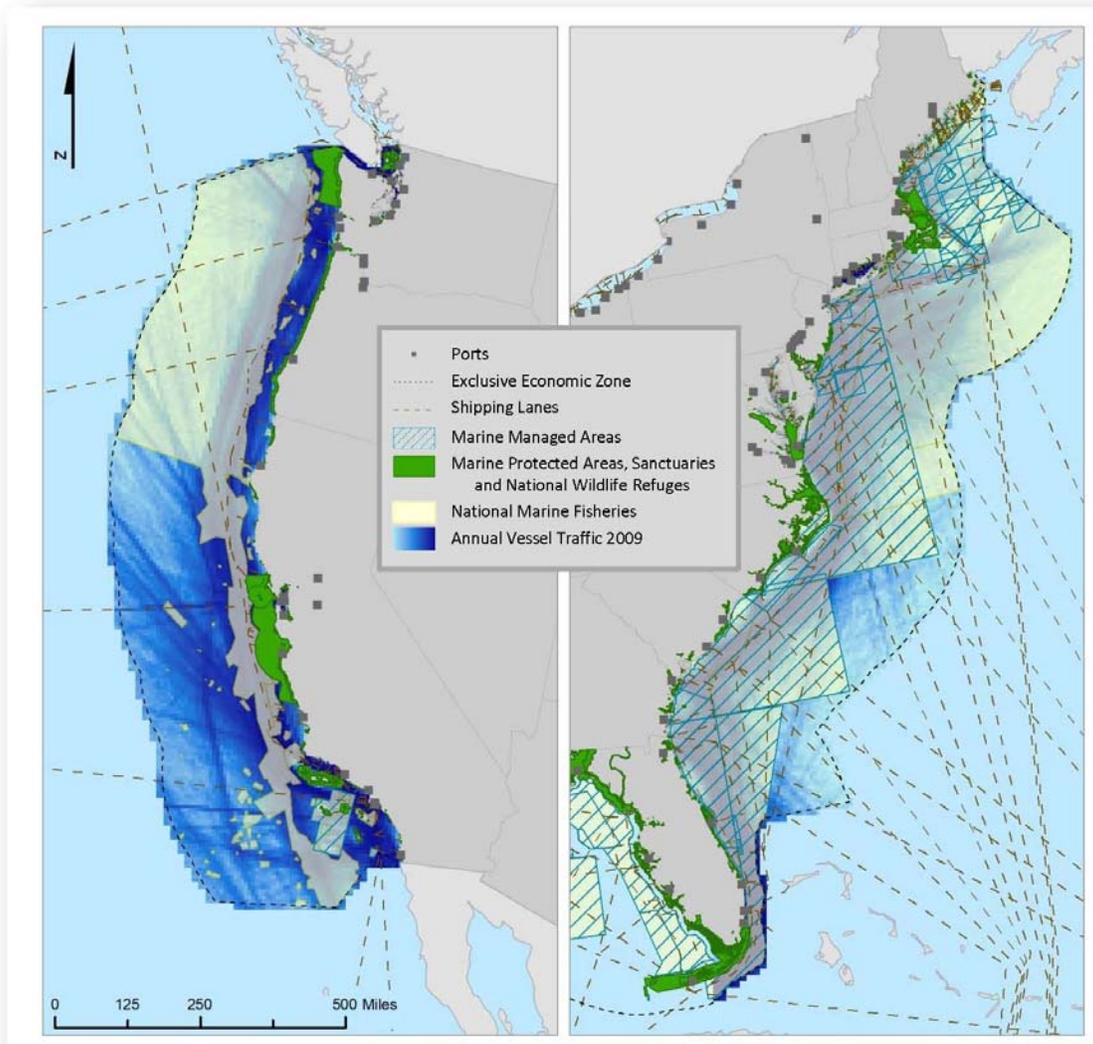


# Identification of Outer Continental Shelf Renewable Energy Space-Use Conflicts and Analysis of Potential Mitigation Measures



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



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## 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.<sup>1</sup>

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

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<sup>1</sup>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).

## INTRODUCTION

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

<b>Region/Planning Area</b>	<b>States</b>
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

## INTRODUCTION

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

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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

<b>Source</b>	<b>Number of Data Layers</b>
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

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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

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### 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.

## METHODOLOGY

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.<sup>2</sup> 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.

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<sup>2</sup> 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.<sup>3</sup>

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

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<sup>3</sup> See “Who fishes matters” testimonials for perspectives on scales of fishing: <https://namanet.org/who-fishes-matters-video-testimonies>

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

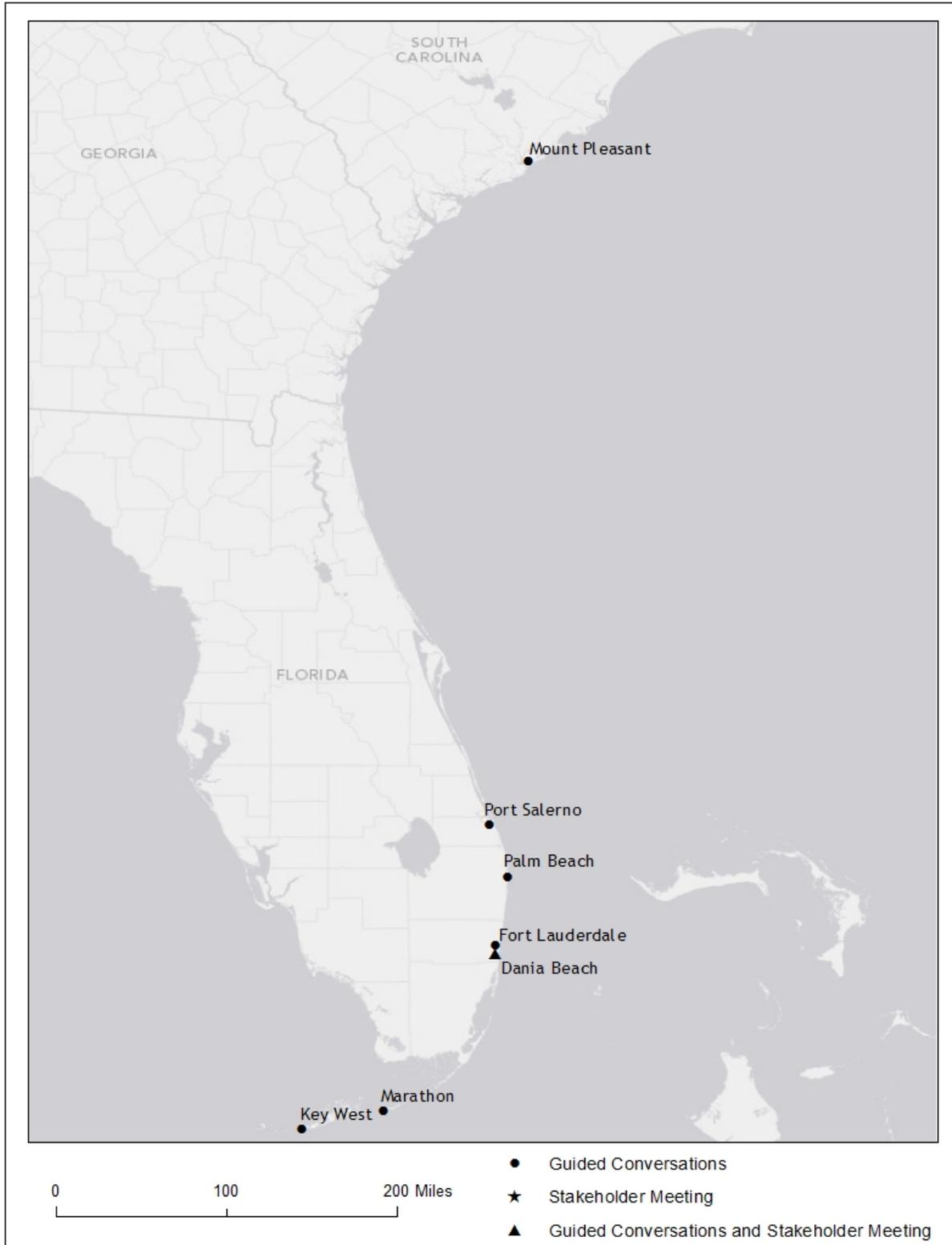


Figure 2-2 Locations of guided conversations and stakeholder meetings in the South Atlantic region

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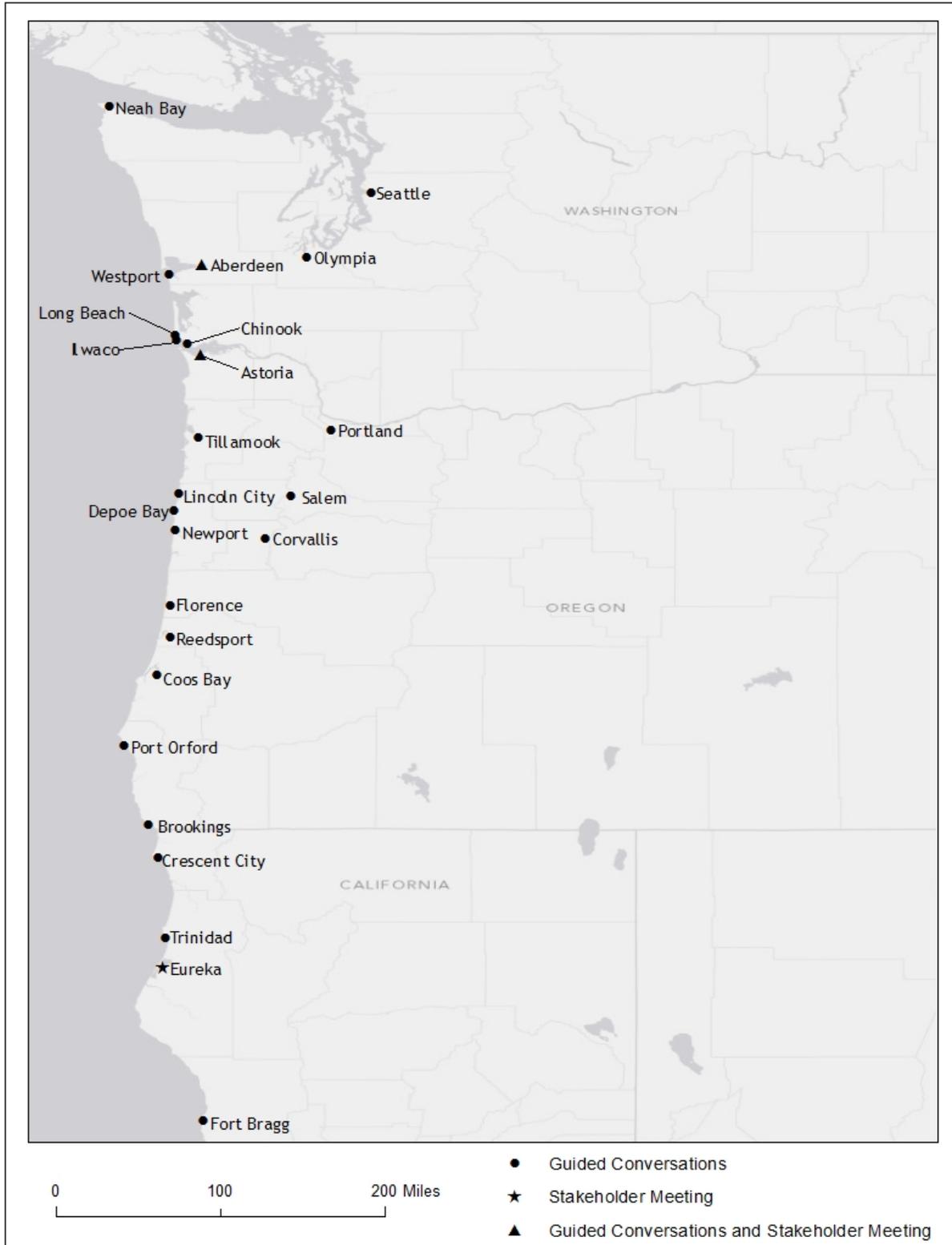


Figure 2-3 Locations of guided conversations and stakeholder meetings in the Pacific Northwest and Northern California regions

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.

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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
<b>Total</b>		<b>43</b>	<b>40</b>	<b>3</b>

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:

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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

	<b>Sector</b>	<b>Number</b>
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
	<b>Total</b>	<b>24</b>

### **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

	<b>Sector</b>	<b>Number</b>
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
<b>Total</b>		<b>33</b>

**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

<b>Date</b>	<b>Location</b>	<b>Number of participants</b>
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.

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### **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),<sup>4</sup> 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).

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<sup>4</sup> 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)
<b>TOTAL</b>	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)
<b>TOTAL</b>	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

**METHODOLOGY**

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

## METHODOLOGY

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.

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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

<b>Group</b>	<b>Subgroups</b>	<b>Total<sup>a</sup></b>
Commercial fishing	Commercial, charter <sup>b</sup> , 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
<b>Total</b>		<b>58</b>
<sup>a</sup> Some individuals play multiple roles, and are assigned to their self-ascribed “primary” role. <sup>b</sup> 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.

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Table 2-13

### Pacific Coast Stakeholder Meetings

<b>Date</b>	<b>Location</b>	<b>Number of Participants</b>
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		

### 3.0 FINDINGS: NORTHEAST ATLANTIC

#### 3.1 REGIONAL CHARACTERIZATION AND OVERVIEW OF RELATED ACTIVITIES

Commercial fishing is a significant ocean use in the Northeast Atlantic region. Total landings in the region in 2009 accounted for approximately 8 percent of total U.S. landings by mass (including Alaska), but approximately 20 percent of total landings revenue. In the continental United States, the 2009 landings revenue in this region accounted for more than 30 percent of the total. Massachusetts, with a fishing industry centered around the ports of Gloucester and New Bedford, accounted for more than 50 percent of the landings and landings revenue in this region (NMFS 2010). The seafood industry supported more than 115,000 jobs in the Northeast Atlantic region in 2009; Massachusetts and Maine accounted for approximately 67 and 18 percent of these jobs, respectively (NMFS 2010). Table 3-1 summarizes commercial fishery landings in the Northeast Atlantic states in 2009, the most recent year for which data are currently available. Figure 3-1 illustrates the distribution of commercial fishing activity in this region.

The Northeast Atlantic region accounted for approximately 10 percent of 2009 recreational fishing effort (i.e., number of trips) in the United States and approximately 9 percent of total recreational fishing trip expenditures (Table 3-2). Consistent with the national trend, almost all of the effort was divided equally between private boat and shore-based activity.

Northeast Atlantic commercial vessel activity is concentrated around the ports of Boston, Portland, ME, and, to a lesser extent, Providence, RI (Table 3-3 and Figure 3-2). The total number of vessel calls in 2010 in this region (1,426) is the smallest among the five regions in this study. (The next smallest, at 6,158 calls, is the Pacific Northwest.) The predominant transport, support, and marine operations industries in this region, based on the most recent available data (2008) are marinas and ship and boat building. The number of establishments in these two industries account for 13 and 11 percent of the national totals, respectively (NMFS 2010).

Tables 3-1 through 3-4 provide a broad characterization of important user communities in the Northeast Atlantic region, 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 region, 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. Figures 3-1 through 3-3 provide visual illustrations of ocean use activity in the Northeast region, with a focus on commercial fishing (Figure 3-1), commercial vessels (Figure 3-2), and other activity (Figure 3-3). As noted in the Introduction, Figure 3-3 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.

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Table 3-1

### Commercial Fishery Landings, Northeast Atlantic Region, 2009

State	Species Group	Quantity (000s lbs)	Revenue (\$000s)
Maine	Finfish and Other	87,248	\$30,488
	Shellfish	97,310	\$255,437
New Hampshire	Finfish and Other	10,094	\$5,528
	Shellfish	3,792	\$12,181
Massachusetts	Finfish and Other	279,324	\$114,784
	Shellfish	76,641	\$285,464
Rhode Island	Finfish and Other	46,314	\$23,465
	Shellfish	38,180	\$38,198
Connecticut	Finfish and Other	5,388	\$3,778
	Shellfish	2,584	\$12,848
<b>Subtotal</b>			
	Finfish and Other	428,368	\$178,043
	Shellfish	218,507	\$604,128
<b>Total</b>			
		646,875	\$782,171

Source: NOAA National Marine Fisheries Service 2010

Table 3-2

### Recreational Fishing Activity, Northeast Atlantic Region, 2009

State	Fishing Mode	Effort (000s trips)	Trip Expenditures (\$000s)
Maine	For-Hire	26	\$4,964
	Private Boat	330	\$7,111
	Shore	658	\$63,387
New Hampshire	For-Hire	98	\$8,708
	Private Boat	149	\$4,901
	Shore	167	\$4,609
Massachusetts	For-Hire	227	\$35,303
	Private Boat	1,872	\$60,341
	Shore	1,507	\$115,288
Rhode Island	For-Hire	55	\$5,821
	Private Boat	414	\$15,375
	Shore	572	\$19,747
Connecticut	For-Hire	43	\$3,262
	Private Boat	725	\$20,874
	Shore	668	\$11,554
<b>Subtotal</b>			
	For-Hire	449	\$58,058
	Private Boat	3,490	\$108,602
	Shore	3,572	\$214,585
<b>Total</b>			
		7,511	\$381,245

Source: NOAA National Marine Fisheries Service 2010

Table 3-3

Vessel Calls by Oceangoing Self-Propelled Vessels of 10,000 DWT or Greater\* at Northeast Atlantic Region Ports, 2010

Port	State	All Types	Tanker			Container	Dry Bulk	Roll-On/Roll-Off	Vehicle	Gas Carrier	Combination	General Cargo
			Product	Crude	Total							
Bucksport	ME	1	0	0	0	0	1	0	0	0	0	0
Eastport	ME	7	0	0	0	0	0	0	0	0	0	7
Portland	ME	317	143	131	274	0	23	8	0	0	3	9
Sandy Point	ME	10	2	7	9	0	1	0	0	0	0	0
Searsport	ME	100	80	0	80	0	16	0	0	0	0	4
Portsmouth	NH	83	41	0	41	0	31	1	0	7	0	3
Boston	MA	584	238	0	238	141	57	75	61	66	0	7
Neptune Terminal	MA	2	0	0	0	0	0	0	0	2	0	0
Davisville	RI	45	0	0	0	0	0	45	45	0	0	0
Newport	RI	5	0	0	0	0	2	0	0	0	0	3
Providence	RI	172	78	0	78	0	45	42	40	6	0	1
Bridgeport	CT	14	0	0	0	0	14	0	0	0	0	0
Groton	CT	1	1	0	1	0	0	0	0	0	0	0
New Haven	CT	73	59	2	61	0	11	0	0	0	0	1
New London	CT	12	3	0	3	0	8	0	0	0	0	1
<b>Totals</b>		<b>1,426</b>	<b>645</b>	<b>140</b>	<b>785</b>	<b>141</b>	<b>209</b>	<b>171</b>	<b>146</b>	<b>81</b>	<b>3</b>	<b>36</b>

\* 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](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.

**NORTHEAST ATLANTIC**

Table 3-4

Transport, Support, and Marine Operations, Northeast Atlantic Region, 2008

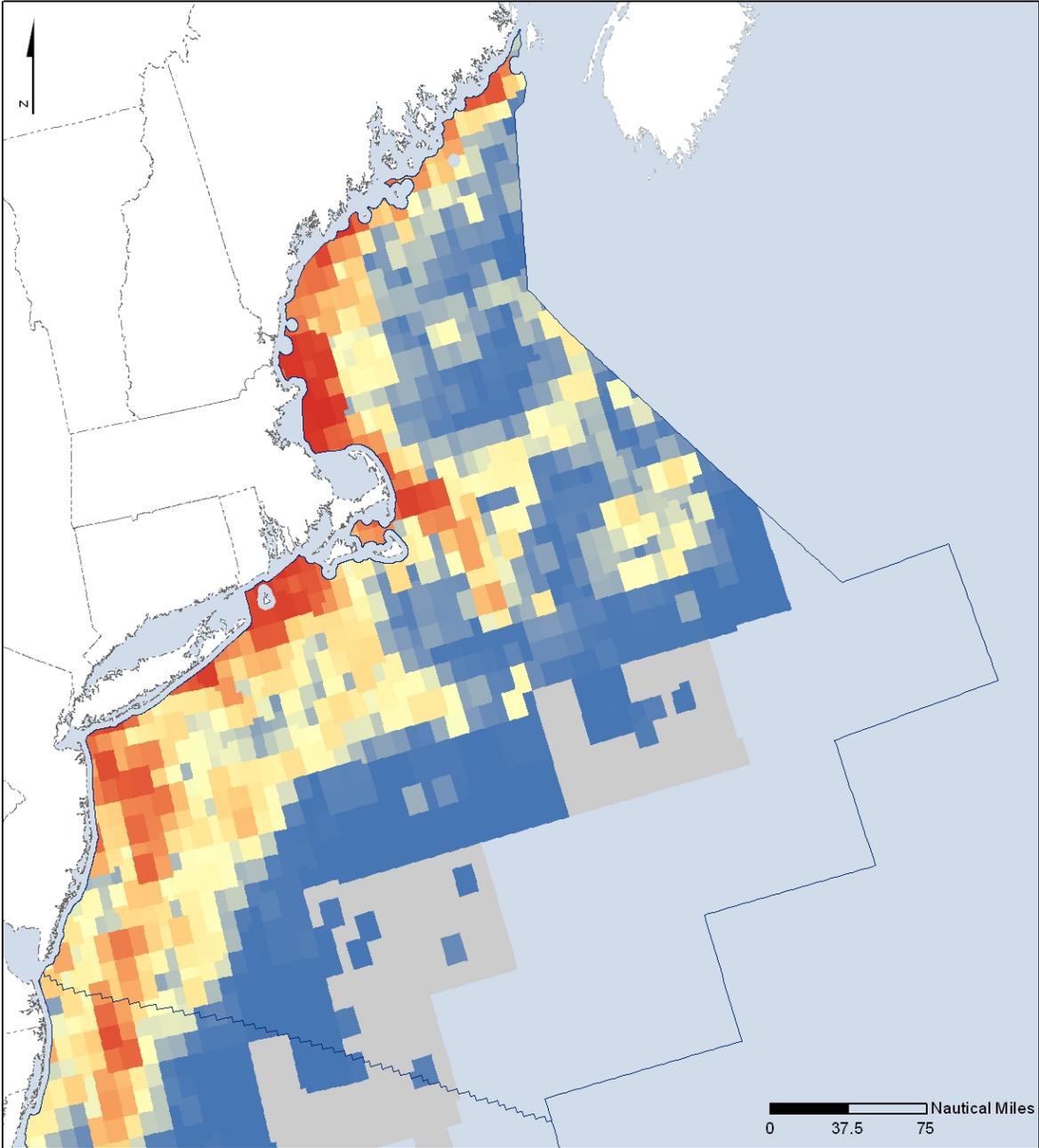
Activity	Parameter	Maine	New Hampshire	Massachusetts	Rhode Island	Connecticut	Total
Coastal freight transportation	Establishments	5	NA	14	2	5	26
	Employees	ND	NA	169	ND	ND	169
	Payroll (\$000s)	\$1,058	NA	\$11,701	ND	ND	\$12,759
Deep sea freight transportation	Establishments	1	1	8	2	12	24
	Employees	ND	ND	361	ND	243	604
	Payroll (\$000s)	ND	ND	\$38,908	ND	\$46,595	\$85,503
Deep sea passenger transportation	Establishments	1	NA	NA	1	1	3
	Employees	ND	NA	NA	ND	ND	ND
	Payroll (\$000s)	ND	NA	NA	ND	ND	ND
Marinas	Establishments	87	37	175	73	125	497
	Employees	411	173	1,138	476	1,352	3,550
	Payroll (\$000s)	\$15,203	8,114	\$53,694	\$23,204	\$60,016	\$160,231
Marine cargo handling	Establishments	3	NA	3	5	4	15
	Employees	ND	NA	ND	ND	ND	ND
	Payroll (\$000s)	ND	NA	\$2,271	ND	ND	2,271
Navigational services to shipping	Establishments	15	2	8	8	6	39
	Employees	138	ND	75	ND	ND	213
	Payroll (\$000s)	\$6,178	ND	\$4,355	\$5,904	\$338	\$16,775
Port and harbor operations	Establishments	2	NA	4	2	8	16
	Employees	ND	NA	63	ND	179	242
	Payroll (\$000s)	ND	NA	\$1,289	ND	\$6,136	7,425
Ship and boat building	Establishments	90	9	43	39	15	196
	Employees	6,930	ND	603	1,342	ND	8,875
	Payroll (\$000s)	\$354,899	ND	\$28,402	\$54,225	ND	\$437,526

NA: Data not available

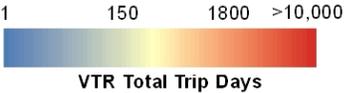
ND: Non-disclosable confidential data

Source: NOAA National Marine Fisheries Service 2010

NORTHEAST ATLANTIC



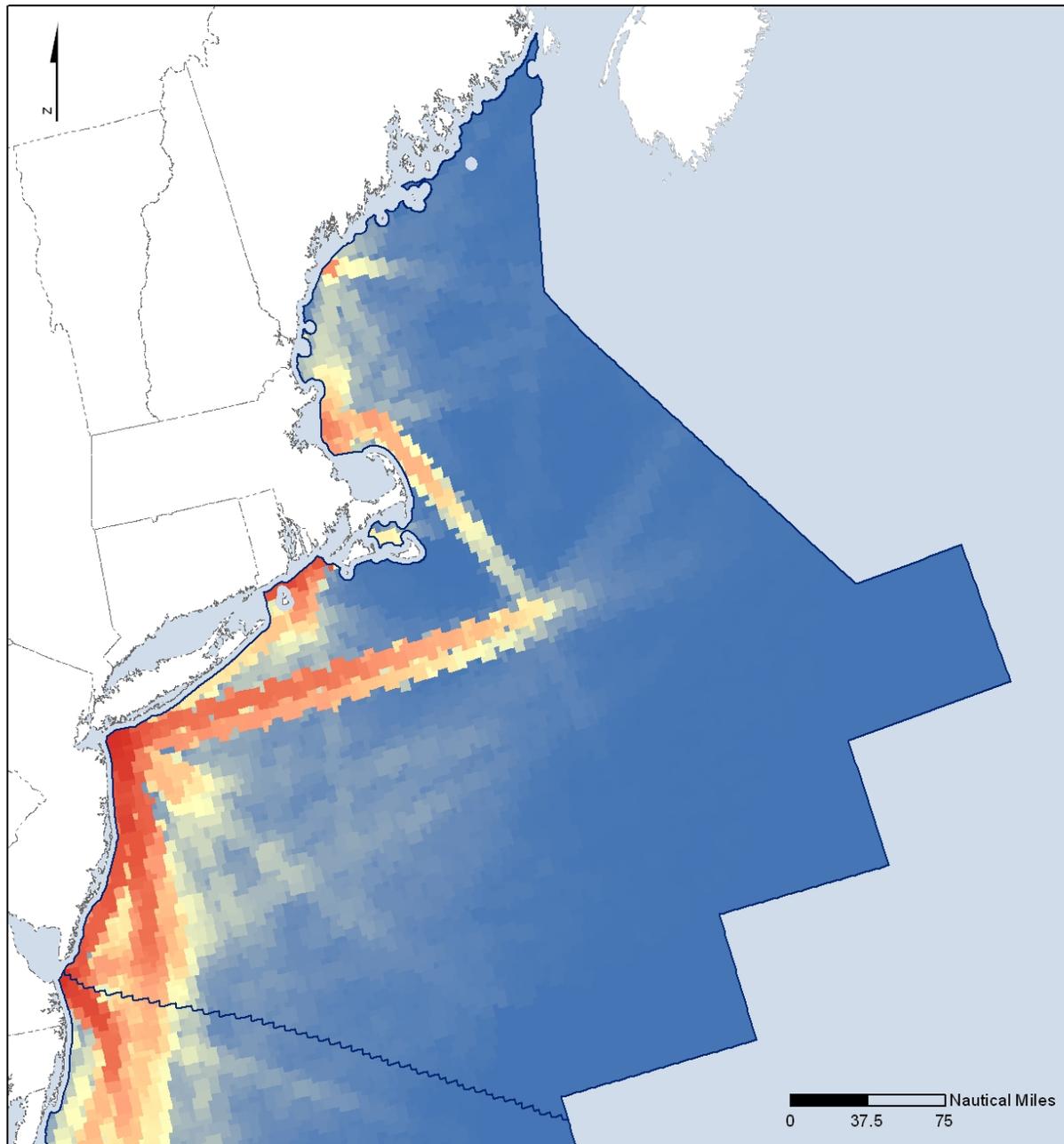
For each BOEM lease block, this map conveys the maximum total number of fishing trips for all Commercial Fishing from 2004 to 2008. The National Marine Fisheries Service provided these data based upon the Northeast Fishing Vessel Trip Reporting Program (VTR). Readers are encouraged to access the Space Use Geodatabase directly to identify additional details for each lease block.



Map Projection: North American Equal Area Conic 1:4,430,290

Figure 3-1 Commercial Fishing Activity in the Northeast Atlantic Region

# NORTHEAST ATLANTIC



The Automatic Identification System (AIS) dataset is a comprehensive dataset maintained by the United States Coast Guard that tracks commercial vessel navigation of vessels at or above 300 gross tonnage. This dataset provides a summary of the AIS vessel navigation data for calendar year 2009. The raw data were processed by importing the ASCII text file into a PostgreSQL/PostGIS database one day at a time. A subset of only the vessels that were underway was extracted from the data. The latitude/longitude values in the AIS data were used to generate the spatial location for each record. This location information was then overlaid onto a 5nm grid with only one unique value per vessel per gridcell counted. The count of vessels for the day was then added to the gridcell. This process was repeated for each day of the month. After the whole month was processed the counts for each of the days was added to give the total count for the month. The counts for the month were then added to obtain the counts for the quarter and year. For additional information on AIS data, readers are encouraged to access the Space Use Geodatabase.

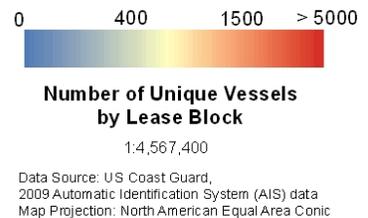
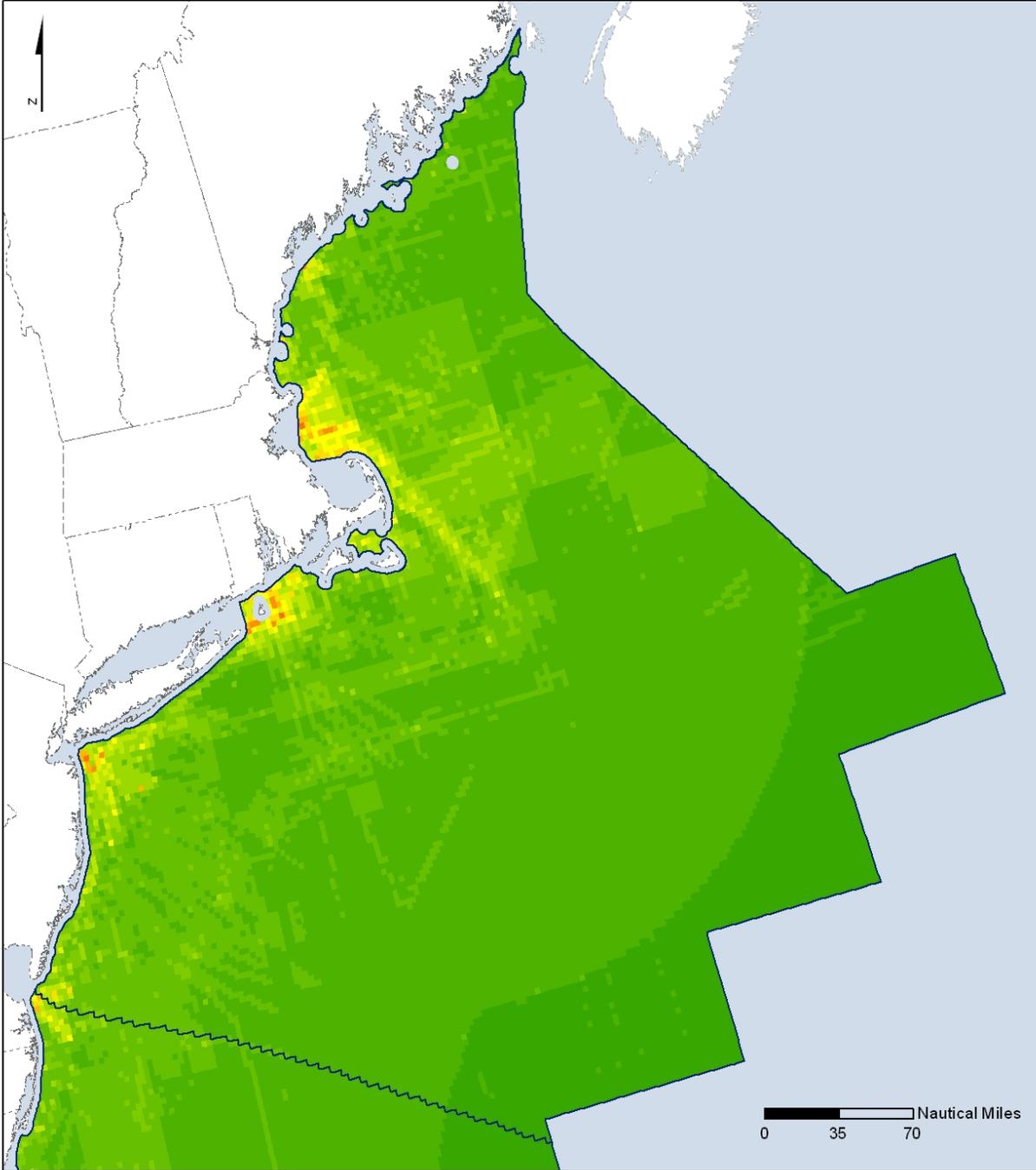


Figure 3-2 Commercial Vessel Activity in the Northeast Atlantic Region

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For each BOEM lease block, this map conveys the number of data sets included in the Space Use Project Geodatabase. Commercial Fishing and Large Vessel Navigation data are excluded since these data cover all lease blocks. Readers should examine the fishing and navigation maps for additional information on these uses. Readers are encouraged to access the Space Use Geodatabase directly to identify the particular data sets with information for each lease block and to learn more about the uses inventoried.

0 20 90  
**Number of Datasets Applicable to Each Lease Block**

1:4,348,710  
Map Projection: North American Equal Area Conic

Figure 3-3 Occurrence of Data Sets Describing Noncommercial Uses in the Northeast Atlantic Region

## NORTHEAST ATLANTIC

The Northeast Atlantic region is also home to a number of activities related in general to the identification and management of marine uses. An understanding of these activities is essential to the successful future management of renewable energy development activities. Therefore, several of the most important are described below.

### *New England Fishery Management Council's Essential Fish Habitat*

The New England Fishery Management Council's (NEFMC) defines essential fish habitat (EFH) as "those waters and substrates necessary for spawning, breeding, feeding, and growth to maturity." The 1996 reauthorization of the Magnuson Stevens Fishery Conservation and Management Act (MSA) included provisions requiring fishery management plans (FMPs) to minimize the adverse effects of fishing on EFH. A NOAA website displays the EFH for a user-selected species of interest ([http://sharpfin.nmfs.noaa.gov/website/EFH\\_Mapper/map.aspx](http://sharpfin.nmfs.noaa.gov/website/EFH_Mapper/map.aspx)). A few of the species, such as red crab, have a very narrow band or relatively small areas identified, suggesting that avoidance of these areas for permanent structures would be advisable.

### *Human Use Mapping (Maine)*

As described on the Island Institute web site ([www.islandinstitute.org](http://www.islandinstitute.org)), "[i]n 2009 the [Institute] started a human use mapping initiative aimed at filling critical data gaps in spatial information on human uses of the marine environment along the coast of Maine, particularly commercial fishing, recreational fishing and boating, near-shore shipping, and tourism. This project is designed to document how island and coastal communities use and depend on marine areas." A pilot project began with *Penobscot Bay Human Use*. Work in early 2010 focused on Mapping Penobscot Bay's Working Waters. "This pilot project is an effort by the Island Institute to collect spatial data on community uses of the marine environment, with a particular focus on commercial fishing data, much of which is not currently documented. Institute staff are working closely with fishermen and other community members to tailor methods for participatory geographic information systems (GIS) through interviews and group meetings and developing clear, data sharing agreements to protect confidential information while allowing the data to be publicly accessible. Results will add substantially to the information that is currently available about where, when and how communities use the water." This work is not sufficiently advanced to identify specific sites that might engender conflict, but is likely to be useful in the near future.

### *Atlas Project*

The Atlas Project used GIS to produce maps based on anecdotal and scientific evidence of areas and resources in the Gulf of Maine that fishing communities depend upon. The goal was to develop a mapping tool that links port communities in New England to fisheries resource areas. Rather than mapping fishing effort using landings data, the project mapped at-sea fishing communities and how those communities have changed over time based on vessel trip report (VTR) data. Included in the data used to create the charts were numbers of vessels, average crew size, average catch, and other statistics. Interviews by community researchers of 57 fishermen documented change over time, communities at sea, and local ecological knowledge.

This project had a surprising outcome of demonstrating that the charts based on several years of VTR data, when it included crew size, could accurately represent where vessels from different ports fished. Initially, fishermen were skeptical that the charts would be accurate because at the time, the fishermen reported only their starting points in their vessel trip reports, then because

they were mobile, their fishing covered a much broader range of territory. The project found that once sufficient data was gathered, clusters of fishing were accurately represented according to interviewees, at least at a broad scale. However, comments on finer scale charts did reveal that effort extended beyond the clusters depicted or in wholly other areas. Some of this effort could not be captured in the charts because of confidentiality rules.

### ***Ecosystem Services Tradeoff Modeling***

As described on the web site of SeaPlan (formerly the Massachusetts Ocean Partnership; [www.seaplan.org](http://www.seaplan.org)), “[m]arine ecosystems provide essential services that people value and benefit from – for example: food, recreation, jobs, transportation, wildlife viewing or just opportunities for rest and relaxation. When conflicts arise over which services are more important (e.g. when whale migration routes cross cost-effective shipping channels), how do managers make informed decisions? Because these are value-based decisions, visualizing and discussing potential tradeoffs is vital to effective ecosystem-based marine spatial planning.” A group of scientists are working on the development of an ecosystem model that considers all available ecosystem dynamic data for the study area. This team will utilize Multiscale Integrated Models of Ecosystem Services (MIMES) to understand changes in services with given activities. Other researchers are developing a visualization and decision tool for stakeholders and managers to interact with the underlying models. The Marine Integrated Decision Analysis System (MIDAS), is designed to promote collaborative decision making by illustrating the effects on uses of making tradeoffs in ecosystem services. The MIDAS interface will allow the user to explore the project area and the impact of decisions by relating uses to services, and will include a unique feature that will identify an association between data layers and social motivations (MIDAS 2012).

This work is still at a pilot stage. It may eventually prove to be a valuable tool for decision-making, but like all models, it has limitations. (For a discussion of the use of models in social science, see Hall-Arber et al. 2009).

### ***New England Aquarium’s Kerry Lageaux***

As described on the New England Aquarium web site ([www.neaq.org](http://www.neaq.org)), Lageaux’s research interests include “using GIS technology to: help understand the potential conflicts between the North Atlantic right whale and human use in the ocean, analyze the space-use conflicts of potential offshore aquaculture in the Gulf of Maine, spatial distributions of satellite tagged released animals, biologic monitoring of liquefied natural gas (LNG) port facilities, and understand animal distributions through satellite-derived oceanographic cues.” Like the Island Institute’s Human Use project, this research is not sufficiently far along to provide a map useful to establishing zones of potential conflict or compatibility, but when specific projects are proposed, the principals in this project should be consulted.

### ***Northeast Ocean Data Portal***

In June 2011, the Northeast Regional Ocean Council (NROC) launched the Northeast Ocean Data Portal, and in interactive map viewer ([www.northeastoceandata.org](http://www.northeastoceandata.org)) to provide easy access to data describing human activities, natural resources, and jurisdictional information associated with the New England coast and offshore environment.

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### *Rhode Island and Massachusetts Area of Mutual Interest*

On July 26<sup>th</sup>, 2010, Rhode Island and Massachusetts signed a Memorandum of Understanding (MOU) outlining how the two states will work together to coordinate the development of offshore wind projects in an “Area of Mutual Interest” (AMI) in Rhode Island Sound. The AMI is located in 400 square miles of Federal waters, beginning 12 miles southwest of Martha’s Vineyard and extending 20 miles westward into Rhode Island Sound. The MOU notes that any offshore wind projects in the AMI must be approved by the governors of both states, and that economic benefits must be shared by both states.

Two recent efforts to engage stakeholders in the context of proposals for marine use also provide very useful context, and can serve as models of what worked and what did not. In general, communication and process can play a critical role in either reducing or exacerbating conflict in the use of marine resources. Generally, resilience researchers have found that “voluntary coordination could be more effective than hierarchical leadership in building trust, managing conflict, linking actors and initiating partnerships, promoting rapid communication, fostering innovation, and mobilizing support for change” (Goldstein 2009).

Despite mandates to identify stakeholders and open projects to public scrutiny and comment, stakeholders are often uncertain about the utility of their participation. Specifically, research points out that “it is often unclear, to participants and to outsiders, whether policy uptake of the decision advice can be expected. The limited scope for agency of non- governmental participants jeopardizes meaningful collaboration of user groups and (subnational) NGOs. Another significant issue is trust: trust here refers to the need to collectively gain confidence in the process, to progressively build social capital and not simply to sympathize with other individuals or organizations (Berghofer et al. 2008).

### *Rhode Island Special Area Management Plan*

The Rhode Island Coastal Resources Management Council’s Ocean Special Area Management Plan (SAMP) describes the use of scientific research and public input to develop an ecosystem-based strategy for zoning Rhode Island’s offshore waters. Development of the SAMP involved an extensive process, with monthly stakeholder meetings (all stakeholders) and additional fisheries-focused stakeholder meetings over a two-year period. When Rhode Island began the SAMP process, the need for extensive education and communication outreach was clear. The principals leading the project made every effort to accommodate the concerns and interests of participants. They, for example, responded to requests for comparative information from the stakeholders by inviting several European researchers to spend a week at a time in Rhode Island to discuss the European protocols and issues of interest to the Rhode Island stakeholders. In retrospect, project leaders agree that they were able to successfully document current users and uses and where these users hope to go in the future. Less clear is where future new uses will fit in.

Two important points were underscored with regard to engaging fisheries stakeholders: their schedules must be accommodated (winter, bad weather days, and evening meetings tend to be best), and to gain trust a consistent message must be relayed. (In this case, the message was that fisheries stakeholders’ views were important and would be considered in any development.) Also of concern for the future is the role of the SAMP with regard to developments in Federal waters.

Federal consistency requirements will apply to any Federal agency's activities that have a foreseeable effect on natural resources of Rhode Island's coastal zone, but whether consistency requirements will be triggered by activities farther out (considering the SAMP covers 30-miles out) remains to be seen.

***Massachusetts Ocean Plan***

A comprehensive plan for managing the state waters of the Commonwealth of Massachusetts was approved by the Secretary of Energy and Environmental Affairs in December 2009 (MA EOEEA 2009). Its promulgation was mandated by and its purposes prescribed by the Massachusetts Ocean Act of 2008. The Ocean Plan is to serve as the basis for the protection and sustainable use of the state's ocean and coastal waters and is to be updated every five years.

The planning process was guided by the Ocean Advisory Commission and a Science Advisory Council. The public process for the draft plan released in June 2009 involved 18 public meetings and 90 stakeholder consultations. Over 300 written comments on the draft along with testimony from five public hearing and 25 information meetings held throughout the state were considered in preparing the final plan. Based on the best scientific information available, the plan establishes an integrated management approach in which allowed uses and activities are managed by siting and performance standards associated with mapped resources and uses. In general, these standards direct development away from high value resources and concentrations of existing water-dependent uses.

The plan identifies two areas for commercial-scale wind projects in state waters, allocates a number of wind turbines that can be developed within each of seven regions as community-scale wind projects, and enables the regional planning authorities to define the appropriate scale of these projects for locations in the multi-use areas within their jurisdictions.

A report prepared by the Massachusetts Ocean Partnership (SeaPlan) that summarizes the stakeholder process conducted during the plan development stage noted that, "the one-on-one stakeholder group interviews created considerable dialogue, significantly facilitated information sharing, and educated stakeholders about the Plan development process" (Consensus Building Institute and Massachusetts Ocean Partnership 2009).<sup>5</sup> Furthermore the report said, "Continued, substantive stakeholder involvement is integral to the concept of ecosystem-based ocean management and should remain a foundational component of the state's efforts to promulgate and successfully implement the Plan." Nevertheless, the report also underscored that individual interviews are very time-consuming.

Going forward, as described on the SeaPlan web site, "[l]everaging expertise and constructive working relationships cultivated during development of the first generation Massachusetts Ocean Management Plan in 2008-2009, SeaPlan aims to advance science-based and stakeholder informed ocean management throughout the Northeast region and nationally by enhancing

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<sup>5</sup> The Massachusetts Ocean Partnership (SeaPlan) is a broadly representative public-private partnership created originally to support and advance ecosystem-based integrated multi-use management of the Commonwealth of Massachusetts's coastal ocean resources. MOP brought significant resources to the development of the Massachusetts Ocean Plan, assisting with and funding a number of technical studies, and supporting the stakeholder involvement process.

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knowledge, relationships and management tools through effective practice of ecosystem-based coastal and marine spatial planning (CMSP) and the dissemination of its products and approaches. SeaPlan's work began and will continue in Massachusetts, while most of [its] projects already involve regional collaborations for wider application."

Unlike the Rhode Island SAMP's thirty-mile range, Massachusetts' plan, as directed by the Oceans Act, only addresses the state's territorial sea (i.e., to a distance of three miles from shore). As a consequence, a large proportion of marine sites important to stakeholders associated with Massachusetts were not scrutinized. The Executive Office of Energy and Environmental Affairs relied heavily on representatives of organizations to develop the Ocean Plan. Some participants in that process expressed concern about whether or not there was sufficient depth of knowledge about specific sites to lead to equitable and appropriate development, and registered complaints that there has been insufficient acknowledgement of existing users/uses and that only the largest businesses have been considered.

These complaints may be partially due to the fact that the Massachusetts Oceans Act required a draft plan to be promulgated by June 2009, providing just one year to actually develop the Ocean Plan. This presented a challenging timeframe for planning and systematic engagement of stakeholders, particularly traditional users such as fishermen and fishing organizations. While 30 or 40 charts of fishing use, for example, were developed from state permit and landings data and discussed informally with various fishing industry participants, too little time was available to thoroughly engage fishermen and fishing organizations. Consequently, the perception among many in the fishing industry is that insufficient consideration was given to their interests and concerns.

### ***BOEM Request for Interest***

BOEM's December 2010 Request for Interest (RFI) related to the potential development of renewable energy projects in an area south of Martha's Vineyard (Massachusetts), which was prepared with the assistance of a BOEM-convened Task Force and involved a request for comments and several public meetings during the period when this study was ongoing, affected our research efforts and so must be acknowledged.

Stakeholders with whom we interacted expressed confusion about the connection, if any, between the RFI and this study. Several stakeholders also commented on what they perceived as the shortcomings of the RFI process, in particular the fact that there was only one fisherman on the Task Force who did not represent the diverse commercial fisheries of the area. During the research phase of this study, anger was expressed in some conversations with, and during discussions among, fishing industry participants who believed that the BOEM planning (i.e., pre-leasing) process focused on the AMI was ignoring the input from industry stakeholders who spent many hours helping to develop the Rhode Island SAMP, which included the AMI. One stakeholder commented that the proposed lease area could not have been placed in a worse area for fishing interests. In fact, these proposals for the AMI were unsolicited bids that identified areas the bidders were interested in. The proposed sites were not offered by BOEM, but they did have to publicize that they had received these bids.<sup>6</sup>

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<sup>6</sup> On February 3, 2012, subsequent to this study's research phase, BOEM published a Call for Information and Nominations to identify locations of potential industry interest for the development of commercial wind energy

## 3.2 COMMERCIAL FISHING

### 3.2.1 Characteristics and use of space

The Northeast U.S. Continental Shelf Large Marine Ecosystem extends from the Gulf of Maine to Cape Hatteras, bounded on the east by the Gulf Stream. This is a highly productive and complex ecosystem that supports a tremendous variety of marine life, and commercial fishing has been a significant traditional use of this region's OCS for centuries. Indeed, fishermen comprised some of the earliest immigrants to the region.

The value of commercial fishing to the region can be partially inferred from the landings and value statistics annually released by the U.S. Department of Commerce (see Table 3-1). The region as a whole is second only to the Pacific Coast in the value of fish landings. Massachusetts and Maine were second and third behind Alaska in 2010.

The two hub ports in Massachusetts are Gloucester and New Bedford, where we focused our commercial fishing oriented meetings and conversations. In addition, we engaged stakeholders from Aquinnah and Oak Bluffs (Martha's Vineyard), Boston, Scituate, Sandwich and Newburyport in Massachusetts, and Pt. Judith in Rhode Island. Meetings and conversation with principals on other spatial planning efforts in the region were held in Maine and Cambridge, Massachusetts.

Gloucester is near Stellwagen Bank National Marine Sanctuary, a Marine Protected Area (MPA), and is a significant port with over 300 years of commercial fishing history. Gloucester is typically among the top ten ports by volume of landings in the country (in 2009 with 122.3 million pounds, 11<sup>th</sup> in value at \$50.9 million, though this volume fell drastically in 2010 with changes in groundfish regulations. Gloucester landed 89 million pounds in 2010 (rank of 15) valued at 57 million dollars (rank of 12). New Bedford has for several years boasted the highest value of landings in the United States (\$249.2 million in 2009 and a \$306 million in 2010, for catches of 170 million pounds and 133 million pounds, respectively). In both of these ports, all of the shoreside services needed by participants in the commercial fisheries are available. Industry participants whose principal ports are geographically spread along the coast usually visit New Bedford or Gloucester to obtain certain supplies. New Bedford accounts for 45 percent of employment in the seafood-harvesting sector in the state of Massachusetts (State of Massachusetts 2002).

Point Judith, Rhode Island and Portland, Maine are also considered major ports in the Northeast, followed by, in order of volume of landings, Rockland, Maine and Provincetown-Chatham, MA, and Stonington, Maine. Any future CMSP efforts should include these communities in their stakeholder engagement process.

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projects. The Call Area encompasses approximately 826,000 acres, approximately 50 percent smaller than the area identified in the December 2011 RFI. All of the activity to date has occurred as part of the Planning and Analysis phase of the offshore renewable energy development process. In subsequent phases, BOEM will issue leases (through a competitive process if warranted by expressions of interest); oversee site-specific data collection that will inform preparation of a lessee's construction and operations plan; and oversee project construction, operation, and eventual decommissioning in accordance with BOEM's regulatory and other requirements.

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Commercial fishing in the Northeast is very diverse—in gear used, sizes and types of vessels, target species and fishing grounds. Famous for cod, sea scallops and lobster, the commercial fishermen also catch 12 species of groundfish alone; they harvest whiting and squid; pelagic species such as herring and mackerel; monkfish; red crab; and skates. In addition, there are offshore quahog or sea clam harvesters, wild shellfish harvesters and dogfish fishermen.

Commercial fishing techniques range from large trawlers and scallopers, as well as offshore trap boats, that roam widely through diverse fishing grounds from the Gulf of Maine to Georges Bank and as far south as the Mid-Atlantic, to relatively small vessels working with fixed gear (traps and gillnets) and longlines. While these 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. The fishing industry in the region is dominated by family-owned businesses and, until recently, primarily owner-operated vessels. Today there are several families who have invested heavily in fishing vessels and permits and run small fleets.

Vessels that bottom trawl or drag for groundfish pull nets attached to cables and “doors” that keep the mouth of the net open, along the bottom; midwater trawlers’ nets move through the water column to catch pelagic species, sometimes working with another vessel (pair trawling). Scallops and clams are usually caught using dredges, a metal mesh on a steel frame that looks something like a scoop. Other vessels use a longline with baited hooks attached that can extend over a mile. Like lobster or crab traps, gillnets are referred to as fixed gear; the fisherman anchors a net which hangs vertically in the water column and catches fish as they try to swim through.

The fishing grounds also vary. Groundfishermen often refer to sandy/muddy bottom as “good” bottom since they can fish the grounds without tearing their nets. Gillnetters tend to prefer rocky bottoms where they can hang their nets and not worry about gear conflict with mobile gear. Some fishermen seek grounds where the shelf falls off; others look for peaks. The grounds are often long-standing grounds, with the characteristics noted by fathers or grandfathers and the knowledge passed on through families.

The terms Local Ecological Knowledge (LEK), Traditional Ecological Knowledge and Local Fisheries Knowledge (LFK) are becoming more prominent in fisheries management circles. Though each has a slightly different focus, all three refer generally to knowledge acquired by resource users in the course of pursuing their livelihoods and/or their subsistence practices. This type of knowledge is different from scientific knowledge in that it is more niche-based, concentrated in particular areas. However, it is like science in its meticulous observations of flora and fauna, and their interactions with each other, their habitat and general environment, and the changes in all of these through the seasons and over time. One use of LEK in fisheries management is in mapping habitat. The NEFMC is currently considering a project to do this. MacArthur Genius Award winner Ted Ames has mapped LEK related to cod and haddock in the Gulf of Maine (Penobscot East Research Center 2012). St. Martin and Hall-Arber (2008) also worked with commercial fishermen in the Gulf of Maine to map their usage.

Despite the population of the region having grown in the last few decades, leading to far more urbanization, the importance of the image and practices of fishing communities cannot be ignored. As movements to “eat local” and support local businesses have drawn attention to the benefits of the “community,” the fishing communities’ pride in their local industry has been reinforced. Concomitantly, the product of their enterprise is in greater demand. Commercial fishing access is a critical concern in this region.

The value of commercial fishing to the nation is not limited to food provisioning, stakeholders explained. Study participants noted that the business of commercial fishing has strong multiplier effects on shore-side businesses and the communities as a whole. Such comments demonstrated awareness that in an evaluation of “best uses,” sometimes the value of fish landings is used as a marker for the value of the whole industry, but in fact this fails to consider the way that the income from fishing reverberates through the community and beyond. Shore-side businesses that are either necessary to the fishing industry or reliant on the industry are often ignored. Research on Marine Reserves in Wales has shown that not only high-resolution biodiversity data is necessary to select the most valuable areas for marine reserves, but also high-resolution socioeconomic considerations optimize choices of reserves that avoid areas most profitable to the fishing industry (Richardson et al. 2006).

*Zoning [on land] keeps families from complaining about noise. But [at sea, there’s] no way to do it equitably, encroaching on use that’s centuries old. Mega corporations would want to own a zone and kick historical users out. Need to pay attention to historical uses of resources. “Not saying whole ocean belongs to me,” but food fish producing areas. . .*

Section 2.3.2.1 (p. 14) includes a description of the pool of Atlantic coast commercial fishing sector participants who contributed information to this study. Table 2-4 (p. 19) lists these participants’ specific sectors and locations.

### **3.2.2 Compatible and conflicting uses**

Marine spatial planning efforts, including those led by NOAA and those by BOEM, often imply that their planning efforts will resolve or avert conflicts in the use of marine waters. Like past conceptions of the marine resources as inexhaustible (Huxley 1883), this view suggests that there is plenty of space to do everything, it just needs to be allocated. However, stakeholders who participated in this study suggest that there are incompatible uses and that that should be acknowledged. Furthermore, there were virtually no areas that everyone agreed were currently unused or unvalued. While some stakeholders did express willingness to compromise, it is important to recognize that they do feel that this is a compromise and they would be relinquishing access to some areas that they value or use. Respondents also agreed that the assumption that the current users “can just move” is not valid or reasonable.

Existing conflicts on the OCS occur among commercial fishermen of different gear groups and different target species (especially between fixed and mobile gear, but also between large and small vessels, between herring boats and groundfish boats, etc.) Most of the time, direct communication between the vessels leads to accommodation. Occasionally a representative of a certain gear group will contact the representative of another and work out arrangements to share the space.

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Mobile gear fishermen, in particular, tend to feel that they are subject to “constant attack” from other fishing sectors, environmental groups and government agencies. For them, wind farm projects are just the latest intrusion. Because they move from place to place with the seasons to find the most productive places to make a living, several noted that fishermen are analogous to the traditional lifestyle of the Native Americans and the fishermen are treated similarly.

Commercial fishermen noted that while there was a potential benefit to marine spatial planning, misinterpretation and unnecessary or unreasonable rules would likely be the result. Several stakeholders were careful to explain that their opposition was based on values, specifically the importance of safeguarding the ability to provide food to the nation.

Commercial fishing stakeholders’ target species affected their opinions. Lobstermen, for example, noted that lobsters are a sensitive species that may be affected by the harmonic vibrations associated with wind farms and their cables. They also pointed out that the construction itself disturbs benthic organism and disrupts fishing. (This applies not only to lobsters, but to any of the species usually trapped, such as crab and sea bass in the Mid-Atlantic.) Mobile gear groundfishing (e.g., trawlers) were generally considered incompatible with wind turbines due to the difficulty of controlling the nets that stretch out behind the fishing vessel, especially during turns.

The commercial fishing stakeholders who are opposed to the development of renewable energy projects on the OCS emphasized that fishing locations change to follow the species sought, some of the changes are cyclical (usually seasonal), but some are unpredictable due to movements of prey that may be reacting to winds, currents, weather, or other environmental cues. Faced with fisheries management closures that are permanent and/or rolling, fisheries stakeholders noted that they consider their traditional fishing grounds already sufficiently attenuated and that development of renewable energy is likely to be one more opportunity to limit fishermen’s access that could result in further consolidation and less diversity in the fleet.

Commercial fishing stakeholders’ views on the possibility of coexisting with wind farms or other alternative energy developments ran the gamut 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. Furthermore, several noted that they opposed the developments for environmental or philosophical reasons. In general, fixed gear fishermen tended to be more circumspect about the potential for energy development than the owners/operators of mobile gear. In some cases, this is because the fixed gear fishermen tend to be more territorial (Acheson 1988). These territorial considerations are both social and knowledge-based.

Several fishermen, both mobile and fixed gear users, noted that fishing grounds were already restricted and that they had no interest in giving up any more territory. Others noted that spreading fishing out over a larger territory is ecologically important as well. One stakeholder

advised that if wind farms are permitted that they be sited in an important fish refuge or spawning area, thereby creating long-term protection without creating additional closures.

Most respondents were very clear that “it depended.” While some were willing to say that, in general, they could imagine compatibility, the specific site would have to be discussed and analyzed. Several stakeholders noted that though they might be willing to propose alternative energy in a particular site because they did not use that site, they were reluctant to do so since they could not be certain that another gear type or fishermen from another community did not value and use it.

Where, what and how they normally fished clearly influenced commercial fishing stakeholders’ views on compatibility with energy developments. Very shallow water, especially if far enough away from land to avoid interference with viewsapes, was cited by a number of stakeholders for not only wind, but projects that could use the current or tide for energy. Some suggested that nearshore was more practical since that would limit the distance that cables would have to be laid and would make maintenance easier.

However, stakeholders pointed out that concerns about terrorism might trump any intention to allow fishing or other activities close to the turbines. If that were not the case, some suggested that the wind turbines might be compatible with aquaculture, particularly such enterprises as mussel and seaweed farming that could be anchored on lines between adjacent turbines. Alternatively, they might act as fish-aggregating devices, thus benefiting both commercial and recreational fishermen.

Some of the commercial fishing stakeholders were willing to consider the potential for different configurations of wind farms, for example, that might allow fishing in between the turbines. However, safety is a concern quite apart from the technology of wind energy itself. One respondent, for example, noted that if you configured the farm into a long line rather than a box, you could more easily navigate through, but if you lost an engine, you could still drift into one of the turbines.

Aquaculture supporters suggested that integrated, multi-trophic aquaculture was a use potentially compatible with wind farms. Questions remain about the feasibility of the structures being able to withstand both the turbines and nets or lines that would be required for aquaculture. Ecological questions also remain unanswered.

### **3.2.3 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.

The following is specific avoidance and mitigation information drawn from conversations with Northeast Atlantic region commercial fishing interests.

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For those who feel strongly that the current uses of marine resources are also the best uses and that the development of alternative energy poses a threat economically, socially, culturally and/or environmentally, no mitigation is possible. Some stakeholders argued that mitigation sounds like a “pay-off.” If the fishermen take money as compensation, some ask, are they giving someone the right to buy a public resource? Are they selling out on a tradition? Has the public resource been transformed to profit for a few? Many agreed that siting and mitigation should be decided locally and, in the words of one participant, should be “*left up to the people, the citizens.*”

Rhode Island’s Ocean SAMP found that mitigation would likely be needed, although direct monetary payments to current users were not necessarily considered essential or the best form of mitigation. (For example, support to enhance fisheries research might be acceptable.)

In Massachusetts, the construction of a LNG terminal provided a similar approach to mitigation. “Fishermen and environmentalists in the Gloucester area [were] strongly opposed to the development of two offshore LNG facilities near Gloucester. The facilities require fishermen to avoid a large area for security reasons, restricting some important fishing grounds and causing vessels to have to steam longer to get around the closed areas. Environmentalists have been concerned about the effect the ship traffic may have on endangered right whales inhabiting the area. In December 2006, \$6.3 million was provided to the Gloucester Fishing Community Preservation Fund as part of a \$12.6 million mitigation package for the LNG terminal being built off the coastline. These funds [are being] used to buy fishing permits from local fishermen who wish to leave the industry, and lease them to others” (Moser 2007).

Effects of funding for the permit bank are lauded by some as providing a means for the fishing community of Gloucester to retain control over permits through leasing rather than having them sold out of the community that would lead to undesirable consolidation and loss of local fishing enterprise. Others complain that the permit bank increases demand and thus causes an increase in permit leasing (or sale) prices to the detriment of smaller scale operations. The implication for these observations is that mitigation itself can have both positive and negative impacts, so that mandates for mitigation should consider the community’s goals or vision in their design.

### ***Financial mitigation***

For those who rely on the local knowledge that they have learned through experience, such as fixed gear fishermen, financial compensation may be the only possible compensation. Stakeholders noted that they cannot expect to move to an unknown area and be successful.

The challenges associated with financial mitigation include the difficulty of assessing the value of a person’s livelihood in a certain area and the question of how many generations should be “bought out?” Further, who should be paying for the mitigation and who should receive it? Should the government or energy companies pay for the mitigation and if the energy companies are the responsible party, does the government have the right to some of the compensation?

Some of those who were not concerned about their own business, suggested financial payments or buyouts of those who are financially in trouble. The majority, however, noted that much would depend on the scope of the project and also on what impacts arose over time. Several

noted that the amount of money it would take to truly compensate fishermen for today and for their progeny's future would be too high to be considered realistic. Several noted the importance of the energy developers being responsible for any negative impacts no matter how long in the future they arise.

### *Other forms of mitigation*

Other stakeholders noted that direct monetary payments to stakeholders would not necessarily result in long-term benefits that they valued. These respondents suggested creating a foundation that could be used to sustain fishing communities and fishermen by, for example, subsidizing health care, creating a permit bank, providing low-interest loans, especially for safety equipment, and/or funding collaborative research. A few respondents suggested facilities improvements, possibly even sharing the facilities needed by the energy developers for their businesses. Interestingly, in a logical way, some commercial fishermen suggested compensation in the form of energy. Specifically, either directly as discounted fuel or providing more energy-efficient engines.

Finally, some who have been disappointed with mitigation of negative impacts from other projects stressed the importance of really investigating who is likely to be harmed prior to the development. This is a commonly expressed issue relating to a sense of fairness or equity. As in any human endeavor, there are those who attempt, some believe, to undeservedly profit at every opportunity. Careful research and independent verification should be undertaken before mitigation is offered. Furthermore, several pointed out that this same level of careful research should also be focused on the living resources, for example, a stock assessment should be conducted before any construction is started and followed up with another following the construction.

### **3.2.4 Communication and process**

Social science literature has long discussed the challenges of gathering input from diverse sources through the use of the public hearing process (King et al. 1998). Sometimes it is the format (formal setting and time limits) that intimidates those without a formal education or those who speak English as a second language. In other cases, stakeholders consider the proceedings a formality, with the convening agency simply abiding by regulations, making it a waste of time to participate or testify.

The commercial fishing stakeholders who participated in this project had many ways of saying essentially that participation in the public hearing process was not an effective way of having an impact on decisions so many of them no longer participate, or have abandoned hope of actually making a difference.

Furthermore, chances of getting a fisherman to a meeting are generally low – if they have to be at the dock (and not fishing), they are probably tending to their boats, nets, etc. If the weather is bad –you might get a good turnout. However, suggestions for maximizing the probability of convening a larger group included:<sup>7</sup>

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<sup>7</sup> All of these avenues were tried for the New Bedford stakeholder meeting, but attendance was very low. The sense of urgency may have been muted by the prior two meetings focused on wind energy projects and, as pointed out above, we had no control over the sudden “scheduling collision,” as one of the assessment scientists commented.

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Emphasize urgency and need for their participation.

Identify key people who can spread the word.

Announce in Savingseafood.org, Gloucester Daily Times.

Fisheries associations such as the Massachusetts Fishery Partnership, an umbrella organization for a large variety of fishing associations, can let their members know.

Post notes at dealers', distributors, auction houses, etc. – then you will reach some of the people not affiliated with an association/group.

Make sure not to cross-schedule meetings and try not to have too many meetings – fishermen are tired of meetings.

Though most fishermen have email, few use it regularly.

The minute BOEM starts to think about doing something to an area of the ocean, they should bring the fishing industry into the discussion.

Shift burden of proof away from fishermen.

Make sure little projects do not creep into the larger projects [without analysis] (e.g., gravel mining associated with Deep Water Energy off New York).

It was difficult to attract multiple attendees to stakeholder meetings due to scheduling conflicts, the frequency of “urgent” meetings on topics relating to management that have immediate impacts on commercial fishermen, meetings scheduled by other entities with overlapping objectives, distrust of what is perceived as another approach to displacing fishermen, and a lack of compelling reason for non-commercial users to participate. Furthermore, the larger gatherings tended to be dominated by a few of the participants. We found, therefore, that personal calls on individuals, though also difficult to schedule, were an effective way to communicate about the project and more importantly, to obtain stakeholders' views.

Questions about whether or not commercial fishing is compatible with wind farms cannot be answered until fishermen learn answers to the following:

*Will there be an exclusionary zone? Will there be an area that is off-limits to all fishing? Will there be an area that is off-limits to mobile gear fishing? Some European wind turbines have an exclusionary zone of 50m and others have an exclusion around the entire field. What will be the case in New England? What about cables? Can we fish on top of the cables?*

As noted in prior sections, in some cases, the commercial fishing stakeholders expressed support of the concept of alternative energy development, but reiterated the critical importance of developing a dialogue with the stakeholders to make sure that the projects were sited to sustain traditional uses. On-going communication is best, rather than relying on formal public hearings. Queries about use must be geographically specific and it is important that stakeholders be assured that their views will actually be considered. The process to develop Rhode Island's

SAMP was occasionally cited as a good model, especially by those who had participated, but recent events raised questions about BOEM's regard for the SAMP in the AMI for Rhode Island and Massachusetts. While this may be based on a misunderstanding, according to one person involved in the process, since the proposed lease sites in the AMI were unsolicited (that is, the energy companies submitted bids for sites they were interested in, BOEM had not offered them), the perception that BOEM does not feel constrained by the Rhode Island SAMP is evident.

The commercial fishing industry participants learn about regulations and other activities that could affect their business from direct mail (e.g., letters from government agencies), emails from sectors and/or trade associations, as well as trade journals such as *Commercial Fisheries News* and *National Fishermen* and the email newsletter *Saving Seafood*. Some industry members noted that they also listened to the news, read newspapers and learned about events or activities by word-of-mouth (networking) including via cell or satellite phone calls. Many of the vessels in the Northeast are required to maintain a vessel monitoring system on their boats such as Boatracs that can receive and send emails, making notification by both friends and regulatory agencies easier. The newspapers for the fishing ports of New Bedford and Gloucester have columnists who specialize in reporting on fisheries issues, sometimes including investigative pieces.

Certain fisheries (e.g., herring) have hired representatives to attend regulatory meetings and keep up with changes. Professional organizations such as the Offshore Lobstermen's Association, Massachusetts Lobstermen's Association, the Northeast Seafood Coalition, the Massachusetts Fishermen's Partnership, Gloucester Fishermen's Wives Association, New England Red Crab Harvesters' Association, the Fisheries Survival Fund, the Point Club, the Rhode Island Party and Charter Boat Association, Rhode Island Salt Water Anglers Association, National Party Boat Owners Alliance, and the Rhode Island Commercial Fisheries Center usually have executive directors or presidents who represent their members at appropriate meetings. Similarly, for aquaculture interests, professional meetings such as those of the Martha's Vineyard Shellfish Group and the World Aquaculture Society are used to disseminate information about common concerns, such as regulations and predators.

NMFS regularly sends permit holders letters regarding regulations. They apparently send all permit holders notices about species other than those for which they hold permits, so permit holders often receive multiples of each notice.

The NEFMC maintains extensive mailing lists for those interested in each species and sends notices of pertinent meetings, including Advisory Panel meetings. Vessel owners often attend these meetings, though occasionally will send a captain to represent their interests.

The fish auctions and buyers or Settlement Houses (accounting offices) usually post notices of interest to fishermen. City commissions or advisory panels such as Gloucester Fisheries Commission and the New Bedford Mayor's Seafood Council meet regularly with topics of interest to their fishing community on their respective agendas.

Some noted that at times there is information overload, so it is better to go through a group rather than to contact an individual.

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### 3.3 COMMERCIAL VESSELS

#### 3.3.1 Characteristics and use of space

The Northeast Atlantic region is home to 29 ports, of varying sizes, supporting commercial shipping as well as other maritime activities. There are many ways to characterize and compare ports (by volume or value of trade, vessel calls, number of cruise passengers, revenues, and storage capacity, etc.), but since the focus of this report is on offshore space-use conflicts, the most informative way to characterize ports is by the number of vessels, by type, that call at the port. This provides a sense of how busy shipping routes are in the area. Table 3-3 presents the number of calls by oceangoing self-propelled vessels of 10,000 deadweight tonnage (DWT) or greater in the northeast region (these vessels account for well over 90 percent of the capacity calling at U.S. ports).

By this and some other measures, the Port of Boston is the largest port in the region, followed by Portland, ME and Providence, RI. Boston is the principal container port in the region and leads in the import of refined petroleum products. Boston ranks fourth nationwide in the number of natural gas carriers. One natural gas terminal is located in Boston Harbor and two deepwater LNG terminals, the Neptune LNG and the Northeast Gateway, are located in Massachusetts Bay. The petroleum and LNG arriving in the Port of Boston supply more than 90 percent of Massachusetts' heating and fossil fuel needs. Portland receives from producing nations twenty-three million tons of crude oil each year on 420 ships, including very large crude carriers (VLCC) and underclasses. The Portland-Montreal Pipe Line connects storage terminals in Portland Harbor to refineries in Montreal, Canada.

In this region, most trans-oceanic routes are to and from the New York transportation separation scheme (TSS) south of Cape Cod, and the ports of Boston and Portland. A large amount of commercial vessel traffic in the northeast region is coastwise between the ports on the Atlantic seaboard. These vessels include container ships, tankers, general cargo, roll-on/roll-off, and tugs and barges. East coast tugs and barges try to stay within 10-12 miles of the coast and stay away from where ships operate. Though no lanes are designated, significant tug and barge traffic travels north and south through Massachusetts Bay.

The coast's population increase has led to a perception of crowding both on the sea and on the coast. Harbor plans address conflicting demands in the near shore areas of communities such as Gloucester, MA, New Bedford, MA, and Portland, ME. Designated port areas in Massachusetts permit only water-dependent businesses. Maine also has special tax programs that support working waterfronts. There is a general awareness of the concept of zoning applied to marine areas, though not necessarily an acceptance of additional space being allocated to other uses.

The growing population of the East coast has also attracted increased shipping activity, both international and coastal, to supply the larger population centers. Plans to further develop short sea shipping, especially to remove some road congestion, is being actively pursued.

Section 2.3.2.2 (p. 18) includes a description of the pool of Atlantic coast commercial vessel sector participants who contributed information to this study. Table 2-5 (p. 21) lists these participants' specific sectors.

### 3.3.2 Compatible and conflicting uses

#### *Commercial Shipping*

Cargo ships determine routes based on operating efficiency (minimum fuel consumption and/or minimum hours underway) and safety. For trans-oceanic trips the route generally will follow a Great Circle, with deviations based on weather service recommended routing. Otherwise, the route will follow a rhumb line or a composite course. Once in coastal waters, ships are subject to routing measures such as traffic separation schemes, lanes, and separation zones approved by the International Maritime Organization's (IMO) Maritime Safety Committee.

The characteristics of ports to which a ship is headed (location, capabilities, size, and the depth of entrance channels and berths) have a great deal to do with the patterns of shipping by ocean carriers and coastwise vessels. Over the past decades, technological changes in cargo transportation and handling, particularly containerization of cargo, has led to a concentration of cargo handling and shipping in a smaller number of "load center" ports. This is a function of the need for increasingly deeper channels to accommodate ever larger ships, large expanses of land to store and marshal containers, and the importance of good rail and highway connections to move the containers inland. Older ports, or ports without these attributes, have fewer visits by ocean-going vessels and may also become feeder ports receiving cargo from the larger ports. The latter phenomenon, moving cargo between ports on the East coast by smaller ships, towboats and barges, is predicted by many to have the potential to grow significantly in the future.

Stakeholders in the ocean carrier and tug and towboat industries explained that different types of cargo ships have different operational characteristics that affect their patterns of use of the ocean.

Container ships are on fixed schedules that if interrupted or altered have serious operational and cost implications. Further, route disruptions or difficulties can cause a change in itinerary, costing ports significant business losses.

Bulk shipping (oil, chemicals, and dry raw materials) does not operate as much on a fixed schedule, but sails when and where needed as determined by the cargo. The patterns of shipping by product tankers carrying refined oil products such as gasoline, diesel, kerosene, jet or fuel oil to market, are not the same year-round as each season is different and each year may be different. Petroleum products are sometimes re-sold en route with consequent rerouting of the ship with the change in destination.

East coast tugs and barges try to stay within 10-12 miles of the coast and stay away from where ships operate.

Port stakeholders made the following points:

Ports have developed specialized infrastructure to handle specific types of cargo. Activities in the ocean that disrupt established shipping routes may affect port business and sunk investments. This is particularly true for niche ports.

The location and capability of ports are key indicators of where future offshore projects will be developed because of the need for logistical support. Offshore projects cannot happen without adequate landside infrastructure.

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In general, shipping routes are determined based on economic efficiency, the avoidance of known hazards or user conflicts, and conformance with navigational and operational safety measures. Each of these is fundamental to the shipping industry and not readily alterable.

### ***Ferries***

Passenger vessel owners and industry representatives who participated in this study uniformly responded that the development of offshore renewable energy in Federal waters is unlikely to directly interfere with their operations since there are/have been very few offshore routes. Almost all ferry routes are in state waters and operate within bays, harbors, intracoastal waterways, estuaries and rivers or other coastal waters.

The exception to this was the Cape Wind project located in a patch of Federal waters surrounded by state waters in the middle of Nantucket Sound. The Passenger Vessel Association, and the two companies operating ferries in Nantucket Sound, the Steamship Authority and Hy-Line Cruises, opposed the construction of Cape Wind because of its potential hazardous impact on navigation and safety of passengers on ferry vessels. The concern was over navigational needs in the event of bad weather (poor visibility or ice), or a navigation incident such as the need to make an evasive maneuver. Following approval of the project, Hy-Line Cruises has partnered with Cape Wind to offer guided tours of the project during and after construction.

Asked if there have been, are, or might be ferry vessels operating in Federal water, industry stakeholders identified:

The high-speed car ferry that operated until 2009 across the Gulf of Maine between Bar Harbor, Maine and Yarmouth, Nova Scotia. This service has been discontinued and the vessel sold.

The ferry operating during the summer between Montauk, Long Island and Block Island.

It is important to understand that many ferry routes compete with an alternative transportation mode (automobiles, in this case). A good example is the ferry service between Boston and Provincetown, Massachusetts. The economic viability and success of this route is extremely time-sensitive. If the ferry had to follow a less direct route or slow its speed because of an offshore renewable energy project, much of the advantage of choosing the ferry would disappear, as would passengers, and the route would no longer be financially viable. Further, the loss of one profitable route such as this affects the economic health of the company and may very well have far-reaching impacts on the company's remaining operations.

### ***Excursion Vessels***

Commercial whale watch companies operate from a number of ports in New England. Most try to do two trips per day, which limits the distance they will go offshore and puts a premium on unobstructed and unconditioned routes. As revealed during conversations with these stakeholders, direct navigational access to areas such as Stellwagen Bank (National Marine Sanctuary), where whales congregate at times during the year, is important to their businesses. These excursions must run efficiently for scheduling purposes and any required re-routing could result in a serious economic consequence.

### ***Cruise Ships***

Cruise ship stakeholders identify conflicts with renewable energy projects as a priority concern. This seems to be based on their operational characteristics:

Trans-Atlantic routes do not change dramatically, ships follow Great Circle routes. Passengers are not interested in spending time at sea.

Cruise itineraries change over time because new ports-of-call are added; others are dropped for reasons such as pollution, crime, taxation, better profit margins elsewhere, etc.

Cruise ship routes do differ seasonally.

Cruise ships will go far enough offshore to get out of sight of land, approximately 25 miles, but much depends on currents, weather, shoals, and the ports-of-call. If there are ports-of-call along the way, ships will not go as far offshore.

Most cruise ships are foreign flagged vessels so cannot transport passengers between U.S. ports. This has an effect on the pattern of itineraries and the routes.

### **3.3.3 Avoidance and mitigation strategies**

The reader is directed to Chapter 8 of this report for a discussion of avoidance and mitigation strategies relevant in the context of potential conflicts between commercial vessels 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.

### **3.3.4 Communication and process**

The Harbor Safety Committees for each port (where there is a U.S. Coast Guard sector) are an excellent portal to the diverse commercial-shipping and related interests operating out of the port. Harbor safety committees (also variously referred to as Port Safety Forum, Marine Advisory Association, Port Advisory Group, Port Operators Group) are local port coordinating bodies throughout the country that work with the U.S. Coast Guard to address issues relating to the safety, security, mobility, and environmental protection of a port or waterway. Membership typically comprises local representatives of: port authorities; vessel owners and operators; harbor pilots; Marine Exchanges; tug and tow operators; shipping agents; terminal operators; industry associations; organized labor; commercial fishing industry associations; and local, State and Federal government agencies.

Industry organizations also suggested that they are a good means for communicating with their members. In the commercial shipping sector, these include, among others:

American Association of Port Authorities

North Atlantic Ports Association

American Waterways Operators (a conduit for the tug, towboat and barge industry)

Union of Greek Ship Owners

Chamber of Shipping of the U.S. (cargo ships)

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Communication with passenger vessel interests can occur through the Passenger Vessel Association and Cruise Lines International Association, which serves East Coast ports. In addition, individual ferry companies indicated that direct email to them would be effective. The National Association of Charter Boat Operators provides a channel to the charter boat industry. Harbor pilots can generally be reached through the American Pilot Association, a national trade association of professional maritime pilots with membership comprising approximately 60 groups of state-licensed pilots.

### **3.4 NONCOMMERCIAL USES**

#### **3.4.1 Characteristics and use of space**

[Note: In addition to describing other region-specific non-commercial uses, this section describes recreational boating activity (a principal non-commercial use) generally along the entire Atlantic seaboard.]

Recreational fishing along the East coast is dominated by Florida, followed by the Carolinas, New Jersey, New York and then Massachusetts. Maine and Rhode Island also have active recreational fishing participation. As reported by NOAA, recreational fishermen in the region harvested 32,773 thousand pounds of finfish in 2010. Of this quantity, Massachusetts fishermen harvested 20,662 thousand pounds, Connecticut and Rhode Island fishermen harvested 5,671 thousand and 3,811 thousand respectively. Fishermen landed 1,219 thousand and 1,410 thousand in Maine and New Hampshire (NMFS 2011).

Recreational fishing is linked to commercial fishing by both the availability of services in fishing communities and the cross-cutting ties between commercial and recreational interests represented by charter-party boats. In 2010, 6.7 million residents of the Atlantic coast participated in recreational fishing and, including visitors, caught approximately 198 million fish during 44 million fishing trips. Approximately 8 percent of these trips originated in Massachusetts, with lesser percentages originating in Maine, New Hampshire, Rhode Island, and Connecticut (NMFS 2011).

Characterizing recreational boating use of coastal and ocean waters is somewhat difficult in that one of the key attractions of such activity is the fact that the boaters are free to go where they please (within obvious limitations). As much of this type of activity is not destination-based, predicting where recreational boating activity may occur is not a simple matter. According to a number of recreational boaters and marine industry representatives, when trips are destination-based (e.g., boaters are leaving their homeport to visit another, or a dive site or fishing spot), it is common for the chosen route to be the most direct. Simply put, many boaters will travel far enough offshore to be clear of potential coastal hazards and, once in open water, make a beeline to their destination. This is especially true for powerboats. However, even this may not always be the case as for some boaters, the actual enjoyment of boating is as important as the destination, and others may not feel comfortable venturing too far from land, in which case the journey may be more of a cruise along the coast.

