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Combining geographic information systems and ethnography to better understand and plan ocean space use

Colleen M. Sullivan [a,*], Flaxen D.L. Conway [b], Caroline Pomeroy [c,d], Madeleine Hall-Arber [e], Dawn J. Wright [a,f]

[a] *Oregon State University, College of Earth, Ocean, and Atmospheric Sciences, USA*
[b] *Oregon State University/Oregon Sea Grant, USA*
[c] *University of California, San Diego, California Sea Grant Extension Program, USA*
[d] *University of California, Santa Cruz, Institute of Marine Sciences, USA*
[e] *Massachusetts Institute of Technology Sea Grant College Program, USA*
[f] *Environmental Systems Research Institute, USA*

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ABSTRACT

Agencies in the US with oversight for marine renewable energy development idealistically have sought space where this new use might proceed unhindered by other uses. Despite experiential evidence of spatial overlap among existing ocean uses, a lack of documentation made the identification of potential space-use conflicts, communication between existing and potential ocean users, and the design of mitigation exceedingly challenging.

We conducted a study along the US Atlantic and Pacific coasts to gather and document available spatial information on existing use through a compilation and organization of geographic information system (GIS) data. Stakeholder group meetings were used to vet the collected spatial data, and ethnographic interviews were conducted to gather knowledge and cultural perspectives. Results show extensive coverage and overlap of existing ocean space uses and provide a visualization of the social and cultural landscape of the ocean that managers can use to determine which stakeholders to engage.

Marine resource managers are encouraged to recognize that marine space use is dynamic and multi-dimensional and as such research thereof requires a balance between the efficiency of GIS and the stories captured and told by ethnographic research. There are important linkages within and across fisheries and other uses, communities and interests, and across the land–sea interface. Therefore, it is important to use techniques demonstrated in this research that (1) integrate ethnographic and geospatial data collection and analysis; (2) engage stakeholders throughout the process; and (3) recognize the unique qualities of each geographic location and user group to support sound decision-making.

Introduction

Nationally, the oceans provide a significant contribution – on the order of trillions of dollars each year – to the U.S. economy (Interagency Ocean Policy Task Force, 2010). The ocean is a highway for shipping, a store of biodiversity that could provide critical pharmaceuticals, a buffer to climate change, and a source of food, recreation, and cultural heritage (U.S. Commission on Ocean Policy, 2004). As the U.S. struggles with energy independence, harnessing the potential wind, wave, and tidal energy of the ocean with marine renewable energy (MRE) is increasingly important. Momentum in entrepreneurial interest, technological development, and ocean policy is building. However, responsible implementation is critical in order to preserve ocean ecosystems and maintain ecosystem services important to the public.

In order for the U.S. government to appropriately allocate lease blocks for MRE development, it must target sites with existing space uses that are compatible with the project, avoid or mitigate potential conflict, and optimize the necessary trade-offs between preserving existing space use and fulfilling U.S. energy needs. One tool that can be used to assess the ecologic, economic, and social needs already competing for space is marine spatial planning

* Corresponding author. Present address: Ecology & Environment, 505 Sansome Street #300, San Francisco, CA 94111, USA.
E-mail address: sullivan.colleen.m@gmail.com (C.M. Sullivan).

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(MSP). MSP is a comprehensive ecosystem-based approach to decision-making concerning human interaction with marine resources (Ehler & Douvere, 2007). MSP benefits from spatial analysis in a geographic information system (GIS), which facilitates the combination of multiple datasets to examine the spatial configuration and interaction of various habitats and uses across scales (St. Martin & Hall-Arber, 2008). Central to MSP is stakeholder engagement to ensure all space uses are accounted for (accurately) and to increase legitimacy of decisions (Higgs, Berry, Kidner, & Langford, 2008; Pomeroy & Douvere, 2008). Ethnography is necessary both to create and explain spatial data that represent stakeholder values and characterize its use.

The U.S. Bureau of Ocean Energy Management (BOEM), the federal agency responsible for lease block allocation for offshore MRE development in federal waters, funded this research to begin to fill the knowledge gap in regional ocean space use and valuation. The three year effort (2009–2012) was implemented by a team comprised of social scientists and GIS analysts working from both the east and west coasts. The research considers where stakeholders are currently using ocean space and why, how many uses overlap, and the extent to which existing ocean space use might present potential for conflict with MRE development. This paper outlines the reasoning behind our approach, the specific methods used, and conclusions from our integration of GIS and ethnography to better understand ocean space use.

Background

State and federal agencies are working to implement ecosystem-based management (EBM), especially following direction from the recently adopted U.S. National Ocean Policy. EBM for the oceans is a framework for management that benefits from the use of MSP. It requires analysis of connections among components of the marine ecosystem and the social landscape that relies upon its ecosystem services (McLeod & Leslie, 2009). The guidelines for EBM provide an excellent model for siting MRE projects because the process entails understanding the connections within the marine ecosystem and with associated human systems, requires collaboration among participants in the process, and seeks achievement of multiple objectives.

MSP is a space-oriented tool to implement EBM with the goal of efficiently identifying stakeholders and compatible ocean space uses, thereby enabling managers to reduce conflict among users while siting renewable energy projects (Ehler, 2008). MSP can designate areas for one or multiple uses in order to balance the demands on ecosystem services and improve resilience. For the purpose of siting offshore renewable energy, MSP could help ensure responsible allocation of lease blocks for development.

