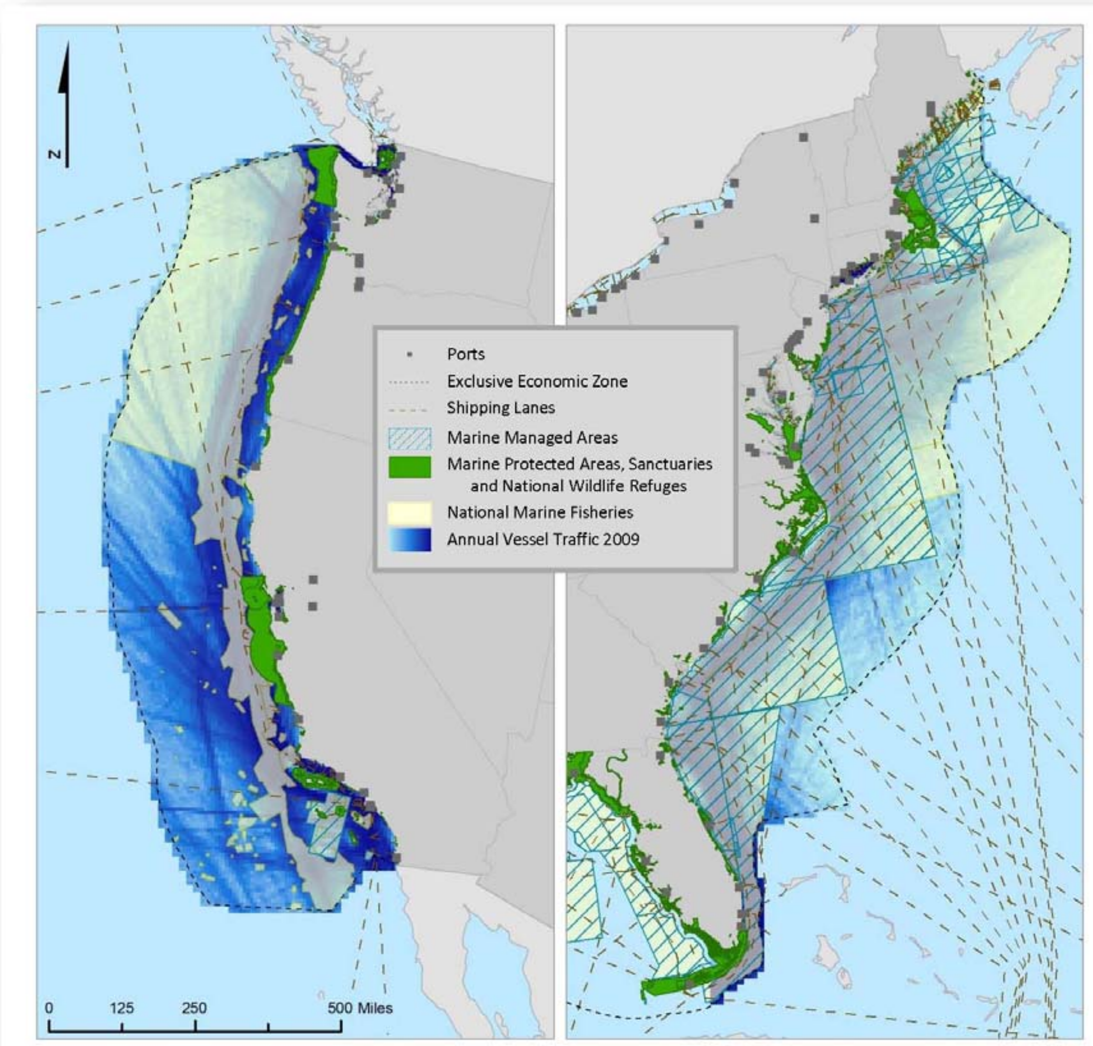
OCS Study
BOEM 2012-083

Identification of Outer Continental Shelf Renewable Energy Space-Use Conflicts and Analysis of Potential Mitigation Measures



U.S. Department of the Interior
Bureau of Ocean Energy Management

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Identification of Outer Continental Shelf Renewable Energy Space-Use Conflicts and Analysis of Potential Mitigation Measures

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ABBREVIATIONS AND ACRONYMS

ACCSP	Atlantic Coastal Cooperative Statistics Program
AIS	Automatic Identification System
AMI	Area of Mutual Interest
ATBA	Area to be Avoided
BOEM	Bureau of Ocean Energy Management
BSEE	Bureau of Safety and Environmental Enforcement
CalCOFI	California Cooperative Fisheries Investigations
CARB	California Air Resources Board
CMSP	Coastal and Marine Spatial Planning
COP	Construction and Operations Plan
DWT	Deadweight Tonnage
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EMF	Electromagnetic Field
ESA	Endangered Species Act
ESRI	Environmental Systems Research Institute
FCF	Fishermen's Contingency Fund
FERC	Federal Energy Regulatory Commission
FISH	Fishermen Interested in Safe Hydrokinetics
FKNMS	Florida Keys National Marine Sanctuary
FLOWW	Fisheries Liaison with Offshore Wind and Wet Renewables
FMPs	Fishery Management Plan
GAP	General Activities Plan
GIS	Geographic Information System
HBHRCD	Humboldt Bay Harbor, Recreation and Conservation District
IALA	International Association of Marine Aids to Navigation and Lighthouse Authorities
ICPC	International Cable Protection Committee
IMO	International Maritime Organization
ITOS	International Tug of Opportunity Service
LEK	Local Ecological Knowledge
LFK	Local Fisheries Knowledge
LNG	Liquefied Natural Gas
MAFMC	Mid-Atlantic Fishery Management Council
MARCO	Mid-Atlantic Regional Council on the Ocean
MIDAS	Marine Integrated Decision Analysis System
MIMES	Multiscale Integrated Models of Ecosystem Services
MLPA	(California) Marine Life Protection Act
MMC	Multipurpose Marine Cadaster
MMS	Minerals Management Service
MOU	Memorandum of Understanding
MPA	Marine Protected Area
MRC	Marine Resource Committee

MSA	Magnuson-Stevens Fishery Conservation Act
NANOOS	Northwest Association of Networked Ocean Observing Systems
NAVFAC	Naval Facilities Engineering Command
NEFMC	New England Fishery Management Council
NEPA	National Environmental Policy Act
NGA	National Geospatial-Intelligence Agency
NGO	Non-Governmental Organization
NMFS	NOAA National Marine Fisheries Service
NMSP	National Marine Sanctuary Program
NOAA	National Oceanic and Atmospheric Administration
NOC	National Ocean Council
NOP	National Ocean Policy
NOS	NOAA National Ocean Service
NROC	Northeast Regional Ocean Council
NSCPO	U.S. Naval Seafloor Cable Protection Office
OCS	Outer Continental Shelf (also NOAA NOS Office of Coast Survey)
OFP	Naval Facilities Engineering Command Ocean Facilities Program
OFCC	Oregon Fishermen's Cable Commission
PaCOOS	Pacific Coast Ocean Observing System
PARS	Port Access Route Study
PAWSA	Ports and Waterways Safety Assessment
PFMC	Pacific Fishery Management Council
PGE	Pacific Gas and Electric
PSMFC	Pacific States Marine Fisheries Commission
PWSA	Ports and Waterways Safety Act
RCA	Rockfish Conservation Area
RFI	Request for Interest
RNA	Regulated Navigation Area
SAMP	Rhode Island Special Area Management Plan
SAP	Site Assessment Plan
TEC	Tidal Energy Converter
TEU	Twenty-Foot Equivalent Unit
TSS	Transportation Separation Scheme
UNESCO	United Nations Educational, Scientific and Cultural Organization
USCG	United States Coast Guard
VHF	Very High Frequency
VLCC	Very Large Crude Carrier
VMS	Vessel Monitoring System
VTR	Vessel Trip Report
VTS	Vessel Traffic Service
WCGA	West Coast Governors' Agreement on Ocean Health
WEA	Wind Energy Area
WEC	Wave Energy Converter
WTG	Wind Turbine Generator

1.0 INTRODUCTION

1.1 STUDY PURPOSE

The ocean accommodates a wide variety of uses that are separated by time of day, season, location, and zones. Conflict can and does occur, however, when two or more groups wish to use the same space at the same time in an exclusive manner. The potential for conflict is well known and the management of ocean space and resources has been, and is being, addressed by a number of State, regional, and Federal organizations, including, among others, coastal zone management agencies, state task forces, and regional fisheries management councils. However, with new and emerging uses of the ocean, such as aquaculture and offshore renewable energy, comes the potential for new types of space-use conflicts in ocean waters.

In recent years, the Bureau of Ocean Energy Management (BOEM) (formerly the Minerals Management Service [MMS]) has examined ocean space-use conflicts and mitigation strategies in the context of offshore oil and gas exploration and production and sand and gravel dredging, activities that are both subject to BOEM regulation and oversight. BOEM now has authority to issue leases on the Outer Continental Shelf (OCS) for renewable energy projects, but seeks additional information on potential conflicts between existing uses of the ocean environment and this new form of activity.[1]

The broad purpose of this study was to begin to fill this gap by (1) identifying potential space-use conflicts between OCS renewable energy development and other uses of the ocean environment, and (2) recommending measures that BOEM can implement in order to promote avoidance or mitigation of such conflicts, thereby facilitating responsible and efficient development of OCS renewable energy resources. The result is a document intended to serve as a desktop resource that BOEM can use to inform its decision making as the agency carries out its statutory and regulatory responsibilities.

1.2 STUDY SCOPE

At BOEM’s direction, the study scope was limited to Federal waters in the Atlantic region from Maine to Florida and in the Pacific region from Washington to California. Since the resources available for the ethnographic research at the heart of the study were not unlimited, and since OCS-based renewable energy development will likely be concentrated along these two coasts, BOEM did not include within the scope the OCS regions associated with the Gulf of Mexico, Alaska, Hawaii, and U.S. Territories. Resource constraints and presumed near- to medium-term prospects for OCS renewable energy development resulted in an additional narrowing of the scope for the Pacific region to include the OCS areas offshore Washington, Oregon, and the North Coast of California (the latter defined as the coastal region north from Point Arena to the Oregon border). The study area thus comprises six of BOEM’s OCS Planning Areas. Note, however, that our grouping of states within sub-regions is not entirely consistent with BOEM’s designations. Specifically, as described and illustrated in Table 1-1 and Figure 1-1, we have

[1] The Outer Continental Shelf comprises the submerged lands, subsoil, and seabed, lying between the seaward extent of the States' jurisdiction (in most cases, three nautical miles, or approximately 3.3 statute miles, from shore), and the seaward extent of Federal jurisdiction (generally 200 nautical miles from shore).

included New York and New Jersey in the Mid-Atlantic region, and refer to the remainder of BOEM's North Atlantic Planning Area (i.e., New England) as the "Northeast Atlantic" region (indicated by the dashed line on Figure 1-1).

Table 1-1

Study Area Regions

Region/Planning Area	States
Northeast Atlantic	Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut,
Mid-Atlantic	New York, New Jersey Delaware, Maryland, Virginia, North Carolina
South Atlantic/Straits of Florida	South Carolina, Georgia, Florida (Atlantic coast only)
Pacific Northwest	Washington, Oregon
Northern California	California (south to Point Arena)

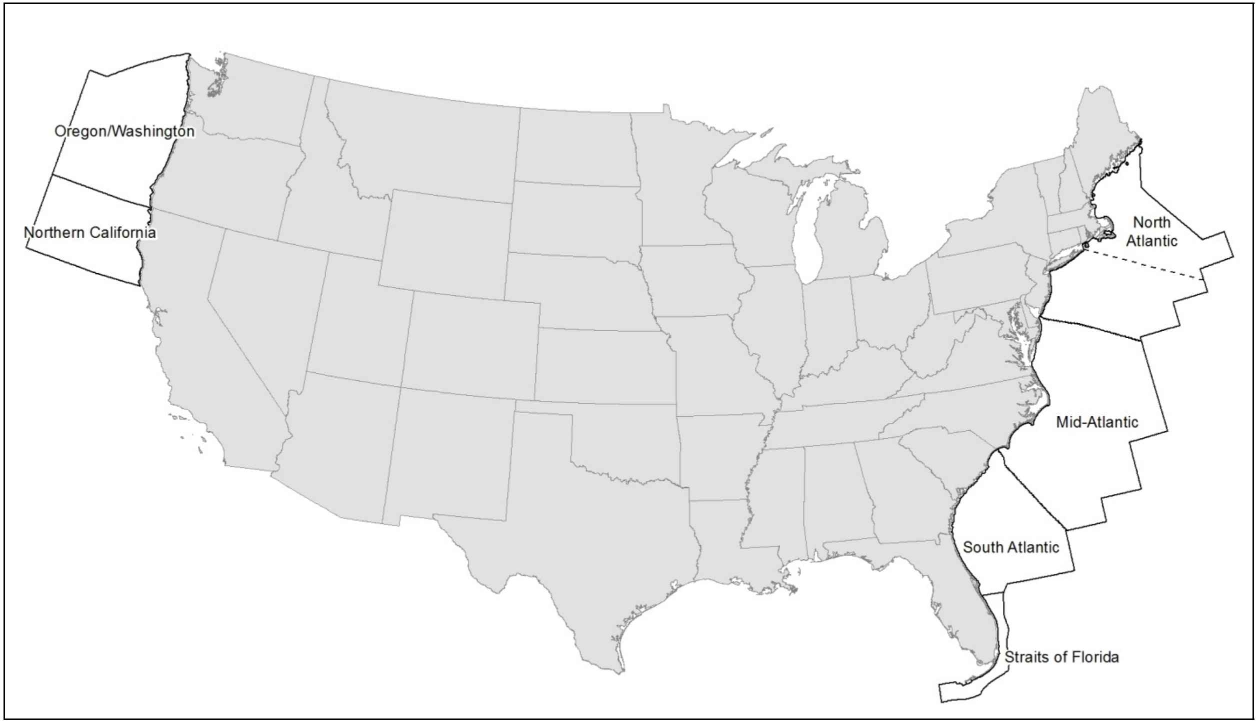

Figure 1-1 Study Area Regions

As described further in Chapter 2, the study has a particular focus on two user communities – broadly defined as commercial fishing and commercial vessels – with which the potential for space or use conflict is greatest, given the geographic breadth and scale of activity associated with each. To the extent possible within the limits of this research and analysis effort, the study also addresses the many other uses (e.g., recreational fishing and boating, scientific research, military) that occur on the OCS and that may present conflicts with renewable energy development.

1.3 STUDY ELEMENTS

The study comprised three principal elements:

A comprehensive literature review focused on case studies or other documented examples of relevant spatial conflicts and how they were resolved, mitigated, or otherwise addressed by stakeholders;

Development of a geospatial database, using a geographic information system (GIS), comprising detailed information on the broad range of activities that occur in the ocean environment and thus could give rise to conflicts with renewable energy development; and

A comprehensive program of ethnographic data collection through direct interaction with representatives of important stakeholder communities, with a focus on fishing (commercial, recreational, and charter) and boating (commercial and recreational) interests.

The findings presented in this document are a synthesis of literature- and ethnographic research-based information. The geospatial database is a companion to this document and serves as a tool for further exploration of relationships between specific uses of ocean space in a particular region. Maps produced using information in the database were used to help facilitate stakeholder interactions during the ethnographic research phase of the study.

1.4 GUIDE TO THE REPORT

A primary use of this document is as a desktop resource that can, at a minimum, provide BOEM (and others) with practical information that will contribute to decision makers' ability to serve in their roles as regulators of offshore renewable energy development more effectively and efficiently. Toward this end, the document is organized around five regionally-focused sections (Chapters 3 through 7), each of which contains three sub-sections organized by use category: commercial fishing, commercial shipping, and non-commercial uses. Each sub-section provides literature- and research (i.e., GIS data development and ethnographic research)-based findings with respect to (1) the potential for conflict between the use category and renewable energy development, and (2) potential avoidance and mitigation strategies from both an "upstream" (pre-development) and "downstream" (development and post-development) perspective.

Each regional section begins with a general characterization of the type and scale of ocean uses within that region. These characterizations include a standard set of four data tables:

Commercial fishery landings (quantity and revenue for finfish and shellfish), by state

Recreational fishing activity (trips and expenditures for three activity modes), by state

Commercial vessel calls at regional ports, by vessel type

Transport, support, and marine operations (establishments, employees, and payroll), by state

Though each of these tables presents only a single-year snapshot of selected activities, they provide useful illustrations of the scale of different uses within a region and make it easy to understand the relative importance of these uses across regions.

Each regional characterization also includes a set of three standard maps.

Commercial fishing activity by NOAA National Marine Fisheries Service (NMFS) reporting areas

Commercial vessel navigation data based upon U.S. Coast Guard data

Quantitative summary of the number of other uses (i.e., non-commercial fishing and vessel navigation) documented within the GIS geodatabase (intended to provide an overview of the extent of other uses identified)

As with the data tables, these maps are intended to be generally illustrative of the scale of activity within a region and should not be viewed as a basis for project-level or programmatic assessment. The maps should instead serve to guide the reader to the comprehensive geodatabase that accompanies this document for further, more refined visualization of one or more use categories within a region or sub-region. This is true in particular for the third map in each set, which is simply a depiction of the number of unique data layers, *not including those that describe commercial fishing or commercial vessels*, associated with each BOEM lease block on the OCS. The user is strongly advised not to draw any conclusions from these maps about the specific number and type of potential conflicts in a particular location or region. Rather, these maps should serve as a prompt for using the geospatial database to identify the types of "other" users in a region and thus to broaden the range of interests with whom engagement might be warranted during a development process.

In addition to the data tables and maps, the regional characterizations include information on other recent and relevant ocean use planning and management-related activities. An understanding of these activities is essential to the future management of offshore renewable energy development activities.

Chapter 2 describes the methods employed to complete the literature review, construct the geospatial database, and perform the ethnographic research. Chapter 8 is a synthesis of potential conflict types and the avoidance and mitigation strategies that could be employed to address them. The discussion in Chapter 8 also includes an initial analysis of the primary implementation authority for each avoidance or mitigation strategy, with a focus on identifying those that are available to BOEM. Since avoidance and mitigation strategies for individual development projects will be location- and circumstance-specific, the synthesis in Chapter 8 does not attempt to reach broad, region-specific conclusions; rather, the conclusions in this chapter are meant to be generally applicable and to serve as a starting point for project-level decision making.

This document also includes six appendices. Appendix A presents a detailed characterization of the literature we identified and reviewed. Appendix B is an annotated bibliography of the identified literature. Appendix C provides summary descriptions of all geospatial data sources. Appendix D is a comprehensive inventory of all geospatial data files included the database. Appendix E provides a user guide for the geospatial database. Appendix F comprises summaries of six meetings at which the study team presented information to and gathered information from a variety of stakeholder interests.

2.0 METHODOLOGY

This section describes the methods employed to complete each of the three principal study elements.

2.1 LITERATURE REVIEW

The objectives of the literature review were to:

Identify and characterize potential space use conflicts that could result from renewable energy activities in the Atlantic and Pacific regions,
Summarize key underlying causes of coastal and marine space conflicts,
Describe strategies and specific measures for avoiding or resolving these conflicts, including coastal and marine spatial planning and mechanisms for improved communication and cooperation among stakeholders.

The biophysical impacts of offshore renewable energy development were beyond the scope of the literature review, except as they affect competing human uses for coastal and marine space. For example, the reviewed literature would not address the impact of a wave energy array on whales, but could address the impact of wave energy arrays on whale watching as a tourism activity.

The study team searched the available published literature on the topic of spatial conflicts and their resolution/mitigation. The searches focused on the marine environment in the professional, grey, and peer-reviewed literature. Some effort was spent examining analogous conflicts and mitigation in the onshore environment as well as general best practices in conflict management. The results, although not necessarily comprehensive given the nature of the current information landscape, are clearly representative of the breadth of authorship, contexts, and perspectives on marine spatial conflict associated with offshore renewable energy development.

All members of the study team engaged in the literature review used similar search strategies that included the broad topic of conflict, the ocean regime, and the conceptual areas of interest such as planning, management, resource use, or zoning and sea/ocean/marine conflict.

Given the variety of sources searched, flexibility in search strategies was needed. For example, structured databases accommodate structured searches in ways that GoogleScholar, for example, does not. The resources searched were varied, some proprietary or commercial products, and others openly accessible. They included the following:

Databases:

LexisNexis

Aquatic Science and Fisheries Abstracts

Web of Science

GeoRef

Sociological Abstracts

Environmental Sciences and Pollution Management

Army Corps of Engineers' PONDS database

BOEM Environmental Studies Program Information System

Web and Open Repository Resources

Science.Gov

FedWorld.gov

Web Search Engines

GoogleScholar

Bing

Past work by MMS/BOEM was reviewed if it appeared to primarily address the topic at hand. As many BOEM publications address conflict in part, reviewing all for this project was not feasible. Additionally, a study team goal was to look beyond the agency's expertise at other perspectives on marine spatial conflict.

All identified references were entered into a bibliographic database and each database record was tagged with keywords that capture the following elements.

Use (based on a taxonomy developed by the United Nations Educational, Scientific and Cultural Organization (UNESCO) for marine spatial planning)

Geographic region(s)

Jurisdiction (near-shore, territorial sea, Outer Continental Shelf, etc.)

Designation of the source as "Project/case study" or "General" to differentiate between references that discuss an actual project, such as a wind farm, rather than a more general issue, such as the siting of offshore wind farms

Aspect of conflict and resolution mechanisms

The result was a database of more than 350 unique references. Of these, 192 were considered highly, moderately or somewhat relevant to this study. Many that did not address the marine environment or renewable energy were deselected, as well as those that did not address the topics with any depth.

2.2 Development of the Geospatial Database

2.2.1 Overview

GIS provides an ideal platform for identifying potential space and use conflicts. The study team acquired available data and generated GIS products to characterize activities on the OCS as well as within State waters. The data include information on commercial fishing and boating as well as other uses such as recreational fishing and boating activity, aquaculture, dive sites, sand and gravel resource sites, and underground pipelines and cables. In addition to compiling all available and relevant Federal, State, and nongovernmental entity data sets, the study team generated new GIS products, using tabular and qualitative information not already in a geospatial form, and added them to the database.

2.2.2 Sources of information

Development of the spatial database required obtaining information from many agencies at the Federal and State levels as well as from nongovernmental organizations. Several data sources maintain spatial data spanning both the East and West coasts. Other sources provide information specific to the Atlantic or Pacific waters or a more focused region (e.g., waters of an individual state).

Tables 2-1 through 2-3 summarize the sources of data included in the geospatial database. Table 2-1 lists sources that provide information for both coasts, while Tables 2-2 and 2-3 list sources for East and West coast data, respectively. For each source, the tables also provide the number of data layers obtained from each source and/or generated from data provided.

Table 2-1

Sources of Data Covering the Full Study Area

Source	Number of Data Layers
BOEM/National Oceanic and Atmospheric Administration (NOAA)	15
U.S. Coast Guard	5
Environmental Systems Research Institute (ESRI)	1
Pacific Coast Ocean Observing System (PaCOOS)	2
U.S. Army Corps of Engineers	1

Table 2-2

Sources of Data Covering the East Coast Study Area

Source	Number of Data Layers
Atlantic Coastal Cooperative Statistics Program	2
BOEM/NOAA	5
Cape Hatteras National Seashore	1
Dan Hellin research	1
Florida Fish and Wildlife Conservation Commission-Fish and Wildlife Research Institute	13
Georgia Department of Natural Resources	1
iBoattrack	3
Jack Wiggin research	3
Dr. Madeleine Hall-Arber research	4
Maine GIS	2
Massachusetts Department of Fish & Game	1
Massachusetts Office of Coastal Zone Management	24
National Marine Protected Areas Center	3
New Jersey Department of Environmental Protection, Division of Fish & Wildlife, Bureau of Marine Fisheries	1
NOAA Coastal Services	2
NOAA Electronic Navigational Charts Direct to GIS	150
NOAA National Marine Fisheries Service	112
NOAA Office of Response and Restoration	16
North Carolina Department of Environment and Natural Resources, Division of Marine Fisheries	1
Rhode Island Special Area Management Plan	8
South Atlantic Fishery Management Council	15
South Carolina Department of Natural Resources	12
U.S. Army Corps of Engineers	2
U.S. Coast Guard	3
U.S. Environmental Protection Agency	3

Table 2-3

Sources of Data Covering the West Coast Study Area

Source	Number of Data Layers
BOEM/NOAA	6
California Ocean Uses Atlas	74
California Department of Fish and Game	10
California Wreck Divers	1
Flaxen Conway and Carrie Pomeroy research	37
iBoattrack	1
MarineMap Consortium	96
National Atlas	1
National Marine Protected Areas Center	1
NOAA Electronic Navigational Charts Direct to GIS	111
NOAA National Marine Fisheries Service	2
NOAA Northwest Fisheries Science Center	6
NOAA Office of Response and Restoration	19
Oregon Coastal Atlas	9
Oregon Department of Fish and Wildlife	1
Oregon Department of Land Conservation and Development	41
Oregon Geospatial Enterprise Office	1
Oregon SeaGrant	1
Pacific Coast Marine Habitat Program	3
Pacific States/British Columbia Oil Spill Task Force	1
Pacific Coast Ocean Observing System	29
Pacific States Marine Fisheries Commission/Pacific Fisheries Information Network	5
The Nature Conservancy	1
U.S. Navy	2
Washington Department of Ecology	1
Washington Department of Fish and Wildlife	1
Washington Recreation and Conservation Office	1
Washington State Department of Natural Resources	1

2.2.3 Collection and data creation methods

Development of the geospatial database entailed two major elements: 1) collection of available GIS data, and 2) generation of new GIS files from raw data sources. The following describes in additional detail the collection of data (in both GIS and non-GIS formats) and, in the case of non-GIS format data, the processes used to generate new GIS datasets.

The study team's initial focus was on the identification and collection of available GIS data. To identify data, the team identified previous research efforts and conducted outreach to Federal, State, and other organizations active in the analysis or management of offshore uses.

To initiate the effort, the study team integrated data already in the possession of BOEM. Specifically, BOEM staff provided a DVD of data layers relevant to human uses of the OCS from the Multipurpose Marine Cadastre (MMC), which is a joint project of BOEM and NOAA.

The study team then initiated a search for additional data through a review of websites and geodatabase repositories accessible through the Internet. For example, the majority of State data were obtained by downloading publicly available shapefiles from State agency websites. Through in-person meetings as well as phone and email-based discussions, the study team also contacted representatives from organizations that focus on marine-based issues and thus were considered potential sources of additional geospatial information. For example, the team participated in multiple meetings as part of the Northeast Regional Ocean Council and the West Coast Governor's Agreement on Ocean Health to identify parallel research efforts and potential datasets. Additional organizations, such as the MarineMap Consortium (a collaboration among the University of California-Santa Barbara Marine Science Institute, Ecotrust, and The Nature Conservancy), the California Ocean Uses Atlas of the NOAA National Marine Protected Areas Center, the Oregon Coastal Atlas, and the Atlantic Coastal Cooperative Statistics Program provided access to additional data repositories.

To obtain information regarding specific stakeholders, the study team also conducted targeted outreach to numerous governmental agencies, associations, and other organizations. For example, to acquire data on commercial shipping vessel navigation, the study team worked directly with the staff at the U.S. Coast Guard headquarters. For commercial fishing data, the study team was unable to acquire comprehensive products from a single source. Instead, the team worked with numerous regional NMFS offices, as well as other organizations involved in tracking fishing activity (e.g., Atlantic Coastal Cooperative Statistics Program, Pacific States Marine Fisheries Commission). Additional communications were required with organizations specializing in information on specific use groups (e.g., Columbia River Bar Pilots, California Wreck Divers). During these discussions, the study team provided background information on the study and identified the purpose of the requests. Discussions focused on the potential data sources that each organization might be able to contribute, whether already in a geospatial format or in another raw format.

When obtaining prepared GIS data layers, the study team requested metadata records to document the known limitations of the data and processing steps used to generate the information. In limited cases, sources were able to provide spatial datasets but not metadata. In these situations, the study team developed an abbreviated metadata record to document the source of the information and integrate information conveyed in email correspondences or through organization/agency websites. For original GIS datasets created for this study, the study team also prepared metadata records to document the information covered, process for creation, and limitations. Each of the metadata records is accessible directly within the geospatial database.

2.2.4 Database organization

The geospatial information is held in three separate file geodatabases based on the location of the data. The collection consists of one file geodatabase for the full study area, and separate geodatabases for the East coast and the West coast data. The full study area includes layers spanning both the East and West coasts such as the Automatic Identification System (AIS) commercial vessel navigation data. The East coast and West coast geodatabases include data layers that are specific to the respective coast; for example, many NOAA datasets are created by regional offices and only represent the corresponding regional area.

The team also created an inventory database to track each file within the geodatabases. The inventory database holds the basic information about each shapefile such as the coverage area, the category, subcategory, source and more detailed location extent information. The specific geodatabases holding each file is also tracked in the inventory geodatabase. In addition to providing basic information about each file, the inventory database is easily searchable as described in the geospatial database user guide (Appendix E).

2.3 Ethnographic Research

2.3.1 General methods

The ethnographic research for this effort included more than 200 individual, "guided conversations" with knowledgeable members of fishing, shipping, and other user communities, and six "stakeholder" meetings with participants from multiple user communities. Throughout this report, selected stakeholder comments appear in *italics*. While the research team endeavored to collect information at the same level of breadth and depth for each of the five geographic regions, the amount of information we are able to present is not consistent across regions. Variations in the type and scale of uses that are relevant or particularly important to a region, and, perhaps more importantly, the number and variety of people who made themselves available for the study, directly influenced the quantity and quality of information available for the analysis of potential conflicts and avoidance and mitigation strategies within a particular region or sector.

The ethnographers who conducted field data collection for this project have been engaged in research in marine use communities for decades. They came to the project particularly familiar with the range of fishing communities, gear, vessels and target species in each study region and with strong, prior relationships with the individuals who are the opinion leaders and/or leaders of the region's fishing organizations. The communities selected as sites for both guided conversations and group meetings were those that are most influential in each region due to their size, history, and availability of organizations, markets, and other services.

Consequently, the ethnographers conducted guided conversations with knowledgeable individuals who represent the major commercial fishing gear and species groups, as well as other important user groups, in the selected communities.[2] This was a purposive sample (rather than random), seeking information from "experts." To the extent possible, guided conversations took place face-to-face in participants' communities at a place most comfortable to them.

In general, the ethnographers used the following topics as a guide to one-on-one and group interactions with stakeholders.

Characteristics of place(s)

Areas that are valued (habitat, proximity to home, markets, etc.)

What's important and why (economic/social/cultural aspects of this place)

Use of place

Past use, current use and future trends

Factors that have contributed to changes in use

Adaptations and impacts if access is lost

Where else people would go

Social, economic, cultural, other impacts

Compatible and conflicting uses of place by diverse interests (existing or potential)

Compatible uses

Conflicting uses

Conflict prevention, avoidance, resolution

Communication about place / space use (process and content)

Preferences for how to gather information on current and potential space use conflicts

Information that is worth keeping, should be changed, should be added

Who is most knowledgeable about places and how they should be contacted

Mitigation strategies if conflict cannot be avoided

At the same time, and true to ethnographic tradition, stakeholder conversations emphasized open-ended questions. The researchers assumed that the stakeholders would guide the discussion towards topics of genuine concern. Also based on accepted ethnographic practice, the research results include stakeholders' impressions or perceptions without determination of fact per se. Although their actions and reactions at times may be based on incomplete or incorrect information, any change in the use of or access to marine resources must consider stakeholders' beliefs.

[2] The scope of this study does not include in-depth consideration of tribal perspectives. While our research does allow us to introduce these perspectives in general, we note that the information provided to us, through contact with a small number of individuals who have direct or indirect knowledge of tribal matters, is not assumed to be representative of tribal interests in general, nor does it present an official position of one or more tribal governments.

The six stakeholder meetings (three each on the Atlantic and Pacific coasts) were an effort to reach a broader mix of user interests, to "ground truth" maps with geospatial data depicting specific uses, and to identify additional candidates for one-one-one conversations whom the ethnographers may not have previously identified. Generating interest among stakeholders in participating in these meetings was a challenge, attributable largely to "meeting fatigue" and the fact that the intent was to focus on the general question of conflict avoidance and mitigation rather than on strategies to avoid or mitigate conflict in the context of a specific development proposal. In response, the study team did not attempt to rely solely on meetings called expressly for the purposes of this study; in the Oregon/Washington region, we "piggybacked" on two previously scheduled meetings at which a cross-section of user groups were in attendance.

Figures 2-1, 2-2, and 2-3 illustrate the locations of guided conversations and stakeholder group meetings on the Atlantic and Pacific coasts.

2.3.2 Atlantic coast ethnographic research

This section presents in more detail the implementation of the study's ethnographic research method on the Atlantic coast and the nature and extent of study participants.

2.3.2.1 Atlantic coast commercial fishing

Commercial fishing-related interests included permit owners, captains, crewmembers, their associations and shore-support industries, as well as charter boat owners and captain, processors and aquaculture. In the Northeast, the study team engaged stakeholders currently employing the major commercial fishing gear: scallop dredges, trawls, pots, and gillnets. Some individuals had also used longlines in the past. Boat sizes represented were generally mid-size (50-60 feet) to large (80-110 feet). The active fishermen with whom the study team engaged were usually male, but several of the association executive directors, family members, and shoreside services included female stakeholders. Study participants have had an average of 29 years of experience in the fishing industry.

