The Future of Marine Spatial Planning in the Northwest Atlantic: Key Findings from Two Regional Workshops

June 8-9, 2009
Warwick, Rhode Island

and

June 11-12, 2009
Newark, Delaware

The Nature Conservancy

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Acknowledgements

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Sally Yozell
Director Marine Conservation
Eastern U.S. Division
The Nature Conservancy

Foreword

We depend on our coasts and oceans for food, recreation, transport, and a variety of ecosystem services. We have faced urban sprawl issues for decades, and now, as we enter an era of unprecedented growth in ocean activities, we are facing “marine sprawl”. Stakeholders for renewable energy, offshore oil and gas development, aquaculture, commercial fishing, recreational use, and shipping are all competing to stake their claims in the ocean. In this increasingly crowded marine environment, we must pay careful attention to the survival requirements of whales, sea turtles, sea birds, fish, and the habitats on which they depend.

As a society, we need to design ocean management plans that align diverse uses with ecologically compatible places to maintain and protect biodiversity and assure resilient marine systems that will continue to provide the ecosystem services upon which all life on earth depends. To accommodate current and future uses of our oceans, it is essential that we change the way we manage our oceans. Instead of addressing marine management piecemeal, or on a sector-by-sector basis, we need to focus on the entire seascape in consideration of the many stakeholders who use it and the complex interactions between human activities and essential ecosystem features and functions. There is a need to assess tradeoffs between different management choices and identify solutions that minimize conflicts between human stakeholder groups, and between human uses and the long term health of marine ecosystems. Various countries around the world are showing that this is possible through marine spatial planning (MSP).

MSP is moving quickly in the United States. Several states, including Massachusetts, Rhode Island, and New York, have started initiatives toward integrated MSP. On June 12, 2009, President Barack Obama charged a new Federal Task Force with developing a framework for effective coastal and marine spatial planning within six months. This timely announcement coincided exactly with the end of the Mid-Atlantic MSP workshop. Recognition of the need for national level MSP approaches is growing rapidly and several legislative initiatives to require MSP for offshore energy development and other resource uses have recently been introduced in Congress.

Practice around the world illustrates that MSP can only be accomplished successfully with an integrated foundation of scientific information from which decisions can be made. Such information is necessary at different scales. On the one hand, we need spatial and temporal data detailed enough to develop adequate plans within state and federal jurisdictions. On the other hand, we need to make sure that each of those plans is consistent with one another and that the combination of all our actions leads us toward a healthy and productive ocean in the region as a whole. For this reason, the Conservancy has undertaken a science-based marine ecoregional assessment for the Northwest Atlantic Marine region. During the two two-day workshops in Rhode Island and Delaware, we discussed MSP, identified regionally important principles, and initiated a discussion among all participants on how the current NAM ERA results can support and advance the development and implementation of MSP at state, regional, and federal levels.

Executive Summary of Feedback from MSP Workshops

During the two workshops, many excellent ideas were identified that would support and advance the implementation of marine spatial planning at the regional level, make MSP more effective, improve the science base for MSP, and improve opportunities for partnerships among institutions involved with MSP and ocean governance. In summary, some of these ideas included:

Key Elements to Make MSP Effective

- Science based/data driven process
- Regionally-based scale
- Ecosystem based approach
- Multi-objective planning, including conservation of nature
- Clear, measurable goals and objectives
- Spatially explicit
- Cumulative Impact Assessment
- Integrated/coordinated
- Adaptive/Not a one-time plan
- Participatory/Transparent
- Iterative process, including feedback loops
- Proactive and future oriented, including the effects of climate change
- Precautionary approach

Data and Science

- Use best-available science
- Include multiple, spatially (and temporally)-explicit datasets
- Make data available, distributable and maintained by the federal government.
- Develop regional cumulative impact assessment
- Understand the value of ecosystem services and include in MSP decision making

Federal, State and Regional Partnerships

- Establish federal executive order or legislation to provide authority for regional councils to create marine spatial plans
- Increase funding for state, regional, and federal MSP efforts and for new surveys needed to support MSP
- Enhance cooperation with offshore industries and the federal government, including the military
- Use MSP as a mechanism to address conflicts or synergies across jurisdictions
- Adaptive, iterative, look to future scenarios and uses
- Build and ensure the availability of technical MSP expertise at different levels of government
- Strengthen authorities to develop MSP planning and analysis initiatives beyond the 3-mile state jurisdiction
- Enhance communication among governmental agencies
- Implement regional pilot projects with federal agencies
- Create future regional vision for ecological, economic and social goals
- Share good practices and technical expertise (state, federal and partners)

1. Introduction and Overview

The Northeast Regional Workshop on MSP was held in Warwick, Rhode Island, on June 8-9, 2009. The Mid-Atlantic Regional Workshop on MSP was held in Newark, Delaware, on June 11-12, 2009. Both of these workshops were organized by the Marine Conservation Program of The Nature Conservancy's Eastern U.S. Division and co-sponsored by the National Oceanic and Atmospheric Administration (NOAA). The Rhode Island workshop was also co-sponsored by the Northeast Regional Ocean Council (NROC). Both workshops included presentations by a variety of federal and state MSP experts and MSP practitioners from the field.

The goals of the workshops were two-fold:

1. Develop a common level of understanding of marine spatial planning (MSP) and address how it can support coordinated state and federal management solutions that align human uses with compatible marine areas. Participants were asked to engage in discussion about planning principles, concepts, and potential avenues for advancing integrated MSP at state and federal levels in the Northeast, Mid-Atlantic, and nationally, and how to best achieve ecological, economic, and social objectives.

