

BOEM OCEAN SCIENCE

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

VOLUME 13 ISSUE 2 • JULY/AUGUST/SEPTEMBER 2016



Preserving the Past for Our Future

**BOEM's Historic Preservation
Program: Why is Historic
Preservation Important?**

**Atlantic Region Preservation
and Partnerships**

**Historic Preservation in the
Pacific Region**

**Archaeological Preservation
in the Gulf of Mexico**

**Cultural and Archaeological
Resources in the Alaska
Region**

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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

Narragansett Indian Tribal member and University of Rhode Island undergraduate student Chali Machado investigates a tree trunk and root structure of an exposed ca. 6,500 year-old forest floor during the Submerged Paleocultural Landscapes study off Block Island, RI. Photo by David Robinson, University of Rhode Island Graduate School of Oceanography.

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

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FREQUENTLY USED ABBREVIATIONS

ESP	Environmental Studies Program
GIS	Geographic Information System
GOM	Gulf of Mexico
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NOAA	National Oceanic and Atmospheric Administration
NRHP	National Register of Historic Places (or NR)
OCS	Outer Continental Shelf
OREP	Office of Renewable Energy Programs
TCP	Traditional Cultural Properties
WWII	World War II
YBP	Years Before Present

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



THE DIRECTOR'S MESSAGE

The bottom of the sea holds many mysteries that scientists are always eager to explore. For centuries, shipwrecks and other archaeological discoveries have captured our imagination but their real value lies in the information they provide about our past and our inextricable link to the sea. Novelists, playwrights, and poets alike have written about ships overwhelmed by storms, attacked by pirates, or lost during the engagements of war. Indigenous tribes have shared vital information about their heritage, oral histories, and the now-submerged lands

they hold as sacred cultural landscapes.

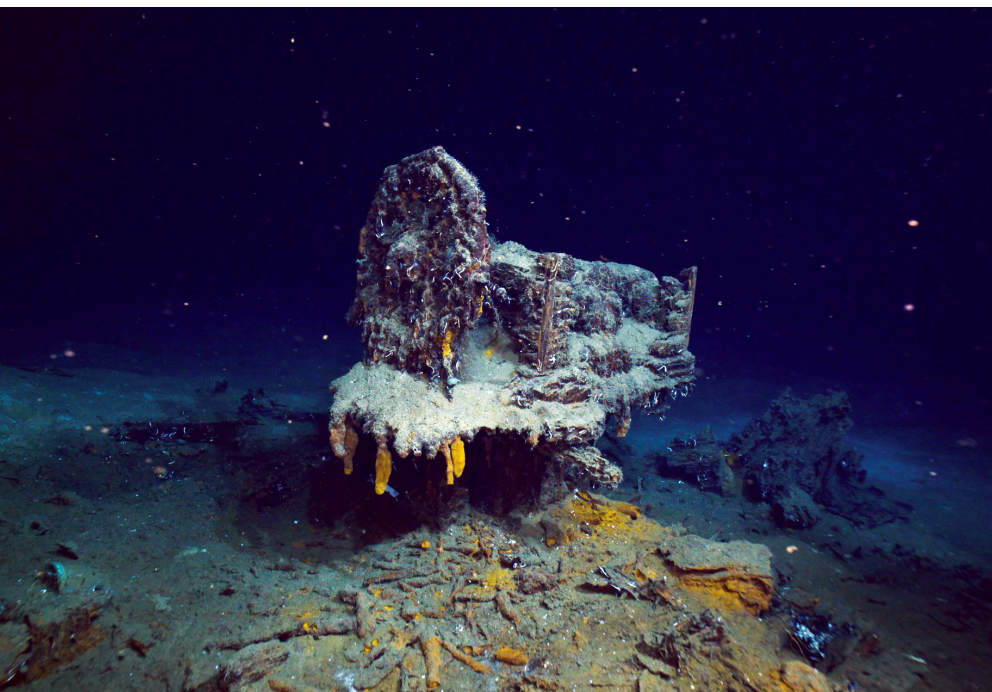
This issue of *BOEM Ocean Science* celebrates the 50th anniversary of the National Historic Preservation Act (NHPA), a key piece of historic preservation legislation enacted in 1966 to ensure that Federal agencies consider potential impacts to cultural resources *prior to* issuing permits or distributing funds for activities under their purview. Under the NHPA, BOEM ensures that cultural resources such as historic shipwrecks and submerged indigenous sites are identified and protected as they are valued elements of our collective cultural heritage. BOEM is responsible for resolving adverse effects to those resources identified within BOEM-permitted areas of industry activity or excavation of marine minerals on the Outer Continental Shelf (OCS).

In addition to the NHPA, the National Environmental Policy Act (1969) and the Outer Continental Shelf Lands Act (1953) also guide activities related to historic preservation during the exploration and development of OCS energy sources and extraction of sand and gravel used to restore coasts and wetlands. These national laws, along with executive orders, ensure that our maritime history is preserved for future generations.

Our Bureau has a dedicated team of marine archaeologists who study and work to protect the cultural resources that lie at the bottom of the OCS as well as those near the coast that could be impacted by OCS activities. Several members of our historic preservation staff are experienced divers who participate in the Bureau's scientific diving program.

This issue of the magazine defines historic preservation and why it is important, and focuses on key historic preservation-related studies in each of our regions. And we interview Willie Hoffman, one of our marine archaeologists. Please enjoy this issue of *BOEM Ocean Science*.

– Abigail Ross Hopper, Director



FOR MORE INFORMATION

BOEM's Environmental Studies Program

<http://www.boem.gov/Studies/>

Steering gear from the "7,000 foot wreck" observed during the *Lophelia II* study in 2009. Image courtesy of *Lophelia II* 2009 Expedition, NOAA-OER/BOEMRE.

BOEM's Historic Preservation Program: Why is Historic Preservation Important?



"Historic preservation is a conversation with our past about our future. It provides us with opportunities to ask, 'What is important in our history?' and 'What parts of our past can we preserve for the future?' Through historic preservation, we look at history in different ways, ask different questions of the past, and learn new things about our history and ourselves. Historic preservation is an important way for us to transmit our understanding of the past to future generations."

- National Park Service 2016

BOEM is charged with developing and implementing policies, regulations, and guidance to ensure that cultural resources (see sidebar) are identified and given due consideration during conventional and renewable energy exploration and development and marine minerals extraction in Federal waters of the OCS. This responsibility for historic preservation is mandated by the National Historic Preservation Act (NHPA) of 1966, the National Environmental Policy Act (NEPA) of 1969, the Outer Continental Shelf Lands Act (OCSLA) of 1953, all as amended; and several Executive Orders. Cultural resources, in the broadest sense, include "stories, knowledge, people, places, structures, and objects, together with their associated environment, that contribute to the maintenance of cultural identity and/or reveal the historic and contemporary human interactions with an ecosystem" (Ball et al. 2015). Important and often overlooked components of cultural resources are those places, structures, and objects related to our Nation's heritage that now lie submerged beneath the sea.