New England's fishing industry has been characterized as traditionally owner-operator, small-scale, family-based enterprises. The inshore lobster fleet generally still fits that characterization. The scallop and groundfish fleets, however, have drastically changed in the last decade. While there are still a majority of "boots on deck" owner-captains, a few individuals own as many as 10 to 40 vessels and hire captains to run their boats. Guided conversations were held with representatives of each end of the spectrum, from single boat to multiple boat owners. Many prize the diversity of the fleet although this does make generalizations about New England's fishing industry fraught with contradictions and exceptions.[3]

Processors dependent on local marine resources are located primarily in the hub ports of New Bedford and Gloucester. Offshore aquaculture has not yet been established, though there is

[3] See "Who fishes matters" testimonials for perspectives on scales of fishing: https://namanet.org/who-fishes-matters-video-testimonies

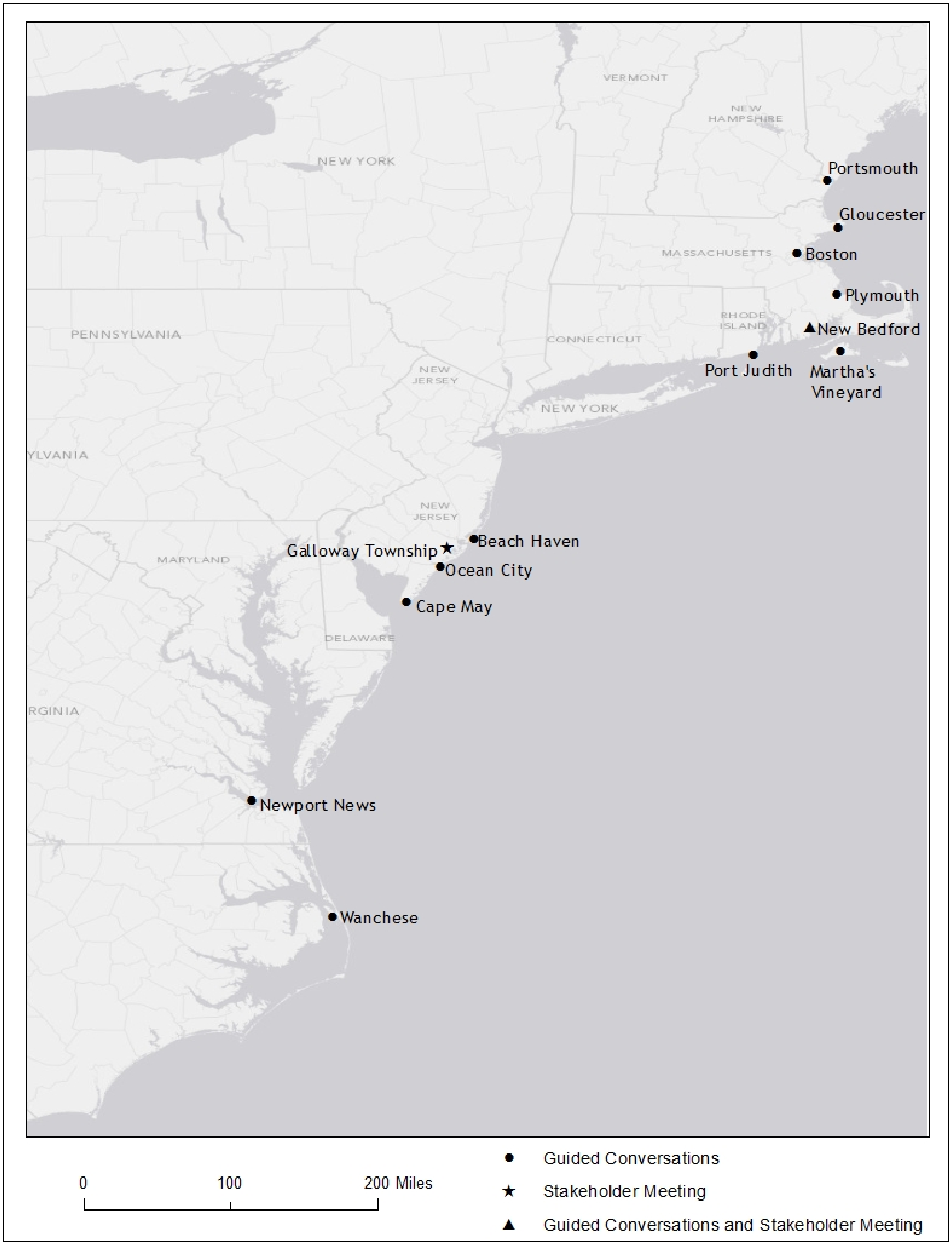

Figure 2-1 Locations of guided conversations and stakeholder meetings in the Northeast Atlantic and Mid-Atlantic regions

Figure 2-2 Locations of guided conversations and stakeholder meetings in the South Atlantic region

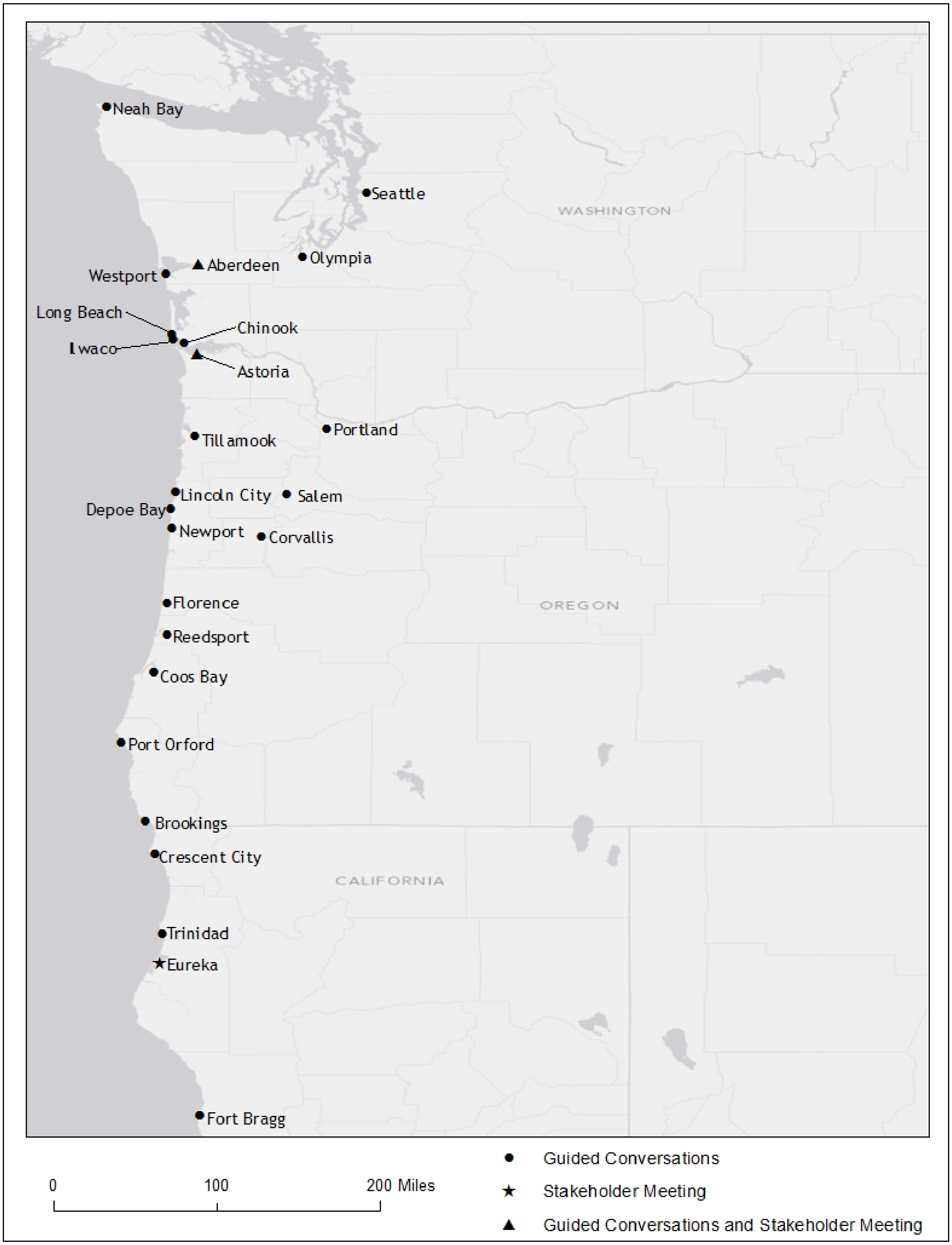

Figure 2-3 Locations of guided conversations and stakeholder meetings in the Pacific Northwest and Northern California regions

interest. The Ronald C. Baird Sea Grant Science Symposium held November 2-4, 2009 focused on the Ecology of Marine Wind Farms. The prospect of integrating aquaculture with offshore wind development was a primary subject of discussion.

Northeast stakeholders were identified initially by organization, using lists of stakeholders developed by Rhode Island for their Special Area Management Plan (RI SAMP). Emails and phone calls were made to the organizations, concentrating on individuals known to the researchers. Requests to introduce the project during already scheduled meetings were granted in the case of the Maine Fishermen's Forum, New Bedford Mayor Lang's Seafood Council, a Massachusetts Lobstermen's Association meeting, and the Northeast Regional Ocean Council (NROC). Study participants were asked to recommend others to talk to that were knowledgeable about offshore areas.

In the Mid-Atlantic and South Atlantic regions, the study team completed a total of 10 commercial fishing industry conversations, consisting of eight commercial fisher conversations and two fish house and processor conversations. The conversation participants in these regions have fished or purchased fish products for an average of over 30 years. One fisher reported that he had been fishing south Florida and its environs for over 50 years, and several others had used the study areas for 40 or more years. By engaging with fish house and processor operators, the study team could better determine the potential macroeconomic, or fishery-wide, impacts (as opposed to fisherman, or micro-level, effects) of the renewable energy development industry.

Almost half of the Mid-Atlantic and South Atlantic fishermen who participated in the study were affiliated with a single fish house and were affiliated with a commercial fishing organization. None of the participating fishermen or fish house operators had affiliations with other, civic or non-governmental organizations, such as the local chamber of commerce or other business guilds, tourist organizations, or civic groups. The lack of horizontal connections suggested that the commercial fishing industry, though largely physically adjacent to the waterfronts and using the same resources and areas as those used by other resource-based users, is mostly separate from the larger industry sector such as ocean energy, shipping and a primarily tourism-based economy.

Table 2-4 summarizes the number and location of guided conversations with parties involved in Atlantic coast commercial fishing activity.

2.3.2.2 Atlantic coast commercial vessels

As an initial step in exploring the commercial vessel sector, the study team analyzed existing information and ocean use sector data to identify significant areas of ocean usage and, importantly, land-based locations from which ocean uses emanate. The study team focused in particular on three sectors:

Commercial shipping: The study team compiled Atlantic coast port data and information from the Maritime Administration and the US Army Corps of Engineers to define those areas with the heaviest commercial vessel traffic and the greatest diversity of cargo types.

Table 2-4

Guided Conversation Participants, Atlantic Coast Commercial Fishing

Stakeholder Sub-group	Port	Number	Gender	
			M	F
Trawler	Martha's Vineyard, MA	1	1	0
Trawler	New Bedford, MA	1	1	0
Trawler	Boston, MA	1	1	0
Trawler	Gloucester, MA	2	2	0
Trawler	Pt. Judith, RI	2	2	0
Trawler/gillnet	South Shore, MA	1	1	0
Trawler/scallop	New Bedford, MA	2	2	0
Scallop dredge	New Bedford, MA	2	2	0
Pots	New Bedford, MA	1	1	0
Pots	South Shore, MA	3	3	0
Pots	Maine	1	1	0
Shore-gear	New Bedford, MA	2	1	1
Processor	New Bedford, MA	1	1	0
Rep. All gear	Gloucester, MA	1	0	1
Rep. Lobster	New Hampshire	1	0	1
Manager (groundfish)	n/a	1	1	0
Charter	Pt. Judith, RI	2	2	0
Aquaculture	Martha's Vineyard, MA	1	1	0
Commercial Fish	Key West/Stock Isl, FL	2	2	0
Commercial Fish	Marathon, FL	1	1	0
Commercial Fish	Port Salerno, FL	1	1	0
Commercial Fish	Mt. Pleasant, SC	1	1	0
Commercial Fish	Wanchese, NC	1	1	0
Commercial Fish	Cape May, NJ	1	1	0
Commercial Fish	Newport News, VA	1	1	0
Commercial Fish Dock	Cape May, NJ	1	1	0
Commercial Fish Dock	Newport News, VA	1	1	0
For Hire Fishing	Key West, FL	1	1	0
For Hire Fishing	Ft. Lauderdale, FL	1	1	0
For Hire Fishing	Palm Beach, FL	1	1	0
For Hire Fishing	Dania, FL	1	1	0
For Hire Fishing	Mt. Pleasant, SC	1	1	0
For Hire Fishing	Beach Haven, NJ	1	1	0
For Hire Fishing	Ocean City, NJ	1	1	0
	Total	**43**	**40**	**3**

Various types of cargo vessels have different operational requirements and characteristics..

Ferries: The study team consulted the U.S. Department of Transportation, Research and Innovative Technology Administration's National Census of Ferry Operations, along with information from the 1995 National Waterborne Passenger Transportation Data Base compiled by the Urban Harbors Institute for the Federal Transit Administration, to determine all coastal locations where ferries operate. With just a few exceptions, passenger ferries on the East Coast operate in harbors, bays, sounds, rivers and other nearshore coastal waters.

Cruise ships: The study team consulted itineraries for each cruise line. Cruise ship routes are included in the AIS data compiled for this study.

The project team subsequently identified the organizations, associations, and authorities that represent the interests of the various sectors of ocean users, and the names of key industry businesses and individuals. Study team members contacted and met with key individuals in each sector to describe the study and obtain further insight and information on organizations, major companies, names of key industry people, and any regular meetings or forums at which the industry exchanges information. This was accomplished beginning with a telephone call, followed by a one-page description of the project and its objectives, and a meeting at the contact's place of business. Most of these conversations took place in the Boston area. Ocean user sectors such as commercial shipping are well-represented in the Boston area and the industries have well-developed and active internal networks. The following organizations provided key sectoral contacts during this initial outreach phase:

Commercial shipping: Massachusetts Port Authority; Maritime Exchange for the Delaware River and Bay; Port Authority of New York and New Jersey; the North Atlantic Ports Association, and the U.S. Coast Guard

Tugs, towboats and barges: Maritime College of the State University of New York and the Port of New York and New Jersey

Passenger ferries: Boston Harbor Cruises

Members of the project team also arranged to appear and present the project's purposes and needs at any regularly scheduled meetings held by industries to exchange information. Following a brief presentation on the project, study team members asked for general feedback on the key questions, including data sources, and for names of key people in the sector with whom to engage further. Four organizations offered venues for this additional outreach during the study period:

Mariners Advisory Committee for the Bay & River Delaware (65 attendees)

Port Operators Group Boston (32 attendees)

Massachusetts Seaport Council (45 attendees)

Port of New York/New Jersey (62 attendees)

Over the course of the project, the project team conducted guided conversations with key industry representatives in each sector in those geographic areas where:

Earlier research indicated the industry to be most active,

Energy resource potential is highest (half of the country's identified offshore wind potential is located off the New England and Mid-Atlantic Coasts), and

Population, and thus energy demand, is concentrated (since that is a driver for siting offshore renewable energy projects).

Attention to reasonable geographic distribution was also a factor in selecting those with whom to conduct guided conversations. Accordingly, conversations were concentrated around the ports of Boston, MA, Portland, ME, New York, NY, and Delaware Bay, DE and PA.

The study team completed a total of 21 guided conversations (and three informal conversations) with representatives of commercial vessel-related interests along the Atlantic coast (Table 2-5).

Table 2-5

Guided and Informal Conversation Participants, Atlantic Coast Commercial Vessels

	Sector	**Number**
Guided conversations	Commercial shipping	7
	Tugs, barges and towboats	2
	Ferries	3
	Harbor pilots	2
	Water-based touring (Florida)	4
	Whale watching	1
	Cruise ships	1
	Cables	1
Informal conversations	Ferries	1
	Cables	1
	Port operator	1
	Total	**24**

2.3.2.3 Atlantic coast non-commercial and other uses

In addition to commercial interests, the study team used its network of contacts to reach out to representatives of a range of non-commercial and other users and interests. Within this broad segment of the user community, the study team completed a total of 19 guided conversations and 14 informal conversations (Table 2-6).

Table 2-6

Guided and Informal Conversation Participants, Atlantic Coast Non-Commercial and Other Uses

	Sector	Number
Guided conversations	Academic	5
	Government – Fishery management	4
	Government – Military (Navy, U.S. Coast Guard)	4
	Environmental	1
	Tribal	1
	Recreational boating	4
Informal conversations	Recreational fishing	2
	Recreational boating	5
	Government – Military (Navy)	2
	Government – Other (NOAA Weather Service)	1
	Academic	2
	Offshore wind development	2
	Total	**33**

2.3.2.4 Atlantic coast stakeholder meetings

The study team convened three stakeholder meetings on the Atlantic coast. Appendix F provides detailed summaries of these meetings, including descriptions of advance preparations and the nature of the discussions with participants. The locations of the stakeholder meetings and the number of participants at each are summarized in Table 2-7.

Table 2-7

Atlantic Coast Stakeholder Meetings

Date	Location	Number of participants
February 28, 2011	New Bedford, MA	8
May 3, 2011	Dania Beach, FL	23
May 25, 2011	Galloway Township, NJ	17

2.3.3 Pacific coast ethnographic research

This section presents in more detail the implementation of the study's ethnographic research method on the Pacific coast and the nature and extent of study participants.

2.3.3.1 Washington/Oregon ethnographic research

The Washington/Oregon commercial fishing sector includes harvesters (non-tribal fishermen; boat owners, crew, skippers, on-shore business partners, families), processing and service (large and small, corporate), tribal fishermen (and associated entities, such as the Northwest Indian Fisheries Commission), charter (businesses that provide sport harvest excursions),[4] and offshore aquaculture. The study team engaged individuals as well as formal and informal groups, including commodity commissions and advisory bodies. The study team engaged with a wide variety of groups from eight to 10 port regions in Oregon and three to five port regions in Washington (north, central, and south), including all major gear groups and boat sizes, crew and owners, tribal and non-tribal interests, harvesters, fish farmers, and processors, as well as people who work in other marine/fisheries sectors (e.g., gear repair, marine supply). As such, a wide variety of perspectives and viewpoints were accessed despite the fact that this target audience group is well known (and documented in the research) for being independent and a challenge to engage.

The commercial vessel sector includes shipping (cargo, tankers), towboats and barges, and navigation and safety-oriented enterprises, including the U.S. Coast Guard, the marine exchanges, harbor safety committees, and ports. Here too the study team was able to engage with a wide variety of stakeholders, primarily via Astoria and Coos Bay in Oregon and small ports in southwest Washington, as well as district and local U.S. Coast Guard officials, bar and river pilots, and tug operators. These users are more organized, making it easier to engage them once networks have been identified. The study team gained a wide variety of perspectives and viewpoints from this stakeholder group.

The study team’s efforts in the non-commercial sector focused on recreational fishing, recreational boating, and ocean scientists. A wide variety of stakeholders – from a few ports in Oregon and Washington, as well as from Federal, State, and academic institutions – were engaged during the study. Like the commercial fishing group, a wide variety of perspectives and viewpoints were received despite the fact that several members of this target audience group are a challenge to engage.

After conducting the initial stakeholder engagement in fall 2010, the study team conducted a total of 72 guided conversations, including 45 in Oregon and 27 in Washington (Tables 2-8 and 2-9).

[4] Because charter is a fishing-related business that does make money on the OCS, it is included in the commercial fishing stakeholder group instead of the noncommercial stakeholder group. Charter is managed as a component of the recreational sector with identical management measures. It is considered commercial by the U.S. Coast Guard but not NOAA Fisheries.

Table 2-8

Guided Conversation Participants, Oregon

Stakeholder Group	Total Number	Location			Gender		Subgroups	
		N	C	S	M	F		
Commercial fishing	26	8	7	11	21	5	21 harvesters, charter, aquaculture	5 service, processing
Commercial vessel	8	7	0	1	8	0	4 shipping, tow	4 safety, service
Non-commercial	11	1	9	1	10	1	3 recreational fishing, boating	8 scientists (Federal, State, academic)
TOTAL	45	16	16	13	39	6		
N=North, C=Central, S=South								

Table 2-9

Guided Conversation Participants, Washington

Stakeholder Group	Total Number	Location			Gender		Subgroup Specifics	
		N	C	S	M	F		
Commercial fishing	14	2	2	10	12	2	11 harvesters, charter, tribal, aquaculture	3 service, processing
Commercial vessel	8	0	5	3	8	0	4 shipping, tow	4 safety, service
Non-commercial	5	0	4	1	4	1	2 recreational fishing, boating	3 scientists (Federal, State, academic)
TOTAL	27	2	11	14	24	3		
N=North, C=Central, S=South								

Table 2-10 lists the range of Washington and Oregon organizations within each of the target stakeholder groups that are represented in this study's research.

"Initial maps" (representations of data layers contained in the study geospatial database) were used when conducting the guided conversations. The study team encouraged participants to make handwritten adjustments to the maps to make them more reflective of their perception of actual conditions. The only stakeholders willing to spend time looking at them were commercial fishing and non-commercial users. Of these, it was primarily the recreational fishing and commercial fishing stakeholders who took the time to provide direct input because they felt that the existing data sets did not accurately portray use. Many also questioned the current fishing effort mapping projects (near shore, using mapping methods conducted by Ecotrust). This led

Table 2-10

Washington and Oregon Organizations Represented in the Study's Research

Sector	Organization
Commercial fishing	Oregon Fishermen's Cable Committee
	Bandon Cable Committee
	Coastal Coalition of Fisheries (and all their member associations)
	Oregon Trawl Commission
	Oregon Salmon Commission
	Oregon Dungeness Crab Commission
	Fisherman Advisory Committee for Tillamook
	Fishermen Involved in Natural Energy
	Fishermen's Information Service for Housing Confidential Release and Essential Distribution
	Florence, Oregon Ocean Resource Coalition
	Southern Oregon Ocean Resource Coalition
	Port Orford Ocean Resource Team
	Washington Dungeness Crab Fisherman's Association
	Westport Charterboat Association
Commercial vessel	Merchant Exchange (Oregon and Washington)
	Harbor Safety Committees
	Towboaters' Association
	Bar Pilots Association
	U.S Coast Guard
	U. S. Coast Guard monthly breakfast meeting
Non-commercial	Marine Resource Committees
	Near Shore Action Team
	Northwest Fisheries Science Center
	Northwest Indian Fisheries Commission
	Yacht clubs
	Recreational Fishermen of America
	Oregon State University
	University of Washington
	Pacific Fisheries Management Council
	Pacific States Marine Fisheries Commission
	Oregon Department of Fisheries and Wildlife
	Washington Sea Grant Extension
	West Coast Governor's Agreement

participants to modify the maps in two main ways. They felt that any spatial fishing data should show three main elements using a broad brush:

Where they could fish if they were unregulated (in other words, where and what are the characteristics of the places they have to go in order to harvest these moving creatures)

Existing limits to where they fish due to regulations and other conflicting uses

Cooperation and conflict on this highly utilized space and place.

They also pointed out that maps do not and should not necessarily reflect the relative economic value of their fishing grounds, but merely show where they try to harvest species.

Participants made it clear that they must be consulted when specific areas are to be considered; consequently, they were only willing to indicate with a broad brush the areas that are important for each species (see Table 6-5). They were clear to share that they felt that any unmarked areas should not be seen as “fine for development” and that any marked areas should be seen as 100 percent opposed to development.

2.3.3.2 Northern California ethnographic research

California’s North Coast commercial fisheries and fishing communities have a long and well-established history, and are central to the identity of many of its coastal communities (Pomeroy et al. 2010). The Eureka-based commercial fishing fleet consists of about 120 vessels, skippers and crew; counts for the three other major North Coast ports are: Fort Bragg, 80; Trinidad, 17; and Crescent City, 100 (Pomeroy et al. 2010). Smaller fleets are based at Shelter Cove in Humboldt County, and Albion and Point Arena in Mendocino County (Impact Assessment Inc. 2010). In addition, fishermen and vessels based at other ports throughout the West coast participate in North Coast fisheries, especially those for salmon and albacore.

Primary fisheries include those for crab, groundfish, shrimp, salmon and albacore, which vary in terms of gear and methods used, places and seasons fished, management, products produced, and other features. Most commercial fishermen participate in an annual round of fisheries, with crab playing an increasingly important role in recent years given its relative abundance, accessibility and strong market compared to fisheries that are more constrained by economic and/or regulatory factors. Nonetheless, the region’s other fisheries long have had, and continue to play, an important social and economic role locally and regionally.

Also included in this category are charter operators who run for-hire fishing operations. Although private boat and shore-based fishing account for the great majority of recreational fishing activity in the region, most ports have a core group of charter vessels. During the period 2003-2007, an annual average of 16 charter operations were active in the North Coast region, accounting for an annual average of more than 15,000 angler days (Pomeroy et al. 2010). Based on fieldwork conducted in the late 2000s, Pomeroy et al. (2010) estimated the number of resident charter fishing operations for the four largest ports: Fort Bragg (5), Eureka (3), Trinidad (6), and Crescent City (1).

This research focused on several fisheries defined by species or species-gear combination that comprise the majority of commercial fishing activity in the region: crab pot, black cod trawl and fixed gear, groundfish trawl and fixed gear, salmon troll, (albacore) tuna troll, and pink shrimp trawl. Several other fisheries (e.g., hagfish (slime eel) pot, halibut hook-and-line) also were discussed by study participants.

The study team engaged individuals representing a range of fisheries and affiliated with a diversity of local and regional associations (Table 2-12). Logistics of working on the North Coast dictated a focused geographic approach that targeted the port communities of Fort Bragg (especially for recreational fishing) and Eureka (for all uses, given its status as a deepwater port). However, bearing in mind the interconnectedness among North Coast fishing communities, the study team engaged a wide variety of OCS users, including individuals based in Trinidad and Crescent City. Most of those in this group are active fishery participants (i.e., those who use the OCS to catch fish for sale or to take others out to fish for sport). Receivers and processors engaged for the study offered some insights, but tended to defer to fishermen, as they actually use and are therefore most knowledgeable of OCS uses. However, those with whom the study team spoke indicated strong interest and concern, and would expect to be engaged if and when offshore renewable energy moves forward in the region. Although aquaculture plays a major role in the Humboldt Bay fishery system (Pomeroy et al. 2010), open ocean mariculture does not and is not expected to operate in the region's OCS in the foreseeable future, and those operators did not engage in this study. However, should offshore renewable energy development proceed, support activities are expected to affect within-bay aquaculture operations and facilities, and operators of those businesses should be engaged.

Other commercial users in the North Coast region include marine tourism operators and those engaged in or that support ocean-going commerce (e.g., shipping, tug and barge operations). Few if any marine tourism operators in this region are OCS users (as opposed to operating exclusively within the bay or state waters).

Study participants identified three shipping companies and three tug and barge companies as the primary shipping entities that operate at the Eureka port, and more that use the region's OCS for transit. The harbor employs two bar pilots to assist vessels arriving, departing and moving within the harbor. Although shipping occurs all along the North Coast, Eureka is the only port at which such vessels regularly call, and is the center of related activity. As such, most of those in this group with whom the study team engaged were located, or their operations were based, in Eureka. As with the commercial fishing group, a wide variety of perspectives and viewpoints were engaged.

Ocean scientists who work in the region's OCS are located primarily in the Eureka area, and are based at Federal science centers and universities elsewhere. The study team engaged several diverse members of this group.

The North Coast region is home to more than 100 tribal groups, many of which are federally recognized sovereign entities, while some are not. Although not an OCS user group in the sense used here, the North Coast tribes are also integral to considerations of potential offshore renewable energy development, albeit for distinct reasons. Tribal interests are addressed apart from the user groups because of special circumstances related to their identity, OCS use and interest, and status and role in ongoing State and Federal processes at the time of this work. The tribes are not distinct OCS "stakeholders," nor are they "users" in the sense that commercial fishermen, other commercial users, and non-commercial users are (although some tribal individuals are engaged in some of these activities). Nonetheless, the tribes have important and particular views, interests, and concerns related to the OCS, its use, and their engagement in any offshore renewable energy process. Through conversations with three staff members from two tribal communities in the Eureka area, the study team was able to gain some insights on the project themes. However, note that those individuals' comments were not offered on behalf of those tribal communities.

The study team's extensive recent experience working with North Coast fishing and harbor/port community members on fishing community profiles and socio-economic characterization and risk assessment provided a strong foundation of basic knowledge, contacts, and recognition as a trusted "neutral broker of information" that were essential and invaluable to this research. The study team began by contacting known user group and community leaders to inform them of the project, seek their participation (where appropriate), solicit their insights about approaching and working with community members, and ask for suggestions of appropriate OCS user group members to engage in the study. This purposive, or "snowball," sampling approach (Goodman 1961) led to the identification of well over 100 individuals, primarily in Eureka and Fort Bragg, but also in other North Coast communities and, in the case of shipping and scientific research, further afield. From this group, the study team sought to engage individuals from each of the OCS user groups and the two main study locations (Eureka and Fort Bragg) through one-on-one and small group guided conversations.

In the course of most of these conversations, the study team also sought participants' spatially explicit input through the use of nautical charts. Initial reactions were mixed, although most participants expressed strong reservations about providing spatial information about existing uses without more information about potential future uses:

I mean it's hard to answer any questions as far as what it could do to fishing, if you don't know what it is you know or where it is. We need more information.

Some participants declined to draw on the charts; others provided spatially explicit information about use patterns for their own and, in some cases, other user groups examples (i.e., where they had years of direct observation of those activities, and in some cases, had participated in those activities in the past). Although substantial insights were gained, the following critical caveats should be noted:

For most of these conversations, using an electronic mapping device (e.g., a laptop with chart layers) was impractical due to meeting location/logistics and/or participant preferences.

Although participants were interested in and appreciated compiled map data, they found it difficult to work with custom paper charts. The study team therefore used simple nautical charts to collect their input.

Because some participants were comfortable mapping whereas others were not, all map data should be considered preliminary or examples of uses, features, and interactions.

The study team's ethnographic research focused primarily on the Eureka area, where the Humboldt Bay Harbor, Recreation and Conservation District (HBHRCD) and the City of Eureka support diverse activities on the OCS, including commercial fisheries (i.e., food and charter (for hire recreational) fisheries); other commercial uses (i.e., shipping, tug and barge activity), and non-commercial uses (i.e., private boat recreational fishing, scientific research and recreational sailing/boating). The research also addressed the Fort Bragg area to a more limited extent, where all of the above uses and activities pertain, except for shipping, and on a smaller scale than at Eureka. In addition, the study team conducted limited ethnographic field research in the Trinidad and Crescent City areas, from which commercial and recreational fishing, boating and research on the region's OCS also originate. Due to logistical, funding and time constraints, the study team did not engage individuals from smaller port communities such as Albion and Point Arena in Mendocino County and Shelter Cove in Humboldt County, although those sites are known for their commercial and recreational fisheries and other recreational uses of both State and Federal waters (Impact Assessment Inc. 2010).

After conducting preliminary contacts and conversations, the study team conducted 58 guided conversations in California, as described in Table 2-11. Table 2-12 lists the range of California organizations within each of the target stakeholder groups that are represented in this study's research.

Table 2-11

Guided Conversation Participants: California

Group	**Subgroups**	**Total**[a]
Commercial fishing	Commercial, charter[b], service, processing	18
Commercial vessel	Shipping, tug & barge, safety, service	9
Non-commercial	Recreational fishing/boating, scientists (Federal, State, academic), tribal, Sea Grant staff, community leaders	31
	Total	**58**

[a] Some individuals play multiple roles, and are assigned to their self-ascribed "primary" role.
[b] Some charter operators also operated non-fishing charter services (e.g., whale-watching/wildlife viewing tours, burial at sea)

These guided conversations occurred between October 2010 to June 2011, each lasting from 45 minutes to about three hours, depending in large part on whether the conversation included mapping. In a small number of cases, the meeting was divided into two sessions, one focused primarily on discussion of the themes, the other focused on mapping (with further discussion of the relevant themes). Most of these guided conversations were recorded (with participants' permission) and transcribed verbatim; for the few that were not recorded, detailed notes were taken and transcribed.

Table 2-12

California Organizations Represented in the Study's Research*

Sector	Organization
Commercial fishing	Del Norte Fishermen's Marketing Association
	Fishermen Interested in Safe Hydrokinetics
	Fishermen's Marketing Association
	Humboldt Fishermen's Marketing Association
	Salmon Trollers Marketing Association
	Trinidad Fishermen's Marketing Association
Commercial vessel	Crescent City Harbor District
	Humboldt Bay Harbor Conservation and Recreation District
	Humboldt Bay Harbor Safety Committee
	Pacific Gas & Electric Co.
	U.S. Coast Guard
Non-commercial	California Department of Fish and Game
	California Sea Grant Extension
	City of Fort Bragg
	Humboldt Area Saltwater Anglers
	Humboldt County Board of Supervisors
	Humboldt State University
	Humboldt Tuna Club
	Humboldt Yacht Club
	North Coast Fishing Alliance
	North Coast Local Agency Coordinating Committee
	NOAA National Marine Fisheries Service Southwest Fisheries Science Center & Southwest Region
* Not all participants identified with these groups spoke for the group per se.	

2.3.3.3 Pacific coast stakeholder meetings

The study team convened one stakeholder meeting in northern California and received permission to include a discussion centered around this study on the agendas of two previously scheduled meetings (in Oregon and Washington) that included participants from the target stakeholder groups. Appendix F provides detailed summaries of these meetings, including descriptions of advance preparations and the nature of the discussions with participants. The locations of the stakeholder meetings and the number of participants at each are summarized in Table 2-13.

Table 2-13

Pacific Coast Stakeholder Meetings

Date	Location	Number of Participants
March 9, 2011	Astoria, OR*	28
June 2, 2011	Eureka, CA	7
June 21, 2011	Aberdeen, WA**	57

* Hosted by the Lower Columbia River Harbor Safety Committee
** Hosted by the Grays Harbor County Marine Resource Committee

7.0 FINDINGS: NORTHERN CALIFORNIA

7.1 REGIONAL CHARACTERIZATION

Commercial fishing in California accounted for approximately 5 percent of the total U.S. landings by mass, and approximately 4 percent of U.S. landings revenue (including Alaska) in 2009 (NMFS 2010). The seafood industry supported approximately 121,000 jobs in California in 2009 (NMFS 2010). Table 7-1 summarizes commercial fishery landings in California in 2009, the most recent year for which data are currently available. Data were not readily available describing the share of landings (mass or revenue) for the Northern California region. It is possible, however, to illustrate the distribution of commercial fishing activity in the Northern California region (Figure 7-1).

California accounted for the largest share of recreational fishing effort (i.e., number of trips) and recreational fishing trip expenditures on the Pacific coast in 2009, but smaller shares relative to the Atlantic coast regions in this study (approximately 6 and 8 percent of the national totals, respectively) (Table 7-2). A large share of this effort (approximately 77 percent) was reported as shore-based activity.

California commercial vessel and commercial vessel-related activity occurs primarily in the portion of the State that is south of this study's area of interest (Table 7-3). Figure 7-2 illustrates the relatively low volume of commercial vessel activity in Northern California waters, reflecting the lack of major ports in this region.

Tables 7-1 through 7-4 provide a broad characterization of important user communities in California, including commercial fishing, recreational fishing, and commercial vessels and related industries. These particular data, though only capturing a fraction of all ocean uses in the state, are presented because they come from data sets that present useful data in a consistent manner across regions, thereby facilitating comparisons between regions with respect to the nature and scale of specific activities. Note however, that these data sources do not distinguish between northern, central, and southern California, making it difficult to characterize the region of interest for this study (Northern California, from the Oregon border to Point Arena, which is approximately 130 miles north of San Francisco). Figures 7-1 through 7-3 provide visual illustrations of ocean use activity in the Northern California region, with a focus on commercial fishing (Figure 7-1), commercial vessels (Figure 7-2), and other activity (Figure 7-3). As noted in the Introduction, Figure 7-3 is simply a depiction of the number of unique data layers, *not including those that describe commercial fishing or commercial vessels,* associated with each BOEM lease block on the OCS. The user is strongly advised not to draw any conclusions from these maps about the specific number and type of potential conflicts in a particular location or region. Rather, these maps should serve as a prompt for using the geospatial database that accompanies this report to identify the types of other users in a region and thus to broaden the range of interests with whom engagement might be warranted during a development process.

