

## **BOEM ENVIRONMENTAL STUDIES PROGRAM: Ongoing Studies**

**Region:** Pacific OCS Region

**Planning Area:** Northern California, Oregon/Washington

**Title:** Seabird and Marine Mammal Surveys off the Northern California, Oregon and Washington Coasts

**BOEM Information Need(s) to be Addressed:** BOEM is considering renewable energy proposals offshore northern California, Oregon, and southern Washington. This study will provide up-to-date information on species composition, distribution, abundance, seasonal variation, and habitat utilization of marine mammals and seabirds along this section of coast. Data generated will be used for overall evaluation of proposed renewable energy sites and environmental review of specific project proposals received by BOEM.

**Total BOEM Cost:** \$1.7 mil      **Period of Performance:** FY 2010-2013

**Conducting Organization:** USGS/BRD and USFWS

**Principal Investigator:** John Takekawa, Josh Adams and John Mason

**BOEM Contact:** [Dave Pereksta](#)

### **Description:**

**Background:** BOEM (formerly MMS) funded seabird surveys offshore central and northern California in 1980-1983 (MMS 84-0043) and marine mammal/seabird surveys offshore Oregon and Washington in 1989-1990 (MMS 91-0093). While these surveys provide a good foundation of information for the area, they may be limited by potential shifts of species' distribution and abundance that may have occurred over the past two decades. The proposed study would review and refine the methodology used in earlier studies to provide up-to-date information and establish a more robust longitudinal data set from which to draw on for environmental analyses.

The Pacific Region updated its "Summary of Knowledge" (SOK) for northern California, Oregon, and southern Washington in 2009. The SOK identified data gaps and researchers active in this area. Data collected by other survey efforts will be evaluated to ensure that new surveys complement earlier studies and avoid duplication of effort. In many cases, past studies have focused fine scale data collection on areas not being considered for renewable energy development (e.g. Marine Sanctuaries and other marine protected areas). This survey effort will focus on offshore areas suitable for renewable energy development.

**Objectives:** Objectives of this study would include:

## **BOEM ENVIRONMENTAL STUDIES PROGRAM: Ongoing Studies**

**Region:** Pacific Region

**Planning Area(s):** Southern California

**Title:** Pacific Regional Intertidal Sampling and Monitoring (PRISM) Study

**BOEM Information Need(s) to be Addressed:** The information collected through the direct monitoring of rocky intertidal shores by BOEM staff will be used to determine the effects of OCS oil and gas operations, including those from accidental oil spills, on the nearby shoreline habitats.

**Total BOEM Cost:** \$100,000      **Period of Performance:** FY 2011-2015

**Conducting Organization:** BOEM Pacific Region. This study is conducted with inhouse biologists.

**BOEM Contact:** [Lisa Gilbane](#)

### **Description:**

Background: OCS platforms offshore California are located in close proximity to the shoreline where important biological resources are present. Activities from offshore oil and gas drilling have the potential to directly affect these shoreline habitats, especially in the event of an accidental oil spill. The OCS Lands Act states in 43 U.S.C 1345 Section 20 (3)b that “*Subsequent to the leasing and developing of any area or region, the Secretary shall...monitor the human, marine, and coastal environments of such area or region in a manner designed to provide time-series and data trend information which can be used for comparison with any previously collected data for the purpose of identifying any significant changes in the quality and productivity of such environments, for establishing trends in the areas studied and monitored...*” This study is designed to monitor shorelines across the four counties that border producing OCS oil and gas facilities. The BOEM PRISM team (formerly the MMS Intertidal Team or MINT) is one of twelve monitoring teams which collect the data for the Multi-Agency Rocky Intertidal Network (MARINE) rocky intertidal monitoring at over 120 established sites. However, importantly, in addition to the biannual monitoring of established rocky intertidal sites, PRISM staff design and implement individual studies of associated resources to answer questions identified in the field during this monitoring, and to support the overall BOEM mission. The monitoring work in this study was initiated in 1991. PRISM presence in the field has the added benefit of interacting with the public during monitoring and provides BOEM with the opportunity to demonstrate our commitment to the environment in a visible manner.

Objectives: This study has three objectives. The first objective is to collect data in the field monitor the shoreline adjacent to existing oil and gas operations, collecting data about natural and anthropogenic perturbations in the rocky intertidal habitat, so that BOEM has the basis to determine effects from our operations, including those from an accidental oil spill. The second objective accomplished by this study is to improve our understanding of the effects of OCS activities through the direct study by BOEM staff in field studies designed to further understand effects on shoreline habitats. Lastly, this study fulfills our commitment to participate

in the Cooperative Agreement with the University of California for MARINe. BOEM funds a separate study for the monitoring, analysis and publication of these data and management of the MARINe Network which spans two coastlines. Federal participation is a requirement of Cooperative Agreements with the State.

Methods: There are several tasks included in this study. The first task, biannual monitoring, remains the same throughout the five-year program. An additional 4-6 tasks will be identified at the beginning of the fiscal year in an annual plan which is reviewed and approved by the region and headquarters. These additional tasks are either special short-term studies designed by staff to answer specific questions, or efforts which support the monitoring task (e.g., updating maps, archiving specimens, etc.)

For the monitoring task, PRISM biologists collect data each fall and spring at a majority of the 24 sites established in each of four counties bordering oil and gas platforms. PRISM biologists work directly with the University biologists and provide support where the need is greatest. Individual staff average completion of 8-12 sites/5-10 field days each year. Fixed replicate plots of barnacles, mussels, turf algae, rockweeds and anemones are photographed for determination of percent cover. Barnacle recruitment is counted in the field using magnification. Seastars and black abalone are measured and counted in irregular plots. Owl limpets are counted and measured in circular plots with a 1 meter diameter. Percent cover of surfgrass and associated species is estimated along line transects. Poached species such as *Postelsia* are counted where they occur. Motile invertebrates (snails, crabs, chitons, limpets) are counted systematically in subsamples of existing photoplots. Data is collected in the field by PRISM biologists and sent to the University for analysis.

Examples of the range of topics pursued by the PRISM team include testing new protocols, developing archiving protocols, analyzing data from special studies, devising new field mapping efforts and developing rapid shoreline field response protocols.

**Current Status:** PRISM biologists completed Fall 2011 sampling and will be conducting 2012 spring sampling the spring monitoring, which includes motile invertebrate plots.

**Final Report Date:** October 2015.

**Affiliated WWW Sites:** <http://www.BOEM.gov/omm/pacific/enviro/prism.htm>

**Revised Date:** January 18, 2012

## **BOEM ENVIRONMENTAL STUDIES PROGRAM: Ongoing Studies**

**Region:** Pacific OCS Region

**Planning Area:** Southern California

**Title:** Southern Sea Otter Range Expansion and Habitat Use and Interaction with Manmade Structures

**BOEMRE Information Need(s) to be Addressed:** The southern sea otter (*Enhydra lutris nereis*) is exceptionally vulnerable to oil spills. This species is also listed as threatened under the Endangered Species Act. In the past five years, the southern sea otter population has significantly expanded its range down the coast of California into areas of existing oil and gas production. BOEM needs to understand where and how southern sea otters are using habitat near oil and gas facilities in order to calculate risks to otters in environmental analysis of on-going OCS activities and oil spill response planning. Such information, coupled with ongoing research being done by USGS and funded by BOEM, fingerprinting seep oils, would inform BOEMRE of the possible source of oil on any otters that potentially become oiled.