#### ***Numbers of registered boats***

The U.S. Coast Guard's Office of Auxiliary and Boating Statistics summarizes boat registration data by state as part of its annual Recreational Boating Statistics reports. Data from 1998 to 2010 were available on the Office of Auxiliary and Boating Statistics website and were used to assess if there had been any changes in the number of state-registered recreational along the Atlantic coast. The limitations of state boat registration data have been discussed previously; however, changes in the number of registered boats may provide an indication of the popularity of recreational boating. Between 1999 and 2010, there were, on average 4,099,676 boats registered in all coastal Atlantic states from Maine through Florida. The minimum number of registered boats was in 1998 when the Office of Auxiliary and Boating Statistics reports 3,926,025 boats. The maximum number of 4,229,003 boats was recorded in 2006 (U.S. Coast Guard 2011). Thus, over the last 12 years, the number of registered boats in coastal Atlantic states has fluctuated by approximately 300,000 boats, suggesting that the changes in state-boat registration have not been particularly significant.

Figure 3-4 shows the changes in state-registered boat numbers as the percentage difference relative to the mean between 1998 and 2010. While the absolute changes have not been particularly significant, Figure 3-4 suggests that between 1998 and 2006 there was a general trend of increasing numbers of state-registered boats from year to year. However, this trend appears to have reversed since 2007, with the number of state-registered boats steadily falling. It is beyond the scope of this study to conclude why this trend may be occurring, but it may relate to general economic circumstances and a general trend of increasing gas prices. However, while the current trend may be downward, it does not suggest a rapid decrease in the number of state-registered boats.

It is important to note that boat ownership and boat usage are not the same thing. It is possible that in tough economic times, boaters will reduce discretionary spending by simply reducing their boat usage rather than selling their vessel. The 2010 Massachusetts Recreational Boater Survey (Hellin et al. 2011) found that 53 percent of boaters reported that their 2010 boating activity had been "somewhat less" to "much less" than normal. This was despite the fact that gas prices had dropped and the weather was generally suitable for boating. However, Massachusetts was still recovering from a severe recession at that time.

Weather is also an important factor influencing recreational boating activity, especially in the Northeast where the boating season is limited by the seasons. In Massachusetts, the peak recreational boating season is during July and August. Boating industry representatives generally suggest that little recreational boating occurs before May. As more people take their boats out of winter storage and the weather improves, boating activity gradually increases through May and June. Recreational boating activity then begins to decline through September and October, with Labor Day being the last big boating holiday. The seasons also influence the movement of recreational boats up and down the Atlantic seaboard with many boaters from the Northeast travelling south to Florida for the winter and returning north for the summer.

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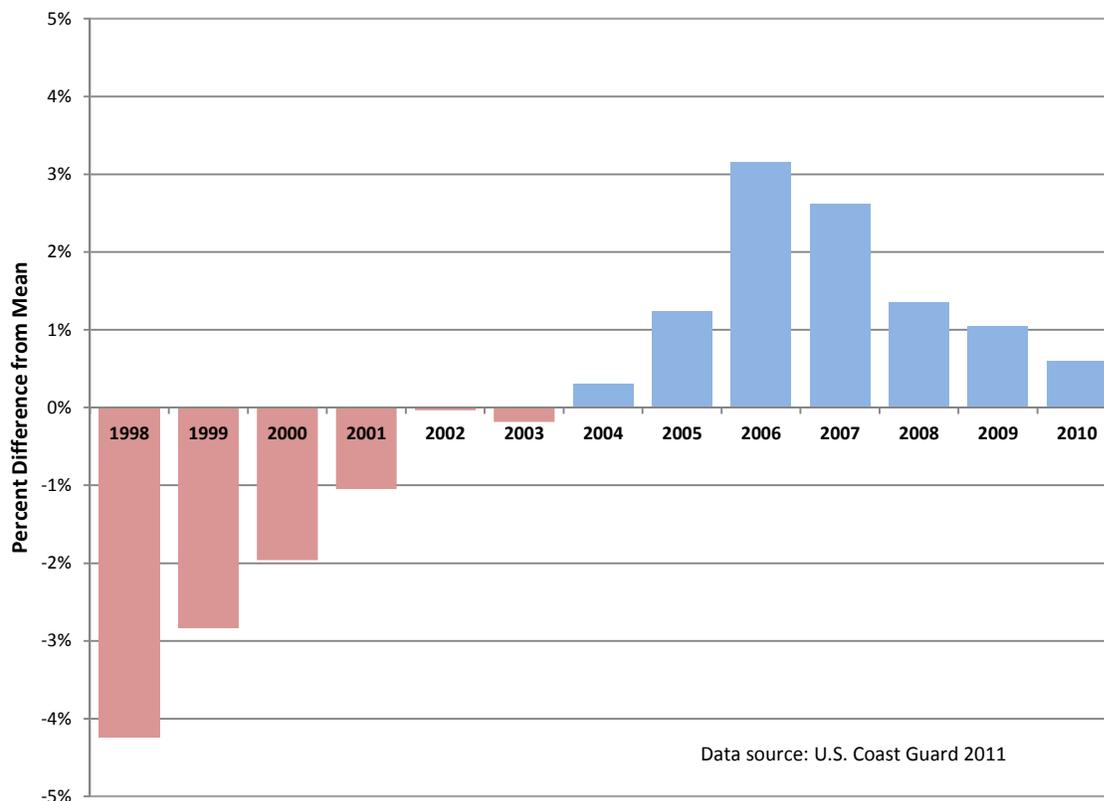


Figure 3-4 Changes in the Number of Registered Boats in Atlantic Seaboard States, 1998 - 2010

Representatives of the offshore sailing community suggested that as many of the major offshore races have existed for decades, there is little to suggest that this will change. It is possible that new races will be established but they are likely to be between ports already recognized as centers for offshore sailing events. It is also possible that new long distance (e.g., round-the-world) races will be organized, but these too are likely to use ports that already cater to offshore racing events.

Section 2.3.2.3 (p. 21) includes a description of the pool of Atlantic coast non-commercial sector participants who contributed information to this study. Table 2-6 (p. 22) lists these participants' specific sectors.

### 3.4.2 Compatible and conflicting uses

Many recreational boaters use the waters of the United States and all evidence suggests that the nearshore waters are often frequented by recreational boats; however, it is not easy to characterize areas that are of particular value to these users and it remains difficult to quantify the intensity of recreational boat use, especially in offshore areas.

Boating industry representatives suggested that between 13,000 and 16,000 recreational boats travel between the northeast and Florida each year. Of these, they estimated that probably 80

percent travel closer to shore and, where possible, use the intracoastal waterway. The Atlantic intracoastal waterway, authorized in the 1939 Rivers and Harbors Act and maintained by the U.S. Army Corps of Engineers, provides recreational and commercial vessels with a protected inland waterway extending approximately 1,200 miles from Norfolk VA to Miami FL (see <http://www.atlintracoastal.org/>). The remaining 20 percent are generally larger boats that are more suited for and remain offshore for longer periods. Industry representatives suggested that some boaters choose to stay offshore due to the need for dredging within the intracoastal waterway. Motorboats transiting offshore generally travel in relatively straight lines from port to port while the routes taken by sailboats are more dependent on the prevailing winds and currents.

Even when boaters are not making long distance journeys, many remain relatively close to shore. A recent study of recreational boating carried out in Massachusetts suggests that recreational boating is common throughout most nearshore waters (Hellin et al. 2011), a finding supported by conversations with boating and industry representatives and boaters. It was suggested that sailing is common in almost all nearshore waters and that much of this activity occurs out of yacht clubs. In addition to general sailing, much of the competitive sailing occurs in close proximity to yacht clubs and consists of races out to and around buoys or other “markers” and back, or from one yacht club to another. As such, the location of yacht clubs may be a proxy for centers of sailing activity.

The need for shoreside facilities, infrastructure and the proximity of emergency services (e.g., marinas, boat ramps, mooring fields, U.S. Coast Guard stations, etc.) means that, in general, most boating occurs within a few miles of such facilities. This infrastructure and support offers a safe haven for boaters in the event of bad weather or an emergency. If boaters are venturing further from the relative safety of shoreside facilities and emergency services, they require vessels that are designed to withstand more severe conditions and are equipped for longer distance travel. Generally these are larger, more specialized vessels that are expensive to purchase and to run and, as such, are less common than smaller vessels designed for nearshore use. Additionally, operating offshore or over long distances requires a higher degree of seamanship than many boaters possess.

As one moves further from shore, fewer and fewer boats are suited to such areas and it would be expected that, if boaters were simply cruising around, the density of recreational boating would decline significantly. However, the question then arises as to what such boaters are doing so far offshore. Some boaters may be heading for dive sites or fishing spots and, as such, would be expected to take the most direct route possible once clear of nearshore hazards. When sailing, there are many factors that determine the route that is taken, including weather, prevailing wind, and currents (particularly the Gulf Stream). In general, sailors use weather forecasts to determine the best possible route to their destination.

One particularly specialized group of users of offshore waters is the sailors who participate in ocean racing. There are a number of long distance races along the Atlantic coast or in and out of Atlantic ports and these represent a culturally, historically and economically important use of the coastal and offshore waters. Probably the most well-known of these is the “Bermuda Race” or the “Newport Bermuda Race,” which is the oldest ocean race for amateur sailors in normal boats. This biannual race has historically started from locations such as Brooklyn NY, Marblehead MA,

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New London CT and Montauk NY, but since 1936, the starting point has been Newport, RI. Since it was founded in 1906, this 635-mile, 3 to 6 day race has taken place 47 times and has involved nearly 5,000 boats and more than 50,000 sailors (Newport Bermuda Race 2012).

Other East Coast races include:

Marblehead, MA to Halifax, Nova Scotia (Marblehead to Halifax Ocean Race – established 1905)

Annapolis, MD to Bermuda (Bermuda Ocean Race – established 1979)

Marion, MA to Bermuda (Marion-Bermuda Cruising Yacht Race – established 1977)

Charleston, SC to Bermuda (Charleston Bermuda Race)

Antigua to Charleston, SC (Antigua Charleston Race)

Annapolis, MD to Newport, RI (Annapolis to Newport Race – established 1947)

Stonington, CT to Boothbay Harbor, ME (Lobster Run Race)

Port Everglades Inlet, FL to Montego Bay, Jamaica (Pineapple Cup – established 1961)

Newport to Bermuda to Newport (Bermuda One-Two – established 1977)

Miami, FL to Nassau, Bahamas (Nassau Cup Ocean Race – established 1934)

While these races have long-established start and end points, the routes taken in between vary considerably. The fastest route between two points for a sailboat is rarely the most direct. The factors skippers consider including prevailing wind and weather, but also the probable location of the Gulf Stream, or eddies associated with the Gulf Stream.

Since recreational boating occurs over a wide area, it is likely that a wind energy project would have some impact on this activity, with the degree of impact influenced by a number of factors. If recreational boaters are not restricted from the project area, the impact on use of smaller recreational boats may be minimal; in fact, the project could attract boaters for sightseeing or fishing purposes. If recreational boaters are prohibited from entering the project area, due to regulations or practical limitations (e.g., limited ability to maneuver between turbines), the impact would be greater. Project size is also a factor. Recreational boaters may be able to easily avoid a project area with a small footprint. A larger footprint, especially if located in a route to a popular recreational boating destination, would have a larger impact. In addition to a project's physical impact, some concern was expressed about the possibility of a wind energy project creating a "wind shadow," 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 a project were proposed in or near established racing routes or areas. Some races have over 100-years of history and, as such, represent a historic and cultural asset.

Stakeholders offered little advice about how potential conflicts between wind energy projects and recreational boating could be avoided apart from locating facilities away from heavily used areas and away from historic racing routes or areas. However, members of the sailing community

acknowledged that as sailors and offshore wind farms are both reliant on wind energy, some conflict may be unavoidable.

***Commercial Vessels***

One of the most serious space-use conflicts is between recreational boaters and shipping. It is not unknown for recreational boats to be hit by ships, especially near shipping lanes. However, commercial shipping traffic is not restricted to these lanes and commercial vessels may be encountered almost anywhere where recreational boating might occur, particularly in the vicinity of busy ports. These conflicts are potentially more serious when they occur between sailboats and commercial shipping as sailboats are generally less maneuverable than powerboats and are therefore less able to steer clear of collisions.

***Commercial Fishing***

Space-use conflicts between recreational boaters and commercial fishing vessels are common. Simply put, many areas used by the commercial fishing industry are also popular with recreational boaters and recreation vessels can damage and become entangled in fishing gear. One area that was specifically identified during one conversation was Maine, where popular boating areas are also heavily used by lobstermen leading to frequent conflicts. Once again, there is little that can be done to limit such conflicts.

***Whales***

Whales can be an issue particularly for large racing sailboats. In order to protect certain whales, regulations exist that restrict how close a vessel may approach whales and limit the speed of some vessels to reduce the risk of serious injury to a whale in the event of a ship strike. One example of this is with the North Atlantic right whales. Due to low numbers, this species is one of the most endangered whales in the world. In addition, the fact that they are slow moving, are often found near to the coast, and spend extended periods of time near the surface makes them particularly vulnerable to being struck by vessels. To reduce this risk, all vessels over 65 feet in length must travel at or below 10 knots when in certain areas along the Atlantic seaboard at certain times of the year. The basis for the conflict between these regulations and large racing sailboats is that it is almost impossible for such vessels to move so slowly. The skippers therefore have the choice of being in breach of the regulations or steering clear of such areas.

***Native American Tribe***

The Aquinnah Wampanoag stakeholders have social, historic, cultural and spiritual concerns. Nantucket Sound, for example, was dry land thousands of years ago and the Wampanoag believe that areas of the Sound are likely to have been traditional burial grounds. In addition, a traditional ceremony of the Wampanoag involves the rising sun over the Sound. The Massachusetts Historical Commission has recognized Horseshoe Shoal by including it in the National Register of Historic Places. The Wampanoag have filed suit to block the Cape Wind project on Horseshoe Shoal (Vineyard Gazette 2011).

***Stellwagen Bank National Marine Sanctuary***

The sanctuary is engaged in a five-year partnership between the National Marine Sanctuary Program (NMSPP) and the National Centers for Coastal Ocean Science, Center for Coastal Monitoring and Assessment in order to develop a biogeographical approach to managing the

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marine resources in the sanctuary. The sanctuary hosts a vast array of fish, seabirds, and marine mammals. While the commercial fishermen currently retain rights to fish in the sanctuary, there are some indications that sanctuary staff would prefer to curtail those rights. They are unlikely to approve major construction in the sanctuary.

### **3.4.3 Avoidance and mitigation strategies**

The reader is directed to Chapter 8 of this report for a discussion of avoidance and mitigation strategies 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.

### **3.4.4 Communication and process**

A common sentiment expressed throughout the data-gathering phase of this study was how effective and timely communication are critical when offshore renewable energy facilities are being considered. Early stakeholder involvement is likely to greatly improve any public process when it comes to developing offshore renewable energy.

#### ***Recreational boating***

While recreational boaters represent a diverse group of stakeholders, there are a number of key organizations through which information about potential offshore renewable facility siting should be disseminated. Two of the most important organizations are the Boat Owners Association of the United States (BoatUS), which has represented the boating community since 1966 ([www.boatus.com](http://www.boatus.com)) and US Sailing, the National Governing Body for the sport of sailing ([home.ussailing.org](http://home.ussailing.org)). Other organizations that should be considered for communication purposes are listed in Table 3-5.

#### ***Native American Interests***

Consultation with Native American interests is critical, but can be complicated by Tribes' right to direct communications between sovereign nations (i.e., between the United States and the Tribe). Tribes in New England requiring consultation include the Wampanoag Confederacy, which includes the Passamaquoddy, Penobscot, Mashpee, Aquinnah Wampanoag, Narragansett, Shinnecock and Micmac. However, no single tribe can represent the others. Consultation should begin with direct communication between a ranking government official and the tribal leader, each of whom would then appoint subordinate staff to continue a more detailed conversation. As with commercial fishermen, the tribes consider on-going dialogue to be important.

Table 3-5

Organizations Representing Recreational Boating Interests

Name	Description	Website
National Marine Manufacturers Association	Leading U.S. trade association representing boat, marine engine and accessory manufacturers. Collectively, NMMA members manufacture an estimated 80 percent of marine products used in North America.	<a href="http://www.nmma.org/">www.nmma.org/</a>
National Boating Federation	Largest non-profit, nationwide alliance of recreational boating organizations, representing over 2,000,000 of America's recreational boaters.	<a href="http://www.n-b-f.org">www.n-b-f.org</a>
United States Power Squadrons	Non-profit, educational organization dedicated to making boating safer and more enjoyable by teaching classes in seamanship, navigation and related subjects.	<a href="http://www.usps.org">www.usps.org</a>
States Organization for Boating Access	Devoted to the acquisition, development and administration of public recreational boating facilities nationwide.	<a href="http://www.sobaus.org">www.sobaus.org</a>
Recreational Boating & Fishing Foundation	Non-profit organization whose mission is to increase participation in recreational angling and boating and thereby increase public awareness and appreciation of the need for protecting, conserving and restoring this nation's aquatic natural resources.	<a href="http://www.rbff.org">www.rbff.org</a>
American Boating Association	Focused on improving the safety, affordability, environmental cleanliness, growth and fun of recreational boating.	<a href="http://www.americanboating.org">www.americanboating.org</a>
National Association of State Boating Law Administrators	Non-profit organization that works to develop public policy for recreational boating safety.	<a href="http://www.nasbla.org">www.nasbla.org</a>
Coast Guard Auxiliary Association	The U.S. Coast Guard's "Executive Agent" for recreational boating safety programs.	<a href="http://www.cgauxa.org">www.cgauxa.org</a>
The Cruising Club of America	Promotes cruising by amateurs, encourages the development of suitable types of cruising craft, and stimulates interest in seamanship, navigation and handling of small vessels.	<a href="http://www.cruisingclub.org">www.cruisingclub.org</a>
Offshore Racing Association	An alliance of the Chicago Yacht Club , Cruising Club of America and Transpacific Yacht Club formed to promote and support the use of VPP-based handicapping.	<a href="http://www.offshorerace.org/">www.offshorerace.org/</a>
Association of Marina Industries	Non-profit membership organization dedicated exclusively to serving the needs of the marina industry.	<a href="http://www.marinaassociation.org/">www.marinaassociation.org/</a>



## 4.0 FINDINGS: MID-ATLANTIC

### 4.1 REGIONAL CHARACTERIZATION AND OVERVIEW OF RELATED ACTIVITIES

Commercial fishing activity in the Mid-Atlantic region is comparable to the Northeast Atlantic region in terms of landings quantity, accounting for approximately 9 percent of total U.S. landings by mass (including Alaska) in 2009. However, the value of these landings was considerably less than the Northeast Atlantic, accounting for approximately 11 percent of total U.S. landing revenues (20 percent when Alaska is excluded) (NMFS 2010). The seafood industry supported more than 125,000 jobs in the Mid-Atlantic region in 2009; New York and New Jersey accounted for approximately 35 and 30 percent of these jobs, respectively (NMFS 2010). Table 4-1 summarizes commercial fishery landings in the Mid-Atlantic states in 2009, the most recent year for which data are currently available. Figure 4-1 illustrates the distribution of commercial fishing activity in this region.

The Mid-Atlantic region accounted for the largest share of recreational fishing effort (i.e., number of trips) and recreational fishing trip expenditures in the United States in 2009 among the regions in this study (approximately 29 and 31 percent of the national totals, respectively) (Table 4-2). Consistent with the national trend, almost all of the effort was divided equally between private boat and shore-based activity.

Mid-Atlantic commercial vessel activity is concentrated around the ports of New York, Philadelphia, Baltimore, and the Virginia port complex (Table 4-3 and Figure 4-2; see also Figure 3-2 for the New York/New Jersey area). The total number of vessel calls in 2010 in this region (12,318) is the largest among the five regions in this study. In general, based on the most recent available data (2008), the Mid-Atlantic region accounts for the largest relative share of transport, support, and marine operations industries in the United States, including approximately one-quarter of the nation's deep sea freight transportation activity (NMFS 2010).

Tables 4-1 through 4-4 provide a broad characterization of important user communities in the Northeast Atlantic region, 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 region, 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. Figures 4-1 through 4-3 provide visual illustrations of ocean use activity in the Northeast region, with a focus on commercial fishing (Figure 4-1), commercial vessels (Figure 4-2), and other activity (Figure 4-3). As noted in the Introduction, Figure 4-3 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.

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Table 4-1

Commercial Fishery Landings, Mid-Atlantic Region, 2009

<b>State</b>	<b>Species Group</b>	<b>Quantity (000s lbs)</b>	<b>Revenue (\$000s)</b>
New York	Finfish and Other	16,186	\$17,495
	Shellfish	18,227	\$31,777
New Jersey	Finfish and Other	73,605	\$23,033
	Shellfish	87,994	\$125,999
Delaware	Finfish and Other	1,154	\$1,061
	Shellfish	3,856	\$6,475
Maryland	Finfish and Other	20,420	\$11,957
	Shellfish	47,893	\$64,100
Virginia	Finfish and Other	379,538	\$41,725
	Shellfish	46,714	\$111,005
North Carolina	Finfish and Other	32,413	\$33,993
	Shellfish	36,222	\$43,018
<b>Subtotal</b>			
	Finfish and Other	523,316	\$129,264
	Shellfish	240,906	\$382,374
<b>Total</b>			
		764,222	\$511,638

Source: NOAA National Marine Fisheries Service 2010

Table 4-2

## Recreational Fishing Activity, Mid-Atlantic Region, 2009

State	Fishing Mode	Effort (000s trips)	Trip Expenditures (\$000s)
New York	For-Hire	372	\$34,773
	Private Boat	2,889	\$81,319
	Shore	1,656	\$30,745
New Jersey	For-Hire	434	\$48,804
	Private Boat	2,753	\$151,778
	Shore	2,257	\$79,979
Delaware	For-Hire	43	\$4,917
	Private Boat	498	\$26,932
	Shore	379	\$25,796
Maryland	For-Hire	205	\$25,257
	Private Boat	1,598	\$58,410
	Shore	1,008	\$80,163
Virginia	For-Hire	47	\$5,721
	Private Boat	2,021	\$125,568
	Shore	917	\$28,109
North Carolina	For-Hire	219	\$57,032
	Private Boat	2,032	\$95,410
	Shore	3,446	\$415,644
Subtotal	For-Hire	1,320	\$176,504
	Private Boat	11,791	\$539,417
	Shore	9,663	\$660,436
Total		22,774	\$1,376,357

Source: NOAA National Marine Fisheries Service 2010

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Table 4-3

Vessel Calls by Oceangoing Self-Propelled Vessels of 10,000 DWT or Greater\* at Mid-Atlantic Region Ports, 2010

Port	State	All Types	Tanker			Container	Dry Bulk	Roll-on/ Roll-off	Vehicle	Gas Carrier	Combination	General Cargo
			Product	Crude	Total							
Albany	NY	2	1	0	1	0	1	0	0	0	0	0
New York	NY	4,534	1,016	286	1,302	2,421	178	529	371	1	8	95
Northeast Gateway Terminal	NY	5	0	0	0	0	0	0	0	5	0	0
Northville	NY	15	6	8	14	0	1	0	0	0	0	0
Port Jefferson	NY	2	2	0	2	0	0	0	0	0	0	0
Riverhead	NY	40	22	18	40	0	0	0	0	0	0	0
Philadelphia	PA <sup>1</sup>	2,022	319	483	802	393	180	204	131	26	1	416
Annapolis	MD	1	0	0	0	0	1	0	0	0	0	0
Baltimore	MD	2,011	108	8	116	385	471	902	707	0	16	121
Cove Point	MD	15	0	0	0	0	0	0	0	15	0	0
Piney Point	MD	15	5	8	13	0	2	0	0	0	0	0
Virginia Ports	VA <sup>2</sup>	3,021	104	37	141	1,908	692	176	91	4	27	73
Morehead City	NC	85	35	0	35	0	22	2	0	0	1	25
Wilmington	NC	550	222	4	226	211	49	21	2	0	0	43
<b>Totals</b>		<b>12,318</b>	<b>1,840</b>	<b>852</b>	<b>2,692</b>	<b>5,318</b>	<b>1,597</b>	<b>1,834</b>	<b>1,302</b>	<b>51</b>	<b>53</b>	<b>773</b>

\* 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](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.

1 Philadelphia/Delaware River Ports: Burlington, NJ; Camden, NJ; Claymont, DE; Chester, PA; Delair, NJ; Delaware City, DE; Eddystone, PA; Fairless Hills, PA; Gloucester, NJ; Marcus Hook, PA; Paulsboro, NJ; Philadelphia, PA; Reedy Point, DE; Salem, NJ; Tullytown, PA; Westville, NJ; Wilmington, DE.

2 Virginia Ports: Chesapeake, Hampton Roads, Hopewell, Lynnhaven Roads, Newport News, Norfolk, Portsmouth, Richmond, Yorktown.

Table 4-4

## Transport, Support, and Marine Operations, Mid-Atlantic Region, 2008

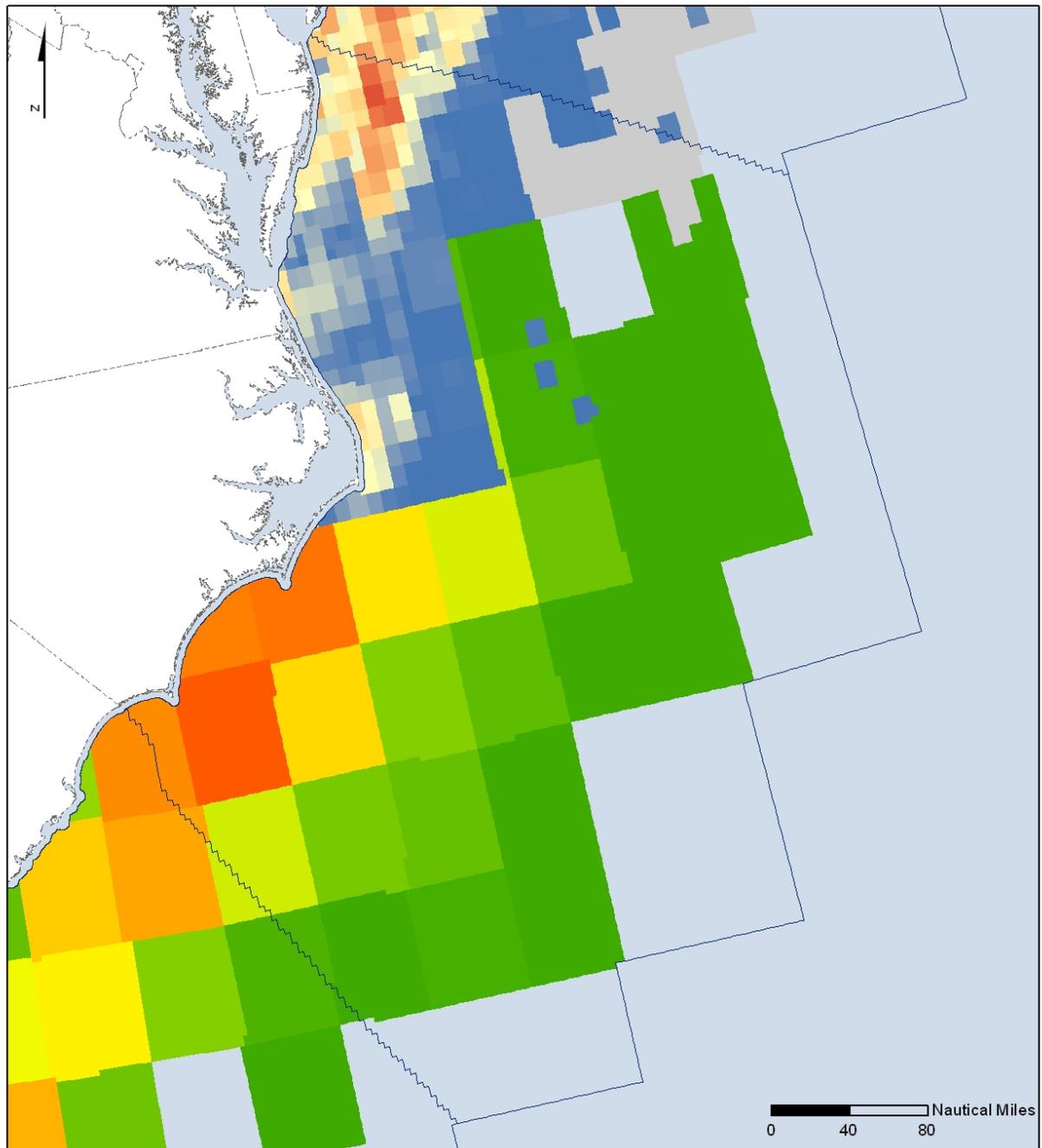
Activity	Parameter	New York	New Jersey	Delaware	Maryland	Virginia	North Carolina	Total
Coastal freight transportation	Establishments	50	18	2	6	10	4	90
	Employees	1,759	645	ND	ND	ND	ND	2,404
	Payroll (\$000s)	\$160,735	\$48,911	ND	ND	ND	ND	\$209,646
Deep sea freight transportation	Establishments	29	27	4	13	18	5	96
	Employees	732	1,115	ND	250	409	ND	2,506
	Payroll (\$000s)	\$108,744	\$75,848	ND	\$19,765	\$32,473	\$533	\$237,363
Deep sea passenger transportation	Establishments	3	2	NA	3	2	NA	10
	Employees	ND	ND	NA	ND	ND	NA	ND
	Payroll (\$000s)	\$316	ND	NA	ND	ND	NA	\$316
Marinas	Establishments	419	211	19	179	119	107	1,054
	Employees	2,263	916	65	1,383	964	656	6,247
	Payroll (\$000s)	\$100,910	\$39,596	\$1,738	\$45,965	\$24,326	\$17,164	\$229,699
Marine cargo handling	Establishments	10	21	3	15	12	13	74
	Employees	ND	4,244	629	1,572	ND	760	7,205
	Payroll (\$000s)	ND	\$278,189	\$19,204	\$48,382	ND	\$23,328	\$369,103
Navigational services to shipping	Establishments	32	20	9	9	23	10	103
	Employees	386	191	79	92	375	87	1,210
	Payroll (\$000s)	\$23,294	\$7,776	\$5,360	\$3,968	\$21,014	\$3,668	\$65,080
Port and harbor operations	Establishments	3	6	8	3	8	3	31
	Employees	ND	143	ND	ND	ND	ND	143
	Payroll (\$000s)	ND	\$12,446	ND	ND	ND	ND	\$12,446
Ship and boat building	Establishments	49	30	2	46	59	77	263
	Employees	688	2,019	ND	677	ND	4,281	7,665
	Payroll (\$000s)	\$30,462	\$79,309	ND	\$22,363	ND	\$138,243	\$270,377

NA: Data not available

ND: Non-disclosable confidential data

Source: NOAA National Marine Fisheries Service 2010

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For each BOEM lease block, this map conveys the maximum total number of Commercial Fishing trips from 2004 to 2008. The National Marine Fisheries Service provided these data based upon the Northeast Fishing Vessel Trip Reporting (VTR) and the Southeast Commercial Fishing Logbook programs. Readers are encouraged to access the Space Use Geodatabase directly to identify additional details for each lease block.

Map Projection: North American Equal Area Conic 1:4,696,370

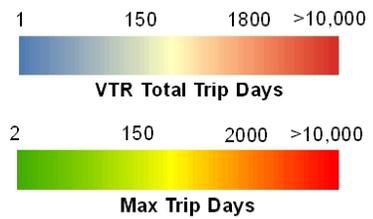
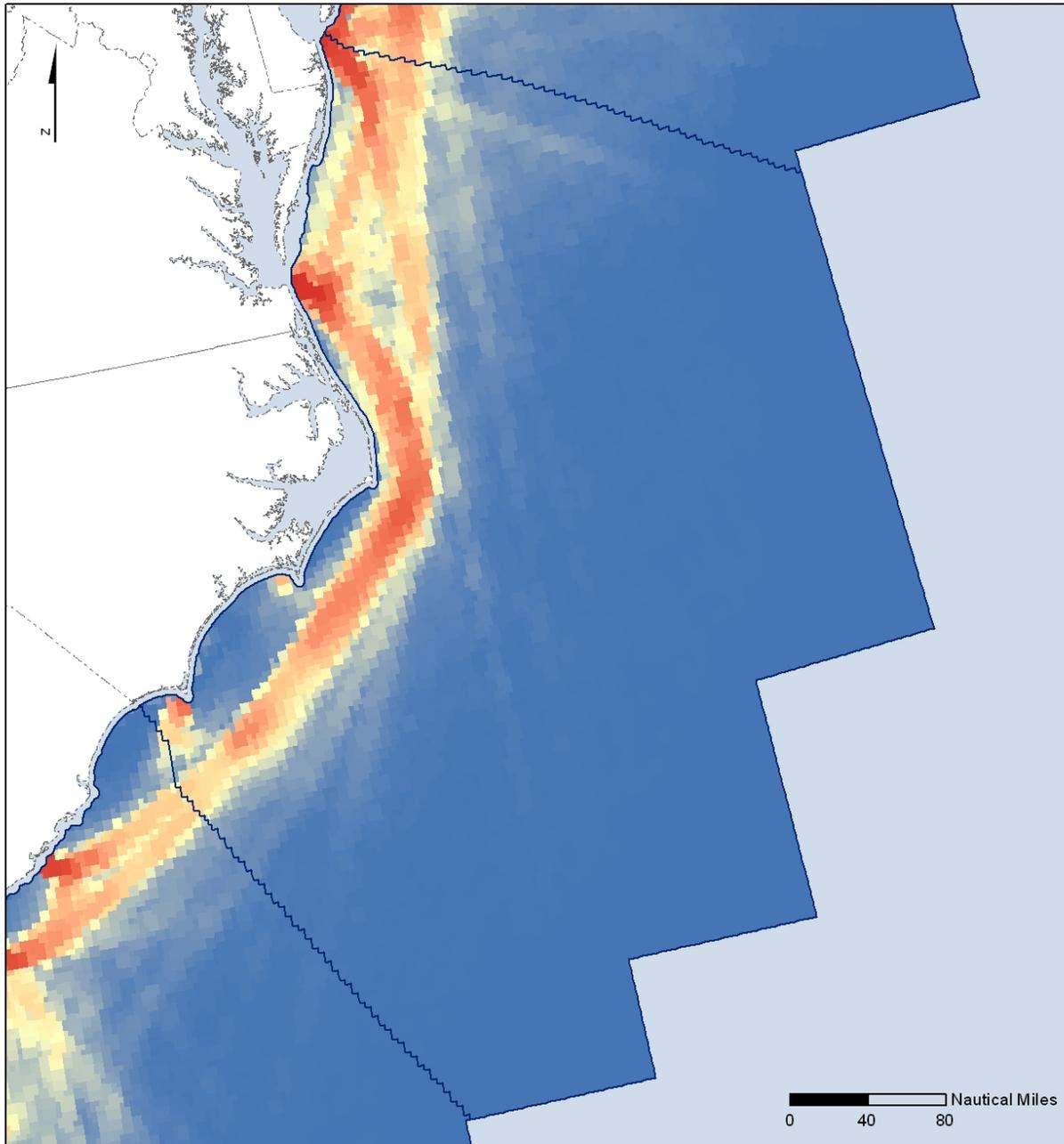


Figure 4-1 Commercial Fishing Activity in the Mid-Atlantic Region



The Automatic Identification System (AIS) dataset is a comprehensive dataset maintained by the United States Coast Guard that tracks commercial vessel navigation of vessels at or above 300 gross tonnage. This dataset provides a summary of the AIS vessel navigation data for calendar year 2009. The raw data were processed by importing the ASCII text file into a PostgreSQL/PostGIS database one day at a time. A subset of only the vessels that were underway was extracted from the data. The latitude/longitude values in the AIS data were used to generate the spatial location for each record. This location information was then overlaid onto a 5nm grid with only one unique value per vessel per gridcell counted. The count of vessels for the day was then added to the gridcell. This process was repeated for each day of the month. After the whole month was processed the counts for each of the days was added to give the total count for the month. The counts for the month were then added to obtain the counts for the quarter and year. For additional information on AIS data, readers are encouraged to access the Space Use Geodatabase.

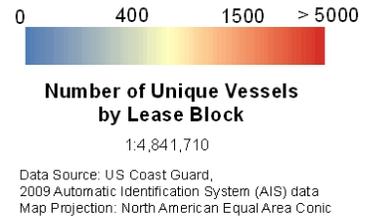
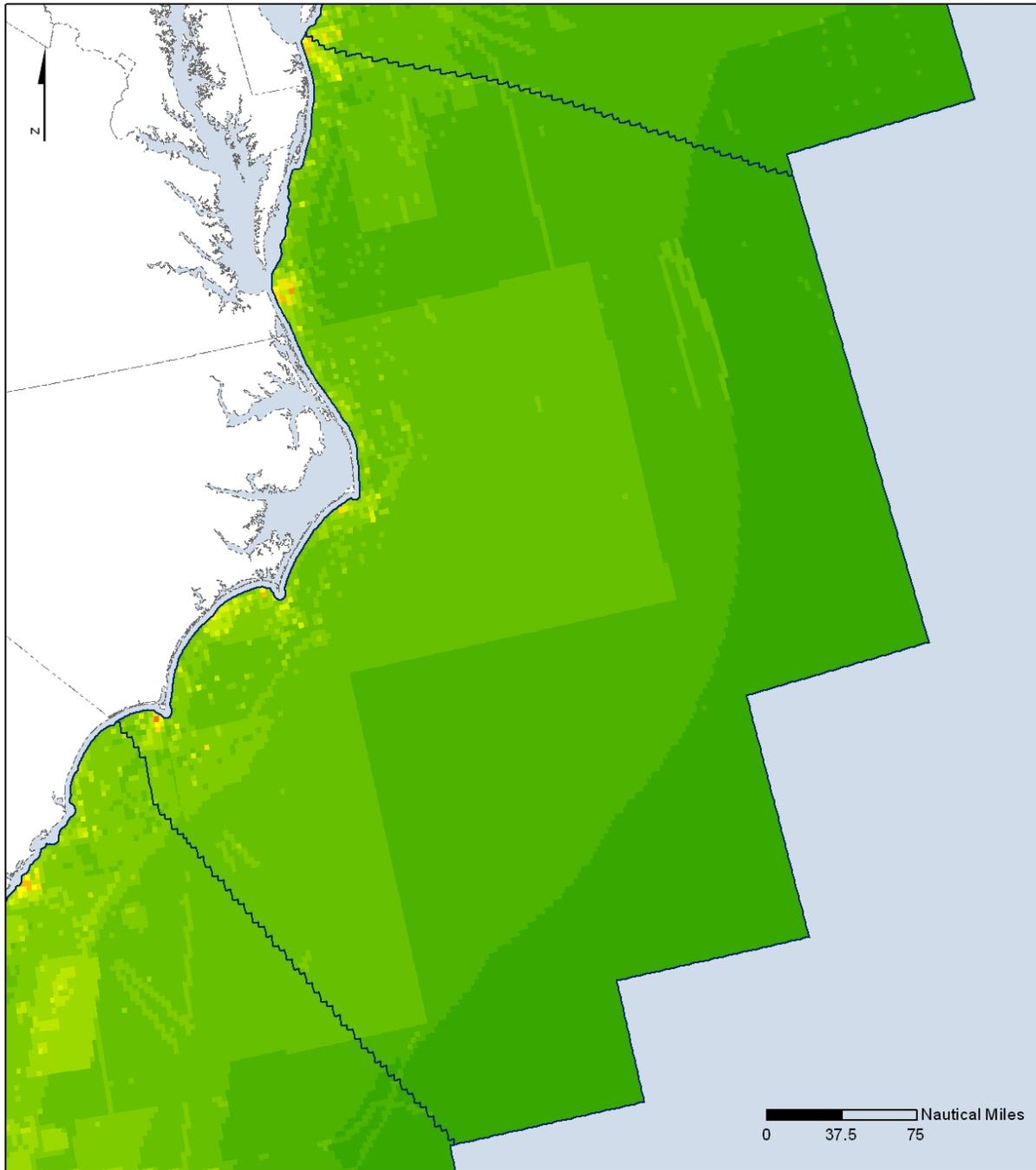


Figure 4-2 Commercial Vessel Activity in the Mid-Atlantic Region

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For each BOEM lease block, this map conveys the number of data sets included in the Space Use Project Geodatabase. Commercial Fishing and Large Vessel Navigation data are excluded since these data cover all lease blocks. Readers should examine the fishing and navigation maps for additional information on these uses. Readers are encouraged to access the Space Use Geodatabase directly to identify the particular data sets with information for each lease block and to learn more about the uses inventoried.

0 20 90  
**Number of Datasets Applicable to Each Lease Block**

1:4,609,880  
Map Projection: North American Equal Area Conic

Figure 4-3 Occurrence of Data Sets Describing Noncommercial Uses in the Mid-Atlantic Region

Previous and ongoing activities that address ocean use planning and the management of potential conflicts are more limited in the Mid-Atlantic region. Nevertheless, an understanding of these activities is essential to the successful future management of renewable energy development activities. The following describe two such activities.

#### ***Mid-Atlantic Regional Council on the Ocean***

The Mid-Atlantic Regional Council on the Ocean (MARCO), formed by Mid-Atlantic Governors' Agreement on Ocean Conservation, serves to organize and foster both the protection of the ocean environment and the development of offshore renewable energy. Among the efforts undertaken to-date, MARCO is coordinating the development of consistent survey and monitoring protocols for offshore wind projects and working with the Atlantic Offshore Wind Energy Consortium to research the potential impacts of wind energy development (MARCO 2011).

A collaboration between MARCO, the Virginia Coastal Zone Management Program, and The Nature Conservancy lead to the development of the MARCO Mapping and Planning Portal ([http://www.midatlanticocean.org/map\\_portal.html](http://www.midatlanticocean.org/map_portal.html)). This online geographic information system (GIS) tool serves to visualize relevant data in the Mid-Atlantic region. Although many data elements are already available, the organization intends to further expand the repository.

#### ***Development of a Regional Ocean Research Plan for the Mid-Atlantic Region***

In 2008, the Sea Grant programs from six Mid-Atlantic states (New Jersey, Pennsylvania, Delaware, Maryland, Virginia, and North Carolina), in collaboration with State and Federal government agencies and academic, industry, and non-governmental organization interests, initiated a four-year project to identify research needs across a wide range of ocean and coastal issues, including offshore renewable energy development.

## **4.2 COMMERCIAL FISHING**

### **4.2.1 Characteristics and use of space**

The Mid-Atlantic Fishery Management Council (MAFMC) is responsible for the management of Atlantic mackerel, *Loligo* and *Ilex* squid, butterfish, bluefish, dogfish, surf clams and ocean quahogs, summer flounder, scup, black sea bass, tilefish and monkfish. While these species may be caught further south and further north, the Mid-Atlantic may be considered the center of their range. Commercial fisheries off Virginia dominate landings in the region; in fact, by volume, landings in Reedville, Virginia, were second only to Dutch Harbor-Unalaska, Alaska, the top landings port by volume in the country (NMFS 2011). Cape May, New Jersey ranked sixth in the nation in the value of landings, and Hampton Roads Area of Virginia was seventh. (The value of landings in Reedville were ranked 24th since the major species landed there is menhaden with a low price per pound.) Several of the New Jersey ports were also listed among the top ports in the nation.

#### ***For Hire Fisheries***

Along the Mid-Atlantic, party boats travel great distances offshore to fish the Hudson Canyon and other geo-morphological significant habitat. Also, almost all respondents fished different areas, stating that they 'follow' the fish or adjust to weather conditions. Most of the respondents

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from this sector believed that changes had occurred over time, most pointing to fewer fish and increased sedimentation inshore as key indicators of local change. Additionally, two-thirds of those who participated in this study reported changes in the number and abundance of marine species, believed that local conditions (especially sea grass meadows) had degraded, and complained about the condition of local ecosystems. Overall, a majority of charter-boat operators and guides agreed that there have been shifts in ecosystems (flora and fauna) during their tenure.

Section 2.3.2.1 (p. 14) includes a description of the pool of Atlantic coast commercial fishing sector participants who contributed information to this study. Table 2-4 (p. 19) lists these participants' specific sectors and locations.

### 4.2.2 Compatible and conflicting uses

The Mid-Atlantic commercial fishermen who participated in this study operate highly mobile vessels, fishing multiple species complexes from Virginia to New England, and frequenting various bottom types and depths depending upon the primary target species for each trip.

Study participants anticipate that commercial fishing would be banned around alternative energy developments, though recreational fishing may be allowed. Areas suitable for wind farms are generally areas of more sedentary species, rather than migratory species that could be caught elsewhere, so the displacement of fishermen could have a serious impact. Specific comments from commercial fishermen in this region include:

Fixed gear might be feasible around the wind farms.

*"If sites are too close together you may not be able to use mobile gear to fish but it could be good for reef fishing. Biggest potential dislocation would be with bottom tending gear such as trawls and dredges. Our boats can move but there are critical sites we would not want to lose."*

Not knowing the locations of the potential projects complicates commenting. As one fisherman noted, *"if we have a 20-mile jog to get around these areas, in order to reach Baltimore Canyon, for example, it's a big deal to us."*

Ecologically, the wind farms may affect surface currents that would in turn impact the dispersal of larvae of various marine species, including blue crab.

Any wind farm off Atlantic City would probably mean service/support vessels at Fisherman's Wharf.

Paulsboro Port is a key location for support services for such operations as so much land is required.

### 4.2.3 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.

In addition, Mid-Atlantic region commercial fishing stakeholders offered the following specific comments regarding avoidance and mitigation.

Fishing is very site and gear specific. A panel consisting of diverse users could reduce conflict at the outset. *“Our experience has been that unless fishermen get their part in the plans they never get added back in.”* Regional Fishery Council Advisory Panels could be useful for panels but need to have currently active fishermen.

Perhaps alternative energy structures would lead to increased biomass, leading to eventual reopening of currently closed areas.

Infrastructure improvement that would benefit groups of commercial fishermen is one potential form of mitigation. For example, in Europe, mitigation has included providing an icehouse or purchasing a crane. Purchasing someone’s permit would be possible, but not every valuable activity requires a license/permit.

Another form of mitigation would be to reopen closed areas to fishing, increase quota or extend seasons. These, however, would depend on the status of the stocks. If areas are closed to recreational and commercial fishing, there might be ecosystem benefits resulting in increased biomass so closed areas could be reopened.

Some respondents suggested there are possibilities for suspended aquaculture alongside turbines. *“This could be a big plus and even a form of mitigation.”* However, there needs to be a national aquaculture policy that addresses such combined uses.

#### **4.2.4 Communication and process**

In order for traditional users to be able to respond to proposed projects, respondents pointed out that early communication is needed and the information about the size, configuration, etc. of the project is requisite. One respondent questioned why the BOEM process is moving so fast and without apparent coordination with the National Ocean Policy group. One suggestion was to create local panels of diverse users to guide siting. These panels should identify suitable areas before RFIs are issued. Importantly, commercial fishermen should be well represented on the panels (thus the current Task Force Committees would not suffice).

### **4.3 COMMERCIAL VESSELS**

#### **4.3.1 Characteristics and use of space**

Shipping and trade have long been characteristic of the Mid-Atlantic region. Historically, trade with Europe to the heartland of the country went through the states centered on the Eastern seaboard. Trade with Asia via ships passing through the Suez and Panama canals is increasing, perhaps exponentially with the anticipated completion of the Panama Canal expansion that will bring much larger ships to the region. Two intermodal corridors associated with the Norfolk Southern and CSX Transportation Railroads are being improved to facilitate freight transport from the coast to Chicago and elsewhere in the Midwest.

The Mid-Atlantic region is home to 42 ports that support commercial shipping as well as other maritime activities. Two of the top ten U.S. container ports are in the Mid-Atlantic region, the Port of New York/New Jersey (3) and Norfolk, VA (5).

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Short sea shipping is the waterborne transportation of commercial freight between domestic ports through the use of coastal waterways. Short sea shipping is a high priority component of the Federal freight transportation strategy. In August 2010, the U.S. Department of Transportation identified 18 marine corridors, eight projects, and six initiatives for further development as part of “America’s Marine Highway Program” (U.S. DOT 2010). In addition, the Maritime Administration made available \$7 million for which these projects will be able to compete through a Notice of Funding Availability.

A large number of tugboats and barges operate in this region. This vessel traffic moves in an out of Chesapeake Bay and also north and south connecting New York to Florida. Transiting along the coast in this entire region, tugs and barges operate 35 or more nautical miles off the coast and articulated tug barges operate 65 or more nautical miles offshore.

The Panama Canal Authority is engaged in a project to expand the Panama Canal. The expansion, scheduled for completion in 2014, will allow an almost tripling of the size of vessel able to transit the canal. Today, the Panama Canal’s maximum ship (“Panamax”) size is 4,400 twenty-foot equivalent units (TEUs, approximately 1,000 feet long by 100 feet wide). Upon completion of the expansion, much larger 12,600 TEU vessels (1,400 foot long by 160 feet wide), known as “Post-Panamax” ships, will be able to pass and the canal’s capacity will increase to 42 vessels per day. The shortened distances and increased cargo capacity should generate cost reductions and increase reliability.

Currently, the Port of Hampton Roads (Virginia Port Authority) and the Port of Baltimore are the only two East coast ports with a 50-foot depth channel and a 50-foot berth depth required for the larger container ships that will be able to pass through the wider Panama Canal. A “race to the bottom” is underway at a number of the East coast ports to increase their depths to 50 feet. Dredging is underway in the Port of New York and New Jersey (though additional funds are needed to address a height limitation posed by the Bayonne Bridge), regulatory and funding approvals are in place for the Port of Miami, the Port of Savannah is seeking regulatory approvals, and the Port of Charleston is pursuing funding for a feasibility study. Almost every ocean and Gulf port in the eastern and southeastern U.S.—from New York to Miami to Houston—has projects under way or in the planning stage to prepare for expected growth in international trade. The U.S. Army Corps of Engineers identifies ten ports on the East coast that have adjusted, are adjusting, or plan to adjust their channel depths to attract an increase in container ships coming through the Panama Canal.

Section 2.3.2.2 (p. 18) includes a description of the pool of Atlantic coast commercial vessel sector participants who contributed information to this study. Table 2-5 (p. 21) lists these participants’ specific sectors.

### **4.3.2 Compatible and conflicting uses**

#### ***Commercial Shipping***

Cargo ships determine routes based on operating efficiency (minimum fuel consumption and/or minimum hours underway) and safety. For trans-oceanic trips the route generally will follow a Great Circle, with deviations based on weather service recommended routing. Otherwise, the

route will follow a rhumb line or a composite course. Once in coastal waters, ships are subject to routing measures such as traffic separation schemes, lanes, and separation zones approved by the IMO's Maritime Safety Committee.

The characteristics of ports to which a ship is headed (location, capabilities, size, and the depth of entrance channels and berths) have a great deal to do with the patterns of shipping by ocean carriers and coastwise vessels. Over the past decades, technological changes in cargo transportation and handling, particularly containerization of cargo, has led to a concentration of cargo handling and shipping in a smaller number of "load center" ports. This is a function of the need for increasingly deeper channels to accommodate ever larger ships, large expanses of land to store and marshal containers, and the importance of good rail and highway connections to move the containers inland. Older ports, or ports without these attributes, have fewer visits by ocean-going vessels and may also become feeder ports receiving cargo from the larger ports. The latter phenomenon, moving cargo between ports on the East coast by smaller ships, towboats and barges, is predicted by many to have the potential to grow significantly in the future.

Stakeholders in the ocean carrier and tug and towboat industries explained that different types of cargo ships have different operational characteristics that affect their use of space.

Container ships are on fixed schedules that if interrupted or altered have serious operational and cost implications. Further, route disruptions or difficulties can cause a change in itinerary, costing ports significant business losses.

Bulk shipping (oil, chemicals, and dry raw materials) does not operate as much on a fixed schedule, but sails when and where needed as determined by the cargo. The patterns of shipping by product tankers carrying refined oil products such as gasoline, diesel, kerosene, jet or fuel oil to market, are not the same year-round as each season is different and each year may be different. Petroleum products are sometimes re-sold en route with consequent rerouting of the ship with the change in destination.

East coast tugs and barges try to stay within 10-12 miles of the coast and stay away from where ships operate.

Port stakeholders made the following points:

Ports have developed specialized infrastructure to handle specific types of cargo. Activities in the ocean that disrupt established shipping routes may affect port business and sunk investments. This is particularly true for niche ports.

The location and capability of ports are key indicators of where future offshore projects will be developed because of the need for logistical support. Offshore projects cannot happen without adequate landside infrastructure.

In general, shipping routes are determined based on economic efficiency, the avoidance of known hazards or user conflicts, and conformance with navigational and operational safety measures. Each of these is fundamental to the shipping industry and not readily alterable.

Ships moving north along the Atlantic seaboard encounter heavy fishing vessel traffic off Hatteras. Ships will head farther offshore, just off the edge of deep water where the fishing

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vessels are concentrated, then head straight for Ambrose Light (marking the entrance to Lower New York Bay).

Tugs, barges and towboats engaged in coastwise trade operate closer to shore for safety reasons and to avoid the routes followed by larger ships. There are no lanes designated for this traffic, but the area 10-12 miles off the Atlantic Coast between Delaware Bay and New York north is heavily transited.

### ***Ferries***

Passenger vessel owners and industry representatives who participated in this study uniformly responded that the development of offshore renewable energy in Federal waters is unlikely to directly interfere with their operations since there are/have been very few offshore routes. Almost all ferry routes are in state waters and operate within bays, harbors, intracoastal waterways, estuaries and rivers or other coastal waters.

### ***Excursion Vessels***

Commercial whale watch companies operate from Cape May and ports in Chesapeake Bay. Most try to do two trips per day, so that limits the distance they will go offshore and puts a premium on unobstructed and unconditioned routes. These excursions must run efficiently for scheduling purposes and any required re-routing could result in a serious economic consequence.

### **4.3.3 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 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.

### **4.3.4 Communication and process**

A number of port and shipping operations personnel expressed some concern about the process that had led up to the issuing of RFIs and Calls for potential offshore wind development along the eastern seaboard from Maryland through Delaware, New Jersey, New York and up to Massachusetts. The stakeholders felt that it would have been advisable for BOEM to have consulted with them and other interested parties prior to identifying the potential wind energy areas (WEAs). The RFIs and Calls that were issued showed a number of WEAs immediately adjacent to, at the seaward end of, or encroaching on existing traffic separation schemes or shipping lanes. Locating offshore renewable facilities in such areas would have severe implications for shipping and port operations and, as such, those involved in such operations regarded these areas completely unsuitable for the development of offshore renewable energy.

It is interesting to note that while many stakeholders expressed concern about the lack of consultation, they focused more on what they perceived as BOEM's lack of understanding about shipping and port operations than on whether or when they had been consulted. At the meeting of the Mariners Advisory Committee in Philadelphia, it was reported that BOEM staff had

acknowledged such a lack of understanding and agreed to work closely with members of the committee to address their concerns.

There are a number of reasons why the process associated with identifying WEAs may not have been of greater concern to port and shipping stakeholders:

They know that there will be numerous other opportunities to comment on any potential offshore renewable energy development and believe that their concerns will be taken seriously.

There is an assumption that any offshore renewable development that would detrimentally affect port or shipping operations is unlikely to be approved as:

Shipping and port operations are critical to the U.S. economy.

These industries are represented by large national organizations that are effective at gathering data, developing policies and lobbying at a State and Federal level.

Changing traffic separation schemes or vessel routing systems is not necessarily a simple task if they have been previously adopted by the IMO. If this is the case, any changes must first be approved by the IMO's Sub-Committee on Safety of Navigation.

Port and maritime operations rely heavily on good communication and coordination between all those involved and as such, stakeholders have a close working relationship with multiple Federal agencies, including the U.S. Coast Guard whose missions include marine safety, aids to navigation and search and rescue. With U.S. Coast Guard personnel intimately involved in port and shipping operations, it is likely that they would readily identify potential maritime safety threats that could result from the development of a renewable energy facility in an unsuitable location.

Many larger ports have regular meetings that are attended by a multitude of agencies, groups, organizations and businesses involved in various aspects of port operations. These are often called Maritime Safety Committees or Port Operators Groups. Typical attendees might include: port authorities, ferry operators, tug boat operators, pilots, marina operators, terminal operators, municipal government representatives and state agency personnel. Most importantly, these meetings are almost always attended by representatives from the U.S. Coast Guard, U.S. Army Corps of Engineers, and NOAA. Such meetings provide an opportunity for information to be disseminated and for people to be updated on port and other operations. In addition, such meetings help develop working relationships and help each stakeholder group understand how the port and maritime industries coordinate and work as a whole.

To the extent that BOEM does not have a permanent regional presence, and thus would not be able to regularly attend maritime safety committee meetings in the major ports, the agency may be unaware of critical aspects of port and shipping operations. The Harbor Safety Committees for each port (where there is a U.S. Coast Guard sector) are an excellent portal to the diverse commercial-shipping and related interests operating out of the port. Harbor safety committees (also variously referred to as Port Safety Forum, Marine Advisory Association, Port Advisory Group, Port Operators Group) are local port coordinating bodies throughout the country that work with the U.S. Coast Guard to address issues relating to the safety, security, mobility, and environmental protection of a port or waterway. Membership typically comprises local representatives of: port authorities; vessel owners and operators; harbor pilots; Marine

## MID-ATLANTIC

Exchanges; tug and tow operators; shipping agents; terminal operators; industry associations; organized labor; commercial fishing industry associations; and local, State and Federal government agencies.

The Marine Exchanges existing for many port areas are a good way to get information to the shipping community. Marine Exchanges are not-for-profit trade associations dedicated to promoting and encouraging commerce. Members generally comprise all aspects of international trade and related businesses. Marine Exchanges exist to resolve issues of concern related to shipping and to share information. Mid-Atlantic Exchanges include Baltimore Maritime Exchange, Inc. (<http://www.balmtx.org/>); Maritime Association of The Port of New York/New Jersey (<http://www.nymaritime.org/>); and Maritime Exchange for the Delaware River and Bay (<http://www.maritimedelriv.com/>).

Industry organizations also suggested that they are a good means for communicating with their members. In the commercial shipping sector, these include, among others:

American Association of Port Authorities

North Atlantic Ports Association

American Waterways Operators (a conduit for the tug, towboat and barge industry)

Union of Greek Ship Owners

Chamber of Shipping of the U.S. (cargo ships)

Communication with passenger vessel interests can occur through the Passenger Vessel Association. In addition, individual ferry companies indicated that direct email to them would be effective. The National Association of Charter Boat Operators provides a channel to the charter boat industry. Harbor pilots can generally be reached through the American Pilot Association, a national trade association of professional maritime pilots with membership comprising approximately 60 groups of state-licensed pilots.

## 4.4 NONCOMMERCIAL USES

### 4.4.1 Characteristics and use of space

See Section 3.4.1 for a discussion of non-commercial (recreational) uses of the Atlantic seaboard.

### 4.4.2 Compatible and conflicting uses

See Section 3.4.2 for a discussion of the compatibility of non-commercial (recreational) and other uses of the Atlantic seaboard.

In the Mid-Atlantic region, the non-commercial vessel operators who participated in this study generally acknowledged that renewable energy developments have impacts on the physical environment, but also noted their belief that renewable energy development is essential to the nation's economic security, both in the present and into the future. Because the group is closely associated with general tourists (more so than charter boat operators and flats fishing guides

who, by their own admission, tend to cater to a specialized clientele), its views are congruent with a pro-tourism development position.

Respondents also expressed concern about impacts on night fishing. *“You need to keep your night vision. But if there are large turbines they will need to be lit and this will ruin people’s night vision, so there is a risk.”*

#### **4.4.3 Avoidance and mitigation strategies**

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

#### **4.4.4 Communication and process**

See Section 3.4.4 for information regarding potentially effective channels of communication with recreational boating interests. In addition, stakeholders in the Mid-Atlantic region suggested starting with user posts to websites such as sport fishing association websites to contact individual recreational fishermen. Stakeholders also commented that one of the best ways to inform recreational fishermen would be to make use of social media networks. Said one study participant, *“Place a PSA on television with a link to Facebook or Twitter and the like to obtain a huge amount of input.”*



## 5.0 FINDINGS: SOUTH ATLANTIC

### 5.1 REGIONAL CHARACTERIZATION AND OVERVIEW OF RELATED ACTIVITIES

Commercial fishing is a relatively less significant activity in the South Atlantic region compared to other regions in this study, with landings quantity accounting for approximately 1.5 percent of 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 73,000 jobs in the South Atlantic region in 2009, with Florida (Atlantic coast) accounting for approximately 90 percent of this total (NMFS 2010). Table 5-1 summarizes commercial fishery landings in the South Atlantic states in 2009, the most recent year for which data are currently available. Figure 5-1 illustrates the distribution of commercial fishing activity in this region.

The South Atlantic region accounted for the second largest share of recreational fishing effort (i.e., number of trips) and recreational fishing trip expenditures in the United States in 2009 among the regions in this study (approximately 17 and 12 percent of the national totals, respectively) (Table 5-2). Consistent with the national trend, almost all of the effort was divided equally between private boat and shore-based activity.

South Atlantic commercial vessel activity is concentrated around the ports of Charleston, SC, Savannah, GA, and Jacksonville, Port Everglades, and Miami, FL (Table 5-3 and Figures 5-2a and 5-2b). The total number of vessel calls in 2010 in this region (8,790) is the third largest among the five regions in this study, only slightly lower than California (9,174). Among the transport, support, and marine operations industries in the South Atlantic region, the deep sea passenger transport sector is notable (60 percent of all establishments in the five study regions), reflecting the importance of the cruise ship industry in this region (NMFS 2010).

Tables 5-1 through 5-4 provide a broad characterization of important user communities in the Northeast Atlantic region, 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 region, 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.

Figures 5-1 through 5-3 provide visual illustrations of ocean use activity in the Northeast region, with a focus on commercial fishing (Figure 5-1), commercial vessels (Figure 5-2), and other activity (Figure 5-3). As noted in the Introduction, Figure 5-3 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.

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Table 5-1

### Commercial Fishery Landings, South Atlantic Region, 2009

State	Species Group	Quantity (000s lbs)	Revenue (\$000s)
South Carolina	Finfish and Other	2,319	\$5,186
	Shellfish	7,119	\$11,730
Georgia	Finfish and Other	305	\$624
	Shellfish	5,061	\$8,672
Florida (Atlantic)	Finfish and Other	16,100	\$23,152
	Shellfish	11,360	\$17,781
Subtotal	Finfish and Other	18,724	\$28,962
	Shellfish	23,540	\$38,183
Total		42,264	\$67,145

Source: NOAA National Marine Fisheries Service 2010

Table 5-2

### Recreational Fishing Activity, South Atlantic Region, 2009

State	Fishing Mode	Effort (000s trips)	Trip Expenditures (\$000s)
South Carolina	For-Hire	148	\$8,439
	Private Boat	1,051	\$40,783
	Shore	1,192	\$105,639
Georgia	For-Hire	16	\$669
	Private Boat	503	\$8,117
	Shore	332	\$4,947
Florida (Atlantic)	For-Hire	180	\$42,956
	Private Boat	5,401	\$190,925
	Shore	4,561	\$111,504
Subtotal	For-Hire	344	\$52,064
	Private Boat	6,955	\$239,825
	Shore	6,085	\$222,090
Total		13,384	\$513,979

Source: NOAA National Marine Fisheries Service 2010

Table 5-3

Vessel Calls by Oceangoing Self-Propelled Vessels of 10,000 DWT or Greater\* at South Atlantic Region Ports, 2010

Port	State	All Types	Tanker			Container	Dry Bulk	Roll-on/Roll-off	Vehicle	Gas Carrier	Combination	General Cargo
			Product	Crude	Total							
Charleston	SC	1,818	156	13	169	1,266	72	264	236	0	1	46
Brunswick	GA	304	1	0	1	0	2	296	283	0	0	5
Elba Is.	GA	37	0	0	0	0	0	0	0	37	0	0
Savannah	GA	2,406	206	28	234	1,819	113	144	101	0	0	96
Fernandina	FL	3	0	0	0	1	0	0	0	0	0	2
Fort Lauderdale	FL	1	0	0	0	1	0	0	0	0	0	0
Jacksonville	FL	1,641	260	13	273	453	133	659	490	0	0	123
Miami	FL	1,030	4	1	5	767	1	201	20	0	0	56
Palm Beach	FL	126	8	0	8	49	1	0	0	0	0	68
Port Canaveral	FL	38	22	1	23	0	7	7	7	0	0	1
Port Everglades	FL	1,386	382	12	394	834	15	45	7	0	0	98
<b>Totals</b>		<b>8,790</b>	<b>1,039</b>	<b>68</b>	<b>1,107</b>	<b>5,190</b>	<b>344</b>	<b>1,616</b>	<b>1,144</b>	<b>37</b>	<b>1</b>	<b>495</b>

\* 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](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.

**SOUTH ATLANTIC**

Table 5-4

Transport, Support, and Marine Operations, South Atlantic Region, 2008

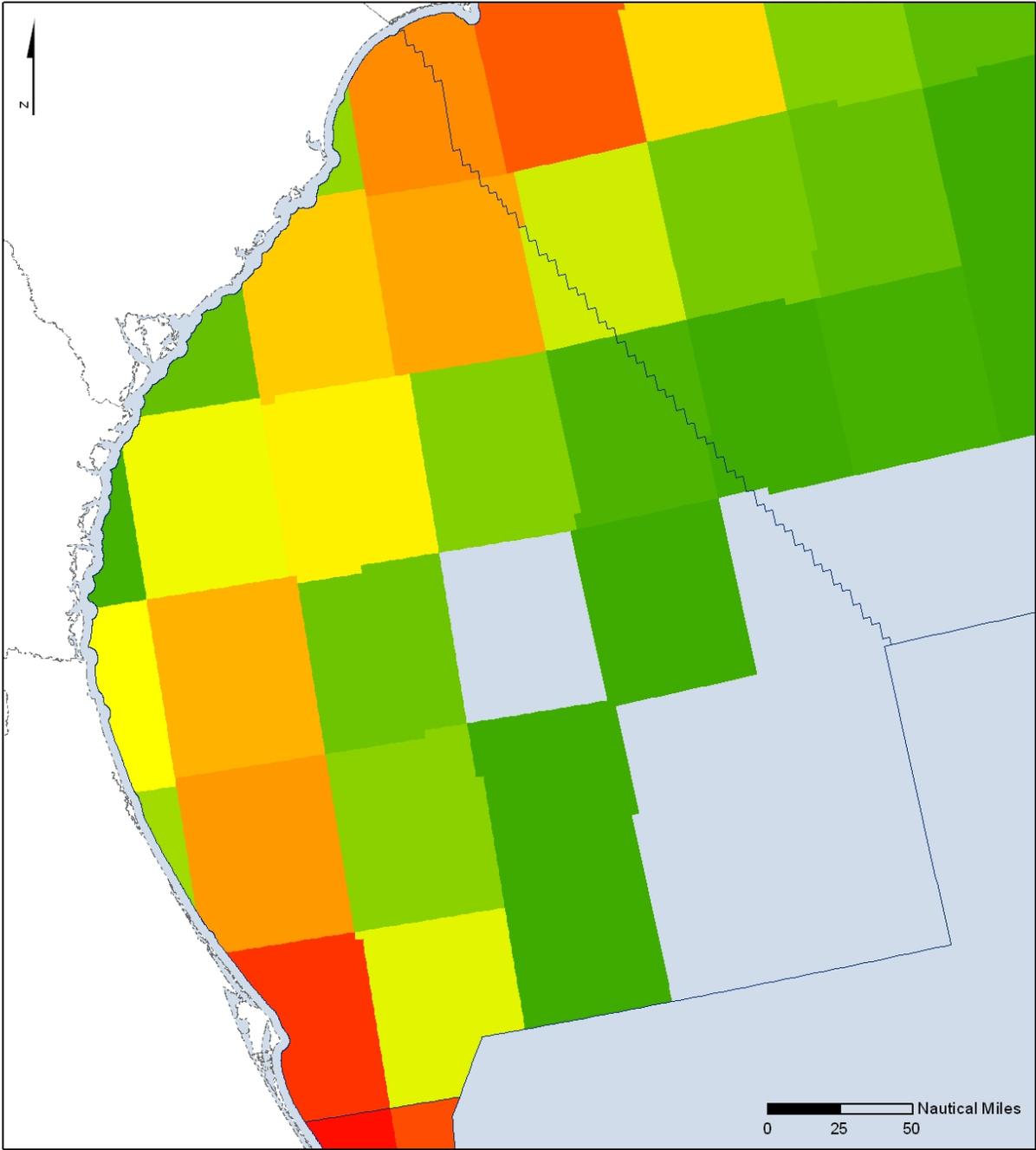
Activity	Parameter	South Carolina	Georgia	Florida (Atlantic)	Total
Coastal freight transportation	Establishments	4	6	42	52
	Employees	ND	28	1,106	1,134
	Payroll (\$000s)	ND	\$2,040	\$50,115	\$52,155
Deep sea freight transportation	Establishments	5	14	57	76
	Employees	ND	156	2,486	2,642
	Payroll (\$000s)	\$533	\$11,275	\$169,055	\$180,863
Deep sea passenger transportation	Establishments	NA	NA	31	31
	Employees	NA	NA	ND	ND
	Payroll (\$000s)	NA	NA	ND	ND
Marinas	Establishments	107	60	442	609
	Employees	656	527	5,024	6,207
	Payroll (\$000s)	\$17,164	\$15,571	\$151,677	\$184,412
Marine cargo handling	Establishments	13	17	56	86
	Employees	760	2,660	8,052	11,472
	Payroll (\$000s)	\$23,328	\$97,869	\$192,473	\$313,670
Navigational services to shipping	Establishments	10	11	147	168
	Employees	87	182	894	1,163
	Payroll (\$000s)	\$3,668	\$10,193	\$56,917	\$70,778
Port and harbor operations	Establishments	3	5	40	48
	Employees	ND	ND	712	712
	Payroll (\$000s)	ND	ND	\$24,668	\$24,668
Ship and boat building	Establishments	77	20	297	394
	Employees	4,281	2,159	12,419	18,859
	Payroll (\$000s)	\$138,243	\$69,096	\$442,096	\$649,435

NA: Data not available

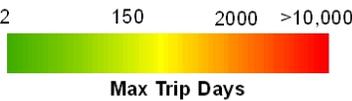
ND: Non-disclosable confidential data

Source: NOAA National Marine Fisheries Service 2010

**SOUTH ATLANTIC**



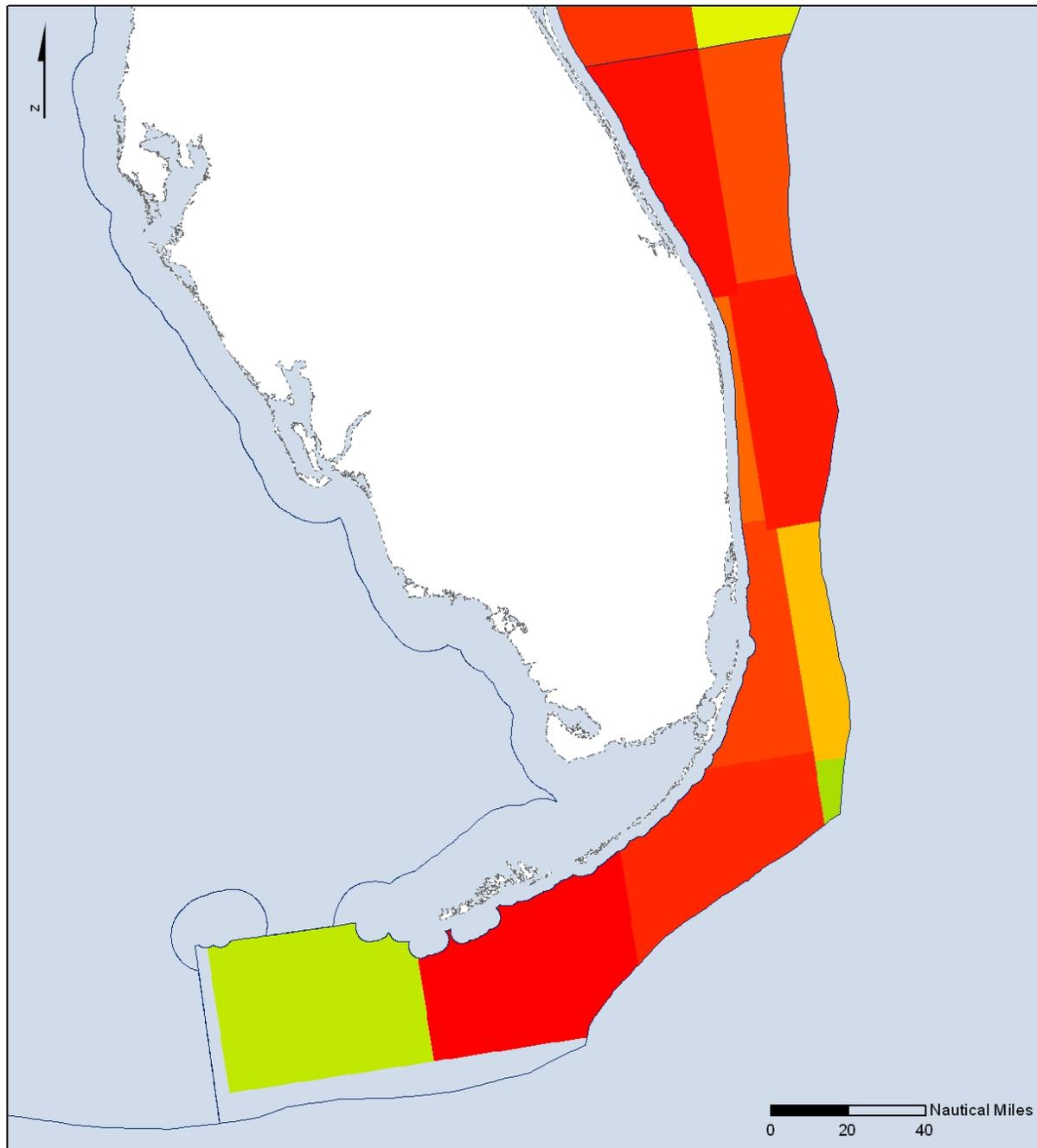
For each BOEM lease block, this map conveys the maximum number of Commercial Fishing trips for any gear type from 2004 to 2008. The National Marine Fisheries Service provided these data based upon the Southeast Commercial Fishing Logbook program. Readers are encouraged to access the Space Use Geodatabase directly to identify additional details for each lease block.



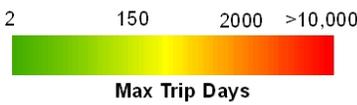
Map Projection: North American Equal Area Conic 1:3,168,520

**Figure 5-1a Commercial Fishing Activity in the South Atlantic Region**

# SOUTH ATLANTIC

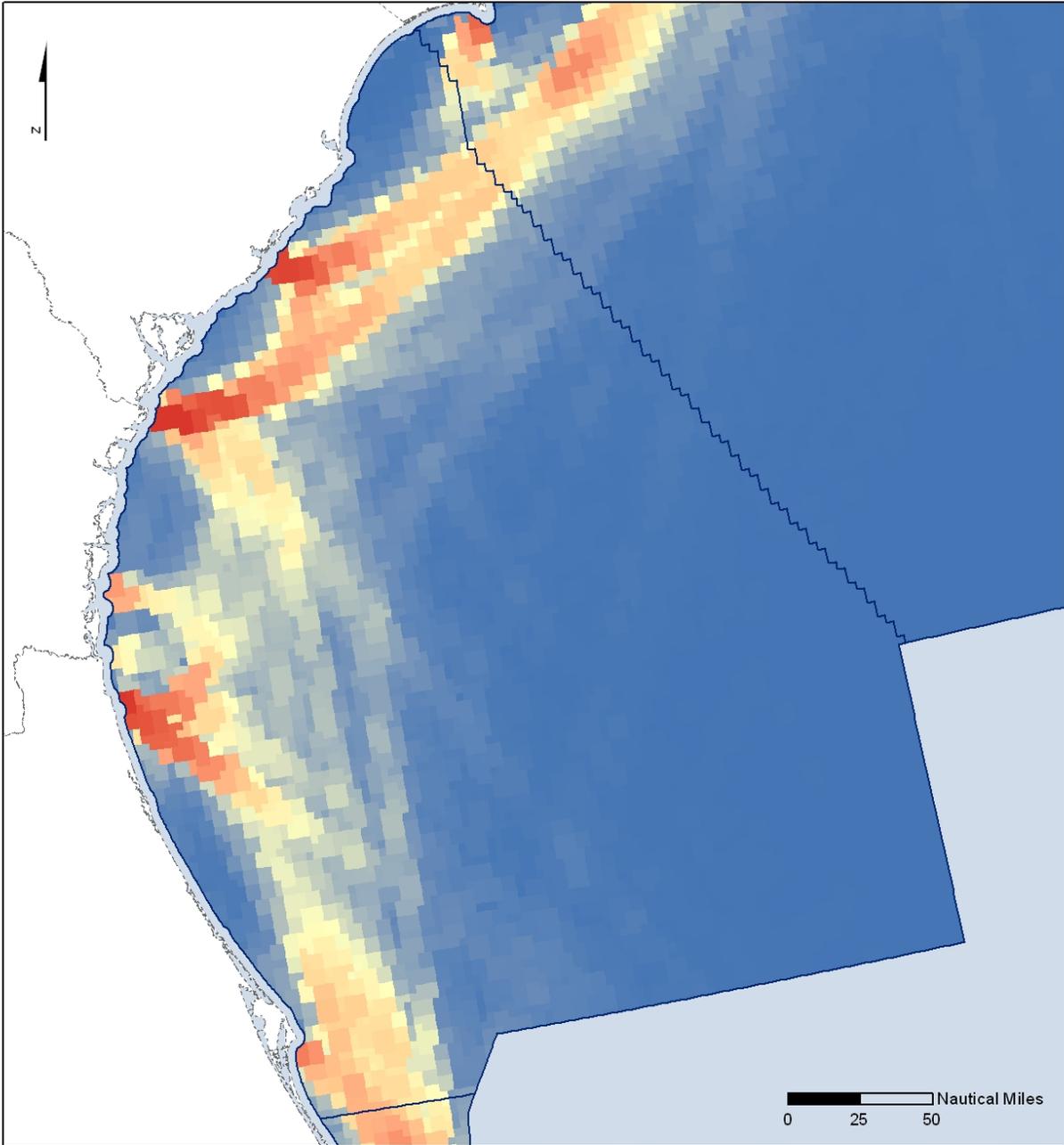


For each BOEM lease block, this map conveys the maximum number of Commercial Fishing trips for any gear type from 2004 to 2008. The National Marine Fisheries Service provided these data based upon the Southeast Commercial Fishing Logbook program. Readers are encouraged to access the Space Use Geodatabase directly to identify additional details for each lease block.



Map Projection: North American Equal Area Conic      1:2,376,190

Figure 5-1b Commercial Fishing Activity in the South Atlantic Region (Straits of Florida Planning Area)



The Automatic Identification System (AIS) dataset is a comprehensive dataset maintained by the United States Coast Guard that tracks commercial vessel navigation of vessels at or above 300 gross tonnage. This dataset provides a summary of the AIS vessel navigation data for calendar year 2009. The raw data were processed by importing the ASCII text file into a PostgreSQL/PostGIS database one day at a time. A subset of only the vessels that were underway was extracted from the data. The latitude/longitude values in the AIS data were used to generate the spatial location for each record. This location information was then overlaid onto a 5nm grid with only one unique value per vessel per gridcell counted. The count of vessels for the day was then added to the gridcell. This process was repeated for each day of the month. After the whole month was processed the counts for each of the days was added to give the total count for the month. The counts for the month were then added to obtain the counts for the quarter and year. For additional information on AIS data, readers are encouraged to access the Space Use Geodatabase.