Table 7-1

Commercial Fishery Landings, California,[1] 2009

State	Species Group	Quantity (000s lbs)	Revenue ($000s)
California	Finfish and Other	147,186	$46,399
	Shellfish	225,150	$103,578
Total		372,336	$149,977

Source: NOAA National Marine Fisheries Service 2010
[1] Data reported for the entire state

Table 7-2
Recreational Fishing Activity, California,[1] 2009

State	Fishing Mode	Effort (000s trips)	Trip Expenditures ($000s)
California	For-Hire	385	$83,025
	Private Boat	676	$80,767
	Shore	3,599	$192,241
Total		4,660	$356,033

Source: NOAA National Marine Fisheries Service 2010
1 Data reported for the entire state

Table 7-3
Vessel Calls by Oceangoing Self-Propelled Vessels of 10,000 DWT or Greater* at California Ports, by Type, 2010

Port	All Types	Tanker			Container	Dry Bulk	Roll-on/ Roll-off	Vehicle	Gas Carrier	Combination	General Cargo
		Product	Crude	Total							
El Segundo	257	75	182	257	0	0	0	0	0	0	0
Los Angeles/Long Beach	4,695	539	501	1,040	2,610	364	272	226	1	0	182
Port Hueneme	427	9	0	9	0	0	164	151	0	0	103
S. California Light. Area	196	4	192	196	0	0	0	0	0	0	0
San Diego	458	16	0	16	55	6	191	170	0	0	20
San Francisco	3,089	400	294	694	1,741	386	122	92	16	0	38
San Pedro	51	0	1	1	49	0	0	0	0	0	1
Wilmington	1	0	1	1	0	0	0	0	0	0	0
Totals	**9,174**	**1,043**	**1,171**	**2,214**	**4,455**	**756**	**749**	**639**	**17**	**0**	**344**

* In 2005, these vessels accounted for 98 percent of the capacity calling at U.S. ports.
Source: U.S. Department of Transportation, Maritime Administration, Vessel Calls at U.S. Ports by Vessel Type, http://www.marad.dot.gov/library_landing_page/data_and_statistics/Data_and_Statistics.htm, accessed 12 January 2012
Lloyd's Maritime Intelligence Unit, Vessel Movement Data Files.

Table 7-4

Transport, Support, and Marine Operations, California,[1] 2008

Activity	Parameter	California
Coastal freight transportation	Establishments	28
	Employees	ND
	Payroll ($000s)	ND
Deep sea freight transportation	Establishments	43
	Employees	ND
	Payroll ($000s)	ND
Deep sea passenger transportation	Establishments	5
	Employees	ND
	Payroll ($000s)	ND
Marinas	Establishments	277
	Employees	2,652
	Payroll ($000s)	$85,315
Marine cargo handling	Establishments	61
	Employees	22,086
	Payroll ($000s)	$1,453,281
Navigational services to shipping	Establishments	40
	Employees	815
	Payroll ($000s)	$65,225
Port and harbor operations	Establishments	17
	Employees	256
	Payroll ($000s)	$23,316
Ship and boat building	Establishments	136
	Employees	11,630
	Payroll ($000s)	$477,300

NA: Data not available
ND: Non-disclosable confidential data
Source: NOAA National Marine Fisheries Service 2010
[1] Data reported for the entire state

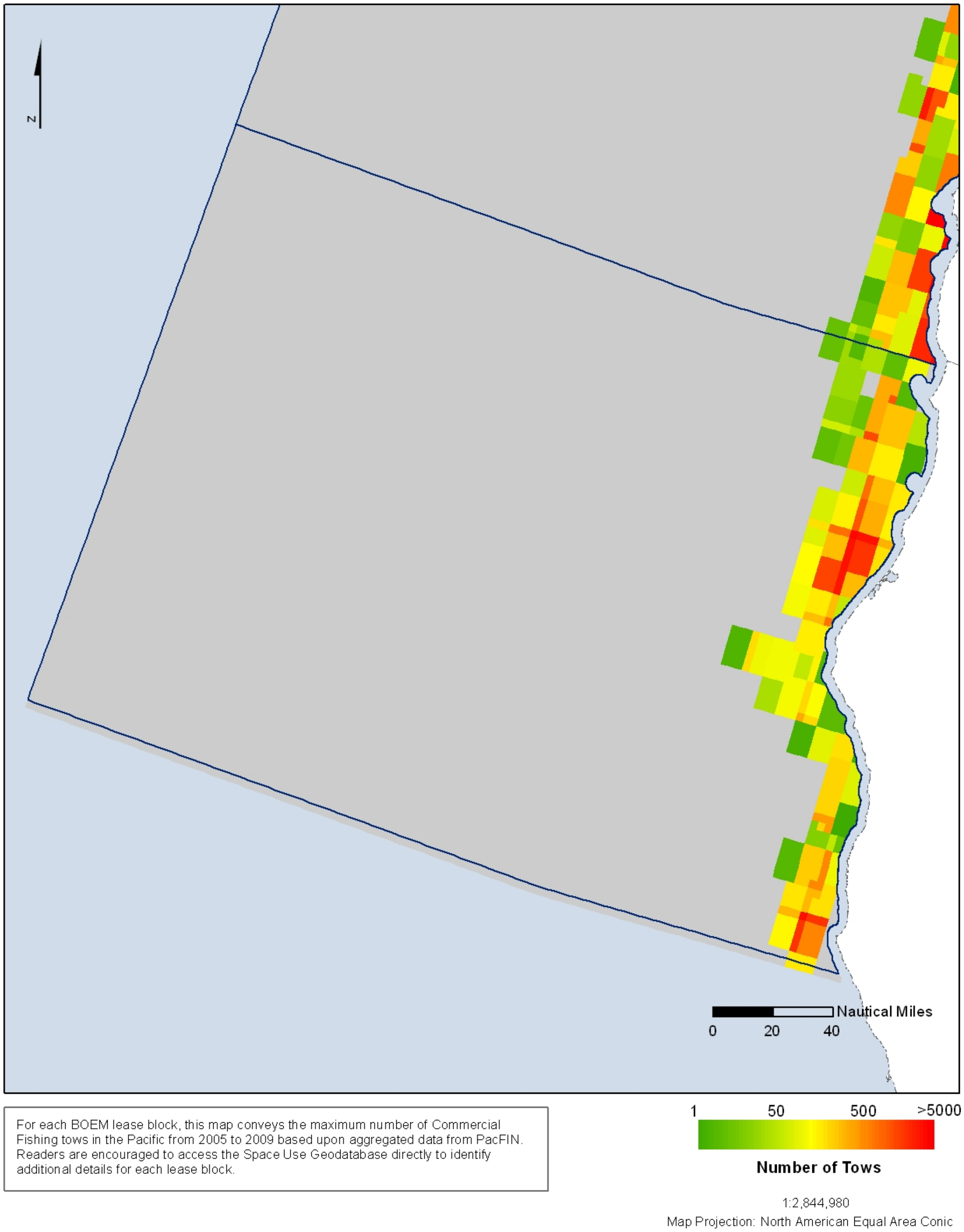

Figure 7-1 Commercial Fishing Activity in the Northern California Region

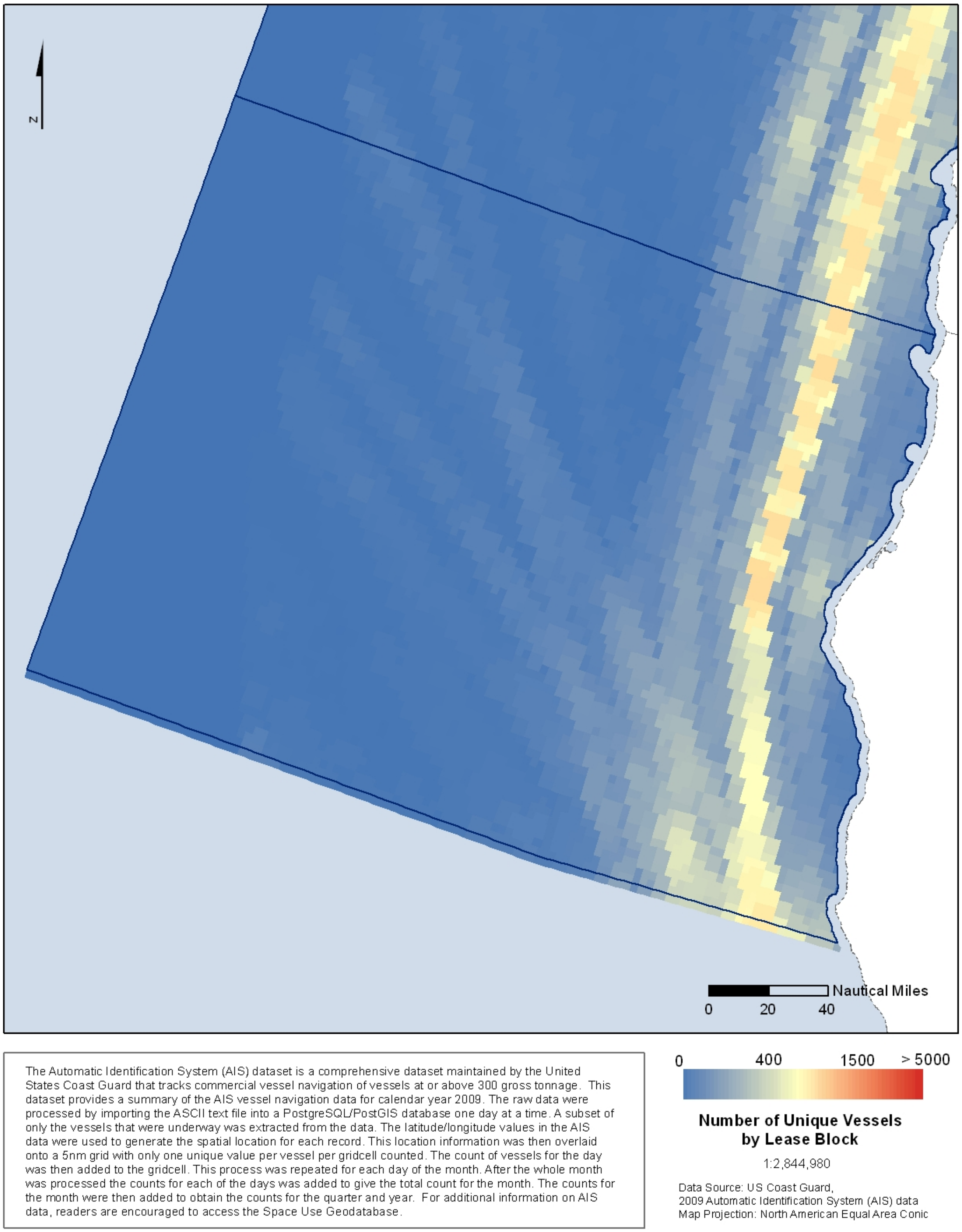

Figure 7-2 Commercial Vessel Activity in the Northern California Region

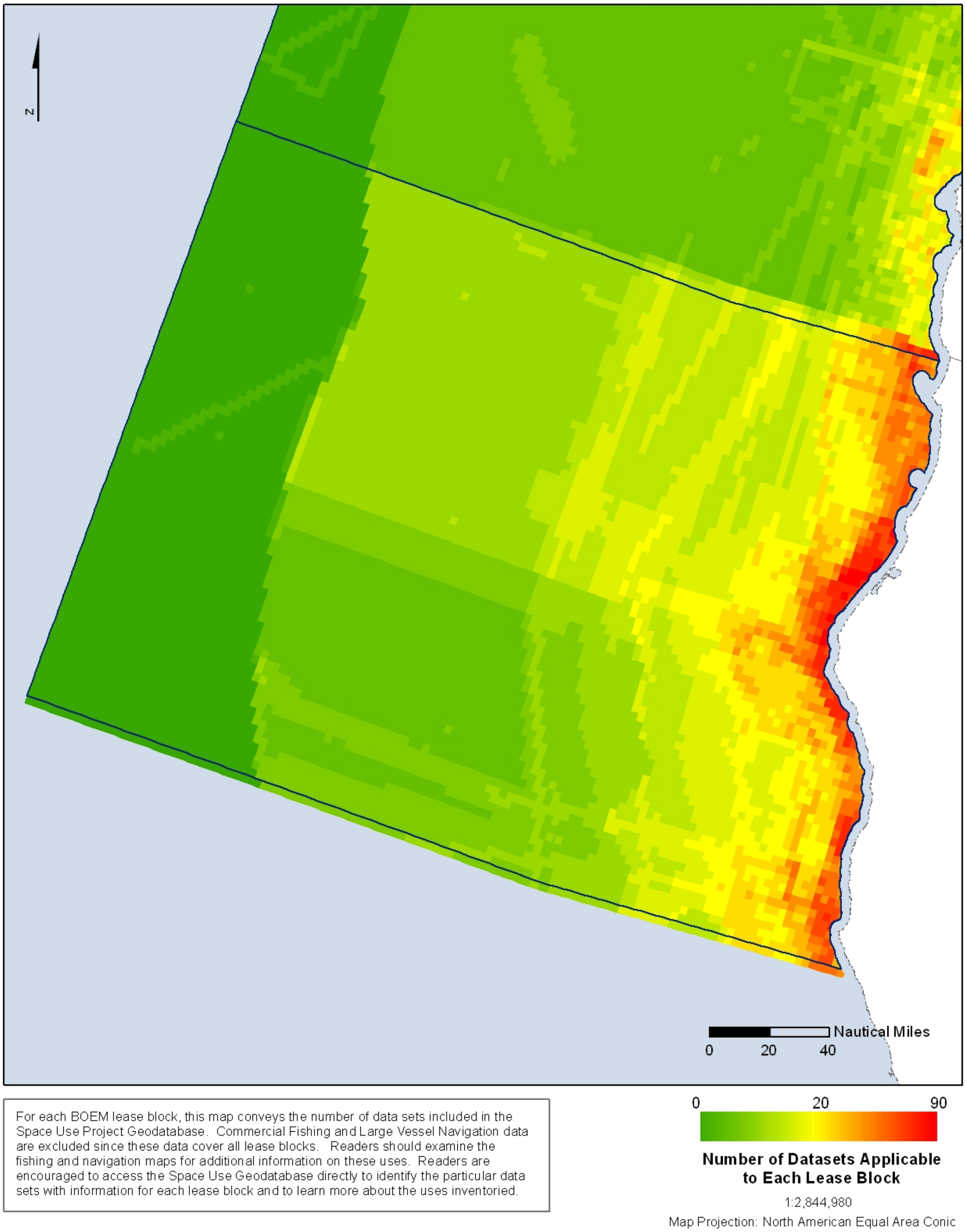

Figure 7-3 Occurrence of Data Sets Describing Noncommercial Uses in the Northern California Region

With more than 1,100 miles of coastline, California's marine environment encompasses two biogeographic zones, more than 30 fishing ports, and many more landing sites. The state's North Coast region, defined here as extending from Point Arena in Mendocino County to the border with Oregon, about 15 miles north of Crescent City in Del Norte County, is highly productive, both biologically and energetically. According to the California Energy Commission, "The western coastline has the highest wave potential in the U.S.; in California, the greatest potential is along the northern coast."[9]

Demographically, the North Coast region, comprising Mendocino, Humboldt and Del Norte counties, is largely rural and sparsely populated, in sharp contrast to the more urbanized central and south coast regions (Pomeroy et al. 2010). Relative to California as a whole, the North Coast population is generally older, more limited in terms of income and education, and less racially diverse. Unemployment rates have historically been much higher in these counties than the state, although that gap narrowed considerably by 2009 due to statewide increases in unemployment associated with the economic downtown.

Since long before white settlement, the resources of the North Coast have been a critical source of sustenance and cultural significance to local Indian tribes (Pomeroy et al. 2010). Following White settlement during the gold rush of the mid-1800s, residents turned to the area's massive redwood forests and abundant fishery resources such as salmon, groundfish, and crab. The development of land transportation routes linked North Coast communities with cities further south, and brought tourists, including sport fishermen, to the area. Timber harvesting was the primary industry for many decades, particularly after World War II with the U.S. housing boom, and helped to stimulate coastwise and trans-Pacific shipping. However, by the 1960s, an estimated 90 percent of the redwoods were gone. As logging declined, fisheries became an increasingly important industry in this remote region.

Today, the region's residents identify strongly with the local coastal and marine environment, and many depend on and value its fisheries and other amenities for livelihood, recreation, and subsistence – and often a mix of these. Shipping is important for receiving fuel (especially given the limited land-based transportation infrastructure) and for natural resource-based commerce. The region also is the site of substantial and growing interest to marine scientists in a diversity of fields.

In contrast to many other coastal communities elsewhere in California, many North Coast residents, including many OCS users, wear "multiple hats," playing multiple roles and engaging in diverse activities. For example, a local tug operator also is a commercial fisherman or operates a local tour vessel, and a California Department of Fish and Game biologist also serves in public office. In addition, the North Coast's geographic communities are connected by their cross-cutting communities of interest (especially commercial and charter fishing). This social and economic interconnectedness, together with the region's remoteness and the often rough ocean and weather conditions, have enhanced awareness, respect and appreciation for diverse locally-based uses, and an aversion to larger external government and corporate institutions, as evidenced in the recent marine reserve and wave energy development processes described below. At the same time, California's North Coast communities differ from one another in fundamental

[9] http://www.energy.ca.gov/oceanenergy/index.html, accessed 7/22/11.

ways. As such, any understanding gained about one user group or location should not be assumed to pertain to all others.

The following briefly describe other regional efforts (past and present) to identify and manage marine uses in this region. The North Coast region, and the Eureka area in particular, have decades of experience with past and ongoing marine spatial management and development efforts. As study participants repeatedly demonstrated, these efforts afford practical information and insights for those considering offshore renewable energy development; have affected them and shaped their attitudes and actions; and have both discrete and cumulative impacts. This information is important for considering the potential utility of those efforts' resulting data; for appreciating the cumulative impacts of diverse research inquiries and agency actions on study participants and their communities; and for informing efforts to engage them in renewable energy development processes.

Minerals Management Service Lease Sale 91, 1980-1989

In 1977, the Minerals Management Service (MMS) announced Lease Sale 53, which would have enabled the installation of offshore oil and gas rigs in Northern California for the first time. According to study participants, the site was one of extensive commercial fishing activity, with significant potential for conflict, and the action elicited substantial opposition from the larger North Coast community; that development did not occur.

In the early 1980s, the MMS began the process for Lease Sale 91, located off Humboldt County (MMS 1986, King 1988). Concerned about the potential impacts of offshore oil development on the local community and economy, and especially local fisheries, the County of Humboldt worked with the fishing community, California Sea Grant, and others to establish a spatially explicit biogeophysical and socio-economic baseline and assess potential outcomes under a set of offshore oil development siting scenarios (Humboldt County Board of Supervisors 1988, King 1988). Comparing maps of species distribution and key habitat for the groundfish trawl fishery, along with the mechanics of groundfish trawling, it was determined that the actual footprint (spatial scope of impact) of two platforms considered at the time would have been substantially larger than described by the agency given the relative distribution of marine species and the mechanics of operating a groundfish trawl vessel and gear (Humboldt County Board of Supervisors 1988, King 1988). In 1986, the California Coastal Commission recommended that "no areas be leased under Lease Sale 91 due to unacceptable impacts on coastal resources, the lack of an overall energy policy which precludes rational planning for such lease sales, and the absence of an adequate EIS" (California Coastal Commission 1988). In June 1990, President George H.W. Bush, called for the "indefinite postponement of three [OCS] lease sales," including Lease Sale 91 (Fitzgerald 2002).

This experience is relevant in the context of present-day offshore renewable energy development for two reasons. First, the collaborative effort in Humboldt County at the time of Lease Sale 91 deliberations resulted in data that describe the nature and extent of selected activities (i.e., groundfish trawling) in the OCS. Although the spatial extent of these activities has changed somewhat due to changing regulations and other social, economic and environmental factors (Pomeroy et al. 2010), trawling continues, and is expected to continue, into the foreseeable future. Second, the experience with MMS was cited by multiple fishermen (commercial and recreational) and County staff, and others we spoke with during fieldwork for this project. They emphasized 1) the relevance and potential utility of the data collected in the 1980s to the consideration of offshore renewable energy development and any offshore activity, 2) the importance of understanding that space use is dynamic in both place and time, and 3) the critical importance of meaningful engagement with community members to gain a more complete understanding of a) space use patterns and their dynamics, b) community values as they relate to offshore energy development, and c) community attitudes toward non-local entities undertaking projects that affect established, local uses.

Essential Fish Habitat, 2000s-present

Following the 1996 re-authorization of the Federal Magnuson-Stevens Fishery Conservation and Management Act (MSA), the Federal fishery management councils were required to identify and develop conservation measures for Essential Fish Habitat (EFH)." Two distinct mapping processes were undertaken, and, in 2006, more than 150,000 square miles off the West Coast were designated as groundfish EFH, with fishing gear restrictions and prohibitions, including areas closed to trawling and other bottom-contact fishing (NMFS 2005). In the North Coast region, waters from the 700-fathom contour out to the 200-mile Exclusive Economic Zone (EEZ) limit are closed to bottom trawling from Cape Mendocino north. South of Cape Mendocino, groundfish EFH extends inshore in selected places and from the 700-fathom contour out about 50 miles. In February 2011, the NOAA National Marine Fisheries Service (NMFS) and the Pacific Fishery Management Council (PFMC) began a review of the West Coast groundfish EFH designations, with the possibility that current EFHs and associated regulations will change, with changes in fishing patterns to follow as fishermen adapt.

Rockfish Conservation Areas, 2000s-present

Similar to EFH areas, Federal rockfish conservation areas (RCAs) have been established off California to protect species of concern. The RCAs, each with boundaries defined by specific latitude and longitude coordinates that approximate depth contours, differ by fishery and gear type (e.g., trawl and non-trawl commercial, and recreational), and vary throughout the year.[10] The RCAs have significantly reduced areas available to some fisheries, with concomitant impacts on North Coast commercial and recreational fishermen, fisheries and communities. As with the EFH conservation areas, the RCAs have been and can be changed, expanded or reduced depending on resource conditions as determined by stock assessments.

Liquefied Natural Gas Terminal Proposal, 2003-2004

In 2003, Houston-based energy company Calpine proposed the development of a liquefied natural gas (LNG) facility on Humboldt Bay. Although the proposed facility would not have directly affected use of the OCS or state waters outside Humboldt Bay,[11] ocean users and the larger community were concerned about the potential safety hazards, aesthetic impacts, and other implications of a terminal with two 13-story LNG storage tanks to receive fuel deliveries from 900-foot tankers near Samoa, a sparsely populated area on the north spit that bounds Humboldt Bay on the west. (The tallest building in Eureka is five stories.) More directly important to bay

[10] http://www.nwr.noaa.gov/Groundfish-Halibut/Groundfish-Fishery-Management/Groundfish-Closed-Areas/Trawl-Rockfish.cfm, accessed 7/21/11.

[11] The siting of such a facility might have directly affected marine use if a security perimeter around the LNG terminal site were deemed necessary.

and ocean users, because of the considerable danger in transporting LNG, fuel deliveries would require an armed U.S. Coast Guard escort and the closure of the harbor entrance to all other vessel traffic for one or more hours at a time. This, in turn, added to concerns about potential safety (given the already hazardous conditions at the harbor entrance and often extreme weather conditions offshore) as well as economic impacts on existing users (Easthouse 2003). In March 2004, Calpine withdrew its plans for an LNG terminal on Humboldt Bay (Gurnon and Schioch 2004).

Wave Energy Development Projects, 2006-2010

In the North Coast region, offshore wave energy projects have been pursued by two companies, Green Wave, LLC in Mendocino County, and Pacific Gas & Electric Company (PGE) in Mendocino and Humboldt Counties. Each of these processes has involved a complex course of events, with distinct community contexts, processes and responses; all three efforts, however, have ended in cancellation or withdrawal of project permits. Space limitations preclude a detailed discussion of these processes, but a brief overview is provided below.

In early 2007, PGE obtained a preliminary license from the Federal Energy Regulatory Commission (FERC) for a pilot wave energy project in state waters along the Mendocino County coast (Hartzell 2008). Although the City initially expressed interest in the concept, it subsequently withdrew its support, noting that the current PGE configuration was not consistent with what had been discussed previously. Nonetheless, PGE moved forward. Opposition to the project grew, and the city and the county formed ad hoc committees to help insure that there would be a public process to inform the community of wave energy decisions (Hartzell 2008). The Mendocino-based Ocean Protection Coalition, established during the MMS lease sale activities three decades earlier, re-mobilized amid concerns about a new project's potential negative environmental and socio-economic impacts. Local fishing interests formed Fishermen Interested in Safe Hydrokinetics (FISH), focused especially on the potential impacts of wave energy development on the local fishing community and economy. These groups also shared substantial concerns about local authority being usurped by powerful external interests with values quite different from the local community. PGE eventually cancelled its plans for the area, citing Noyo Harbor's narrow entrance bar and small harbor as a major constraint – an issue local fishermen and others had pointed out from the onset.

In late 2007, Green Wave, LLC obtained a preliminary permit from FERC for wave energy development off Mendocino and San Luis Obispo Counties. In January 2009, FISH filed motions to intervene and comment in the application process for Green Wave's preliminary permit off the Mendocino Coast. Local governments and others subsequently joined the suit requesting that the agency develop a comprehensive plan for hydrokinetic energy off the coasts of California, Oregon, and Washington. These legal petitions were determined to be moot, however, when Green Wave's inaction on its preliminary permit resulted in FERC canceling that permit in 2010 (Ruffing 2010).

The PGE Humboldt WaveConnect experience was somewhat different. A "Humboldt Working Group" consisting of stakeholder representatives from all potentially affected user groups was convened in mid-2009, and met regularly over the next year in a process facilitated by a consulting firm. PGE also contracted with Humboldt State University for a suite of research projects to inform the process, including a socio-economic baseline study conducted by a Humboldt State economist (Hackett et al. 2010).[12] Hackett and colleagues used map data collected by Ecotrust, which covered the same study area (in contrast to this project) with permission from fishermen who had participated in Ecotrust's Marine Life Protection Act (MLPA) mapping exercises (see below). In late summer 2010, however, PGE cancelled Humboldt WaveConnect, citing unexpectedly high project costs.

As one study participant summarized these divergent outcomes:

"A major difference in the response of Fort Bragg versus Eureka to (offshore renewable energy) is that Fort Bragg wanted a comprehensive environmental baseline study and Eureka wanted local port jobs and fishing compensation."

California Ocean Uses Atlas, 2005-present

In 2005, the National Marine Protected Areas Center initiated the "Human Use Patterns and Impacts" project, which led to the development of the California Ocean Uses Atlas Project in partnership with the Marine Conservation Biology Institute. From early 2008 through late 2009, the project convened groups of "regional experts," including several North Coast community members, to map human uses of State and Federal waters off the California coast to support regional and national spatial/ocean use management efforts.[13] The resulting maps depict "dominant use areas," "general use footprints," and "future use areas" for 26 use types on a 1 x 1 mile grid system (see http://www.mpa.gov/).

Marine Life Protection Act Process, 2009-present

Following the passage of the California MLPA in 1999, the state has overseen a process coordinated by the "MLPA Initiative" to develop a statewide network of marine protected areas (MPAs). The process entails the convening of a regional stakeholder group, a science advisory team and a Blue Ribbon Task Force to focus on MPAs for each of five coastal regions of the state. Between 2007 and 2010, the MLPA Initiative focused on the North-Central Coast region (just south of this project's study area), which includes state waters from Pigeon Point near Half Moon Bay in San Mateo County to Alder Creek, near Point Arena in Mendocino County. MPAs in that region were implemented in May 2010, affecting not only North-Central Coast fishermen and communities, but also fishermen based in the North Coast region and others who fish in those areas. MPAs proposed for the North Coast have similar implications for use of California's coastal waters within and beyond the region, due to the mobility of fishery participants and the inter-connectedness among ports and regions (Pomeroy et al. 2010).

The North Coast MLPA process began in June 2009, with the resulting network slated for final approval and implementation in 2012. Under contract to the MLPA Initiative, Ecotrust conducted mapping exercises with local commercial and recreational fishermen to identify their "most important" grounds for fisheries in state waters.[14] Concerned about the limitations of the

[12] Previously, Hackett had explored the potential socio-economic impacts of wave energy development in a white paper developed for the state (Hackett 2008); see (Nelson et al. 2008) for the full report.
[13] The project has since expanded to New Hampshire and Hawaii.
[14] Ecotrust used a refined version of the "100-penny" ranking system first developed and used in California by C. Barilotti for the Channel Islands Marine Working Group process in 2000.

Ecotrust work (i.e., the limited values captured, the lack of information about shoreside linkages and impacts), a coalition of North Coast agencies and interests, coordinated by the HBHRCD, contracted with Impact Assessment, Inc. to develop a contextualized socio-economic characterization of relevant activities to support assessment of potential MPA impacts. Like Ecotrust, Impact Assessment mapped local fishery activity, but used an ethnographic approach to capture the diversity of values, features and use characteristics relevant to the region's fisheries, and insights into potential socio-economic impacts of alternative MPA scenarios (Impact Assessment, Inc. 2010).

Study participants had varied reactions to the data collected by Ecotrust under contract to the MLPA Initiative. The Ecotrust data reportedly represent some fisheries (in state waters) well and others very poorly, owing in part to differential interpretations of the mapping instructions as well as limitations of the "100-penny" approach. The Impact Assessment project overcame many of these limitations through its attention to the diversity of values, temporal and spatial variability of use, and the interconnectedness of on-the-water use with shoreside businesses and communities. However, the Impact Assessment study is of somewhat limited utility for understanding OCS uses because those who primarily or exclusively use Federal waters (especially groundfish and shrimp trawlers) are not fully represented.

Three other insights from the North Coast MLPA process are noteworthy. First, the process in general and associated mapping have been contentious. There was and continues to be substantial mistrust of those funding and running the process, exacerbated by MLPA Initiative staff insisting that group meetings were exempt from public meeting laws.[15] Second, although the North Coast process entailed unprecedented cooperation among diverse interests to develop a single "unified proposal" for consideration by the Blue Ribbon Task Force and the California Fish and Game Commission, many community members caution that it should not be viewed as a replicable success story, due to the particulars of the North Coast context and the sense among many that that unified proposal was driven in part by fear rather than a more positive sense of collaboration. Third, a critical and as yet unresolved issue is that of tribal fishing and gathering in MLPA-designated areas, an issue that has revived long-standing tensions between the state and the tribes over access to and use of coastal resources.

Coastal and Marine Spatial Planning, 2009-present

Coastal and marine spatial planning (CMSP) efforts at the national, regional and state level, initiated in 2009, are underway. The state, in coordination with the West Coast Governors' Agreement on Ocean Health (WCGA), has engaged in a variety of activities toward developing a West Coast regional framework for CMSP, and is now focused on: 1) developing a West coast data network to address regional ocean and coastal issues; and 2) gathering information needed to identify ecologically important habitats and areas, and mapping areas of human use (see http://cmsp.noaa.gov/activities/wcga.html).

California Air Emissions Standards, 2008

In July 2008, the California Air Resources Board (CARB) adopted "Fuel Sulfur and Other Operation Requirements for Ocean-Going Vessels within California Waters and 24 Nautical

[15] The process was subsequently determined to be a public one, subject to the state's open meeting laws (Hartzell 2010).

Miles of the California Baseline" to reduce particulate matter, oxides of nitrogen, and sulfur oxide emissions from ocean-going vessels to improve air quality and public health in California (CARB 2011). As a result, many larger vessels have adjusted their transit patterns to minimize travel time – and the use of more costly (but lower-sulfur) distillates - inside 24 miles (Vestel 2011). Automatic Identification System (AIS) data can be (and has been) used to identify this shift in vessel patterns. The Federal government is slated to implement similar rules throughout the 200-miles U.S. EEZ in 2015 (Maritime Executive 2011).

Past and Ongoing Non-Spatial Management Actions

In addition to spatial efforts per se, numerous other management actions, most notably those in fisheries, also have affected (and continue to affect) OCS users, and have implications for this study and future renewable energy development efforts. The North Coast region has been the focus of extensive State and Federal fishery management in an effort to sustain fishery resources, resulting in substantially reduced participation and landings. (See Pomeroy et al. (2010) for in-depth discussion of those measures.) Of particular relevance to OCS users are salmon, groundfish and shrimp fishery management measures, which include limited entry (capping or reducing the number of participants), gear restrictions, catch quotas, minimum size specifications, seasonal (as well as area) closures, and other measures. Individually and cumulatively, these measures have substantially constrained fishing activity and created significant operational, social, and economic challenges for fishery participants, harbors, and fishery-support businesses and communities (Pomeroy et al. 2010). Fishery participants and their communities are in flux as they adjust to the Trawl Individual Quota program, and understanding of OCS space use patterns and values, the potential for conflict, and other topics of interest in this study are affected accordingly.

Within this context, most participants expressed strong reservations about providing spatial information about existing uses on maps without more information about potential future renewable energy uses. In the words of one study participant, *"It's hard to answer any questions as far as what it could do to fishing if you don't know what it is or where it is. We need more information."* Whereas some participants declined to draw on the charts, others provided spatially explicit information about use patterns for their own and, in some cases, other user groups (i.e., where they had years of direct observation of those activities, and in some cases, had participated in those activities in the past). Others described use patterns, as summarized in the tables in this report. Because some participants were comfortable mapping whereas others were not ***all ethnographic map data in the associated geodatabase should be considered examples of uses, features and interactions***.

7.2 COMMERCIAL FISHING

7.2.1 Characteristics and use of space

California's North Coast commercial fisheries and fishing communities have a long and well-established history on the North Coast region, and are central to the identity of many of its coastal communities (Pomeroy et al. 2010). The commercial fishery system includes not only fishermen (skippers and crew), but also boat owners (at times distinct from skippers), receivers and processors, harbors staff, and fishery-support business operators (i.e., those who provide goods and services to enable and support fishing activities). Charter fishing operators (who are paid to take sport fishermen fishing) and aquaculture operators also are part of the fishery system.

Primary North Coast fisheries include those for crab, groundfish, shrimp, salmon, and albacore, which vary in terms of gear and methods used, places and seasons fished, management, products produced, and other features. Most commercial fishermen participate in an annual round of fisheries, with crab playing an increasingly important role in recent years given its relative abundance, accessibility, and strong market compared to fisheries that are more constrained by economic and/or regulatory factors. Nonetheless, the region's other fisheries continue to play an important social and economic role locally and regionally.

Also included in this user category are charter, or for-hire, fishing operations. Although private boat and shore-based fishing account for the great majority of recreational fishing activity in the region, most ports have a core group of charter vessels. During the period 2003-2007, on average, 16 charter operations were active in the North Coast region, and accounted for an average of more than 15,000 angler days per year (Pomeroy et al. 2010). The estimated number of resident charter fishing operations for the four largest ports (Fort Bragg, Eureka, Trinidad, and Crescent City) are estimated to have five, three, six, and one resident charter fishing operations, respectively. Charter vessels tend to operate on a smaller scale and participate in a more limited set of fisheries - troll/hook-and-line for rockfish, halibut, salmon, and albacore, and crab pot - compared to commercial fishermen.

