

BOEM OCEAN SCIENCE

THE SCIENCE & TECHNOLOGY JOURNAL OF THE BUREAU OF OCEAN ENERGY MANAGEMENT

VOLUME 11 ISSUE 1 • JANUARY/FEBRUARY/MARCH 2014



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Mapping and Boundary Branch**

**Mapping for Renewable Energy
Critical for Leasing on the OCS**

***MarineCadastre.gov* Providing
Easy Access to Data and Maps**

**Modernizing ESPIS Through
Digital Mapping with geoESPIS**

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Renewable Energy Leasing Program**

**2012 Alaska Fieldwork -
Bathymetric Mapping with NOAA**

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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

A Digital Elevation Model (DEM) illustrates the bathymetric and topographic features of Kachemak Bay on the southern Kenai Peninsula, Alaska. This DEM was created by NOAA's National Geophysical Data Center, Boulder, CO, using software similar to that used by BOEM cartographers.

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

Publication services provided by Schatz Publishing Group.

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FREQUENTLY USED ABBREVIATIONS

BOEM	Bureau of Ocean Energy Management
ESPIS	Environmental Studies Program Information Systems
GIS	Geographic Information System
MBB	Mapping and Boundary Branch
NEPA	National Environmental Policy Act
NOAA	National Oceanic and Atmospheric Administration
OCS	Outer Continental Shelf
PROUA	Pacific Regional Ocean Uses Atlas

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THE DIRECTOR'S MESSAGE

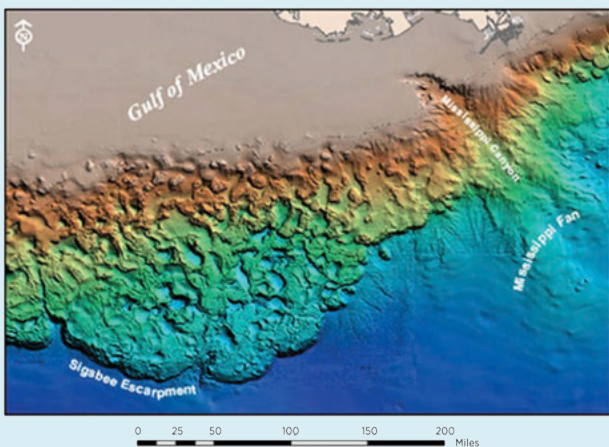
The earliest preserved maps are found on Babylonian clay tablets created more than 4,000 years ago. Maps are a universal form of communication that provide a snapshot unlike any other medium and are often the central guide to our knowledge of a specific area. Maps are essential to BOEM's mission of responsible management of the Nation's offshore energy and marine mineral resources.

This issue of *BOEM Ocean Science* is dedicated to exploring the critical role of mapping in ocean planning. Within our bureau, maps noting Outer Continental Shelf grids were originally used to identify blocks of seafloor that could be leased for offshore oil and gas exploration. Later, the agency's Marine Minerals Program was established and relied on mapping to identify and document appropriate borrow areas for sand and gravel used to restore our wetlands and coasts. More recently, mapping has provided data needed to locate the best possibilities for offshore wind area identification as domestic offshore renewable energy is developed.

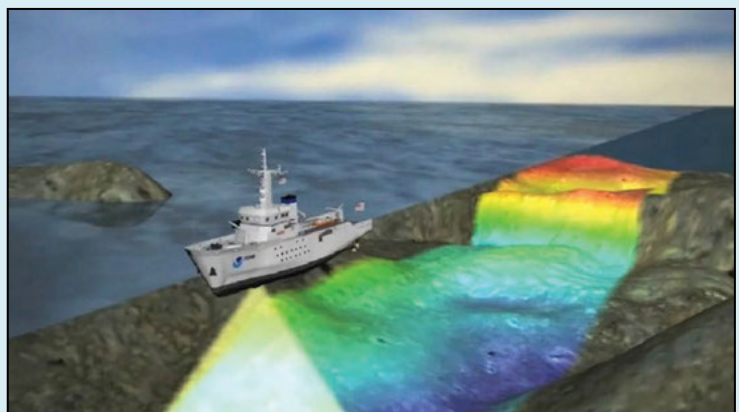
In this issue, we look at our own 40 years of ocean mapping and boundary delimitation as well as new tools such as MarineCadastr.gov. This online interactive map viewer, developed by BOEM and our federal partners with the National Oceanic and Atmospheric Administration (NOAA), integrates submerged lands information consisting of legal, property ownership (cadastre), physical, biological, ocean uses, and cultural information from multiple agencies. This exciting product gives us a common reference point and allows users to create, view, and print maps, or link GIS data layers from the cadastre into their own GIS applications. It is especially useful to those looking to assess suitability for ocean uses, such as energy siting.

Last quarter, we also added Dr. William Yancey Brown to the *Ocean Science* Editorial Board. Dr. Brown, who joined us as Chief Environmental Officer in November 2013, will have a critical role in setting the scientific agenda for the bureau. We look forward to future issues of the journal with Dr. Brown's input. Enjoy this issue of *Ocean Science*.

Tommy P. Beaudreau, Director



Multibeam bathymetry allows terrain models to be created for large areas of the seafloor. This image depicts the Gulf of Mexico seafloor off the coast of Louisiana. Image courtesy of TDI-Brooks.



Visualization of how multibeam bathymetry is collected. Image courtesy of Jennifer Taschek, *Deep-Water Mid-Atlantic Canyons 2011 Exploration*, NOAA-OER.

Introduction to the BOEM Mapping and Boundary Branch

The Mapping and Boundary Branch (MBB) has the responsibility within the Bureau of Ocean Energy Management (BOEM) to produce and maintain the official marine cadastre for the Outer Continental Shelf (OCS) areas of the United States.

The *marine cadastre* is a comprehensive spatial data infrastructure whereby rights, restrictions, and responsibilities in the marine environment can be assessed, administered, and managed. The marine cadastre includes the lease block grids and various offshore boundaries, which provide the base for nearly all of BOEM's offshore maps and leasing processes. It also gives BOEM the means to define, describe, analyze, and account for every acre/hectare of federal offshore submerged lands.

The MBB produces and maintains all:

- Official Protraction Diagrams (OPDs),
- Leasing Maps (LMs),
- Supplemental Official OCS Block Diagrams (SOBDs), and
- Composite Block Diagrams (CBDs).

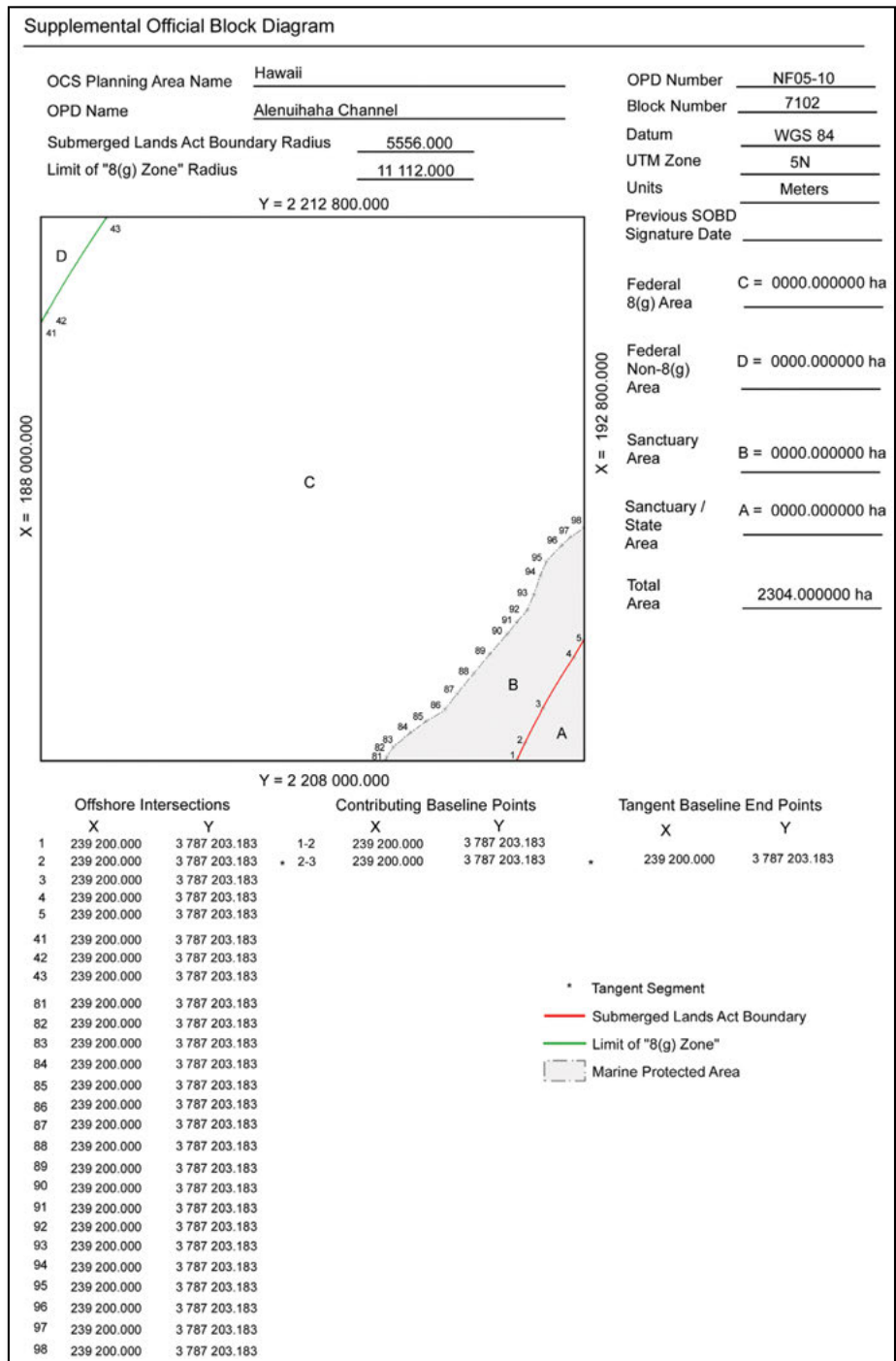
The MBB produces and maintains official boundaries such as the:

- Official coastline for leasing purposes,
- Submerged Lands Act boundary,
- OCS Lands Act 8(g) Revenue Zone boundary,
- OCS Regional boundaries, and
- OCS Planning Area boundaries.

Thematic maps produced by the MBB include:

- Current 5-Year Program (2012-2017),
- Status of Federal Leasing Programs,
- U.S. Continental Shelf Boundary
- Federal OCS Administrative Boundaries,
- Atlantic Region Maps (Multiple Uses; Planning Areas; Seismic Studies, etc.), and
- BOEM Sand and Gravel Program in the Atlantic to support Hurricane Sandy recovery efforts.

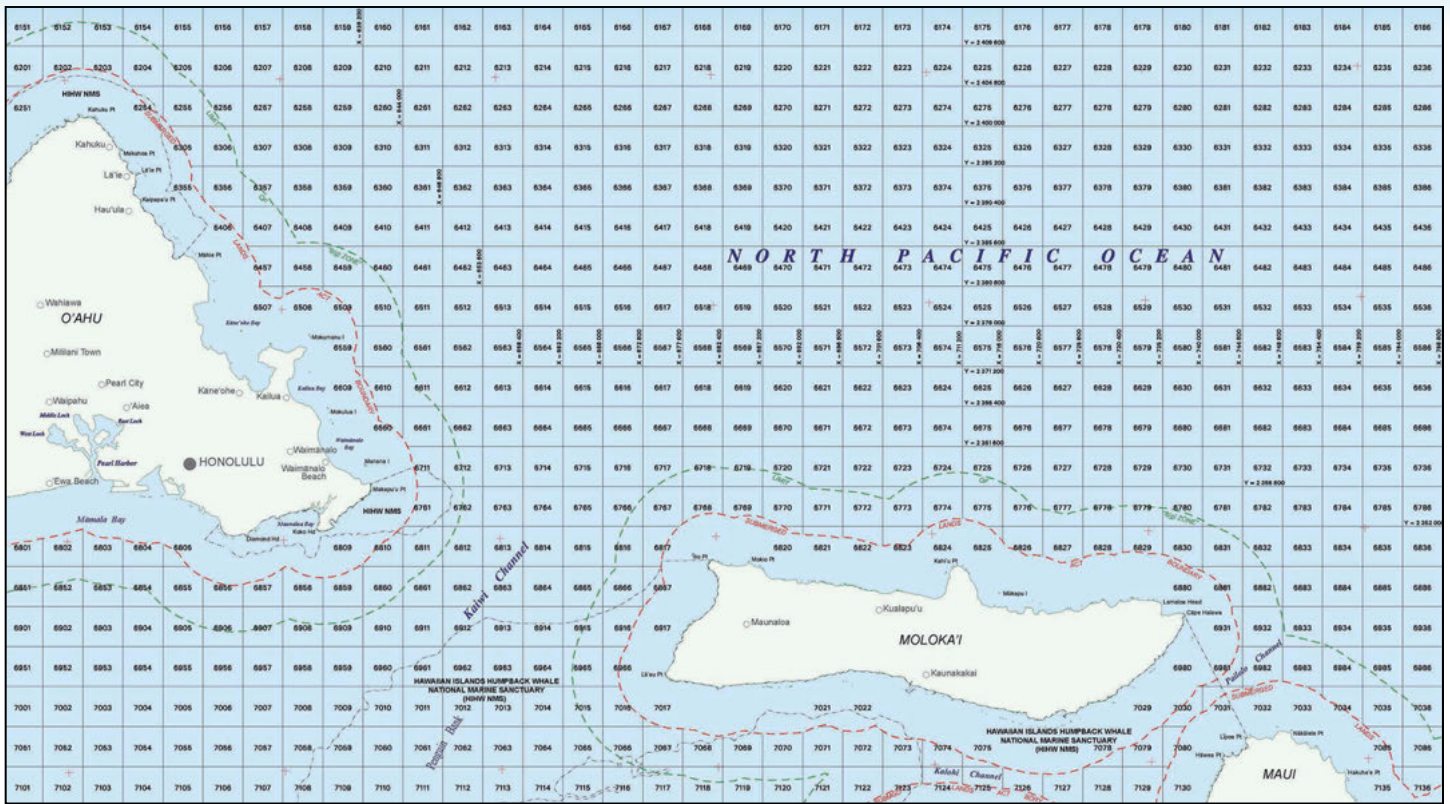
Other official responsibilities of the MBB include administering, developing, populating, maintaining, and distributing official offshore cadastral data through the Technical Information Management System (TIMS) Block and Boundary component, and posting the resulting Geographic Information System (GIS) files, metadata, maps, and diagrams online at



Supplemental Official Block Diagram illustrating lease block number 7102 in the Hawaii OCS Planning Area.

www.boem.gov/Oil-and-Gas-Energy-Program/Mapping-and-Data/Index.aspx and on the Marine Cadastre website at www.MarineCadastre.gov.

The MBB also coordinates with the Department of State, NOAA, Federal Geographic Data Committee Subcommittees,



Portion of the 2013 Oahu Provisional Official Protraction Diagram (OPD). An OPD depicts the shoreline and offshore boundaries within the OCS leasing areas. The red dashed line indicates the Submerged Lands Act Boundary (3 nautical mile) while the green dashed line indicates the 8(g) Zone Boundary (6 nautical mile). Each numbered lease block square measures 4800 x 4800 meters.

The MBB also coordinates with the Department of State, NOAA, Federal Geographic Data Committee Subcommittees, coastal state agencies, and other organized bodies on the depiction of international and other offshore boundaries.

coastal state agencies, and other organized bodies on the depiction of international and other offshore boundaries. Additionally, the MBB provides coordinates and legal descriptions for leases, planning areas, and boundaries, such as the Submerged Lands Act boundary. The MBB also provides technical expertise and input to the Department of the Interior's (DOI's) Office of the Solicitor relative to federal offshore boundaries of the United States and its possessions.

The MBB has an interesting array of current priority projects that includes:

1. **Hawaii mapping** - Working with the Office of Renewable Energy Programs to produce maps required for offshore leasing and generate OPDs and SOBDS for the eight principal Hawaiian Islands.
2. **Block and Boundary redesign** - Analyzing and verifying the usability of custom GIS tools created for the MBB by Esri, Inc.
3. **Fixing the Submerged Lands Act boundaries** - Immo-bilizing this boundary provides certainty for leasing.

California is in the final stage of review by the Department of Justice. Future boundaries to be fixed are Alaska (Cook Inlet), Florida (Gulf Coast), Oregon, Washington, and all Atlantic states.

4. **MarineCadastre.gov website** – Providing continued maintenance, updates, and improvements to this important resource.
5. **Creation of a BOEM-BSEE-ONRR GIS Coordination Group** – Working to improve communication between GIS users within our bureau and with our immediate partners, the Bureau of Safety and Environmental Enforcement (BSEE) and the Office of Natural Resource Revenue (ONRR).