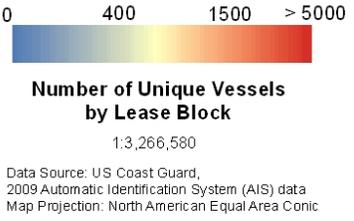
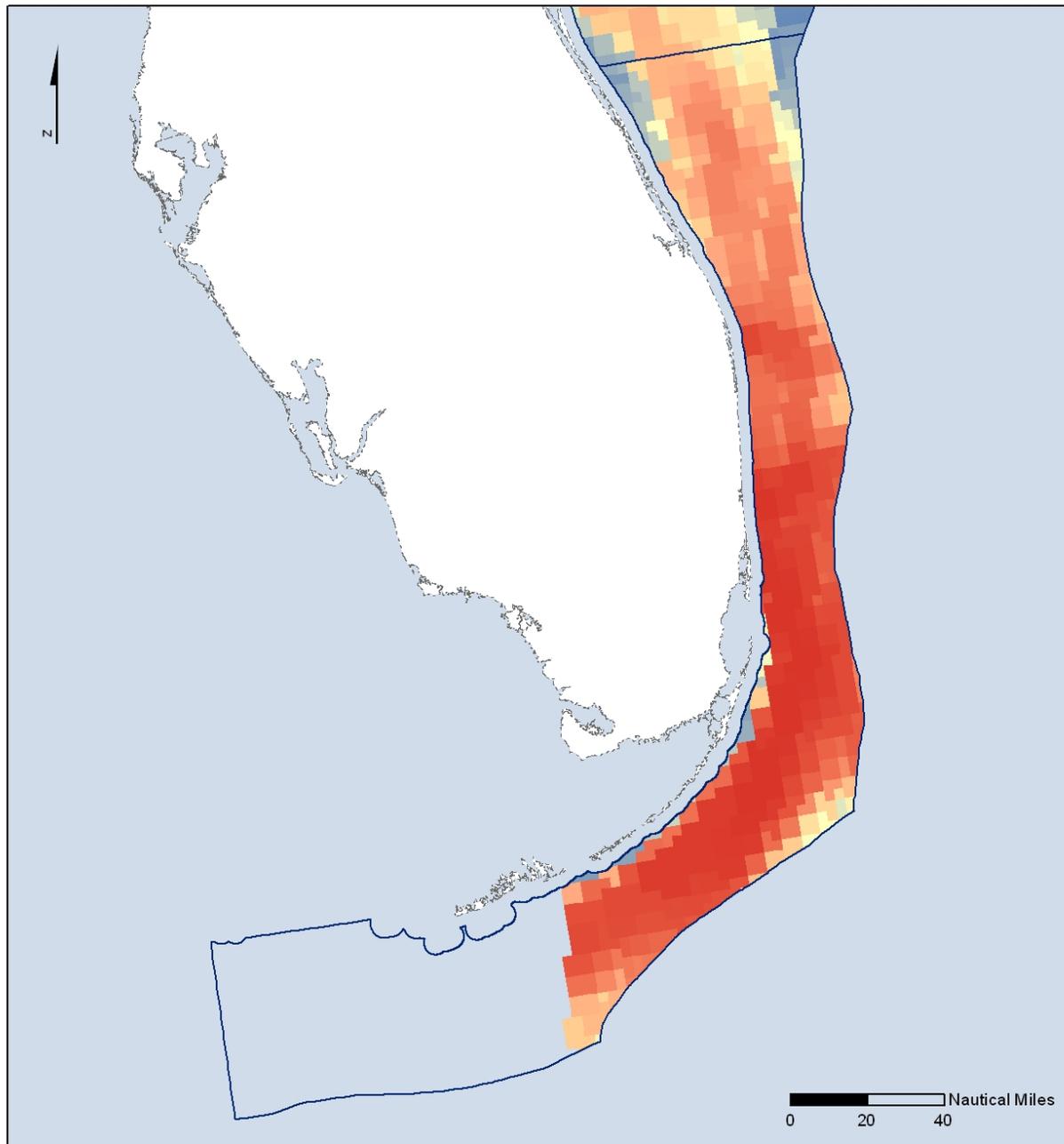


Figure 5-2a Commercial Vessel Activity in the South Atlantic Region

# SOUTH ATLANTIC



The Automatic Identification System (AIS) dataset is a comprehensive dataset maintained by the United States Coast Guard that tracks commercial vessel navigation of vessels at or above 300 gross tonnage. This dataset provides a summary of the AIS vessel navigation data for calendar year 2009. The raw data were processed by importing the ASCII text file into a PostgreSQL/PostGIS database one day at a time. A subset of only the vessels that were underway was extracted from the data. The latitude/longitude values in the AIS data were used to generate the spatial location for each record. This location information was then overlaid onto a 5nm grid with only one unique value per vessel per gridcell counted. The count of vessels for the day was then added to the gridcell. This process was repeated for each day of the month. After the whole month was processed the counts for each of the days was added to give the total count for the month. The counts for the month were then added to obtain the counts for the quarter and year. For additional information on AIS data, readers are encouraged to access the Space Use Geodatabase.

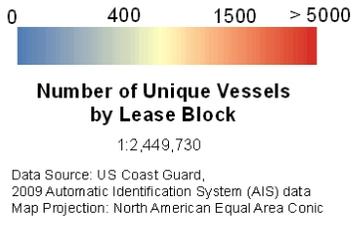
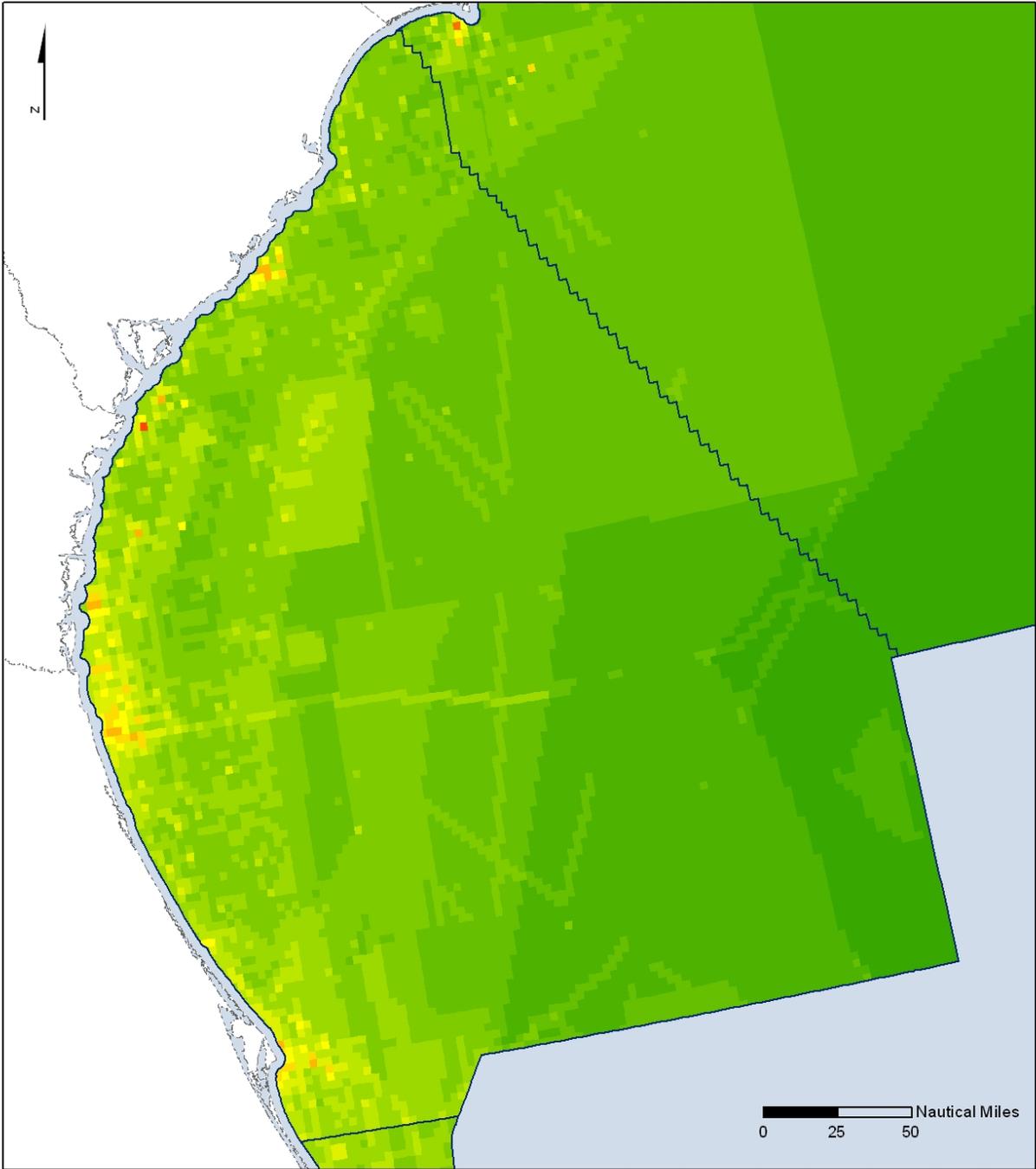


Figure 5-2b Commercial Vessel Activity in the South Atlantic Region (Straits of Florida Planning Area)



For each BOEM lease block, this map conveys the number of data sets included in the Space Use Project Geodatabase. Commercial Fishing and Large Vessel Navigation data are excluded since these data cover all lease blocks. Readers should examine the fishing and navigation maps for additional information on these uses. Readers are encouraged to access the Space Use Geodatabase directly to identify the particular data sets with information for each lease block and to learn more about the uses inventoried.

0 20 90  
**Number of Datasets Applicable to Each Lease Block**

1:3,110,170  
Map Projection: North American Equal Area Conic

Figure 5-3a Occurrence of Data Sets Describing Noncommercial Uses in the South Atlantic Region

# SOUTH ATLANTIC

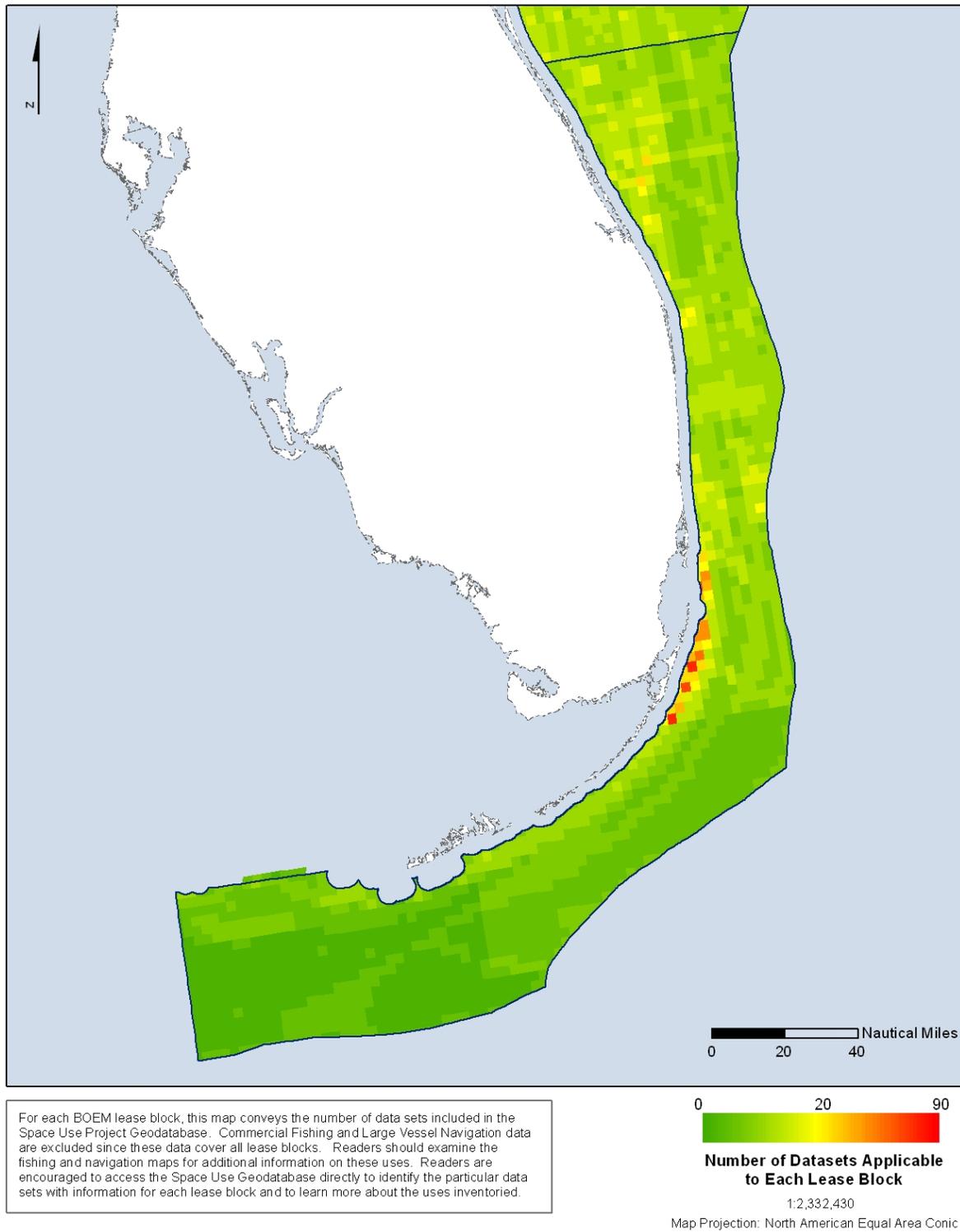


Figure 5-3b Occurrence of Data Sets Describing Noncommercial Uses in the South Atlantic Region (Straits of Florida Planning Area)

Activities that address ocean use planning and the management of potential conflicts have been relatively limited in the South Atlantic region. The following describes one such activity. An awareness of activities that may occur in the future will be essential to the successful future management of renewable energy development activities.

### *South Atlantic Alliance*

The Governor's South Atlantic Alliance ([www.southatlanticalliance.org](http://www.southatlanticalliance.org)) is a joint effort by Florida, Georgia, South Carolina, and North Carolina to "serve as a conduit for collectively finding, acting on, and regionally implementing science-based actions to sustain the coastal and ocean ecosystems." Among their priority activities is to improve ecosystem-based management in the region and develop a more detailed understanding of the "scope, scale, and distribution of resources within the region."

## **5.2 COMMERCIAL FISHING**

### **5.2.1 Characteristics and use of space**

South Atlantic region commercial fishermen who participated in this study report that they fish areas east of State of Florida waters primarily due to gear limitations within state waters (e.g., the net ban). The specific areas fished depend primarily on the species targeted. Although outside the geographic boundaries covered by this project, Key West is considered one of the major U.S. fishing ports.

The majority of the commercial fisheries respondents for this study target spiny lobster and reef fish in the South Atlantic around Miami and Fort Lauderdale - south to the Dry Tortugas. Finfish were targeted mainly by southern fishermen using hand lines in shallow reef areas and vertical hook and line or "snapper rigs" in deeper Federal waters. Other, pelagic species are caught in the deeper waters adjacent to the Gulf Stream eddies, and including king mackerel and dolphin. Over three-quarters of the South Atlantic commercial fishermen who participated in this study reported that they do not fish the same areas each trip; all stated that they change location depending on the species they are targeting during an individual trip.

A majority of the commercial fishing industry sample stated that there had been changes in local conditions, which many of the fishermen identified as increased pollution. Fewer respondents had noticed a change in the condition of preferred species, and fewer yet reported changes in local habitats and/or ecosystems. Instead, most fishermen believed that upstream pollution has been responsible for the changes in local conditions, which they identified most often as sedimentation, increased algal cover, and a general decline in water quality.

Most South Atlantic commercial fishermen study participants did not blame the renewable energy development industry for these changes. A few believe that the renewable energy development industry would cause significant local impacts to the benthos or marine biodiversity, while about one third felt that renewable energy developments would likely affect water quality (most often stated as an increase in turbidity). However, many fishermen also qualified their answers, arguing that while the expansion of renewable energy developments would cause increased turbidity, that the effects are temporary and do not result in chronic, environmental damage.

## SOUTH ATLANTIC

Other fishermen stated that natural events, such as strong northerly winds and tropical storms, often create the same effect as energy development construction and operations. Finally, some fishermen reported that while specific locations have not been proposed for energy development that they are aware of, the potential loss of critical grounds is foremost on their minds. They particularly fear that trap gear that would inevitably get tangled in and cut by renewable energy development-related vessel traffic or displaced vessel traffic.

Section 2.3.2.1 (p. 14) includes a description of the pool of Atlantic coast commercial fishing sector participants who contributed information to this study. Table 2-4 (p. 19) lists these participants' specific sectors and locations.

### 5.2.2 Compatible and conflicting uses

Fishermen most commonly pointed to the expansion in size and numbers of Marine Protected Areas including artificial reefs, gear restricted areas, marine sanctuaries (for example the two ecological reserves (no-fishing zones) that the Florida Keys National Marine Sanctuary (FKNMS) implemented in the Lower Florida Keys), and argued that these zones have pushed users closer together. Most of the fishermen felt that offshore energy development will likely not occur in those already closed areas and, consequently, will lead to more areas taken from open fishing grounds.

Several fishermen believe that the future rise in tourism (rather than ocean energy) will lead to the eventual decline of their occupation. One problem that almost all respondents blamed on coastal and ocean industrial developments is the absence of affordable housing. When asked about the future of water access and commercial fisheries, all of the commercial fishermen who participated in this study had a negative opinion. Many felt that there was no hope for commercial fishing in the region, and that fish houses would be converted into recreational marinas and condominiums soon, with even more pressure coming from the proposed energy developments and need for water-front access. They pointed to recent developments all along the coast and particularly in the New Jersey and South Florida areas where such gentrification had occurred. The attitude towards any ocean or coastal development was summarized by one of the respondents who, when asked about affordable housing, replied, *“This (Fort Lauderdale) is a place for the rich...(where) billionaires are buying out the millionaires.”*

The conversations with South Atlantic region stakeholders that occurred during this study suggest that the commercial fishing industry believes that the renewable energy development industry, like the tourism sector, presents economic and social challenges, particularly by increasing spatial competition and generating congestion and waterfront displacement. However, at least one stakeholder noted that closed areas may well act as sanctuaries for fish and could actually help fish populations.

Overall, the for-hire vessel group also harbored mainly negative views on renewable energy development and its impacts on the marine environment and the local economy. Most of those who participated in this study believe that renewable energy developments have a negative, chronic impact on the region's marine environment, which affects their livelihood, and there is a shared belief that crowding fishing effort would drive away the for-hire fishing clients.

### **5.2.3 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.

In addition, South Atlantic region commercial fishing stakeholders offered the following specific comments regarding avoidance and mitigation.

After Florida banned gill netting as people felt it was an inhumane way to catch fish, efforts were made to provide alternative livelihoods to those who had been gill netters. These efforts included training them as clam farmers. The programs failed and were a disaster. Many of the fishermen are now struggling to survive. Any suggestion of this type of mitigation in Florida in the future is likely to be met with fierce opposition.

Several of the study participants expressed their belief that the local inshore communities should consider raising waterfront access fees to provide funding to mitigate crowding and expected adverse impacts.

### **5.2.4 Communication and process**

Among the South Atlantic region commercial fishing stakeholders who participated in this study, opinion was generally split between those who believe renewable energy development will have some effect on the marine environment and those who do not foresee any tangible impact. A slight majority suggested they would not want to place limits on renewable energy development so long as siting processes solicited input from local professional fishermen and mariners.

## **5.3 COMMERCIAL VESSELS**

### **5.3.1 Characteristics and use of space**

The South Atlantic region includes 14 ports supporting commercial shipping as well as other maritime activities. Two of the top ten container ports are in the South Atlantic region: Savannah (fourth) and Charleston (seventh). Savannah has the largest container terminal in the country and has been the fastest growing port over the past decade. Cruise ship operations are also very important to this region. Florida accounts for 60 percent of all U.S. cruise ship embarkations. Florida's pre-eminent position is largely due to its five cruise ports: Miami, Port Everglades, Port Canaveral, Tampa, and Jacksonville (BREA 2011).

The Panama Canal Authority is engaged in a project to expand the Panama Canal. The expansion, scheduled for completion in 2014, will allow an almost tripling of the size of vessel able to transit the canal. Today, the Panama Canal's maximum ship ("Panamax") size is 4,400 twenty-foot equivalent units (TEUs, approximately 1,000 feet long by 100 feet wide). Upon completion of the expansion, much larger 12,600 TEU vessels (1,400 foot long by 160 feet wide), known as "Post-Panamax" ships, will be able to pass and the canal's capacity will increase to 42 vessels per day. The shortened distances and increased cargo capacity should

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generate cost reductions and increase reliability. The ports of the South Atlantic region expect the expansion of the Panama Canal to directly and indirectly affect shipping patterns and business. For example, the Port of Miami, the closest major U.S. container seaport to the Panama Canal, where shipping lines currently call on more than 100 countries and 250 ports across the world, anticipates it will be the first port of call for Post-Panamax vessels.

Currently, the Port of Hampton Roads (Virginia Port Authority) and the Port of Baltimore are the only two East Coast ports with a 50-foot depth channel and a 50-foot berth depth required for the larger container ships that will be able to pass through the wider Panama Canal. A “race to the bottom” is underway at a number of the East coast ports to increase their depths to 50 feet. Dredging is underway in the Port of New York and New Jersey (though additional funds are needed to address a height limitation posed by the Bayonne Bridge), regulatory and funding approvals are in place for the Port of Miami and the Port of Savannah is seeking regulatory approvals and Port of Charleston is pursuing funding for a feasibility study. Almost every ocean and Gulf port in the eastern and southeastern U.S.—from New York to Miami to Houston—has projects under way or in the planning stage to prepare for expected growth in international trade. The U.S. Army Corps of Engineers identifies ten ports on the East coast that have adjusted, are adjusting, or plan to adjust their channel depths to attract an increase in container ships coming through the Panama Canal.

Section 2.3.2.2 (p. 18) includes a description of the pool of Atlantic coast commercial vessel sector participants who contributed information to this study. Table 2-5 (p. 21) lists these participants’ specific sectors.

### **5.3.2 Compatible and conflicting uses**

#### ***Commercial Shipping***

Cargo ships determine routes based on operating efficiency (minimum fuel consumption and/or minimum hours underway) and safety. For trans-oceanic trips the route generally will follow a Great Circle, with deviations based on weather service recommended routing. Otherwise, the route will follow a rhumb line or a composite course. Once in coastal waters, ships are subject to routing measures such as traffic separation schemes, lanes, and separation zones approved by the IMO’s Maritime Safety Committee.

The characteristics of ports to which a ship is headed (location, capabilities, size, and the depth of entrance channels and berths) have a great deal to do with the patterns of shipping by ocean carriers and coastwise vessels. Over the past decades, technological changes in cargo transportation and handling, particularly containerization of cargo, has led to a concentration of cargo handling and shipping in a smaller number of “load center” ports. This is a function of the need for increasingly deeper channels to accommodate ever larger ships, large expanses of land to store and marshal containers, and the importance of good rail and highway connections to move the containers inland. Older ports, or ports without these attributes, have fewer visits by ocean-going vessels and may also become feeder ports receiving cargo from the larger ports. The latter phenomenon, moving cargo between ports on the East coast by smaller ships, towboats and barges, is predicted by many to have the potential to grow significantly in the future.

Stakeholders in the ocean carrier and tug and towboat industries explained that different types of cargo ships have different operational characteristics that affect their patterns of use of the ocean.

Container ships are on fixed schedules that if interrupted or altered have serious operational and cost implications. Further, route disruptions or difficulties can cause a change in itinerary, costing ports significant business losses.

Bulk shipping (oil, chemicals, and dry raw materials) does not operate as much on a fixed schedule, but sails when and where needed as determined by the cargo. The patterns of shipping by product tankers carrying refined oil products such as gasoline, diesel, kerosene, jet or fuel oil to market, are not the same year-round as each season is different and each year may be different. Petroleum products are sometimes re-sold en route with consequent rerouting of the ship with the change in destination.

East coast tugs and barges try to stay within 10-12 miles of the coast and stay away from where ships operate.

Port stakeholders made the following points:

Ports have developed specialized infrastructure to handle specific types of cargo. Activities in the ocean that disrupt established shipping routes may affect port business and sunk investments. This is particularly true for niche ports.

The location and capability of ports are key indicators of where future offshore projects will be developed because of the need for logistical support. Offshore projects cannot happen without adequate landside infrastructure.

In general, shipping routes are determined based on economic efficiency, the avoidance of known hazards or user conflicts, and conformance with navigational and operational safety measures. Each of these is fundamental to the shipping industry and not readily alterable.

For vessels transiting north and south from Florida to New York/New Jersey, those traveling north seek the Gulf Stream as the current provides an assist. Vessels traveling south avoid the Gulf Stream by transiting closer to shore. The position of the Gulf Stream off the Atlantic coast varies over the course of the year, so the routes will as well.

### ***Ferries***

Passenger vessel owners and industry representatives uniformly responded that the development of offshore renewable energy in Federal waters is unlikely to directly interfere with their operations since there are/have been very few offshore routes. Almost all ferry routes are in state waters and operate within bays, harbors, intracoastal waterways, estuaries and rivers or other coastal waters.

Asked if there have been, are, or might be ferry vessels operating in Federal water, industry stakeholders identified. Ferries between Florida to the Bahamas exist, but seem to come and go. A high-speed catamaran runs between Palm Beach and Grand Bahama Island, a ferry from Fort Lauderdale to Freeport, and another from Port Everglades. Ferries operating between Florida (proposed U.S. ports are Miami, Fort Lauderdale and Tampa) and Cuba is possible in the future.

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### ***Cruise Ships***

Cruise ship stakeholders identify conflicts with renewable energy projects as a priority concern. This seems to be based on their operational characteristics:

Trans-Atlantic routes don't change dramatically, Ships follow Great Circle routes. Passengers are not interested in spending time at sea.

Cruise itineraries change over time because new ports-of-call are added, others are dropped for reasons such as pollution, crime, taxation, better profit margins elsewhere, etc.

Cruise ship routes do differ seasonally.

Cruise ships will go far enough offshore to get out of sight of land, approximately 25 miles, but much depends on currents, weather, shoals, and the ports-of-call. If there are ports-of-call along the way, ships will not go as far offshore.

Most cruise ships are foreign flagged vessels so cannot transport passengers between US ports. This has an effect on the pattern of itineraries and the routes.

### **5.3.3 Avoidance and mitigation strategies**

The readers 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 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.

### **5.3.4 Communication and process**

The Harbor Safety Committees for each port (where there is a U.S. Coast Guard sector) are an excellent portal to the diverse commercial-shipping and related interests operating out of the port. Harbor safety committees (also variously referred to as Port Safety Forum, Marine Advisory Association, Port Advisory Group, Port Operators Group) are local port coordinating bodies throughout the country that work with the U.S. Coast Guard to address issues relating to the safety, security, mobility, and environmental protection of a port or waterway. Membership is typically comprised of local representatives of: port authorities; vessel owners and operators; harbor pilots; Marine Exchanges; tug and tow operators; shipping agents; terminal operators; industry associations; organized labor; commercial fishing industry associations; local, State and Federal government representatives.

The Marine Exchanges existing for many port areas are a good way to get information to the shipping community. Marine Exchanges are not-for-profit trade associations dedicated to promoting and encouraging commerce. Members generally represent all aspects of international trade and related businesses. Marine Exchanges exist to resolve issues of concern related to shipping and to share information. One such organization operates in the South Atlantic region, the Jacksonville Marine Transportation Exchange (<http://jmtxweb.org/>)

Industry organizations also suggested that they are a good means for communicating with their members. In the commercial shipping sector, these include, among others:

American Association of Port Authorities

North Atlantic Ports Association

American Waterways Operators (a conduit for the tug, towboat and barge industry)

Union of Greek Ship Owners

Chamber of Shipping of the U.S. (cargo ships)

Communication with passenger vessel interests can occur through the Passenger Vessel Association and Cruise Lines International Association, which serves East coast ports. In addition, individual ferry companies indicated that direct email to them would be effective. The National Association of Charter Boat Operators provides a channel to the charter boat industry. Harbor pilots can generally be reached through the American Pilot Association, a national trade association of professional maritime pilots with membership comprising approximately 60 groups of state-licensed pilots.

## **5.4 NONCOMMERCIAL USES**

### **5.4.1 Characteristics and use of space**

See Section 3.4.1 for a discussion of non-commercial (recreational) uses of the Atlantic seaboard.

Water-based operators, or those operations that take out tourists on non-consumptive, water excursions, comprised the last third of resource-bases user groups characterized for this study. While combined into a single group as a result of sharing non-consumption as a key characteristic, water operators included diverse businesses, such as dive and snorkel operators, kayak tour operators, eco-tour guides, sunset and other pleasure excursions, and marine mammal charters, parasailing, and sailing trips. All operations provided more than one type of water activity.

### **5.4.2 Compatible and conflicting uses**

See Section 3.4.2 for a discussion of the compatibility of non-commercial (recreational) and other uses of the Atlantic seaboard.

Additional comments from non-commercial stakeholders in the South Atlantic region regarding compatibility of uses include the following.

Though a limited sample, half of those who participated in this study believe that renewable energy developments have an impact on local, marine biodiversity and the benthos; slightly more expressed a belief that renewable energy developments negatively affect water quality. Some respondents added that the problem is limited to the harbor and surrounding areas, but others argued that the problem is more pervasive and chronic, and that the resulting turbidity affects both benthic habitat and fish populations.

Asked whether renewable energy development tourism leads to socioeconomic impacts, such as crowding and user conflicts, most in the sample agreed that renewable energy development may

## **SOUTH ATLANTIC**

burden the local area and its resources promote user conflicts and lead to over-crowded conditions along the waterfront. Others were less critical but nevertheless felt that if the development results in less access/fishing grounds resulting crowding would be detrimental to the clientele to which they cater. Interestingly, charter boat operators and guides did not point to other management impacts that may affect crowding and user conflicts (i.e., Marine Protected Areas (MPAs) and the no-fishing zones like the FKNMS).

Fewer than half those who participated in this study agreed that renewable energy development is important to the region's economy; arguing that, unlike other tourism, renewable energy development will only contribute to a limited portion of economy – namely large ports and heavy maritime industry.

When asked how their operations would be affected with an increase or decrease in renewable energy development tourism, most believed that there would be no effects. However, some believed that an increase would negatively affect their operations. Others added that the damage had already been done by other sources in terms of resource damage and clientele loss. Nevertheless, almost all agreed that renewable energy development should be limited, mainly by limiting the number of renewable energy developments that can be sited and that a very specific assessment of their impacts should follow. Some operators suggested that this may be accomplished by raising the development fees.

### **5.4.3 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.

### **5.4.4 Communication and process**

See Section 3.4.4 for information regarding potentially effective channels of communication with recreational boating interests. In addition, stakeholders in the South Atlantic region suggested that the Marine Industries Association of South Florida is a good way to inform boaters about specific proposed projects. Although it is an association of marine industries, the member organizations have close contact with the boating population.

## 6.0 FINDINGS: PACIFIC NORTHWEST

### 6.1 REGIONAL CHARACTERIZATION

Commercial fishing is an important element of the Pacific Northwest regional economy, though its scale, in terms of landings and landings revenue, is smaller than Northeast Atlantic and Mid-Atlantic fisheries. In 2009, the Pacific Northwest commercial fisheries accounted for approximately 5 percent of the total U.S. landings by mass, and approximately 9 percent of U.S. landings revenue (including Alaska) (NMFS 2010). The seafood industry supported approximately 71,000 jobs in the Pacific Northwest region in 2009, with approximately 80 percent of this total in Washington (NMFS 2010). Table 6-1 summarizes commercial fishery landings in the Pacific Northwest states in 2009, the most recent year for which data are currently available. Figure 6-1 illustrates the distribution of commercial fishing activity in this region.

The Pacific Northwest region accounted for the smallest share of recreational fishing effort (i.e., number of trips) and recreational fishing trip expenditures in the United States in 2009 relative to other regions in this study (approximately 2 and 3 percent of the national totals, respectively) (Table 6-2). Consistent with the national trend, almost all of the effort was divided equally between private boat and shore-based activity.

Pacific Northwest commercial vessel activity is concentrated at the Columbia River and Seattle/Tacoma (Puget Sound) outlets (Table 6-3 and Figure 6-2). The total number of vessel calls in 2010 in this region (6,158) is the second smallest among the five regions in this study. In general, based on the most recent available data (2008), the Pacific Northwest region accounts for 5 to 10 percent of the various categories of transport, support, and marine operations industries in the United States, as measured by the number of establishments and employees (NMFS 2010).

Tables 6-1 through 6-4 provide a broad characterization of important user communities in the Northeast Atlantic region, 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 region, 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. Figures 6-1 through 6-3 provide visual illustrations of ocean use activity in the Northeast region, with a focus on commercial fishing (Figure 6-1), commercial vessels (Figure 6-2), and other activity (Figure 6-3). As noted in the Introduction, Figure 6-3 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.

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Table 6-1

Commercial Fishery Landings, Pacific Northwest Region, 2009

State	Species Group	Quantity (000s lbs)	Revenue (\$000s)
Oregon	Finfish and Other	154,147	\$52,749
	Shellfish	44,184	\$49,704
Washington	Finfish and Other	120,452	\$61,115
	Shellfish	43,485	\$166,658
Subtotal	Finfish and Other	274,599	\$113,864
	Shellfish	87,669	\$216,362
Total		362,268	\$330,226

Source: NOAA National Marine Fisheries Service 2010

Table 6-2

Recreational Fishing Activity, Pacific Northwest Region, 2009

State	Fishing Mode	Effort (000s trips)	Trip Expenditures (\$000s)
Oregon	For-Hire	56	\$11,008
	Private Boat	396	\$41,038
	Shore	233	\$16,093
Washington	For-Hire	51	\$11,321
	Private Boat	399	\$39,220
	Shore	513	\$23,612
Subtotal	For-Hire	107	\$22,329
	Private Boat	795	\$80,258
	Shore	746	\$39,705
Total		1,648	\$142,292

Source: NOAA National Marine Fisheries Service 2010

Table 6-3

Vessel Calls by Oceangoing Self-Propelled Vessels of 10,000 DWT or Greater\* at Pacific Northwest Region Ports, 2010

Port	State	All Types	Tanker			Container	Dry Bulk	Roll-on/ Roll-off	Vehicle	Gas Carrier	Combination	General Cargo
			Product	Crude	Total							
Columbia River	OR	2,776	142	0	142	91	2,031	154	141	3	0	214
Coos Bay	OR	37	0	0	0	0	37	0	0	0	0	0
Anacortes	WA	11	1	0	1	1	5	0	0	0	0	4
Bellingham	WA	3	0	0	0	0	0	0	0	0	0	3
Bremerton	WA	3	0	0	0	0	1	2	0	0	0	0
Cherry Point	WA	271	114	157	271	0	0	0	0	0	0	0
Everett	WA	82	0	0	0	25	1	21	1	0	0	34
Ferndale	WA	101	3	85	88	0	11	0	0	2	0	0
Grandview	WA	28	3	9	12	0	14	0	0	1	0	1
Manchester	WA	14	11	0	11	0	2	0	0	0	0	1
March Point	WA	188	86	96	182	0	3	0	0	0	0	3
Olympia	WA	22	0	0	0	0	22	0	0	0	0	0
Point Wells	WA	14	14	0	14	0	0	0	0	0	0	0
Port Angeles	WA	326	81	154	235	3	76	7	1	1	0	3
Port Townsend	WA	1	0	0	0	1	0	0	0	0	0	0
Seattle	WA	1,047	15	2	17	749	229	2	1	0	1	48
Tacoma	WA	1,217	22	34	56	438	253	286	182	0	0	2
Westport	WA	17	0	0	0	0	8	4	4	0	0	1
<b>Totals</b>		<b>6,158</b>	<b>492</b>	<b>537</b>	<b>1,029</b>	<b>1,308</b>	<b>2,693</b>	<b>476</b>	<b>330</b>	<b>7</b>	<b>1</b>	<b>314</b>

\* 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](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.

**PACIFIC NORTHWEST**

Table 6-4

Transport, Support, and Marine Operations, Pacific Northwest Region, 2008

<b>Activity</b>	<b>Parameter</b>	<b>Oregon</b>	<b>Washington</b>	<b>Total</b>
Coastal freight transportation	Establishments	8	24	32
	Employees	ND	2,222	2,222
	Payroll (\$000s)	ND	\$168,832	\$168,832
Deep sea freight transportation	Establishments	4	21	25
	Employees	ND	263	263
	Payroll (\$000s)	ND	\$24,843	\$24,843
Deep sea passenger transportation	Establishments	NA	4	4
	Employees	NA	ND	ND
	Payroll (\$000s)	NA	ND	ND
Marinas	Establishments	37	116	153
	Employees	106	573	679
	Payroll (\$000s)	\$2,178	\$18,931	\$21,109
Marine cargo handling	Establishments	13	25	38
	Employees	ND	4,821	4,821
	Payroll (\$000s)	ND	\$334,193	\$334,193
Navigational services to shipping	Establishments	20	76	96
	Employees	200	1,213	1,413
	Payroll (\$000s)	\$11,808	\$100,542	\$112,350
Port and harbor operations	Establishments	1	11	12
	Employees	ND	111	111
	Payroll (\$000s)	ND	\$6,359	\$6,359
Ship and boat building	Establishments	41	169	210
	Employees	1,692	8,067	9,759
	Payroll (\$000s)	\$74,583	\$402,253	\$476,836

NA: Data not available

ND: Non-disclosable confidential data

Source: NOAA National Marine Fisheries Service 2010

# PACIFIC NORTHWEST

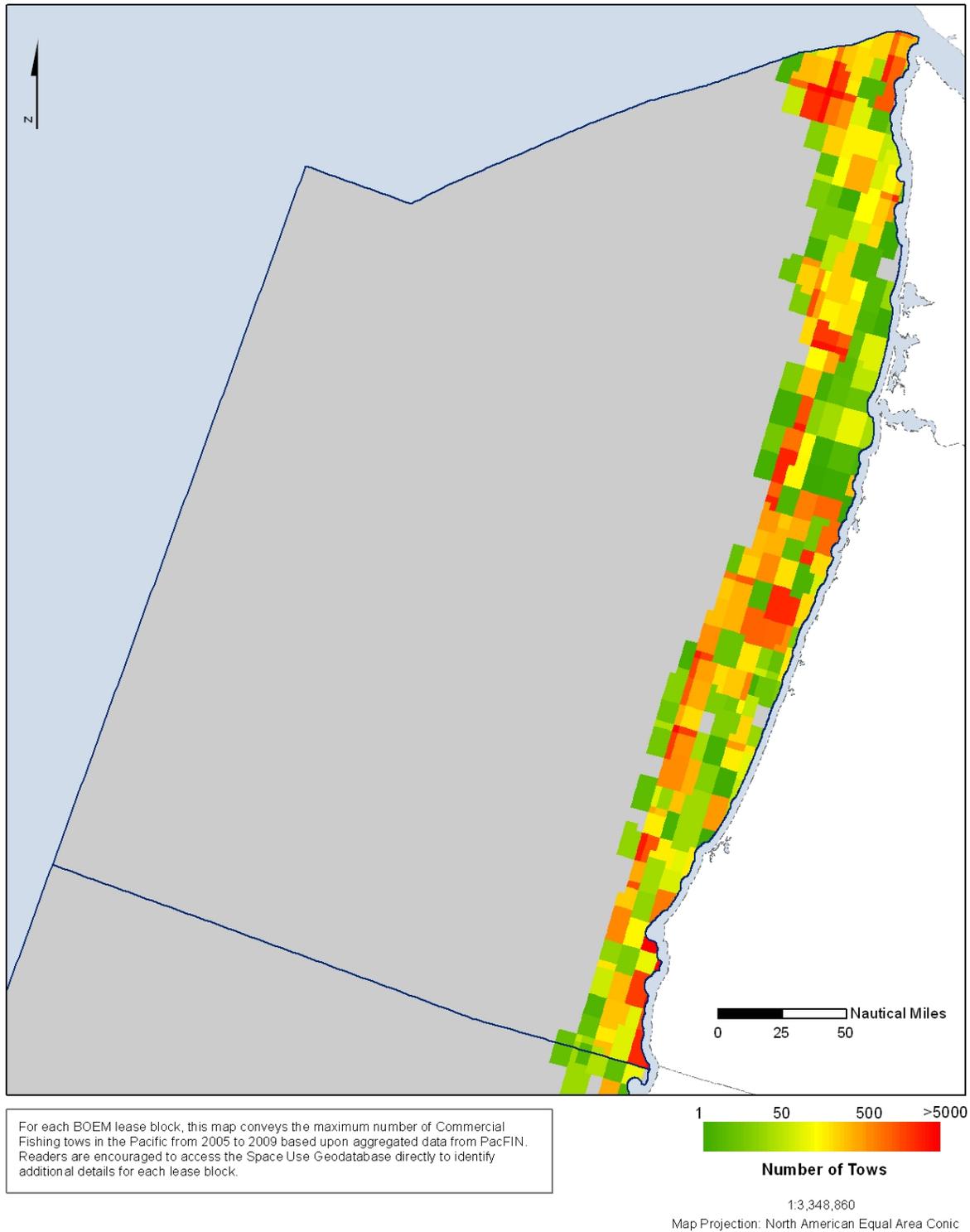
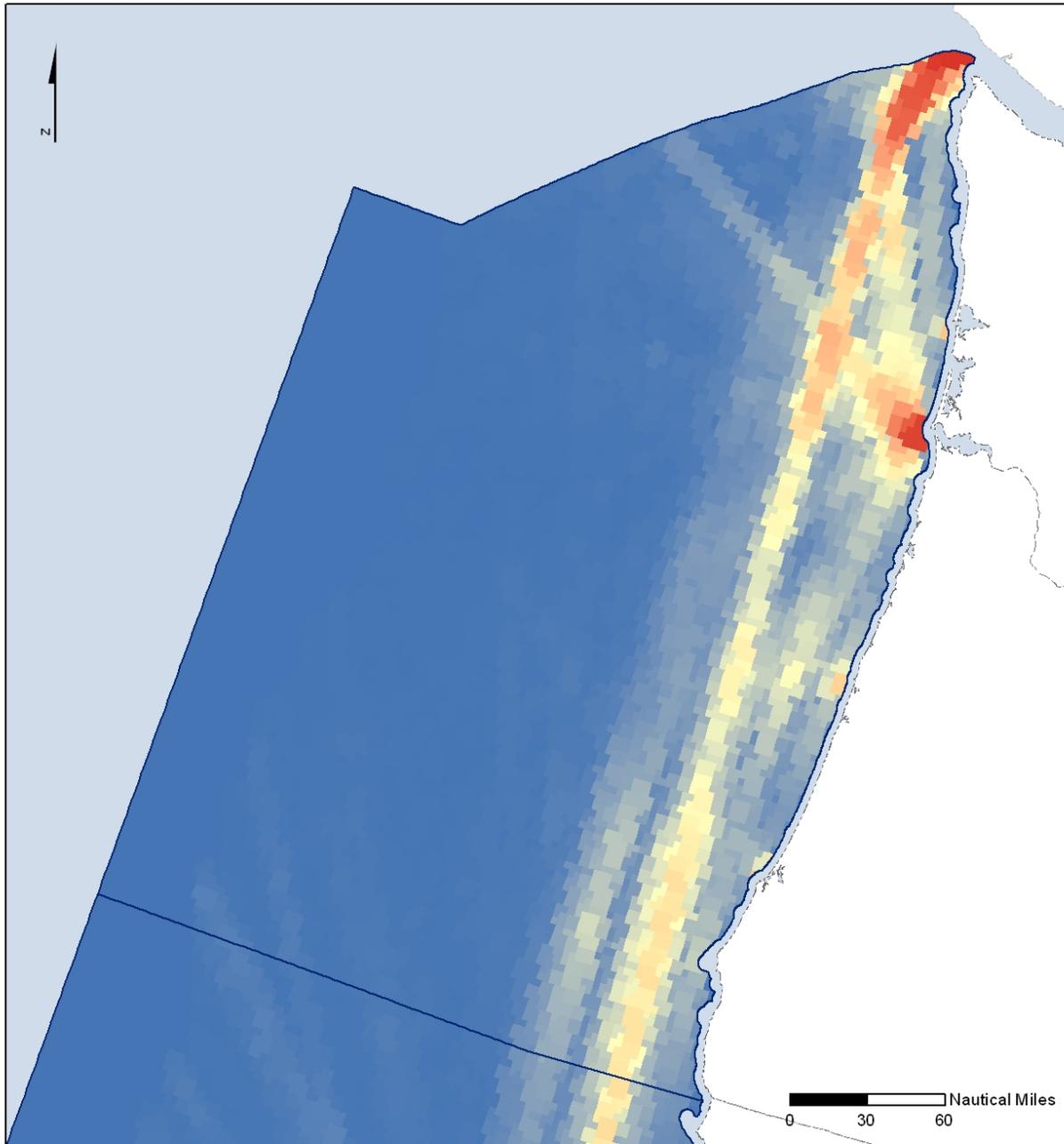


Figure 6-1 Commercial Fishing Activity in the Pacific Northwest Region

# PACIFIC NORTHWEST



The Automatic Identification System (AIS) dataset is a comprehensive dataset maintained by the United States Coast Guard that tracks commercial vessel navigation of vessels at or above 300 gross tonnage. This dataset provides a summary of the AIS vessel navigation data for calendar year 2009. The raw data were processed by importing the ASCII text file into a PostgreSQL/PostGIS database one day at a time. A subset of only the vessels that were underway was extracted from the data. The latitude/longitude values in the AIS data were used to generate the spatial location for each record. This location information was then overlaid onto a 5nm grid with only one unique value per vessel per gridcell counted. The count of vessels for the day was then added to the gridcell. This process was repeated for each day of the month. After the whole month was processed the counts for each of the days was added to give the total count for the month. The counts for the month were then added to obtain the counts for the quarter and year. For additional information on AIS data, readers are encouraged to access the Space Use Geodatabase.

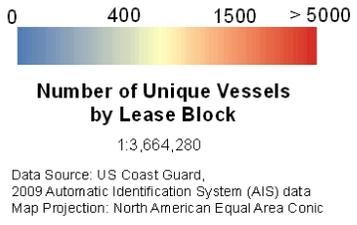


Figure 6-2 Commercial Vessel Activity in the Pacific Northwest Region

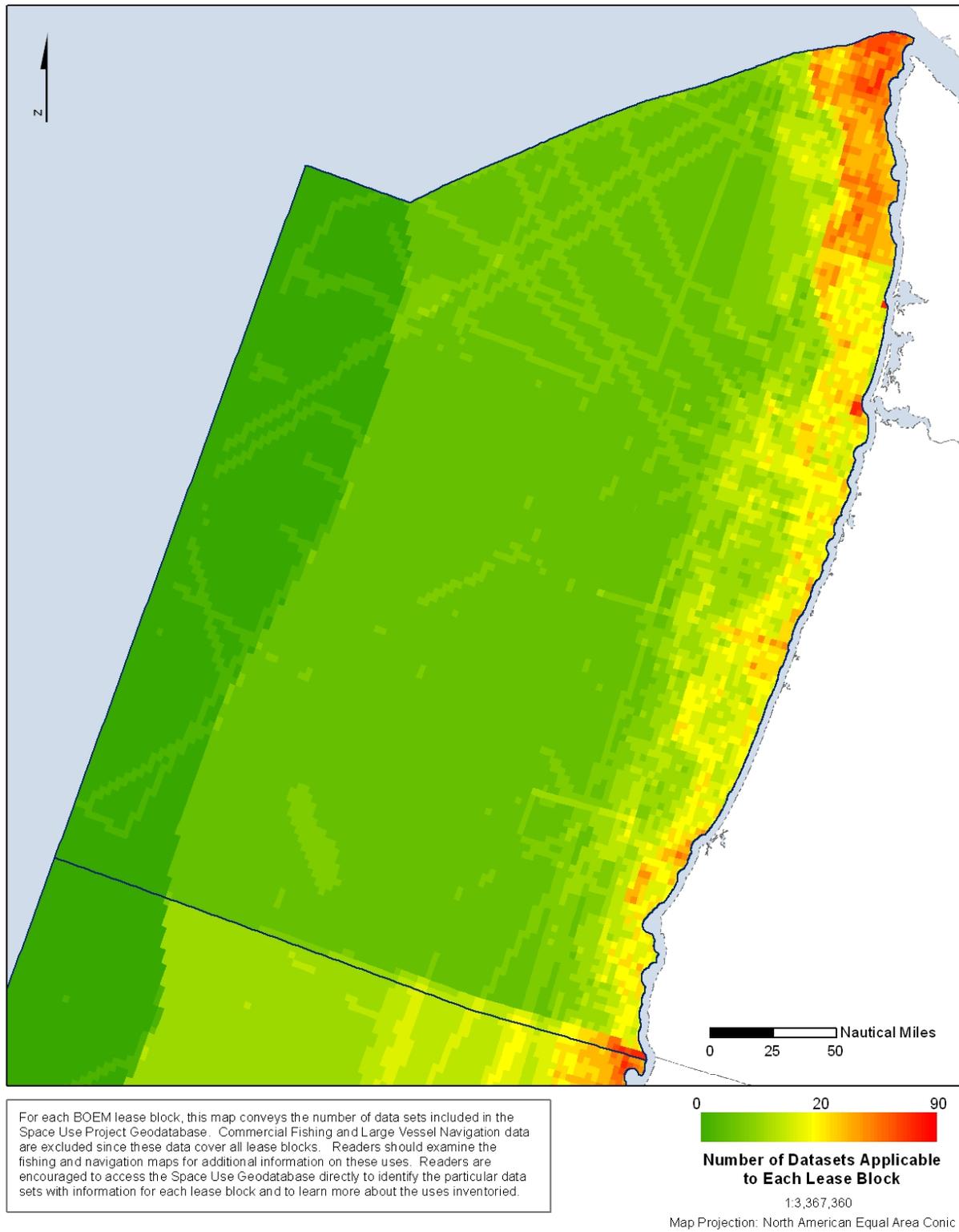


Figure 6-3 Occurrence of Data Sets Describing Noncommercial Uses in the Pacific Northwest Region

## **PACIFIC NORTHWEST**

Coastal and offshore marine waters make a valuable contribution to the social, cultural, and economic wellbeing of Oregon and Washington. Increasingly, traditional marine industries such as shipping and commercial fishing, and non-commercial but important endeavors such as marine research and marine recreation, have to share an already-utilized ocean with emerging uses such as offshore renewable energy.

The Pacific Northwest region is also home to a number of activities related in general to the identification and management of marine uses. An understanding of these activities is essential to the successful future management of renewable energy development activities. Therefore, several of the most important are described below.

### ***Essential Fish Habitat in the Pacific Northwest***

The Pacific Fishery Management Council (PFMC) created an ad hoc Groundfish Habitat Technical Review Committee to review and guide the scientific assessment process for the Pacific Groundfish Essential Fish Habitat Environmental Impact Statement (EIS). To evaluate the status of habitat, a “risk assessment methodology” was developed with oversight from the Committee. One of the elements considered in this risk assessment is the amount and location of fishing effort over time. The Committee, at their February 19-20, 2003 meeting, reviewed the results of a fishing effort model that was produced for the Pacific State Marine Fisheries Commission (PSMFC) by Ecotrust. The Committee was concerned about some of the assumptions in the model and recommended that, among other comparisons, experience-based information from fishermen be compiled for comparison with the Ecotrust product. The methodology for responding to the Committee direction was described in the report entitled *Pilot Project to Profile West Coast Fishing Effort Based on the Practical Experience of Fishermen* and resulted from collaboration between PSMFC, NOAA Fisheries, Oregon Sea Grant, and commercial fishing representatives from the three coastal states. The primary objectives of this work were to (1) gather and produce a compilation of experience-based information to indicate fishing effort location by gear type for areas off the West Coast over time; (2) design and conduct a collaborative project in partnership with the fishing community, the fisheries management community, and the scientific community; and (3) gain experience in developing useful products for application in fisheries management that are based entirely on experience-based information. Study results were subjected to the scrutiny of the PFMC system (including the Technical Review Committee and the Scientific and Statistical Committee) with the intention of becoming part of the universe of available fishing effort data that, among other things, includes logbooks, observer data, and the Ecotrust model.

### ***Oregon Territorial Sea Plan Revision Process***

[www.oregon.gov/LCD/OCMP/Ocean\\_TSP.shtml](http://www.oregon.gov/LCD/OCMP/Ocean_TSP.shtml)

Goal 19 (Ocean Resources) of Oregon’s statewide planning goals and guidelines focuses on conserving marine resources and ecological functions in the state’s territorial sea for the purpose of providing long-term ecological, economic, and social value and benefits to future generations. In this context, what began as a data gathering process for wave energy siting has more recently become a marine spatial planning exercise and as such has, in some instances, led to confusion regarding the connection between the Territorial Sea Plan revision process and the objectives of this study. In some cases, the confusion manifested itself as a reluctance to participate in our research.

***Marine Reserve Process in Oregon*** ([www.oregonocean.info](http://www.oregonocean.info))

The marine reserve process had been ongoing for several years prior to the initiation of this study, it had been “reinvigorated” and become quite active prior to the start of our research. The process included the formation of “community teams” that overlapped, in part, with this study’s target stakeholder groups, leading to reluctance by some to participate in this study, given the competing demands on volunteers’ time, and some strongly held reservations about the separation between the “Federal process” and the “state process.” Some of the lessons learned from the marine reserve process in Oregon have direct applicability to this research, such as the need to engage and empower stakeholders, and to have clear goals and a neutral, facilitated process.

***Marine Sanctuary Process in Washington*** (<http://olympiccoast.noaa.gov/>)

Unlike a marine reserve, the Olympic Coast National Marine Sanctuary is a working facility in which fishing is permitted (though other activities, such as oil and gas development and waste disposal are limited). Some study participants described the process for establishing the Sanctuary as an inclusive one that could offer lessons learned for other forms of ocean planning.

***Marine Spatial Planning Process in Washington***

Washington is also engaging in marine spatial planning. Passage of Senate Bill SSB6350 in 2009 initiated the formation of Marine Resource Committees (MRCs) which, at the time of our research, were in the process of forming a lead planning entity from a coastal community standpoint. This coast-wide coastal group – tentatively named the Washington Coastal Solutions Group – will be stakeholder-driven and anchored by broad-based MRCs, will have a primary initial focus on CMSP including Federal leases, and will be seeking legislative recognition in 2012.

**6.2 COMMERCIAL FISHING**

**6.2.1 Characteristics and use of space**

Although competitive with each other and relatively unorganized (compared to shipping), commercial fishermen do belong to formal commodity commissions (e.g., Oregon Dungeness Crab Commission, Oregon Trawl Commission) and less formal but equally important groups such as the Coastal Coalition of Fisheries, the Washington Dungeness Crab Fisherman’s Association, the Westport Charterboat Association, the Fisherman Advisory Committee for Tillamook, Fishermen Involved in Natural Energy, and the Port Orford Ocean Resources Coalition.

Pacific Northwest fishermen use mobile as well as fixed gear. Our research focused on eight target species: tuna, salmon, crab, shrimp, two groundfish (sablefish (black cod) and halibut), other groundfish, and spot prawns (Table 6-5). Most commercial fishing harvest enterprises in Oregon and Washington are small businesses. Even tribal fishermen do not fish for the tribe, per se, but for themselves, although it should be clear that there are no tribal allocations for ocean

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Table 6-5

Pacific Northwest Commercial Fisheries, Gear Types, and Locations\*

Fishery	Gear Type	Washington	Oregon	Charter
Tuna	Mobile (troll/pole, hook and line)	Generally near surface, 30-40 nm or more from shore	Generally near surface, 30 nm or more from shore at 50-100 up to 500-2,000 fathoms	Out to 20-50 nm (within a 70 – 80 mile radius of port)
Salmon	Mobile (troll, hook and line)	10-180 fathoms from Canada to Oregon border	Breakers to 200 fathoms; sometimes up to 650 fathoms	Breakers to 50 fathoms; 20+/- nm to high spots
Crab	Fixed (pot)	0-10 fathoms up to 90-100 fathoms; mostly sandy or mud bottom; <b>important tribal issues here - only southernmost 38 miles open to all</b>	Breakers to 130 fathoms and up to 700 in some years; around tops of canyons, high spots	Often inside of bays and estuaries; in the ocean out to 20-70 fathoms
Shrimp	Mobile (trawl)	30-150 fathoms; muddy, flat, soft bottom	30-150 fathoms; 90 percent in 60-140 fathoms; muddy, soft, flat bottom	n/a
Groundfish	Mobile (bottom and midwater trawl, hook and line)	Surf to 700 fathoms; midwater trawl generally at 1,000 fathoms, but nets are not this deep	Breakers to 400 -700 fathoms; 1,200f for midwater, but nets are not this deep.	Bottom fishing very important; within 5 nm or 40 fathoms (within 30 mile radius of port); look for reefs and high spots
Black Cod	Mobile (trawl); Fixed (pots, long line)	100-500 fathoms; depends on time of year	100-500/650 fathoms	See above for black cod as well
Halibut	Fixed (long line)	90-100 fathoms	22 nm at 100-125 fathoms	Very valuable fishery; within 40 – 100 fathoms; focus on sand or gravel habitat
Spot Prawns	Fixed (pot)	85-120/130 fathoms, Washington to California; primarily hard bottom at around 100 fathoms		n/a

Source: Guided conversations with stakeholders conducted for this study nm = nautical miles

\* Bottom trawling is not currently allowed outside of 700 fathoms in the entire West Coast Exclusive Economic Zone. This relatively new regulation is intended to protect essential fish habitat.

fisheries in Oregon. These small businesses are family run and intergenerational, and many users are long-term residents of coastal communities.

A common theme among commercial fishers who participated in this study was a strong sense of pride in being a “hunter and gatherer” and working hard over the years to gain the skills needed to do this well. Another theme that arose was the cooperation that exists within the commercial fishing community, described by one study participant as “shared camaraderie plus competition.” An additional theme was that “fish move” – that is, while some species are very territorial and can be located near specific habitat year after year (e.g., halibut), others move quite a bit within a season and between years (e.g., shrimp, groundfish, tuna). All study participants agreed that this variability makes the use of maps (for planning purposes) challenging, and frequently noted the need for “enough space and skill” to harvest effectively and for proximity to the areas where harvesting is possible.

### ***Processors***

Processors’ concerns about proximity and access are driven by their lack of mobility; they locate their operations at strategic points along the coast that are close to the areas where fish are caught. Two large processors (Pacific Seafood Group, Trident) and a handful of small- to medium-sized processors (e.g., Bornstein, Ilwaco Fish, High Tides, Ocean Gold, Ocean Beauty) currently characterize a regional industry that previously comprised a larger number of small, independent companies. A small, but growing, number of niche/specialty processors or direct sales efforts also operate in the region (e.g., Oregon’s Choice, Sea Q Fish), as do two processor associations (West Coast Seafood Processors Association and the Pacific Seafood Processors Association). Processors process both tribal- and nontribal-caught fish.

### ***Charter Fishing***

Charter fishing businesses echo and amplify the importance of, and concerns about proximity, since charter fishing operations are limited by time, size of boat and fuel, and often even the length of the day. Although some charters offer overnight trips, many are day boats with maximum daily distance constraints. Charter operations are also dependent on access to particular habitats for some target species (e.g., rocky structures and reefs for bottom fishing; sandy or muddy bottom for crabbing) and on particular water column and current conditions for others (e.g., salmon and tuna), but must also conform to regulatory constraints (such as Rockfish Conservation Areas [RCAs]).

### ***Aquaculture***

Off-shore aquaculture is at an early development stage in the Pacific Northwest. The aquaculture industry has indicated a strong interest in sharing place and space with offshore renewable energy, especially for shellfish and marine plants (seaweed/algae), through a system called Integrated Multi-Trophic Aquaculture. The aquaculture industry in the Pacific Northwest is connected via the Pacific Aquaculture Caucus (PacAqua; [www.pacaqua.org](http://www.pacaqua.org)). Note that NOAA, Oregon State University, and PacAqua (among others) sponsored an offshore aquaculture forum in September 2008 in Newport, OR and produced a white paper on the topic (<http://ORstate.edu/conferences/event/aquaculture2008/>).

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### *Differences between Oregon and Washington*

Oregon and Washington perspectives regarding space, place, and use are similar in many respects. However, study participants in Washington, as well as some from Oregon, also clearly and strongly articulated that in some respects “*Washington is different.*” Commercial harvest in Washington is limited and/or controlled by government to government (tribal and U.S.) agreements, which allocate resources to both tribal and nontribal fishermen.<sup>8</sup> As summarized by two study participants:

*“There are no negotiated tribal rights off the coast of Oregon. That’s a whole other ball of wax that we haven’t dealt with in Oregon, but they certainly do in Washington.”*

*“The tribes as a whole in Washington are allowed 50 percent of all of the catch. So they’re always negotiating with a) the non-tribal entities and b) amongst themselves for whatever fishery particular allocation. It’s very complicated.”*

Other differences include the existence of the Olympic Coast National Marine Sanctuary, concern about seismic activity, and the need to manage issues associated with an international border.

Section 2.3.3.1 (p. 23) includes a description of the pool of Pacific Northwest coast commercial fishing sector participants who contributed information to this study. Tables 2-8, 2-9, and 2-10 (pp. 24-25) list these participants’ specific sectors and organizational affiliations.

### **6.2.2 Compatible and conflicting uses**

#### *Oregon Fishermen’s Cable Committee*

The most frequently cited example of cooperation and compatibility was the Oregon Fishermen’s Cable Committee (OFCC; <http://www.ofcc.com/>). OFCC is a committee that seeks agreement between Oregon commercial trawlers and fiber optic cable companies. Many study participants suggested that developers, BOEM, and other agencies study the OFCC process and mimic it in every way possible.

*“OFCC is a model for working together/cooperation. I don’t think we have had a single dissenting vote in over 10 years. We do have one more vote than the cable guys do. Theoretically, we could override them but it has never come to that. They can explain things out to us; nobody is trying to blow smoke by us. It’s been really, really, really good because what they have asked for has not been unreasonable. You could have the wrong people on that board, on either side, and it could make things a lot more stressful than it is. It’s really good. Maybe some didn’t like it maybe initially, but I think that everybody is sold on it now. It is the model for cooperation in the world because there are no two groups that have more at odds historically over time than fishermen and submarine fiber optic cable companies. The first one was laid across the English Channel...I think the fishermen broke that thing within a week. It’s really a horrible, horrible history of conflict. But not with OFCC, I’m tickled to be*

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<sup>8</sup> Tribal rights to commercial fishing grounds in Western Washington are governed in part by two judicial rulings: the 1974 Boldt Decision and the 1994 Rafeedie Decision. For more information, see <http://nwifc.org/about-us/fisheries-management/> and <http://nwifc.org/about-us/shellfish/rafeedie-decision/>.

*a part of that. I almost feel I'm not worthy. It's pretty cool sitting down with people and talking things out. We have 99.8 percent of the cable buried and that's pretty incredible."*

***Other Examples of Compatibility and Cooperation***

The second most commonly mentioned example of compatible use was the negotiated “crabber–towboat” lanes (<http://www.wsg.washington.edu/mas/econcomdev/lanes.html>).

*“Tow boat lanes have been pretty successful by and large. I’m not saying everybody is perfect. I’m not saying the tow boats don’t ever veer out of those and I’m not saying that the crabbers don’t go into them, because I’m sure it happens. For the most part, it saves a lot of stress on everybody’s part.”*

Study participants from the crabber and scientific communities also described the benefits of agreements that have been reached between the two groups to enable shared use. At the same time, most of these participants expressed skepticism that a system of cooperation similar to that facilitated by the OFCC could be established between the fishing and scientific communities.

Another example of note is the work among bar pilots, crabbers, cable companies, and the NOAA National Weather Service to cooperatively locate a wave buoy in 200 fathoms off the coast of Astoria, Oregon. The process took many months of negotiation, but eventually resulted in the identification of a mutually satisfactory location (though one of the participants in that negotiation commented, *“Imagine all the trouble it was getting one buoy out there; wait until they try to put 100 of ‘em out there.”*).

***Management***

Existing management decisions (e.g., closures, marine sanctuaries) were mentioned frequently by participants as sources of conflict. The tension and conflict brought about by the RCAs and other regulations came up most often. When asked to describe how the RCAs have affected commercial fishing, participants described it as a series of constrictions that affect some users more than others.

*“One way [to understand how regulations affect the space available] would be to look at the regulations, build a timeline backwards, and then look at fish landings. Talk to some of the old timers that drag fished back into the 1970s and 1980s. That would give you a true perspective of where the grounds actually are if the regulations (RCA) went away.”*

Other comments yielded insight into the tension between fishing gear groups and RCA regulations.

*“Due to trawl overfishing and the RCA, we are confined to a smaller and smaller area, further and further out. I mean we have to go out past 125 fathoms in some places in 100 in others in order to fish. And, you know, we are getting squeezed both ways because it was 30 fathoms and now it’s 20. I mean there is a narrow strip of ground that we have been fishing on.”*

***Science***

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Some participants described the tension between scientific gear and fishing gear.

*“Just the other day, one of (scientist’s) gliders was pulled out of the water by somebody being ‘helpful.’ They saw this thing floating around and thought ‘Oh we should return it to its owner’. Unfortunately when you recover a glider off of your fishing boat you typically break it, and so they broke a wing off of it.”*

Other examples included solar panels stolen from moorings located 10 miles offshore, pieces of equipment “held for ransom,” and the general challenge of negotiations needed to install large, new scientific projects. As with all conflict, the tension goes both ways. Fishermen often mentioned the problem of getting hung up on scientific equipment, or, more importantly, equipment being placed out in high use areas during the peak of a fishing season.

### ***Etiquette***

Despite being fiercely competitive with each other, a significant amount of compatibility and cooperation exists within commercial fishing. Cooperation exists between fisheries and between offshore and onshore interests, in Oregon as well as Washington.

*“Fishermen find a way to play together. Even at great competitive odds against each other we find a way to play together. We have to, or we can’t survive...It’s a competitive camaraderie, is what it is.”*

### ***Aquaculture***

The aquaculture segment of commercial fishing stakeholder group expressed particular interest in the potential for “shared equipment.” Some noted the similarity of development timeframes for both the ocean aquaculture and offshore renewable energy industries.

A theme that emerged repeatedly in the context of compatible and conflicting uses was access and displacement, or the feeling of being “kicked out” of traditional space and place. The issue of displacement is not new to the commercial fishing stakeholder group. Many spoke of regulatory-caused displacement, but they were clear to articulate that displacement by a renewable energy project would be an entirely different thing: a loss on a more permanent basis.

### **6.2.3 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.

Pacific Northwest region commercial fishing stakeholders indicated a strong preference for avoiding, rather than mitigating, conflict and emphasized the need to be included in any decision making process. In addition, stakeholders offered the following specific comments regarding avoidance and mitigation.

*“I don’t want a subsidy; I want to fish. Give us your criteria and we will give you options.”*

*“Unless they want to pay each fisherman on the West Coast so much a year for forever. Forever, not just a couple of years. And they shouldn’t just have to pay us. They should have to pay everybody. It’s not just our area. It displaces us then we displace others. So unless they want to pay everybody on the coast whatever their calculated losses were, which I highly doubt they are going to do, they should really put some hard effort into working with us to find the best places to put these buoys. I think fishermen should decide where to put them.”*

*“Create a mitigation system modeled after the Oregon Fishermen’s Cable Committee. You are not paying people off to put in what you want to put in. You’re inconveniencing them for a little while, while you are putting them in, and then you are not in their way anymore. When you put those wind farms or wave farms off shore, it’s going to take a chunk out of our grounds and I think it’s a really important piece. You’d have to work it out.”*

*“Put money into fisheries management and fisheries research. Maybe this would open up the RCAs and give us more places to fish.”*

*“Certain components of the fleet would be willing and able to do some of the construction of some of these projects. Certainly the scientific analysis, the biological, the habitat surveys, that kind of thing, and really it makes a lot of sense to use these guys because of their vast knowledge of the area and of the patterns of the sea life that passes through them at different times based on their past uses of the areas.”*

*“Work with local fishermen and I expect some of that to happen, but maybe set up a training program so that they could take advantage of fishermen’s knowledge of what’s out there and behaviors. Maintenance workers from processors too. They have a lot of knowledge of how to keep things working and transfer their skills to this environment / buoys. Maybe even fund a training program at coastal community colleges.”*

*“We can’t get the shrimp trade into Europe. We need to get rid of the 25 percent shrimp tariffs to Europe. If we could do away with that, great, because then we could be more competitive. Even if they could get some political help with getting the whiting treaty with Canada ratified, and the albacore treaty with Canada. If they had any political pull with any Congressmen or Senators, that would help. Anything would help.”*

#### **6.2.4 Communication and process**

Study participants expressed support for as well as skepticism about current ocean-planning processes, and a strong desire to be at the table, listened to, and respected, but not pressured to participate in a prescribed manner. Several participants, who indicated they had participated in recent planning processes, shared their belief that engagement with their group is necessary while also carefully voicing concerns about whether they had done the right thing. Others echoed this tension, questioning the benefits versus the costs of engagement.

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Several participants talked about how to use groups, agencies, or advisory committees to reach out to and engage with commercial fishing stakeholders, citing specific channels such as:

Department of Fish and Wildlife annual newsletter

Special mailing

Posters on the dock

Fishermen Involved in Natural Energy (Lincoln Co., Oregon)

Fisherman's Advisory Committee for Tillamook (Tillamook Co., Oregon)

The Coastal Coalition of Fisheries (Washington)

Several cautioned, however, that even though it is important to use groups, BOEM and other agencies as well as developers would be wise to recognize that not everybody is a joiner, that the fishermen are inherently independent, and that effort will be required to reach a broad segment of the community.

*"They could send out surveys to permit holders, for people who don't come to meetings."*

*"The little loudmouth deck hands are part of the industry, and the irate wives who are angry that their husband isn't fishing as much as he used to, and it's all your fault. Well, those voices should be heard. There're a lot of them. It's a hard nut to crack. I know that those people deserve to be heard, and they aren't. I used to complain to the (gear group), 'what about all these council numbers and economic impact on the beach, nobody's asked me how many employees I have or what my payroll is, or what we do in business? I'd be happy to let them know.'"*

Study participants indicated that communications with processors and other on-shore service providers should begin with organizations such as the West Coast Seafood Processors Association, but that it is also important to talk to individual processors since not all processors are members of the trade association. The best channel to the Pacific Northwest aquaculture industry is through PacAqua.

To address one of Washington's unique characteristics, namely tribal fishing rights in federally-managed waters, multiple study participants advised first contacting the Northwest Indian Fisheries Commission, which helps manage all the tribal fisheries, before following up, as appropriate, with individual tribes.

## 6.3 COMMERCIAL VESSELS

### 6.3.1 Characteristics and use of space

Commercial vessel-related stakeholders include shippers (cargo, tankers), towboat and barge operators, and those who work in navigation and safety-oriented enterprises such as the U.S. Coast Guard, the marine exchanges (those who coordinate and represent commercial shipping), harbor safety committees, and port operators. The Pacific Northwest has only two main ports, in Astoria, Oregon (130-150 commercial vessels entering or exiting each month) and Seattle, Washington (250-300 commercial vessels per month), and one considerably smaller port (Coos Bay, Oregon; 5-8 commercial vessels per month).

This stakeholder group operates in a highly organized fashion when entering and exiting ports, and generally travels in straight lines between two points when operating outside of a port. Unlike the commercial fishing and non-commercial stakeholder groups, which tend to perceive the ocean in terms of habitat and fathoms, the commercial vessel-related stakeholders perceive the ocean in two dimensions and generally indicated that they can “work around anything,” even though most study participants acknowledged that container shipping worldwide is growing and thus could result in greater potential for conflict.

Tankers generally travel parallel to the coast at a distance of approximately 50 nautical miles, while large container ships operate approximately 25 nautical miles offshore. Smaller container ships travel at a distance of approximately 5-10 nautical miles from shore. Tugs and barges operate within negotiated towboat lanes, which in the summer are generally located 4-10 nautical miles (Oregon) and 20-30 nautical miles (Washington) offshore. During other times of year, the lanes are generally 4-6 nautical miles offshore. Extra care is required to avoid crossing or placing gear that might interfere with tugs’ catenary tow cables.

Section 2.3.3.1 (p. 23) includes a description of the pool of Pacific Northwest coast commercial vessel sector participants who contributed information to this study. Tables 2-8, 2-9, and 2-10 (pp. 24-25) list these participants’ specific sectors and organizational affiliations.

### **6.3.2 Compatible and conflicting uses**

Within the commercial vessel stakeholder group, spoken and unspoken “rules of the road” combined with technology (e.g., Automatic Identification System [AIS]) and the services of bar and river pilots facilitate multiple, compatible uses.

*“Tows, tugs, and deep draft vessels maintain specific distances that they have a gentleman’s agreement so they stay out of each other’s way. The last conflict was around 18-19 years ago. People stay out of each other’s way...they obey the rules of the road.”*

Several people noted the good relationship between deep draft ships and tug and barge operators. AIS technology is credited for facilitating a lot of this cooperation. Little direct contact occurs between other boats and the deep draft ships.

Some commercial shipping interests expressed concern about the potential costs associated with the development of renewable energy projects.

*“It costs a lot to run a ship (\$20,000/day) so things getting in their way or stopping them create costs that really add up. Fuel costs for ships are enormous. Going way far out of the way will hurt them.”*

An important but often over-looked segment of the commercial vessel stakeholder group includes those who work in navigation and safety-oriented enterprises such as the U.S. Coast Guard, the marine exchange, harbor safety committees, and ports. Safety and communication, both separately and linked together, were main themes expressed during our research. Having the ability to get out to sea as soon as possible and without obstruction, to make sure that ocean users

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are aware of obstructions, and to use all possible forms of communication were concerns voiced frequently in association with comments about duties and jurisdictions. Conversations with study participants frequently cited the lack of ocean service vessel infrastructure in the Pacific Northwest and concern about adding new users/industry to the space in the absence of sufficient infrastructure.

### 6.3.3 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 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.

However, several Pacific Northwest region commercial vessel stakeholders suggested that mitigation would not be necessary. Specifically:

*“There’s not going to be a lot of mitigation when it comes to shipping. Don’t put it near a harbor. Get it on the charts and make it known and visible.”*

*“Commercial ships will mitigate this by accepting that they have to go around them. They will just plot a different course.”*

*“Actually with the tow boaters, it would just be a big pain in the ass for us and we’d have to go around it. Although at the meetings when we had our little chat (negotiation for siting), I would explain to them that if the weather got to a certain point and we had to go through their buoys, they’re going to lose a whole bunch of money.”*

### 6.3.4 Communication and process

Nearly every research participant in the commercial vessel stakeholder group mentioned the need to utilize existing organization and networks for communication purposes, especially given that a large majority of vessels are not U.S.-based. In particular, stakeholders suggested that BOEM, other government agencies, and developers should consult with the Marine Exchanges and Harbor Safety Committees.

*“Marine Exchanges are a resource for distributing information to the shipping industry. When they talk to the Marine Exchange, they are also talking to their marine agent. The marine agent is the guy or gal on the dock who is arranging for provisions, for food, for electricity, for all the stuff that the vessel needs when it comes into port.”*

*“There are also these things called Harbor Safety Committees. Our Harbor Safety Committee has every industry segment represented on the committee. It has an environmental representative, a public at large member, a recreational boater, etc. All the agencies (NOAA, Army Corps of Engineers, U.S. Coast Guard) are advisors to the Harbor Safety Committee. . . More recently in the last 15 to 20 years, the Coast Guard has recognized them as a way to help facilitate safe practices.”*

In the Pacific Northwest region, Marine Exchanges include the Merchants Exchange of Portland, OR (<http://www.pdxmex.com/>) and the Marine Exchange of Puget Sound (<http://www.marineexchange-sea.com/>). These venues also help in communicating with the pilots and the tugs and tows.

*“[BOEM] could communicate with the American Pilot Association and the Oregon Board of Maritime Pilots, the Puget Sound Towboaters Association and the Columbia River Towboaters Association.”*

## **6.4 NONCOMMERCIAL USES**

### **6.4.1 Characteristics and use of space**

#### ***Recreational fishermen and boaters***

As with commercial fishing, recreational harvesting of species like salmon or tuna requires traveling farther offshore. The “drive to fish” and recreate freely on the ocean was a frequent theme in conversations with study participants. As one commercial fisherman recalled, *“We were the only bigger boat out there and there was this rec guy in a 14 foot boat. We were done and ready to come in. We felt bad about leaving him there but 22 miles out in a 14 foot boat?”*

Recreational boaters (many of whom are also recreational fishermen) frequently described their use of the ocean in terms of the freedom of movement it offers and the ability to travel anywhere from three to 40 nautical miles from shore (*“away from everything”*). A typical answer in response to the question of how the presence of a renewable energy facility would affect use was, *“Obviously, if we had something there that we had to avoid we could do it. We would find another place to race or another way to do it.”* The most common theme during conversations with recreational boaters was safety as the first objective.

Table 6-6 lists the general locations of recreational fisheries in the Pacific Northwest.

#### ***Scientists***

Many scientific studies occur in Pacific Northwest waters. For example, NOAA conducts regular trawl surveys, acoustic surveys, recruitment surveys, and juvenile surveys. An important organization for the coordination of data collection and research efforts is the Northwest Association of Networked Ocean Observing Systems (NANOOS). Members of the scientific research community highlighted in particular the value of being able to study a species or place (and all of its attributes) over time.

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Table 6-6

Pacific Northwest Recreational Fisheries and Locations

<b>Fishery</b>	<b>Location</b>
Tuna	Typically 30-50 nm (within a 70 – 80 mile radius of port)
Salmon	Breakers to 50 fathoms; usually stay within 20 nm
Crab	In Washington, 80-90 percent in bays and estuaries; in Oregon and Washington ocean, typically out to about 20 fathoms
Shrimp	n/a
Groundfish	Within 5 nm or 40 fathoms (further if closures were lifted; typically within 30 mile radius of port); mostly in pockets of high relief habitat
Black Cod	Typically bycatch when fishing for halibut
Halibut	Within 40 – 100 fathoms; focus on sand or gravel habitat
Spot Prawns	n/a
Source: Guided conversations with stakeholders conducted for this study nm = nautical miles	

Section 2.3.3.1 (p. 23) includes a description of the pool of Pacific Northwest coast non-commercial sector participants who contributed information to this study. Tables 2-8, 2-9, and 2-10 (pp. 24-25) list these participants’ specific sectors and organizational affiliations.

### 6.4.2 Compatible and conflicting uses

Within the non-commercial stakeholder group, study participants described numerous examples of compatibility between recreational boaters and recreational fishermen, such as long but orderly lines at put-ins and taking turns crossing a bar. They also described numerous instances in which recreational users found scientific equipment and returned it to the owner.

When the relationship between recreational boaters and energy facilities came up, participants cited parallels with the way large vessels are accommodated.

*“You just make the tradeoff. We would do the same thing if there was big wave energy configurations or wind.”*

*“We may have the right of way because we are under sail. But I don't press that issue. We stay pretty much away from those guys because they can't see you, and it takes them three or four miles to even think about stopping. It's just not worth that.”*

*“I think that most of us would get together and look at some issue and come to a conclusion as to how we could all live with it before somebody would just come out and say, ‘Over my dead body’. The last 3-4 years we haven't had any great battles.”*

Another example of compatibility within the noncommercial stakeholder group, and within the science community specifically, is agreements between agencies within the U.S. government.

*“We have to get permits to do our surveys. We don't just go out and do them. All of those could involve different kinds of conflict, or cooperation, depending on doing something slightly different. The (regulators) will permit (the scientists) to go out and do these things, but it takes a negotiation process.”*

A source of conflict frequently cited across all study participant groups was the military's use of the ocean.

*“The Navy trumps everything... They can really shut you down, I mean, you'll get a call. When you're out on a cruise, you'll find out while you are out there that they put a bulletin out, and the waters are closed to all operations.”*

Several stakeholders spoke of ocean-related decisions being made by one level of government and not including another. The most strongly held opinions related to the *“state making decisions for us that we need to be a part of.”* Some noted the internal tension between regulatory and scientific responsibilities within a single government agency: *“We want to do the science and they want to regulate the science, as well as the fisheries.”*

### **6.4.3 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.

As a general rule, however, members of this stakeholder group believed that mitigation would not be an issue. *“Commercial fishermen might need this but recreational fishermen or boaters won't.”* The same could be said for scientists, who simply do not want to be displaced; mitigation is not seen as an option.

### **6.4.4 Communication and process**

The best way to reach recreational boaters is through the various ports or local yacht clubs.

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*“Every one of them has to pay their moorage to some port office. By the very nature of it, they are going to be focused on the docks. There will be somebody down there on the docks working on their boat every weekend or sailing or doing something.”*

*“The local yacht clubs are a good way. Our little club, we would be happy to host meetings where you could talk to people. We have fishermen as well as sailors in our group; we have about 150 members, so it’s a pretty active group of recreational fishermen.”*

Research participants indicated that it is hard to find a clear way to reach all scientists, but offered suggestions including NANOOS, the Center for Coastal Margin Observation and Predictions (<http://www.stccmop.org/>), and academic institutions such as the University of Washington and Oregon State University, both of which have active programs in oceanography and marine science.

*“I think the best way is for BOEM’s science staff to think carefully about what kind of information they need and come have a dialogue with us. We can help figure out what is needed. And then work with the Science Centers to figure out the right contact people and the appropriate databases. It’s the way people should do business, but it doesn’t always happen that way. But you know, it might be best to go to the Regional Office first, then come to the scientists. We can’t just say our opinion; we have to go within guidelines.”*

## 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.

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Table 7-1

### Commercial Fishery Landings, California,<sup>1</sup> 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

<sup>1</sup> Data reported for the entire state

Table 7-2

### Recreational Fishing Activity, California,<sup>1</sup> 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

<sup>1</sup> 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
<b>Totals</b>	<b>9,174</b>	<b>1,043</b>	<b>1,171</b>	<b>2,214</b>	<b>4,455</b>	<b>756</b>	<b>749</b>	<b>639</b>	<b>17</b>	<b>0</b>	<b>344</b>

\* 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](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.