Due to the particularly rough ocean conditions along the North Coast, aquaculture activities have been limited primarily to the protected waters of Humboldt Bay and Crescent City harbor. In Humboldt Bay, oyster aquaculture began in earnest in the 1950s with the establishment of the Coast Oyster Company (now Coast Seafoods); as of 2009, five aquaculture operations were active in Humboldt Bay, producing oysters and oyster seed (Pomeroy et al. 2010). The Crescent City harbor area has one currently inactive abalone culturing operation. Although these activities do not occur on the OCS, offshore renewable energy projects could interact with these operations, which rely on access to space within their respective bays, along with particular water quality and other features.

The North Coast ocean environment is highly variable, with a mix of sand, mud and rocky habitat, and areas that are more or less vulnerable to the region's strong wind and waves. In addition, the bathymetry and extent of the shelf are highly variable along the coast, with several marine canyons, many of which extend from river mouths along the coast. The shelf is very narrow along the Mendocino County coast, becoming progressively more extensive off Eureka and Crescent City. Consequently, the North Coast fisheries include a range of species targeted, vessel sizes and types, gears used, markets served and products produced.

Many North Coast fishermen engage in an annual round of fisheries, with the particular combination and timing defined by environmental,[16] economic and regulatory factors. (See Pomeroy et al. (2010) for common commercial fishery combinations associated with the four larger North Coast ports and how these have changed over time.) The annual round of fisheries

[16] Environmental factors include oceanographic and weather conditions, which influence the abundance and distribution of stocks within and across seasons.

helps to mitigate limited production or demand in any one fishery. Increasing regulation in many fisheries, however, has generally increased North Coast commercial fishermen's and fishing communities' dependence on Dungeness crab. In some cases, most notably at Trinidad, several fishermen participate in the crab fishery in the winter, and run charter operations in the spring, summer and fall.

Commercial fishing patterns along the North Coast are affected by fishing in other regions (and vice versa), as many fishermen "follow the fish" over the course of the season. Some fishermen (big-boat and small-boat) travel along the coast, as far south as the San Francisco Bay area and as far north as Oregon and southern Washington to participate in various fisheries. (See, for example, Pomeroy and Stevens (2008) and Pomeroy et al. (2010).)

As a result of participating in multiple fisheries (often in multiple places), North Coast fishermen have insights and perspective on multiple fisheries, enabling them to speak to considerations for individual fisheries, how they compare (e.g., in terms of places valued), and the implications of space use - and changes in it - for the fishery system as a whole. Although requests to identify places used in any detail struck a nerve, especially following recent experience with the California MLPA process, several study participants identified general characteristics and areas for each of several major North Coast fisheries (see Table 7-5).

Although fishermen in a given fishery may seek the same kind of habitat, the actual location (e.g., in state waters, on the OCS) can vary considerably given the variability in the North Coast's ocean environment and conditions. Moreover, and especially important, fish move (some more than others) intra- and inter-annually. In order to catch them, fishermen move as well – they "follow the fish." As a result, fishermen highly value broad access to the ocean to better enable them to apply and build their cumulative knowledge of ocean conditions, fishing areas, and fish distribution and behavior, knowledge that is central to their safety and success.

North Coast fisheries that most commonly use the OCS are the groundfish trawl and hook-and-line, shrimp trawl, crab pot, black cod trawl and longline, hagfish (slime eel) pot, and salmon and albacore troll fisheries. Trawl, pot, and longline fisheries tend to be bottom or benthic fisheries (with some exceptions such as the mid-water hake (whiting) trawl fishery), whereas troll fisheries occur in the pelagic zone. Different species are associated with different habitats, described in terms of bottom type (e.g., rock, hard, sand, mud) and depth (usually expressed in fathoms). Fishing areas also vary within and across seasons as environmental, regulatory, and market conditions change.

Commercial fishermen cited the importance of proximity to port for refuge, berthing, unloading the catch and access to goods and services necessary for safe and effective fishing. The nature and extent of these features varies considerably from port to port, as does their importance to participants within and across fisheries (Pomeroy et al. 2010). Accessibility of these ports varies as well, with Fort Bragg known for its narrow and often treacherous entrance bar and Eureka known for its substantial berthing and amenities but also a hazardous entrance, especially in rough weather. Entry and exit to these two harbors must be especially carefully timed and executed. In contrast, Trinidad Harbor, located in semi-protected Trinidad Bay, has no entrance bar – nor berthing (only moorings), and can be vulnerable to weather such that many fishermen will move their boats to more protected Humboldt Bay when severe storms approach and sometimes for the winter. Crescent City is the most remote of California's North Coast ports, but offers easier entrance and exit and more substantial protection from weather.[17]

Commercial fishermen highlighted several operational considerations related to the safe and effective operation of vessels and gear. For example, crabbers run strings of pots (each attached to a buoy, not to each other) north to south and roughly along currents and depth contours. Running pots east to west is impractical given ocean currents, depth changes, and other considerations. The gear is configured for a particular depth range; the amount of line used to connect a pot on the bottom with a buoy on the surface must be proportional to the depth fished. Too much line makes it more difficult to find and retrieve the pot and more likely that it will become entangled with other nearby gear; too little line will submerge the buoy, making it very difficult to find. Surface and subsurface currents, which vary temporally and spatially, exacerbate these issues.

Crab gear, which is set and left to soak over one or more days, is more likely to remain there in calm weather. However, the height of the fishery occurs in winter, when frequent and severe storms can destroy gear, move it a considerable distance, bury it in sediment, or entangle it with other gear or buoys. Fishermen move their gear to avoid these outcomes. In addition, because the crab are not distributed homogeneously and move within and across seasons, fishermen move

[17] The harbor is also vulnerable to tsunamis; the March 2011 event destroyed the inner boat basin, and available moorings are insufficient to accommodate the local fleet – or visitors.

Table 7-5

Northern California Commercial Fisheries, Gear Types, and Locations[a]

Fishery	Gear Type	Commercial[b]	Charter[c]
Albacore (tuna)	Mobile (troll, hook-and-line)	Pelagic/surface, Distribution varies by water temperature and feed BRG: ≤ 25 nm, 500 fathoms and beyond ERK: ≥ 30-40 nm and beyond the EEZ; Range: Pt Arena – Canadian border	BRG: 10-60 nm ERK: 10-60 nm (some further)
Black cod	Mobile (trawl); Fixed (pot, longline)	Transitional hard, mud and some sand bottom BRG longline: edges of canyons, outside RCA (150 fathoms), ~200 fathoms, ~14 nm NW; range: Pt Arena – Shelter Cove. BRG trap: 8 nm west ERK: longline and groundfish trawl occur ~ same areas	n/a
Crab	Fixed (pot)	Sand or mud bottom, shelf Most of N Coast in winter BRG: ≤ 60 fathoms (Federal waters here) for smaller boats; ≤ 100 fathoms for larger boats; avoid canyons; most in state waters; a few OCS spots ERK: most boats ≤ 60 fathoms, 5-100 fathoms, ≤ 15 miles	BRG: state waters, ≥ 20 feet ERK: state waters
Groundfish	Mobile (bottom and midwater trawl, hook-and-line)	Fish move in and out over season; different species distributed differently ERK: “beach” fishing (<100 fathoms, some 3-4 nm; most 45-80 fathoms, 5-10 nm); offshore fishing (outside RCA), some out to ~28 nm, 40°10’ N BRG longline: < 20 fathoms and > 150 fathoms (5-6 nm) BRG trawl: soft bottom, sand mud; ~4.5 nm – 20 nm; 600-700 fathoms, 40°10’ line - below Cordell Banks; inside RCA to Pt Arena	BRG: rockfish inside 20 fathoms (due to RCA), experimental chilipepper permit outside 150 fathoms ERK: < 20 fathoms (due to RCA); rockfish on rocky bottom 16 miles off ERK for deepwater species when permitted; otherwise travel to False Cape and Trinidad

Table 7-5

Northern California Commercial Fisheries, Gear Types, and Locations (cont.)

Fishery	Gear Type	Commercial[b]	Charter[c]
Hagfish	Fixed (pot lines)	Mud bottom, similar to crab ≥ 35 fathoms	n/a
Pacific Halibut	Fixed (longline)		BRG: ≥ 3 nm ERK: Punta Gorda to Mad River, ≥ 30 feet, ≤ 10 nm at canyons at Cape Mendocino and Gorda
Salmon	Mobile (troll, hook-and-line)	Pelagic, distribution varies by feed and time of season BRG: inside and outside the RCA, often 3 nm good ERK: KMZ closures have sharply limited ERK-CRS fishery since 1985; ≤ 25 miles, some follow 100 fathom curve, canyon fingers	BRG: Edge of nearby canyons, ~8-12 nm ERK: ≤ 10 nm
Shrimp	Mobile (trawl)	Mud/soft bottom BRG: ERK: 3 nm – 110 fathoms; 40-100 fathoms, range from Westport, California to Coos Bay, Oregon	n/a
Spot Prawn	Fixed (pot)	85-120/130 fathoms, Washington to California; primarily hard bottom at around 100 fathoms	n/a

Source: Guided conversations with stakeholder conducted for this study

BRG = Ft Bragg area/fleet, ERK = Eureka area/fleet, nm = nautical miles

[a] Since space and use information for fisheries off Crescent city is limited, this table focuses on the Eureka area and Fort Bragg.

[b] For most commercial fisheries, most productive area is 3-20 nm, although much crabbing occurs in state waters, and some fisheries (e.g., albacore tuna) range > 20 nm. Bottom trawling is prohibited in state waters (<3 miles), and since 2006, has been prohibited outside 700 fathoms throughout most of the U.S. West Coast EEZ under Federal Essential Fish Habitat (EFH) regulations. The Rockfish Conservation Areas (RCAs), which vary by gear type and change periodically, also constrain space use.

[c] Except for albacore and some salmon (especially off ERK), most recreational fishing occurs well within 10 nm because of vessel range, safety and time considerations. Rockfish anglers out of ERK tend to head south of port to fish because more areas to the north are used by the Trinidad sport fleet, although some prefer to heard north because northwesterly winds come up later in the day, making it difficult and dangerous to return from the south. In either case, the recreational RCA precludes fishing for rockfish outside 20 fathoms.

their pots, sometimes every few days – and count on access to diverse areas to test for and find the crab.

As another example, trawlers (or 'draggers') seek longer stretches of sand, mud, or hard bottom (depending on species targeted) along a given depth contour to enable uninterrupted towing of the trawl net. Tow speed, length, and distance vary considerably by area and species. Shrimp trawling occurs only by daylight, and tows tend to be short, lasting 30 minutes to an hour and covering one to two miles. In some cases, dragging for black cod and related species can involve 10- to 12-hour tows that cover 25 miles. Often, draggers' fishing plans involving "roping" tows at different depths together, making a tow, running to another location, then making another tow, and so on.

The actual footprint of fishing activities can be considerably more extensive than the specific location gear is deployed. For trawlers, for example, space is needed to set the gear and to retrieve it, with additional space used to complete maneuvers. During that time, the vessel's maneuverability is very limited, and sudden stops, backing up, or shifting course can be extremely difficult and hazardous. As one participant recalled from the MMS Lease Sale 91 process in 1981, fishermen spoke to this point:

"You may think that you're only depriving us of these patches where you're actually going to drill, but here is the way it works. The zone between (proposed rigs) is highly productive flatfish grounds. There's not (enough) room between those zones for a dragger to get his gear down, make his tow, and get it up. So by (placing the rigs) here and here, you're effectively taking us out of those grounds in between also, and it's a much larger footprint you're taking us out of than your actual project."[18]

Salmon and albacore troll fisheries also tend to have a large footprint given the species' more variable distribution within and across seasons and the extensive searching often required to locate the fish.

Consistent with these features and fishermen's values of the ocean as a commons, trollers and crabbers alike emphasized the importance of having broad access to areas to enable searching for fish and running gear.

Fishermen also discussed other dimensions of use such as the timing and direction of transit to and from the fishing grounds (which also factor into fishermen's decision-making about where to fish). Although conditions are changeable, and fishermen will run south as well as north as needed, smaller boat operators discussed preferring to head north from port to go fishing, so that when returning with a load of fish, the wind would be at their back, reducing the likelihood of accidents.

Navigating existing obstacles (stationary and mobile) is something common to fishermen and other OCS users, but the challenges differ by fishery and depth. For example, crabbers may fish fairly close to nearby offshore buoys, but nearly as close when they fish in depths of 100 fathoms because the greater range of movement makes entanglement more likely at that distance.

[18] See Humboldt County Board of Supervisors (1988) for more information.

In summary, commercial fishermen's space use is:

Complex, variable and contingent, a function of multiple environmental, regulatory, market and personal factors (e.g., risk tolerance/averseness, species and operational preferences),

Three-dimensional, a function of bottom, water column and surface conditions, and

Expansive, involving not only gear deployment and retrieval, but searching and transiting.

Charter fishing

Charter fishing operations' use patterns have much in common with commercial and private boat recreational fishing operations (described below), although there are some key differences (Table 7-5). Because they are subject to the same fishery management regulations as private boat recreational fishermen, much of the information presented in this section applies to the latter group as well.

For some of fisheries (e.g., most crab, rockfish), charters operate closer to shore and/or port; for others (e.g., salmon, halibut, albacore and some crab), they operate primarily in the OCS. Most engage in an annual round of fisheries, as well, although recreational fishing tends to be most active in the summer.

Most charter (and private boat recreational) rockfish fishing and crabbing occur within state waters. Following establishment of the RCAs in the early 2000s, recreational groundfish fishing is prohibited outside 20 fathoms. This constraint coupled with the lack of rocky habitat off Eureka means that most charter rockfish fishing ranges in state waters several miles along the coast to areas with appropriate habitat. These Eureka-based charters for rockfish tend to head south to less frequented areas rather than north toward Trinidad, which has its own active charter (and private boat) fleet. Rockfish fishing off Fort Bragg and Trinidad occur much closer to port due the proximity of appropriate habitat; from Crescent City, St. George Reef is valued. Most charter (and private boat recreational) crabbing occurs on soft bottom very near the North Coast ports, consistent with habitat for and abundance of crab, which increases from the southern part of the region (Mendocino County) northward.

North Coast charter (and in general recreational) fisheries that tend to range further offshore are those for salmon, halibut, and albacore. Coastwide, charter and private boat sport salmon fishing tend to occur within 10 miles of the coast, but because salmon are pelagic, they may be found across a broad area. Charter fishing for halibut extends out about the same distance. Much of the fishing for halibut, a bottom fishery, occurs at about 50 fathoms over mud bottom and out to 10 miles off Eureka; further south, the charter fishing off Cape Mendocino and Gorda focuses on the canyons. Albacore fishing ranges considerably further offshore, usually no closer than 10 miles offshore, and more often 40-60 miles or even further off Eureka.

Many of the same use considerations for commercial fisheries apply to charter fisheries, with "quality of habitat, where the fish live, and proximity to port" being most important. Proximity to port is valued by charter operators for cost, customer preference, and safety reasons. Fuel costs – as high as $4.50 per gallon recently – were cited by charter and private boat anglers alike as influencing their fishing strategies. A Fort Bragg charter operator noted that customers in his area tend to prefer half-day to full-day trips, meaning that trips tend to be more limited in range compared to some other ports where longer trips are preferred. More generally, charter operations also are constrained by U.S. Coast Guard requirements; depending on the type of license obtained (and associated safety equipment on board), a vessel may be limited in its range from port. The changeability and potential severity of weather also are considerations for charter operators.

Given the variability of habitat and species distribution within and across seasons as well as fisheries, charter operators (like most all other fishermen) value the "flexibility to be able to go where the fish are." Bottom type and depth are critical for some species (e.g., rockfish, halibut, crab). For the pelagic species, bottom type is less critical, although edges of canyons are valued because they are upwelling sites, with temperature gradients and feed that attract those species.

In contrast to commercial fisheries, however, the actual footprint of charter fishing is smaller by virtue of the smaller number of operators, the type of gear (hook-and-line, troll or pot gear), and when and how it is deployed. Moreover, most recreational fishing (charter and private boat) involves day trips with the gear deployed for less than 12 hours, and often for a much shorter time. Charter vessels also tend to be more maneuverable than larger commercial fishing vessels, but like both commercial and private boat operators, charter captains prefer direct transit lines, and having the wind at their back when returning to port.

Section 2.3.3.2 (p. 26) includes a description of the pool of Northern California coast commercial fishing sector participants who contributed information to this study. Tables 2-11 and 2-12 (pp. 29-30) list these participants' specific sectors and organizational affiliations.

7.2.2 Compatible and conflicting uses

Most participants indicated that commercial fishing and most existing OCS uses were sufficiently compatible, or that there are informal and formal mechanisms for avoiding, resolving, or mitigating potential conflict. Of course, not all users can use the same space at the same time; however, where uses might not be compatible (e.g., crabbing and dragging), they tend to be separated in space and/or time by their nature, through informal negotiation or by regulation.

Within and across commercial fisheries, fishermen often seek to work in the same space or general area. This works for some fisheries, especially mobile, pelagic fisheries (e.g., salmon and albacore troll), where fishermen can readily navigate their vessels and gear around each other. For fixed gear (e.g., crab pot, longline) and bottom trawl fisheries, this is more problematic. In general however, there are common understandings related to how close and in what direction gear is set, and notifying others if one is setting gear or has gear set where others are. Conflict is usually avoided or resolved through one-on-one communication by radio or on the docks.

The nature and extent of such on-the-water conflict or incompatibility varies in time and space, and is affected by area closures and the mix of fisheries open at any given time. Especially following reductions in groundfish and salmon fishing in recent years, crab fishing effort and the amount of gear have increased (Dewees et al. 2004, Pomeroy et al. 2010). In addition, more crabbing is occurring beyond the first six to eight weeks of the season, and the fishery has extended into deeper waters. Some study participants noted an increase in gear lost (e.g., due to storms) or left on the bottom, resulting in the increased likelihood of snagging on that gear while trawling, trolling, or engaged in other fisheries. Others discussed incompatibility and recurring conflict between the black cod longline and groundfish trawl fisheries in the Eureka area.

Conflict between commercial and recreational fisheries reportedly is limited, due in in part to the de facto or regulated separation of these uses in space and time. For example, in the Eureka area, recreational rockfish fishing is limited (by the recreational RCA) to within 20 fathoms, whereas commercial rockfish fishing is limited to outside that area (as constrained by the commercial RCAs and the prohibition on bottom trawling in state waters), and the commercial nearshore hook-and-line fishery has been sharply limited in recent years, substantially reducing effort in overlapping areas. This is less the case in the Fort Bragg and Shelter Cove areas, where the commercial and recreational rockfish fisheries overlap.

When asked about compatibility of offshore renewable energy with commercial fisheries, responses often were expressed as contingent on the actual layout and footprint of such development relative to commercial fishing particulars such as vessel and gear maneuverability and other aspects of navigation, gear location (bottom, water column, surface), and impacts on fish and habitat.

Across user groups, most respondents felt that offshore renewable energy projects would be *incompatible* with commercial crabbing and to some extent with trawling. As one participant noted, *"Crab gear doesn't mind very; well it takes off…so figuring out a way to keep the crab pots from hanging up on the (devices or) cable would be a pretty important issue."* The concern about conflict with the crab fishery was heightened by the recent WaveConnect process, where the proposed project *"was right in the heart of crab fishing grounds."* This participant added, *"The idea of being able to produce energy from waves is a great one, but I didn't like the way they were going about it at all."*

One crabber said, *"if they could place these things out past 100 fathoms, that'd be ideal for us."* For trawlers and longliners, however, locating renewable energy devices outside 100 fathoms would conflict directly with their uses. Offshore renewable energy was seen as likely more compatible with salmon and albacore fisheries because they operate at the surface and tend to be more mobile and maneuverable (vessel- and gear-wise), than bottom fishing operations. Some study participants noted that a stationary device would be safer, and easier to navigate around and avoid, compared to a moored device (as proposed for Humboldt WaveConnect), because one could see a stationary device and be certain of its location throughout the water column. Fishermen also raised concerns about abandoned equipment creating conflict for many types of users, but especially for bottom (e.g., crab, halibut, groundfish) fishermen.

Among commercial fishermen, as among recreational fishermen and some other OCS users, another potential conflict or concern with offshore renewable energy is lost access due to closed or "no-go" buffer zones that the U.S. Coast Guard might establish around an installation to reduce the likelihood of undesired (and likely injurious) interactions with other ocean users. (With the WaveConnect process, the U.S. Coast Guard did not indicate whether or not it would establish such a zone.) Such zones could substantially expand the footprint of, and the access lost as a result of, a renewable energy project.

In considering other aspects of offshore renewable energy, commercial fishermen – and study participants from other groups – discussed potential conflict in terms of traffic that would affect access to and transit through the harbor entrance, recalling the recent CalPine LNG terminal proposal, whereby the harbor entrance would have been closed periodically for up to an hour at a time for tanker transit.

To insure safety and minimize conflict, participants across groups stressed the importance of clearly marking (on the water and on nautical charts) and noticing renewable energy project sites, and the need for sufficient travel lanes through or around an installation to ensure safe and effective transit.

7.2.3 Avoidance and mitigation strategies

The reader is directed to Chapter 8 of this report for a discussion of avoidance and mitigation strategies that will be relevant in the context of potential conflicts between commercial fishing and renewable energy development interests. Chapter 8 draws from avoidance and mitigation approaches described in the literature and by participants throughout this study's ethnographic research. The information provided in Chapter 8 is a useful starting point for the development of avoidance or mitigation strategies that will be appropriate given local or regional circumstances.

Northern California commercial fishery participants identified the following potential impacts of offshore renewable energy projects:

Loss of access to space, habitats, species

Interactions with (and loss of) gear, equipment

Increased operating costs

Disturbance and/or damage to species abundance, distribution and habitat

Increased safety hazards (e.g., devices, debris)

Reduced access to working waterfront

Loss of social and cultural values

Participants discussed these impacts individually and cumulatively, and in the larger context of recent and ongoing resource management actions and other factors. Although the above are largely self-explanatory, socio-cultural impacts are less so, and include:

Transformation of the commons and becoming "residual claimants"

Crowding, leading to increased conflict, safety issues and environmental impacts

Reduced/changed base for building and using local ecological knowledge

Loss of or undesirable change to amenities valued by locals and by visitors (and industrialization)

Threat of "outside interests" changing the place, over-riding local interests and values

Commercial fishery participants urged that conflict and negative impacts of renewable energy projects should be *avoided* via meaningful and genuine communication and negotiation "from the get-go." Although many said it was difficult or impossible to imagine or accomplish mitigation, the following strategies were identified.

Infrastructure maintenance and development

Concerns about loss of access to and maintenance of working waterfront are common across fishing communities. Issues are particularly acute at Noyo Harbor (Ft. Bragg) and Crescent City, especially following the 2011 tsunami. At Eureka, circumstances are somewhat different, following the recent opening of a new Fishermen's Terminal with fish offloading and work space, after a two-decade-long effort by the fishing community, the City, and others to re-develop the site. Some see offshore renewable energy as an opportunity to garner support for continued dredging, necessary to the viability of the port and its diverse users. Yet they also are concerned about losing access to waterfront sites, which are necessary to their safe and effective operation.

Employment

Some fishermen expressed interest in being hired (on their own or others' vessels) to help service renewable energy projects as occurs with the offshore oil and gas facilities in southern California.

Relaxed regulation

Given the extensive regulation of fisheries, and the recent proliferation of areas closed to some or all fishing, fishery participants suggested that areas currently closed either be used for renewable energy development or, if new areas were used, that the agency work with other agencies toward getting some areas closed to fishing re-opened.

Financial compensation

Whereas some fishery participants suggested financial compensation as a mitigation strategy, most saw this as the least desirable option – and for some, it was unacceptable: *"I don't want welfare; I just want to be left alone,"* said several study participants. Opinions differed on how financial mitigation should be handled and distributed. Some suggested that funds be made available to compensate for losses of gear and/or area through an entity modeled after the Bandon Cable Committee. Several North Coast fishermen have had direct experience with the Bandon Cable Committee and other such entities in California (e.g., at Point Arena). Some suggested that funds be directed specifically toward affected individuals, whereas others suggested that they be directed toward communities or user groups (e.g., commercial crabbers or draggers) as a lump sum for projects that would benefit the group.

7.2.4 Communication and process

Commercial fishery participants' recent experiences with the CalPine, MLPA, and WaveConnect processes shaped their ideas and views related to communication and process, leading to four key principles of communication and process, as summarized by one participant from a local agency:

Involve us from the get-go.

Use our knowledge; work with us.

Don't waste our time if you're not going to use the information.

Don't lie to us.

These pertain both to larger processes engaging all users and related interests, and to specific, project-related communications and negotiations with commercial fishing interests. Commercial fishermen and others stressed the importance of getting key fishing community members – and other directly affected by a proposed project - involved from the start, both to benefit from their knowledge and to enable them to have some meaningful input into and “ownership” of the process. This also entails treating their input with respect; not dismissing valid local knowledge and insight as “anecdotal” (in a derogatory sense), even if it is contrary to the agency’s or proponents’ desires or beliefs; and providing clear, accurate, and consistent information about project timeline, process, and scope. Failure to engage this substantial group of ocean users risks alienating them and fostering strong resistance to offshore renewable energy. In the words of one (non-fishing) study participant:

“Go to them and say, “Hey, this is kind of our idea. What do you think? Where would you want to see that happen and why?” Go to each one and then try and define the area. …I think that’s the best way to approach them because they get riled up when they think something is going to get shoved down their throat.”

Even for their many misgivings about certain aspects of the recent processes, many suggested convening a broad range of stakeholders, beginning with the same groups identified for the PGE WaveConnect Humboldt Working Group process. In both cases, it was noted that, given the diversity among fishermen in terms of their fisheries, operations, and areas used, it is important to fully account for this diversity and “find balance.” Moreover, because not all OCS users are “joiners” – and some of these non-joiners may be especially knowledgeable, it is important and valuable to reach out to them as well: “Finding the right people to communicate with during this process is going to be key. The old quiet guy sitting over there in the corner, he has the best ideas sometimes.”

Participants discussed the importance of an iterative process to build and learn through communication, and establishing *“a common language. If you don’t understand that language, you can’t hear what people are saying.”*

In terms of getting the word out, whether for initial contact or for a particular project, study participants suggested the following:

Harbor managers (including the harbor districts and commissions, port cities, and the Trinidad Rancheria)

Fishing associations;

Community papers and radio

Notice to mariners

Several fishery participants (again) cited the Bandon (Oregon) Cable Committee and other such telecommunications cable committees along the West coast as possible models for facilitating communication between fishermen on the one hand and BOEM and renewable energy interests on the other. Many expressed interest in direct engagement with agency and developer interests to discuss the agency's and proponents' ideas and needs, and to work together to determine whether, and how best, new uses might be accommodated. To catalyze this process, they suggested working through the local fishermen's associations, and with association and other fishing community leaders. (See Table 2-12 for some of those organizations engaged in this project, and Pomeroy et al. (2010) for further information.) However, it was noted that these organizations are not as robust and representative as they once were, with fewer members following substantial reductions in fisheries and fishing opportunities. As a result,

"There's a lot of non-members that aren't part of that whole communication thing, and so anybody that comes into an area to negotiate with the fishing fleet will have to overcome the problem that the fishing fleet right now is very splintered as far as representation."

7.3 COMMERCIAL VESSELS

7.3.1 Characteristics and use of space

Other commercial users of the OCS in the North Coast region include shipping, tug, and barge operations.[19] The only deep-draft port between San Francisco, California and Coos Bay, Oregon, Port of Humboldt is the site of coastwise and trans-Pacific shipping, historically dominated by forest product exports such as wood chips, wood pulp, lumber, and logs (HBHRCD 2007, Planwest Partners 2008). In recent years, dominant cargoes (by ship and/or barge) have been outgoing forest products and incoming petroleum products, wood chips, and unprocessed logs (HBHRCD 2007). However, shipping is down significantly from levels at the height of the timber industry, to one to two vessels per month.[20] This change is also due in part to the decline, especially since the early 1990s, in "inter-loading," whereby a ship would come in to port and load paper lumber, then go to the next port down and top off.

Shipping along the North Coast consists of trans-Pacific and coastwise (north-south) traffic. Study participants identified three shipping companies and three tug and barge companies as the primary shipping entities that operate at the port. Many use the region's OCS for transit.[21]

In contrast to San Francisco and some other major West coast deep-draft ports, there are no formally designated shipping lanes at or near Eureka. However, most ship traffic runs outside 24

[19] Few (if any) marine tourism operators are OCS users; most operate exclusively within the bay or state waters.
[20] Other ship traffic in the area includes occasional cruise ships transiting the region, although they tend to stay off shore; one such vessel has called at the Port Humboldt in recent years. Another possible source of expanded use of coastwise shipping is the possible development of an "M5 marine highway system" along the U.S. West coast, in which the Port of Humboldt would be one of several coastwise cargo shipping nodes along the West coast.
[21] The Harbor employs two bar pilots to assist vessels arriving, departing and moving within the harbor. All foreign vessels and U.S. flagged vessels navigating Humboldt Bay that are 300 gross tons or greater and lack a U.S. Coast Guard-issued coastwise endorsement are required to use a Humboldt Bay-licensed pilot (HBHRCD 2007).

miles from the coast, following California's 2008 establishment of more stringent emissions standards.

Most ships entering the Port of Humboldt come from the south or the west, with few coming from the north. Once they are roughly west of the port, they will turn toward the coast. When a ship is about two miles west of the port entrance, a local tug operator will transport one of the port's two bar pilots to the ship to navigate the harbor entrance.

Barge traffic works differently, with the exception of fuel barges, which are required to remain 24 miles offshore for the majority of their transit in compliance with oil spill prevention regulations. Most other coastwise barge traffic occurs within 10 miles of the coast in towboat lanes established through negotiations between the towboat and crab industries. The specifics of the lanes vary somewhat over the year in order to minimize interactions with different fisheries. Some of these lanes are inside, but most are outside, three miles from the coast. Barge traffic through the Port of Humboldt includes log and chip barges, and a fuel barge that delivers 60,000 barrels of fuel to Eureka for regional distribution once every eight to ten days.

Coastwise (north-south) barge traffic in the North Coast region is more frequent than shipping traffic per se. According to one operator, an estimated 18 barges are transiting along the West coast at any given time. Nonetheless, barge traffic at Eureka, too, has declined in recent years. Until about 2009, three log barges and two to three chip barges came in to the port each week. However, according to study participants, the log barge traffic has dropped significantly, due primarily to the reduced domestic housing market, competition in global markets, and high fuel prices.

For shipping, tug, and barge operators, economic efficiency, weather and (broader) safety are key considerations. Whereas there are commonly understood areas where ships operate, the fact that they come from many different places and must adapt to weather and ocean conditions, regulations, and other users means that they may not always operate in those areas. Shippers seek to make as direct a course for their destination as possible. Given that time and fuel costs are key considerations, operators noted that depending on the length of the voyage, coastwise ships may stay within eight to ten miles of the coast rather than traveling out 24 miles offshore, only to have to come back in again to reach the port.

Following coastal currents along fairly straight north-south stretches of the coast can enhance fuel efficiency and affords some relief from extreme offshore weather. But coastwise travel also can be hazardous because of the risk of getting washed ashore and then being less accessible to assistance vessels, as well as the increased risk of encountering fishing and other vessels and fishing gear. These hazards are exacerbated by the limited maneuverability of both ships and tug and barge operations, which are connected by lines up to a mile in length.

Section 2.3.3.2 (p. 26) includes a description of the pool of Northern California coast commercial vessel sector participants who contributed information to this study. Tables 2-11 and 2-12 (pp. 29-30) list these participants' specific sectors and organizational affiliations.

7.3.2 Compatible and conflicting uses

Shipping, tug, and barge operators noted that they are continually adapting to changing biophysical conditions and other uses on the OCS. Actual space use conflicts between shipping and fishing are limited, due in part to the limited ship traffic where most fishing occurs along the North Coast, and because of precautions taken by both groups. Nonetheless, the lack of explicit shipping lanes in the region, together with variable and at times challenging ocean conditions (including fog) have led to some “near misses” with ships, particularly those operated by non-English speakers. Should short-sea shipping (i.e., port-to-port cargo transport using the emergent M-5 “marine highway” system) increase, however, more substantial issues may arise – although these may be amenable to negotiation through the current towboat-crabbing agreement.

The potential for conflict between fishing and tug and barge operations is somewhat greater, but still limited by the relatively low level of tug and barge activity at and near the port. Study participants discussed interactions between commercial crab operations and tug and barge traffic, especially right off Eureka. Lines up to a mile in length are used to connect tugs and barges. As towboat operations transit the crab grounds, the lines are likely to pick up crab pots (via their floats and lines), with potentially costly and dangerous results to both fishermen and tug and barge operators.

To limit this conflict, West coast towboat operators and crabbers came together in the mid-1970s to negotiate towboat lanes for ocean-going tugs.[22] The system has evolved through ongoing negotiations, with considerable give-and-take. As one study participant noted, *“It may not be the best for everybody, but it does work, and there are compromises and everybody leaves the table making it work.”*

Both groups make efforts to communicate with one another on the water as well, and, in general, towboat operators and crab fishermen abide by these lanes. However, conflict can still occur. As some noted, most crabbers stay out of the tow lanes most of the time, but some still will set their gear there if they feel the fishing will be good enough to offset the possible loss of a few pots. Especially during the height of the crab season in winter when the most gear is deployed and storms are more frequent and severe, crab gear can move into the tow lanes even if not set there in the first place. And whereas towboat operators tend to follow the lanes, exceptions occur, especially when weather or sea conditions lead them to run an alternate route.

This group generally saw offshore renewable energy as compatible with its uses, with two key caveats: that existing shipping and towboat lanes remain unchanged (except as re-negotiated through the current agreement with crabbers), and that projects not preclude access from so much of the fishing grounds as to further concentrate crabbing at the edge of those lanes.

7.3.3 Avoidance and mitigation strategies

The reader is directed to Chapter 8 of this report for a discussion of avoidance and mitigation strategies that will be relevant in the context of potential conflicts between commercial vessels and renewable energy development interests. Chapter 8 draws from avoidance and mitigation

[22] See http://www.wsg.washington.edu/mas/econcomdev/lanes.html and http://www.wsg.washington.edu/mas/pdfs/2010TowlaneCharts_lr.pdf, accessed 8/4/11.

approaches described in the literature and by participants throughout this study's ethnographic research. The information provided in Chapter 8 is a useful starting point for the development of avoidance or mitigation strategies that will be appropriate given local or regional circumstances.

Commercial vessel-related participants in this region noted that they are accustomed to navigating amid and adapting to other users. Some did, however, suggest that opportunities to provide support services for offshore renewable energy siting, installation, and maintenance could help mitigate loss of access to space and other operational impacts that might result from project development.

