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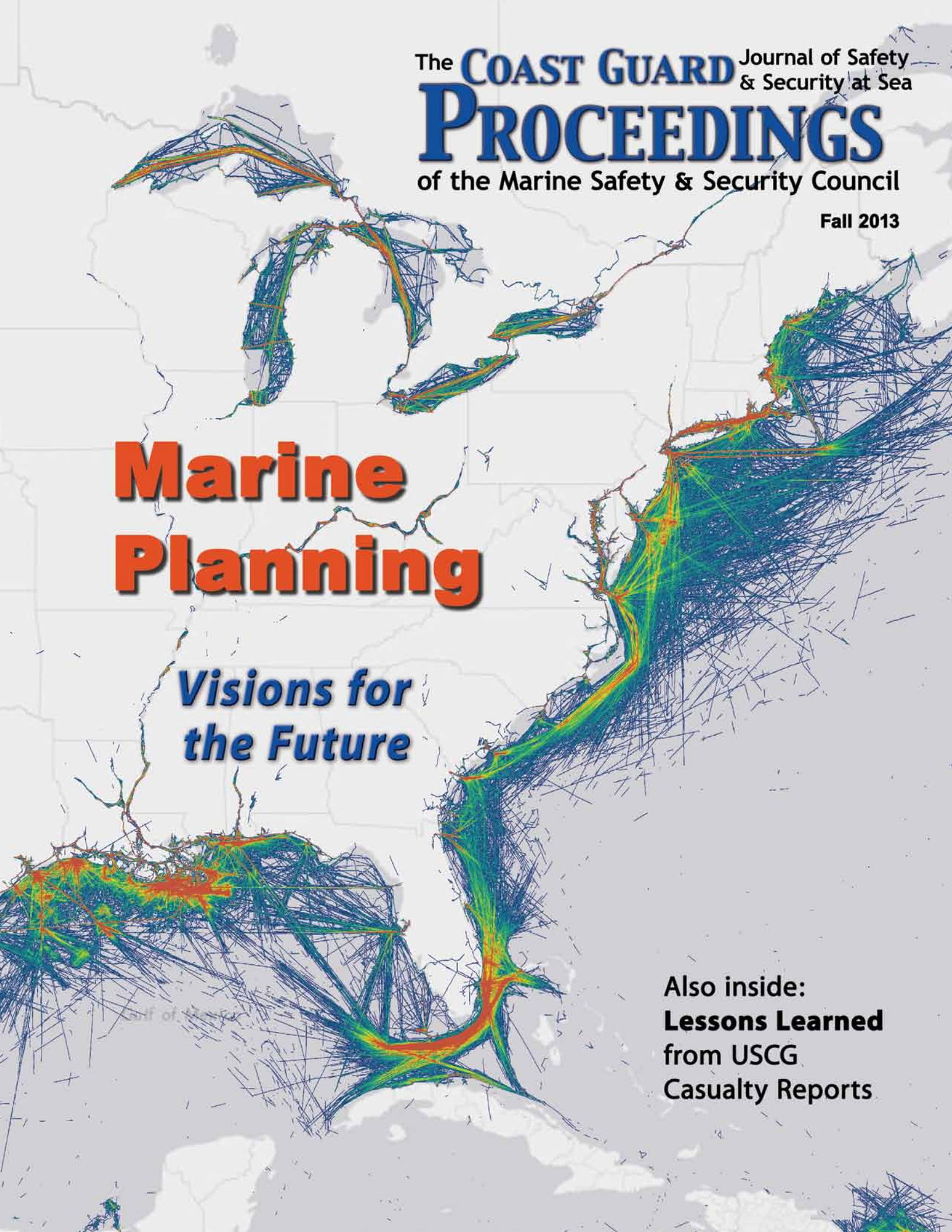

Marine Planning

Visions for the Future

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Casualty Reports

PROCEEDINGS

Fall 2013 Vol. 70, Number 3

National Ocean Policy

Protecting the Marine Environment

Promoting Economic Development

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Lessons Learned

On Deck

The map on the cover depicts vessel traffic density for August of 2010 via Automatic Identification System data. Density levels are indicated by color, with red indicating the highest level. Map created and provided by Ms. Brittney Baker of Booz Allen Hamilton, in support of the U.S. Coast Guard Marine Transportation Systems Directorate.

Deputy Commandant's Perspective

by Vice Admiral Peter V. Neffenger
U.S. Coast Guard
Deputy Commandant for Operations

On July 19, 2010, the president signed Executive Order 13547, *Stewardship of the Ocean, Our Coasts and the Great Lakes*. This directive, which did not create any new regulations or authorities, called for federal agencies to participate in support of the concept of marine planning and established the National Ocean Council to lead the nation's efforts. The executive order also directed federal agencies to improve how the federal government manages ocean uses and conducts business with stakeholders along the nation's coasts and the Great Lakes.

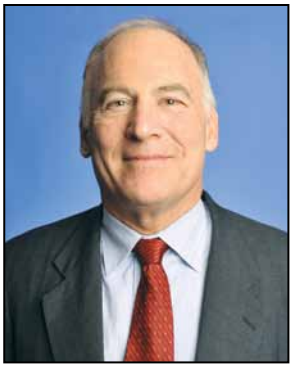
The benefits of an improved federal approach to address the diversity, tempo, scope, and gravity of ocean activities are clear. Indeed, this initiative did not come a moment too soon. We once acted as though the sea in all its vastness could provide unlimited resources and absorb and clean up all manner of pollution from vessels, land, air, and intentional dumping. Moreover, we responded to maritime safety and security concerns with targeted approaches that addressed discrete threats and focused on key facilities.

Today, however, we know better. As we carefully consider activities that depend on the ocean, our coasts, and the Great Lakes, we do so in the context of a more complex and vulnerable seascape than we have ever known before. Rising sea levels, the effects of warming ocean waters, changes in the abundance and distribution of species, and increasing acidification are all forcing agents that will guide our future use of the ocean. On our coasts, the population continues to increase, along with development in flood-prone areas, placing new demands on vulnerable and often antiquated infrastructure. And on the Great Lakes, changing precipitation regimes, the introduction of exotic and invasive species, and the maintenance of our inland waterways demand our attention. In the face of these challenges, we must draw upon the full complement of available tools and capabilities to ensure that marine resources are used in a sustainable manner.

The National Ocean Council's Implementation Plan, released this past April, calls for marine planning to deal with these challenges more effectively. The implementation plan describes the specific actions federal agencies will take to address key ocean challenges, including growing the ocean economy, advancing ocean science, addressing threats to an increasing coastal population, and conserving the natural resources we rely on for our economy, security, and quality of life. It reflects two years of extensive public and stakeholder input, including public listening and outreach sessions held across the continental United States, and in Alaska and Hawaii. Stakeholder and public participation continues to be an important component of marine planning to ensure it is based on a full understanding of the range of interests, conditions, and interactions in each region.

The Coast Guard is committed to advancing the National Ocean Policy and supporting marine planning. We hope that readers of *Proceedings* will find this issue interesting and worthwhile.

Champion's Point of View



by Dr. John T. Oliver
U.S. Coast Guard
Senior Ocean Policy Advisor

Wise decision makers use marine planning to help shape our relationship to the sea. They use information about human activities and environmental data to coordinate management decisions and deliver ocean and Great Lakes management commensurate with the scale and importance of that undertaking. Today, the United States is poised to shift the long-standing *ad hoc* paradigm for ocean management by implementing the president's National Ocean Policy. Managers and stakeholders can chart a course to maximize the capacity to deliver environmental services and generate economic value through use of the ocean, our coasts, and the Great Lakes, while protecting their beauty, sustainability, and ecological diversity.

I predict that in 20 to 25 years, we will look back on the National Ocean Policy and its influence as the pivotal moment where we adopted the tenets of marine planning and supporting stewardship activities as better ways to do business. The conflicts emerging from intensifying uses, changing ocean and Great Lakes characteristics, and the opportunities and promise that they still hold, are expanding every year.

For example, global trade contributes trillions of dollars each year to the nation's gross domestic product. The nation relies on marine sources to extract oil and gas. Telecommunication cables cross the seabed, aquaculture operations provide sustainable fish and shellfish, and military and law-enforcement missions protect national security.

The future looks promising with renewable energy from offshore winds, currents, and waves; floating airports and even cities are possible within the not-too-distant future, especially in localities where land is scarce or sea-level rise would jeopardize coastal infrastructure.

Make no mistake, the challenges facing our ocean, coasts, and Great Lakes are many and daunting. The waters are warming, and the sea is becoming more acidic. Sea levels are rising, beaches and shorelines are changing at an unprecedented pace, pollution from ships and other air emissions are ever-growing problems, many fish stocks are depleted or declining, and coral reefs are dying.

By implementing marine planning, decision makers can strategically preserve the nation's coastal regions. Moreover, how we resolve these conflicts will largely determine whether we overcome the challenges, while maximizing the benefits.

We have always turned to the sea to provide opportunities to generate wealth, to feed us, and to buffer the climate and protect the coastline. Marine planning, developed through dialog that draws on data and is applied in an adaptive and comprehensive manner and with due regard for all stakeholders and the ecosystems that support our human uses, is the key to a prosperous future that will respect our cultural ties to the sea and provide for our nation in the future.

This edition includes perspectives that span a broad spectrum of disciplines and provide insights into the benefits and challenges associated with marine planning. I want to thank Mr. Steve Tucker, Office of Law Enforcement Policy, for his incredibly able, conscientious, and visionary assistance; and the *Proceedings* staff for editorial and graphics support. We hope and trust that these articles will give you a better appreciation and understanding of marine planning.

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From Coastal and Marine Spatial Planning to Marine Planning

In this issue of *Proceedings* magazine, the term "marine planning" refers to a key part of the president's 2010 National Ocean Policy. However, there are other similar terms that have been used in the marine planning community, including coastal and marine spatial planning (CMSP) and marine spatial planning (MSP).

Coastal and Marine Spatial Planning

In June 2009, President Obama established the Interagency Ocean Policy Task Force. In his memorandum, the president directed the members of the new task force to develop "a recommended framework for effective coastal and marine spatial planning." This emphasis on spatial analysis to support marine planning is timely and a testament to the strides that have been made toward building a community of practice and developing improved, widely available planning tools that support decisions about ocean uses.

During the effort to implement the president's directive, terminology underwent some changes to ensure all involved were using a common language. In April 2013, the White House issued a final implementation plan that includes the terminology evolution: "Marine planning is a science-based tool that regions can use to address specific ocean management challenges and advance their economic development and conservation objectives."

Since then, the Marine Planning Implementation Subgroup has also adopted the same terminology. However, CMSP remains as the "key" term within the implementation plan appendix to describe one of the nine priority objectives in the task force's final recommendations.

Spatial Analysis Remains a Vital Part of the Process

As described throughout this edition of *Proceedings,* spatial analysis sheds light on impacts to and opportunities available in the ocean, our coasts, and the Great Lakes, based on the intensity and distribution of human activities and prevalent environmental characteristics of a given area. Coastal and marine spatial planning informs decisions about use of the marine environment, which is used in the broader practice of marine planning.

While keeping an emphasis on the application of spatial analysis, we use the term "marine planning" throughout this issue to capture the important complementary processes that can translate the results of spatial planning analysis into sound policy and improved results on the water. For the purposes of this publication, spatial analysis through CMSP, together with robust stakeholder engagement and implementation through adaptive approaches to ocean management, comprise marine planning.

What's in a Name?

Whether called marine planning or another term, this framework for action facilitates a coordinated, responsive intergovernmental effort and allows all regional coastal and ocean interests to collaborate within that region.

The National Ocean Policy

Advances in ocean, coastal, and Great Lakes stewardship.

by Captain Christopher Corvo
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Many federal agencies including the U.S. Coast Guard, National Oceanic and Atmospheric Administration (NOAA), U.S. Fish and Wildlife Service, U.S. Army Corps of Engineers, the Maritime Administration, and the Bureau of Ocean and Energy Management, manage and regulate our nation's waters. These agencies must reconcile numerous users and waterway uses—from commercial shipping, military training and operations, commercial and recreational fishing, and conservation interests to offshore traditional and renewable energy development. Coastal states also have an important role to play for our nation's ocean, as they generally manage uses out to three miles from shore.

Without coordinated efforts and advance planning, negative impacts to our economy, safety and security, and environmental stewardship are bound to occur. Recognizing these challenges, the Obama administration commissioned an interagency ocean policy task force to study the status quo and provide recommendations for a smarter future. This effort paved the way for what became the National Ocean Policy.

What is the National Ocean Policy?

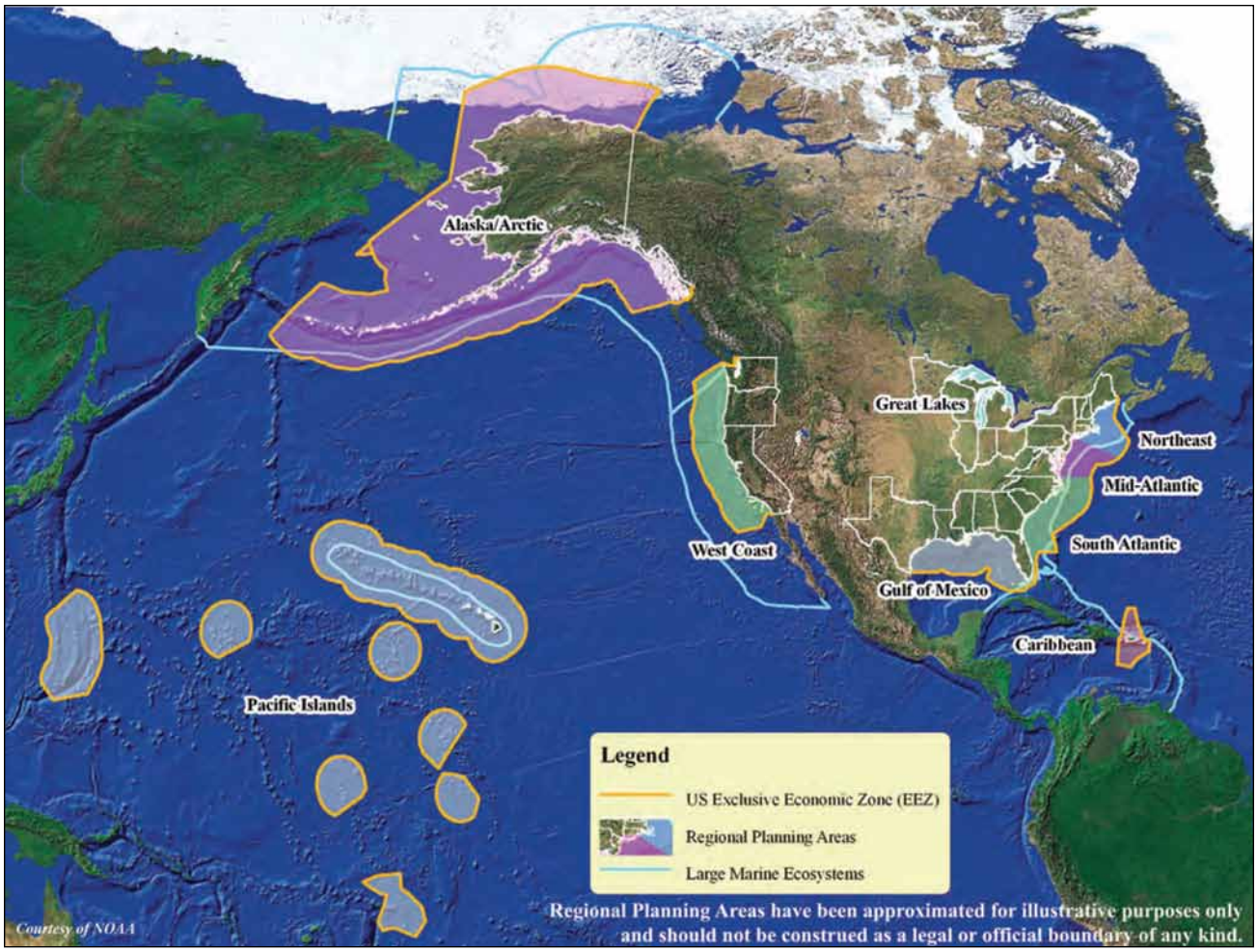
On July 19, 2010, President Obama signed Executive Order 13547, *Stewardship of the Ocean, Our Coasts, and the Great Lakes,* commonly referred to as the National Ocean Policy, which directs federal agencies to:

- identify common priorities and their benefits to the economy, environment, safety and security, and local communities;

The marine planning process involves a commitment to work with stakeholders, tribes and indigenous communities, and the public, to identify common priorities and define the goals and objectives necessary to achieve those priorities. The purpose is to collaboratively build a common foundation of knowledge and understanding, so that agencies and governing bodies exercise existing authorities in an informed, coordinated, and efficient manner.

Marine planning is not the same as ocean zoning, in that it does not restrict any ocean uses or activities or direct that any area be designated for a specific use or be off-limits to specific activities.

Regional planning bodies are not regulatory agencies and have no independent legal authority to regulate or otherwise direct federal, state, tribal, or local government actions.



The nine marine planning regions are: Alaska/Arctic • Caribbean • Great Lakes • Gulf of Mexico • Mid-Atlantic • Northeast • Pacific Islands • South Atlantic • West Coast. Graphic courtesy of NOAA.

- gather, use, and share science and information to improve decision-making;
- coordinate across all levels of government and with partners, stakeholders, and the public; and
- eliminate wasteful duplication and red tape

The National Ocean Policy also provides a framework for marine planning and defines nine marine planning regions, which coincide with natural large marine ecosystems: the Northeast, Mid-Atlantic, South Atlantic, Caribbean, Gulf of Mexico, Great Lakes, West Coast, Alaska/Arctic, and the Pacific Islands.

This year, the National Ocean Council, a collection of federal agencies, departments, and offices created by the policy, released an implementation plan that outlined the on-the-ground actions federal agencies will take to help Americans sustain and enjoy our ocean resources. A few months later, the council released the *Marine Planning Handbook,* to support regional efforts to carry marine planning forward.

What is Marine Planning?

Voluntary marine planning is a way for regions to engage marine industries, stakeholders, the public, and government in advancing their economic and conservation objectives. It is a transparent, bottom-up, science-based tool to help reduce conflicts, grow ocean industries, and support the healthy natural resources our economy and communities depend on. In the context of the policy, regions that are interested in marine planning have the flexibility to define the scope, scale, and content of their marine planning activities, subject to the needs, interests, and capacity of their region.

Additionally, the policy provides an organizational construct known as a regional planning body (RPB) to assist regions to move forward with marine planning.

An RPB consists of representatives from all levels of regional government, including federally recognized tribes as well as a regional fishery management council representative (if applicable). Each region has the flexibility to build the elements of its plans in response to what it wants to accomplish, the resources available to do the work, and the time it will take to learn what works best in that region. Stakeholder engagement, public participation, and information from a wide variety of sources (including scientists, technical experts, industry, government agencies, and native communities) are paramount to ensuring that efforts are based on the full understanding of the range of interests and activities in the region.

Marine planning is a flexible tool that can build upon and occur within existing governance structures. It is not intended to supplant any other ocean-related activities like regional ocean partnerships, ongoing state activity, or fishery initiatives. Rather, marine planning can complement these ongoing efforts, and through the process, ensure that states and regions can promote and carry out their priorities in the most efficient way. The marine planning process also includes participation and input from federal agencies with equities in our waters to support regional priorities and enhance regional partnerships' ability to address important issues.

What's in it For You?

The regional planning body's inclusive construct brings interested parties into the planning process, and provides an efficient forum for stakeholders to engage a coordinated team of government officials working on priorities of shared interest to the region and to those stakeholders.

Additionally, marine planning provides one overriding benefit to stakeholders—predictability. A coordinated planning process builds in the benefits of time and robust information sharing to arrive at thoughtful, efficient approaches that can alleviate last-minute, costly conflicts and project-by-project management decisions lacking in "big picture" perspective. Predictability is crucial to industry, as advance knowledge of a region's priorities and perspectives is necessary for businesses to efficiently operate. Understanding ongoing and planned waterway uses is especially important for military operations, exercises, and training, as potentially conflicting uses can be identified and addressed early, before actual conflicts arise. Predictability is important to other ocean users as well, through the economic benefits of marine planning.

Simply put, marine planning leads to transparency for all users, which reliably leads to better decision making. Stakeholders supply information through their active engagement and participation in the planning process. In return, they have the opportunity to be part of the solution to regional issues and challenges. All of us stand to benefit from the new economic opportunities, emboldened safety and security conditions, and environmental stewardship measures that inclusive and well-informed marine planning can provide.

Today, the Northeast, Mid-Atlantic, Caribbean, and Pacific Islands regions have formally established regional planning bodies. For the first time, regions are taking advantage of this historic opportunity through the National Ocean Policy to make a sound investment in the future of their local economies, the safety and security of their citizens and infrastructure, and the health and productivity of their ocean, coastal, and Great Lakes environments.

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Marine Sanctuaries and Marine Planning

Protecting endangered marine life.

by Dr. David Wiley
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Stellwagen Bank National Marine Sanctuary

U.S. national marine sanctuaries are federally designated marine protected areas that are often located in highly productive waters, which makes these sanctuaries important to a diverse, economically vital human user community and for biodiversity conservation. As a result, appropriate sanctuary management must balance conflicting goals. Fortunately, sanctuaries have been early adapters in marine planning.

Marine planning is a transparent, ecosystem-based, science-driven decision making process developed with a high level of stakeholder and public involvement. As established marine planning practitioners, national marine sanctuaries can provide valuable case studies and insights.

The co-occurrence of endangered whales and commercial ships made the Stellwagen Bank National Marine Sanctuary a historic "hot spot" for lethal collisions. Photo courtesy of NOAA/Stellewagen Bank National Marine Sanctuary.

Marine Planning in Action

For example, the National Oceanic and Atmospheric Administration's (NOAA) Stellwagen Bank National Marine Sanctuary, an 852-square-mile marine protected area located off the coast of Massachusetts and New Hampshire, hosts some of the largest aggregations of endangered large whales (such as the humpback, fin, and North Atlantic right whales). However, the Boston Traffic Separation Scheme (BTSS), a major shipping route, transits it.

Because of its close proximity to transiting ships, the area has become a "hot spot" for collisions between vessels and whales. To reduce incidents near the sanctuary and in its surrounding waters, we used a marine planning process to:

- identify a new BTSS route to spatially separate whales and ships,
- gain stakeholder and government acceptance for the route,
- verify mariner compliance,

- assess approaches to improve whale detection,
- improve communications.

Separating Whales and Ships

To understand the spatial distribution of whales, we:

- plotted the distribution and relative abundance of right and other baleen whales within the sanctuary and adjacent waters,
- identified whale high-use areas,
- modeled various traffic separation scheme reconfigurations through the sanctuary to spatially separate whales and ships,
- calculated the risk reduction and industry impact of alternative paths.

We used a geographic information system (GIS) mapping tool to compile geographic data to help us plot the distribution and relative abundance of whales and identify their habitat. Afterward, we worked with the maritime community to investigate variously reconfigured traffic separation schemes to minimize the number of whales in the shipping path as well as reduce impacts to industry (including transit time, turning angles, and number of turns).

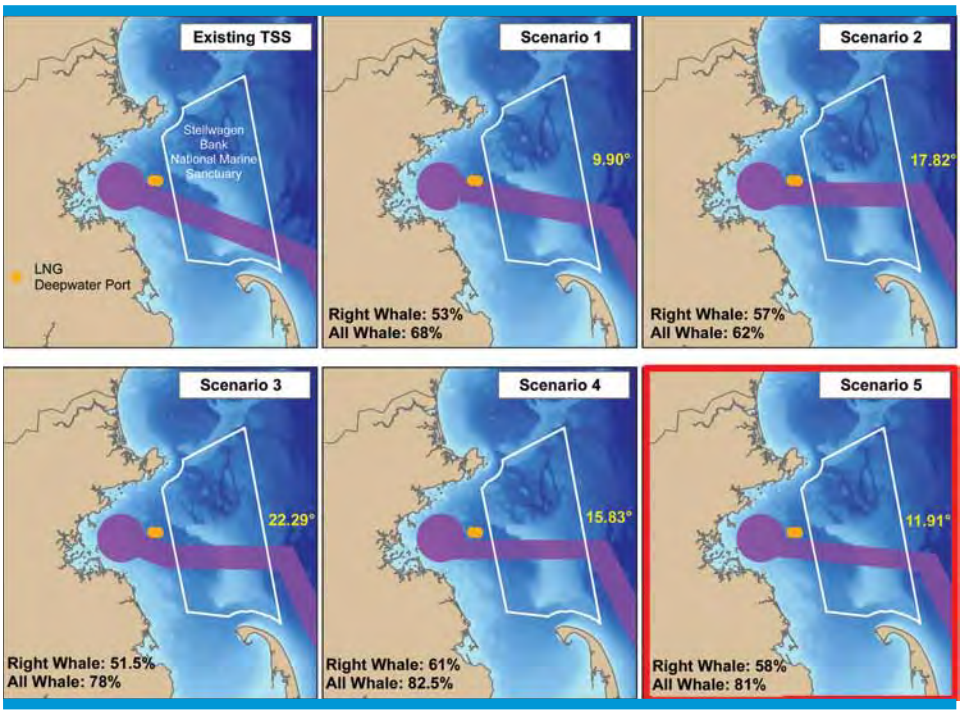
The consensus choice: rotating the western end of the Boston Traffic Separation Scheme 12 degrees and narrowing the traffic separation scheme by one nautical mile. Analysis indicated that there were 81 percent fewer baleen whale sightings and 58 percent fewer right whale sightings in the modified BTSS relative to the one that was superseded. Industry transit times increased nine to 22 minutes for vessels traveling between 10 and 25 knots, and the number of required turns remained the same.

To increase confidence in our conservation decision, we used GIS mapping to identify ecological correlates that could explain the decreased sightings in the newly reconfigured traffic separation scheme. The result: fewer prey in the realigned BTTS. The key prey source for many whale species—the American sand lance—occurs predominantly over sandy seafloor substrate. Analysis revealed that the substrate underlying the original Boston Traffic Separation Scheme consisted of 48 percent sand, while the substrate underlying the realigned BTSS was 16 percent sand, indicating a reduced occurrence of prey in the new area. In addition, modeling indicated that currents would also tend to aggregate the prime prey of North Atlantic right whales away from the realigned traffic separation scheme.

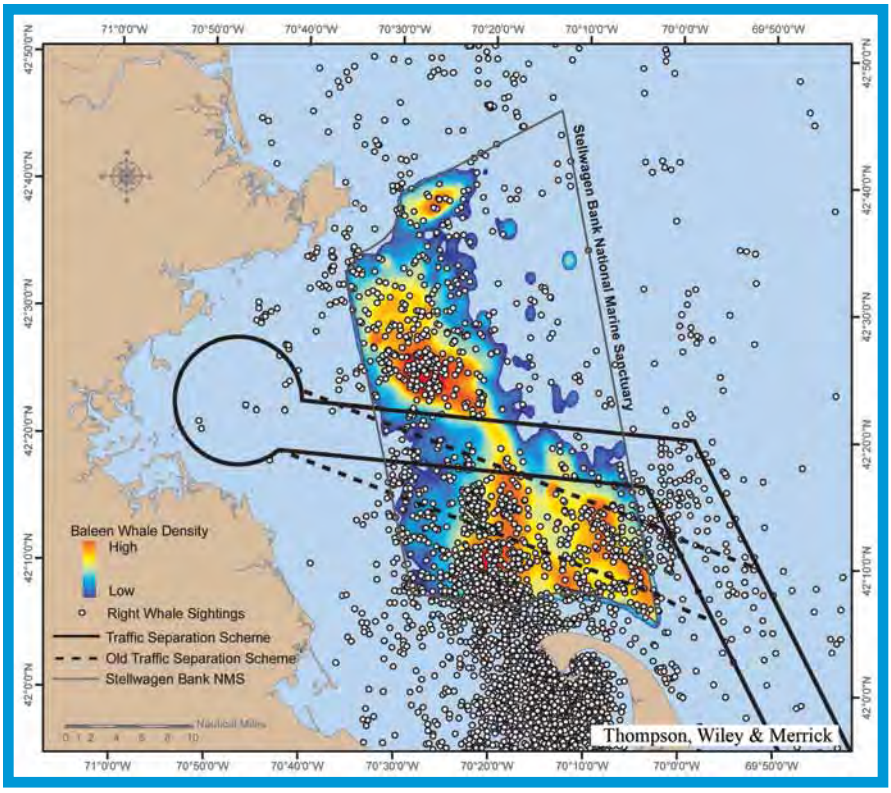
Working with Stakeholder and Governmental Organizations

During the analysis, we engaged in an iterative stream of meetings with the Boston Port Operators Group, which represents the local, national, and international shipping communities. This engagement began early in the process, allowing the operators group to view the data and verify its validity. The sanctuary scientific team analyzed any questions, concerns, and ideas and presented the results at the following month's meeting.

