological data, and conduct surveys and sampling to map sand and gravel resources in Federal and State waters offshore California. These study areas could potentially provide resources to nearby Beach Erosion Concern Areas as identified by the CSMW Beach Erosion Assessment Survey and the California Regional Sediment Management Plans. The three study areas are: the San Francisco Littoral Cell, the Oceanside Littoral Cell offshore northern San Diego, and the Silver Strand Littoral Cell offshore southern San Diego.

The objective of this Sand Resource Assessment is to produce maps with the locations, thicknesses, and sediment grain-size information of sand and gravel deposits. Maps will be constructed using a combination of new and existing information, including high-resolution bathymetry, seafloor characteristics derived from side-scan sonar, sub-bottom geophysical surveys, seafloor sediment grab samples, and sediment cores. The USGS will conduct new surveys and coring to fill gaps in existing data.

–Chima Ojukwu, Lease Management Section Chief
Pacific OCS Region



Oceanside Littoral Cell study area offshore San Diego, CA.

Sharing Information through the Marine Minerals Information System and Regional Planning Bodies Data Portals

Sub-bottom, bathymetric, and sediment core data are as important to marine minerals resource stewardship as sub-surface data is to land-based activities. To manage this data, the MMP faces a number of challenges: identifying and inventorying existing data, organizing and facilitating access to it, determining the extent of legacy paper files and how much is available digitally, calculating the cost to incorporate older data into modern systems, and managing it in perpetuity.

The current state of BOEM data does not always meet our partners' expectations. Federal directives mandate that data sharing meet state and local government needs; regional planning bodies seek improved quality and quantity. Marine mineral data users seek wider dissemination, digital outputs, coordination, data exchange, and interoperability. These needs led BOEM to develop the Marine Minerals Information System (MMIS) to support the National OCS Sand/Sediment Inventory.

BOEM developed the MMIS tool with a contractor, Quantum Spatial, through a contract with the National Oceanic and Atmospheric Administration. The system contains custom tools to interact with historical and current collections of non-spatial and geospatial marine minerals data. This allows us to improve visual outputs from projects, surveys, and collaborations supported by BOEM and our partners. It supports highly informed decision-making and fosters secure, authoritative, and open access to the Nation's marine mineral resource inventory. The MMIS is a relational geodatabase that acts as a document repository for historical, current, and future OCS marine mineral program data in the Atlantic, Gulf of Mexico, and Pacific regions.

The presence of significant quantities of unstructured data is an unfortunate reality of collaborative information sharing. While unstructured data is a challenge for all federal agencies, in the marine mineral world there are minimal tools and work flows available to effectively organize data. During the past three years, BOEM has focused on developing the MMIS so that we can identify, review, assess, and compile our national marine minerals data, which was obtained over the past 25 years from various leasing and environmental surveys, studies, and cooperative agreements. The goal is to house this data in a manner that supports leasing and environmental assessment responsibilities.

Data users expect that data holders will improve customer service by making data more accessible. They expect greater data exchange and sharing mechanisms. The real key to data sharing starts with the metadata, which makes it authoritative and credible; metadata acts as the citation and is the vital component needed to register data assets on www.marinecadastre.gov/data. In our modern information-sharing world, many datasets are still received without sufficient levels of metadata. The MMP is actively working to improve all stages of data collection and processing in order to inform lease management, ocean, and environmental planning decisions.

–Lora Turner, Marine Minerals Branch

Viewer Prototype.

Sand Resource Dashboard Prototype.

Spotlight on A Scientist: Lora Turner

What is your job?

I am a physical scientist in the Leasing Division of the Marine Minerals Branch and joined BOEM in 2013 after a career in the U.S. Navy. My role involves outreach and coordination with federal and state agencies, academic bodies, and commercial contractors to organize and share our data. Currently, the focus of my work is overseeing, organizing, and developing the Marine Minerals Program data holdings into a geospatial database: the Marine Minerals Information System (MMIS).

Why did you decide to work for BOEM?