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Table 7-4

Transport, Support, and Marine Operations, California,<sup>1</sup> 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

<sup>1</sup> Data reported for the entire state

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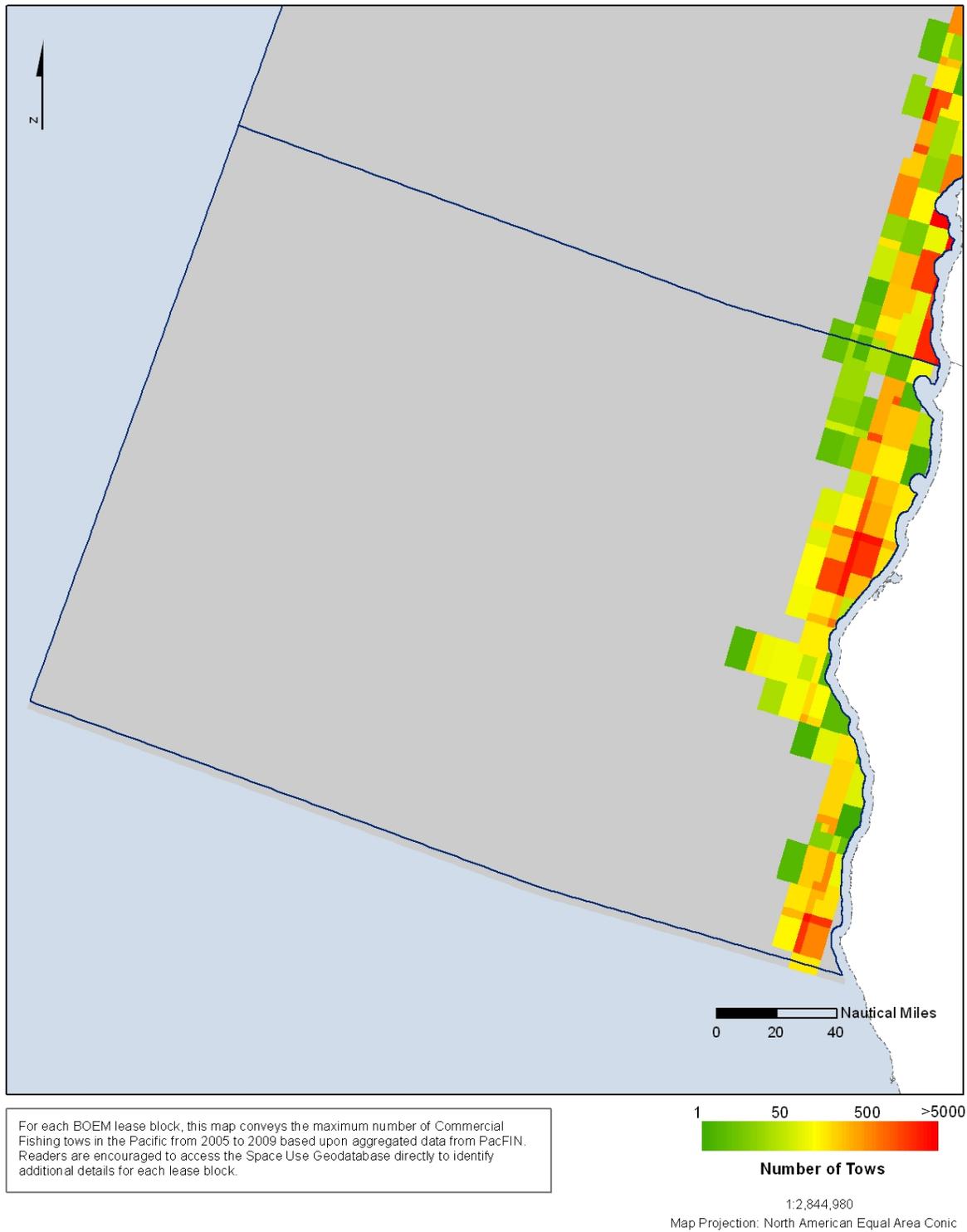
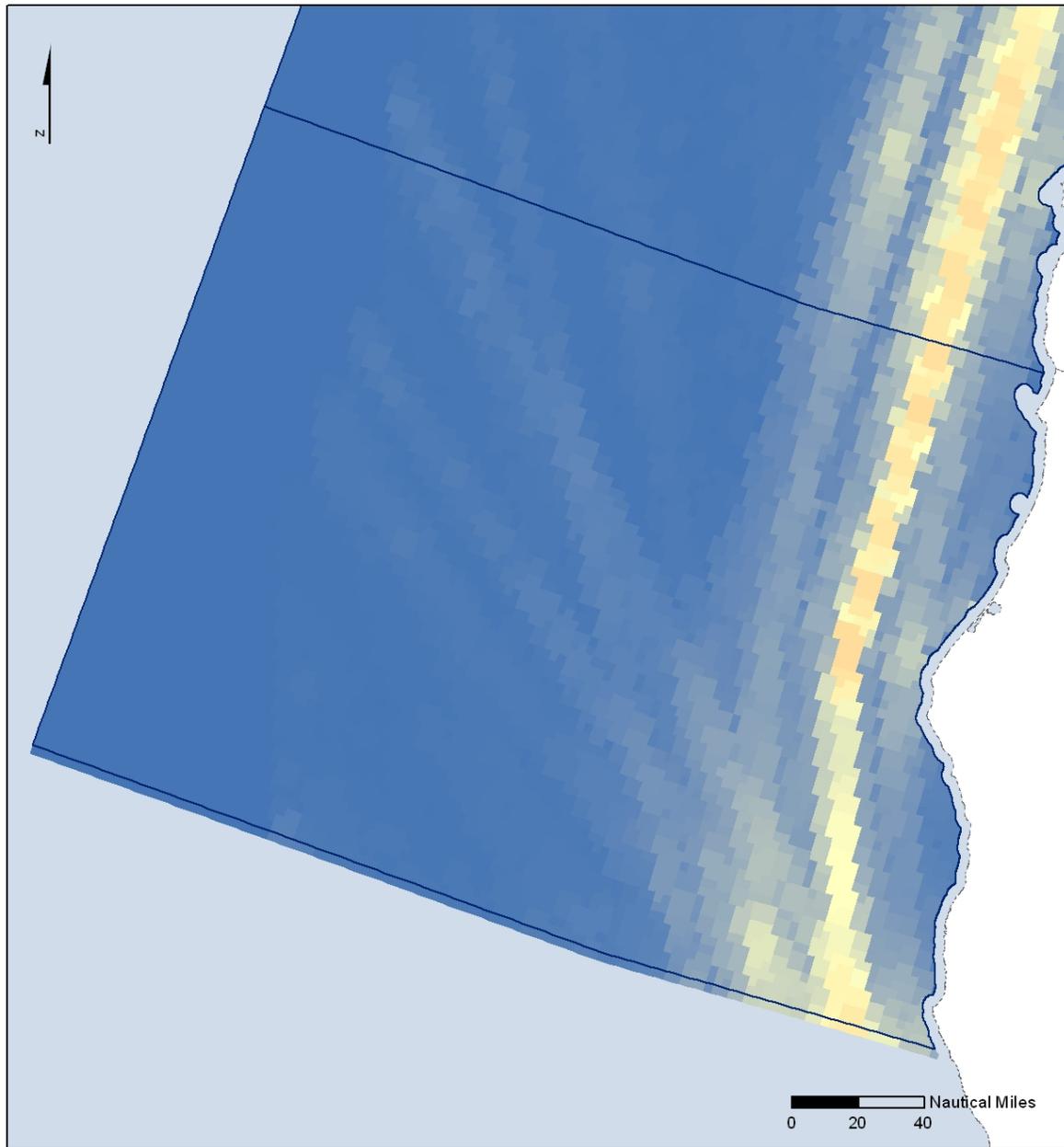


Figure 7-1 Commercial Fishing Activity in the Northern California Region

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The Automatic Identification System (AIS) dataset is a comprehensive dataset maintained by the United States Coast Guard that tracks commercial vessel navigation of vessels at or above 300 gross tonnage. This dataset provides a summary of the AIS vessel navigation data for calendar year 2009. The raw data were processed by importing the ASCII text file into a PostgreSQL/PostGIS database one day at a time. A subset of only the vessels that were underway was extracted from the data. The latitude/longitude values in the AIS data were used to generate the spatial location for each record. This location information was then overlaid onto a 5nm grid with only one unique value per vessel per gridcell counted. The count of vessels for the day was then added to the gridcell. This process was repeated for each day of the month. After the whole month was processed the counts for each of the days was added to give the total count for the month. The counts for the month were then added to obtain the counts for the quarter and year. For additional information on AIS data, readers are encouraged to access the Space Use Geodatabase.

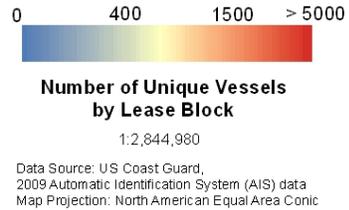


Figure 7-2 Commercial Vessel Activity in the Northern California Region

# NORTHERN CALIFORNIA

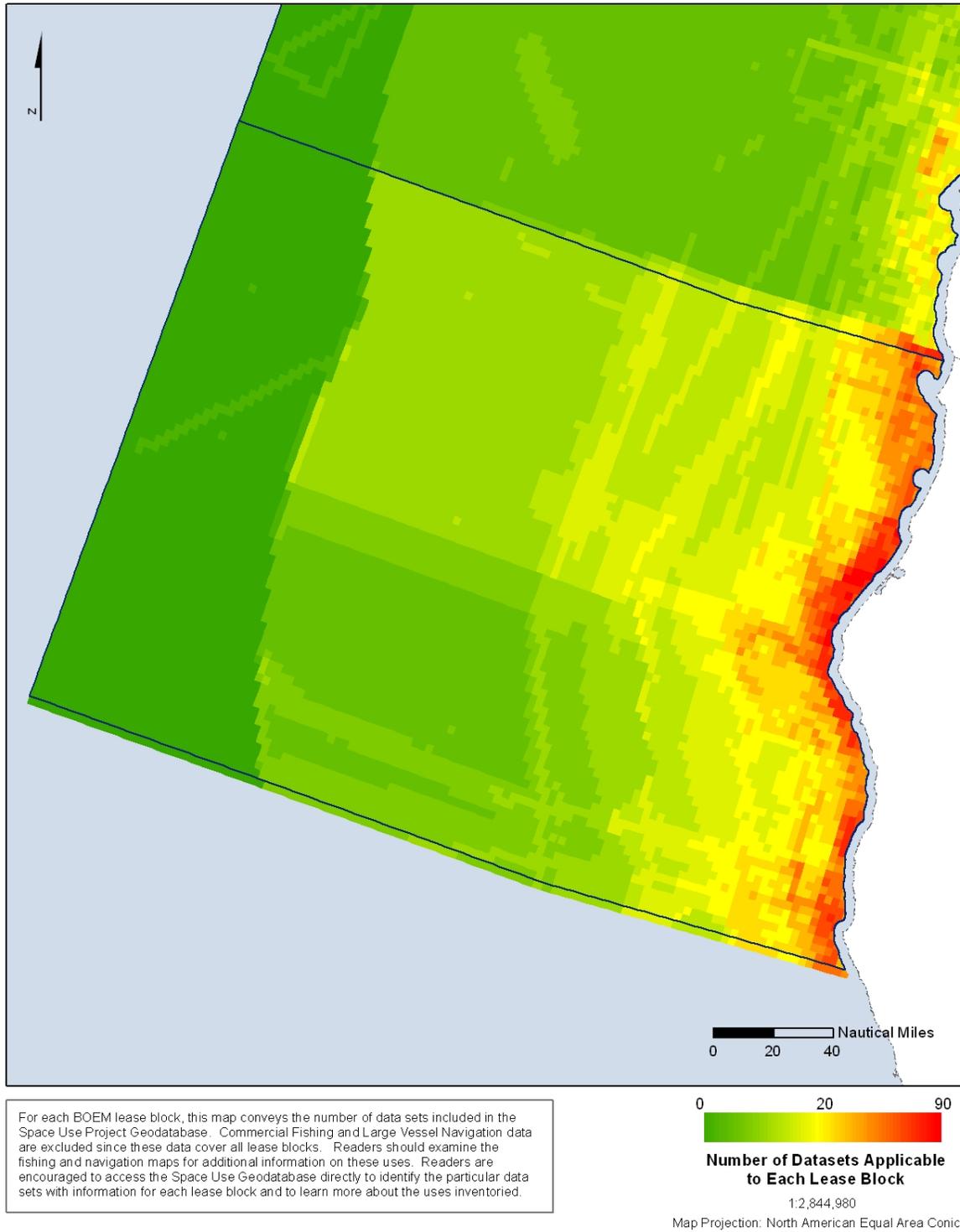


Figure 7-3 Occurrence of Data Sets Describing Noncommercial Uses in the Northern California Region

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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."<sup>9</sup>

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 downturn.

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

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<sup>9</sup> <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

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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.<sup>10</sup> 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,<sup>11</sup> 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

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

<sup>11</sup> 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

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projects to inform the process, including a socio-economic baseline study conducted by a Humboldt State economist (Hackett et al. 2010).<sup>12</sup> 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.<sup>13</sup> 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.<sup>14</sup> Concerned about the limitations of the

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<sup>12</sup> 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.

<sup>13</sup> The project has since expanded to New Hampshire and Hawaii.

<sup>14</sup> 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.<sup>15</sup> 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

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

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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,<sup>16</sup> 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

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<sup>16</sup> Environmental factors include oceanographic and weather conditions, which influence the abundance and distribution of stocks within and across seasons.

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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.<sup>17</sup>

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

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<sup>17</sup> 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.

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Table 7-5

Northern California Commercial Fisheries, Gear Types, and Locations<sup>a</sup>

Fishery	Gear Type	Commercial <sup>b</sup>	Charter <sup>c</sup>
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 <sup>b</sup>	Charter <sup>c</sup>
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**

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

<sup>b</sup> 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.

<sup>c</sup> 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 head 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.

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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.”<sup>18</sup>*

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.

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<sup>18</sup> 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

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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 (Deweese 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 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

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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:

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*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.<sup>19</sup> 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.<sup>20</sup> 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.<sup>21</sup>

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

<sup>19</sup> Few (if any) marine tourism operators are OCS users; most operate exclusively within the bay or state waters.

<sup>20</sup> 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.

<sup>21</sup> 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).

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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.<sup>22</sup> 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

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<sup>22</sup> See <http://www.wsg.washington.edu/mas/econcomdev/lanes.html> and [http://www.wsg.washington.edu/mas/pdfs/2010TowlaneCharts\\_lr.pdf](http://www.wsg.washington.edu/mas/pdfs/2010TowlaneCharts_lr.pdf), accessed 8/4/11.

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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 11<sup>th</sup> 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.<sup>23</sup>

### *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

<sup>23</sup> <http://www.uscg.mil/d11/grphumboldtбай/allunits.asp>, accessed 8/2/11.

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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 head 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.

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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.<sup>24</sup> 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

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

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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.<sup>25</sup>

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.<sup>26</sup> Their sovereignty requires BOEM (or any other Federal agency) to engage in formal government-to-government consultation.

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<sup>25</sup> 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.

<sup>26</sup> 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.<sup>27</sup> 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

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<sup>27</sup> 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).

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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***

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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.<sup>28</sup>

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

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<sup>28</sup> 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.

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Table 8-1

Taxonomy of Ocean Uses

<b>Category</b>	<b>Subcategory</b>
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.)

<b>Category</b>	<b>Subcategory</b>
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

## SYNTHESIS

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
<b>Regulated, Restricted, or Prohibited Access</b>			
Marine Protected Areas (MPA) such as Marine Reserves, National Monuments, Marine Sanctuaries	<b>Low:</b> 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). ( <a href="http://www.mpa.gov/pdf/helpful-resources/us_mpas_snapshot.pdf">http://www.mpa.gov/pdf/helpful-resources/us_mpas_snapshot.pdf</a> ).	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)	<b>Medium:</b> 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 ( <a href="http://sharpfin.nmfs.noaa.gov/website/EFH_Mapper/map.aspx">http://sharpfin.nmfs.noaa.gov/website/EFH_Mapper/map.aspx</a> ).	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)	<b>Unlikely:</b> 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

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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	<p><b>Low:</b> 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.</p>	<p>Obstruction of construction, maintenance, and repair activities; Damage to existing pipelines</p>	<p>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</p>
Submarine power and communication cables	<p><b>Medium:</b> 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 (<a href="http://www.offshore-power.net/Files/Dok/casestudy-europeanoffshorewindfarms.pdf">http://www.offshore-power.net/Files/Dok/casestudy-europeanoffshorewindfarms.pdf</a>)</p>	<p>Obstruction of construction, maintenance, and repairs; Damage to existing cables</p>	<p>Increased costs associated with any cable re-routing activities; disruption of service due to damage of cables</p>

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	<b>Unknown:</b> 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	<b>Low:</b> 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	<b>High:</b> 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
<b>Existing or Potential Activities</b>			
Areas of archaeological interest	<b>Low:</b> 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	<b>Medium:</b> 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

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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	<b>High:</b> 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	<b>Medium:</b> During the period 2002-2011, the USCG responded to between 20,000 and 37,000 search and rescue cases each year ( <a href="http://www.uscg.mil/hq/cg5/cg534/sarfactsinfo/SAR_Sum_s tats1964-2011.pdf">http://www.uscg.mil/hq/cg5/cg534/sarfactsinfo/SAR_Sum_s tats1964-2011.pdf</a> ). 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	<b>Medium:</b> 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	<b>High:</b> 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	<b>Low:</b> 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	<b>Low:</b> 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

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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	<p><b>Medium:</b> 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.</p>	Visual impact during day and at night	Change in property values; Viewshed alteration
Tourism and recreation activities	<p><b>Low:</b> 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.</p>	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	<p><b>Medium:</b> Research is geographically broad and variable, therefore co-location with renewable energy projects is possible.</p>	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.

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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

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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

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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 (EPAAct; 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 EPAAct 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 EPAAct 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).

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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 siting 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 Douvère 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

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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

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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 cross-

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sector 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

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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.

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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 sighted 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.

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### ***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

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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***

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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

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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 EPOA 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:

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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

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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.

Area to be avoided (ATBA): 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.

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

Inshore traffic zone: 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).

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### 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.

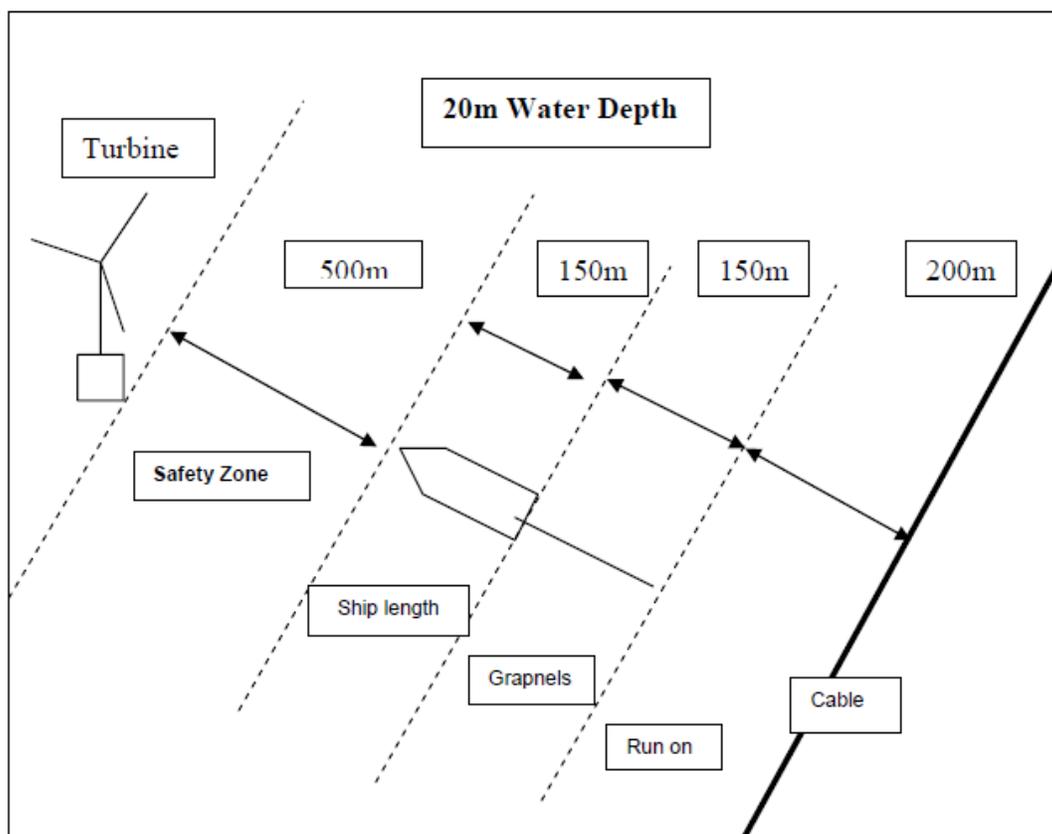
The siting of renewable energy facilities in proximity to existing cables may detrimentally affect the general safety and accessibility of these cables for maintenance and repair purposes. Cable

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

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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.

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### 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

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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 EPCA 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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## APPENDIX A: LITERATURE CHARACTERIZATION AND GENERAL REVIEW

[Note: See Appendix B – Annotated Bibliography for sources cited in this section.]

In developed areas of the world, the ocean is becoming more industrialized and competition among marine spatial users is increasing (Buck et al. 2004). Increased spatial competition can lead to conflict between ocean users themselves, and to conflict that also spills over to include other stakeholders and the general public (McGrath 2004). Such conflict can wind up in litigation, which is costly and can distract from other important priorities. To break free of a reactive cycle of conflict, agencies, stakeholders, and developers need ways to avoid or mitigate marine space use conflicts.

Marine spatial conflict is distinct from terrestrial environmental conflict that involves well-defined ownership rights. Marine spatial conflict plays out against a background of public ownership of natural resources, remoteness, and difficulty of monitoring and enforcement (Portman 2009). In the United States and many other nations, the sovereign (represented by government agencies) manages the resources of the seabed and offshore waters for the public's benefit. As ocean uses and the potential for conflict both increase, often so does the number of possible parties to (and thus the complexity of) the conflict. Parties can include any entity with an interest in the coastal and marine areas under consideration, including government agencies with coastal and marine jurisdiction. Although the facts of, and parties to, each environmental conflict and its resolution are context dependent, successful strategies do exist to arrive at durable, collaborative solutions to ocean space conflicts.

Coastal and offshore marine waters make a valuable contribution to our nation's social and cultural wellbeing and to our economic prosperity. Increasingly, traditional marine industries, such as shipping and fishing have to share an already crowded ocean with emerging uses such as offshore renewable energy. Identifying both the potential for conflict between ocean uses and ways of mitigating conflicts is key in balancing decision-making needed for effective marine spatial planning that meets the needs of our economy and society while safeguarding the environment. Although the need is clear, there is no comprehensive documentation of the spatial uses, values, or potential economic contributions of the coastal and ocean waters, making the identification of potential space conflicts and the design of mitigation methods exceedingly challenging.

### A.1 Literature Characterization

Overall, the literature points to a field that is not well developed in terms of conflict description and resolution. In fact, of the 192 citations, only 86 directly address offshore renewable energy uses. Much of the discussion is general and describes potential conflicts rather than specific instances with productive resolutions. Even so, there appears to be consistency between offshore renewable energy development and past experience with offshore oil and gas exploration and development as well as sand and gravel operations. The context, scale, and severity of conflicts differ on a case-by-case basis and cannot be divorced from underlying causes and human values.

Tables A-1 through A-6 present characterizations of the identified citations by geography, use type, renewable energy type, study type, conflict arena, and resolution methodology. As not

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every reference discussed all the aspects, there are gaps and overlaps. Wind energy has been in planning stages longer than any other type of offshore renewable energy, so has more developed literature including planning documents, siting guidelines, and resolution measures. Wave, current and tidal energy lag.

The 139 citations that specify a geographic Location showed a bias towards the eastern Atlantic in waters within the Exclusive Economic Zone (EEZ) of European countries. The bias is not surprising given the longer European history of offshore renewable energy development in comparison to more recent development in North America and other parts of the world. Much of the Pacific literature addresses conflicts other than offshore renewable energy including the work associated with offshore oil and gas and commercial fishing. Most is either very site specific or very general (e.g., policy and planning).

Resolution methodologies are difficult to categorize because the literature does not consistently express strategies and many current conflicts remain unresolved. The citations listed reveal strategies from other areas of marine spatial conflict and not particularly offshore renewable energy. This is to be expected given the young nature of the field.

Table A-1

### Characterization of the Literature by Geography

<b>Geographic Focus</b>	<b>Citations</b>	
	<b>Number</b>	<b>Percent of Total</b>
Atlantic Ocean Basin (eastern: Europe & Africa)	60	43%
Atlantic Ocean Basin (western: Americas)	35	26%
Pacific Ocean Basin (eastern: Americas)	27	19%
Pacific Ocean Basin (western: Australia & Asia)	4	3%
Gulf of Mexico	15	11%
Indian Ocean	3	2%
Terrestrial	10	7%

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Table A-2

Characterization of the Literature by Use Type

Use Type	Citations	
	Number	Percent of Total
Cables, Pipelines, Transmission Lines	12	6%
Commercial Fishing	52	27%
Cultural and Historic Conservation	26	14%
Marine Transportation	25	13%
Military Operations and Aviation	14	7%
Offshore Aquaculture	9	4%
Offshore Minerals	5	3%
Offshore Oil & Gas	26	14%
Port and Harbor Operations and Dredging	8	4%
Recreational Boating	16	8%
Recreational Fishing	23	12%
Sand and Gravel Mining	9	5%
Strictly Protected Marine Reserves	12	6%
Wildlife Viewing	5	3%

Table A-3

Characterization of the Literature by Renewable Energy Types

Renewable Energy Type	Citations	
	Number	Percent of Total
Wave	29	34%
Wind	74	86%
Tidal & Current	16	19%

Table A-4

Characterization of the Literature by Study Type

Study Type	Citations	
	Number	Percent of Total
Case Study	48	25%
Environmental Assessment	17	9%
Guidelines	19	10%
General	128	66%

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Table A-5

Characterization of the Literature by Conflict Arena

Conflict Arena	Citations	
	Number	Percent of Total
Cultural (including conflicts with indigenous people)	15	8%
Economic	38	20%
Environmental	15	8%
Historic	5	3%
Institutional	37	19%
Legal	30	16%
Political	24	13%
Social	9	5%

Table A-6

Characterization of the Literature by Resolution Methodology

Conflict Arena	Citations	
	Number	Percent of Total
Conflict identification and avoidance	12	6%
Mapping	23	12%
Mediation	2	1%
Marine spatial planning	34	18%
Stakeholder involvement	26	12%
Technical/Engineering	15	8%
Voluntary agreement	10	5%

### A.2 Identification and Characterization of Conflicts

The scale and severity of potential conflicts are heavily dependent on both the type of marine renewable device deployed and the physical location of a development, and therefore it is only possible to give a generic description of conflicts. Moreover, the relatively sparse literature on use conflicts with renewable energy, combined with few actual case studies, especially for wave energy converter (WEC) and tidal energy converter (TEC) devices, means that the summary presented is based:

On a small sample size and/or

On inference from marine space conflicts associated with oil and gas development, offshore aquaculture, and other uses of the marine environment.

Several reports proved the most useful in compiling a description of potential conflicts:

OSPAR Commission (2008) "Guidance on Environmental Considerations for Offshore Wind Farm Development." This report assists OSPAR European nations, developers, consultants, and

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regulators in the identification and consideration of some of the issues associated with determining the environmental effects of offshore wind farm developments. The potential impacts discussed within this document are not an exhaustive list and guidance has been structured to consider the main stages of the life history of an offshore wind farm.

Halcrow Group Limited (2006) "Wave Hub Environmental Statement." The Wave Hub is a renewable energy project to create the UK's first offshore facility to demonstrate the operation of WEC devices. The South West of England Regional Development Agency developed the Wave Hub project to provide the electrical infrastructure necessary to support and encourage developers of WECs to generate electricity from wave energy. The Wave Hub environmental statement provides a comprehensive list of potential conflicts with other ocean uses.

Sørensen, et al. (2003) "Social Planning and Environmental Impact." This report collates information on barriers to large-scale development of wave energy arising from competing uses of marine resources. The information presented has been collated through interviews with developers and regulators and review of the available literature.

Michel et al. (2007) "Worldwide Synthesis and Analysis of Existing Information Regarding Environmental Effects of Alternative Energy Uses on the Outer Continental Shelf." The objectives of this study were to identify, collect, evaluate, and synthesize existing information about alternative energy uses; the study includes sections addressing space-use conflicts.

Chapter 8 of the "OceanSAMP: Rhode Island Ocean Special Area Management Plan" (State of Rhode Island Coastal Resources Management Council, 2010) couches the potential issues posed by wind energy installations in terms of process to address and strategies to ameliorate. A summary table provides a useful overview. The Plan is an example of proactive management that places energy development into a broad context including social, natural and economic interests.

A useful U.S. case study of offshore wind development is the "Cape Wind Energy Project: Final Environmental Impact Statement" (U.S. Department of the Interior 2009). This report identifies potential use conflicts during the operational phase of the Cape Wind Project. Conflicts examined include commercial fishing, other submarine cables, navigation dredging, vessel anchoring, sand mining, marine radar, recreational fishing and boating, air navigation, shipping, and ferries. Chapter 5 of the Mineral Management Service "OCS Alternative Energy and Alternate Use Final Programmatic Environmental Impact Statement" (2007) provides the framework for mitigation measures.

### A.2.1 Characterizing Conflicts

Siting conflicts over the use of marine and coastal space fall into two broad categories (Sørensen et al. 2003):

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

Major shipping routes.

Military exercise grounds.

Major coastal or offshore structures (bridges, harbors, oilrigs).

Sub-sea cables or pipelines.

Marine protected areas for fisheries management or marine conservation.

Areas with conflicting uses such as:

Commercial and recreational fishing grounds.

Resource extraction areas (aggregate extraction, etc.).

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Tourism and non-consumptive recreational areas.

Archaeological interest such as shipwrecks.

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

Areas with existing regulations, restrictions, and prohibitions are site limiting and suitability, if any, for offshore renewable energy facilities can be quickly determined (Michel et al. 2007; Sørensen et al. 2003). Areas with 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.

Potential conflicts can also be classified by whether they occur or vary during different phases of site development and operation including construction, operation, and decommissioning. Unless otherwise noted in this document, there appear to be few significant differences in the nature or magnitude of space-use conflicts during the construction, operation and decommissioning phases of an offshore renewable energy project. Table A-7 summarizes potential conflicts.

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Table A-7

### Potential Conflicts with Offshore Renewable Energy

	<b>Issue</b>	<b>Potential Conflict</b>
Regulated, Restricted, or Prohibited Access	Marine Protected Areas such as Marine Reserves, National Monuments, Marine Sanctuaries	Loss of area or function of area, or disturbance of biota or ecosystem services in the protected areas.
	Listed areas of biological or ecological interest or value (e.g., habitats of rare or threatened species, Essential Fish Habitat)	Loss of area or function of area, or disturbance of biota in the sensitive or ecologically valuable area.
	Military exercise areas (ships, submarines, aircraft)	Loss or restriction of exercise areas.
	Submarine gas and oil pipelines	Loss or restriction of areas available for routes. Obstruction of maintenance and repairs. Damage to existing pipelines.
	Submarine power and communication cables	Loss or restriction of areas available for shipping routes. Obstruction of maintenance and repairs. Damage to existing cables.
	Disposal sites for munitions	Disturbance of past disposal sites (risk of detonation and remobilization).
	Disposal sites for dredged material	Loss of disposal sites. Obstruction of disposal activities.
	Navigation/shipping lanes	Loss, restriction, rerouting of recognized sea-lanes through restriction zones and Areas To Be Avoided.

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Table A-7

Potential Conflicts with Offshore Renewable Energy (cont.)

	<b>Issue</b>	<b>Potential Conflict</b>
Existing or Potential Activities	Areas of archaeological interest	Loss of areas of archaeological interest. Destruction of or damage to archaeological sites.
	Cultural	Loss of access to customary food gathering areas. Loss of cultural identity. Disturbance of cultural traditions.
	Commercial and recreational vessel navigation	Vessel restrictions on innocent navigation, freedom of navigation and anchoring. Collisions between devices and powered and unpowered (drifting) vessels; vessel-to-vessel collisions.
	Search and Rescue	Obstacle to air navigation in particular for low flying aircraft (e.g., helicopters). Obstacle to SAR vessel navigation. Radar interference.
	Civil air traffic	Obstacle to air navigation in particular for low flying aircraft (e.g., helicopters) Interference with radar

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Table A-7

Potential Conflicts with Offshore Renewable Energy (cont.)

	<b>Issue</b>	<b>Potential Conflict</b>
Existing or Potential Activities	Recreational and commercial fisheries	Construction: Noise from construction may cause temporary changes in local fish abundance, distribution, and behavior. Possible dredging and consequent changes in water quality and depth Operation: Loss of fishing grounds. Snagging of gear, Increased steaming time. Increased costs to fishermen. Loss of income. EMF may cause localized changes in fish abundance, distribution and behavior affecting local catch per unit effort. Interference with marine communication systems
	Sediment extraction	Temporary loss or restriction of areas Disturbance of extraction.
	Offshore oil and gas activities	Temporary exclusion or restriction of exploitation or exploration activities.
	Seascape	Visual impact during day and at night.
	Tourism and recreation activities	Restrictions to on-water recreation and transportation activities. Changes in visitation rates and participation rates. Changes to wave form impacting surfing and beach form.

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Table A-7

Potential Conflicts with Offshore Renewable Energy (cont.)

	<b>Issue</b>	<b>Potential Conflict</b>
Existing or Potential Activities	Scientific research	Restrictions for scientific research. Disruption to research transects. Changes in marine community structure. Changes in local ocean currents. Changes in the abundance, distribution, and behavior of marine life.
Adapted from OSPAR Commission 2008		

### A.2.2 Major Conflicts Noted in the Literature

It is assumed that offshore renewable energy developments will generally avoid locating in areas with existing regulated, restricted, or prohibited access (Sørensen et al 2003; Michel et al. 2007). The literature on the remaining category of conflicts between offshore renewable energy and other uses of ocean space identifies only a few conflicts of major significance. These are with:

Vessel navigation (commercial and recreational);  
Commercial fisheries;  
Cultural activities; and,  
Tourism and recreation.

As noted in Table 2-7, numerous other use conflicts can occur but the four listed above receive by far the most attention in the literature and are therefore documented in more detail here.

#### A.2.2.1 *Navigation*

Navigation conflicts can occur during the construction, operation, and decommissioning of offshore renewable energy facilities (OSPAR Commission 2008; Michel et al. 2007; Halcrow Group Limited 2006; Sørensen et al. 2003; UK Maritime and Coastguard Agency 2008a, 2008b). Anticipated conflicts include:

With designated shipping lanes, especially in areas of high vessel traffic or restricted navigation such as entry and exit to harbors.

With freedom of navigation and innocent navigation outside of designated shipping zones.

Prevention of anchoring within an array or within or near transmission cables.

Increased vessel traffic due to maintenance needs.

Risk of collision between service vessels and other vessel traffic.

Risk of collision between renewable energy devices and shipping and aircraft in the case of wind turbine generators (WTGs). Collision may involve powered or drifting vessels (Halcrow Group Limited 2006).

Effects of WTG, WEC, and TEC on wind and currents creating navigation hazards (UK Maritime and Coast Guard Agency 2008a, 2008b).

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WEC or WTG devices drifting into shipping lanes or creating other collision hazard if mooring lines break (Sørensen et al. 2003).

Effects of WTG, WEC, and WTGs on navigational devices such as radar, communication systems, and positioning systems (Howard and Brown 2004; MARICO Marine 2007; U.S. Coast Guard 2009; US Department of Interior 2009).

Physical interference from WTG, WEC, or WTG devices with airborne or vessel based search and rescue operation and interference with search and rescue radar and other equipment (Brown and Stanley 2005; US Department of Interior 2009).

### A.2.2.2 *Commercial Fisheries*

Together with navigational impacts, potential restrictions to fishing rights from offshore renewable energy developments are the best-documented ocean space conflicts (Berkenhagen et al. 2010; Gray et al. 2005; Mackinson et al. 2006). The conflicts described are similar in nature to the conflicts documented between the oil and gas industry and commercial fisheries (see for example Centaur Associates 1981; Impact Assessment Inc. 2004; Continental Shelf Associates, 2002) or other competing uses such as marine reserves, recreation-only fishing zones, and aquaculture (Rayns et al. 2006; Bess and Rallapudi 2007). Key conflicts noted in the literature include:

Prevention of fishing activity within any exclusion zone that may be established around offshore renewable energy facilities and associated cable corridors (Berkenhagen et al. 2010; Halcrow Group Limited 2006; Rayns et al. 2006).

Increased fishing pressure on adjacent fishing grounds due to displacement of fishing from the deployment area (Rayns et al. 2006; Halcrow Group Limited 2006; Mackinson et al. 2006).

Commercial fishing vessels will be affected by navigation restrictions and in heavy traffic areas could see increased space conflict between fishing vessels and commercial vessels as a result of navigation restrictions (Halcrow Group Limited 2006; Sørensen et al. 2003).

Snagged and loss of fishing gear from operator error or exposed cables, moorings and other subsurface structures if fishing is allowed within offshore renewable energy production areas (Rayns et al. 2006; Impact Assessment Inc. 2004).

Competition for moorage and general space in port between support vessels and fishing fleet (Centaur, 1981).

Gray et al. (2005) note that there is often little supporting evidence for claims of economic losses in fisheries from offshore wind energy developments in the UK, creating further tension between energy developers and fishing groups who continue to perceive a potential loss of income. In contrast, Berkenhagen et al. (2010) found that fishing opportunities in Germany's North Sea EEZ could be reduced by 20 to 53 percent for some flatfish species as a result of WTG development.

### A.2.2.3 *Cultural Heritage*

Many coastal communities and tribes have close cultural affinities with the marine environment. Several reports discuss impacts of offshore renewable energy developments on cultural heritage including:

Cultural identity;

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Tribal traditional use of the marine environment; and  
Religious beliefs.

(Halcrow Group Limited 2006; U.S. Department of the Interior, National Park Service 2010; Offshore Energy Environmental Research Association (OEER), 2008; US Department of Interior 2009)

In some communities, the perception of competing uses that are local versus nonlocal and old versus new plays a critical role in perceptions that can set up conflict (Buck et al. 2004). Even more fundamentally developments may impact religious beliefs. For example the Wampanoag Tribe of Gay Head/Aquinnah is concerned about the impact that the Cape Wind project could have on their ceremonies and religious practices that are dependent on maintaining the ability to view the first light on the eastern horizon (U.S. Department of the Interior, National Park Service 2010; US Department of Interior 2009). This issue and several related ones led to the determination that Nantucket Sound is eligible for listing in the National Register as a traditional cultural property (U.S. Department of the Interior, National Park Service. 2010).

### A.2.2.4 *Recreation and Tourism*

The coastal and marine areas are a major vacation and leisure resource. Recreational areas and values can be significant barriers to major near-shore construction projects (Michel et al. 2007; Sørensen et al. 2003). While the literature usually refers to recreational users and tourist, local residents can share similar values and concerns (Firestone et al. 2009; Lilley et al. 2010; Krueger 2007).

The major conflict concerns the visual intrusion of the technology into the viewscape. In general, conflicts and opposition lessen when facilities are deployed ‘out of sight’ (Bishop and Miller 2007). Ladenburg and Dubgaard (2009) found that specific users and frequent visitors of the coastal zone in Denmark are willing to pay approximately twice as much to have future offshore wind farms moved further away from the coast, when compared to less frequent users and visitors. They conclude that the recreational value of the coastal use is potentially jeopardized by visual impacts from offshore wind farms. As such the optimal location of offshore wind farms might be closer to the coast in areas with fewer recreational activities compared to coastal areas with greater levels of recreational activities.

Coastal residents in Delaware also expressed viewshed concerns, but were willing to adjust perceptions through increased familiarity with wind energy and possible routes to development (Firestone et al. 2009; Lilley et al. 2010). Another Danish study pointed residents’ concerns with the impact of ETG installations on natural resources. Again, attitudes changed with greater familiarity with the project (DONG Energy 2006) and understanding the economics of energy (Ladenburg et al. 2005).

Compared to wind power, where significant local opposition to large-scale farms is found in several countries, viewscape conflict is likely to be less severe for WEC and TEC compared to WTG since they are less visible from a distance. Nevertheless WEC and TEC devices in coastal areas with relatively little offshore vessel traffic and/or infrastructure may be especially visible at night due to navigation lighting and thus impact amenity values (Halcrow Group Limited 2006).

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Other possible recreational conflicts include:

Recreational and charter boating due to navigation restrictions (Royal Yachting Association and Cruising Association 2004; UK Maritime and Coast Guard Agency 2008b).

Recreational and charter fishing due to potential access restriction and changes (positive and negative) in fish distribution and abundance (Michel et al. 2007; Halcrow Group Limited 2006; US Department of Interior 2009; DONG Energy 2006).

Beach replenishment/nourishment (natural and engineered) due to changes in coastal processes from presence of device arrays (Michel et al. 2007; US Department of Interior 2009).

Surfing due to changes in wave energy and form (Michel et al. 2007; Halcrow Group Limited 2006). Halcrow Group Limited (2006) conducted numerical modeling in conjunction with the UK Wave Hub project and estimated between 3 and 13 percent reduction in wave heights depending on the wave conditions. AquaEnergy Ltd. (2006) suggested that there would be no impact on the local wave climate for the Makah Bay project in Washington State, but did not reference any quantitative estimation approaches.

### **A.2.3 Underlying Legal, Institutional, and Economic Causes of Conflict**

Mitigating marine space use conflicts, while a necessary and pragmatic aspect of offshore renewable energy development, can be akin to treating the symptoms of an illness rather than addressing the underlying cause of the disease. Over the course of this literature review several reoccurring underlying challenges, typical of many common property resources, to conflict mitigation have emerged. These are:

The legal system creating the framework for the governance of our coastal and oceans commons;  
The institutional system for ocean and coastal management; and,  
The economic characteristics of coastal and marine resources.

#### *A.2.3.1 Legal*

By law, the natural resources in, on, and beneath the ocean within the U.S. EEZ belong to the public and are managed on their behalf by the United States (Kalo et al. 2007; Christie and Hildreth 2007; Salcido 2009). This legal framework is based in both common law and statutory U.S. law. Therefore, any natural resource use or extraction needs to receive government approval by one or more agencies by means of permits. Uses of public resources are open to public scrutiny, including through formal notice and public comment on the environmental impact of each use before a permit can be issued. Natural resource extractions or uses on public land, including ocean uses, must also provide a fair return to the public (for example, fees generated by offshore oil, gas or mineral leases and royalties on resources extracted offshore) (Hoagland et al. 2006).

There are some 140 Federal ocean-related statutes reflecting the prevailing approach of sector-by-sector management (fishing, energy, shipping, etc.) (Crowder et al. 2006; Salcido 2009). Many authors suggest this sector-by-sector “silo” approach is the source of many conflicts (Crowder et al. 2006; Masalu 2000; Kearney et al. 2007). Within and between each sector, there are multiple users representing sometimes competing and/or conflicting interests. Some authors have pointed

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out that when new uses are proposed or become viable technologically, in the rush to usher them in there is a lack of consideration of the potential interaction of new uses with existing uses (Buck et al. 2004; Salcido 2009).

Existing laws or ordinances may be rigid and incapable of the flexibility needed to adapt to change. The ability of laws to clearly indicate rights between parties or priorities between uses is compromised by weak or vague regulations concerning some uses (Buck et al. 2004), or when several agencies are involved but there is no designated lead for final decision-making (Buck et al. 2004; Pew Oceans Commission 2003; U.S. Commission on Ocean Policy 2004). At best, regulatory frameworks are inconsistent and incongruent across boundaries (Buck et al. 2004; Interagency Ocean Policy Task Force 2009a, 2009b; Pew Oceans Commission 2003; U.S. Commission on Ocean Policy 2004). This situation is exacerbated when innovative new uses require laws and regulations to be cobbled together that are often patterned on those that were written for other uses (Salcido 2009). Also, states struggle to address the regulatory process and each develops individual approaches (Dhanju and Firestone 2009).

### A.2.3.2 *Institutional*

No single U.S. agency is in charge of ocean and coastal management. Instead this arena is characterized by multiple agencies with competing, conflicting, and often inconsistent directives and policies (Crowder et al. 2006; Interagency Ocean Policy Task Force 2009b; Pew Oceans Commission 2003; Salcido 2009; U.S. Commission on Ocean Policy 2004). This situation creates fundamental space use conflict when activities that would be otherwise considered incompatible are approved or even promoted by different agencies. In order to carry out contemporary practices of ecosystem-based management and “integrated” coastal and ocean management, agencies at both the State and Federal levels have been challenged to grow beyond the old “silo” paradigm and work together (Interagency Ocean Policy Task Force, 2009b). The lack of a coherent Federal public trust doctrine also hampers ecosystem-based management (Turnipseed et al, 2009).

In response to the requirements for interdisciplinary and complex problem solving for complex ecosystems, increased cross-agency consultation is beginning to be evident (Salcido 2009). For example, the U.S. National Oceanographic Partnership Program, established in 1997, has had successes in collaboration around scientific efforts in the marine environment. Integrated management requires the former silos to cooperate not just across the divisions within each agency, but also across Federal, state, and local governing levels. This dissolution of communication barriers is similar to the need to break down the management barriers between sectors (Interagency Ocean Policy Task Force 2009a, 2009b; Crowder et al. 2006).

### A.2.3.3 *Economic*

Space use conflicts are further exacerbated by economic factors (Barbier 2009; National Research Council (NRC) 2005; Wainger and Boyd 2009):

Marine areas within national jurisdiction feature few or poorly defined private rights and few regulations devoted to private rights (Buck et al. 2004; Portman 2009). Tenure, use privileges, and property rights in the marine environment are therefore often incompatible (Hanna 1999; Bess and Rallapudi 2007). Multiple use rights can be issued for the same area of the ocean even

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though these uses may be incompatible or competing. For example a harvest privilege to fish in a location is a separate entitlement from the lease right to occupy the seabed in the same place. Occupying the seabed may well prevent the exercise of the harvest privilege. This leads to conflict in several ways:

A change in ocean use results in an economic loss to one or more parties holding rights to use that area (Cicin-Sain and Tiddens 1989; OEER 2008).

There may be no formal mechanism to compensate the losers for their loss and gainers are not required to compensate the losers. In some instances there are explicit agency mandates against compensation that can further exacerbate conflict (Bess and Rallapudi 2007).

Economic markets do not exist for some types of consumptive and non-consumptive marine activities even though they are important for people and communities (Pendleton et al. 2007). These marine uses or activities may be unvalued or undervalued in subsequent planning processes and permitting deliberations (Lynam et al. 2007).

New in the marine economics literature is the concept of ecosystem services (Fisher et al. 2009; Crowder and Norse 2008). These can be defined as “aspects of ecosystems utilized (actively or passively) to produce human well-being” (Fisher et al. 2009, p. 645). Ecosystem services have become an important focus in natural resource management as a way of integrating economic and ecological considerations into ecosystem-based decision-making systems (Fisher et al. 2009; Millennium Ecosystem Assessment 2005; NRC 2005).

Ecosystem services associated with marine systems include (Beaumont et al. 2007; Millennium Ecosystem Assessment 2005):

Provisioning services that are the direct products obtained from the ecosystem, such as fish taken for food.

Regulating services, such as the role that extensive kelp beds can play in preventing shoreline erosion.

Cultural services providing nonmaterial benefits to humans, such as the identity a community and its population have as a fishing community or a center for whale watching.

Supporting services that are necessary for the production of other ecosystem services, but do not directly benefit humans, such as the habitat structure provided by a rocky reef.

The concept of ecosystem services has highlighted a number of issues that challenge our ability to efficiently allocate resources of any type between competing uses (Boyd and Banzhaf 2007; Cowling et al. 2008; Fisher et al. 2009; Limburg et al. 2002). Any of these issues singly or cumulatively can heighten space-use conflict in marine systems. For example:

The high degree of ecological complexity and the non-linearity in marine ecosystems mean that ecosystems services can be heterogeneous in space and time. Tradeoffs between services are non-linear and dynamic creating uncertainty and complexity in decision making over the allocation of marine resources including space.

A single ecosystem service can produce multiple benefits. This is called joint production and it can further complicate resource use and conflict. For example, a wave can provide recreational benefits to surfers, energy for electricity generation, and aesthetic beauty to beach goers. When all these uses can be supplied without a change in the quantity or quality of services conflict is

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unlikely. Where there is a real or perceived change in the quantity or quality of these services then conflict is likely.

Many traditional uses and the apparently unlimited supply of marine resources gave the impression that marine ecosystem services were by and large non-rival (use by one person does not reduce the amount available for another person) and/or non-excludable (one person cannot prevent another person from using the ecosystem service) and consequently have been managed as public goods for the benefit of all. As demand for marine ecosystem services increases and new uses emerge, marine activities are increasingly taking on rival and excludable characteristics that are more commonly associated with private goods and services, yet laws and management institutions are still geared to the management of these services as public goods.

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[Note: Annotations are provided for those sources determined to be relevant to the identification of OCS renewable energy space-use conflicts and analysis of mitigation measures.]

1. AquaEnergy, L. 2006. *Makah Bay offshore wave energy pilot project: FERC docket no. D102-3-002: Preliminary draft environmental assessment*. Washington, D.C.: U.S. Federal Regulatory Energy Commission. 179 pp.

Available from:

[http://www.oreg.ca/docs/environmental\\_assessment\\_Makah\\_Bay.pdf](http://www.oreg.ca/docs/environmental_assessment_Makah_Bay.pdf)

The Preliminary Draft Environmental Assessment of the pilot deployment of four AquaBuOYs (total 1MW) in Makah Bay, Washington resulted in a finding of “no significant impact.” Consequently, the draft is in essence the FEIS. The offshore area proposed is 60’ by 240’ with an accompanying terrestrial area. The assessment discusses siting and potential impacts on the environment and users. This siting was affected by its proximity to a national marine sanctuary, a national wildlife refuge, and tribal lands and resources. The offshore portion was mainly used tribal and recreational fishing, recreational boating, and general marine recreation. Much of the potential conflict was mitigated by siting the offshore and onshore project components in the least sensitive areas in consultation with the tribe and other users. The document states that an exclusion zone for fishing and navigation would need to be established to protect the project and to maintain human safety.

2. Ball, I. 2002. *Turning the tide: Power from the sea and protection for nature*. Surrey: World Wildlife Fund.-. UK. 189 pp.

Available from: <http://www.tidalelectric.com/documents/news-wwf-tide.pdf>

This study is a follow-up to a U.K. Royal Commission report on energy policy in a changing climate. It seeks to describe the technological options of wind, wave and tidal power with their possible applications in Wales. Additionally, the authors discuss environmental effects and possible social and economic impacts. Space use conflicts are outlined under each power option. The tidal option is seen as having great economic benefit with possible enhancement of recreational opportunities. However, restrictions to navigation and port operation are possible. Wind and wave operations also have potential impacts on other uses including fishing, recreational boating, marine transportation and air traffic. The need for broad communication and assessment of proposals is emphasized.

3. Ban, N. C., H. M. Alidina, and J. A. Ardron. 2010. Cumulative impact mapping: Advances, relevance and limitations to marine management and conservation, using Canada’s Pacific waters as a project/case study. *Marine Policy* 34 (5):876-886.

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The authors expand methods for analysis of cumulative human impacts on the marine environment at a regional scale. The study's results suggest percentages for attributing impacts to different sectors. It notes recent advances but remaining limitations in mapping cumulative impacts.

4. Barbier, E. B. 2009. Ecosystem services trade-offs. In *Ecosystem-based management for the oceans*, edited by K. L. McLeod and H. Leslie. Washington, D.C.: Island Press. pp. 129-145.  
Available from: <http://bit.ly/dc8nwr>

Using the context of marine ecosystems, Barbier explains the utility of valuing ecosystem services when using them or making policy or legislative decisions regarding their use. (Ecosystem services refer to effects or uses resulting from physical, biological and chemical functions and processes. Examples of these services are flood control or water supplies.) The development of an accurate accounting framework would reveal to which values may be lost when ecosystems are impaired or destroyed. The process of assigning meaningful or accurate values to ecosystem services is difficult. Yet, this challenge must be addressed in order to allow economic valuation to contribute to ecosystem-based management. Barbier proposes a multiservice production function model to help understand and describe the interactions of various services and the benefits they convey. An integrated mangrove-coral reef-sea grass ecosystem is presented as an example

5. Bean, M., L. Fisher, and M. Eng. 2007. Assessment in environmental and public policy conflict resolution: Emerging theory, patterns of practice, and a conceptual framework. *Conflict Resolution Quarterly* 24 (4):447-468.

The authors argue for a comprehensive but flexible conceptual framework for assessment of environmental conflict resolution. In analysis of highly sought after best practices for conducting environmental conflict resolution, this piece is most useful for history and critiques of so-called "best practices."

6. Beaumont, N. J., M. C. Austen, J. P. Atkins, D. Burdon, S. Degraer, T. P. Dentinho, S. Derous, P. Holm, T. Horton, E. van Ierland, A. H. Marboe, D. J. Starkey, M. Townsend, and T. Zarzycki. 2007. Identification, definition and quantification of goods and services provided by marine biodiversity: Implications for the ecosystem approach. *Marine Pollution Bulletin* 54:253-265.  
Available from: <http://www.vliz.be/imisdocs/publications/118829.pdf>

The authors provide and demonstrate an analytical framework for assessing the values of biological diverse ecosystem goods and services in the marine environment. They argue that the values are directly dependent on the health of the entire system. Assigning values before and after a human use is difficult. That combined with the short time horizon of human policy decisions and a lack of

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sufficient data about marine systems the authors to conclude that realistic and consistent quantification and comparison of ecosystem goods and services is not possible at this time. They call for continued development of cohesive approaches to valuation, and creation of a database of marine case studies to aid comparison of services. These actions would increase the viability of using ecosystem service quantification and valuation in decision-making.

7. Beck, M. W., Z. Ferdaña, J. Kachmar, K. K. Morrison, and P. Taylor. 2009. *Best practices for marine spatial planning*. Arlington, VA: The Nature Conservancy. 32 pp.

In 2009, The Nature Conservancy convened a workshop on marine spatial planning at the University of California, Santa Cruz attended by 20 practitioners with marine spatial planning experience in more than 20 regions of the United States, Canada, and other nations. The session's goal was to provide advice on best practices for marine spatial planning around key issues based on the experience of the participants. The focus was not on a comprehensive list of steps but on certain critical points in the marine planning process. The advice is divided into sections on geo-graphic planning boundaries, planning scale and resolution, data collection and management, multi-objective planning and interactive decision support.

8. Berkenhagen, J., R. Döring, H. O. Fock, M. H. F. Kloppmann, S. A. Pedersen, and T. Schulze. 2010. Decision bias in marine spatial planning of offshore wind farms: Problems of singular versus cumulative assessments of economic impacts on fisheries. *Marine Policy* 34 (3):733-736.

The current approval procedure for wind farm proposals in the German EEZ only considers site-specific conflict analysis between the wind farm and fisheries. Due to the relatively small spatial coverage of the sites, potential opportunity losses to the fisheries are considered low or negligible. Cumulative effects on fisheries that will occur once all proposed wind farms are in place are not considered adequately but are thought to be quite substantial. In particular, opportunities to catch such valuable species as flatfish will be considerably reduced. The authors include an analysis of conflict potential. The authors note that 500 meters are added on to the perimeter of the proposed wind farm for security reasons; this significantly enlarges the closed area. The authors argue that piecemeal decision-making fails to take into account the aggregate impact of the final project on other uses or the environment.

9. Bess, R., and R. Rallapudi. 2007. Spatial conflicts in New Zealand fisheries: The rights of fishers and protection of the marine environment. *Marine Policy* 31:719-729.

The authors indicate that a need for greater effort to harmonize and balance space allocations with protection of the marine environment and existing use by

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fisheries resources. They question whether the New Zealand Ocean Plan's dedication of 10% of ocean space to indigenous fishers will effectively address the conflicts between fishermen while resolving the government's missions to both protect the environment and promote fishing.

10. Biodiversity Committee. OSPAR Commission. Guidance on assessments of the environmental impacts of, and best environmental practice for, offshore wind-farms in relation to location. London: OSPAR Commission 2005. [web page]  
Available from:  
<http://www.tematea.org/?q=node/3548&PHPSESSID=4e1b4ab1a169b0d84d441c49d70bb734>

The OSPAR Commission is the body interpreting and enforcing the Convention for the Protection of the Marine Environment of the North-East Atlantic. These guidelines cover a broad range of possible conflicts. The focus is on environmental effects, so protected areas and those of special biological value are of particular interest. However, effects of wind farms on other uses are considered. These include marine transportation, military operations, fishing, aesthetics, cables and pipelines, dredging and archaeology. The guidelines include resolution and mitigation strategies such as avoidance of sensitive areas or existing uses (i.e. shipping lanes), phased planning and selection of appropriate areas.

11. Bishop, I. D., and D. R. Miller. 2007. Visual assessment of offshore wind turbines: The influence of distance, contrast, movement and social variables. *Renewable Energy* 32 (5):814-831.

Bishop and Miller describe people's reaction to on-line visualizations of various wind farm installations. This detailed information on response can assist developers in planning installations with less perceived impact. Responses varied by involvement with existing installations, interest level in wind energy and age. They provide one tool for planning and addressing conflict over citing and the impact on the visual landscape.

12. Bishop, I. D., and C. Stock. 2010. Using collaborative virtual environments to plan wind energy installations. *Renewable Energy* 35 (10):2348-2355.

Building on earlier work, Bishop and Stock have developed a visualization tool built on a geographic information system (GIS) database that allows for collaborative planning. They have a test case of Challicum Hills in Victoria, Australia.

13. Blæsbjerg, M., J. Pawlak, T. K. Sørensen, and V. Ole. 2009. *Marine spatial planning in the Nordic region - principles, perspectives and opportunities*. Copenhagen: Nordic Council of Ministers. 98 pp.  
Available from: <http://bit.ly/bNo3hb>

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This introduction and discussion of Nordic marine spatial planning is intended for planners and managers in local, national and regional administrations, policy-makers, interest groups and actors across different maritime sectors, as well as researchers and students. The authors argue that new approaches and commitments for sustainability are needed in light of increasing demands and activities in the marine area that threaten the area's future use and viability. The authors consider marine spatial planning as an integrated approach to managing the multiple and potentially conflicting uses of the sea. They describe efforts to address a set of key questions relating to marine spatial planning in a Nordic context. The resulting effort integrates, synthesizes and disseminates knowledge from recent and developing Nordic activities.

14. Blyth-Skyrme, R.E. 2010. Options and opportunities for marine fisheries mitigation associated with windfarms. Final report for Collaborative Offshore Wind Research Into the Environment contract FISHMITIG09. London, U.K.: COWRIE Ltd, London. 125 pp.

This report identifies options and opportunities for marine fisheries mitigation associated with wind farms. Working in consultation with fishermen, a wide suite of mitigation strategies are presented. Some of these are co-location with currently protected areas including cable routes, compensation for losses, development of fuel subsidies, development of aquaculture around wind farms, and reduction of footprint. Consultation with affected stakeholders should happen early in the process and continue throughout. Funding should be available for coherent consultation and planning. Compensation for loss of access to fishing ground should be considered but the better solution is keeping the commercial fisheries viable. Insurance and fuel costs are pieces of the cost of displacement that are addressed.

15. Bouchard, J. 2007. *Impact of offshore gas drilling on the Virginia Capes operating area*. Atlantic, VA: Eastern Shore Defense Alliance. 6 pp.  
Available from:  
<http://easternshoredensealliance.org/files/Impact%20of%20Offshore%20Gas%20Drilling.pdf>

Rather than presenting a strategy to mitigate a potential conflict, this paper argues for choosing one use over the other based on a cost-benefit analysis. In this case, however, the analysis is incomplete -- the author simply calculates the anticipated monetary benefit of the conflicting use and concludes that it is very small.

16. Boyd, J., and S. Banzhaf. 2007. What are ecosystem services: The need for standardized environmental accounting units. *Ecological Economics* 63:616-626.  
Available from:  
<http://www.epa.gov/nhr/sup1/arm/streameco/docs/BoydBanzhaf07.pdf>

Boyd and Banzhaf argue that the ecosystem services approach is too ad hoc to be of practical use. Also, the necessary units applicable to welfare accounting have

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not been developed. Using economic principles, they devise a system of ecosystem service units that allow these services to be compared with conventional goods and services found in the GDP and other national frameworks. The authors propose that their unit system could be employed for environmental performance measurement by governments and institutions, and in environmental markets.

17. British Wind Energy Association (BWEA). 2002. *Best practice guidelines: Consultation for offshore wind energy developments*. London: BWEA. 32 pp. Available from: <http://www.bwea.com/pdf/bwea-bpg-offshore.pdf>

These guidelines encourage good planning and communication around the development of offshore wind energy. Their audience is developers, planners, government departments, local communities and stakeholders. These guidelines encourage identifying all the relevant stakeholders and providing them with the information they need in language they can understand. They suggest being open and honest about what an individual project involves. Engaging with stakeholders in a variety of different ways enables everybody to have their opinions heard and their ideas taken seriously. Following the guidelines will facilitate planning and implementation of wind energy projects.

18. ----- . 2004. *BWEA recommendations for fisheries liaison*. London: BWEA. 36 pp. Available from: <http://www.bwea.com/pdf/FisheriesBP.pdf>

These recommendations were written by the British Wind Energy Association working in close cooperation with various fisheries groups such as National Federation of Fishermen's Organizations, Scottish Fishermen's Federation, Sea Fisheries Inspectorate. They are intended as guidelines for developers of offshore wind and the fishing community. They are based on best practices developed through the experience of the UK's fishing community, and the offshore oil and gas and cable industries. The proposed measures would avoid, minimize and mitigate potential conflict with commercial fishing. The recommendations apply to all activities associated with constructing and servicing wind farms.

19. ----- . 2006. *Framework for dialogue between the fishing and wind farm industries on how to assess the value of fishing activities and any disruption or displacement caused to them by wind farm developments*. London: BWEA. 4 pp. Available from: [http://www.bwea.com/pdf/offshore/fisheries\\_framework.pdf](http://www.bwea.com/pdf/offshore/fisheries_framework.pdf)

The Fisheries Liaison with Offshore Wind (FLOW) working group supported this effort by the BWEA to facilitate discussion between the industries in the context of specific development proposals. This work supplements the existing guidelines prepared by FLOW on best practice in liaison between the two industries (see BWEA 2009). It does not provide a methodology for calculating compensation nor assume that compensation will be a relevant consideration for every project.

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Developers will still need a detailed impact assessments and consultations to prepare their permit application. Working with the fishing industry is only one of many aspects of the process.

20. Brody, S. D., W. Highfield, S. Arlikatti, D. H. Bierling, and R. M. Ismailova. 2004. Conflict on the coast: Using geographic information systems to map potential environmental disputes in Matagorda Bay, Texas. *Environmental Management* 34 (1):11-25.

These authors employ geographic information systems to map potentially competing stakeholder interests associated with establishing protected areas in Matagorda Bay, Texas. Their strategy is proactive, taking place in the planning phase before a conflict arises. The range of tools for assessing stakeholder preferences includes Multiple Criteria Decision Analysis, Spatial Decision Support Systems, and GIS. The authors explain the strategy of pinpointing and mapping spatial areas where conflict between existing users would likely develop. Therefore, this strategy is one of conflict avoidance and is akin to marine spatial planning in advance of designing a marine protected area.

21. Brown, C., and J. M. Stanley. 2005. MCA / RAF wind farm trials March 2005: Report of the trials undertaken on March 22nd 2005 by the Maritime and Coastguard Agency and C Flight 22 Squadron Royal Air Force, RAF Valley, Anglesey U.K. Southampton, U.K.: Maritime and Coastguard Agency, and Royal Air Force. 32 pp.  
Available from: [www.dft.gov.uk/mca/helicopter\\_wind\\_farm\\_sar\\_trials-3.pdf](http://www.dft.gov.uk/mca/helicopter_wind_farm_sar_trials-3.pdf)

Those involved with military operations including search and rescue concern have concerns with adverse effects on marine shore-based radar systems A critical assessment was needed. This study examines how wind farms may affect search and rescue efforts using helicopters. The results indicate that radio communications from and to the aircraft operate satisfactorily, as do their VHF homing system. Vessels, turbines and personnel in the wind farm are clearly identifiable on the aircraft's thermal imaging system when operating in dry weather conditions. No compass deviations are experienced. However, there could be limitations on the use of helicopters in off-shore wind farms that would have an impact on search and rescue operations around wind farms. There are significant radar side lobe returns from structures limiting target detection when vessels are near the turbines. Some wind farms operators are unable to remotely lock turbine blades in rotation and in yaw. There are limitations in approach distances from turbines in clear weather. Restricted visibility makes surface rescues within wind farms impossible. Helicopters as radar search platforms are limited if the wind farm is large and has irregularly spaced turbines. Thermal imaging in conditions of mist or precipitation is limited. Radar tracking of helicopter movements within wind farms is generally poor. Aircraft power requirements increase down-wind of the wind farm.

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22. Bruckmeier, K. 2005. Interdisciplinary conflict analysis and conflict mitigation in local resource management. *AMBIO - A Journal of the Human Environment* 34 (2):65-73.
23. Brummons, B. H. J. M., L. L. Putnam, B. Gray, R. Hanke, R. J. Lewicki, and C. Wiethoff. 2008. Making sense of intractable multiparty conflict: A study of framing in four environmental disputes. *Communications Monographs* 75 (1):25-51.
24. Buck, B. H., G. Krause, and H. Rosenthal. 2004. Extensive open ocean aquaculture development within wind farms in Germany: The prospect of offshore co-management and legal constraints. *Ocean & Coastal Management* 47:95-122.

Increased use of the German coastal and EEZ waters leads to larger areas dedicated for specific, often exclusive uses thus multiplying conflicts among interest groups. The example of offshore wind farms and open ocean aquaculture is used to analyze the multifunctional use of space. Following presentation of a the case study, the authors state that any attempt to establish sustainable multifunctional utilization of offshore must be preceded by efforts to build an integrated regulatory framework given the unique set of rights and duties. Existing frameworks are not set up to support new management techniques or the variety of conflicts and constraints in the marine environment.

25. Butler, S. H. 2009. Headwinds to a clean energy future: Nuisance suits against wind energy projects in the United States. *California Law Review* 97:1337-1368.
26. Capitini, C., B. Tissot, M. S. Carroll, W. J. Walsh, and S. Peck. 2004. Competing perspectives in resource protection: The case of marine protected areas in west Hawaii. *Society and Natural Resources* 17 (9):763-778.

The protection of coral reefs from aquarium fish collecting along the coast of western Hawaii involve several parties included aquarium fish collectors, dive tour operators, Hawaii Division of Aquatic Resources, reef protection advocates, and state actors. An attempt was made to resolve the controversy through legislation, environmental dispute resolution and negotiated agreements based on the best available scientific information. The authors suggest that scientific perspectives framed and dominated the resolution process to the perceived detriment or under-representation of some community perspectives. The resulting agreement established reef protection in the form of marine protected areas, but negotiated enforcement procedures were reversed, revealing that not all stakeholders were supportive of the agreement. The authors argue that this reversal resulted in fewer effective enforcement provisions and marginalization of the broader community's role in resource management.

27. Carton, L. J., and W. A. H. Thissen. 2009. Emerging conflict in collaborative

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mapping: Towards a deeper understanding? *Journal of Environmental Management* 90 (6):1991-2001.

This serves as a literature review on the use of maps in public deliberations. There exists some literature about the support through visualization that GIS provides stakeholders in spatial planning; this article seems to point out potential pitfalls.

28. Centaur Associates Inc. 1981. *Assessment of space and use conflicts between oil and gas industry and commercial and recreational fishermen*. Springfield, VA: National Technical Information Service. 5 volumes St.  
Available from: <http://www.gomr.boemre.gov/PI/PDFImages/ESPIS/4/4517.pdf> v.1  
<http://www.gomr.boemre.gov/PI/PDFImages/ESPIS/1/1901.pdf> v.2  
<http://www.gomr.boemre.gov/PI/PDFImages/ESPIS/4/4519.pdf> v.3  
<http://www.gomr.boemre.gov/PI/PDFImages/ESPIS/4/4520.pdf> v.4  
<http://www.gomr.boemre.gov/PI/PDFImages/ESPIS/4/4521.pdf> v.5

This study in the Gulf of Mexico, Atlantic, and California OCS lease sale regions reviews historical, ongoing and potential conflicts between OCS oil and fishing industries. It develops a predictive catch loss model due to space loss by OCS oil structures. It also assesses the ability of particular harbors to accommodate oil support vessels and staging operations. The gear seen as most likely to conflict with oil structures are otter trawls, bottom dredges, and purse seines. Submerged wellheads, pipelines, and other sub-sea structures are the most hazardous for these gear types. Structure-related debris and activities cause more problems to fishermen than the actual oil structures. Most significant projected catch losses are related to otter trawl fisheries in the North Atlantic, Mid-Atlantic, and Eastern Gulf of Mexico regions. Fishery expansion is not expected to be significant in most areas.

29. Christie, D. R., and R. G. Hildreth. 2007. *Coastal and ocean management law in a nutshell*. Third ed. St. Paul, MN: Thomson West. 446 pp.

This standard and succinct ocean and coastal law reference volume in conjunction with the text by Kalo et al. (2004) provide basic background for marine and coastal issues. This provides brief explanations of the public trust doctrine and relevant U.S. ocean and coastal laws.

30. Cicin-Sain, B., and A. Tiddens. 1989. Private and public approaches to solving oil/fishing conflicts offshore California. *Ocean Shoreline Management* 12 (3):233-251.

The authors surveyed commercial fishermen to assess the impacts of oil operations in California. They report impacts including expected area displacement effects typical in other oil/fishing conflict cases, as well as the unleashing of a chain of events which also affects fishermen working in other

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locations and fish processors whose supply sources and markets may be disrupted. Efforts to mitigate negative effects on the fishing industry have been made in both the private and public realms with mixed results. The authors conclude that in conflict cases involving publicly owned resources and pitting contestants of unequal power, private mediation should not become a replacement for, but only a supplement to, public decision-making.

31. Clarke, S., F. Courtney, K. Dykes, L. Jodziewicz, G. Watson, and U.S. Offshore Wind Collaborative. 2009. *U.S. offshore wind energy: A path forward: A working paper of the U.S. Offshore wind collaborative*. U. S. Offshore Wind Collaborative. 52 pp.  
Available from: <http://www.usowc.org/pdfs/PathForwaCambridge, MS: rdfinal.pdf>

This update of the 2005 Framework for Offshore Wind Energy Development in the United States focuses on State and Federal policy and regulatory structure, technology development, economics, environmental/marine use compatibility, coordinating leadership. It includes brief summaries of case experiences from Europe and US with offshore wind development standards and mitigation measures.

32. Connelly, S. 2006. Looking inside public involvement: How is it made so ineffective and can we change this? *Community Development Journal* 41 (1):13-24.

Connelly approaches public involvement in decision making as both a product and a process. He observes that the government entity cannot control public involvement where stakeholders have conflicting perspectives and agendas. However, the complex process can be managed better. The author suggests that effective public involvement needs to be strategic, involve alliances with conveners, and work to influence both the public involvement processes and the policy development processes.

33. Continental Shelf Associates, Inc. 2002. *Deepwater program: Bluewater fishing and OCS activity, interactions between the fishing and petroleum industries in deepwaters of the Gulf of Mexico*. New Orleans: Mineral Management Service. 193 pp + apps.  
Available from: <http://www.gomr.boemre.gov/PI/PDFImages/ESPIS/3/3094.pdf>

The expansion of oil and gas exploration into deeper water (>200 m) in the Gulf of Mexico poses potential space conflicts with existing bluewater fisheries. Traditional oil and gas structures as well as new ocean floor exploration techniques present potentials for conflict that are different from those inshore. Concern was raised at a 1998 conference and the following report commissioned to examine the current state of offshore oil and gas, bluewater fisheries, species involved, potential conflicts and recommendations to address intersections

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between the two uses. Section 5 summarizes other domestic areas of conflict between commercial fishing and oil and gas including the Santa Barbara Channel and the shelf water of the Gulf of Mexico. In each, the activities are detailed and conflicts described. The mitigation strategies described including compensation, operations monitoring and adequate notice to mariners concerning seismic activities. In the Gulf, conflict occurs with geophysical explorations and is at times exacerbated by language issues (e.g. Vietnamese fishermen without good English skills). Mitigation efforts include State and Federal compensation and safety zones around oil platforms. International conflicts in Nova Scotia, Australia and New Guinea are also described covering similar topics. The report goes on to predict possible conflicts in the Gulf of Mexico using GIS by overlaying fisheries and their methodologies and potential areas to fish with those areas of possible interest to the oil and gas industry. Recommendations to avoid conflict include these: produce a guidebook describing both fisheries and oil and gas operations so both industries could have a readable and credible information resource; improve the NMFS contingency fund so bluewater fishers understand its purpose; appoint a fisheries liaison committee; improve communication so operations are clearly and widely broadcast.

34. Conway, F., J. Stevenson, D. Hunter, M. Stefanovich, H. Campbell, Z. Covell, and Y. Yin. 2010. Ocean space, ocean place: The human dimension of wave energy in Oregon. *Oceanography* 23 (2):82-91.  
Available from:  
[http://www.tos.org/oceanography/issues/issue\\_archive/issue\\_pdfs/23\\_2/23-2\\_conway.pdf](http://www.tos.org/oceanography/issues/issue_archive/issue_pdfs/23_2/23-2_conway.pdf)

Conway and her fellow authors make the case for involving stakeholders in the planning and implementation of offshore renewable energy. They encourage the use of the three C's: Connections (within and between people), Communication (direct and indirect), and Change (support smooth transitions through aiding adaptation). Too often, the human dimension of environmental decisions is ignored. They suggest that three areas need special attention: the marine renewable industry needs to operate in a socially, economically and environmentally responsible manner; policies need to be made and reviewed in an open and inclusive manner; research and testing need to be supported and the results shared with all stakeholders. Conflict can be mitigated if stakeholders are involved early and deeply.

35. Cormick, G. W., and A. Knaster. 1986. Oil and fishing industries negotiate mediation and scientific issues. *Environment* 28 (10):6-30.

Cormick and Orr consider if the success of mediation as an approach to conflict resolution is appropriate when scientific and environmental issues are involved. Mediated negotiations and similar processes have increasingly been used during the past decade to resolve a variety of disputes over such public policy issues as the use and allocation of natural resources. As of 1986, the total number of

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disputes mediated was relatively small, yet many issues had been successfully settled. Consequently, mediation is a widely accepted public policy option. The authors suggest caution when mediating environmental conflicts and remind those involved that the technique has its origins in a very different realm – labor-management disputes

36. County of Santa Barbara. Planning & Development Department. Energy Division. 2008. *Santa Barbara County coastal resource enhancement fund guidelines*. Santa Barbara, CA: County of Santa Barbara. 17 pp.  
Available from:  
<http://www.countyofsb.org/energy/documents/mitigation/GUIDE2-12-08.pdf>

In 1987 Santa Barbara County established the Coastal Resource Enhancement Fund in response to increasing oil and gas facility development in coastal waters (specifically, Exxon's Santa Ynez Unit Project, Plain's Point Arguello Project, Equilon's Gaviota Terminal, and Torch's Point Peñales Project). The fund is designed to provide financial support for project-specific impact mitigation and cumulative impacts to users of affected coastal resources. In assigning impact values, the following factors are considered: area affected by impact; duration of impact; frequency of impact; extent to which impact exceeds impact significance criteria; number of project components contributing to the impact; number of people affected; quality of resource prior to impact; and priority given to impacted resource in the Local Coastal Program and other elements of the County's Comprehensive Plan. The guidelines provide an example of a structured assessment of impact and a process for assigning support.

37. County of Santa Barbara. Resource Management Department. Energy Division. 1987. *Santa Barbara County fisheries enhancement fund guidelines*. Santa Barbara, CA: County of Santa Barbara. 17 pp.  
Available from:  
<http://www.countyofsb.org/energy/documents/mitigation/FEFGuidelines.pdf>

The inception and initial history of the FEH is of lesser importance than the process used to estimate fees and its definition of proper use of funds. The fee estimation process begins as part of the permitting process, goes through rounds of public input, and gets reevaluated every five years to determine if initial fee assessments were accurate and if an adjustment is warranted. The definition of proper use of funds considers that since direct mitigation may not always be possible, monies may be directed towards projects that improve the local fishing industry, community, as well as the fishery. In addition, funds cannot be used to support lobbying efforts, and the use of matching funds is encouraged and has occurred.

38. Cowling, R. W., B. Egoh, A. T. Knight, P. J. O'Farrell, B. Reyers, M. Rouget, D. J. Roux, A. Welz, and A. Wilhelm-Rechman. 2008. An operational model for mainstreaming ecosystem services for implementation. *Proceedings of the*

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*National Academy of Science (PNAS)* 105:9483-9488.

Available from: [http://www.pnas.org/\\_cgi/\\_doi\\_10.1073/\\_pnas.0706559105](http://www.pnas.org/_cgi/_doi_10.1073/_pnas.0706559105)

The authors propose a pragmatic operational model for achieving the safeguarding of ecosystem services. The model is comprised of three phases: assessment, planning, and management. The authors state that following the phases would empower stakeholders to implement effective on the ground management that would safeguard ecosystem services while achieving resilience of the corresponding social-ecological systems.

39. Crowder, L., and E. Norse. 2008. Essential ecological insights for marine ecosystem-based management and marine spatial planning. *Marine Policy* 32:772-778.

Available from: [http://www.unesco-ioc-marinesp.be/publications/marine\\_policy\\_special\\_issue?lkz=1#item\\_div\\_48](http://www.unesco-ioc-marinesp.be/publications/marine_policy_special_issue?lkz=1#item_div_48)

Given the complexity of marine ecosystems, Crowder and Norse posit that preventing systemic stress is a better management strategy than fixing degraded systems. They argue that successful place-based management must align governance objectives with stakeholder incentives. Marine spatial planning must incorporate an understanding of the marine, integrate the socio-economic and governance concerns can to adequately protect the ecosystems and promote sustainable use of marine resources.

40. Crowder, L. B., G. Osherenko, O. R. Young, S. Airame, E. Norse, N. Baron, J. C. Day, F. Douvère, C. N. Ehler, B. S. Halpern, S. J. Langdon, K. L. McLeod, J. C. Ogden, R. E. Peach, A. A. Rosenberg, and J. A. Wilson. 2006. Resolving mismatches in U.S. Ocean governance. *Science* 313 (August 4, 2006):617-618.

This article is a critique of traditional sectorial management, and advocates for comprehensive ocean zoning.

41. Degnbol, D., and D. C. Wilson. 2008. Spatial planning on the North Sea: A case of cross-scale linkages. *Marine Policy* 32 (2):189-200.

This article suggests that fishing interests have weaker influence in negotiations or discussions about space. One reason for this is that fishing is perceived as being flexible due to the fact that it is mobile and not fixed or "they can just go somewhere else." Degnbol indicates that some uses have been placed in the worst places for fishermen not out of ill intentions but because of a lack of data.

42. Dempster, T., and P. Sanchez-Jerez. 2008. Aquaculture and coastal space management in Europe: An ecological perspective. In *Aquaculture in the ecosystem*, edited by M. Holmer, K. Black, C. M. Duarte, N. Marbà and I. Karakassis. Dordrecht: Springer. pp. 87-116

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43. Detweiler, G. H., Jr. 2011. Offshore renewable energy installations: Impact on navigation and marine safety. *The Coast Guard Proceedings of the Marine Safety & Security Council* 68 (1):19-21.

Available from:

[http://www.uscg.mil/proceedings/Spring2011/articles/19\\_Detweiler.pdf](http://www.uscg.mil/proceedings/Spring2011/articles/19_Detweiler.pdf)

Detweiler outlines the major issues with offshore renewable energy installation that may impact marine navigation safety. These include location, visibility, electronic impact and effects on tides, tidal streams, currents and changes to the seabed. The U.S. Coast Guard approach is to assess each project using a risk management strategy common across the agency (<http://www.uscg.mil/hq/cg5/cg5211/E-Guidelines.asp>). Specific guidelines are not given, but the assessment process is succinctly presented.

44. Dhanju, A., and J. Firestone. 2009. Access system framework for regulating offshore wind power in state waters. *Coastal Management* 37 (5):441-478.

Dhanju and Firestone describe various efforts at the state level to develop coherent regulatory frameworks for emerging uses of the nearshore. The focus is on wind power but the authors draw on other types of development to illustrate the issues.

45. DONG Energy, Vattenfall, Danish Energy Authority, and Danish Forest and Nature Agency. 2006. *Danish offshore wind: Key environmental issues*. Denmark: DONG Energy, Vattenfall, Danish Energy Authority, Danish Forest and Nature Agency. 144 pp.