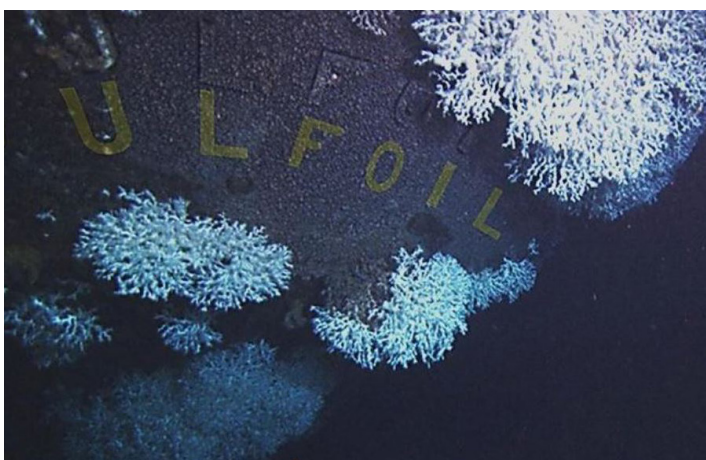
Within BOEM's jurisdiction of the OCS, the majority of cultural resources fall into two categories: historic sites (those more than 50 years old) such as shipwrecks and associated remains, sunken aircraft, and other maritime infrastructure; and indigenous sites including Traditional Cultural Properties. Historic shipwrecks are the more well-known of the two as watercraft have been used for millennia around the world to transport people and goods across waterways, lakes, and oceans. Many people don't realize that the lands that comprise parts of the OCS were exposed and habitable in the past but have been submerged for more than 8,000 years as glaciers melted and sea levels rose. During that period, ancient indigenous peoples of North America may have lived on portions of the now-submerged OCS, and in rarer cases, the archaeological material in the form of discrete sites may have survived rising sea levels.

In addition, BOEM is required to consider viewshed impacts to cultural resources on land that may derive their historical character, cultural significance, or ceremonial importance from their visual setting on the coast looking out over the ocean. Many Alaska Natives, Native American tribes, and Native Hawaiians consider the oceans as sacred landscapes. Even today, indigenous communities perform ceremonies that require an unobstructed view of the horizon for observing the rising or setting sun, or of distant islands related to creation narratives or where souls return after death to reunite with ancestors, all of which are integral to their cultural identity (Kikiloi 2010).

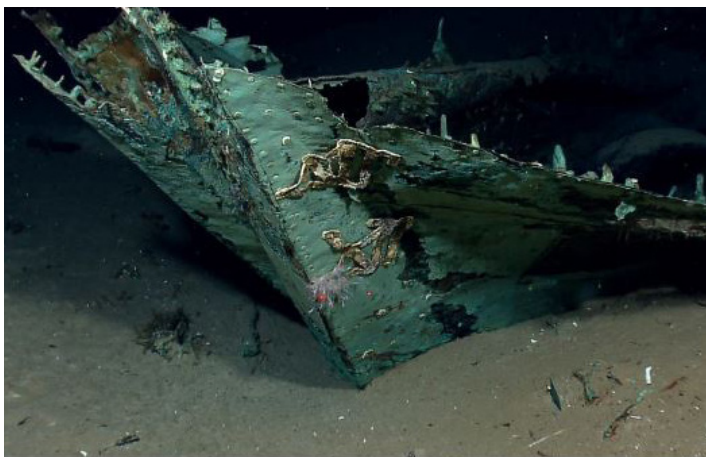
BOEM's historic preservation program includes a staff of eleven archaeologists located in its headquarters and regional offices who are passionate about studying and protecting the



BOEM marine archaeologist Dave Ball records the remains of the German U-boat U-701 off the coast of North Carolina. Photo by Steve Sellers, NOAA.



Lophelia pertusa coral obscures part of the tanker *Gulfoil's* stern in the Gulf of Mexico. Image courtesy of *Lophelia II* 2010 Expedition, NOAA-OER/BOEMRE.



Copper sheathing and lead draft marks on the stern of the 19th century Monterrey Shipwreck in the Gulf of Mexico. Photo by NOAA Okeanos Explorer, 2012.

cultural resources that lie on or beneath the OCS. Several members of the historic preservation staff are qualified and experienced SCUBA divers who participate in BOEM's Scientific Diving Program. Staff members also develop policies and

guidelines to ensure that any cultural resources that may be impacted by energy exploration and development and marine minerals extraction in Federal waters are identified and protected. Another important aspect of the historic preservation program is participation in stakeholder-engagement meetings and Government-to-Government consultations with Federally recognized tribes, Alaska Native Claims Settlement Act Corporations, and Native Hawaiian Organizations. Our archaeologists are also dedicated scientists who develop and participate in innovative, cutting-edge environmental studies funded by BOEM, and often partner with other Federal, State, and Tribal agencies, industry, private firms, academic institutions, and non-profit organizations. To date, we have funded more than \$14 million dollars of cultural resources-related research.

Examples of Cultural Resources

- Indigenous sites
- Buildings/structures
- Traditional Cultural Properties
- Landscapes
- Cemetery/burials
- Shipwrecks/watercraft
- Aircraft
- Lighthouses
- Ports/wharves/other maritime infrastructure
- Battlefields

For more than 40 years, BOEM and its predecessor agencies have acquired cultural resource information for decision-making purposes primarily through industry-sponsored archaeological surveys on the OCS and our Environmental Studies Program (ESP). For example, in the Gulf of Mexico, the oil and gas industry has been required to submit archaeological assessments of geophysical data collected within their proposed project area prior to receiving a permit since 1973. This survey requirement now exists in all of BOEM's OCS regions. Potential cultural resources identified during these surveys include magnetic anomalies, sonar targets, shipwrecks, or buried landforms that might contain preserved pre-European contact period sites.

Through the ESP, BOEM has been at the forefront of identifying, studying, and understanding maritime heritage, and for providing a framework where OCS energy development, marine minerals extraction, and historic preservation goals can be simultaneously accomplished to preserve the irreplaceable remnants of our Nation's history. Beginning in the 1970s, BOEM funded several large-scale regional historical, archaeological, and geological studies that examined the potential for pre-contact and historic period cultural resources

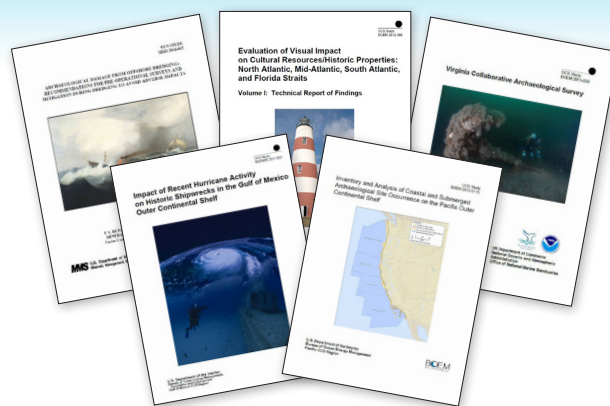
and developed inventories of potential cultural resources in the Atlantic, Gulf, Pacific, and Alaska regions.