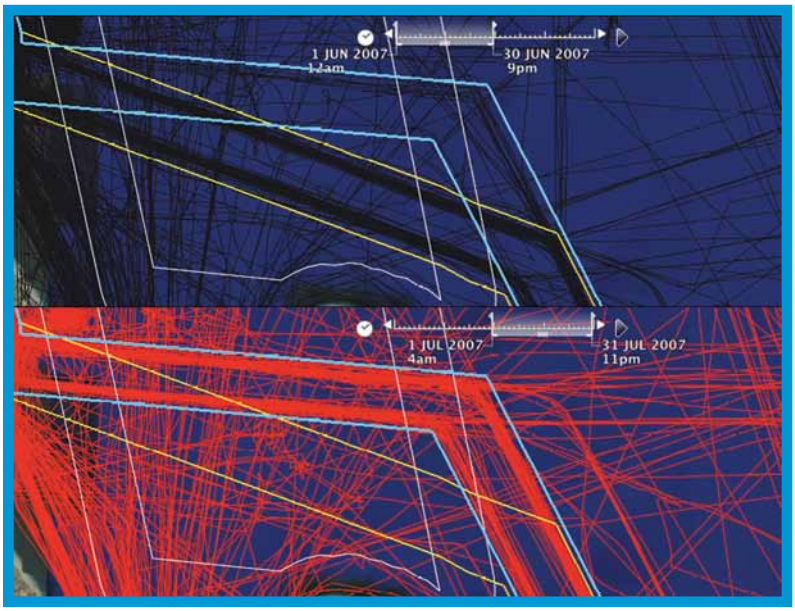
Following the consensus choice of a new BTSS route, our activity transitioned to the governmental policy arena, where team members made presentations to and garnered the support of the relevant agencies (such as the Office of National Marine Sanctuaries, NOAA Fisheries, National Ocean Service, and the U.S. Coast Guard). The combined agendas of industry priorities, conservation needs, and federal planning activities came into alignment, and the International Maritime Organization accepted the proposal



Working together, scientists and stakeholders investigated the conservation value and industry impact of various alternatives based on the number of whales avoided, the number/angle of turns, and ship transit time. Scenario 5 (red border) was the consensus choice. Graphics courtesy of NOAA/Stellewagen Bank National Marine Sanctuary.



The realigned Boston Traffic Separation Scheme moved ship transits from high- to low-use whale areas. Graphic courtesy of NOAA/Stellewagen Bank National Marine Sanctuary.



The top pane shows the vessel traffic pattern prior to the BTSS shift (June 1 to 10, 2007) and the bottom pane the vessel traffic pattern post-shift (July 1 to 31, 2007). The original BTSS is depicted in yellow and the new BTSS in blue. Monitoring demonstrated high compliance. Graphic courtesy of Dr. Kurt Schwehr.

in December 2006. The new Boston Traffic Separation Scheme became active the following July.

This was the first time in the U.S. that a TSS was shifted to mitigate whale/ship collisions, and the transparent process helped create a rapprochement among the various stakeholders, so subsequent actions to reduce the likelihood of collisions were viewed in a favorable light.

AIS Evaluates Compliance

An important but often neglected aspect of marine planning and a core principle of adaptive management is monitoring to ensure that the desired impact is achieved and adequate data exists to support decisions to perpetuate, discontinue, or alter the new scheme. Since commercial ships use the Boston Traffic Separation Scheme on a voluntary basis, we evaluated mariner adherence to the new alignment as an indicator of the efficacy of the conservation action.

Large vessels are required to carry an Automatic Identification System (AIS) transceiver, which transmits the ship's name, position, speed, and heading (among other things) with updates occurring as often as every two seconds. While originally conceived as a real-time collision avoidance system, this information can also be gathered, archived, and analyzed to give insights into ship traffic over time. With respect to the BTSS, AIS analysis indicated that nearly 100 percent of the shipping traffic shifted from the old pattern to the new alignment.

While this vessel compliance with the new traffic separation scheme resulted in substantial reduction in the risk of collisions between ships and whales, the large numbers of whales using the sanctuary and their highly variable behavior means that there will always be some risk of whales within the reconfigured BTSS. Ship traffic transiting the Boston Traffic Separation Scheme is also variable. For example, shortly after realignment, developers proposed building two deep water ports for offloading liquefied natural gas (LNG) adjacent to the national marine sanctuary, bringing increased traffic through the BTSS.

Acoustic Detection Buoys

To lower the increased risk of LNG traffic and whale collisions, the Stellwagen Sanctuary science team and various federal agencies worked with stakeholders and conservation groups to develop a strategy that would provide near real-time right whale detection. The result: an acoustic detection system, which consists of 10 automatic detection buoys that "listen" for right whale calls.

Cornell University's Bioacoustics Research Program staffers are available 24/7 to examine the calls and

eliminate any false alerts or to confirm whale sounds. The staff reports whale alerts to LNG vessel masters. LNG ships are mandated to slow to 10 knots in areas of whale detection and heighten observation to avoid striking them. These alerts remain active for 24 hours, and other mariners are also requested to slow.

This first-of-its-kind approach to vessel routing represents a second successful outcome from applying a marine spatial planning approach to resolve potential conflicts among existing and intensifying uses and biodiversity conservation.

Lessons Learned

As a concept, marine planning is gaining traction around the world. As practitioners move forward, learning from past endeavors can inform future efforts. In our ongoing project, we have found the following conditions lead to success:

- **High quality, locally produced scientific information.** Good decisions require good data. This is particularly true in potentially contentious situations. While information derived from literature and/or from other locations can be important and should not be ignored, it is unlikely to yield a perfect fit for local challenges or lead to widely supported decisions. Information for decisions should be powered by data specific to the problem and location.
- **Scientific information collected/analyzed in conjunction with stakeholders.** The traditional perception that science provides credible and unbiased information, because research is conducted in isolation from those most impacted by its results (stakeholders), is not valid. Such research contributes to stakeholder entrenchment by allowing stakeholders to construct myriad reasons to reject it, rather

Whale Alert

The *Whale Alert* app, available on iTunes, is a free iPad/iPhone-based mobile application that notifies users regarding right whale protection and management information along the U.S. eastern seaboard, including:

- **Current ship location.** An icon depicts a ship's real-time GPS-derived location.
- **Seasonal management areas.** As a ship enters one of these areas, a pop-up window appears, notifying the mariner that he/she should be traveling at less than 10 knots.
- **Mandatory ship reporting areas.** When a ship enters one of these areas, a pop-up display appears, reminding the mariner to contact the Coast Guard to receive right whale information.
- **Areas to be avoided.** IMO-sanctioned areas to protect right whales appear on *Whale Alert* when and where they are active.

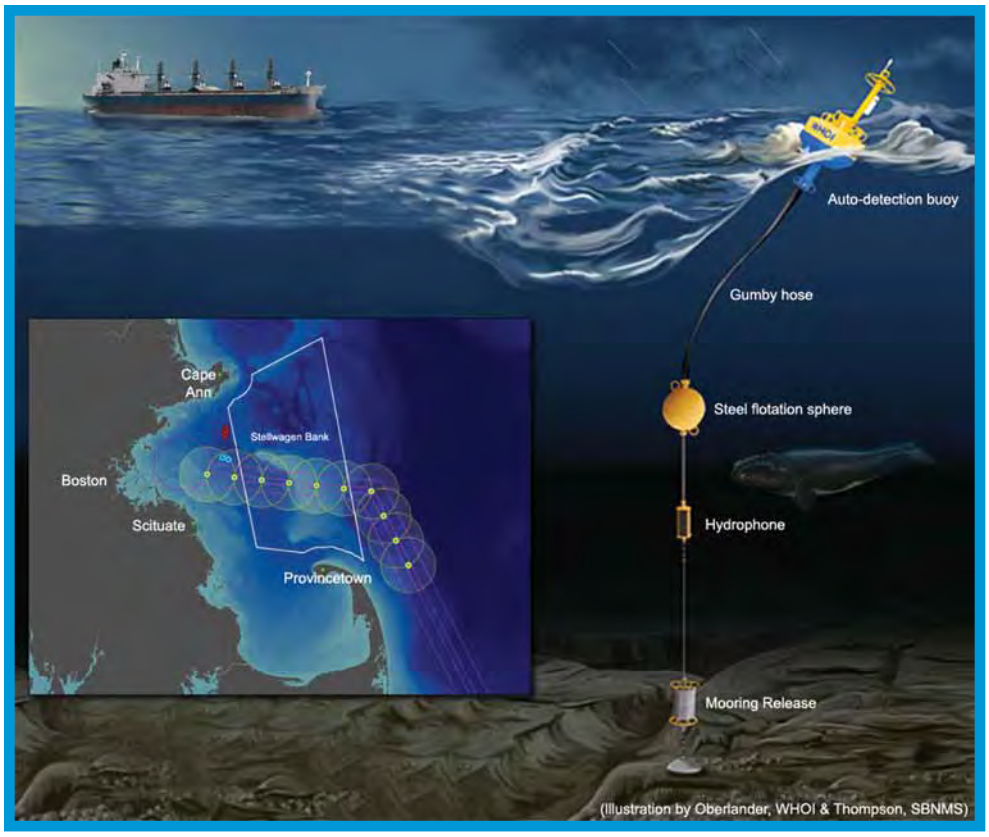
Graphic courtesy of NOAA.

Right whale management information as displayed on an iPad via *Whale Alert*. Color coding is as follows:

- seasonal management area, orange;
- dynamic management area, grey;
- area to Be avoided, red;
- recommended routes, purple;
- mandatory ship reporting perimeter, blue;
- acoustic buoy without a right whale detection, green;
- acoustic buoy with a right whale detection, yellow.

than contributing to problem solving by providing agreed-upon information for decisions. Research that is inclusive and balanced by a diversity of interests provides results that stakeholders view as more credible and acceptable.

- **Data that is presented so that all participants can understand it.** Too often scientists expect stakeholders to accept undesired information based on obtuse models and statistical probabilities. It is incumbent upon scientists to develop techniques that show results clearly and concisely, rather than expecting stakeholders to "trust" science or become scientifically literate for the occasion.
- **A driver for timely action.** While stakeholder involvement and cooperation were essential to the process, it is unlikely to have occurred without a regulatory impetus for action. At the time of our activities, the estimated North Atlantic right whale population was approximately 300 animals, and the



Buoys detect the presence of a right whale through the whale's "up call," and use a satellite connection to relay the call spectrogram to scientists for species confirmation. LNG companies paid for the acoustic detection system as part of their USCG and MARAD licensing agreements. Illustration by E. Paul Oberlander, Woods Hole Oceanographic Institution, and graphic adapted courtesy of NOAA/Stellewagen Bank National Marine Sanctuary.

Whale Alert is a free mobile software application that provides up-to-date information pertaining to North Atlantic right whale management initiatives and regulations and displays it on digital nautical charts. Graphic courtesy of NOAA/Stellewagen Bank National Marine Sanctuary.

Endangered Species Act and the Marine Mammal Protection Act required further reductions in human-caused serious injury or death. In addition, a number of lawsuits had been directed at NOAA's National Marine Fisheries Service alleging inaction in protecting right whales from ship strike and fishing gear entanglement.

We share these tips to help other marine stakeholders manage the delicate processes that come with successful marine planning, and to capture the lessons we learned during this marine planning process.

About the authors:

Dr. David Wiley is the research coordinator for NOAA's Stellwagen Bank National Marine Sanctuary. His research has ranged from studying endangered whales to mapping marine hazardous dumpsites. He is the recipient of numerous honors, including a Switzer Environmental Leadership award, the International Society for Marine Mammalogy's award for Excellence in Scientific Communication, an Ian Axford (Fulbright) Fellowship in Public Policy, and the U.S. Department of Commerce's Gold Medal for scientific leadership.

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Additionally, *Whale Alert* was designed with considerable input from stakeholders. The Massachusetts Port Authority and Boston Harbor Pilots Association were lead groups, while NYK Line and the Norwegian and Holland America cruise lines were part of a test fleet to gain additional industry input and make the app operational. The U.S. Coast Guard was instrumental in working with the team to transmit information via AIS. On the conservation side, the International Fund for Animal Welfare provided important program input and funding. In addition to the Stellwagen Bank NMS, scientists and engineers from the Bioacoustic Research Program at Cornell University, the Center for Coastal and Ocean Mapping at the University of New Hampshire, NOAA's Northeast Fisheries Science Center, and the Woods Hole Oceanographic Institution provided expertise supporting different aspects of the app. EarthNC, with extensive experience in spatial mapping and real-time mobile data acquisition, aided app development.

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The Marine Planning Implementation Subgroup

Managing the challenges to make marine planning a reality.

by Ms. Robin Fitch
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Department of the Navy

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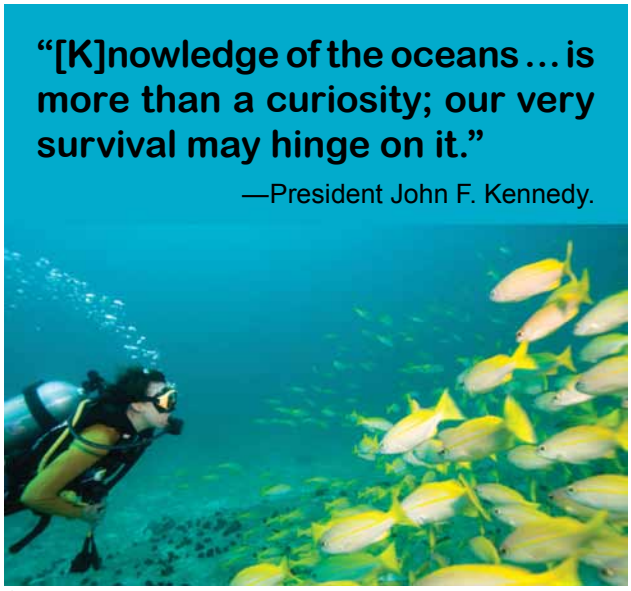
The ocean, our coasts, and the Great Lakes are national assets of tremendous value. They support millions of jobs, promote safe and efficient global trade, sustain emerging offshore industries, support our culture, and provide a wide range of environmental services, security benefits, and recreational opportunities. However, our coasts and ocean waters are vulnerable to resource overuse, habitat degradation, sea-level rise, ocean acidification, various sources of pollution, and extreme weather events. Fortunately, the president's National Ocean Policy contains a clear vision for dealing with these challenges.



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Other articles in this issue support marine planning as one of the most important tools to promote ocean stewardship. The interagency marine planning implementation subgroup monitors the progress on National Ocean Policy Implementation Plan actions related to marine planning and provides expertise and guidance to those seeking to make marine planning a reality.

Interagency Ocean Policy Collaboration

Interagency collaboration to develop and implement ocean policy has a long history. In 1966, Congress established the Stratton Commission, seeking to improve coordination for federal ocean-related activities. The 1969 Stratton Report had an unprecedented influence on the federal marine policies and priorities of the time, and the commission's findings led to the Coastal Zone Management Act, the Marine Mammal Protection Act, and the Clean Water Act and provided the impetus to create the National Oceanic and Atmospheric Administration and Environmental Protection Agency.

Congress then passed the Oceans Act in 2000, establishing the U.S. Commission on Ocean Policy. The commission's final report, *An Ocean Blueprint for the 21st Century*, was published in September 2004. Pursuant to the commission's recommendations, President Bush signed an executive order in December 2004 that established a committee on ocean policy and issued the *U.S. Ocean Action Plan*. However laudable these goals, that committee met once in 2005, and never took any coordinated measures to accomplish its objectives.

In June 2009, President Obama established the Interagency Ocean Policy Task Force, calling on senior officials from across the federal government to develop a comprehensive ocean policy and a framework for effective marine planning. The task force took advantage of the Stratton Commission and the U.S. Ocean Commission reports and considered developments in ocean uses, science, and policy that emerged since their publication to prepare its final recommendations and drafted Executive Order 13547 on July 19, 2010.[1] The executive order articulated the federal commitment to the ocean, our coasts, and the Great Lakes, and directed establishing the National Ocean Council to promote consistent actions across the federal government and to engage state, tribal, and local authorities; regional governance structures; the public; and the private sector.

Pursuant to those efforts, the National Ocean Council coordinates National Ocean Policy Implementation Plan actions via the Interagency Policy Groups. The National Ocean Council and staff are working to implement the national ocean policy and are garnering participation and support from collaborators, partners, and stakeholders.

The Implementation Plan and Actions

Marine planning is a science-based tool that regional planning bodies and other entities use to address specific management challenges associated with ocean uses—thereby advancing economic development and conservation objectives. The process brings together ocean users to share information on how we use and sustain ocean resources. The National Ocean Council recently approved and the White House issued the *National Ocean Policy Implementation Plan*, which contains specific implementation actions designed to better coordinate existing federal agency authorities and

Federal Marine Planning Efforts

Some of the initiatives currently underway to ensure that voluntary marine planning resonates across the federal agencies and through federal partners and stakeholders include:

- **Standing up the Marine Planning Implementation Subgroup, a headquarters-level working group comprised of federal agency policy analysts and managers to ensure that the member agencies are apprised of what is happening in each of the regions that are participating in marine planning and that regions share lessons learned and advertise available planning tools. In addition, the Marine Planning Implementation Subgroup is forming linkages and providing support to other interagency working groups to avoid duplications and maximize efficiencies.**
- **Working on and with the Ocean Resources Management Interagency Policy Committee, a senior leadership body that reports directly to the National Ocean Council, considers issues and roadblocks, recommends policy improvements, and ensures coordinated efforts across the government at the most senior departmental levels.**
- **Providing agency representatives to regional planning bodies (RPBs) in regions that choose to engage in marine planning. The Departments of Commerce, Defense, and Interior, plus the Joint Chiefs of Staff and the U.S. Coast Guard, have each designated representatives for all regions, and will participate on regional planning bodies as regions choose to establish them. Other member agencies are staffing the RPBs as they deem necessary to ensure that key authorities and missions are represented.**

One of the challenges associated with this effort is ensuring that information flows back to senior leadership and decision makers. To meet this challenge:

- **RPB co-leads coordinate with the National Ocean Council Office in support of regional planning bodies. In addition, the National Ocean Council Office directly assists with state and tribal engagement and outreach efforts.**
- **The Marine Planning Implementation Subgroup is also charged to ensure that agency concerns and actions are communicated to agency leadership and the National Ocean Council representatives. This communication flow is two-way, facilitating information exchange among regions, agencies, implementers, and decision makers.**

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missions and to support voluntary regional marine planning.[2]

Marine planning can yield substantial economic, ecological, security, and social benefits. Regions that move forward with marine planning define the scope, scale, and content of their efforts in accordance with their needs, interests, and capacities. Marine planning does not create or change laws, regulations, legal authorities, or responsibilities; it does place a premium on stakeholder engagement and public participation, as both are essential to ensure that actions are based on a full understanding of the range of interests and interactions that occur in each planning area.

Marine planning fosters sustainable economic growth in coastal and Great Lakes communities, while promoting ecosystem-based management and avoiding unnecessary conflict. In the area of improved data and management tools, the implementation plan directs two actions for 2013:

- Build out the national marine planning data portal (ocean.data.gov), and develop and implement a governance strategy for the national information management system to ensure high data quality and standards-based data management for maximum data utility and interoperability.
- Make non-classified agency data, decision-support tools, and visualization capabilities relevant to marine planning and publicly available in machine-readable formats through the online data portal.

The plan also directs agencies to better support regional priorities and empower regional efforts by:

- providing guidance and information for federal, state, and tribal agency regional planning body members;
- assisting regional, state, and tribal partners with marine planning workshops;
- working with regional planning bodies to determine initial steps needed to support regional planning to advance regional interests;
- identifying and addressing priority science, general information, ocean management issues, and coordinating with non-federal partners and stakeholders from regions without an established regional planning body.

Marine planning builds on and complements existing programs, partnerships, and initiatives. So, the intent is for each region to develop an approach to determine what works bests to balance regional and national interests. Knowledge and experience will build over time and contribute to achieving national objectives. The goal is that by 2017, the established regional planning bodies will develop marine plans. Currently, four regions—Northeast, Mid-Atlantic, Caribbean, and Pacific Islands—have established regional planning bodies and have made steady progress toward the 2017 target date.

Challenges and Opportunities

Dealing with the challenges of the task has helped the federal agencies form a new paradigm of participatory teamwork, recognizing that no single federal agency, state, or tribe can improve ocean, coasts, and Great Lakes management in isolation. Federal agencies continue to support successful marine planning by collaborating with state and tribal partners, as well as other interested stakeholders. As a result, we are seeing an unprecedented level of cooperation and participation at the national and regional levels. For example:

- Consistent with the National Ocean Policy, federal agencies have identified a lead agency for each region. The Department of Commerce/National Oceanic and Atmospheric Administration is co-leading the Northeast, West Coast, and Pacific Island regions; the Department of Interior/Bureau of Ocean Energy Management is the federal co-lead for the Mid-Atlantic region; the Department of Defense/Department of Navy has assumed the role for the South Atlantic and the Gulf of Mexico; the Department of Homeland Defense/U.S. Coast Guard has taken on the Great Lakes and Alaska/Arctic regions; and the Department of Agriculture is handling the Caribbean. In regions that choose not to establish regional planning bodies, federal agencies will identify specific ocean management issues or projects that would benefit from improved interagency coordination. In determining what issues to work on, federal agencies will work with relevant states and tribes to ensure that their actions support and advance a common interest.
- Where state regional ocean partnerships are already operating, agencies will collaborate with one another on resources and energies to help produce comprehensive marine planning. Where regional partnerships do not yet exist, federal agencies will work with their state and tribal partners to try to form a regional planning body.

As described above, four regions have chosen to establish regional planning bodies, and other regions are engaged in informal activities with the federal agencies and/or discussing how they would like to move forward.

Additionally, ocean.data.gov is up and running, no longer a "prototype" website, but a maturing resource with data and tools for the people who will be doing the actual planning. In short, the ocean partners are implementing the president's vision, laid out in his National Ocean Policy.

The Marine Planning Implementation Subgroup, operating now for more than a year, meets monthly and on an *ad hoc* basis (when action items are pending). We recently completed work on, and the National Ocean Council issued, a marine planning handbook that should prove valuable to all participants and stakeholders. We are strongly optimistic in our outlook and anticipate that our partners will be successful in the extraordinary work that they all have started.

Crew aboard a security boat from Coast Guard Maritime Safety and Security Team 91106 keep watch over passenger vessels and high-profile landmarks in the New York Harbor. U.S. Coast Guard photo by Petty Officer Kelly Newlin.

The Future of Marine Planning

As we move forward, the scope, scale, and content of marine planning will be defined by the regions themselves, and regional bodies will be able to solve problems that they care about in ways that reflect their unique interests, capacity to participate, and ways of doing business. Marine planning has the potential to improve the overall decision-making process, as sea levels change and more severe storms and other environmental and economic stressors continue to threaten the health and value of our offshore water.

The Marine Planning Implementation Subgroup members are confident that in 20 or 25 years, the citizens of our nation will look back on this period as one in which marine planning became the most important tool to maximize the value and protect the health of our ocean, coastal, and Great Lakes waters.

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Endnotes:

1. These two documents as well as other excellent ocean-related materials and links are available at www.whitehouse.gov/administration/eop/oceans.
2. The implementation plan and its appendix of implementation actions are available online at www.whitehouse.gov/administration/eop/oceans/implementationplan.

Protecting a Nation of the Seas

Resources, trade, and sea power.

by Commander James E. Landis
Senior Military Counsel
U.S. Navy

Captain Robin Fitch
U.S. Navy (ret)

The United States was born of the sea, is protected by the sea, and is dependent upon the sea. From the settlers who crossed the Atlantic, to the growth of the colonies under the maritime power of Great Britain, through the Revolutionary War, the Barbary Wars, and the international victories of the world wars, the ocean has been woven into our history and nurtured our emergence.

"In any operation, and under all circumstances, a decisive naval superiority is to be considered as a fundamental principle, and the basis upon which every hope of success must ultimately depend." —*General George Washington, 1778.*

Our oceans continue to play a large role in our national identity. In close connection to the path of our history, seagoing transportation, commerce, and resource development have been protected through an understanding and emphasis on naval power to extend national interests and protect the means of growth for an emerging international leader.

The United States depends on the oceans, which provided buffer and protection until our nation grew able to take full advantage of the seas, to optimize resources, build commerce, and develop as a naval power.

Naval Power is Never Stagnant

Following World War II, technology pushed naval strategy and tactics through advances like submarines, aircraft carriers, radar, steam turbines, rocket engines, and nuclear propulsion—all pioneered or critically advanced in the U.S. More recently, computer technology has changed communications, weapons systems, infor-

"…to the general question of the influence of government upon the sea career of its people, it is seen that that influence can work in two distinct but closely related ways. First, in peace: The government by its policy can favor the natural growth of a people's industries and its tendencies to seek adventure and gain by way of the sea; or it can try to develop such industries and such sea-going bent, when they do not naturally exist; or, on the other hand, the government may by mistaken action check and fetter the progress which the people left to themselves would make. … Secondly, for war: The influence of the government will be felt in its most legitimate manner in maintaining an armed navy, of a size commensurate with the growth. … More important even than the size of the navy is the question of its institutions, favoring a healthful spirit and activity … when considering the character and pursuits of the people." —*Alfred Thayer Mahan, 1890.*

mation transfer, and in turn, radically changed the means and pace of modern warfare.

Even as the United States appears ready to end the need to traverse oceans to engage threats through traditional warfare, seagoing trade remains the dominant means of commerce in a world less constrained by political boundaries. Water space is often at a premium; sea lanes grow increasingly crowded; and the need to deconflict defense training, marine sanctuaries, resource exploration, and commercial uses is critical. In a world that remains highly dependent on oceangoing trade for economic and political stability, sea power must include practical planning that allows compatible ocean use.

Effective Training

In recent decades, the Navy has also taken on an increased role in international disaster response and humanitarian relief. Now, as always, a credible naval presence provides stability and predictability. Because resources, trade, and sea power are intricately linked, the U.S. Navy remains a vital resource for national interests and for the peaceful, stable, and interdependent prosperity of nations in the global community.

The Navy's ability to successfully execute the nation's at-sea policies and priorities is closely tied to its ability to train sailors and to develop weapons and tactics. Navy training typically proceeds on a continuum, from teaching basic and specialized individual military skills to intermediate skills or small unit training to advanced, integrated training events—culminating in multiservice or multinational exercises or certification events. Live training in realistic environments is key to real-world success and is provided at our range complexes, test ranges, and operating areas. Effective training requires sufficient sea and airspace to maneuver in tactically realistic scenarios with credible targets and accurate instrumentation to objectively monitor and play back the events for efficient learning. Some scenarios lead to new tactics and improved methods.

"…90% of the world's commerce travels by sea; the vast majority of the world's population lives within a few hundred miles of the oceans; nearly three quarters of the plant is covered by water. Sea power protects the American way of life."
—Cooperative Strategy for the 21st Century.

Naval Marine Planning Support

The Navy represents the Department of Defense (DOD) on the National Ocean Council. We have established a formal executive steering group within DOD and the Joint Chiefs of Staff (JCS), comprised of senior executives and flag officers to ensure that DOD leadership is kept abreast of developments and is provided with opportunities to contribute to National Ocean Policy implementation. Our primary objective, across all of the military services, is to ensure that operational, training, research and development, test and evaluation, environmental compliance, and national security equities are considered throughout the marine planning process.

The DOD, with special emphasis on the Navy and the unique role of the Army Corps of Engineers within the DOD, has interests in each of the nine marine regional planning bodies (RPBs). Accordingly, we have formally designated representatives for the DOD and Joint Chiefs who participate in RPB planning activities and coordinate activities internally to ensure consistency throughout the DOD.

Leadership

Department of Defense and Navy leadership strongly support regional planning in the coastal and marine systems to reduce spatial and temporal conflicts and to promote healthier and more resilient coasts and oceans. Additionally, the Navy has offered to serve as the federal co-lead for the South Atlantic and the Gulf of Mexico RPBs. Together, these two RPBs largely coincide with our Southeast Regional Commander's area of responsibility.

With the approval of senior Navy leaders, the commander of Navy Region Southeast decided that assuming a leadership position in the Southeast was warranted, given the level of Navy and other military service activities in the region.

Partnership

At the national level, headquarters staffs are working to ensure that all members of the DOD and JCS team are working together consistently and are reporting back to leadership. We have representatives working on each of the interagency working groups, at the interagency policy committee level, and on the steering committee.

The Navy also endorses and actively supports the federal effort to provide data access through ocean.data.gov. There are vast sources of federal data and data.gov provides an excellent mechanism for advertising and distributing these data products.

In our emergency and disaster relief roles and through our experience in armed conflict, particularly in less developed or war-torn nations, the Navy has seen first-hand that resource management, including maintaining sustainable ecosystems, is fundamental to the success of sovereign nations; additionally, healthy and resilient coasts and oceans are essential components of a secure, peaceful, and prosperous world.

In addition to training U.S. sailors in real-world conditions, military readiness requires developing ships, aircraft, weapons, combat systems, sensors, and other necessary equipment to support their missions and to give them a technological edge over adversaries. The wide open spaces that we see from the shoreline are but a very small portion of the ocean and coastal space that our Navy has relied upon for generations to provide training grounds for victory at sea.

The true missions of a ready and capable seagoing force are twofold. First, the United States, through its Navy, must accomplish tasking that furthers national interests. With competing importance, the nation's companion duty is to give its sailors the greatest likelihood of returning home safely from battle.