To improve conflict management during MSP it is particularly important to first improve understanding of the human dimension of the marine environment (Bonzon, Fujita, & Black, 2005; Conway et al., 2010; St. Martin & Hall-Arber, 2008). The increasing utility of GIS for multicriteria analyses is an exciting and potentially comprehensive tool to achieve MSP, but only with all the appropriate data (McGrath, 2004; St. Martin & Hall-Arber, 2008). Much of the significant data, however, is lacking. Specifically, managers need GIS data that represent human reliance on resources at sea, to allow its inclusion with the abundance of spatial data on physical and biological features (St. Martin & Hall-Arber, 2008). As a bonus, the process of creating GIS layers to represent the human dimension is highly compatible with another key aspect of MSP – stakeholder research, analysis, and engagement.

There are many benefits to the process of identifying and understanding key stakeholders and subsequently empowering them to engage in MSP (Conway et al., 2010; Pomeroy & Douvere, 2008). Users of ocean space benefit from having their interests accurately represented because early involvement helps to alert planners of major issues, discover compatible (as well as incompatible) uses, and mitigate conflict (Gilliland & Laffoley, 2008; Portman, 2009). Early and sustained involvement of stakeholders greatly enhances the legitimacy of MSP decisions and therefore the likelihood of cooperation of the affected parties (Higgs et al., 2008; Pomeroy & Douvere, 2008). Stakeholders such as fishermen, shippers, and scientists all have critical interests in ocean space use and possess local and traditional knowledge about use patterns that must be integrated into MSP (Kliskey, Alessa, & Barr, 2009; Pomeroy & Douvere, 2008). If no attempt is made to gather and utilize this information, the potential for conflict increases. Stakeholder engagement provides key insights as to the complexity and extent of human use in a given area and the potential compatibility (or lack thereof) of their space use with concurrent uses by other stakeholders (Pomeroy & Douvere, 2008). This process encourages community involvement in MSP while creating much needed GIS and qualitative data for use in EBM.

St. Martin and Hall-Arber (2008) show that logbook data can be a very useful starting point to approximate broad-scale behavior. Their maps of fishing communities in the Gulf of Maine used Vessel Trip Records (VTR), which were analyzed with density maps and contours to highlight spatial clusters of trip destinations and gear-type-based communities (St. Martin & Hall-Arber, 2008). These maps were vetted by local fishermen and found to be useful representations of human dependence on the ocean (St. Martin & Hall-Arber, 2008). The combination of existing data (e.g., VTR data, even with its limitations) and knowledge and participatory mapping as a groundtruthing mechanism is an invaluable tool for documenting the social landscape (NOAA Coastal Services Center, 2009).

EBM as a guiding framework, and MSP as a tool to enhance its implementation, are promising approaches to marine decision-making not only to ensure stewardship of ocean ecosystem services but to incorporate new uses such as MRE while recognizing and mitigating potential conflict, thereby bolstering the U.S. energy portfolio.

Methodology

Study area

The study area includes state waters and the outer continental shelf (OCS) of the U.S. mainland Pacific and Atlantic coasts. Specifically this extends from baseline, the mean lower low water line along the coast, to the greater of 200 nm from the baseline or the edge of the continental margin. BOEM chose not to include the OCS of the Gulf of Mexico, Alaska, Hawaii, or U.S. territories due to limited funding. The project team included ten researchers on the east coast team based mainly out of Cambridge, MA and ten researchers on the west coast team based mainly out of Corvallis, OR working together for about three years on various aspects of this project. Each team further divided the work to focus on sub-regions of the two coasts and specific tasks (e.g., data mining and organization, meeting coordination, literature review) but the larger group met regularly via conference call to ensure alignment of methods.

Data gathering

Federal, state, and nongovernmental GIS data clearinghouses were searched, and ocean related data located along the US Atlantic and Pacific coasts were downloaded. Examples of GIS data downloaded include shapefiles of cables, dredged material dumping areas, and military training areas from sources including the NOAA

ENC Direct database and the US Navy. If any downloaded data did not have Federal Geographic Data Committee-compliant metadata, the necessary information was gathered from Internet searches and correspondence with data managers. When tabular or qualitative spatial information was obtained (e.g., coordinates of dive sites), it was used to prepare new shapefiles with complete metadata. Correspondence concerning data and metadata requests was recorded in a Microsoft Excel spreadsheet contact log to track inquires. Email conversations with 60 individuals and groups were used to obtain data and metadata not available for direct download. The shapefiles were tracked using a Microsoft Access database and characteristics of each (e.g., coverage, category, source, description) were recorded. Fortunately, recently developed gateways not available at the time of this study such as the federal MarineCadastre.gov and regional catalogs like the West Coast Ocean Data portal (http://portal.westcoastoceans.org/) are greatly simplifying the process of data mining and significantly increasing the amount of data available for public consumption.

