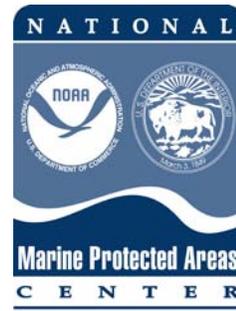


The California Ocean Uses Atlas Project

Participatory GIS informing marine spatial planning on the west coast

The California Ocean Uses Atlas Project is an innovative public-private partnership between NOAA's Marine Protected Areas Center and the Marine Conservation Biology Institute. Funded by grants from the Gordon and Betty Moore Foundation and the Resources Legacy Fund Foundation, and the MPA Center, the Atlas project fills a critical information gap in ocean management by mapping, for the first time, the full range of significant human uses of the ocean in state and federal waters of the coast of California. By tapping the knowledge of local ocean experts, this project both improves the information base for decision-making and provides an opportunity for broader engagement in building decision making databases and tools.



Methods

NON-CONSUMPTIVE

- Beach Use
- Motorized Boating
- Paddling
- Sailing
- SCUBA/Snorkeling
- Surface Water Sports
- Swimming
- Tidepooling
- Wildlife Viewing at Sea

FISHING

- Commercial Dive Fishing
- Commercial Fishing w/Benthic Fixed Gear
- Commercial Fishing w/Benthic Mobile Gear
- Commercial Kelp & Algae Harvest
- Commercial Pelagic Fishing
- Recreational Kayak Fishing
- Recreational Dive Fishing
- Recreational Fishing from Boats
- Shore-based Fishing

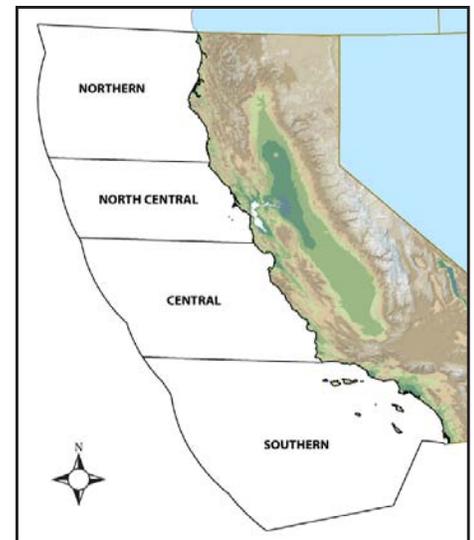
INDUSTRIAL/MILITARY

- Aquaculture
- Cruise Ships
- Mining & Mineral Extraction
- Military Operations
- Offshore Alternative Energy
- Offshore Oil & Gas
- Shipping
- Underwater Cables

This effort focused on the California marine environment from the shoreline to the 200-mile offshore boundary of the exclusive economic zone (EEZ). Using a participatory GIS approach, use data were gathered through regional expert workshops held in four regions throughout the state (right). The study targeted three broad use sectors; non-consumptive, fishing, and industry/military, including 26 specific uses of the ocean (left).

Workshop participants were selected based on their spatial knowledge of how the ocean is used in each region and their experience working with or engaging in ocean activities. Participants were enlisted from a variety of local, state and federal agencies, tribes, community organizations and non-governmental organizations. They included Coast Guard and Navy representatives, marine scientists, lifeguards, park managers, harbor masters, bay pilots, recreational and commercial fisherman, as well as recreational boat operators, charter ship captains, conservation organizations, and others.

During the workshops, participants were separated into break-out groups and charged with documenting the location and spatial extent of each ocean use based on their collective understanding of how and where the use occurs. The primary goal of the workshops was to gather three distinct layers of spatial information for all ocean uses targeted in the study: the general use footprint, dominant use areas, and potential future use areas. Participants drew use areas interactively on a digital whiteboard or tablet and refined the use patterns through group discussion and deliberation. After the workshops, the MPA Center performed post-processing to compile and map the data (using a 1x1 nautical mile grid).