Over the past few decades, these and more recent studies, along with industry's archaeological and geological surveys, provide critical data that are stored in regional Geographic Information System (GIS) databases of cultural resources. Collectively, this information is used by BOEM to identify potential cultural resources within areas proposed for seafloor-disturbing activities, whether for oil and gas activity (e.g., drilling, platform installation, and pipeline-laying), renewable energy (e.g., wind turbine installation), or marine minerals extraction (e.g., dredging sand for coastal restoration projects). If a potential cultural resource is located within an area of proposed seafloor-disturbing activities, BOEM develops avoidance mitigations or directs a lessee to obtain additional information about the potential cultural resource, usually through an archaeological investigation. If a cultural resource cannot be avoided, BOEM develops a mitigation strategy, in consultation with the appropriate Federal, State, and Tribal agencies, to minimize the impacts to the resource and to recover any information that may be lost through the permitted activity.

In addition to inventories of potential cultural resources, BOEM's studies have investigated shipwrecks to assess their eligibility for nomination to the National Register of Historic Places, examined the artificial reef effect of deepwater shipwrecks, and examined potential impacts from offshore dredging. Other studies have informed revisions and updates to BOEM's archaeological survey guidelines and reporting requirements.



Photos, page 6, bottom left to right: The Old Lighthouse Tower at Key Biscayne, Florida. Photo by John Milner Associates, Inc.; BOEM marine archaeologist, Brandi Carrier, dives on the WWII shipwreck, John Morgan, off the Virginia coast; Engine order telegraph from the steamship Robert E. Lee in the Gulf of Mexico during the 2004 Deep Wrecks Project.



Examples of BOEM cultural resource study reports.

Multi-disciplinary studies are integral to continually gather additional baseline information on the possible locations of shipwrecks and ancient shorelines and landforms (paleolandforms), as well as for studying maritime landscapes and individual sites to more fully understand their cultural and ecological significance. More recent and ongoing studies are looking at the potential environmental and anthropogenic effects (such as oil spill impacts and scouring from infrastructure placement) resulting from BOEM-permitted activities on cultural resources to develop appropriate management strategies that will ensure these non-renewable resources are preserved and available for study by future scientists.

In October 2016, we celebrate the 50th anniversary of a critical piece of historic preservation legislation for Federal agencies and the Nation: the National Historic Preservation Act. In addition to providing an over-arching view of BOEM's historic preservation program, this issue of *BOEM Ocean Science* features regional perspectives and touches upon key issues we've studied and cultural and archaeological information needs we've identified during the 40-plus years of our program.

– Dr. Brian Jordan, BOEM Federal Historic Preservation Officer

FOR MORE INFORMATION

BOEM's Ongoing Cultural and Archaeological Resource Studies

<http://www.boem.gov/BOEM-Archaeological-Studies/>

<http://www.boem.gov/Renewable-Energy-Ongoing-Studies/>

Ball et al. 2015, A Guidance Document for Characterizing Tribal Cultural Landscapes.

<http://www.boem.gov/2015-047/>

Kikiloi, K. 2010. Rebirth of an Archipelago: Sustaining a Hawaiian Cultural Identity for People and Homeland. *Hulili* (6):73-115.

http://www.ksbe.edu/_assets/spi/hulili/hulili_vol_6/5_Rebirth_of_an_Archipelago.pdf

National Park Service. 2016. What is Historic Preservation?

<https://www.nps.gov/subjects/historicpreservation/what-is-historic-preservation.htm>

Spotlight on A Scientist: Willie Hoffman

What is your job at BOEM?

I am an archaeologist with BOEM's Office of Renewable Energy Programs (OREP) in Sterling, Virginia. Overall, my role is to serve as a subject matter expert assisting the renewable energy program in fulfilling its responsibilities under the National Historic Preservation Act of 1966. For offshore wind energy projects in the Atlantic, this includes identifying and considering diverse resources from archaeological sites on the seafloor to architectural resources onshore.

I also serve as the Atlantic Regional Diving Officer for BOEM's Scientific Diving Program. The Bureau has a national team of scientific divers that support BOEM's applied science. My job is to work together with the other regions to ensure that divers are trained and equipped to conduct science in the offshore environment that BOEM regulates and, most importantly, to do this safely.

Day to day, my job takes many different forms and involves everything from conducting consultation meetings with stakeholders to participating in archaeological fieldwork offshore. I love having a job where I get to travel frequently and often have to pack both a business suit and a wetsuit.

Why did you decide to work for BOEM?

I previously worked as an archaeologist in BOEM's Gulf of Mexico OCS Region office and, after a stint with the U.S. National Park Service, I returned to BOEM in 2011 for a position with the OREP. Renewable energy is a frontier for both the Nation and BOEM and I felt that this new and developing program offered a place where I could have a positive influence on how BOEM approaches its historic preservation responsibilities.

BOEM is unique in that it primarily regulates areas that are entirely submerged. Identifying archaeological sites in offshore areas where no one has ever looked before is very exciting to me. There is such incredible potential for shaping our understanding of the past through these offshore sites, whether they are ancient submerged habitation sites or shipwrecks from World War II. However, along with this potential comes a great responsibility in how we as a society choose to preserve these resources. It's my hope that the Bureau continues to move forward as a leader in the stewardship of these unique places.

What role do you play in BOEM's Environmental Studies Program?

I manage environmental studies that seek to develop the best approaches for conducting archaeology in such a unique and challenging environment. My favorite part is the opportunity to develop partnerships and collaborations to overcome these challenges. It is expensive, time consuming, and difficult to do archaeology offshore and there is no reason to tackle it



Willie Hoffman diving on the sunken USCG vessel *Cuyahoga* offshore Virginia. Photo by Joe Hoyt, NOAA.

alone. In the OREP, we've had great success with an ongoing collaboration with the NOAA's Monitor National Marine Sanctuary and other partners to investigate archaeological sites within Wind Energy Areas. So far, we've completed projects offshore Virginia and Maryland with another underway off North Carolina. There is great value in agencies conducting this type of work for themselves as it directly informs decision making, is cost-effective, and increases the capacity for managing offshore cultural resources.

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

My career that has taken me on land and underwater and I've always been interested in the connection between the two. My first taste of archaeology was in the city of Alexandria, Virginia while an undergraduate at the George Washington University in Washington, DC. It was eye-opening to experience that archaeology wasn't only done in far off and exotic places, but that, literally, it could be done in your own backyard. I've been hooked ever since. There is still so much to be learned about the past and archaeology contributes to this knowledge, particularly in places where we may think we know everything already.

I attended graduate school at the Florida State University (FSU) to pursue underwater archaeology. While at FSU, I was trained in scientific diving and had the opportunity to work on shipwrecks and pre-contact archaeological sites. This gave me a well-rounded experience that is very relevant to the day-to-day work I do at BOEM.

What do you find most rewarding about your work?

The most fulfilling part of my work is the opportunity to interact hands-on with the amazing archaeological resources that exist in the offshore environment. Although much of the work we do relies on sophisticated technology and is done remotely through geophysical survey equipment, there is really nothing that can replace having archaeologists in the water observing and documenting these resources first hand, just as they would on land. It can be a challenge to determine if sites are significant archaeological resources that should be avoided and protected or if they should not prevent renewable energy development within a particular location on the seafloor. You don't always know until you go and take a look.