2. Share information from the Nature Conservancy's Northwest Atlantic Marine Ecoregional Assessment (NAM ERA), a two-year project to compile, analyze, and map geophysical, biological, and human use data for the marine environment. Participants were asked to review the draft work and discuss its utility to help inform MSP, ecosystem-based management, and regional ocean governance.

The Northeast workshop was introduced by the workshop co-sponsors, Steve Murawski, Director of Research Programs of NOAA's National Marine Fisheries Service (NMFS), Kathleen Leyden, Chair of the Northeast Regional Ocean Council (NROC) and Sally Yozell, Director of Marine Conservation for the Conservancy's Eastern Division. Steve Murawski highlighted the ability of MSP to reduce impacts on ecologically sensitive areas and minimize disputes between incompatible uses. He further stressed the need for integrated governance and partnerships among institutions to establish MSP successfully and specified some technical requirements, including enhanced mapping and the multipurpose marine cadastre, ocean habitat characterization studies, monitoring, enforcement, hydrodynamic models, living marine resource assessments, characterization of human use patterns, and integrated ecosystem assessments. He concluded that it is necessary to articulate better the objectives, costs, and benefits of MSP, and the need to move toward pro-active rather than re-active planning.

Kathleen Leyden discussed the various interests of NROC in working together with The Conservancy, including the eagerness to see how the NAM ERA data – to which all states have contributed information – can be built upon in the future and support NROC activities. She also focused on the importance of sharing expertise from states with MSP experience in relation to some of the larger regional questions. She welcomed the

opportunity provided by the workshop to discuss important lessons learned from MSP practice in Massachusetts and Rhode Island regarding collaboration with federal agencies and data management needs. The Northeast Workshop's special guest speaker, U.S. Senator Sheldon Whitehouse (RI), shared his commitments to marine conservation and made a compelling case for moving MSP forward in the region, in Rhode Island and nationally.

At the Mid-Atlantic Workshop, Sally Yozell opened the meeting and introduced Peyton Robertson, Director of NOAA's Chesapeake Bay Office and the lead for NOAA's North Atlantic Regional team. He emphasized the need for and advantages of comprehensive MSP, in particular the importance of addressing individual sector concerns or activities jointly and across the board. This will help address conflicts at the beginning of the process and highlight compatibilities of ocean uses. During his talk, he drew analogies with his own management experience in the Chesapeake Bay. Sarah Cooksey, Director of Delaware Coastal Programs, presented an overview of the newly established Mid-Atlantic Regional Council on the Ocean (MARCO) and discussed how the governors of New York, New Jersey, Delaware, Maryland, and Virginia have committed to working together to maintain and improve the health and economic vitality of the ocean and its resources. Additional representatives of MARCO from each of the five Mid-Atlantic States attended the workshop and made substantial contributions to the discussions.

Each of the two-day workshops began with an introductory presentation on MSP followed by a comprehensive overview of the NAM ERA project goals, methods, and results. The NAM ERA data and maps were discussed in depth during a two hour "Data Café" organized around four break-out groups, including (a) demersal, small pelagic, and diadromous fish; (b) benthic communities and oceanographic processes; (c) coastal ecosystems; and (d) migratory species.

At each workshop, the second day commenced with an overview of human uses of ocean resources by Jay Odell, Director of Marine Conservation for the Conservancy's Mid-Atlantic Program. The presentation highlighted NAM ERA spatial data on the distribution and intensity of diverse human uses, with observations on links and impacts to marine and coastal ecosystem features. This was followed by presentations on current MSP initiatives at the state and federal level. The Northeast workshop included presentations and discussions of the Massachusetts Ocean Management Plan by Bruce Carlisle of the Massachusetts Office of Coastal Zone Management and Rhode Island Ocean Special Area Management Plan (SAMP) by Grover Fugate of the Rhode Island Coastal Resources Management Council.

The Mid-Atlantic workshop included a presentation by Jeff Herter of New York's Department of State on implementation of the New York Ocean and Great Lakes Ecosystem Conservation Act, including review of their new online Ocean Atlas to support MSP and New York's perspective on the value of MARCO to improve ocean management at regional scale. Lauren Wenzel from NOAA's National Marine Protected Areas Center presented recently collected data on human uses of ocean resources in California and discussed the benefits of the California Ocean Atlas as a tool for MSP.

Both workshops included presentations and discussions regarding national level MSP. Information regarding new collaborative work by the Department of Interior's Minerals Management Service (MMS) and NOAA to develop comprehensive spatial data to support management of offshore energy resources (the Multipurpose Marine Cadastre) was presented at both workshops. This exciting new partnership was highlighted at the Providence workshop by Renee Orr, Chief of the Leasing Division of MMS, and in Newark by Brian Smith, Coastal Ecologist for NOAA's Coastal Service Center. MMS was also represented at the Newark workshop by Maureen Bornholdt, Alternative Energy Program Manager, who shared information on development of MMS policy on alternative energy development and energy legislation in relation to MSP. David Kaiser, a Senior Policy Analyst from NOAA, provided an overview of existing laws and some of the MSP oriented legislative initiatives before Congress.

Both workshops culminated in lively breakout group discussions regarding principles for MSP and what potential next steps could be taken to move MSP forward. The principles discussion was introduced with an overview of good MSP practices from around the world. Lynne Hale, Director of the Conservancy's Global Marine Initiative summarized the key next steps raised during the Northeast workshop, both for the continuation of the Conservancy's NAM ERA work and the advancement of MSP in general. The closure of the Mid-Atlantic workshop was celebrated with the timely announcement of the new Presidential Memorandum establishing a Task Force for the development of a framework for effective MSP in the United States over the next 180 days.