Ethnographic research

Ethnographic research included more than 200 semi-structured interviews and six stakeholder group meetings with knowledgeable members of three ocean user communities defined for the purpose of this study: commercial fishing (tribal/non-tribal harvesters, processing and service, charter, aquaculture), commercial non-fishing (shipping, towboats, navigation and safety), and non-commercial (recreational fishing and boating, scientific research). Our goal was to gain understanding of characteristics and use of space and place, compatible and conflicting uses, economic and social impacts, communication preferences, and perspectives on mitigation related to potential MRE development.

The ethnographers came to the study familiar with the range of fishing communities, gear, vessels and target species in each study region (Hall-Arber, Dyer, Poggie, McNally, & Gagne, 2001; Package & Conway, 2010; Pomeroy, Thomson, & Stevens, 2010) and with strong, prior relationships with key informants (Berg & Lune, 2012); individuals or leaders of the region's fishing organizations. Selected communities were those most influential in each region due to their size, history, and availability of organizations, markets, and other services. Consequently, this purposive sample (rather than random; Berg & Lune, 2012) included knowledgeable “experts” who represented the major commercial fishing gear and species groups, as well as other important user groups, in the selected communities. Interviews and group meetings emphasized open-ended questions that allowed participants to guide the discussion towards topics of genuine concern. Based on accepted ethnographic practice, the results include stakeholders'

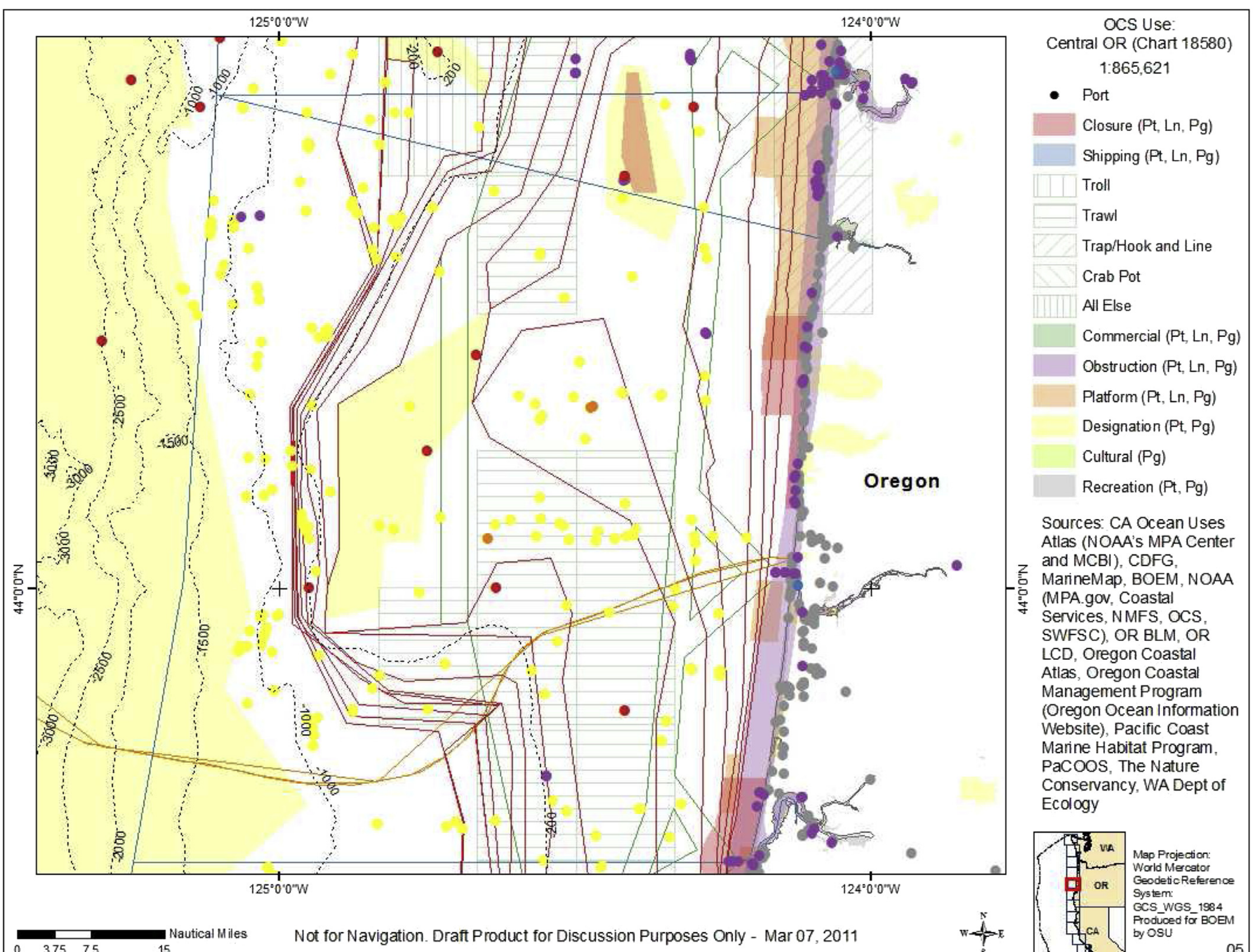

Fig. 1. Example map printed for use in ethnographic research (resized from its 3′ × 4′ layout for the purpose of legibility).

perceptions without determination of fact; any change in the use of or access to marine resources must consider stakeholders' beliefs. Additional information on the interview process, structure and content and associated findings are discussed in the project report (Conway et al., 2012).