**Total BOEMRE Cost:** \$400,000      **Period of Performance:** FY 2011 - 2014

**Conducting Organization:** USGS Western Ecological Research Center

**Principal Investigator:** Dr. Tim Tinker

**BOEM Contact:** [Greg Sanders](#)

### **Description:**

Background: The southern sea otter was listed as threatened primarily because of its small population size and the risk of oil spills. Since listing, the southern sea otter population has gradually increased its size and range. Approximately 2,800 sea otters now inhabit the coastline from Half Moon Bay to Santa Barbara. Within the past five years, about 100 sea otters have been routinely observed in the Point Conception area, adjacent to active oil and gas facilities and natural oil and gas seeps. Very little is known about their daily activity patterns and habitat use in this area.

Objectives: Research objectives include 1) identification of important sea otter resting and foraging areas adjacent to oil and gas facilities; 2) delineation of movement patterns along the southern California coast; and 3) assessment of sea otter distribution and behavior in the vicinity of natural oil and gas seep areas (e.g., Coal Oil Point, Santa Barbara County).

Methods: Up to 20 sea otters per year will be captured on the southern California coast over a two year period. Each animal will be implanted with a VHF radio tag and a time-depth-recorder using well established techniques developed by the U.S. Fish and Wildlife

Service and the U.S. Geological Survey. Geospatial tags may be considered and used if they are developed and approved for use in sea otters by the time this study is initiated. These movement data would be correlated to the location of known seeps in the Santa Barbara Channel and correlations to possible oiling estimated.

Tagged animals will be tracked for a two year period from land and air on a weekly basis with periodic intensive survey periods designed to determine daily movement and activity patterns in relationship to oil and gas facilities and naturally occurring oil seeps. In the third year of the project, some of the tagged sea otters will be recaptured to recover their time-depth-recorders for more detailed analysis of their activity patterns.

<b>Current Status:</b>	Tagging equipment purchased; planning fieldwork
<b>Final Report Due:</b>	2014
<b>Publications Completed:</b>	None
<b>Affiliated WWW sites:</b>	None
<b>Revised Date:</b>	January 18, 2012

## **BOEM ENVIRONMENTAL STUDIES PROGRAM: Ongoing Studies**

**Region:** Pacific OCS Region

**Planning Area:** Southern California

**Title:** DOI Partnership: Distinguishing Between Human and Natural Causes of Change in Nearshore Ecosystems Using Long-term Data from DOI Monitoring Programs

**BOEM Information Need(s) to be Addressed:** Monitoring and predicting the potential impacts of OCS oil/gas and alternative energy production on nearshore ecosystems requires an ability to distinguish between changes caused by natural processes versus those caused by human activities. This is often hampered by the lack of long-term data to describe natural variation. In southern California, two Department of the Interior monitoring programs that focus on kelp forest communities have the potential to provide considerable insight into the patterns and causes of change in kelp forest ecosystems. Analysis of these datasets (which span 25+ years) will enable scientists and managers to evaluate possible impacts from offshore energy activities and develop options to mitigate these impacts. This is especially important to BOEM in light of global climate change and the need to understand the cumulative impacts of multiple projects on the OCS.

**Total BOEM Cost:** TBD

**Period of Performance:** FY 2011-2013

**Conducting Organization:** TBD

**Principal Investigator:** TBD

**BOEM Contact:** [Donna Schroeder](#)

### **Description:**

**Background:** Due to the inherent connectivity of the marine environment, a number of activities related to outer continental shelf (OCS) oil/gas and alternative energy production can adversely affect nearshore habitats. These activities are: (1) alteration of habitat through the installation, maintenance, and/or removal of platforms, pipelines, cables, and other structures, (2) release of contaminants into the marine environment by oil spills and discharges (3) decreased water quality via sediment disturbance during anchoring, dredging, etc., and (4) onshore activities that result in erosion or spillage into the nearshore environment.

BOEM requires information about the sensitivity and resilience of biological habitats to disturbance to perform environmental analyses. Understanding the natural dynamics of nearshore ecosystems requires comprehensive long-term data that span a wide range of environmental conditions in areas potentially impacted by OCS energy activities. Such data exist for kelp forest communities that occur at offshore islands in southern

California, which are monitored regularly by two Department of the Interior Bureaus (U.S. Geological Survey and National Park Service). Unfortunately, a lack of funding and staff for analyses have caused these data to be under utilized, yet they have an enormous potential to aid in assessing potential impacts of OCS-related activities on sensitive nearshore communities.

Objectives: The ultimate goal is to understand the natural range and sources of variability in the kelp forest ecosystem well enough to generate predictions on how it will respond to environmental change and to enable scientists and managers to evaluate possible impacts from offshore oil/gas and alternative energy production, and develop options to mitigate these impacts. To this end, long-term data on the kelp forest communities of San Nicolas Island and the Channel Islands National Park will be combined and analyzed to determine: (1) the influence of short and long-term climate oscillations on the abundance, species composition, and trophic structure of kelp forest communities, (2) resilience of the community to varying levels of disturbance and, (3) the periodicity (and, if possible, causes) in shifts of community state. Anticipated products for the proposed work include peer-reviewed scientific publications, and compiled data and metadata that are archived in an accessible format that facilitates future syntheses and environmental analyses required under the National Environmental Policy Act.

Methods: Funds will support the analysis of existing data collected by the United States Geological Survey (USGS) and National Park Service (NPS). The USGS has been collecting data on the abundance of macroalgae, benthic invertebrates and fishes at six kelp forest sites around San Nicolas Island since 1980. The NPS has been collecting similar data at 16 sites within the Channel Islands National Park since 1982. These two databases are very compatible in terms of their content, time period, and methods of data collection. The general approach will be to conduct detailed comparative time series analyses. Importantly, both data sets encompass two of the largest El Niño events ever recorded (1982-83 and 1997-98). Moreover, differences in environmental conditions among islands and among sites within islands (owing to different current regimes and exposures) provide a wide range of environmental conditions over which natural changes in kelp forest communities can be assessed.

<b>Current Status:</b>	Post-award and planning meetings completed.
<b>Final Report Due:</b>	2013
<b>Publications Completed:</b>	Draft manuscript and database completed for submission to Journal Ecology
<b>Affiliated WWW sites:</b>	None at this time.
<b>Revised Date:</b>	January 18, 2012

## **BOEM ENVIRONMENTAL STUDIES PROGRAM: Ongoing Studies**

**Region:** Pacific OCS Region

**Planning Area(s):** Washington, Oregon, All California

**Title:** Inventory and Analysis of Coastal and Submerged Archaeological Site Occurrence on the Pacific OCS

**BOEM Information Need(s) to be Addressed:** Development of energy and mineral resources on the Outer Continental Shelf off the west coast of the United States is expected to continue, whether as a result of the opportunity for development of renewable energy resources created by the Energy Policy Act of 2005, the possible inclusion of areas off California on a 5-Year Oil and Natural Gas Leasing Program, or proposals by developers for exploiting strategic mineral resources. Therefore, a complete understanding of known and potential submerged cultural resources, as well as an understanding of potential visual impacts to coastal historic properties will be crucial for environmental assessment and mitigation of potential adverse affects to these resources. The study “Inventory and Analysis of Coastal and Submerged Archaeological Site Occurrence on the Pacific OCS” will address the issue. This information is necessary under Section 106 of the National Historic Preservation Act and Executive Order 11593, which require that Federal agencies must apply the National Register Criteria to properties that may be affected by a Federal undertaking.