Available from:

[http://www.ens.dk/graphics/Publikationer/Havvindmoeller/havvindmoellebog\\_no\\_v\\_2006\\_skrm.pdf](http://www.ens.dk/graphics/Publikationer/Havvindmoeller/havvindmoellebog_no_v_2006_skrm.pdf)

This publication describes the Danish experiences with off shore wind power and discusses the challenges of environmental issues that Denmark has had to address in relation to the two large-scale demonstrations off shore wind farms Horns Rev and Nysted since 1999. The focus is on the natural environment with chapters on baseline assessments and possible mitigation of issues. Construction dredging had limited impact on the environment, but was noticeable in certain areas. Attitudes towards wind farm installations are examined using a scenario methodology. Policy recommendations include the importance of involving the public and the need for extensive environmental assessment.

46. Douvère, F. 2008. The importance of marine spatial planning in advancing ecosystem-based sea use management. *Marine Policy* 32 (5):762-771.

Available from: [http://www.unesco-ioc-](http://www.unesco-ioc-marinesp.be/publications/marine_policy_special_issue?lkz=1#item_div_48)

[marinesp.be/publications/marine\\_policy\\_special\\_issue?lkz=1#item\\_div\\_48](http://www.unesco-ioc-marinesp.be/publications/marine_policy_special_issue?lkz=1#item_div_48)

Douvère provides a brief history of the use of marine spatial planning from its

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early use in developing marine protected areas, e.g., the Great Barrier Reef Marine Park. More recently, marine spatial planning has been implemented as a tool for managing the multiple use of marine space, especially in areas such as the North Sea that feature conflicts between ocean users. The author finds that the scope of marine spatial planning is not clear and terms such as integrated management, marine spatial management, and ocean zoning are used inconsistently. This lack of consistency impedes the progress of marine spatial planning's adoption at higher levels of policy and decision-making in most countries. Douvère describes the core objectives of the approach and why it is an essential step to achieve ecosystem-based ocean use management, and how it can better defined. She concludes with an analysis of its international use and achievements.

47. Downs, M. A., E. Coughlin, and Kea Environmental Inc. 2000. *Using commercial fishing and marine environmental data in assessing the differential distribution of social impacts of marine conservation and development*. In 2000 User Conference Proceedings. San Diego: ESRI. [web page]  
Available from:  
<http://proceedings.esri.com/library/userconf/proc00/professional/papers/pap805/p805.htm>

The authors discuss the use of geographic information in anticipating social impacts associated with fisheries management. Two case studies are used, one focusing on resource protection planning in the U.S. Virgin Islands and one on underwater fiber optic cable development in Southern California's coastal waters. Their work is useful as a technical discussion on the use of GIS to identify the geographic distribution of potential impacts to commercial fishing activity. Its main limitation is its focus on the identification and description of potential conflict, rather than its resolution or mitigation.

48. Drew, S. C., and A. G. Hopper. 2009. *Fishing and submarine cables: Working together*. Lymington: International Cable Protection Committee. 54 pp.  
Available from:  
[http://www.iscpc.org/information/Openly%20Published%20Members%20Area%20Items/ICPC\\_Fishing\\_Booklet\\_Rev\\_2.pdf](http://www.iscpc.org/information/Openly%20Published%20Members%20Area%20Items/ICPC_Fishing_Booklet_Rev_2.pdf)

This booklet is intended to help fishermen avoid accidentally catching submarine cables. It provides information on what fishermen should do if their gear becomes snagged in a cable area. Improved communication is highlighted as a means to avoid conflict between cable installations and commercial fishing, particularly the availability and utility of cable awareness charts.

49. Dukes, E. F. 2004. What we know about environmental conflict resolution: An analysis based on research. *Conflict Resolution Quarterly* 22 (1-2):191-220.

Duke reviews various forms of environmental conflict resolution and their

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success. The focus is on the U.S. and includes Federal agencies such as Department of the Interior, Environmental Protection Agency and Federal Energy Regulatory Commission. The author provides a useful summary of legal cases and the state of environmental conflict resolution in the U.S. although neglects the marine and coastal areas.

50. Ecotrust. 2009. *Marine fisheries uses and values project in support of the Oregon Territorial Sea Plan revision*. Portland, OR: Ecotrust. 15 pp.  
Available from: [http://www.ecotrust.org/tsp/TSP\\_values\\_project.pdf](http://www.ecotrust.org/tsp/TSP_values_project.pdf)

Ecotrust, a non-government organization focusing on economic opportunity, social equity and environmental well-being, worked with commercial fishermen to bring their expert knowledge directly to bear on marine planning processes. The organization is compiling comprehensive maps that illustrate the commercial and consumptive recreational fishing use patterns and values along the Oregon coast. Fishermen share their knowledge of their fishing grounds and have a forum in which to express their values. The project engages stakeholders, provides better information to the planning process, and integrates the human dimension into marine spatial planning.

51. Eder, B. 2010. Navigating the public process: Engaging stakeholders in wave energy development. *Oceanography* 23 (2):106-107.  
Available from:  
[http://www.tos.org/oceanography/issues/issue\\_archive/issue\\_pdfs/23\\_2/23-2\\_op-eds.pdf](http://www.tos.org/oceanography/issues/issue_archive/issue_pdfs/23_2/23-2_op-eds.pdf)

The author, a commercial fisherman from Newport, Oregon, argues that involvement with marine spatial planning including mapping efforts is a necessity for the fishing community. Involvement in planning for wave energy will ensure that the concerns of fishermen are part of the process.

52. Ehler, C. 2008. Conclusions: Benefits, lessons learned, and future challenges of marine spatial planning. *Marine Policy* 32 (5):840-843.  
Available from: [http://www.unesco-ioc-marinesp.be/publications/marine\\_policy\\_special\\_issue?lkz=1#item\\_div\\_48](http://www.unesco-ioc-marinesp.be/publications/marine_policy_special_issue?lkz=1#item_div_48)

Ehler summarizes the principal conclusions from papers presented in a special issue of *Marine Policy* on marine spatial planning. In general, the paper identifies potential economic, ecological, and administrative costs and benefits that might be realized from the implementation of MSP, summarizes lessons learned, and identifies future challenges and directions for MSP, including the development of international guidelines for its implementation. Ehler provides a clear and succinct overview.

53. Ehler, C., and F. Douvère. 2009. *Marine spatial planning: A step-by-step approach toward ecosystem-based management*. Vol. 53, IOC manual and guides.

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Paris: UNESCO. 99 pp.

Available from: [http://www.unesco-ioc-marinesp.be/msp\\_guide](http://www.unesco-ioc-marinesp.be/msp_guide)

UNESCO's Marine Spatial Planning guide describes how marine spatial planning can be developed and implemented. Most steps are illustrated with relevant examples from the real world. The guide is primarily intended for professionals responsible for planning and managing marine areas and their resources. Most managers have strong scientific or technical backgrounds, but few have been trained as professional planners or managers. The guide attempts to fill this gap by using a step-by-step approach for developing and implementing marine spatial planning. It gives an understanding of the different tasks, skills and expertise needed to develop and maintain marine spatial planning efforts. It also discusses issues such as obtaining financial resources, organizing stakeholders, or monitoring and evaluating performance.

54. Ekebom, J., J. Jäänheimo, J. Reker, M. Kindström, C. Lindblad, A. Mattisson, A. Sandström, V. Jermakovs, C. Feucht, J. Lamp, T. Pitkänen, M. Snickars, T. Sørensen, O. Vestergaard, P. Blanner, H. Wichmann, U. Bergström, G. Sundblad, M. Haldin, G. Martin, J. Aigars, J. Andersen, L. Bergstöm, and M. Bostöm. 2008. *Towards marine spatial planning in the Baltic Sea*. Copenhagen: Baltic Sea Management – Nature Conservation and Sustainable Development of the Ecosystem through Spatial Planning (BALANCE). 137 pp.  
Available from: <http://balance-eu.org/xpdf/balance-technical-summary-report-no-4-4.pdf>

This effort seeks to present a holistic approach to marine spatial planning within the multinational context of the Baltic Sea Region. The approach combines ecological health, multiple human uses, a spatial planning template, and a zoning classification system that allows for all human uses while minimizing the impact on the marine environment. The zoning classification consists of four zones - the General Use Zone, the Targeted Management Zone, the Exclusive Use Zone, and the Restricted Access Zone. The document provides a set of GIS tools including GIS data layers that can be used in marine spatial planning and guidelines for how to communicate with stakeholders. The document is a general planning guide and, as such, does not include specific examples of conflict resolution or mitigation, but rather methods for conflict avoidance and minimization. Its methodology and recommendations build upon internationally developed templates, and are thoughtful and thorough.

55. Elcock, D., and Mineral Management Service. U.S. Department of the Interior. 2006. *Potential alternative energy technologies on the Outer Continental Shelf*. Oak Ridge, TN: Argonne National Laboratory, Environmental Science Division. 68 pp.  
Available from: [http://ocsenergy.anl.gov/documents/docs/ANL\\_EVS\\_TM\\_06-5.pdf](http://ocsenergy.anl.gov/documents/docs/ANL_EVS_TM_06-5.pdf)

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This memorandum describes the technology requirements for offshore wave, wind and current projects on U.S. Outer Continental Shelf. For each of the technologies, the authors present an overview and a description of the technology requirements for four development phases: site monitoring and testing, construction, operation, and decommissioning. Although all of these technologies continue to develop, this remains a solid reference for explanations of them.

56. Elsam Engineering. 2004. *Cape Wind Associates report on horns rev. Vhf radio and marine radar*. 186820. Fredericia, DK: Elsam Engineering. 9 pp.  
Available from: <http://www.mms.gov/offshore/PDFs/CWFiles/26.pdf>

This Danish study on the effects of the Horns Rev wind farm on radar and marine radio concludes that the construction and operation of the wind farm has no significant effect on radar or marine radios.

57. ELSAMPROJEKT A/S. 2000. *Horns Rev offshore wind farm environmental impact assessment: Summary of EIA report*. Fredericia, DK: Elsam Engineering. 17 pp.  
Available from: [http://www.hornsrev.dk/Miljoeforhold/pdf/Resume\\_eng.pdf](http://www.hornsrev.dk/Miljoeforhold/pdf/Resume_eng.pdf)

As part of the assessment, various mitigation efforts are discussed e.g. painting the turbines light grey. Trawling was prohibited near the wind farm and near the cable. It was expected that compensation would be paid to those affected.

58. Emerson, K., P. J. Orr, D. L. Keyes, and K. M. McKnight. 2009. Environmental conflict resolution: Evaluating performance outcomes and contributing factors. *Conflict Resolution Quarterly* 27 (1):27-64.
59. English, M. R., A. K. Gibson, D. L. Feldman, and B. E. Tonn. 1993. *Stakeholder involvement: Open processes for reaching decisions about the future uses of contaminated sites: Final report*. Knoxville, TN: University of Tennessee. 110 pp.  
Available from: <http://eerc.ra.utk.edu/publications/staff-reports/stake.pdf>

The authors detail a set of recommendations on engaging stakeholders in a land-use decision-making setting. They describe the sequence of actions leading up to a decision, including mechanisms and techniques for stakeholder involvement. They briefly review the basic elements of an open process including goal determination, design of the process, and the way in which the issue at hand is to be analyzed. They note the importance of expressing values early in the process before objectives or alternatives are posited. They explain how different mechanisms can have different purposes, and how mechanisms can be used in a complementary fashion at various points in the total process.

60. Executive Office of Energy and Environmental Affairs. 2009. *Appendix 2 - compatibility assessment/ data screening*. Boston, MA: Executive Office of

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Energy and Environmental Affairs. 9 pp.

Available from: [http://commpres.env.state.ma.us/mop/draft\\_plan/v1/draft-v1-app2.pdf](http://commpres.env.state.ma.us/mop/draft_plan/v1/draft-v1-app2.pdf)

The Partnership's work assesses various marine uses for potential conflicts with other uses and impacts on the environment. Offshore uses covered are wind, tidal and wave energy, sand mining, cables and pipelines, and deep-water, non-tidal aquaculture. It provides siting criteria for each use indicating requirements based on current technology, physical restrictions for such uses, and other considerations

61. -----, 2009. *Final Massachusetts ocean management plan*. Boston: Commonwealth of Massachusetts. 126 pp.  
Available from: <http://www.env.state.ma.us/eea/mop/final-v1/v1-complete.pdf>

The 2008 Massachusetts Oceans Act directs the Secretary of Energy and Environmental Affairs to develop a comprehensive ocean management plan by December 31, 2009. The final plan along with the draft plan and technical reports, and information on the ocean planning process provide insight into the complexity of planning at the state level. It is one example of state level planning that establishes measure to minimize conflict among users.

62. Firestone, J., W. Kempton, and A. Krueger. 2009. Public acceptance of offshore wind power projects in the United States. *Wind Energy* 12 (2):183-202.  
Available from: <http://onlinelibrary.wiley.com/doi/10.1002/we.316/abstract>

The authors compare local public opinion towards the Cape Wind Project and a proposed project off the Delaware coast finding significant differences in reaction and perception. Viewshed is an important consideration for the Delaware group, but recognition for making a transformative change in energy production appears to override concerns. Differences in the two settings include a public-led opposition to Cape Wind versus an industry-led conflict over development rights, perception of public ownership of state waters, and timing. Increased knowledge of energy systems and possible detrimental effects appeared to lead more public support.

63. Fisher, B., R. K. Turner, and P. Morling. 2009. *Defining and classifying ecosystem services for decision making*. Norwich, UK: Centre for Social and Economic Research on the Global Environment. 19 pp.  
Available from: [http://www.uea.ac.uk/env/cserge/pub/wp/edm/edm\\_2007\\_04.pdf](http://www.uea.ac.uk/env/cserge/pub/wp/edm/edm_2007_04.pdf)

Fisher, Turner and Morling present a definition and classification scheme for ecosystem services. They offer an operational definition of ecosystem. They argue that any attempt to classify ecosystem services should be based on the characteristics of the ecosystems of interest and the decision context being used. Ecosystem variability dictates that no single classification scheme is adequate for

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the many contexts in which ecosystem service research may be utilized. The authors provide examples for a decision-making context.

64. Flannery, W., and M. Ó. Cinnéide. 2008. Marine spatial planning from the perspective of a small seaside community in Ireland. *Marine Policy* 32 (6):980-987.

The authors describe how and why local coastal communities in small town situated on the southwest coast of Ireland decided to participate in marine spatial planning. The community in question has marine-based tourism and other relatively new uses of the sea alongside traditional fishing activities. There is significant discussion of conflict, but the authors do not focus on conflict. Rather, they explore the use of marine spatial planning at the local level. They found positive acceptance of planning that incorporated meaningful local involvement.

65. Fletcher-Tomenius, P., and C. Forrest. 2000. Historic wreck in international waters: Conflict or consensus? *Marine Policy* 24:1-10.

There is little reporting of conflicts over cultural and historic conservation in the marine environment. The authors illustrate the importance of understanding the parties' motives, values, and interpretations of important terms in order to begin to address the conflicts between the parties. The authors describe the failure of UNESCO to propose methods to resolve conflict.

66. Foley, T. 2007. Environmental conflict resolution: Relational and environmental attentiveness as measures of success. *Conflict Resolution Quarterly* 24 (4):485-504.

Foley's article is an example of a critical evaluation of techniques for environmental conflict resolution. It is a literature review of measures of success, and does include brief discussions of two terrestrial case studies. The author concludes that any measures of success of environmental dispute resolution are incomplete unless they fully take environmental conditions and transformation of stakeholders into account.

67. Gerdes, G., A. Tiedemann, and S. Zeelenberg. 2006. *Project/case study: European offshore wind farms - a survey for the analysis of the experiences and lessons learnt by developers of offshore wind farms*. Deutsche WindGuard, Deutsche Energie-Agentur, and University of Groningen. 155 pp. Available from: [http://www.offshore-wind.de/page/fileadmin/offshore/documents/Case\\_Study\\_European\\_Offshore\\_Wind\\_Farms.pdf](http://www.offshore-wind.de/page/fileadmin/offshore/documents/Case_Study_European_Offshore_Wind_Farms.pdf)

The report reviews several European offshore wind farms, touching upon their technical aspects as well as some of the siting criteria. Mitigation measures are not discussed; however the siting criteria and explanation of lessons learned are

useful.

68. Gilliland, P. M., and D. Laffoley. 2008. Key elements and steps in the process of developing ecosystem-based marine spatial planning. *Marine Policy* 32:787-796. Available from: [http://www.unesco-ioc-marinesp.be/publications/marine\\_policy\\_special\\_issue?lkz=1#item\\_div\\_48](http://www.unesco-ioc-marinesp.be/publications/marine_policy_special_issue?lkz=1#item_div_48)

Gilliland and Laffoley report on a workshop session that focused on the process of marine spatial planning. They state that marine spatial planning should be based on a clear set of principles with a sustainable development purpose draw from terrestrial land use planning. It should include appropriate planning activity at different spatial scales. Care must be taken when these scales do not align. The timeframe for plans is tending to increase from around 10 to 20+ years. This lengthening requires periodic reviews that enable a balance between stability and relevance. Workshop participants found that planning processes that address conflicts effectively have certain characteristics such as understandable legislation, clear objectives, strong principles and guidance, ‘driving’ priorities, and strong stakeholder engagement. Conflict is specifically discussed in two brief examples and the use of a goals achievement matrix. The authors recommend that stakeholder involvement start at the beginning of the planning process, and not be ad hoc as each new offshore project is planned.

69. Gleason, M., S. McCreary, M. Miller-Henson, J. Ugoretz, E. Fox, M. Merrifield, W. McClintock, P. Serpa, and K. Hoffman. 2010. Science-based and stakeholder-driven marine protected areas network planning: A successful project/case study from North Central California. *Ocean & Coastal Management* 53 (2):52-68.

California’s Marine Life Protection Act proposes a statewide network of marine protected areas for sustained ecosystem. The authors describe factors that contribute to a successful regional planning process. These include a legislative mandate, political will, and adequate capacity and funding. They identify strategic principles that guided the design of a transparent public planning process which meet science guidelines and achieve a high level of support among stakeholders. Elements such as spatial data, planning tools, and scientific evaluation are essential for designing, evaluating, and refining alternative marine protected areas. The authors suggest one approach to conflict mitigation is allowing stakeholders to select alternative proposal rather than simple debating one choice.

70. Gonzalez, E., and U. S. Department of the Interior. 2004. *Survey of federal departments and agencies on use of environmental conflict resolution: DOI response to survey*. Washington, D.C.: U. S. Department of the Interior.. 14 pp.

The survey was intended to help determine to what extent US agencies are using environmental conflict resolution and what the barriers are to its use within each agency. This response of the Department of Interior indicates that individual projects are funded but that it is up to each department to find the funding. The

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survey responses provide information on the perceived disincentives to using the method within the agency. The disincentives included a shortage of funding for programs and capacity building for agency personnel and stakeholders, shortage of time, and senior staff commitment for long term projects, some resistance to the method, difficulty collecting and evaluating data on its efficacy, and a perceived lack of rewards for engaging in environmental conflict resolution projects.

71. Gramling, R. B. 1996. *Oil on the edge: Offshore development, conflict, gridlock*. Albany, NY: State University of New York Press. 208 pp.  
Available from: <http://bit.ly/cY8HZT>
72. Grant, J. P. 1978. The conflict between the fishing and the oil industries in the north sea: A project/case study. *Ocean Management* 4 (2-4):137-149.
73. Gray, B. 2004. Strong opposition: Frame-based resistance to collaboration. *Journal of Community and Applied Social Psychology* 14 (3):166-176.
74. Gray, T., C. Haggett, and D. Bell. 2005. Offshore wind farms and commercial fishing in the U.K.: A study in stakeholder consultation. *Ethics, Place and Environment* 8 (2):127-140.

The authors explore the development of wind farms in the U.K. from two industrial perspectives – the developers and commercial fishermen. The core issues of conflict include the adequacy of stakeholder consultation processes, the right to compensation for loss of livelihood, and the lack of adequate data. They analyze the question of compensation to the fishermen and how compensation is viewed by the different parties.

75. Hagerman, G., and R. Bedard. 2004. *Offshore wave power in the US: Environmental issues*. Walnut Creek, CA: Global Energy Partners, L.L.C.. 29 pp.  
Available from:  
[http://oceanenergy.epri.com/attachments/wave/reports/007\\_Wave\\_Envr\\_Issues\\_Report.pdf](http://oceanenergy.epri.com/attachments/wave/reports/007_Wave_Envr_Issues_Report.pdf)

This overview of issues associated with offshore wave power offers few specifics.

76. Halcrow Group Limited. 2006. *Wave Hub environmental statement*. Exeter: South West of England Regional Development Agency. 278 pp.  
Available from: <http://bit.ly/becSvW>

The South West of England Regional Development Agency proposed the Wave Hub project to provide the electrical infrastructure necessary to support and encourage developers of wave energy converter. The project supported a new regional energy policy that included a 60% reduction in carbon emissions by 2050 and the South West region's commitment to contribute to the region's renewable

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energy target of 11% - 15% of electricity production by 2010. Possible impacts to commercial, fishing, navigational and various other uses are discussed including possible mitigation through exclusion areas.

77. Hanna, S. S. 1999. Strengthening governance of ocean fishery resources. *Ecological Economics* 31:275-286.

Hanna examines the internal workings of fishery governance and their links to fishery outcomes. She suggests that there are fundamental weaknesses in the way fishery governance works that contribute to sustainability problems. The weak scope and structure of ocean fisheries governance varies with each fishery and with geopolitical regions. However, the substance of the weakness is common across all regions. The author thoroughly discusses transaction costs, and argues that in situations where resource users experience uncertainty caused by governance changes they act to intensify their own use or to act in disregard for the future.

78. Hein, L., K. van Koppen, R. S. de Groot, and E. C. van Ierland. 2006. Spatial scales, stakeholders, and the valuation of ecosystem services. *Ecological Economics* 57:209-228.  
Available from: <http://bit.ly/bXfyKn>

79. Hildreth, R. G. 1989. *The public trust doctrine and conflict resolution in coastal waters: West coast developments*. In Proceedings of the Sixth Symposium on Coastal and Ocean Management. Charleston, South Carolina. Corvallis, OR: Oregon Sea Grant. pp. 2604-2619

Hildreth argues the public trust doctrine, the principal that certain resources are for the public use and the government should maintain that use, is not of great help in resolving submerged lands use conflicts. The law does not assign priorities among the permissible public trust uses of submerged lands, so other conflict resolution strategies are needed. These include planning to identify potential conflicts, separating exploration and development rights to remove legal impediments to conflict avoidance, using activity schedules, corridors, and buffer zones to avoid conflicts, coordinating Federal and State planning and permit processes to reduce conflicts, and providing compensation for unavoidable conflicts.

80. Hoagland, P., M. E. Schumacher, H. L. Kite-Powell, and J. A. Duff. 2006. *Legal and regulatory framework for siting offshore wind energy facilities*. Cambridge, MA: Offshore Wind Energy Collaborative. 156 pp.

This study was part of a larger effort by the U.S. Offshore Wind Energy Collaborative to begin addressing "important environmental and public policy concerns" concerning wind energy and ocean use. In this report, the authors argue that the resource in question is space not wind and that the policy goal is to

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maximize the 'resource rents'. Using this argument, decision can be based on which uses or assortment of uses can maximize rents. However non-commercial uses must be factored in as well. This is a framework for working through the complex policy decisions that must be made locally and nationally.

81. Howard, M., and C. Brown. 2004. *Results of the electromagnetic investigations and assessments of marine radar, communications and positioning systems undertaken at the North Hoyle Wind Farm by QinetiQ and the Maritime and Coastguard Agency*. Southampton, U.K.: Maritime and Coastguard Agency and QinetiQ. 84 pp.  
Available from:  
[http://www.mcga.gov.uk/c4mca/effects\\_of\\_offshore\\_wind\\_farms\\_on\\_marine\\_systems-2.pdf](http://www.mcga.gov.uk/c4mca/effects_of_offshore_wind_farms_on_marine_systems-2.pdf)

The Maritime and Coastguard Agency has responsibility for navigation safety, for the direction and co-ordination of search and rescue operation, and for marine pollution prevention. In this context, the Agency assessed all foreseeable marine safety risks associated with the development of wind farms. The assessment covers scientific and practical operational data on various navigation and communications systems performance within and in the vicinity of offshore wind farms. The investigation includes effects of wind farms on Global Positioning System (GPS); Magnetic compasses; Loran C; VHF and other communications; The Automatic Identification System (AIS) ; Small Vessel radar performance; Shore based radar performance; and Radar and ARPA carried on larger vessels. The Agency found no significant affects to navigational efficiency or safety. Radar is the one exception.

82. Impact Assessment Inc., J. S. Petterson, and E. W. Glazier. 2004. *A study of the drift net gillnet fishery and oil/gas industry interactions and mitigation possibilities in the Cook Inlet*. Anchorage, AK: Mineral Management Service. U.S. Department of the Interior, Alaska OCS Region. 111 pp.  
Available from: <http://www.gomr.mms.gov/PI/PDFImages/ESPIS/3/3401.pdf>

This report describes the nature of the gillnet fishery's historic and potential future interactions with offshore oil and gas industry activities. It identifies and assesses appropriate means and venues for mitigating problems that might occur should the fishery and offshore industry eventually interact on the Outer Continental Shelf (OCS) of Cook Inlet. Such mitigation could benefit both forms of enterprise. Findings suggest that the navigational challenges of operating drift gillnet fishing vessels on Cook Inlet can test even the most skilled mariners. Placing stationary object such as a drilling platform in the swift currents of the fishing grounds could increase the challenges and present the possibility for spatial conflict. The research suggests that navigational challenges and spatial conflicts may be avoided through strategic planning and many problems for the drift gillnet fleet can be mitigated. Finally, the research indicates that while oil and gas industry activity on the OCS could affect fishery operations in certain

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ways, the issue is overshadowed by a host of economic and other challenges.

83. Inger, R., M. J. Attrill, S. Bearhop, A. C. Broderick, W. J. Grecian, D. J. Hodgson, C. Mills, E. Sheehan, S. C. Votier, M. J. Witt, and B. J. Godley. 2009. Marine renewable energy: Potential benefits to biodiversity? An urgent call for research. *Journal of Applied Ecology* 46:1145-1153.

Concerns over the potential negative environmental effects of offshore renewable energy installations include habitat loss, collision risks, noise and electromagnetic fields. The authors suggest that if appropriately managed and designed, installations may increase local biodiversity and potentially benefit the wider marine environment. They may act as artificial reefs and fish aggregation devices, which have been used previously to facilitate restoration of damaged ecosystems. Installations become de facto marine-protected areas, which have shown some success in enhancing both biodiversity and fisheries. Involving stakeholders with their planning and implementation could minimize conflicts over installation. Clear evidence of their potential environmental benefits would help. The authors stress the need research on the possible environmental benefits to assist policy makers in making key siting decisions that maximize benefits and minimize impacts

84. Interagency Ocean Policy Task Force. 2009. *Interim framework for effective coastal and marine spatial planning*. Washington DC: The White House Council on Environmental Quality. 35 pp.  
Available from: <http://www.whitehouse.gov/sites/default/files/microsites/091209-Interim-CMSP-Framework-Task-Force.pdf>

The Interagency Ocean Policy Task Force identified implementation of coordinated coastal and marine spatial planning (CMSP) in the U.S. as very important. This framework defines CMSP, explains why the country should engage with it and describes the geographic scope. The intent is to provide a coherent approach to CMSP that builds on regional efforts and strengths while engaging in a national effort.

85. ----- . 2009. *Interim report of the interagency ocean policy task force*. Washington DC: The White House Council on Environmental Quality. 38 pp.  
Available from:  
[http://www.whitehouse.gov/assets/documents/09\\_17\\_09\\_Interim\\_Report\\_of\\_Task\\_Force\\_FINAL2.pdf](http://www.whitehouse.gov/assets/documents/09_17_09_Interim_Report_of_Task_Force_FINAL2.pdf)

The Interagency Ocean Policy Task Force was charged with developing recommendations for a national policy to protect, maintain, and restore the health of ocean, coastal, and Great Lakes ecosystems and resources. This includes a framework for policy coordination, an implementation strategy that identifies and prioritizes objectives, and a framework for ecosystem-based coastal and marine spatial planning. One goal is to address conservation, economic activity, user

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conflict, and sustainable use of the ocean, coastal, and Great Lakes resources. The Report states that the US policies, programs, and activities that may have an impact ocean or coastal ecosystems, or that use ocean or coastal resources, should be developed within an integrated planning framework that addresses potential use conflicts. Marine spatial planning is one of the nine priority objectives proposed. The Task Force provides a definition of marine spatial planning, identifies the reasons for planning, and describes its geographic scope. National planning goals and guiding principles are articulated. The framework described is regional in scope and developed cooperatively among all stakeholders.

86. International Association of Marine Aids to Navigation and Lighthouse Authorities, and Association Internationale de Signalisation Maritime. 2008. *Recommendation 0-139 on the marking of man-made offshore structures*. Saint Germain en Laye, FR: IALA. 36 pp.  
Available from:  
[www.ialathree.org/chapo/publications/documentspdf/doc\\_225\\_eng.pdf](http://www.ialathree.org/chapo/publications/documentspdf/doc_225_eng.pdf)

The IALA and AISM have issued a series of recommendations on the marking of off-shore man-made structures. This is the most recent and comprehensive to date. Recommendations include stakeholder involvement, clear communication of extent of devices and specific marking suggestions. Guidance is given to all phases of operation including construction, decommissioning and support infrastructure.

87. International Energy Agency. 2005. Summary of IEA R&D wind – 46th topical expert meeting on obstacle marking of wind turbines. Paper read at 46th Topical Expert Meeting on Obstacle Marking of Wind Turbines, at Stockholm, Sweden. 7 pp.  
Available from:  
[http://www.ieawind.org/Task\\_11/TopicalExpert/Summary\\_46\\_Obstacle.pdf](http://www.ieawind.org/Task_11/TopicalExpert/Summary_46_Obstacle.pdf)
88. Jackson, L. S. 2004. Introduction: Environmental conflict in the Asia-Pacific. *Asia Pacific Viewpoint* 45 (1):1-11.
89. Jacobson, B., and Fishermen Involved in Natural Energy Committee (FINE). 2008. *Fisheries discussion and policy: Wave power buoy discussion*. Newport, OR: FINE. 13 pp.

Fishermen Involved with Natural Energy Committee (FINE) was form in 2007 with 16 voting members from fishery industries in Lincoln County, Oregon. Their goal is to proactive in the discussion and implementation of wave energy off the Oregon coast. This is an example of stakeholder involvement from an early stage to mitigate conflict in siting, constructing and operating nearshore wave energy installations.

90. Jago, P., and N. Taylor. 2002. *Wind turbines and aviation interests: European*

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*experience and practice*. London, U.K.: U.K. Department of Trade and Industry. 95 pp.

Available from: <http://www.bwea.com/pdf/European-Experience-and-Practice.pdf>

Jago and Taylor review the ways European countries approach conflict resolution between wind farms and aviation. Issues are navigable airspace, radar systems, low flying military aircraft and search and rescue operations. The latter are considered extremely hazardous within wind farms. They discuss day marking and nighttime illumination of turbines. Conflicts are addressed by proper siting at a distance from airports and radar installations, accurately denoting wind farms on aeronautical charts, and illuminating the turbines.

91. Juda, L., and T. Hennessey. 2001. Governance profiles and the management of the uses of large marine ecosystems. *Ocean Development and International Law* 32:43-69.

This is included for its use of a variety of matrices to proactively and comprehensively identify potential conflicts before they arise. Using the matrices and associated scales of interference allows visual analysis of how likely different ocean users, management agencies, or ecological needs are to come into conflict with one another. The article provides a scientific and geographic perspective on ecosystem-based management.

92. Kalo, J. J., R. G. Hildreth, A. Rieser, and D. R. Christie. 2007. *Coastal and ocean law cases and materials*. Third ed. St. Pau, MN: Thomson West. 748 pp.

This is the third edition of the original textbook on coastal and ocean law by four of its leading authorities. It covers the common law and statutory history of the ocean jurisdictions and provides relevant case excerpts and discussion of concepts.

93. Kearney, J., F. Berkes, C. Anthony, E. Pinkerton, and M. Wiber. 2007. The role of participatory governance and community-based management in integrated coastal and ocean management in Canada. *Coastal Management* 35:79-104.

The authors demonstrate compelling evidence that participatory governance helps address complex problems of managing the marine environment for multiple values and outcomes. Canadian ocean policies strive to achieve both ecological sustainability and economic development. They provide a strong basis for participatory governance and community based management of coastal and large ocean resources. The authors recommend nine initiatives to realize the goals of the Canadian policies: (1) shifting paradigms, (2) overcoming turf protection, (3) ensuring compatibility of goals, (4) ensuring sufficiency of information, (5) dealing with internal community stratification, (6) creating cross-scale linkages, (7) creating a participatory policy environment, (8) building community capacity, and (9) monitoring and assessment of local-level initiatives.

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94. Kempton, W., J. Firestone, J. Lilley, T. Rouleau, and P. Whitaker. 2007. The offshore wind power debate: Views from Cape Cod. *Coastal Management* 33 (2):119-149.  
Available from: <http://newark.cms.udel.edu/windpower/docs/KempEtAl-OffshoreWindDebate05.pdf>

In this article, the authors use the debate over the Cape Wind project off of Cape Cod as a case study to analyze "values, beliefs, and mobilization" in the context of environmental policy and law. They give a brief overview on wind power including other case studies involving terrestrial installations. They conducted 24 informal interviews after analyzing on three earlier surveys of local residents. They found differences in values and beliefs between supporters and opponents of the project. They suggest four areas that are relevant to the debate but currently ignored: human mortality related to current sources of fossil fuel (e.g. the Iraq War), the Federal decision-making process as it address environmental justice issues, the role of wind energy in mitigating global climate change, and the concept of scale in terms of energy benefits versus environmental impact. They do not address conflict resolution, yet encourage broad debate beyond the simple local aspects of a local installation.

95. Kittinger, J. N., K. N. Duin, and B. A. Wilcox. 2010. Commercial fishing, conservation and compatibility in the northwestern Hawaiian Islands. *Marine Policy* 34 (2):208-217.
96. Klapp, M. G. 1980. *Inter-industry conflict in the North Sea and South China Sea: A comparative analysis of oil, shipping, and fishing in four nations*: Pd.D. dissertation, University of California, Berkeley, Berkeley, CA. 294 pp.
97. Klein, C. J., A. Chan, L. Kircher, A. J. Cundiff, N. Gardner, Y. Hrovat, A. Scholz, B. E. Kendall, and S. Aïramé. 2008. Striking a balance between biodiversity conservation and socioeconomic viability in the design of marine protected areas. *Conservation Biology* 22 (3):691-700.  
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[http://www.uq.edu.au/spatialecology/docs/Publications/2008\\_Klein\\_etal\\_StrikingABalance.pdf](http://www.uq.edu.au/spatialecology/docs/Publications/2008_Klein_etal_StrikingABalance.pdf)

The authors provide a useful example of planning that considers socioeconomic and environmental factors for the most productive siting of marine protected areas off the California coast. They develop multiple scenarios and use them to compare area, compactness, impact on fishing effort, biodiversity, and other factors. The planning model could be translated into an effective siting model for offshore renewable energy facilities.

98. Knaster, A. S., C. Fusaro, J. Richards, O. R. Magoon, H. Converse, B. Baird, and M. Miller-Henson. 1998. Mediating conflicts between fish and oil: A prototype

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for joint problem solving of space-use and resource conflicts. In California and the world's oceans '97: An agenda for the future: Conference proceedings, March 1997. Reston, VA: ASCE. Pp. 1655-1666

99. Kona Blue Water Farms, L. 2007. *Draft supplemental environmental assessment for expanded production capacity and extended farm lease area for Kona Blue's offshore open ocean fish farm project off Unaaloha Point, Kona, Hawaii*. Honolulu, HI: Land Division, Hawaii Department of Land and Natural Resources. 81 pp.  
Available from: [http://www.kona-blue.com/download/DRAFT\\_EnvironmentalAssessment.pdf](http://www.kona-blue.com/download/DRAFT_EnvironmentalAssessment.pdf)
100. Krueger, A. 2007. *Valuing public preference for offshore wind power: A choice experiment approach*. Ph.D. dissertation, Marine Studies, University of Delaware. 272 pp.  
Available from:  
<http://www.ceoe.udel.edu/windpower/docs/KruegerDissertation.pdf>
101. Kumar, M., and P. Kumar. 2008. Valuation of ecosystem services: A psycho-cultural perspective. *Ecological Economics* 64:808-819.  
  
Kumar and Kumar consider social and individual connections to the environment when constructing method of valuation of ecosystems services. They suggest that the ecological identity of individuals is revealed at various levels of the decision-making hierarchy from local to regional to global. They use insights from psychoanalytic and environmental-psychology to redefine concepts such as ecological identity, self-other dichotomy, and the fostering of identification with nature. These conflicts must be embraced in the valuation of ecosystem services.
102. Ladenburg, J., and A. Dubgaard. 2009. Preferences of coastal zone user groups regarding the siting of offshore wind farms. *Ocean & Coastal Management* 52:233-242.  
  
The authors investigate the preference for reducing visual impacts from offshore wind farms using a survey of Danes. The results strongly indicate that users of the coastal zone perceive the visual impacts much more negatively than people who do not use the coastal area for recreation or habitation. Respondents who frequent the beach also have stronger preferences for reducing the visual impact when compared to less frequent visitors. The authors conclude that the optimal location of offshore wind farms would vary from closer to the coast in areas with little recreational activities to further out in coastal areas with a higher level of recreational activities.
103. Ladenburg, J., A. Dubgaard, L. Martensen, and J. Tranberg. 2005. *Economic valuation of the visual externalities of off-shore wind farms*. Copenhagen,DK: Food and Resource Economics Institute, The Royal Veterinary and Agriculture

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University. 185 pp.

Available from:

<http://www.hornsrev.dk/Miljoeforhold/miljoerapporter/ECONOMIC%20VALUATION%20OF%20THE%20VISUAL%20EXTERNALITIES%20OF%20OFFSHORE%20WIND%20FARMS.pdf>

This report is one project funded by the Danish Government to assess the effects of marine wind farms. The authors conducted an intense survey of people's attitudes towards wind turbines and their economic costs and benefits in relationship to visual impact, noise and energy costs. In general, people accepted additional wind turbines, appreciated that marine installations mitigated the noise factor and were willing to pay more to move installations some distance from shore but not willing to pay to move them out of sight.

104. Langan, R. 2009. *Co-location of offshore energy and seafood production: Potential synergies, compatibilities and conflicts*. In *The Ecology of Marine Wind Farms: Perspectives on Impact Mitigation, Siting, and Future Uses: 8th Annual Ronald C. Baird Sea Grant Science Symposium*. Newport, RI, U.S.: Rhode Island Sea Grant. 5 pp.  
Available from: <http://seagrant.gso.uri.edu/baird/2009/abstracts/langan.pdf>

Langan introduces the idea of co-locating wind turbines and fish and shellfish farms, a strategy that would reduce the overall footprint of human uses in ocean. Potential sites must be favorable for both uses as they benefit from reasonable proximity to shoreside infrastructure. The combined uses might pose conflict with uses that the other does not such as mussel lines strung between towers that might entangle marine mammals or vessel use patterns for aquaculture that might pose risks to turbines.

105. Lange, M., B. Burkhard, S. Garthe, K. Gee, A. Kannen, H. Lenhart, and W. Windhorst. 2010. *Analyzing coastal and marine changes: Offshore wind farming as a case study. Zukunft küste - coastal futures synthesis report*. Geesthacht, Germany: GKSS Research Center, LOICZ International Project Office. 212 pp.  
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Germany's Coastal Futures project used offshore wind energy as a means to develop a better understanding of integrated coastal zone management. The 6 year project used a scenario approach that integrated data, model results and qualitative estimations to assess impacts on the North Sea ecosystem and its related economy. The study identified the clear need to address existing use patterns and identify their cumulative effects as well as conflict with other uses. Minimizing conflicts while maximizing uses is a dynamic process that does not have a single solution or approach. Patterns of use change and hence response must as well. Society's values also drive process and decisions. New technology poses new

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risks and traditional planning approaches do not work well. This project demonstrates that the Driver-Pressure-State-Impact-Response framework is useful in its ability to integrate varying socio-economic forces with environmental impacts.

106. Lilley, M. B., J. Firestone, and W. Kempton. 2010. The effect of wind power installations on coastal tourism. *Energies* 3:1-22.  
Available from: [www.mdpi.com/1996-1073/3/1/1/pdf](http://www.mdpi.com/1996-1073/3/1/1/pdf)

The researchers surveyed beachgoers at the Delaware shore on their perceptions about an offshore wind energy installation. Those surveyed were overwhelmingly positive about wind energy and its effect on the environment. Half were neutral about the effect on the landscape with the half split between positive and negative. Distance of a proposed wind energy farm from the beach mattered with the closest installations generating the typical response of moving to another beach. There would be some effect on tourism related activities, but it appears to be both negative and positive. The authors' results suggest that conflict is best avoided when siting is far enough offshore and when alternative recreation opportunities are available.

107. Limburg, K. E., R. V. O'Neil, R. Costanza, and S. Farber. 2002. Complex systems and valuation. *Ecological Economics* 41:409-420.  
Available from:  
[http://www.uvm.edu:8889/~gundiee/publications/Limburg\\_et\\_al.pdf](http://www.uvm.edu:8889/~gundiee/publications/Limburg_et_al.pdf)

The authors review some of the relevant characteristics of complex systems finding that while ecosystems and economic systems share many properties, valuation has typically been driven by short-term human preferences. They conclude that as the force of humanity increases on the planet, ecosystem service valuation will need to switch from choosing among resources to valuing the avoidance of catastrophic change.

108. Lynam, T., W. de Jong, S. Sheil, T. Kusumoto, and K. Evans. 2007. A review of incorporating community knowledge, preferences and values into decision making in natural resources management. *Ecology and Society* 2 (1):online.  
Available from: <http://www.ecologyandsociety.org/vol12/iss1/art5/>

The authors painstakingly review methods available for engaging in collaborative management with stakeholders. The methods assessed are Bayesian belief networks, system dynamic modeling tools, discourse-based valuation, the 4Rs framework, participatory mapping, scoring or the Pebble Distribution Method, future scenarios, spidergrams, Venn diagrams, and Who Counts Matrices. The authors are careful to point out that the context, the length of time the collaborators have worked together, the combination of tools used and the robustness of the implementation design determine the success of collaboration.

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109. Mackinson, S., H. Curtis, R. Brown, K. McTaggart, N. Taylor, S. Neville, and S. Rogers. 2006. *A report on the perceptions of the fishing industry into the potential socioeconomic impacts of offshore wind energy developments on their work patterns and income*. Lowestoft: CEFAS. 62 pp.  
Available from: <http://www.cefas.co.uk/publications/techrep/tech133.pdf>

The authors gathered the views of the fishing industry on wind farms development in the U.K. During recent years, European fisheries management has encouraged cooperation providing opportunities for managers, scientists and fishermen to work more closely on common problems. Many of the uncertainties highlighted by the authors are being addressed by this approach, and by the joint identification of studies that could be undertaken in future planning. It is vital to include fishermen as collaborating partners to help specify research priorities and to help design and conduct field studies. The authors urge the Fisheries Liaison with Offshore Wind group continues to focus on this role.

110. MARICO Marine, and The British Wind Energy Association (BWEA). 2007. *Investigation of technical and operational effects on marine radar close to Kentish Flats offshore wind farm*. London, U.K.: BWEA. 57 pp.  
Available from: [http://www.bwea.com/pdf/radar/BWEA\\_Radar.pdf](http://www.bwea.com/pdf/radar/BWEA_Radar.pdf)

This document describes detailed data on the reported effects observed on ship's radar displays close to offshore wind farm structures. It is context specific to this trial, i.e. collision avoidance in pilotage waters from about 1 nm outside a single small wind farm. It does not draw conclusions about general navigation close to or within other anticipated wind farm developments. The observations are summarized and general and specific mitigation are suggested.

111. Masalu, D. C. P. 2000. Coastal and marine resource use conflicts and sustainable development in Tanzania. *Ocean and Coastal Management* 43:475-494.

Tanzania's coast is rich in resources and that has led to rapid population growth and a rise in conflicts over natural resources. Masalu surveys the conflicts and proposes a management scheme to deal with them. Conflicts include those revolving around agriculture and industrial uses in the uplands, marine transportation, tourism, urbanization, threats to mangroves and coral reefs. He suggests a multi-sectorial approach to national planning and establishment of well-defined principles and procedures for conflict resolution. The interdependence of uses of the coastal zone requires planning and managing across sectors rather than piecemeal. The author points out that collaborative management would strengthen the success of the government's emphasis on environmental concerns.

112. Massachusetts Technology Collaborative. 2002. *Cape & Winds Offshore wind public outreach initiative progress report*. Hyannis, MA: Massachusetts Technology Collaborative. 57 pp.

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Available from: <http://www.masstech.org/offshore/highlights.htm>

The Cape Wind project proposed for offshore Massachusetts has generated considerable support and opposition. Based on numerous interviews with key stakeholders, The Massachusetts Technology Collaborative determined a need for contextual and project specific information to be presented in a neutral setting. The resulting initiative aimed to support a transparent regulatory review process for the Cape Wind Project, to provide stakeholders and key decision makers with credible technical information, and to initiate a broader discussion of the energy system and renewable energy development in New England. This 2002 report reveals how the public outreach for Cape Wind was approached. More information (full summaries of the meetings and background materials) is available at [www.raabassociates.org](http://www.raabassociates.org), the company that facilitated the effort.

113. McCreary, S., J. Gamman, B. Brooks, L. Whitman, R. Bryson, B. Fuller, A. McInerney, and R. Glazer. 2001. Applying a mediated negotiation framework to integrated coastal zone management. *Coastal Management* 29:183-216.

The authors reiterate the intrinsic nature of conflict in the coastal zone. They observe that relatively few peer-reviewed studies have examined how coastal managers might apply conflict resolution processes in this zone's management context. They believe that many of these disputes can be 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 integrated coastal zone management.

114. McGrath, K. 2004. The feasibility of using zoning to reduce conflicts in the exclusive economic zone. *Buffalo Environmental Law Journal* 11:183-213.

McGrath suggests using marine protected areas as a framework for ocean zoning using the example of the Florida Keys National Marine Sanctuary. Given potential for conflict among ocean users, the public and other stakeholders, agencies should map existing uses in the EEZ. The author advocates a consultation among the Federal agencies similar to the process in place for determination of Essential Fish Habitat. Developing a comprehensive plan for the EEZ is desirable though barriers to zoning exist.

115. Michel, J., H. Dunagan, C. Boring, E. Healy, W. Evans, J. M. Dean, A. McGillis, and J. Hain. 2007. *Worldwide Synthesis and Analysis of Existing Information Regarding Environmental Effects of Alternative Energy Uses on the Outer Continental Shelf*. Herndon, VA: Government Printing Office. 254 pp. Available from: <http://www.mms.gov/itd/pubs/2007/2007-038.pdf>

Section 388 of the 2005 Energy Policy Act authorized the Mineral Management Service to develop a research program supporting offshore renewable energy.

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This review synthesizes existing information and data on environmental effects of alternative energy uses and identifies information needs. Topics covered include current offshore energy technologies, public reaction to existing projects, potential direct, indirect, and cumulative environmental impacts of offshore energy technologies, previously used mitigation measures, current physical and numerical models designed to determine environmental impacts, and information gaps in our current understanding of environmental impacts.

116. Michler-Cieluch, T., and G. Krause. 2008. Perceived concerns and possible management strategies for governing wind farm-mariculture integration. *Marine Policy* 32 (6):1013-1022.

Increased use of offshore waters of the German North Sea by multiple stakeholders leads to conflicting claims and possible exclusions. Due to legal constraint, wind farms exclude uses by other sectors such as commercial fisheries. In this context, integrating marine aquaculture with designated wind farm areas might provide chances to combine two industries in the frame of a multiple-use concept. The authors introduce the concept of combining offshore uses in a novel but mutually beneficial way in order to reduce the amount of space allocated offshore. They discuss the scientific, technical and other requirements of such an effort.

117. Millennium Ecosystem Assessment. 2005. *Ecosystems and human well-being: Synthesis*. Washington, D.C.: Island Press. 137 pp.  
Available from:  
<http://www.millenniumassessment.org/documents/document.356.aspx.pdf>

The Millennium Ecosystem Assessment examines the consequences of ecosystem change for the quality and sustainability of human life. The project involved the work of more than 1,360 experts worldwide. Their findings provide a state-of-the-art scientific appraisal of the condition and trends in global ecosystems and the services they provide, as well as the scientific basis for action to conserve and use them sustainably. This report presents a synthesis and integration of the findings of the four working groups along with more detailed findings for selected ecosystem services concerning condition and trends and scenarios, and response options.

118. (U.S.). Committee on Assessing and Valuing the Services of Aquatic and Related Terrestrial Ecosystems. 2005. *Valuing ecosystem services: Toward better environmental decision-making*. Washington, D.C.: National Academies Press. 277 pp.  
Available from: [http://www.nap.edu/openbook.php?record\\_id=11139&page=1](http://www.nap.edu/openbook.php?record_id=11139&page=1)

Ecosystem functions are seldom experienced directly by users of the natural resource. Rather, it is the services provided by ecosystems, such as flood risk reduction and water supply, together with ecosystem goods, that create value for

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human users. This report describes those services and synthesizes the state of current knowledge.

119. NOAA Marine Protected Areas Center, and Marine Conservation Biology Institute. 2011. *The California ocean uses atlas*. NOAA Marine Protected Areas Center 2010 [cited July 18 2011]. Available from: [http://www.mpa.gov/dataanalysis/atlas\\_ca/](http://www.mpa.gov/dataanalysis/atlas_ca/)

The California Ocean Uses Atlas Project focuses on the California EEZ and brings data together on three broad usage groups - fishing, recreation and industrial/military. The purpose is to provide a mapping tool for decision makers and stakeholders. However it also provides information to anyone interested in what happens where within California's ocean zone.

120. Ocean Policy Advisory Council. 2009. Use of the territorial sea for the development of renewable energy facilities or other related structures, equipment or facilities. In *Oregon Territorial Sea Plan*. Portland: State of Oregon. 19 pp. Available from: [http://www.oregon.gov/LCD/OCMP/docs/Ocean/otsp\\_5.pdf](http://www.oregon.gov/LCD/OCMP/docs/Ocean/otsp_5.pdf)

This addition to the state's 1994 Territorial Sea Plan, a section of the state comprehensive plan, describes the process for making decisions concerning the development of offshore renewable energy facilities and specifies the areas where that development may be sited. The requirements are intended to protect areas important to renewable marine resources, ecosystem integrity, marine habitat and areas important to fisheries from the potential adverse effects of renewable energy facility siting, development, operation, and decommissioning. It provides guidelines for identifying appropriate locations for development that minimizes the potential adverse impacts to existing ocean resource users and coastal communities.

121. Odell, J., M. E. Mather, and R. M. Muth. 2005. A biosocial approach for analyzing environmental conflicts: A project/case study of horseshoe crab allocation. *BioScience* 55 (9):735-748.
122. OEER (Offshore Energy Environmental Research) Association. 2008. *Fundy tidal energy strategic environmental assessment: Final report*. Halifax: Nova Scotia Department of Energy. 92 pp. Available from: [http://www.oreg.ca/docs/Fundy\\_SEA.pdf](http://www.oreg.ca/docs/Fundy_SEA.pdf)

The Bay of Fundy has the largest tidal range in the world. The development of new tidal energy technologies has resulted in renewed and more urgent interest in harnessing tidal power. Throughout this report, OEER stresses the necessity of meaningful stakeholder engagement through future environmental assessment processes, the creation of a Stakeholder Advisory Board to build on consultation with fishermen, other marine resource users, and communities at every stage of tidal development. OEER recommends ongoing engagement with First Nations

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communities by requiring proponents to facilitate discussion and information sharing at the earliest stages. There is some discussion of how exclusion zones would affect users but no details as the exclusion zones would vary based on the technology used and the scale of projects.

123. Offshore Windenergy Europe. 2010. Conflicts of interest. Offshore Windenergy Europe. [web page]  
Available from:  
[http://www.offshorewindenergy.org/txt2html.php?textfile=expert\\_guides/Environment#15](http://www.offshorewindenergy.org/txt2html.php?textfile=expert_guides/Environment#15)

This industry report provides an overview of environmental and human use conflicts associated with offshore wind development. It includes a section on several European countries environmental assessment programs. The findings suggest some areas may definitively be excluded from consideration for use for offshore wind power. These are major ship lanes, areas close to airports, oil and gas pipelines, cable routes, raw material deposits, military restricted areas. It provides a summary description of the nature of the conflicts between wind development and marine transportation, air traffic, military operations, commercial fishing, mineral and sediment deposits, and marine archaeology sites. Mitigation measures are mentioned in passing.

124. Orr, P. J. 2006. *ECR performance evaluation: An inventory of indicators*. Tucson: U.S. Institute for Environmental Conflict Resolution. 26 pp.  
Available from: [www.ecr.gov/pdf/INV20061010.pdf](http://www.ecr.gov/pdf/INV20061010.pdf)

Orr updates MacFarlane's and Mayer's 2004 literature review of environmental conflict resolution. She puts the literature into perspective for users to evaluate the utility of environmental conflict resolution as well as how to improve it in practice. The review's organization assists users to identify when it is appropriate, how to use it effectively and what outcomes can be expected

125. Orr, P. J., K. Emerson, and D. L. Keyes. 2008. Environmental conflict resolution practice and performance: An evaluation framework. *Conflict Resolution Quarterly* 25 (3):283-301.

A group of Federal and State agencies developed an environmental conflict resolution evaluation framework to make a strong case for use of the method. Orr describes the evolution, structure, associated instrumentation, and current applications of this method's evaluation framework. He argues that the possibility of costly litigation, planning delays, and contentious stakeholder relations suggest a need for improved environmental governance. The need for improvement does not, however, in and of itself make a case for alternatives that engage diverse interests collaboratively in environmental decision-making. Hence the need for an environmental conflict resolution framework.

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126. OSPAR Commission. 2004. *Problems and benefits associated with the development of offshore wind-farms*. London, U.K.: OSPAR Commission. 18 pp. Available from: [http://www.ospar.org/documents/dbase/publications/p00212\\_Wind%20farms\\_Problems%20and%20benefits.pdf](http://www.ospar.org/documents/dbase/publications/p00212_Wind%20farms_Problems%20and%20benefits.pdf)

The study's main focus is on environmental impacts. However there is limited some discussion on socio-economic effects as well.

127. -----, 2006. *An overview of the environmental impact of non-wind renewable energy systems in the marine environment*. London, U.K.: OSPAR Commission. 13 pp. Available from: [http://www.oreg.ca/docs/Environment\\_Impact\\_Non-Wind\\_Renewable\\_Marine\\_Environment.pdf](http://www.oreg.ca/docs/Environment_Impact_Non-Wind_Renewable_Marine_Environment.pdf)

128. -----, 2008. *Guidance on environmental considerations for offshore wind farm development*. London, U.K.: OSPAR Commission. 19 pp. Available from: [http://www.ospar.org/v\\_measures/get\\_page.asp?v0=08-03e\\_Consolidated%20Guidance%20for%20Offshore%20Windfarms.doc&v1=5](http://www.ospar.org/v_measures/get_page.asp?v0=08-03e_Consolidated%20Guidance%20for%20Offshore%20Windfarms.doc&v1=5).

OSPAR's guidelines address development of offshore wind farms in terms of minimizing environmental impact and conflict. The audience is government agencies, developers, consultants, and other interested parties. These are not a definitive set of instructions but provide context for developments. The list of potential impacts discussed is not exhaustive. Every location will have a unique set of impacts and potential conflicts. The guidelines are structured around the main development stages of an offshore wind farm: siting, licensing, monitoring, construction and operation, and decommissioning.

129. Pendleton, L., P. Atiyah, and A. Moorthy. 2007. Is the non-market literature adequate to support coastal and marine management? *Ocean & Coastal Management* 50 (5-6):363-378.

The authors find that the existing literature on estimating of the non-market value of coastal and marine resources is inadequate. They examine the comprehensiveness, timeliness, geographical completeness, and methodological breadth of the peer-reviewed literature on non-market valuation studies for coastal and ocean resources in the United States. Studies of beaches and recreational fishing are generally sufficient to support effective policy-making. However, most resources have not been well studied and values for many have not been estimated in recent years, the geographical coverage is incomplete, and the application of methodologies is uneven. The authors offer recommendations to improve the policy usefulness of valuation literature.

130. Pew Oceans Commission. 2003. *America's living oceans : Charting a course for sea change : A report to the nation : Recommendations for a new ocean policy*

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Arlington, VA: Pew Oceans Commission. 144 pp.

Available from:

[http://www.pewtrusts.org/our\\_work\\_report\\_detail.aspx?id=30009&category=130](http://www.pewtrusts.org/our_work_report_detail.aspx?id=30009&category=130)

The comprehensive report of the Pew Oceans Commission outlines a national agenda for protecting and restoring America's oceans. The Pew report should be read in conjunction with the United States Ocean Commission report released in 2004 as both reports were carried out in parallel. The current location for the ongoing work of both commissions is the U.S. Joint Ocean Commissions Initiative (see U.S. Commission on Ocean Policy, 2004). Before the seminal reports of the Pew and U.S. ocean commissions, the last time the nation had examined its marine resources was in the historic Stratton Commission Report of 1966 (<http://www.archive.org/download/ournationseaplan00unit/ournationseaplan00unit.pdf>).

131. Pomeroy, R., and F. Douvère. 2008. The engagement of stakeholders in the marine spatial planning process. *Marine Policy* 32 (5):816-822.  
Available from: [http://www.unesco-ioc-marinesp.be/publications/marine\\_policy\\_special\\_issue?lkz=1#item\\_div\\_48](http://www.unesco-ioc-marinesp.be/publications/marine_policy_special_issue?lkz=1#item_div_48)

Pomeroy and Douvère advocate a comprehensive method for involving people in marine spatial planning through stakeholder analysis and mapping. They describe various types and stages of stakeholder participation and illustrate how to conduct a stakeholder analysis that meaningfully involves stakeholders.

132. Portland Harbour Authority. 2009. *Portland Harbour Authority marine spatial plan adopted December 2008*. Portland Harbour Authority. 7 pp.  
Available from: [http://www.portland-port.co.uk/commercial\\_shipping/port\\_estate\\_and\\_tenants/documents/CompleteMarineSpatialPlan.pdf](http://www.portland-port.co.uk/commercial_shipping/port_estate_and_tenants/documents/CompleteMarineSpatialPlan.pdf)
133. Portman, M. 2009. Involving the public in the impact assessment of offshore renewable energy facilities. *Marine Policy* 33 (2):332-338.

Portman's research expands the discussion of public involvement in decisions about marine resource use by examining public participation in environmental impact assessment for offshore renewable energy projects. The author's review of the empirical and theoretical research is summarized in a framework for involvement. The framework consists of five main features: effective communication, broad-based inclusion, prioritization, early three-way learning, and alternatives analysis. Portman explores the relevance of such a framework and indicate possible applications.

134. Portman, M. E., J. A. Duff, J. Köppel, J. Reiser, and M. E. Higgins. 2009. Offshore wind energy development in the exclusive economic zone: Legal and

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policy supports and impediments in Germany and the U.S. *Energy Policy* 37:3596-3607.

The authors assess the Federal role of two coastal nations, German and the U.S., in regards to their domestic legal and policy frameworks in the siting of offshore renewable energy facilities. Germany has approved many offshore sites while recent US proposals have for the most part stalled. Based on a review of legal and policy documents, laws and regulations, academic literature, and interviews, these authors identify and compare factors that figure most prominently for the development of offshore renewable energy policies. Comparisons are organized under four categories: the regulatory framework, the public's role in siting, targeted economic mechanisms, and indirect mechanisms. The authors conclude that U.S. regulatory framework, more open public process and lack of coordinated marine spatial planning make for more difficult development of wind farms.

135. President. 2010. Executive order 13457: Stewardship of the ocean, our coasts, and the Great Lakes. *Federal Register* 75 (10):43021-43027.  
Available from: <http://www.whitehouse.gov/files/documents/2010stewardship-eo.pdf>

This order adopts the recommendations of the Interagency Ocean Policy Task Force. Based on those recommendations, this order establishes a national policy to ensure the protection, maintenance, and restoration of the health of ocean, coastal, and Great Lakes ecosystems and resources, enhance the sustainability of ocean and coastal economies, preserve our maritime heritage, support sustainable uses and access, provide for adaptive management to enhance our understanding of and capacity to respond to climate change and ocean acidification, and coordinate with our national security and foreign policy interests. This order also provides for the development of coastal and marine spatial plans that build upon and improve existing Federal, State, tribal, local, and regional decision-making and planning processes.

136. Ramsey, K. 2009. GIS, modeling, and politics: On the tensions of collaborative decision support. *Journal of Environmental Management* 90 (6):1972-1980.

Ramsey discusses the tension between using GIS to solve problems rather than understanding them. GIS applications designed for problem solving often pre-define the spatial aspects of the issue by structuring the kind of information that can be considered or the way in which the problem is conceptualized. This inherently privileges particular perspectives and understandings of the problem while marginalizing others. As a result, true understanding of the problem is undermined. Ramsey provides a set of recommendations to those seeking to balance problem solving with issue understanding so the use of GIS in the context of contentious environmental and natural resource decisions improves. Although from a terrestrial case study, the results and conclusions could be highly applicable to marine situations.

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137. Rayns, N., T. MacDonald, and A. Read. 2006. *Protected commercial fishing areas (pcfas) - a concept for improving equity in resource allocation between aquatic resource users*. In *Sharing the Fish 2006*. Perth: Western Australian Department of Fisheries. 16 pp.  
Available from:  
<http://www.fish.wa.gov.au/docs/events/ShareFish/papers/pdf/papers/TraceyMacDonald.pdf>

The Authority discusses the use of Protected Commercial Fishing Areas (PCFAs) for achieving equity for space allocations. Current protection strategies for commercial fishing in Australia include potential design and regulatory improvements, and the establishment of PCFAs with reference to existing national and international protection measures, recreational fishing, and marine protected areas. The authors provide a thoughtful discussion of the relationship between a fishery's ecological characteristics, its commercial harvesters, and current trends in marine spatial planning. With respect to competing use conflict resolution and mitigation, the discussion is limited, as it does not address one particular conflict, but rather the cumulative effect of conflicting spatial rights on commercial fishing. In addition, specific discussion of conflicts with recreational fishing and marine protected areas are not very valuable. The idea of PCFAs is inventive and unique, however, and would be of interest to a planner.

138. Rhode Island Coastal Resources Management Council. 2010. *OceanSAMP: Rhode Island ocean special area management plan*. Providence, RI: Rhode Island Coastal Resources Management Council. 1021 pp.  
Available from:  
[http://www.crmc.ri.gov/samp\\_ocean/finalapproved/RI\\_Ocean\\_SAMP.pdf](http://www.crmc.ri.gov/samp_ocean/finalapproved/RI_Ocean_SAMP.pdf)

The Rhode Island Ocean Special Area Management Plan, or Ocean SAMP is conceived to be a federally recognized coastal management and regulatory tool. Using the best available science, the Ocean SAMP seeks to provide a balanced approach to the development and protection of Rhode Island's ocean-based resources. The draft plan does not yet include a discussion of conflict mitigation. The Plan is currently proceeding through an eight-step review process prior to adoption. As it develops and becomes finalized, this will be one effort to monitor as a possible state level model.

139. Royal Yachting Association. 2005. *RYA and a proposed marine bill: Opportunities and concerns as seen by the RYA concerning a marine bill*. Southampton, U.K.: Royal Yachting Association. 13 pp.  
Available from: <http://bit.ly/bOlbj1>

The Royal Yachting Association (RYA) is the national body for all forms of recreational boating, under power and sail, on inland and tidal waters, with 100,000 personal members and 1500 affiliated clubs. The RYA represents the

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interests of an estimated 2 million recreational boaters and watercraft enthusiasts. This report presents its views of the opportunities and concerns in the proposed Marine Bill. Concerns include boating exclusion areas.

140. -----, 2006. *Royal Yachting Association environmental briefing 06/01: Offshore renewable energy developments*. Southampton, U.K.: Royal Yachting Association. 5 pp.  
Available from: <http://tinyurl.com/4xp7ykw>
141. -----, 2009. Consultation on UK offshore energy strategic environmental assessment. Future leasing for offshore wind farms and licensing for offshore oil & gas and gas storage - environmental report, January 2009, April 6, 2009. Southampton, U.K.: Royal Yachting Association. 5 pp.  
Available from: <http://bit.ly/aZ5sz3>

The Royal Yachting Association is UK body representing all forms of recreational and competitive boating. These are comments on the UK's Offshore Energy Strategic Environmental Assessment. They identify conflicts and issues with potential offshore wind energy from the boating perspective. These include collision risk, need for marking and lighting, effects on small craft navigational and communication equipment, loss of cruising routes, competition with commercial routes, effects on sailing and racing areas, and potential visual intrusion and noise. The report supports development beyond 12nm, in areas lightly used by recreational boating and marine transportation.

142. Royal Yachting Association, and Cruising Association. 2004. *'Sharing the wind' recreational boating in the offshore wind farm strategic areas: Identification of recreational boating interests in the Thames Estuary, Greater Wash and North West (Liverpool Bay)*. Southampton, U.K.: Royal Yachting Association and the Cruising Association. 42 pp.  
Available from: <http://tinyurl.com/43pblh8>

The Royal Yachting Association and the Cruising Association support the Government's efforts for developing renewable energy. However they want to ensure that the safety of recreational boaters is not compromised and that sites do not impinge directly on important recreational boating areas. The authors provide an analysis of RYA's specific concerns about offshore wind farms and recreational boating.

143. Sagarin, R. D., and L. B. Crowder. 2008. Breaking through the crisis in marine conservation and management: Insights from the philosophies of Ed Ricketts. *Conservation Biology* 23 (1):24-30.

Sagarin and Crowder use the backdrop of the two major U.S. commissions on ocean policy to reiterate that ocean ecosystems are in crisis and that current policies are inadequate to prevent further ecological damage. Ecosystem-based

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management is viewed as an approach to address conservation issues in the oceans, but managers remain uncertain as to how to implement ecosystem-based approaches in the real world. The authors present a thoughtful and promising contribution on marine conflict that describes an approach for stakeholders to proceed in open discussions and negotiation without feeling coerced.

144. Salcido, R. E. 2009. Rough seas ahead: Confronting challenges to jump-start wave energy. *Environmental Law* 39:1073-1108.

Sacido examines the challenge of increasing wave energy development within a sustainable development framework. She recommends addressing this by establishing the role of ocean renewables within the larger energy policy, funding research that will prove the value of wave energy, and moving forward with ecosystem-based zoning to facilitate restoration and sustainable long-term management of the oceans. She urges recognition that increasing intensity of all offshore uses is unsustainable. Her recommendations illuminate the trade-offs of wave energy production with other competing uses of the oceans. Salcido argues that hard choices are necessary to facilitate responsible stewardship of the oceans as a current and future public resource.

145. Scholz, A., C. Steinback, and M. Mertens. 2006. *Commercial fishing grounds and their relative importance off the central coast of California: Report to the California Marine Life protection Act Initiative in partial fulfillment of contract no. 2005-0067m*. Portland: Ecotrust. 39 pp.  
Available from: [http://www.ecotrust.org/mlpa/report\\_review\\_final.pdf](http://www.ecotrust.org/mlpa/report_review_final.pdf)

This Ecotrust publication contains results of work conducted in California to develop and implement an effective tool to gather and present information from commercial fishermen. The authors created an interactive interview instrument to collect geo-referenced information about the extent and relative importance of central coast commercial fisheries. The data were compiled in a geographic information system that was integrated into a central geodatabase housed at the University of California at Santa Barbara. The authors analyzed the collected data and additional data provided by the California Department of Fish and Game to estimate potential impacts of proposed marine protected area networks developed in the Marine Life Protected Areas process.

146. Sheehy, D. 2009. *Constructed reefs for mitigation and fishery enhancement in marine wind farm development*. In *The Ecology of Marine Wind Farms: Perspectives on Impact Mitigation, Siting, and Future Uses*. Newport, R.I.: Rhode Island Sea Grant. 5 pp.  
Available from: <http://seagrant.gso.uri.edu/baird/2009/abstracts/sheehy.pdf>

Sheehy proposed that using constructed reefs to enhance the marine habitat within or near areas with offshore renewable energy structures offers a way to offset possible negative impacts to fishery economies. These possible negative impacts

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to fisheries are gear restrictions and exclusion zones. An integrated approach will have greater potential if there is advanced planning to ensure optimal integration and economic advantage. The right habitat enhancement technologies for specific locations must be selected. There should be close coordination and proactive communication with regional fisheries and coastal zone management efforts.

147. Society of Professionals in Dispute Resolution. 1997. *Best practices for government agencies: Guidelines for using collaborative agreement-seeking processes: Report and recommendations of the SPIDR environment/public disputes sector critical issues committee*. Reston: Society of Professionals in Dispute Resolution. 27 pp.

Available from:

<http://law.gsu.edu/cncr/pdf/papers/BestPracticesforGovtAgenices.pdf>

The Report's recommendations were developed through a joint effort of the Society of Professionals in Dispute Resolution, Environmental/Public Disputes Sector and the Consortium on Negotiation and Conflict Resolution in Atlanta, Georgia, supported by the William and Flora Hewlett Foundation. The report focuses on best practices for government agencies and other users in the United States and Canada for successful use of collaborative decision making processes.

148. Sørensen, H. C., L. K. Hansen, R. Hansen, K. Hammarlund, T. Thorpe, and P. McCullen. 2003. Social planning and environmental impact. In *Wavenet: Results from the work of the European thematic network on wave energy: Energy, Environment and Sustainable Development Programme*. pp. 305-377.

Available from: [http://www.emu-](http://www.emu-consult.dk/includes/networkreport_section_e.pdf)

[consult.dk/includes/networkreport\\_section\\_e.pdf](http://www.emu-consult.dk/includes/networkreport_section_e.pdf)

This document provides an overview to the barriers to large-scale development of wave energy arising from competing uses of the resources, such as areas required for marine transportation, military operation, pipelines and cables, recreational uses and commercial fishing. The information was collated through interviews with developers and regulators as well as a review of the literature. Barriers resulting from conflicting uses are not expected to constitute major barriers for the large-scale development of wave energy. Recommendations to reduce conflict vary but most depend on thorough, open planning. Compensation is useful in some situations but problematic with commercial fishing. Communication of site specific solutions would be useful.

149. St. Martin, K., and M. Hall-Arber. 2008. The missing layer: Geo-technologies, communities, and implications for marine spatial planning. *Marine Policy* 32:770-786.

Available from: [http://www.unesco-ioc-](http://www.unesco-ioc-marinesp.be/publications/marine_policy_special_issue?lkz=1#item_div_48)

[marinesp.be/publications/marine\\_policy\\_special\\_issue?lkz=1#item\\_div\\_48](http://www.unesco-ioc-marinesp.be/publications/marine_policy_special_issue?lkz=1#item_div_48)

St. Martin and Hall-Arber recognize that the assessment and management of

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marine resources is dependent upon spatial technologies, such as geographic information systems. The diverse layers of spatial information are focused on biophysical processes. The social landscape of the marine environment is undocumented and consequently is missing data layer. Consequently, the resource areas important to stakeholders and communities are not well integrated into planning processes reliant on spatial technologies. The authors describe a participatory method to map the presence of fishing communities offshore. They suggest that spatial representation of these communities informs fisheries and incorporates the human dimensions of the marine environment in assessment and planning.

150. Stephenne, N., C. Burnley, and D. Ehrlich. 2009. Analyzing spatial drivers in quantitative conflict studies: The potential and challenges of geographic information systems. *International Studies Review* 11:502-522.

The authors attempt to understand how geographical information systems can help analyze spatial drivers of conflict. While the geographic drivers of territorial conflicts have been extensively described by a number of political studies, the quantitative analysis of these drivers is quite new. The authors focus on large conflicts i.e. wars, although they also it does discuss smaller scale. This work serves as a literature review on the topic, and includes citations dealing with natural resource availability.

151. Sterne, J. K., T. C. Jensen, J. Keil, R. Roos-Collins, and D. Wand. 2009. The seven principles of ocean renewable energy: A shared vision and call for action. *Roger Williams University Law Rev.* 14:600-615.

152. Susskind, L., and S. McCreary. 1985. Techniques for resolving coastal resource management disputes through negotiation. *Journal of the American Planning Association* 51 (3):365-374.

These authors walk the reader through some seminal cases of coastal conflict and dispute resolution from the 1950s through the 1980s. Following analyses and discussion of the case studies, they draw major conclusions that can be interpreted as recommendations. All involved parties can ‘win’ if they are willing to meet face to face in negotiation. Consensus decision-making depends on a proper process of identifying interests, generating alternatives, spelling out commitments, jointly evaluating uncertainty and the available scientific evidence and framing written agreements.

153. Sustainable Development Commission. 2007. *Turning the tide: Tidal power in the UK*. Sustainable Development Commission. [London, U.K.: Sustainable Development Commission.]158 pp.  
Available from: [http://www.sd-commission.org.uk/publications/downloads/Tidal\\_Power\\_in\\_the\\_UK\\_Oct07.pdf](http://www.sd-commission.org.uk/publications/downloads/Tidal_Power_in_the_UK_Oct07.pdf)

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154. Swedish Energy Agency. 2009. *Radar and offshore wind turbines*. Eskilstuna: Energy Agency. 2 pp.  
Available from:  
[http://www.energimyndigheten.se/Global/Engelska/About%20us/Radar\\_And\\_Offshore\\_Wind\\_Turbines\\_summary.pdf](http://www.energimyndigheten.se/Global/Engelska/About%20us/Radar_And_Offshore_Wind_Turbines_summary.pdf)

Radar shadow behind wind turbines decreases the capacity of radar to detect objects in that area. Turbines can also cause false radar echoes through the movement of their blades. Practical tests were carried out using flights and radar located by the wind park Yttre Stengrund in Kalmar Sund. The project results showed that it is difficult to give any general directives for how a wind farm should be configured to give as little effect as possible on radar functions. The results also show, however, that it is better to have large wind parks at a greater distance from the land than smaller wind parks close to the coast. It may also be possible to take measures connected with the radar equipment, such as increasing the mast height or supplementing intelligence with new radar installations on land or next to the wind farm.

155. Symes, D. 2005. *Marine spatial planning: A fisheries perspective, a report to English Nature*. Hull, U.K.: Department of Geography, University of Hull. 35 pp.  
Available from:  
[http://ioc3.unesco.org/marinesp/files/Marine%20Spatial%20Planning\\_Fisheries%20Perspective.pdf](http://ioc3.unesco.org/marinesp/files/Marine%20Spatial%20Planning_Fisheries%20Perspective.pdf)

156. Tomlinson, B. N., J. S. Petterson, E. W. Glazier, J. Lewis, I. Selby, R. Nairn, T. Kenny, G. P., C. J. Espinasse, L. Stanley, and R. L. Cooke. 2007. *Investigation of dredging impacts on commercial and recreational fisheries and analysis of available mitigation measures to protect and preserve resources*. Herndon, VA: Minerals Management Service, US Department of the Interior. 233 pp.  
Available from:  
<http://www.mms.gov/SandAndGravel/PDF/FloridaStudyReport/Studies/2006-065.pdf>

The authors look at dredging impacts in the U.S. and internationally. Specific conflicts between dredging and the brown crab fishing fleet are discussed including illustrations of the major stages of the conflict. Key issues are seabed disturbance and sediment plumes. Mitigation measures include compensation, seasonal restrictions, zoning, reduction in sediment plumes, formal liaison and consulting relationships.

157. Turnipseed, M., L. B. Crowder, R. D. Sagarin, and S. E. Rody. 2009. Legal bedrock for rebuilding America's ocean ecosystems. *Science* 324 (5924):183-184.

The authors argue for a coherent and comprehensive public trust doctrine that covers all of U.S. oceans. The various agencies and the different regions of the coastal zone offer scenarios ripe for repeated conflict over jurisdiction. The public

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good suffers.

158. U.K. Department for Business. 2007. *Consultation on safety zones: Final regulatory impact assessment: Implementation of the provisions of the energy act 2004 relating to the establishment of safety zones around offshore renewable energy installations* London, U.K.: Department for Business, Enterprise and Regulatory Reform. 18 pp.  
Available from: <http://www.berr.gov.uk/files/file40649.pdf>

These recommendations for exclusion zones around offshore renewable energy facilities are well considered. They acknowledge that the need to keep other users out varies on the operations and the users, and so propose a safety zone scheme requiring applications from OREI developers based on site-specific circumstances. Where no application is made, the Secretary of State could take initiative in appropriate cases. The proposed starting presumptions for the dimensions of safety zones are based on prior consultation with the Maritime and Coastguard Agency (MCA) the statutory advisor for navigation safety. These would be 500 meters during construction, possible extension and decommissioning of an OREI and 50 meters during the much longer operational phase of an OREI's life.

159. U.K. Department for Business Enterprise & Regulatory Reform. 2008. *Fishing liaison with offshore wind and wet renewables group (FLOWW) recommendations for fisheries liaison: Best practice guidance for offshore renewables developers*. London: U.K. Department for Business Enterprise & Regulatory Reform. 34 pp.  
Available from: <http://www.berr.gov.uk/files/file46366.pdf>

The Department provides guidelines for developers involved in the offshore renewables energy sector when dealing with fishing and fisheries. The offshore renewable energy sector and fisheries should coexist to the advantage of both parties. These guidelines and the Fishing Liaison with Offshore Wind and Wet Renewables Group (FLOWW) aim to facilitate that process through encouraging effective liaison with the fishing industry and the production of industry-wide standards for fisheries liaison.

160. U.K. Department for Business Enterprise & Regulatory Reform, Royal Haskoning, and BOMEL Ltd. 2008. *Review of cabling techniques and environmental effects applicable to the offshore wind farm industry*. London: U.K. Department for Business Enterprise & Regulatory Reform. 164 pp.  
Available from: <http://www.berr.gov.uk/files/file43527.pdf>

The Department addresses one element of the formal environmental impact assessment, cabling. The intended audience is wind farm developers, consultants and regulators. The review is an information resource on the range of cable installation techniques available, their likely environmental effects and potential

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mitigation. It draws on current wind farm and other marine industry practices and experiences. While not formal guidelines, the report will assist government agencies, developers, stakeholders and regulators during the formal review by indicating the types of information needed for the assessment.

161. U.K. Department for Environment, Food and Rural Affairs. 2007. *Exploring the practical implications of proposals for marine planning, licensing and the marine management organization (MMO) in coastal areas*. London, U.K. U.K. Department for Environment, Food and Rural Affairs. 50 pp.  
Available from:  
<http://www.defra.gov.uk/environment/marine/documents/legislation/marine-plan-desk-full.pdf>

The best Integrated Coastal Zone Management or Marine bill will include effective engagement with stakeholders, include links between terrestrial planning systems and marine plans. The planning process should be transparent with a clear objection or resolution of conflict process. The first step should be a resource mapping exercise and looking for any data gaps before MMO process begins.

162. U.K. Department of Energy and Climate Change. 2009. *A prevailing wind: Advancing UK offshore wind deployment*. London, U.K.: Department of Energy and Climate Change. 48 pp.  
Available from: <http://www.berr.gov.uk/files/file51989.pdf>
163. -----, 2009. *Offshore energy strategic environmental assessment - post public consultation report*. London, U.K.: Department of Energy and Climate Change. 127 pp.  
Available from: [http://www.offshore-sea.org.uk/consultations/Offshore\\_Energy\\_SEA/OES\\_Post\\_Consultation\\_Report.pdf](http://www.offshore-sea.org.uk/consultations/Offshore_Energy_SEA/OES_Post_Consultation_Report.pdf)
164. -----, 2009. *U.K. offshore energy strategic environmental assessment: Future leasing for offshore wind farms and licensing for offshore oil & gas and gas storage: Environmental report*. London, U.K.: Department of Energy and Climate Change. 336 pp.  
Available from: [http://www.offshore-sea.org.uk/site/scripts/book\\_info.php?consultationID=16&bookID=11](http://www.offshore-sea.org.uk/site/scripts/book_info.php?consultationID=16&bookID=11)
165. U.K. Department of Trade and Industry. 2007. *Consultation on safety zones: Government response: Implementing the provisions of the energy act 2004 relating to the establishment of safety zones around offshore renewable energy installations*. London, U.K.: Department of Trade and Industry. 23 pp.  
Available from: <http://www.berr.gov.uk/files/file39103.pdf>
166. U.K. Department of Trade and Industry, U.K. Maritime and Coastguard Agency,

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and U.K. Department for Transport. 2005. *Guidance on the assessment of the impact of offshore wind farms: Methodology for assessing the marine navigational safety risks of offshore wind farms*. London, U.K.: Department of Trade and Industry. 160 pp.

Available from: <http://www.berr.gov.uk/files/file22888.pdf>

The Department recognizes the need for a methodology to assess the marine navigational safety risks of offshore wind farms. The resulting guidelines evolved with the close co-operation of developers, government agencies, and other stakeholders in conjunction with British Maritime Technology Renewables Ltd. Extensive consultation and research was done to ensure that the methodology is robust, verified, auditable and accountable in various contexts. The guidelines present a template to be used by developers in preparing their navigation risk assessments, and for government departments to help in the assessment of these. The methodology focuses on risk controls and the feedback from risk controls into risk assessment. It requires developers to show that sufficient risk controls are, or will be, in place before the assessed risk would be considered as broadly acceptable or tolerable with possible further controls or actions.