7.3.4 Communication and process

As with other groups, commercial vessel interests emphasized the importance of early and open communication, both to make any project more acceptable and to enable input on project siting and operational issues. It was suggested that initial ideas or plans for a potential renewable energy project should be provided to them so that they can provide specific input on a suite of navigation and other issues, and information based on their extensive experience operating amid the region's often challenging conditions.

For communication channels, participants suggested several of the same outlets highlighted by commercial fishermen, adding: the Humboldt Harbor Safety Committee; the American Waterways Operators, a national trade association for the U.S. tugboat, towboat and barge industry; and the Pacific Merchants Shipping Association, *"which represents probably the majority of what we call the non-tank vessels."* (See http://humboldtharborsafety.com; http://www.americanwaterways.com; and http://www.pmsaship.com/, respectively.)

7.4 NONCOMMERCIAL USES

7.4.1 Characteristics and use of space

For the purpose of this study, noncommercial users in Northern California comprise recreational fishermen, boaters/sailors, scientific researchers and agencies such as the U.S. Coast Guard that are responsible for ensuring maritime safety. Although considerable recreational fishing occurs in state waters, the salmon and albacore troll fisheries, and some halibut and rockfish hook-and-line fisheries occur in Federal waters.

Recreational boating in the OCS is quite diffuse, although there is an identifiable sailing community at Eureka (and other ports), and other ocean-going boaters may call at any of the region's ports to visit, re-provision, and /or secure safe refuge. Marine scientists who work in the region's OCS are located primarily in the Eureka area, and are based at Federal science centers and universities elsewhere.

The U.S Coast Guard Station is responsible for marine search and rescue operations, monitoring, and maintaining navigational safety and aids to navigation in the area. The North Coast region falls within the agency's 11th District, headquartered in Alameda. U.S. Coast Guard Group Humboldt Bay units include: Coast Guard Cutter Dorado, stationed at Crescent City, Coast

Guard Station Humboldt Bay, and Coast Guard Station Noyo River (Fort Bragg); Coast Guard Air Station Humboldt Bay is co-located with the Group.[23]

Recreational fishing

Private boat recreational fishing along the North Coast occurs from all harbors (and some smaller landings), and consists of trailered skiffs and larger boats that berth or moor at North Coast ports, most commonly during the summer season (Pomeroy et al. 2010). From 2005 through 2007, an annual average of about 78,000 private or rental boat trips were made by recreational fishermen (Pomeroy et al. 2010). Historically, salmon has been "king" (a play on the name of the prized Chinook or king salmon), although salmon fishing north of Shelter Cove (in southern Humboldt County) has been constrained since the early 1990s to protect Klamath River stocks, and, more recently, coastwide due to concerns about Central Valley stocks. Nonetheless, the salmon troll recreational fishery remains central to the identity and activities of North Coast recreational fishermen. With more limited salmon seasons, some anglers have focused more on the rockfish fishery, although it, too, has been subject to significant restriction following establishment of the recreational RCA and other measures. The albacore troll fishery also has become increasingly popular among recreational fishermen. The crab fishery occurs primarily in state waters, targeting the nutrient-rich mouths of Humboldt Bay and the Eel River, and extending a couple of miles into Federal waters. Recreational fisheries for urchin and abalone (both nearshore dive fisheries) occur in state waters, and are not addressed directly here. Table 7-6 summarizes the general locations of key recreational fisheries in the North Coast region.

As with commercial and charter fishery participants, the availability of target species is governed by environmental and regulatory conditions, which vary within and across years and locations. The fishery for crab (and for Humboldt squid in the Fort Bragg area) occurs primarily in winter, salmon fishing occurs from late spring through summer, and albacore fishing runs from mid-summer through the fall.

Most recreational fishing in the Fort Bragg area, with the exceptions of albacore and some salmon fishing, occurs in state waters because of the short shelf. The location of albacore fishing depends on the location and intensity of warm water currents. Although some years the fish are as close as about 10 miles from the coast, most recreational albacore fishing occurs between 16 and 40 miles offshore, and ranges from Point Arena north to Shelter Cove. Most recreational albacore fishing from Fort Bragg is focused around the region's deep-water canyons, as the currents and localized upwelling attract the fish. Salmon reportedly "can be just about anywhere out there," with the best areas in about 300 to 350 feet (50 fathoms) of water. In recent years, study participants reported, salmon have been further out and in Federal waters and deeper in the water column than usual, highlighting the uncertainty and variability in the availability and distribution of the fish, which in turn governs where anglers go to catch them.

Further north toward Eureka and Crescent City, the wider shelf and differences in habitat mean that anglers are more likely to fish the OCS. In recent years, recreational salmon fishing has occurred from six to ten miles out, "quite a ways off shore" relative to the past. One fisherman attributed this in part to "a whole new dynamic with modern outboard and less expensive boats

[23] http://www.uscg.mil/d11/grphumboldtbay/allunits.asp, accessed 8/2/11.

and better electronics where people can go farther, and be more effective when they get to the places where the fish are."

Use considerations for recreational anglers include proximity to port, availability of target species, weather, safety, and expense. Recreational boats vary in their seaworthiness and range (defined in part by fuel capacity), and fishermen vary in their knowledge and experience of North Coast fisheries and ocean conditions. Most recreational fishermen prefer to fish closer to port for comfort and safety, and to keep their expenses down. However this can mean very

Table 7-6

Northern California Recreational Fisheries and Locations

Fishery	**Location***
Albacore (tuna)	BRG: 15-40 nm, some closer (e.g., 10 nm off Albion), at canyon edges with strong currents ERK: 10-60 nm (some further)
Black cod	n/a
Crab	ERK: Humboldt Bay, river mouths (e.g., Eel River), w/in 1 nm of harbor entrance; 23-30 F, some go out ≤ 5 nm
Groundfish	Rocky bottom BRG: < 20 F (due to RCA) and ≤ 3 nm, ERK: <20 F (due to RCA) most ≤ 3 nm; when allowed few travel ~16 miles W of port for deeper rockfish
Hagfish	n/a
Pacific Halibut	BRG: Flat, muddy bottom, gravely bottom; canyon mouths, ≥ 150 feet (some in state waters) ERK: Punta Gorda to Mad River, ≥ 30 Ft, ≤ 10 nm
Salmon	BRG: ~3 nm, 300-350 feet (~50 fathoms) ERK: ≤ 10 nm for most
Shrimp	n/a
Spot Prawn	n/a
Hagfish	n/a

Source: Guided conversations with stakeholders conducted for this study

BRG = Ft Bragg area/fleet, ERK = Eureka area/fleet, RCA = Rockfish Conservation Area, nm = nautical miles

* Space and use information for fisheries off Crescent city is limited; therefore, this table focuses on the Eureka and Fort Bragg areas. Except for albacore and some salmon (especially off ERK), most recreational fishing occurs well within 10 NM because of vessel range, safety and time considerations. Rockfish anglers out of ERK tend to head south of port to fish because more areas to the north are used by the Trinidad sport fleet, although some prefer to heard north because northwesterly winds come up later in the day, making it difficult and dangerous to return from the south. In either case, the recreational RCA precludes fishing for rockfish outside 20 fathoms.

different places depending on the fishery, and these areas tend to be more congested with commercial as well as recreational fishermen, and other users. With relatively small vessels and simple gear, recreational fishermen tend to be more maneuverable than their commercial fishing counterparts and other larger vessels.

Some fishermen, especially those with sufficient financial resources, will travel the coast by land and launch at sites near their favored fishing grounds, although this is contingent on the quality and quantity of launch facilities, which vary along the coast. Like commercial fishermen, recreational fishermen travel offshore and/or up and down the coast to find the fish. For rockfish fishing, they tend to stay in state waters largely because of the recreational RCA, which prohibits fishing outside 20 fathoms, but may travel considerable distances up and down the coast to reach suitable or preferred habitat, although fuel prices are a constraint.

Weather and ocean conditions are a critical consideration, and affect when and where recreational fishermen go. Because of prevailing northerly winds, fishermen prefer to go north first rather than south, so that if the wind comes up, it’s at one’s back coming back to port. Fog is another consideration for recreational fishermen, many of whom do not have the navigation equipment that charter or commercial fishermen have. Participants noted that after the spring winds die down and it starts warming inland, the fog can extend for miles along and out from the coast, significantly reducing visibility and increasing the risk of colliding with fishing vessels, barges, and ships.

Sailing/boating

Recreational boating in the North Coast OCS includes locally based sailing and coastwise yachting, albeit with fewer participants than in central and southern California, owing in part to the region’s more challenging weather and oceanic conditions, and greater distances between ports. (Kayaking has grown in popularity but occurs in state rather than Federal waters.) Larger (non-local) sailboats and yachts transit the area from southern and central California to the San Juan Islands (in Washington), or from points north to Baja, Mexico, for example. Locally-based boaters typically sail within a half day of port, but also make longer and more distant trips. In the Eureka area, some sailing occurs in Federal waters, but the majority occurs in state waters, most of it on the weekend.

Use considerations differ somewhat among different types of recreational boaters. While sailboats are relatively maneuverable, local sailors have a preference for sailing two to three miles from shore and not much closer in order to avoid having to tack frequently to avoid rocky areas along the coast. Larger (non-local) sailboats and yachts tend to sail offshore. Some prefer to sail far enough from shore with little or no view of land, in part to allow for open-ocean wildlife viewing. However, weather is an important consideration, and many sailors will stay close enough to shore to be able to get to port quickly in the event of a sudden storm. If getting to port is too dangerous, they may set their weather sails and wait things out offshore, keeping a safe distance (of at least a few miles) from the coast. This is especially important where the coastline is very rocky (e.g., off Trinidad) and/or at capes and other points (e.g., near Point Arena), as getting pushed into these areas can be very dangerous.

As with fisheries, proximity to port and weather are key considerations for day sailors out of Eureka. They tend to head north toward Trinidad (located about 20 miles away) rather than south to Shelter Cove (nearly 55 miles, by way of rough Cape Mendocino) or Fort Bragg further south. Wind waves commonly pick up during the day, and it is preferred to have those at one's back when returning to port.

Seasonal variability is also a consideration for the sailing community. Local sailing is most popular during the summer months, when longer daylight enables longer sails and affords more safety, as sailors are more likely to see other vessels, fishing gear, and other on-the-water activity, and to be seen. October signals a shift toward rougher weather as well as less daylight. Another change occurs in December when the commercial crab season gets under way, and sailboats risk snagging on buoys and lines.

Boaters, especially long distance boaters who may not be as familiar with North Coast harbors, also carefully consider harbor access for the ways currents, shoaling, and other processes work. In general, they plan to come across a bar at slack tide. At Eureka, timing and approach are particularly important. Crescent City harbor, with its crescent-shaped entrance, can be more forgiving, especially at high tide, when following the entrance channels is less critical than at low tide.

Wildlife viewing

Although not commercial fishing per se, several charter operations also run trips for wildlife viewing and other purposes (e.g., burial at sea; especially in the off season for major fisheries). Whereas most of these trips occur within state waters, some operators travel further offshore. For example, one Fort Bragg-based charter operator reported taking passengers to Noyo Canyon, and even as far as 18 miles off Point Arena, for bird-watching.

Scientific research

Multiple government agencies, higher education institutions, and other entities conduct scientific research along the North Coast. Research cruises in the region for ongoing monitoring projects include NOAA's California Cooperative Fisheries Investigations (CalCOFI) and Pacific Coast Ocean Observing System (PaCOOS), and NMFS' West Coast bottom trawl survey; the U.S. Geological Survey's seafloor mapping cruises; and periodic cruises for university research and teaching. Humboldt State University's R/V *Coral Sea*, which berths at Woodley Island Marina in Humboldt Bay, is the platform for many of these cruises.[24] Other research vessels use the area as well, calling at Noyo Harbor (Fort Bragg), Eureka or Crescent City, depending on the purpose and design of the research. The vessels that moor in Humboldt Bay typically sail out across the harbor entrance bar, then transit to one or more research sites in State and Federal waters.

Cruise trajectories, length, and timing (of day and season) vary depending on research purpose and ocean conditions. According to study participants, most of the research cruise patterns are east-west transects, with the exception of trawl cruises, which run north-south following the depth contours. For example, the monthly PaCOOS cruise is carried out at a series of stations located from one mile off Trinidad Head to about 27 miles offshore. (The stations extend to the

[24] The *Coral Sea* operates all along the California coast, but principally in the North Coast region and up to Brookings, Oregon.

western edge of the EEZ, but the monthly cruises do not go that far at this time.) Other agency- and university-sponsored work includes trawl surveys (typically outside of 50 fathoms, and frequently at about 100 fathoms, box coring (10-15 fathoms, one to eight miles offshore, especially at the Eel River), and a range of other oceanographic studies, most on the OCS and especially between about 5-10 miles from shore. The *Coral Sea* also does research cruises in support of marine wildlife studies (e.g., mammalogy, ornithology), most of them within about five miles of the coast.[25]

Use considerations for scientific research include accessibility of appropriate sites for the given research project and access to nearby ports. For ongoing research projects, consistent access to the same or similar sites is valued, although there is some flexibility depending on project goals and design.

Depending on the research focus, particular bottom types or habitats may be targeted. For example, NMFS' West coast bottom trawl survey is an annual survey conducted in two sweeps (in May and July) at randomly stratified stations at depths of 50-1,280 meters (25-640 fathoms). Each cruise involves some searching at each station for bottom habitat that is appropriate for bottom trawling and avoiding highly structured habitats where the vessel, gear, and crew, as well as the habitat, risk severe harm. For seismic and other types of oceanographic research and teaching that involve coring, mud bottom, which is located in 20-25 fathoms, usually in federal waters, is easier to work with and preferred compared to sand bottom found closer to shore.

For some surveys such as the pelagic fisheries surveys, returning to the same station every time is important for consistency and controlling for spatial variability. Because sampling designs are based on certain assumptions, spatial management measures (e.g., closing areas to some uses) require adjustments to those assumptions, including, in the case of fishery sampling, added uncertainty and challenges to reconciling pre- and post-management change data.

Access to harbors is important to research operations for refuge, provisioning, and transferring personnel. Eureka is central in these considerations, but Fort Bragg and Crescent City are valued as well, as are other sites. For the locally based Coral Sea, most trips are day-trips, with departure and return to port on the same day. Other research vessels, and sometimes the Coral Sea, may run multi-day trips and anchor offshore, especially at more remote sites with less infrastructure, such as Shelter Cove.

Tribal Interests

The North Coast region is home to well over 100 tribes, most of which are federally recognized sovereign entities. The tribes are not distinct OCS "stakeholders" or "users" like the above groups because of special circumstances related to their identity, OCS interests, and status and role in ongoing State and Federal processes.[26] Their sovereignty requires BOEM (or any other Federal agency) to engage in formal government-to-government consultation.

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[25] The *Coral Sea* also does "mud puddle" research cruises by external contract, primarily in state waters, as it can work closer to shore than other, larger vessels.

[26] Because of their sovereignty and worldview, tribes consider the distinction between State and Federal waters – and between land and sea – to be moot.

Several North Coast tribes depend on the region's marine resources for their cultural, social, and economic well-being.[27] They engage in subsistence use of coastal and marine areas, and some (e.g., the Yurok) have commercial in-river fisheries and other enterprises that depend on resources, most notably salmon, that are dependent on oceanic as well as coastal and in-river conditions. Ancestral sites, including middens, burial grounds and other features of deep cultural and spiritual significance, occur in ocean areas (as well as on land). Tribal knowledge of these sites is closely guarded in most cases, in an effort to protect those sites. Many tribes own coastal lands and/or have ancestral territories along the coast or that otherwise connect (or are viewed as connecting) with the marine environment (California Marine Life Protection Act Initiative 2010). Some operate infrastructure that supports and depends on non-tribal as well as tribal ocean uses. Trinidad Rancheria, for example, owns and operates the pier and related harbor facilities at Trinidad, supporting and depending on substantial charter fishing and whale watching, private boat recreational fishing, and commercial fishing for crab, salmon and rockfish.

Section 2.3.3.2 (p. 26) includes a description of the pool of Northern California coast noncommercial sector participants who contributed information to this study. Tables 2-11 and 2-12 (pp. 29-30) list these participants' specific sectors and organizational affiliations.

7.4.2 Compatible and conflicting uses

Although conflict among existing North Coast OCS uses arises at times, many participants including noncommercial users were reluctant to characterize most of this as such, preferring instead to address issues, differences, disagreements, and incompatibilities.

As noted above, the potential for conflict between recreational fisheries and commercial fisheries in many cases is limited by de facto or regulated spatial and temporal separation of use. For example, the North Coast recreational fishery opener was changed recently to mid-November to afford sport fishermen a two-week head start, and commercial crabbing is prohibited within one mile of the harbor entrance. These measures give recreational fishermen a chance at particularly abundant early season crab and a place to set their gear apart from commercial crabbers, and reportedly have reduced sport-commercial conflict. Once the commercial crab season begins, sport crabbers tend to reduce their effort and/or move their gear closer to port, as only they are permitted to set gear within a mile of the harbor entrance. The potential for conflict in the salmon fishery off Eureka has not been realized because "*there's been no wide open commercial salmon season for years*."

Recreational fishermen did not report conflict with other users, although they noted that they take particular care in avoiding ship and tug and barge traffic.

Reportedly, conflict between scientific researchers and fishermen is limited. In several cases, researchers have met with local fishermen to alert them to projects and figure out how best to avoid conflict. Some researchers also noted that they often have some flexibility in designing and carrying out their work, and try to accommodate or be responsive to fishermen's needs and

[27] During the course of the North Coast MLPA process, it was determined that of the 109 federally recognized tribes in California, more than 20 are in the North Coast region, with at least nine non-federally recognized tribes, as well (California Marine Life Protection Act Initiative 2010).

concerns. One researcher commented, *"They're out there trying to make a living; they're generating this economy, you know."*

Still, the commercial crab fishery – especially at the height of the season – is the primary fishery that can conflict with scientific research, most notably with nearshore (<100 fathoms) bottom trawl work: *"Sometimes there's too many crab pots to put the net in the water and you're just going to drag up a bunch of pots and get fishermen really angry at you, and also wreck your gear."* Although as one researcher noted, *"We don't want to catch their gear any more than they want us to catch their gear, it's a lose-lose for everybody all the time. So the gear we use has very minimal impact on that and we can maneuver pretty well and we just pull up short if we have to."*

Often, potential conflict is avoided through at-sea radio communication between fishermen and researchers to alert each other to their presence and concerns, although there are some cases when such communication does not occur.

Similarly, there is some potential for conflict between recreational boaters and commercial fishermen, especially during crab season, as buoys used to mark the crab pots may be hard to see and avoid. Conflict also can arise if bad weather comes up, and boaters may be less attentive to other vessels and gear because they "*are in a hurry to get safe*."

For many noncommercial users, offshore renewable energy development is generally considered more compatible with their use of the OCS, however this varied among groups. Most recreational fishermen, especially those on the OCS, tend to target pelagic species, use less gear over more limited time periods, and use gear that remains relatively close to the boat. These features make entanglement with other gear or devices on the water less likely than for commercial fishermen. In addition, recreational fishing boats tend to be smaller and more maneuverable.

In the Eureka area, recreational fishermen expressed interest in renewable energy devices as fish attractants, provided they could fish near those sites. However, their interest was tempered by concern about the possibility of buffer zones around the devices, which would result in loss of access and constitute obstacles to navigation. Such obstacles are of particular concern in light of severe weather, which can come up suddenly. Others – both recreational fishermen and boaters - were concerned about how such devices might change the larger ecosystem and attract pinnipeds and other predators.

Among sailors and other boaters, renewable energy development on the OCS is generally seen as compatible with their use of space, with some exceptions. Local sailors tend to remain in state waters, suggesting limited potential for space use conflicts, although they see some potential for conflict related to navigation between port and offshore sites. Greater potential for conflict exists with coastwise or offshore sailing and boating, although given sufficient information, these users should be able to maneuver around or through renewable energy project sites. As with other uses, however, the potential for severe weather can lead to conflict.

In general, offshore renewable energy is likely compatible with scientific research, with the exception of those agency and non-governmental research programs that rely on consistent access to fixed sites or stations. To the extent that development would preclude access to these sites, there is the potential for conflict or, as one researcher preferred to frame it, incompatibility. A related concern, especially for fisheries research, is the impact of additional closures on sampling, time series data and analyses and, ultimately, management. Such closures would add uncertainty to stock assessments of groundfish and other species, likely resulting in more conservative management, with attendant negative impacts on resource users and communities.

A further consideration cited is the compatibility of offshore renewable energy with research and teaching, to the extent that it affords such opportunities.

7.4.3 Avoidance and mitigation strategies

The reader is directed to Chapter 8 of this report for a discussion of avoidance and mitigation strategies that will be relevant in the context of potential conflicts between noncommercial uses and renewable energy development interests. Chapter 8 draws from avoidance and mitigation approaches described in the literature and by participants throughout this study's ethnographic research. The information provided in Chapter 8 is a useful starting point for the development of avoidance or mitigation strategies that will be appropriate given local or regional circumstances.

Noncommercial users in this region differed in their attitudes toward and ideas for mitigation should renewable energy projects unavoidably conflict with their activities and values.

Recreational fishermen cited concerns about the same potential impacts that commercial fishermen cited, except for impacts on working waterfront. Most were reluctant, too, to consider mitigation, noting that fishing was a very strong social and cultural value, and its loss would be very hard to replace or mitigate, but did offer the following ideas.

Access
Providing fishermen with access to or near renewable energy project sites, which would serve as artificial habitat, could help to compensate for the impacts of other development-related activities, such as increased vessel traffic and habitat and species disturbance – especially if valued species are attracted to renewable energy devices.

Infrastructure maintenance and development
Although recreational fishermen felt that financial compensation to individuals or communities could not mitigate loss of access and aesthetics, and attendant social and cultural values, they identified ways in which financial resources could be combined with other measures toward mitigation. In the Eureka area, where there is limited rocky substrate to attract and support rockfish and related species, recreational fishermen have sought to place artificial reefs. These fishermen suggested that the agency or renewable energy developers provide assistance with artificial reef development, permitting, and siting to mitigate for various project-related impacts. Some also suggested shoreside mitigation such as financial and/or other assistance with development and maintenance of launch ramps and other fishery-support infrastructure they use.

Relaxed regulation

As commercial fishermen did, some recreational fishermen suggested that the re-opening of some closed areas (e.g., MPAs, RCAs) could help mitigate renewable energy development impacts, especially loss of access to fishing sites. They, too, recognized that this would involve inter-agency coordination.

Boaters' concerns focused primarily on loss of space and about impacts on and changes to wildlife:

"How do you mitigate for that? What would you mitigate? What can you replace (lost space) with? I don't know if you can mitigate the ocean… It's so fluid; you can't say, 'Alright, you guys go over here; alright whales, swim over there,' you know? You're not going to do that, they don't listen to us very well."

For scientific researchers, discussions about mitigation focused on potential loss of access for valued research sites. Given the potential disruption to fisheries research with its broader management implications, one scientist suggested that appropriate mitigation would include a three-year lead time on any new project to enable the establishment of a baseline and study design to facilitate calibration of research tools and protocols. These activities would be necessary to limit disruption of established time series critical to fishery management, and to support the required monitoring and evaluation of renewable energy projects. More generally, researchers also suggested that access to agency and developer sites and data would afford interesting and valuable research and teaching opportunities that in turn, would inform the efforts of the agency and the developers.

7.4.4 Communication and process

The key principles cited for commercial fishing users pertain to most noncommercial users, as well; that is, involvement from the start; respect and use of local knowledge; and timely, meaningful, and honest communication with the diversity of users.

Noncommercial users also expressed concern about standard public processes for environmental review, noting a strong preference for soliciting locals' input well before the preparation of such a document, rather than solely using existing data to prepare a document for public comments.

Some noncommercial users shared commercial fishing users' misgivings about some aspects and space use implications of the recent space-use processes, but they and other noncommercial users suggested convening a broad range of stakeholders as had been done for those processes. In addition to the groups previously identified for inclusion in the process, they added:

Universities

Local yacht clubs

Local (city and county), state, and regional agencies, including the U.S. Coast Guard and local law enforcement

In addition, noncommercial users cited the importance of using diverse methods to insure that fishermen and boaters, especially those from outside the area or travelling coastwise, are sufficiently informed of potential obstacles to navigation.

At the Eureka group meeting, noncommercial users likened current ocean uses to a choreographed dance among diverse players, in which considerable give and take allow for things to operate reasonably smoothly. Commercial fishing and other commercial users agreed with the analogy, and added the concept of their area as a neighborhood. They suggested that the agency and project developers think of themselves as newcomers to that neighborhood, with a reasonable expectation of a cautious welcome and the obligation to do their best to fit in with, adapt to, and respect the local context.

Tribal interests

Of paramount importance to the tribes is that they be engaged in formal and meaningful government-to-government consultation. Because each tribe is distinctive and has a different relationship with the ocean, a meeting with one tribe does not suffice for consultation with all the tribes, as apparently occurred during the WaveConnect process (see p. 135 for information about the WaveConnect project). Communication with the tribes should allow sufficient time to accommodate tribal decision-making processes, which are particularly deliberative.

8.0 SYNTHESIS

8.1 NATURE AND DIVERSITY OF COASTAL AND OCS USES

Coastal and offshore marine waters make a valuable contribution to our nation's social and cultural wellbeing and to our economic prosperity. For example, in 2009, the combined US commercial seafood industry accounted for over one million jobs, sales of over $116 billion, and income of over $31 billion (NMFS 2010). Commercial shipping and related marine transportation accounted for nearly $5 billion dollars in total salaries.[28]

Numerous uses of the ocean environment both coexist and compete. Table 8-1, a taxonomy of ocean uses, reflects the use categories and subcategories for which data were available for inclusion in the geospatial database prepared as part of this study. Although not an exhaustive list of all potential uses (for example, the Archeological category is limited to one subcategory – Wrecks – given the lack of readily available spatial data describing the locations of other archeological resources), the table provides information on the broad array of stakeholders with potential interests in the siting of offshore renewable energy facilities.

As the regional sections of this report illustrate, it is essential to recognize the variation in uses between locations. For example, commercial fishing in the Northeast is very diverse—in gear used, sizes and types of vessels, target species and fishing grounds. The region off the coasts of Maine through New Jersey is among the most active commercial fishing grounds in the country. While smaller vessels (typically under 50 feet) traditionally worked closer to shore than the larger vessels, fishing restrictions, especially time and area closures, have resulted in more of these vessels working further offshore. In the offshore, one can see significant variations in the documented extent of commercial fishing activity (see for example Figure 3-1). In contrast to the Northeast, the Southeast Atlantic has substantially less commercial fishing activity (as illustrated by the landings data in Tables 3-1 and 4-1). However, in the Southeast, the year round activity associated with warmer weather makes seasonal planning around construction less useful.

8.2 POTENTIAL CONFLICTS WITH RENEWABLE ENERGY DEVELOPMENT

Given the diverse and varied nature of ocean uses, the potential for conflict between renewable energy projects and other uses will frequently be present. The extent of actual conflict for specific overlapping uses, however, may vary significantly. For example, this study's ethnographic research revealed that commercial fishing stakeholders' views on the possibility of coexisting with wind farms or other alternative energy developments ranged from theoretically compatible to beneficial to totally incompatible. For those who fish widely dispersed grounds in the Gulf of Maine, Georges Bank and south, especially if they are accustomed to following migrating fish, the prospects of having to maneuver around energy development was not a major concern. However, even for these individuals, the specific location of any development had the potential for being incompatible with their operation. Although fixed gear commercial activities are likely to be able to work in close proximity to a renewable energy project, substantial

[28] All fishing and transport economic indicators are based upon national level statistics and therefore include uses within planning areas not included in this study. Commercial shipping and transport costs excludes an additional over $10 billion associated with onshore transport construction.

Table 8-1

Taxonomy of Ocean Uses

Category	Subcategory
Archeological	Wrecks
Area of Special Concern	Critical Coastal Area
	Disposal/Dump
	Kelp Bed Lease
	Marine Managed Area
	Marine Protected Area
	Marine Reserve
	Marine Sanctuary
	Designated Native American Fishing Rights
	State Park
	Wildlife Refuge
	Artificial Reef
	Wastewater
	Desalinization Plant
	Corals
	Habitat
Marine Transportation	Marine Transportation
	Navigation Aid
	Shipping Lanes
	Ferry Routes
	Cruise Ship Operations
Historical Fishing and Fishing Areas	Aquaculture
	Diving
	Dredge Gear
	Fishing Closure Areas
	Fixed Gear
	Gill Net and Seines
	Handlines, Electric Reels, and Rods
	Harpoons
	High Use Area/Restricted Area
	Longlines
	Mobile Gear
	Other Gear Types
	Pelagic Fishing
	Pots
	Squid
	Traps
	Trawls

Table 8-1

Taxonomy of Ocean Uses (cont.)

Category	Subcategory
Historical Fishing and Fishing Areas (cont.)	Trolling
	Commercial Kelp
	Oysters
Military Use Area	U.S. Coast Guard Station
	Fortified Structure (Former Military Defense)
	Military Danger Zone
	Military Practice Area
Oil and Gas Leasing Blocks	Leases
Oil/Gas Deposits and Infrastructure/Cables	"8g" Revenue Sharing Boundary
	Cable
	Gas
	Offshore Platform
	Pipeline
	Well
	Barrier Constructed to Dam Oil on Water
	Mining
	Oil
Recreation Activities	Beach/Coast Use
	Recreational Boating
	Charter Boat (Rec. Fishing)
	Diving
	Recreational Fishing
	Hunting
	Sailing
	Sports
	Swimming
	Tidepooling
	Wildlife Viewing/Whale Watching
	Surfing
Research Areas	Ocean Special Area Management Plan
	Sampling location
Sand/Gravel	Dredge Source
	Material Disposal

concern exists, for example, that lobsters might disappear from area fishing grounds during the construction phase due to their sensitivity to habitat disturbances.

Sørensen et al. (2003) identified two broad categories of marine and coastal space use that can give rise to siting conflicts.

Areas with existing regulated, restricted, or prohibited access such as:

Major shipping lanes

Military exercise grounds

Major coastal or offshore structures (bridges, harbors, oil rigs)

Sub-sea cables or pipelines

Marine protected areas for fisheries management or marine conservation

Areas with potentially conflicting uses such as:

Commercial and recreational fishing grounds

Resource extraction areas (aggregate extraction, etc.)

Tourism and non-consumptive recreational areas

Archaeological interest such as shipwrecks

Cultural significance due to, for example, customary use or tribal history

In some instances, existing regulations, restrictions, and prohibitions will limit a location's suitability for development of a renewable energy facility (Michel et al. 2007; Sørensen et al. 2003). Areas with potentially conflicting uses are more complicated and the nature and significance of the conflict will be site-specific. State and Federal agencies have in place public processes for determining whether or not marine energy development is appropriate in these circumstances. Environmental impact assessment/statement processes and related consultation form the basis for this deliberation.

Table 8-2 describes the potential for, and nature of, conflicts between renewable energy projects on the OCS and other OCS uses. When planning for offshore renewable energy projects, and potential conflicts with other ocean uses, it is important to think about "conflict" in terms of (1) the likelihood that multiple uses might occupy the same "space" (i.e., the ocean surface, water column, submerged land, and/or airshed) and (2) the implications of those uses occupying the same space. In some cases, multiple uses in the same space may be compatible.

In this table, the likelihood that a renewable energy project will be co-located with another OCS use is identified as "high," "medium," "low," or "unknown." These are relative designations based on information that describes the spatial extent of each use on the OCS (rather than in the nearshore environment) under the assumption that renewable energy projects would most likely be located in offshore areas near population centers. The specific issue(s) that might arise should a renewable energy project become located in space occupied by another use are also identified,

Table 8-2

Potential Impacts of Conflicts between Offshore Renewable Energy and Existing OCS Uses

Use	Likelihood of Co-Location with a Renewable Energy Project	Issue	Potential Impact
Regulated, Restricted, or Prohibited Access			
Marine Protected Areas (MPA) such as Marine Reserves, National Monuments, Marine Sanctuaries	**Low**: The likelihood of co-location will vary by region. Within 0-200 nautical miles from shore, the regional breakdown of MPAs (by percent) is: 8 percent of Northeast waters, 7 percent of Southeast waters, and 8 percent of West coast waters. The likelihood of conflict would increase in Alaskan waters (52 percent are in some form of MPA) and waters surrounding the Pacific Islands (19 percent of waters are MPAs), and decrease in the Gulf of Mexico (6 percent are MPAs). (http://www.mpa.gov/pdf/helpful-resources/us_mpas_snapshot.pdf).	Impact to area/function of area; Disturbance of biota or ecosystem services in the protected areas	Impacts to populations of animals and health/availability of habitats
Listed areas of biological or ecological interest or value (e.g., habitats of rare or threatened species, Essential Fish Habitat)	**Medium**: Listed areas of biological and ecological interest/value – especially essential fish habitat (EFH) – are quite vast. For example, all Federal waters off of Washington and Oregon are listed as EFH for ground fish, and all Federal waters off of northern New England are listed as EFH for Atlantic Halibut (http://sharpfin.nmfs.noaa.gov/website/EFH_Mapper/map.aspx).	Impact to area/function of area; Disturbance of biota in the sensitive or ecologically valuable area	Impacts to populations of animals and habitats
Military exercise areas (ships, submarines, aircraft)	**Unlikely**: BOEM has been coordinating with the military on matters pertaining to offshore renewable energy issues, and the information provided to BOEM (including maps of military exercise areas) will be included in the planning process.	Loss or restriction of exercise areas	Increased risk of collisions and allisions; Radar interference (wind); Damage to renewable energy project

Table 8-2

Potential Impacts of Conflicts between Offshore Renewable Energy and Existing OCS Uses (cont.)

Use	**Likelihood of Co-Location with a Renewable Energy Project**	**Issue**	**Potential Impact**
Submarine gas and oil pipelines	**Low**: Offshore oil and gas pipelines in the study areas are limited. Locations of offshore gas and oil pipelines are generally known and marked on charts. In other areas of the ocean beyond the scope of this report, such as the Gulf of Mexico, the potential for co-location would be much higher given the multitude of offshore oil and gas pipelines.	Obstruction of construction, maintenance, and repair activities; Damage to existing pipelines	Increased costs associated with re-routing pipes; pollution (and associated impact on animal life, habitat, recreation opportunities, etc.) if a pipeline were damaged by renewable energy project activity
Submarine power and communication cables	**Medium**: Co-location of existing cables and a renewable energy facility (including new cables required to transfer energy (1) between energy facility structures and (2) from the facility to shore) is possible. Locations of offshore cables are generally known and marked on charts (with varying degrees of accuracy), although older/abandoned cables are not marked at all or only marked by a general area. A co-location issue will most likely arise in the context of telecommunications cables because they generally run across oceans, and land in locations likely to also support transmission cables from energy facilities. Co-location issues are less likely in the context of basic power cables because they generally run along the coast and do not go offshore. At the Borkum West wind farm in Germany, 11 routes for a new cable were proposed, and coastal and marine spatial planning (CMSP; see Section 8.3.3) was used to determine the route that created the least conflict (http://www.offshore-power.net/Files/Dok/casestudy-europeanoffshorewindfarms.pdf)	Obstruction of construction, maintenance, and repairs; Damage to existing cables	Increased costs associated with any cable re-routing activities; disruption of service due to damage of cables

Table 8-2

Potential Impacts of Conflicts between Offshore Renewable Energy and Existing OCS Uses (cont.)