**Total BOEM Cost:** \$642,229.01

**Period of Performance:** FY 2011-2013

**Conducting Organization:** ICF International Jones and Stokes

**Principal Investigators:** Dana McGowan, Michael Bever

**BOEM Contact:** [David Ball](#)

### **Description:**

**Background:** It's been over twenty years since any type of archaeological study has been completed on the Pacific OCS for BOEM. The study *Archaeological Resource Study: Morro Bay to Mexican Border*, completed in 1987, evaluated potential submerged archaeological resources along the southern coast of California; and the study *California, Oregon and Washington Archaeological Resource Study*, volumes I through VI, completed in 1990, assessed potential submerged archaeological resources from Morro Bay, California, north to the Canadian border. Since that time, there have been a number of significant archaeological discoveries along the Pacific coast, including both historic shipwrecks and submerged prehistoric sites. Additionally, an assessment of the potential for visual impacts from offshore energy development to coastal properties that are either listed on, or eligible for listing on the National Register of Historic Places has never been conducted along the Pacific coast. These properties include historic structures, historic archaeological sites, and prehistoric archaeological sites.



The Pacific Coastline is lined with many historic properties that potentially could be impacted visually. The determination of adverse impacts to historic properties (either physical or visual) is a requirement of Section 106 of the NHPA. The basis for making the determination of whether a property is adversely impacted depends upon the description within the property listing or the archaeological and historic assessment of the property. If within the description the rationale for listing the property or its potential eligibility includes the visual aspects of its surroundings, then the property may be adversely impacted by visual disruption. Analyses under the National Environmental Policy Act will be made as to whether visual impacts could affect the revenue from the property. In particular where a property is open to the public for a fee, a concern is whether visitation of the property would be affected by an altered visual experience. The first step in making this evaluation is to determine which properties are open to the public and what level of visitation occurs.

As a result, there is a critical need to update baseline studies, identify areas where inundated prehistoric sites might be located, develop a digital database of known and reported submerged cultural resources, and a digital database of coastal historic properties along the Pacific OCS. A similar effort is nearing completion for the Atlantic OCS (GM-08-10 and GM-09-10).

Objectives: While remote sensing surveys will be required of permittees for all offshore activities within the area of potential effect, an inventory of potential submerged archaeological resources developed by the proposed study will help guide decisionmakers in developing appropriate mitigation strategies and best management strategies for targets located by remote sensing; the development of an effective survey strategy is contingent upon knowing the nature of these resources and where they most likely may be located. The objectives of this study are to develop digital inventories of known, reported, and potential submerged archaeological sites for the Pacific OCS, similar to what has been developed for the Atlantic and Gulf of Mexico Regions, and listed or potentially eligible coastal properties that could be impacted through BOEM-permitted undertakings. The proposed study will develop an inventory of historic shipwrecks, emphasizing the use of primary historic sources; assess areas of the Pacific OCS for prehistoric site potential and develop a model for where prehistoric sites might be expected; recommend appropriate survey methodology in order to detect and avoid impacts to such resources; and develop an inventory of coastal historic properties. The database and survey strategy should incorporate the entire West Coast of the United States.

Methods: Using the previous two Pacific Region studies as a baseline, the proposed study will synthesize data collected over the past 20 years to develop an inventory of historic shipwrecks emphasizing the use of original sources; assess areas of the OCS for prehistoric site potential by evaluating current theories on prehistoric settlement patterns, paleo- shorelines, sea level rise, and regional geology; and synthesize this information to recommend an appropriate survey methodology in order to detect and avoid impacts to archaeological resources. The database will be developed using the same format as the current GOMR and Atlantic shipwreck databases and should link to a Geographic Information System (GIS) compatible to the existing BOEM GIS.

**Current Status:** The study was awarded 6/21/2011, and a post-award meeting was held on 8/18/11. Revisions to the existing BOEM shipwreck databases have been made and a revised database for the Pacific OCS was submitted for review in November 2011. Data collection of existing shipwreck databases, collection of paleoshoreline information and literature review of paleoenvironmental information, and data collection of coastal cultural resources is on-going. A draft database of coastal properties was also developed for BOEM review.

**Final Report Due:** June 2013

**Publications Completed:** None at this time.

**WWW sites:** None at this time.

**Revised Date:** January 18, 2012

## **BOEM ENVIRONMENTAL STUDIES PROGRAM: Ongoing Studies**

**Region:** Pacific OCS Region

**Planning Area(s):** Oregon/Washington, Northern and Southern California

**Title:** Protocols for Baseline Studies and Monitoring For Ocean Renewable Energy

**BOEM Information Needs to be Addressed:** The final product will provide guidance on a consistent approach to collecting baseline and pre-construction information regarding the human, marine, and coastal environment prior to offshore renewable energy projects. In addition, the study will also provide guidance on the stressors to monitor, and the methodology for monitoring, after offshore renewable energy facility emplacement. The final product will be very useful to the BOEM environmental reviews of proposed and eventual environmental monitoring of actual offshore renewable energy facilities.

**Total BOEM Cost:** \$499,705      **Period of Performance:** FY 2010-2012

**Conducting Organizations:** Pacific Energy Ventures; National Oceanic and Atmospheric Administration, Northwest Fisheries Science Center.

**Principal Investigators:** Justin Klure

**BOEM Contact:** [Dr. Ann Bull](#)

### **Description:**

**Background:** With the support of the National Oceanographic Partnership Program, this study project (Topic 2) was solicited through a competitive joint funding process known as a Broad Agency Announcement. This innovative partnership between Bureau of Ocean Energy Management, Regulation and Enforcement (BOEM), the Department of Energy (DOE), and the National Oceanic and Atmospheric Administration (NOAA) created a common research portfolio that meets key management needs. This significantly magnifies the impact of all three agencies' research funding by eliminating redundancies, supporting complementary work, and sharing the results of research findings.