Over 100 MSP practitioners participated in each of the workshops, including scientists, federal and state resource managers and policy makers, experts representing industry, academics and non-governmental organizations. The success of the workshops was largely a result of their active participation and engagement in discussions about the application of the NAM ERA data to the development of MSP, principles and concepts for MSP, and potential avenues for advancing integrated MSP at state and federal levels in the Northeast, the Mid-Atlantic, and nationally. The agenda of the workshops and list of participants and their contact details is provided in Appendix I and II of this report, respectively.

2. The Nature and Use of Marine Spatial Planning

Fanny Douvere and Bud Ehler, consultants to the Intergovernmental Oceanographic Commission (IOC) of the United Nations Educational, Scientific, and Cultural Organization (UNESCO), gave an introductory presentation on MSP. In the context of their work, they have been analyzing and documenting good practices on MSP from around the world and published a guide on the critical steps for developing and implementing ecosystem-based MSP. The sections below are a summary of their presentation.

2.1 Introduction

MSP is a practice whose time has come in the United States. Offshore renewable energy facilities, commercial fishing, diverse recreational uses, offshore drilling, shipping "super highways", all have competing claims for ocean space and make the ocean an increasingly crowded place. Most countries already designate marine space for a number of human activities such as maritime transportation, oil and gas development, renewable energy, offshore aquaculture, waste disposal, among others. However, the problem is that usually this is done on a sector-by-sector, case-by-case basis without much consideration of effects either on other human activities or the marine environment. This situation results in conflicts that weaken the ability of the ocean to provide the necessary ecosystem services[1] upon which humans and all other life on Earth depend.

During recent years, MSP has been the focus of considerable interest throughout the world, particularly in heavily-used marine areas. Countries such as Australia, Germany, the United Kingdom, The Netherlands, Norway, and China, among others, have all achieved successful results in integrating ecological, economic and social objectives in their ocean areas. They have done so through development and implementation of MSP. MSP offers countries an operational framework to maintain the value of their marine biodiversity while at the same time allowing sustainable use of the economic potential of their oceans. When applied at an ecosystem level, MSP is an approach that can make key components of ecosystem-based management (EBM) in marine areas a reality.

2.2 What Is Marine Spatial Planning?

MSP is a public process of analyzing and allocating the spatial and temporal distribution of human activities in marine areas to achieve ecological, economic, and social objectives that are usually set through a political process. Characteristics of effective MSP include:

- *Ecosystem-based*: Balancing ecological, economic, and social goals and objectives toward sustainable development.
- *Integrated*: Across sectors and agencies, and among levels of government with clearly articulated criteria for trade-offs.
- *Place-based or area-based:* Managing the area and its use as a whole.
- *Adaptive:* Capable of learning from experience and changing circumstances.
- *Strategic and anticipatory:* Focused on the long-term, particularly in light of climate change.
- *Participatory:* Stakeholders actively involved in the process.

MSP does not only produce a one-time plan. It is a continuing, iterative process that adapts and changes over time based on experience and lessons learned. The

[1] Ecosystem services include 'provisioning services' such as food, fresh water, fiber, biochemicals, genetic resources; 'regulating services' such as climate regulation, disease regulation, water regulation, water purification, pollination; 'cultural services' such as recreation and tourism, as well as spiritual and religious, aesthetic, inspirational, and educational benefits; and 'supporting services' such as soil formation, nutrient cycling, and primary production.

development and implementation of MSP typically involves a number of steps, including[2]:

1. Identifying need and establishing authority.
2. Obtaining financial support.
3. Organizing the process through pre-planning.
4. Organizing stakeholder participation.
5. Defining and analyzing existing conditions.
6. Defining and analyzing future conditions.
7. Preparing and approving the marine spatial plan.
8. Implementing and enforcing the marine spatial plan.
9. Monitoring and evaluating performance.
10. Adapting the marine spatial planning process.

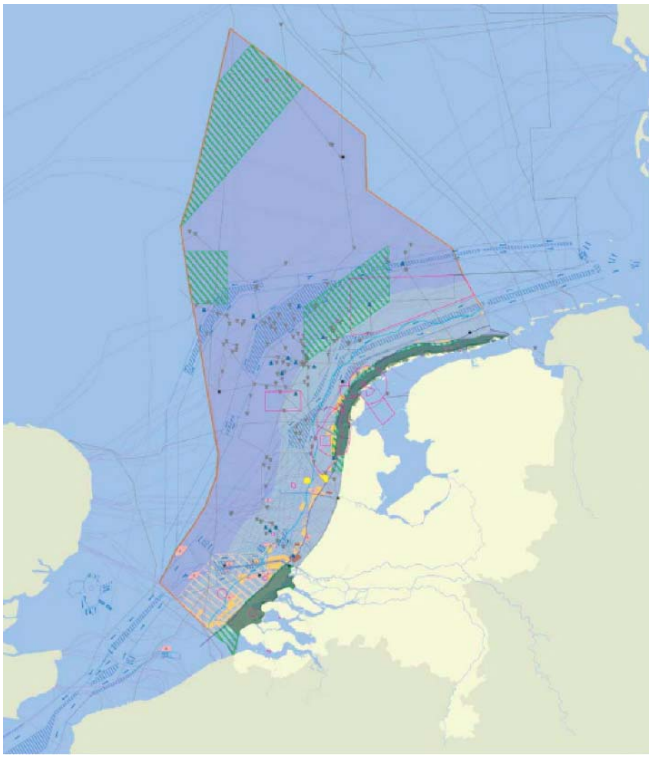
The ten steps are not simply a linear process that moves sequentially form step to step. Many feedback loops should be built into the process. Through these steps, MSP can help decision-makers answer three critical questions:

1. Where are we today?
2. Where do we want to be in the future?
3. How do we get there?

It is important to understand MSP as a proactive, future-oriented activity. Identifying alternative futures for the ocean enables a determination of the desired direction toward which the marine management area should develop. The latter is central to selecting the right management measures and decisions needed to get there. Practices in The Netherlands, for example, illustrate the value of MSP as a practical way to identify what to do today to ensure that valuable ecosystem goods and services are sustained for current and future generations. Through MSP, The Netherlands not only mapped current conditions, but also identified how their ocean area should look like by 2015 (and for some areas even beyond). By developing alternative spatial use scenarios for economic development, biodiversity protection, and sea level rise as a result of climate change, they were able to decide how to allocate ocean space now to realize their ecological, economic, and social objectives by 2015 (Figure 1 and 2).

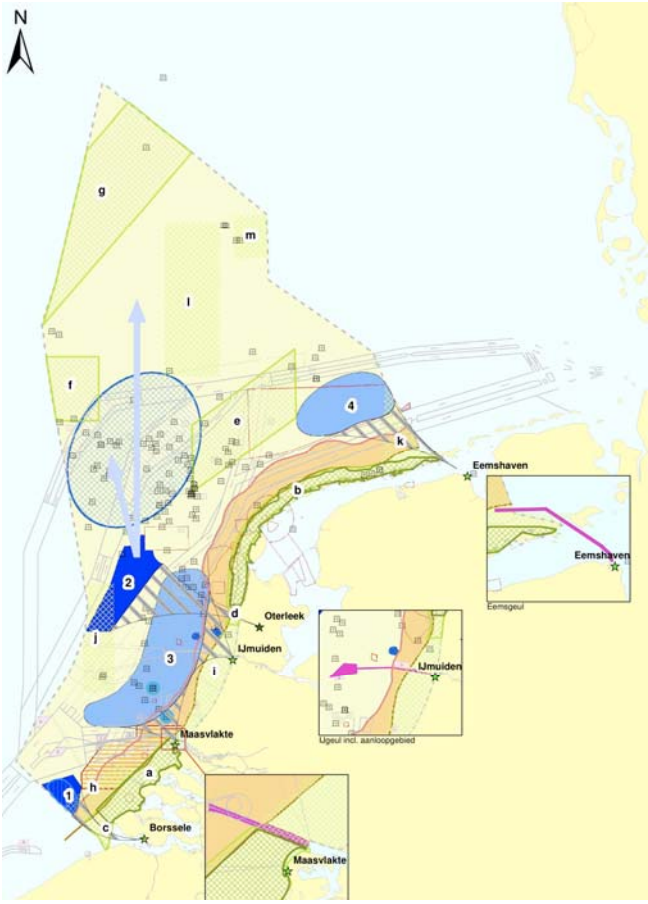
[2] For more information, see: C. Ehler and F. Douvere. Marine spatial planning: A step-by-step approach toward ecosystem-based management. Intergovernmental Oceanographic Commission and Man and the Biosphere Programme. IOC Manual and Guides, no. 53, ICAM Dossier, no. 6. Paris, UNESCO, 2009. Available at: ioc3.unesco.org/marinesp

Figure 1: Current space utilization in the Dutch North Sea



Source: Ministerie van Verkeer en Waterstaat, 2008

Figure 2: Desired future space utilization in the Dutch North Sea



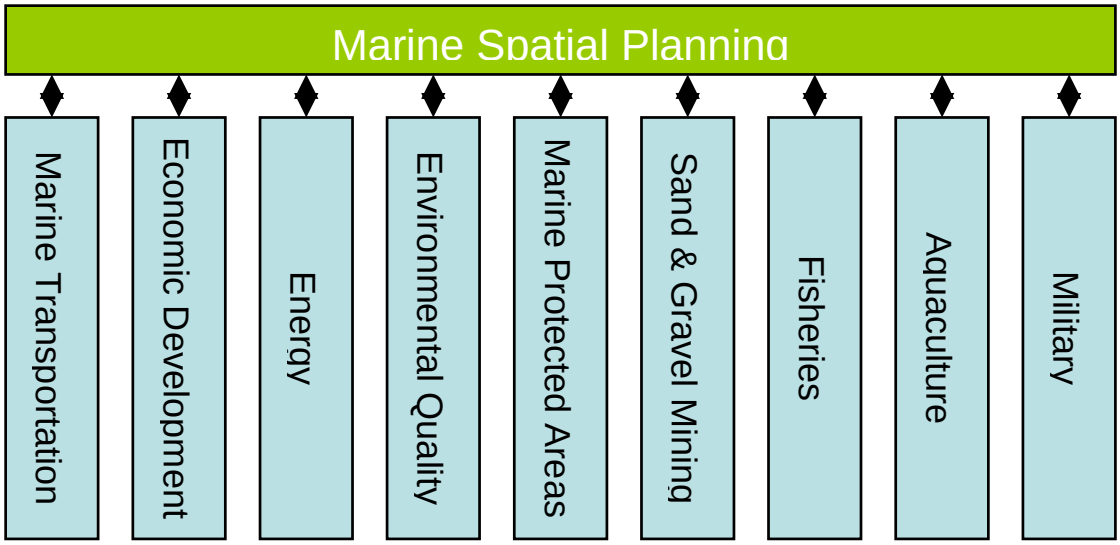
Source: Ministerie van Verkeer en Waterstaat, 2008

2.3 How Does Marine Spatial Planning Work?

The ocean is not a homogenous place. Some areas are more important than others – both ecologically and economically. Areas of high biodiversity, high endemism, or high productivity, spawning and nursery areas, or migration stopover points are all important areas from an ecological perspective. Oil and gas deposits, sand and gravel areas, fishing grounds, areas of sustained winds are also all distributed in specific places and at specific times, and are important for economic reasons.