167. U.K. Energy Research Centre. 2009. UKERC Spatial Planning for Marine Renewable Energy Arrays Workshops. Paper read at [Workshop on] Marine Planning for Arrays: Social, economic and environmental issues and implications, [and Workshop on] Marine spatial planning for the deployment of arrays, at Edinburgh. Edinburgh: 58 pp.  
Available from: [http://www.ukerc.ac.uk/support/tiki-download\\_file.php?fileId=279](http://www.ukerc.ac.uk/support/tiki-download_file.php?fileId=279)

Detailed guidelines are presented concerning interactions between offshore renewable energy installations and navigation. They include information on the visibility and appearance of wind farms, the effects of wind turbines on routing options, suggested spacing of turbine, potential impact on the seabed, effects on communications and navigation systems, and possible rotor effects. Guidelines for installations include methods for fixing these to the seabed and possible impacts on mariners. There is also discussion about safety zones or exclusion zones around offshore renewable energy installations.

168. U.K. Maritime and Coastguard Agency. 2008a. *Offshore renewable energy installations (OREIS): Guidance to mariners operating in the vicinity of UK OREIS*. Southampton: Department for Transport. 12 pp.  
Available from: <http://www.mcga.gov.uk/c4mca/mgn372.pdf>

These guidelines highlight issues that need to be taken into consideration when assessing the impact on navigational safety from offshore renewable energy developments. The recommendations are directed at developers. Emphasis is on siting, structures from safety and navigation perspectives and communications. A template for assessing distances between wind farm boundaries and shipping

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routes is described. Safety and mitigation measures are recommended for the construction, operation and decommissioning process. Standards and procedures for generator shutdown and other operational requirements are outlined in the event of a search and rescue operations or a pollution or salvage incident.

169. ----- . 2008b. *Offshore renewable energy installations (OREIS) - guidance on UK navigational practice, safety and emergency response issues*. London, U.K.: Department for Transport. 17 pp.  
Available from: <http://www.mcga.gov.uk/c4mca/mgn371-2.pdf>

This is a detailed guidance about Offshore Renewable Energy installations (OREIs) and navigation issues. Contains five annexes addressing: considerations on site position, structures and safety zones; navigation, collision avoidance and communications; an MCA template for assessing distances between wind farm boundaries and shipping routes; safety and mitigation measures recommended for OREI during construction, operation and decommissioning; and 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 OREI.

170. U.S. Coast Guard. 2009. *U.S. Coast guard assessment of potential impacts to marine radar as it relates to marine navigation safety from the Nantucket Sound wind farm as proposed by Cape Wind, LLC*. Washington, D.C.: U.S. Coast Guard. 16 pp.  
Available from:  
<http://www.mms.gov/offshore/RenewableEnergy/PDFs/USCGRADARfindingsandrecommendationsFINAL.pdf>

The U.S. Coast Guard's assessment found that the proposed Cape Wind project would have a moderate impact on navigation safety, but sufficient mitigation measures are available to reduce risk to acceptable levels. It also observed that the project would have a negligible or no adverse impact on U.S. Coast Guard missions, and may in some circumstances actually facilitate the prosecution of certain missions. This document addresses a number of concerns identified by boaters who use Nantucket Sound including competition with commercial fishing and marine transportation.

171. U.S. Commission on Ocean Policy. 2004. *An ocean blueprint for the 21st century : Final report*. Washington, D.C.: U.S. Commission on Ocean Policy. 8 volumes  
Available from:  
[http://oceancommission.gov/documents/full\\_color\\_rpt/welcome.html](http://oceancommission.gov/documents/full_color_rpt/welcome.html)

Thirty-five years ago, the Stratton Commission comprehensively reviewed the U.S. management of the oceans, coasts, and Great Lakes. In that time, significant changes have occurred in uses of marine assets and general understanding of the consequences of these uses. This report provides a blueprint for change in the 21st

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- century, with recommendations for creation of an effective national ocean policy that ensures sustainable use and protection of our oceans, coasts, and Great Lakes for today and far into the future. It should be read in conjunction with the Pew Commission Report (Pew 2003).
172. ----- . 2004. Managing offshore energy and other mineral resources. In *An ocean blueprint for the 21st century: Final report*. Washington, D.C.: U.S. Commission on Ocean Policy. pp. 352-370.  
Available from:  
[http://oceancommission.gov/documents/full\\_color\\_rpt/24\\_chapter24.pdf](http://oceancommission.gov/documents/full_color_rpt/24_chapter24.pdf)
173. U.S. Department of Energy, Energy Efficiency & Renewable Energy, and Wind and Hydropower Technologies Program. 2009. *Report to Congress on the potential environmental effects of marine and hydrokinetic energy technologies: Prepared in response to the energy independence and security act of 2007, section 633 (b)*. Washington, D.C.: U.S. Department of Energy. 89 pp.  
Available from:  
[http://www1.eere.energy.gov/windandhydro/pdfs/doe\\_eisa\\_633b.pdf](http://www1.eere.energy.gov/windandhydro/pdfs/doe_eisa_633b.pdf)
- This Report to Congress was prepared based on peer-reviewed literature, project documents, and both U.S. and international environmental assessments of these new technologies. It focuses on potential impacts of marine and hydrokinetic technologies to aquatic, fish and fish habitats, ecological relationships, and other marine and freshwater aquatic resources. A comprehensive list of possible adverse environmental effects are identified ranging from alteration of current and wave strengths to alteration of habitats for benthic organisms to toxicity of paints. The literature points to additional potential environment effects when using ocean thermal energy conversion technologies. Mitigation approaches are also identified such as not taking a certain action or parts of an action; minimizing impacts by limiting the degree or magnitude of the actions, repairing, rehabilitating, or restoring the affected environment, and compensating for the impact by replacing or providing substitute resources or environments. Adaptive management techniques are proposed, but this focus on environmental effects and do not account for social, economic or political effects.
174. U.S. Department of the Interior. 2010. DOI's final alternative dispute resolution policy. Washington, D.C.: Office of Collaborative Action and Dispute Resolution. [web page]  
Available from: [http://mits.doi.gov/cadr/main/DOI\\_ADRPolicy.cfm](http://mits.doi.gov/cadr/main/DOI_ADRPolicy.cfm)
175. U.S. Department of the Interior. Mineral Management Service. 2007. Potential impacts of alternative energy development on the OCS and analysis of potential mitigation measures. In Programmatic Environmental Impact Statement for Alternative Energy Development and Production and Alternate Use of Facilities on the Outer Continental Shelf: Final Environmental Impact Statement. Washington, D.C.: U.S. Department of the Interior. 342 pp.

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Available from: <http://ocsenergy.anl.gov/documents/fpeis/index.cfm>

The Minerals Management Service focused the four volume EIS on marine wind, wave and current technologies and on areas in the OCS that industry expressed a potential interest in and ability to develop by 2014. Potential is expected to occur near the shore, where maximum water depth would be 100 meters (m) or less for wind and wave technologies and 500 m for ocean current technology. Chapter 5 assesses potential impact on biological and physical resources and address social issues as well. This gives a thorough listing of potential issues that must be addressed and should be referred to by anyone concerned with impacts of offshore renewable energy development. The document is organized by type of technology (wind, wave, current) with the issues listed under each. Mitigation measures are described for each issue and often refer to avoidance or compliance with existing Federal procedures. Information gathering and consultation are referenced but little is given in specifics on involvement of the public or multiple stakeholders. Even so, the articulation of issues is very useful.

176. ----- 2009. *Cape Wind Energy Project: Final environmental impact statement*. Herndon, VA: U.S. Department of the Interior. 9 pp.  
Available from:  
<http://www.mms.gov/offshore/AlternativeEnergy/PDFs/FEIS/Cape%20Wind%20Energy%20Project%20FEIS.pdf>

The proposed Cape Wind project is a wind energy facility off the coast of Massachusetts that can interconnect with and deliver electricity to the New England Power Pool. The FEIS presents the characteristics of the environment in the project area and analyzes the effects of the construction, operation and maintenance, and decommissioning of the project, consistent with the requirements of the Outer Continental Shelf Lands Act and the National Environmental Policy Act. The FEIS identified potential conflicting uses during the operational phase including commercial fishing, submarine cables, navigation dredging, vessel anchoring, sand mining, marine radar, recreational fishing and boating, air navigation and marine transportation. Mitigation for impacts is proposed.

177. U.S. Department of the Interior. Minerals Management Service. Renewable Energy and Alternate Use Program. 2006. *Technology White Paper on Wind Energy Potential on the U.S. Outer Continental Shelf*. Washington, D.C.: U.S. Department of the Interior. 16 pp.  
Available from:  
[http://ocsenergy.anl.gov/documents/docs/OCS\\_EIS\\_WhitePaper\\_Wind.pdf](http://ocsenergy.anl.gov/documents/docs/OCS_EIS_WhitePaper_Wind.pdf)

The Minerals Management Services prepared a series of white papers on offshore renewable energy technologies to prepare its alternative energy use program and rules. MMS focuses on the resource potential, technologies, associated environmental impacts and use conflicts, and economics of wind energy on the

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OCS. This paper includes a list of siting constraints where existing uses of the ocean will need to be considered in selecting OCS wind facility locations.

178. -----, 2006. *Technology White Paper on Wave Energy Potential on the U.S. Outer Continental Shelf*. Washington, D.C.: U.S. Department of the Interior. 12 pp.  
Available from:  
[http://ocsenergy.anl.gov/documents/docs/OCS\\_EIS\\_WhitePaper\\_Wave.pdf](http://ocsenergy.anl.gov/documents/docs/OCS_EIS_WhitePaper_Wave.pdf)

The Minerals Management Services prepared a series of white papers on offshore renewable energy technologies to prepare its alternative energy use program and rules. MMS focuses on the resource potential, technologies, associated environmental impacts and use conflicts, and economics of wind energy on the OCS. This paper addresses the resource potential, technologies, associated environmental impacts and use conflicts, and economics of wave energy on the OCS. Wave technologies with high freeboards may be a navigation hazard requiring lights, sound, and radar reflectors. Potential conflicts with commercial shipping and fishing and recreational boating are noted. Wave energy converters may have near field effects on wave heights that may conflict with recreational uses such as surfing.

179. ----- 2006. *Technology White Paper on Ocean Current Energy Potential on the U.S. Outer Continental Shelf*. Washington, D.C.: U.S. Department of the Interior. 7 pp.  
Available from:  
[http://ocsenergy.anl.gov/documents/docs/OCS\\_EIS\\_WhitePaper\\_Current.pdf](http://ocsenergy.anl.gov/documents/docs/OCS_EIS_WhitePaper_Current.pdf)

The Minerals Management Services prepared a series of white papers on offshore renewable energy technologies to prepare its alternative energy use program and rules. MMS focuses on the resource potential, technologies, associated environmental impacts and use conflicts, and economics of wind energy on the OCS. This paper describes the resource potential, technologies, associated environmental impacts and use conflicts, and economics of ocean current energy on the OCS. The document recommends that the siting of submerged current-driven turbines should consider shipping routes and present and anticipated commercial and recreational fishing and recreational diving. Possible mitigation would include fishery exclusion zones.

180. -----, 2006. *Technology White Paper on Solar Energy Potential on the U.S. Outer Continental Shelf*. Washington, D.C.: U.S. Department of the Interior. 14 pp.  
Available from:  
[http://ocsenergy.anl.gov/documents/docs/OCS\\_EIS\\_WhitePaper\\_Solar.pdf](http://ocsenergy.anl.gov/documents/docs/OCS_EIS_WhitePaper_Solar.pdf)

181. U.S. Department of the Interior. National Park Service. 2010. *Determination of eligibility notification*. Washington, D.C.: National Park Service. 9 pp.

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Available from:

<http://www.nps.gov/nr/publications/guidance/NantucketSoundDOE.pdf>

The Keeper of the National Register of Historic Places determined that Nantucket Sound is eligible for listing in the National Register as a traditional cultural property and as an historic and archeological property. This is the proposed site of the Cape Wind project. The Park Service states that the property has important information about the Native American exploration and settlement of Cape Cod and the Islands with the potential for more. Listing in the National Register assures that the values that make the area significant are considered in the planning of projects in which the Federal Government is involved.

182. U.S. Federal Regulatory Energy Commission, Office of Energy Projects, Division of Hydropower Licensing. 2007. *Environmental assessment for hydropower license: Makah Bay offshore wave energy pilot project: FERC project no, 12751-000*. Washington, D.C.: U.S. Federal Regulatory Energy Commission. 187 pp.

Available from:

<http://teeic.anl.gov/documents/docs/library/MakahBayOffshoreWave.pdf>

The environmental assessment of the pilot deployment of four AquaBuOYs (total 1MW) in Makah Bay, Washington concluded that licensing the project would not significantly affect the quality of the human environment. The assessment discusses siting and potential impacts on the environment and users. This siting was affected by its proximity to a national marine sanctuary, a national wildlife refuge, and tribal lands and resources. The offshore portion was mainly used for tribal and recreational fishing, recreational boating, and general marine recreation. Much of the potential conflict was mitigated by siting the offshore and onshore project components in the least sensitive areas in consultation with the tribe and other users. The document states that an exclusion zone for fishing and navigation would need to be established to protect the project and to maintain human safety. Additional requirements include monitoring for environmental effects and cultural resources, development of spill prevention and response plan, and implementation of an interpretive and education plan.

183. U.S. Government Accountability Office. 2008. *Report to the chairman, subcommittee on public lands and forests, committee on energy and natural resources, U.S. Senate: Natural Resource Management: Opportunities exist to enhance federal participation in collaborative efforts to reduce conflicts and improve natural resource conditions*. Washington, D.C.: GAO. 139 pp.

Available from:

<http://mits.doi.gov/cadr/main/GAO08262NaturalResourceManagement.pdf>

This review presents positive perspectives on the use of collaborative resource management involving public and private stakeholders in natural resource decisions. Benefits include reduced conflict and litigation and improved natural resource conditions. A number of collaborative practices, such as seeking

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inclusive representation, establishing leadership, and identifying a common goal among the participants are crucial to successful efforts. Success` is often judged by whether they increase participation and cooperation or improve natural resource conditions. Many experts also note that there are limitations to the approach, such as the time and resources it takes to bring people together to work on a problem and reach a decision.”

184. U.S. Institute for Environmental Conflict Resolution. 2005. *Final report of the national environmental conflict resolution advisory committee*. Tucson, AZ: U.S. Institute for Environmental Conflict Resolution of the Morris K. Udall Foundation. 186 pp.

Available from: <http://www.ecr.gov/Resources/NEPAECR.aspx>

In 2000, a bipartisan group of U.S. Senators asked the Institute to examine strategies for using collaboration, consensus building, and dispute resolution to achieve the goals of the National Environmental Policy Act of 1969 and to assist with resolution of environmental policy issues. This report extensively documents various conflict resolution initiatives and programs, opportunities, barriers and lessons learned.

185. UMass Boston Planning Frameworks Team, and Massachusetts Ocean Partnership. 2009. *Compatibility determination: Considerations for siting coastal and ocean uses (draft)*. Boston: Massachusetts Ocean Partnership. 33 pp.

Available from:

[http://commpres.env.state.ma.us/mop/draft\\_plan/tech\\_reports/compatibility\\_determination.pdf](http://commpres.env.state.ma.us/mop/draft_plan/tech_reports/compatibility_determination.pdf)

This draft report is one of several to support the Massachusetts Executive Office of Energy and Environmental Affairs in its development of the integrated coastal ocean management plan mandated by the Massachusetts Oceans Act of 2008. It is anticipated that the plan will identify appropriate locations and siting consideration for uses of the ocean and coastal zones. The draft report employs a matrix system to organize and help evaluate compatibility of different ocean and coastal uses. The matrix headings include spatial and temporal considerations, and examples of siting standards and compensation/mitigation conditions. While the draft report is not focused on conflict, the information contained in it is an excellent resource for planning facility siting to avoid or constructively address potential conflicts. (See Massachusetts Ocean Partnership 2009 and Executive Office of Energy Environmental Affairs 2010.)

186. Wainger, L. A., and J. W. Boyd. 2009. Valuing ecosystem services. In *Ecosystem-based management for the oceans*, edited by K. L. McLeod and H. Leslie. Washington, D.C.: Island Press.

Available from: <http://bit.ly/dc8nwr>

Wainger and Boyd state that the concept of ecosystem service accounting is not a

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panacea to achieving ecosystem-based management. They suggest its utility to bring together technical and social information to move beyond cost-benefit accounting. Ecosystem service accounting provides a context for disparate stakeholders to focus on shared goals and work at cross-jurisdictional scales to achieve ecosystem-based management. They analyze the criteria for the complex task of developing a comprehensive economic accounting framework for valuing ecosystem services. They conclude that the lack of this valuation limits public policy analysis of ecosystem. Economics can help identify, prioritize, and choose actions if the consequences are recognized. The authors urge consideration of causal connections between use and policy choices and ecosystem services.

187. Warwick Energy, Thanet Offshore Wind Ltd., and Royal Haskoning. 2005. *Thanet offshore wind farm environmental statement: Non-technical summary*. Wellesbourne, U.K.: Warwick Energy. 12 pp.  
Available from: <http://www.warwickenergy.com/pdf/ThanetNTSlr.pdf>
188. Weiss, J. C., B. B. Boehlert, and R. E. Unsworth. 2007. *Assessing the Costs and Benefits of Electricity Generation Using Alternative Energy Resources on the Outer Continental Shelf: Final report*. Herndon, VA: Department of the Interior, Minerals Management Service. 67 pp.  
Available from:  
[http://ocsenergy.anl.gov/documents/docs/final\\_synthesis\\_report.pdf](http://ocsenergy.anl.gov/documents/docs/final_synthesis_report.pdf)

The authors present an analysis of the benefits and costs of offshore renewable energy projects. They include an analysis of the electric power market and the state of technological development for various types. Categorized benefits and costs focus on those that are market "externalities," i.e., those with a benefit or cost to society but that is not part of the pricing of electricity. These include socioeconomic externalities such as impacts on tourism and recreational opportunities, commercial fishing, and visual impacts.

189. West Coast Governors. 2009. West Coast governors' agreement on ocean health. State of California, State of Oregon, State of Washington. [web page]  
Available from: <http://westcoastoceans.gov/>

In 2006 the Governors of California, Oregon and Washington announced the West Coast Governors' Agreement on Ocean Health. The Agreement launches a new, proactive regional collaboration to protect and manage the ocean and coastal resources along the entire west coast of the lower U.S. as called for in the recommendations of the U.S. Commission on Ocean Policy and the Pew Oceans Commission. The Agreement seeks to advance the following goals: clean coastal waters and beaches, healthy ocean and coastal habitats, effective ecosystem-based management, reduced impacts of offshore development, increased ocean awareness and literacy among the region's citizens, expanded ocean and coastal scientific information, research, and monitoring, sustainable economic development of coastal communities.

## APPENDIX B – ANNOTATED BIBLIOGRAPHY

190. Whittaker, D., B. Shelby, R. Bowers, J. Harn, S. Rosebrough, R. Thapaliya, and R. Thoreson. 2010. *Hydrokinetic energy projects and recreation: A guide to assessing impacts*. National Park Service, Department of Energy and Hydropower Reform Coalition. [web page]  
Available from: <http://www.hydroreform.org/hydroguide/hydrokinetic-recreation>

The authors provide guidance on how to study impacts on recreation caused by new hydropower technologies such as river currents and wave energy. They consider ways to minimize adverse ones. Possible impacts include the loss of or restricted access, displacement of user groups, changes in aesthetics, changes in wave or hydraulic characteristics, habitat damage or pollution caused by deterioration or destruction of physical installations, effects on recreation-relevant wildlife, and cumulative effects. Three protection strategies could mitigate impacts on recreation: identify sensitive and non-sensitive areas, modify designs to reduce impact and develop off-site mitigation where appropriate. They emphasize the importance stakeholders being involved throughout the licensing process by identifying areas of concern, proposing studies, commenting on proposals, recommending various measure to improve the proposals, and challenging FERC decisions through the appeals process. This report provides a solid examination of the possible effects of hydrokinetic projects in marine and terrestrial settings on recreational uses of the same.

191. Wiersma, J. 2008. *An economic analysis of mobile gear fishing within the proposed wind energy generation facility site on Horseshoe Shoal in Nantucket Sound*. Massachusetts Fishermen's Partnership Inc. 71 pp.  
Available from: <http://www.mass-fish.org/social-wind.html>

Wiersma is the fisheries economist for the Massachusetts Fishermen's Partnership presents a thorough economic analysis of two wind farm scenarios - one excluding commercial trawling and the other allowing it. This study was done in response to perceived shortcomings of the Cape Wind's Final Environmental Impact Report that concluded that there would be no economic impact on the commercial fishing industry of Nantucket Sound. The author discusses the nature of the current fishing effort and its value, best management practices to avoid conflict, and areas of concern for commercial fishermen. These alter include loss of income, increased insurance costs, altered historic fishing patterns and exclusion from traditional ground. The author suggests that conflict could have been avoided if communication has been properly initiated through the planning process.

192. Ziza, I. 2008. Siting of renewable energy facilities and adversarial legalism: Lessons from Cape Cod. *New England Law Review* 42:591-629.

Ziza analyzes administrative and judicial challenges and opposition to Cape Wind project, a 180-turbine offshore wind farm proposed for construction in Federal

## APPENDIX B – ANNOTATED BIBLIOGRAPHY

waters close to Massachusetts' Cape Cod and the islands of Martha's Vineyard and Nantucket. This is an analysis of the Cape Wind controversy from a legal perspective. The author discusses the role of environmental nonprofits, access to the courts, level of organization of stakeholders, role of property owners, aesthetics, legal or institutional frameworks and analyses, and the NIMBY phenomenon.



## APPENDIX C: SUMMARY AND DESCRIPTION OF GEOSPATIAL DATA SOURCES

### C.1 Data Sources Included in Project Geodatabase

Table C-1 summarizes the data sources that provided data for the full study area. The table also includes information on the team's point of contact and (if applicable) a description on further processing required in generating the geospatial data product. For example, in cases where the team obtained raw tabular data files, the table explains the process for integrating the information into the final spatial format included in the geodatabase. For additional detail on creation of the data, see the respective metadata records.

The majority of available data are specific to one of the coasts or a smaller region (e.g., waters off of a particular state). Tables C-2 and C-3 summarize data sources for information specific to each of the coasts.

**APPENDIX C – GEOSPATIAL DATA SOURCES**

Table C-1

Summary of Data Sources Covering the Full Study Area

Data	Contact Name And E-Mail	Geodatabase Location	Processing Description (If Applicable)
FEDERAL DATA SOURCES			
NOAA and BOEM			
Multipurpose Marine Cadastre (MMC) Data	Andrew Krueger, BOEM	Full Study Area, East Coast, West Coast	NA
NOAA National Ocean Service (NOS), Office of Coast Survey (OCS)			
ENcDirect Data – NOAA’s Electronic Navigational Charts	Website: <a href="http://ocs-spatial.ncd.noaa.gov/encdirect/viewer.htm">http://ocs-spatial.ncd.noaa.gov/encdirect/viewer.htm</a>	East Coast, West Coast	NA
NOAA National Ocean Service, Office of Response and Restoration, Hazardous Materials Response Division			
Environmental Sensitivity Index	Website: <a href="http://response.restoration.noaa.gov/">http://response.restoration.noaa.gov/</a>	East Coast, West Coast	NA
United States Coast Guard			
Automated Information System (AIS)	Jaime Rickerson ( <a href="mailto:Jamie.I.rickerson@uscg.mil">Jamie.I.rickerson@uscg.mil</a> ) and official online request system: <a href="http://www.navcen.uscg.gov/enav/ais/historical_data_request.htm">http://www.navcen.uscg.gov/enav/ais/historical_data_request.htm</a>	Full Study Area	The raw AIS data were processed by importing the ASCII text file into a PostgreSQL/PostGIS database one day at a time. A subset of only the vessels that were underway was extracted from the data. The latitude/longitude values in the AIS data were used to generate the spatial location for each record. This location information was then overlaid onto a 5nm grid with only one unique value per vessel per grid cell counted. The count of vessels for the day was then added to the grid cell. This process was repeated for each day of the month. After the whole month was processed the counts for each of the days was added to give the total count for the month. The counts for the month were then added to obtain the counts for the quarter.

**APPENDIX C – GEOSPATIAL DATA SOURCES**

Table C-1

Summary of Data Sources Covering the Full Study Area (cont.)

Data	Contact Name And E-Mail	Geodatabase Location	Processing Description (If Applicable)
United States Army Corps of Engineers			
US Army Corps of Engineers Dredge Disposal areas (USACE_DredgeDisposal_FullStudy)	US Army Corps of Engineers Ocean Disposal Database <a href="http://el.erdc.usace.army.mil/odd/">http://el.erdc.usace.army.mil/odd/</a>	Full Study Area	Downloaded geographic information system (GIS) shapefiles from <a href="http://el.erdc.usace.army.mil/odd/">http://el.erdc.usace.army.mil/odd/</a> . Identified 10 unique shapefiles and combined them to create the comprehensive USACE_DredgeDisposal_FullStudy shapefile.
OTHER DATA SOURCES			
iBoattrack			
Recreational 2010 Sailboat races: Newport to Bermuda, Provincetown schooner, Stonington to Boothbay	Raw data provided to Dan Hellin by iBoattrack.	East Coast, West Coast	Obtained csv file containing periodic latitude/longitude of vessels during available races. The study team created a shapefile using the XY coordinates and the metadata record.
PaCOOS			
Data includes critical habitats, dredge disposal areas, marine managed areas, marine sanctuaries, state parks, wildlife refuges, cities and wave energy permit sites	Pacific Coast Ocean Observing System (PaCOOS) West Coast Habitat Server <a href="http://pacoos.coas.oregonstate.edu/datasets.html">http://pacoos.coas.oregonstate.edu/datasets.html</a>	Full Study Area	NA

**APPENDIX C – GEOSPATIAL DATA SOURCES**

Table C-2

Summary of Data Sources Covering the East Coast Study Area

Data	Contact Name And E-Mail	Processing Description (If Applicable)
<b>FEDERAL DATA SOURCES</b>		
National Marine Fisheries Service – Northeast Regional Office		
Northeast Fishing Vessel Trip Reporting Program (VTR)	John Witzig <a href="mailto:John.Witzig@noaa.gov">John.Witzig@noaa.gov</a> 55 Great Republic Drive, Gloucester MA	Received non-confidential data in .csv files from the Northeast Regional Office of the National Marine Fisheries Service. NMFS staff produced the data by aggregating individual Vessel Trip Report records by month of activity, fishing gear category, and location of activity. The study team imported the.csv files into a Microsoft Access database with separate tables for specific gear types and season of activity. The number of trips for the larger areas (up to and including one degree squares) were evenly distributed over the appropriate ten minute square areas to estimate trip activity in State and Federal waters based on information fishermen report to the Federal Vessel Trip Report (VTR) system. The team then assigned each ten minute square a center latitude/longitude and spatially joined the total number of trips with the ten minute grid shapefile to create this file.
Northeast Commercial Closure and Rolling Closure Areas	Brett Alger <a href="mailto:Brett.Alger@noaa.gov">Brett.Alger@noaa.gov</a>	NOAA Fisheries Service, Northeast Regional Office NMFS posted latitude and longitude and maps of closure areas on the Internet. The study team created a shapefile using the XY coordinates of the closure areas and created the metadata record.

Table C-2

Summary of Data Sources Covering the East Coast Study Area (cont.)

Data	Contact Name And E-Mail	Processing Description (If Applicable)
National Marine Fisheries Service – Southeast Fisheries Science Center		
Southeast Commercial Fishing Logbook	Kevin McCarthy <a href="mailto:kevin.j.mccarthy@noaa.gov">kevin.j.mccarthy@noaa.gov</a>	Raw, non-confidential data provided to the study team in .csv format by Kevin McCarthy of the Southeast Fisheries Science Center (SEFSC). These data were provided in cumulative form and aggregated by season, gear type, and one degree grid area, which is the native spatial resolution of the self-reported logbook data. Areas where less than three vessels were marked as less than three to differentiate from no vessels (note: less than three vessels may be fishing in that one degree area repeatedly but those data are considered confidential). The study team imported the .csv file format data into an MS Access Database with separate tables for specific gear types and season of activity. Each degree latitude/longitude area was then assigned to a center coordinate and spatially joined to the degree square grid along with the total number of vessels and trips to create this file.

**APPENDIX C – GEOSPATIAL DATA SOURCES**

Table C-2

Summary of Data Sources Covering the East Coast Study Area (cont.)

Data	Contact Name And E-Mail	Processing Description (If Applicable)
NOAA Fisheries – Office of Science and Technology		
Recreational Fishing – Marine Recreational Fisheries Statistics Survey (MRFSS) – Shoreline Anglers Survey	Tom Sminkey <a href="mailto:tom.sminkey@noaa.gov">tom.sminkey@noaa.gov</a>	Raw survey data (recreational angler estimates) were provided to the study team by Tom Sminkey of the Fisheries Statistics Division of NMFS. Survey responses were aggregated by month and by weekday and weekend for each site. The study team integrated these data in an Access Database to create annual estimates of anglers per site for each of the three fishing types (shore mode, rental/private boat and charter boats). The study team then created this layer based on the latitude and longitudes of the sites. The metadata was created based on information provided by Tom Sminkey at the Fisheries Statistics Division.
United States Environmental Protection Agency		
US EPA Region 4 maintained dredge disposal areas: Canaveral, FL, Palm Beach, FL, and Savannah, SC	Christopher McArthur, EPA Region 4 <a href="mailto:Mcarthur.Christopher@epamail.epa.gov">Mcarthur.Christopher@epamail.epa.gov</a>	NA
National Marine Protected Areas Center		
New Hampshire and Southern Maine Ocean Uses Atlas Non-Consumptive Sector, Fishing Sector, Industrial and Military Sector	New Hampshire and Southern Maine Ocean Uses Atlas <a href="http://www.mpa.gov/dataanalysis/atlas_nhsm/">http://www.mpa.gov/dataanalysis/atlas_nhsm/</a>	NA

APPENDIX C – GEOSPATIAL DATA SOURCES

Table C-2

Summary of Data Sources Covering the East Coast Study Area (cont.)

Data	Contact Name And E-Mail	Processing Description (If Applicable)
STATE DATA SOURCES		
Maine		
Maine Coast Molluscan shellfish datasets	Downloaded from Maine Department of Marine Resources/Maine Office of Geographic Information Systems: <a href="http://megis.maine.gov/catalog/catalog.asp">http://megis.maine.gov/catalog/catalog.asp</a>	NA
Massachusetts		
Numerous Massachusetts datasets including: Public Access points; LNG lines, Cape Wind permit; artificial reefs; dive sites; dredge sites; cables; tidal projects; boating; fishing, etc.	Massachusetts Office of Coastal Zone Management – MORIS downloads: <a href="http://www.mass.gov/mgis/">http://www.mass.gov/mgis/</a> and NROC	NA
Rhode Island		
Numerous Rhode Island datasets including: cables, fisheries information, research, recreation and vessel density (AIS).	Rhode Island SAMP downloads: <a href="http://www.narrbay.org/d_projects/oceansamp/">http://www.narrbay.org/d_projects/oceansamp/</a>	NA
New Jersey		
Sportfishing	Downloaded from NJ Department of Environmental Protection at: <a href="http://www.state.nj.us/dep/gis//digidownload/meta/data/statewide/sportfishing.htm">http://www.state.nj.us/dep/gis//digidownload/meta/data/statewide/sportfishing.htm</a>	NA
South Carolina		
Artificial Reefs, Wildlife Management Areas, Military Facilities, Refuges	Layers downloaded layers from South Carolina Department of Natural Resources site: <a href="http://www.dnr.sc.gov/GIS/qisdnrdata.html">http://www.dnr.sc.gov/GIS/qisdnrdata.html</a>	NA

**APPENDIX C – GEOSPATIAL DATA SOURCES**

Table C-2

Summary of Data Sources Covering the East Coast Study Area (cont.)

Data	Contact Name And E-Mail	Processing Description (If Applicable)
North Carolina		
Artificial Reef Locations	Jim Francesconi ( <a href="mailto:jim.francesconi@ncdenr.gov">jim.francesconi@ncdenr.gov</a> )	A PDF file with data tables containing location names, latitudes, and longitudes were exported to Excel. Excel XY file was imported into ArcGIS and converted into a shapefile.
Georgia		
Artificial Reefs	Layers downloaded from Georgia Department of Natural Resources website: <a href="http://crd.dnr.state.ga.us/content/displaynavigation.asp?TopCategory=32">http://crd.dnr.state.ga.us/content/displaynavigation.asp?TopCategory=32</a>	A PDF file with data tables containing location names, latitudes, and longitudes were exported to Excel. Excel XY file was imported into ArcGIS and converted into a shapefile.
Florida		
Numerous Florida datasets including: Marine facilities; artificial reefs, lobster sanctuaries, shipwrecks and obstructions, managed areas, anchorages, right whale critical habitats, hardbottom coral, and sensitive areas	Layers downloaded from Florida Fish and Wildlife Conservation Commission and Florida Fish and Wildlife Research Institute sites: <a href="http://atoll.floridamarine.org/Data/Metadata/SDE_Current/marine_facilities_fl_point.htm">http://atoll.floridamarine.org/Data/Metadata/SDE_Current/marine_facilities_fl_point.htm</a> AND <a href="http://ocean.floridamarine.org/mrgis/Description_Layers_Marine.htm">http://ocean.floridamarine.org/mrgis/Description_Layers_Marine.htm</a>	NA

Table C-2

Summary of Data Sources Covering the East Coast Study Area (cont.)

Data	Contact Name And E-Mail	Processing Description (If Applicable)
OTHER DATA SOURCES		
Atlantic Coastal Cooperative Statistics Program		
Commercial Fisheries Data for State and Federal waters, Information on gear used to target specific species.	Julie Marie Defilippi julie.defilippi@accsp.org	Data provided .csv and MS Excel files containing data on fishery activity by NMFS statistical area. The study team imported the data into an MS Access Database. Visual Basic code was used to develop a list of species caught within each statistical area and by each gear category. Each statistical area data record was joined to the corresponding Statistical area shapefile.
NROC		
Marine Farms, VMS lines, Danger Restricted Areas, LNG sites, Unexploded Ordinance Areas and Locations, and Disposal Sites	Northeast Regional Ocean Council (NROC) website download. Includes information from U.S. Coast Guard, MORIS, NOAA Coastal Services, and US Army Corps of Engineers	NA

**APPENDIX C – GEOSPATIAL DATA SOURCES**

Table C-3

Summary of Data Sources Covering the West Coast Study Area

Data	Contact Name And E-Mail	Processing Description (If Applicable)
<b>FEDERAL DATA SOURCES</b>		
NOAA National Marine Protected Areas Center		
California Ocean Uses Atlas - California human use data generated from stakeholder outreach, including data on fishing, non-consumptive and industrial uses	Mimi D'Iorio <a href="mailto:mimi.diorio@noaa.gov">mimi.diorio@noaa.gov</a>  Shapefiles downloaded from <a href="http://www.mpa.gov/dataanalysis/atlas/">http://www.mpa.gov/dataanalysis/atlas/</a>	NA
National Marine Protected Areas Inventory	Shapefile downloaded from <a href="http://www.mpa.gov/dataanalysis/mpainventory/">http://www.mpa.gov/dataanalysis/mpainventory/</a>	NA
National Atlas		
Native American lands of the United States (on land only, but to indicate proximity to potential tribal stakeholders)	Shapefile downloaded from <a href="http://nationalatlas.gov/">http://nationalatlas.gov/</a>	NA
NOAA National Marine Fisheries Service Northwest Regional Office (NMFS)		
Groundfish closed areas - recreational rockfish and yelloweye rockfish conservation areas	<a href="http://www.nwr.noaa.gov/Groundfish-Halibut/Groundfish-Fishery-Management/Groundfish-Closed-Areas/Index.cfm">http://www.nwr.noaa.gov/Groundfish-Halibut/Groundfish-Fishery-Management/Groundfish-Closed-Areas/Index.cfm</a>	Created shapefiles for recreational rockfish and yelloweye rockfish conservation area boundaries using tabular data obtained from NMFS's groundfish fishery management data available online, specifically: <a href="http://www.nwr.noaa.gov/Groundfish-Halibut/Groundfish-Fishery-Management/Groundfish-Closed-Areas/Index.cfm#CP_JUMP_30272">http://www.nwr.noaa.gov/Groundfish-Halibut/Groundfish-Fishery-Management/Groundfish-Closed-Areas/Index.cfm#CP_JUMP_30272</a> and <a href="http://www.nwr.noaa.gov/Groundfish-Halibut/Groundfish-Fishery-Management/Groundfish-Closed-Areas/Index.cfm#CP_JUMP_30276">http://www.nwr.noaa.gov/Groundfish-Halibut/Groundfish-Fishery-Management/Groundfish-Closed-Areas/Index.cfm#CP_JUMP_30276</a> . Excel XY files were imported into ArcGIS and converted into a shapefile.

Table C-3

Summary of Data Sources Covering the West Coast Study Area (cont.)

Data	Contact Name And E-Mail	Processing Description (If Applicable)
STATE DATA SOURCES		
Washington		
Washington's Public Beach Access Database, created by a NOAA Fellow over 2 years (2008-2010), includes all beach access locations and many attributes, including whether they are used for surfing.	Washington Department of Ecology Liz O'Dea, <a href="mailto:lode461@ecy.wa.gov">lode461@ecy.wa.gov</a> emailed a draft version 6/30/2011 for the purposes of this inventory. They are still working on improving the data dictionary and other components of the metadata, an updated version may be downloaded from their website in the future.	NA
Artificial reefs of Puget Sound	Washington Department of Fish and Wildlife (WDFW) Wayne A. Palsson (Research Scientist 2), <a href="mailto:wayne.palsson@dfw.wa.gov">wayne.palsson@dfw.wa.gov</a> provided multiple shapefiles which OSU improved by combining them, adding a 'Type' attribute and creating metadata.	In response to the study team's request for assistance in obtaining artificial reef data for Washington State, Mr. Palsson provided two word documents containing latitude and longitude coordinates of (1) WDFW Artificial Reefs (most of which were constructed during the 1970s and 1980s) (2) Artificial reefs made of tire bundles by the Washington Department of Natural Resources and local authorities, (positions approximate and with the caveat that private citizens may have unofficially made underwater structures of their own without permits). Eager to help, he then sent shapefiles as well, two days later. The study team improved the shapefiles by combining them, adding a 'Type' attribute to distinguish between the two types of reefs and created metadata.
Boat launch and moorage sites of Washington	Washington Recreation and Conservation Office (WA RCO) Rebecca Connolly, <a href="mailto:rebecca.connolly@rco.wa.gov">rebecca.connolly@rco.wa.gov</a>	NA

**APPENDIX C – GEOSPATIAL DATA SOURCES**

Table C-3

Summary of Data Sources Covering the West Coast Study Area (cont.)

Data	Contact Name And E-Mail	Processing Description (If Applicable)
Kelp habitat	Washington State Department of Natural Resources (WA DNR) <a href="http://fortress.wa.gov/dnr/app1/dataweb/dm/matrix.html">http://fortress.wa.gov/dnr/app1/dataweb/dm/matrix.html</a>	NA
Oregon		
Data included dumpsites, kelp habitat, towlanes, wells, recreational fishing, renewable energy, Ecotrust commercial and noncommercial fishing valuation, marine reserves and research areas	Oregon Department of Land Conservation and Development (OR LCD) - Oregon Coastal Management Program's Oregon Ocean Information Website ( <a href="http://www.oregonocean.info">http://www.oregonocean.info</a> ) (formerly known as Oregon Coastal Atlas) now houses data for Oregon MarineMap, which was provided by Tanya Haddad (Coastal Atlas Administrator), <a href="mailto:tanya.haddad@state.or.us">tanya.haddad@state.or.us</a> - Nearshore Research Inventory Project (Kate Sherman, College of Oceanic Atmospheric Science, Oregon State University for OR LCD), <a href="mailto:ksherman@coas.oregonstate.edu">ksherman@coas.oregonstate.edu</a>	NA

Table C-3

Summary of Data Sources Covering the West Coast Study Area (cont.)

Data	Contact Name And E-Mail	Processing Description (If Applicable)
<p>Non-confidential commercial logbook data for the years 1996-2009 in 10 minute blocks for Washington, Oregon and Northern California.</p>	<p>Maggie Sommer (Data &amp; Technical Services), <a href="mailto:maggie.sommer@state.or.us">maggie.sommer@state.or.us</a> and Mark Karnowski (Commercial fisheries data coordinator), <a href="mailto:mark.d.karnowski@state.or.us">mark.d.karnowski@state.or.us</a> Oregon Department of Fish and Wildlife (ODFW)</p>	<p>Mark Karnowski emailed an excel shapefile of commercial logbook data for the years 1996-2009 in 10 minute blocks for Washington, Oregon and Northern California. All records represent the effort of at least three vessels for the specific species caught. Data includes Nearshore Logbooks: 2005-2009, Shrimp Logbooks: 1996-2009 and Sardine Logbooks: 2008-2009. Data were imported to Microsoft Access and prepared for GIS - confidential records that had no coordinates were removed and codes were replaced with corresponding names. The coordinates in the resulting table were used to create a point shapefile of the grid centroids. A Spatial Join (Analysis tools -&gt; Overlay) was then used to join the point shapefile to the empty grid shapefile (provided by ODFW).</p>
<p>Beach access points</p>	<p>Oregon Geospatial Enterprise Office (GEO) <a href="http://www.oregon.gov/DAS/EISPD/GEO/sdlibrary.shtml">http://www.oregon.gov/DAS/EISPD/GEO/sdlibrary.shtml</a></p>	<p>NA</p>

**APPENDIX C – GEOSPATIAL DATA SOURCES**

Table C-3

Summary of Data Sources Covering the West Coast Study Area (cont.)

<b>Data</b>	<b>Contact Name And E-Mail</b>	<b>Processing Description (If Applicable)</b>
Surf spots	Oregon SeaGrant Christopher S. Eardley (Marine Resource Management Program, OSU), <a href="mailto:ceardley@coas.oregonstate.edu">ceardley@coas.oregonstate.edu</a> worked with Dr. Flaxen Conway to publish the report “Oregon’s Non-Consumptive Recreational Ocean User Community: Understanding an Ocean Stakeholder” which includes survey results for surfing locations in Oregon, which he is working on digitizing. Chris provided a draft shapefile for the purposes of this inventory; the completed shapefile may be obtained Fall 2011 by emailing him directly.	NA

Table C-3

Summary of Data Sources Covering the West Coast Study Area (cont.)

Data	Contact Name And E-Mail	Processing Description (If Applicable)
California		
Commercial fishing logbook data; Artificial Reefs; Surf spots; Kelp Habitat; Marine Protected Areas	California Department of Fish and Game (CDFG) - Layers downloaded from GIS clearinghouse ( <a href="http://www.dfg.ca.gov/biogeodata/gis/clearinghouse.asp">http://www.dfg.ca.gov/biogeodata/gis/clearinghouse.asp</a> ) - Landings data provided in tabular format by Jana Robertson (Management Services Technician, Marine Fisheries Statistical Unit), <a href="mailto:jroberts@dfg.ca.gov">jroberts@dfg.ca.gov</a> - Artificial reef and surf spots provided by Laura McGarvie (GIS Specialist, Pacific States Marine Fisheries Commission), <a href="mailto:LMcGarvie@dfg.ca.gov">LMcGarvie@dfg.ca.gov</a>	Jana Robertson provided a spreadsheet of 2005 - 2009 summary logbook data for the State of California by year and block for all species and gears. Because the data were unwieldy in their raw form, the 52 gear codes were grouped into 5 categories following discussion with Flaxen Conway and Carrie Pomeroy (crab pot, other, trap/hook and line, trawl, troll). Python code was used to group the data into the 5 categories and list the species caught in each block in each year using that gear type (e.g. in Block 134 in 2005, of the trolling gear types pacific mackerel and chinook salmon were caught, so these two records are collapsed to one that lists both species). When the 5 years were combined for each gear group, the values were not aggregated, so that the shapefiles have overlapping data, preserving the species caught with that gear group in each year. The block codes were used to join the tabular data with the grid (provided) to produce the 5 resulting grid shapefiles.
OTHER DATA SOURCES		
California Wreck Divers		
Artificial reefs/Shipwreck location	California Wreck Divers <a href="http://www.cawreckdivers.org/Wrecks/Yukon.htm">http://www.cawreckdivers.org/Wrecks/Yukon.htm</a>	Coordinates for an Artificial Reef (purposely sunken ship) off of Mission Bay, San Diego, CA were obtained from the organization website, inserted into an excel spreadsheet, and used to create a shapefile.

**APPENDIX C – GEOSPATIAL DATA SOURCES**

Table C-3

Summary of Data Sources Covering the West Coast Study Area (cont.)

Data	Contact Name And E-Mail	Processing Description (If Applicable)
MarineMap Consortium		
Consumptive use, non-consumptive use, cultural, management and marine protected areas	Connection information for their ArcSDE geodatabase was obtained from <a href="http://marinemap.org/">http://marinemap.org/</a> and data were downloaded directly. Worked with Colin Ebert (Research Scientist / GIS Specialist, Database/Systems Administrator), <a href="mailto:ebert@marinemap.org">ebert@marinemap.org</a> and Laura McGarvie (GIS Specialist), <a href="mailto:LMcGarvie@dfg.ca.gov">LMcGarvie@dfg.ca.gov</a> to resolve issues with metadata for individual files.	NA
The Nature Conservancy		
Protected Areas in the Pacific Northwest	Obtained from The Nature Conservancy	NA
Not state-specific		
Conservation data and commercial groundfish trawl logbook data	Pacific States Marine Fisheries Commission (PSMFC) - Pacific Coast Marine Habitat Program <a href="http://marinehabitat.psmfc.org/">http://marinehabitat.psmfc.org/</a> A data portal for data collected for the Pacific Coast Groundfish Essential Fish Habitat Environmental Impact Statement (EFH EIS) - Pacific Fisheries Information Network (PacFIN) Coastwide Groundfish Trawl Logbook was provided in tabular form by Brad Stenberg (PacFIN Program Manager), <a href="mailto:brad_stenberg@psmfc.org">brad_stenberg@psmfc.org</a>	PSMFC/PacFIN provided summary groundfish trawl logbook data to indicate fishing activity for 2005-2009 for Washington, Oregon and California in text files. The 5 text files (one for each year 2005-2009) were imported to Microsoft Access and aggregated in a single table. The species and gear codes were translated to plain English, and tables were exported by species management group for use in GIS. Coordinates in the data were used to create point shapefiles of the grid centroids. ET Geowizard's "Points to Rectangles" tool was then used to create a 10 minute grid with each point layer as the input for the grid centroids. Note that grids overlap in order to preserve original data.

**APPENDIX C – GEOSPATIAL DATA SOURCES**

Table C-3

Summary of Data Sources Covering the West Coast Study Area (cont.)

Data	Contact Name And E-Mail	Processing Description (If Applicable)
<p>West Coast Offshore Vessel Traffic Risk Management Boundaries (1 shapefile total)</p>	<p>Jean Cameron (Executive Director),  <a href="mailto:JeanRCameron@oregoncoast.com">JeanRCameron@oregoncoast.com</a>                      Pacific States/British Columbia Oil Spill Task Force</p>	<p>Jean Cameron provided qualitative data to allow digitizing their recommendations for vessel traffic lanes, as published in their 2002 West Coast Offshore Vessel Traffic Risk Management Project Report. (Recently, U.S. Coast Guard analysis of AIS data showed that 95% of the vessels transiting coastwise on the West Coast are observing these voluntary offshore transit distances.) To do so, the buffer tool (Analysis toolbox) in ArcMap was used to buffer the states of Washington, Oregon and California (using dtl_st from ESRI's data CD) by 50 nm and by 25 nm, producing two new polygon files. ET Geowizards v10 'Convert polygon to polyline' tool was then used on the two buffered files to produce two new polyline files. ET Geowizards v10 'Split polyline with layer' tool was used to split each buffered polyline file using the EEZ. The 'Select by Location' tool in ArcMap was then used to select parts of the two polyline files that intersected the original states shapefile, and these were deleted during an edit session. The remaining pieces to the North and South that extended beyond the EEZ were then selected and deleted as well, leaving only a line representing either the 25nm or 50nm line off the west coast of the US. Finally, ArcMap's 'Merge' tool was used to combine the two line shapefiles into a polyline file representing the two transit boundaries.</p>

## APPENDIX C – GEOSPATIAL DATA SOURCES

### C.2 Review of Included Data

The remainder of this Appendix identifies the major categories of data included in the database and summarizes the major datasets that characterize the commercial marine transportation and commercial fishing datasets. Appendix D of this report provides a comprehensive accounting of each dataset organized by information category.

#### C.2.1 Overview of data by source category

The study team collected a variety of different spatial data that all speak to human use on the Outer Continental Shelf (OCS). For ease of use, these data were then organized into 13 categories and 92 subcategories. Table C-4 lists the 13 general categories these data were grouped into as well as the number of data layers within that category.

Table C-4

General Categorization of Data

<b>Category</b>	<b>Category Description</b>	<b>Number of Data Layers</b>
Archeological	Archeological – including archeological wrecks	16
Area of Special Concern	Includes Critical Coast Areas, Refuges, Marine Protected, Managed or Sanctuary Areas, Habitats, ESI, and Artificial Reef	147
Demarcations	Lines or areas	11
Ethnography	Ethnography – data specifically collected by ethnographers working on this project	45
Historical Fishing and Fishing Areas	Historical fishing and fishing areas includes fishing closure areas, gear use areas and economic fishing	215
Marine Transportation/Shipping Lanes/Ferry Routes	Buoys, lights, ferry routes, obstructions and shipping lanes	199
Military Use Area	Areas that military uses including military practice areas and military danger zones	24
Oil and Gas Leasing Blocks	BOEM lease blocks	3
Oil/Gas Deposits and Infrastructure/Cables	Mining, Gas, Oil, pipelines and wells	49
Recreation Activities	Recreation includes boating, fishing, sailing, surfing, etc.	126
Renewable Energy	Renewable Energy leases, tidal projects, wave projects and wind projects	16
Research Areas	Research sampling locations, Ocean Special Area Management Plan research areas and Institutions	17
Sand/Gravel Source and Disposal	Includes dredging areas and dredge disposal areas	8

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Table C-5 illustrates the further division of the general categories into 92 subcategories. 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.

### C.2.2 Key data

Although each of the datasets contains data potentially applicable to renewable energy siting projects, the study team considers several products to be particularly important for future use and for users to understand the source of the data and known limitations. Specifically, this section describes the core ethnographic, commercial transportation, and commercial fishing datasets.

#### C.2.2.1 *Ethnographic data*

As described in Section 2 of this report, the study team conducted extensive guided conversations with stakeholders to identify areas of particular importance to individuals or groups as well as to identify potential opportunities to mitigate conflicts between potential renewable energy projects and existing uses. During in-person discussions, the study team had draft maps and/or nautical charts available for reference. In cases where stakeholders were willing to share comments specific to an area, the ethnographers asked the respondent to mark the area on the map. The study team then geocoded the identified area and incorporated the comment into the corresponding dataset attributes. These data are available directly within the geodatabase as well as through the inventory tool described above and in Appendix D. Through the inventory, users can identify any spatially explicit comments that intersect with a specified lease block area.

The study team developed 45 distinct data layers with ethnographic comments. Several of these data layers contain multiple spatially explicit comments. As described in Section 2 of this report, the ethnographic team experienced significant differences in the willingness of fishing stakeholders to mark locations on the maps.

On the West Coast, many recreational fishing and commercial fishing stakeholders took the time to provide direct input because they felt that the existing data sets did not accurately portray use. Although many stakeholders were willing to provide comments, they also indicated that the ocean is used already and that no agency or developer could site any other future uses just by looking at a map. They were adamant that they should not be required to record their favored fishing grounds, or even areas less valuable to them, because they feel that they have already given up enough traditional fishing grounds to other users and because they are necessarily mobile, changing their grounds depending on weather, species movements, season, price, and other considerations. They indicated 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 (depth and distance from shore). They stated that unmarked areas are not necessarily appropriate for development either.

In the East Coast, maps of fishing activity on the East Coast were only modestly modified by stakeholders for two primary reasons.

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Table C-5

Data Subcategories

<b>Source</b>	<b>Coverage</b>	<b>Number of Data Layers</b>
Archeological	Wrecks	16
Area of Special Concern	Corals	1
	Critical Coastal Area	1
	Desalinization Plant	1
	Kelp Bed Lease	1
	Wildlife Refuge	2
	Marine Reserve	3
	Wastewater	3
	State Park	3
	Designated Native American Fishing Rights	3
	Marine Sanctuary	8
	Artificial Reef	10
	Marine Protected Area	10
	Marine Managed Area	21
	Disposal/Dump	21
	Habitat	22
ESI	37	
Demarcations	Cities	1
	EEZ	1
	Place Names	1
	Ports	8
Ethnography	Boating	1
	Research	3
	Features	4
	Commercial Nonfishing	8
	Recreational Fishing and Tourism	10
	Fishing	19
Historical Fishing and Fishing Areas	Corals	1
	Oysters	1
	Aerial Survey	2
	Squid	2
	Commercial Kelp	3
	Conservation	3
	Mobile Gear	3
	High Use Area/Restricted Area	3
	Fixed Gear	4
	Pelagic Fishing	4
	Harpoons	4
	Handlines and Rod	5
	Handlines and Electric Reels	5
	Gill Net	5
	Dredge Gear	5
	Gill Net and Seines	5
	Other Gear Types	6
Trolling	6	
Pots	7	

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Table C-5

Data Subcategories (cont.)

<b>Source</b>	<b>Coverage</b>	<b>Number of Data Layers</b>
Historical Fishing and Fishing Areas	Trawls	8
	Aquaculture	9
	Longline	10
	Diving	12
	Traps	13
	All Gear	14
	Fishing	36
	Fishing Closure Areas	39
Marine Transportation/Shipping Lanes/Ferry Routes	Navigation Aid	80
	Marine Transportation	119
Military Use Area	Fortified Structure (Former Military Defense)	3
	U.S. Coast Guard Station	4
	Military Danger Zone	5
	Military Practice Area	12
Oil and Gas Leasing Blocks	Leases	3
Oil/Gas Deposits and Infrastructure/Cables	"8g" Revenue Sharing Boundary	1
	Cable	1
	Gas	2
	Offshore Platform	2
	Pipeline	3
	Well	3
	Barrier Constructed to Dam Oil on Water	9
	Mining	10
	Oil	18
	Recreation Activities	Surfing
Hunting		2
Sports		3
Swimming		3
Tidepooling		4
Beach/Coast Use		6
Charter Boat (Rec. Fishing)		6
Wildlife Viewing		7
Sailing		7
Diving		8
Combined		9
Recreational Boating		23
Recreational Fishing		46
Renewable Energy	Leases	1
	Permit	2
	General	2
	Wind	4
	Wave	7
Research Areas	Ocean Special Area Management Plan	2
	Institution	3
	Sampling location	12
Sand/Gravel Source and Disposal	Dredge	8

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The commercial fishing industry, particularly in the Northeast region, is required to submit Vessel Trip Reports (VTR) or utilize Vessel Monitoring Systems (VMS) for each fishing trip. Informants generally agreed that the spatial record of their fishing activity is reflected in the maps generated from the VTR data. They did point out caveats, however, specifically noting that the maps do not necessarily reflect the relative value of their fishing grounds. Because of their mobility, too, VTR data may not accurately record the boundaries of their activity; that is, the statistical area may be recorded but the geographic coordinates change as they move.

There was evidence of a general distrust of the potential outcome of mapping. Several of the informants were also adamant that they would not record their favored fishing grounds, or even areas less valuable to them. Others refused because they are necessarily mobile, changing their grounds depending on weather, species movements, season, price, and other considerations.

### C.2.2.2 *Commercial Transportation -- Automatic Information System (AIS)*

The Automatic Identification System (AIS) dataset is a comprehensive dataset maintained by the United States Coast Guard that tracks commercial vessel navigation for vessels at or above 300 gross tonnage. This dataset provides a summary of the AIS vessel navigation data for calendar year 2009.

The AIS signal extends approximately 50 nautical miles from the shoreline out to Federal waters. Sometimes the AIS signals may be stronger and be picked up from farther than 50 nm out, but many times signals are weaker and do not extend the full 50 nautical miles.

The study team contacted several U.S. Coast Guard contacts before requesting these data using the U.S. Coast Guard online Historical AIS request system. One year of raw AIS data were provided to the project team by the U.S. Coast Guard. These raw data include all original AIS data for the entire country, including Alaska and the Gulf of Mexico. The study team then processed these raw data files into AIS density shapefiles, which were added to the full study area geodatabase.

This dataset is a five nautical mile grid system along the east and west coasts of the United States from the shoreline out to the exclusive economic zone boundary. The value of the grids are the count of unique vessels present in the grid for each month and quarter year. The count is for unique vessels per grid cell per day. Therefore if a vessel remained in the same grid cell for two consecutive days it would be counted twice. This includes only vessels that are in transit and not moored vessels. Also no information is included on the type of vessel.

The five nautical mile grid was calculated and is not based on real world locations. The vessel location accuracy is consistent with the AIS database. The positional accuracy of the AIS system is about 10 meters, with the data being recorded in 1/10,000 minute precision.

### C.2.2.3 *Commercial Fishing – Atlantic Coastal Cooperative Statistics Program*

The Atlantic Coastal Cooperative Statistics Program (ACCSP) serves as a clearinghouse for commercial fishing data covering both State and Federal waters. Data are provided to ACCSP by the National Marine Fisheries Service (NMFS) as well individual state fishery management agencies based on their respective fishery tracking methods (e.g., trip tickets, recall reports,

## APPENDIX C – GEOSPATIAL DATA SOURCES

statistical surveys). As such, the data collection methods vary significantly within the region covered. In some regions, fishery data cannot be aligned to specific fishing grounds. As such, the data reported should not be considered to cover 100 percent of activity.

The primary dataset included in this geodatabase includes information on the estimated catch, ex-vessel revenue, and number of trips by gear type in each of the NMFS statistical fishing areas. In addition, ACCSP data provides a means of examining the type of species caught using each of the gear types. For reference purposes, the layer titled “ACCSP\_Gear\_SpeciesGroup\_by\_Area\_2009” provides generalized species groups caught by fishers.

### *C.2.2.4 Commercial Fishing Logbooks (Southeast)*

This dataset identifies the extent of historical fishing along the Southeast Atlantic Coast based on non-confidential trip logs reported to the Southeast Logbook system, which is the most comprehensive, spatially explicit inventory of fishing activity within that Outer Continental Shelf region. The NMFS Southeast Fisheries Science Center (SEFSC) maintains the Logbook system to track the location and number of active vessels operating within Federal waters within the Atlantic off the coasts of North Carolina through Florida. Vessels permitted by the Southeast Regional Office of NMFS must submit a logbook record for each trip.

Each trip report includes information on the type of gear fished as well as the degree of latitude and longitude in which the trip took place. SEFSC staff aggregated the non-confidential data by season, gear type, and degree latitude/longitude area. In cases where less than three vessels fished within a particular degree area for a given season, the actual number is not provided in order to protect confidential information. Instead, "<3" is reported for the number of vessels as well as the number of trips taken.

These data represent commercial fishing vessel trips from the Southeast Fisheries Science Center, NMFS office Logbook reports. These data are non-confidential and represent the commercial fishing trips within each degree latitude/longitude during the 2004 through 2009 time period. Vessels permitted by the States for activity in State waters may not be included in these data.

The one degree grids were calculated and are not based on real world locations. The vessel trip accuracy is consistent with the non-confidential logbook report data.

### *C.2.2.5 Commercial Fishing Vessel Trip Reports (Northeast)*

This dataset identifies the extent of historical fishing along the Northeast Atlantic coast based on trip logs as reported to the Northeast VTR system, which is the most comprehensive inventory of fishing activity within the Outer Continental Shelf region. NMFS maintains the VTR system to track the location and number of active vessels operating within Federal waters within the Atlantic off the coasts of Maine through Virginia. Vessels permitted by the NMFS, Northeast Regional Office (NERO) must submit a VTR for each trip. Individuals that hold only an American Lobster Permit, however, are not required to submit a VTR. Vessels permitted by the States for activity in State waters may not be included in these data.

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Each trip report includes information on the type of gear fished as well as the average location of activity for that trip. NMFS NERO aggregated the non-confidential data by month, gear type, and 10-minute grid cell areas. The number of trips for the larger areas (up to and including one degree squares, but do not include statistical areas) were evenly distributed over the appropriate ten minute square areas to estimate trip activity in State and Federal waters based on information fishermen report to the Federal VTR system. The data represent approximately 93 percent of all federally reported fishing trips. The remaining seven percent of trips represent data where less than three fishermen operate within a one degree square area. To avoid exposing the location of activity for a single operator, these data are considered confidential and excluded from the dataset.

The data provided may be compromised by imprecision or inaccuracy on the part of those who file the report as well as by the limitations of the data collection instrument. The VTR system provides data on the gear the vessel employed and the area in which it fished. Fishermen provide longitude and latitude coordinates that represent their average location for each fishing trip. Although a single point location is provided, the fishermen's activity is dispersed over a wider area. As such, the original reports represent a generalized representation of fishing activity.

Most Federal commercial fishing permits administered by NMFS NERO require fishermen to file a VTR at the conclusion of every trip. Technically, the regulations require fishermen to submit separate reports for each statistical area and type of gear fished. In practice, many fishermen compile all information for a single trip on one form.

### *C.2.2.6 Commercial fishing logbook data from Oregon Department of Fish and Wildlife*

The Oregon Department of Fish and Wildlife (ODFW) serves as a clearinghouse for commercial fishing data within the Oregon Territorial Sea. It also works closely with the Pacific Fisheries Information Network (PacFIN) which seeks to distribute timely and accurate regional fisheries data to aid the effective management of fisheries and fishery resources (see Section C.2.2.8). The policy of the ODFW is to protect the privacy of commercial logbook and landings information by aggregating it so that each "unit" of information (spatial or numeric) that is available to the public (i.e., in any product resulting from use of the data) represents no fewer than three fishing vessels.

ODFW considers one-minute blocks to be too small to allow much of Oregon's fishing location data to be shown, so they usually summarize by 5-minute blocks (in some cases, ten, because even at five too many trips drop out as confidential). This could vary depending on the number of years one wishes to include in the analysis: more years equals more vessels equals finer scale. Data that remain confidential even at the scale used are put into a "confidential" block that gives the user information on how many trips occurred that are not represented on the map.

The study team requested non-confidential tabular data from ODFW's logbook and received a spreadsheet containing data for 1996-2009 in 10 minute blocks for Washington, Oregon and Northern California. All records represent the effort of at least three vessels for the specific species caught. Data include Nearshore Logbooks: 2005-2009, Shrimp Logbooks: 1996-2009 and Sardine Logbooks: 2008-2009. Information included the year, gear, species, count of the

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individual vessels fishing in the block, number of individual tows (shrimp) or the number of starting sets (nearshore) or starting tows (sardine) in a block, average depth in fathoms of the individual tows or the starting set in a block, and time fished in hours. For the nearfish logbook 'time fished in hours' is only found in the 'Total Effort' record for each block, when available and represents the total duration for all activity in the block/year from that logbook (this is not available for the sardine logbook.) A single shapefile was produced using these data, where data were available from multiple logbooks or years, they overlap in the grid. The file can easily be dissolved or split to examine attributes of interest. The positional accuracy of the grid is consistent with that of the logbook.

### *C.2.2.7 Commercial fishing logbook data from California Department of Fish and Game*

The California Department of Fish and Game (CDFG) serves as a clearinghouse for commercial fishing data within the California Territorial Sea. It also works closely with PacFIN in disseminating data and enforces policies very similar to the ODFW in term of data aggregation in order to protect the privacy of commercial logbook and landings information.

The study team requested non-confidential summary data based on the fish tickets that indicated the presence/absence of effort by CDFG block by calendar year for 2005-2009 for the following fisheries:

1. Salmon troll
2. Albacore troll
3. Crab pot
4. Bottom trawl (shrimp and groundfish combined)
5. Whiting trawl (i.e., pelagic trawl)
6. Fixed gear (e.g., longline, pot) groundfish
7. Non-fixed gear (e.g., hook-and-line) groundfish
8. All else (combined)

Jana Robertson provided a spreadsheet of 2005 - 2009 summary logbook data for the State of California by year and block for all species and gears. Because the data were unwieldy in their raw form, the 52 gear codes were grouped into five categories following discussion with Flaxen Conway and Carrie Pomeroy (crab pot, other, trap/hook and line, trawl, troll).

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Gear Grouping	Gears included
Crab pot	Hoop net - crab rings, crab or lobster trap
Trap/Hook and line	Hook & line, vertical hook & line/Portuguese longline, set longline, fish trap, traps - Seattle type (sablefish), horizontal set line
Trawl	Danish/Scottish seine, selective flatfish trawl - small footrope, trawl - footrope less than 8 in. In diameter, trawl - footrope greater than 8 in. In diameter, trawl net, midwater trawl, beam trawl, bottom trawl, balloon trawl, single-rigged trawl, double-rigged trawl
Troll	Mooching (salmon), jig/bait (albacore), troll (albacore), troll (groundfish or other fish), troll (salmon), troll long line
Other	Live bait, harpoon/spear, diving/hooks (sea urchins), diving, dredge, entrapping, prawn trap, shrimp net - Chinese type, fyke net, lift net, brail/dip net or a-frame, dip net, entangling nets, trammel net, drift gill net, set gill net, encircling nets, purse seine, drum seine, lampara net, null, beach seine, net, hand take, hand pump, raft/lines for herring roe on kelp, null, unknown, miscellaneous

Python code was used to group the data into these five categories and list the species caught in each block in each year using that gear type (for example, in block number 134 in 2005, of the trolling gear types pacific mackerel and chinook salmon were caught, so these two records were collapsed to one that lists both species). When the five years were combined for each gear group, the values were not aggregated, so that the shapefiles have overlapping data, preserving the species caught with that gear group in each year. The data can easily be dissolved to aggregate across an attribute of interest. The positional accuracy of the grid is consistent with that of the logbook.

### *C.2.2.8 Commercial groundfish trawl logbook data from Pacific Fisheries Information Network (PacFIN)*

The study team sought the resources of PacFin for any data not directly available from CDFG (e.g., summary logbook data showing catch for whiting trawl and non-whiting groundfish trawl (for all species combined in 10-minute by 10-minute block location by calendar year for 2005-2009). In addition, the Washington Department of Fish and Wildlife (WDFW) opted to release their data only through PacFin. These data consisted also of aggregated groundfish trawl logbook trip data, summarized by 10-minute block with aggregations to include a minimum of three vessels and 10 tows or sets per area block.

Washington State does not collect logbook data for their salmon fishery. The state-managed coastal Dungeness crab fishery just began a logbook program, however, and those data are collected on very large-scale management areas, primarily to assist with state/tribal management efforts. In aggregate, they would essentially cover the entire Washington coastal waters from the shore to about 50 fathoms, so this was deemed to be unhelpful to the project.

With regard to fish ticket data matched up to logbooks, the WDFW could not accommodate the request. Their fish ticket data are held to higher confidentiality standards than commercial logbook data and typically the data are only released to those who are parties to the fish ticket

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(i.e., vessel owner and processor). In addition, the WDFW indicated that releasing fish ticket data would negate the purpose of aggregating the WDFW logbook data in the first place.

According to Michele Culver, Region 6 director of the WDFW, the agency is currently in the process of identifying available data for all Washington marine areas--the coast, Puget Sound, and mouth of the Columbia River. They are reviewing data on uses (e.g., fishing, recreation, shipping), as well as marine protected areas, habitat types, water quality, and known locations of marine life in an effort to prepare for future spatial planning efforts. At this point, they do not have any active applications for renewable energy off the Washington coast, although there are some for Puget Sound and Willapa Bay. One of the areas that a spatial planning effort would focus on would be renewable energy, but they are not necessarily limiting spatial planning to that purpose. They have begun a public outreach effort to better understand the importance of particular uses of Washington's marine areas, and plan to do a broader outreach effort to get a sense of spatial planning objectives.

Overall, Washington has little to no data for locations of some of their most important commercial fisheries, and lack data on other uses, such as recreational fishing, boating, surfing, and kayaking. WDFW is hoping to collect some anecdotal information through interviews with charter skippers, anglers, and other recreational users.

For each year from 2005 through 2009, the aggregated data from PacFIN (for each block in Washington, Oregon and California) provided the management group, gear group (bottom trawl or mid-water trawl), number of vessels fishing for a species, and number of tows fishing for a species. The full dataset was used to create five shapefiles, one for each of the management groups included (all coastal pelagic, all groundfish, all highly migratory, all shrimp and prawns, other species - no management group.) The values were not aggregated across years, so that the shapefiles have overlapping data, preserving the number of vessels and tows in each year. The data can easily be dissolved to aggregate across an attribute of interest. The positional accuracy of the grid is consistent with that of the logbook.

### **C.3 The role of forthcoming coastal and marine spatial planning efforts**

Coastal and marine spatial planning (CMSP) is a way to manage competition for space in the oceans in order to achieve a host of societal benefits. CMSP is an adaptive, science-based approach to analyze current and future uses of marine and coastal areas, assessing tradeoffs between uses, and allocating space to different uses in a way that maximizes societal benefits (Ehler 2008). As such, CMSP is a planning process that seeks to identify areas that are the most suitable for various activities.

The practice of CMSP also stands to benefit from the plethora of space-use data currently available, in production, and planned for development by government and private GIS data clearinghouses. A variety of agencies and organizations continue to identify data gaps and to refine the state of art in data collection efforts (ERG 2010). These resources are constantly evolving to incorporate newly-created data and remove outdated information, ensuring that data are available at the finer scale and resolution for CMSP.

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As such, the geodatabases developed for this effort must be viewed as a snapshot of past activities. Given the dynamic nature of commercial fisheries, for example, the spatial distribution of fishing activities will certainly change. Consequently, regular updates will be needed. In particular, the study team recommends obtaining regular updates to the navigation and commercial fishing data. In addition, the discussion that follows highlights several sources that should be monitored, because they are expected to incorporate data that would prove invaluable to renewable energy siting efforts. As CMSP develops further, additional sources of information will most certainly evolve and should also be integrated into the geodatabases and/or used in siting efforts.

### C.3.1 Key entities working on coastal and marine spatial planning

#### C.3.1.1 Federal sources

##### *US Army Corps of Engineers*

The U.S. Army Corps of Engineers is creating a database of all disposal areas, with a 2011 target completion date. Although this effort is nationwide, the data are held and distributed by the individual divisions. Therefore, not all regions will have the same timeline, and obtaining these data could take some time.

##### *US Navy*

The DoD is still completing approvals for the release of the data. It was originally put together as a response to the MMS "Draft Proposal for Outer Continental Shelf Oil and Gas Leasing Program 2010-2015." When the dataset is approved it will be submitted to BOEM.

##### *NOAA*

As part of this research effort, the team committed substantial efforts to obtain VMS data that identify the location of fishing vessels as they operate. Although the team was able to acquire logbook and trip report data, NOAA was unable to provide comprehensive VMS data due to confidentiality concerns. Through the ongoing CMSP efforts, the study team and many of the individuals contacted as part of the study anticipate that these data will be made available in a comprehensive and aggregated fashion that protects the confidentiality of the information while also providing valuable information on spatial and temporal variations in fishing activity.

The NOAA National Marine Protected Areas Center provides human use data generated from stakeholder outreach. The most recent data available were used and organized for this deliverable but they anticipate updates to these data, which may be obtained at their website (<http://www.mpa.gov/dataanalysis/atlas/>).

The U.S. Integrated Ocean Observing System (IOOS) works at the regional level to provide resources to the Federal government and to the states in support of not only oceanographic science but in informed ecosystem-based management and CMSP. The regional associations of IOOS (e.g., the Northwest Association of Networked Ocean Observing Systems or NANOOS on the west coast, and the Northeast Regional Association of Coastal Ocean Observing Systems or NERACOOS on the East Coast) are components of a national IOOS, created to ensure the sustained observation of our coasts and oceans and to develop and disseminate information products based on those observations. These regional associations produce important near-real-time, dynamic data sets that may be important for siting renewable energy assets on the Outer

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Continental Shelf (e.g., surface current trends such as seasonal and annual eddies and circulation patterns, exposure maps from known point sources, or connectivity maps for larval transport). In California, some of these data sets have already been integrated into MarineMap. In addition these regional organizations bring to bear their experience in data management and integration, as well as expertise in product development and visualizations, especially regarding spatially complex time series (3D and 4D) and near-real-time ocean information.

### C.3.1.2 State sources

#### *Maine Lobstermen's Association*

MLA is in the process of completing a survey on the location and gear usage for the lobster fishery within state waters of Maine.

#### *Washington MarineMap*

The MarineMap Consortium website announced on March 22, 2011 that it was working on a release of Washington MarineMap.

#### *Washington Department of Ecology*

Washington's Public Beach Access Database was created by a NOAA Fellow over two years (2008-2010) and includes all beach access locations of the state and many attributes for each, including whether they are used for surfing. The data were just released and they are working on improving the data dictionary and other components of the metadata. An updated version may be downloaded from their website in the future.

#### *Washington State Department of Ecology & West Coast Governors' Agreement on Ocean Health (<http://westcoastoceans.gov/>)*

Jennifer Hennessey (Ocean Policy Associate, Shorelands & Environmental Assistance Program) and Dan Crowther (Hershman Fellow) are compiling an initial spatial data inventory (a list of datasets and who has them) based on the revised list of spatial data needs to support marine spatial planning that were identified at a WCGA working session. They are only collecting metadata for their list, and thus far have mostly intertidal data but it would be worth following up on this effort next year to see if they obtained metadata for sources unavailable at the time of this writing.

#### *Oregon Coastal Management Program's Oregon MarineMap - <http://oregon.marinemap.org/>*

Recently launched, Oregon MarineMap currently holds data that will be used in decision-making to amend the Oregon Territorial Sea Plan. They anticipate adding data throughout the coming year. These data may be downloaded directly from their master list of shapefiles ([http://www.oregonocean.info/index.php?option=com\\_content&view=article&id=338&Itemid=134](http://www.oregonocean.info/index.php?option=com_content&view=article&id=338&Itemid=134)).

#### *Oregon Sea Grant*

Christopher S. Eardley (Marine Resource Management Program, OSU), [ceardley@coas.oregonstate.edu](mailto:ceardley@coas.oregonstate.edu) worked with Dr. Flaxen Conway to publish the report "Oregon's Non-Consumptive Recreational Ocean User Community: Understanding an Ocean Stakeholder" which includes survey results for surfing locations in Oregon, which he is working on digitizing.

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Chris provided a draft shapefile for the purposes of this inventory and the completed shapefile may be obtained Fall 2011 by emailing him directly.

### C.3.1.3 *Additional sources*

*MarineMap Consortium* - <http://marinemap.org/>

The MarineMap Consortium updates its Twitter feed often with news of its progress on improving their decision-support tool and data content.

## C.4 References

Eastern Research Group. 2010. A Review and Summary of Human Use Mapping in the Marine and Coastal Zone. Conducted for NOAA Coastal Services Center, Charleston, SC, under NOAA Contract # EAJ33C-09-0034. 46 pp.

Ehler, C. 2008. Conclusions: Benefits, lessons learned, and future challenges of marine spatial planning. *Marine Policy*, 32(5), 840-843.