Mapping and Boundary Branch Staff

- Andy Archer – Cartographer/Project Manager
- Richard Naito – Cartographer
- Douglas Nedrich – Cartographer
- Steve Schwartz – Cartographer/Land Surveyor/Geodesist
- Jeremy Smith – Cartographer
- Christine Taylor – Lead Physical Scientist
- Doug Vandegraff – Cartographer/MBB Chief

Richard Naito: 40 Years of Mapping Tools

Cartographic tools have changed since Richard Naito joined the National Ocean Service in 1974.

“Back then, we did everything by hand,” he explained. “Revising nautical charts began with a black line replica of a chart. Black lines meant existing, unchanged; fresh red lines meant updated. The most important tool for me was a magnifying glass. An artist’s knife scraped off the black images of outdated coastlines and bathymetry. A drop of red ink on a crow quill pen nib transferred to the chart marked the new reality. Skillfully varying the pressure on the pen tip altered line widths, but even the most deliberate strokes sometimes left unintended results. Though archaic, these tools and techniques ensured the permanence of the changes for archiving.”

Richard says that back then, computer-assisted mapping supported the manual processes. “Noisy keypunch machines perforated cards with spatial data. Card decks were securely bundled with rubber bands for overnight processing on a mainframe computer offsite. Hopefully, the next morning dawned with a 10” nine-track magnetic tape and a stack of paper, indicating a successful run. Mounted onto a reel-to-reel tape drive, the package of magnetized chart bits magically revealed themselves on a room-sized flatbed plotter.”

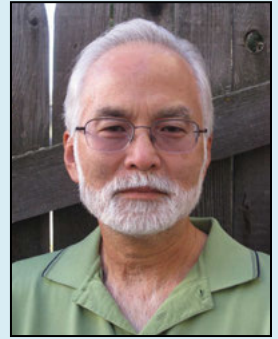
Digitizing or converting the chart’s graphical information into digital format was a slow, tedious process that involved manually tracing the charted features with a mouse-like instrument called a puck. “Squinting through the puck’s crosshairs, we traced the chart’s line work or centered it on

discrete points,” Richard explains. “Depressing its buttons in correct sequence recorded the chart’s coordinates. We meandered around an oversized table, stretching and contorting our bodies to get the best angles.”

In 1982, a core of Bureau of Land Management mapmakers in Colorado became part of the new Minerals Management Service and, for the next 24 years, was simply known as “Denver.” When Richard came aboard in 1985, the mapping tools were essentially the same, but the mainframe performed rigorous calculations to locate offshore leasing boundaries.

“The late 1980s brought sufficient processing power to move us off the mainframe, and the decades of hand-drawn and typewritten lease block diagrams ended,” he recalls. “The 1990s introduced Geographic Information Systems.”

“I did everything by hand 40 years ago,” he adds. “Today, the magnifying glass has been replaced by the Zoom icon, the artist’s knife has been replaced by the Delete button, errant squiggles can be erased by the Undo command, and high-speed scanners can digitize in minutes. Instead of overnight mainframe processing across town, networks connect us across the country in real time. What was for me a technical revolution is a continuing evolution for BOEM’s mapmakers of tomorrow.”



Richard Naito



Mapping tools of the past included the crow quill pen (left) and the artist's knife (right).

Mapping for Renewable Energy Critical for Leasing on the OCS

BOEM has seen strong interest in renewable energy projects on the OCS. However, the road to project implementation involves many steps, and mapping plays a key role along the way.

Projects for the Atlantic are developed using task forces, composed of federal, state, local, and tribal representatives, that address the unique concerns of their stakeholders. Many factors are considered and conflicts addressed through inter-agency collaboration, GIS analysis, and mapping efforts.

Vessel traffic – Using U.S. Coast Guard archives of individual Global Positioning System (GPS) points and ship attribute data, the Office of Renewable Energy Programs (OREP) built a GIS modeling process to analyze all one-minute interval vessel points over a three-year period. The resulting data depicts the number of vessels that travel through each 1200 x 1200-meter area (or aliquot) within each leasing block on the Atlantic OCS in a year.

Fishing – Exact fishing locations are not typically available on charts, but input from the fishing community and digitized data from historical fishing atlases have assisted mapping efforts to reduce conflicts. OREP has also depicted fishing densities using vessel monitoring system (VMS) data. All of these affect task force outcomes.

Marine mammals/sea turtles – Siting surveys conducted over a period of years (by ocean vessel and aerial) are considered.

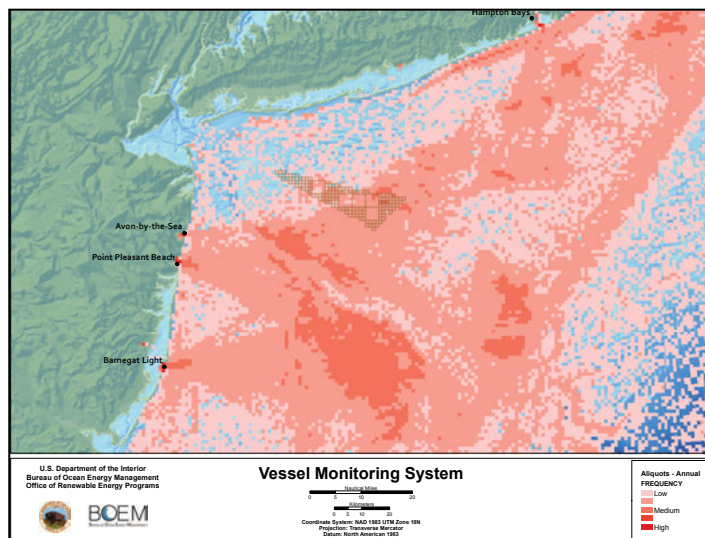
DoD – In addition to charted military areas, the Department of Defense conducts assessment surveys based on training and operation activity to determine compatibility of potential wind energy projects.

Archaeological sites – Historic properties on the OCS include shipwrecks, sunken aircraft, lighthouses, and prehistoric archaeological sites (sites dating before European contact with Native Americans). Historic properties onshore (e.g., sites, buildings, and districts) are also considered to determine if they may be affected by a proposed project.

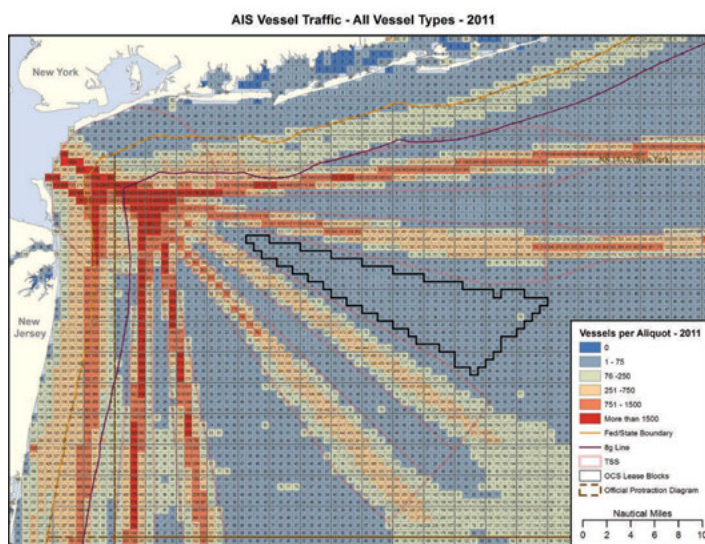
Avian and biologically sensitive areas – Site surveys reflecting bird activity and migration routes are considered, as are biologically sensitive areas.

Viewshed – Another consideration is how wind turbines might look from locations along the coast. Studies funded by BOEM have used turbine types, number of turbines, and layout to produce realistic simulations that depict a wind farm viewed from shore, and BOEM has conducted GIS analyses using land elevations and turbine locations/size to visualize line of sight locations on shore.

Proximity to viable interconnection points – Transmission of electricity can add significantly to wind energy project costs. GIS data for utilities infrastructure of existing and proposed substations/hubs and lines are examined to determine the most logical transmission tie-in points.



Density analysis of VMS data aids BOEM in identifying fishing effort.



Vessel Traffic Analysis for the potential New York Leasing Area showing total vessels per leasing sub-block (aliquot) during 2011.

Developer interest – Interested parties for offshore wind development nominate areas in which they are interested. OREP combines nominations to gauge areas most likely to be developed.

Improvements in technology and advanced mapping components such as **MarineCadastre.gov** may not shorten the time required to make renewable energy leasing decisions, but they help ensure those decisions are well informed.

MarineCadaastre.gov Providing Easy Access to Data and Maps

The official marine cadastre was created and has been maintained since oil and gas leasing moved offshore in the 1950s. Started by a small group in Denver, Colorado, as part of the Bureau of Land Management, fast-forwarding over 60 years to the Mapping and Boundary Branch (MBB) in Herndon, Virginia, the marine cadastre has undergone many changes in technology and application.