Each improvement in training and testing builds capability, improves mission execution, and allows more efficient comprehension, all of which promote successful operations and reduce loss.

"…the only truly, sacred obligation we have as a nation–to equip those we send to war and care for them when they come home from war."*—Vice President Joe Biden.*

Failing to Plan is a Failing Plan

In the end, every incompatibility reconciled through planning supports the Navy's mission and potentially saves sailors' lives. Marine planning is a way to assess and compare the Navy's training and testing needs to other proposed uses. Planning also provides federal agencies, states, and tribes an opportunity to work collaboratively and plan initiatives that identify the best ways forward.

Additionally, the Navy is an integral part of the cities and states that host its installations. Our sailors are part of the community, and the communities are intricately linked to the vitality of Navy bases, installations, and ships. As citizens and partners in federal and local government, part of our mission is to conduct business in a manner that supports the local population.

We cannot afford to duplicate activities. A comprehensive planning process, working with all stakeholders, provides an outstanding venue for the Navy to participate in work that will protect our equities and those of our federal, tribal, state, municipal, neighborhood, and economic partners.

The Department of the Navy recognizes that ocean governance, environmental stewardship, and resource management are inherent in its mission to defend the nation and safeguard the seas. We have long associated our war fighting mission with our responsibility to protect the natural systems upon which our quality of life depends. A fundamental tenet of military philosophy is that the national defense mission includes natural resources protection.

From operational and societal contexts, the Department of Navy understands that proper planning maximizes positive outcomes, while failing to plan leads to conflict and discord. Marine planning provides the Navy and Department of Defense an efficient and effective way forward to optimize offshore uses.

The oceans remain our closest and most immediate frontiers, providing crucial resources for multiple sectors. Our oceans shelter, protect, and provide for the people of this country in ways that are sometimes identifiable, but just as often are immeasurable or even unrecognized. They also connect us to the rest of the world through trade, commerce, and international security.

Demands on our oceans are intense and growing. We need to plan ocean uses for all sectors of American life, including national defense. To this end, the Department of the Navy is positioned and committed to provide the greatest support possible to the National Ocean Council, the National Ocean Policy, and marine planning.

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Marine Planning Benefits the Environment

by Dr. Giancarlo Cicchetti
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The oceans, coasts, and Great Lakes of the United States contribute to our nation in many ways, from supporting recreational enjoyment and our culture to fostering a greater appreciation for our surroundings. Oceans, rivers, and lakes also support tens of millions of jobs and add trillions of dollars to the nation's annual economy.[1] However, many of these benefits depend directly on the condition or health of these aquatic environments.

The Stratton Report was a Catalyst for Action

Recognizing the need to maintain aquatic health, federal ocean resource stewardship began in earnest in 1966, when President Lyndon Johnson formed the Stratton Commission. In fact, the 1969 Stratton Report is considered the catalyst for much of our current ocean legislation.[2]

Federal, state, and local environmental efforts have achieved many successes in the years since the Stratton Report. Toxic input to our waterways, for example, has been greatly reduced since the 1972 Clean Water Act. (The act itself was a direct result of the Stratton Report.) Also, many acres of land and water have been set aside as nature reserves, and populations of protected seabirds and marine mammals have increased during the past 40 years.[3]

Ongoing Challenges

However, in more recent decades, the combined effects of nutrient pollution, overfishing, habitat alteration, coastal acidification, and other stressors have led to new problems. For example, many coastal and marine areas have seen severe reductions in acres of valued habitats and in numbers of fishes, birds, and other animals despite continuing efforts and new programs. In addition, many areas also suffer from degraded water quality.

This is particularly striking when incremental losses are viewed over a longer time period. Comparisons to historic conditions show tremendous loss of resources. For example, we have lost almost 66 percent of our

This lagoon in Charlestown, R.I., and the adjacent ocean beaches contribute heavily to the economy and the identity of the town and the area. Note the residential development, the recreational boat in the inlet, and the abundant sea grass (dark blue-green patches just above the light-colored sand flats). Photo courtesy of author.

native oyster areas and almost 90 percent of oysters (by weight) over a 100-year period—due largely to overharvesting, changes in coastal drainage patterns that affect oyster beds and reefs, and disease.[4]

Oil-skimming operation following a spill in Staten Island, N.Y. U.S. Coast Guard photo.

Dead menhaden on a beach in Greenwich Bay, R.I., a sub-estuary of Narragansett Bay. Low oxygen conditions contributed to this fish kill, likely due to cumulative effects of nutrient enrichment, decaying organic material, and warm water temperatures. Photo courtesy of Mr. Tom Ardito of the Narragansett Bay Estuary Program.

Three recent national surveys reveal that, while some indicators of coastal, ocean, and estuarine condition have been fairly stable in the past 10 years, many specific areas are severely degraded. Moreover, the overall national coastal condition is only "fair." We lost more than 84,000 acres of marine and estuarine intertidal wetlands from 2004 to 2009. In addition, nationwide, 28 percent of our commercial fisheries stocks are designated as overfished. A majority of our estuaries are adversely affected by nutrients, and this is predicted to worsen in almost 66 percent of our estuaries by 2020.[5]

As a Nation, What Are We Doing?

In the early 2000s, two major initiatives convened expert panels to re-examine the condition of our oceans. Both of these panels—the Pew Ocean Commission and the U.S. Commission on Ocean Policy—arrived at similar conclusions. Both pointed out that under the status quo, we do a poor job managing the multiple environmental effects that have been damaging our coasts and oceans during the last decades.[6]

Both panels reported that federal agencies, states, and local and private groups generally target their efforts at individual problems like nutrient pollution, vessel discharge, climate change, land development, or overfishing. These findings demonstrate that, while each specific action may be well-considered and valid, these actions are not sufficiently coordinated to address larger, long-term problems. Furthermore, our decisions and actions have been largely reactive.

To address future coastal and marine environmental trends and degradation, we need a governance structure that promotes proactive, collaborative efforts among all key players, including large-scale and long-term goals that promote sustainability. If we are to succeed, these goals should include the views of a wide range of concerned groups and individuals and must balance environmental and economic priorities.

In 2010, the Interagency Ocean Policy Task Force coalesced these views and described specific actions—including an effective framework for marine planning, an integrated

A coral reef, with high biological diversity and productivity, offers exceptional recreational use opportunities. Photo courtesy of author.

Beach areas support recreation, culture, tourism, and provide opportunities for the public to connect with the ocean. U.S. Coast Guard photo.

In the Weeki Wachee River, a manatee calf rests its head on mom's back. This ecologically valuable spring-fed river is a very popular destination for paddlers, birders, nature watchers, and other recreational users. Healthy manatee populations are a large part of the local attraction. Photo courtesy of author.

governance structure, and an improved management framework.

How Does Marine Planning Work?

Marine planning can address problems of cumulative effects through two major mechanisms:

- encouraging states, regions, tribes, agencies, and stakeholders to develop long-range and large-scale goals for future marine environments and for human uses;
- developing information and guidance that provides context for and informs the actions of all invested parties and participating authorities to achieve goals, monitor progress, and adjust action as necessary.

Additionally, the marine planning process incorporates the tenets of ecosystem-based management (EBM), a scientific approach that emphasizes stakeholder involvement and considers the functional characteristics of natural ecosystems, rather than focusing on individual species or isolated indices. As such, EBM is a form of adaptive management, intended to address complexities of cumulative environmental impacts while balancing economic and societal needs.[7]

Adaptive management considers new environmental condition challenges in decision-making, thereby ensuring all actions lead toward goal progress. These management principles have been successfully applied in projects around the world, and marine planning has been implemented successfully in a number of countries including Australia, New Zealand, China, Norway, Belgium, Germany, and Great Britain.[8]

Within the U.S., the basic marine planning unit is a large region, and the country is divided into nine of these regions. Each region can establish regional planning bodies to develop a marine plan for the region, based on regional interests and stakeholder input, considering ecological, economic, societal, and other needs and uses. Several U.S. regions have already started down this path.

Planning for the Future

Marine planning and ecosystem-based management promote developing long-term goals that are driven by stakeholder input and tied to a vision of a desired future. Effective goals must balance environmental concerns (including healthy ecosystems, natural habitat, water quality, and aquatic life) with human-use needs (including recreation, seafood, transportation, security, housing, industry, tourism, and energy). For marine planning to succeed, stakeholders must accept the planning goals.

Additionally, long-term goals and visions should define objectives that can lead to numeric targets that direct specific actions. Marine planning and EBM provide strong management platforms. First, marine planning brings decision makers, planners, and stakeholders together to develop goals for a desired future. Ecosystem-based management provides recommendations to achieve consensus on goals. Marine planning then provides a structure that coordinates actions to achieve goals at the federal, regional, state, and local levels.

Information Needs

Resource and human use planning require identifying and mapping the natural resources and the human uses and activities in the management area. By way of resources, our coastal and marine areas offer locations with high wind, tidal, or current energy; rich mineral deposits; and high-value ecological habitats, such as oyster beds, coral reefs, seagrass and kelp beds, deep-water sponge grounds, salt marshes; and other areas of enhanced plant, algal, and animal diversity and productivity.

These biological "hot spots" support high numbers of species and are vital juvenile nurseries, feeding areas, and nutrient cycling areas. We cannot adequately protect these areas without identifying their locations and values. Further, mapping these locations, along with current and potential human uses, can mitigate conflicts.

Of course, such spatial planning requires information. Federal and state partners are working to develop mapping approaches, maps, and data to improve information quality and quantity and to provide other tools such as consistent naming and classification standards such as the Coastal and Marine Ecological Classification Standard. Additionally, a central repository for marine planning data and related tools is maintained online through the National Ocean Council and federal partners at ocean.data.gov. (See related article in this edition.)

The cumulative and additive effects of multiple stressors lead to more rapid environmental change than would any one stressor acting individually. By looking at environmental trends of the past, planners can determine if environments and ecological resources have been stable, improving, or degrading. By projecting these environmental trends into the future, regional personnel can consult with partners and stakeholders to predict possible future conditions, identify favorable and unfavorable futures, and plan actions accordingly.

This iterative approach depends on ecosystem-based management and science-based tools to identify areas and ecosystems at risk for degradation. Marine planning provides a structure that applies these tools to inform management actions to curtail damage.

Marine Planning is About Balance

A fundamental element is balanced stakeholder involvement—including the public, tribal leaders, industry, nonprofit and private groups, energy, recreational and commercial fishing, tourism, and landowners. Successful marine planning is inherently participatory, drawing from workshops, outreach, and other specific actions to involve stakeholders of all types.

The goals:

- maintain healthy and sustainable coastal and ocean ecosystems, healthy economies, jobs, and energy;
- support the ocean use expectations of the concerned public and stakeholders.

When we protect and maintain a sustainable environment, we also protect a sustainable economic future. Economies that draw from or depend upon natural resources cannot sustain long-term economic growth when the necessary resources are continuously degraded.

Finally, we must plan for the future, rather than revisit previous decisions. Marine planning manages coastal and ocean uses in a transparent way, but the planning process is not intended to create new regulations or restrictions. This approach uses spatial context to coordinate existing regulations to bring about a more desirable future. This kind of planning allows considerable flexibility for regions, states, tribes, and other

stakeholders to determine regional goals, desired marine uses, pathways and actions, or even to opt out of marine planning entirely.

Marine planning directs federal agencies to coordinate coastal and marine actions around national priorities and objectives and to provide support to interested regions and states in setting and achieving regional objectives. This approach gives voice to all concerns, regardless of environmental or economic leanings, and promotes balance in managing our valued environmental resources together with human use needs. Marine planning offers our nation opportunities to address cumulative impacts and thereby ensure that sustainable coastal and marine environments can support future generations.

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For more information:

NOAA's Coastal Services Center tools, including the Habitat Priority Planner, are available at **www.csc.noaa.gov/tools/**. Additional digital coast tools are available at **www.csc.noaa.gov/digitalcoast/tools**.

Marine protected area information is available at **http://marineprotectedareas.noaa.gov**.

Ecosystem-based management tools help practitioners incorporate scientific and socioeconomic information into decision making. For more information on tools, visit **www.ebmtools.org/about_ebm_tools.html**.

Access Coastal and Marine Ecological Classification Standard information at **www.csc.noaa.gov/benthic/cmecs/**.

The National Ocean Council maintains a central repository for marine planning data and related tools at **ocean.data.gov**.

A Slippery Fish

Effective, integrated marine resources management.

by Mr. Steven M. Tucker
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The American way of life was built, in part, on the economic returns and societal dividends gleaned from existential ties to the sea. Early European visitors traversed the seas in search of fish, whales, trade, and respite from a nation struggling under the weight of monarchy and a culture hobbled by intolerance. Their predecessors, natives to this land, were accustomed to the various moods of the sea and skilled at harvesting its bounty—generally doing so in keeping with its ability to replenish harvested resources.

Today, the U.S. stands at the forefront among maritime nations, benefitting from sustainably managed fisheries, a robust maritime transportation network, and a national system of marine protected areas.[1] Despite these close ties to the sea, our legacy of effectively managing human activity that affects the ocean is far from perfect and, like other parts of our nation's environmental capital,[2] requires immediate attention. The different tiers of our government have grappled with managing access to and use of public trust resources comprising the ocean, our coasts, and the Great Lakes since America's inception. Agencies have been charged to either promote or constrain activities in the marine environment, while looking through the lens of their different authorities that advance disparate and sometimes conflicting purposes.[3]

"Americans have long looked to the sea as a source of security and prosperity. Bounded by two oceans and the Gulf of Mexico, and criss-crossed by a myriad of inland waterways, America's destiny as a maritime nation was a story foretold."
—President Barack Obama, National Maritime Day, 2009.

Some Persistent Challenges

The majority of U.S. fisheries are sustainably managed, but some stocks are diminished and remain less productive, even as the U.S. imports 90 percent of its annual seafood products.[4] Some fishermen struggle to remain in business despite regulations necessary to meet rebuilding targets, often by lowering the efficiency of their fishing activities, with the corollary effect of reducing fishing effort and fleet capitalization. The "fight for fish" [5] has erupted in more distant waters, and the Coast Guard and Navy have been brought to bear to curtail illegal, unregulated, and unreported fishing occurring in seas far from North America, but where shared interests have led to international agreements targeting this illegal activity.[6]

Additionally, coastal communities across much of the U.S. are confronted by sea level changes and are subject to the sea's penchant for redrawing the coastline, particularly in areas where shoreline armoring, revetments, and tidal channel manipulation have attempted to change dynamic features into static fixtures. The ocean is incrementally inundating America's coastal marshes and submerging the plains where rivers meet the sea. This inland march of extreme tides promises heightened demand for investment to repair and protect existing coastal infrastructure—a precursor to the bill that will come due when roads, utilities, and neighborhoods will need to be relocated.

This phenomenon has been known, measured, and tracked for decades, and yet many areas are unprepared to relocate coastal infrastructure and to deal with the looming threat to properties and resources.

Episodic effects from coastal storms that drive water ashore produce greater damage, so that persistent actions that manifest as narrowing beaches and shifting channels are often suborned to more immediate priorities.[7]

To prepare for and respond to challenges such as these, we need to move toward a more coordinated approach among governments and stakeholders, drawing on ecosystem-based management inclusive of human activities, undertaken in a strategic manner with the aid of adaptive and, when called for, precautionary approaches.

Marine protected areas can provide growth opportunities for sectors of the ocean economy, such as recreational diving. Photo: Joe Hoyt, NOAA, Thunder Bay NMS.

Resources at Risk

Species at risk and their habitats will figure prominently in marine planning efforts.

Through the Endangered Species Act and the Marine Mammal Protection Act, Congress chose to afford certain species additional protection from human disturbance. To implement the resulting safeguards, human activities may be subject to additional scrutiny or pre-empted by the need to protect listed species and their habitats.

For the Coast Guard, these protective regulations create dual responsibilities. The Coast Guard must take the necessary steps to ensure that its own operations give due consideration to listed species concerns, while also enforcing regulations that safeguard these species. This is not a new development. For example, in the waters off Alaska, the Coast Guard has been enforcing regulations to protect marine mammals since the late 1800s.[8] As an agency specifically cited in the Endangered Species Act, the Coast Guard is consistently engaged enforcing regulations for protected species and the special challenges that this activity presents.

More recently, in 2002, the Commandant of the Coast Guard signed *Ocean Steward*, a strategic plan for marine protected species, which articulates the Coast Guard's commitment to be responsible stewards of the nation's marine resources and charts a course for the service's work to engage partners and stakeholders to do likewise.

Illegal "takes" resulting from contact with protected species at sea are sometimes inadvertent, unintended consequences of legitimate activities such as fishing or boating or even the byproduct of attempts to assist animals in distress. Regulations that protect listed species may derive from different laws, focus on a narrow set of actions, or comprise broad prohibitions. For example, fishing regulations in certain areas or for the harvest of certain target species may prescribe gear modifications to reduce endangered seabird bycatch or mandate specific fishing hook configurations to reduce bycatch. Regulations also limit large commercial vessel speed when whales may be present or prohibit vessel transits of a designated habitat area. Such regulations require different enforcement approaches and can present difficult choices for enforcement planners seeking the best alternative to ensure compliance with regulations and ultimately support species recovery.

However, activity at sea is only increasing in areas where protected species exist. Fortunately, while

Photo by Claire Fackler, NOAA National Marine Sanctuaries.

there is no single approach that mitigates the risk of vessel collisions, an evolving network of technologies and communication capabilities help reduce that risk. For some species, detection and notification is a feasible approach. Some species of whale are large enough and tend to be near the surface frequently enough that they might be observed by mariners or lookouts, keeping watch in accordance with known periods of increased density. Others vocalize and can be detected by listening devices. Today, drawing from direct observations, various monitoring approaches, and probabilities based on past records, we can develop a reasonable, actionable estimation of the relative risk of whale/vessel encounters.[9]

Marine planning can help ensure regulations take into account static habitat characteristics and factors such as relative risk of encounters based on species distribution, seasonal migratory patterns and other more dynamic patterns, and to place these characteristics in the context of anticipated human activity.

Keeping the "Management" in Ecosystem-Based Management

Ecosystem-based management (EBM) is the first of nine priority objectives developed to translate the National Ocean Policy into "on the ground" and "in the water" results. However, implementing EBM is hampered by a number of factors including discontinuity between geopolitical boundaries and the edges of discrete habitat types, difficulty delineating and quantifying "the links between ecosystem components and benefits to humans,"[1] and a persistent margin of uncertainty often associated with limited and incomplete data sets.

Efforts to implement ecosystem-based management can run aground on the topic of scientific uncertainty and the challenges inherent in teasing apart and binding up elements of complex, interdependent natural systems. "Successful management requires the ability to understand and predict the sea's varying physics, biogeochemistry and ecosystem interactions in space and time.... There will always be a level of uncertainty or a lack of data in a particular area, but it should not be used as an excuse to postpone a marine spatial planning process."[2]

It is management's role to choose a stepping-off point, ensuring that decisions are informed by the best available science and also that lingering scientific uncertainty does not hold progress hostage. Ecosystem-based management establishes the scope for management efforts and a framework for such decision making. The manner in which decisions are carried out and implemented varies, but three management techniques hold special promise for marine planning and ecosystem-based management:

- anticipatory actions,
- adaptive management, and
- precautionary approaches that address cumulative effects.

Anticipatory Actions

Anticipatory management is essential to successful ecosystem-based management. Science has a foundational role in formulating sound planning efforts and developing prudent public policy. Scientific knowledge and understanding of marine and Great Lakes ecosystems is greater than it has ever been, yet when data is so diverse and abundant, this can be a management challenge. Additionally, we will know even more in a short period of time, and that data may uncover heretofore unrecognized linkages among environmental processes or bring to light new ways that human activities benefit, impact, or make use of these resources.

Still, we have ample evidence to illustrate the jeopardy that we find ourselves in when we fail to act in the face of some uncertainty. Anticipatory actions are often based on information considered in the context of identified trends and necessarily driven by subject matter expertise rather than scientific certainty.

Adaptive Management

Adaptive management is a series of steps tailored to a particular management arrangement that ensures actions are properly keyed to desired results, monitored over time, amended to accommodate changing circumstances, incorporate new information, or otherwise evolve to keep pace with the dynamic nature of the ocean environment and myriad human uses.

Precautionary Approach

A precautionary approach places a premium on avoiding unanticipated impacts and those impacts that could exceed the span of control for mitigation measures (i.e., irreversible damage).[3] This approach generally requires the proponent of a regulated activity to affirmatively demonstrate that adverse impacts are unlikely or will not occur, rather than going forward based on a presumption that unacceptable impacts will not follow unless they are known to be a certainty.

Application of the precautionary approach was identified as a guiding principle for "management decision and actions affecting the ocean" in the final recommendations of the Ocean Policy Task Force. Accordingly, there may be circumstances when a bias toward action is warranted (resource protection actions that are not wholly proven, but may stave off irreversible impacts, for example). Conversely, a precautionary approach to a proposed action that cannot prove that it can be conducted in a benign manner may favor restraint.

Regulators are working to develop the most appropriate way to incorporate this concept, when applicable, into existing regulations. Managers may have additional latitude to

Marine Protected Areas

The increasing imprint of human activity on ocean resources and the changing parameters of ocean chemistry, climate, and overall condition are catalysts for designating new areas of the world's ocean and America's seas as "special" or protected. International frameworks such as the Convention on Biological Diversity's Aichi accord under the Convention for Biological Diversity, recognize the role that marine protected areas can play in a balanced palette of ocean uses. The Aichi accord, for example, calls for 10 percent of coastal and marine areas to be conserved and equitably managed by 2020—a target that would leave 90 percent subject to an even less certain future.[10]

However, the somewhat vague nature of the term "marine protected area," or MPA, has proven to be both an asset and a challenge, and conceptions of MPAs and implications for the application of different types of MPA, vary. When interpreted broadly, any area where human activities that affect the sea are constrained can be considered a marine protected area. Fishing regulations, discharge prohibi-

apply these tenets through the decisions they make every day, prioritizing research activities, shaping programmatic priorities and balancing the multitude of interests and demands that bear on natural resources under their purview.

Cumulative Effects

Assessing potential cumulative effects is similarly challenging and requires decision makers to weigh trade-offs among outcomes that are inherently uncertain. This approach can be problematic when it is initiated during a regulatory process. Proper scoping and incorporating cumulative effects into deliberative and planning process are critical components of success.[4]

Fortunately, the approach is a great fit for advance planning efforts such as those called for in marine planning. Spatial analysis is one preferred tool for analyzing cumulative effects and it is emerging as an important tool for portraying existing ocean uses and establishing a credible baseline. As such, marine spatial planning models that can incorporate or emulate cumulative effects can provide a window into the future of ocean uses, rather than a snapshot of its current state.

Future Efforts

Today, improved data and advancements in science and data processing shed new light on cumulative effects and their bearing on ocean resiliency. Initially, this work grappled with large data sets on a global scale, fitting known patterns of use and known environmental sensitivities to indicate aggregate stress on ocean areas.[5] Working on a global scale comes with inherent challenges in the disparate and patchy nature of available data, but also affords the opportunity to aggregate features, while still providing useful information.

This is the same scoping challenge that has confronted ocean stakeholders and managers at various tiers of government from the outset and spans the breadth of coastal and ocean issues from hazards and emergency response to restoration and stewardship. Developing data and tools of adequate resolution to address general priorities and concerns that are common to a diversity of environments and jurisdictions is a challenge distinct from honing in on high-resolution findings adequately tailored to address regional, state, and tribal priorities. The key is ensuring compatibility across these tiers of management and governance.

Accordingly, regional planning bodies have evolved in some parts of the country working to bridge the gulf that sometimes exists between broad national priorities and locally implemented solutions. Marine planning is one framework to organize these efforts, capable of producing visual representations and tangible products that reflect capabilities, stressors, and environmental characteristics at different degrees of resolution. Work is underway to move beyond abstract discussions of such frameworks and to build decision support tools that move these concepts into action.

In Massachusetts, for example, survey-based data regarding cumulative impacts from human activities was integrated into a spatial framework to model the coupled "natural and human" elements of the marine ecosystem.[6] Rollout of the web-based visualization and decision support tool (MIDAS) that draws on these relationships is anticipated in late 2013.

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tions, and a multitude of other regulations can create these *de facto* marine protected areas, even when they are undertaken in isolation rather than pursuant to a management scheme. A more nuanced understanding of the role marine protected areas can play is evolving and steps are being taken to distinguish between regulations that function in isolation and areas subject to management planning efforts. As this conversation evolves, confusion should subside over whether all of the sea, or merely a small percentage, is already protected. Efforts are being made to refine the lexicon and to call out the potential downside of merely declaratory designations.

In a 2008 report, the Marine Protected Areas Center identified the Coast Guard as the federal agency with the largest area of *de facto* Marine Protected Areas under its purview.[11] This could hardly have been contemplated in 1787 when Alexander Hamilton opined: "A few armed vessels, judiciously stationed at the entrances of our ports, might at a small expense, be made useful sentinels of our laws." [12] Nor, one might argue, would a more deliberate and directed approach to the nation's maritime interests have led to such an outcome. While the Coast Guard has broad enforcement authority and remains sentinels of our laws at sea, its regulatory role is tied to its statutory authorization and its role to directly manage natural resources generally tracks with the baseline obligations incumbent on all federal agencies. Many of the activities that unfold in accordance with Coast Guard's 11 statutory missions play important roles in support of resource management, but they are not resource management efforts in their own right. This disconnect is one indicator that our nation's approach to the ocean, our coasts, and the Great Lakes requires fresh thinking.

Enforcing marine protected area regulations can be a complex proposition involving more than routine patrols that may result in opportunistic enforcement. Ensuring accountability for individual vessels that exceed speed limits, discharge regulated or prohibited materials, or harvest fish in excess of quota or that are protected from harvest, are vital enforcement functions. Identifying individual operator noncompliance is one consideration for enforcement planning, but winnowing away at one illicit activity at a time is an approach that is drastically disproportionate to the task of gaining compliance.

Sound enforcement practice considers data that better characterizes the range of environmental conditions that shed light on patterns of use and provides insight into factors that could lead to noncompliance. Effective enforcement programs deploy forces and interact with mariners in a manner that fosters improved compliance throughout the maritime community. Activities that complement traditional enforcement by fostering voluntary compliance and increasing the likelihood that noncompliant behavior will be reported and addressed can act as force multipliers and improve the reach of a modest force operating across such a vast area.

Finally, marine protected areas that are designated for their relatively pristine environmental qualities in remote reaches of the ocean that are subject to low levels of human presence or activity raise challenges for management and enforcement. These precautionary designations, intended to safeguard representative sites from activities that could result in degradation or loss, can be particularly alluring to private interests that can profit from the natural resources there. However, monitoring and providing at-sea enforcement in such areas comes at a steep cost. Patrols of remote areas require intensive planning, involve greater transit times and often involve other complexities that must be factored into enforcement planning. Coast Guard vessels, boats, aircraft, and personnel engaged in these functions are not available to support efforts to monitor, manage, and enforce more proximate areas that may be less resilient and may be subject to more frequent and more intense activities.

Open seas are becoming more crowded, demanding efforts to balance interests and protect resources. U.S. Coast Guard photo by Petty Officer Barbara L. Patton.

These specially designated marine areas are important touchstones for our shared history, as rally points for coastal and marine stewardship, as

important venues for marine science and education, and as important destinations that generate economic benefits for communities and businesses. Efforts to refine this lexicon are important. Marine planning efforts will depend in part on developing clear terms that are consistently applied and have the same meaning for managers, enforcement officials, the scientific community, and stakeholders.

As Senator Maria Cantwell so aptly stated, "Our Blue Economy has been the foundation of our economy for centuries in the past, and it holds tremendous potential to growing economic opportunities for future generations. Our challenge is to strike a balance between maintaining the economic and social benefits of our oceans and coastline while protecting the vital marine ecosystem resources." [13]

America's enormous exclusive economic zone—at 3.36 million square nautical miles, the world's largest—has the potential for greater economic activity. The maritime economy is evolving at a global scale, and America's commitment to remain at the forefront will benefit from a dedicated effort to improve coordination among decision-making authorities and to strengthen the scientific basis for forward-leaning policy that is consistent, predictable, and transparent.

Once, vessel masters exercised absolute discretion for navigation practices on transoceanic voyages. Today, to prepare for more effective rescue operations, improve transit efficiency, and to manage complexities introduced by ever-larger vessels and more dense patterns of traffic near major ports, that cone of discretion has been narrowed. In addition, regulations to address endangered species affect marine transportation cost and efficiency.

For example, off the shores of the U.S., mandatory and recommended practices have been promulgated to reduce the likelihood of vessels colliding with North Atlantic right whales (and by extension, other species). Various measures have been implemented, which produces a patchwork quilt of approaches and introduces greater complexity into orchestrating activities in the maritime realm. Strategies to manage vessel traffic include:

- areas to be avoided,
- traffic separation schemes,
- recommended routes,
- mandatory ship reporting areas,
- seasonal management areas, and
- dynamic management areas.

Transparency, collaboration and engagement are hallmarks of successful marine planning. Photo by Claire Fackler, NOAA National Marine Sanctuaries.