I was attracted to BOEM as an opportunity to develop applied science tools and gather geophysical information for practical applications to enable the sensible use of the Nation's marine mineral resources. From my career in the Navy working as a Meteorological and Oceanographic Officer, I gained many professional and technical skills. As a senior navigator, meteorologist, and oceanographer, I led teams providing geospatial products and environmental services. I collected, processed, and analyzed meteorological and oceanographic information that directly influenced operational planning and executive decision making. Working for BOEM allows me to continue contributing to the understanding of the offshore environment that I am passionate about. At BOEM, we are constantly thinking of new ways to apply geospatial tools to describe, characterize, and analyze the marine minerals environment.

What role do you in play in BOEM's Marine Minerals Program?

My role within in BOEM is primarily focused on overseeing the successful development and implementation of the MMIS, a relational database designed to allow us to share marine minerals data across government more effectively. It will help answer important questions about our OCS marine mineral resources, like where are the right sand resources to most effectively restore beaches after a hurricane? What information do we have in each area to inform environmental decisions with respect to ocean planning and marine minerals leasing? Within the MMIS we have developed many tools that let us speed up this process (from months to hours), making it more widely available (within the constraints of authoritative sharing), and acting as a national repository for marine minerals information.

How has your educational background and experience prepared you for the work you do?

Growing up in rural Illinois, my family and education sowed my inquisitive seeds. My 26-year Navy career shaped my deep passion for geospatial and oceanographic work; the last 10 years provided opportunities for oceanographic policy work

Lora Turner, Physical Scientist/Physical Oceanographer, Marine Minerals Branch

in Washington, DC, along with significant operational experience. As an undergraduate, I studied physical geography and GIS. As a Meteorology and Physical Oceanography graduate, I absolutely loved the practical aspects of going to sea and spending days gathering and analyzing oceanographic and meteorological data. I combined these into a thesis on an application of Light Detection and Ranging (LIDAR) to examine coastal erosion and its effects on land use in Monterey Bay, California. I didn't know at the time that it would prepare me for BOEM, but with the benefit of hindsight it was a pretty good choice!

What do you find most exciting or rewarding about your work?

BOEM presents many exciting challenges that allow me to work with great people and use my experience to help solve real problems. I enjoy MMP's work environment where colleagues are passionate about supporting our offshore environment. The most rewarding experience is collaborating with our partners to improve our understanding of potential marine mineral resources, and their support in developing data that will go into our offshore information system is amazing.

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New Waves

Late-Breaking News & Information

Interior developing a new National Outer Continental Shelf Oil and Gas Leasing Program

In April, President Trump issued Executive Order 13795, outlining an America First Offshore Energy Strategy. As a key piece of this strategy, BOEM, acting on a Secretarial Order from Interior Secretary Ryan Zinke, began development of a new National Outer Continental Shelf Oil and Gas Leasing Program (National OCS Program) to replace the current program, which covers 2017–2022.

The *Discoverer Enterprise* platform. Photo by BOEM.

The Secretary's order calls for enhancing opportunities for energy exploration, leasing and development of the OCS, establishing regulatory certainty for OCS activities, and enhancing conservation stewardship, thereby providing jobs, energy security, and revenue for the American people.

The first step in the development of a National OCS Program, which takes 2–3 years to complete, was a Request for Information (RFI), published on July 3, which invited comments from the public and stakeholders. BOEM received more than 800,000 comments during the 45-day comment period.

As required by law, BOEM will evaluate all 26 of the Nation's OCS planning areas during the first stage, and consider comments received on all areas.

Next, BOEM will prepare and publish a Draft Proposed Program based on input received and information and analysis on the 26 planning areas. This will be followed by a Proposed Program and Final Proposed Program. Throughout the planning process, BOEM will consult with all interested parties and seek additional public comment. Public meetings will be scheduled as part of the planning process.

For More Information

Executive Order 13795

https://www.whitehouse.gov/the-press-office/2017/04/28/presidential-executive-order-implementing-america-first-offshore-energy

National OCS Leasing Program

https://www.boem.gov/National-OCS-Program/

Press Release for New Five Year Oil and Gas Leasing Program

https://www.doi.gov/pressreleases/president-trump-and-secretary-zinke-open-comment-period-new-5-year-national-offshore