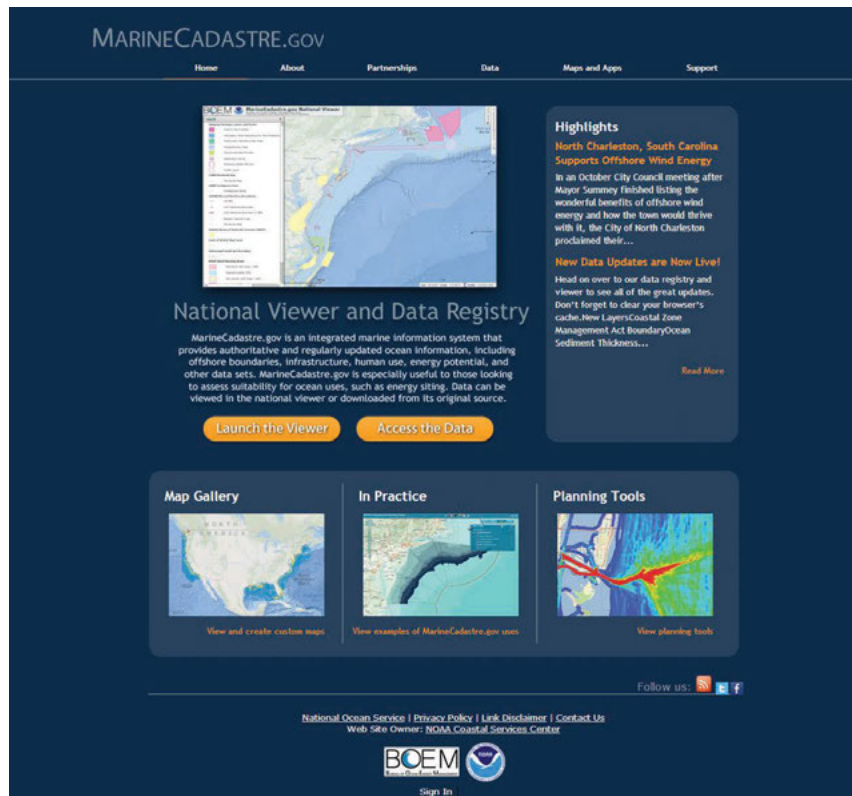
What is it? A cadastre is a system to enable the boundaries of maritime rights and interests to be recorded, spatially managed, and physically defined in relationship to the boundaries of other neighboring or underlying rights and interests. Until recently, the focus has been mapping leasable blocks on the OCS for conventional energy and marine minerals programs. However, interest in renewable energy leasing and advances in technology culminated in MarineCadaastre.gov (formerly known as Multipurpose Marine Cadastre or MMC), developed by BOEM and NOAA's Coastal Services Center.

Many find a helpful resource in MarineCadaastre.gov, a dynamic, integrated information system that enables users to move beyond fixed maps. The first three months of Fiscal Year 2013 saw over 33,000 hits on the MarineCadaastre.gov map viewer and approximately 2,000 unique visitors to the website. With a map gallery, national map viewer, a data registry with more than 180 ocean data layers, technical support, and marine planning tools, users can access information quickly for studies, research, planning, and leasing in U.S. waters.

Users can zoom in on a specific ocean area to find its jurisdictional boundaries, restricted areas, laws, and critical habitat locations. They do not have to weed through all of

BOEM uses MarineCadaastre.gov to:

- Identify areas where stakeholders have expressed an interest in leasing.
- Illustrate project planning activities and known information to stakeholders.
- View uses of the OCS to determine if conflict exists.
- Compile relevant data for wind energy state task force meetings.
- Inform the public about offshore areas offered for potential future oil and gas lease sales.
- Inform the public about offshore areas offered for potential renewable energy lease sales.



Screenshot of the MarineCadaastre.gov.

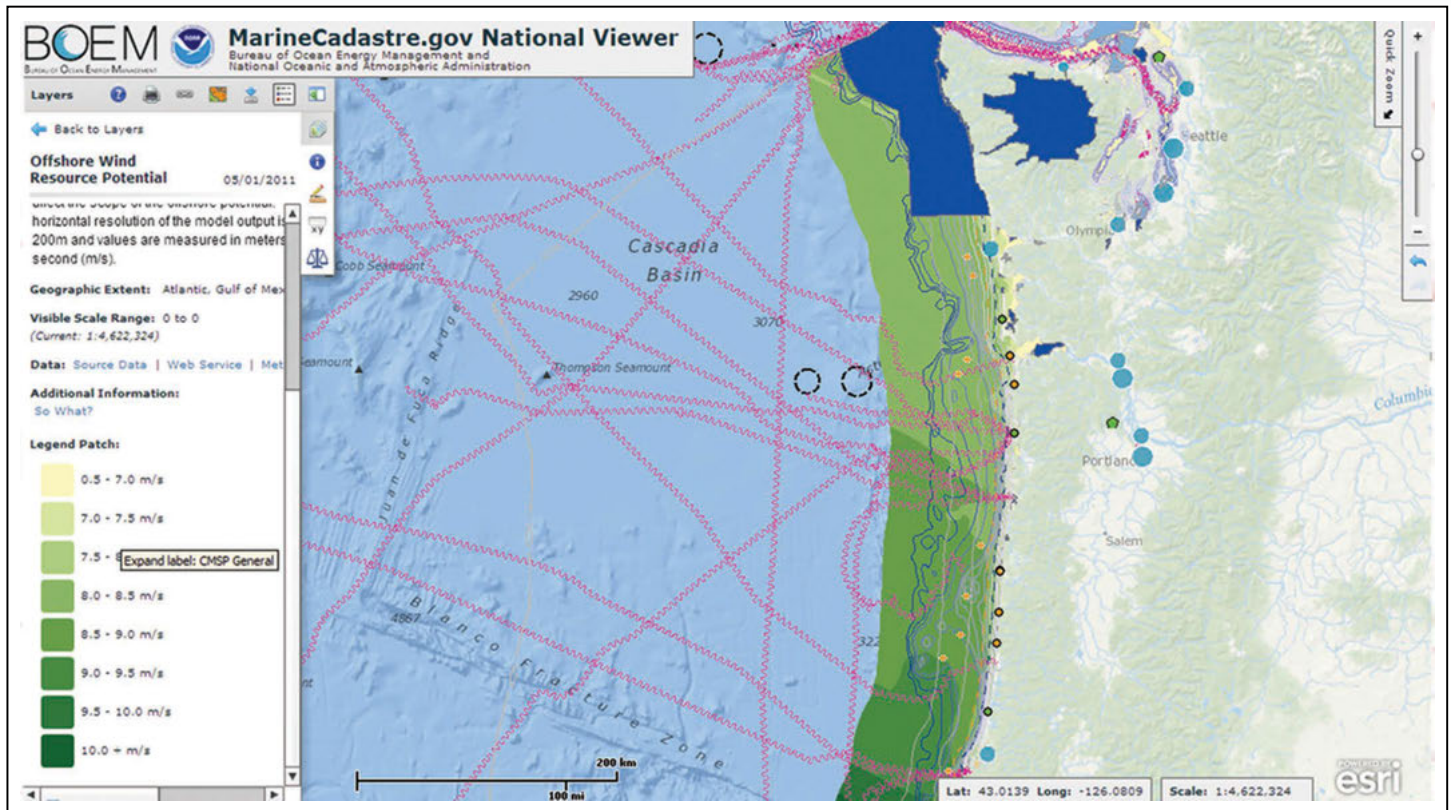
the data; they may include or leave out data sets as desired. They can create and customize maps and can view and share data across agencies and organizations, which speeds up the ability to address critical marine planning details.

Industry uses it to screen regions for offshore energy projects. For example, Department of Defense Wind Stipulation and North Carolina Planning Areas data are being used to determine potential constraints for wind energy developers.

Other government agencies use it as well. Data and services from the project are routinely being integrated into regional ocean governance portals, including those in the Northeast, Mid-Atlantic, Southeast, and West Coast to support marine planning efforts.

MarineCadaastre.gov has been partnering with the U.S. Coast Guard since 2011 to provide its Automated Identification Systems (AIS) data, which shows where ship traffic exists, to the ocean energy community. These data are being used to map potential anthropogenic noise, inform port access route studies, and monitor compliance with areas to be avoided within marine protected areas.

Georgia's offshore wind suitability study and state environmental authorities are using MarineCadaastre.gov to help fill data gaps identified for the state's coastal zone management program.



