

Gulf of Maine

Environmental Studies Overview

January 2023



BOEM has invested over
\$80 million in collecting
baseline information

Through the **Bureau of Ocean Energy Management (BOEM)** Environmental Studies Program, BOEM funds scientific research to inform decisions about offshore wind. BOEM has invested more than \$80 million in collecting baseline information about the distribution and abundance of marine life, birds, and bats and potential impacts from development (seafloor disturbance, sound, electromagnetic fields [EMF]). The topics studied are informed through intergovernmental task forces, public meetings, formal information solicitations, and recommendations made in BOEM-funded studies. BOEM identifies priorities annually during the development of the [studies plan](#). Selected studies that provide information about the Gulf of Maine are listed below. A complete list of studies that are [in progress or completed](#) is available on the BOEM website. BOEM also supports regional data portals, such as the [Northeast Ocean Data Portal](#), where data form study products are made available to the public.

- Marine Life
- Birds and Bats
- Seafloor Disturbance
- Sound
- Electromagnetic Fields (EMF)

[Assessing Population Effects of Offshore Wind Development on North Atlantic Right Whales](#) (Ongoing)

- Using modeling to assess the effects from offshore wind development on the North Atlantic Right Whale.

[Zooplankton Ecology of the Gulf of Maine](#) (Ongoing)

- Monitoring of zooplankton that are a critical food source for marine mammals.

[Humpback Whale Encounter with Offshore Wind Mooring Lines and Inter-Array Cables](#) (Completed)

- Characterizing the interaction of whales with mooring lines and cables.

[Atlantic Marine Assessment Program for Protected Species: FY15 - FY19; Appendix I; Appendix II; Appendix III](#) (Completed)

- Continuation of the Atlantic Marine Assessment Program for Protected Species (AMAPPS) which focuses on collecting seasonal data on the abundance, distribution, and behavior of marine mammals, sea turtles, and seabirds throughout the U.S. Atlantic.

[Atlantic Marine Assessment Program for Protected Species: 2010-2014; Appendix I; Appendix II-V](#) (Completed)

- Seasonal surveys of protected species on the outer continental shelf.

[Atlantic Marine Assessment Program for Protected Species III](#) (Ongoing)

- Continuation of broad-scale surveys for marine mammals and turtles on the outer continental shelf.

[Ecological Baseline Study of the U.S. Outer Continental Shelf Off Maine](#) (Ongoing)

- Conducting aerial surveys over portions of the Gulf of Maine.

[Potential Impacts to Marine Mammals and Sea Turtles from Offshore Wind Research Framework Workshop](#) (Completed)

[A Framework for Studying the Effects of Offshore Wind Development on Marine Mammals and Sea Turtles](#) (Completed)

- Developing a research framework to evaluate the effects of offshore wind development on protected species.

[Risk Assessment to Model Encounter Rates between Large Whales and Vessel Traffic from Offshore Wind Energy on the Atlantic OCS; Vessel Risk Calculator: Graphical User Interface User's Manual; Vessel Risk Calculator](#) (Completed)

- Determining risk of vessel strikes for large whales.

[Best Management Practices Workshop for Atlantic Offshore Wind Facilities and Protected Species](#) (Completed)

- Discussing and identifying approaches for preventing, reducing, and monitoring impacts to marine protected species from the development of offshore wind on the Atlantic Outer Continental Shelf.

[Behavioral effects of sound sources from offshore renewable energy construction on the black sea bass \(*Centropristis striata*\) and longfin inshore squid \(*Doryteuthis pealeii*\)](#)
(Ongoing)

- Establishing fish auditory thresholds for Black Sea Bass and Longfin Squid.

[Behavioral Effects of Sound Sources from Offshore Renewable Energy Construction on the Black Sea Bass \(*Centropristis striata*\) and Longfin Inshore Squid \(*Doryteuthis pealeii*\): A Field Study](#) (Ongoing)

- Examining the effects of offshore wind farm construction noise on two key commercially and ecological important taxa, squid and black sea bass, using field-based controlled exposures.

[Habitat Mapping and Assessment of Northeast Wind Energy Areas](#) (Completed)

- Establishes baseline benthic habitat characteristics for wind energy areas along the Atlantic coast.

[Fishing/Offshore Wind Mitigation Measures Development Workshops](#) (Completed)

[Final Report on Best Management Practices and Mitigation Measures](#) (Completed)

- Recommendations about best management practices and mitigation measures for offshore wind development from a series of workshops with fisherman.

Gulf of Maine Socioeconomic Impacts of OCS Wind Development on Fishing
(Planned)

- Evaluating the economic impacts of offshore wind on commercial fishing.

[Identifying Information Needs and Approaches for Assessing Potential Impacts of Offshore Wind Farm Development on Fisheries Resources in the Northeast Region](#) (Completed)

- Provides guidance for establishing a research strategy for both pre- and post- construction.