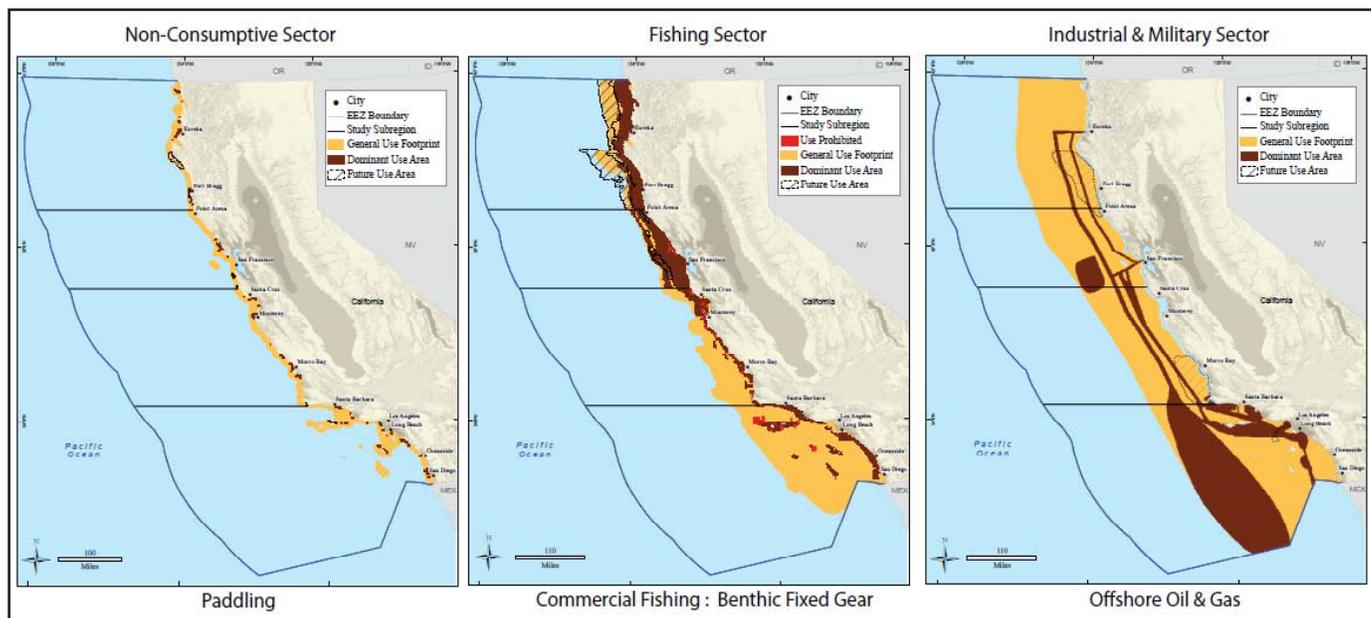
General Use Footprint: areas where the use is known to occur with some regularity, regardless of frequency or intensity
Dominant Use Areas: areas within the general use footprint where the use is pursued by most of the users, most of the time
Future Use Areas: areas where the patterns of use may either expand or increase in intensity in the foreseeable future

Products

Various data layers, maps and analytical products have been derived from the atlas project. Maps of individual uses, maps by sector and applied management scenarios are some of the ways that this information can be used to inform ocean management and decision making. The following examples highlight some these products and suggest ways in which the atlas data can be applied to existing marine planning issues.

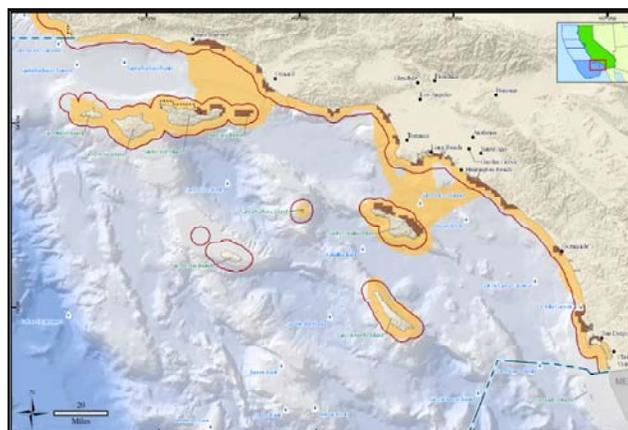
I. INDIVIDUAL USE MAPS

Statewide and regional maps of individual ocean uses detail the patterns and trends of the use activities as they occur throughout the study area. These maps are helpful for visualizing the relative extents and locations of use areas, hot spots, and gaps in use, and may also provide insight to potential spatial relationships between human uses and other geographic features and processes (e.g. access points, coastal morphology).