MarineCadastre.gov viewer showing the Pacific NW region with Wind Potential, Major Ports, Depth Contours, Submarine Cables, Marine Sanctuaries, and High-Frequency Radar stations.

Top 12 Compelling Datasets Critical To Offshore Energy/ Marine Planning

1. Ship Traffic Data (AIS)
2. Wind Planning Areas & Leases
3. Habitat Areas of Particular Concern
4. Maritime Boundaries
5. Offshore Wind Resource Potential
6. Marine Mammal Seasonal Probability Maps
7. DOD Offshore Wind Mission Compatibility Assessments
8. Offshore Oil and Gas Leases
9. Marine Protected Areas Inventory
10. Danger Areas and Unexploded Ordnances
11. Coastal Energy Facilities
12. Digital Nautical Charts (background option)

The Northeast Regional Ocean Council (NROC) uses MarineCadastre.gov data along with northeast regional data in their regional data portal, allowing that system to share data from authoritative sources without redundant efforts, thereby saving time and money.

MarineCadastre.gov data was integrated into the Gulf of Mexico coastal and marine atlas developed by the Ocean Conservancy. This product is being used to inform local

and regional decision makers charged with restoration and ecosystem management.

Up next for the MarineCadastre.gov team is integrating datasets of greater complexity that are often requested by users. This will include data from BOEM Environmental Studies (geoESPIS); avian, deep water, and shallow water coral probability maps from NOAA's National Center for Coastal Ocean Science; and updated marine mammal and turtle density maps being delivered via the Cetacean Mapping Group partnership. Soon the team will be able to connect users to the information, data, and results in BOEM environmental studies through a search tool called geoESPIS. The MarineCadastre.gov web site will be updated to modernize the look, make it mobile friendly, and require fewer clicks for access to the products users want and need: data and maps. Additionally, the data registry will allow users to search, sort, and pick the data they are interested in, add it to a shopping cart, and create their own map utilizing ArcGIS.com technology so that they can also add other datasets they may have available within their new map.

FOR MORE INFORMATION:

Marine Cadastre

<http://www.MarineCadastre.gov>

Modernizing ESPIS Through Digital Mapping with geoESPIS

The Environmental Studies Program Information System (ESPIS) is the repository for more than 40 years worth of BOEM environmental research reports. These reports help the Bureau meet its environmental stewardship responsibilities in developing and managing OCS energy and mineral resources.

ESPIS has evolved over the years, most notably from paper to digital formats. The next stage will be to use the latest Geographic Information System technology to display the geographic areas referenced in ESPIS reports. An updated database, dubbed geoESPIS, is being developed in partnership with cartographic experts from the NOAA Coastal Services Center (CSC), with beta launch scheduled for late 2014. These updates will enable ESPIS reports to reach a larger audience from the scientific community and the general public, who increasingly need access to environmental studies research findings to address their day-to-day ocean uses and regional governance activities, such as marine planning.

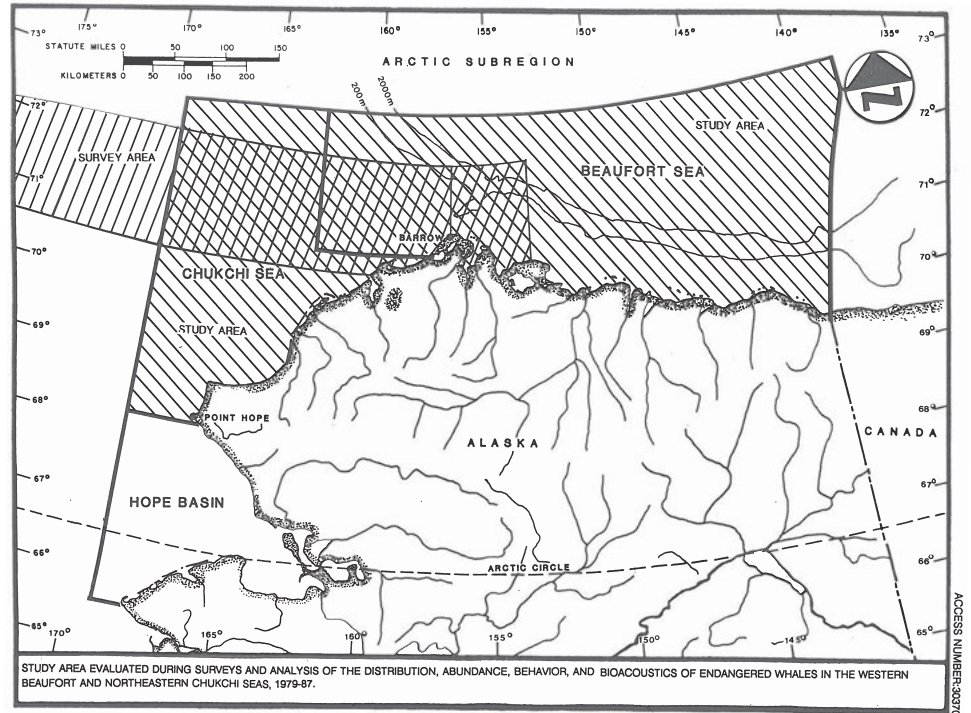


Figure 1. Spatial index for an endangered whale study area from the Technical Summary Project circa 1991. Although technology has improved, the cartographic concept for referencing the study area is still the basis for the geographic information to be used in geoESPIS.



Figure 2. The latest design diagram of the geoESPIS search tool interface that will be hosted on MarineCadastre. Gov. The design is under review by a BOEM/NOAA team, and it may change some to produce the most informative and intuitive user interface for the geoESPIS system.

Maps that are in ESPIS reports provide important visual context to material presented in the report. However, the map data are static figures that are difficult to extract. This makes it difficult for users to search for studies with relevant geography. With current technology, search engines can pull out references to keywords buried in the body of documents, but no similar capability for searching graphical depiction of geographic information exists.

A 1980s ESPIS update called the Technical Summaries Project provided a useful illustration of the spatial indexing concept, mapping study areas on a series of 24 base maps. The study areas from the technical summaries effort were recorded and delivered to BOEM in hard copy; all that remains of this early mapping effort are the camera-ready originals of the index volumes (Figure 1).

Geographic mapping technology has vastly improved since then. The geoESPIS database will use the latest in Internet-based technology and enhance the public's ability to find relevant BOEM environmental stewardship information.

The BOEM partnership with NOAA CSC will leverage the MarineCadastr.gov, developed through another BOEM-NOAA collaboration. Since MarineCadastr.gov already attracts a marine planning audience familiar with using the GIS application, ESPIS reports will benefit by being highlighted in cartographic context. NOAA CSC has applied its expertise to develop a fresh look and an improved user experience for finding ESPIS reports (Figure 2). At the same time, investments in geoESPIS are also allowing the MarineCadastr.gov framework to enhance its data infrastructure, as the great volume of geographic information from ESPIS reports needs to be organized in a more structured data architecture.

One capability being tapped for geoESPIS is the MarineCadastr.gov framework's ability to link together relevant information distributed across a variety of sources on the Internet. Relevant research findings may be available in conference proceedings, scientific journal articles, and other sources of scientific data and information. To illustrate this situation, consider the survey records from the Bowhead Whale Aerial Survey Project in Alaska that were documented in a recent ESPIS report (Clarke et al., 2011), which have been developed into mapping products available through the Ocean Biogeographic Information System SEAMAP online GIS database (Figure 3). By cross-referencing ESPIS reports with other sources on the Internet, geoESPIS users may more easily find the scientific data and information that originated from BOEM Environmental Studies research.