Prior to stakeholder outreach, maps were created for potential use in the interviews (if the subject was comfortable and willing), in order to vet the data compiled, created, and organized to date and to encourage stakeholders to share data about space use (Fig. 1). The maps displayed the collected shapefiles, which were organized into 13 categories: recreational; shipping; closures; designations; obstructions; platforms; cultural (tribal); commercial non-fishing; and commercial fishing effort organized into troll, trawl, trap/hook-and-line, crab pot, and all else. Nautical charts were used as a background to help orient the research participants in a familiar medium (Wedell, Revell, Anderson, & Cobb, 2005).

For the purpose of interviews in which discussion would center on the space use of the particular user group or "community" (such as the commercial fishing fleet, the recreational boating community, or regional ocean shippers), it was determined that extending 40–60 nm from shore would be more appropriate than showing the entire OCS. During ethnographic research, some interviewees used Sharpie pens to mark Mylar sheets placed over the printed maps or blank NOAA nautical charts to record their understanding of their community's ocean space use, based on their background and personal experience. While marking up the maps, interviewees also shared their local knowledge and their perspective on the importance of use by one or more user groups. This included, but was not limited to, characteristics and use of the space and place; factors contributing to changes in use; compatible and conflicting use; potential impacts of loss of use; communication networks and preferences; and thoughts about mitigation strategies.

Table 1
Categories and subcategories used to organize the ethnographic research results.

Category	Subcategory – shapefiles created for each geometry as needed
Commercial fishing	Crab, groundfish, hagfish, halibut, sablefish, salmon, shrimp, spot prawn, tuna and tribal
Commercial non-fishing	Cables, shipping, towlane
Noncommercial	Crab, groundfish, halibut, sablefish, salmon, tuna, boating, research
Other	Marine reserves, physical features, placemarks

Following the interviews that resulted in spatial data, the 36 Mylar sheets were placed on the floor on top of a blank poster, and photographed with a digital camera while standing on a chair, with the camera centered over the map, to try to minimize distortion (Fig. 2). The .jpg images were then georeferenced using corner marks traced by the interviewer, along with other known reference points. Effort was made to choose high quality control points and obtain a low RMSE during georeferencing. The reference point data for each photograph were saved to a text file.

Using the georeferenced images, marks made by the interview subjects were digitized to record interview results in a GIS. A new shapefile with a unique ID was created for each feature or comment written on the Mylar and the relevant area was traced using the Editor tool in ArcGIS 9.3. Shapefiles also were created to represent interviewees' statements about space and its use that were not