Understanding this spatial and temporal heterogeneity, and mapping it, is central to successful implementation of MSP. Essentially, MSP enables components of EBM to become real because it takes the heterogeneity of the ocean as the basis for planning and analysis of the area. By doing this, it can provide guidance to a range of decision-makers responsible for particular sectors, activities or concerns so that they will have the means to make decisions in a more comprehensive, integrated, and complementary way (Figure 3).

Figure 3: MSP as the guiding process for single-sector decisions, concerns, or activities



Source: Ehler and Douvere, 2009

In the Northwest Atlantic region, for example, MSP requires spatial and temporal data and information of sufficient detail to enable the development of marine spatial plans at the state level (marine areas generally up to three nautical miles offshore)and the federal level (marine areas generally beyond three nautical miles and out to 200 nautical miles offshore). Often, marine spatial plans are developed for areas where boundaries are based on political or administrative considerations rather than ecological ones. MSP at a broader ecoregional scale in the Northwest Atlantic would ideally entail cooperation between two countries (Canada and United States), ten coastal states (from Maine to Cape Hatteras North Carolina, and a range of federal government agencies. Consequently, development of MSP in the Northwest Atlantic marine region also requires spatial and temporal data that reflects the ecological and economic heterogeneity at the larger scale of the region as a whole. Such information can ensure

that marine spatial plans developed by different authorities are consistent with one another and are mutually reinforcing in achieving goals and objectives, including protection of valuable ecosystem services and sustainable economic development.

Such broader ecoregional data has been largely lacking in many seas of Europe. In the North Sea, for example, national plans have been developed that are inconsistent with one another and are – at least to some degree - limiting adequate conservation of key ecological features or growth of sustainable economic development at the larger North Sea scale. Understanding and mapping the ecological and economic heterogeneity at the broader ecoregional scale of the Northwest Atlantic is the key goal of The Nature Conservancy's NAM ERA. The results of the NAM ERA work are discussed in section 2 of this report.

2.4 Marine Spatial Planning in the United States

Over the past year, MSP has been moving quickly in the United States, both at the state and federal level. MSP initiatives relevant to the Northwest Atlantic region were presented at the workshop. These presentations form the basis for the summaries below.

2.4.1 Marine Spatial Planning Efforts at the Federal Level

In many ways, state-led MSP efforts are driving increased interest in coordinated, comprehensive MSP at the federal agencies and within United States Congress. During the Northeast workshop, Steve Murawski, Director of Research Programs of NOAA's National Marine Fisheries Service and David Kaiser, Senior Policy Analyst for NOAA's National Ocean Service both discussed MSP efforts at the federal level. Steve Murawski concentrated on the goals, potential and challenges of MSP, emphasizing the need for an integrated governance system with partnerships among government institutions, universities, NGO's, industry, and cooperation across sectors and/or interests. David Kaiser illustrated the current legislative and policy framework for MSP at the federal level.

Key goals of MSP at the federal level include reducing cumulative impacts of human activities on ecologically sensitive areas, and minimizing disputes between incompatible uses. Federal agency support to MSP initiatives include:

- Providing climate change information needed for effective decision-making, including atmospheric, tidal, current and mapping data.
- Collecting data to facilitate siting (including biological, chemical, oceanographic and human use data, for example).
- Providing habitat protection and restoration information and data.
- Reviewing projects to minimize environmental impacts.
- Promoting monitoring and adaptive management.
- Mapping ocean uses.
- Working with state coastal management programs.

Currently, four federal policy and legislative initiatives are addressing (or potentially will be addressing) MSP, including:

1. A Task Force for the development of a framework for effective MSP in the U.S. issued by a White House memorandum on 12 June 2009. The Task Force has 6 months to prepare its recommended framework.

2. The *American Clean Energy and Security Act of 2009* (ACES) (H.R. 2454), introduced on 15 May 2009. The bill, a comprehensive energy legislation to deploy clean energy resources, aims at increasing energy efficiency, reducing global warming, and a transition to a clean energy economy. Part I, Subtitle I of the ACES included a provision, that was later dropped in Committee, to direct the Federal Energy Regulatory Commission, the Secretary of Interior, and NOAA, in consultation with the Council on Environmental Quality (CEQ) and as appropriate coastal states and relevant NGOs, to 'jointly conduct a study of the potential for MSP to facilitate development of offshore renewable energy facilities in a manner to protect and maintain the coastal and marine ecosystems.' The study would have identified the steps involved in regional MSP for siting offshore energy facilities and recommend an approach to develop regional marine spatial plans for siting offshore renewable energy facilities[3]. The provision was dropped in Committee, but similar language is expected to be added later in the legislative process. The ACES Act was passed by the House of Representatives on 26 June 2009.