The BOEM, an agency of the U.S. Department of the Interior, is charged with the responsibility of considering the effects of its actions on the human, marine, and coastal environments. Under the Energy Policy Act of 2005, BOEM is responsible for permitting renewable energy activities on the Outer Continental Shelf (OCS). There are a number of different renewable energy projects and offshore technologies that can capture energy from wind, wave, tidal flow, and/or ocean current. In order to effectively manage coastal and offshore renewable energy projects a significant amount of environmental data needs to be collected in baseline and pre-construction studies, and in operational monitoring. Currently, no standards exist to ensure that data collection methodologies produce

scientifically valid and comparable data. Standard protocols and formats for the collection and comparison of data clearly are needed for offshore renewable energy. In order to ensure that these protocols are accepted by both regulatory agencies and developers alike, and to reduce potential conflicts, it is important that these protocols be developed in a fashion that takes into account input from stakeholders. The primary outcome of this project will be a *Protocol Framework* for identifying, collecting and comparing environmental data relevant to offshore renewable energy projects. The *Protocol Framework* will be developed and evaluated by leading scientists and stakeholders (*i.e.*, regulators, agencies, environmental and non-governmental organizations, ocean users, and industry representatives). The *Protocol Framework* will outline the criteria and thresholds for collecting data for both (1) baseline and (2) operational monitoring studies for wave, tidal, and offshore wind projects with focus on the U.S. West Coast (California Current large marine ecosystem).

**Objectives:** The study objectives are to develop and execute a collaborative process to design a suite of protocols for the collection of data in baseline studies and operational monitoring for offshore renewable energy projects. The project will develop and validate a *Protocol Framework* that will: 1) Identify key environmental issues to guide development and adoption of protocols for collecting baseline and monitoring data for wave, tidal, and offshore wind projects; 2) Be expandable to include protocols for other offshore renewable energy resource technologies, sites, and conditions; and, 3) Be applicable to California Current large marine ecosystem (LME) focus, but also applicable to other LMEs.

**Methods:** The approach consists of four major tasks:

*Task 1: Protocol Framework and Case Studies.* Develop a framework to identify: 1) the key ecological and physical issues present when renewable energy devices and arrays are installed and developed; and 2) standard assessment and monitoring protocols and metrics to address issues in an adaptive management context. In essence, the *Protocol Framework* will identify what gets measured, how it's measured, and how the data sets are compared and analyzed.

*Task 2: Stakeholder Engagement.* Lead and engage stakeholders to: 1) establish a stakeholder advisory team; 2) establish priorities for protocol development; 3) review *Protocol Framework* and protocols; and 4) lead process to adopt *Protocol Framework* and representative protocols.

*Task 3: Final Protocol Recommendations.* Synthesize results of the Protocol Workshop (Task 1.5), incorporating stakeholder comments to produce final draft of *Protocol Frameworks*.

*Task 4: Final Process Recommendations.* Use stakeholder engagement to produce final process recommendations for future adoption of protocols utilizing the *Protocol Framework*.

**Current Status:** The contract to Pacific Energy Ventures was awarded on September 23, 2010 and the post award kick off meeting was held October 21, 2010. The

Intra-agency Agreement from BOEM to NOAA was finalized in November 2010. The DOE is directly funding its Pacific Northwest National Laboratory. Draft deliverables have been produced and reviewed.

**Final Report Due:** September 2012

**Publications:** None at this time.

**Affiliated Websites:** None at this time

**Revised date:** January 18, 2012

## **BOEM ENVIRONMENTAL STUDIES PROGRAM: Ongoing Studies**

**Region:** Pacific OCS Region

**Planning Area:** Oregon-Washington, Northern and Southern California

**Title:** Renewable Energy Visual Evaluations

**BOEM Information Need(s) to be Addressed:** The final product will be incorporated into BOEM environmental reviews of proposed offshore renewable energy facilities under the National Environmental Policy Act and the National Historic Preservation Act.

**Total BOEM Cost:** \$497,768      **Period of Performance:** FY 2010-2012

**Conducting Organizations:** Center for Advanced Spatial Technologies, University of Arkansas; Argonne National Laboratories;

**Principal Investigators:** Jackson Cothren, University of Arkansas  
Bob Sullivan, Argonne National Laboratories

**BOEM Contact:** [Dave Ball](#)

### **Description:**

Background: With the support of the National Oceanographic Partnership Program, this study project (Topic 6) was solicited through a competitive joint funding process known as a Broad Agency Announcement. This innovative partnership between Bureau of Ocean Energy Management, Regulation and Enforcement (BOEM), the Department of Energy (DOE), and the National Oceanic and Atmospheric Administration created a common research portfolio that meets key management needs. This significantly magnifies the impact of all three agencies' research funding by eliminating redundancies, supporting complementary work, and sharing the results of research findings.

The BOEM, an agency of the U.S. Department of the Interior, is charged with the responsibility of considering the effects of its actions on significant cultural resources. This program arose out of a variety of legislation enacted to ensure proper management and protection of the nation's cultural heritage. The most pertinent of these laws are the National Historic Preservation Act (NHPA), the National Environmental Policy Act (NEPA), and the Outer Continental Shelf Lands Act (OCSLA).

Under the Energy Policy Act of 2005, BOEM is responsible for permitting renewable energy activities on the Outer Continental Shelf (OCS). There are a number of different renewable energy projects and offshore technologies that can capture energy from wind, wave, tidal flow, and/or ocean current. One of the concerns with the development of these facilities is the visual impacts these installations will have on-shore, both from the structures and the lighting, on archaeological resources and historic properties listed on,

or potentially eligible for listing on, the National Register of Historic Places. These properties include historic structures, historic archaeological sites, prehistoric archaeological sites, and traditional cultural properties. Our coastlines are lined with many historic properties that potentially could be impacted visually. The determination of whether a property may be adversely impacted is a requirement of Section 106 of the NHPA.

**Objectives:** The objective of the study is to develop a GIS-based computer tool designed expressly to support the assessment of potential visual impacts associated with offshore renewable energy technologies, including wave, wind, tidal flow, and ocean current facilities.

**Methods:** The proposed offshore renewable energy facility visual impact evaluation system will consist of a landscape visualization system controlled by and integrated with a Toolbox for ArcGIS Desktop. The project will include a literature review, technology and needs assessments, and development of a computer-based system that incorporates 3D computer models of energy facilities, among other parameters, to identify potential visual impacts from construction of offshore facilities. The project is broken into 7 discrete tasks and numerous sub-tasks.

**Current Status:** The contract was awarded on October 1<sup>st</sup>, 2010. A design workshop was held for BOEM staff was held in Herndon, VA, in February 2011, to develop a technical assessment and needs assessment, which resulted in a product design brief.

A contract modification request was approved in July 2011 to allow for ten days of fieldwork assessment in the United Kingdom of existing offshore wind turbine arrays. The fieldwork was carried out at the end of August 2011 and successfully completed 48 daytime and 6 nighttime observations of ten offshore wind arrays from 29 onshore locations. A kmz file, which includes data and photos from this fieldwork, was developed by the contractor.

Systems (hardware/software) testing was completed in the BOEM GOMR office in October 2011. Several issues were identified that will prevent the system from operating within the BOEM Citrix environment. The contractor prepared a list of hardware requirements that BOEM regions will need to acquire for the final system to function properly.

**Final Report Due:** The fully integrated GIS visualization system is due March 31, 2012.

**Publications Completed:** The contractors have submitted abstracts for the following conferences based on preliminary assessments of the UK fieldwork: AWEA Regional Wind Energy Summit in Chicago, IL, March 6-7, 2012; MidAmerica GIS Consortium (MAGIC) Symposium in Kansas City, MO, April 22-26, 2012; and the NAEP conference in Portland, Or, May 21-24, 2012. They have also submitted a draft manuscript for publication in the June 2012 issue of Environmental Practice.