These tools vary in their approach and intended outcome,[15] and are tailored to address a particular concern or threat in a particular area. Marine planning can provide an additional framework to weigh approaches to mitigate risk, ideally placing a premium on preserving mariner discretion, while also facilitating efficient, consistent maritime transportation and adequate safeguards for species vulnerable to related disturbances.

Also, among the promising but largely untried economic opportunities are the potential to convert kinetic energy from waves, winds, tides, and currents into electricity; the potential to access rare metals and as-yet untapped repositories of oil and gas; and the promise of new medications and other compounds that may be brought to light through proprietary inquiry. In these areas, private inventors and entrepreneurs will augment existing or foster new economic drivers that ultimately benefit the American people.

The nation's future can also be enhanced by recovering the ocean's capacities that have been depleted, changed, or altered, if we rise to the challenge to do so. For example, in 2009, the National Oceanic and Atmospheric Administration found that the value of rebuilding U.S. fish stocks would increase annual dockside landings value by $2.2 billion—a 54 percent increase in the landed value at that time.[16]

Planning for Prosperity

Is marine planning as described in the National Ocean Policy the solution? Realigning the nation's approach to the ocean, our coasts, and the Great Lakes to ensure responsible stewardship of public trust resources is timely. This change to prioritize marine planning holds the promise of more predictable, effective, and efficient permitting decisions; improved results from resource management and stewardship activities; and

a more proactive approach to reduce use conflicts and improve critical ecosystem resiliency.

Marine planning provides a deliberate, systematic approach to managing ocean uses, removing barriers to unprecedented projects, and establishing a roadmap for project approval and resources to help identify the concerns of greatest consequence. It will improve consistency for the project and proposal review that builds on similar work and fosters confidence by providing more predictable regulatory review.

Looking Ahead

The ocean plays a pivotal role in our lives, releasing into the atmosphere half of the oxygen that we breathe and playing a key role modulating global climate. It provides food for our tables, removes excess heat from our power plants, moderates our climate, and generates energy to light our homes. We cannot expect to continue to reap these benefits while managing impacts solely on an opportunistic basis, addressing effects after they occur, and engaging in management compartmentalized according to market sector, statutory authorization, or scope of expertise. The National Ocean Policy, particularly marine planning, calls for greater coordination among federal agencies, states, and stakeholders so that the public trust in the use and stewardship of ocean resources is preserved.

America's standing as a maritime nation is a product of geography, proximity, and perhaps, inclination. But our nation has addressed ocean issues sporadically, establishing management regimes to address perceived problems while relying on the vastness and seeming imperturbability of the ocean to take care of the rest.

We can no longer afford to leave the sea to its own device; the degree to which our activities affect the ocean demands closer scrutiny. While we have focused on particularly dire challenges, broader changes have come into play and their locus of effect is the sea itself. For instance, changing water temperature regimes, variations in circulation systems, migration patterns, and increasing ocean acidification will affect the base of the food web in ways that we are still working to understand.

Marine planning may not be the immediate panacea to accommodate the changing climate or the cumulative effect of decades of use on marine resources. But it charts a course to apply the power of spatial analysis and other tools and provides a framework to coordinate federal, regional, state, and tribal interests.

In the meantime, the Coast Guard is keeping a taut watch to protect those on the sea, protect the nation from seaborne threats, and to protect the sea itself. The Coast Guard fulfills a unique role, working to accomplish its missions with a small force that is at once a military force, a law enforcement agency, and a governmental organization. The service will continue to support the work of its partner agencies, advancing the National Ocean Policy, and participating in marine planning efforts to come.

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I Can't Believe We Mapped the Whole Thing

The Coast Guard Atlantic Coast Port Access Route Study.

by Mr. Emile Benard
Project Manager
Atlantic Coast Port Access Route Study

Mr. Pat Wycko
Lead, U.S. Coast Guard Atlantic Area
Coastal and Marine Spatial Planning

The U.S. Coast Guard must preserve navigational safety, even as new ocean uses emerge along the coastal regions of our waters, such as offshore renewable energy installations, including facilities that harness wind, currents, tides, and hydrothermal energy to generate electricity. This type of development is new in the United States and may present unanticipated marine and navigational safety challenges.

The Ports and Waterways Safety Act requires the U.S. Coast Guard to conduct a study of port access routes before establishing new or adjusting existing fairways or traffic separation schemes. This initiative poses significant challenges for the Coast Guard, as it evaluates navigational effects and makes recommendations on the suitability of proposed areas in compressed time frames. Moreover, regarding offshore installations, the Department of the Interior launched the "Smart from the Start" wind energy initiative in November 2010, for the Atlantic Ocean's outer continental shelf. This initiative is designed to harness the economic and energy benefits of our nation's vast wind potential, including outer continental shelf Atlantic winds, by implementing a permitting process that is efficient, thorough, and unburdened by unnecessary red tape.

To support DOI's wind energy initiative and the nascent marine planning effort, the Coast Guard Atlantic Area commander determined that personnel should conduct a port access route study for the entire Atlantic coast from Maine to Florida.

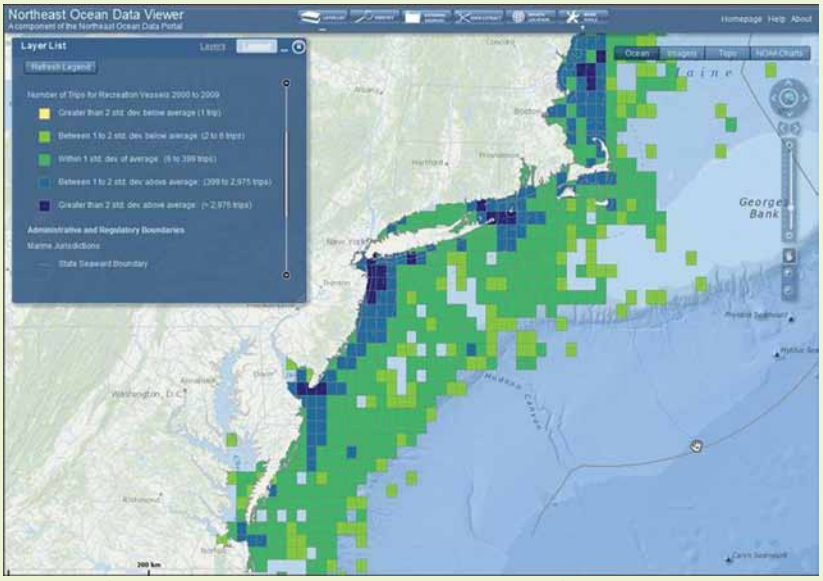
The Atlantic Coast Port Access Route Study

Through this unprecedented effort, Coast Guard personnel worked to:

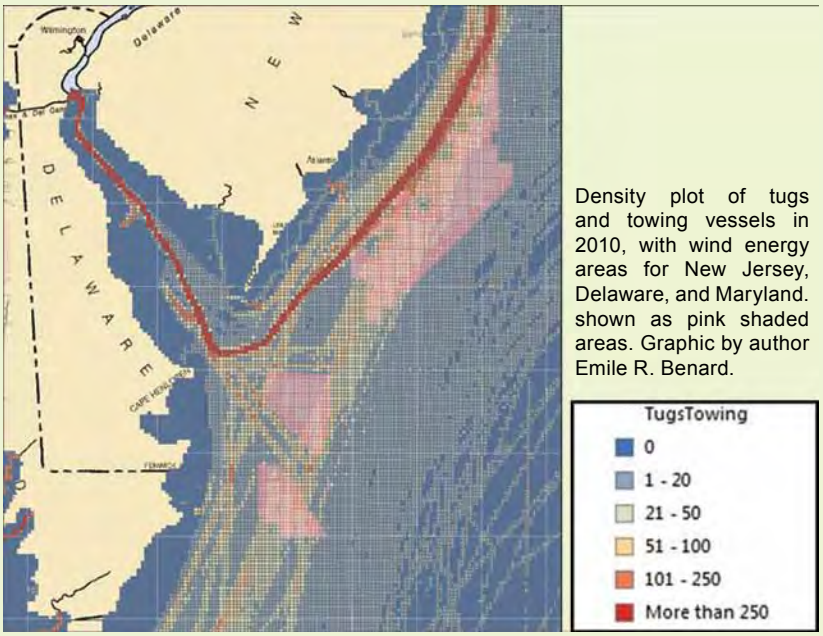
- identify all current users and anticipated new users of the Atlantic near coastal zone;
- determine what impact proposed alternative energy facility siting, construction, and operation may have on these users;
- evaluate whether routing measures should be modified or created to ensure the safety of navigation; and
- provide a baseline characterization of existing navigational routes that will support the National Ocean Policy's marine planning process.

In May 2011, the commander chartered the Atlantic Coast Port Access Route Study (ACPARS) workgroup, consisting of waterways management professionals from the Coast Guard, to meet the following objectives:

- Determine whether the Coast Guard should initiate actions to modify or create safety fairways, traffic separation schemes, or other routing measures.



Data layer from the data viewer available on the Northeast Ocean Data website depicts the number of trips for recreational vessels 2000 to 2009. Graphic courtesy of the Northeast Ocean Data website.



Density plot of tugs and towing vessels in 2010, with wind energy areas for New Jersey, Delaware, and Maryland. shown as pink shaded areas. Graphic by author Emile R. Benard.

To carry out this three-goal objective, the workgroup similarly developed its own three-phase process to identify traditional shipping routes, applying suitability criteria to make initial suitability determinations for areas proposed for development; predict changes in traffic patterns; and determine changes in navigational risk, given different siting and routing scenarios.

Phase One—Determine Suitable Development Areas

During this phase, U.S. Coast Guard personnel gathered data via stakeholder outreach and published two requests for comments in the *Federal Register,* which received 129 individual submissions. Work group members also gathered information and statistics on the marine transportation systems and the many uses of our coastal waters to help predict future trends.

Although outreach and stakeholder comments provided invaluable information, Automatic Identification System (AIS) data has been the primary source of information to determine traditional vessel routes. That said, there were many challenges with initially processing and analyzing AIS data. To overcome these barriers, workgroup members partnered with personnel from the Bureau of Ocean Energy Management and the National Oceanic and Atmospheric Administration (agencies that were also analyzing AIS data) to provide many of the early workgroup products like "heat maps," displaying vessel traffic intensity.

Since then, the type and availability of AIS products have greatly improved. For example, Automatic Identification System data is now available online through the Marine Cadastre, which also hosts ocean planning tools and a data registry, and regional portals such as the Northeast Ocean Data Portal or the Mid-Atlantic Ocean Data Portal. Regional efforts are also underway to gather vessel and usage data that AIS doesn't capture, such as commercial fishing and recreational boating information.

With this readily available information, we can use geospatial displays to view multiple layers simultaneously and quickly identify any conflicts in tasks like evaluating proposed areas for leasing.

- Provide data, tools, and/or methodology to assist in future determinations of waterway suitability for proposed projects.
- Develop, in the near term, Automatic Identification System products and provide other support as necessary to assist Coast Guard districts with planning emerging coastal and offshore energy projects.

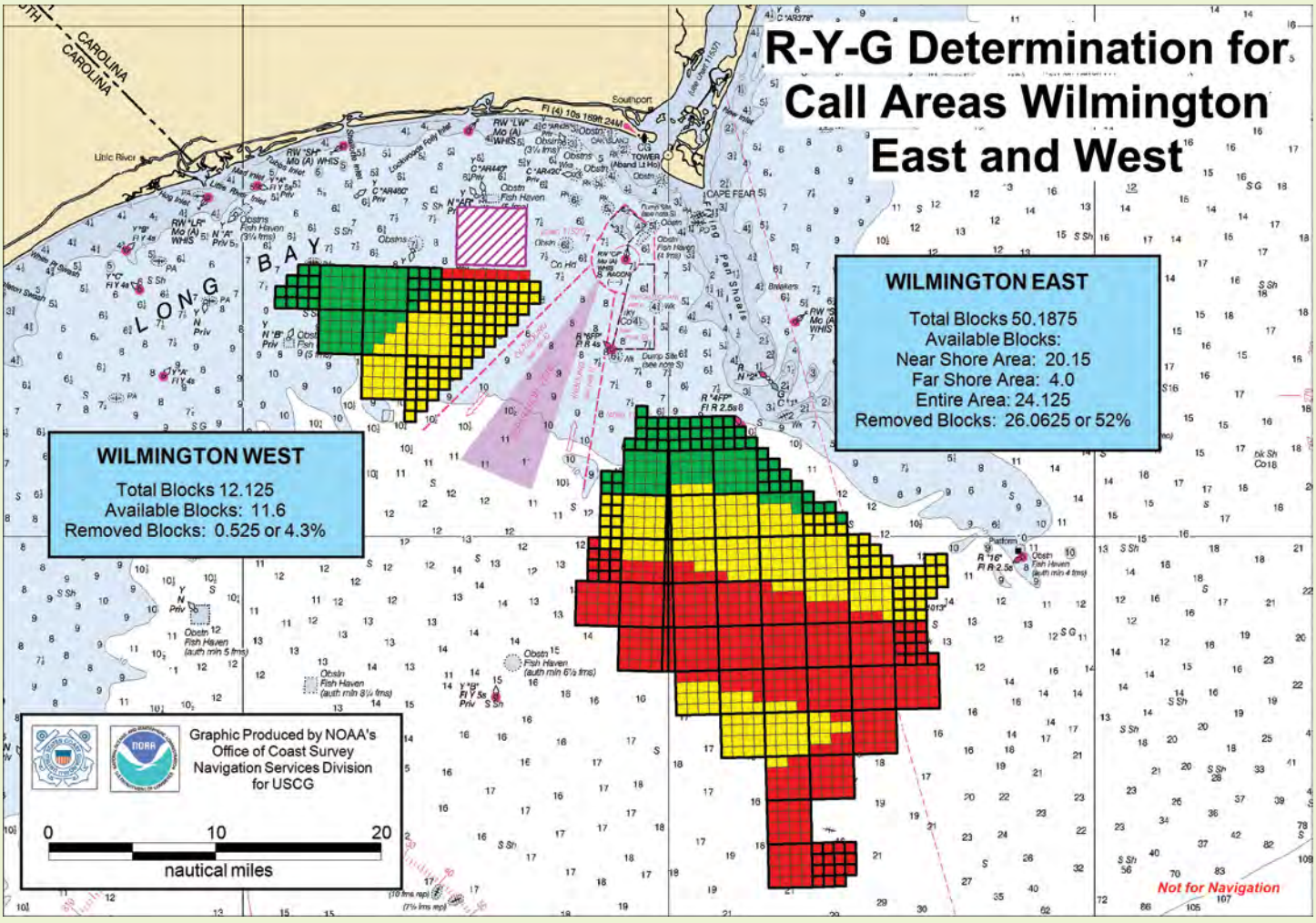
Phase Two—Predict Changes in Traffic Patterns

During this phase, workgroup members created a standardized, repeatable, and defensible process to make initial determinations of what areas may be suitable for wind farms—relative to identified vessel routes. Gleaning information from guidance developed in the United Kingdom, the workgroup determined the level of risk associated with siting wind farms within certain distances from shipping routes.

Workgroup members agreed that three break points between wind energy areas and vessel traffic routes were most significant and useful to this determination:

- **1 nm.** The minimum distance to the parallel boundary of a traffic separation scheme. At this distance, there would still be S-band radar interference and automatic radar plotting aids are affected. This is also the boundary between high and medium navigational safety risk.
- **2 nm.** The distance where COLREG compliance becomes less challenging, mitigation measures would still be required to reduce risk to as low as reasonably practicable. This is also the boundary between medium and low navigational safety risk.
- **5 nm.** The distance where there is minimal impact to navigational safety and risk should be acceptable without additional mitigation. This is also the boundary between low and very low navigational safety risk.

Armed with this information, the ACPARS workgroup members selected the transition points where risk went from high to medium (1 nm) and from low



Red-yellow-green determinations for North Carolina wind energy areas Wilmington-West and Wilmington-East. Graphic courtesy of NOAA.

Distance	Factors	Risk	
<0.25 NM	Inter-turbine spacing = only small craft recommended	Very High	RED
0.5 NM	Mariner's high traffic density domain	High	
1.0 NM	Minimum distance to parallel boundary of TSS	Medium	YELLOW
1.5 NM	S band radar interference - ARPA affected	Medium	
2.0 NM	Compliance with COLREGS becomes less challenging	Medium	
>2.0 NM	But not near a TSS	Low	
5.0 NM	Adjacent wind farm introduces cumulative effect. Distance from TSS entry/exit	Very Low	GREEN
10.0 NM	No other wind farms	Very Low	

Risk levels at varying distances from vessel traffic routes, derived from the United Kingdom Maritime Guidance Note 371. Chart by Mr. Pat Wycko, U.S. Coast Guard Atlantic Area.

to very low (5 nm). They labeled the edge of a shipping route out to 1 nm red, indicating it is not suitable for development based on existing traffic routes. Between 1 nm and 5 nm, a moderate level of risk remains and was labeled yellow, indicating additional safety measures may be required to mitigate the risk. And finally areas greater than 5 nm from a shipping route are expected to pose minimal impact to navigational risk, so were labeled green.

III Phase Three—Determine the Risks of Varied Siting and Routing Scenarios

Phase three was beyond the scope of the Coast Guard—so the workgroup sought BOEM's assistance to complete the modeling and analysis.

The Atlantic Coast Port Access Route Study workgroup requested specific deliverables including an analytical determination of routes and a geospatial information system-based model to predict traffic density and patterns. The modeling and analysis process is ongoing and the final report is expected in late 2013. With that report in hand, the workgroup expects to complete a final ACPARS report shortly thereafter.

Coordinated Efforts

Although the project is not quite finished, it's clear that the ACPARS workgroup has been an effective forum to leverage limited resources to accomplish a large-scale project. Collaboration among subject matter experts throughout Coast Guard headquarters, Atlantic Area, and districts to develop methodologies, core language for correspondence, and outreach tools has resulted in higher quality products, consistency, and economies of scale.

Finally, coordinated efforts not only enabled the larger project of studying the Atlantic Coast as a whole, but also provided the support necessary for CG districts and sectors to engage in individual state task forces in an effective manner.

About the authors:

Mr. Emile Benard is an associate with Booz Allen Hamilton, supporting the Coast Guard Atlantic Area as the project manager for the Atlantic Coast Port Access Route Study. He is a retired Coast Guard commander with extensive experience in program management and analysis. He was formerly the chief of the Waterways Management Branch at Coast Guard Atlantic Area. Mr. Benard holds a B.S. in applied science from the United States Coast Guard Academy and a master's degree in industrial hygiene from Johns Hopkins School of Hygiene and Public Health.

Mr. Patrick Wycko is the Coast Guard Atlantic Area lead for the National Ocean Policy and coastal and marine spatial planning. He is a subject matter expert on offshore energy siting.

For more information:

To access marine planning information and tools, visit:

www.marinecadastre.gov/default.aspx

www.northeastoceandata.org

http://portal.midatlanticocean.org/portal/

Using Science to Inform Marine Planning

by Dr. Rodney Cluck
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Division of Environmental Sciences
Bureau of Ocean Energy Management

Dr. Amardeep Dhanju
Senior Ocean Policy Analyst
Bureau of Ocean Energy Management contractor

A plan is only as good as the information used in the planning process, and marine planning is no different. The National Ocean Policy, which is the result of Executive Order 13547, establishes a framework to improve ocean and coastal resource stewardship. The policy envisions marine planning as a science-based tool that addresses ocean management challenges. Marine planning also allows the opportunity to move from the current sector-by-sector approach to a resource management framework that considers the needs of multiple sectors simultaneously.

In addition, marine planning can enhance baseline data quality and provide valuable information on cumulative regional impacts. National Ocean Policy implementation is intended to improve federal agency coordination that supports new research and enhances marine planning data accessibility and availability.

Science in Marine Planning

Marine planning is a comprehensive, ecosystem-based management approach to address conservation, economic activity, user conflict, and sustainable use of ocean and coastal resources.[1] Even a casual observer knows there are multiple uses of our oceans and coasts, some of which can interfere with other uses. For example:

- Sunbathers enjoy the beach, but are kept away from beaches that are prime sea turtle nesting areas during the endangered turtle's nesting season.
- Commercial shippers must have access to sea lanes to move goods, but they have to make way for Navy and Coast Guard activities in those same areas. Likewise, those involved with planning military activities must consider the needs of other ocean users.
- Efforts to preserve shipwrecks can limit or prohibit fishing around such wrecks to avoid damage from trawling operations. This interferes with the commercial fisherman's access to such ideal fishing spots.
- Traffic lanes designed to improve vessel safety while entering and leaving ports must take into account whale feeding areas and offshore energy infrastructure.

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These competing interests demonstrate why resource managers must have a broad perspective to consider multiple uses in coastal and ocean management. Based on the best available science and data, regional marine plans can inform existing resource management measures, describe future desired conditions,

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and provide guidance to support regional actions moving forward.

Science can inform marine planning in many ways:

- Scientific information can enhance objectivity, minimize uncertainty, and build trust among stakeholders. Moreover, promoting scientific information over anecdotal evidence in a planning process diffuses conflict and clears the way for evidence-based discussions and negotiations.
- Scientifically collected and analyzed baseline data can provide an assessment of current conditions and can allow resource managers to assess the effects of their management decisions over time.
- A better understanding of physical, biological, and social science data regarding ocean uses will allow resource managers to set measurable goals.
- Data on seasonal "subsistence use" (hunting and fishing by native peoples) can be used to identify communities potentially affected by regional planning decisions.
- Modeling and simulations based on scientific information can create an enhanced understanding of coastal and offshore impact from climate change or human-induced catastrophic events such as oil spills.

Creating a New Ocean Science Framework

Providing effective science-based support for marine planning requires a collaborative framework that can harness the institutional capacities of science programs within federal agencies. Some federal agencies with an ocean role have created environmental science programs to inform their decision making. Research priorities in these programs have traditionally been determined by internal information needs, although much of the research that these programs have produced is also relevant to marine planning.

As the regional planning bodies voluntarily established under the National Ocean Policy implementation plan embark on regional marine planning exercises, such science programs can play an important role in meeting their information needs. For example, federal agency science programs can:

- partner with regional planning bodies to allow a comprehensive assessment of regional information and assist in identifying data gaps,
- ensure that existing data and information is easily accessible for marine planning,
- identify common information needs for marine planning across the federal agencies and regional planning bodies and include these needs as part of a research plan,
- collaboratively fund new research and share data from such initiatives,
- revamp their information dissemination capabilities to ensure that historic and current scientific data is publicly accessible.

The Bureau of Ocean Energy Management (BOEM), through its Environmental Studies Program (ESP), has started various initiatives to provide scientific information for marine planning.

Environmental Studies Program Initiatives

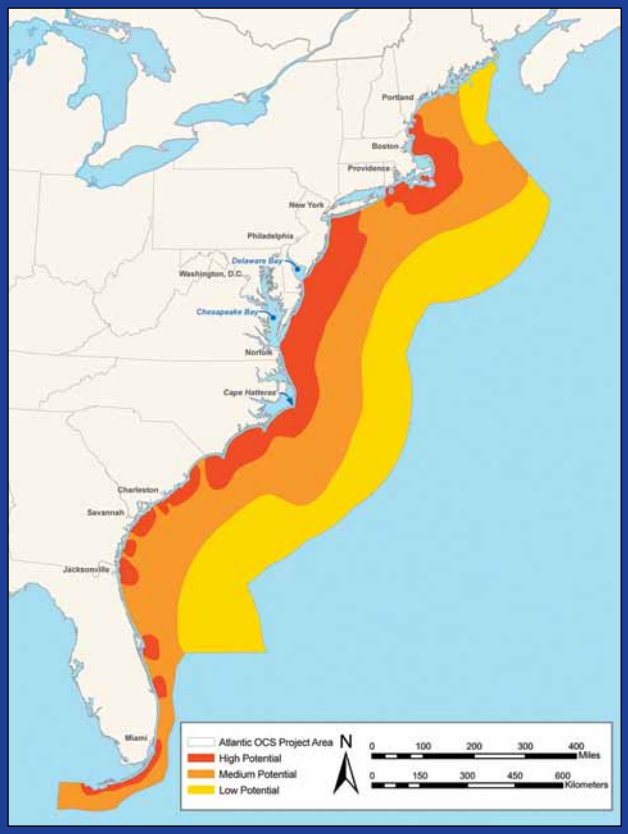
The Bureau of Ocean Energy Management's ESP plans, conducts, and oversees ocean research to inform outer continental shelf (OCS) energy and mineral resources management. ESP studies cover a broad range of

disciplines including physical oceanography, atmospheric sciences, biology, protected species, social sciences, economics, submerged cultural resources, and the environmental effects of energy development.

Findings from relevant studies are incorporated in the environmental review documents that determine the potential effects and mitigation strategies. These studies cover regions where stakeholders are interested in developing OCS energy and mineral resources, including areas along the Atlantic and Pacific coasts, the Gulf of Mexico, and Alaskan coast. Simultaneously, ESP personnel have undertaken a number of initiatives to ensure scientific information and other resources are available for marine planning.

- **Environmental Studies Program Information System (ESPIS):** This is BOEM's information management system, which makes all ESP reports, including images and graphics, available online as full electronic text-searchable documents. This system includes more than 1,100 technical summaries of BOEM-sponsored environmental research projects and more than 3,300 research reports spanning four decades. Currently, Environmental Studies Program scientists are revamping ESPIS to enhance its search capabilities and to allow linkages with MarineCadastre.gov, which is a GIS-based data and mapping system that is co-managed with the National Oceanic and Atmospheric Administration. In addition, Bureau of Ocean Energy Management personnel are creating a new data standards policy to streamline and enhance research data availability.[2]
- **Partnership with Udall Foundation:** BOEM created a partnership with the U.S. Institute of Environmental Conflict Resolution, a program of the congressionally established Udall Foundation, to offer training on collaborative leadership and stakeholder engagement to regional planning body members. These training sessions, tailored to regional needs and priorities, can build capacity for effective engagement among regional stakeholders and can create a solid foundation of collaborative skills at the onset of the marine planning process. This can strengthen regional working relationships, so all relevant parties can work together to address challenges that are inherent in any complex planning process.
- **Partnering with Regional Data Portals:** Regional ocean partnerships, such as the Northeast Regional Ocean Council and Mid-Atlantic Regional Council on the Ocean, have created interactive data portals to serve marine planning information needs. BOEM scientists are partnering with these regional portals to understand their information needs and to create electronic linkages with the agency's information system, so data can be served directly for use in regional marine planning activities.
- **Identifying Scientific Studies and Outreach:** Bureau of Ocean Energy Management personnel have identified a number of scientific studies that support its own mission and regional marine planning group initiatives. Relevant studies include:
  - **Bayesian Integration for Marine Spatial Planning and Renewable Energy Siting:** This study uses advanced probabilistic statistical methods to integrate oceanographic, ecological, and human-use data; stakeholder input; and cumulative effects to evaluate renewable ocean energy siting proposals. Findings from this study will support ocean renewable energy siting needs in the context of regional marine planning.[3]
  - **Compendium of Avian Occurrence Information for the Continental Shelf Waters along the Atlantic Coast of the United States:** BOEM scientists, in collaboration with the United States Geological Survey and the U.S. Fish and Wildlife Service, compiled a database of seabird observations along the Atlantic coast to model seabird distribution and to evaluate the importance of various biological and biophysical factors on select populations.[4]

Photo courtesy of U.S. Fish and Wildlife Service.



Potential for shipwrecks based on shipwreck density and geographic factors. Graphic courtesy of TRC Environmental Corporation.

- **Outer Continental Shelf Renewable Energy Space-Use Conflict Identification and Analysis of Potential Mitigation Measures:** This study identifies potential conflicts including new and emerging ocean uses, such as aquaculture and offshore renewable energy, and recommends mitigation measures. Information will be valuable to state, regional, and federal organizations, including coastal zone management agencies, state task forces, and regional fisheries management councils.[5]
- **Archaeological Site Occurrence Inventory and Analysis on the Atlantic Outer Continental Shelf:** This study gathers information on historic shipwrecks and models the potential for finding shipwrecks and submerged archeological resources at various sites, based on reconstruction of past landscapes, human settlement patterns with site formation and preservation conditions—particularly during the period of coastal transgression. It builds upon this body of work by exploring more recent research on prehistoric settlement patterns, and archaeological research to refine the predictive model for locating intact, submerged prehistoric archaeological sites.[6]

Looking Ahead

Humans are biased with respect to their "favorite" natural resources (such as coral reefs, sensitive habitats, marine mammals, sea birds, or cultural resources). Therefore, conversations that begin with bias will end with bias or they will end with competition to acquire what one values most at the possible expense of the greater good.

Because science provides an objective and rational basis for decision making, it is the only logical starting point for discussions regarding marine planning. As regional planning bodies are formed and the planning process begins, it is time for federal agencies to expand the scope of their ocean science programs, so that they can effectively serve a broad spectrum of future marine planning information needs.

About the authors:

Dr. Rodney Cluck is the chief of the Bureau of Ocean Energy Management Division of Environmental Sciences. He has served as BOEM's senior social scientist and as the project manager for the first U.S. offshore wind facility. Dr. Cluck holds a Ph.D. in environmental sociology from Mississippi State University and a master's degree in rural sociology from the University of Arkansas, Fayetteville.