**APPENDIX D – GEOSPATIAL DATA INVENTORY**

**APPENDIX D: GEOSPATIAL DATA INVENTORY**

Category	Name	Coverage	Source
<i>Subcategory</i>			
<b>Archeological</b>			
<i>Wrecks</i>			
	APPROACH_HARBOR_WRECKS_point_ec	East Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_WRECKS_POINT_point_wc	West Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_WRECKS_poly_ec	East Coast Only	NOAA ENCDirect
	CHNS_Beach_Shipwrecks	East Coast Only	Cape Hatteras National Seashore
	COASTAL_WRECKS_point_ec	East Coast Only	NOAA ENCDirect
	COASTAL_WRECKS_POINT_point_wc	West Coast Only	NOAA ENCDirect
	COASTAL_WRECKS_poly_ec	East Coast Only	NOAA ENCDirect
	CUL_NCCSR_Shipwrecks	West Coast Only	Marine Map
	GENERAL_WRECKS_point_ec	East Coast Only	NOAA ENCDirect
	GENERAL_WRECKS_POINT_point_wc	West Coast Only	NOAA ENCDirect
	GENERAL_WRECKS_poly_ec	East Coast Only	NOAA ENCDirect
	MORIS_AWOIS_SUB_WRECKS_PT	East Coast Only	Massachusetts Office of Coastal Zone Management
	OVERVIEW_WRECKS_point_ec	East Coast Only	NOAA ENCDirect
	OVERVIEW_WRECKS_POINT_point_wc	West Coast Only	NOAA ENCDirect
	s_mmc_S_MMC_Wrecks_Obstructions_AWOIS	Full Study Area	BOEM/NOAA
	shipwrecks_obstructions_point	East Coast Only	Florida Fish and Wildlife Conservation Commission-Fish and Wildlife Research Institute
<b>Area of Special Concern</b>			
<i>Artificial Reef</i>			
	artificialreefs201010	East Coast Only	South Carolina Department of Natural Resources
	artificial_reef	West Coast Only	California Wreck Divers
	artificialreef_fl_point	East Coast Only	Florida Fish and Wildlife Conservation Commission-Fish and Wildlife Research Institute
	ArtificialReefs	East Coast Only	Georgia Department of Natural Resources

## APPENDIX D – GEOSPATIAL DATA INVENTORY

Category	Name	Coverage	Source
<i>Subcategory</i>			
	HAB_SCSR_ArtificialReefs_BC	West Coast Only	California Department of Fish and Game
	HAB_SCSR_ArtificialReefs_Cen	West Coast Only	California Department of Fish and Game
	MORIS_ARTIFICIAL_REEFS_PT	East Coast Only	Massachusetts Office of Coastal Zone Management
	NCDMF_AR_2011	East Coast Only	North Carolina Department of Environment and Natural Resources, Division of Marine Fisheries
	s_mmc_S_MMC_Artificial_Reefs	East Coast Only	BOEM/NOAA
	WA_PugetSound_ArtificialReefs_pts	West Coast Only	Washington Department of Fish and Wildlife (WDFW)
<i>Corals</i>			
	coral_hardbottom_poly	East Coast Only	Florida Fish and Wildlife Conservation Commission-Fish and Wildlife Research Institute
<i>Critical Coastal Area</i>			
	MAN_CA_CCA	West Coast Only	Marine Map
<i>Desalinization Plant</i>			
	CUL_SCSR_Desal_Plants	West Coast Only	Marine Map
<i>Disposal/Dump</i>			
	APPROACH_HARBOR_DMPGRD_point_ec	East Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_DMPGRD_poly_ec	East Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_DMPGRD_POLYGON_poly_wc	West Coast Only	NOAA ENCDirect
	COASTAL_DMPGRD_point_ec	East Coast Only	NOAA ENCDirect
	COASTAL_DMPGRD_POINT_point_wc	West Coast Only	NOAA ENCDirect
	COASTAL_DMPGRD_poly_ec	East Coast Only	NOAA ENCDirect
	COASTAL_DMPGRD_POLYGON_poly_wc	West Coast Only	NOAA ENCDirect
	DisposalSites	East Coast Only	US Army Corps of Engineers
	GENERAL_DMPGRD_point_ec	East Coast Only	NOAA ENCDirect
	GENERAL_DMPGRD_POINT_point_wc	West Coast Only	NOAA ENCDirect
	GENERAL_DMPGRD_poly_ec	East Coast Only	NOAA ENCDirect
	GENERAL_DMPGRD_POLYGON_poly_wc	West Coast Only	NOAA ENCDirect

## APPENDIX D – GEOSPATIAL DATA INVENTORY

Category	Name	Coverage	Source
<i>Subcategory</i>			
	MAN_CA_Dumpsites	West Coast Only	Marine Map
	MAN_SCSR_Major_WW_Dcharge	West Coast Only	Marine Map
	MAN_SCSR_WW_Dcharge_Int	West Coast Only	Marine Map
	MAN_SCSR_WW_Dcharge_Maj	West Coast Only	Marine Map
	MAN_SCSR_WW_Dcharge_Min	West Coast Only	Marine Map
	MAN_SCSR_WW_PPlant_Dcharge_Pipes	West Coast Only	Marine Map
	NPDES_outfalls_Coastal_DEQ_2008	West Coast Only	PaCOOS
	OR_ncpdi_2001	West Coast Only	Oregon Coastal Atlas
	OVERVIEW_DMPGRD_poly_ec	East Coast Only	NOAA ENCDirect
<i>ESI</i>			
	Calif_Central_ESI_alerts_point	West Coast Only	NOAA ORR
	Calif_Central_ESI_mgt_poly	West Coast Only	NOAA ORR
	Calif_Central_ESI_socecon_point	West Coast Only	NOAA ORR
	Calif_Northern_ESI_mgt_polygon	West Coast Only	NOAA ORR
	Calif_Northern_ESI_socecon_arc	West Coast Only	NOAA ORR
	Calif_Northern_ESI_socecon_point	West Coast Only	NOAA ORR
	Calif_SFBay_ESI_mgt_polygon	West Coast Only	NOAA ORR
	Calif_SFBay_ESI_socecon_arc	West Coast Only	NOAA ORR
	Calif_SFBay_ESI_socecon_point	West Coast Only	NOAA ORR
	Calif_Southern_ESI_acp_point	West Coast Only	NOAA ORR
	Calif_Southern_ESI_mgt_polygon	West Coast Only	NOAA ORR
	Calif_Southern_ESI_socecon	West Coast Only	NOAA ORR
	Calif_Southern_ESI_socecon_arc	West Coast Only	NOAA ORR
	Columbia_River_ESI_mgt	West Coast Only	NOAA ORR
	Columbia_River_ESI_soceconl	West Coast Only	NOAA ORR
	Columbia_River_ESI_soceconp	West Coast Only	NOAA ORR
	CUL_CA_SocioEcon	West Coast Only	Marine Map
	Long_Island_ESI_mgt_polygon	East Coast Only	NOAA ORR
	Long_Island_ESI_socecon_arc	East Coast Only	NOAA ORR

## APPENDIX D – GEOSPATIAL DATA INVENTORY

Category	Name	Coverage	Source
<i>Subcategory</i>			
	Long_Island_ESI_soceconp	East Coast Only	NOAA ORR
	Maryland_ESI_mgt_polygon	East Coast Only	NOAA ORR
	Maryland_ESI_socecon_arc	East Coast Only	NOAA ORR
	Maryland_ESI_socecon_point	East Coast Only	NOAA ORR
	Massachusetts_ESI_mgt_polygon	East Coast Only	NOAA ORR
	Massachusetts_ESI_socecon	East Coast Only	NOAA ORR
	Massachusetts_ESI_socecon_point	East Coast Only	NOAA ORR
	SensitiveAreas_D7_D8	East Coast Only	Florida Fish and Wildlife Conservation Commission-Fish and Wildlife Research Institute
	Virginia_ESI_mgt_arc	East Coast Only	NOAA ORR
	Virginia_ESI_mgt_label	East Coast Only	NOAA ORR
	Virginia_ESI_mgt_polygon	East Coast Only	NOAA ORR
	Virginia_ESI_mgt_tic	East Coast Only	NOAA ORR
	Virginia_ESI_socecon_arc	East Coast Only	NOAA ORR
	Virginia_ESI_socecon_point	East Coast Only	NOAA ORR
	Virginia_ESI_socecon_tic	East Coast Only	NOAA ORR
	Wash_PugetSound_ESI_mgt_polygon	West Coast Only	NOAA ORR
	Wash_PugetSound_ESI_socecon_arc	West Coast Only	NOAA ORR
	Wash_PugetSound_ESI_socecon_point	West Coast Only	NOAA ORR
<i>Habitat</i>			
	altb02	West Coast Only	PaCOOS
	altb03	West Coast Only	PaCOOS
	altb04	West Coast Only	PaCOOS
	altb06	West Coast Only	PaCOOS
	AltB3_CanopyKelp_PMFSC_2004	West Coast Only	Oregon Coastal Atlas
	BIO_CatalogOregonSeabirdColonies_POINTS_USFWS_2007	West Coast Only	PaCOOS
	BIO_NCCSR_Kelp2009	West Coast Only	California Department of Fish and Game
	Coral_EH_geo	East Coast Only	South Atlantic Fishery Management Council (SAFMC)

## APPENDIX D – GEOSPATIAL DATA INVENTORY

Category	Name	Coverage	Source
<i>Subcategory</i>			
	ECOPRES	West Coast Only	BOEM/NOAA
	efh_700fm_polygons	West Coast Only	PaCOOS
	efh_consarea_polygons	West Coast Only	PaCOOS
	efh_polygons	West Coast Only	PaCOOS
	invert_race	West Coast Only	Pacific Coast Marine Habitat Program
	kelp_ca	West Coast Only	Pacific Coast Marine Habitat Program
	kelp1989_2004	West Coast Only	Washington State Department of Natural Resources (WA DNR)
	MAN_CA_EFH_ConsArea	West Coast Only	Marine Map
	MarbledM_CritHab_USFWS_1996	West Coast Only	PaCOOS
	Modern_Kelp_Surveys_ODFW_90_96_99	West Coast Only	PaCOOS
	Pinniped_Haulout_ODFW_2007	West Coast Only	PaCOOS
	rightwhale_critical_hab_poly	East Coast Only	Florida Fish and Wildlife Conservation Commission-Fish and Wildlife Research Institute
	seagrass_pub	West Coast Only	Pacific Coast Marine Habitat Program
	WSPIlover_CritHab_USFWS_2005	West Coast Only	PaCOOS
<i>Kelp Bed Lease</i>			
	MAN_CA_KelpAdmin	West Coast Only	Marine Map
<i>Marine Managed Area</i>			
	bennp89wma	East Coast Only	South Carolina Department of Natural Resources
	BoilerBayResearchReserve	West Coast Only	PaCOOS
	CCSR_MarineProtectedAreas	West Coast Only	PaCOOS
	COASTAL_ADMARE_poly_ec	East Coast Only	NOAA ENCDirect
	fenwi89wma	East Coast Only	South Carolina Department of Natural Resources
	greep89wma	East Coast Only	South Carolina Department of Natural Resources
	HUM_MGMT_StateMarineManagedAreas_ODFW	West Coast Only	PaCOOS
	managed_areas_fl_poly	East Coast Only	Florida Fish and Wildlife

## APPENDIX D – GEOSPATIAL DATA INVENTORY

Category	Name	Coverage	Source
	Subcategory		Conservation Commission-Fish and Wildlife Research Institute
	minii89wma	East Coast Only	South Carolina Department of Natural Resources
	MPA_CA_MPAC_DB_Fed	West Coast Only	Marine Map
	MPA_NCCSR_AdoptedMPAs	West Coast Only	PaCOOS
	MPA_NCCSR_AdoptedSpecialClosures	West Coast Only	PaCOOS
	nerr_g	Full Study Area	PaCOOS
	NHME_OceanUseAtlas_industrial	East Coast Only	National Marine Protected Areas Center
	nmfs_geo	Full Study Area	PaCOOS
	sante89wma	East Coast Only	South Carolina Department of Natural Resources
	SDE_park_polygon	East Coast Only	South Carolina Department of Natural Resources
	SDE_refuge_polygon	East Coast Only	South Carolina Department of Natural Resources
	SDE_reservation_polygon	East Coast Only	South Carolina Department of Natural Resources
	wavem89wma	East Coast Only	South Carolina Department of Natural Resources
	wiggi89wma	East Coast Only	South Carolina Department of Natural Resources
	<i>Marine Protected Area</i>		
	MAN_CA_Fed_CCNM	West Coast Only	Marine Map
	MAN_CA_FedMPA	West Coast Only	Marine Map
	MPA_CA_Existing	West Coast Only	California Department of Fish and Game
	MPA_CA_Existing_State	West Coast Only	Marine Map
	MPA_Inventory_Sites_March_2010	Full Study Area	NOAA Marine Protected Areas Center
	MPA_Inventory_Sites_March_2010	West Coast Only	MPA.gov
	PNWC_Protected_Areas_TNC_2005	West Coast Only	The Nature Conservancy
	rightwhale_mandshipreport_arc	East Coast Only	Florida Fish and Wildlife Conservation Commission-Fish and Wildlife Research Institute
	s_mmc_S_MMC_MPAs	Full Study Area	BOEM/NOAA

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Category	Name	Coverage	Source
<i>Subcategory</i>			
	s_mmc_S_MMC_National_marine_fisheries	Full Study Area	BOEM/NOAA
<i>Marine Reserve</i>			
	aquaticpreserves_fl_poly	East Coast Only	Florida Fish and Wildlife Conservation Commission-Fish and Wildlife Research Institute
	MR_AreasOfWork_2010	West Coast Only	Oregon Department of Land Conservation and Development (OR LCD)
	s_mmc_S_MMC_NERR	East Coast Only	BOEM/NOAA
<i>Marine Sanctuary</i>			
	cbnms_py	West Coast Only	PaCOOS
	cinms_py	West Coast Only	PaCOOS
	gfnms_py	West Coast Only	PaCOOS
	MARSANC	West Coast Only	BOEM/NOAA
	mbnms_py	West Coast Only	PaCOOS
	ocnms_py	West Coast Only	PaCOOS
	s_mmc_S_MMC_National_Marine_Sanctuaries	Full Study Area	BOEM/NOAA
	spinylobster_sanctuary_poly	East Coast Only	Florida Fish and Wildlife Conservation Commission-Fish and Wildlife Research Institute
<i>Native American</i>			
	CUL_NCCSR_Tribal_Use_Pub	West Coast Only	Marine Map
	indlandp020	West Coast Only	National Atlas
	s_mmc_S_MMC_Coastal_reservations	Full Study Area	BOEM/NOAA
<i>State Park</i>			
	HUM_REC_OREGONSTATEPARKS_OPRD_2008	West Coast Only	PaCOOS
	MAN_CA_StateParks_UWunits	West Coast Only	Marine Map
	MAN_CA_StateParksLand	West Coast Only	Marine Map
<i>Wastewater</i>			
	CUL_CA_Oceanoutfalls	West Coast Only	Marine Map
	CUL_CA_Oceanoutfalls_Minor	West Coast Only	Marine Map
	CUL_CA_Oceanoutfalls_WTI	West Coast Only	Marine Map

## APPENDIX D – GEOSPATIAL DATA INVENTORY

Category	Name	Coverage	Source
<i>Subcategory</i>			
<i>Wildlife Refuge</i>			
	OR_Islands_NWR_USFWS_2003	West Coast Only	PaCOOS
	s_mmc_S_MMC_Coastal_NWR	Full Study Area	BOEM/NOAA
<b>Demarcations</b>			
<i>Cities</i>			
	Cities20wgs84_SelCoastalTown	West Coast Only	PaCOOS
<i>EEZ</i>			
	s_mmc_S_MMC_EEZ	Full Study Area	BOEM/NOAA
<i>Place Names</i>			
	s_mmc_S_MMC_Undersea_Feature_Placenames	Full Study Area	BOEM/NOAA
<i>Ports</i>			
	anchorages_fl_point	East Coast Only	Florida Fish and Wildlife Conservation Commission-Fish and Wildlife Research Institute
	CUL_CA_Ports	West Coast Only	Marine Map
	CUL_NCSR_Ports	West Coast Only	Marine Map
	CUL_NCSR_PortsAndMarinas	West Coast Only	Marine Map
	CUL_OREGON_PORT_LOCATIONS_OCMP_2008	West Coast Only	PaCOOS
	CUL_SCSR_PortsAndHarbors	West Coast Only	Marine Map
	CUL_SCSR_PortsAndHarbors_poly	West Coast Only	Marine Map
	s_mmc_S_MMC_ports	Full Study Area	BOEM/NOAA
<b>Ethnography</b>			
<i>Boating</i>			
	Ethnography_Noncomm_Boating_In_wc	West Coast Only	Dr. Flaxen Conway and Dr. Carrie Pomeroy's Interviews
<i>Commercial Nonfishing</i>			
	Ethnography_Boston_Pilots	East Coast Only	Jack Wiggin
	Ethnography_Boston_Provincetown_Ferry	East Coast Only	Jack Wiggin
	Ethnography_CommNonFish_Cables_In_wc	West Coast Only	Dr. Flaxen Conway and Dr. Carrie Pomeroy's Interviews

## APPENDIX D – GEOSPATIAL DATA INVENTORY

Category	Name	Coverage	Source
<i>Subcategory</i>			
	Ethnography_CommNonFish_Shipping_In_wc	West Coast Only	Dr. Flaxen Conway and Dr. Carrie Pomeroy's Interviews
	Ethnography_CommNonFish_Shipping_pg_wc	West Coast Only	Dr. Flaxen Conway and Dr. Carrie Pomeroy's Interviews
	Ethnography_CommNonFish_Shipping_pt_wc	West Coast Only	Dr. Flaxen Conway and Dr. Carrie Pomeroy's Interviews
	Ethnography_CommNonFish_Towlane_In_wc	West Coast Only	Dr. Flaxen Conway and Dr. Carrie Pomeroy's Interviews
	Ethnography_SE_Vessels	East Coast Only	Dan Hellin
<i>Features</i>			
	Ethnography_MarineReserve_pg_wc	West Coast Only	Dr. Flaxen Conway and Dr. Carrie Pomeroy's Interviews
	Ethnography_Physical_pg_wc	West Coast Only	Dr. Flaxen Conway and Dr. Carrie Pomeroy's Interviews
	Ethnography_Placemark_pg_wc	West Coast Only	Dr. Flaxen Conway and Dr. Carrie Pomeroy's Interviews
	Ethnography_Placemark_pt_wc	West Coast Only	Dr. Flaxen Conway and Dr. Carrie Pomeroy's Interviews
<i>Fishing</i>			
	Ethnography_CommFish_Crab_In_wc	West Coast Only	Dr. Flaxen Conway and Dr. Carrie Pomeroy's Interviews
	Ethnography_CommFish_Crab_pg_wc	West Coast Only	Dr. Flaxen Conway and Dr. Carrie Pomeroy's Interviews
	Ethnography_CommFish_Groundfish_In_wc	West Coast Only	Dr. Flaxen Conway and Dr. Carrie Pomeroy's Interviews
	Ethnography_CommFish_Groundfish_pg_wc	West Coast Only	Dr. Flaxen Conway and Dr. Carrie Pomeroy's Interviews
	Ethnography_CommFish_Hagfish_pg_wc	West Coast Only	Dr. Flaxen Conway and Dr. Carrie Pomeroy's Interviews
	Ethnography_CommFish_Halibut_pg_wc	West Coast Only	Dr. Flaxen Conway and Dr. Carrie Pomeroy's Interviews
	Ethnography_CommFish_Sablefish_pg_wc	West Coast Only	Dr. Flaxen Conway and Dr. Carrie Pomeroy's Interviews
	Ethnography_CommFish_Salmon_In_wc	West Coast Only	Dr. Flaxen Conway and Dr. Carrie Pomeroy's Interviews
	Ethnography_CommFish_Salmon_pg_wc	West Coast Only	Dr. Flaxen Conway and Dr. Carrie Pomeroy's Interviews
	Ethnography_CommFish_Shrimp_In_wc	West Coast Only	Dr. Flaxen Conway and Dr. Carrie Pomeroy's Interviews

## APPENDIX D – GEOSPATIAL DATA INVENTORY

Category	Name	Coverage	Source
<i>Subcategory</i>			
	Ethnography_CommFish_Shrimp_pg_wc	West Coast Only	Dr. Flaxen Conway and Dr. Carrie Pomeroy's Interviews
	Ethnography_CommFish_SpotPrawn_pg_wc	West Coast Only	Dr. Flaxen Conway and Dr. Carrie Pomeroy's Interviews
	Ethnography_CommFish_Tribal_pg_wc	West Coast Only	Dr. Flaxen Conway and Dr. Carrie Pomeroy's Interviews
	Ethnography_CommFish_Tuna_In_wc	West Coast Only	Dr. Flaxen Conway and Dr. Carrie Pomeroy's Interviews
	Ethnography_CommFish_Tuna_pg_wc	West Coast Only	Dr. Flaxen Conway and Dr. Carrie Pomeroy's Interviews
	Ethnography_Herring	East Coast Only	Madeleine Hall-Arber
	Ethnography_New_Bedford_Scalloper	East Coast Only	Madeleine Hall-Arber
	Ethnography_RI_charter_boat	East Coast Only	Madeleine Hall-Arber
	Ethnography_RI_drag	East Coast Only	Madeleine Hall-Arber
<i>Recreational Fishing and Tourism</i>			
	Ethnography_Cape_May	East Coast Only	Jack Wiggin
	Ethnography_Noncomm_Boating_pg_wc	West Coast Only	Dr. Flaxen Conway and Dr. Carrie Pomeroy's Interviews
	Ethnography_Noncomm_Crab_pg_wc	West Coast Only	Dr. Flaxen Conway and Dr. Carrie Pomeroy's Interviews
	Ethnography_Noncomm_Groundfish_pg_wc	West Coast Only	Dr. Flaxen Conway and Dr. Carrie Pomeroy's Interviews
	Ethnography_Noncomm_Groundfish_pt_wc	West Coast Only	Dr. Flaxen Conway and Dr. Carrie Pomeroy's Interviews
	Ethnography_Noncomm_Halibut_pg_wc	West Coast Only	Dr. Flaxen Conway and Dr. Carrie Pomeroy's Interviews
	Ethnography_Noncomm_Sablefish_pg_wc	West Coast Only	Dr. Flaxen Conway and Dr. Carrie Pomeroy's Interviews
	Ethnography_Noncomm_Salmon_pg_wc	West Coast Only	Dr. Flaxen Conway and Dr. Carrie Pomeroy's Interviews
	Ethnography_Noncomm_Tuna_In_wc	West Coast Only	Dr. Flaxen Conway and Dr. Carrie Pomeroy's Interviews
	Ethnography_Noncomm_Tuna_pg_wc	West Coast Only	Dr. Flaxen Conway and Dr. Carrie Pomeroy's Interviews
<i>Research</i>			
	Ethnography_Noncomm_Research_In_wc	West Coast Only	Dr. Flaxen Conway and Dr. Carrie Pomeroy's Interviews

## APPENDIX D – GEOSPATIAL DATA INVENTORY

Category	Name	Coverage	Source
<i>Subcategory</i>			
	Ethnography_Noncomm_Research_pg_wc	West Coast Only	Dr. Flaxen Conway and Dr. Carrie Pomeroy's Interviews
	Ethnography_Noncomm_Research_pt_wc	West Coast Only	Dr. Flaxen Conway and Dr. Carrie Pomeroy's Interviews
<b>Historical Fishing and Fishing Areas</b>			
<i>Aerial Survey</i>			
	CON_SCSR_LightHawk_CommFish	West Coast Only	Marine Map
	CON_SCSR_LightHawk_CommNonFish	West Coast Only	Marine Map
<i>All Gear</i>			
	Atlantic_Coastal_Cooperative_Statistics_Program_2006_to_2010_Atlantic_Commercial_Fisheries_Statistics	East Coast Only	Atlantic Coastal Cooperative Statistics Program (ACCSP)
	Atlantic_Coastal_Cooperative_Statistics_Program_Gear_and_Species_Group_by_Area_2009	East Coast Only	Atlantic Coastal Cooperative Statistics Program (ACCSP)
	CON_CA_C FIS_Blocks	West Coast Only	Marine Map
	MORIS_OM_CONC_COM_FISH_TRAF_POLY	East Coast Only	Massachusetts Office of Coastal Zone Management
	MORIS_OM_HIGH_COMM_FISHING_POLY	East Coast Only	Massachusetts Office of Coastal Zone Management
	NHME_OceanUseAtlas_fishing	East Coast Only	National Marine Protected Areas Center
	ODFW_Logbook	West Coast Only	Oregon Department of Fish and Wildlife(ODFW)
	VesselMonitoringSystemDemarcationLines	East Coast Only	NOAA Coastal Services
	VTR_NE_Annual_ComFish_AllGear	East Coast Only	NOAA NMFS
	VTR_NE_AprMayJun_ComFish_AllGear	East Coast Only	NOAA NMFS
	VTR_NE_CommercialTrips_1999to2008	East Coast Only	NOAA NMFS
	VTR_NE_JanFebMar_ComFish_AllGear	East Coast Only	NOAA NMFS
	VTR_NE_JulAugSep_ComFish_AllGear	East Coast Only	NOAA NMFS
	VTR_NE_OctNovDec_ComFish_AllGear	East Coast Only	NOAA NMFS
<i>Aquaculture</i>			
	APPROACH_HARBOR_MARCUL_poly_ec	East Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_MARCUL_POLYGON_poly_wc	West Coast Only	NOAA ENCDirect
	aquaculture_dominant	West Coast Only	CA Ocean Uses Atlas

## APPENDIX D – GEOSPATIAL DATA INVENTORY

Category	Name	Coverage	Source
<i>Subcategory</i>			
	aquaculture_footprint	West Coast Only	CA Ocean Uses Atlas
	aquaculture_future	West Coast Only	CA Ocean Uses Atlas
	class03e	East Coast Only	Maine GIS
	class03w	East Coast Only	Maine GIS
	MAN_CA_Aquaculture	West Coast Only	Marine Map
	MarineFarms	East Coast Only	NOAA Coastal Services
<i>Commercial Kelp</i>			
	com_kelp_dominant	West Coast Only	CA Ocean Uses Atlas
	com_kelp_footprint	West Coast Only	CA Ocean Uses Atlas
	com_kelp_future	West Coast Only	CA Ocean Uses Atlas
<i>Conservation</i>			
	MAN_CA_RCA_NonTrawl_2009	West Coast Only	Marine Map
	rca_2009to2010_m	West Coast Only	NOAA NMFS
	yrca_2009to2010	West Coast Only	NOAA NMFS
<i>Corals</i>			
	NMFS_Corals_1980to2007	West Coast Only	PaCOOS
<i>Diving</i>			
	com_dive_dominant	West Coast Only	CA Ocean Uses Atlas
	com_dive_footprint	West Coast Only	CA Ocean Uses Atlas
	com_dive_future	West Coast Only	CA Ocean Uses Atlas
	Logbook_SE_Annual_Dive	East Coast Only	NOAA NMFS
	Logbook_SE_AprMayJun_Dive	East Coast Only	NOAA NMFS
	Logbook_SE_JanFebMar_Dive	East Coast Only	NOAA NMFS
	Logbook_SE_JulAugSep_Dive	East Coast Only	NOAA NMFS
	Logbook_SE_OctNovDec_Dive	East Coast Only	NOAA NMFS
	VTR_NE_Annual_DivingGear	East Coast Only	NOAA NMFS
	VTR_NE_AprMayJun_DivingGear	East Coast Only	NOAA NMFS
	VTR_NE_JulAugSep_DivingGear	East Coast Only	NOAA NMFS
	VTR_NE_OctNovDec_DivingGear	East Coast Only	NOAA NMFS

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Category	Name	Coverage	Source
<i>Subcategory</i>			
<i>Dredge Gear</i>			
	VTR_NE_Annual_Dredge	East Coast Only	NOAA NMFS
	VTR_NE_AprMayJun_Dredge	East Coast Only	NOAA NMFS
	VTR_NE_JanFebMar_Dredge	East Coast Only	NOAA NMFS
	VTR_NE_JulAugSep_Dredge	East Coast Only	NOAA NMFS
	VTR_NE_OctNovDec_Dredge	East Coast Only	NOAA NMFS
<i>Fishing</i>			
	ast_all	West Coast Only	Oregon Department of Land Conservation and Development (OR LCD)
	ast_all_kd_line	West Coast Only	Oregon Department of Land Conservation and Development (OR LCD)
	ast_cpfv	West Coast Only	Oregon Department of Land Conservation and Development (OR LCD)
	ast_cpfv_kd_line	West Coast Only	Oregon Department of Land Conservation and Development (OR LCD)
	bgd_all	West Coast Only	Oregon Department of Land Conservation and Development (OR LCD)
	bgd_all_kd_line	West Coast Only	Oregon Department of Land Conservation and Development (OR LCD)
	CON_NCCSR_cfis_flatfish	West Coast Only	Marine Map
	CON_NCCSR_cfis_halibut	West Coast Only	Marine Map
	CON_NCCSR_cfis_herring	West Coast Only	Marine Map
	CON_NCCSR_cfis_landings_com	West Coast Only	Marine Map
	CON_NCCSR_cfis_redAbalone	West Coast Only	Marine Map
	CON_NCCSR_cfis_redUrchins	West Coast Only	Marine Map
	CON_NCCSR_cfis_rockfish	West Coast Only	Marine Map
	CON_NCCSR_cfis_salmon	West Coast Only	Marine Map
	CON_NCCSR_cfis_sharksSkatesRays	West Coast Only	Marine Map
	CON_NCCSR_cfis_surfperch	West Coast Only	Marine Map

## APPENDIX D – GEOSPATIAL DATA INVENTORY

Category	Name	Coverage	Source
Subcategory			
	CON_NCCSR_Hotspot_BlK	West Coast Only	Marine Map
	CON_NCCSR_Hotspot_Boc	West Coast Only	Marine Map
	CON_NCCSR_Hotspot_Can	West Coast Only	Marine Map
	CON_NCCSR_Hotspot_Ling	West Coast Only	Marine Map
	CON_NCCSR_Hotspot_YelEye	West Coast Only	Marine Map
	CON_NCSR_AbaloneCatchBySite	West Coast Only	Marine Map
	CON_NCSR_UrchinLogs	West Coast Only	Marine Map
	CON_SCSR_CFID_Total_lbs	West Coast Only	Marine Map
	dpo_all	West Coast Only	Oregon Department of Land Conservation and Development (OR LCD)
	dpo_all_kd_line	West Coast Only	Oregon Department of Land Conservation and Development (OR LCD)
	flr_all	West Coast Only	Oregon Department of Land Conservation and Development (OR LCD)
	flr_all_kd_line	West Coast Only	Oregon Department of Land Conservation and Development (OR LCD)
	gar_all	West Coast Only	Oregon Department of Land Conservation and Development (OR LCD)
	PacFIN_0509_Groundfish_Activity	West Coast Only	PSMFC/PacFIN
	PacFIN_0509_HighlyMigratory_Activity	West Coast Only	PSMFC/PacFIN
	PacFIN_0509_OtherSpNoMgt_Activity	West Coast Only	PSMFC/PacFIN
	PacFIN_0509_ShrimpPrawns_Activity	West Coast Only	PSMFC/PacFIN
	src_all	West Coast Only	Oregon Department of Land Conservation and Development (OR LCD)
	src_all_kd_line	West Coast Only	Oregon Department of Land Conservation and Development (OR LCD)
	tll_all_kd_line	West Coast Only	Oregon Department of Land Conservation and Development (OR LCD)

## APPENDIX D – GEOSPATIAL DATA INVENTORY

Category	Name	Coverage	Source
<i>Subcategory</i>			
<i>Fishing Closure Areas</i>			
	BlkPots_geo2	East Coast Only	South Atlantic Fishery Management Council (SAFMC)
	BtmLngLn_geo2	East Coast Only	South Atlantic Fishery Management Council (SAFMC)
	closed_to_traps_pennekamp_poly	East Coast Only	Florida Fish and Wildlife Conservation Commission-Fish and Wildlife Research Institute
	Crab_A	East Coast Only	South Atlantic Fishery Management Council (SAFMC)
	Crab_B	East Coast Only	South Atlantic Fishery Management Council (SAFMC)
	Crab_C	East Coast Only	South Atlantic Fishery Management Council (SAFMC)
	Crab_Northern	East Coast Only	South Atlantic Fishery Management Council (SAFMC)
	Crab_Southern	East Coast Only	South Atlantic Fishery Management Council (SAFMC)
	fish_traps_geo2.	East Coast Only	South Atlantic Fishery Management Council (SAFMC)
	Georges_Bank_Seas_Closure_Area	East Coast Only	NOAA NMFS
	MAN_CA_RCA_Recreational_2009	West Coast Only	Marine Map
	MAN_CA_RCA_Trawl_2009	West Coast Only	Marine Map
	MAN_NCCSR_CordellBanksClosure	West Coast Only	Marine Map
	MAN_NCSR_DungenessClosuresCom	West Coast Only	Marine Map
	MAN_NCSR_SalmonClosuresCom	West Coast Only	Marine Map
	MAN_NCSR_SalmonClosuresRec	West Coast Only	Marine Map
	MAN_SCSR_Cowcod_ConsArea	West Coast Only	Marine Map
	MAN_SCSR_HalibutTrawlClosures	West Coast Only	Marine Map
	MAN_SCSR_RCA_Rec_scorp_fish_07	West Coast Only	Marine Map
	NE_AmerLobster_Restricted_Gear_Area_1	East Coast Only	NOAA NMFS
	NE_AmerLobster_Restricted_Gear_Area_2	East Coast Only	NOAA NMFS
	NE_AmerLobster_Restricted_Gear_Area_3	East Coast Only	NOAA NMFS
	NE_AmerLobster_Restricted_Gear_Area_4	East Coast Only	NOAA NMFS
	NE_EFH_Closure_Areas	East Coast Only	NOAA NMFS

## APPENDIX D – GEOSPATIAL DATA INVENTORY

Category	Name	Coverage	Source
<i>Subcategory</i>			
	NE_Monkfish_Closed_Areas	East Coast Only	NOAA NMFS
	NE_Multispecies_Closure_Areas	East Coast Only	NOAA NMFS
	NE_Scallop_Areas	East Coast Only	NOAA NMFS
	NE_Scallop_Closed_Areas	East Coast Only	NOAA NMFS
	RollerRig_geo2	East Coast Only	South Atlantic Fishery Management Council (SAFMC)
	Rolling_Closure_Area1	East Coast Only	NOAA NMFS
	Rolling_Closure_Area2	East Coast Only	NOAA NMFS
	Rolling_Closure_Area3	East Coast Only	NOAA NMFS
	Rolling_Closure_Area4	East Coast Only	NOAA NMFS
	Rolling_Closure_Area5	East Coast Only	NOAA NMFS
	Sargassum_rules_geo2	East Coast Only	South Atlantic Fishery Management Council (SAFMC)
	SFAA_A	East Coast Only	South Atlantic Fishery Management Council (SAFMC)
	SFAA_B	East Coast Only	South Atlantic Fishery Management Council (SAFMC)
	SFAA_C	East Coast Only	South Atlantic Fishery Management Council (SAFMC)
	SFAA_D	East Coast Only	South Atlantic Fishery Management Council (SAFMC)
<i>Fixed Gear</i>			
	com_benthic_fixed_dominant	West Coast Only	CA Ocean Uses Atlas
	com_benthic_fixed_footprint	West Coast Only	CA Ocean Uses Atlas
	com_benthic_fixed_future	West Coast Only	CA Ocean Uses Atlas
	fisheries_fixed	East Coast Only	RI SAMP
<i>Gill Net</i>			
	Logbook_SE_Annual_Gillnet	East Coast Only	NOAA NMFS
	Logbook_SE_AprMayJun_Gillnet	East Coast Only	NOAA NMFS
	Logbook_SE_JanFebMar_Gillnet	East Coast Only	NOAA NMFS
	Logbook_SE_JulAugSep_GillNet	East Coast Only	NOAA NMFS
	Logbook_SE_OctNovDec_GillNet	East Coast Only	NOAA NMFS

## APPENDIX D – GEOSPATIAL DATA INVENTORY

Category	Name	Coverage	Source
<i>Subcategory</i>			
<i>Gill Net and Seines</i>			
	VTR_NE_Annual_GillNetSeine	East Coast Only	NOAA NMFS
	VTR_NE_AprMayJun_GillNetSeine	East Coast Only	NOAA NMFS
	VTR_NE_JanFebMar_GillNetSeine	East Coast Only	NOAA NMFS
	VTR_NE_JulAugSep_GillNetSeine	East Coast Only	NOAA NMFS
	VTR_NE_OctNovDec_GillNetSeine	East Coast Only	NOAA NMFS
<i>Handlines and Electric Reels</i>			
	Logbook_SE_Annual_HandlineEReel	East Coast Only	NOAA NMFS
	Logbook_SE_AprMayJun_HandlineReel	East Coast Only	NOAA NMFS
	Logbook_SE_JanFebMar_HandlineEReel	East Coast Only	NOAA NMFS
	Logbook_SE_JulAugSep_HandlineEReel	East Coast Only	NOAA NMFS
	Logbook_SE_OctNovDec_HandlineEReel	East Coast Only	NOAA NMFS
<i>Handlines and Rod</i>			
	VTR_NE_Annual_HandlineRod	East Coast Only	NOAA NMFS
	VTR_NE_AprMayJun_HandLineRod	East Coast Only	NOAA NMFS
	VTR_NE_JanFebMar_HandLineRod	East Coast Only	NOAA NMFS
	VTR_NE_JulAugSep_HandlineRod	East Coast Only	NOAA NMFS
	VTR_NE_OctNovDec_HandlineRod	East Coast Only	NOAA NMFS
<i>Harpoons</i>			
	VTR_NE_Annual_Harpoon	East Coast Only	NOAA NMFS
	VTR_NE_AprMayJun_Harpoon	East Coast Only	NOAA NMFS
	VTR_NE_JulAugSep_Harpoon	East Coast Only	NOAA NMFS
	VTR_NE_OctNovDec_Harpoon	East Coast Only	NOAA NMFS
<i>High Use Area/Restricted Area</i>			
	APPROACH_HARBOR_FSHFAC_poly_ec	East Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_FSHFAC_POLYGON_poly_wc	West Coast Only	NOAA ENCDirect
	Towlanes_WASG_2007	West Coast Only	Oregon Coastal Atlas
<i>Longline</i>			
	Logbook_SE_Annual_Longline	East Coast Only	NOAA NMFS

## APPENDIX D – GEOSPATIAL DATA INVENTORY

Category	Name	Coverage	Source
<i>Subcategory</i>			
	Logbook_SE_AprMayJun_Longline	East Coast Only	NOAA NMFS
	Logbook_SE_JanFebMar_Longline	East Coast Only	NOAA NMFS
	Logbook_SE_JulAugSep_Longline	East Coast Only	NOAA NMFS
	Logbook_SE_OctNovDec_Longline	East Coast Only	NOAA NMFS
	VTR_NE_Annual_Longline	East Coast Only	NOAA NMFS
	VTR_NE_AprMayJun_Longline	East Coast Only	NOAA NMFS
	VTR_NE_JanFebMar_Longline	East Coast Only	NOAA NMFS
	VTR_NE_JulAugSep_Longline	East Coast Only	NOAA NMFS
	VTR_NE_OctNovDec_Longline	East Coast Only	NOAA NMFS
<i>Mobile Gear</i>			
	com_benthic_mobile_dominant	West Coast Only	CA Ocean Uses Atlas
	com_benthic_mobile_footprint	West Coast Only	CA Ocean Uses Atlas
	fisheries_mobile	East Coast Only	RI SAMP
<i>Other Gear Types</i>			
	CDFG_OtherLandings_05to09	West Coast Only	California Department of Fish and Game
	Logbook_SE_Annual_Other	East Coast Only	NOAA NMFS
	Logbook_SE_AprMayJun_OtherGear	East Coast Only	NOAA NMFS
	Logbook_SE_JanFebMar_OtherGear	East Coast Only	NOAA NMFS
	Logbook_SE_JulAugSep_OtherGear	East Coast Only	NOAA NMFS
	Logbook_SE_OctNovDec_OtherGear	East Coast Only	NOAA NMFS
<i>Oysters</i>			
	SCoyster2008Live	East Coast Only	South Carolina Department of Natural Resources
<i>Pelagic Fishing</i>			
	com_pelagic_dominant	West Coast Only	CA Ocean Uses Atlas
	com_pelagic_footprint	West Coast Only	CA Ocean Uses Atlas
	com_pelagic_future	West Coast Only	CA Ocean Uses Atlas
	PacFIN_0509_CoastalPelagic_Activity	West Coast Only	PSMFC/PacFIN

## APPENDIX D – GEOSPATIAL DATA INVENTORY

Category	Name	Coverage	Source
<i>Subcategory</i>			
<i>Pots</i>			
	CDFG_CrabPotLandings_05to09	West Coast Only	California Department of Fish and Game
	MORIS_LOBSTER_HARVEST_POLY	East Coast Only	Massachusetts Office of Coastal Zone Management
	VTR_NE_Annual_Pot	East Coast Only	NOAA NMFS
	VTR_NE_AprMayJun_Pot	East Coast Only	NOAA NMFS
	VTR_NE_JanFebMar_Pot	East Coast Only	NOAA NMFS
	VTR_NE_JulAugSep_Pot	East Coast Only	NOAA NMFS
	VTR_NE_OctNovDec_Pot	East Coast Only	NOAA NMFS
<i>Squid</i>			
	CON_CCSR_Squid_TonnageLog	West Coast Only	Marine Map
	CON_NCCSR_cfis_squid	West Coast Only	Marine Map
<i>Traps</i>			
	CDFG_TrapHookNLineLandings_05to09	West Coast Only	California Department of Fish and Game
	CON_CA_SpotPrawn_TrapLog	West Coast Only	Marine Map
	CON_NCCSR_cfis_crabs	West Coast Only	Marine Map
	Logbook_SE_Annual_Trap	East Coast Only	NOAA NMFS
	Logbook_SE_AprMayJun_Traps	East Coast Only	NOAA NMFS
	Logbook_SE_JanFebMar_Trap	East Coast Only	NOAA NMFS
	Logbook_SE_JulAugSep_Trap	East Coast Only	NOAA NMFS
	Logbook_SE_OctNovDec_Trap	East Coast Only	NOAA NMFS
	VTR_NE_Annual_Trap	East Coast Only	NOAA NMFS
	VTR_NE_AprMayJun_Trap	East Coast Only	NOAA NMFS
	VTR_NE_JanFebMar_Trap	East Coast Only	NOAA NMFS
	VTR_NE_JulAugSep_Trap	East Coast Only	NOAA NMFS
	VTR_NE_OctNovDec_Trap	East Coast Only	NOAA NMFS
<i>Trawls</i>			
	CDFG_TrawlLandings_05to09	West Coast Only	California Department of Fish and Game

## APPENDIX D – GEOSPATIAL DATA INVENTORY

Category	Name	Coverage	Source
<i>Subcategory</i>			
	fisheries_historictrawl	East Coast Only	RI SAMP
	MAN_SCSR_HalibutTrawlGrounds_2008	West Coast Only	Marine Map
	VTR_NE_Annual_Trawl	East Coast Only	NOAA NMFS
	VTR_NE_AprMayJun_Trawl	East Coast Only	NOAA NMFS
	VTR_NE_JanFebMar_Trawl	East Coast Only	NOAA NMFS
	VTR_NE_JulAugSep_Trawl	East Coast Only	NOAA NMFS
	VTR_NE_OctNovDec_Trawl	East Coast Only	NOAA NMFS
<i>Trolling</i>			
	CDFG_TrollLandings_05to09	West Coast Only	California Department of Fish and Game
	Logbook_SE_Annual_Trolling	East Coast Only	NOAA NMFS
	Logbook_SE_AprMayJun_Trolling	East Coast Only	NOAA NMFS
	Logbook_SE_JanFebMar_Trolling	East Coast Only	NOAA NMFS
	Logbook_SE_JulAugSep_Trolling	East Coast Only	NOAA NMFS
	Logbook_SE_OctNovDec_Trolling	East Coast Only	NOAA NMFS
<b>Marine Transportation/ Shipping Lanes/Ferry Routes</b>			
<i>Marine Transportation</i>			
	AIS_GridQ1	Full Study Area	Coast Guard
	AIS_GridQ2	Full Study Area	Coast Guard
	AIS_GridQ3	Full Study Area	Coast Guard
	AIS_GridQ4	Full Study Area	Coast Guard
	AIS_GridYR2009	Full Study Area	Coast Guard
	APPROACH_HARBOR_ACHARE_point_ec	East Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_ACHARE_POINT_point_wc	West Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_ACHARE_poly_ec	East Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_CTNARE_point_ec	East Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_CTNARE_POINT_point_wc	West Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_CTNARE_poly_ec	East Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_CTNARE_POLYGON_poly_wc	West Coast Only	NOAA ENCDirect

## APPENDIX D – GEOSPATIAL DATA INVENTORY

Category	Name	Coverage	Source
Subcategory			
	APPROACH_HARBOR_FAIRWY_poly_ec	East Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_FAIRWY_poly_wc	West Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_FERYRT_line_ec	East Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_FERYRT_poly_ec	East Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_HBRFAC_point_ec	East Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_HBRFAC_poly_ec	East Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_ISTZNE_poly_ec	East Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_ISTZNE_poly_wc	West Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_MORFAC_line_ec	East Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_MORFAC_point_ec	East Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_MORFAC_POINT_point_wc	West Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_MORFAC_poly_ec	East Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_NAVLINE_line_ec	East Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_NAVLINE_line_wc	West Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_OBSTRN_line_ec	East Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_OBSTRN_point_ec	East Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_OBSTRN_POINT_point_wc	West Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_OBSTRN_poly_ec	East Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_OBSTRN_POLYGON_poly_wc	West Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_PILBOP_point_ec	East Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_PILBOP_POINT_point_wc	West Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_PILBOP_poly_ec	East Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_PILPNT_point_ec	East Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_PILPNT_point_wc	West Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_PRCARE_poly_ec	East Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_RCRTCL_line_ec	East Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_RCRTCL_line_wc	West Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_RCTLPT_POLYGON_poly_wc	West Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_RECTRC_line_ec	East Coast Only	NOAA ENCDirect

## APPENDIX D – GEOSPATIAL DATA INVENTORY

Category	Name	Coverage	Source
	Subcategory		
	APPROACH_HARBOR_RECTRC_LINE_line_wc	West Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_RESARE_poly_ec	East Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_RESARE_poly_wc	West Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_TSELNE_line_wc	West Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_TSEZNE_poly_ec	East Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_TSEZNE_poly_wc	West Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_TSSBND_line_ec	East Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_TSSBND_line_wc	West Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_TSSLPT_poly_ec	East Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_TSSLPT_poly_wc	West Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_UWTROC_point_ec	East Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_UWTROC_point_wc	West Coast Only	NOAA ENCDirect
	COASTAL_ACHARE_poly_ec	East Coast Only	NOAA ENCDirect
	COASTAL_CTNARE_point_ec	East Coast Only	NOAA ENCDirect
	COASTAL_CTNARE_POINT_point_wc	West Coast Only	NOAA ENCDirect
	COASTAL_CTNARE_poly_ec	East Coast Only	NOAA ENCDirect
	COASTAL_CTNARE_POLYGON_poly_wc	West Coast Only	NOAA ENCDirect
	COASTAL_FAIRWY_poly_ec	East Coast Only	NOAA ENCDirect
	COASTAL_FAIRWY_poly_wc	West Coast Only	NOAA ENCDirect
	COASTAL_ISTZNE_poly_wc	West Coast Only	NOAA ENCDirect
	COASTAL_MORFAC_point_ec	East Coast Only	NOAA ENCDirect
	COASTAL_MORFAC_POINT_point_wc	West Coast Only	NOAA ENCDirect
	COASTAL_NAVLNE_line_ec	East Coast Only	NOAA ENCDirect
	COASTAL_NAVLNE_line_wc	West Coast Only	NOAA ENCDirect
	COASTAL_OBSTRN_line_ec	East Coast Only	NOAA ENCDirect
	COASTAL_OBSTRN_LINE_line_wc	West Coast Only	NOAA ENCDirect
	COASTAL_OBSTRN_point_ec	East Coast Only	NOAA ENCDirect
	COASTAL_OBSTRN_POINT_point_wc	West Coast Only	NOAA ENCDirect
	COASTAL_OBSTRN_poly_ec	East Coast Only	NOAA ENCDirect

## APPENDIX D – GEOSPATIAL DATA INVENTORY

Category	Name	Coverage	Source
	Subcategory		
	COASTAL_OBSTRN_POLYGON_poly_wc	West Coast Only	NOAA ENCDirect
	COASTAL_PILBOP_point_ec	East Coast Only	NOAA ENCDirect
	COASTAL_PILBOP_POINT_point_wc	West Coast Only	NOAA ENCDirect
	COASTAL_PILBOP_poly_ec	East Coast Only	NOAA ENCDirect
	COASTAL_PILBOP_POLYGON_poly_wc	West Coast Only	NOAA ENCDirect
	COASTAL_PILPNT_point_ec	East Coast Only	NOAA ENCDirect
	COASTAL_PILPNT_point_wc	West Coast Only	NOAA ENCDirect
	COASTAL_PRCARE_poly_ec	East Coast Only	NOAA ENCDirect
	COASTAL_PRCARE_POLYGON_poly_wc	West Coast Only	NOAA ENCDirect
	COASTAL_RECTRC_line_ec	East Coast Only	NOAA ENCDirect
	COASTAL_RECTRC_LINE_line_wc	West Coast Only	NOAA ENCDirect
	COASTAL_RESARE_poly_ec	East Coast Only	NOAA ENCDirect
	COASTAL_RESARE_poly_wc	West Coast Only	NOAA ENCDirect
	COASTAL_TSEZNE_poly_ec	East Coast Only	NOAA ENCDirect
	COASTAL_TSEZNE_poly_wc	West Coast Only	NOAA ENCDirect
	COASTAL_TSSBND_line_ec	East Coast Only	NOAA ENCDirect
	COASTAL_TSSBND_line_wc	West Coast Only	NOAA ENCDirect
	COASTAL_UWTROC_point_ec	East Coast Only	NOAA ENCDirect
	COASTAL_UWTROC_point_wc	West Coast Only	NOAA ENCDirect
	GENERAL_CTNARE_point_ec	East Coast Only	NOAA ENCDirect
	GENERAL_CTNARE_POINT_point_wc	West Coast Only	NOAA ENCDirect
	GENERAL_CTNARE_poly_ec	East Coast Only	NOAA ENCDirect
	GENERAL_CTNARE_POLYGON_poly_wc	West Coast Only	NOAA ENCDirect
	GENERAL_OBSTRN_point_ec	East Coast Only	NOAA ENCDirect
	GENERAL_OBSTRN_POINT_point_wc	West Coast Only	NOAA ENCDirect
	GENERAL_OBSTRN_poly_ec	East Coast Only	NOAA ENCDirect
	GENERAL_OBSTRN_POLYGON_poly_wc	West Coast Only	NOAA ENCDirect
	GENERAL_PILBOP_POLYGON_poly_wc	West Coast Only	NOAA ENCDirect
	GENERAL_PILPNT_point_wc	West Coast Only	NOAA ENCDirect

## APPENDIX D – GEOSPATIAL DATA INVENTORY

Category	Name	Coverage	Source
<i>Subcategory</i>			
	GENERAL_PRCARE_poly_ec	East Coast Only	NOAA ENCDirect
	GENERAL_PRCARE_POLYGON_poly_wc	West Coast Only	NOAA ENCDirect
	GENERAL_RECTRC_line_ec	East Coast Only	NOAA ENCDirect
	GENERAL_RECTRC_LINE_line_wc	West Coast Only	NOAA ENCDirect
	GENERAL_RESARE_poly_ec	East Coast Only	NOAA ENCDirect
	GENERAL_RESARE_poly_wc	West Coast Only	NOAA ENCDirect
	GENERAL_UWTROC_point_ec	East Coast Only	NOAA ENCDirect
	GENERAL_UWTROC_point_wc	West Coast Only	NOAA ENCDirect
	mtransport_aisgrid	East Coast Only	RI SAMP
	north_america_ferries	Full Study Area	ESRI
	OVERVIEW_CTNARE_point_ec	East Coast Only	NOAA ENCDirect
	OVERVIEW_CTNARE_poly_ec	East Coast Only	NOAA ENCDirect
	OVERVIEW_CTNARE_POLYGON_poly_wc	West Coast Only	NOAA ENCDirect
	OVERVIEW_OBSTRN_point_ec	East Coast Only	NOAA ENCDirect
	OVERVIEW_PILPNT_point_ec	East Coast Only	NOAA ENCDirect
	s_mmc_S_MMC_Atl_GOM_Shipping_Fairways	East Coast Only	BOEM/NOAA
	s_mmc_S_MMC_shipping_lanes	Full Study Area	BOEM/NOAA
	shipping_dominant	West Coast Only	CA Ocean Uses Atlas
	shipping_footprint	West Coast Only	CA Ocean Uses Atlas
	WCOVTRMP_Boundary	West Coast Only	Pacific States/British Columbia Oil Spill Task Force
<i>Navigation Aid</i>			
	APPROACH_HARBOR_BCNISD_point_ec	East Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_BCNLAT_point_ec	East Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_BCNLAT_point_wc	West Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_BCNSAW_point_ec	East Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_BCNSPP_point_ec	East Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_BCNSPP_point_wc	West Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_BOYISD_point_ec	East Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_BOYLAT_point_ec	East Coast Only	NOAA ENCDirect

## APPENDIX D – GEOSPATIAL DATA INVENTORY

Category	Name	Coverage	Source
Subcategory			
	APPROACH_HARBOR_BOYLAT_point_wc	West Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_BOYSAW_point_ec	East Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_BOYSAW_point_wc	West Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_BOYSPP_point_ec	East Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_BOYSPP_point_wc	West Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_DAYMAR_point_ec	East Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_DAYMAR_point_wc	West Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_FOGSIG_point_ec	East Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_FOGSIG_point_wc	West Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_LIGHTS_point_ec	East Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_LIGHTS_point_wc	West Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_LITFLT_point_ec	East Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_RETRFL_point_ec	East Coast Only	NOAA ENCDirect
	APPROACH_HARBOR RTPBCN_point_ec	East Coast Only	NOAA ENCDirect
	APPROACH_HARBOR RTPBCN_point_wc	West Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_TOPMAR_point_ec	East Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_TOPMAR_point_wc	West Coast Only	NOAA ENCDirect
	COASTAL_BCNLAT_point_ec	East Coast Only	NOAA ENCDirect
	COASTAL_BCNLAT_point_wc	West Coast Only	NOAA ENCDirect
	COASTAL_BCNSPP_point_ec	East Coast Only	NOAA ENCDirect
	COASTAL_BCNSPP_point_wc	West Coast Only	NOAA ENCDirect
	COASTAL_BOYISD_point_ec	East Coast Only	NOAA ENCDirect
	COASTAL_BOYLAT_point_ec	East Coast Only	NOAA ENCDirect
	COASTAL_BOYLAT_point_wc	West Coast Only	NOAA ENCDirect
	COASTAL_BOYSAW_point_ec	East Coast Only	NOAA ENCDirect
	COASTAL_BOYSAW_point_wc	West Coast Only	NOAA ENCDirect
	COASTAL_BOYSPP_point_ec	East Coast Only	NOAA ENCDirect
	COASTAL_BOYSPP_point_wc	West Coast Only	NOAA ENCDirect
	COASTAL_DAYMAR_point_ec	East Coast Only	NOAA ENCDirect

## APPENDIX D – GEOSPATIAL DATA INVENTORY

Category	Name	Coverage	Source
	Subcategory		
	COASTAL_DAYMAR_point_wc	West Coast Only	NOAA ENCDirect
	COASTAL_FOGSIG_point_ec	East Coast Only	NOAA ENCDirect
	COASTAL_FOGSIG_point_wc	West Coast Only	NOAA ENCDirect
	COASTAL_LIGHTS_point_ec	East Coast Only	NOAA ENCDirect
	COASTAL_LIGHTS_point_wc	West Coast Only	NOAA ENCDirect
	COASTAL_RETRFL_point_ec	East Coast Only	NOAA ENCDirect
	COASTAL_RTPBCN_point_ec	East Coast Only	NOAA ENCDirect
	COASTAL_RTPBCN_point_wc	West Coast Only	NOAA ENCDirect
	COASTAL_TOPMAR_point_ec	East Coast Only	NOAA ENCDirect
	COASTAL_TOPMAR_point_wc	West Coast Only	NOAA ENCDirect
	GENERAL_BCNLAT_point_ec	East Coast Only	NOAA ENCDirect
	GENERAL_BCNLAT_point_wc	West Coast Only	NOAA ENCDirect
	GENERAL_BCNSPP_point_ec	East Coast Only	NOAA ENCDirect
	GENERAL_BCNSPP_point_wc	West Coast Only	NOAA ENCDirect
	GENERAL_BOYLAT_point_ec	East Coast Only	NOAA ENCDirect
	GENERAL_BOYLAT_point_wc	West Coast Only	NOAA ENCDirect
	GENERAL_BOYSAW_point_ec	East Coast Only	NOAA ENCDirect
	GENERAL_BOYSAW_point_wc	West Coast Only	NOAA ENCDirect
	GENERAL_BOYSPP_point_ec	East Coast Only	NOAA ENCDirect
	GENERAL_BOYSPP_point_wc	West Coast Only	NOAA ENCDirect
	GENERAL_DAYMAR_point_ec	East Coast Only	NOAA ENCDirect
	GENERAL_DAYMAR_point_wc	West Coast Only	NOAA ENCDirect
	GENERAL_FOGSIG_point_ec	East Coast Only	NOAA ENCDirect
	GENERAL_FOGSIG_point_wc	West Coast Only	NOAA ENCDirect
	GENERAL_LIGHTS_point_ec	East Coast Only	NOAA ENCDirect
	GENERAL_LIGHTS_point_wc	West Coast Only	NOAA ENCDirect
	GENERAL_RTPBCN_point_ec	East Coast Only	NOAA ENCDirect
	GENERAL_RTPBCN_point_wc	West Coast Only	NOAA ENCDirect
	GENERAL_TOPMAR_point_ec	East Coast Only	NOAA ENCDirect

## APPENDIX D – GEOSPATIAL DATA INVENTORY

Category	Name	Coverage	Source
<i>Subcategory</i>			
	GENERAL_TOPMAR_point_wc	West Coast Only	NOAA ENCDirect
	OVERVIEW_BCNLAT_point_ec	East Coast Only	NOAA ENCDirect
	OVERVIEW_BCNSPP_point_ec	East Coast Only	NOAA ENCDirect
	OVERVIEW_BCNSPP_point_wc	West Coast Only	NOAA ENCDirect
	OVERVIEW_BOYLAT_point_ec	East Coast Only	NOAA ENCDirect
	OVERVIEW_BOYLAT_point_wc	West Coast Only	NOAA ENCDirect
	OVERVIEW_BOYSAW_point_ec	East Coast Only	NOAA ENCDirect
	OVERVIEW_BOYSAW_point_wc	West Coast Only	NOAA ENCDirect
	OVERVIEW_BOYSPP_point_ec	East Coast Only	NOAA ENCDirect
	OVERVIEW_BOYSPP_point_wc	West Coast Only	NOAA ENCDirect
	OVERVIEW_DAYMAR_point_ec	East Coast Only	NOAA ENCDirect
	OVERVIEW_FOGSIG_point_ec	East Coast Only	NOAA ENCDirect
	OVERVIEW_LIGHTS_point_ec	East Coast Only	NOAA ENCDirect
	OVERVIEW_RTPBCN_point_ec	East Coast Only	NOAA ENCDirect
<b>Military Use Area</b>			
<i>Coast Guard Station</i>			
	APPROACH_HARBOR_CGUSTA_point_ec	East Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_CGUSTA_point_wc	West Coast Only	NOAA ENCDirect
	COASTAL_CGUSTA_point_ec	East Coast Only	NOAA ENCDirect
	COASTAL_CGUSTA_point_wc	West Coast Only	NOAA ENCDirect
<i>Fortified Structure (Former Military Defense)</i>			
	APPROACH_HARBOR_FORSTC_point_ec	East Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_FORSTC_poly_ec	East Coast Only	NOAA ENCDirect
	COASTAL_FORSTC_poly_ec	East Coast Only	NOAA ENCDirect
<i>Military Danger Zone</i>			
	DangerRestrictedAreas	East Coast Only	US Army Corps of Engineers
	s_mmc_S_MMC_Military_Danger_Zones	Full Study Area	BOEM/NOAA
	securityzones_brevard_poly	East Coast Only	Florida Fish and Wildlife Conservation Commission-Fish and Wildlife Research Institute

## APPENDIX D – GEOSPATIAL DATA INVENTORY

Category	Name	Coverage	Source
<i>Subcategory</i>			
	UnexplodedOrdinanceAreas	East Coast Only	Coast Guard
	UnexplodedOrdinanceLocations	East Coast Only	Coast Guard
<i>Military Practice Area</i>			
	APPROACH_HARBOR_MIPARE_poly_ec	East Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_MIPARE_POLYGON_poly_wc	West Coast Only	NOAA ENCDirect
	COASTAL_MIPARE_poly_ec	East Coast Only	NOAA ENCDirect
	COASTAL_MIPARE_POLYGON_poly_wc	West Coast Only	NOAA ENCDirect
	GENERAL_MIPARE_poly_ec	East Coast Only	NOAA ENCDirect
	GENERAL_MIPARE_POLYGON_poly_wc	West Coast Only	NOAA ENCDirect
	military_dominant	West Coast Only	CA Ocean Uses Atlas
	military_footprint	West Coast Only	CA Ocean Uses Atlas
	military_future	West Coast Only	CA Ocean Uses Atlas
	Navy_Northwest_airspace	West Coast Only	US Navy
	Navy_Northwest_OPAREA	West Coast Only	US Navy
	OVERVIEW_MIPARE_poly_ec	East Coast Only	NOAA ENCDirect
<b>Oil and Gas Leasing Blocks</b>			
<i>Leases</i>			
	MAN_CA_OilBedLeases	West Coast Only	Marine Map
	s_mmc_S_MMC_OCS_blocks	Full Study Area	BOEM/NOAA
	z801lease	West Coast Only	BOEM/NOAA
<i>Uses</i>			
	Count_of_Uses_by_Lease_Block	Full Study Area	Industrial Economics, Inc.
<b>Oil/Gas Deposits and Infrastructure/Cables</b>			
<i>Barrier</i>			
	APPROACH_HARBOR_oilbar_line_ec	East Coast Only	NOAA ENCDirect
<i>Boundary</i>			
	s_mmc_S_MMC_8g_line	Full Study Area	BOEM/NOAA

## APPENDIX D – GEOSPATIAL DATA INVENTORY

Category	Name	Coverage	Source
<i>Subcategory</i>			
<i>Cable</i>			
	APPROACH_HARBOR_CBLARE_poly_ec	East Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_CBLOHD_line_ec	East Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_CBLSUB_line_ec	East Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_CBLSUB_line_wc	West Coast Only	NOAA ENCDirect
	cables_dominant	West Coast Only	CA Ocean Uses Atlas
	cables_footprint	West Coast Only	CA Ocean Uses Atlas
	COASTAL_CBLARE_poly_ec	East Coast Only	NOAA ENCDirect
	COASTAL_CBLARE_poly_wc	West Coast Only	NOAA ENCDirect
	COASTAL_CBLOHD_line_ec	East Coast Only	NOAA ENCDirect
	COASTAL_CBLSUB_line_ec	East Coast Only	NOAA ENCDirect
	COASTAL_CBLSUB_line_wc	West Coast Only	NOAA ENCDirect
	GENERAL_CBLARE_poly_wc	West Coast Only	NOAA ENCDirect
	GENERAL_CBLSUB_line_ec	East Coast Only	NOAA ENCDirect
	GENERAL_CBLSUB_line_wc	West Coast Only	NOAA ENCDirect
	MORIS_HAR_NAN_CABLE_ARC	East Coast Only	Massachusetts Office of Coastal Zone Management
	MORIS_HYAN_NAN_CABLE_ARC	East Coast Only	Massachusetts Office of Coastal Zone Management
	mutil_att	East Coast Only	RI SAMP
	OVERVIEW_CBLSUB_line_ec	East Coast Only	NOAA ENCDirect
<i>Gas</i>			
	LNGsites	East Coast Only	Coast Guard
	s_mmc_S_MMC_LNG_sites	East Coast Only	BOEM/NOAA
<i>Mining</i>			
	mining_dominant	West Coast Only	CA Ocean Uses Atlas
	mining_footprint	West Coast Only	CA Ocean Uses Atlas
	mining_future	West Coast Only	CA Ocean Uses Atlas
<i>Offshore Platform</i>			
	APPROACH_HARBOR_OFSPFL_point_ec	East Coast Only	NOAA ENCDirect

## APPENDIX D – GEOSPATIAL DATA INVENTORY

Category	Name	Coverage	Source
<i>Subcategory</i>			
	APPROACH_HARBOR_OFSPFL_poly_ec	East Coast Only	NOAA ENCDirect
	COASTAL_OFSPFL_point_ec	East Coast Only	NOAA ENCDirect
	COASTAL_OFSPFL_POINT_point_wc	West Coast Only	NOAA ENCDirect
	CUL_SCSR_Oilplatforms	West Coast Only	Marine Map
	GENERAL_OFSPFL_point_ec	East Coast Only	NOAA ENCDirect
	GENERAL_OFSPFL_POINT_point_wc	West Coast Only	NOAA ENCDirect
	OVERVIEW_OFSPFL_point_ec	East Coast Only	NOAA ENCDirect
	s_mmc_S_MMC_Platforms	West Coast Only	BOEM/NOAA
<i>Oil</i>			
	oil_dominant	West Coast Only	CA Ocean Uses Atlas
	oil_footprint	West Coast Only	CA Ocean Uses Atlas
	oil_future	West Coast Only	CA Ocean Uses Atlas
<i>Pipeline</i>			
	APPROACH_HARBOR_PIPARE_poly_ec	East Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_PIPOHD_line_ec	East Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_PIPSOL_line_ec	East Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_PIPSOL_LINE_line_wc	West Coast Only	NOAA ENCDirect
	COASTAL_PIPSOL_line_ec	East Coast Only	NOAA ENCDirect
	COASTAL_PIPSOL_LINE_line_wc	West Coast Only	NOAA ENCDirect
	MORIS_ALGONQUIN_HUBLINE_LNG_ARC	East Coast Only	Massachusetts Office of Coastal Zone Management
	MORIS_NE_GATEWAY_LNG_ARC	East Coast Only	Massachusetts Office of Coastal Zone Management
	MORIS_NEPTUNE_LNG_ARC	East Coast Only	Massachusetts Office of Coastal Zone Management
	s_mmc_S_MMC_pipelines	Full Study Area	BOEM/NOAA
<i>Well</i>			
	OR_Oilwells_1965to1967	West Coast Only	Oregon Coastal Atlas
	pc_wells	West Coast Only	BOEM/NOAA

## APPENDIX D – GEOSPATIAL DATA INVENTORY

Category	Name	Coverage	Source
<i>Subcategory</i>			
<b>Recreation Activities</b>			
<i>Beach/Coast Use</i>			
	beach_dominant	West Coast Only	CA Ocean Uses Atlas
	beach_footprint	West Coast Only	CA Ocean Uses Atlas
	beach_future	West Coast Only	CA Ocean Uses Atlas
	CON_CCSR_Coastal_Visitation	West Coast Only	Marine Map
	CON_SCSR_SD_St_Bchs_Vis_Use	West Coast Only	Marine Map
	CUL_CA_Coast_AccessPoints	West Coast Only	Marine Map
<i>Charter Boat (Recreational Fishing)</i>			
	VTR_NE_Annual_CharterBoat	East Coast Only	NOAA NMFS
	VTR_NE_AprMayJun_CharterBoat	East Coast Only	NOAA NMFS
	VTR_NE_CharterBoatTrips_1999to2008	East Coast Only	NOAA NMFS
	VTR_NE_JanFebMar_CharterBoat	East Coast Only	NOAA NMFS
	VTR_NE_JulAugSep_CharterBoat	East Coast Only	NOAA NMFS
	VTR_NE_OctNovDec_CharterBoat	East Coast Only	NOAA NMFS
<i>Combined</i>			
	NHME_OceanUseAtlas_nonconsumptive	East Coast Only	National Marine Protected Areas Center
	NON_NCCSR_Human_Use	West Coast Only	Marine Map
	OptIn_Cumulative_Ocean_PU	West Coast Only	Oregon Department of Land Conservation and Development (OR LCD)
	OptIn_Cumulative_Shore_PU	West Coast Only	Oregon Department of Land Conservation and Development (OR LCD)
	Panel_Lasttrip_Ocean	West Coast Only	Oregon Department of Land Conservation and Development (OR LCD)
	Panel_Lasttrip_Ocean_PU	West Coast Only	Oregon Department of Land Conservation and Development (OR LCD)
	Panel_Lasttrip_Shore	West Coast Only	Oregon Department of Land Conservation and Development (OR LCD)

## APPENDIX D – GEOSPATIAL DATA INVENTORY

Category	Name	Coverage	Source
<i>Subcategory</i>			
	Panel_Lasttrip_Shore_PU	West Coast Only	Oregon Department of Land Conservation and Development (OR LCD)
	Public_Access_WA	West Coast Only	Washington Department of Ecology
<i>Diving</i>			
	CON_CCSR_CencalSpearfishSites	West Coast Only	Marine Map
	CUL_NCSR_ShoreDive_Locations	West Coast Only	Marine Map
	MORIS_DIVE_SITES_PT	East Coast Only	Massachusetts Office of Coastal Zone Management
	NON_NCCSR_Diving	West Coast Only	Marine Map
	NON_SCSR_Shore_Dive_Locs	West Coast Only	Marine Map
	scuba_dominant	West Coast Only	CA Ocean Uses Atlas
	scuba_footprint	West Coast Only	CA Ocean Uses Atlas
	scuba_future	West Coast Only	CA Ocean Uses Atlas
<i>Hunting</i>			
	hunting_dominant	West Coast Only	CA Ocean Uses Atlas
	hunting_footprint	West Coast Only	CA Ocean Uses Atlas
<i>Recreational Boating</i>			
	APPROACH_HARBOR_SMCFAC_point_ec	East Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_SMCFAC_POINT_point_wc	West Coast Only	NOAA ENCDirect
	boat_launch_moorage	West Coast Only	Washington Recreation and Conservation Office (WA RCO)
	COASTAL_SMCFAC_POINT_point_wc	West Coast Only	NOAA ENCDirect
	CON_NCCSR_Kayak_Fish_Sts	West Coast Only	Marine Map
	CON_SCSR_KFACA_KayakFishAreas	West Coast Only	Marine Map
	CON_SCSR_LightHawk_RecBoats	West Coast Only	Marine Map
	CUL_NCSR_BoatAndKayakLaunchSites	West Coast Only	Marine Map
	CUL_SCSR_BoatLaunchSites	West Coast Only	Marine Map
	MORIS_BOATING_USAGE_POLY	East Coast Only	Massachusetts Office of Coastal Zone Management
	MORIS_MOORING_FIELDS_POLY	East Coast Only	Massachusetts Office of Coastal Zone Management

## APPENDIX D – GEOSPATIAL DATA INVENTORY

Category	Name	Coverage	Source
<i>Subcategory</i>			
	MORIS_OM_CONC_REC_BOATING_POLY	East Coast Only	Massachusetts Office of Coastal Zone Management
	MORIS_OM_CONC_REC_BOATING_ROUTES_ARC	East Coast Only	Massachusetts Office of Coastal Zone Management
	motorized_boating_dominant	West Coast Only	CA Ocean Uses Atlas
	motorized_boating_footprint	West Coast Only	CA Ocean Uses Atlas
	motorized_boating_future	West Coast Only	CA Ocean Uses Atlas
	NON_NCCSR_Kayaking	West Coast Only	Marine Map
	or_beach_boat_access_pts	West Coast Only	Oregon Geospatial Enterprise Office (GEO)
	paddling_dominant	West Coast Only	CA Ocean Uses Atlas
	paddling_footprint	West Coast Only	CA Ocean Uses Atlas
	paddling_future	West Coast Only	CA Ocean Uses Atlas
	Panel_Lasttrip_Boating	West Coast Only	Oregon Department of Land Conservation and Development (OR LCD)
	Panel_Lasttrip_Boating_PU	West Coast Only	Oregon Department of Land Conservation and Development (OR LCD)
<i>Recreational Fishing</i>			
	CON_CA_CPFV_Landing_04_06	West Coast Only	Marine Map
	CON_CA_CRFS_SkiffEffort_04_05	West Coast Only	Marine Map
	CON_CCSR_CPFV_Effort_87_98	West Coast Only	Marine Map
	CON_SCSR_Pier_Fishing_Locations	West Coast Only	Marine Map
	CUL_NCCSR_Kayak_Fish_A_CLine	West Coast Only	Marine Map
	CUL_NCCSR_Kayak_Fish_A_Pt	West Coast Only	Marine Map
	CUL_NCSR_Fishing_Piers_Jetties	West Coast Only	Marine Map
	CUL_SCSR_Fishing_Piers_Jett	West Coast Only	Marine Map
	CUL_SCSR_KFACA_KayakLaunchSts	West Coast Only	Marine Map
	dcrab_slmk	West Coast Only	Oregon Department of Land Conservation and Development (OR LCD)
	dcrab_slmk_line	West Coast Only	Oregon Department of Land Conservation and Development (OR LCD)

## APPENDIX D – GEOSPATIAL DATA INVENTORY

Category	Name	Coverage	Source
	Subcategory		
	fisheries_recreation	East Coast Only	RI SAMP
	kayak_fishing_dominant	West Coast Only	CA Ocean Uses Atlas
	kayak_fishing_footprint	West Coast Only	CA Ocean Uses Atlas
	kayak_fishing_future	West Coast Only	CA Ocean Uses Atlas
	marine_facilities_fl_point	East Coast Only	Florida Fish and Wildlife Conservation Commission-Fish and Wildlife Research Institute
	MORIS_OM_CONC_REC_FISHING_POLY	East Coast Only	Massachusetts Office of Coastal Zone Management
	MORIS_OM_REC_FISHING_MMTA_POLY	East Coast Only	Massachusetts Office of Coastal Zone Management
	OFBA_PT	East Coast Only	Mass. Department of Fish & Game
	OR_recfish_1990	West Coast Only	Oregon Coastal Atlas
	phal_slmk	West Coast Only	Oregon Department of Land Conservation and Development (OR LCD)
	phal_slmk_line	West Coast Only	Oregon Department of Land Conservation and Development (OR LCD)
	rckf_slmk	West Coast Only	Oregon Department of Land Conservation and Development (OR LCD)
	rckf_slmk_line	West Coast Only	Oregon Department of Land Conservation and Development (OR LCD)
	rec_boat_dominant	West Coast Only	CA Ocean Uses Atlas
	rec_boat_footprint	West Coast Only	CA Ocean Uses Atlas
	rec_boat_future	West Coast Only	CA Ocean Uses Atlas
	rec_dive_dominant	West Coast Only	CA Ocean Uses Atlas
	rec_dive_footprint	West Coast Only	CA Ocean Uses Atlas
	rec_dive_future	West Coast Only	CA Ocean Uses Atlas
	rec_shore_harvest_dominant	West Coast Only	CA Ocean Uses Atlas
	rec_shore_harvest_footprint	West Coast Only	CA Ocean Uses Atlas
	rec_slm	West Coast Only	Oregon Department of Land Conservation and Development (OR LCD)

## APPENDIX D – GEOSPATIAL DATA INVENTORY

Category	Name	Coverage	Source
<i>Subcategory</i>			
	rec_slmk_line	West Coast Only	Oregon Department of Land Conservation and Development (OR LCD)
	sal_slmk	West Coast Only	Oregon Department of Land Conservation and Development (OR LCD)
	sal_slmk_line	West Coast Only	Oregon Department of Land Conservation and Development (OR LCD)
	shore_fishing_dominant	West Coast Only	CA Ocean Uses Atlas
	shore_fishing_footprint	West Coast Only	CA Ocean Uses Atlas
	Shoreline_Anglers_Survey	East Coast Only	NOAA NMFS
	sportfishing	East Coast Only	New Jersey Department of Environmental Protection (NJDEP), Division of Fish & Wildlife (DFW), Bureau of Marine Fisheries(BMF)
	VTR_NE_Annual_PartyBoat	East Coast Only	NOAA NMFS
	VTR_NE_AprMayJun_PartyBoat	East Coast Only	NOAA NMFS
	VTR_NE_JanFebMar_PartyBoat	East Coast Only	NOAA NMFS
	VTR_NE_JulAugSep_PartyBoat	East Coast Only	NOAA NMFS
	VTR_NE_OctNovDec_PartyBoat	East Coast Only	NOAA NMFS
	VTR_NE_PartyBoatTrips_1999to2008	East Coast Only	NOAA NMFS
<i>Sailing</i>			
	Longbeach_cabo_recreational_race_2010_clip	West Coast Only	iBoattrack
	Newport_bermuda_recreational_race_2010_clip	East Coast Only	iBoattrack
	Provincetown_schooner_recreational_race_2010	East Coast Only	iBoattrack
	sailing_dominant	West Coast Only	CA Ocean Uses Atlas
	sailing_footprint	West Coast Only	CA Ocean Uses Atlas
	sailing_future	West Coast Only	CA Ocean Uses Atlas
	Stonington_boothbay_recreational_race_2010_clip	East Coast Only	iBoattrack
<i>Sports</i>			
	surface_sports_dominant	West Coast Only	CA Ocean Uses Atlas
	surface_sports_footprint	West Coast Only	CA Ocean Uses Atlas

## APPENDIX D – GEOSPATIAL DATA INVENTORY

Category	Name	Coverage	Source
	Subcategory		
	surface_sports_future	West Coast Only	CA Ocean Uses Atlas
	<i>Surfing</i>		
	CUL_CA_SurfSpot_points	West Coast Only	California Department of Fish and Game
	ORSeaGrant_SurfSpots	West Coast Only	Oregon SeaGrant
	<i>Swimming</i>		
	swimming_dominant	West Coast Only	CA Ocean Uses Atlas
	swimming_footprint	West Coast Only	CA Ocean Uses Atlas
	swimming_future	West Coast Only	CA Ocean Uses Atlas
	<i>Tidepooling</i>		
	NON_NCCSR_Tidepooling	West Coast Only	Marine Map
	tidepooling_dominant	West Coast Only	CA Ocean Uses Atlas
	tidepooling_footprint	West Coast Only	CA Ocean Uses Atlas
	tidepooling_future	West Coast Only	CA Ocean Uses Atlas
	<i>Wildlife Viewing</i>		
	NON_NCCSR_Wildlife_Viewing	West Coast Only	Marine Map
	OptIn_Cumulative_Wildlife_PU	West Coast Only	Oregon Department of Land Conservation and Development (OR LCD)
	Panel_Lasttrip_Wildlife	West Coast Only	Oregon Department of Land Conservation and Development (OR LCD)
	Panel_Lasttrip_Wildlife_PU	West Coast Only	Oregon Department of Land Conservation and Development (OR LCD)
	wildlife_viewing_dominant	West Coast Only	CA Ocean Uses Atlas
	wildlife_viewing_footprint	West Coast Only	CA Ocean Uses Atlas
	wildlife_viewing_future	West Coast Only	CA Ocean Uses Atlas
	<b>Renewable Energy</b>		
	<i>General</i>		
	alt_energy_future_dominant	West Coast Only	CA Ocean Uses Atlas
	alt_energy_future_footprint	West Coast Only	CA Ocean Uses Atlas

## APPENDIX D – GEOSPATIAL DATA INVENTORY

Category	Name	Coverage	Source
<i>Subcategory</i>			
<i>Leases</i>			
	s_mmc_S_MMC_Alt_Energegy_nominated_ocs_lease_blocks	Full Study Area	BOEM/NOAA
<i>Permit</i>			
	LincolnCounty_PrelimPermit_FERC_2007	West Coast Only	Oregon Coastal Atlas
	s_mmc_S_MMC_hydrokinetic_ca	West Coast Only	BOEM/NOAA
<i>Wave</i>			
	CoosCounty_OffshoreWave_FERC_2007	West Coast Only	Oregon Coastal Atlas
	CUL_CA_Wave_Farms	West Coast Only	Marine Map
	Florence_Wave_FERC_2007	West Coast Only	Oregon Coastal Atlas
	HUM_IT_OR_Wave_Energy_Prelim_Permits_FERC_2008	West Coast Only	PaCOOS
	MORIS_MA_TIDAL_ENERGY_POLY	East Coast Only	Massachusetts Office of Coastal Zone Management
	MORIS_OM_POTENTIAL_TIDAL_RES_POLY	East Coast Only	Massachusetts Office of Coastal Zone Management
	Oregon_Wave_Energy	West Coast Only	Oregon Coastal Atlas
<i>Wind</i>			
	MORIS_CAPE_WIND_PT	East Coast Only	Massachusetts Office of Coastal Zone Management
	MORIS_OM_PROPOSED_MREC_AREA_POLY	East Coast Only	Massachusetts Office of Coastal Zone Management
	MORIS_OM_WIND_ENERGY_AREAS_POLY	East Coast Only	Massachusetts Office of Coastal Zone Management
	PermittedCapeWind	East Coast Only	Massachusetts Office of Coastal Zone Management
<b>Research Areas</b>			
<i>Institution</i>			
	CUL_CA_Research_Inst	West Coast Only	Marine Map
	CUL_NCSR_Rsrch_Ed_Instns	West Coast Only	Marine Map
	CUL_SCSR_Research_Inst	West Coast Only	Marine Map
<i>Ocean Special Area Management Plan</i>			
	mbounds_priority_georesearch	East Coast Only	RI SAMP
	mbounds_priority_research	East Coast Only	RI SAMP

## APPENDIX D – GEOSPATIAL DATA INVENTORY

Category	Name	Coverage	Source
<i>Subcategory</i>			
<i>Sampling location</i>			
	MAN_NCCSR_ROV_MBARI	West Coast Only	Marine Map
	NOAA_ScientistsFavoriteSampleSpots	West Coast Only	NOAA NWFSC
	NRI_Lines	West Coast Only	Oregon Department of Land Conservation and Development (OR LCD)
	NRI_Points_Final	West Coast Only	Oregon Department of Land Conservation and Development (OR LCD)
	NRI_Polygons_Final	West Coast Only	Oregon Department of Land Conservation and Development (OR LCD)
	NRI_Stations_Final	West Coast Only	Oregon Department of Land Conservation and Development (OR LCD)
	NRI_Transects	West Coast Only	Oregon Department of Land Conservation and Development (OR LCD)
	NWFSC_2009_AcousticSurveyTransects	West Coast Only	NOAA NWFSC
	NWFSC_BPAPlumeSurvey	West Coast Only	NOAA NWFSC
	NWFSC_PelagicFishSurveys_SAIP	West Coast Only	NOAA NWFSC
	WCGBTS_AllExclusions_2010_poly	West Coast Only	NOAA NWFSC
	WCGBTS_SurveyExtent_2010_poly	West Coast Only	NOAA NWFSC
<b>Sand/Gravel Source and Disposal</b>			
<i>Dredge</i>			
	APPROACH_HARBOR_DRGARE_poly_ec	East Coast Only	NOAA ENCDirect
	APPROACH_HARBOR_DRGARE_poly_wc	West Coast Only	NOAA ENCDirect
	Canaveral_Poly_Geo_NAD83	East Coast Only	US EPA
	MORIS_DREDGE_USACE_PT	East Coast Only	Massachusetts Office of Coastal Zone Management
	PalmBeach_Poly_Geo_NAD83	East Coast Only	US EPA
	s_mmc_S_MMC_OCS_borrow_areas	East Coast Only	BOEM/NOAA
	Savannah_Poly_Geo_NAD83	East Coast Only	US EPA
	USACE_DredgeDisposal_FullStudy	Full Study Area	US Army Corps of Engineers

## APPENDIX E: GEOSPATIAL DATABASE USER GUIDE

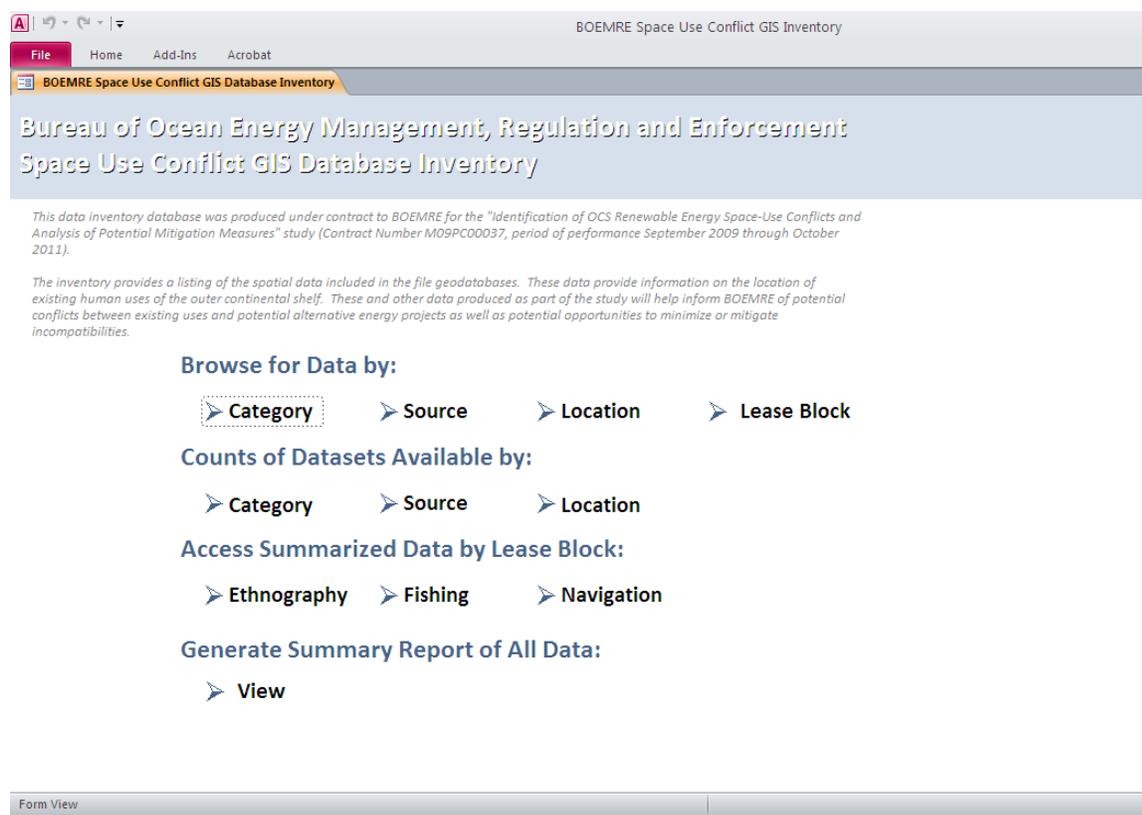
In addition to the development of study-area specific geodatabases that contain the spatial datasets relevant to the study, the research team created an interactive database to assist BOEM in accessing and applying these data. Specifically, the team developed the database to enable:

1. Searching the catalog for information about a specific category of use; and
2. Identifying data that may of particular relevance to specific area or region.

The remaining sections of this Appendix provide a brief overview of the features of the inventory tool.