For example, individual use maps of paddling (above left), commercial fishing with benthic fixed gear (above center) and offshore oil and gas (above right) reveal a variety of interesting use patterns depicting how each use varies spatially throughout coastal California as well as in relation to other uses. Paddling is mainly restricted to state waters with isolated dominant use areas scattered throughout the state. Benthic commercial fishing with fixed gear extends further offshore with increasing dominant use areas in the northern regions. Dominant use for offshore oil and gas is concentrated in the southern region and limited to transportation (narrow corridors) and lightering areas in the north.

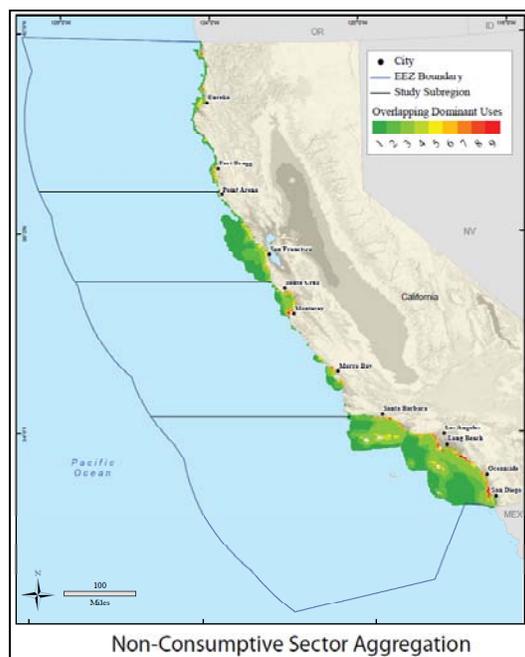
Viewed at the regional scale, atlas data reveal trends that are relevant to local and regional marine planning efforts. For example, the map of paddling (right) in the Southern California region shows that this use is pursued throughout state waters with isolated areas of dominant use near major cities (Santa Barbara, Long Beach and San Diego) and on the leeward side of the near shore Channel Islands.



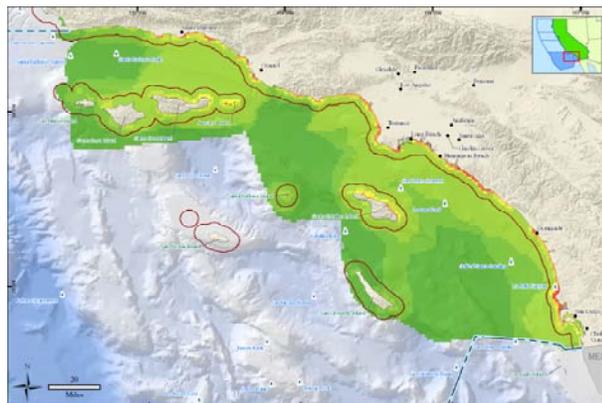
Individual use maps can guide users to the most popular areas to pursue their activities, reveal unknown gaps in use that may be of interest for development or conservation, and help visualize patterns of use in a spatial context at various scales. Additionally, these data can be used to help evaluate socio-economic relationships between uses, infrastructure, administrative boundaries and other geographic and demographic features and trends.

Products, continued

II. SECTORAL ANALYSES



Another way to interpret the atlas data is to aggregate similar types of uses together in one map. Compiling all the dominant use areas for all uses in each sector reveals patterns that describe how a larger group of users engage in a wider suite of similar activities. At either the statewide or regional scale, sectoral compilations can reveal areas where many uses overlap, which can be useful for evaluating potential threats or conflicts in high use areas. For non-consumptive uses, sectoral analysis lends insight to the collective pattern of non-consumptive use at state (left) and regional scale (right). These maps suggest that non-consumptive activities are pursued in more variety and over a larger area in southern California than the rest of the state with additional high use areas concentrated around San Francisco, Monterey, and Morro Bay.