Atlantic Region Preservation and Partnerships

With the passage of the Energy Policy Act of 2005, BOEM assumed the responsibility for regulating wind energy development on the OCS. Since then, the Bureau has participated in and funded many cultural resource studies, as well as developed archaeological survey guidelines to ensure that culturally significant sites are properly considered in its decision making process. BOEM must evaluate the potential direct, indirect, and cumulative impacts on the human, coastal, and marine environments to make environmentally sound decisions about managing renewable energy activities and to develop mitigation measures to avoid or minimize impacts. Through compliance with NHPA and NEPA, BOEM routinely requires that developers avoid impacting historic properties—including archaeological sites—that are potentially eligible for listing on the National Register of Historic Places (National Register or NR). Recognizing that restricting activity in certain portions of project areas has the potential to reduce energy development opportunities, BOEM is engaged in several key studies for evaluating these interfaces.

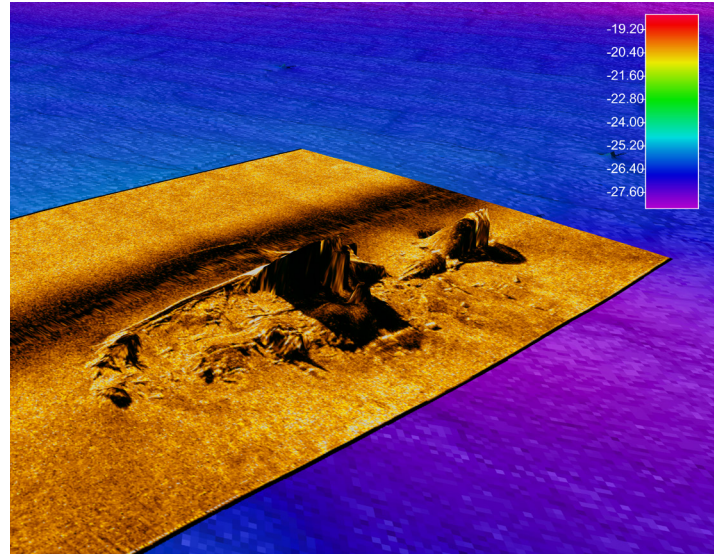
BATTLE OF THE ATLANTIC

The Battle of the Atlantic was waged from the waters off England to the U.S. Atlantic coast, even into the Gulf of Mexico, in potentially the longest military campaign of World War II (WWII). As a result, hundreds of shipwreck casualties, many of which are war graves, now rest on the seafloor. BOEM, in collaboration with the NOAA Monitor National Marine Sanctuary (MNMS), is supporting research to ensure the identification and preservation of these historically and culturally significant sites through archaeological investigations. The “Battle of the Atlantic” study is developing an inventory of WWII-related shipwrecks off North Carolina and cataloging site significance to allow preparation of nominations of selected sites for listing on the National Register. Investigations are also characterizing the state of preservation of these shipwrecks to provide baseline information for future monitoring.

Archaeological research of these WWII shipwrecks includes site mapping, visual documentation, and archival research. Marine archaeologists are applying a variety of techniques for obtaining data, including remote sensing, diving, and Remotely Operated Vehicle inspections.

The first field expedition in July 2008 documented the remains of several German U-boats in Federal waters. Subsequent expeditions (2009–2014) discovered more than a dozen additional wreck sites, including the U.S. Navy trawler *YP-389* and the Navy tugboat *Keshena*. During 2014 fieldwork, the team identified vessels lost during the 1942 attack on the KS-520 Convoy, including the German U-boat U-576 and the tanker *Bluefields*, which now rest less than 240 yards (219 m) apart.

The shipwrecks surveyed as part of this study are important pieces of world history and collectively tell the story of WWII



Overlay of side scan sonar and bathymetric imagery depicting a metal-hulled shipwreck. Image by BOEM.

off the Nation’s Atlantic coast. The inventory of WWII sites created through this study will assist BOEM in planning efforts offshore North Carolina and allow consideration of impacts to these sites from OCS energy development.

MARYLAND COLLABORATIVE ARCHAEOLOGICAL SURVEY

BOEM and NOAA are performing archaeological surveys and investigations near and within wind planning areas to gather baseline geophysical survey data. NOAA MNMS and BOEM share resources, provide scientific and technical specialists, and analyze the resulting data.

The “Maryland Collaborative Archaeological Survey,” one of several collaborations with NOAA, achieved three goals:

- Ground-truthed geophysical survey targets and anomalies to determine which are archaeological sites (and therefore warrant protection) and which are not (and therefore should not delay development);
- Assessed the stability and integrity and determined NR eligibility of identified archaeological sites; and
- Made recommendations for future management and protection of archaeological sites, including long-term preservation.

The investigators collected high-resolution sonar imagery and performed diving investigations. Archaeologists explored four geophysical targets conclusively identified as shipwrecks potentially eligible for inclusion in the National Register. One of the sites is a very large shipwreck with boilers and machinery; others are older wooden-hulled shipwrecks that may yield information important to our understanding of history. BOEM will require developers operating within the

Maryland Wind Energy Area to avoid these sites in order to protect our shared maritime cultural heritage

EVALUATION OF VISUAL IMPACTS ON CULTURAL RESOURCES/HISTORIC PROPERTIES

Under the NHPA, BOEM is not only required to consider potential impacts to historic properties on the OCS; the Bureau must also consider potential impacts from OCS-permitted activities on historic properties along the coasts, such as wind turbines constructed within the viewshed of NR-eligible or listed sites on shore. Viewshed is an important consideration for NR eligibility as a site's "significance" can, in part, be derived from its setting within its historic context, which can include the surrounding environment. New areas of interest and concerns such as these were addressed in the "Evaluation of Visual Impact on Cultural Resources/Historic Properties" study. The study acquired baseline information for formulating decisions regarding site selection for OCS wind energy facilities in the Atlantic Region and evaluated the impact of wind energy structures and lighting on the viewshed of historic properties in publically accessible areas.

This study encompassed an area of approximately 3,800 linear miles (6,115 km) along the Atlantic coast and catalogued 9,600 cultural resources and historic properties that could be visually affected by OCS development. The study included only previously identified historic properties. For demographic information, the National Register, the State Historic Preservation Offices in 13 coastal states, local municipalities, other government agencies, and Native American Tribes were contacted to provide data addressing various key attributes. A substantial number of sites—96%—were considered to have a historically significant maritime setting, and nearly 12% were considered to have a historically significant view toward the open sea.

SUBMERGED PALEOLANDSCAPE PROJECT

When offshore wind developers began focusing on southern New England, Native American Tribes began to express concern over the likelihood that their ceremonial sites and ancestral burial grounds would be disturbed. In response to these concerns, BOEM is funding a study, through a cooperative agreement with the University of Rhode Island (URI), in partnership with the Narragansett Indian Tribal Historic Preservation Office. According to Narragansett oral history, their villages became inundated by water off the coast of Rhode Island more than 15,000 years ago. Beginning in 2012, an interdisciplinary team of geologists, archaeologists, and Tribal members conducted remote sensing surveys and diver visual assessments of near-shore submerged paleolandscapes. In addition, the study is developing best practices for identifying submerged ancient landscapes and determining the potential for preservation of ancient Native American sites. These best practices will aid BOEM in developing guidance to ensure that wind energy developers will utilize the best available scientific methods for identifying potential ancient Native American sites prior to installation of wind energy facilities on the OCS.