Dr. Amardeep Dhanju is a senior ocean policy analyst with Avanti Corporation on a contract to the Bureau of Ocean Energy Management, to assist with the National Ocean Policy initiative. He holds a Ph.D. in Marine Studies from the University of Delaware.

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Marine Planning Along the East Coast

A realistic approach.

by Ms. Kris Ohleth
Director of Permitting
Atlantic Wind Connection

The ocean is a busy environment; this can be daunting for most ocean users, but especially for an offshore energy developer. Offshore energy is the "new kid on the block" when it comes to ocean uses, and we are still working to understand how it will best fit into the ocean-user mix.

Marine planning is one important tool that can help address today's multifaceted ocean environment and balance offshore energy siting with other uses. Appropriate marine planning allows developers and stakeholders to consider the effects of any offshore energy project early on, during the project's siting and development phases.

For example, the Atlantic Wind Connection (AWC) is a proposed undersea transmission cable that will span the mid-Atlantic region, beginning in northern New Jersey and eventually extending to southern Virginia. The transmission line is designed to connect wind farms that are anticipated in the federally designated wind energy areas 10 to 12 miles off the adjacent coast, to move offshore wind electricity from its generation site to where it is needed and most valuable.

When the winds are calm and the wind farm output drops, the line will move conventional energy resources from places where there is surplus power to places where the demand—and the price—is high. This capability can help buffer power outages and have a moderating effect on price extremes in different markets. In addition, the grid along the coast is generally weak, and building a high-capacity cable paralleling the coast will strengthen the grid and make it more reliable.

The Nuts and Bolts

There are three basic physical components of the AWC project:

- submarine and land-based transmission cable,
- offshore converter platforms, and
- land-based converter stations.

More than 700 miles of cable will be buried in trenches offshore. Six offshore converter platforms located 12 to 15 miles offshore will be supported by offshore jacket foundations. Six land-based converter stations will be located about 10 miles inland to connect the cables to existing substations at the strongest points of the terrestrial electrical grid.

Capable of carrying 6,000 megawatts of offshore wind, the Atlantic Wind Connection project is designed to increase the reliability and efficiency of the existing land-based electrical grid. All graphics courtesy of the Atlantic Wind Connection.

There will be six offshore platforms associated with the project, each capable of converting 1,000 megawatts of alternating current power (collected from the offshore turbines) to direct current power for delivery throughout the system.

Of course, with a large-scale project such as this one, it is important to properly site it, using a deliberate and focused protocol to anticipate use conflicts, conflicting jurisdictional issues, and possible delays. These risks can be managed by applying the principles set for marine planning and the process for moving from idea to proposal to development and construction should be more predictable.

A Layered Process

While we knew the Atlantic Wind Connection would be sited off the coast of New Jersey and run south to Virginia, we needed to further micro-site the project to avoid use conflicts and minimize environmental effects and costs. So the development team employed a geographic information system (GIS)—a digital mapping program that allows users to develop maps to assist an ocean energy developer with project siting issues.

GIS is a powerful analytical tool, and we found it particularly useful to identify stakeholders in a particular area and to provide insight into the patterns of their ocean use. It allows the user to gather location information and data points about types of resources and activities, and then plot them as "layers" of data. When the locations of activities and resources are stacked one upon the other to form a use map, potential conflicts are easier to identify.

For example, one of the layers of the map can show shipwrecks, while another can show where fishing activity takes place. This information helps developers identify and avoid areas of potential conflict and determine optimal preliminary project siting. This type of analysis is particularly helpful in the offshore environment, where the uses may be intermittent, the resources of concern are likely to be submerged, and the area under consideration is not readily available for visual review or inspection.

The Layers

The Atlantic Wind Connection team launched a GIS data-mining process to begin this process and create the layered map. For the offshore environment, the layers included:

- commercial and recreational fishing,
- shipping and navigation,
- shipwrecks and other physical obstructions,
- unexploded ordnance,
- essential fish habitat,
- proposed offshore energy developments,
- cultural and historic resources,
- potential offshore wind farm locations,
- sea-floor type,
- sand mining areas,
- marine mammal and other biological hotspots.

All of these layers were included in a geo-database, a spatial database to view the pertinent GIS data layers.

Building a Firm Foundation

Additionally, when collecting the data, it was critical to inspect it to understand its source, quality, accuracy, and applicability to the AWC siting process. So this data inspection and review process was lengthy and involved, but this was necessary to ensure that accurate, authoritative data provided the foundation for our geo-database. Those who work with datasets know that not all data are "created equal." It is the responsibility of the user to conduct a quality assurance/quality control review to understand the data and control for different methodologies, adequate metadata, and timeliness of the data, before using them in an analytical application.

Having located the data and conducted a sound review, the next step in the siting process was to position all of the data layers on top of each other, thus identifying the areas that have the highest use coincidence. We assumed that the areas of the highest use would most likely have the most users in the space

and, therefore, the probability of the most conflict. Our goal was to avoid all of those areas; and, based on this first assessment, we came up with a base map for the project.

Stakeholder Involvement

Including stakeholders is a critical component of marine planning, as is maintaining a transparent and open siting process. Accordingly, once the base map was prepared, we were able to meet with the many coastal- and ocean-based stakeholders to discuss our preliminary siting analysis.

However, identifying ocean stakeholders can be one of the most challenging parts of the engagement process, since almost all people are connected to the ocean in one way or another. So the Atlantic Wind Connection team cast its net as wide as possible, to include stakeholders like federal and state regulators; national, state, and local environmental groups; commercial ocean users (fishing, shipping, energy developers, etc.); the recreational fishing and boating communities; and any other stakeholders who accepted our invitation to engage.

Engagement Informs Stakeholders, Transforms the Project

When we began these meetings, many stakeholders asked why we were developing the Atlantic Wind Connection in the Mid-Atlantic area, which is an appropriate place to begin. Fortunately, as a result of our thorough marine planning process, we were able to give fact-based, well-reasoned answers. Specifically, the Mid-Atlantic region of the East Coast is the ideal place to develop offshore wind, because it has relatively shallow waters, a gently sloping offshore shelf, and lots of offshore wind. More specifically, New Jersey has long been considered the leader in the mid-Atlantic region for offshore wind, as it has been developing the policy, regulations, and financial mechanism to support the offshore wind industry for several years.

Based on these facts, the first phase of the AWC project (once approved) will be located off the coast of New Jersey—connecting northern New Jersey to southern New Jersey, and connecting the offshore wind farms along the way. This system is called the New Jersey Energy Link and will enable offshore wind energy from multiple turbines to be delivered to state regions that need it most.

The meetings with stakeholders were profoundly helpful, and the stakeholders weren't the only ones to learn important things. When we met with offshore wind energy developers to discuss the location of the cables on the seafloor, the developers had concerns that the AWC transmission cables would negatively impact their design requirements for locating the wind farms' own cables. Without this input, we might have moved forward, making decisions about siting and permitting a project that may have had a negative impact on the industry that the project is designed to support.

The first phase of the project will be the New Jersey Energy Link, which is capable of carrying 3,000 megawatts of offshore wind and delivering it to the strongest points on the terrestrial grid.

The Process Continues

Marine planning was a critical component to the progress of the AWC project, and we will continue to rely heavily on continued sustained stakeholder participation and engagement in keeping with marine planning principles. Offshore wind and the Atlantic Wind Connection can be an opportunity to create jobs; to deliver lower, more stable energy prices; and to improve our electric system. The AWC team continues to work to provide an offshore transmission system that advances important renewable energy goals, is environmentally responsible, and has the lowest cost and greatest benefit to all.

About the author:
Ms. Kris Ohleth is the director of permitting for the Atlantic Wind Connection transmission project. Her previous positions include policy manager for coastal and marine spatial planning issues for the Ocean Conservancy, director of environmental affairs for two leading offshore wind energy developers, research technician and editor for the National Marine Fisheries Service, and as a communication coordinator for the Nature Conservancy. She holds a master's degree in coastal and ocean policy from the University of Rhode Island.

Northeast Regional Ocean Planning

Commitment to collaboration.

by Ms. Michele DesAutels
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Ms. Betsy Nicholson
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National Oceanic and Atmospheric Administration

Mr. John Weber
Ocean Planning Director
Northeast Regional Ocean Council

Northeast region map. Courtesy of the Northeast Regional Ocean Council.

The U.S. Coast Guard has limited resources to carry out its 11 statutory missions, but it also has a long-standing history of collaborating with other agencies to achieve its goals. Thus, it is no surprise that the Coast Guard is committed to being a cooperative player in advancing Northeast regional ocean planning efforts. Through our partnerships, we are finding that the same motivations are common across federal, tribal, and state governments.

The need for a more comprehensive approach to managing the Northeast ocean and coast is self-evident, through many illustrations of increased demand for ocean space and our inability to address this larger context of activities under current mandates. For example, traditional uses, such as commercial fishing, face challenges to maintain practices; others, such as commercial shipping, continue to grow due to Panama Canal expansion and an increasingly ice-free Arctic. At the same time, newer uses such as renewable energy and aquaculture, are actively seeking appropriate sites.

Two major initiatives have jump-started the Northeast regional ocean planning initiative. For example, Rhode Island and Massachusetts have comprehensive ocean plans for the territorial sea and outer continental shelf adjacent to their coasts that provide baseline data sets, based on reliable science and research and address a wide spectrum of ocean uses to facilitate efficient decision making.

The Northeast Regional Ocean Council

In 2005, New England governors formed the Northeast Regional Ocean Council (NROC), as a federal and state partnership that helps local government agencies address ocean and coastal issues pertaining to their region. NROC's mission is to provide a voluntary forum for governmental partners in cooperation with stakeholders, to discuss balanced approaches regarding Northeast regional ocean and coastal resource uses and conservation.

NROC has standing committees and leverages capabilities to address areas including:

- ocean and coastal ecosystem health,
- coastal hazards resilience,
- ocean planning.

Foundational Elements

Several key elements are necessary criteria for effective ocean planning and are likely models for other regions to consider—including a concerted effort to work with subject matter experts to gather relevant and timely data on existing and new uses and natural resources in the region.

Additionally, there needs to be a healthy amount of diverse stakeholder engagement, primarily by reaching out to those directly affected by the possible outcomes of ocean planning. As one example, NROC works directly with the recreational boating community to map recreational boating activity patterns.

Information

Decision makers of any discipline must have access to relevant, timely information especially when dealing with the ocean, which has many uses and overlapping authorities and hosts complex ecosystems. In response, Northeast Regional Ocean Council members formed a working group to collect and share regional spatial data on human activities, natural resources, and jurisdictional information for New England's coasts and ocean waters. The result: the Northeast Ocean Data Portal (see sidebar).

Additionally, NROC has engaged with marine industry stakeholders in a project to characterize industry sectors, identify key issues and trends relevant to their industries, and serve as a starting place for

The Northeast Ocean Data Portal

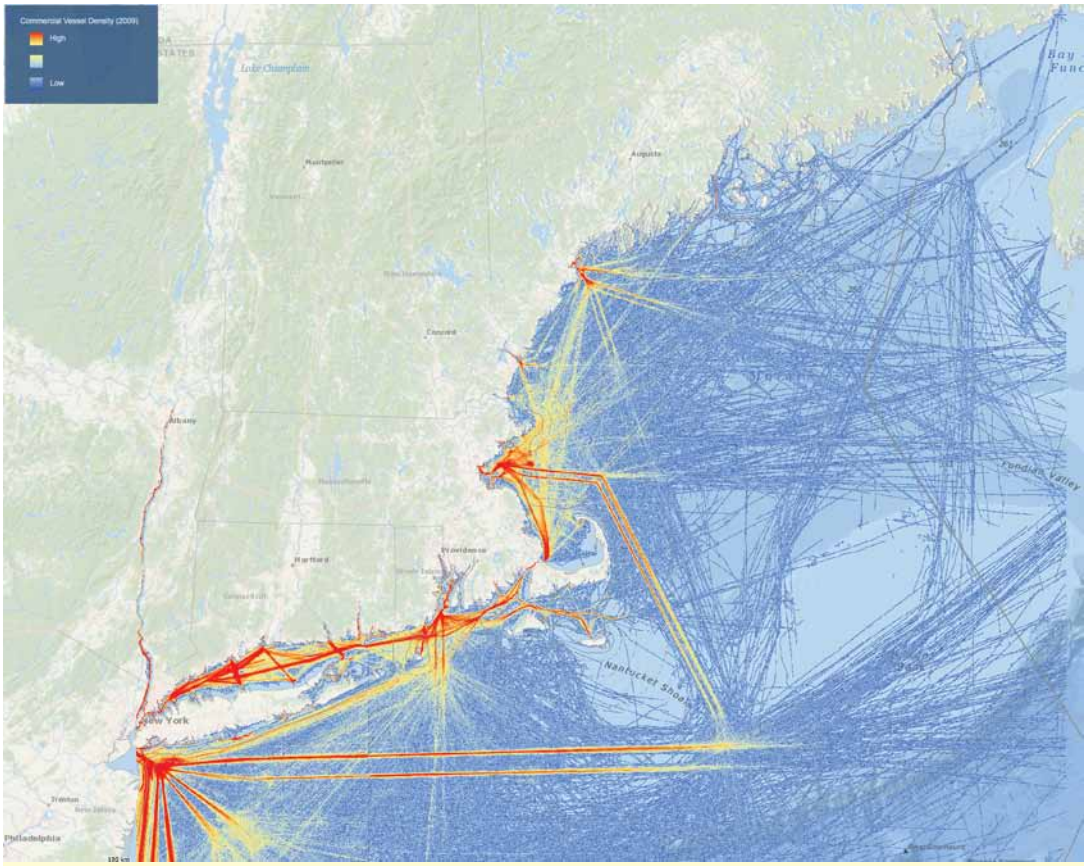
http://northeastoceandata.org

A product of a working group comprised of participants from NROC, the Nature Conservancy, the Northeastern Regional Association of Coastal and Ocean Observing Systems, SeaPlan, NOAA, and ASA Science Associates, the Northeast Ocean Data Portal is an ocean use data clearinghouse. With readily available information, regulators and ocean users have greater perspective on the totality of activities in the Northeast planning region.

The portal launched in 2011 and provides spatial data products and links to other data sources. It features the Northeast Ocean Data Viewer, a user-friendly online application that shows data on human uses, environmental features, and political and administrative boundaries. It also includes a catalog with downloadable data files, a directory of web-mapping services, and a guide to other data resources, along with a select listing of ocean planning authorities in the region. The primary audience includes regional managers, ocean stakeholders, and technical staff participating in planning, although the information is useful in other ocean management and industry contexts.

The portal builds on existing efforts in the region (including individual state data as well as national and regional systems). In general, the approach to developing data products includes working with specific constituencies by developing draft products, reviewing them with representatives of the issue, and then refining final products based on that review and stakeholder feedback. For example, in addition to recreational boating work, NROC has undertaken a project to use certain commercial fisheries data to map the spatial footprint of commercial fishing in the Northeast. The resulting draft maps were discussed at meetings with fishermen, fisheries scientists, and fisheries managers prior to their completion.

The portal is updated as data products are developed in response to identified priority regional data needs, including ocean uses, biology and habitat, and oceanography. Additionally, NROC and regional partners will discuss additional functions and decision-support tool development to further address needs as regional ocean planning advances.



Atlantic AIS vessel traffic count in 2010. Graph courtesy of the Northeast Ocean Data Portal.

future discussions. The council's focus on this project included:

- aquaculture,
- maritime commerce (including ports, shipping companies and pilots),
- energy (including offshore wind, marine hydrokinetic, natural gas and transmission).

Through interviews, surveys, and direct dialogue with industry members, Northeast Regional Ocean Council members produced a series of white papers that analyze resultant key publications and reports.[1]

Stakeholder Engagement

NROC's transparency and broad participation have been keystone principles since its inception, serving as the convener for regional ocean planning discussions. Robust and meaningful stakeholder engagement is widely recognized as one of the essential elements for successful ocean planning. Specific characteristics of good engagement that build trust and confidence in ocean planning and the entities leading the process include:

- reaching out to a wide range of stakeholders by going beyond engagement of only the most obvious leaders of well-established interest groups;
- providing a variety of mechanisms and forums for engagement;
- demonstrating how stakeholder input is taken into account in ocean planning and decision-making processes;
- helping stakeholders understand how ocean planning can improve livelihoods.

Most recently, the Northeast Regional Ocean Council has been successful in implementing a process for regional participation with key deliverables by revamping the website to be more user-friendly, holding open and interactive meetings, creating annual public regional workshops to share and gather input on ocean planning goals, and creating targeted user community meetings to confirm data. The NROC's state and federal co-chairs also lead quarterly public council meetings that include information regarding future strategic planning and partner updates.

Additionally, annual public workshops include a participatory effort to define the needs of particular human uses, as they relate to physical space and associated infrastructure requirements and as they change, based on technological trends and economic drivers. Specifically, in support of the National Ocean Policy, NROC held the first regional ocean planning workshop in March 2012, with a design based on best practices from individual state efforts. This forum served to inform participants from across various audiences (federal, state, tribes, industry, non-governmental organizations, academia) about progress to date and provided opportunities to submit input that builds commitment and support and helps define NROC's vision.

Since then, the Northeast Regional Ocean Council has launched several key community projects. Through one of its partners, SeaPlan, the council is able to obtain spatial and economic information on

recreational saltwater boating activity throughout the Northeast, directly from boaters, through a detailed online survey. The Northeast Regional Ocean Council is also involving the science and conservation communities to identify and better understand natural resource conservation issues that can be addressed through ocean planning. Finally, NROC is reviewing a range of approaches to marine habitat classification that can help advance ocean habitat management. In all of these projects, the council is connecting with key stakeholders to review data and identify ocean planning issues.

Collaboration

The breadth and complexity of ocean planning requires a collaborative approach. The Northeast Regional Ocean Council benefits from and values close relationships with other regional organizations that have financial resources, expertise, and time devoted to similar ocean management challenges, and the council has formalized this effort through a memoranda of understanding with the Northeastern Regional Association of Coastal Ocean Observing Systems, the Regional Sea Grant Consortium, and the U.S. Association of the Gulf of Maine.

NROC will also capitalize on the partnerships and engagement to date through a regional planning body that includes federal, tribal, state, and New England Fishery Management Council representatives, and will demonstrate shared leadership through federal, state, and tribal co-leads. While the Northeast Regional Ocean Council has focused on information gathering and engagement, the regional planning body complements these efforts by undertaking high-level discussions on policy, planning, and products.

Additionally, regional leaders from 15 federal departments or agencies including the First Coast Guard District, formed the New England Federal Partners in 2006 to address subjects such as ones that involve ocean planning. Participating agencies signed a common statement of purpose committing to collaboration on ocean planning, climate change mitigation, and adaptation issues. This partnership also enabled a critical conversation regarding incorporating ocean planning into federal regulatory processes.

Along those lines, the First Coast Guard District, the National Oceanic and Atmospheric Administration (NOAA), and the Environmental Protection Agency held a federal regulatory framework workshop in Boston in September 2012. Attendees included the National Ocean Council director and deputy director, along with 35 regulatory and planning representatives from nine federal agencies, who discussed challenges and possible solutions to better respond to the constant inflow of new technologies and projects in Northeast coastal and ocean waters.

Two key workshop take-aways:

- Early consensus is needed on the appropriate agency lead. Nuances of a project proposal can change responsibilities and have a domino effect on the rest of the lead regulatory and subject matter expert agencies.
- Address gaps and overlaps. There are situations where agencies have the knowledge or authority on a topic but lack practical enforcement or inspection ability.

Coast Guard Interaction

Ocean use is expanding at a rate that challenges the Coast Guard's ability to manage significant and often competing demands without negative impact to its ability to protect the ports, coastal waters, and sea through waterways management, law enforcement, and environmental protection. The First Coast Guard District recognized this challenge and has been involved in the Northeast Regional Ocean Council and the New England Federal Partners since inception—initially co-leading the Ocean Planning Committee well before the National Ocean Policy emerged. It has become obvious that stronger, more comprehensive, and better-integrated ocean and coastal governance regimes will have a positive impact across virtually all First Coast Guard District mission areas.

In November 2012, the Northeast Regional Planning Body (RPB) convened for the first time in response to the President's National Ocean Policy. Federal, state, and tribal partners engaged in ocean planning. Northeast Regional Planning Body members (from left) Mr. Tim Konnert, Federal Energy Regulatory Commission; Mr. Tom Burack, NH Dept. Environmental Services; and Mr. Doug Harris, Narragansett tribe. Photo courtesy of NOAA.

Port Security at the 2012 Boston Harborfest. U.S. Coast Guard photo by Petty Officer Jetta H. Disco.

Ocean planning is not a new concept to the Coast Guard or to other federal agencies and states in the Northeast region. The Coast Guard has been working with the public, industry, state, and tribal partners for decades to ensure safe, secure, and productive waterways. With the First Coast Guard District as a committed collaborator, NROC has become even more effective and remains at the forefront of change aimed at preserving our coasts and oceans for future generations.

A better understanding of current and potential human uses of the ocean, active and inclusive stakeholder engagement, and continued commitment to partnerships will enable the Northeast region to achieve its social and economic goals and ensure a healthy ocean.

In addition to participating in projects in which the Coast Guard has expertise and significant equities (such as maritime commerce), the First District has delivered key data for the Northeast Ocean Data Portal and is leading an effort to support National Ocean Policy implementation through a comprehensive, organized, and consistent communication and outreach program. This effort concentrates on specific activities and communication methods to gather input into the ocean planning process primarily from within the First District and with key stakeholders. It is serving as a model for other Coast Guard districts and government agencies to raise staff awareness of ocean planning and connecting it to their regular duties.

About the authors:

Ms. Michele DesAutels is a Coast Guard subject matter expert on energy and ocean planning policy and procedures. She came to Boston after working at DOE and DOI, through her appointment as a Presidential Management Fellow, focusing on renewable energy policy, communications, and administration.

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Mr. John Weber provides strategic direction for the Northeast response to the National Ocean Policy, particularly ocean planning efforts. He served as the ocean program manager for the Massachusetts Office of Coastal Zone Management, where he managed the Massachusetts Ocean Management Plan in 2009.

Endnote:

1. NROC's key publications and reports are available at http://northeastoceancouncil.org.

Federal Relations with Native Americans

Marine planning offers a seat at the table.

by Dr. George Stetson
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The federal government's relationship with Native Americans is based on two contradictory ideas: Native American tribes are distinct political communities with sovereign rights to self-determination, and the U.S. government has a responsibility to protect them. Thus, the history of this relationship is both murky and complex.

In 1831, in *Cherokee Nation v. Georgia,* Chief Justice Marshall wrote: "Indian tribes are in a state of pupilage," and that they look to the government for protection and kindness. He even suggested that they think of the president as "their great father." However, Marshall also argued that the Cherokee were a distinct political entity "capable of managing [their] own affairs and governing [themselves]." As a way to reconcile these two ideas, Marshall found that Indian tribes were domestic dependent nations, which were dependent on and subordinate to the federal government, but also retained certain rights to self-governance.[1] In reality, the tension between these two ideas has never been resolved.

A Long and Winding Road

The historical relations between the federal government and Native Americans can be described as a arduous path that ultimately led to broad-based consensus recognizing Native American rights to self-determination. This path, built on an explicitly racist foundation, held that Native Americans were inferior people who needed protection, guidance, and a benevolent government (or father figure) to make decisions on their behalf.

In *United States v. Kagama* (1885), which dealt with federal rights to enforce criminal law on reservations, the court described Native Americans as weak, helpless, and dependent on the United States. Rejecting the idea of any sort of consent, one commissioner of Indian Affairs in the late 1800s spoke of Native Americans as "children," suggesting that you would not ask the consent of an 8- or 10-year-old child regarding investing funds. These sentiments ended up in official U.S. policies such as forced assimilation and removal to boarding schools.[2]

This paternalistic approach finally began to shift significantly in the early 1970s when President Nixon pushed Congress to officially recognize Native Americans' self-determination. The change came as a response to the utter failure of assimilation policies that tried to force Native Americans to integrate into mainstream society, or, more drastically, in policies that sought to erase Native American culture altogether. These approaches had dire consequences for Native American peoples, in many cases, leading to poverty-stricken, ailing communities, and by creating reservations that had become utterly dependent on aid and guidance from the federal government.

President Nixon argued that Native Americans should determine their own future rather than the federal government. It was, to a certain degree, an attempt to place decision-making power in the hands of Native American officials and to promote the idea of Native American sovereignty and self-determination. However, given the long history of exploitation of Native American peoples and their often dire social state,

Chief Alfred Berryhill, from the Muscogee Nation of Oklahoma, speaks with members of the Deepwater Horizon response team during a 2010 government-to-government tribal consultation in New Orleans. U.S. Coast Guard photo by Petty Officer Rob Simpson.

the federal government also recognized that it had a responsibility to provide for and to protect Native American peoples and their interests. The solution Congress came up with was a "modified trust responsibility" that cobbled together these two contradictory doctrines. The policy provided federal services and, simultaneously, protected tribal sovereignty and resources.[3] This notion of a modified trust still defines the relationship between the federal government and the Native American tribes.

> **"First Americans hold a unique place in our history. Long before others came to our shores, the first Americans had established self-governing societies. Among their societies, democracy flourished, long before the founding of our nation." —*Executive Order 13175***

Moving toward self-determination, however, required Natives Americans to become more involved in the decisions that affect their lives and futures. This is recognized in U.S. laws and regulations including President Clinton's 2000 Executive Order 13175, *Consultation and Coordination with Indian Tribal Governments.* President Clinton ordered: "I reaffirm our commitment to tribal sovereignty, self-determination, and self-governance by issuing this revised executive order on consultation and coordination with Indian tribal governments."[4] The goal: Institute meaningful consultation and collaboration with tribal officials as a vehicle to uphold Native American rights to self-determination. This mandate, binding on all executive departments and federal agencies, has been supported by each president since. Most recently, President Obama issued an executive memorandum that required all federal agencies to develop a plan to implement Executive Order 13175.

The Challenges of Meaningful Consultation and Collaboration

The consultation process is an important component to building relations between the government and Native Americans. Put differently, the absence of consultation would necessarily constitute a violation of Native American rights, which would undermine self-determination. Many Coast Guard personnel who have worked with Alaska Natives can attest to the value of government-to-government consultations.

However, it is worth asking if the consultation process, albeit valuable, is a sufficient mechanism to move toward Native American sovereignty and self-determination. My own preliminary research on meaningful consultation and collaboration with Alaska Natives in the Arctic suggests that the current consultation process—although well-intentioned—falls short. After speaking with a host of individuals who are close to this issue, including Alaska Natives, my sense is that too often consultations are perfunctory exercises based on information-giving and that they take place after decisions have already been made. While consultations do establish good will and friendship, they do not necessarily engage Native American peoples as equal partners who have a say on the issues that will ultimately affect them. For many Alaska Natives, the consultation process is "broken."

My background work in Latin America focuses on environmental conflict between indigenous peoples and the state in the Peruvian Amazon. However, when I describe some of the problems with the consultation process in the Peruvian Amazon, most are surprised to learn how similar the two cases are.

In Peru, for example, one of the fundamental sources of conflict between the government and indigenous peoples is the ambiguity over the legal framework of consultation. The Peruvian government interprets consultation as a legal obligation to create dialogue, but one that does not prevent the government from implementing development projects without indigenous consent. Indigenous peoples, on the other hand, see consultation as a right, supported by national and international law, to actively pursue development

according to their own cultural values. In 2009, this ambiguity led to a violent conflict between Peruvian police and indigenous peoples, who clashed during a Amazonian indigenous rights protest.

In the United States, there is also a certain ambiguity about the meaning of consultation. Part of the challenge is that each federal agency must come up with its own plan to implement Executive Order 13175. As a result, there have been many interpretations of consultation, but very little consensus on its meaning.[5] This question is especially relevant in the Arctic region, where climate change is leading to increased economic opportunities in oil and gas development, mining, tourism, fisheries, and shipping. Although these developments will trigger increased consultation among federal agencies and Alaska Natives, ambiguity is likely to remain.

Consultation Does Not Necessarily Mean Inclusion

It is important to note, Native Americans have an opportunity to "consult" with federal agencies on issues that concern them; as such, in the case of offshore oil and gas development in the Chukchi and Beaufort Sea, the sheer volume and complexity of the legal policy framework surrounding the consultation process can be overwhelming. The Outer Continental Shelf Lands Act, the National Environmental Policy Act, the Marine Mammal Protection Act, the Clean Air Act, and the Clean Water Act all include consultation and public comment processes that require dealing with large volumes of information (thousands of pages), conducting and submitting written responses, providing oral testimony, and attending multiple meetings. This places a demand on the time, energy, and resources of the indigenous people. Furthermore, the volume and complexity of these processes can make it difficult to understand how local input shapes decisions.[6]

However, contrary to its implication, meaningful consultation is not necessarily about providing more opportunities to consult. A recent case study on the role of Native American tribes in fisheries management and policy in the Bering Strait region is particularly illustrative. According to social scientist Julie Raymond-Yakoubain, Alaskan tribes are frustrated and dissatisfied with the process of consultation with one federal agency and a regional council. Similar to the Peruvian case, the source of contention is related to what seems to be two distinct visions of consultation.