**Affiliated WWW Sites:** None at this time.

**Revised date:** January 18, 2012

## **BOEM ENVIRONMENTAL STUDIES PROGRAM: Ongoing Studies**

**Region:** Pacific OCS Region

**Planning Area:** Oregon-Washington, and Northern California

**Title:** Survey of Benthic Communities near Potential Renewable Energy Sites Offshore the Pacific Northwest

**BOEM Information Need(s) to be Addressed:** BOEM requires knowledge of the seafloor environment and of biological communities that may be affected by renewable energy activities. Understanding species-habitat associations throughout the region will be a powerful tool to plan lease sales for renewable energy for the Pacific Northwest and for determining the nature and extent of further seafloor explorations.

**Total BOEM Cost:** \$1,598,846

**Period of Performance:** FY 2010 - 2014

**Conducting Organizations:** Oregon State University, Oregon  
Awarded through the Pacific Northwest Cooperative Ecosystem Studies Unit

**Principal Investigator:** Dr. George Boehlert

**BOEM Contact:** [Lisa Gilbane](#)

### **Description:**

Background: An agreement was made and entered into by the Department of the Interior, BOEM, for the purpose of scientific research that will provide a regional understanding of the distribution and location of physical properties and invertebrates on the seafloor for Federal waters in the Pacific Northwest. The wave and wind climates along the west coast of North America represent one of the best prospects for the development of offshore renewable energy yet initial assessments of the potential ecological effects of wave energy has only just begun. This program of research on benthic invertebrate communities and habitats of the Outer Continental Shelf (OCS) off of Washington, Oregon, and northern California will assess baseline biological and geological patterns in areas of potential marine renewable energy development.

Objectives: The objective of this study is to understand species-habitat relationships and develop predictive capabilities of where benthic invertebrate species of interest and unique communities occur. In order to develop species-habitat relationships, this study will identify, analyze, and report on key factors that drive invertebrate species and distributions.

Methods: Study methods to achieve the objective include the following:

#### 1. Coordinate Scientific Review Group meetings

Three individuals have been chosen to serve as the Scientific Review Group for the duration of the study to provide scientific review of field methods and data analysis. This group has met and more meetings will occur throughout the study.



## 2. Synthesize existing physical and biological datasets

Existing datasets will be analyzed together with new sampling to determine the distribution of species and habitat associations more broadly throughout the region and, potentially, how they vary over time. Existing datasets include:

- The Surficial Geologic Habitat (SGH) map that currently covers Oregon and Washington will be updated to include newer data and extended to include data in northern California;
- *Delta* submersible video from the NOAA's National Undersea Research for invertebrates. Analysis of footage will characterize the invertebrate communities at shelf depths across a large area; and
- Sources of data for soft substrate invertebrate communities, which to date include EPA's Environmental Monitoring & Assessment Program.

## 3. Sampling Plan refinement of sampling design and logistics

A sampling plan of locations and dates for the 2010 cruise season was submitted to BOEM for review. Once the multi-beam sonar mapping and ground-truth samples identify where hard bottom areas exist, a 2011 sampling plan for the video surveys will be developed. The sampling plan will focus on surveying depths or habitat types that have not previously been covered.

## 4. Field sampling

Surveys and sample collections have begun in six areas on the Pacific OCS that have the potential to be developed for renewable energy. Seafloor habitat information is being collected by multi-beam sonar and sediment collection using methods similar to Oregon and California mapping programs. Biological sampling includes using box cores and remote observation vehicles outfitted with collecting devices to collect and identify both hard bottom and soft substrate organisms.

## 5. Data analysis, synthesis, and reporting

Collected data will be synthesized with existing biological and physical data sets from adjacent areas to build community profiles and identify unique species assemblages. Ordination, cluster, and other multivariate analyses will be used to identify and display spatial patterns in benthic invertebrate and sediment characteristics. All collected data will be available on an existing online data viewer in a GIS-based format that is readily accessible. Bimonthly and annual reporting is required.

**Current Status:** The contract was awarded to Oregon State University on June 02, 2010, the post-award meeting was held on July 27, 2010, and field collections began in August, 2010. Year 1 and 2 field work completed.

**Final Report Due:** March 2014

**Publications:** None at this time

**Affiliated Websites:** <http://hmsc.oregonstate.edu/overview.html> and <http://pacoos.coas.oregonstate.edu/>

**Revised date:** January 18, 2012

## **BOEM ENVIRONMENTAL STUDIES PROGRAM: Ongoing Studies**

**Region:** Pacific OCS Region

**Planning Area:** Southern California

**Title:** Completion of Fish Assemblage Surveys around Manmade Structures and Natural Reefs off California

**BOEM Information Need(s) to be Addressed:** Completion of this long-term data set will provide the foundational information of regional rockfish populations so that BOEM can specify requirements to industry or other interested parties when they propose decommissioning.

**Total BOEM Cost:** \$775,000      **Period of Performance:** FY 2010 - 2012

**Conducting Organization:** University of California, Santa Barbara

**Principal Investigator:** Dr. Milton Love

**BOEM Contact:** [Dr. Ann Bull](#)

### **Description:**

Background: The fate of spent offshore platforms off California continues to be a subject of considerable debate. Platforms and reefs offshore the southern areas of Ventura, Los Angeles, and Orange Counties have been surveyed once or twice. Platforms off northern Santa Barbara and Ventura Counties have been surveyed multiple times with a few surveyed annually during the past 13 years of research. The Interagency Decommissioning Working Group and the Pacific Region recommend that BOEM complete this long-term study project through the 15-year mark. This 2-year effort will thus complete the overall research effort and conclude 1.5 decades of surveys and analyses. Data gaps may continue to exist, but may be approached on a case-by-case basis when decommissioning is proposed for individual structures. It is recognized that knowledge of fish assemblages inhabiting OCS facilities is fundamental to determining the effects of decommissioning on fish populations. Since 1995 the U.S. Geological Survey, the Minerals Management Service, and most recently the California Artificial Reef Enhancement Program (CARE), have provided funding to conduct research on the fishes that live around the platforms and on natural rock outcrops of Central and southern California. The goal of this research is to determine the patterns of fish assemblages around both platforms and natural reefs. A major synthesis of this work was published in 2003 and has been well received. This research involves broad scale surveys at numerous oil/gas platforms and natural reefs. When complete, this long-term data set will provide the foundational information of regional populations so that BOEM can specify requirements and/or additional surveys to industry or other interested parties when they propose decommissioning.

Objectives: Research objectives include 1) characterizing the fish assemblages around all Pacific platforms and on nearby natural reefs, 2) describing the spatial and temporal patterns of fish diversity, density and size distribution among habitat types, and 3) completion of the 15 year data-set so that trend analyses or synthesis documents can be produced in the future.

Methods: A multiple-year fish survey of platforms and nearby natural outcrops using the same methodology used over the past 13 years. Identical methodology will ensure future comparability of data.