SUMMARY

As OCS wind energy development expands in the Atlantic Ocean, our cultural resource studies will continue to inform decision-making and ensure BOEM's compliance with NHPA and NEPA. These studies, and others, provide opportunities to build positive partnerships with Federal and Tribal entities; obtain a better understanding of cultural resources on the shore and underwater; and develop scientifically proven, standardized, best practices methodology for identifying these delicate and irreplaceable resources on the Atlantic OCS.

— Janet Purdy, Schatz Publishing



BOEM Archaeologist and Federal Preservation Officer Brian Jordan surveys an exposed paleolandform off Block Island, RI in 2016. Photo by David Robinson, University of Rhode Island.

FOR MORE INFORMATION

Battle of the Atlantic

<http://www.boem.gov/AT-10-04/>

Maryland Collaborative Archaeology Survey

<http://www.boem.gov/Renewable-Energy/Historic-Preservation-Activities/>

<http://www.boem.gov/MCAS-Report-Final-Public/>

Evaluation of Visual Impacts on Cultural Resources/Historic Properties

<http://www.data.boem.gov/PI/PDFImages/ESPIS/5/5249.pdf>

<http://www.data.boem.gov/PI/PDFImages/ESPIS/5/5250.pdf>

Developing Protocols for Reconstructing Submerged Paleocultural Landscapes

<http://www.boem.gov/Developing-Protocols-for-Reconstructing-Submerged-Paleocultural-Landscapes/>

Historic Preservation in the Pacific Region

BOEM's Pacific OCS (POCS) Region has overseen conventional energy exploration and development for decades; however, recent interest is focusing on renewable energy development. Understanding the types and locations of significant archaeological and cultural resources is essential to their preservation as they are important considerations when planning for development of OCS renewable energy. The impact of OCS infrastructure on coastal properties is significant to various communities, including Native Americans and Native Hawaiians. These impacts can include physical disturbances to archaeological sites and traditional use areas, as well as viewshed impacts to sacred places through siting of energy-related structures in Federal waters.

OUTREACH ON THE PACIFIC OCS

Over the last six years, BOEM has undertaken several studies that focused on historic preservation and better coordination with indigenous communities in the POCS Region. In 2011, BOEM funded a study titled "Inventory and Analysis of Coastal and Submerged Archaeological Site Occurrence on the Pacific Outer Continental Shelf." The report, released in 2013, evaluated the archaeological potential of the POCS, and is the latest in a series of similar baseline reports produced for other regions managed by BOEM. The "Inventory" study included the area offshore California, Oregon, and Washington extending from 1 mile inland to approximately 200 miles offshore (1.6–321.9 km). The study accomplished three objectives to identify sites and site potential on the POCS: 1) developed paleolandscape reconstructions to help predict the potential for submerged pre-contact site locations, 2) conducted research and outreach to identify significant coastal properties, and 3) updated the regional database of historic shipwrecks.

BOEM is in the process of completing a similar effort offshore Hawaii. As with BOEM's other regional studies, the Hawaii effort includes conducting research and developing a regional database of historic shipwrecks and other underwater cultural heritage sites located within Hawaii's OCS. Similar to

regional studies conducted for the Atlantic OCS and Pacific OCS, it also incorporates research and outreach to identify significant terrestrial properties. The third component of the Hawaii effort, however, will also develop a best practices methodology for incorporating a cultural landscape approach to working with Native Hawaiian communities. This effort is similar to the POCS Region's Tribal Cultural Landscapes study that is nearing completion. Both of these studies were highlighted in the April/May/June 2016 issue of *BOEM Ocean Science* (p. 14–15).

ARCHAEOLOGICAL AND BIOLOGICAL ASSESSMENT OF SUBMERGED LANDFORMS OFF THE PACIFIC COAST

The goal of a new study, conducted with San Diego State University, is to refine the model for submerged paleoshorelines off the POCS. This study is a step beyond the desk-based research phase completed in the 2013 inventory study.

The study will assemble existing geological and geophysical data sets from offshore southern California and central Oregon, conduct field investigations of areas identified as having a high potential to be associated with submerged cultural landforms, refine local sea-level curve models in the areas of investigation, develop and field test a geospatial model that will aid in identifying and classifying potential cultural landforms from existing remote sensing data and seafloor maps, and determine if these features are associated with ecologically sensitive areas. This phase of research will explore and synthesize the influence of landforms and coastal processes on biodiversity hotspots, biological productivity, and the structure of coastal food webs.

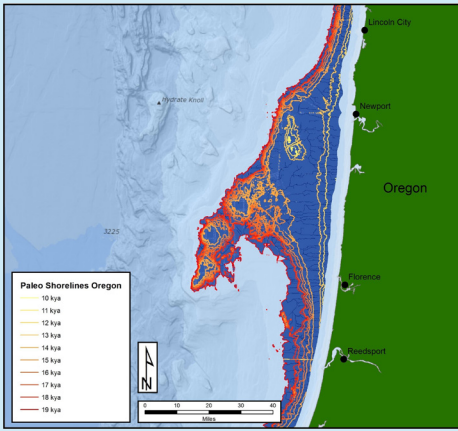
The high-resolution surveys and sampling conducted as part of this effort should enhance regional landscape models of submerged archaeological resources and sensitive biological features, and assist BOEM in future planning for OCS development.

VISUAL IMPACT EVALUATION SYSTEM FOR OFFSHORE RENEWABLE ENERGY (VIESORE)

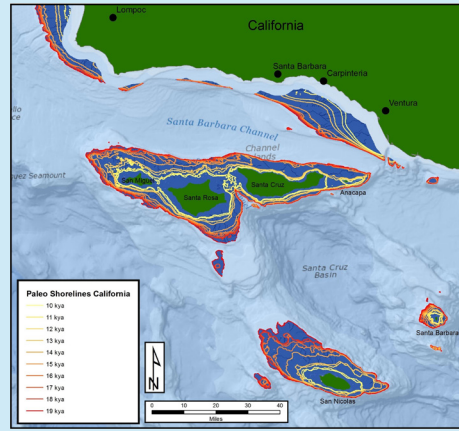
The potential for OCS wind facilities to cause visual impacts to seascapes has emerged as a stakeholder concern; the facilities are large, with tall structures having colors and a geometry that contrast with natural seascapes. The synchronized sweeping movement of the massive blades during the day and flashing of the aviation and navigation lighting at night contribute to the facilities' visibility over very long distances. As largescale deployment of OCS wind energy facilities ensues, an important challenge that developers and regulators face is minimizing potential visual impacts to: 1) important coastal scenic, historic, and recreational resources; 2) indigenous properties and treasured seascapes; 3) commercial interests



Inter-Tribal workshop held in support of the TCL study. Photo by Valerie Grussing, NOAA.



Reconstructed paleo shoreline off central Oregon. Map by BOEM.



Reconstructed paleo shoreline off Channel Islands, California. Map by BOEM.



View of the Thanet wind facility in the UK during sunrise. Photo by BOEM.

dependent on tourism; 4) private property of coastal residents; and 5) the quality of life for millions of residents living and working along the coasts.

To address these concerns, BOEM contracted with the University of Arkansas Center for Advanced Spatial Technologies (CAST) and Argonne National Laboratory's Environmental Science Division (EVS) to develop the Visual Impact Evaluation System for Offshore Renewable Energy (VIESORE). VIESORE is an in-house Geographic Information System-based (GIS-based) software application that allows BOEM staff to import and interactively design the spatial layout and content of proposed OCS wind and wave energy facilities; import and prepare geospatial data and then run sophisticated GIS analyses to support visual impact assessments; specify atmospheric, lighting, and wave conditions; and generate one or a series of spatially accurate visualizations from multiple viewpoints.