Use	Likelihood of Co-Location with a Renewable Energy Project	Issue	Potential Impact
Disposal sites for munitions	**Unknown**: Insufficient publicly available information to determine likelihood of co-location.	Disturbance of past disposal sites	Risk of detonation and remobilization
Disposal sites for dredged material	**Low**: There are 31 ocean dredged material disposal sites offshore of the East coast and 10 off the coast of the Pacific Northwest region. For operational reasons, they are relatively close to shore (generally less than 20nm), but are sited outside navigational lanes away from important fishing grounds.	Obstruction of disposal activities	Loss of disposal sites; Increased cost of disposal activities, including transportation of disposed material over greater distances
Navigation/shipping lanes	**High**: Much transoceanic and coastwise shipping traffic moves to and from population centers which are also attractive to and necessary for offshore renewable energy projects. Activity is often more concentrated in proximity to ports.	Obstruction of efficient and safe navigation and shipping activities	Loss/restriction of navigable waters; Rerouting of recognized sea-lanes through restriction zones and Areas To Be Avoided; Introduction of inefficiencies in shipping (and related cost implications); Increased risk of collision/allision
Existing or Potential Activities			
Areas of archaeological interest	**Low**: Many of these areas are already known, though new Native American areas of archaeological interest have been identified through the course of permitting the Cape Wind project and other studies.	Loss of areas of archaeological interest	Destruction of or damage to archaeological sites; Physical access to site decreased
Cultural	**Medium**: Most of the cultural resources will be close to land, so likelihood of co-location will decrease as distance from shore increases.	Loss of areas of cultural use	Loss of access to customary food gathering areas; Adverse effect on cultural identity; Disturbance of cultural traditions

Table 8-2

Potential Impacts of Conflicts between Offshore Renewable Energy and Existing OCS Uses (cont.)

Use	Likelihood of Co-Location with a Renewable Energy Project	Issue	Potential Impact
Commercial and recreational vessel navigation	**High**: The ocean supports a great deal of transoceanic and coastal commercial vessel traffic. The ocean also supports a great deal of recreational usage, though the level of activity diminishes with distance offshore.	Obstacle to safe navigation	Vessel restrictions on innocent navigation, freedom of navigation and anchoring; Need for new navigational markers and monitoring of the area; Allisions of structures and powered and unpowered (drifting) vessels; vessel-to-vessel collisions/allisions
Search and Rescue	**Medium**: During the period 2002-2011, the USCG responded to between 20,000 and 37,000 search and rescue cases each year (http://www.uscg.mil/hq/cg5/cg534/sarfactsinfo/SAR_Sum_stats1964-2011.pdf). While there may be some "hot spots," search and rescue activities are not limited to specific places. Offshore renewable energy projects may require additional search and rescue efforts in the vicinity of projects due to an increase in activity in an area and any increased risks presented by the infrastructure.	Increased need for search and rescue operations and obstacle to safe search and rescue activities	Wind developments may be an obstacle to air navigation - in particular for low flying aircraft (e.g., helicopters); Obstacle to navigation; Radar interference
Civil air traffic	**Medium**: Air traffic is more concentrated along the shoreline than it is over the OCS, therefore the spatial overlap will be greater as projects approach the shoreline.	Offshore wind facilities present an obstacle to safe navigation	Increased risk of allision - in particular for low flying aircraft (e.g., helicopters, planes going to nearby islands); Interference with radar; Need for re-routing

Table 8-2

Potential Impacts of Conflicts between Offshore Renewable Energy and Existing OCS Uses (cont.)

Use	Likelihood of Co-Location with a Renewable Energy Project	Issue	Potential Impact
Recreational and commercial fisheries	**High**: The geographic and temporal extent of commercial and recreational fishing locations and fish habitats suggests that many types of offshore renewable energy projects will have some level of co-location with fishing activities.	Impaired safe access, diminishing resource/habitat	Noise from construction and operation may cause temporary or permanent changes in local fish abundance, distribution, and behavior; Possible construction activities and consequent changes in water quality and depth might alter habitat and support non-native species colonization; Fishermen might be displaced from traditionally productive fishing grounds; Renewable energy projects may require significant detours to access fishing grounds; Fishing activities within the renewable energy development could increase loss of gear; Wind projects might cause interference with marine communication systems
Sediment extraction	**Low**: For operational reasons (distance to shore, depth of water) sand and gravel mining often takes place within a few miles of shore.	Disruption of extraction activities (temporary or long-term)	Temporary or permanent loss or restriction of extraction areas
Offshore oil and gas activities	**Low**: Given that most offshore oil and gas activities are currently located in southern California, northern Alaska, and in the Gulf of Mexico (areas not included in this study), the likelihood of co-location (and of exclusions and restrictions for oil and gas development) are low at this time.	Temporary or long-term exclusion or restriction of exploitation or exploration activities	Increased risk of collision and allusion; Accidents causing oil and gas pollution; Displacement of productive oil and gas extraction activities

Table 8-2

Potential Impacts of Conflicts between Offshore Renewable Energy and Existing OCS Uses (cont.)

Use	Likelihood of Co-Location with a Renewable Energy Project	Issue	Potential Impact
Seascape	**Medium**: Projects located on the OCS will have a decreasing visual impact with increasing distance from shore. Visual impact to the seascape could affect those travelling near the development (via water or air). Additionally, impacts from wind energy projects are likely to be more significant than those caused by wave and tidal energy given the lower vertical profile of the latter two types of projects. Supporting infrastructure (maintenance vessels, etc.), however, may have visual impacts on the nearshore seascape. Absent an actual project, the nature and magnitude of any impact is uncertain.	Visual impact during day and at night	Change in property values; Viewshed alteration
Tourism and recreation activities	**Low**: Given that most tourism and recreation activities take place not on the OCS but in the nearshore environment, the likelihood for co-location will be low. Where it does occur, benefits could be realized (in the form of new activities such as sightseeing trips to wind farms). Some co-location with ferry and cruise routes may occur, though siting decisions will likely seek to avoid these existing travel lanes.	Restrictions to recreation and transportation activities	Changes in visitation rates and participation rates; Alteration of visitor “experience” at coastal state or national parks; Alteration of waves may affect surfing and beach formation
Scientific research	**Medium**: Research is geographically broad and variable, therefore co-location with renewable energy projects is possible.	Restriction/disruptions to scientific research	Changes in marine community structure; Changes in local ocean currents and habitats; Physical barrier to accessing research sites (especially those used for long-term data collection)

Adapted from OSPAR Commission 2008

along with the potential impact(s) of co-located uses (recognizing that actual impacts would be project- and location-specific). The analysis of likelihood for co-location does not address the potential for avoidance, nor does it address any potential benefits of co-location. It is possible that some of these conflicts can be avoided very early in the planning process for a project, and that some of the issues arising from co-location might provide opportunities for new uses.

8.3 Identification and Analysis of Potential Mitigation Strategies

An objective of this study was to recommend measures that BOEM can employ, within the limits of its authority, to avoid or mitigate conflicts between renewable energy development and other ocean uses on the Outer Continental Shelf. The ethnographic research that took place for this study on the Pacific coast and the northeast Atlantic coast produced markedly similar general conclusions regarding stakeholder engagement (particularly with respect to commercial fishing interests) in the offshore renewable energy development process. And while the data are more limited for the Mid-Atlantic/South Atlantic region, the consistency in results among the other regions gives the study team confidence that the conclusions hold true for all regions. However, similar general perceptions do not suggest similar engagement strategies, especially at the local level where the real work needs to take place. Fishing communities possess their own unique characteristics that reflect local history, culture, and circumstance (economic, regulatory, etc.), and while perhaps not as marked, other communities can similarly be expected to exhibit differing characteristics at the regional and local levels. Even the type of potential development – with wave energy a primary near-term focus on the Pacific coast, and wind energy the driving force on the Atlantic coast – will likely influence the needs and expectations of the interested parties and ultimately define the nature of any potential space and use conflicts.

In short, the literature review completed as part of this study as well as the study team's ethnographic research provide a variety of examples of strategies that have been or could be successful at specific times and specific places. While extremely useful in thinking about avoidance and mitigation strategies during future development processes, the circumstance-specific nature of these examples strongly suggests that no one measure can or should be recommended as generally preferred option in the context of a particular type of conflict.

Table 8-3 and the text that follows identify and describe 31 distinct strategies, drawn from all aspects of the study, for avoiding potential conflicts or mitigating the extent of any actual conflicts. Table 8-3 indicates the applicability of each strategy to (1) one or more of four general conflict types, (2) one or more ocean use categories, and (3) one or more offshore renewable energy project phases.

In addition, Table 8-3 notes the entity(ies) with authority to implement each avoidance or mitigation strategy. The bases for these determinations are described in the narrative description of each strategy. It is important to recognize that, while mitigation of the impact of OCS activities has occurred for many years (e.g., in the context of oil and gas exploration and development), offshore renewable energy installations present a new set of potential impacts and require consideration in a new context of what may be existing mitigation strategies and measures. In many cases, because the conflict management process integrates and coordinates the jurisdictional purviews of multiple federal agencies, mitigation measures may be proposed and imposed through more than one authority and approval.

In all cases, an offshore renewable energy developer must receive a lease and subsequent approvals from BOEM for each of several phases of the decision-making process in accordance with the authorities in Section 8(p) of the Outer Continental Shelf Lands Act and regulations promulgated pursuant to that Act including 30 CFR 285. Developers are also responsible for applying for other applicable permits and complying with any terms, conditions, or obligations that may be imposed by Federal law or regulations, or other Federal agencies. For example, as offshore renewable energy projects require Federal authorization they must comply with the Section 7 Consultation and Biological Assessment provisions of the Endangered Species Act. BOEM, as the federal agency authorizing the activity, is responsible for ensuring its actions are not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat. BOEM enters into a consultation process with either NMFS or the U.S. Fish and Wildlife Service, depending on the species involved, which may result in the issuance of a biological opinion and Incidental Take Statement with mandatory requirements to minimize the impacts. These measures are implemented both through the aforementioned rulings and BOEM's lease. For example, if through the collaborative process of creating a lease, the U.S. Coast Guard requests that the developer submit a Private Aids to Navigation Plan for approval prior to development (something which the Coast Guard does not have independent authority to request), and BOEM agrees to include this as a requirement of the lease, then BOEM has the authority to see that the requirement is fulfilled. The lease may specify that the developer coordinate with others to fulfill mitigation requirements. An example of such required coordination can be seen in the Record of Decision for the Cape Wind Project where it is stated that, "[Cape Wind Associates] shall adopt traffic management measures that may be prescribed by the Coast Guard, after consultation with the Southeastern Massachusetts Port Safety and Security Forum…" (U.S. DOI/MMS 2010).

We note that BOEM and the Federal Energy Regulatory Commission (FERC) finalized a Memorandum of Understanding (MOU) on April 9, 2009 to clarify jurisdictional understandings regarding renewable energy projects on the OCS. Specifically, the MOU recognizes that (1) BOEM has exclusive jurisdiction with regard to the production, transportation, or transmission of energy from non-hydrokinetic alternative energy projects on the OCS, including renewable energy sources such as wind and solar; (2) BOEM has exclusive jurisdiction to issue leases, easements, and rights-of-way regarding OCS lands for hydrokinetic projects; and (3) the Commission has exclusive jurisdiction to issue licenses and exemptions for hydrokinetic projects located on the OCS. As a result, no FERC license or exemption for a hydrokinetic project on the OCS shall be issued before BOEM issues a lease, easement, or right-of-way. Further, the MOU states that BOEM and FERC will work together to the extent practicable to develop policies and regulations with respect to OCS hydrokinetic projects, and coordinate to ensure that hydrokinetic projects meet the public interest, including the adequate protection, mitigation, and enhancement of fish, wildlife, and marine resources and other beneficial public uses.

Table 8-3

Applicability of Potential Avoidance and Mitigation Strategies for Particular Conflicts, Uses, and Project Phases

Avoidance/Mitigation Strategy	Conflict				Ocean Use						Project Phase					Primary Implementation Authority*
	Navigation	Gear	Natural Resource	Physical Space	Shipping	Comm. Fishing	Recreation	Cables	Ferries/Cruises	Research	Planning	Siting/Permitting	Construction	Operation	Decommissioning	
1. Conflict Avoidance	X	X	X	X	X	X	X	X	X	X	X	X				BOEM
2. Communication/Stakeholder Engagement	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	BOEM
3. Coastal and Marine Spatial Planning	X	X	X	X	X	X	X	X	X	X	X					NOC
4. Spatial Analysis	X	X	X	X	X						X	X				BOEM/Other Govt/Industry
5. Impact Minimization through Design/Construction	X	X	X	X	X	X	X	X	X	X		X	X	X	X	BOEM/NMFS/FWS
6. Environmental Assessments			X			X				X			X	X	X	BOEM
7. Mitigation Funds and Subsidies for Displaced/Impacted Users	X	X	X	X		X						X	X	X	X	BOEM as informed by NOAA
8. On and Off-Site Stock Enhancement			X			X							X	X	X	NMFS/FWS
9. Research			X			X							X	X	X	BOEM/Other Govt
10. Facilities Improvements					X	X	X					X	X	X	X	BOEM
11. Fishing Effort Increases			X			X							X	X	X	NMFS
12. Fishing Area Re-Opening	X	X	X	X		X										NMFS
13. Fishing Ground Access Restrictions for Public						X							X	X	X	NMFS
14. Access Allowed Within Facility Area	X				X	X	X	X	X	X			X	X	X	USCG
15. Waterways Safety Assessment	X				X						X					USCG/Other Govt
16. Collision Risk Assessment	X				X							X				USCG
17. Vessel Routing Measures	X				X	X	X		X	X		X	X	X	X	USCG/IMO
18. Vessel Traffic Service (VTS)	X				X								X	X	X	USCG
19. Safety Fairways	X				X	X						X	X	X	X	USCG

Table 8-3

Applicability of Potential Avoidance and Mitigation Strategies for Particular Conflicts, Uses, and Project Phases (cont.)

Avoidance/Mitigation Strategy	Conflict				Ocean Use						Project Phase					Primary Implementation Authority*
	Navigation	Gear	Natural Resource	Physical Space	Shipping	Comm. Fishing	Recreation	Cables	Ferries/Cruises	Research	Planning	Siting/Permitting	Construction	Operation	Decommissioning	
20. Buffer Zones around Existing Uses	X	X		X	X	X		X	X	X	X	X				BOEM/USCG
21. Operational Restrictions for Navigation	X				X								X	X	X	USCG
22. Establishment of the International Tug of Opportunity System	X				X								X	X	X	USCG
23. Guard Ships	X				X	X							X	X	X	USCG
24. Chart Updates to Reflect Changes Related to Safe Navigation	X	X			X	X	X	X	X	X			X	X	X	USCG/NOAA
25. Voyage Planning	X				X								X	X	X	Private shipping companies
26. Notices to Mariners	X				X	X	X		X	X			X	X	X	USCG/NOAA
27. Mariner Education	X				X	X	X		X	X		X	X	X	X	USCG/NOAA
28. Power Cables Trenching/Burial	X	X			X	X	X		X				X	X	X	BOEM
29. Emergency Response Plans Regarding Turbine Failure	X				X								X	X	X	BOEM/USCG
30. Radar, Radio Navigation, and Radio Communication Interference Research	X				X	X	X		X	X			X	X	X	FAA
31. Post-Construction Obstruction Removal	X	X	X	X	X	X	X	X	X	X					X	BOEM/Other Govt

* See text for explanation

8.3.1 Conflict avoidance

When planning, permitting, and siting offshore renewable energy projects, the need for mitigation may be reduced by avoiding spatial conflicts altogether. Conflict avoidance can be implemented to varying degrees ranging from broad conflict avoidance (e.g., do not plan/permit/site a project within a specific distance from any submarine cable), to more specific conflict avoidance (e.g., do not obstruct passage to one specific anchorage area). Conflict avoidance can be especially important in the early planning stages for offshore renewable energy development, and also has a role in the siting and permitting stages of a project.

Commercial Shipping

The International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) is a nonprofit, nongovernmental, international technical authority whose objective is to harmonize aids to navigation worldwide to ensure safe, expeditions, and cost effective movement of vessels. IALA is recognized internationally as the authoritative source for aids-to-navigation information. Collectively, its members represent a body of international navigation expertise. Seventy-four countries are members, and twenty-four member countries – of which the United States is one – comprise the IALA Council. The organization's national members (e.g., the U.S. Coast Guard) are the authorities legally responsible for aids to navigation in their respective countries. IALA develops common standards which are published as recommendations and guidelines. One such standard is:

In general, development of offshore energy structures or wind farms should not prejudice the safe use of Traffic Separation Schemes, Inshore Traffic Zones, recognized sea lanes and safe access to anchorages, harbours and places of refuge. (IALA 0-139, section 2.3.1)

Throughout the ethnographic research, commercial shipping stakeholders indicated that offshore renewable energy facilities should not be sited in locations that would interfere with maritime traffic. Further:

If ships are to be able to pass through offshore developments, two lanes are needed each lane should be 1 1/2 to 2 miles wide (1 mile on each side of ship is needed).

Before siting an offshore renewable energy project, first create lanes for shipping where ships now go, are projected to go, or would agree to go. This sequence was not followed in the Gulf of Mexico (for oil platforms) and the resulting shipping lanes are less than ideal.

Given the importance of standard lands and efficient vessel routing, the majority of those who participated in this study expressed the importance of avoiding conflict so as not to have to mitigate.

One example of successful avoidance can be seen at the Barrow Offshore Wind Farm, located in the East Irish Sea, United Kingdom. The submarine cable route associated with the energy project was carefully selected to avoid main anchorage areas (Warwick Energy 2002).

Commercial Fishing

Avoidance in commercial fisheries includes strategies such as avoiding negative impacts to habitats and resources, maintaining the ability to access/utilize fishing grounds, and preventing impacts to safety. Commercial fishermen expressed strong interest in conflict avoidance; however, they acknowledged that any project will likely impact some aspect of commercial fishing. They also noted that avoidance is especially important in site-specific fixed-gear fisheries.

Avoidance of important U.S. fishing grounds has already played an important role in siting offshore renewable energy projects. For example, in April 2011, Massachusetts requested that the Federal government revise the area under consideration for offshore wind development to exclude areas significant to, among other uses, the state's commercial fisheries operations.

Cables

The standard commercial practice concerning construction on the Outer Continental Shelf is to site the proposed pipe/cable route or energy structure to minimize impact to existing cables. In particular, avoidance of all existing pipes and cables to the greatest extent possible is the preferred method of mitigation.

Recreational Boating

Due to the fact that recreational boating occurs over a wide area, it is likely that a renewable energy facility will have at least some impact on recreational boating (though the likelihood decreases with distance from shore). If the footprint of the facility is small, recreational boaters may be able to avoid the area with little difficulty and, as such, the impact may not be significant. If the footprint of the facility is large, or it is located at, or on the way to, a popular recreational boating destination, the impact to such boaters would increase. In the case of wind energy projects, the structures may also cause wind shadows which could affect sailing in nearby waters.

While the sailing community is generally supportive of offshore renewable energy, this support may quickly turn to opposition if it were proposed that a wind farm be located where it might affect established racing routes or areas. Some races have over 100 years of history and, as such, represent a historic and cultural asset.

Research

While some research sites are flexible in nature, others, such as long-term data collection locations, should generally be avoided.

During the early stages of project planning, prospective developers could be required to conduct a comprehensive, location-specific survey of known or potential conflicts with specific uses or users within the proposed project's footprint. The results of this survey could then be documented in a "conflict profile," which would describe in detail, at a minimum, the nature of known or potential conflicts (including the project phase(s) during which the conflict would exist) and the likelihood of potential conflicts. This document could serve as a precursor to, and eventually become the basis for portions of, any subsequent environmental impact assessment as required by the National Environmental Policy Act.

BOEM Methods to Avoid Conflict

To determine conflicts BOEM utilizes several techniques including State Renewable Task Force meetings, the "Smart from the Start" Initiative, and an overall commitment to public outreach and coordination with state and federal government entities.

State Renewable Energy Task Force Meetings
Section 388 of the Energy Policy Act of 2005 (EPAct; Pub. L. 109-58, 119 Stat 594 (2005), 42 U.S.C. 15801 et seq.) amended Section 8 of the Outer Continental Shelf Lands Act (OCSLA; Pub. L. 83-212, 67 Stat. 462 (1953), 43 U.S.C. §1331 *et seq.*) to give the Secretary of the Interior authority to issue a lease, easement, or right-of-way on the OCS for activities that are not otherwise authorized by the OCSLA, or other applicable law, if those activities:

Produce or support production, transportation, or transmission of energy from sources other than oil and gas; or

Use, for energy-related purposes or other authorized marine-related purposes, facilities currently or previously used for activities authorized under the OCS Lands Act, except that any oil and gas energy-related uses shall not be authorized in areas in which oil and gas preleasing, leasing, and related activities are prohibited by a moratorium.

Examples of such energy-related or marine-related purpose include, but are not limited to: offshore aquaculture, research, education, recreation, and support for operations and facilities authorized under OCSLA.

One of the key mandates in Section 388 of EPAct requires BOEM to "provide for coordination and consultation with the Governor of any State or the executive of any local government that may be affected by a lease, easement, or right-of-way under this subsection." Accordingly, BOEM finalized regulations for carrying out the responsibilities and authority granted under EPAct Section 388 in its 2009 Final Rule on Renewable Energy and Alternate Uses of Existing Facilities on the Outer Continental Shelf (30 C.F.R. § 250, 285, and 290). Section 285.102(e) states that BOEM "will provide for coordination and consultation with the Governor of any State or the executive of any local government or Indian tribe that may be affected by a lease, easement, or [right of way] under this subsection. [BOEM] may invite any affected State Governor, representative of an affected Indian tribe, and affected local government executive to join in establishing a task force or other joint planning or coordination agreement in carrying out our responsibilities under this part."

BOEM implements this requirement through State Renewable Energy Task Force meetings with an individual state. A particular state task force comprises elected officials from state, local, and tribal governments, and other relevant Federal agencies with explicit or inherent governmental responsibility. These meetings are intended to be the preferred first step of the leasing process. Such a task force serves as a forum to facilitate education, communication, data exchange, and continuing dialogue. Through a task force, BOEM can share information about current leasing activities offshore of a particular state. At the same time, task force members may provide meaningful and timely input in the implementation of the MMS renewable energy regulatory framework (U.S. DOI/MMS 2009).

While the task force members cannot alter the regulatory framework or established leasing processes, the members can provide input on how these features are implemented throughout the leasing process. BOEM will consider such input as it makes renewable energy leasing decisions (U.S. DOI/MMS 2009).

Smart From the Start Initiative
In November 2010, Secretary of the Interior Ken Salazar announced a “Smart from the Start” initiative for wind energy facilities on the Atlantic Outer Continental Shelf (U.S. DOI 2010). Under this initiative, which is intended to facilitate siting, leasing, and construction of new projects, BOEM will work with state partners, including the previously established State Renewable Energy Task Forces, as well as relevant Federal agencies, to identify Wind Energy Areas (WEAs) offshore of several Atlantic states. WEAs are offshore locations that are considered most suitable for wind energy development. BOEM will work with the above entities to conduct environmental assessments, including gathering sufficient information on potential resource and use conflicts, in these high priority areas. This information then will be used to support or avoid wind energy development in the identified area. By identifying high priority areas, and gathering data on potential resource and use conflicts, BOEM seeks to avoid conflict and create a more efficient process for permitting and sitting responsible development (U.S. DOI 2010).

Throughout the multi-year process to develop a Final Programmatic EIS and subsequent Final Rule regulations for renewable energy and alternate uses on the Outer Continental Shelf, BOEM has held numerous public scoping meetings and hearings across the country. Through these meetings and associated comments, BOEM has engaged the general public in this process and gathered significant data on potential resource and use conflicts. Through early conflict identification via engagement with knowledgeable state and federal government entities, hopefully a greater amount of conflict can be avoided.

Implementation Authority
Pursuant to the authority granted by the Energy Policy Act of 2005 and the National Environmental Policy Act of 1969 (NEPA), (Pub. L. 91-190, 83 Stat. 852 (1970), 42 U.S.C. 4321 et seq.), and consistent with the 2009 Final Rule on Renewable Energy and Alternate Uses of Existing Facilities on the Outer Continental Shelf (30 C.F.R. § 250, 285, and 290), BOEM has the authority to determine which OCS tracts are made available for lease. The Bureau, therefore, could exclude certain tracts, in whole or in part, from a lease sale.

8.3.2 Communication/stakeholder engagement

Effective communication and stakeholder engagement is critical to avoiding, minimizing, and mitigating conflicts stemming from offshore renewable energy development. An important element of effective communication and engagement is the availability and use of information that all parties consider credible, from the engineering specifications of proposed projects to the ecological characteristics of project sites. Conflict and the need for mitigation are more likely absent a foundation of credible, shared information.

Engaging stakeholders in the assessment and evaluation of offshore renewable energy proposals allows group deliberation to inform knowledge about cumulative impacts, societal relationships with those impacts and the value of benefits and costs associated with the impacts (Portman 2009). Engagement can lead to better agreement on mitigation and monitoring of projects as demonstrated in the final EIS for the proposed Makah Bay Project (FERC 2007). It also has wider benefits including:

Understanding potential for conflict over multiple objectives for the use and management of coastal and marine ecosystems

Better specification of existing interactions between marine ecosystems and the communities that depend on them

Disseminating knowledge about costs and benefits of alternative uses of marine systems, such as renewable energy development, to coastal communities, decision makers, and stakeholders

Fostering community participation in CMSP

(Cowling et al. 2008; Inger et al. 2009; Kumar and Kumar 2008; Lynam et al. 2007; Pomeroy and Douvere 2008).

Stakeholder consultation is an essential part of CMSP or other planning or site assessment process.

Tools that support stakeholder engagement

Geographic information systems (GIS) are increasingly being used to support stakeholder engagement (Ramsey 2009). GIS are used to inform, engage, and include stakeholders and their knowledge in management of coastal and marine resources. For example, St. Martin and Hall-Arber (2008) describe a participatory method to map the at sea presence of fishing communities in the U.S. Northeast. The *California Ocean Uses Atlas* (NOAA 2010) compiles data on three broad usage sectors – fishing, industrial/military and recreation – in an attempt to provide access to a rich geographic view of the California EEZ. The lessons learned concerning the spatial representation of communities could inform sectors such as offshore renewable energy striving to incorporate human dimensions in site assessment and planning. Brody et al. (2004) used GIS to map potentially competing stakeholder values associated with establishing protected areas in Matagorda Bay, Texas. By overlaying multiple values associated with a range of stakeholders across space, they were able to identify hotspots of potential conflict as well as areas of opportunity for maximizing joint gains.

As part of this study, the ethnographic team also employed maps illustrating data from the GIS database development along with nautical charts to assess the validity of available information and promote further discussion. Such data serve as an initial screening of potentially affected stakeholders and thus a starting point for ensuring that those parties are integrated into further outreach efforts.

Tools for incorporating community knowledge, preferences, and values into decision making

During stakeholder engagement, other tools can be used to organize and translate stakeholder input into information for decision-making. Such tools include:

Bayesian belief networks and system dynamic modeling tools that simplify complex systems through key variables and their relationships

Discourse-based valuation that develops a common and group representation of importance

The 4R framework that assesses stakeholder roles and resilience in natural resource management

Participatory mapping representing spatial relationships between people and natural resources

Scoring or the Pebble Distribution Method that rates alternatives and explores the underlying reasons for these ratings

Scenarios that describe several possible future outcomes (negative or positive) based on current trends and uncertainties

Spidergrams representing causal or categorical relationships among variables related to a central resource management question or issue

Venn diagrams that represent social relationships and power differences between stakeholders

Who Counts Matrices that use different criteria to assess stakeholder links to the management of a natural resource

In its report "Best Practice Guidelines: Consultation for Offshore Wind Energy Developments," the British Wind Power Association (now RenewableUK) stated that the purpose of consultation is to "enable all stakeholders to make known their views and to work together to ensure they are addressed" (BWEA 2002, p. 8). According to the guidelines, consultation needs to:

Be inclusive

Treat people equally

Ensure responsibility for the process and feedback needs to be shared

Use independent professional facilitators as appropriate

Be transparent, especially about uncertainties

Incorporation of stakeholders in offshore renewable energy planning remains challenging. Gray et al. (2005) explored the divide between developers of offshore wind farms and the fishing industry in the United Kingdom. Their research highlights conclude that offshore wind farm development would be better managed if stakeholder consultation was more extensive, compensation claims were standardized, and scientific data were more readily available.

Conflict Resolution

If engagement of stakeholders fails to mitigate conflict once an offshore renewable energy development is proposed then dispute resolution becomes necessary. BOEM has a history of successful conflict resolution in the oil and gas and minerals contexts (U.S. DOI 1996). For example, the department has a strong tradition of conflict resolution training for offshore minerals management personnel; establishing joint review panels for constituent review of environmental documents; and employing a process targeted at settling outstanding and contentious mineral royalty claims, which has reduced appeals and litigation and increased royalty collections.

McCreary et al. (2001) undertook an examination of environmental conflict and alternative dispute resolution literature to determine what practices could be best applied to conflicts in the coastal zone. The authors found that many disputes are best addressed by using a structured mediation model that involves face-to-face negotiation with a broad range of stakeholders to build consensus-based agreements for coastal zone management.

Thoughtful and open consideration of each party's preconceptions, prejudices, complaints, and desires helps ensure the creation of a lasting agreement (Buck et al. 2004, Capitini et al. 2004). The common interest(s) identified for purposes of the present objective might not be strong enough to endure if difficulties arise in the future. On the other hand, McCreary et al. (2001) note that during one three-year stakeholder process, the participants bonded so well that the group was able to quickly and effectively deal with unexpected circumstances that threatened the negotiated agreement.

The Environmental/Public Disputes Sector and the Consortium on Negotiation and Conflict Resolution of the Society for Professionals in Dispute Resolution have created a compendium of "guidelines for best practice" for agencies in the United States and Canada (Society of Professionals in Dispute Resolution 1997). Its recommendations include:

An agency should first consider whether a collaborative agreement-seeking approach is appropriate.

Stakeholders should be supportive of the process and willing and able to participate.

Agency leaders should support the process and ensure sufficient resources to convene the process.

Ground rules should be mutually agreed upon by all participants, and not established solely by the sponsoring agency.

The sponsoring agency should ensure the facilitator's neutrality and accountability to all participants.

Agency and participants should plan for implementation of the agreement from the beginning of the process.

Policies governing these processes should not be overly prescriptive.

The theory behind assessing and identifying "best practices" is continually evolving (U.S. Institute for Environmental Conflict Resolution 2005, Orr 2006, Orr et al. 2008). Which tools and practices in ECR are best depends a good deal on the context or setting of the specific conflict and the unique composition of its participants (Bean et al. 2007).

Use-Specific Communications

Due to the diverse nature of ocean uses, stakeholder engagement efforts must embrace differences in the needs of the communities. For example, communication during the construction, operation, and decommissioning phases of a renewable energy development project will be important in terms of warning fishermen of activities that could affect their operations (e.g. maintenance activities requiring adjustments to buffer zones).

One example of effective communication strategy is that between the fishing industry and the U.K. Department for Business, Enterprise and Regulatory Reform, as described in "Fishing Liaison with Offshore Wind and Wet Renewables (FLOWW). FLOWW provides a means to agree upon compensation standards for disruption to work and loss of income. FLOWW also suggests that, in some cases, it makes sense to have a fishery representative on construction/maintenance vessels (U.K. DBERR 2008). That person would help to guide timing of activities to minimize/avoid unnecessary conflicts as well as maintain a log of at-sea communications between energy personnel and fishing community. FLOWW also recommends the use of a dedicated very high frequency (VHF) channel for the transmission of any warnings related to local renewable energy projects. Study participants in the Northeast suggested using Boatracs (a vessel monitoring system that can send and receive emails) to notify fishermen of important issues. During this study's ethnographic research, multiple participants across sectors stressed the importance of obtaining direct assistance from industry representatives to foster active communications. [See the regional sections for suggested communications channels for different user groups.]

The Oregon Fishermen's Cable Committee (OFCC) and the Oregon Fishermen's Agreement provide further examples of targeted outreach. The committee comprises cable owners and fishermen and was formed to collaboratively determine appropriate locations for underwater cables and to provide a fair mechanism to minimize damage to cables from fishing activities and compensate fishermen for lost gear.

The OFCC website (http://www.ofcc.com/index.htm) provides the following history and description of purpose:

"In July 1998, some concerned Oregon commercial trawl fishermen negotiated a cooperative agreement with WCI Cable, Inc. and Alaska Northstar Communications, LLC, two related fiber optic cable companies operating a fiber optic cable landing at Nedonna Beach, Oregon. The Oregon Fishermen's Undersea Cable Committee Agreement (Oregon Fishermen's Agreement) was the first effort by two industries to discuss, describe and delineate their shared use of a community resource-the ocean.

Since this historic cooperative effort, seven other undersea fiber optic cables have benefited from this relationship with West Coast fishermen by joining the Oregon Fishermen's Cable Committee. The Committee continues to dedicate itself to maintaining and building upon these industry-to-industry relationships.

…The Oregon Fishermen's Agreement is the Magna Carta between member West Coast commercial fishermen and fiber optic cable companies. The OFCC intends to maintain, and build upon, its long history of collaborating with the fishing and undersea telecommunications industries in order to reach mutually satisfactory solutions to ocean- use issues."

Cable owners, including telecommunications companies and utilities, have decades of experience siting, operating, and repairing cables in conjunction with other ocean uses. These companies can provide a wealth of information regarding location and type of existing cables. Often these individual companies have joined together as a collaborative group to represent the cable industry. These groups aim to maximize cable protection and are open to sharing their knowledge with all users of ocean space. Through collaboration these industry groups and renewable energy developers can develop site-specific construction plans to avoid or minimize impact to the utilities. The North American Submarine Cable Association, a non-profit organization of cable-related companies provides and exchanges information on technical, legal, and policy issues of common interest and maintains active working relationships with other marine industries (http://www.n-a-s-c-a.org/). Similarly, the International Cable Protection Committee (ICPC) aims to promote the protection of submarine cables against natural and man-made hazards. The Committee, founded in 1958, comprises over 124 members from over 60 countries. Membership is open to submarine cable owners, submarine cable maintenance authorities, submarine cable system manufacturers, cable ship operators, submarine cable route survey companies, national governments, and other companies that are key players in the submarine cable industry. Overall the ICPC promotes information exchange and dialogue among seabed users, fosters development and distribution of cable awareness charts, recommends procedures for cable routing and cable/pipeline crossing, and produces educational materials in an effort to foster cable awareness in fishing and offshore industries (http://www.iscpc.org/).