Gulf of Maine Fish and Invertebrate Benthic Habitat Baseline Data Collection
(Planned)

- Evaluating the benthic habitats in areas proposed for offshore wind development.

Socio-Economic Impact of Outer Continental Shelf Wind Energy Development on Fisheries in the U.S. Atlantic [Volume 1](#), [Volume 2](#) (Completed)

- BOEM worked with the National Marine Fisheries Service to better understand fishing activity as it relates to areas of potential offshore wind energy development.

[Atlantic Offshore Renewable Energy Development and Fisheries Proceedings of a Workshop](#) - in Brief (Completed)

- Summarizing National Academy of Sciences subcommittee discussion on the research and monitoring needed to assess potential impacts from offshore wind turbine installation and operation on fisheries on the Atlantic OCS.

[Effects of Noise on Fish, Fisheries, and Invertebrates in the U.S. Atlantic and Arctic from Energy Industry Sound-Generating Activities, Workshop Report](#) (Completed)

- Literature review and proceedings on effects of noise on fish, fisheries, and invertebrates.

Anticipating Shifts in Marine Bird Distributions for Planning, Leasing, and Assessment of Energy Development on the Outer Continental Shelf (Ongoing)

- Using historical distribution data to predict future shifts in bird distribution patterns.

Transparent modeling of collision risk for three federally-listed bird species to offshore wind development (Ongoing)

- Developing a new modeling approach to evaluate the risk of collision of birds with offshore wind turbines.

Building a Database to Assess the Relative Vulnerability of Migratory Bird Species to Offshore Renewable Energy Projects on the Atlantic OCS (Completed)

- Providing an index to determine the vulnerability of 177 species of birds observed on the outer continental shelf to bird strikes by wind facilities and displacement.

Compendium of Avian Occurrence information for The Continental Shelf Waters Along The Atlantic Coast of The United States: Final Report (Database Section – Shorebirds) (Completed)

Compendium of Avian Occurrence information for The Continental Shelf Waters Along The Atlantic Coast of The United States: Final Report (Database Section-Seabirds) (Completed)

- Provides a synthesis of observations of seabirds and shorebirds along the Atlantic Coast for 177 species including maps of sightings per unit effort.

Information Synthesis on the Potential for Bat Interactions with Offshore Wind Facilities (Completed)

- Synthesis of observations of bats in the offshore environment along the Atlantic coast with emphasis on locations off Maine.

Modeling At-Sea Density of Marine Birds to Support Atlantic Marine Renewable Energy Planning Appendix A; Appendix B; Appendix C; Appendix D (Completed)

- Provides easily understandable information in the form of maps of distribution and abundance of birds to aid offshore wind development siting decisions and reduce the risk of impacts to birds.

[Floating Offshore Wind Turbine Development Assessment](#) (Completed)

- Assessment of the technological, environmental, and financial issues related to the development of floating offshore wind turbines on the Outer Continental Shelf.

[Determining the Infrastructure Needs to Support Offshore Floating Wind and Marine Hydrokinetic Facilities on the Pacific West Coast and Hawaii](#) (Completed)

- Identifying the infrastructure needed for offshore renewable energy development on the Pacific coast and Hawaii.

[Floating Offshore Wind in California: Gross Potential for Jobs and Economic Impacts from Two Future Scenarios](#) (Completed)

[Floating Offshore Wind in Hawaii: Potential for Jobs and Economic Impacts from Two Future Scenarios](#) (Completed)

[Floating Offshore Wind in Oregon: Potential for Jobs and Economic Impacts from Two Future Scenarios](#) (Completed)

[Floating Offshore Wind in Oregon: Potential for Jobs and Economic Impacts in Oregon Coastal Counties from Two Future Scenarios](#) (Completed)

- Analysis of scenarios to determine the economic impact of Floating wind developments to state economies.



Floating Offshore Wind

[Synthesis, Analysis, and Integration of Air Quality and Meteorological Data for the Atlantic Coast Region](#) (Completed)

[Synthesis, Analysis, and Integration of Air Quality and Meteorological Data for the Atlantic Coast Region: Volume II: Technical Reference Manual for the Atlantic Region Air Quality Database](#) (Completed)

[Synthesis, Analysis, and Integration of Air Quality and Meteorological Data for the Atlantic Coast Region: Volume III: Data Analysis](#) (Completed)

- Compiling existing information about air emission sources on the Atlantic Outer Continental Shelf.

[Offshore Wind Energy Facilities Emission Estimating Tool Version 2.0 | User's Guide V2 | Technical Summary | Technical Documentation | Instructional Video](#) (Completed)

- Quantifying emissions associated with the development, operation, maintenance and decommissioning of a proposed offshore wind farm.