As part of this study, EVS and CAST conducted a preliminary assessment of the visibility of offshore wind facilities in the United Kingdom. Study objectives included identifying the maximum distances at which facilities could be seen in both daytime and nighttime views and assessing the effect of distance on the visual contrasts associated with the facilities. The facilities ranged in size from 25 to 140 turbines and were located within 3.4 to 32.3 miles (5.5–52 km) of the viewpoints. Elevations for the viewpoints varied from near sea level to 840 ft (256 m). This preliminary study documented that even small offshore wind facilities (~12 turbines) can be easily seen at distances exceeding 15 miles (24 km), and moderately-sized facilities (~100) at distances of greater than 22 miles (35.4 km), in a variety of weather and lighting conditions.

Previous assessments of visual impacts have identified lower levels of visibility at a given distance than what this study recorded, likely a result of assessing turbines and facilities that were much smaller than those observed in this study. It is important to have up-to-date and more precise data in order to avoid underestimating the visibility of offshore wind facilities.

FUTURE DIRECTIONS

BOEM will continue to evaluate the impact of OCS development in the Pacific Region, including visual, archaeological, and biological concerns. Engaging stakeholders is part of an ongoing effort to balance important national energy goals while minimizing potential environmental and social impacts.

– By Janet Purdy, Schatz Publishing

FOR MORE INFORMATION

Inventory and Analysis of Coastal and Submerged Archaeological Site Occurrence on the Pacific Outer Continental Shelf

<http://www.boem.gov/Study-2013-0115/>

Archaeological and Biological Assessment of Submerged Landforms off the Pacific Coast

<http://www.boem.gov/PC-14-04-Fact-Sheet/>

Visual Impact Evaluation System for Offshore Renewable Energy (VIESORE)

<http://visualimpact.anl.gov/offshorevitd/docs/OffshoreVITD.pdf>

<http://visualimpact.anl.gov/viesore/>

POCS cultural resources studies featured in the April/May/June 2016 issue of *BOEM Ocean Science* (pg. 14–15)

<http://www.boem.gov/Ocean-Science-2016-Apr-May-Jun/>

Maritime Cultural Resources Site Assessment in the Main Hawaiian Islands (ongoing study profile)

<http://www.boem.gov/pc-13-01/>

Characterizing Tribal Cultural Landscapes (ongoing study profile)

<http://www.boem.gov/pr-12-tcl/>

Archaeological Preservation in the Gulf of Mexico

For more than 60 years, BOEM's Gulf of Mexico OCS Region (GOMR) (and predecessor agencies) has overseen a robust oil and gas program that began in the shallow waters off the Louisiana coast and has expanded to deeper waters nearly 200 miles (321.9 km) offshore. In recent years, marine minerals extraction has become increasingly important as Gulf Coast states seek OCS sand sources for coastal restoration and beach renourishment projects. Growing out of the Bureau of Land Management/U.S. Geological Survey archaeological program beginning in 1973 with OCS Lease Sale 32, BOEM's historic preservation program adapted to overcome the challenges of balancing the Nation's energy and mineral needs with protection and preservation of cultural resources. BOEM meets these challenges in part by funding studies that assess historical and culturally sensitive archaeological resources and the potential impacts to those resources from OCS development activities and other influences.

DEEPWATER MARINE ARCHAEOLOGY STUDIES

World War II (WWII) shipwrecks have been a recurring focus of BOEM research. The 2004 study "Archaeological and Biological Analysis of World War II Shipwrecks in the Gulf of Mexico: Artificial Reef Effect in Deep Water" incorporated a multidisciplinary approach to assess archaeological and biological aspects of shipwrecks in the northern Gulf of Mexico (GOM). Historic shipwrecks, remnants of our past and shared cultural heritage, also serve as pseudo-hardbottom for recruitment of corals and other marine organisms. The study investigated six deepwater WWII-era shipwrecks to determine site boundaries, assess eligibility for nomination to the National Register (NR), and record their current state of preservation and potential for serving as artificial reefs.

More than 300 hours of video footage was collected at the sites, along with sediment cores and samples of microbial, invertebrate, and vertebrate specimens. The study found three general debris patterns for the deepwater shipwreck sites but acknowledged that sites can exhibit a combination of patterns due to the wrecking event and the sinking process. The study concluded that the size of a shipwreck site, including its associated debris field, increases proportionately in relation to water depth. This information assists BOEM with determining the appropriate size of avoidance areas for oil and gas-related seafloor disturbing activities in the vicinity of deepwater sites. The biological data from this study provided new information about the ecology of deepwater shipwrecks; the sites clearly provided habitat for several commercial species of fish and invertebrates.

NATIONAL REGISTER OF HISTORIC PLACES EVALUATIONS OF SUBMERGED SITES

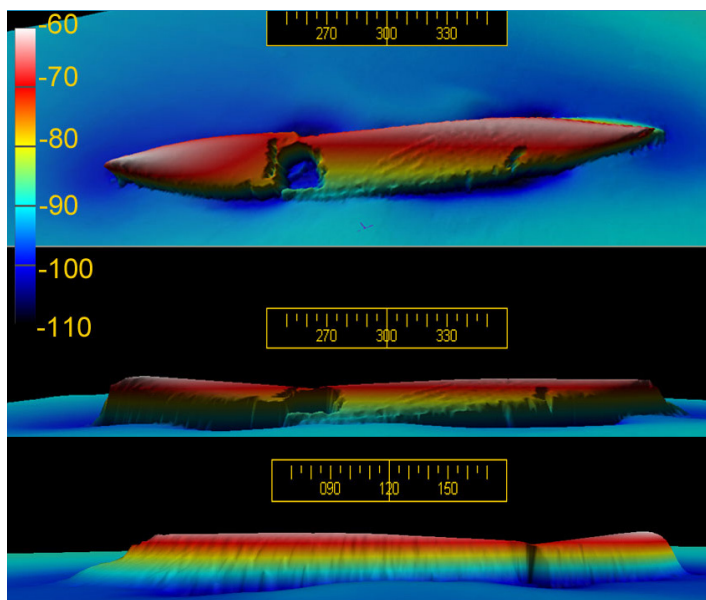
One of the ways BOEM ensures protection of cultural

resources is by assigning avoidance zones around potential archaeological sites as conditions of approval for permitted, seafloor-disturbing activities. Magnetic anomalies, sonar targets, and potential shipwrecks identified for avoidance during geophysical surveys typically are not further investigated by developers; therefore, BOEM has little information regarding the nature of these objects and whether they represent historic cultural resources or modern debris.

The 2006 "Study to Conduct National Register of Historic Places Evaluations of Submerged Sites on the Gulf of Mexico Outer Continental Shelf" evaluated the NR eligibility of fourteen unidentified sonar targets, and assessed the adequacy of and industry's compliance with prescribed avoidance zones around targets. Addressing avoidance criteria and industry compliance exposed several issues including the need to tailor avoidance zones for magnetic anomalies versus



Recording the paddlewheel of the Civil War Union vessel, U.S.S. *Hatteras*, off Galveston, Texas in 2010. Photo by Colm O'Reilly.