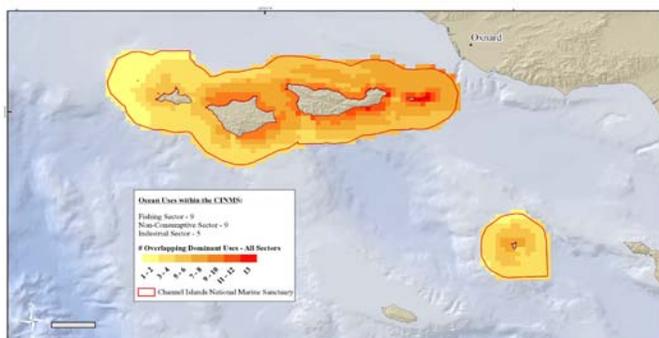


Aggregating the use data can also be helpful for informing management issues that focus on certain groups of uses and their distributions in given geographic areas. Providing a flexible way to interpret various sorts of use patterns, the atlas database is formatted to allow for aggregation of data for selected uses, uses within each sector, as well as all uses across all sectors.

II. APPLIED MANAGEMENT EXAMPLES

Ocean uses data also can be useful for evaluating or prioritizing various sorts of applied ocean management scenarios. The maps to the right and below offer two examples of how ocean uses data can be used to address current management questions in coastal California.

Offshore alternative energy options are currently under consideration in certain areas off the California coast. Siting for the development of offshore energy facilities requires a clear understanding of the human uses that occur in and around proposed development areas. Currently, researchers are using spatial models to define the marine areas with the greatest potential for wind energy capture in the Southern California region.



Preliminary findings have delineated two areas (red outlined areas shown on map above) in the region where modeled wind potential is greatest (Dvorak, 2009), suggesting that consideration of wind farms may be most appropriate. The color coded grid shows a "heat map" of overlapping uses derived from the atlas workshops in Southern California. When viewed together, it is apparent that there is many more use activities occurring throughout Area A than Area B. Development in Area B may present fewer challenges from the marine community, as it poses fewer potential conflicts with other ocean uses being pursued in the region.

Products, continued

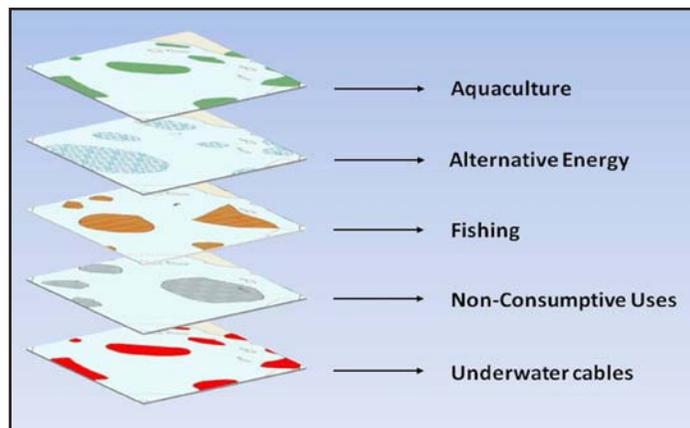
Understanding human use patterns is also important for the effective management of marine protected areas. Many different activities occur in the Channel Islands National Marine Sanctuary (bottom left, previous page). Using an all-sector compilation of the atlas data, patterns of overlapping use can be visualized and interpreted to locate use hot spots, evaluate resource trade offs and plan for effective management of conservation resources and competing socio-economic drivers.

These examples highlight a few select ways in which the atlas data can be applied to inform planning and decision making in the coastal and marine environment. Designed to be a flexible and user-friendly tool, the atlas database can be queried in an infinite number of ways to visualize human use patterns relevant to all sorts of ocean management issues.

Conclusions

The California Ocean Uses Atlas combines contemporary spatial tools and a participatory method of data gathering to create a unique perspective on how humans use California's coastal and marine environment. Providing information on a wide range of human activities that occur in the marine environment, this atlas project offers spatially-based decision support tools to evaluate patterns and potential use conflicts across various spatial scales and geographic domains.

Whether the questions are focused on a regional scale or statewide, the atlas data provides a baseline for the current patterns of human use in the marine environment and offers spatial resources to address a variety of existing and future coastal and marine management issues. Spatial data, maps and associated project products can be accessed in various formats online at http://mpa.gov/science_analysis/atlas.html.



References

Dvorak, M.J., C.L. Archer, and M.Z. Jacobson. California offshore wind energy potential. In press, Renewable Energy (2009).

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