3. The draft House Natural Resources Committee bill, the *Federal Lands and Resources Energy Development Act of 2009*. This draft Act proposes to combine offices and responsibilities for onshore and offshore energy into one office with the Department of Interior (DOI). In doing so, it would take some of the MSP and ecosystem-based management concepts of the ACES and put those concepts into action by creating Regional OCS Councils that would develop strategic plans that the DOI would use in its decision-making. The strategic plans would be based on MSP and ecosystem-base considerations. The Act would also authorize Regional Ocean Partnerships among states and would direct funds from offshore revenues to coastal states and regional ocean activities. If this Bill were to become law, it would have significant consequences for how the United States makes decisions related to the use of ocean space.

4. The draft of the Senate *Federal Oil and Gas Act of 2009*, containing an extensive inventory of Outer Continental Shelf hydrocarbon reserves and an inventory of renewable energy resources including biological and ecological resources.

Renee Orr, Chief of the Leasing Division of MMS, and Brian Smith, Coastal Ecologist at NOAA Coastal Service Center, presented an overview of the Multipurpose Marine Cadastre that is currently being developed by the two agencies (Orr at the Northeast and Smith at Mid-Atlantic workshops, respectively). MMS, in cooperation with the

[3] The ACES Act was passed by the House of Representatives on 26 June 2009.

Federal Geographic Data Committee (co-chaired by MMS and NOAA) is presently leading the process. The Cadastre is directed by the Energy Policy Act of 2005 and seeks to include not only MMS and NOAA marine and coastal data and related jurisdictions, but also those of other federal agencies, states, NGO's and regional associations. The Cadastre is a web-based service that provides baseline data and information for the outer continental shelf and state waters that can support MSP efforts, particularly those that involve locating optimal sites for renewable energy projects or marine protected areas. The Cadastre is intended to evolve toward meeting the needs of the entire United States ocean community for the purpose of planning ocean uses, avoiding conflicts, and determining the necessary participants for individual project assessments[4].

During the Mid-Atlantic workshop, Maureen Bornholdt, Alternative Energy Program Manager at MMS, presented a comprehensive overview of how the OCS Renewable Energy Program is involved in the development and advancement of MSP. Based on the Energy Policy Act of 2005, MMS has the authority to grant leases, easement or right of way for activities on the Outer Continental Shelf (OCS) that produces or supports production, transportation, or transmission of energy from sources other than oil and gas[5]. Under this new authority, MMS is in the process of developing proposed regulations intended to encourage orderly, safe, and environmentally responsible development of renewable energy resources and alternate use of facilities on the OCS. During the spring of 2009, non-competitive limited leases for offshore energy in New Jersey and Delaware were issued as part of the interim policy.

Finally, Lauren Wenzel of the NOAA National Marine Protected Areas Center illustrated the advantage of MSP as a process to balance competing ocean uses. She emphasized that effective ocean management increasingly requires planning for all ocean uses and discussed the California Ocean Uses Atlas as a critical step toward such planning. The Ocean Use Atlas includes maps of 30 significant current and projected ocean uses (8 industrial/military uses, 12 fishing uses, and 10 non-consumptive uses) and was developed in partnership with the Marine Conservation Biology Institute, the Gordon and Betty Moore Foundation and the Resources Legacy Fund Foundation. She stressed the need for spatially explicit ecosystem information, spatially explicit ocean use information, and decision support tools, as core components of MSP[6].

2.4.2 Marine Spatial Planning Efforts at the State Level

The focus of the presentations and discussions of MSP at the state level was different in both workshops and primarily reflected the different stages of MSP development in each region. In the Northeast, for example, more attention was paid to the exchange of lessons learned from existing MSP practice in Massachusetts and Rhode Island with other states. With MSP being less advanced in the Mid-Atlantic, discussion was more

[4] More information is available at: www.csc.noaa.gov/mmc.

[5] Examples include wind energy, wave energy, ocean current energy, solar energy, and hydrogen production.

[6] For further information contact: Dr. Charlie Wahle at the NOAA MPA Center: charles.wahle@noaa.gov.

focused on how to get started with MSP, and particularly what kind of data, institutional arrangements, partnerships, authority, etc., are needed or sufficient to begin an MSP process.

Generally, state-led MSP efforts are largely driven by initiatives for offshore renewable energy. For example, New Jersey has the goal of installing 1000 MW of offshore wind energy by 2012. A developer (*Deepwater Wind*) was selected to construct a 350 MW pilot project. Delaware has selected a developer (*Blue water Wind*) to construct a 200 MW facility on the OCS by 2012. Other states on the east coast, including Massachusetts, Rhode Island, Maryland, Georgia, Maine, North and South Carolina, are also exploring the potential for offshore wind development

At the Mid-Atlantic workshop, Jeffrey Herter of the New York Department of State presented an overview of the online ocean and coastal resources atlas and illustrated its potential for the development of MSP. In the Northeast comprehensive MSP efforts at the state level are advancing rapidly in Massachusetts and Rhode Island. Bruce Carlisle of the Massachusetts Office of Coastal Zone Management presented an overview of the development of the Massachusetts Ocean Management Plan, highlighting how spatial data and information has been used to translate fifteen goals and principles of the Massachusetts Ocean Act. Grover Fugate of the Rhode Island Coastal Resources Management Council presented a comprehensive overview of the Rhode Island Special Area Management Plan, in which he demonstrated the various layers of spatial data used for its development.