At Platforms and Natural Outcrops within SCUBA Depth:

- 1) Conduct scuba surveys of the upper 30 m of these platforms, along with surveys of relatively shallow natural outcrops.

At Platforms and Natural Outcrops below SCUBA Depth:

- 1) Conduct fish surveys using the *Delta* or *Dual DeepWorker* submersible, a along belt transects about two meters from the substrata.
- 2) Make transects around the bottom of the platform and around each set of horizontal cross beams up to a depth of approximately 30 m (100 ft) below the surface.
- 3) Conduct belt transects to sample the shell mounds and natural rock outcrops. During all transects document (1) species (if known); (2) estimated total length; (3) the habitat it occupied (e.g., rock, sand, mud, cobble, boulder); (4) its position relative to the substrate (e.g., in crevice, on reef crest, on slope, above structure); and (5) the distance of the fish from that substrate.

**Current Status:** Fieldwork completed and analyses begun

**Final Report Due:** 2012

**Publications Completed:** None at this time.

**Affiliated WWW sites:** None at this time.

**Revised date:** January 18, 2012

## **BOEM ENVIRONMENTAL STUDIES PROGRAM: Ongoing Studies**

**Region:** Pacific OCS Region

**Planning Area(s):** Southern California

**Title:** BOEM-MARINe (Multi-Agency Rocky Intertidal Network)

**BOEM Information Need(s) to be Addressed:** Ongoing monitoring of rocky intertidal sites adjacent to OCS production facilities allows BOEM to directly assess potential and/or real impacts to the coastline from OCS operations. With these data, BOEM can directly assess impacts to shoreline resources from OCS activities by differentiating between naturally caused impacts and other anthropogenic impacts including impacts from OCS oil and gas production and accidental oil spills. The study implements BOEM's OCS Lands Act mandate to monitor the marine and coastal environment adjacent to OCS operations.

**Total BOEM Cost:** \$1.7 million      **Period of Performance:** FY 2010-2014

**Conducting Organization:** University of California, Santa Cruz

**Principal Investigators:** Dr. Pete Raimondi, Dr. Jack Engle, Dr. Rich Ambrose, Dr. Steve Murray, Dr. Jennifer Burnaford

**BOEM Contact:** [Mary Elaine Helix](#)

### **Description:**

**Background:** Potential impacts to the shoreline are of particular concern in the Pacific OCS Region because OCS operations are located very close to shore. Public concern with these impacts has a considerable effect on the program. BOEM and its 40 partners in MARINe biannually monitor over 100 established shoreline rocky intertidal sites using a targeted assemblage protocol from California to British Columbia. MARINe partners also use a biodiversity protocol to sample an additional 100 plus sites from Alaska to Mexico on a periodic basis. MARINe employs standardized field protocols and a shared database ([www.MARINe.gov](http://www.MARINe.gov)). This study provides funding to monitor all 24 BOEM long-term monitoring sites adjacent to OCS operations. BOEM continues to participate actively in the management and oversight of MARINe, to access the data critical to our ongoing operations, and to fulfill our responsibility to monitor OCS platforms and pipeline operations.

A significant change documented at MARINe sites is the recent finding of juvenile black abalone at selected sites on offshore islands. This finding, while encouraging, is not sufficient to offset the need to list the black abalone as endangered (see Federal Register Notice January 14, 2009) Black abalone, throughout the area affected by withering foot syndrome, are still at the low levels (5% of the original population in the late 1980's and early 1990's) along much of the coastline. While the areal extent affected by withering

foot syndrome disease has leveled off, new evidence of the disease is still being found at BOEM sites in San Luis Obispo County. For many years, miles of coastline continued to be affected and the numbers of abalone fell drastically. It appears that the decline in abalone numbers continues due to a combination of loss of animals from withering foot coupled with an absence of recruitment. Evidence of withering foot syndrome was most recently observed in Central California. It seems unlikely the black abalone will recover; one of the problems limiting their recovery is the physical alteration to the community that routinely occurs after the abalone leave. No impacts have been identified from oiling over the recent past, either from OCS or non-OCS operations.

Partnerships are also fostered with local, State and Federal government agencies involved in monitoring research. This is an important Cooperative Agreement with the State as currently the State funding has been severely cut and BOEM-funded MARINE data are the key source of rocky intertidal information being used in Southern California to determine Marine Life Protected Areas designations/monitoring, and determining impacts to biology in Areas of Special Biological Significance. MARINE partners interact in technical conferences, government forums, and academic conferences to inform managers about the state of the rocky intertidal.

Objectives: This study will provide for the continued monitoring of 24 rocky intertidal sites on the mainland shore immediately adjacent to OCS facilities. Information generated will provide the basis for evaluating impacts to the shoreline from OCS activities, especially accidental oil spills. A web-based trend analysis of BOEM funded sites in combination with other MARINE sites in the shared database, along with coordination of MARINE and database tasks are included so that BOEM has access to the data needed for management decisions.

Methods: Sites are monitored biannually by 5 teams of field biologists, including the BOEM MINT team. Barnacles, mussels, seastars, black abalone, surfgrass, limpets, turf weed, rock weed and other algae are either photographed in fixed plots in the field, or measured and counted in irregular, circular or band plots. The sampling protocols are standardized across MARINE and are used by all MARINE field teams. Data is placed in a common database and is reviewed and published by the Science Panel.

The most recent analysis report describing changes at BOEM sites was completed in 2005 and covered data up to winter sampling 2003. It is proposed to update the analysis with data from 2003 to present in the first year of the funding. Rather than a report, however, a web-based product is planned to analyze trends at BOEM sites, in combination with data at other MARINE sites in the shared database. This will allow changes at BOEM sites to be evaluated in context with broader changes. Being able to evaluate changes occurring at BOEM-funded MARINE sites in context with the changes occurring at other MARINE sites monitored in exactly the same way is what makes the MARINE monitoring program so valuable. Rocky intertidal systems are so dynamic that it is very difficult to understand the importance or cause of significant changes without this contextual analysis.

Additionally, it is also envisioned as part of this funding to explore a real-time interface, which would allow users to produce trend products interactively with the data over the web. This work will be leveraged with work from one of BOEM's partners, PISCO, who has been developing a real-time interface for the biodiversity rocky intertidal data. These products are being produced in response to State and Federal managers who expressed the need to have quicker access to trends and comprehensive analyses.