3D multibeam rendering of the oil tanker *R.W. Gallagher*, a U-boat casualty during WWII. Image by Tesla Offshore, Inc.

sonar targets; consideration of water depth; and avoidance of potential shipwrecks with lay barge anchor cables.

A second study published in 2013, "Archaeological Analysis of Submerged Sites on the Gulf of Mexico Outer Continental Shelf," investigated eleven sites through a combination of remote-sensing survey, diver observation, and sediment core acquisition. The study identified five sites eligible for NR listing. Anthropogenic impacts were observed on the seafloor at several of the wreck sites, including anchor drag or trawl scars; however, no apparent damage could be clearly attributed to oil and gas-related activities.

NATURAL EVENTS AND DREDGING IMPACTS

In addition to identifying significant cultural resources and assessing their NR eligibility, other studies separately addressed impacts associated with natural and human-induced events.

In 2007, BOEM funded the study "Impact of Recent Hurricane Activity on Historic Shipwrecks in the Gulf of Mexico Outer Continental Shelf" following Hurricanes Katrina and Rita in 2005. The study evaluated hurricane impacts utilizing archaeology, sediment analysis, and oceanographic wave modeling. Nine sites were selected based on the ability to analyze pre-storm, peak-storm, and post-storm conditions from previous data collection efforts. The report also compared study results with published data on hurricane impacts to vessels intentionally sunk as artificial reefs.

The combined analysis indicated that structural failure of hulls is the most common type of damage, though hull displacement occurred as well. Lateral displacement of artificial reef wrecks has been observed from 30 ft to 1.5 miles (9.1 m–2.4 km), and vertical displacement observed up to 7 to 20 ft (2.1–6 m). Movement and extent of damage depended upon several factors, including vessel depth, orientation with respect to storm direction, wave height, friction forces, weight of the vessel, length of time it had been submerged and subject to corrosion, and its vertical profile.

Wave-current interaction models indicated strong bottom currents at the study sites during peak hurricane conditions ranging 5.6–7.6 mph in the direction of wave circulation followed by current velocities of 1.6–2.9 mph in the opposite direction. The force transferred by wave action to the seafloor becomes greatly magnified as the wave heights build and as the water depth decreases. This study confirmed that hurricanes are capable of causing substantial damage to shipwrecks, even at depths of 200 ft (61 m).

Human-induced impacts on cultural resources are another concern addressed by BOEM's studies in the GOMR. A 2004 study, "Archaeological Damage from Offshore Dredging," focused on potential impacts from dredging OCS sand and gravel sources, and reviewed current dredging practices, including the type of equipment, location of the dredge position, and buffer zones.

Impacts due to dredging can be categorized as direct or indirect. Direct impacts of dredging occur from



Side scan sonar mosaic showing scars on the seafloor from offshore dredging. From *Research Planning, Inc. et al. 2004*.

damage caused by the equipment itself. While the most destructive impacts are normally related to cutter-head or drag-head contact, submerged cultural resources can also be adversely impacted by ground tackle associated with mooring or maneuvering the dredge. Indirect impacts include exposure or burial of archaeological resources during and after the dredging activity. As

a result of the study, new regulations were implemented to address archaeological survey requirements in order to protect potential cultural resources from dredging impacts.

MOVING FORWARD

BOEM's recent research in the GOMR has focused on identifying and characterizing sites; understanding the impacts of various natural and anthropogenic processes, including impacts from the 2010 *Deepwater Horizon* oil spill; as well as evaluating new techniques for ensuring necessary measures are taken to protect these resources. Future areas of interest include potentially preserved indigenous sites on the now-submerged OCS.

– By Janet Purdy, Schatz Publishing

FOR MORE INFORMATION

Archaeological and Biological Analysis of World War II Shipwrecks in the Gulf of Mexico: Artificial Reef Effect in Deep Water

<http://www.data.boem.gov/PI/PDFImages/ESPIS/4/4239.pdf>

Study to Conduct National Register of Historic Places Evaluations of Submerged Sites on the Gulf of Mexico Outer Continental Shelf

<http://www.data.boem.gov/PI/PDFImages/ESPIS/3/3595.pdf>

Archaeological Analysis of Submerged Sites on the Gulf of Mexico Continental Shelf

<http://www.data.boem.gov/PI/PDFImages/ESPIS/5/5332.pdf>

Impact of Recent Hurricane Activity on Historic Shipwrecks in the Gulf of Mexico Outer Continental Shelf

<http://www.data.boem.gov/PI/PDFImages/ESPIS/4/5111.pdf>

Archaeological Damage from Offshore Dredging: Recommendations for Pre-operational Surveys and Mitigation During Dredging to Avoid Adverse Impacts

<http://www.boem.gov/BOEM-Newsroom/Library/Publications/2004/2004-005.aspx>

Cultural and Archaeological Resources in the Alaska Region



The Alaska OCS has the potential for containing significant pre-European contact and historic cultural resources. Occupation sites of early humans crossing from Asia to North America over the Bering Land Bridge may be associated with the many submerged landforms seen on the shallow western and northern continental shelves. This vast area was emergent during the Last Glacial Maximum from about 25,000 to 11,000 years before present (YBP), and is therefore of great significance to North American archaeology and our understanding of early human inhabitants in the Americas. As is done in the present, subsistence practices of past humans were undertaken from sites with better drainage, such as elevations or terraces, or on barrier islands, and people likely settled in seasonal communities with the best access to subsistence resources.

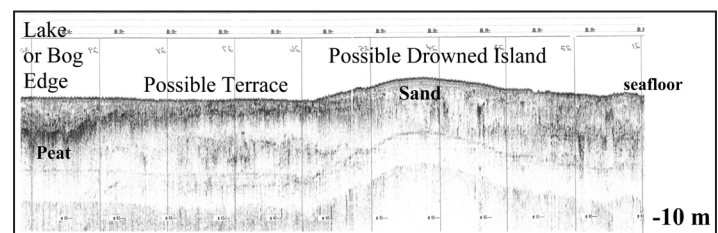
While little is known about Late Pleistocene-Early Archaic Period foraging and hunting in this region, some inferences may be drawn from modern Alaska Natives who continue the subsistence practices of their ancestors. Perhaps early humans similarly constructed small watercraft using locally available materials to access marine resources offshore. Unfortunately, organic materials such as wood, bone, and animal skins, certainly available to humans thousands of years ago as they are today, are not likely to be found in an archaeological context in this region unless they were buried or preserved in a low-oxygen environment. Instead, archaeologists focus efforts on identifying the larger, preserved paleolandforms that might contain archaeological sites and evidence of past human behavior.

Detecting paleo-river channels, drowned islands, paleo-lagoons, and paleo-shore features like beach and delta structures is primarily accomplished through interpretation of high-resolution seismic data (e.g., sub-bottom profiler) and sediment cores acquired during site clearance surveys for OCS exploration wells. It has long been known that submerged landform features exist on the OCS but their ages and states of preservation were not known.