An important longtime member of the ICPC is the U.S. Naval Seafloor Cable Protection Office (NSCPO), located within the Ocean Facilities Program (OFP) of the Naval Facilities Engineering Command (NAVFAC) of the U.S. Navy. NSCPO was established in 2000 with a mission to protect the Navy's interests with respect to seafloor cables by providing internal coordination and external representation of Navy's interests and concerns to the Department of Defense, other government agencies and the cable industry, both foreign and domestic. NSCPO serves as the official point of contact for all Navy and other Department of Defense cables. In this way NSCPO presents a single, unified, and coordinated approach to cable protection and policy issues (U.S. Navy 2012).

NSCPO participates in national and international forums as well as information exchanges with the commercial undersea cable industry and other government agencies. In addition, NSCPO maintains a comprehensive GIS database of cable systems, which incorporates NSCPO, Commercial, Bathymetry/Geological, Petroleum, Marine Protected Areas, Global Maritime Boundaries, Digital Nautical Charts and other government datasets. NSCPO also provides a cooperative relationship with the telecommunications industry. To minimize potential conflict, NSCPO encourages commercial industry to communicate with them early in the planning stages about new cable routes (U.S. Navy 2012).

A significant conclusion from this study is the importance of the stakeholder engagement *process* (i.e., actions that occur before any consideration of the need for mitigation of unavoidable conflicts). The establishment of an effective communication and process platform would likely make the need for mitigation a less frequent occurrence while also facilitating quicker resolutions when mitigation does become necessary and appropriate. Prospective developers could use information in the conflict profile to engage proactively with the parties whose interest would or might be in conflict with project development activities through the formation of an avoidance and mitigation strategy network. The formation of such a network would address two critical needs:

Establishment of a system of early communications with the right parties. Participation in any planning or decision making process should be broad-based, with an emphasis on traditional users whose sometimes unique schedules should be accommodated. For longer-term planning, interest group-specific Advisory Boards may be an effective tool, perhaps combined with crosssector meetings in order to help all understand each group's constraints and values and identify compromise solutions. In any case, the goals of interaction with stakeholders should always be clear, concise, and consistent, with explicit transparency and credible assurances that participant views and knowledge are important and will be taken into consideration.

Developing an understanding of and respect for cultural differences among interested parties. This study illuminated the fact that "ocean as place" and "ocean as space" cultures coexist in the context of offshore renewable energy development. The former comprises those for whom the ocean is a source of sustenance or simple enjoyment, while the latter captures a more land-based perspective in which the ocean is a frontier for new uses or simply a large expanse in which people and vessels can move about. These two perspectives need to be recognized, and bridge-building between them should be an underlying theme in all deliberations. A related but separate issue is the importance of recognizing tribal interests as distinct from user group "stakeholder" interests. Repeatedly, and on both coasts, the study team heard tribal representatives describe the importance of engaging with them on a government-to-government basis, with similar expectations that doing so early in the development process provides the greatest opportunity for reaching mutually satisfactory resolutions of any potential conflicts.

Implementation authority

BOEM has primary authority to implement this mitigation strategy pursuant to the authority granted by the Energy Policy Act of 2005 (Pub. L. 109-58, 119 Stat 594 (2005), 42 U.S.C. 15801 et seq.) and the National Environmental Policy Act of 1969 (Pub. L. 91-190, 83 Stat. 852 (1970), 42 U.S.C. 4321 et seq.), and consistent with the 2009 Final Rule on Renewable Energy and Alternate Uses of Existing Facilities on the Outer Continental Shelf (30 C.F.R. § 250, 285, and 290). BOEM seeks public input during environmental review and regulatory programs for renewable energy. Also BOEM maintains an online list of open public documents via regulations.gov to facilitate public comment. BOEM publicly acknowledges that "[agency] coordination and consultation with regional, state, and local planning mechanisms will give those entities that will be most affected by renewable energy activity a proper voice in the development of priorities" (30 C.F.R. § 250, 285, and 290 [2009]).

In addition, prior to issuing a lease BOEM is required to "…coordinate and consult with relevant Federal agencies (including, in particular, those agencies involved in planning activities that are undertaken to avoid conflicts among users and maximize the economic and ecological benefits of the OCS, including multifaceted spatial planning efforts), the Governor of any affected State, the executive of any affected local government, and any affected Indian tribe, as directed by subsections 8(p)(4) and (7) of the OCS Lands Act or other relevant Federal laws. Federal statutes that require [BOEM] to consult with or respond to findings include the Endangered Species Act (ESA), and the Magnuson-Stevens Fishery Conservation Act (MSA)" (30 C.F.R. § 285.203 [2009]).

BOEM implements these regulations through a variety of mechanisms including the formation of and regular meetings with State Renewable Energy Task Forces, the Smart from the Start Initiative, and consultation and coordination with other state and Federal agencies under required NEPA analyses. NEPA requires Federal agencies to consider the impacts of any major federal action significantly affecting the natural or human environment prior to making a decision or taking action. BOEM is the lead Federal agency for NEPA compliance for renewable energy and alternate use activities on the Outer Continental Shelf. BOEM prepares a NEPA document, such as an Environmental Analysis or EIS, for the major stages of development planning for these activities. As a result BOEM is coordinating with government entities and engaging stakeholders throughout the planning process.

Numerous Federal departments and agencies have authority to govern and maintain ocean resources pursuant to other Federal laws. To implement its responsibilities under the OCSLA, BOEM must coordinate with these entities, which include but are not limited to the National Ocean and Atmospheric Administration, the U.S. Coast Guard, the U.S. Environmental Protection Agency, the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, the U.S. Army Corps of Engineers, the Federal Aviation Administration, the U.S. Geological Survey, the Federal Energy Regulatory Commission, and the Department of Defense, as well as state, local, and tribal governments (U.S. DOI/MMS 2007).

In particular several Federal laws establish specific consultation and coordination requirements with Federal, State, and local agencies independent of the NEPA process. As required for lease issuance or plan approval, BOEM will undertake formal consultation with the following agencies regarding relevant legislation:

Endangered Species Act Section 7 with NOAA and the U.S. Fish and Wildlife Service
MSA (Essential Fish Habitat) with the National Marine Fisheries Service
Coastal Zone Management Act Federal consistency determination with affected state CZM program and NOAA Office of Ocean and Coastal Resource Management
National Historic Preservation Act (Section 106) with the National Park Service, Advisory Council on Historic Preservation, and State Historic Preservation Office
National Marine Sanctuaries Act with NOAA Office of National Marine Sanctuaries
Marine Mammal Protection Act with the National Marine Fisheries Service and U.S. Fish and Wildlife Service

(U.S. DOI/MMS 2007).

8.3.3 Coastal and marine spatial planning

Executive Order 13547 issued in 2010 established a National Policy for the Stewardship of the Ocean, Coasts, and Great Lakes. The Executive Order directs Federal agencies to implement the Final Recommendations of the Interagency Ocean Policy Task Force. Among those recommendations was to establish a National Ocean Council (NOC) to strengthen ocean governance and coordination and to develop a framework for coastal and marine spatial planning (CMSP). The NOC comprises more than 25 Federal agencies and offices with responsibility for activities in the oceans, coasts, and Great Lakes. Overall the NOC will provide overarching guidance to implement the National Ocean Policy (NOP). Among many responsibilities associated with nine priority objectives, the NOC will coordinate and facilitate the regional development and implementation of CMSP (CEQ 2010).

The Task Force defines coastal and marine spatial planning as a comprehensive, adaptive, integrated, ecosystem-based, and transparent spatial planning process, based on sound science, for analyzing current and anticipated uses of ocean, coastal, and Great Lakes areas. Coastal and marine spatial planning identifies areas most suitable for various types or classes of activities in order to reduce conflicts among uses, reduce environmental impacts, facilitate compatible uses, and preserve critical ecosystem services to meet economic, environmental, security, and social objectives. In practical terms, CMSP provides a public policy process for society to better determine how the ocean, coasts, and Great Lakes can be sustainably used and protected – now and for future generations (CEQ 2010).

In January 2012, the NOC released the Draft National Ocean Policy Implementation Plan which describes specific initial actions the Federal Government will take to pursue the nine priority objectives on the National Ocean Policy, one of which is CMSP. This plan identifies nine regional planning areas for the nation's coasts and oceans. These planning areas encompass the entire U.S. EEZ and continental shelf. The NOC will work with the states and Federally-recognized tribes to create corresponding regional planning bodies. These regional planning bodies, consisting of Federal, state, local, and tribal representatives, will cooperatively develop regional CMS plans within 3 to 5 years of their establishment. These plans will address regional objectives as well as national objectives of (1) preserving and enhancing opportunities for sustainable ocean use through the promotion of regulatory efficiency, consistency, and transparency, as well as improved coordination across Federal agencies, and (2) reduce cumulative impacts on environmentally sensitive resources and habitats in ocean, coastal, and Great Lakes waters. The NOC will guide and certify the development of these regional CMS plans (CEQ 2010).

Effective implementation of the NOP and related conflict avoidance requires extensive collaboration among Federal agencies, state, tribal, and local authorities, regional governance structures, academic institutions, nongovernmental organizations, recreational interests, private enterprise, and public citizens. The NOC will engage these entities through the NOC's Governance Coordinating Committee, the Ocean Research and Resources Advisory Panel, workshops, and other means. In addition stakeholder and public participation will be sought through a variety of mechanisms including workshops, town halls, public hearings, public comment process, and other means (CEQ 2010). Overall the National Ocean Policy priority objectives, including the CMSP framework, do not supersede existing regulatory authority. These objectives serve to inform the regional decision making process, but do not control the outcome.

If regional planning body members disagree during development or modification of CMS plans or in the interpretation of NOC-certified CMS Plans, the CMSP process provides for conflict resolution. The NOC, together with the Governance Coordinating Committee, will develop this process with a structure to ensure that a majority of disputes would be resolved at the regional level. If resolution at the regional level is not possible, the regional planning body would elevate the issue to the NOC for resolution. Disputes between Federal and non-Federal members would be resolved by the NOC. A dispute that concerns an agency's actions under its statutory authority would be resolved through procedures under that authority or other relevant authorities, such as the Administrative Procedure Act. Disputes that cannot be resolved by the NOC would be referred to the Co-Chairs of the NOC for decision; if consensus still cannot be reached, the President will have the final decision (CEQ 2010).

One example of an action that can influence CMSP is the designation of marine protected areas or other types of areas that create restrictions on fishing effort for conservation purposes. The United Kingdom has explored the concept of co-locating offshore energy (specifically wind energy projects) and marine conservation zones, and while the idea is still in the discussion phase, an analysis of the advantages and disadvantages has been described in *Benefits and disadvantages of Co-locating windfarms and marine conservation zones* (Blyth-Skyrme 2011).

By co-locating these conservation areas with the development of offshore renewable energy projects, the footprint of affected fishing grounds would presumably be less than the area affected by two separate projects. In addition to minimizing the footprint of reduced fishing pressure, the selection of these co-located projects would ideally be based upon the likelihood that the closure (and perhaps the new habitat created by the renewable energy infrastructure) would also have benefits in terms of protecting and/or rebuilding stocks of commercially significant species.

Offshore renewable projects might not be appropriate for conservation areas depending on the objectives of the conservation areas and the impacts of the renewable energy projects. If projects were co-located with conservation areas, monitoring would be needed to make sure that the infrastructure does not create new habitat for non-native species.

As the development of a geospatial database for this study made clear, data that are critical for successful and useful mapping of ocean uses vary in quality and coverage across regions and use categories. The data limitations inherent in two-dimensional maps make them insufficient as tools that can by themselves drive the identification of potential development areas (e.g., while shipping information in a particular region might be comprehensive and accurate, the same might not be true for commercial fishing). Maps should be viewed as tools that can facilitate the more deliberate stakeholder engagement process that all study participants agree is warranted.

Stakeholders want to be informed and engaged, and to have their knowledge and perspectives of the ocean place recognized. This is true in general but especially true because initial/existing geospatial data might be available and accurate for some groups (shipping) but not for others (fishing, recreation). Therefore, after initial mapping and characterization based on research of a specific lease area, user communities should have the opportunity to review the aggregated data for ground-truthing and additional observations.

Implementation authority

As the lead government entity for coastal and marine spatial planning in the United States, the National Ocean Council (NOC) has authority to coordinate and facilitate the regional development and implementation of CMSP (CEQ 2010 and Executive Order No. 13547, 75 Fed. Reg. 43023 (July 22, 2010), Stewardship of the Ocean, Our Coasts, and the Great Lakes).

8.3.4 Spatial analysis

Compiling and displaying spatial information on human uses of the ocean (including management and regulatory bounds), biological and ecological dimensions of species and/or communities, and oceanographic and physical environmental features provides an understanding of existing patterns of usage and of areas of high environmental or economic value.

Spatially-explicit data come from government sources, stakeholder knowledge, and scientific investigations. In some cases, such data will have been collected and collated as part of a state or regional coastal and marine spatial planning initiative (see above) or a more limited exercise by government to evaluate opportunities and constraints for a proposed use of the ocean. Several efforts are underway to make ocean data available to the public, such as (1) the Multipurpose Marine Cadastre developed by BOEM and NOAA to provide users with spatial data on topics such as human uses, ecological resources, and jurisdictions; and (2) the National Ocean Council's ocean data portal which offers users access to data as well as decision support tools.

Having this understanding of the existing spatial conditions is a fundamental step to mitigating conflict. It provides the basis for siting new development or activities so as to avoid, or at least minimize conflict with other uses or resources.

Although substantial historical data are available, for example historical fishing data as included in the geodatabase compiled for this study, it is essential for participants to understand the limitations as well. Catalogued uses may not be spatially resolved at the level necessary to understand impacts of a particular offshore renewable energy facility and/or may shift over time. As such, maps should be viewed as tools that can facilitate the more deliberate stakeholder engagement process that all study participants agree is warranted.

Implementation authority

BOEM, pursuant to the authority granted by the Energy Policy Act of 2005 (Pub. L. 109-58, 119 Stat 594 (2005), 42 U.S.C. 15801 et seq.) and the National Environmental Policy Act of 1969 (Pub. L. 91-190, 83 Stat. 852 (1970), 42 U.S.C. 4321 et seq.), and consistent with the 2009 Final Rule on Renewable Energy and Alternate Uses of Existing Facilities on the Outer Continental Shelf (30 C.F.R. § 250, 285, and 290), as well as other government entities and private development interests have the authority to implement this mitigation strategy. As part of the required NEPA process, BOEM will compile spatially-explicit data on human uses of the ocean (including management and regulatory bounds), biological and ecological dimensions of species and/or communities, and oceanographic and physical environmental features.

8.3.5 Impact minimization through design/construction

The design and construction of offshore renewable energy projects can be accomplished in ways that will minimize disruption to other ocean users. For example, some have advocated that offshore wind projects plan the spacing of turbines to either allow boats to pass safely between the structures, or to minimize the footprint of the affected area to reduce the size of any exclusion zone. Such design changes can help improve vessel safety, minimize loss of habitat and marine resources, and reduce inconveniences in other ocean use sectors.

In addition to design considerations, the actual construction activities related to the development, maintenance, and decommissioning of projects can be undertaken so as to minimize impacts. For example; scheduling construction for times when fisheries or ferries are inactive; working to reduce the amount of time needed to construct a project (in cases where uses within the project would be permitted post-construction); using innovative technologies to reduce impacts to resources and habitats (e.g., bubble curtains to minimize noise impacts); and working outside of known breeding seasons for target commercial fish species (if applicable) and migration and reproduction seasons for whales (OSPAR 2006).

Given that the presence of whales is key to whale watching activities, it is important not to commence or increase siting or construction practices while whales are known to be in the immediate area of activity. While whales cannot be physically prevented from entering the siting or construction area, a 500-meter radius exclusion zone can be established for observation and safety purposes (JNCC 2009, MMS 2009). This exclusion zone should be centered over the piling/construction site or seismic survey source vessel. A qualified observer should monitor visually and/or acoustically for whales for 30 minutes prior to commencement of pile driving or the ramp up to a seismic survey. If a whale is sited before the pile driving or ramp up begins, these activities are delayed until the whale moves out of the exclusion zone or until at least an additional 30 minutes after the last whale was observed. Survey and construction activities are also delayed during periods of low visibility due to poor light, fog, or rough sea conditions until the exclusion zone is visible for the full 30-minute monitoring period. Monitoring of the exclusion zone will continue during the pile driving or seismic survey, and also for 30 minutes after these activities are completed (JNCC 2009, MMS 2009).

Despite other important temporal mitigation measures, it is likely some whales will be exposed to harmful noise levels. Best technology should be employed to minimize the noise created by seismic surveys and pile driving. By minimizing the noise generated by these activities at the source, the noise mitigation will be more effective over a wider geographical area and therefore beneficial to more whales (OSPAR 2006). Technology options for noise mitigation include the use of bubble curtains, complaint surface treatments, or cofferdams during pile driving (Stokes et al. 2010, Wursig et al. 2000) and the use of lower impact seismic tools such as boomer and chirp devices for sub-bottom profiling.

Implementation authority
BOEM and other government agencies share the authority to implement this mitigation strategy. The specific agencies in each instance will depend on the location of and the uses affected by the project in question. BOEM has authority pursuant to the authority granted by the Energy Policy Act of 2005 (Pub. L. 109-58, 119 Stat 594 (2005), 42 U.S.C. 15801 et seq.) and the National Environmental Policy Act of 1969 (Pub. L. 91-190, 83 Stat. 852 (1970), 42 U.S.C. 4321 et seq.), and consistent with the 2009 Final Rule on Renewable Energy and Alternate Uses of Existing Facilities on the Outer Continental Shelf (30 C.F.R. § 250, 285, and 290). NMFS and the U.S. Fish and Wildlife Service have authority under the Marine Mammal Protection Act, Pub. L. 92-522, 86 Stat. 1027 (1972), 16 U.S.C. 1361 *et seq*. and under the Endangered Species Act (ESA), Pub. L. 93–205, 87 Stat. 884 (1973), 16 U.S.C. §1531 *et seq*. Section 7 consultation requirements.

8.3.6 Environmental assessments

Given that relatively few offshore renewable energy projects are in operation in the United States, there is a great deal of uncertainty as to what the actual, long-term effects of these projects will be. Frequent assessment efforts will, therefore, be an important part of any permit issued for offshore renewable energy projects.

Commercial Fisheries

Environmental assessments can potentially yield a tremendous amount of fisheries-related information. Of particular interest might be a project's capacity to function as an artificial reef, and the associated impacts; the effects of excluding or limiting fishing access within the vicinity of a project; changes in the water column due to noise and vibrations; and colonization by non-native species.

Cables

Submarine transmission cables used to carry electricity from an offshore renewable energy facility to a shore-based substation produce magnetic fields surrounding the cable. It is standard industry practice to shield such cables in construction to effectively block electric field emissions produced by the conductors; however, electromagnetic field (EMF) emissions are not blocked by such construction and the oscillating magnetic field also creates an electric field (RI CRMC 2010).

EMF is detectable by fish, sharks, rays, and some invertebrate species and may affect navigation and prey location. Individual organisms may be attracted to or avoid cables due to EMF; however, the potential population-level effect on fish and invertebrate species from such EMF-related behavior is unknown.

The following are among the conclusions of recent EMF research conducted for BOEM (Normandeau et al. 2011):

Modeling anticipated EMFs from power cables is easy given the availability of specific information regarding cable design, burial depth and layout, magnetic permeability of the sheathing, and electrical loading.
Electrosensitive species will likely be able to detect EMFs from both DC and AC cables, but with high sensitivity to DC cables, while species with magnetosensitivity are more likely to be able to detect EMFs from DC cables.
Modeling indicates that EMFs from undersea power cables have limited spatial impact, which would reduce the risk of exposure for any particular organism.

Given the potential detrimental impact of EMF and the uncertainty about how marine species will respond to EMF over time, avoiding the siting of offshore renewable energy facilities in the areas of essential fish habitats and high-use fishing areas is generally preferred.

Research

In the event that an offshore renewable energy project affects an ongoing or planned research or monitoring effort, there may be opportunities to collaborate with those conducting the environmental assessment in order to obtain some additional information pertinent to the research/monitoring effort.

Implementation authority

Pursuant to the authority granted by the Energy Policy Act of 2005 (Pub. L. 109-58, 119 Stat 594 (2005), 42 U.S.C. 15801 et seq.) and the National Environmental Policy Act of 1969 (Pub. L. 91-190, 83 Stat. 852 (1970), 42 U.S.C. 4321 et seq.), and consistent with the 2009 Final Rule on

Renewable Energy and Alternate Uses of Existing Facilities on the Outer Continental Shelf (30 C.F.R. § 250, 285, and 290), BOEM has the authority to implement this mitigation strategy through the compilation of spatially-explicit data on human uses of the ocean (including management and regulatory bounds), biological and ecological dimensions of species and/or communities, and oceanographic and physical environmental features.

8.3.7 Mitigation funds and subsidies for affected users

The appropriateness of any financial mitigation option will vary among regions and user groups, though it is worth noting that this study documented a commonly held view across regions and user groups that financial compensation is among the least preferred mitigation options. Mitigation funds are most commonly established and managed by a government entity, with funding from the users whose activities give rise to the need for mitigation. For example, the Federal Fishermen's Contingency Fund (FCF), a revolving fund seeded by assessments on oil and gas interests, was established in 1978 by an amendment to the Outer Continental Shelf Lands Act and compensates fishermen for property and economic loss caused by obstructions related to oil and gas development activities on the OCS. NMFS processes FCF claims, while BOEM coordinates communications with OCS lease holders. (See http://www.gomr.boemre.gov/homepg/regulate/regs/laws/fcf.html for more information.)

At a more local level, agreements between undersea fiber optic cable companies and Oregon fishermen (organized as the Oregon Fishermen's Cable Committee) both release participating fishermen from any possible civil liability for "ordinary negligence to a fiber optic cable company" and provide immediate compensation for gear that is sacrificed when it becomes snagged on a cable (see Section 6.2.2). Similarly, Santa Barbara County (CA) created a Local Fishermen's Contingency Fund (for gear loss compensation) and a separate Fisheries Enhancement Fund using mitigation fees collected from specific offshore oil and gas projects. The Enhancement fund has led to the implementation of projects such as the publication of fisheries-related newsletters, the purchase and installation of shared equipment in the harbor (e.g., ice machine, a fish hoist, equipment to retrieve snagged gear), start-up costs for a fishermen's market, feasibility studies for replenishing local stocks, and reimbursement for safety gear (County of Santa Barbara 1998, 2008). The Enhancement Fund's website (http://www.countyofsb.org/energy/mitigation/fef.asp) provides a complete list of projects.

Using this model, BOEM might seek to establish a dedicated fund to help mitigate the various impacts from offshore renewable energy. Other forms of potential financial mitigation, drawn from both the literature and this study's research, include the following.

Purchase/subsidize fuel for affected fishing industry

Renewable energy projects may displace fisheries operations, requiring them to go around developments or steam to fishing grounds further away – both of which can cause fuel consumption to rise. As fuel consumption rises, so does the amount of money spent on fuel. A mechanism to offset the cost of fuel would help relieve some of that new financial pressure. While a fuel subsidy is one option, it alone is inconsistent with the ideas promoting renewable energy development. To remedy this inconsistency, fuel subsidies could be combined with mitigation strategies to reduce the carbon footprint of fishing. For example, since fishing consumes large quantities of diesel fuel, fuel subsidies could be combined with subsidized conversion to biodiesel or more energy-efficient engines. Conversion might be possible not only for the fishing vessels but also for harbor-based service vessels. The installation of electronic fuel meters can also help to find the most energy efficient speeds at which to operate.

Improve vessel safety

Safety is a significant concern for fishing operations, and safety concerns will increase with the development of offshore renewable energy. Low interest loans or grants could be made available to the fleets for the specific purchase of additional or upgraded safety gear (e.g., life rafts, flares, lifejackets, radar) or for vessel safety training programs, as appropriate.

Support development and purchase of new fishing gear to be used within a renewable energy project area

If fishing is permitted in the vicinity of offshore renewable energy projects, some activities may need to be modified for safe and effective operation. Examples include shortening pot strings or using smaller towed nets. Some modifications in gear would be costly, and could be subsidized with mitigation funds. Additionally, financial assistance could be provided to design and test new gear. Gear modifications/development should occur in close coordination with fishermen who may have reservations about using some gear types in close proximity to offshore renewable energy projects.

Support vessel maintenance costs

Maintaining vessels for safe and efficient use can be costly to vessel owners, and is required by all active fishing boats. Using mitigation funds to support the maintenance of these vessels might not only reduce expenses of boat owners, but also increase boats' capacities to safely maneuver in the vicinity of the offshore renewable energy projects. Maintenance support will also benefit the industries responsible for maintaining the fleets.

Cover increases in insurance costs

In the event that vessels are allowed to operate in the vicinity of offshore renewable energy developments, there is a chance that their insurance premiums would rise, given the increased risk. Funds could be used to help off-set any increased insurance costs. Two U.K.-based marine insurance companies were contacted during the development of the report "Options and Opportunities for Marine Fisheries Mitigation Associated with Windfarms" regarding the likelihood of increasing insurance premiums. Both companies stated that they did not have plans underway to increase premiums, though they recognized that risks and exposure would be better understood as more information became available (Blyth-Skyrme 2011).

Enhance fishery marketability/competitiveness

The increasing consumer interest in sustainable fisheries presents an opportunity for fisheries to seek a sustainability certification such as that offered by the Marine Stewardship Council (http://www.msc.org/). Mitigation funds could be used to help fishermen organize for the sake of applying for certification. Similarly, mitigation funds could be used to assist with marketing of seafood coming from affected areas. This could range from hiring an outside entity to develop and implement marketing strategies, to funding the development of a marketing cooperative where fishermen could work together to promote their product as being, for example, unique, sustainable, and/or local (e.g., the American Albacore Fishermen's Association).

Another strategy to improve the marketability of fisheries is the idea of enlisting assistance to address some of the foreign trade arrangements (e.g., 25 percent shrimp tariff in Europe and Whiting Treaty in Canada) to make fisheries more profitable.

Support transition into jobs in other sectors related to renewable energy
While renewable energy projects may displace existing uses of the marine environment, they may also open doors to new opportunities for fishermen. Some examples include research, repair, construction, enforcement, monitoring, and guarding. Mitigation funds could be used to help fishermen transition into these new positions through the development of training programs and the provision of gear needed to support their new role(s).

Support adaption to take advantage of tourism and recreation opportunities
Displaced fishermen might have some of the skills and equipment needed to make transitions into other sectors of the marine economy that benefit from the introduction of offshore renewable energy projects. Examples of such new industries might include sight-seeing (offshore wind energy projects have been viewed as attractions), charter fishing, and SCUBA diving excursions. Such opportunities will depend on the location of the project and the limits on activities permitted within the vicinity of the projects.

Support training for new fisheries opportunities
If fishing in and/or around an offshore renewable development is prohibited/limited/impaired due to an offshore renewable energy project, it may be possible to provide fishermen with training and gear to transition into a new or different fishery. Specific training might include apprenticeships, product-quality training, best practices for the on-board handling of catch, and peer-to-peer networks to facilitate the exchange of information. Expansion into new fisheries could include targeting other wild species as well as becoming involved in aquaculture activities, given the potential opportunities to take advantage of offshore renewable energy infrastructure to establish shellfish and finfish aquaculture operations, or even the culture of algae. Some evaluation of the potential to adapt longline aquaculture (blue mussels, oysters, and seaweed) for use in wind energy project areas within the open waters of the German Bight has occurred (Buck et al. 2004), though large scale aquaculture activities co-located with renewable energy projects do not appear to exist yet.

Engage in a fishery buy-out program
The idea of a buy-out program is most commonly used to reduce fishing effort in specific fisheries such as the Alaskan crab fishery and the groundfishery in Morro Bay. Buy-outs have also been used to compensate fishermen displaced by the establishment of Marine Protected Areas in Australia (MPA News 2006). This concept may have applications in terms of compensating fishermen displaced by offshore renewable energy projects. Some fishermen noted that the amount of money needed to truly compensate fishermen for the losses felt in the short-term as well as the long-term would be higher than what they believe they would actually be paid. Fishermen also noted that fairness will be difficult to achieve in a direct buy-out situation.

Implementation authority

Pursuant to the authority granted by the Energy Policy Act of 2005 (Pub. L. 109-58, 119 Stat 594 (2005), 42 U.S.C. 15801 et seq.) and the National Environmental Policy Act of 1969 (Pub. L. 91-190, 83 Stat. 852 (1970), 42 U.S.C. 4321 et seq.), and consistent with the 2009 Final Rule on Renewable Energy and Alternate Uses of Existing Facilities on the Outer Continental Shelf (30 C.F.R. § 250, 285, and 290), BOEM has the authority to issue leases for renewable energy projects on the OCS. As the lease issuer, BOEM has the authority to include in the lease any relevant conditions, such as the establishment of a mitigation fund, that are negotiated between the developer and other entities, including state government and fishermen’s organizations. BOEM does not have to manage the mitigation fund, but it does have the authority to include this negotiated condition in the lease with the developer. As noted above, NOAA administers the Fishermen’s Contingency Fund to compensate U.S. commercial fishermen and other eligible individuals and entities for property and economic loss caused by obstructions related to OCS oil and gas activities. This fund does not currently cover loss caused by obstructions related to renewable and alternate energy activities; however, the legislation could be expanded to include this type of loss.

8.3.8 On and off-site stock enhancement

Stock enhancement activities can include those intended to mitigate (1) impacts at the site of the renewable energy project and (2) impacts in other locations accessible to fishermen (e.g., crowding due to displacement of fishermen).

Stock enhancement activities might include looking to the design and placement of wind turbine bases and scouring material to promote their function as artificial reefs; laying cultch strategically to create new habitat; and using mitigation funds to conduct propagation activities and/or fund a program to pay fishermen to release large broodstock animals. Such activities could be designed to conduct on-site enhancement related to fisheries that were allowed to operate amidst the renewable energy infrastructure. Additionally, on-site stock enhancement activities could be conducted to take advantage of any reduction of fishing pressure within the renewable energy project. Off-site stock enhancement could be a way to support the movement of displaced fishermen into a new fishery.

The concept of designing infrastructure to serve as artificial reefs has received some push back in that safety, performance, and cost-effectiveness all influence the design of the offshore renewable energy infrastructure and cannot be compromised for the sake of creating artificial reefs. Artificial reefs also create new habitat for non-native species, which leads to debates about whether or not artificial structures should be used to attract target species or enhance the overall fisheries production. Additionally, many of these enhancement opportunities could require additional permits and research.

Research is underway to better understand the success and effects of artificial reefs, though some have cautioned that if reefs are successfully used to attract target species for harvest on-site, additional management measures should be considered in order to address the potential increase in fishing pressure (Blythe-Skyrme 2011).

Implementation authority
NMFS and the U.S. Fish and Wildlife Service have primary authority to implement this mitigation strategy. NMFS' authority is pursuant to the MSA (Pub. L. 94-265, 90 Stat. 331 (1976), 16 U.S.C. 1801 et seq.) NMFS consults with the Regional Fishery Management Council in the relevant geographic area to implement this strategy and establish quotas for a particular fishery. The U.S. Fish and Wildlife Service has authority under the Federal Aid in Fish Restoration Act (Pub. L., Stat. (1950), Pub. L. 98-369, 64 Stat. 430, 16 U.S.C. 777 et seq.).

8.3.9 Research

The BOEM Environmental Studies Program, as well as the Bureau of Safety and Environmental Enforcement's (BSEE) Technology Assessment and Research program, sponsor millions of dollars' worth of research each year to address mission-relevant questions. The results of these studies directly inform project-related environmental assessments and contribute to the agency's understanding of actual or potential project impacts. In addition, BOEM partners with NOAA, the U.S. Department of Energy and other Federal agencies to conduct research intended to advance the development of offshore renewable energy.

To the extent it addresses issues that are outside the current scope of BOEM's and other agencies' offshore renewable energy-related research agendas, financial or other support for research activities might be warranted as an indirect mitigation strategy. Examples in the fisheries context include better understanding how to prevent parasites in aquaculture efforts, identifying causes of decline in certain target species not affected by offshore renewable energy projects, and understanding the impacts of certain harvesting technologies with an eye toward reducing those impacts through technological innovations. Results from such research opportunities could enhance fishing in sectors that absorb any displaced fishing effort that might result from the construction of offshore renewable energy facilities.

In addition to producing useful science, research activities may also present opportunities to engage displaced fishermen who possess skills useful in ocean-based research (e.g., familiarity with fishing gear, ability to safely navigate a vessel, etc.).

Implementation authority
Pursuant to the authority granted by the Energy Policy Act of 2005 (Pub. L. 109-58, 119 Stat 594 (2005), 42 U.S.C. 15801 et seq.) and the National Environmental Policy Act of 1969 (Pub. L. 91-190, 83 Stat. 852 (1970), 42 U.S.C. 4321 et seq.), and consistent with the 2009 Final Rule on Renewable Energy and Alternate Uses of Existing Facilities on the Outer Continental Shelf (30 C.F.R. § 250, 285, and 290), BOEM has the authority to implement this mitigation strategy, along with NOAA and its other Federal partners, in their capacity as sponsors and managers of relevant research.

8.3.10 Facilities improvements

In situations where ports are modified to support offshore renewable energy development, opportunities may exist to make port modifications (for example, with mitigation funds, but also with external funding) that also support other ocean users (e.g., new dockage, dredging projects, repair facilities, gear/fuel storage). Consideration should also be given to enhancing facilities not directly connected to the operation of offshore renewable energy development – especially if the renewable energy industry pushes other ocean users out of an existing port.

Implementation authority

Pursuant to the authority granted by EPAct and NEPA, and consistent with the 2009 Final Rule on Renewable Energy and Alternate Uses of Existing Facilities on the Outer Continental Shelf, BOEM has the authority to issue leases for renewable energy projects on the OCS. As the lease issuer, BOEM has the authority to include in the lease any relevant conditions, such as the establishment of a mitigation fund, that are negotiated between the developer and other entities, including state government and fishermen's organizations. BOEM does not have to manage the mitigation fund, but it does have the authority to include this negotiated condition in the lease with the developer.

8.3.11 Fishing effort increases

If fishermen are displaced or significantly inconvenienced by the development of an offshore renewable energy project (e.g., being required to increase their travel time to fishing grounds in order to avoid a project area), they may benefit from increasing a quota or extending the season to provide a way to financially justify the extra effort needed to fish. These mitigation measures should take into consideration the sustainability implications of additional fishing pressure. Additionally, a change in quotas may create some divisiveness in the affected fisheries depending on how the quotas are allocated.

Implementation authority

NMFS has primary authority to implement this mitigation strategy in its capacity to assess and predict the status of fish stocks, ensure compliance with fisheries regulations, and work to reduce inefficient fishing practices under the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (Pub. L. 94-265, 90 Stat. 331 (1976), 16 U.S.C. 1801 *et seq*.). NMFS consults with the Regional Fishery Management Council in the relevant geographic area to implement this strategy and establish quotas for a particular fishery.