Coastal Landscape/Seascape Character Classification and Assessment Methodology Development (Ongoing)

- Standardizing methodologies for evaluating scenic and visual resource impacts from offshore wind development.

Evaluation of Visual Impact on Cultural Resources/Historic Properties: North Atlantic, Mid-Atlantic, and Florida Straits (Completed)

Evaluation of Visual Impact on Cultural Resources/Historic Properties: North Atlantic, Mid-Atlantic, and Florida Straits: Volume II. Appendices (Completed)

- Summary of historic properties along the Atlantic coast that may be affected by offshore wind development under section 106 of the National Historic Preservation Act.

Evaluation of Lighting Schemes for Offshore Wind Facilities and Impacts to Local Environments (Completed)

- Recommending best management practices for lighting of offshore structures that maintain safety while minimizing the effects on the marine environment.

Development of Guidance for Lighting of Offshore Wind Turbines Beyond 12 Nautical Miles (Completed)

- Providing an evaluation of lighting and marking guidance for offshore wind turbines.

Assessment of Seascape, Landscape, and Visual Impacts of Offshore Wind Energy Developments on the Outer Continental Shelf of the United States (Completed)

- Providing a methodology for assessing the visual impacts of offshore wind energy facilities.

Atlantic Region Wind Energy Development: Recreation and Tourism Economic Baseline Development (Completed)

- Synthesis of economic information for selected coastal counties for use in determining effects from offshore wind development.

Atlantic Offshore Wind Energy Development: Values and Implications for Recreation and Tourism (Completed)

- Regional-level analysis of visual effects from offshore wind facilities on tourism and recreation.

Baseline Tourism and Recreation Along the Gulf of Maine (Planned)

- Establishing baseline information about tourism and recreation prior to offshore wind development.



Recreation & Tourism



National Environmental Policy Act Documentation for Impact-Producing Factors in the Offshore Wind Cumulative Impacts Scenario on the North Atlantic Outer Continental Shelf (Completed)

- Providing a framework for the evaluation of cumulative effects in environmental assessments.

Developing Protocols for Reconstructing Submerged Paleocultural Landscapes and Identifying Ancient Native American Archaeological Sites in Submerged Environment *Summary report of the initial project workshop; Field Report: 2013-2016; Best Practices; Geoarchaeological Modeling; Final Report (Completed)*

Inventory and Analysis of Archaeological Site Occurrence on the Atlantic Outer Continental Shelf (Completed)

- Database of known marine archaeological sites on the Atlantic Outer Continental Shelf.



**Paleocultural
Landforms &
Archaeology**

Comprehensive Assessment of Existing Gulf of Maine Ecosystem Data and Identification of Data Gaps to Inform Future Research *(Planned)*

- Collating existing information to inform future research.

Energy Market and Infrastructure Information for Evaluating Alternate Energy projects for the OCS Atlantic and Pacific Regions - Volume 1: Technical Report *(Completed)*

Energy Market and Infrastructure Information for Evaluating Alternate Energy projects for the OCS Atlantic and Pacific Regions - Volume 2: Appendices *(Completed)*

- Providing an overview of energy markets and energy infrastructure along the Atlantic and Pacific coasts.

Electromagnetic Field (EMF) Impacts on Elasmobranch (shark, rays, and skates) and American Lobster Movement and Migration from Direct Current Cables *(Completed)*

- Field measurements and modeling of electromagnetic fields (EMF) from high voltage direct current (HVDC) cables and field observations of response to the fields by the American Lobster and Little skate Under Fates and Effects.

Radar Interference Analysis for Renewable Energy Facilities on the Atlantic Outer Continental Shelf *(Completed)*

- Provides potential radar interference mitigation solutions for land-based systems impacted by offshore wind development and a summary of how atmospheric phenomenon or “ducting” influences these impacts.

Identification of OCS Renewable Energy Space-Use Conflicts and Analysis of Potential Mitigation *(Completed)*

- Identifying space use conflicts between renewable energy and other uses of the ocean on both the Atlantic and Pacific coasts.

Supporting National Environmental Policy Act Documentation for Offshore Wind Energy Development Related to Navigation *(Completed)*

- Assessing the potential impacts associated with the development of offshore wind energy facilities on marine vessel navigation.

The Identification of Port Modifications and their Environmental and Socioeconomic Consequences *(Completed)*

- Examining ports along the Atlantic coast for their use in supporting offshore wind development and determining the modifications they may needed on selected ports.

Offshore Wind Energy Development Site Assessment and Characterization: Evaluation of the Current Status and European Experience *(Completed)*

- Sharing of experiences from Europe in the areas of cultural resources, avian species, and benthic habitats.

Phased Approaches to Offshore Wind Developments and Use of Project Design Envelope *(Completed)*

- Informs BOEM on how phased approaches and project design envelopes could be implemented for environmental reviews of offshore wind facility Construction and Operations Plans.