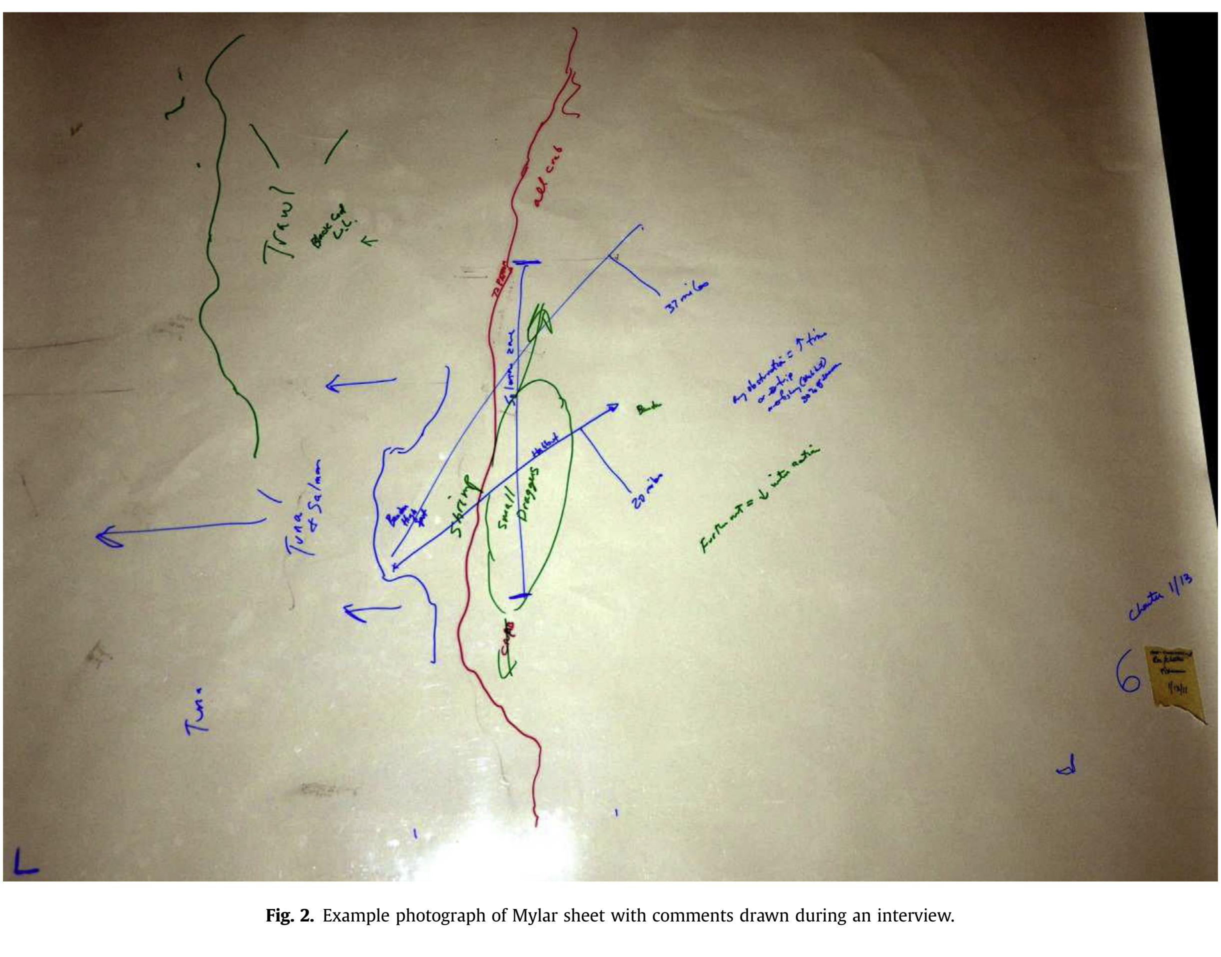

Fig. 2. Example photograph of Mylar sheet with comments drawn during an interview.

drawn (e.g., “recreational fishing for crab occurs at depths between 0 and 20 fathoms”) by drawing shapefiles around appropriate depths (using a shapefile of soundings data) and/or distances from shore (using the buffer tool). Any assumptions or judgment calls necessary were recorded for future reference.

The resulting 222 shapefiles (with comments in the attribute table) were then merged to consolidate into 24 subcategories within four broader categories (Table 1). Some comments were placed into more than one subcategory if applicable. Separate shapefiles were created for point, line, and polygon geometries as needed for each of the 24 subcategories, resulting in 37 shapefiles as opposed to 24. Metadata were written and imported to each of the final shapefiles, which then were copied into the final geodatabase for BOEM. This proved to be an affordable and effective method of incorporating ethnographic research results into a GIS.

Updated maps showing all data collected were prepared for use in follow-up meetings. These displayed the following categories: fishing; archeological sites; areas of special concern; marine transportation/shipping lanes/ferry routes; military use areas; oil and gas deposits and infrastructure/cables; recreation activities; renewable energy sites; research areas; sand and gravel sources and disposal. An example export of all data in central Oregon is shown in Fig. 3. Maps showing all data were prohibitively complex and confusing, so more specific maps were exported showing subsets of the data for focused discussions. Electronic versions of these maps were provided for use in larger group meetings in PowerPoint presentations, to communicate our findings and provide opportunity for stakeholders to review and add additional input. The feedback received at vetting meetings was incorporated before delivering the final ESRI file geodatabase to BOEM. Additional details on data management processes and approaches to visualization used in this work may be found in Sullivan (2012).

Results and discussion

Given the enormity of the study area along the US Atlantic and Pacific coasts, the final geodatabase included a wealth of data. For the purpose of this paper, quantitative analysis of the collected data will focus only on the OCS of Oregon; however, the discussion covers findings from the entire project area. The relative density of ocean space use based on the data collected with coverage in Oregon is shown in Fig. 4. Values (number of categories with space use in a given nm^2 cell) range from 1 to 17 with a mean of 6.97 and a standard deviation of 1.65. The visualization shows higher space use closer to shore and that there is no portion of the study area without at least one category of ocean space use. The most frequent cell value is six categories of use, and 99.7% of the cells represent at least six categories of use. In Fig. 4 the orange color (in the web