2.4.2.1 Massachusetts Ocean Management Plan

Based on its Oceans Act (2008), Massachusetts is developing a comprehensive Ocean Management Plan for its state waters (out to three miles), following an extensive scientific and stakeholder process that has led to the release of a draft plan on 30 June 2009. Final promulgation of the plan is expected by 31 December 2009. Formal public hearings are planned for the first part of September 2009. Upon adoption by the state legislature and after approval by NOAA, the Ocean Management Plan will become part of the Massachusetts coastal program plan[7].

The Oceans Act sets out fifteen directives or principles for the plan, (referred to as "Oceans 15") by stating that the plan shall:

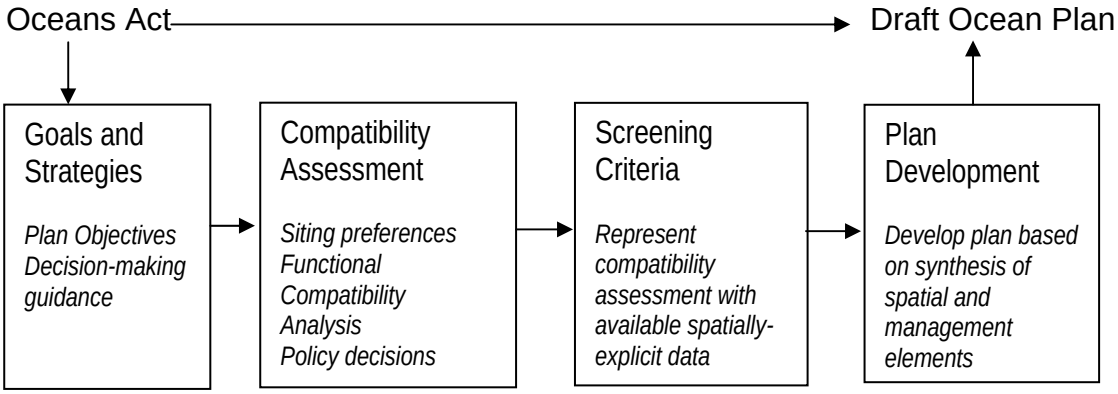
1. Set forth the commonwealth's goals, siting priorities and standards for ensuring effective stewardship of its ocean waters held in trust for the benefit of the public.
2. Adhere to sound management practices, taking into account the existing natural, social, cultural, historic and economic characteristics of the planning areas.
3. Preserve and protect the public trust.

[7] More information is available at: www.mass.gov/eea (ocean plan under key initiatives); www.mass.gov/czm/oceanmanagement and www.massoceanpartnership.org

4. Reflect the importance of the waters of the commonwealth to its citizens who derive livelihoods and recreational benefits from fishing.
5. Value biodiversity and ecosystem health.
6. Identify and protect special, sensitive or unique estuarine and marine life and habitats.
7. Address climate change and sea-level rise.
8. Respect the interdependence of ecosystems.
9. Coordinate uses that include international, federal, state and local jurisdictions.
10. Foster sustainable uses that capitalize on economic opportunity without significant detriment to the ecology or natural beauty of the ocean.
11. Preserve and enhance public access.
12. Support the infrastructure necessary to sustain the economy and quality of life for the citizens of the commonwealth.
13. Encourage public participation in decision-making.
14. Adapt to evolving knowledge and understanding of the ocean environment.
15. Identify appropriate locations and performance standards for activities, uses and facilities allowed under sections 15 and 16 of chapter 132A.

Spatial data and information has been used to translate the requirements of the Ocean Act into a comprehensive, integrated ocean plan (figure 4).

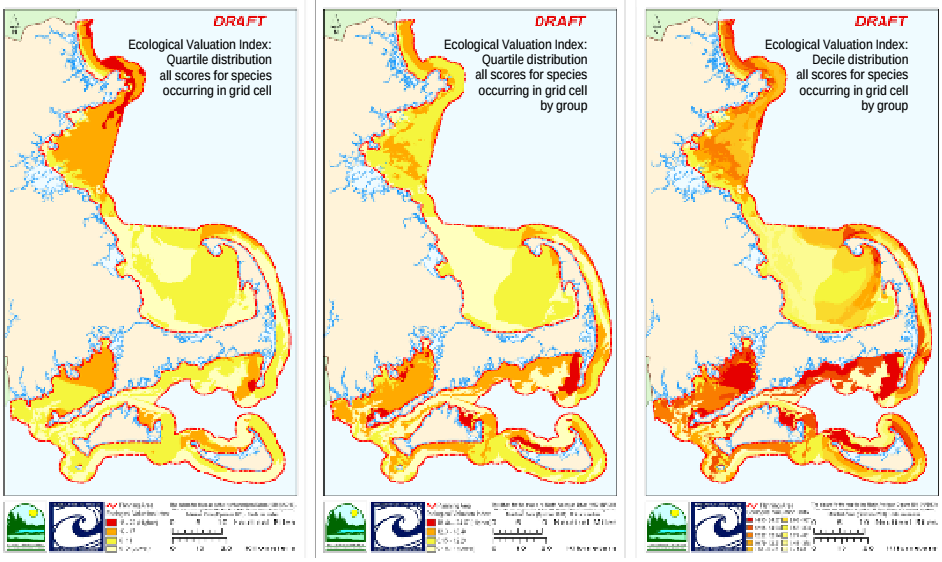
Figure 4: Translating Oceans Act into Ocean Plan through spatial data and information



Source: Bruce Carlisle, Massachusetts Office of Coastal Zone Management, 2009

An Ecological Valuation Index (EVI) is being developed for the identification of special, sensitive, or unique estuarine and marine life and habitat. The EVI included compilation and analysis of spatial data for marine mammals, birds, crustaceans and mollusks, and 22 fish species. Additionally, the EVI designed a set of criteria and scoring, including (a) major contribution to fitness of population, (b) spatial rarity, and (c) global and regional importance. Three output options were designed, using EVI (Figure 5).