From the tribes' perspective, consultation boils down to having an active role in the decision-making process to manage and regulate fisheries. Part of the problem is related to the capacity of tribes to engage with the proper decision-making entities. The position of the agency and the council is that government-to-government consultation is not required at the regional council level, because under the terms of Executive Order 13175, it is not an "agency."[7]

This can be troubling for the tribes. Under the Magnuson-Stevens Act, the council is charged with developing plans and regulations for fisheries and, as such, acts as the *de facto* decision-making entity. In this context, tribes have not been able to protect fisheries resources, because they are not being engaged at this decision-making level. This is just one example of the current relationship between American Natives and the federal government, which recognizes that Native Americans have certain sovereign rights, but these rights are limited and, arguably, do not provide significant power to influence policymaking.

What Marine Planning Can Bring to the Table

Most recently, however, the Obama administration has placed an emphasis on implementing Executive Order 13175, which pushes the government toward what Chief Justice Marshall recognized: Most American Natives groups are distinct political communities under sovereign tribal governments with rights to self-determination. The fact that federal agencies recognize this, and to a large extent, have developed government-to-government consultation mechanisms is a good sign. Many federal entities, especially the U.S. Coast Guard, consult regularly with Alaska Natives on various issues. Marine planning, in particular, may present an opportunity to lay the groundwork for more meaningful consultations with Arctic and other indigenous peoples and help to reinforce the federal government's responsibility to honor Native American self-determination. While marine planning is not a panacea and should not replace


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government-to-government consultations, it might improve them.

First of all, marine planning could provide a venue to include Native American groups early on in the long-term planning process. Part of the problem with government-to-government consultations is that they often take place after decisions have already been made. Marine planning, in this context, could help create plans, projects, and policies that are in line with Native American values, insights, and perspectives.

Secondly, because marine planning is location-based, it provides Native Americans with spatially defined governance arrangements that can work in harmony with distinct Native American cultures that are directly tied to the marine spaces in which they reside. This has important political, ecological, and social ramifications. Politically, it allows for particular Native American groups to become involved in decision-making venues that are directly related to their own regions and, further, allows tribes to form alliances with other tribes based on ecological and marine spaces.

Ecologically, marine planning provides Native American groups a venue where they can use their knowledge of these spaces to improve the environmental security of the local marine environment. Socially, it permits Native American groups to integrate economic and social concerns of the local, coastal communities. Marine planning, consequently, could be a vehicle that allows Native American groups to shape planning decisions and projects in ways that are specific to the particularities of the marine environments they rely on to survive.

Finally, marine planning is an appropriate venue to build relationships. One of the most important aspects of marine planning is its dynamic planning, implementation, monitoring, and evaluation process. While the government-to-government consultation process happens in multiple instances, at times Native Americans may feel that consultations are one-time events that offer very little feedback. Because marine planning is an iterative process, it can create meaningful relationships with different Native American groups (officially recognized tribes, Native American corporations, non-governmental organizations, and such) at different levels.

This is especially important in terms of matching federal decision makers with Native American decision makers at the appropriate moments of the planning and decision-making process. Given the number of tribes (approximately 229 federally recognized tribes in Alaska), it is important to create ongoing venues where long-term relationships can foster with the diverse gamut of indigenous groups.

A Template for the Future

Not only is marine planning a valuable tool to improve policy decisions, but it can also improve the relationship between the federal government and Native Americans. The challenge, as I have indicated here, is to recognize that Native American peoples are not merely stakeholders, but rights-holders who have a special relationship with the U.S. government as sovereign entities with rights to self-determination.

That is, marine planning may work to incorporate mechanisms that will not only allow Native Americans the opportunity to voice their own opinions or concerns about decisions that may affect the land, waters, and resources that they rely on to survive and prosper, but will also allow them to have a seat at the decision-making table.

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Note: The views expressed in this article are solely those of the author and do not necessarily reflect the views of the Center for Maritime Policy & Strategy, U.S. Coast Guard, Department of Homeland Security, or any other U.S. government agency.

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Building Social Capital through Collaboration

by Dr. Tiffany C. Smythe
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Marine planning is often promoted as a tool to improve collaboration, resolve conflicts, and enhance decision making among government agencies, ocean and coastal users, and stakeholders. A collaborative planning process that involves a diverse group of ocean and coastal interests can have tangible benefits for all involved, and those benefits can extend far beyond the scope of the marine plan.

It's a Two-Way Street

Few know this better than Mr. Edward LeBlanc, chief of Waterways Management for nearly a decade at USCG Sector Southeastern New England. LeBlanc's office conducted the navigation safety review of the nation's first proposed utility-scale offshore wind farm—the Cape Wind proposal in Nantucket Sound—which came before the era of comprehensive marine planning. He is also the Coast Guard's reviewer for the Block Island offshore wind farm, proposed for a location based on the outcome of one of the nation's first marine plans—the Rhode Island Ocean Special Area Management Plan (Ocean SAMP).

"The contrast between these two processes could not be more striking," LeBlanc said. "Cape Wind was hugely contentious in large part because stakeholders felt they were not included in the initial planning stages. They felt that they didn't have a voice in the development of the proposal for a new use of the waterway. Conversely, most stakeholders in the Block Island proposal had already participated in the Ocean SAMP process, so felt comfortable when a proposal was made for a water area already identified—with their input—as compatible for wind farm installation."

Collaboration in marine planning is a joint activity through which individuals and organizations interact to make decisions and solve problems that cannot be solved independently. Collaboration should not be confused with legally required public participation processes, such as review and comment periods in which information flows one way. Rather, it is a joint, multi-dimensional effort in which government officials, users, and other stakeholders interact with each other to produce a specific outcome.

"It's all about relationships," said Jennifer McCann, extension leader at the University of Rhode Island Coastal Resources Center / RI Sea Grant (URI), who co-led Ocean SAMP development. "A successful collaboration is a healthy partnership. The two sides need to give and take equally, and there needs to be trust."

Social Capital

Collaboration is important in that it builds social capital, unlike a typical public comment process. Social capital refers to relationships among individuals characterized by respect, trust, credibility, reciprocity, and networks. As implied by the term "capital," these relationships can be valuable. Used properly, social capital provides access to information and resources, but it can also be relied upon in a crisis or to help solve problems. In addition, social capital can be leveraged to acquire other resources.

Most of us have experienced social capital firsthand through business relationships. For example, you develop a new working relationship with a colleague at another organization, and this colleague helps you by answering a question, providing a reference, or

The Coast Guard Academy Center for Maritime Policy and Strategy

In an era of a changing climate and extreme storms, increasing conflict regarding ocean uses, reduced fishing quotas, emerging maritime security threats, and dwindling government resources, the maritime domain needs social capital—and marine planning can help build it.

U.S. Coast Guard Academy Superintendent Rear Admiral Sandra L. Stosz recently initiated the Center for Maritime Policy and Strategy at the academy, which is intended to become a national center of excellence on this and other such challenges facing the maritime domain. Additionally, marine planning, collaboration, and other maritime governance matters are currently being integrated into the academy curriculum, preparing cadets to engage in today's maritime world.

U.S. Coast Guard Academy Superintendent Rear Adm. Sandra Stosz, right, speaks with Mayor Denise Michels of Nome, Alaska, and retired U.S. Coast Guard Rear Adm. Gene Brooks at the U.S. Coast Guard Academy. Brooks and Michels were invited to speak at the academy's Center for Maritime Policy and Strategy. U.S. Coast Guard photo by Petty Officer Diana Honings.

Mr. Grover Fugate, project director of the RI Ocean Special Area Management Plan, center, speaks with Bureau of Ocean Energy Management officials at a Rhode Island Sea Grant-sponsored international marine spatial planning conference. Photo courtesy of the RI Sea Grant/University of Rhode Island Coastal Resources Center.

introducing you to another key contact. Later, you do the same for him or her.

LeBlanc describes the benefits of social capital built through his involvement in Rhode Island's marine plan: "I met people who I didn't even know existed. It opened up a whole world for me of resources I can tap into, to make decisions regarding navigation safety, maritime security, and other Coast Guard missions."

The inherently complex nature of the maritime environment illustrates the need for collaboration and the value of social capital. A complex web of government agencies oversees ocean and coastal resource management: By one count, there are at least 20 different federal government agencies charged with implementing more than 140 federal statutes and regulations related to the ocean.[1] Moreover, the maritime environment is increasingly crowded by more users, interests, and issues. Traditional users like commercial fishermen and shippers are now joined by renewable energy developers and aquaculturists.

Maritime security presents another overlay of issues, as does the threat of global climate change. All of these agencies, users, interests, and issues intersect (and often conflict) in the maritime environment. "Marine planning is a way to coordinate action in shared jurisdictions, and to get information that you may not have, particularly about users of the marine environment," said Grover Fugate, executive director of the RI Coastal Resources Management Council (CRMC), the regulatory agency that led the state marine plan development.

Despite these challenges, there have been relatively few venues or established practices outside of project-specific permitting processes through which marine-related agencies and stakeholders come together, coordinate activities, and share information. And while project-specific permitting processes may bring agencies and stakeholders together, such processes can also devolve into conflict about the pros and cons of the project, especially if social capital has not been generated beforehand.

Providing a Seat at the Table

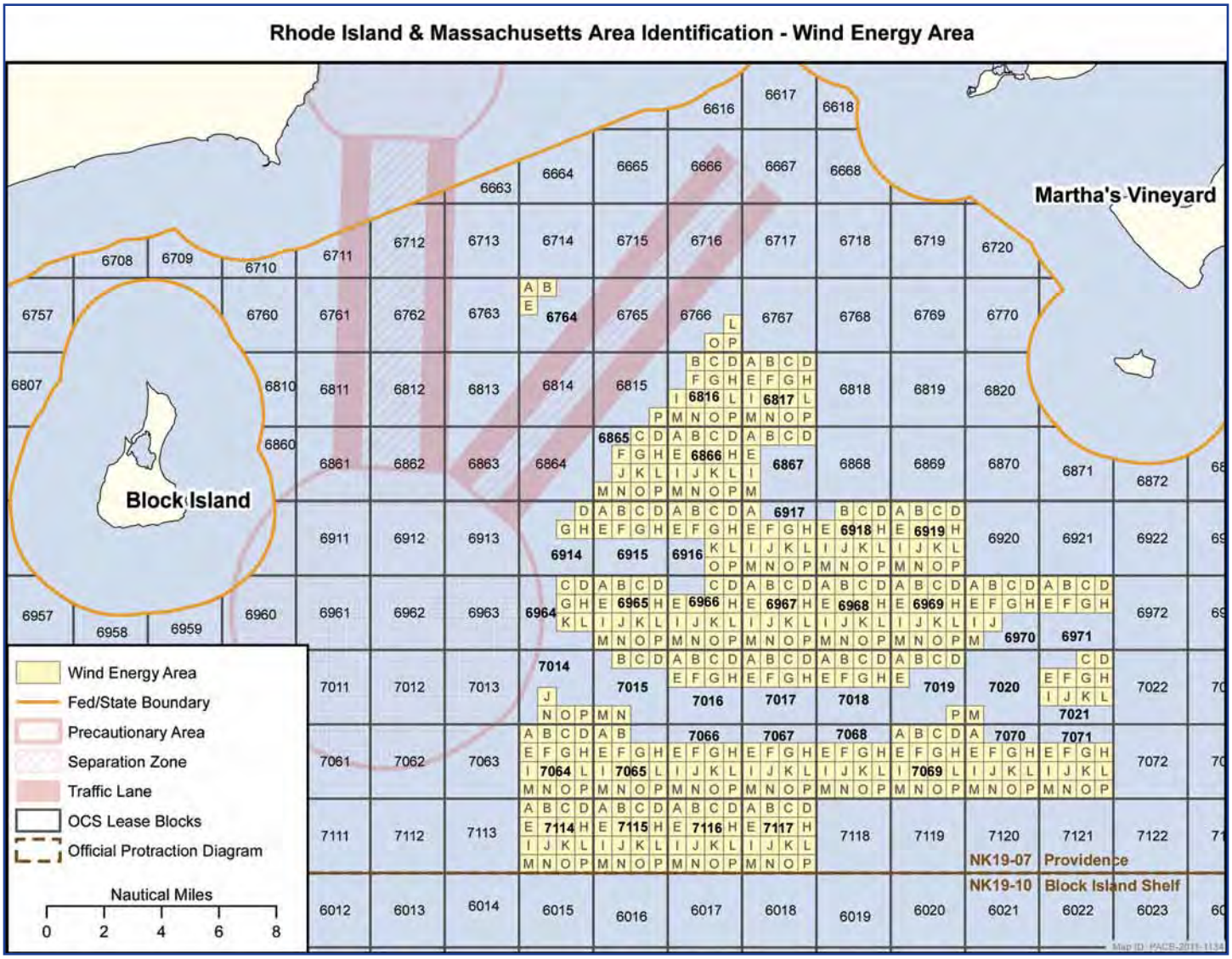
Fortunately, the Coast Guard and other agencies have a history of facilitating collaborative processes to address specific issues. For example, ports and

waterways safety assessments, port safety forums, and harbor safety committees all involve extensive collaboration among the Coast Guard, officials, users, and other stakeholders, and help develop social capital within port and harbor communities. Yet, these typically do not extend offshore, nor do they consider a full range of ocean resources and uses.

Additionally, collaboration through marine planning is truly comprehensive—not limited to any one specific issue, interest, project, or user group. In Rhode Island, marine plan development participants included members of the Coast Guard, Navy, and other government officials; commercial fishermen; scientists; town planners; environmental advocates; yacht racers; coastal residents; aquaculturists; historians; maritime industry representatives; and the Narragansett Indian tribe. Extensive collaboration among this diverse group of stakeholders helped build relationships among those who were not otherwise connected. Collaboration grants the opportunity to look at issues through a number of different perspectives.

Preservationist for Ceremonial Landscapes, Doug Harris, along with the Narragansett Indian Tribe Historic Preservation Office, found participation worthwhile:

"I got to understand things about fishermen and their issues … and hopefully they understand the tribal issues," Harris said. "We are all part of the same community, and we need to respect each other's interests



Map of the Rhode Island and Massachusetts wind energy areas excluding Cox Ledge. The beige lettered boxes represent areas available for future wind energy development; blue areas are excluded from consideration. Cox Ledge is roughly represented by the blue areas of boxes 7014 through 7021. Photo courtesy of the RI Coastal Resources Management Council, University of Rhode Island, and RI Fishermen's Advisory Board.

and imperatives. And, it was rewarding to be at the table and have an equal voice with all the stakeholders and the military—the Coast Guard and the Navy."

Benefits

The social capital built through this kind of collaboration has practical benefits that can extend far beyond the scope of an initial planning process. Consider, for example, the involvement of commercial fishermen in Rhode Island's marine plan. Prior to the RI Ocean SAMP, the RI Coastal Resources Management Council had no working relationship with most Rhode Island commercial fishermen, due to the regulatory program's focus on the near-shore environment. "Fishermen are vast users of the ocean who need to be engaged if we want to achieve a long-term sustainable fishery," Fugate said, adding that initial interactions with commercial fishermen were challenging. Fugate indicated that "the trust level has been built over time." He said, "Now we sit down, cooperate, and try to find win-win solutions."

That relationship has yielded benefits for all involved. CRMC officials and University of Rhode Island scientists have gained a wealth of information, including fishery activity areas and fishermen's local knowledge, which enhances the marine plan. "In meetings with fishermen, climate change often comes up, and they're seeing things, changes, that are often ahead of what the scientists are seeing," Fugate said. Fishermen have also gained new opportunities to have input into offshore energy siting via the CRMC Fishermen's Advisory Board. "I do feel better about this process than other processes," said Eastern New England Scallop Association President Michael Marchetti.

But the most notable outcome of this social capital to date took place about a year ago, after the marine planning process concluded. In early 2012, ongoing communications and information exchange among commercial fishermen, CRMC, and the University of Rhode Island led to a series of discussions with the Bureau of Ocean Energy Management (BOEM) about proposed wind energy areas located in Rhode Island's marine planning area. The proposed areas coincided with highly valuable commercial fishing grounds around Cox Ledge, an offshore feature discussed

Tribal Engagement

While the Narragansett Indian Tribe Historic Preservation Office has had a longstanding relationship with the Coastal Resources Management Council, it had not worked with URI scientists on the offshore environment. "The marine environment was something entirely new for us—it was a big leap," comments Harris, who credits Fugate and the Narragansett Indian Tribe Medicine Man John Brown, with encouraging their office's participation in the Ocean SAMP.

According to Mr. LeBlanc, Sector Southeastern New England did not have much experience with local tribes. "On the routine issues I work with, there is usually little opportunity to engage local tribes. But they have valid and valuable input, especially on the larger projects such as offshore wind farms. They shared things I needed to be aware of—for example, their concerns about the view shed, and why this is culturally and historically important to them."

A Shared History

The relationship that developed among the Narragansett Indian Tribe Historic Preservation Office, Coastal Resources Management Council, URI, and other stakeholders bore much fruit. Tribal representatives provided an oral history and other substantive information about the offshore environment for the marine plan. In doing so, they engaged in discussions with URI oceanographers about how Narragansett oral history and geological surveys told the same story: More than 15,000 years ago, an area in Rhode Island Sound was then a dry, inhabitable plain.

Future Planning

But again, the real benefits of this social capital did not become evident until after marine plan development. URI scientists, tribal representatives, and BOEM staffers are working together to develop standard protocols for identifying Native American submerged cultural resources prior to siting offshore renewable energy facilities. This work will help improve the regulatory process for offshore renewable energy development, and may head off the future possibility of conflict and controversy over submerged cultural resources.

"Had this [Ocean SAMP] initiative not been put forward, had there not been a request of all stakeholders about what their concerns were, we might have stood on the sidelines saying that someone should've addressed our concerns," says Harris. "Now, we are developing an improved toolkit for addressing tribal concerns offshore."

in substantial detail in the Ocean SAMP. To underscore the importance of Cox Ledge, fishermen provided state officials and scientists with detailed information about fishing activity, including individual tow lines in this area.

This is a type of information that is rarely, if ever, shared outside of the fishing industry. This information was then consolidated and shared with BOEM, and the commercial fishermen and agency officials worked together to negotiate the exclusion of this commercially important fishing ground from the proposed wind energy areas. Fugate points out that collaboration and the social capital that results from it can reduce conflict and solve problems efficiently. "If we hadn't done this … it may have been a knock-down, drag-out fight," Fugate said.

A Template for Success

McCann believes facilitating effective collaboration and building social capital is not a simple a matter of getting everyone into the same room.

"You build trust by providing people with appropriate and realistic access to a process," McCann said. "You are considerate. You are empathetic to their situation. You make sure that participants feel that they're being respected and listened to."

"You show them, in the plan or the policies and regulations that you develop, that their issues, concerns, and recommendations have been addressed," she said. "They can see that they have had influence over the outcome, that they are valuable. You need to ensure that people see themselves in the result."

This is easier said than done; yet, it has been done—in Rhode Island as well as in Massachusetts, and now throughout all of New England on a regional level through collaborative bodies such as the Northeast Regional Ocean Council. While collaboration requires time and resources, those who have been through it confirm that building social capital is an investment that pays off.

About the author:
Dr. Tiffany Smythe teaches and conducts research on marine policy at the Center for Maritime Policy and Strategy at the U.S. Coast Guard Academy. She has a Ph.D. in marine affairs from the University of Rhode Island and was part of the team that developed Rhode Island's marine spatial plan. She also holds a 100-ton USCG master's license and has sailed as professional crew aboard sail-powered training ships.

Note: The views contained herein are solely those of the author and do not necessarily reflect the views of the Center for Maritime Policy and Strategy, U.S. Coast Guard, Department of Homeland Security, or any other agency or department of the U.S. government.

Endnote:

1. Crowder, L.B., et al. (2006). "Resolving Mismatches in U.S. Ocean Governance." *Science* Magazine 313: 617-618.

The Bottom Line

1 Collaboration increases buy-in. LeBlanc's comparison between the Cape Wind and Block Island review processes says it all: Collaborative marine planning increased buy-in for the Block Island project.

2 Collaboration reduces conflict and achieves efficiencies. In a time of shrinking government resources, everyone is being asked to do more with less. Though collaboration may seem time-consuming, it can reduce conflict, which saves time and other resources in the long run.

3 Social capital provides access to information and resources. Rhode Island's marine planning work brought an international network of scientists together with commercial fishermen, tribal representatives, and others to synthesize diverse sources of information.

4 Social capital provides access to networks. Marine planning can expand networks, which enables participants to connect substantively with people of different affiliations, areas of expertise, or points of view. Such networks help practitioners to be adaptable and resilient in times of change and to innovate and solve problems in times of crisis.

Ocean.data.gov

A portal to regional marine planning data.

by LCDR Jonathan Andrechik
U.S. Coast Guard
Policy Analyst, Executive Office of the President

Mr. Kevin Kirby
Enterprise Data Architect
Environmental Protection Agency

Dr. Mary Boatman
Environmental Studies Chief
Bureau of Ocean Energy Management

Ms. Laura Muhs
Natural Resource Specialist
Department of the Navy

Mr. Adam Bode
GIS Spatial Analyst
National Oceanic and Atmospheric Administration

Ms. Andrea Ostroff
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United States Geological Survey

Ms. Jeanne Holm
Technology Evangelist, Data.gov
General Services Administration

Mr. David Stein
Geographer
National Oceanic and Atmospheric Administration

Ocean.data.gov's main page. All images courtesy of Ocean.data.gov.

Successful marine planning requires accessible, authoritative, up-to-date data about how people and animals use our ocean, coasts, and Great Lakes. However, this information has been scattered across various government and private databases. Now, utilizing increasingly sophisticated and effective information technologies, it is possible to discover and access marine planning data from a multitude of sources through a single, dedicated portal: Ocean.data.gov. (Ocean.data.gov is one of several data.gov communities.)

Launched in 2011, ocean.data.gov supports the open government initiative by allowing marine planners and decision makers to access relevant data to inform marine planning activities.

Today, the website serves as the National Ocean Council's central portal to access scientific data and information pertinent to marine planning. The portal also provides links to regionally scaled datasets and other resources. Currently, ocean.data.gov only serves federal data, but efforts are underway to include data from non-federal sources.

data.gov

Technical Community of Practice

Data.gov's data management system is based on CKAN, which is an open-source software solution. By choosing open-source software, Data.gov promotes transparency and greater citizen engagement at low cost and in useful, machine-readable formats.

As systems become more distributed and technology continues to evolve, the need to share information and provide a venue for open dialogue is paramount. So developers created a marine planning portal network (a combination of a listserv, webinar series, and informational resources) for outreach to the portal developers in the nine planning regions. As such, the network facilitates communication among state, regional, and national portal developers to share lessons learned and new portal development methods. Representatives from each of the nine marine planning regions participate.

Technical requirements are shared with regional data portal developers through ocean.data.gov's online technical guide, which provides reference materials from a variety of web resources, as well as network member technical and content expertise. The technical guide serves as the touchstone for information about data publishing and exchange, including documentation on common mapping services, data encoding standards, other data publishing considerations and suggested metadata standards, and data quality and documentation requirements. This helps develop a robust information management system to support marine planning by creating a technical community of practice, including GIS analysts, data developers and managers, IT staff, and researchers.

ocean.data.gov

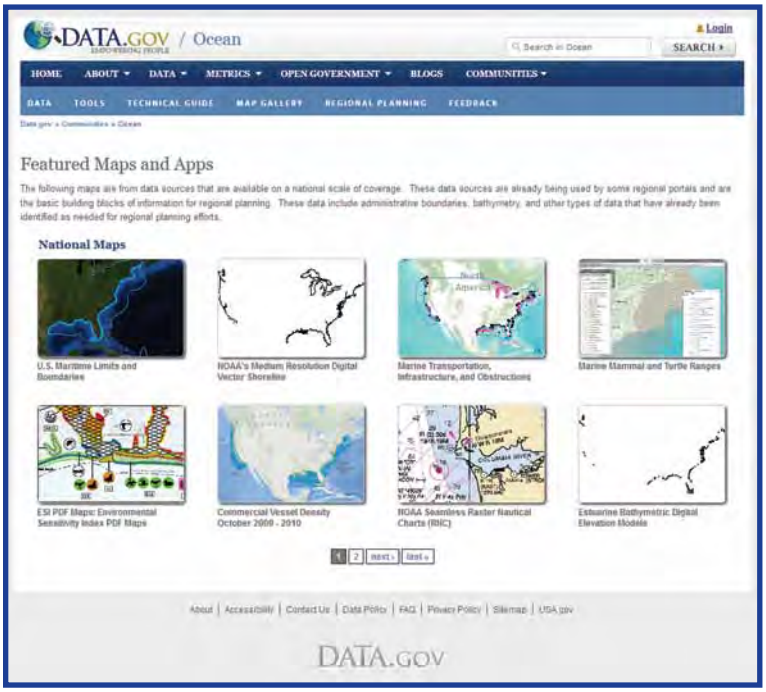
Data and Maps

The portal provides a starting point to access regional marine planning data. Ten federal agencies contribute to the data offerings and more are poised to follow.[1] Each contributing agency is responsible for making relevant data available to all and for adherence to applicable data quality standards.

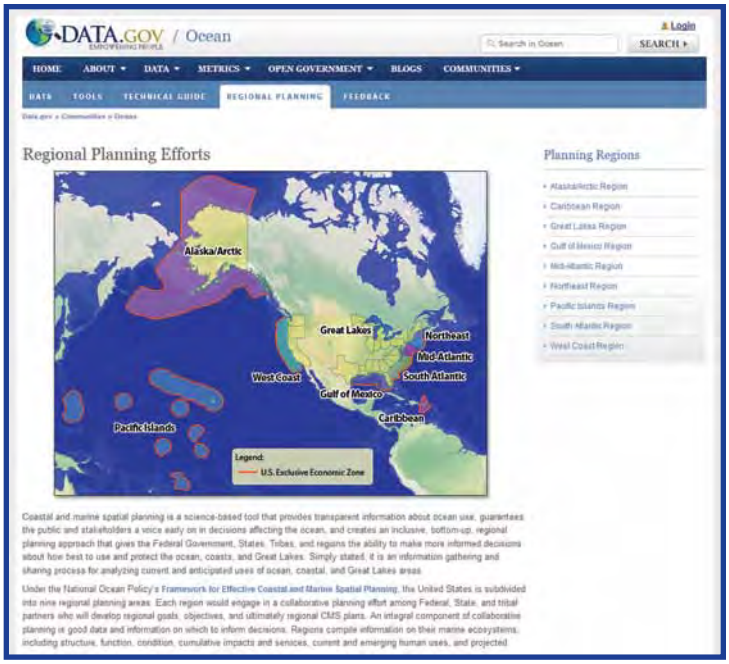
Maritime boundaries, raster nautical charts, navigation obstructions, bathymetry, and processed nationwide Automatic Identification System data are a few examples of the data offerings already available through ocean.data.gov. By early 2013, the portal provided access to nearly 300 data offerings, with most of the data listings representing groups or catalogues of data, rather than individual datasets.

Since the purpose is to allow users access to spatial planning data, most of the data offerings have geographic attributes configured for spatial analysis and map display. In addition, users can visualize data coverage via the portal's map gallery. Different datasets vary in their geographical extent (bathymetry data covers all ocean areas, while the spatial extent of estuarine data is limited to near coastal areas). Complete and accurate metadata (basic "who, what, where, when, why" information about a dataset) enables planners to create integrated, multi-layer maps that incorporate ocean and coastal use datasets. These maps support spatial analysis and may reveal valuable information about ocean use conflicts or other factors critical to the marine planning process.

As non-federal data becomes available, planners will be able to create combined maps for a more complete picture of the uses of their local marine environment.



Ocean.data.gov's map gallery allows access to national and regional maps.



The nine marine planning regions.

Non-federal data will be clearly identified as such, so that users can factor the point of origination into their analysis and to account for any differences in collection methods, quality control practices, or other important attributes.

Regional Connections

Ocean.data.gov also serves as a central resource or hub for collaboration across the nine U.S. marine planning regions established in the National Ocean Policy:

- Alaska/Arctic,
- Caribbean,
- Great Lakes,
- Gulf of Mexico,
- Mid-Atlantic,
- Northeast,
- Pacific Islands,
- South Atlantic, and
- West Coast.

While the portal is national in scope, it supports many regional efforts as well. Each region has the flexibility to determine the scope, scale, and content of its marine planning activities. In several planning regions, regionally scoped data portals have been developed to provide tailored data access and analysis capabilities responsive to the specific priorities of a planning region, with information drawn from Ocean.data.gov (see sidebar).

Looking Ahead

Ocean.data.gov provides valuable data and information to support marine planning, enabling informed decisions about when, where, and how we use our ocean, coasts, and Great Lakes. While we may look out on the ocean and observe a vast, unobstructed view, the ocean is a busy place, and a framework to support successful marine planning must contend with a complex array of challenges. The portal provides access to information that helps to paint a more complete picture of the dynamic marine environment and attendant human uses, supporting sound decision making.