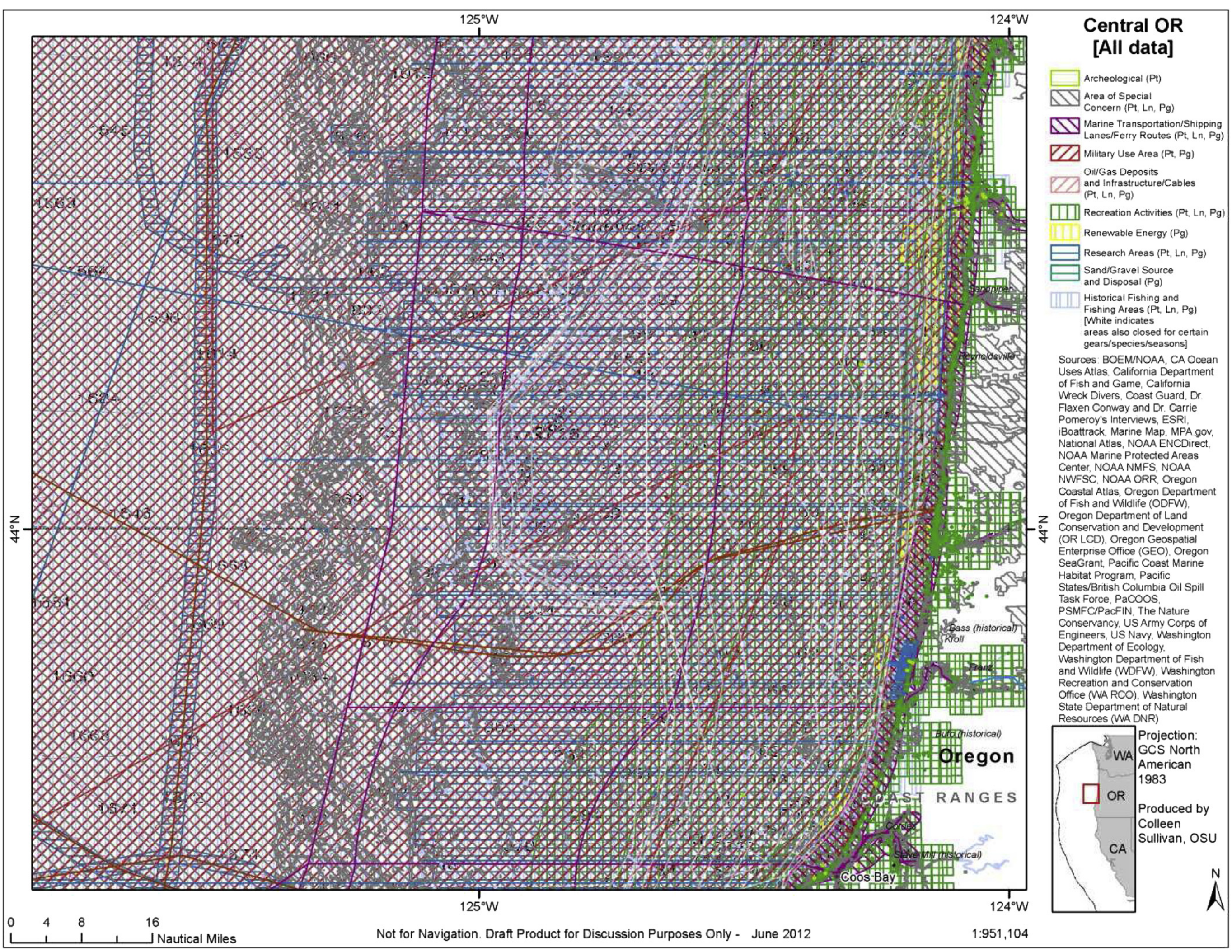

Fig. 3. Example of a final map for follow-up meetings with stakeholders, showing all data collected, created, and digitized in central Oregon.