As the history of ESPIS indicates, BOEM has pursued a forward-looking approach to the challenges of providing information services. For example, the geographic index used in the late 1980s anticipated the study area concept used in today's geoESPIS project. This anticipation of future technology continues today by focusing on ways to integrate

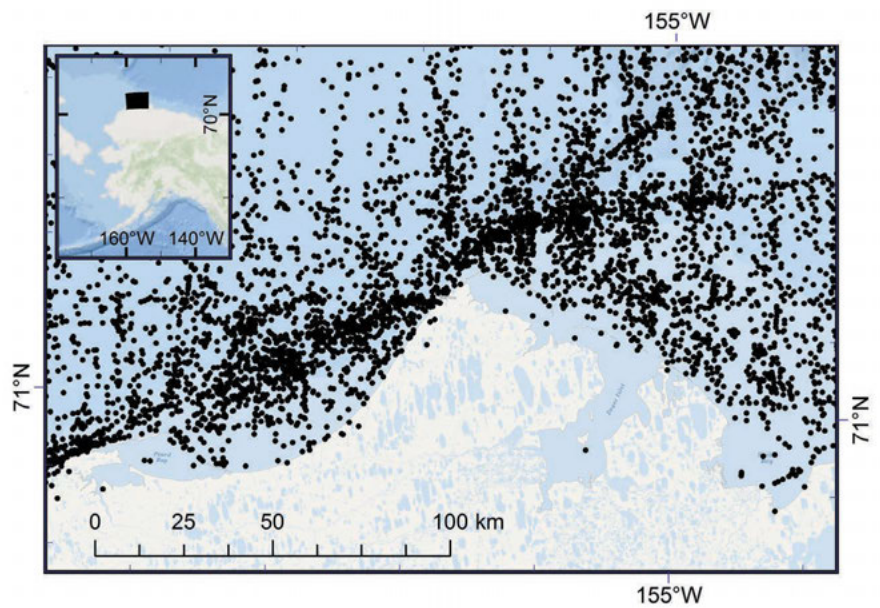


Figure 3. Bowhead Whale Aerial Survey Project data accessible online through the Ocean Biogeographic Information System. Markers indicate the location of individual sightings from the 30-year survey period (1979–2010).

various sources of data published on the Internet. The geoESPIS information architecture will provide a common system to manage and cross-reference a greater variety of Environmental Studies Program data.

In the future, it may be common for BOEM to disseminate scientific information that includes datasets, such as the marine mammal data depicted in Figure 3, that are linked to scientific analyses from ESPIS reports. This ability to index and cross-reference scientific reports with geographic information systems will improve the search and discovery of ESPIS information and provide a capacity to manage a wider variety of information in the MarineCadastr.gov framework. Similar applications could be developed for the dissemination of other BOEM products, such as NEPA analyses and Endangered Species Act consultations, providing a new way of doing business and sharing information with the public.

FOR MORE INFORMATION:

BOEM's Environmental Studies Program Information System (ESPIS)

http://www.data.boem.gov/homepg/data_center/other/espis/espismaster.asp?appid=1

Clarke, J.T., M.C. Ferguson, C.L. Christman, S.L. Grassia, A.A. Bower, and L.J. Morse. 2011. Chukchi Offshore Monitoring in Drilling Area (COMIDA) Distribution and Relative Abundance of Marine Mammals: Aerial Surveys. Final Report. OCS Study BOEMRE 2011-06

<http://www.data.boem.gov/PI/PDFImages/ESPIS/5/5206.pdf>

Ocean Biogeographic Information System

<http://seamap.env.duke.edu/dataset/825>

SeaSketch Informing Pacific Renewable Energy Leasing Program

Growing U.S. energy needs have led to increasing interest in offshore renewable energy development in the Pacific OCS Region. Understanding existing and potential recreational, commercial, industrial, and cultural ocean uses is essential to informed decision making for such development. While California has an ocean uses atlas that provides baseline information on the location and extent of a wide variety of human uses of the ocean from the shoreline to 200 miles offshore, nothing similar exists at a regional scale. BOEM's need for similar information gave rise to the Pacific Regional Ocean Uses Atlas (PROUA) project, an interagency collaboration between BOEM and NOAA. The PROUA project will identify and map ocean uses offshore Oregon, Washington, and Hawaii through

participatory mapping by community ocean uses experts. The PROUA data will play a role in informing future decisions for orderly, safe, and environmentally responsible Pacific OCS renewable energy leasing activities.

One tool that will be used with the PROUA project is SeaSketch, a user-friendly, web-based mapping platform that could be used for (a) interacting with ocean geospatial data, (b) gathering additional geospatial information, and (c) discussing the data in collaborative forums. Using a simple interface, project managers (e.g., BOEM and NOAA personnel) can invite ocean uses experts to review and validate the PROUA data collected in participatory mapping workshops. Project managers can also conduct surveys through SeaSketch to solicit additional ocean uses geospatial information.

Once the PROUA project is complete and the final spatial data are publicly available, users (e.g., BOEM personnel, PROUA data providers, OCS Renewable Energy Task Force members, etc.) will be able to easily view and organize the complex dataset using SeaSketch to more fully understand patterns of human uses of the ocean.

While SeaSketch and MarineCadastre.gov both display spatial data for marine planning, SeaSketch offers one advantage. SeaSketch is a collaborative workspace and

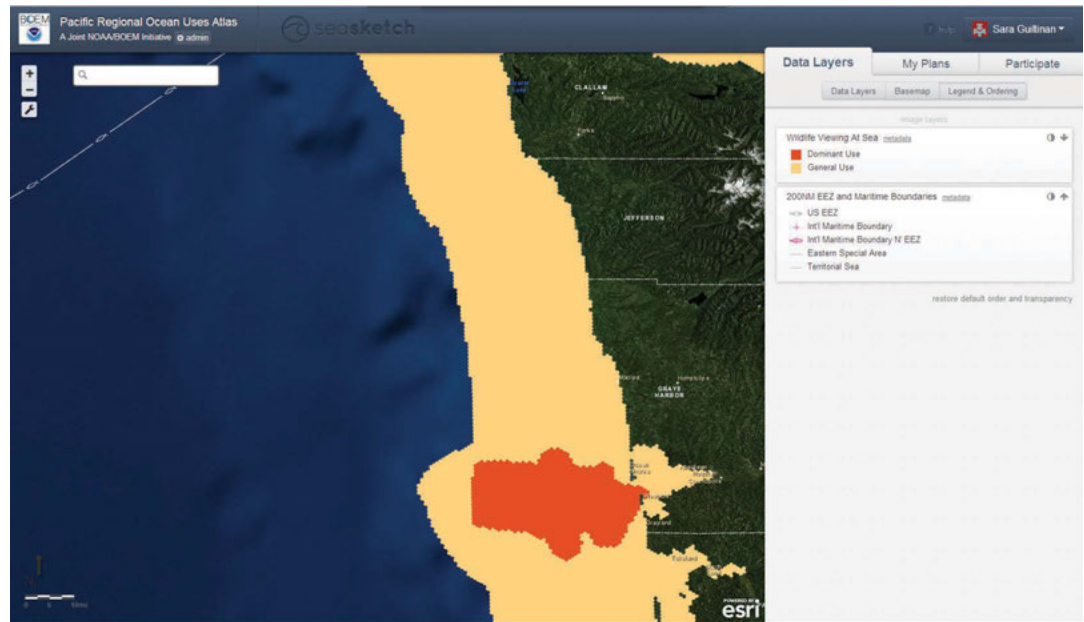


Image shows an example of ocean use data displayed in the SeaSketch online platform. Ocean uses experts in Washington mapped where wildlife viewing at sea is known to occur with some regularity (general use) and areas routinely used by wildlife viewers most of the time within seasonal patterns (dominant use). The data show that wildlife viewing at sea is most dominant out of Westport and Neah Bay, but there are also wildlife boat tours out of Port Angeles, Ilwaco, and LaPush. SeaSketch users will be able to interact with the different ocean uses data layers and explore the metadata. Note: Washington PROUA data were gathered in collaboration with BOEM, NOAA, and the State of Washington.

forum in addition to an online spatial data viewer. For example, project managers can invite and group users from agencies, industry, and other stakeholder groups, and set up online discussion forums and surveys to contribute information and opinions, evaluate geospatial information, and discuss spatial data.

SeaSketch will also allow BOEM to visually display and discuss specific renewable energy lease proposals with potential developers to raise awareness of existing uses, user groups, and possible space-use conflicts early. Since datasets from various sources are easily integrated into the SeaSketch platform, it is a valuable tool to build a robust portfolio of geospatial information.

BOEM's use of SeaSketch will improve user-friendly accessibility to ocean uses data for the public. The online platform will allow users to use SeaSketch at their convenience, both in terms of time and location, and thereby promote participation in data validation, improve data quality, and encourage exploration of BOEM data holdings.