One of the earliest studies to address potential cultural resources on the Alaska OCS was the Bering Land Bridge Cultural Resource Study published in 1976. Early theories regarding the peopling of the Americas posited that humans crossed into Alaska from northeast Asia across an exposed

“land bridge” in the modern-day Bering Sea. To test the “Beringia” hypothesis, the study team adopted an interdisciplinary approach to identify high-probability regions in the Bering and Chukchi Seas that may contain preserved archaeological remains dating to the Late Pleistocene. To test the utility of their high-probability areas model, the team conducted archaeological investigations on St. Matthew Island to locate archaeological evidence of human occupation on the Bering Land Bridge. Due to a number of factors including inclement weather, insufficient time for surveying, and local conditions not conducive to the preservation of archaeological materials, the team did not discover any conclusive evidence of early human activities on the island.

The Beaufort Sea Cultural Resources study, also completed in the 1970s, assumed that pervasive ice gouging of the seafloor and disturbance by Holocene marine transgression had mixed and eroded sediments and destroyed any in situ sites. However, in the mid-1990s, subsequent analysis of Beaufort Sea oil and gas exploration sites in waters less than 164 ft. (50 m) deep showed that floating shorefast ice extending seaward from the coast forms a barrier to pack-ice impinging on this zone, thereby protecting the seafloor from ice gouging. Many of these submerged paleolandforms seemed to be intact, showing little erosion or modification. Dates obtained from sediment samples collected below the seabed disclosed that the sea level was lower at an earlier point in time. People may well have lived along and hunted from the shoreline. Radiocarbon dating of in situ terrestrial sediments in the Chukchi Sea in the early 1990s yielded an age of 11,000 YBP, which altered BOEM's (then Minerals Management Service



High-resolution sub-bottom profiler data from the Beaufort Sea Liberty prospect area showing buried and potentially preserved Late Pleistocene-Early Holocene terrestrial features below the seafloor.

[MMS]) approach to analyzing the pre-contact period resource potential in the planning area.

A study published by MMS in 2007 assessed the pre-contact archaeological potential for shallow water paleo-terrestrial features in the Beaufort Sea, and established dates of in situ terrestrial sediments associated with these landforms of 1,600–8,600 YBP (OCS Study MMS 2007-004). More recently, two buried organic terrestrial samples were obtained from nearshore cores. They yielded dates of 7,420 +/- 30 YBP and 8,180–8,330 YBP respectively. By this time, human populations were well established in North America.

These reviews resulted in BOEM's requirement of an archaeological survey and analytical report for potential drilling sites and pipeline rights-of-way offshore in the Beaufort and Chukchi Seas and associated mitigation measures (i.e., avoidance of relict features or further archaeological investigation required). Despite new information from these important areas and the advancement of knowledge of North American archaeology, the Alaska OCS Region has not conducted an updated baseline study for the Beaufort Sea since the early 1970s and has never completed one for the Chukchi Sea.

In addition to the potential for significant submerged sites associated with human entry into North America during the Late Pleistocene, the Alaska OCS also contains submerged historic resources such as shipwrecks. Though a comprehensive inventory study for potential historic shipwrecks was never funded in this region, BOEM's Alaska OCS Region staff instead compiled an in-house shipwreck database (<http://www.boem.gov/Alaska-Coast-Shipwrecks/>) using existing historical documents and archival research. The Alaska Shipwreck Database lists thousands of historic and modern shipwrecks dating from 1741 to 2000 and information associated with each vessel's loss. These include the wrecks of U.S. whaling ships sunk in the Bering Sea by the Confederate commerce raider C.S.S. *Shenandoah* in 1865 and the New Bedford whaling fleet crushed by ice and lost along the Chukchi Sea coast in 1871. Surveys by both Project Jeremy in 1998 with NASA and others, and by NOAA's National Marine Sanctuary Program in 2015 found several of the New Bedford whaling fleet shipwrecks.

Other potential sites on the Alaska OCS include sunken aircraft. In 1977, staff from BOEM's predecessor agency, the U.S. Geological Survey Conservation Division, detected a seafloor anomaly in the Gulf of Alaska on a side scan sonar record that may represent a sunken aircraft. Two planes are known to have been lost in this region between the 1950s and 1970s. These include a DC-4 lost in 1951 with 28 U.S. Military service members on board and a twin-engine Cessna lost in 1972 with 4 people aboard, including then-Congressional House Majority Leader Hale Boggs and U.S. Congressman Nick Begich.

Although comparatively little information is available about potential cultural resources in the Alaska OCS Region, future BOEM studies and geophysical surveys conducted on the OCS may yield exciting information about the peopling of



Alaska Natives participate in the spring whale hunt. Early inhabitants of this region may have also hunted whales and other marine mammals. *Photo by John Callahan, BOEM.*



A small anchor and other objects that were observed during the Lost Whaling Fleets expedition. *Image courtesy of NOAA.*

the Americas as well as the ships that plied Alaskan waters as early as the 18th century.

– Dennis Thurston and Chris Campbell, BOEM

FOR MORE INFORMATION

Bering Land Bridge Cultural Resource Study

<http://www.data.boem.gov/PI/PDFImages/ESPIS/1/1874.pdf>

Review of Geological/Geophysical Data and Core Analysis to Determine Archaeological Potential of Buried Landforms, Beaufort Sea Shelf, Alaska. OCS Study MMS 2007-004

<http://www.data.boem.gov/PI/PDFImages/ESPIS/4/4242.pdf>

<http://www.data.boem.gov/PI/PDFImages/ESPIS/4/4243.pdf>

Alaska Outer Continental Shelf Cultural Resource Compendium

<http://www.data.boem.gov/PI/PDFImages/ESPIS/1/1815.pdf>

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New Waves

Late-Breaking News & Information

BOEM's Historic Preservation Officer Receives Award

Secretary Sally Jewell presented the Secretary of the Interior's Historic Preservation Award for 2015 to Dr. Brian Jordan, BOEM's Chief, Branch of Environmental Consultation and Federal Historic Preservation Officer, at a June 17, 2016, ceremony at the Department of the Interior.

Brian's accomplishments included his tireless advocacy for the establishment and stewardship of BOEM's first Historic Preservation Program; his creative approach to preserving submerged paleocultural landscapes; and his perseverance to establish BOEM's reputation as a highly-engaged and supportive agency for historic preservation activities.

"On behalf of all of us at BOEM, and especially the Regional Preservation Officers who nominated him, I am extremely proud to have someone of Brian's extraordinary commitment and talents on our team. I share the high regard and appreciation for his tireless efforts over the past few years in building our



Brian Jordan, Ph.D., received this award from Secretary of the Interior Sally Jewell for tirelessly advocating to establish and develop BOEM's first Historic Preservation Program.
Photo by Tami Heilemann, DOI.

Historic Preservation Program and strengthening our relationships with stakeholders," said BOEM Director Abigail Ross Hopper.

Brian earned a B.A. in Anthropology from Texas A&M University, and after attending the nautical archaeology graduate program, he transferred to the University of Minnesota, earning a M.S. in wood science and a Ph.D. in Natural Resource Science and Management. He has conducted archaeological surveys and excavations offshore the United States, Europe, and Africa.

Brian joined BOEM's environmental assessment staff in 2010.

FOR MORE INFORMATION

National Historic Preservation Awards Press Release

<https://www.nps.gov/orgs/1207/06-17-2016a.htm>

BOEM Historic Preservation Studies

<http://marinecadastre.gov/espis/#/search/txt=historic%20preservation&geo=>