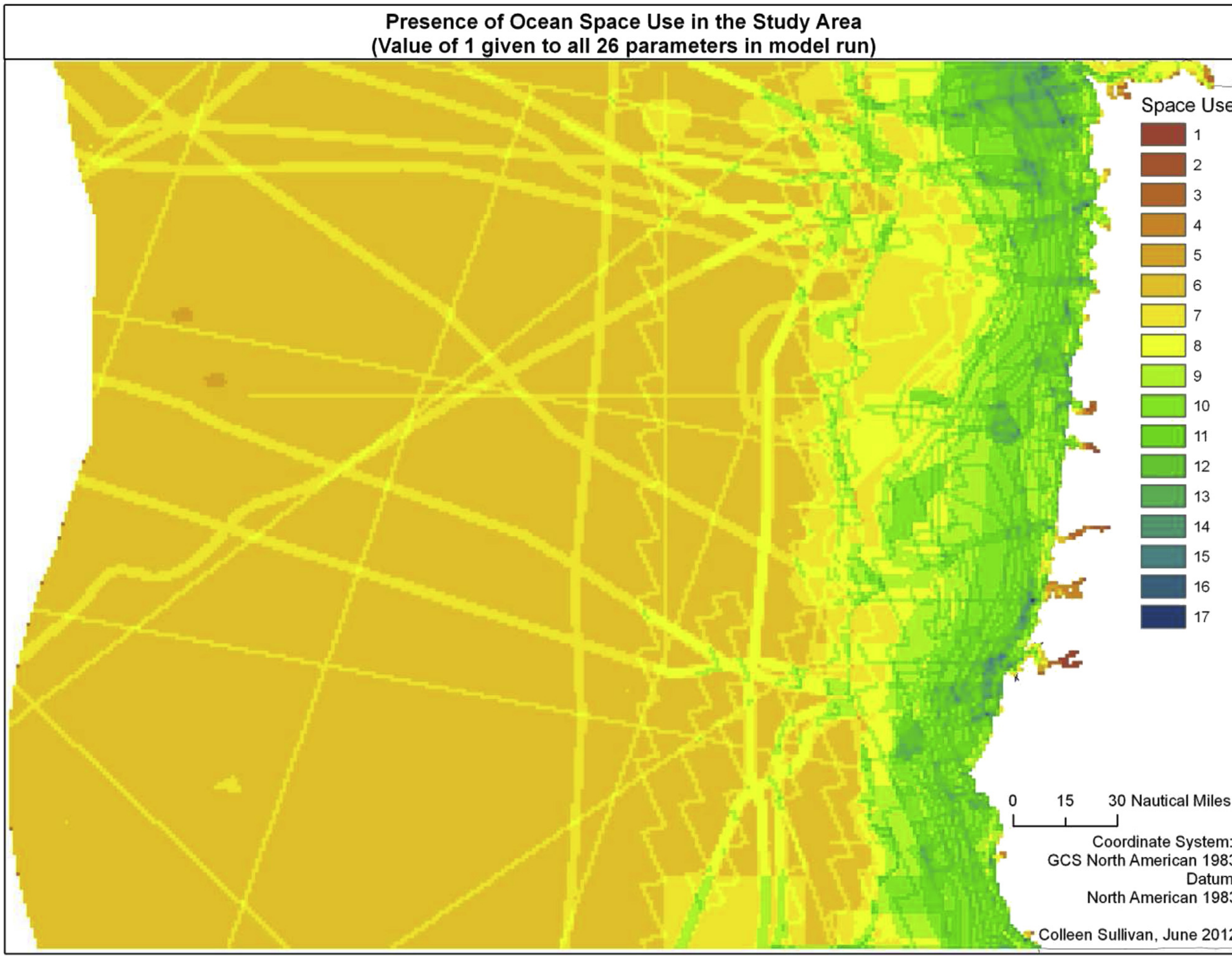

Fig. 4. Relative density of ocean space use in Oregon. Values range from 1 to 17, indicating the number of overlapping categories of ocean space use present in each cell.

version) representing six uses appears as a background for the outer portion of the study area, through which yellow lines (in the web version) (seven or eight uses) representing cables, pipelines, and research transects protrude from the coastal zone.

The six categories of ocean space use with the greatest coverage off the coast of Oregon are: Fishing – Trolling; Habitat; Military; Fishing – Closure Areas; Protected; and Marine Transportation – Low Intensity. It is highly likely that the six base categories of ocean space use in a given cell correspond with these categories that cover the greatest area. The six categories of ocean space use with the least coverage in the study area are: Disposal/Dump, Fishing – Trap, Marine Transportation – Navigation Aid, Dredge, Wrecks, and Pipeline. Space use is most concentrated between the coast and approximately 30 nm offshore, largely as a consequence of depth limitations for some activities (e.g., recreational use), increased shipping density as vessels approach and depart major ports, and increased fuel costs to shippers and fishermen associated with traveling further from shore. Unfortunately for developers, increasing distance from shore also corresponds to increasing project costs, due in part to the expense of cables necessary to transmit energy back to shore.

It was predictably controversial to ask stakeholders to draw the spaces they use, particularly for the commercial fishermen wary of competition and suspicious of maps that depict a dynamic fish population with a static point. Efforts were made to attract participation from a representative sample of all stakeholders, but there is a measure of uncertainty in the digital results due to the trust issues mentioned, lack of precision in drawing on the maps, and digitizing error. During ethnographic research, those willing to draw on the Mylar sheets were mostly recreational and commercial fishermen, their efforts driven by a desire to provide corrections to the inaccurate data on the initial maps (Industrial Economics, Inc., 2012). They drew their space use broadly, often focusing on where the fleet traditionally fished when seeking particular species of fish. They noted that although current or seasonal closures prevent them from accessing certain areas, they anticipated changes to those closures as stocks rebuild, and so were not prepared to relinquish desirable fishing areas to permanent structures that would preclude their future use (Industrial Economics, Inc., 2012). Thus, this would be the cause of any logical inconsistency between digitized fishing grounds and existing closures.

Interviewees also emphasized that any unmarked areas should not be seen as open to development, nor should marked areas be seen as closed to development (Industrial Economics, Inc., 2012). This is consistent with the goal of this project, to gather ocean space use data, because the resulting geodatabase was never intended to be a standalone tool for siting offshore development, but a guide as to what stakeholder groups must be included in the process of researching site options in a particular area. There is significant value added to the types of data previously available for download that were gleaned from the interviews, such as understanding what characteristics are favored by a specific species of fish, which will in turn determine where fishermen will make their livelihood.

Interviewees drew shapes to the best of their knowledge on where their “community” used the space. Accuracy in drawing depended on willingness to draw precise areas, understanding that the scale was 1:180,000 on the paper maps, and even the thickness of the pen used. Effort was made during digitizing to trace each comment as closely as possible or use automated methods when applicable, but this combined with the process of photographing the maps and georeferencing each photo likely introduced additional uncertainty. The results were groundtruthed through presentation at stakeholder meetings, and corrections were incorporated. However, the feedback was given with the understanding that these maps should depict space use with a broad brush, thereby serving as a foundation for future in-depth research, information exchange among current and potential new users and relevant agencies, and negotiation related to new uses of ocean space. The insights from the ethnographic research were extremely useful, and although they were unique to each region researched, a few generalizations are summarized here.

Commercial fishing (tribal/non-tribal harvesters, processing and service, charter, aquaculture) space users have very specific and diverse areas of interest depending on the species of fish they target (some very place or habitat-specific and others less so) and the gear they use. Commercial fishermen “follow the fish,” which are distributed heterogeneously and thus the fishermen are concerned with access to particular habitats as well as enough space and flexibility to operate their gear without risk of entanglement. Charter boat operators are similar to commercial fishermen with more limitations due to inability to travel as far from shore due to time and/or boat size limitations. Aquaculture requires a fixed location meeting appropriate conditions for the species of interest.

Commercial non-fishing (shipping, towboats, navigation and safety) space users have more easily defined needs since their main concern is having enough space (versus particular places) to safely and efficiently traverse from one point to another. These business operators are concerned about potential increases in fuel expenditures and risk to crewmembers caused by diverting usual routes around new developments.