**Current Status:** Workshop February 23-25; Spring fieldwork in planning, including motile invertebrates.

**Final Report Due:** Comprehensive Analysis report due May 2011.

**Publications Completed:** See [www.MARINe.gov](http://www.MARINe.gov)

**Affiliated WWW Sites:** [www.MARINe.gov](http://www.MARINe.gov)

**Revised Date:** January 18, 2012

## **BOEM ENVIRONMENTAL STUDIES PROGRAM: Ongoing Studies**

**Region:** Pacific OCS Region

**Planning Area:** Southern California

**Title:** Regional Importance of OCS Oil and Gas Platforms as Rockfish Nurseries

**BOEM Information Need(s) to be Addressed:** Ecosystem-level understanding of the environment depends upon successful integration of biologic, geologic, and oceanographic information. This integration allows prediction of regional consequences from events occurring within a limited spatial scale. Such predictive capability is important in OCS permitting, mitigation, and decommissioning decisions. This study proposes to integrate seafloor habitat maps, current flow patterns and field surveys to quantify the role oil/gas platform habitat may have in rebuilding stocks of overfished species. Currently, shallow habitats of OCS oil/gas platforms host large numbers of economically important juvenile species, especially rockfishes. Small scale studies indicate that juvenile fish grow and survive better at platform habitats compared to natural reefs. Using biological and physical data, this study will (1) perform a stock assessment of rockfish juveniles within the Southern California Bight, and (2) describe potential connectivity pathways between juvenile and adult habitats within the Santa Barbara Channel region and San Pedro Basin, focusing on platform-natural reef links.

**Total BOEM Cost:** \$475,000      **Period of Performance:** FY 2010 - 2012

**Conducting Organization:** USGS Biological Resources Division, Santa Cruz

**Principal Investigator:** Guy R. Cochrane

**BOEM Contact:** [Donna Schroeder](#)

### **Description:**

**Background:** To obtain an ecosystem-level understanding of the OCS, biological and physical databases must be integrated. To date, most ecological studies are restricted in scale due to limited funds and information. With the completion of region-wide oceanographic and geologic surveys, it is timely to link and expand biological surveys to match the spatial scale of these physical databases. Such integration will be important to all aspects of permitting, mitigation and decommissioning decisions of the OCS.

The majority of marine species observed at oil platforms and natural reefs do not reside in these habitats for their entire life history. Population connectivity within and among habitats varies according to the life history of each species, oceanographic patterns, and distribution of hard bottom. One consequence of a spatially complex life history is that impacts of a reefed platform may propagate across regions and habitats and affect other populations. Therefore, some understanding of connectivity processes, both physical and

biological, must precede predictions regarding the environmental consequences of platform decommissioning alternatives. We believe we now have sufficient knowledge to finally address these large scale questions. Shallow water habitats of platforms are of particular interest to BOEM because these habitats function as nurseries to commercially important juvenile fishes, and because potential decommissioning options eliminate this habitat. BOEM information needs thus include establishing how the removal of such habitat will impact regional environments.

The BOEM -funded study *Assessing the Fate of Juvenile Rockfish at Offshore Platforms and Natural Reefs in the Santa Barbara Channel* NSL PC-04-02 and the proposed companion study *Spatial and Seasonal Variation in the Biomass and Size Distribution of Juvenile Fishes Associated with a Petroleum Platform off the California Coast* for FY 2008 are studies conducted at a local scale, primarily at Platforms Grace and Gilda. The present study represents the final component in a coordinated program that extends local scale studies across the entire region of interest to OCS activities.

Objectives: The objectives of this study are to:

- 1) Assemble and update seafloor habitat maps into one GIS framework within two OCS study areas of interest: the Santa Barbara Channel region and San Pedro Basin;
- 2) Using life history information on abundance distribution in relation to depth, temperature and substrate, generate “potential habitat” layers for species of interest;
- 3) Conduct region-wide field surveys using a random stratified design developed from potential habitat layers;
- 4) Generate stock assessment of juvenile fishes and quantify the contribution of oil/gas platform habitat to regional production;
- 5) Using oceanographic data and potential habitat information, describe potential connectivity pathways between juvenile and adult habitats, focusing on platform-natural reef links.

Methods:

- 1) Partnering with USGS, update a GIS system with new seafloor habitat, temperature, and bathymetry information;
- 2) After consultation with managers, produce a list of “species of interest” important in determining impacts of OCS activities. Obtain from the scientific literature information on abundance distribution of life history stages (juvenile and adult) in relation to depth, temperature, and substrate type, and generate “potential habitat” layers for each species of interest. These potential habitat layers can be used for other OCS studies and assessments;
- 3) Use region-wide patterns of surface currents and potential habitat layers for two overfished species, lingcod and bocaccio, that have pelagic larvae which reside in the upper water column, and generate “connectivity envelopes” across areas of interest (Santa Barbara Channel region and San Pedro Basin) that outline likely pathways of larval transport, and potential juvenile-adult migration patterns. Connectivity envelopes for adult-pelagic larvae stages are constructed using larval duration periods combined with seasonal current vectors and overlaid onto potential habitat layers. Possible juvenile-adult migration patterns will be identified by potential habitat layers of each stage and



distance to nearest habitat patches. In both types of analyses, platform-natural reef links will be featured;

4) Using standard scuba protocols, a field survey that encompasses a regional scale will be conducted to assess the absolute biomass/stock of juvenile rockfishes that inhabit shallow water habitats (both natural reefs and platforms) within the Santa Barbara Channel region. The scuba survey will, for the first time on the Pacific coast, utilize a randomized, stratified, and geo-referenced survey design that allows for proper statistical inference across the region.

**Current Status:** Conducting fieldwork and analyses.

**Final Report Due:** 2012

**Publications Completed:** None at this time.

**Affiliated WWW Sites:** None at this time.

**Revised Date:** January 18, 2012

## **BOEM ENVIRONMENTAL STUDIES PROGRAM: Ongoing Studies**

**Region:** Pacific OCS Region

**Planning Area(s):** Southern California

**Title:** Environmental Mitigation Monitoring

**BOEM Information Need(s) to be Addressed:** Environmental mitigation monitoring data (see examples of potential types in methods section below) would be used by BOEM to evaluate BOEM-imposed specific requirements (environmental mitigation measures and project conditions) of OCS oil and gas operations. Information from environmental mitigation monitoring studies will aid the development of more feasible and scientifically defensible mitigation measures and project conditions for future oil and gas operations.

**Total BOEM Cost:** \$500,000      **Period of Performance:** FY 2007 – FY 2012

**Conducting Organization:** Applied Marine Services

**Principal Investigator:** Jay Johnson

**BOEM Contact:** [Mark Eckenrode](#)

### **Description:**

Background: An integral part of implementing the OCS Lands Act requires BOEM to conduct environmental reviews and prepare environmental documents such as environmental impact statements (EIS) and environmental assessments (EA). During the past decades, the Pacific OCS Region has issued permits for numerous oil and gas activities. BOEM carefully analyzed these projects and included required environmental mitigation measures and associated permit conditions in environmental documents developed for those projects. Review of the success of the spectrum of environmental mitigation employed in the Region will enable BOEM to improve environmental protection and further ensure oil and gas activities proceed in an environmentally sound and timely manner.

The study is a continuation of two studies of the same name that were designed to evaluate the effectiveness of environmental mitigation required of Pacific OCS oil and gas operations: a field analysis segment that was conducted between 1997 and 2001 and another that was conducted between 2002 and 2006. The evaluations consist of field monitoring and observations of Pacific OCS Region oil and gas operations.

Objectives: The study goals are to observe, sample, and/or monitor for mitigation measure effectiveness requirements (BOEM regulations, Lease Sale Stipulations, National Environmental Policy Act (NEPA) requirements, and non-BOEM agency requirements, etc.) imposed on OCS oil and gas operations in the Pacific OCS Region. In many cases, experimental approaches to measuring mitigation effectiveness will be used. The type of data

collected will depend on specific environmental mitigations either in place or proposed for future operations.