### Main Menu

The main menu provides a brief explanation of the content and purpose of the inventory tool along with links to separate pages that allow the user to explore the data in different ways.



The menu is divided into four sections:

- **Browse for Data:** This section provides links to separate interface pages. Each allows the user to browse the inventory in a different way. These approaches include browsing by category of the data (see Section 3 for a summary of the categories); by source of the data (e.g., National Oceanic and Atmospheric Administration), geographic location (i.e.,

## APPENDIX E – GEOSPATIAL DATABASE USER GUIDE

region/waters) covered by the data, and by data that have information intersecting specific lease block areas.

- **Counts of Datasets Available:** This section allows the user to open reports summarizing the number of datasets that provide information related to a specific category, information source, or geographic location. For example, through these reports, users can see the number of datasets that provide information on commercial fishing.
- **Access Summarized Data by Lease Block:** To facilitate BOEM efforts in evaluating potential conflicts between renewable energy projects and other users of the OCS, the research team also included a tool that provides summary use information by specific lease block areas. The data included are limited to the ethnographic information; major commercial fishing (e.g., Northeast Vessel Trip Report, Southeast Logbook, PacFIN, and Oregon Department of Fish and Wildlife Logbook); and commercial vessel navigation (AIS) data.
- **Generate Summary Report of All Data:** The final section opens a comprehensive report (within MS Access) that summarizes the data included in the geodatabases. Information provided in the report includes data category and subcategory, name of the layer, whether the dataset covers both the East and West Coast study areas or only one of the coastal waters, the source of the data, and a brief file description.

Additional information on each of these components is included below.

### Browse for Data



By selecting the corresponding link shown in the main menu, users can explore the inventory in the means most appropriate for their needs. Each of the first three options (category, source, and location) leads the user to a consistent looking page. As shown in the next image, when browsing by category, the user is prompted to select from the category list and can further refine the search using a subcategory; however, identification of a subcategory is not required. Users may also select multiple categories and/or subcategories. As the user changes the selections, the lower panel of the page refreshes to provide a table listing each of the datasets within the inventory matching the selected criteria.

From each page, the user can jump to one of the other browse options using the blue buttons at the top of the page. Users can also exit this page by selecting the close button at the bottom right of the screen,

## APPENDIX E – GEOSPATIAL DATABASE USER GUIDE

BOEMRE Space Use Conflict GIS Database Inventory Browse for Data

### Bureau of Ocean Energy Management, Regulation and Enforcement Space Use Conflict GIS Database Inventory

**Browse for Data by:** Category Source Location Clear Selection

**Category:**

- Alternative Energy
- Archeological
- Area of Special Concern
- Demarcations
- Ethnography
- Marine Transportation/Shipping Lanes/Ferry Routes
- Historical Fishing and Fishing Areas

**Subcategory:**

- Historical Fishing and Fishing Areas; Fishing
- Historical Fishing and Fishing Areas; Fishing Closure Areas
- Historical Fishing and Fishing Areas; Fixed Gear
- Historical Fishing and Fishing Areas; Gill Net
- Historical Fishing and Fishing Areas; Gill Net and Seines
- Historical Fishing and Fishing Areas; Handlines and Electric Reels
- Historical Fishing and Fishing Areas; Handlines and Rod

**Available Datasets (double-click on the File Name to explore):**

File Name	Category; Subcategory	Description
▶ Georges_Bank_Seas_Closure_Area	Historical Fishing and Fishing Areas; Fishing Closure Areas	Georges Bank Seasonal Closure Area
MAN_CA_RCA_Recreational_2009	Historical Fishing and Fishing Areas; Fishing Closure Areas	Recreational closures of rock fish fishing for 09-10
MAN_CA_RCA_Trawl_2009	Historical Fishing and Fishing Areas; Fishing Closure Areas	Rockfish conservation area - closed to certain gear types (Trawl)

Record: 1 of 30 | No Filter | Search

➤ Close

The list of applicable data includes basic information on each dataset (file name, category and subcategory, and brief description). Double-clicking the name of a dataset opens an additional interface that contains further reference information. The top of this page provides the name of the database containing the dataset along with the short description. The tabbed interface provides information on the source of the data, projection, categorization, and location covered.

## APPENDIX E – GEOSPATIAL DATABASE USER GUIDE

The screenshot shows a web application interface for the Bureau of Ocean Energy Management, Regulation and Enforcement Space Use Conflict GIS Database Inventory. The interface includes a header with navigation tabs: "BOEMRE Space Use Conflict GIS Database Inventory", "View Datasets by Lease Block", and "Explore Data". Below the header, the title "Bureau of Ocean Energy Management, Regulation and Enforcement Space Use Conflict GIS Database Inventory" is displayed. The main content area shows the following metadata:

- File Name:** AIS\_GridQ1
- Time Period:** Q1 2009
- Database:** Final\_Prelim\_Geodatabase\_04.08.2011\_Full.gdb
- Description:** 2009 US Coast Guard AIS Data - Area - 85,747,600m Grid

A detailed summary window is open, showing the following information:

- Source:** Coast Guard
- Detailed Source:** RPI created shapefile from Coast Guard AIS ping data
- Data Type:** Polygon
- Internal Use Only:**
- Final Projection:** GCS\_North\_American\_1983
- Original Projection:** GCS\_North\_American\_1983

The window has tabs for "GIS Info", "Categories", and "Location". A "Close" button is located at the bottom right of the window.

If from the main menu the user opts to browse by Lease Block, a different interface appears. From this page (shown below), the user must identify one or more lease blocks (as defined by the protraction and block numbers). To limit the lease block list, users must first select a specific BOEM planning area.

Once a lease block is selected, the table at the bottom of the page refreshes to generate a list of the datasets that have a spatial feature intersecting with the selected block area. Users may scroll through the list using the vertical scroll bar at the right of the table. Similar to the other lists of data, users can double click the name of a file to open the detailed summary page.

BOEMRE Space Use Conflict GIS Database Inventory View Datasets by Lease Block

Bureau of Ocean Energy Management, Regulation and Enforcement  
Space Use Conflict GIS Database Inventory

View Applicable Data by Lease Block: Clear Selection

BOEMRE Planning Area: Lease Block (Protraction Number/Block Number):

<ul style="list-style-type: none"> <li>North Atlantic</li> <li>Mid Atlantic</li> <li>South Atlantic</li> <li>Straits of Florida</li> <li>Eastern Gulf of Mexico</li> <li>Washington/Oregon</li> <li>Northern California</li> </ul>	<ul style="list-style-type: none"> <li>NJ19-01/6021</li> <li>NJ19-01/6022</li> <li>NJ19-01/6023</li> <li>NJ19-01/6024</li> <li>NJ19-01/6025</li> <li>NJ19-01/6026</li> <li>NJ19-01/6027</li> </ul>
--	--

Available Datasets (double-click on the File Name to explore):

File Name	Database	Description
AIS_GridQ1	Final_Prelim_Geodatabase_04.08.201	2009 US Coast Guard AIS Data - Area - 85,747,600m Grid 1_Full.gdb
AIS_GridQ2	Final_Prelim_Geodatabase_04.08.201	2009 US Coast Guard AIS Data - Area - 85,747,600m Grid 1_Full.gdb
AIS_GridQ3	Final_Prelim_Geodatabase_04.08.201	2009 US Coast Guard AIS Data - Area - 85,747,600m Grid 1_Full.gdb

Record: 1 of 39 No Filter Search

Close

## Counts of Datasets

**Counts of Datasets Available by:**

➤ Category
➤ Source
➤ Location

For general reference information, the second section on the main menu allows the user to open a report that summarizes the number of datasets that provide information related to a particular category, information source, or location. Examples of the reports are shown below.

## APPENDIX E – GEOSPATIAL DATABASE USER GUIDE

StateName	Number of Datasets	
	Federal Waters	State Waters
California	244	318
Connecticut	0	117
Delaware	93	108
Florida	97	128
Georgia	76	83
Maine	102	132
Maryland	91	133
Massachusetts	128	166
New Hampshire	90	114
New Jersey	102	122
New York	101	131
North Carolina	83	95
Oregon	86	133
Rhode Island	117	125
South Carolina	76	92
Virginia	136	169
Washington	91	104

Source	Number of Datasets
BOEM/NOAA	26
CA Ocean Uses Atlas	73
California Department of Fish and Game	7
California Wreck Divers	1
Coast Guard	5
Dr. Flaxen Conway and Dr. Carrie Pomeroy's Interviews	1
ESRI	1
Florida Fish and Wildlife Conservation Commission-Fish and Wildlife Research Institute	1
Madeleine Hall-Arber	1
Maine GIS	2
Marine Map	96
Mass. Department of Fish & Game	1
Massachusetts Office of Coastal Zone Management	23
MPA.gov	1
National Atlas	1
New Jersey Department of Environmental	1

### Access Summarized Data



The third section accessible from the main menu provides users with the option of viewing summary data obtained from the spatial datasets. The subsections below describe each of the three summary options (ethnographic, commercial fishing, and vessel navigation data). Each allows the user to obtain data specific to an individual lease block. Whereas the browse by lease block option (accessible from the first section in the main menu) describes which datasets have spatial information intersecting with a lease block, this function allows for a more in-depth examination of the core data products.

#### Ethnography

Once the user selects a planning area and lease block, the table at the bottom of the screen refreshes to show the ethnographic comment obtained through the field research portion of the project (described in Section 2 of this report). The ethnographic team obtained these comments through discussions with stakeholders that were willing to identify one or more areas on a nautical chart or other map when providing their feedback.

Note: The list of lease blocks appearing in the menu is limited to only those areas for which one or more comments were obtained by the ethnographic team.

BOEMRE Space Use Conflict GIS Database Inventory | Access Summarized Data

Bureau of Ocean Energy Management, Regulation and Enforcement  
Space Use Conflict GIS Database Inventory

Access Data by Lease Block: **Ethnography** Fishing Navigation **Clear Selection**

BOEMRE Planning Area:

Lease Block (Protraction Number/Block Number):  
 NL10-01/6009  
 NL10-01/6009  
 NL10-01/6010  
 NL10-01/6010  
 NL10-01/6011  
 NL10-01/6011  
 NL10-01/6012  
 NL10-01/6012  
 NL10-01/6013

*Note: 1. Planning Areas and Lease Blocks displayed where data is available.*

Ethnographic Comments:

- ▶ Shrimp out to 110/120 Fathoms
- Extend Trawl area (CDFG\_B\_05to09.shp)

### Commercial Fishing

The commercial fishery summary provides information on the extent of activity that was recorded in commercial fishery datasets for the selected lease block. The type of fisheries data available varies regionally. As a result, not all indicators are available for each region. By selecting a lease block, the table at the bottom of the page refreshes to show the activity by gear type (e.g., Trawl) within the region. Reported data reflect the aggregation of data from 2004 to 2008 in the Atlantic and 2005 to 2009 in the Pacific. As a result, a vessel that visits a lease block twice per month for ten months of the year would contribute a total of 20 trips. If this pattern held for the five-year period, the total number of trips would be 100. Additional fishery statistics (such as monthly/seasonal activity) are available in the underlying datasets.

## APPENDIX E – GEOSPATIAL DATABASE USER GUIDE

BOEMRE Space Use Conflict GIS Database Inventory Access Summarized Data

**Bureau of Ocean Energy Management, Regulation and Enforcement**  
Space Use Conflict GIS Database Inventory

Access Data by Lease Block: Ethnography Fishing Navigation Clear Selection

BOEMRE Planning Area: Lease Block (Protraction Number/Block Number):

<ul style="list-style-type: none"> <li>North Atlantic</li> <li style="background-color: #333; color: white;">Mid Atlantic</li> <li>South Atlantic</li> <li>Straits of Florida</li> <li>Eastern Gulf of Mexico</li> <li>Washington/Oregon</li> <li>Northern California</li> </ul>	<ul style="list-style-type: none"> <li>NI18-01/7138</li> <li>NI18-02/6010</li> <li>NI18-02/6011</li> <li style="background-color: #333; color: white;">NI18-02/6012</li> <li>NI18-02/6013</li> <li>NI18-02/6014</li> <li>NI18-02/6015</li> </ul>
--	--

Planning Areas and Lease Blocks displayed where data is available.

**Fishing Data Summary (Maximum Value of a Grid Cell in Lease Block; Atlantic 2004 - 2008; Pacific 2005 - 2009):**

Fishing Gear	Days at Sea	Tows	Trips	Vessels
▶ Charter Boat	1	0	4	-
□ Dive	-	-	6	6
□ Dredge	0	3	0	-
□ Gillnet and Seine	34	197	4665	176
□ Handline and Rods	0	0	0	-
□ Longline	0	1	472	48
□ Pot	0	57	1	-
□ Trap	-	-	0	0

Record: 1 of 13 No Filter Search

### Vessel Navigation

The summary of vessel navigation data reports the number of commercial vessels that were recorded in a particular lease block through the Automated Identification System (AIS) data. Monthly, seasonal, and annual numbers are reported for 2009.

## APPENDIX E – GEOSPATIAL DATABASE USER GUIDE

BOEMRE Space Use Conflict GIS Database Inventory [Access Summarized Data](#)

Bureau of Ocean Energy Management, Regulation and Enforcement  
Space Use Conflict GIS Database Inventory

Access Data by Lease Block: **Ethnography** **Fishing** **Navigation** **Clear Selection**

BOEMRE Planning Area:   
North Atlantic  
Mid Atlantic  
South Atlantic  
Straits of Florida  
Washington/Oregon  
**Northern California**  
Central California

Lease Block (Protraction Number/Block Number):   
NJ09-02/6022  
NJ09-02/6023  
**NJ09-02/6024**  
NJ09-02/6025  
NJ09-02/6026  
NJ09-02/6027  
NJ09-02/6028

*Planning Areas and Lease Blocks displayed where data is available.*

AIS Summary by Lease Block:  
Maximum Number of Vessels in an AIS Grid Cell for Lease Block NJ09-02/6024

2009:	Quarterly:	Monthly:
<b>7</b>	Q1: 2 Q3: 5 Q2: 1 Q4: 1	January: 2 April: 0 July: 2 October: 0 February: 0 May: 1 August: 2 November: 0 March: 0 June: 1 September: 3 December: 1

### Generate Summary Report

[Generate Summary Report of All Data:](#)

**View**

The final section of the main menu provides a link to a report listing each of the datasets within the geodatabases. Information provided in the report includes data category and subcategory, name of the layer, whether the dataset covers both the East and West Coast study areas or only one of the coastal waters, the source of the data, and a brief file description.

# APPENDIX E – GEOSPATIAL DATABASE USER GUIDE

## All Data Summary by Category Friday, July 15, 2011 2:34:00 PM

Category	Name	Coverage	Source	Description (Truncated if necessary)
Subcategory				
Archeological				
Wrecks				
	APPROACH_HARBOR_WRECKS_point_ec	East Coast Only	NOAA ENCDirect	Wrecks
	APPROACH_HARBOR_WRECKS_POINT_point_wc	West Coast Only	NOAA ENCDirect	Wreck (The ruined remains of a stranded or sunken vessel which has been rendered useless. (IHO Dictionary, S-32, 5th Edition, 6027))
	APPROACH_HARBOR_WRECKS_poly_ec	East Coast Only	NOAA ENCDirect	Wrecks
	CHNS_Beach_Shipwrecks	East Coast Only	Cape Hatteras National Seashore	This is a shoreline wrecks database converted from a text document list the location of the wrecks
	COASTAL_WRECKS_point_ec	East Coast Only	NOAA ENCDirect	Wrecks
	COASTAL_WRECKS_POINT_point_wc	West Coast Only	NOAA ENCDirect	Wreck (The ruined remains of a stranded or sunken vessel which has been rendered useless. (IHO Dictionary, S-32, 5th Edition, 6027))
	COASTAL_WRECKS_poly_ec	East Coast Only	NOAA ENCDirect	Wrecks
	CUL_NCCSR_Shipwrecks	West Coast Only	Marine Map	Partial list of shipwrecks within the Monterey Bay National Marine Sanctuary
	GENERAL_WRECKS_point_ec	East Coast Only	NOAA ENCDirect	Wrecks
	GENERAL_WRECKS_POINT_point_wc	West Coast Only	NOAA ENCDirect	Wreck (The ruined remains of a stranded or sunken vessel which has been rendered useless. (IHO Dictionary, S-32, 5th Edition, 6027))
	GENERAL_WRECKS_poly_ec	East Coast Only	NOAA ENCDirect	Wrecks

## APPENDIX F: STAKEHOLDER MEETING SUMMARIES

### 1. Identification of OCS Renewable Energy Space-Use Conflicts and Analysis of Potential Mitigation

Stakeholder Meeting  
United Fishermen’s Club, New Bedford, MA  
February 28, 2011  
4-7 pm

#### Meeting Report

**Meeting organizer and facilitator:** Madeleine Hall-Arber, MIT Sea Grant

#### **Invitations**

##### *Press release*

Prior to the meeting a press release was prepared and sent with a personal email to specific reporters at New Bedford’s Standard Times, Savingseafood.org, and the Gloucester Daily Times. We have not been able to confirm whether or not the announcement was printed.

##### *Flyers*

Flyers were created and distributed to the Settlement Houses in New Bedford where fishermen go to pick up their checks (payment for their fishing trips), to well-frequented gear and supply shops, passed directly to fishermen at the docks in New Bedford, posted at the wharf in Provincetown and distributed at a meeting held by BOEM and the Massachusetts Executive Office of Energy and Environmental Affairs focused on the recently announced Request for Interest (RFI).

##### *PSA*

A public service announcement was recorded and played several times over the weekend by WBSM-AM, a radio station commonly listened to by commercial fishermen and companies.

##### *Email to fishermen and scientists*

Email invitations were sent to leaders and/or representatives of the major commercial fishing organizations. Emails were sent to leaders of the Wampanoag tribe and to scientists who work with fisheries.

##### *Scheduling conflicts*

Unfortunately, scientists at the University of Massachusetts, Dartmouth SMAST called a meeting of the Groundfish Steering Committee that coincided with our meeting and attracted groundfishermen and scallopers, the two groups we were targeting for our stakeholder participation,

In addition, two meetings in the prior three weeks were held in New Bedford, focused on offshore wind and the aforementioned RFI. One meeting was sponsored by Fishermen’s Energy of New Jersey, the other by BOEM. Though our meeting had been scheduled prior to either of these, stakeholders may not have realized that our meeting had a broader focus.

## APPENDIX F – STAKEHOLDER MEETING SUMMARIES

### Preparations:

- A PowerPoint presentation to introduce the project was prepared.
- IEc produced large format charts showing the level of fishing activity in the three areas near New Bedford, all gear, all seasons, based on Vessel Trip Report data. Multiple copies were prepared and available for participants to annotate.
- Three large format posters were printed and posted in several places in the meeting space to help guide the discussion (PowerPoint versions provided with this report).
- Pens and note cards for comments were provided at each table for participants reluctant to speak in front of others.
- Five tape recorders were readied.
- Easels and flip charts (and markers) were readied.
- Light refreshments were provided.

### Attendees:

The attendance list for the OCS stakeholder meeting:

Arthur DeCosta, Lobsterman, Fairhaven  
David Casoni, MA Lobstermen's Association, Sandwich  
Tove Bendiksen, Fishing Family, Dartmouth  
Kirsten Bendiksen, Family gear manufacturing business, Fairhaven  
Reidar Bendiksen, Family gear manufacturing business, Fairhaven  
Dick Grachek, Fisherman, Pt. Judith  
Erin Adams, SMAST, New Bedford  
Cate O'Keefe, Yellowtail By-catch Avoidance Program Manager, UMASS, Dartmouth,  
(SMAST), New Bedford  
Madeleine Hall-Arber, MIT Sea Grant  
Gayle Sherman, MIT Sea Grant  
John Weiss, IEc  
Alex Oberg, IEc  
Dan Hellin, Urban Harbors Institute  
Kristin Uiterwyk, Urban Harbors Institute  
Reporter from WBSM-AM

### Agenda

#### *Introductions*

Self-introductions were made.

#### *Introduction to the project*

Because of the small attendance, we did not present the prepared PowerPoint. Instead, Madeleine Hall-Arber gave an informal overview with additional comments from John Weiss and Dan Hellin. We distinguished our project from the request for comments on the RFI. Participants were encouraged to have colleagues contact Madeleine Hall-Arber for individual conversations.

#### *Key Questions*

Introduction to the questions to which we hoped participants would respond.

#### *Charts*

Explanation of the charts based on VTR data. (see comment above)

#### *Discussion*

Comments and discussions covered a wide-range of topics, roughly guided by the questions that we posed.

### Questions (with participant responses):

#### *How or why do you choose the areas you use?*

- Knowledgeable about the area
- Time of the year and management (including licensing restrictions)
- Homeport (limited by available dockage)
- Cost of getting to an area
- Safety concerns (small boats, especially, have limitations)
- Profitability

#### *Are the maps/charts accurate?*

- The maps do not clearly depict the value of the fishing. In particular, because they are based on Vessel Trip Reports (VTRs), the areas where the trips are longer (offshore) are characterized as “low use.” The short, daily trips nearshore are characterized as “high use.” However, the economic value may be much higher for the offshore areas since landings are usually significantly higher.
  - Suggested creating maps to depict economic value, including the economic value of spawning areas. Maps reflecting landings data would help.

## APPENDIX F – STAKEHOLDER MEETING SUMMARIES

- The maps can only show where fishermen are allowed by management to fish, they do not reflect the areas that were significant in the past, or would be significant if regulations did not restrict their use (e.g., the economic value of closed areas).
  - Furthermore, especially for those who use mobile gear, the areas of importance change over time, seasonally, annually, and over the course of several years.
- Bottom topographical maps could be used to identify fish habitat.
- Fixed gear areas of Southern New England seem to be accurate.
- Level and accuracy of reporting varies by state. Massachusetts has rigorous reporting requirements.
- Recreational fishing is exceptionally popular in some areas, e.g., Long Island Sound, that is not reflected in the maps.

### **Conflicts?**

#### ***Existing:***

- Construction that disturbs benthic organisms is disruptive to fishing
  - Particularly for those who use fixed gear (e.g., traps for crab, lobster, sea bass in the Mid-Atlantic)
  - “Every time something goes on in the water, it affects a fisherman.”
- LNG terminals
- Anchorage outside Boston
- Massachusetts Water Resources Authority’s outfall pipe
- In general, fishermen are being pushed out of their usual fishing grounds and forced into smaller and smaller areas.
- Catch shares
- Mobile gear fishermen are subject to “constant attack” from other fishing sectors, environmental groups and government agencies, wind farm projects are just the latest.
  - Because they move from place to place with the seasons to find the most productive places to make a living, fishermen are analogous to Native Americans and treated similarly.

#### ***Potential:***

- Cape Wind
- Homeland security may not allow fishing near stanchions
- Energy projects must evaluate the results of benthic disturbance

## APPENDIX F – STAKEHOLDER MEETING SUMMARIES

- Ships do not stay in designated lanes.
- Fog, racing tides, and turbines could be a bad combination.
- Once any structure is constructed in the ocean, it seems highly unlikely that fishing around it would be permitted (too risky).

### **New ideas for mitigation for unavoidable conflicts?**

- Because they rely on the local knowledge that they have learned through experience, fixed gear fishermen, in particular, can only be compensated financially.
  - They cannot expect to move to an unknown area and be successful
  - It is hard to assess the value of a person's livelihood in a certain area
  - How many generations should be "bought out?"
  - Cape Wind told fishermen to go to the government for mitigation.
- Financial compensation for mitigation distributed in greater proportion to those presently affected by job loss than to the state. The financial compensation associated with the LNG terminals mitigation was, in contrast, said to have been equally divided between the affected lobstermen and the Massachusetts government.
- Mitigation sounds like a "pay-off." If the fishermen take money as compensation, are they giving someone the right to buy a public resource? Are they selling out on a tradition?
  - The idea of "public resource" has changed. Permission to tap into the resource seems to be up for sale (oil, wind, minerals, etc.). Has the public resource been transformed to profit for a few?

### **Best way to communicate with fishermen?**

Chances of getting a fisherman to a meeting are generally low – if they have to be at the dock (and not fishing), they're probably tending to their boats, nets, etc.

(For meetings, you have to hope the weather is bad – then you might get a good turnout.)

However, suggestions for maximizing the probability of convening a larger group included: \*

- Emphasize urgency and need for their participation.
- Identify key people who can spread the word
- Announce in Savingseafood.org, Gloucester Daily Times
- Fisheries associations such as the Massachusetts Fishery Partnership, an umbrella organization for a large variety of fishing associations, can let their members know
- Post notes at dealers', distributors, auction houses, etc. – then you will reach some of the people not affiliated with an association/group
- Make sure not to cross-schedule meetings and try not to have too many meetings – fishermen are tired of meetings

## APPENDIX F – STAKEHOLDER MEETING SUMMARIES

- Though most fishermen have email, few use it regularly

\*Please note that all of these avenues were tried for this stakeholder meeting. The sense of urgency may have been muted by the prior two meetings focused on wind energy projects and, as pointed out above, we had no control over the sudden “scheduling collision,” as one of the assessment scientists commented.

### Sense of “community”

- Competition in fishing thwarts sense of community
- License restrictions divide and pigeonhole people’s use of gear type, permit, etc.
- Could be improved by making more people aware that fishing is not just “a thing of the past”
- Regulations and the cost of getting into the industry have resulted in few new entrants in Massachusetts, with the exception of the scallop industry that is attracting some young fishermen. Maine offers an apprentice program for young people to learn the lobster trade.
- Dealers fix the market price, which cannot be negotiated by individual fishermen

### Advice:

- The minute BOEM starts to think about doing something to an area of the ocean, they should bring the fishing industry into the discussion
- Shift burden of proof away from fishermen
- Make sure little projects don’t creep into the larger projects [without analysis] (e.g., gravel mining associated with Deep Water Energy off New York).

### Other comments:

- Stakeholders’ responses to specific projects or areas will vary [since they have different needs and interests]. For example, lobstermen might want to have projects further offshore, while offshore mobile gear fishermen might want projects in shoal areas where they don’t fish.
  - Fixed gear fishermen might be able to coexist with the wind turbines.
  - Inshore construction would have the advantages of lower costs, less exposure (to waves and weather), shorter cables, easier maintenance and lower costs to consumers.
- Why are lost [lobster] pots “marine debris” while turbines in the water are “habitat”?
- Has anyone decided that offshore wind is a good idea?
  - What is a wind turbine’s life expectancy?

## APPENDIX F – STAKEHOLDER MEETING SUMMARIES

- Will the fishing grounds be forever littered with abandoned foundations?
- Wind companies are making profit from government incentives
- Why should the harvesting of a renewable resource (fishing), that provides food for our country, be “messed up?”

### **Acknowledgements**

Special thanks to Kristin Uiterwyk for excellent notes on the meeting discussions and to Gayle Sherman for additional comments.

## APPENDIX F – STAKEHOLDER MEETING SUMMARIES

### 2. Identification of OCS Renewable Energy Space-Use Conflicts and Analysis of Potential Mitigation: Renewable Energy on the OR/WA Coast

#### Stakeholder Meeting

Held at the Columbia River Maritime Museum, Astoria, OR

Hosted by Lower Columbia River Harbor Safety Committee

March 9, 2011

10am – noon, and 1-3:30 pm

#### Meeting Report

**Meeting organizer and facilitator:** Eric Burnette (LCRHSC Vice Chair) and Flaxen Conway, OR Sea Grant

#### **Invitations**

Email invitations were sent to leaders and/or representatives of commercial and recreational fishing organizations, towboat operations, shipping operations, and the U.S. Coast Guard (USCG), among others.

#### **Piggyback on Existing LCRHSC Meeting**

We used the occasion of a previously scheduled meeting of key marine use stakeholders (focused on safety issues and networking between stakeholders and the USCG) as an opportunity to engage with them on the issue of potential renewable energy space and use conflicts in Oregon and Washington. Our meeting began after the lunch break that followed the completion of the original meeting.

#### **Preparations:**

- Flaxen Conway developed an agenda in cooperation with the LCRHSC. Collaborating on the agenda was a key element in gaining buy-in to expand the original meeting agenda.
- Presenters were identified and PowerPoint presentations were developed.
- Charts were available (but not used). The event was audio recorded.
- Light refreshments were provided.

#### **Attendees:**

The attendance list for the stakeholder meeting included:

Hans Meere, Liz Wainwright -- **Marine Exchange**

Doug Kaup, Len Tunbarelo, Mike Zamperini, Melissa Huska, Jeremy Maginot, Randy Clark,

Mariette Ogg, John Moriarty -- **USCG**

George Birch – **NWFF Environmental**

Herb Florer – **Port of Astoria**

Scott McMullen – **OR Fishermen's Cable Committee**

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Mike Zollistsch – **OR DEQ**

Ed Irish – **Tesoro Refining and Marketing**

Philip Brotherton – **Transmarine**

Susan Johnson – **Board of Maritime Pilots**

Dale Beasley, Dale Tracy, Ed Green, John Hanson – **Columbia River Crab Fishermen’s Association**

Kristin Meira – **Pacific NW Waterways Association**

Dan Jordan, Thron Riggs, Michael Tierney, Robert Johnson, Barry Barrett – **Bar Pilots**

Darren Olson, Mark Paulson, Michael Davis, Steve Dobbins – **Colrip**

Brad Korpela – **Shaver Trans**

Rick Williams – **OR Wave Energy Trust**

Diane Butoral – **WA Ecology**

Jerry Keikow, Steve Oakes – **Kalama Export**

Eric Burnette -- **LCRHSC**

Flaxen Conway – **Oregon Sea Grant**

### **Agenda**

#### *Welcome, Background, and Introductions*

LCRHSC Vice Chair Burnette provided welcoming remarks and brief background on the LCRHSC and its interest in near shore as well as OCS renewable energy. Flaxen Conway briefly introduced herself and the space use project. The other meeting participants also introduced themselves.

#### *Overview of Offshore Renewable Energy*

Rick Williams, a member of the Oregon Wave Energy Trust Board of Directors, provided an overview presentation on offshore renewable energy – specifically wave energy. He covered the various technologies and readiness, some of the environmental concerns, and some of the social concerns (though he focused his remarks on the positive aspects of potential development).

#### *Stakeholder Engagement*

At the request of the LCRHSC, Flaxen Conway’s presentation first focused on the importance of stakeholder engagement in offshore renewable energy, citing research in Oregon and other west coast locations in 2008. Participants responded to this part of the program by noting their desire to be thoroughly engaged in the development process, not just informed via outreach efforts. This finding is in alignment with our ongoing research.

#### *The OCS Project*

Flaxen Conway then presented an overview of the space use conflicts project and the key themes we are using to guide conversations in one-on-one interactions. Specifically:

- Characteristics of place(s) on the West Coast OCS that are valued (habitat, proximity to home, markets, etc.); what’s important to you, and why?
- Use of place(s): past use, current use and future trends / seasons; factors that have contributed to changes in use?

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- Compatible uses of place(s) by diverse interests (conflict avoidance): what, where, when, how and why conflict is/was prevented, avoided, resolved?
- Areas of existing or potential conflicts; where, among whom, when, how and why?
- Economic/social/cultural impacts if access to place is lost?
- If access is lost, where else or next would you go (adaptations/adjustments)
- Communication: preferences for how to gather information on current and potential space use conflicts; what information is worth keeping; what should be changed?
- Mitigation strategies if conflicts can't be avoided?

The presentation also described the importance and interdependence of the three key study elements (literature review, geospatial database, and context via stakeholder engagement).

### *Discussion*

Comments and discussion covered a wide-range of topics, roughly guided by the questions that we posed – use, compatibility, conflict, impacts, and communication – but also included questions for Rick Williams and the LCRHSC. The focus of the discussion was wave energy, given the regional focus on this technology as the most likely near-term alternative.

The discussion touched on:

- Technology and spatial requirements.
- Concern about environmental and economic impacts.
- How one buoy now means more later...and the belief that that is not good.
- Energy demand growth and the ability of wave energy industrial sites to meet this demand.
- The existing networks for communication (marine resource committees in WA and offshore renewable energy-related groups in OR).
- The LCRHSC's role in offshore renewable energy.
- The USCG's role in communication and offshore renewable energy; the need for people who want to be engaged; and the USCG's desire to get out in front and lead on this issue.

### *Next Steps*

LCRHSC will be sending out notices for further meetings.

### 3. Identification of OCS Renewable Energy Space-Use Conflicts and Analysis of Potential Mitigation

Stakeholder Meeting  
International Game Fish Association Head Quarters  
Dania Beach, Florida  
May 3, 2011, 4-7 p.m.

#### Meeting Report

**Meeting Organizer and Facilitator:** Thomas Murray  
**Facilitators:** Madeleine Hall-Arber, *MIT Sea Grant*, Dan Hellin and Jack Wiggin, *Urban Harbors Institute*

#### **Preparation**

##### ***Solicitation for Stakeholder Input***

Prior to the meeting, a press release and informational brochure (Appendix 1) was prepared and sent electronically with a personal e-mail to key ocean interest organizations and leaders, Industry, Academia, and reporters at South Florida Sun Sentinel and Miami Herald.

The initial list of prospective invitees (individuals/organizations) was provided to local sponsors and key stakeholders to review and refine the final list of prospective attendees.

In addition to the electronic transmission of notices and background material, follow-up phone calls and in-person meetings as needed were conducted to solicit participation.

Further, the meeting organizer worked directly with the Marine Industries Association of South Florida (MIASF) located in Fort Lauderdale to utilize its network of 800 marine businesses in the region. MIASF disseminated two bulletins announcing the meeting through its extensive network.

##### ***Location Selection***

The International Game Fish Association Head Quarters (IGFA) meeting location was chosen for both its ready access and central location to the Southeast Florida region. The IGFA Head Quarters was also considered an apt location to discuss issues related to Outer Continental Shelf human uses.

##### ***Tools***

- A PowerPoint presentation to introduce the project was prepared based upon the presentation provided by project colleagues.
- Three large format posters were posted in several places in the meeting space to help guide the discussion.
- Pens and note cards for comments were provided at each table for participants reluctant to speak in front of others.
- Three tape recorders were utilized.

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- Easels and flip charts (and markers) were also available.
- Attendee sign-in sheets were available at the meeting registration table.

### Meeting Format

An introductory power-point presentation provided background on the project and some general questions for discussion including:

1. What areas of the ocean are important to various marine sectors?
2. What use areas can be mapped? What are the existing sources of spatial data?
3. What use conflicts might arise between existing marine uses and offshore renewable energy projects?
4. projects?
5. In what ways could these potential impacts be acceptably mitigated?
6. What are the best ways to reach and communicate with various sectors of ocean users?

Following this introduction, three break-out groups were formed from the attendees who signed in. Discussion was recorded.

### Participants

Mike Brescher	Consultant, Mike Brescher & Associates
Andy Andersen	Houck Andersen
Howard Hanson	Southeast National Marine Renewable Energy Center, Florida Atlantic University
Paul Lehmann	US Coast Guard Reservist (Miami) and USCG civilian environmental analyst (DC)
Gordon Connell	Houck Andersen.
Martha Lord	Resolve Marine Group
Melody White	US Army Corps of Engineers (district: Broward to St. Lucie)
Lenore Alpert	Florida Ocean Alliance
Joe Embres	U.S. Coast Guard District 7 (from South Carolina/Georgia border around to the Gulf)
Sue Skemp	Southeastern National Marine Renewable Energy Center, Florida Atlantic University
Late arrival	unknown from DOT
Late arrival	unknown
Nikolas Camejo	Enovations (consultants)
John Fiore	Broward County Marine Advisory Council
Jim Murley	Coastal States Stewardship Foundation
Camille Coley	Florida Atlantic University
Laurie Bransdorf	Southeastern National Marine Renewable Energy Center, Florida Atlantic University
Pedro Monteiro	Resource Technology, Inc.
Dick Dodge	Dean, NOVA Southeastern Florida University
Maury Stimpson	AT&T
Patience Cohn	Marine Industries Association of South Florida

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Joanna Walczak      Florida Department of Environmental Protection-Coral Reef Program.  
Gabriel Alsenas      Southeastern National Marine Renewable Energy Center, Florida Atlantic  
University

### **Stakeholder Comments**

(Comments reported directly from the discussion groups)

#### *Individual Impressions on Ocean Current Renewable Energy Facilities*

Lots of different types of designs for current renewable energy systems.

Designs will be determined as more testing occurs.

Nobody is planning such a thing at the moment but as research continues the possibility gets greater.

The Straits of Florida represent probably one of the best places in the world for the development of ocean current energy facilities due to the fact that the straits capture the Gulf Stream and also due to the huge demand for electricity that exists along the east coast of Florida.

Florida Power and Light (FPL) are interested in the siting of offshore renewable energy facilities because of the requirements for suitable shoreside infrastructure. A number of locations offer such infrastructure including Turkey Point nuclear power station, Hutchinson Island nuclear power station and a power station by Port Everglades.

Offshore renewable energy most likely to be developed off the east coast of Florida is hydrokinetic and thermal.

Wind resource is less than ideal for commercial wind generation.

In South Florida the conflict between wind facilities and surface traffic would be astronomical.

Representatives from the Southeast National Marine Renewable Energy Center (SNMREC) reported they are working to establish a test-bed site for demonstrating alternative technologies.

SNMREC test-bed site is located between the main north and south shipping routes.

Offshore current energy is a high-risk industry and there are lots of unknowns. A combination of factors could lead to unforeseen surges in current.

Gulf Stream fluctuates but is up to 5 knots. Meanders somewhat but is more towards Florida than the Bahamas and is in the upper water column.

Current is the best potential source of renewable energy in Florida.

Currents run continuously and so could be a continuous source of energy unlike other renewable energy sources.

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The general idea for harnessing energy from the Gulf Stream would be to have equipment floating in the water column and attached to the sea floor.

In Florida, the best location is approximately 50 meters deep.

Some proposed commercial systems generate 1-2.5 megawatts per unit and would have an overall blade diameter of 75ft.

Some system has cutting speeds (blades start rotating) at 1-1.5 knots.

The blunt blades would turn very slowly.

There would be no surface signature.

An offshore current array might be 4 BOEM blocks (i.e. 12 square miles) located 10 to 20 miles offshore. Could have up to 5,000 units in an array.

Hurricanes pose a potential threat but some designs have control surfaces which would allow for the arrays to be moved deeper and so avoid storm related waves etc.

Hurricanes and storm surge can move sunken ships. Example: 200 ft. Mercedes moved. Tire reefs were well intentioned, but split apart in rough weather.

It is necessary to plan for hurricanes and other natural disasters. But also for other anomalies that at this time cannot be predicated or are unknown. SNMREC has identified a strong tidal fluctuation in current speed at a location 15 miles offshore. There is currently no explanation for this phenomenon.

It is potentially possible that *arrays could deflect the Gulf Stream.*

### ***Current Areas of Use and Potential Conflicts***

#### **Commercial Shipping**

The area off southern Florida is a very busy shipping area. The ocean currents are already tapped for commerce and recreation. Commercial vessels follow the Gulf Stream northwards. Often southbound vessels travel between the Gulf Stream and the shore. There is always a large amount of commercial shipping. Cruise ships operate all year long (although the winter is somewhat busier). Cruise ships head in and out through the Northwest Providence Channel, the Old Bahama Channel, and the Yucatan Channel. But they also congregate in the Straits of Florida. Pleasure sailing occurs throughout the year and other areas are used for bill fishing, offshore racing, sail racing etc. While some of these may not be year round, something is going on all the time.

Are the technologies being studied below the depths required by commercial shipping?

The greatest current is in the top 100 to 150 meters of the water column so the equipment would be sub-surface and below any potential commercial shipping.

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It is likely to be at depths of 30-50 meters because these technologies are taking advantage of the Gulf Stream. However, certain technologies might work in shallower depths and others, such as thermal have structures and platforms up to and on the surface.

Also some technologies are designed to alter their depths by “flying” through the water column. *General sense is that deployment should avoid shipping lanes.*

There appears to be a trend in the cruise ship industry to larger ships. Because of size, these will be limited to the ports that can accommodate them: Miami, Port Everglades (Fort Lauderdale/Dania), and Port Canaveral. The latter is planning to expand cruise ship business.

There are currently issues with cruise ships that are generally moving east-west and other traffic, especially oil tankers, which are moving north (in the Gulf Stream) or south between the Gulf Stream and the mainland.

One of the predominant uses concerns the large commercial ships (“Pana-max” ships). If OCS development threatens their operation, they will certainly oppose it. Typically, southbound ships avoid the Gulf Stream so they steam closer in; while northbound ships want to go into the Gulf Stream to increase their speed. If entering a Southern Florida port they won’t always be far offshore.

There is significant *submarine activity off southern Florida* and there is an acoustic signal measurement range off Fort Lauderdale that it working to determine the acoustic characteristics of different vessels.

### **Recreational & Commercial Fishing, Diving, Sailing, Yachting**

National Marine Fisheries Services’ Southeast Fisheries Science Center (SEFC) is conducting studies of sizes of fish being caught by recreational fishermen. These assessments will include spatial use data, for example depicting how far offshore anglers are going to catch fish.

Most recreational fishing does not go more than 100ft deep. Although a few commercial “long liners” do fish deeper. Some fishing occurs in waters up to 1,000 feet. Fishing the thermo-clines along edges of the Gulf Stream is incredibly productive both recreationally and commercially. The commercial includes big game fishing tournaments as well.

Fishermen (in this area primarily means recreational fishermen; comparatively little commercial fishing efforts occur any longer) will anticipate offshore renewable energy sites as no fishing areas. This is likely to be the case for most hydrokinetic projects as they are beneath the surface. The mitigation could be that these areas will be de facto protected areas for fish.

Charter fishing boats cluster around inlets. Tournament (billfish tournaments) fishing follows the Gulf Stream. These tournaments occur in the Spring and Fall.

Recreational diving mainly takes place on wrecks and reefs in less than 125 feet of water (there are maps of these).

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Pleasure sailing occurs throughout the year and other areas are used for bill fishing, offshore racing, sail racing etc.

All waters from the coastline to 5-7 miles offshore are heavily used, especially on weekends. And this activity occurs during the night as well as people often fish at night.

Recreational boaters include those transiting to the Bahamas, Bimini.

It is common for recreational boats to drag their anchors and drift out to sea.

Any type of renewable energy facility (even those systems with no surface signature) will have a significant impact on sport and other fishing.

Ocean current arrays would be in the water column so the units themselves and the tethers could snag fishing gear. So restrictions on fishing in areas where arrays were located would be expected. This would be particularly true with swordfish fishermen.

Tidal devices in inlet and wave devices would be an issue for boaters and, due to the high boating activity are not suitable for Florida. However, the University of Washington is working on a project in Puget Sound which is very heavily used by vessels. Their currents are all the way to the seafloor so equipment can be attached directly to the sea floor.

It would be interesting to know how many fishermen are fishing at what depths and where. There is no good information on this and it is likely to vary with season and species being targeted.

Eighty-percent of recreational boats head offshore and “will scream” if restricted.

### **Waterfront Real Estate**

Condo owners expect certain views, so the list of potential use conflicts goes on which is why stakeholder meetings like this are extraordinarily important.

Another potential conflict is between the need to bring cables onshore and the very high value of waterfront real estate. DOT has found that establishing perpetual easements costs almost as much as buying the property in fee.

It may be possible to tunnel under waterfront property.

### **Other Associated**

No *aquaculture* exists or is currently proposed for Southeast Atlantic coast. However, there *is* discussion and potential for such development in the Gulf of Mexico.

*There are research sites in this area.* Contact the regional association of ocean observing (SECOORA). The Navy has acoustic stations in area. Hydrokinetic installations may impact the Navy’s underwater acoustical tests and training.

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The *potential opening up of Cuba to US interests* will have wide spread ocean industry impacts; likely *changing existing logistical patterns of shipping, cruise ships, recreation boating and fishing*. This has been anticipated for decades.

Potential impacts of offshore renewable facilities will vary depending on the TYPE of facility.

There will be a potential risk to *marine mammals*; even though these systems generally have large, blunt, slow-moving blades. Some marine mammals may be attracted to the noise and investigate what the array is – whales and dolphins. But these are generally intelligent and research suggests that they will avoid the array.

Propellers on large deep draft vessels probably pose a greater threat to marine mammals than ocean current arrays.

There is *greater concern about turtles*. There is little data on offshore distribution of turtles. SNMREC will be gathering this data so it will be available to commercial developers when needed.

There are some questions about what effect high power cables may have. Would they attract sharks?

Education needed--Alternative energy offshore may resonate positively, but there will be cries of “will kill manatees. For example, “Sea grass is holy grail here”. They move seasonally and benthic habitat changes so must investigate annually. Right whales could be problematic; also sea turtles

The impact to *benthic habitat* is key consideration of the Army Corps of Engineers (ACOE) regulatory review of uses that require anchoring to the bottom.

If *larval transport* is affected, the supply of fish to reefs will be disrupted (e.g., if current energy facilities built in water column).

*Anchor dragging and cabling* is an issue. Near reefs anchoring is prohibited but there is an anchorage north of Port Everglades where vessels often drag anchors.

Any bottom-mounted gear (even anchors for tethered devices) has potential impacts on *archaeological sites*.

Many cables already exist in cuts and designated areas and each has its own anchoring restrictions.

*Coral reefs* are a major concern. For example they are at the extreme fringe of their zone.

Cabling to shore is an issue. Laying cable is a well-established process, but it will probably be refined in the future. There are issues with *coastal reefs* and in some cases it may be necessary to carry out horizontal drilling to thread cables through the reefs. In deeper water the *corals and other important habitat* is more patchy and so cables could be laid between and around these patches.

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There is a shifting baseline; impacts from land use have led to a gradual decline in reefs. Impacts like: nutrient rich (sewage outfalls), aquifer cumulative impacts (bleaching, algae, acidification).

Construction, maintenance and operation, and decommissioning would all require surface operations that would interfere with surface activity to some extent.

Maintenance and removal of fouling organisms would likely be a continuous process involving a number of vessels.

Bio-fouling will be an issue for any equipment that is in or under the water and this would necessitate continuous maintenance.

Need contingency plans.

Potential to “frac out” due to porous substrate

If the US were to become reliant on offshore renewable energy it would be likely that *security for such facilities would become of greater concern* and restrictions would increase.

### ***Prior-Related Situations in Florida***

- There was a proposal for an offshore wind facility off the Jacksonville area. While the idea was to site it over the horizon there was significant opposition.
- In the 1980’s Florida Keys Electric Company rebuilt the bases and transmission lines and there were a number of accidents involving boats crashing into the bases and people being injured.
- There was a liquefied natural gas (LNG) terminal proposed and nearly permitted offshore of the coast north of Fort Lauderdale. It was eventually defeated because of objections from coastal condo owners who feared explosions and the impact on their views. It was proposed for 11- 12 miles offshore.

The proposed Calypso Liquid Natural Gas facility (North of Port Everglades) was strongly opposed by the fishermen (especially charter operations) as they felt that it would have significant impact. In addition, there were security issues, which were an additional impact.

Liquid Natural Gas tunnels under the reefs were proposed, most did not object, but the clay used during the drilling could fracture the substrate (can’t anticipate when it would happen and don’t necessarily know that it has happened), but most feel tunnels are better than pipes that can be blown around in a hurricane.

### ***Mitigation***

No changes in use really envisioned, but if facilities were built and acted as Fish Aggregation Devices (FADs) this could change sport fishing patterns as they target fish near to these FADs.

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Closed areas may well act as sanctuaries for fish and could actually help fish populations.

After Florida banned gill netting as people felt it was an inhumane way to catch fish, efforts were made to provide alternative livelihoods to those who had been gill netters. This included training them as clam farmers. These efforts failed for the most part. Many of the fishermen are now struggling to survive.

Any suggestion of this type of mitigation in Florida in the future is likely to be met with fierce opposition.

Timing construction *phases*, to have less impact is not really feasible due to year-round activity.

### Examples mentioned:

- Pick up the tires from the old tire reefs
- Plant mangroves. Mitigation must be local
- Hard to conceive of mitigation since for some, e.g., commercial fisherman, if you have to
- move a degree, may end ability to make a living or may ruin a reef.
- Buy shoreline owners' property and return to a natural shoreline.
- Create a priority for local jobs with such development on the OCS.
- Need to provide on-going funding for monitoring

### ***Communication***

*Marine Industries Association of South Florida* (MIASF) is a good way to inform boaters about specific proposed projects. Even though it is an association of marine industries, the member organizations have close contact with the boating population.

Boaters are generally not very interested in conceptual discussions (like this project) but are extremely interested when specific projects are being proposed.

*BoatUS* (750,000 boaters in Florida alone) is another way to spread the word about projects and they will also offer opinions on more conceptual ideas – although their opinions may not reflect the views of potential developers of offshore renewable.

Boaters do not tend to look at charts or listen to Notice to Mariner bulletins so any restricted areas need to be included in electronic charts and GPS systems.

Communication with ocean users is of critical importance; fishermen, recreational boaters, etc. *Trade associations could be helpful in communications.* Recreational boaters are challenging to reach; other efforts have used postings at marinas, boatyards, boat launch ramps, bait shops, yacht brokers, etc. There are a small number of magazines that most fishermen and boaters read, e.g., *Southern Boating*.

Most attendees indicated they would continue to help communicate to their specialized audiences.

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### Further Suggestions

- Attend local community meetings and town halls
- Press releases to newspapers, TV stations, mass market media
- City commissions (usually meet certain days of the week)
- Broadcast in 3 languages
- *Sea Grant* has some good networking
- E-mail chains
- Schools
- Florida Fish and Wildlife (licensing, so have contact info)
- Be aware that many have day jobs, so need to hold meetings in evening (avoiding existing meeting days)
- Important publications:
  - *The Triton* (international circulation)
  - *Waterfront News*
  - *Waterway Times*

### **Suggested others to be contacted:**

- IMO (commercial shipping)
- Florida Ports Council (regarding anticipated impact of expansion of Panama Canal)
- Harbor Safety Committees (commercial shipping and port activities)
- John Fiore, Broward County Commission, Marine Advisory Committee (recreational boating)
- Rich Pruitt, Royal Caribbean (cruise ships)
- Michelle Page, Florida-Caribbean Cruise Ship Association (cruise ships)
- Dockwise (company involved in yacht transport).

### ***Available Marine Related Data***

Dr. Dick Dodge, Dean Nova Southeastern University Oceanographic Center has mapped reefs off Fort Lauderdale.

SNMREC did some basic marine spatial planning to site their test-bed facility and gathered data for that and said that they would be willing to share that information.

#### 4. Identification of OCS Renewable Energy Space-Use Conflicts & Analysis of Potential Mitigation Measures

##### Stakeholder Meeting

Wednesday May 25, 2011 5:00-8:00 p.m.  
Richard Stockton College of New Jersey  
Campus Center, College Drive  
Galloway Township, New Jersey

##### Meeting Report

**Meeting organizer:** Thomas Murray

**Facilitators:** Jack Wiggin and Dan Hellin, *Urban Harbors Institute*, Madeleine Hall-Arber, *MIT Sea Grant*.

##### **Preparation**

###### *Solicitation for Stakeholder Input*

Prior to the meeting a press release and informational brochure (*Appendix 1*) was prepared and sent electronically with a personal email to key ocean interest organizations and leaders, industry, and academia. The meeting organizer established a *stakeholder meeting development committee* including local sponsors who met by conference call twice to discuss the project and reach consensus on invitees, dates and location to minimize potential conflicts with other scheduled events. In addition to the meeting organizer, the work group consisted of representatives from N.J. Department of Environmental Protection, Garden State Seafood Alliance, N.J. Marine Trades Association and Fisherman's Energy. The committee also included the N.J. Sea Grant Extension Program to utilize its widespread and diverse network of local, state, and regional governmental agencies, industry groups and non-governmental agencies.

###### *Location Selection*

The overall meeting plan included much deliberation in selection of a location proximate to the greatest diversity of ocean users. Originally, the meeting organizer was planning on Cape May, New Jersey to focus on the commercial fishing industry. After discussions with the work group it was decided that a location closer to Atlantic City, New Jersey would provide a more central venue. The N.J. Sea Grant Program identified the Richard Stockton College's new campus in Pomona as a preferred venue. The president of Stockton College agreed to act as a host and an additional local sponsor as well.

###### *Tools*

- A PowerPoint presentation to introduce the project was prepared based upon the presentation provided by project colleagues.

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- Three large format posters were posted in several places in the meeting space to help guide the discussion.
- Pens and note cards for comments were provided at each table for participants reluctant to speak in front of others.
- A tape recorder was utilized for the entire session.
- Attendee sign-in sheets were available at the meeting registration table.

### Meeting Format

An introductory power-point presentation provided background on the project and some general questions for discussion including:

1. What areas of the ocean are important to various marine sectors?
2. What use areas can be mapped? What are the existing sources of spatial data?
3. What use conflicts might arise between existing marine uses and offshore renewable energy projects?
4. In what ways could these potential impacts be acceptably mitigated?
5. What are the best ways to reach and communicate with various sectors of ocean users?

Following this introduction the entire group participated in facilitated discussions for approximately two hours.

### Participants

George Ward	Tuckerton Sea Port
Benson Chiles	Chiles Consulting
Joe Dobarro	IMCS/ Rutgers University
Tom Hoff	Mid-Atlantic Fishery Management Council
Wayne Staub	New Jersey Department of Environmental Protection, Economic Growth and Green Energy
Sam Martin	Atlantic Capes Fisheries, Inc.
Pete Rowe	New Jersey Sea Grant Consortium
Rhonda Jackson	Fishermen's Energy
Mike Danko	New Jersey Sea Grant Consortium
John Koegcroz	Beach Haven Charter Fishing Association
Pete Straub	Stockton College
Jackie Toth	Rutgers University
Rich Langton	NOAA Fisheries
Capt. Lindsay Fuller	Beach Haven Charter Fishing Association

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Mark Sullivan	Stockton College
Tony Macdonald	Urban Coast Institute
Beth Langton	Brookdale Ocean Institute

### Stakeholder Comments

(Comments reported directly from the discussion groups)

#### *Individual Impressions on Renewable Energy Facilities*

OCS energy development is new to everyone and people just want to have a voice. If development is too close there will be significant use conflicts; if it is too far the transmission costs would make it unfeasible. Most of the use would actually be within 8-12 miles of the coast. From 5-20 miles offshore you can name dozens of spots important to different users, and based on different physical and ecological attributions. For some uses sandy bottom is important. So it's an enigma as to how to figure this out. It would seem to come down to who are you going to hurt the least! From a user perspective come together and say this area is important and this area is not as important for specific uses.

Have you mined the other surveys done with offshore wind farm development, in Delaware and Nantucket, etc.? In order to comment we need some concept of what we're looking at. We have no details on what is being considered in terms of nature, size and potential closed areas. Moving closer to shore it would help industry with transmission costs but increase the interactions with small boaters, etc.

With regard to the fragility of the structures the current windmills are adjacent to highways so there is no current fear with respect to running into these large structures. When fields are defined, be sure to have chart makers involved including electronic charting. The technology for wind farms is no longer new. There have been many advances and improvements with generators. Are there likely to be new technologies developed? One issue is the large amount of funding needed to do the necessary testing.

Other technologies may improve (e.g. wave generation). So, it is very difficult to know what will happen in the future. As wind farms are developed it is ESSENTIAL that their locations are included in electronic charts as many people use these.

Scale of development is a major issue. The odd turbine here and there is not an issue but when there is an array this is a problem. While this is looking at whole OCS, in reality it is between 8 and 20 miles from shore that offshore wind will happen.

In all probability the U.S. Coast Guard and Homeland Security will not permit the areas be used or transited. U.S. Coast Guard is proposing a ½ mile closed area around similar structures. These towers are made to withstand harsh ocean conditions. We've had no problem from a risk standpoint with oil rigs. There are thousands of pieces of equipment in the Gulf of Mexico that have not been a problem to the U.S. Coast Guard. Where have they been in the last 60 years? Never a problem with recreational fishermen they are actually encouraging such use around the rigs.

The scale of these developments is just incredible. Blades could be 100 meters long. A lot of work on wind generators that do not look like windmills. With blades getting bigger, what homework is being done by development groups on alternative design? Is there any information on how cables will be handled? Will they be buried? Is there any standard for how deep?

Whole issue with Bureau of Ocean Energy Management (BOEM) is the process is moving so fast. Blocking off the oceans should be in concert with the National Ocean Policy group. Why is BOEM

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moving ahead with RFI with all the Marine Spatial Planning and related work ongoing? Apparently all of these things are moving on parallel tracks to meet in 5-6 years and make commitments on uses.

NJDEP is writing rules for wind farms. Right now developers go to the state of New Jersey to make these decisions.

Mid-Atlantic Council is in favor of offshore wind but BOEM is simply doing it very badly.

A great deal of land-based support will be needed, even though structures will be in OCS. Rhode Island communities are vying for being the landing areas for such development. Fallsboro Port has been developing an economic policy with tax incentives and such for this new use. Port of NY and NJ are already. We will probably have 1-2 service vessels just to service the windmills off Atlantic City. NJDEP is looking worldwide for information on how to best develop. There is a significant investment by the State to enhance Fallsboro's capability in this area. The State has applied to Federal Government for grant support in this area and is putting together tax incentive strategies to support redevelopment to service OCS renewable energy.

### *Current Areas of Use and Potential Conflicts*

#### **Commercial Shipping**

Petroleum refineries, what happens with barges moving up and down the coast 7-10 miles offshore? With windmill farms where will they move? There will be indirect impacts from any displacement. We can't suggest any changes or mitigation since we don't know the impacts. If they move the barges inshore, this impacts the recreational fishing. If barges move offshore then ships will likely alter course as well. There may be domino effects. When things get moved from one place to another, other things are impacted.

Currently there is talk of changing the approach and departure patterns in and out of the Delaware. This would change everything.

#### **Recreational & Commercial Fishing, Diving, Sailing, Yachting**

Areas suitable for wind farms are normally areas for migratory species, so displacement of fishermen would have a real effect. If inshore they impact sport fishing 3-10 miles offshore (fluke, sea bass, etc.)

Need to put together local advisory groups of stakeholders because everything is site specific. More impact and less conflict if commercial fisherman have a consistent representation and input.

Fishing is very specific whether fixed gear, scallops, sport fishing, very gear specific. So a panel consisting of more specific users could reduce conflict at the outset. Right now all we know is where we can fish. Our experience has been that unless fishermen get their part in the plans they never get added back in.

Key is how much area is going to be taken up; and with time to think about all of this the potential conflicts could be minimized. Maps including AIS and VMS should be provided to start discussions. VTR is actually more useful than thought, although the scale is quite gross (360 sq. nautical mile grids.) Regional Fishery Council Advisory Panels could be useful for panels but need to have currently active fishermen. Areas where turbines are likely to be sighted may only be fishing areas for part of the year for fluke, blue fish, etc. Assessments should look over time.

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If sights are too close together you may not be able to use mobile gear to fish but it could be good for reef fishing. Biggest potential dislocation would be with bottom tending gear such as trawls and dredges. Our boats can move but there are critical sights we would not want to lose.

You need real time data and real time fishermen to provide input. We started fighting OCS but it's a need, so now we are proactive and involved in the decision-making.

We fish charters 80 miles offshore overnight. 400' wind farms with required lighting might impact our night vision. So we need to know what the project density will be, how big an area and what uses may be allowed. For example, can we anchor, tie up to structure not come close at all; none of this is coming out. For example if you block areas leading to Baltimore Canyon we take different angles and if we have a 20 mile jog to get around these areas it's a big deal to us. Nobody has explained these critical details. All we hear is "here is this 20 x 20 mile block" and there is no detail on who controls the use within the area.

The New York bight is producing big scallops. Scallop fishing should be doable within a wind farm array but that should be part of the discussion. If it were OK to use fixed gear in and around the turbines then this would be good for those types of fisheries and fishermen. There is a good chance that people will not be able to fish inside a wind farm due to homeland security issues and insurance issues. Most likely commercial fishing would be banned but recreational may be allowed.

### **Waterfront Real Estate**

Issues with space use conflicts are not only in the OCS. There are also land-based requirements that will conflict with other uses.

While maintaining working waterfronts is a good thing it is also potentially a bad thing, as something will be getting displaced. In NJ there are too few marinas, so displacement of recreational boating for support infrastructure for wind farms would be a major issue.

How will that be tied in; that is displacement of current water dependent uses such as a recreational marina. Boaters will be displaced but no new marinas to go to. So how do we tie in land use? A lot of unknowns about the type of access needed, size & nature of vessels, etc.

The point about beachfront owners not liking the vista is not quite right. One Atlantic City hotel charges premium for waterfront rooms. After the 5 windmills opened they got more requests for windmill view rooms. Prices for those rooms went up.

### **Other Associated**

Is anyone looking at movement of marine mammals? Do you take submerged cultural resources into consideration?

Need to consider multi-use with aquaculture. It is in the New Jersey State Aquaculture Plan. Should be in the national aquaculture plan but it does not seem to be a consensus.

BOEM is funding a lot of work on the west coast related to marine mammals.

There is a question of larval (blue crab and other) transport being interrupted by wind turbine disturbances and gyres. Those questions are being asked and connections made. Some scientists at Rutgers are looking at things like larval transport interference. Also NMFS ecosystem based management is gathering information germane to these questions.

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### *Mitigation*

Projects around the world have included mitigation such as buying an icehouse or purchasing a crane for a number of different fishermen. It is hard to discuss mitigation without knowing the nature and extent of the impact. It's very difficult to mitigate. If you give one company an icehouse what does it do for me? Mitigation is very difficult since only commercial industry has license (in N.J.)--could buy out limited access fishing permit but not everyone has permits. It is possible to buy out someone's permit but what about those who do not need a license for their activity. Could re-open closed areas to fishing for example, but it would depend upon the stock assessment and ability willingness to "give back" quota. Without an increased stock bio-mass NMFS can't give it back.

Probably very little mitigation needed because impacts will likely be very site specific. If areas are off limits to commercial and recreational, they actually should be accounted as providing eco-system benefits. Perhaps the structure would lead to increased biomass and then closed areas could be reopened. Fishing sectors could be compensated for by way of increased quota, season, bag limits and the like.

There are possibilities for suspended (in the water column) aquaculture alongside turbines. This could be a big plus and even a form of mitigation. There needs to be a national aquaculture policy that addresses such combined uses.

Mitigation is difficult with such site-specific projects, and with multiple user types. What rights do boaters/fishermen have? These need to be clearly defined. If users are displaced then there has to be mitigation.

### *Communication*

We watch NOAA emails on regulations. That's how to get info out about stakeholder mtgs. Publicity needs to be improved, only got info via Sea Grant list serv. To contact individual recreational fishermen need to start posting with user websites, sport fishing assn. websites. Best way to inform will be to make use of the social media network (i.e. twitter etc.) Place a PSA on television with a *link* to Facebook or Twitter and the like to provide a huge amount of input.

Need to know what people are planning, size, number, restrictions.

Use the regional panels to guide possible placement of facilities and get the word out.

Panels need to include current fishermen. Fishermen are often shy by nature but can be aggressive. They often want others to talk on their behalf. This could be another role of the panels not just to help plan but to get the word back to their sectors.

These panels could help identify suitable area *before* it gets to the stage of BOEM issuing RFIs.

Need to start the communication much earlier.

### *Suggested Contacts/Available Marine Related Data*

NJ DEP has lots of data.

VTR data are very vague and are not very useful for site-specific issues.

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VTR shows date and time when leaving and when returning. So VTR data has use but folks have been told that NOAA does not use it. With VTR that is a good start but not relevant to where the 1000 mg farm would be located.

NOAA doesn't like releasing VMS data. But individuals could voluntarily release VMS data after a delay (so as not to reveal where they were fishing for what).

With VMS, could divulge info after certain period of time. 3 months? Sea Clams, scallops, Loligo squid also observer data could be accessed. VMS data from NOAA fisheries is tough to access so going directly to fishermen may be best route to get real trip details. VMS misses certain fisheries; such as summer flounder, for which there is not VMS data, and automated tracking gets worse as you go south.

When an RFI is released a huge amount of data has already been gathered.

There are other dialogues underway in Marine Spatial Planning (MSP) like MARCO that are talking about doing this very thing: i.e. meeting with fishermen to get baseline operational data. MARCO is planning two meetings in the region looking for specific data. The MARCO portal will inform MSP. Also there is a wealth of related information being generated by the RFI input process even though this is not a part of that effort. It does provide much of what you are looking at in these stakeholder meetings.

There are lots of cables running out from Beach Haven, N.J., and there is much data on cables.

About 5 years ago all artificial reefs and major wrecks from Cape Cod to Cape Hatteras were mapped.

Fishermen's Energy has lots of good contacts as well for future information gathering.

Talk to the Shark Fishing Association.

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### 5. Identification of OCS Renewable Energy Space-Use Conflicts and Analysis of Potential Mitigation

Stakeholder Meeting  
Humboldt Aquatic Center, Eureka  
Thursday, June 2, 2011, 6-8 pm

#### Meeting Report

**Meeting organizer and facilitator:** Carrie Pomeroy, California Sea Grant

#### Invitations

A flyer was created and distributed via e-mail to more than 100 project participants and others (from the commercial fishing, shipping, boating, scientific research, management, tribal and other communities of interest) in the area. Some of these individuals forwarded the information to others. Humboldt Harbor District staff also forwarded by e-mail and posted the notice to harbor users, commissioners and others, encouraging them to participate.

As will be noted in the final project report, a key issue in scheduling this meeting (and other fieldwork activities) was that people were clearly worn out from MLPA, WaveConnect and other meetings of the past 3-4 years, and were disinclined to attend another meeting at this stage in the process, i.e., when there was no specific action (e.g., a lease sale or permit issuance) to address. Also, although we scheduled this meeting to minimize conflict with other meetings and fishing activities, especially the commercial salmon season opener, the first in three years, many of the area's fishermen, having just returned from that opener, declined to spend their time at yet another meeting. Several individuals (from the diversity of groups) responded to the meeting notice with interest, but reported they were unable to attend due to other commitments.

#### Preparation

- A PowerPoint presentation to introduce the project was prepared.
- Colleen Sullivan produced large format charts showing different types of marine activities in the region. Poster-size copies of these, along with standard nautical charts, were printed and made available for annotation.
- Pens, note cards and post-it notes for comments were provided for participants.
- One tape recorder was readied.
- Easels and flip charts were readied.
- Light refreshments were provided.

#### Attendees:

1 biologist, National Marine Fisheries Service  
1 groundfish and shrimp trawler/albacore troller  
1 community and NGO member

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1 Humboldt County Planning Department employee  
1 Humboldt Fishermen’s Marketing Association representative/salmon & albacore troller  
1 Humboldt Area Saltwater Anglers representative  
1 shipping/ tug & barge representative

Vivian Helliwell, fishing community member, notetaker/helper  
Carrie Pomeroy, California Sea Grant  
Debbie Marshall, California Sea Grant, notetaker/helper

### *Introductions*

Pomeroy introduced herself and notetakers; participants introduced themselves, indicating their interests in and reasons for attending the meeting. These included a strong interest in keeping track of and understanding any offshore activities that might affect the community as well as OCS users per se.

### *Introduction to the project*

Because of the small attendance, Pomeroy used the prepared PowerPoint presentation to guide her comments and encourage dialogue among participants as each slide was presented. The result was a rich conversation among participants addressing several of the research questions.

### *Discussion of Key Topics*

- Characteristics of place(s) on the West Coast OCS that are valued (habitat, proximity to home, markets, etc.); what’s important to you, and why?

- Different types of places values by different users; some overlap. Examples include:

If you're carrying fuel, you're coming in from 25 miles; ships are going to be 25 miles out; log and chip barges and cargo barges can go anywhere within the tow boat lanes. But as long as we have a hole and we have enough room to escape if we have a problem, we're not really going to care what's going to happen up and down the coast. All we're interested in the hole to get in and out. So, that's not going to affect us providing it's not too close to the entrance.

From the rec perspective, we want areas close to port (for safety, operating costs, vessel range), which are the same areas that the energy folks want, is close to port because of their transmission costs and the grid to get onshore.

(Shrimping occurs) anywhere from 30 fathoms out to 100 fathoms (offshore in a participant-marked area near Eureka)...it's a strip and, you know, it just depends, there's little spots here and there that are better than others, but they move, they march up and down the coast, so, you know, there's not one really specific...spot; (and) you've got this area here is like taboo now (because of risk of bycatch of groundfish species of concern).

- Places valued not solely in terms of (temporal or spatial) point of use, but broader footprint of use: “If this thing is anchored in 100 fathoms with 5 to 1 scope, it's going to be a lot of places.”

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- This is not limited to OCS space, but shoreward extent of facilities and infrastructure, and implications for access; these places are important to different users as well.

- Valued characteristics encompass transit, space and movement necessary for working in the variable and uncertain marine environment (State and Federal waters).

In terms of fishing, I mean you never know where they are going to be. Some years they run down to Usal to catch shrimp, some years they go up off of Crescent City and Klamath River, you just don't know. Crab (are) the same way, salmon - who knows where they are right now!

- Critical importance of this as 3-dimensional space; bottom, pelagic and surface places valued for various combinations of qualities.

- Use of place(s): past use, current use and future trends / seasons; factors that have contributed to changes in use?

- Regulatory changes in salmon and groundfish fishing areas in recent years have resulted in effort shifts. Those areas have changed over the years, and it is expected they will change in the future. Participants also expect, consistent with fishery management procedures, that some of these areas will be re-sized or re-opened as stocks rebuild and new, finer scale information becomes available. The July commercial salmon fishery opener off Humboldt County for the first time in over a decade is one example.

- Whereas relatively little shrimp trawling had been carried out in recent years, abundant stocks, strong markets and challenges posed by the new Groundfish Trawl Individual Quota system have prompted a resurgence in the fishery, which occurs in Federal waters only.

- The Port of Humboldt has been considering alternative development scenarios, with possibility of increased vessel traffic from other uses; this should be considered as well. The harbor entrance is of particular interest, but so are other parts of the system:

- Compatible uses of place(s) by diverse interests (conflict avoidance): what, where, when, how and why conflict is/was prevented, avoided, resolved?

- If obstacles are known, most users have some ability to maneuver around, although this depends on size and nature of obstacles, other uses and oceanic conditions.

- Critical importance of multiple transit corridors.

- How multiple uses work:

“It’s about a commons, really.”

“ I think we all get along pretty good, I mean we interfere with you guys a little bit every once in a while.”

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“Yeah, but it’s part of business.”

“But, we’re not really screwing anybody up for more than 20 minutes and everybody is courteous and we try to stop and get out of the way and same with the fishermen.”

- Concern about disrupting current system of diverse users coordinating use, avoiding or minimizing conflict:

What I’d be curious about, like the culture you have existing now, with how you operate in Humboldt Bay and leave the Bay and once you’re out in the ocean. You have that dance kind of figured out and so this industry coming in would be a whole new set of folks coming in to get into the dance.

- Areas of existing or potential conflicts; where, among whom, when, how and why?

- Much more information needed to meaningfully respond to this question.

- Areas of conflict for some may be areas of compatibility for others (and vice versa).

- Concerns about devices breaking loose, as occurred off Oregon, and creating a hazard

- Shifting uses can create new conflicts, which often are resolved through direct communication, but can persist and intensify.

- Concerns about other dimensions of offshore renewables: electromagnetic fields, noise, lights disrupting the marine environment, sea and bird life, uses.

- Approach used makes a difference in whether or not conflict arises:

It all depends on the lay out, how much it’s really in the way, ...like (another participants) was saying, even just coming and going in the entrance and in the harbor, you know, we can work together or we cannot. If they’ve got something they want to (do or use), maybe you can just work together just depending on how they want to lay it out. I don’t know how bully they want to be, you know what I mean? It just depends.

It’s kind of like somebody moves in from someplace, ...they’re new to the neighborhood and there’s already a neighborhood there, and so if you’re smart, you fit into the neighborhood, you don’t try to... You really want to fit into the neighborhood, you really have to fit into the neighborhood, and the neighborhood has to be open to having new neighbors.

- Economic/social/cultural impacts if access to place is lost?

- People wear multiple hats, and have diverse and complex interests and concerns.

- Importance of accounting for the cumulative social and economic impacts of recent and ongoing State and Federal processes and actions.

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- Do not want to see offshore renewables development interfere with existing uses, which are economically, socially and culturally important.

- Concerns about negative environmental, social, cultural and economic impacts coupled with interest in opportunities for economic stimulus for the community and the region.

- If access is lost, where else or next would you go (adaptations/adjustments)
- Communication: preferences for how to gather information on current and potential space use conflicts; what information is worth keeping; what should be changed?

- Humboldt County Planning Department spent ~10 years in the 1980s working with the local community (trawlers, other fishermen, tug and barge/shipping operators, etc.) to identify potential space use conflicts and impacts of MMS lease sale 91 (and before that, 53) for offshore oil and gas development.

- Process and participants need to be genuinely transparent from the get-go, including industry and agencies, e.g., re determination of “exclusion zones” by U.S. Coast Guard, detailed plans. Need to get agencies and industry:

...to really pinpoint what they're actually going to *really* do, because they will say, “Oh, yeah we'll do this.” And then when you really look into all the information they give you, it's like the fine print in your insurance policy. Oh, yeah, it'll cover everything except for this and this, and the first 90 days or whatever.

We're sort of a close community, we see each other at different meetings and things like that, we know some of the issues. It's kind of like you know where the fish are because you (fishermen) are out there; we're not, we're just imagining where they are because we're not out there every day. It's kind of the same thing from DC, they've got this big umbrella idea but, they don't know what's actually going on ... so (understanding) the local context of each of these places is important.

(It's important that there) is really understanding about the communication aspect of it because it needs to be well understood what information is transmitted out, that some of the fine details or the, you know, some things that are really important aren't ignored.

- Recent WaveConnect, MLPA, LNG terminal and other experiences have highlighted this issue, one of trust as well as transparency:

So, there's a big challenge in terms of trusting the government or whoever it is that is out to make a profit where you just want the information and there's kind of a game that's played. It's sort of a cultural thing that has just been in place forever and it would be nice if in some of this, there actually was a change where, just tell us what you're going to do, really. Because if we're responding to an imaginary scenario, we're not really talking about anything real and so bringing in the real experiences.

- Concern about inter (and intra-) agency conflict (of mandate, purpose, action).

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- Mitigation strategies if conflicts can't be avoided

- Concerns about noticing of activity, obstructions, etc., and liability.

- Mitigation depends on specific project information. Opinions at this meeting were consistent with some, and at odds with, suggestions from guided conversations. Comments included:

Step one is in what space. You know, you identify the space and then find out who's using that area at what time of year and whatnot, I mean this is going to be a 12 month of the year project, a lot of these fisheries only go on for a couple of months, one month and that sort of thing.... I would think step two is find out when and how large of an area is this, is this an area that's 20 miles long and 3 miles wide where shrimping goes on or something? You know, how valuable is one square half-mile that's going to be taken up by the radius of the anchor apparatus...

I think any time if you get a potential user or a lease holder, they have to come forward, and with some pilot idea what they want to do, and then they just need to involve and notify all the stakeholders out there early on in the process, while their proposal is not set in stone. So, ...if this is the shrimping ground or this is crabbing, or this is a certain trawl area, they can have some flexibility and shift it around to lower the impacts. It's a compromise all the way around so, but they should be willing to come... If they come in here with a heavy hand and say, no this is where it's going to go, this is it, the local community will be against it except for those businesses that reap the direct services.

The unspoken thing about the leases is they're leasing the bottom, and the impacts in addition to being the bottom are the water column above the lease. ...I remember reading something, I believe it was in New England, that was of a two-part lease where it was in state waters but, where they had the bottom leases as well as the water column lease, so it was an additional revenue stream. You are really accounting for that use of that space because the lease really encompasses the bottom.

- Maps/charts

There was limited use of the maps at this meeting, but the following were noted:

- Examples of chart inaccuracies, e.g., replacement of one NOAA buoy ~4 miles from where it's marked on the chart
- Shrimp and other fishing grounds, areas now not used by groundfish fishermen, as certain groundfish stocks are rebuilt.

### *Questions for BOEM*

- What is BOEM's current thinking about where this activity might occur:

Over and over again during that process, that WaveConnect lease or whatever with FERC was inside 3 mile of state waters, and they didn't want to be with MMS going outside and

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they kept repeating over and over again the choice waves here are 7 to 10 miles or something. Is that still the case, is that the area they are looking to develop in perhaps?

- Is BOEM thinking of a pilot project approach, as was with the WaveConnect process?
- Is there a limit to how many you could have?
- How soon or how much pressure is there to get something like this going?

*Closing question to the group: Any other questions for the agency or question or suggestions for me?*

“Put it together and ship it in and make sure they just don’t file it on a shelf.”

### **Acknowledgements**

Special thanks to Debbie Marshall and Vivian Helliwell for the note-taking and other meeting assistance.

## 6. Renewable Energy Space-Use Conflicts on the Outer Continental Shelf

Large Stakeholder Meeting

Held at the Grays Harbor College, Aberdeen, WA

Hosted by Grays Harbor County Marine Resource Committee

June 21, 2011

2pm – 3:30pm

### Meeting Report

**Meeting organizer and facilitators:** Garrett Dalan (GHCMRC Coordinator), Kathy Greer (GHCMRC Chair), and Flaxen Conway, OR Sea Grant

#### **Invitations**

Email invitations were sent to leaders and/or representatives of commercial and recreational fishing organizations, towboat operations, shipping operations, and the U.S. Coast Guard (USCG), among others. A posting was placed on the Grays Harbor College website. An article was run in the local newspaper.

#### **Piggyback on Existing GHCMRC Meeting**

We used the occasion of a previously scheduled meeting of the Grays Harbor County MRC as an opportunity to engage with them and other members of the three target stakeholder groups and the public.

#### **Preparations:**

- Flaxen Conway developed an agenda in cooperation with the GHCMRC. Collaborating on the agenda was a key element in gaining buy-in to expand the original meeting agenda.
- Presenters were identified and PowerPoint presentations were developed.
- Charts were available (but not used). The event was audio recorded.
- Light refreshments were provided.

#### **Attendees:**

There were 57 people in attendance at the meeting, including:

- Commercial fishing and processing (all gears and fisheries)
- Recreational users (fishing and boating)
- Conservation and environmental groups
- Aquaculture companies

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- County commissioners and other elected officials
- Utility commissions / companies
- State agencies
- Port officials

### Agenda

#### *Welcome and Introductions*

GHCMRC Coordinator Dalan provided welcoming remarks and introduced Conway.

#### *Introduction to the Research Project*

Conway went over the rationale, goals and objectives, timeline and anticipated products, plus results so far, for the research project. This included the key themes we used to guide conversations in one-on-one interactions and group meetings. Specifically:

- Characteristics of place(s) on the West Coast OCS that are valued (habitat, proximity to home, markets, etc.); what’s important to you, and why?
- Use of place(s): past use, current use and future trends / seasons; factors that have contributed to changes in use?
- Compatible uses of place(s) by diverse interests (conflict avoidance): what, where, when, how and why conflict is/was prevented, avoided, resolved?
- Areas of existing or potential conflicts; where, among whom, when, how and why?
- Economic/social/cultural impacts if access to place is lost?
- If access is lost, where else or next would you go (adaptations/adjustments)
- Communication: preferences for how to gather information on current and potential space use conflicts; what information is worth keeping; what should be changed?
- Mitigation strategies if conflicts can’t be avoided?

The presentation also described the importance and interdependence of the three key study elements (literature review, geospatial database, and context via stakeholder engagement). Lastly, the results so far were presented and discussed using the same themes as above (use, compatibility and conflict, communication, and mitigation).

#### *Discussion*

Highlights from the discussion include:

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- Thanked Conway for doing this work. They were very happy to have been included, and for how the work was performed.
- Appreciated that Conway had captured that WA is unique! It has tribal issues and agreements, a National Marine Sanctuary, seismic activity, a border with Canada and the issues associated with that, and extreme weather (the mass weather index rates WA weather intensity 50% higher than any other continental US state).
- Recognize that wild capture fisheries require access to open marine waters for economic survival
- Public Trust Doctrine must be considered
- Make sure BOEM doesn't do it like FERC
  - just give/accept applications without engaging the community
  - seemed like FERC just thought about offshore renewable energy and space, but not current users
- Lots of discussion and rich comparisons to what is happening with wind energy on the east side of the state
  - Most talked about “too much energy = closed down!”
  - One brought up “new schools, fire depts., economic benefits”
- To see the ocean get “privatized” goes against every bone in my body
- The initial developer that tried to locate there (Bert Hammer) and his reasons for leaving
- Concerns about infrastructure's ability to handle more power; demand; ship energy to CA; low population on the coast
- How can offshore renewable energy compare to the 5.7c/KWH power they have there now? Get rid of all subsidies for these new technologies
- Strong concerns about the newness of the technology
  - its feasibility
  - efficiencies of generation device must be improved requiring less real estate; some devices are a “NO” from the beginning
  - its ability to withstand the harsh environment of the WA ocean.
- Lease agreements in WA or anywhere on the west coast need to:

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- Get communities engaged and give them veto power; there must be a “clear path to no”; it needs to be an option
- Permitting fees should be shared not only with the state but also with the affected communities
- Permitting fees should be used for developing CMSP nation/region/state wide, and this must include coastal communities

### *Thanks and Adjourn*

The meeting began at 2pm and was scheduled to end at 3:30pm. It was respectfully cut off after two hours of rich exchange so that the GHCMRC could have their regularly scheduled meeting.