Non-commercial (recreational fishing and boating) space users seek adventure in particular places as well as opportunities to connect with family and friends while safely exploring the ocean near their port. Recreational fishermen are concerned with opportunity to fish in a nearby seascape; they are limited in the distance they can travel from shore as well as by the weather and regulations. Scientists are interested in special places to which they can gain long-term access (and deploy often expensive equipment in) in order to collect time series data needed to build an understanding of particular phenomena.

The unique qualities of a region and its users are key to understanding potential synergies among users and between existing users and new MRE development. Each region has its own track record of successful and unsuccessful attempts at cooperation among existing users that are essential to understand before beginning a new dialogue during stakeholder outreach. These experiences highlight local relationships that are strong or volatile and provide key insights into approaches that may work best in a given area.

Not only are there no gaps in the use of ocean space, there is extensive overlap among existing uses and high potential for conflict with permanent MRE installations. The ocean is a busy place with an overwhelming overlay of different space uses, and visualizations such as that in Fig. 4 convey the fallacy of viewing the ocean as a vast and open frontier. Consequently, there is no obvious location most suitable for siting MRE development. Yet the use of spatial data to visualize overlapping space use and the stakeholders with vested interests in each area is an example of how use of GIS may help to responsibly practice EBM, which requires consideration of all ocean space uses. In addition to providing a visualization of areas that may be more or less contentious for development, the data detail the specific stakeholder groups that managers must reach out to when a site is selected for consideration. The qualitative, contextual data derived from the ethnographic research provide a richer understanding of the “why” behind space use (characteristics and use of space and place, compatible and conflicting use, economic and social impacts of use or loss of use) plus preferences for communication and engagement. A full understanding of the diverse uses of space in a given area will help managers to recognize potential compatibilities and achieve multiple objectives during siting. Spatial data can provide management with visual understanding of ocean space use, but it cannot provide a clear action plan when used in isolation.

Further research related to siting a specific project will require in-depth study of the particular region of interest. Care should be taken to ensure that stakeholders represented in spatial data truly encompass all parties with vested interest in a specific location, especially since static data present a snapshot in time and include only information available in a spatial format. The data omit relevant activities on land such as the location of fish processing facilities and dependent coastal communities. Data with greater spatial and temporal resolution, along with extensive outreach, engagement, and conflict mitigation, would be necessary to site a specific project. To understand the details of a specific place, ethnographic research will explain the characteristics of local space users, their values, socioeconomic contributions to communities, their preferences for communication, engagement, and effective mitigation strategies (if any).

As a relatively new framework, EBM does not provide step-by-step instructions for MRE decision-making, but it can be used to foster a shared vision for management at the federal, regional, and state levels. BOEM can provide strong leadership in the siting process, assist coordination of siting efforts within and across locations, improve dialogue and conflict mitigation, and use its broad purview to streamline national renewable energy development (Rosenberg et al., 2009). In fact, the work of groups with a broader purview, such as regional ocean partnerships on each coast, will likely prove important to ensuring that the scale of EBM goals matches the scale of management because ecosystem processes are not confined to jurisdictional boundaries. Meanwhile, making use of integrated GIS and ethnography could provide key insights into, and a fuller sense of, the nature and dynamics of ocean space use.

Conclusion

The ocean has long been a rich resource for U.S. citizens and now represents an opportunity for significant development of wind, wave, and tidal energy (U.S. Commission on Ocean Policy, 2004). In addition to strong entrepreneurial interest in MRE projects and accompanying technological advances, the regulatory climate surrounding renewable energy also has improved in the last decade. Research, development, and testing of the technology for offshore wind, wave, and tidal projects is well underway, and there is government support for renewable energy development at both the state and federal level (Conway et al., 2010).

However, given the significant economic, ecological, and social importance of the oceans, responsible management is critical in order to optimize the necessary trade-offs (Conway et al., 2010). To this end state, regional, and federal management currently supports the implementation of EBM for the oceans and the use of MSP as a tool to aid offshore energy development. Regional and state planning efforts already have made significant strides in implementing EBM and their examples provide useful lessons in structuring adaptive management for future endeavors. Consequently, at the federal level BOEM can take advantage of the extensive research on these topics, the support of the National Ocean Policy, and the increasing utility of GIS for multicriteria analysis to produce defensible lease block allocation decisions that make trade-offs explicit and have the support of a majority of affected stakeholders.

As one person interviewed for this research put it, "The ocean is huge, but how huge it feels depends on how concentrated any resource is." The addition of renewable energy to the current social landscape of the ocean shrinks the resource base for many categories of ocean space use. Our results demonstrate that avoidance or mitigation of conflict between development and existing space use is not merely a best practice supported by current policy, but a necessity. Ultimately, the potential for conflict is highly dependent on the technology to be installed, and the specific location selected.

The integrated use of GIS and ethnography presented herein can serve useful in the initial step of scoping areas for development and identifying the stakeholders necessary to include in the process which can assist management in using MSP and working toward EBM. Visualizations using spatial data are merely a tool, however, and must be part of a broader strategy of MSP that engages stakeholders to harness local knowledge and gain a better understanding of dynamic and multi-dimensional ocean space use. Guided conversations with ocean users are critically important. Moreover, this work is location-specific; the exercise must be repeated in each area of interest because each will have unique qualities that must be considered in order to understand local connections among use communities and values.

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