**Methods:** The Santa Barbara Channel and the Santa Maria Basin will be the primary focus of the environmental mitigation monitoring, with a secondary focus on the San Pedro Basin. Methodology consists of actual mitigation monitoring to determine the environmental effectiveness of mitigation placed upon projects. Examples of potential future field monitoring studies in conjunction with Pacific OCS Region projects of opportunity could include, 1) bio-chemical profiling of shell mounds in the vicinity of the platforms to determine the feasibility of deep water compliance with debris removal; 2) subsea well abandonment studies in the Santa Barbara Channel (e.g., remotely operated vehicle (ROV) site clearance surveys, trawling testing, and sediment and ocean transport); 3) continued studies of the concentration and dilution rates with distance of produced water plumes at representative OCS oil and gas platforms; and 4) collecting drilling discharges and sediment transport samples in the vicinity of hardbottom areas to determine effectiveness of mitigations to protect those resources. The type of data collected will be determined by Pacific OCS Region environmental management and scientists as specified by the particular project and would depend on the specified approval conditions.

**Current Status:** Completed Task Order #2 issued March 2010 on lighting effects on birds; Task Order #3 in Procurement.

**Final Report Due:** 2011

**Publications Completed:** MMS Study Report 2009-021 completed July 2008 on H2S Dispersion.

**Affiliated WWW sites:** <http://www.BOEM.gov/omm/pacific/enviro/Enviro-Studies/2009-021-H2S-Dispersion-Study.pdf>

**Revised Date:** January 18, 2012

## **BOEM ENVIRONMENTAL STUDIES PROGRAM: Ongoing Studies**

**Region:** Pacific OCS Region

**Planning Area:** Oregon-Washington, Northern and Southern California

**Title:** Renewable Energy Visual Evaluations

**BOEM Information Need(s) to be Addressed:** The final product will be incorporated into BOEM environmental reviews of proposed offshore renewable energy facilities under the National Environmental Policy Act and the National Historic Preservation Act.

**Total BOEM Cost:** \$497,768      **Period of Performance:** FY 2010-2012

**Conducting Organizations:** Center for Advanced Spatial Technologies, University of Arkansas; Argonne National Laboratories;

**Principal Investigators:** Jackson Cothren, University of Arkansas  
Bob Sullivan, Argonne National Laboratories

**BOEM Contact:** [Dave Ball](#)

### **Description:**

Background: With the support of the National Oceanographic Partnership Program, this study project (Topic 6) was solicited through a competitive joint funding process known as a Broad Agency Announcement. This innovative partnership between Bureau of Ocean Energy Management, Regulation and Enforcement (BOEM), the Department of Energy (DOE), and the National Oceanic and Atmospheric Administration created a common research portfolio that meets key management needs. This significantly magnifies the impact of all three agencies' research funding by eliminating redundancies, supporting complementary work, and sharing the results of research findings.

The BOEM, an agency of the U.S. Department of the Interior, is charged with the responsibility of considering the effects of its actions on significant cultural resources. This program arose out of a variety of legislation enacted to ensure proper management and protection of the nation's cultural heritage. The most pertinent of these laws are the National Historic Preservation Act (NHPA), the National Environmental Policy Act (NEPA), and the Outer Continental Shelf Lands Act (OCSLA).

Under the Energy Policy Act of 2005, BOEM is responsible for permitting renewable energy activities on the Outer Continental Shelf (OCS). There are a number of different renewable energy projects and offshore technologies that can capture energy from wind, wave, tidal flow, and/or ocean current. One of the concerns with the development of these facilities is the visual impacts these installations will have on-shore, both from the structures and the lighting, on archaeological resources and historic properties listed on,

or potentially eligible for listing on, the National Register of Historic Places. These properties include historic structures, historic archaeological sites, prehistoric archaeological sites, and traditional cultural properties. Our coastlines are lined with many historic properties that potentially could be impacted visually. The determination of whether a property may be adversely impacted is a requirement of Section 106 of the NHPA.

**Objectives:** The objective of the study is to develop a GIS-based computer tool designed expressly to support the assessment of potential visual impacts associated with offshore renewable energy technologies, including wave, wind, tidal flow, and ocean current facilities.

**Methods:** The proposed offshore renewable energy facility visual impact evaluation system will consist of a landscape visualization system controlled by and integrated with a Toolbox for ArcGIS Desktop. The project will include a literature review, technology and needs assessments, and development of a computer-based system that incorporates 3D computer models of energy facilities, among other parameters, to identify potential visual impacts from construction of offshore facilities. The project is broken into 7 discrete tasks and numerous sub-tasks.

**Current Status:** The contract was awarded on October 1<sup>st</sup>, 2010. A design workshop was held for BOEM staff was held in Herndon, VA, in February 2011, to develop a technical assessment and needs assessment, which resulted in a product design brief.

A contract modification request was approved in July 2011 to allow for ten days of fieldwork assessment in the United Kingdom of existing offshore wind turbine arrays. The fieldwork was carried out at the end of August 2011 and successfully completed 48 daytime and 6 nighttime observations of ten offshore wind arrays from 29 onshore locations. A kmz file, which includes data and photos from this fieldwork, was developed by the contractor.

Systems (hardware/software) testing was completed in the BOEM GOMR office in October 2011. Several issues were identified that will prevent the system from operating within the BOEM Citrix environment. The contractor prepared a list of hardware requirements that BOEM regions will need to acquire for the final system to function properly.

**Final Report Due:** The fully integrated GIS visualization system is due March 31, 2012.

**Publications Completed:** The contractors have submitted abstracts for the following conferences based on preliminary assessments of the UK fieldwork: AWEA Regional Wind Energy Summit in Chicago, IL, March 6-7, 2012; MidAmerica GIS Consortium (MAGIC) Symposium in Kansas City, MO, April 22-26, 2012; and the NAEP conference in Portland, Or, May 21-24, 2012. They have also submitted a draft manuscript for publication in the June 2012 issue of Environmental Practice.

**Affiliated WWW Sites:** None at this time.

**Revised date:** January 18, 2012

1. Review and refinement of methodologies used for previous marine mammal/seabird surveys;
2. Monthly field surveys (aerial) offshore northern California, Oregon, and southern Washington over an 24-month period;
3. Assessment, analysis, and comparison of data collected with other sources of survey data;
4. Characterization of the current marine mammal/seabird composition, distribution, abundance, seasonal variation and habitat use within the survey area; and,
5. Publication of report(s) on the findings of the surveys and data analysis.

Methods: Survey methodologies used in previous BOEM studies and other survey efforts would be reviewed and modified, as necessary, to account for new technologies and equipment availability. Available funding would likely limit the field effort to monthly aerial surveys along prescribed transect lines, supplemented by other sources of aerial/shipboard data as available.

**Current Status:** Completed all six year 1 aerial surveys

**Final Report Due:** 2013

**Publications Completed:** None at this time.

**Affiliated WWW Sites:** None at this time.

**Revised date:** January 18, 2012