This effort is national in scope, but its design is based upon a regional approach, because the important work to implement our shared ocean policy will unfold regionally and locally. As a stakeholder, we invite you to explore ocean.data.gov. The portal is continuously expanding its content and data catalog, but we regard user input to be the ultimate arbiter of the portal's utility, potential, and future development.

About the authors:
The authors are part of the ocean.data.gov portal team and represent several of the federal agencies with significant interests in the National Ocean Policy and marine planning. The team has worked together for several years to bring ocean.data.gov online and continues to work to engage the marine planning community and the public.

Endnote:

1. Bureau of Ocean Energy Management, Department of Energy, Department of the Navy, Environmental Protection Agency, Fish and Wildlife Service, Maritime Administration, National Oceanic and Atmospheric Administration, National Science Foundation, United States Coast Guard, United States Geologic Survey.

For more information:

Ocean.data.gov is one of several data.gov communities. Access it at **www.data.gov/ocean/community/ocean**.

Access the feedback page at **www.data.gov/ocean/page/ocean-feedback-form**.

More information on the open government initiative is available at **www.whitehouse.gov/open**.

ocean.data.gov

GeoDesign

Optimizing stakeholder-driven marine spatial planning.

by Dr. Will McClintock
Project Scientist
University of California Santa Barbara
Marine Science Institute

Not long ago, people viewed the ocean as a vast, virtually unlimited resource. In fact, until about 40 years ago, there was relatively little discussion about overfishing, the risks of offshore oil drilling to local communities, or the adverse impact of shipping to marine mammals. As our global population grew, people discovered new ways to make use of ocean resources, such as developing renewable energy in wind and currents and more effective ways to extract fish and other resources.

The cumulative impact of these human activities on the ocean now spans the entire globe,[1] and governments are scrambling to find ways to use ocean resources sustainably and to balance competing stakeholders' needs.[2]

Information is Fundamental

Stakeholders must know something about the current distribution of resources and human activities in and around the ocean, before they can effectively make decisions about where and how to use ocean space. Unfortunately, only a tiny fraction of the world's ocean floor is mapped, because remote sensing technology is expensive. Additionally, commercial and recreational fishing industries are generally not required to provide spatially explicit information about where fish are caught, or the spatial information is so coarse that it is of little value in the design of marine spatial plans that take into account fishing activities.

To undertake marine planning, we generally use geographic information systems (GIS) to store, visualize, and analyze map data and model the potential consequences of alternative plans. For example, to plan offshore wind farms, one might create a GIS database that includes maps of wind energy potential, power grids, the seafloor, shipping, recreational boating, fishing, law-enforcement, military activities, and such. Then one might explore the relative cost and benefits to establishing wind farms in one location versus another. We can predict, for example, the energy value of any given location in the ocean and we can estimate how habitats, fishing, mining, shipping, and other human activities may be affected by an offshore wind farm in a particular area.

Planning Means Different Things to Different Stakeholders

Not surprisingly, individual livelihoods and entire industries depend on access to ocean resources. Therefore, marine planning may lead to conflicting and competing notions about how ocean space is allocated.

There is no all-encompassing plan for stakeholders; considerations depend on who you are, your interests and beliefs, your confidence in the planning process, and your understanding of and access to offshore spatial information. If you are a member of an industry that employs a team of scientists and geographic information systems technologists to gather map data and analyze alternative scenarios, or if you are a scientist or professional planner with marine planning experience, you may have significantly different values than the public.

To prevent resistance or failure, all plans must sufficiently address conflicting views and disparate stakeholder needs. It is for all of these reasons that marine planning requires open access to spatial information and a means by which everyone may meaningfully express their opinions about ocean space usage.

About SeaSketch

SeaSketch is a software service developed at the University of California Santa Barbara Marine Science Institute that represents the next-generation tool for collaborative marine planning.

It is a flexible, web-based platform designed for any number of spatial planning purposes. Recognizing that there is no one-size-fits-all technological solution to marine planning, project administrators (typically planners or agency personnel) may configure SeaSketch to reflect the specific planning goals and objectives of their region.

End-users may use SeaSketch to:

- **visualize map data;**
- **contribute information about the distribution of resources and activities and create new map data in response to surveys;**
- **sketch prospective management plans;**
- **evaluate and compare tradeoffs for scenarios using science, policy, and management-based guidelines; and**
- **share and discuss prospective plans and their associated analytical reports in a dynamic, map-based forum.**

Custom Results

When a user sketches a spatial plan, SeaSketch analyzes that plan and the underlying data, and returns a report customized for each individual project. A simple analysis, for example, might measure the size of a user-drawn prospective wind farm and the area of several map layers (e.g., the distribution of energy potential or valued fishing grounds) captured within that area. The report presents output using meaningful terms, such as:

"This wind farm could generate enough energy to support 10,000 households in this region. It would also negatively impact commercial fisheries by $1 million per year. You have met (or not met) the management guidelines for the design of a wind farm in this region."

Hands On

For any given SeaSketch project, the owner decides how information is analyzed to produce a report that is useful to the end user. Generally, tables and figures that require a great deal of interpretation are not helpful to the average user.

Project administrators must ensure that reports provide information about the consequences of the design. While SeaSketch is relatively simple to configure, encoding analytics and reports will invariably take a great deal of thought, perhaps involving a team of scientists and planners, to weed out unnecessary information and provide the end user reports with meaningful, helpful feedback.

The challenges to such data- and stakeholder-driven marine planning are numerous. Some things to consider:

- How can we gather information on human activity distribution to more accurately reflect how ocean space is currently used?
- Given that most stakeholders have no experience with GIS, geospatial analysis, modeling, or spatial planning, how can we ensure that the values in a given population are sufficiently represented in a marine spatial plan?
- Finally, as values change, science improves, and better spatial information becomes available, how should plans be updated to reflect these changes?

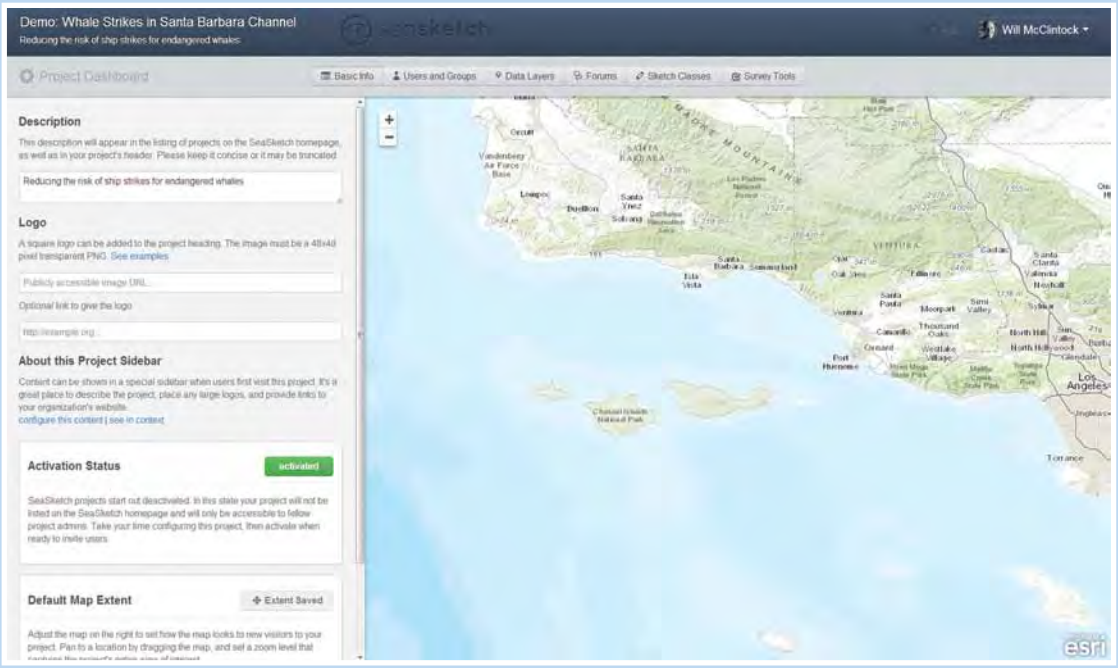
In part, the answer to these questions is better geospatial information technology, a commitment to transparent and inclusive planning, and an emerging approach to computer-aided design called GeoDesign.

Inclusive Design Process

GeoDesign allows its users to sketch virtually any potential design and obtain feedback on information like the environmental, energy potential, and economic consequences of those designs. Through iterative sketching and analysis, users may refine their designs, while learning about the underlying map data, design criteria, and the planning goals and objectives.

Contrast this approach with modeling techniques that limit users to choosing among alternative, computer-generated scenarios based on predefined design criteria. Optimization algorithms are appealing because, given good data and parameters that accurately reflect planning goals and objectives, they help narrow the solution set to the best options, given certain criteria.

With GeoDesign, the freedom to sketch and evaluate virtually any scenario does two important things for its end users. First, it helps them discover "good" or "bad" options. For example, a planning initiative for an offshore wind farm may show that certain areas in the region under consideration experience little or no wind and, therefore, have little value to developers. In this case, planners may be tempted to limit proposals to those that fall within areas of greater than zero wind potential. However, stakeholders are much more likely to trust the outcome of the design process if they are allowed to sketch



SeaSketch in Action

Administrators use the project dashboard to configure a SeaSketch project. Administrators may:

- **define and invite users and groups to participate in the project;**
- **define the default base map, upload and organize map services for viewing map data;**
- **create map-based discussion forums with rules and permissions to participate;**
- **define "sketch classes" for each element or zone;**
- **define analytical scripts to analyze each prospective zone as it is drawn by users in near real-time; and**
- **define and conduct surveys to collect new spatial data.**

All graphics courtesy of the University of California Santa Barbara Marine Science Institute.

designs and see for themselves that certain designs would actually generate little power.

Second, GeoDesign allows users to sketch and propose solutions that may be "bad" by one set of criteria (such as those reflected in the analytical reports), but "good" by another set of values. Imagine a planning process that includes designing marine protected areas that maximize ecological, cultural, and economic value. It is possible that socioeconomists could reach agreement on what areas of the ocean are of high ecological and economic value, and, therefore, develop an optimization algorithm that reflects those values. But you will be hard-pressed to develop an algorithm that captures the distribution value across ocean space. Marine protected area designers, in this case, need a means by which to sketch and evaluate the tradeoffs among scenarios that may or may not be reflected in an optimization algorithm.

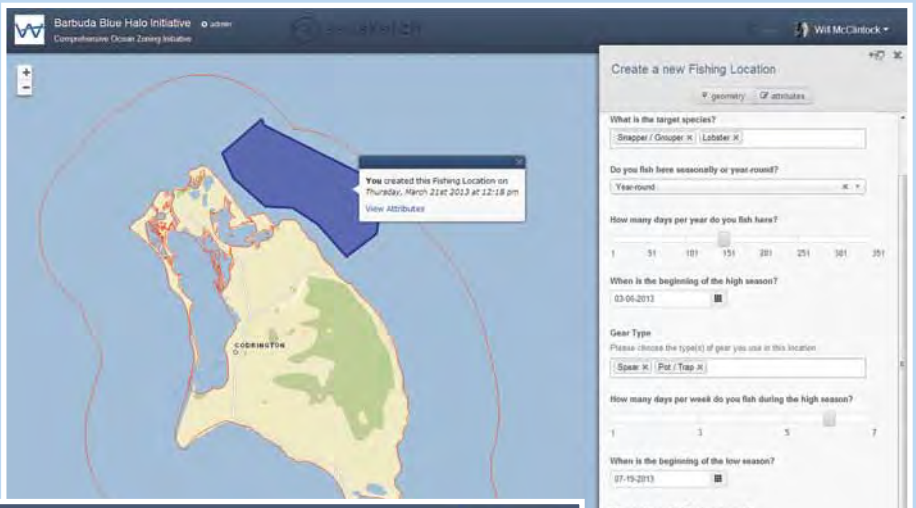
Ideally, one would combine GeoDesign and optimization approaches, allowing users to draw any arbitrary design and then compare that with optimized solutions. Ultimately, a user could pick and choose among optimal and suboptimal elements of a plan to reflect his or her personal values.

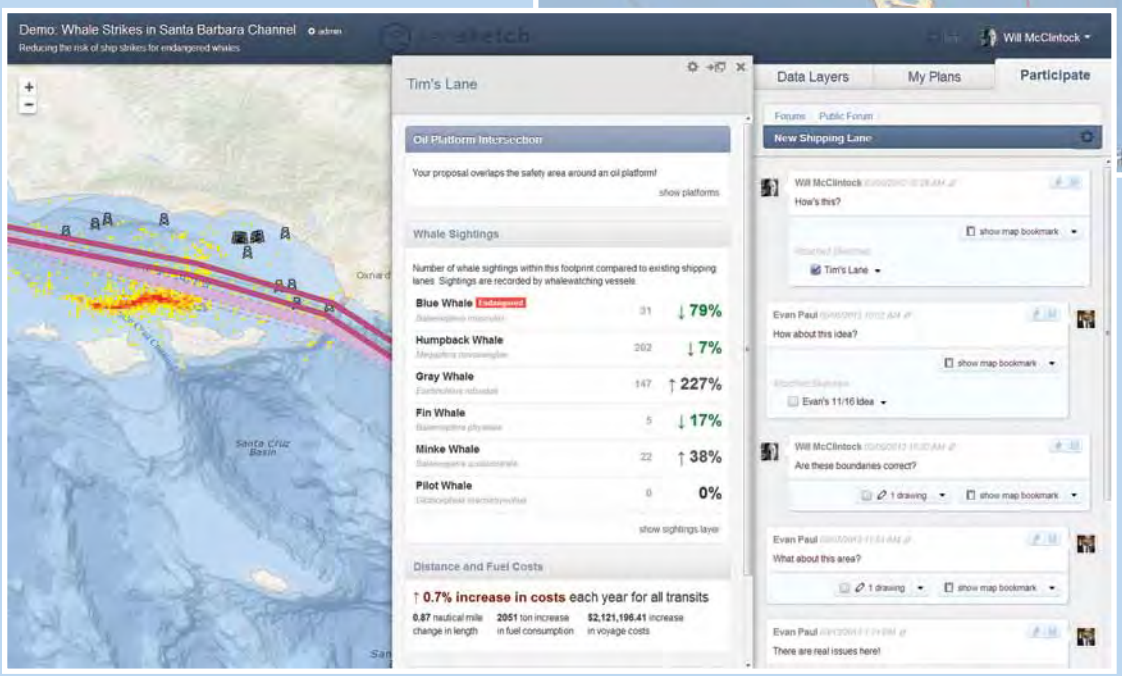
Surveying Ocean Users

Regarding an inclusive and transparent planning process, it is important to begin any marine planning exercise by gathering information on the distribution of resources and human activities in the ocean. In the absence of remote sensing data (AIS that describes the movement of shipping vessels, or side-scan-sonar for bathymetric data) or government-mandated reports (like fishing logs that describe where fish were caught), we can sometimes gather useful information

SeaSketch

A socioeconomic survey designed for use in Barbuda to gather information from fishermen on the location of their valued fishing grounds. Data will be used to create management plans that enhance fisheries yield.





In an example of the collaboration tools in SeaSketch, the user has drawn a prospective shipping lane design for the Santa Barbara Channel. This example report shows the predicted impact to whale species, and added cost to the shipping industry, should this particular design replace the existing shipping lane.

by surveying ocean users themselves and asking specific questions, such as:

- What specific areas in the ocean are valuable to you?
- What do you do there?
- What have you seen there?

Historically, such surveys have involved meetings where individuals draw lines on a map representing patterns of ocean uses.[3] A GIS technician then digitizes the lines, summarizes as map layers, and stores them in a geospatial database. However, these meetings and traditional GIS technologies can bottleneck efficiency, inclusivity, and more useful data. For example, organizing in-person meetings with knowledgeable ocean users to where GIS technicians digitize such information can be difficult. Advances in web-based technologies now mean we can reach a much wider audience and reduce reliance on GIS technicians to gather volunteered geographic information.

Facilitating Dialog

Web-based tools for communication are increasing in popularity. It is hard to find anyone in the developed world who does not use email and soon it will be difficult to find those who do not use videoconferencing. As our reliance on the Internet deepens, we have an opportunity to leverage emerging technologies to facilitate map-based conversations. Helping people develop good marine spatial plans also means helping people communicate.

To that end, we have developed SeaSketch (see sidebar) to support map-based discussions. Project administrators simply create forums and define permissions (such as public access, private to certain groups, moderated or not), and then users may post messages to the forum. Like many real-time messaging applications, discussions in SeaSketch may involve two or more people. Each message offers several optional features, including:

- a bookmark to map the extent and active data layers viewed when sending the message,
- any sketches (prospective plans) that the user shared to the forum,
- any drawings (annotations) the user has made to highlight map features.

Map-based forums in SeaSketch can be communication tools once plans have been finalized. Decision makers may use this tool to expose plans, map data and analytical reports, and perhaps the dialog used to justify marine spatial plans.

Using a simple interface in SeaSketch, project administrators may also configure surveys to gather information from knowledgeable end users. For example, administrators may conduct a survey that invites the general public to identify where and when they have seen whales. In SeaSketch, end users would simply click on the map and answer a series of questions about what they saw.

SeaSketch surveys may also be configured to limit responses to those with specialized and proprietary knowledge (like the location of valued fishing grounds). In this case, fishermen who have been invited to participate in the survey might draw polygons on a map, rank their relative value, and list the species caught or gear type used in that area. Periodically, project administrators may export the survey results and generate summary data products in a desktop GIS.

Although data gathering is particularly intensive at the beginning of any planning exercise, there will always be a need for new or better data. Even after spatial plans have been implemented, adaptive management requires analysis of existing and alternative plans. SeaSketch's platform is designed to gather and incorporate new information as it becomes available.

Current Initiatives

Although SeaSketch is a new innovative tool, planners in New Zealand, British Columbia, the United States, Barbuda, the Mediterranean Sea, and the United Kingdom are using it to develop marine plans for protected areas, transportation zones, aquaculture sites, renewable energy zones, mooring and anchorage zones, and the like.

SeaSketch holds great promise as a means of facilitating marine planning by lowering the technological barriers to creating and participating in planning initiatives. We encourage SeaSketch project administrators to publish analytical scripts as open source, so that others may leverage their work. We also encourage project administrators to maximize transparency and inclusivity by making public as many elements of their project as feasible (e.g., data, surveys, reports, forums), so that other planning initiatives may learn from their work.

About the author:
Dr. Will McClintock is the director of the SeaSketch Program at UCSB and former director of the MarineMap Consortium (2005-2010). He is currently supporting marine spatial planning initiatives in the U.S., Canada, New Zealand, the Cook Islands, Barbuda, the Mediterranean Sea, and the Galapagos Islands.

Endnotes:

1. Halpern, B. S., et al. (2008). *A Global Map of Human Impact on Marine Ecosystems.* Science 319:948-952
2. United States. Interagency Ocean Policy Task Force.2010. *Final Recommendations of the Interagency Ocean Policy Task Force.* Washington D.C.
3. NOAA MPA Center, *Ocean Use Mapping Guide – PGIS from A-Z.*

For more information:

www.seasketch.org

The public may preview many projects hosted on the SeaSketch website.

To experience the collaborative GeoDesign workflow in SeaSketch, visit a demonstration project at **http://goo.gl/T2VYH**, for the design of new shipping lanes in the Santa Barbara Channel. Here you can experiment with the survey, sketching, and collaboration tools typical for a SeaSketch project.

Spotlight on Ocean Uses

Tools help marine planners understand expanding ocean use.

by Dr. Charles M. Wahle, PhD
National Oceanic and Atmospheric Administration
National Marine Protected Areas Center

Dr. Mimi D'Iorio, PhD
National Oceanic and Atmospheric Administration
Coastal Services Center

Ms. Julia G. Townsend
Marine Policy Consultant

All along the shorelines, coastal communities and economies rely heavily on healthy, accessible, and productive waters and the ecosystem services they provide.

Not only does civilization have a long and vibrant tradition of visiting the sea for sustenance, livelihoods, recreation, education, spiritual renewal, energy, and national defense, but understanding these deep-rooted ocean connections—their origins, values, and vulnerabilities—is vital to sustaining healthy and productive oceans for today and future generations.

Diverse Uses, Regional Concerns

Driven by growing populations, energy demands, technologies, and global trade, the human impact on the oceans is expanding rapidly. The explosion of ways to use and enjoy the ocean brings with it vast opportunities and real threats to what we value most from our waters. Growing societal concerns over potential ecosystem impacts and conflicts among uses has spurred some states and regions to embark on proactive marine planning initiatives to envision a sustainable ocean future.

Examples of the diversity of current and emerging ocean uses in US waters. Left to right: a scuba diver swims amid a school of fish in the Flower Garden Banks National Marine Sanctuary (photo by G.P. Schmahl); Chumash Tomol 'Elye'wun Indian paddlers crossing at Santa Cruz Island (photo by Robert Schwemmer); and a containership transiting the Golden Gate Bridge in San Francisco, Calif. Photos courtesy of NOAA/Department of Commerce.

Comprehensive marine planning seeks to balance and find appropriate areas for a growing variety of ocean uses such as commercial fishing. Pictured: a double-rigged shrimp trawler with one net up and the other being brought aboard. Photo by Robert K. Brigham, NOAA's Fisheries Collection.

Regional marine planning is an opportunity for coastal communities to proactively consider the future of our oceans through participatory approaches that take into account new and emerging uses in light of regional objectives, priorities, and capacities. However, while we know much about the nature and inhabitants of the oceans, we have much to learn about how human beings fit into those complex ecosystems. Successful marine planning depends upon gaining a shared understanding of what those uses are, why and how we pursue them, and how they affect coastal ecosystems and the human communities they support.

The National Oceanic and Atmospheric Administration's National Marine Protected Areas (MPA) Center is creating a portfolio of tools to help coastal communities understand the patterns, drivers, conflicts, and compatibilities of ocean uses along their shores. These products are designed to inform marine planning and other place-based management needs.

A Common Language

We believe stakeholders, planners, and managers need more effective and efficient ways to discuss the expanding suite of ocean uses. Currently, the terms we employ to describe how we use or wish to use the ocean can be vague, idiosyncratic, overlapping, and highly variable from place to place and group to group. These inconsistencies transcend simple semantics and can impede vital public policy discourse and create confusion, contention, and delay, by confounding comparisons across larger areas, and by consuming valuable time defining anew the diverse range of ocean uses in each new area undertaking marine planning.

To effectively plan for the future, the U.S. needs coherent terminology that helps ocean planners describe, map, and illuminate the implications of expanding uses in a consistent way throughout U.S. waters. Addressing this need, the MPA Center has developed the guide, *A Common Language of Ocean Uses,* which reflects current and emerging uses and accommodates regional differences in how people engage with the ocean.

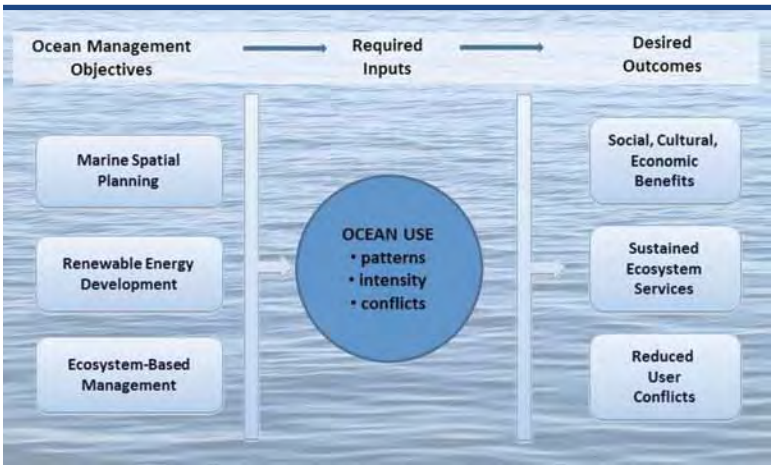
Highlighting extensive experience in mapping ocean uses around the United States, this guide identifies 35 distinct ocean use categories, based on similarities in how each ocean use functions in, interacts with, and depends upon the ocean. The guide is designed to allow objective assessments of individual uses as well as to compare uses across areas or over time.

As such, the guide can serve as a foundation for marine planning activities including:

- mapping and comparing ocean use patterns;
- assessing ocean use impact on ecosystem functions and services;
- avoiding conflicts and fostering compatibilities among co-occurring uses;
- revealing cultural, social, and economic drivers and benefits;
- evaluating tradeoffs among uses within a planning area or across regions.

The guide is also designed to adapt to meet local and regional planning needs, including:

- local variations in existing uses and locally unique uses,
- integrating new and emerging ocean uses,



Understanding ocean uses plays a key role in achieving the goals of marine planning. Graphic courtesy of NOAA's Marine Protected Areas Center.

Comprehensive marine planning seeks to balance and identify appropriate areas for ocean uses, such as whale watching. Photo by Dr. Elliott Hazen, NOAA's Sanctuaries Collection.

- lumping vs. splitting uses,
- tribal and indigenous ocean uses,
- geographic scalability,
- wider regional comparisons of ocean uses.

Ocean Uses Atlas

To further marine planning, the National Oceanic and Atmospheric Administration's MPA Center developed an innovative, practical, and cost-effective approach to map ocean use patterns. The *Ocean Uses Atlas* engages regional experts (such as coastal and ocean managers, enforcement staff, emergency responders, scientists, other users) and allows them to work together to map the full range of ocean uses in their region.

In addition, the atlas provides a cost-effective foundation for more detailed analyses of specific human use of the ocean on scales relevant to regional and local planning. Its methods and approach are intended to be flexible, scalable, and adaptable to a variety of planning and mapping applications.

Via the *Oceans Uses Atlas,* knowledgeable individuals use interactive geographic information systems (GIS) tools to map out what is known about use patterns throughout the region, which reveals:

- the general use footprint of where the use occurs with any frequency;
- the dominant use footprint showing where most of the use occurs most of the time;
- projected future use patterns of existing and emerging uses; and
- qualitative information about aspects of the use not directly reflected in their spatial patterns (historical uses, cultural significance, emerging conflicts).

The resulting spatial data are then quickly processed and synthesized into products intended to help regional marine planners, such as:

- GIS data and services, including metadata;
- cartographic products, including maps of individual uses, and groups of uses;
- online data viewers that show patterns of use in the region and allow access to the data and derived analytical products.

Today, the *Ocean Uses Atlas* project contributes to marine planning efforts in California, Hawaii, New Hampshire, southern Maine, Virginia, and the U.S. Virgin Islands. This process will help map ocean uses from 2013-14 to support renewable energy planning in Washington, Oregon, and Hawaii.

Identifying Conflicts and Compatibilities

Additionally, NOAA's MPA Center is developing two tools to help marine planners to evaluate the implications of future ocean use scenarios:

- Universal Con/Com Assessment Tool: A non-spatial analysis of the potential for conflict and compatibility among various ocean uses, drawing upon their operational requirements for ocean space and ecosystem features and services.
- Spatial Con/Com Assessment Tool: Spatial analyses of the potential for conflict and compatibility among specific ocean uses in ongoing marine planning areas by combining mapped patterns of use with the results of the universal con/com assessment. Results will highlight the implications of specific combinations of existing and emerging uses and inform planning decisions about tradeoffs and management strategies.

The Five Cs of Ocean Use Mapping

Marine planning anticipates a future in which current and new ocean uses can be pursued sustainably with minimal impacts or conflicts. Fundamental to its success are reliable data on the patterns of ocean uses.

Ideally, such ocean use data should meet the "Five Cs" standard:

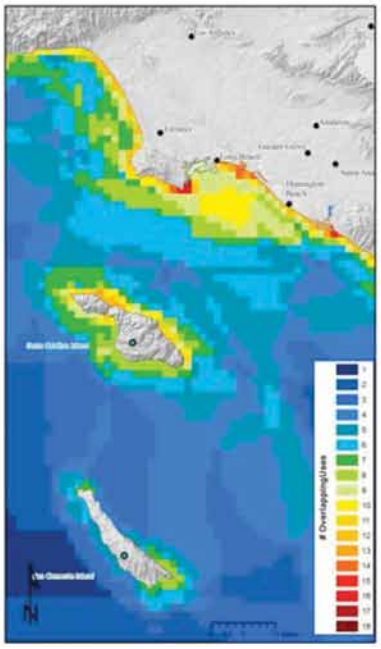
- ***comprehensive*—capturing all major uses in the planning region;**
- ***continuous*—mapped without major spatial gaps across the entire planning region;**
- ***consistent*—acquired at similar geographic and temporal scales and with comparable methods;**
- ***comparable*—analyses and products can be compared within and across regions;**
- ***credible*—acquired and analyzed through documented and valid methods.**

Products and Insights Generated by the *Ocean Uses Atlas.*

Spatial Variability

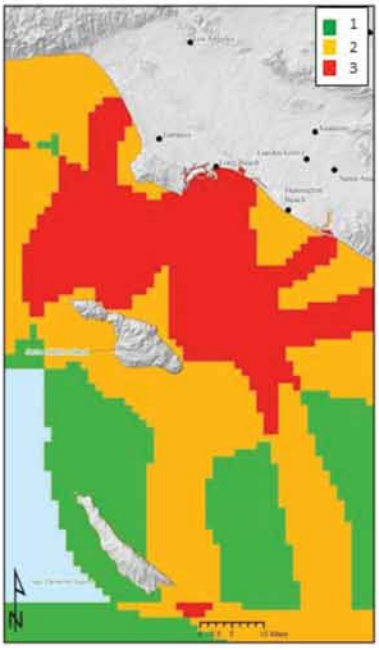
Comparison of spatial footprints off southern California.