8.3.12 Fishing area re-opening

Fishermen express concern about being crowded into other areas of the ocean where they might experience increased competition for space and fish. Some fishermen mentioned that they would be interested in having displaced areas off-set by opening previously closed areas. It might be possible to use mitigation money to study closed areas in the context of re-opening them.

Implementation authority

NMFS has primary authority to implement this mitigation strategy in its capacity to assess and predict the status of fish stocks, ensure compliance with fisheries regulations, and work to reduce inefficient fishing practices under the MSA. NMFS consults with the Regional Fishery Management Council in the relevant geographic area to implement this strategy.

8.3.13 Fishing ground access restrictions for public

In the United Kingdom, fisheries management tools exist whereby the public's right to shellfish is removed (known as "Several and Regulating Orders"). These "Orders" give a specific group of fishermen the right to fish in an area, while prohibiting others (including the public) from fishing at that location (Blyth-Skyrme 2011). It is believed that such Orders can increase the sustainability of certain fisheries, and as a mitigation tool can also limit the number of vessels allowed in the vicinity of a renewable energy project, which would have safety implications as well.

Orders could be time-limited to the duration of a renewable energy project (in the United Kingdom, they can be issued for up to 60 years).

Implementation authority

NMFS has primary authority to implement this mitigation strategy in its capacity to assess and predict the status of fish stocks, ensure compliance with fisheries regulations, and work to reduce inefficient fishing practices under the MSA. NMFS consults with the Regional Fishery Management Council in the relevant geographic area to implement this strategy.

8.3.14 Access allowed within facility area

If an offshore energy facility is sited in an area of high commercial and recreational use, it may be feasible to permit access to vessels of a suitable size, draft, and use.

For example, at Nysted Wind Farm located offshore of Denmark regulations permit sailing through the wind farm. Anchoring, however, is not permitted due to the presence of transmission cables on the seabed. Similarly docking at the turbines or transformer platform is not permitted due to safety concerns. Red/green markings on the turbine indicate a suggested diagonal sailing route through the wind farm (http://www.dongenergy.com/Nysted/EN/Pages/index.aspx).

Some members of the commercial shipping industry advocate that the passage through a wind energy project would require two shipping lanes for vessels travelling in opposite directions, and that each lane would need to be 1 1/2 to 2 miles wide. Also, it was mentioned that pilots might operate ships within wind energy projects.

Implementation authority

The U.S. Coast Guard has primary authority to implement this mitigation strategy under the Ports and Waterways Safety Act (PWSA) of 1972 (Pub. L. 92-340, 86 Stat. 424, 33 U.S.C. §§ 1221 et seq.) and the Navigation and Vessel Inspection Circular No. 02-07 (U.S. Coast Guard 2007). The U.S. Coast Guard also would coordinate with BOEM on this issue.

8.3.15 Waterways safety assessment

The U.S. Coast Guard established the ports and waterways safety assessment (PAWSA) process to address waterway user needs and place a greater emphasis on partnerships with industry. The process involves convening a group of waterway users and stakeholders and conducting a structured workshop to elicit their opinions. The process represents a significant part of joint public-private sector risk mitigation planning. The U.S. Coast Guard uses this input to establish or relocate aids to navigation, adjust vessel traffic service (VTS) reporting requirements, and implement regulatory changes.

The primary objectives are:

Improve coordination and cooperation between government and the private sector by involving stakeholders in decisions affecting them

Develop and strengthen harbor safety committees

Support U.S. Coast Guard responsibilities in waterways management and environmental stewardship

Provide input for projects related to aids to navigation, regulations, or other risk mitigation measures, including potential vessel traffic management projects

Another option is to conduct a Port Access Route Study (PARS). Through the port access route study process, the U.S. Coast Guard consults with affected Native American tribes as well as Federal, State, and foreign state agencies (as appropriate) and considers the views of maritime community representatives, environmental groups, and other interested stakeholders.

The objectives are:

Determine present and potential traffic densities

Evaluate existing vessel routing measures

Justify new vessel routing measures and their type

Determine any mandatory vessel routing measures for specific classes of vessels

This process helps to ensure, to the extent practicable, that the need for safe access routes is reconciled with other reasonable waterway uses. In addition to aiding the U.S. Coast Guard to establish new fairways or adjust existing ones, the process may be used to determine and justify safety zones, security zones, recommended routes and other routing measures, and to create regulated navigation areas.

Port access route studies continue to identify critical changes in maritime traffic volumes or routes, and allow the U.S. Coast Guard to implement sound vessel routing measures to ensure safe passage in the off-shore approaches to our nation's ports and harbors. One example of a PARS is that of the Atlantic Coast from Maine to Florida (Federal Register Vol. 76, No. 91). In May 2011, the Department of Homeland Security announced the intention to undertake a PARS along the eastern seaboard of the United States. The U.S. Coast Guard's Atlantic Area Command is conducting the study in coordination with Coast Guard Headquarters and the district offices situated along the East coast. The goal of the Atlantic Coast PARS is to enhance navigational safety by examining existing shipping routes and waterway uses, and, to the extent practicable, reconciling the paramount right of navigation within designated port access routes with other reasonable waterway uses such as the leasing of Outer Continental Shelf blocks for the construction and operation of offshore renewable energy facilities.

The two primary driving forces of the Atlantic PARS study were the need to address navigational safety concerns related to the initiatives to develop wind energy on a large scale along the Atlantic Coast, and the Coastal and Marine Spatial Planning initiative to identify areas most suitable for various types or classes of activities in order to reduce conflicts among uses, reduce environmental impacts, facilitate compatible uses, and preserve critical ecosystems.

The study is focused on the coastwise shipping routes and near coastal users of the Western Atlantic Ocean between the coastal ports, and the approaches to coastal ports. As part of this study, vessel traffic density, fishing vessel information, and government and stakeholder experience in vessel traffic management, navigation, ship handling, and effects of weather will be analyzed. The study is an attempt to identify all current and new users of the Western Atlantic near coastal zone, and help the U.S. Coast Guard determine what impact, if any, the siting, construction and operation of proposed alternative energy facilities may have on existing near-coastal users of the Western Atlantic Ocean. The U.S. Coast Guard will then evaluate whether a routing system or changes to routing measures are needed to preserve navigational safety.

Implementation authority

The U.S. Coast Guard is required to initiate and manage the PAWSA workshop and therefore has primary authority to implement this mitigation strategy under the Ports and Waterways Safety Act (PWSA) of 1972 (Pub. L. 92-340, 86 Stat. 424, 33 U.S.C. §§ 1221 et seq.) and the Navigation and Vessel Inspection Circular No. 02-07 (USCG 2007). The U.S. Coast Guard however will coordinate with other relevant agencies, which may include BOEM, NOAA, Army Corps of Engineers, and others depending on the content of the safety assessment.

8.3.16 Collision risk assessment

A collision risk assessment is a method to determine navigational safety risks and includes consideration of controls that could be put in place to reduce those risks. The assessment might conclude that siting is too high risk, or that risk is acceptable with controls.

The U.S. Coast Guard takes a risk management approach to wind turbine generator (WTG), wave energy converter (WEC), and tidal energy converter (TEC) installations. This approach does not dictate specific suggestions for buffer zones or marking, but the review may well result in the imposition of measures to reduce risks.

The U.K. Department of Trade and Industry (2005), in its report "Guidance on the Assessment of the Impact of Offshore Wind Farms: Methodology for Assessing the Marine Navigational Safety Risks of Offshore Wind Farms," provides a template for developers to help prepare navigation risk assessments, and guidance for agencies in the assessment of these. The assessment requires:

A Formal Safety Assessment using numerical modeling and/or other techniques of risk assessment

Estimating a "base case" level of risk based on existing densities and types of traffic and the local marine environment

Predicting a "future case" level of risk based on expected growth in future densities and types of traffic

Production of a "hazard log" listing the hazards caused or changed by the introduction of the offshore renewable energy facility, the risk associated with the hazard, the controls put in place and the tolerability of the residual risk

Predicting a "base case" offshore renewable energy facility level of risk based on existing densities and types of traffic with the development in place

Predicting a "future case" offshore renewable energy development level of risk based on expected growth in future densities and types of traffic

Reporting whether the risks associated with the proposed facility are "Broadly Acceptable" or "Tolerable" on the basis of "As Low As Reasonably Practicable" declarations

This advice is supplemented by guidance from the U.K. Maritime and Coastguard Agency (2008) report "Offshore Renewable Energy Installations (OREIs) - Guidance on UK Navigational Practice, Safety and Emergency Response Issues." This guidance addresses:

Site position, structures and safety zones around developments

Navigation, collision avoidance and communications

A wind farm shipping template for assessing wind farm boundary distances from shipping routes

Safety and mitigation measures recommended for installations during construction, operation, and decommissioning

Standards and procedures for generator shutdown and other operational requirements in the event of a search and rescue, counter pollution, or salvage incident in or around an installation.

The International Association of Marine Aids to Navigation and Lighthouse Authorities compiled Recommendation 0-139 (2008) addressing marking of WTG, WEC and TEC installations.

Implementation authority
The U.S. Coast Guard has primary authority to implement this mitigation strategy under the Ports and Waterways Safety Act (PWSA) of 1972 (Pub. L. 92-340, 86 Stat. 424, 33 U.S.C. §§ 1221 *et seq*.) and the Navigation and Vessel Inspection Circular No. 02-07 (USCG, 2007).

8.3.17 Vessel routing measures

A number of vessel routing measures could be required to improve the safety of navigation in areas where, among other things, freedom of vessel movement is inhibited by restrictive searoom and obstructions to navigation, for example.

The International Maritime Organization (IMO) is the international body responsible for establishing or adopting vessel routing measures for use by all ships, certain categories of ships, or ships carrying certain cargoes. The following types of measures could be employed to minimize potential conflict between offshore renewable energy and vessel traffic.

<u>Area to be avoided (ATBA):</u> a routing measure comprising an area within defined limits in which either navigation is particularly hazardous or it is exceptionally important to avoid casualties and which should be avoided by all ships, or certain classes of ships.

<u>Deep-water route</u>: a route within defined limits, which has been accurately surveyed for clearance of sea bottom, and submerged obstacles as indicated on nautical charts.

<u>Inshore traffic zone</u>: a routing measure comprising a designated area between the landward boundary of a traffic separation scheme and the adjacent coast, to be used in accordance with the provisions of Rule 10(d), as amended, of the International Regulations for Preventing Collisions

at Sea, 1972.

No Anchoring Area: a routing measure comprising an area within defined limits where anchoring is hazardous or could result in unacceptable damage to the marine environment. Anchoring in a no anchoring area should be avoided by all ships or certain classes of ships, except in case of immediate danger to the ship or the persons on board.

Precautionary area: a routing measure comprising an area within defined limits where ships must navigate with particular caution and within which the direction of traffic flow may be recommended.

Recommended route: a route of undefined width, for the convenience of ships in transit, which is often marked by centerline buoys.

Recommended track: a route which has been specifically examined to ensure, so far as possible, that it is free of dangers and along which ships are advised to navigate.

Regulated Navigation Area (RNA): a water area within a defined boundary for which regulations for vessels navigating within the area have been established under 33 CFR part 165. (Not an IMO routing measure.)

Roundabout: a routing measure comprising a separation point or circular separation zone and a circular separation zone and a circular traffic lane within defined limits. Traffic within the roundabout is separated by moving in a counterclockwise direction around the separation point or zone.

Separation Zone or separation line: a zone or line separating the traffic lanes in which ships are proceeding in opposite or nearly opposite directions; or from the adjacent sea area; or separating traffic lanes designated for particular classes of ships proceeding in the same direction.

Traffic lane: an area within defined width in which one-way traffic is established. Natural obstacles, including those forming separation zones, may constitute a boundary.

Traffic Separation Scheme: an internationally recognized vessel routing designation which separates opposing flows of vessel traffic into lanes, including a zone between lanes where traffic is to be avoided. Vessels are not required to use any designated TSS, but failure to use one, if available, would be a major factor for determining liability in the event of a collision. TSS designations are most often in international waters and proposed by the U.S. Coast Guard, but must be approved by the International Maritime Organization which is part of the United Nations.

Two-way route: a route within defined limits inside which two-way traffic is established, aimed at providing safe passage of ships through waters where navigation is difficult or dangerous.

Implementation authority

The U.S. Coast Guard and the International Maritime Organization share primary authority to implement this mitigation strategy. The U.S. Coast Guard has authority under the Ports and Waterways Safety Act (PWSA) of 1972 (Pub. L. 92-340, 86 Stat. 424, 33 U.S.C. §§ 1221 *et seq.)* and the Navigation and Vessel Inspection Circular No. 02-07 (USCG 2007). The International Maritime Organization has authority under the International Convention for the Safety of Life at Sea (IMO 1980).

8.3.18 Vessel traffic service

Similar to harbor-based practices, VTS is a shipping service operated by the U.S. Coast Guard or public/private sector consortiums. These services monitor traffic in both approach and departure lanes, as well as internal movement within harbor areas, and use radar, radio, and visual inputs to gather real time vessel traffic information and broadcast traffic advisories and summaries to assist mariners. Typically, a VTS provides active monitoring and navigational advice for vessels in particularly confined and busy waterways. There are two main types of VTS, surveilled and non-surveilled. Surveilled systems consist of one or more land-based sensors (i.e., radar, AIS, and closed circuit television sites), which output their signals to a central location where operators monitor and manage vessel traffic movement. Non-surveilled systems consist of one or more reporting points at which ships are required to report their identity, course, speed, and other data to the monitoring authority. They encompass a wide range of techniques and capabilities aimed at preventing vessel collisions, rammings, and groundings in the harbor, harbor approach and inland waterway phase of navigation. They are also designed to expedite ship movements, increase transportation system efficiency, and improve all-weather operating capability. (See http://www.navcen.uscg.gov/?pageName=vtsMain).

Implementation authority
The U.S. Coast Guard has primary authority to implement this mitigation strategy under the Ports and Waterways Safety Act (PWSA) of 1972 (Pub. L. 92-340, 86 Stat. 424, 33 U.S.C. §§ 1221 *et seq.)* and the Navigation and Vessel Inspection Circular No. 02-07 (USCG 2007).

8.3.19 Safety fairways

Offshore waters in high traffic areas can be designated as safety fairways to prohibit the placement of surface structures such as oil platforms. The Army Corps of Engineers is prohibited from issuing permits for surface structures within safety fairways, which are frequently located between a port and the entry into a Traffic Separation Scheme.

Implementation authority
The U.S. Coast Guard has primary authority to implement this mitigation strategy under the Ports and Waterways Safety Act (PWSA) of 1972 (Pub. L. 92-340, 86 Stat. 424, 33 U.S.C. §§ 1221 *et seq.)* and the Navigation and Vessel Inspection Circular No. 02-07 (USCG 2007).

8.3.20 Buffer zones around existing uses

Buffer zones could be placed around existing uses such as shipping lanes, traffic separation schemes, fishing grounds, and pipes and cables.

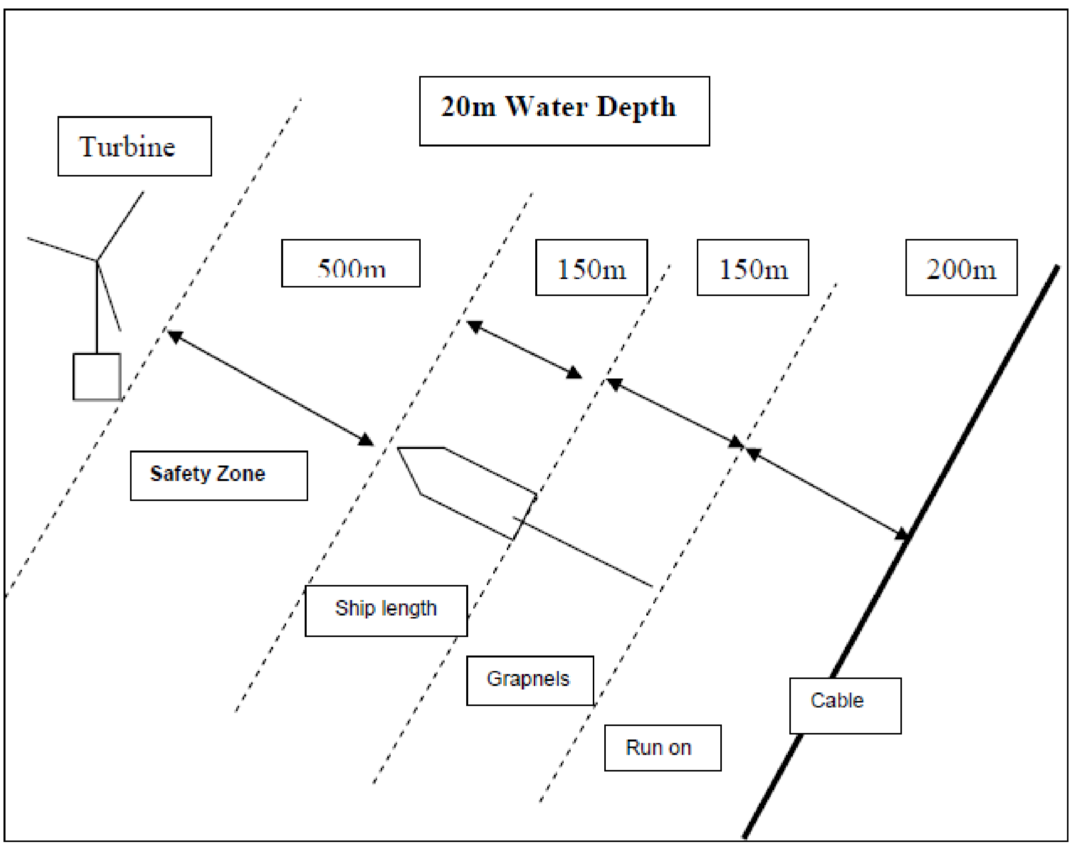
The British government is considering buffer zones around both sides of shipping lanes and traffic separation schemes. Some believe that 1 or 2 miles is an appropriate buffer size to accommodate turning. The need for a buffer will vary among traffic separation schemes; if only one ship transits each day, a buffer may not be necessary.

The siting of renewable energy facilities in proximity to existing cables may detrimentally affect the general safety and accessibility of these cables for maintenance and repair purposes. Cable repair vessels require a minimum distance from an offshore structure to safely maneuver the vessel and recover a submarine cable for maintenance or replacement (ICPC 2007b).

It is recommended that the siting of offshore renewable energy facilities relative to existing cables should allow sufficient space for such cable vessel access. Likewise, cables constructed for use by a facility should follow these same spatial separation recommendations. Project directors and cable companies together should determine these distances during the siting and construction phase. The recommended safety zone around a structure, within which cable repair vessels would not operate, is 500 meters. The distance required for a vessel to access a submarine cable will depend on the water depth, and therefore will affect the overall separation between the structure and the cable. Figure 8-1 illustrates the recommended separation distances in 20 meters of water (ICPC 2007b).

As water depth increases, the grappling rig length must likewise increase. As a result, in deeper water the total recommended distance separation between offshore structure and cable would increase.

Establishing a safety zone around an offshore renewable energy project might also be necessary. Ocean users have expressed an interest in minimizing the size of buffer areas so as to lessen the impacts on existing uses. These buffer areas and safety zones may be changed during the various phases of projects. For example, the development phase of the Barrows Offshore Windfarm in



Source: ICPC 2007b

Figure 8-1 International Cable Protection Recommended Safety Zones the Eastern Irish Sea employed a 500-meter safety zone around vessels, a 50-meter safety zone around each turbine and substation (post-construction), a 500-meter safety corridor during cable installation, and a post-construction anchorage exclusion zone (of 232 meters) (BOWind 2005). The Coast Guard also has recommended a 500-meter safety zone around traffic separation schemes, while the American Waterways Operators advocate that the buffers be expanded to 800 meters for the towing industry, which is usually pushed to the outside edges of traffic safety zones.

Buffers around other types of offshore renewable energy infrastructure might be more difficult to establish if these projects are more mobile than turbines. To that end, the U.K. Marine and Coast Guard Agency notes that safety zones around and wave energy converters and tidal energy installations will likely be more prohibitive than around wind turbines. Any such safety zone should be shown on the navigation chart (IALA 2008).

Implementation authority

BOEM and the U.S. Coast Guard share the authority to implement this mitigation strategy. BOEM has authority granted by the Energy Policy Act of 2005 (Pub. L. 109-58, 119 Stat 594 (2005), 42 U.S.C. 15801 et seq.) and the National Environmental Policy Act of 1969 (Pub. L. 91-190, 83 Stat. 852 (1970), 42 U.S.C. 4321 et seq.), and consistent with the 2009 Final Rule on Renewable Energy and Alternate Uses of Existing Facilities on the Outer Continental Shelf (30 C.F.R. § 250, 285, and 290). The U.S. Coast Guard has authority under the Ports and Waterways Safety Act (PWSA) of 1972, Pub. L. 92-340, 86 Stat. 424, 33 U.S.C. §§ 1221 et seq. and the Navigation and Vessel Inspection Circular No. 02-07 (USCG 2007).

8.3.21 Operational restrictions for navigation

In addition to creating buffers, there may be a need to enforce operational restrictions regarding the travel within and around offshore renewable energy developments. Speed restrictions and rules about overtaking and anchoring are examples of the types of restrictions that might be considered.

Implementation authority

The U.S. Coast Guard has primary authority to implement this mitigation strategy under the Ports and Waterways Safety Act (PWSA) of 1972 (Pub. L. 92-340, 86 Stat. 424, 33 U.S.C. §§ 1221 *et seq.)* and the Navigation and Vessel Inspection Circular No. 02-07 (USCG 2007).

8.3.22 Establishment of a tug of opportunity system

A tug of opportunity system accurately tracks existing tugs using Automatic Identification System (AIS) transponder technology, so they may be quickly identified to respond to a vessel in distress. An international tug of opportunity system (ITOS) was voluntarily sponsored and developed by an industry coalition in the Puget Sound area with the goal of providing U.S. and Canadian Coast Guard first responders with a tool to improve marine transportation safety in the entrance to and Strait of Juan de Fuca, waters around the San Juan Islands, Puget Sound, and adjacent waters.

Implementation authority
The U.S. Coast Guard has primary authority to implement this mitigation strategy under the Ports and Waterways Safety Act (PWSA) of 1972 (Pub. L. 92-340, 86 Stat. 424, 33 U.S.C. §§ 1221 *et seq.)* and the Navigation and Vessel Inspection Circular No. 02-07 (USCG 2007).

8.3.23 Guard ships

Consider the use of guard ships in areas of high traffic density (IALA 2008). The Northeast Gateway, Excelerate Energy's deepwater port located in Federal waters in Massachusetts Bay approximately 13 miles southwest of Gloucester waters is required to have a vessel on station at all times, to protect the loading buoy system, partly due to its proximity to shipping lanes. There have been instances of small vessels running into the tagline. Displaced fishermen may be able to help fill this guard role.

Implementation authority
The U.S. Coast Guard has primary authority to implement this mitigation strategy under the Ports and Waterways Safety Act (PWSA) of 1972 (Pub. L. 92-340, 86 Stat. 424, 33 U.S.C. §§ 1221 *et seq.)* and the Navigation and Vessel Inspection Circular No. 02-07 (USCG 2007).

8.3.24 Chart updates related to safe navigation

As changes are made to navigation, it is imperative that charts be updated to ensure safe passage in the vicinity of the offshore renewable energy projects.

Implementation authority
The U.S. Coast Guard and NOAA National Ocean Service Office of Coast Survey share primary authority to implement this mitigation strategy. The U.S. Coast Guard has authority under the Ports and Waterways Safety Act (PWSA) of 1972, Pub. L. 92-340, 86 Stat. 424, 33 U.S.C. §§ 1221 et seq. and the Navigation and Vessel Inspection Circular No. 02-07 (USCG 2007). The NOAA National Ocean Service has authority under the Coast and Geodetic Survey Act of 1947 (33 U.S.C. 883a et seq., 61 Stat. 787) and the Hydrographic Services Improvement Act of 1998 as amended (Pub. L. 105-384, 112 Stat. 3454 (1998), 33 U.S.C. 892 et seq.).

8.3.25 Voyage planning

Guidance for route planning in the vicinity of installations should take into account the:

Vessels characteristics (type, tonnage, draft, maneuverability)

Weather and sea conditions

Type of installation (wind, wave, tidal)

Markings and navigation aids associated with the installations

Effects of the installation on communication and navigation systems

Implementation authority
Private shipping companies have primary authority to voluntarily implement this mitigation strategy for vessels under their control.

8.3.26 Notices to mariners

Radio Navigational Warnings and Notices to Airmen must be promulgated in advance of and during any offshore wind farm construction (IALA 2008).

Implementation authority
The U. S. Coast Guard and NOAA share primary authority to implement this mitigation strategy. The U.S. Notice to Mariners is made available weekly by the National Geospatial-Intelligence Agency (NGA), and is prepared jointly by the NOAA National Ocean Service Office of Coast Survey (NOS), the U. S. Coast Guard, and the NGA. Local Notices to Mariners are published by the various U.S. Coast Guard districts. The U.S. Coast Guard has authority under the Ports and Waterways Safety Act (PWSA) of 1972 (Pub. L. 92-340, 86 Stat. 424, 33 U.S.C. §§ 1221 *et seq.*) and the Navigation and Vessel Inspection Circular No. 02-07 (USCG 2007). The NOAA National Ocean Service has authority under the Coast and Geodetic Survey Act of 1947 (33 U.S.C. 883a *et seq*., 61 Stat. 787) and the Hydrographic Services Improvement Act of 1998 as amended (Pub. L. 105-384, 112 Stat. 3454, *33 U.S.C.* 892 *et seq.*). The National Geospatial-Intelligence Agency has authority under 44 U.S.C. §1336.

8.3.27 Mariner education

Education for mariners travelling in the vicinity of offshore renewable energy projects should help ocean users identify and avoid hazards. Education efforts should cover the different hazards associated with each phase of a project, and may include guidance on how to operate safely given the hazards. Education can be conducted through stakeholder groups, classes, publications, etc.

A method of communicating cable locations is through the production and distribution of charts exclusively designed to depict cable routes. These charts are known generally as "Cable Awareness Charts" but may also be called "Cable Warning Charts" or "Cable Protection Charts." These charts may be produced by overprinting onto government charts or printed independently. The advantage of such charts over government issued charts is the cable awareness charts can be produced, updated, and distributed rapidly and customized for cable routes and other important information in a specific area. The size and format of cable awareness charts also can be customized for use by specific users, such as fishermen, the oil and gas industry, and others (ICPC 2007a). With the prevalence of GPS and computer-based navigation, cable awareness charts are available in electronic as well as paper format.

Cables companies or fishermen's organizations may distribute cable awareness charts for local waters free of charge to local users. The North American Submarine Cable Association has also developed a set of electronic cable awareness charts compatible with the predominant navigation software used regional fishermen. The ICPC, which includes all major global telecommunications companies and many power cable companies, can direct inquiries regarding cable awareness information to the appropriate local source (Drew and Hopper 2009).

Implementation authority

The U.S. Coast Guard and NOAA National Ocean Service share the authority to implement this mitigation strategy. The U.S. Coast Guard has authority under the Ports and Waterways Safety Act (PWSA) of 1972 (Pub. L. 92-340, 86 Stat. 424, 33 U.S.C. §§ 1221 *et seq.*) and the Navigation and Vessel Inspection Circular No. 02-07 (USCG 2007). The NOAA National Ocean Service has authority under the Coast and Geodetic Survey Act of 1947 (33 U.S.C. 883a *et seq*., 61 Stat. 787) and the Hydrographic Services Improvement Act of 1998 as amended (Pub. L. 105-384, 112 Stat. 3454, *33 U.S.C.* 892 *et seq.*).

8.3.28 Power cables trenching/burial

Power cables between wind turbines, between wind turbines and the transformer station, and between the transformer station and the shore should be sufficiently trenched to avoid exposure from scouring / sand migration or trawling activities (IALA 2008). The standard commercial practice is to bury submarine cable 1-3 meters deep in water shallower than 2,000 meters to protect it from external aggression hazards, such as fishing gear and anchors (Chave et al. 2003). Cable may be buried as deep as 10 meters under the seabed, depending on the local hazards, water depth, and substrate composition (ICPC 2006). Burial of cable in this manner not only protects the cable from damage by accidental hazards, but also protects those hazards, such as fishing gear, from damage by being caught on a cable. These cable burial standards thereby protect several important ocean uses (New Jersey Coastal Management Program 2004).

For example, at the Barrow Offshore Wind Farm, located in the East Irish Sea, United Kingdom different size cables at various locations in the wind farm were buried at different depths. "The 33kV subsea cables, which connect the wind turbine together in strings, are laid on the seabed along each row and will be buried to a minimum depth of 1m. The 33kV subsea cables, which connect the wind turbines at the end of each row to the substation platform, will be buried to a minimum depth of 2m. The 132kV subsea cable, which delivers the electricity from the offshore substation platform to shore will be buried to a depth of 1-3m depending on localized seabed conditions" (Barrow Offshore Wind Limited 2005).

The standards for burial and inspection have been upgraded significantly in recent years. Extent of burial of the cable is a function of specifications of the owner, but burial is usually done out to 1,000 to 1,500 meters of water depth. The distance depends on what else is going on in the area, e.g., commercial fishing, and economics. State permit requirements often include the removal of any old cables that are discovered during installation out to the limits of state waters.

Implementation authority

Pursuant to the authority granted by the Energy Policy Act of 2005 (Pub. L. 109-58, 119 Stat 594 (2005), 42 U.S.C. 15801 et seq.) and the National Environmental Policy Act of 1969 (Pub. L. 91-190, 83 Stat. 852 (1970), 42 U.S.C. 4321 et seq.), and consistent with the 2009 Final Rule on Renewable Energy and Alternate Uses of Existing Facilities on the Outer Continental Shelf (30 C.F.R. § 250, 285, and 290), BOEM has primary authority to implement this mitigation strategy. The depth of burial is based on industry standards including the ability to repair cables in the event of damage, BOEM's NEPA analysis regarding environment impacts, as well as other permits that may be required, such as a Rivers and Harbors Act Section 10 authorization or

Nationwide Permit 52 by the Army Corps of Engineers (Rivers and Harbors Appropriation Act of 1899, 30 Stat. 1151 (1899), 33 U.S.C. 401 *et seq.*)

8.3.29 Emergency response plans regarding turbine failure

Standards and procedures for generator shutdown and other operational requirements should be developed to deal with search and rescue, counter pollution, or salvage operations in or around an installation (U.K. Maritime and Coastguard Agency 2008).

Implementation authority
BOEM and other agencies including the U.S. Coast Guard have primary authority to implement this mitigation strategy and respond in the event of an emergency. Pursuant to the authority granted by EPAct and NEPA, and consistent with the 2009 Final Rule on Renewable Energy and Alternate Uses of Existing Facilities on the Outer Continental, BOEM requires an offshore renewable energy developer to establish a Safety Management System to be used with the Construction and Operation Plan (COP). Among the requirements of the Safety Management System, the developer must describe emergency response procedures and how these procedures will be tested. In the event of an emergency, the U.S. Coast Guard likely would be the onsite response coordinator pursuant to its authority under the (PWSA) of 1972 (Pub. L. 92-340, 86 Stat. 424, 33 U.S.C. §§ 1221 et seq.) and the Navigation and Vessel Inspection Circular No. 02-07 (USCG 2007).

8.3.30 Radar, radio navigation, and radio communication interference research

Wind energy projects have uncertain impacts on radar, radio navigation and radio communications. Efforts to evaluate those impacts on a site-by-site basis should be taken.

Implementation authority
The Federal Aviation Administration has primary authority to implement this mitigation strategy under the Federal Aviation Act of 1958 (Pub. L. 85-726, 72 Stat. 731, 49 U.S.C. App. 1301 *et seq*.).

8.3.31 Post-construction obstruction removal

Once a project is complete, the operator / contractor should remove all obstruction, and return the sea floor to its pre-construction depth and topography. This may be a difficult mitigation measure to enforce given the fact that uses of the area may change (e.g., aquaculture activities in a wind energy project area), making it necessary to displace the new uses in order to appropriately restore the area.

In the event that any residue or obstruction remains that, in the opinion of the Aids to Navigation Authority, constitutes a danger to navigation, then the residue or obstruction shall be marked according to the authority's requirements.

Implementation authority
BOEM and other government agencies, including the U.S. Coast Guard and NOAA, share the authority to implement this mitigation strategy. The specific agencies in each instance will depend on the location of and the uses affected by the project in question.

Pursuant to the authority granted by the Energy Policy Act of 2005 (Pub. L. 109-58, 119 Stat 594 (2005), 42 U.S.C. 15801 et seq.) and the National Environmental Policy Act of 1969 (NEPA), (Pub. L. 91-190, 83 Stat. 852 (1970), 42 U.S.C. 4321 et seq.), and consistent with the 2009 Final Rule on Renewable Energy and Alternate Uses of Existing Facilities on the Outer Continental Shelf (30 C.F.R. § 250, 285, and 290), BOEM requires an offshore renewable energy developer to include a decommissioning concept in their relevant Site Assessment Plan (SAP), Construction and Operations Plan (COP), or General Activities Plan (GAP). In addition the developer must submit and BOEM must approve a decommissioning application before decommissioning activities may commence. Among the information included in this application is a decommissioning schedule, a description of removal methods and procedures, and plans for disposal. As with the initial project siting and construction, other agencies such as the U.S. Coast Guard, NOAA, and FWS may be involved depending on the impact of decommissioning on navigation, habitat, and endangered species.

8.4 CONCLUSION

Literature and information provided by stakeholders during research for this study suggest a broad menu of avoidance and mitigation strategies available for consideration in those instances when an offshore renewable energy project does, or is anticipated to, create a conflict with another ocean use. As Table 8-3 indicates, each of the 31 identified strategies has potential relevance in the context of one or more conflict types, ocean uses with which a project might be in conflict, and project phase. While BOEM has exclusive or shared implementation authority for only 12 of the 31 identified strategies, the degree of coordination among Federal agencies that is expected to occur at various stages of a project's lifecycle suggests that BOEM should at least have an opportunity to influence the consideration and implementation of any actions taken to avoid or mitigate conflict.

This study also highlights the important role of the stakeholder engagement *process* (specifically, those actions that occur before any consideration of the need for avoidance or mitigation strategies) and the value of establishing an effective communication and process platform with the objectives of (1) making the need for mitigation a less frequent occurrence, and (2) facilitating quicker resolutions when mitigation does become necessary and appropriate. At the same time, it is important to acknowledge that management of offshore renewable energy development is a new and evolving challenge. While we can learn from and build upon the offshore wind energy experience already gained in other markets (most notably Europe), as well as from the implementation of avoidance and mitigation strategies that have been successfully employed in other (non-renewable energy) contexts, the conflicts created by offshore renewable energy development (inclusive of the construction, operation and decommissioning phases), and the most appropriate conflict management techniques, will truly be known only upon completion of at least one utility-scale project in U.S. waters.

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