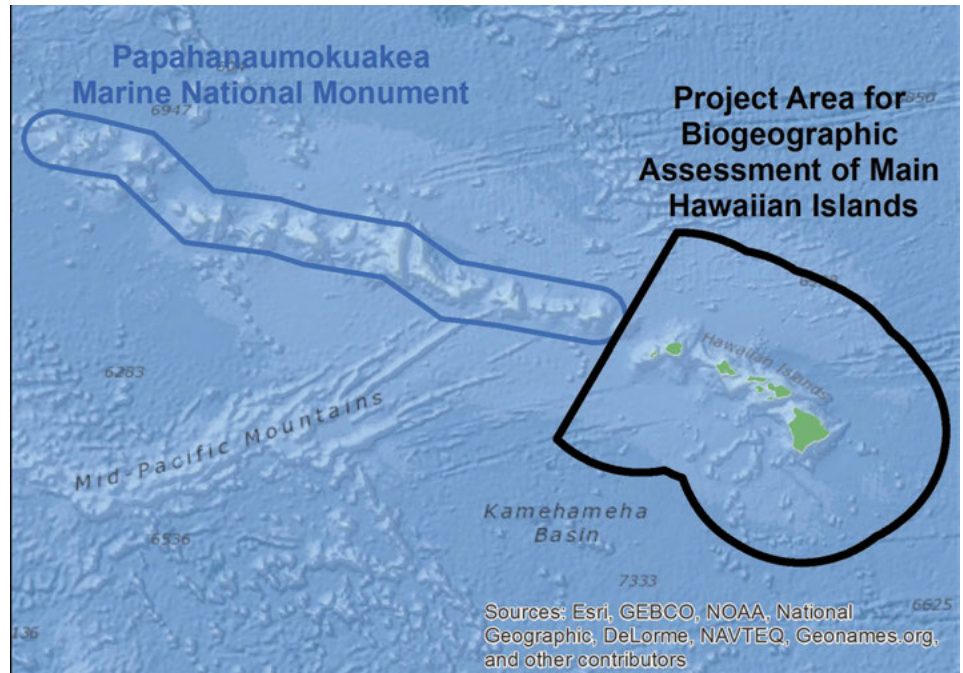
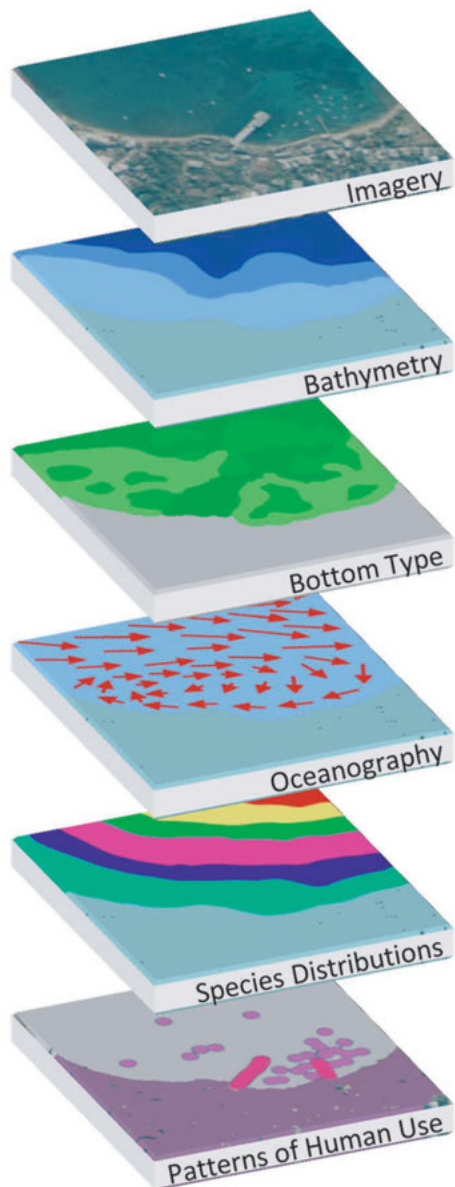
FOR MORE INFORMATION:

SeaSketch

<http://www.seasketch.org>

A Marine Biogeographic Assessment of the Main Hawaiian Islands

For the first time, BOEM is bringing the latest mapping tools to bear on the waters of our southernmost state: Hawaii. The Hawaiian Islands are well known for their impressive surf and consistent trade winds, both potentially valuable sources of renewable energy. The fact that Hawaii must import all fossil fuels drove State representatives to set a goal of generating 40 percent of the State's electricity needs from renewable sources by 2030. Hawaii is currently working to deploy readily



The area of the Main Hawaiian Islands biogeographic assessment encompasses (from southeast to northwest) Hawaii, Maui, Kahoolawe, Lanai, Molokai, Oahu, Kauai, and Niihau.

available renewable energy devices, improve grid infrastructure, and look toward the development of future renewable energy technologies. Moving offshore, the interconnection of the islands' electricity grid with submarine cables is being considered, and tapping offshore renewable energy resources may be an attractive addition to Hawaii's energy portfolio.

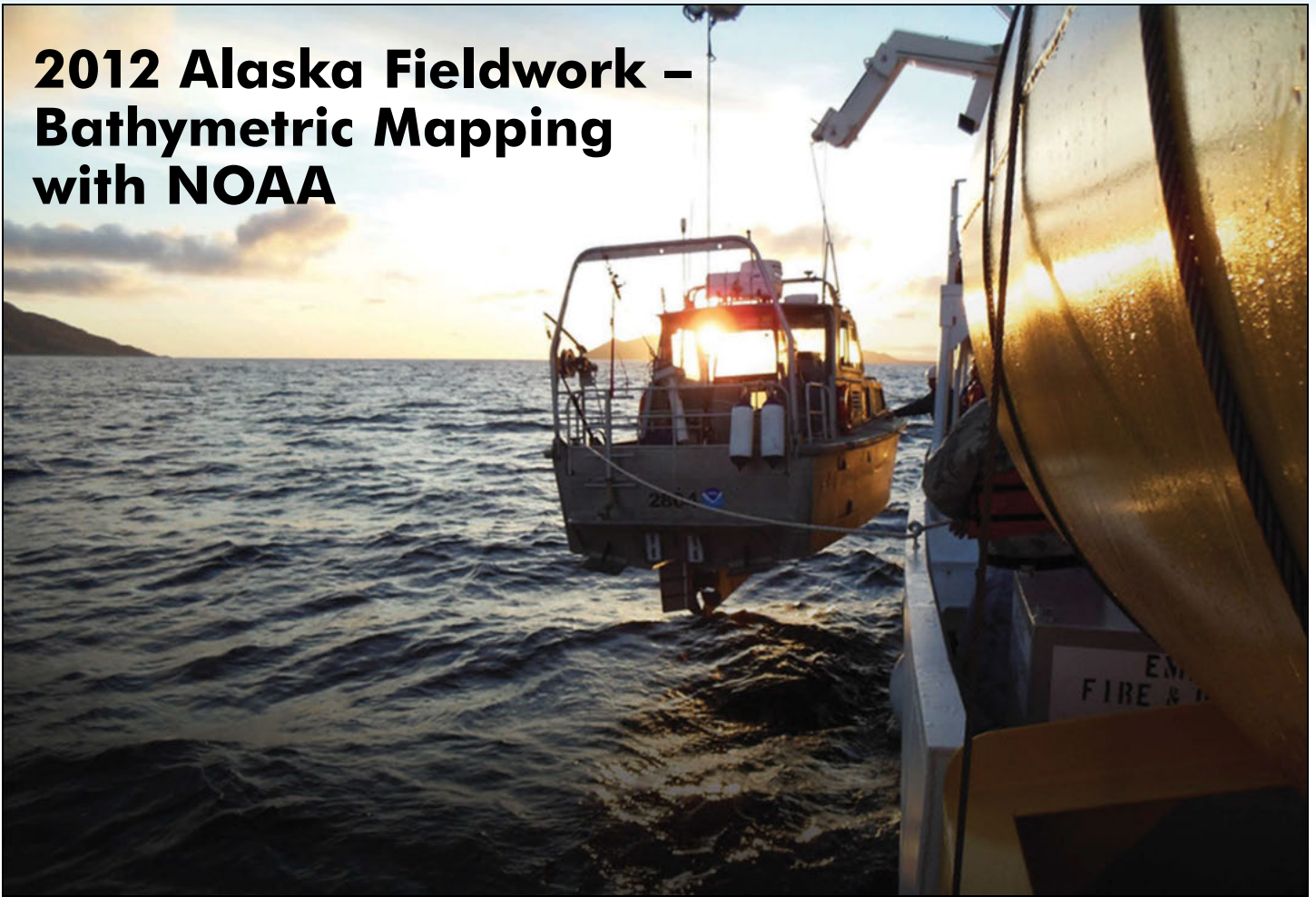
In anticipation of future offshore energy projects in Hawaii, BOEM partnered with NOAA's National Centers for Coastal Ocean Science to characterize the marine environment around the Main Hawaiian Islands. In 2009, NOAA completed a marine biogeographic assessment of the Northwestern Hawaiian Islands (Papahānaumokuākea Marine National Monument). A 2013 interagency agreement between BOEM and NOAA extended that assessment to include the Main Hawaiian Islands.

At left: Layers of information are combined to understand the geographic distribution of organisms and the factors influencing their distribution. Adapted from NOAA.