Use Intensity



Levels of overlap among multiple co-occurring uses in the same area.

Conflicts & Compatibility



Areas of potential conflict among co-occurring ocean uses with similar operational requirements.

Graphics courtesy of NOAA's Marine Protected Areas Center.

Characterizing Interactions Among Uses

Ocean uses co-occur commonly in U.S. waters. The potential outcomes of these interactions, which may be mitigated by spatial and/or temporal activities management, tend to fall along a gradient from conflict (negative) to compatibility (positive).[1]

Conflict: when two uses co-occur with adverse impacts to one or both.

- ***Pre-emption*—the long-term introduction of facilities, structures, or activities that physically preclude other uses from being pursued in that space (e.g., oil rigs vs. commercial shipping).**
- ***Interference*—adverse interactions among transient ocean uses that may create risks or otherwise diminish the successful pursuit of one or more uses (surfing vs. wave energy capture devices).**
- ***Indirect conflict*—impairing the successful pursuit of one use through the impacts of another use on ecosystem features and services it requires, whether or not they co-occur at the same space and time (e.g., nature photography using SCUBA diving vs. fishing with benthic mobile gear).**

Compatibility: when two uses co-occur without adverse impacts to either.

- ***Neutral*—each use has a negligible impact on the other (underwater transmission cables vs. kayak paddling).**
- ***Synergy*—one or both uses may benefit from the presence of the other, such as wind turbine and aquaculture.**

Endnote:

1. Definitions derived from concepts developed as part of the NOC CMSP Guidance Interagency Science Needs Team.

Ocean Use Categories

SCUBA/Snorkeling	Cultural Use	Hunting	Military Vessels
Swimming	Pelagic Fishing	Wind Energy	Mining and Mineral Extraction
Surface Board Sports	Fishing with Benthic Mobile Gear	Wave Energy	Offshore Aquaculture
Paddling	Fishing with Benthic Fixed Gear	Ocean Current Energy	Coastal Aquaculture
Sailing	Kayak Fishing	Tidal Current Energy	Seawater Intake
Motorized Boating	Dive Fishing	Ocean Thermal Energy Conversion	Sewage Discharge
Wildlife Viewing at Sea	Fishing from Shore	Offshore Oil and Gas Energy	Ocean Dumping
Tide Pooling	Gathering from Shore	Commercial Shipping	Underwater Transmission Cables
Shore Use	Offshore Seaweed Harvest	Cruise Ships	

The Common Language of Ocean Uses, showing 35 common Use Categories.
Graphic information courtesy of: NOAA's Marine Protected Areas Center.

Looking Ahead

Marine planning provides coastal communities with the opportunity and forum to consider the implications of current and emerging ocean uses, and to find ways to sustain them and the ecosystems in which they occur for this and future generations of Americans. The data, tools, and concepts described here are intended to give those engaged in marine planning objective information to help them shape a sustainable ocean future.

About the authors:

Dr. Charlie Wahle is a marine ecologist with more than two decades of experience shaping and executing ocean conservation programs and policies in U.S. waters. He has filled key leadership roles in several national initiatives on marine protected areas and marine planning.

Dr. Mimi D'Iorio is a specialist in coastal and marine GIS with more than 15 years of experience applying geospatial technology to advance ocean policy and management. She works to develop participatory mapping methods designed to bring stakeholder and ocean use community perspectives into marine planning.

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Special thanks to:

Jordan Gass, Nicholas Hayden, Hugo Selbie, and Lauren Wenzel of NOAA's MPA Center; Lance Morgan of Marine Conservation Institute; NOAA's CMSP Ocean Uses Theme Team; and the National Ocean Council's interagency team on science needs.

Potential for conflicts among ocean uses include offshore windmills and kite surfers or shipping vessels. Copyrighted image.

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For more information:

Visit
www.marineprotectedareas.noaa.gov,
www.mpa.gov,
www.noaa.gov.

Lessons Learned from USCG Casualty Investigations

Towing Vessel Tragedies

by Ms. Sarah K. Webster
Managing Editor

In January 2010, the U.S. Coast Guard investigated two deadly incidents, involving the sinking of the uninspected towing vessels (UTV) *Betty* and *Misty Dawn*. Although the initiating chain of events leading up to these marine casualties were diverse and unrelated in nature, they do share one similarity. Both masters operating the vessels suffered deadly fates after putting themselves and their crew at risk.

Part One: Lost at Sea

On Jan. 16, 2010 at 3 p.m., the UTV *Betty* departed from Key West, Fla., and headed east to Nassau, Bahamas, to retrieve a dredge pipe and then deliver it to Jamaica. There were two masters aboard the vessel and two crewmembers. When the vessel reached Nassau the crew prepared for their next leg of the journey by placing a 600-meter dredge pipe in a horizontal tow configuration attached to the tug with about 1900 feet of tow wire to the front end of the pipe, joined by a shock line for emergency operations.

On Jan. 18 at 8 a.m., the towing vessel headed back out to sea with the dredge pipe in tow. What started out as a beautiful day with calm weather, calm waves and visibility, would soon take a turn for worse.

"Cut the Tow!"

On Jan. 23 at 7:45 a.m., the sea waves turned into aft swells, and the towing vessel stopped moving. All of a sudden, the end that attached the dredge pipe to the vessel moved into a vertical position, submerging most of the pipe into the sea. Consequently, the towing vessel started to move backward toward its tow. In no time, the engine room began flooding, thus hindering its stability. The master operating the vessel yelled to his crew, *"Cut the tow!"* One minute later, the vessel lost power due to water flooding the engine room and the vessel started listing to starboard. The starboard list caused the master who was not operating the vessel to fall down in the galley and fracture his left leg. Shortly after, the vessel righted itself and stabilized when the tow line parted due to tension and freed the vessel from the tow—simultaneously as the wheelhouse master ordered the crew to "cut the tow." The towing vessel regained its stability shortly around 7: 57 a.m.

With the aft end of the dredge pipe repositioned approximately 25 feet out of the water in a vertical position and the gyro repeaters[1] on the vessel suffered water damage, the master operating the vessel called the pipe manufacturer at 8:20 a.m. to request assistance from the dredging company to assist him regarding his next course of action. The dredging company called the on-duty master back at 10 a.m. and allegedly confirmed to him that the towing operation could resume with the pipe in a vertical position. Note: The surviving master and crewmembers would later report that this is not a common practice.

The on-duty master directed his crew to hook up an emergency line to the aft end of the dredge pipe to tow the pipe vertically. By 2 p.m. that same day, the vessel was moving again, and the crew did not experience anything out of the ordinary for another day and a half.

Mayday at Sea

On Jan. 25 around 3 a.m., the vessel listed dramatically again to starboard. Only this time, the on-duty master responded by placing "mayday" calls to the

Coast Guard and then alerted his crew to muster on the bridge to prepare for an emergency evacuation. According to the crew's testimony, the starboard side of the vessel became partially submerged within 15 minutes of the initial list. Inside the vessel's wheelhouse, the crew attempted to open the port side door to abandon ship, but could not because the starboard list affected the door's movement. The crew had no choice but to climb out through the wheelhouse's port-side window to escape.

Once outside of the wheelhouse, the crew deployed a life raft off the starboard side and then abandoned ship. The last crewmember aboard the vessel testified that he attempted to get the on-duty master to jump into the water with them to swim to the life raft, but instead he turned and headed toward the vessel's stern. Within 40 minutes of the initial list, all crewmembers had embarked the life raft safely with the exception of the on-duty master. By 3:55 a.m. the vessel sank, and the on-duty master disappeared along with it.

Coast Guard Rescue

On Jan. 25 at 8:12 a.m., a U.S. Coast Guard HU-25 Falcon, fixed wing aircraft, arrived on scene and launched a life raft to the surviving crewmembers and master as a precaution. By noon, a Coast Guard HH-60 Jayhawk helicopter arrived and picked up the four survivors. The helicopter transported them to Naval Air Station Guantanamo Bay, Cuba. The following day, the survivors made their way safely back to the United States. Also that day, the Coast Guard called off the search and rescue operation for the missing master, who is presumed dead.

Conclusion

USCG Sector Miami's Investigations Division investigated the incident and concluded the vessel's cause of sinking may have been from the ingress of water into the dredge pipe through cracked welds, which could have compromised the pipe's internal integrity.

Also, marine investigators determined that the crew could not visually monitor the trailing edge of the dredge pipe while underway, because of the pipe's vertical position. The dredge pipe was hollow and the condition of the welds at the end of both sides was unknown after the initial incident. Therefore, if water did creep into the pipe, the crew could not see it build up, and move toward the pipe's aft end.

In addition, testimony made by a member of the crew revealed that the engine space's gyro repeaters appeared damaged from flooding. Note: Water ingress happened when the tow pulled the vessel back the first time, during the initial configuration failure, and then when the dredge pipe was being towed vertically.

Part Two: Trouble on the River › › › › ›

On April 17, 2010 around 6 p.m., the UTV *Misty Dawn* got underway on the Ohio River with one master and a deckhand, towing a crane barge near mile marker 37 on the Kanawha River. This trip included passage through the R.C. Byrd Lock and Dam (L&D) and the Winfield Lock and Dam. The crew expected to complete the 95-mile journey in 22 hours.

Allision, Sinking

On April 18 around 3 p.m., the vessel approached the lock chamber at Winfield. The master maneuvered the vessel in such a way that the port bow corner of the crane barge allided with the lock chamber wall.[2] Shortly afterward, the vessel proceeded through the Winfield L&D without further incident. At mile marker 37, two hours later on the Kanawha River, the crane barge's facing wires attaching the barge to the towing vessel parted—causing the barge to take on water. The master pushed the barge toward the right descending bank out of the navigable channel, before it sank to the bottom of the river. Only the boom could be seen above the waterline.

The master reported the sinking to Coast Guard Sector Ohio Valley's Command Center by cell phone and then proceeded to a power plant located upriver to speak with MSU Huntington investigators assigned to the sunken crane barge investigation. By 11:30 p.m., the vessel left the power plant, fully loaded with fuel, to proceed approximately one mile back down river to comply with CG instructions to remain with the sunken crane barge for the remainder of the night.

The vessel proceeded to the sunken barge with a small amount of free board. Operating with a full load of fuel caused a significant amount of water to wash over the vessel's bow and flood the forward void space through an open hatch cover located on the forward main deck. The vessel continued to take on water over the bow, as it transited downriver.[3] Moreover, the non-watertight doors leading to the galley space and the doors located amidships on the port and starboard sides leading to the engine room were left open—allowing for progressive down flooding.

Man Overboard

Inside the pilothouse, the deckhand felt the vessel roll to port. The deckhand opened the port side door of the pilothouse, stepped outside to investigate the stability issue, and fell overboard. Shortly thereafter, the vessel sank in an upright position with approximately 5,000 gallons of diesel fuel in about 30 feet of water.

The Response

On April 19 around 1:30 a.m., while transiting through the area the crew aboard the UTV *Speedway* discovered the submerged vessel by its radio antenna. The crew contacted Coast Guard Sector Ohio Valley Command Center to report their findings. Two Coast Guard response boats and two West Virginia Fire Department vessels responded to the scene to conduct search and rescue operations.

Dead or Alive?

The deckhand fell overboard without a life preserver. But, fortunately, he swam to the right descending bank and walked to a local gas station to call for help. Emergency vehicles picked him up that morning and then transported him to the hospital for treatment. The hospital staff released the deckhand that day. The vessel's master, however, did not make it out of the pilothouse alive. A fire department dive team, along with the U.S. Coast Guard, recovered the master's body from the submerged vessel's wheelhouse.

Conclusion

Marine investigators determined that progressive down flooding sank the vessel. Other causal factors included compromised watertight integrity of the doors and insufficient crewmembers to assist in an emergency.

Lessons Learned

Both maritime casualties could have been addressed in time to avert tragedy had the masters and crew followed safety protocols. This is why it is important for all mariners to practice vigilance and situational awareness while at sea, because you never know when an emergency will arise.

Incident 1

All crew and vessel masters must remain vigilant at all times and must inspect their towing equipment and tow configuration. *See "For more information" bar for further guidelines.*

Moreover, any unsafe towing evolution should be halted until there is no longer risk. Additionally, in some circumstances it is safer to have two towing vessels involved, one doing the towing and another in the vicinity, in case the evolution fails and emergency assistant is needed. The Coast Guard recommends setting a tow watch and preparing to enable immediate tow line severing, should conditions deteriorate.

The UTV *Misty Dawn* the afternoon of April 18, 2010, shortly after the barge it had been pushing sank. The photo clearly portrays the minimal freeboard of the vessel and the two open doors along the port side of the vessel leading into the main engine and equipment spaces. All factors, combined with lack of watertight integrity, contributed significantly to the rapid progressive flooding of the main spaces and the subsequent sinking of the vessel later that night. U.S. Coast Guard photo.

Finally, masters should not tow a barge that is potentially down flooding, and companies should employ safety management procedures to help prevent unsafe practices (e.g., there should be the means in place to break free a down-flooded tow, such as weak links).

Incident 2

During all vessel operations, masters and crew should always maintain adequate watertight integrity throughout a vessel to reduce risk. In addition, towing vessel operators should maintain a prudent operating speed to prevent excess water from washing up and over the vessel's bow. This is especially important when the vessel has minimal freeboard.

About the author:
Ms. Sarah K. Webster is the managing editor of the Coast Guard Proceedings of the Marine Safety & Security Council *magazine. She was previously a news reporter and feature writer for Gannett Inc., and a beat reporter for Micromedia Publications. She is working on her M.A. in communication from Kent State University, has a B.A. in communication from Monmouth University, and an A.A. in humanities from Ocean County College.*

Acknowledgement:
Proceedings would like to thank Mr. Ken Olsen and Lt. Eric Riveria of the Office of Investigations and Analysis at USCG headquarters, and CDR Lee Boone and CWO William P. Stewart of MSU Huntington Investigations.

Endnotes:

1. A gyro repeater is a navigational compass that automatically indicates true north. *Random House Unabridged Dictionary,* 1997. The gyro repeaters help navigate vessels; they have two significant advantages over magnetic compasses They find true north as determined by Earth's rotation, which is different from, and navigationally more useful than magnetic north. They are unaffected by ferromagnetic materials, such as ship's steel hull, which change the magnetic field.
2. The master of the vessel did not report this incident to the U.S. Army Corps of Engineers nor to the local Coast Guard.
3. The deckhand testified that he asked the master to slow the speed of the vessel when he saw water wash over the bow and flood the forward deck area during the previous transit (after the sinking of the crane barge).

For more information:

It is highly recommended that towing vessels involved in the dredging industry seek guidance found in the Dredging Safety Management Program's best practices and safety initiatives. The guidelines are available at the U.S. Army Corps of Engineers' website at **www.usace.army.mil/**.

The *United States Coast Guard Requirements for Uninspected Towing Vessels* are available at **http://uscg.mil/hq/cg5/TVNCOE/documents/toolbag/UTVGUIDEBOOK.pdf**.

Understanding Acetone

by LT Angelique Geyer
General Chemistry Course Coordinator
U.S. Coast Guard Academy

Chemical of the Quarter

What is it?

Acetone is an organic compound made up of carbon, hydrogen, and oxygen (C_3H_6O). It can be manufactured or found naturally in the environment. It is also known as propanone, dimethyl ketone, 2-propanone, propan-2-one, and beta-ketopropane. Acetone is the simplest representative of the ketones—it is a transparent, highly mobile, flammable liquid with a sweet and slightly aromatic odor.

Acetone is present in normal urine and blood in very small quantities and as a product of the breakdown of body fat. It also occurs naturally in plants, trees, volcanic gases, and forest fires. Acetone exists in vehicle exhaust, tobacco smoke, landfill sites, and among products formed in destructive distillation of wood and sugar.

A common use of acetone is as a solvent for many plastics and synthetic fibers. It is also used for thinning fiberglass resin, paint, vinyl, adhesives, and varnishes. It dissolves epoxies and glue and it is used to dissolve hazardous chemical spills, as a degreaser, and a cleaner. Laboratory settings mainly use acetone as a solvent in many chemical experiments and as an equipment cleaner. In the household it is found in nail polish remover, paint thinner, and household cleaners.

In industry, acetone is commonly used to manufacture bisphenol A (BPA) and methyl methacrylate (MMA). BPA is an important component of many polymers such as polycarbonates, polyurethanes, and epoxy resins. MMA's principal application is in the manufacturing of polymethyl methacrylate acrylic plastics and in the production of a co-polymer used as a modifier for polyvinyl chloride.

Why should I care?

Shipping Concerns

Acetone is chemically stable under normal conditions, but has several compatibility issues that must be carefully considered when being shipped with other chemicals. These compatibility issues are important since acetone can form explosive mixtures. Acetone is extremely flammable and great care must be taken when it is transferred to and from storage tanks and transportation vehicles to avoid ignition. Acetone has hazardous combustion products, which may include and are not limited to carbon monoxide and carbon dioxide,.

Health Concerns

Acetone is very common in our everyday lives. However, people who work in certain industries that process and use acetone can be exposed to higher levels than the general public. When exposed to acetone at higher than normal environmental condition and inhaled through the nose and throat, or ingested, it can harm the nervous system. Symptoms of exposure include depression, fatigue, excitement, stupor, headache, nausea, dizziness, drowsiness, and confusion. A severe exposure can cause unconsciousness. Skin contact may cause mild irritation. Acetone can be absorbed through the skin, but harmful effects are not expected. When in contact with the eyes, acetone can cause moderate to severe irritation with symptoms including soreness, red eyes, and tearing. Long-term (chronic) skin exposure can cause dry, red, cracked skin. Acetone is not known to be a carcinogen, teratogen, or mutagen.

The EPA requires that spills of 5,000 lbs. or more of acetone be reported.

What is the Coast Guard doing about it?

Under domestic shipping standards, acetone is regulated under 49 Code of Federal Regulations (CFR) 172.101, which lays out the specifications for how the product may be packaged and where it may be stowed for transportation. Cargo compatibility requirements are specified in 46 CFR Table I to Part 150. Internationally, it's regulated by the International Maritime Dangerous Goods (IMDG) code.

The Coast Guard inspects vessels that carry this cargo to ensure they meet applicable safety and security standards and to verify compatibility of cargo stowage.

About the author:
LT Angelique Geyer graduated from Texas A&M University, Corpus Christi, with a B.S. in chemistry, and an M.S. in secondary education. After being selected to be a chemistry instructor at the U.S. Coast Guard Academy, she attended Texas A&M University, Kingsville, where she earned an M.S. in chemistry. She is currently a general chemistry instructor as well as the general chemistry course coordinator at the U.S. Coast Guard Academy in New London, Conn.

Nautical Engineering Queries

Questions

Prepared by NMC Engineering Examination Team

1. In a refrigeration system, the heat normally producing the flash gas at the thermostatic expansion valve is obtained by what means?

A. The hot gas by-pass connection at the three-way valve
B. The portion of liquid refrigerant that does not flash
C. Exposure to the high ambient temperature within the coil
D. Exposure to the high ambient temperature of the cooled space

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2. How is electrical conductor insulation classed?

A. Conductor current carrying capacity
B. Voltage rating of the insulation
C. Conductor ampacity
D. Limiting internal hot spot temperature

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3. When checking for the presence of sulfite in the feedwater of an auxiliary boiler, you are in essence checking _____.

A. The hardness of the makeup feed water
B. To ensure the compound additions are adequate for control of pH
C. To ensure the compound additions are adequate for controlling dissolved oxygen
D. To ensure the automatic or manual blowdown rate and frequency is adequate for control of total dissolved solids

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4. A large, low-speed, crosshead, main propulsion diesel engine using residual fuel oils must have a cylinder oil having a _____.

A. Low TBN value
B. High alkaline reserve
C. Low flash point
D. High pour point

1. *Note: Evaporation of a refrigerant in a mechanical refrigeration system is a result of two processes: flashing and boiling. Flashing occurs within the expansion device and is the result of a significant drop in refrigerant pressure as it passes through the orifice. Boiling occurs within the evaporator and is the result of the absorption of heat from the refrigerated space into the boiling refrigerant.*

A. The hot gas by-pass connection at the three-way valve — Incorrect answer. Depending upon the application, a hot gas by-pass connection may be used as a means of capacity control, evaporator freeze-up prevention, heating, or evaporator coil defrosting. None of these processes involve flashing.

B. The portion of liquid refrigerant that does not flash — **Correct answer.** The term "flash gas" is used to indicate that portion of the liquid refrigerant that turns into a vapor as it passes through the expansion valve orifice. The flash gas absorbs heat from the remaining liquid refrigerant, thus cooling same to the saturation temperature corresponding to the evaporator pressure. This process permits the liquid refrigerant to enter the evaporator at a temperature lower than the refrigerated space, thus enabling the refrigeration process.

C. Exposure to the high ambient temperature within the coil — Incorrect answer. The temperature within the coil is lower than the refrigerated space temperature, not higher.

D. Exposure to the high ambient temperature of the cooled space — Incorrect answer. The temperature of the refrigerated space is higher than the refrigerant temperature within the coil and results in boiling, not flashing.

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2. *Note: The classification of insulation systems for rotating machinery and other wound electrical power apparatus is listed by letter code within the nameplate data. The letter codes are a function of the maximum temperature rise above the rated winding cooling medium (or ambient) temperature which corresponds to the actual internal hot-spot temperature limit.*

A. Conductor current carrying capacity — Incorrect answer. The conductor current carrying capacity is a function of the cross-sectional area of the conductor, not the insulation class.

B. Voltage rating of the insulation — Incorrect answer. The voltage rating of the insulation is a function of the dielectric strength (material breakdown voltage) of the insulation, not the insulation class.

C. Conductor ampacity — Incorrect answer. The ampacity of the conductor is the current carrying capacity of the conductor. See explanation for answer A.

D. Limiting internal hot spot temperature — **Correct answer.** The limiting internal hot-spot temperature (which is the maximum temperature rise plus the rated ambient temperature) is given by the insulation class code letter.

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3. *Note: Boiler water treatment chemicals include phosphates that control hard scale. Caustic soda controls pH and sulfites control oxygen pitting corrosion. The reserve sulfite test is used to determine if adequate sulfite is present to control dissolved oxygen. Since sulfites increase the dissolved content of the boiler water and decompose into acidic gases at high temperatures, use is generally limited to boiler pressures below 600 psi. Hydrazine is commonly utilized for boiler pressures above 600 psi.*

A. The hardness of the makeup feed water — Incorrect answer. The hardness of makeup feed water is tested by a soap hardness test or EDTA test, not a reserve sulfite test.

B. To ensure the compound additions are adequate for control of pH — Incorrect answer. The test for insuring adequate control of pH is accomplished by the various alkalinity tests, not a reserve sulfite test.

C. To ensure the compound additions are adequate for controlling dissolved oxygen — **Correct answer.** As explained in the note above, the reserve sulfite test is used to determine if adequate sulfite is present to control dissolved oxygen.

D. To ensure the automatic or manual blowdown rate and frequency is adequate for control of total dissolved solids — Incorrect answer. Although the blowdown rate and frequency controls total dissolved solids, the test for total dissolved solids is accomplished by electrical conductivity meters, not a reserve sulfite test.

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4. *Note: Residual fuel oils have relatively high sulfur content and during the combustion process, the sulfur combines with oxygen and the resulting sulfur-oxides combine with water vapor to form sulfuric acid. Cylinder lubricating oils must be capable of neutralizing these acids.*

A. Low TBN value — Incorrect answer. The cylinder lubricating oil ideally must have a high TBN (total base number) value to provide a reserve capacity to neutralize acids.

B. High alkaline reserve — **Correct answer.** The cylinder lubricating oil ideally must have a high alkaline reserve (also known as a high TBN value) to provide a reserve capacity to neutralize acids as they are formed during the combustion process when residual fuels are burned.

C. Low flash point — Incorrect answer. A cylinder lubricating oil ideally must have a relatively high flash point to facilitate safe forwarding and to prevent vaporization of the oil while lubricating the cylinder.

D. High pour point — Incorrect answer. A cylinder lubricating oil ideally must have a relatively low pour point to facilitate forwarding.

Nautical Deck Queries

Questions

Prepared by NMC Deck Examination Team

1. INLAND ONLY: Maneuvering signals shall be sounded on inland waters by which of the following vessels?

A. All vessels when meeting, crossing, or overtaking and in sight of one another
B. All vessels meeting or crossing at a distance within half a mile of each other and not in sight of one another
C. Power-driven vessels overtaking and in sight of one another
D. Power-driven vessels crossing at a distance within half a mile of each other and NOT in sight of one another

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2. Your ship received a HYDROLANT advising of a special warning to mariners from the Department of State for ships in the Persian Gulf. You are 400 miles south of, and bound for, the Persian Gulf. What action should you take?

A. Continue on course as the warning is advisory in nature only.
B. Send an AMVER report and acknowledge receipt of the warning.
C. Remain a minimum of 500 miles outside the Persian Gulf and maintain radio silence.
D. Send a MERWARN message advising your position, course, speed, and intentions.

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3. You are on a container vessel. Which of the following is true concerning the handling and stowage of containerized hazardous materials?

A. Open-bed containers may be used to transport hazardous materials if the cargo is properly secured.
B. A portable cargo tank of a flammable, cryogenic liquid may not be in transit for a period exceeding its marked rated holding time unless the liquid is inhibited.
C. A portable cargo tank containing a cryogenic liquid must be shipped on deck unless forced ventilation is provided to the tween-decks.
D. A container loaded with packages of tear gas would display a placard reading "Irritant."

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4. Which of the following is the foremost disadvantage of a centrifugal pump?

A. The pump design is not self-priming
B. The pump design does not produce high volume output
C. The pump design inherently requires extensive maintenance
D. The pump design has the highest efficiency in the lift condition

1.

A. All vessels when meeting, crossing, or overtaking and in sight of one another
Incorrect answer. Rule 34 applies to power-driven vessels meeting within half a mile of each other.

B. All vessels meeting or crossing at a distance within half a mile of each other and not in sight of one another
Incorrect answer. Rule 34 stipulates: "power-driven vessels are in sight of one another".

C. Power-driven vessels overtaking and in sight of one another
Correct answer. Rule 34 states: "when power-driven vessels are in sight of one another and meeting or crossing at a distance within half a mile of each other, each vessel underway, when maneuvering as authorized or required by these Rules"

D. Power-driven vessels crossing at a distance within half a mile of each other and NOT in sight of one another
Incorrect. Rule 34 applies to power-driven vessels in sight of each other and meeting within half a mile.

2.

A. Continue on course as the warning is advisory in nature only.
Incorrect answer. Pub 117 section 810E requires the master to respond to the warning message if the vessel is in, or will enter the area depicted in the message.

B. Send an AMVER report and acknowledge receipt of the warning.
Correct answer. Reference: Pub 117 section 810E
This section states that if the vessel is in an area as defined in either the SPECIAL WARNING TO MARINERS or the MARAD ADVISORY that the master immediately file an updated AMVER message report.

C. Remain a minimum of 500 miles outside the Persian Gulf and maintain radio silence.
Incorrect answer. Vessels will be given specific instructions that may include diversion, or changes in their destination.

D. Send a MERWARN message advising your position, course, speed, and intentions.
Incorrect answer. This type of message is broadcast to merchant shipping as an information warning message.

3.

A. Open-bed containers may be used to transport hazardous materials if the cargo is properly secured.
Correct answer. Reference: 49 CFR 176.76 (a) (10)
The carriage of hazardous material is only permitted in open-bed containers if the cargo is properly secured.

B. A portable cargo tank of a flammable, cryogenic liquid may not be in transit for a period exceeding its marked rated holding time unless the liquid is inhibited.
Incorrect answer. Extensions are prohibited to the marked rated holding time of a cryogenic liquid while in transit.

C. A portable cargo tank containing a cryogenic liquid must be shipped on deck unless forced ventilation is provided to the tween-decks.
Incorrect answer. This cargo must be stowed on deck regardless of the stowage as authorized in 49 CFR 172.101.

D. A container loaded with packages of tear gas would display a placard reading "Irritant."
Incorrect answer. Tear gas is required to have a label of either "Poison" or "Poison Inhalation Hazard."

4.

A. The pump design is not self-priming
Correct answer. Reference: Tanker Operations, Huber, Fourth Edition, Page 168
Centrifugal pumps require a continual flow of liquid to maintain an adequate prime.

B. The pump design does not produce high volume output
Incorrect answer. Centrifugal pumps are high volume output units, which is why they are frequently used as main cargo pumps on a vessel.

C. The pump design inherently requires extensive maintenance
Incorrect answer. Centrifugal pumps have few moving parts equating to increased reliability and reduced maintenance.

D. The pump design has the highest efficiency in the lift condition
Incorrect answer. Centrifugal pumps are at optimum pumping efficiency when in the head condition.


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