Spatial information describing the physical environment, benthic communities, and distribution of whales, dolphins, seals, seabirds, fish, and corals is being compiled and synthesized. The resulting spatial data layers and associated metadata will be used to support BOEM environmental analyses by providing descriptions of key ecological patterns, linkages, and locations of biological resources and their habitats. BOEM will also integrate the data collected through this study with other BOEM mapping studies underway in Hawaii, including the Pacific Regional Ocean Uses Atlas and Maritime Cultural Resources Site Assessment in the Main Hawaiian Islands, as well as more specific studies like Habitat Affinities and At-sea Ranging Behaviors among Main Hawaiian Island Seabirds.

A final report for A Marine Biogeographic Assessment of the Main Hawaiian Islands is expected in 2016. Stay tuned for more information as BOEM works with Hawaii to map a more secure, efficient, and sustainable energy future.

2012 Alaska Fieldwork – Bathymetric Mapping with NOAA



Launching one of the marine survey vessels from NOAA's hydrographic survey vessel *Rainier*.

In September 2012, Doug Vandegrift, Chief of the Mapping and Boundary Branch, Leasing Division, reported to the NOAA ship *Rainier* in Alaska to gather hydrographic data for updating nautical charts of the Shumagin Islands in the Aleutians. Climb aboard and enjoy a short synopsis of his field trip!

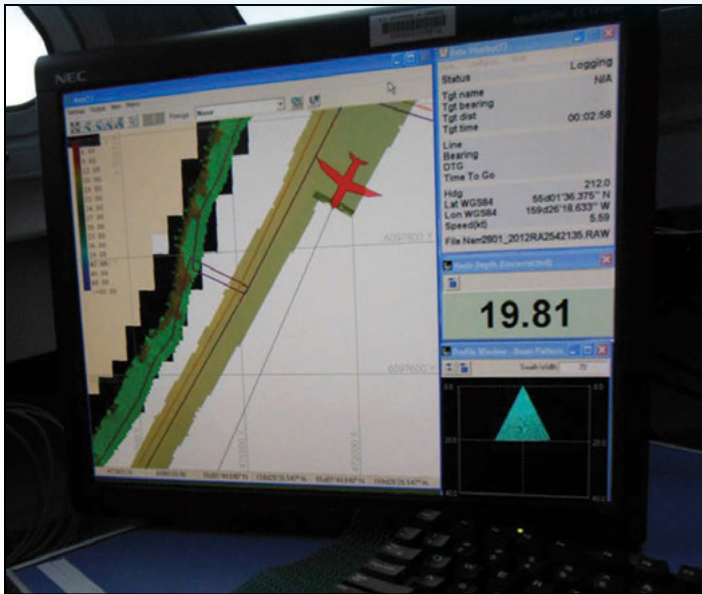
COLLECTING BATHYMETRIC DATA

September 9 – We arrived at the Shumagin Islands after a 36-hour journey from Kodiak and dropped anchor in the Northeast Harbor of Little Koniuji Island. The ship makes extensive use of existing paper and electronic nautical charts, and I discovered that many nautical charts of Alaska were made using minimal, sometimes unreliable data.

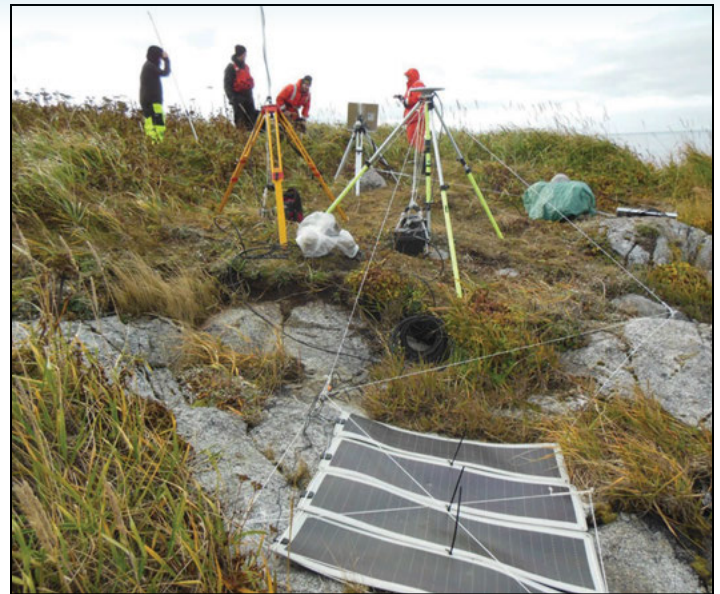
September 10 – A crew and I boarded a small vessel to collect “bathy” data of the ocean floor southwest of Little Koniuji Island. We were given specific polygons to survey with sonar equipment. Like mowing a lawn, the vessel transits back and forth over the ocean floor until it completes the polygon. Data is processed immediately and reveals the topography of the ocean floor as a black and white image. The mapping software color codes the data by depth and reveals where the ocean floor rises and recedes.



Paper nautical charts are still used extensively on board *Rainier*.



Screen inside the vessel displaying the bathy data being collected (“mowing the lawn”).



Data collection instruments for the tide gauge (computer under green tarp).

PROCESSING BATHYMETRIC DATA

September 11 – My assignment today was to process bathy data by downloading and organizing positional data, sound velocity, tidal data, etc. I learned about applying corrections to data, recording the resulting statistics, and exporting cleaned and corrected images of the ocean floor.

COLLECTING OCEAN FLOOR SAMPLES

September 12 – I was assigned to a vessel collecting “bottom samples” of the ocean floor from 28 sites. Neither device we used was more effective than the other. We usually pulled up less than a teaspoon of sand and an occasional seashell. The strong currents were probably the cause, washing the sample out of the device before it reached the surface.

INSPECTING A TIDE GAUGE

September 13 – I left the *Rainier* in an open skiff (boat without a cabin) to collect data from a tide gauge installed on a small islet on the coast of Simeonof Island. Unfortunately, the gauge had been destroyed, probably by wave action. The recording equipment (GPS, laptop, solar panels) was intact, but only a small piece of the actual staff remained.

SURVEYING SHORELINE

September 15 – Doug Nedrich (also of MBB) and I were assigned to verify the existence of rocks near the shoreline of Little Koniuji Island that are currently shown with an asterisk (*) symbol on nautical charts. We confirmed two rocks no longer exist or never existed. The “missing” rocks were based on a cartographic interpretation of aerial photography, which shows that interpreting aerial imagery is not an exact science. Stormy weather forced our return to Kodiak the next day.

INSTALLING A TIDE GAUGE

September 19 – On my last full day aboard the *Rainier*, I helped install a tide gauge at Kizhuyak Bay on the northern



The new tide gauge staff installed at Kizhuyak Bay.

end of Kodiak Island. These are critical for determining tidal datums, from which we project maritime boundaries. The site was near a benchmark set by the U.S. Coast and Geodetic Survey in 1933. We set four new benchmarks, and scuba divers bolted a device to the sea floor that will provide comparison data. The *Rainier* arrived back at Kodiak that evening, and I departed the ship the next day.

Special thanks to Julie Conklin, BSEE; CDR Richard Brennan, Executive Officer at NOAA Ship Rainier; LT Matthew Jaskoski, Executive Officer at NOAA Ship Fairweather; and LCDR Marc S. Moser, NOAA Chief of Operations Branch for providing this field training opportunity for BOEM MBB employees. Doug Vandegraft and Doug Nedrich joined the Rainier crew for three weeks while Andy Archer joined the Fairweather crew for two weeks.

BOEM OCEAN SCIENCE

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New Waves

Late-Breaking News & Information

West Coast Offshore Wind Project

The first offshore wind project was recently proposed for federal waters off the West Coast. Oregon Governor John Kitzhaber and BOEM Director Tommy Beaudreau joined Interior Secretary Sally Jewell to announce that BOEM has given the green light for Principle Power, Inc. to submit a formal plan to build a 30-megawatt pilot project using floating wind turbine technology offshore Coos Bay, Oregon.

The West Coast holds an offshore capability of more than 800 gigawatts of wind energy potential, according to the National Renewable Energy Laboratory, which is equivalent to more than three quarters of the Nation's entire power generation capacity. Total U.S. deepwater wind energy



Prototype WindFloat developed by Principle Power, Inc.

resource potential is estimated to be nearly 2,000 gigawatts.

Principle Power, Inc. will seek to site its project within a 15-square-mile proposed lease area. The project is designed to generate electricity from five floating "WindFloat" units, each equipped with a six-megawatt offshore wind turbine. The turbines would be connected by electrical cables and have a single

power cable transmitting the electricity to the mainland. The facility, sited in about 1,400 feet of water, would be the first offshore wind project proposed in federal waters off the West Coast and the first in the Nation to use a floating structure to support offshore wind generation in the Outer Continental Shelf.