Figure 5: Ecological Valuation Index: Three Output Options



Source: Massachusetts Office of Coastal Zone Management, 2009

During the questions and discussion, emphasis was made on the importance (and challenge) of making a concerted effort to hear and engage stakeholders or interest groups (through hearings, listening sessions, information sessions, etc.) in the early stages of the plan development. Due to data limitations and varying quality of available data on habitat and species, the Massachusetts Ocean Plan was not able to apply a final the Ecological Valuation Index (EVI) to inform new levels of protection for various marine resources. Over the next year, state agency staff will continue to discuss revisions to the EVI methodology to offer a more objective index in future Ocean Plan amendments. Similarly, the planning process highlighted the difficultly in assessing cumulative impacts across space and time. The process emphasized the fact that the presence of a human activity does not necessarily mean that activity is having an adverse impact on marine species and habitats. The Commonwealth hopes to inform this dialogue over the next year through ongoing research on methods for accurately assessing vulnerability of habitats and species to human uses at different levels of intensity. The support of the Massachusetts Ocean Partnership, an independent public-private partnership created specifically to advance ecosystem-based management in Massachusetts state waters, was also stressed as instrumental in the development of the plan.

2.4.2.2 Rhode Island Special Area Management Plan

The Rhode Island Ocean Special Area Management Plan (SAMP) team is working to define use zones for Rhode Island's ocean waters through a research and planning process that aims at integrating the best available science and public input and involvement (out to 25 miles), as permitted under the Coastal Zone Management Act[8]. These use zones are intended to protect or enhance current uses (or non-uses),

[8] More information is available at: http://seagrant.gso.uri.edu/oceansamp/

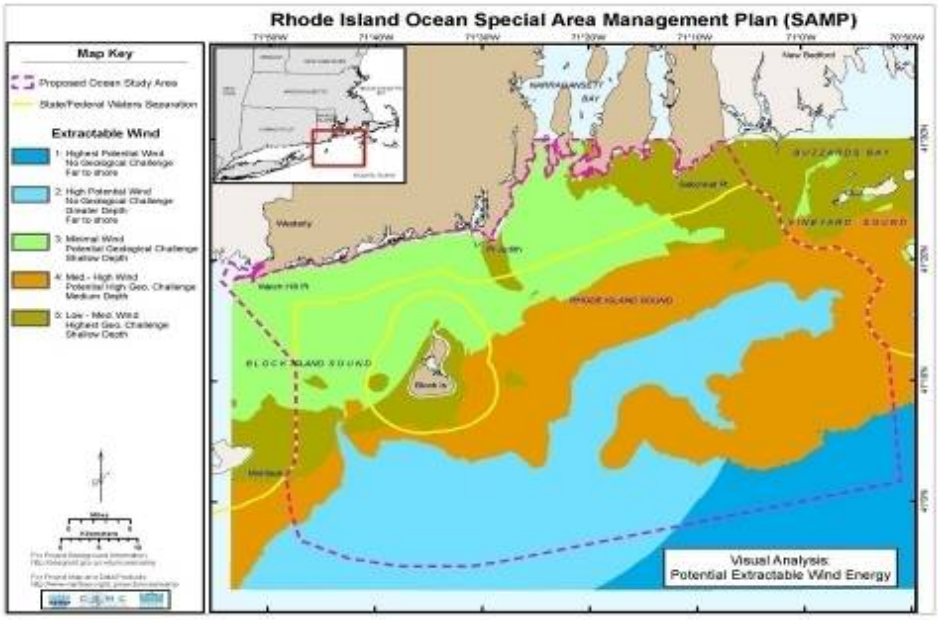
including habitat protection, commercial and recreational uses, while at the same time providing for future uses, such as renewable energy development.

The SAMP advances EBM by:

1. Describing the dynamics of marine ecosystems.
2. Characterizing the salient issues in the area.
3. Setting clear policies and standards for permitting and regulation by federal, state, and municipal governments.
4. Establishing an integrated decision-making process.
5. Building an informed constituency for long-term stewardship.

Currently, the SAMP is developing a preliminary spatial analysis to screen candidate areas eligible for focused research and data acquisition in the context of renewable energy siting. The first phase of the analysis focuses on adequate energy resources (e.g., wind, waves, tidal/mean currents, ocean thermal energy conversion), exclusion areas (e.g., ferry routes, airport buffer zones, etc), technology types for renewable energy, and a metric based on power production potential and associated technical challenges (Figure 6). The second phase of the analysis will focus on potential conflicts or collaborations with other uses (e.g., commercial and recreational fishing and boating, existing licenses, aggregate extraction, conservation, and aquaculture), and impacts on the marine environment (e.g., birds, fish, habitat, marine mammals and turtles, water and air quality, historical and cultural resources).

Figure 6: SAMP Analysis of extractable wind areas



Source: Rhode Island Ocean SAMP, 2009

2.4.2.3 New York Ocean and Coastal Resources Atlas

The New York Ocean and Great Lakes Ecosystem Conservation Act (2006) aims at conserving, maintaining and restoring coastal ecosystems so that they are healthy, productive, resilient and able to deliver the resources people want and need. Based on the Act, New York has started development of an ocean and coastal resources atlas to make information available to the public and decision-makers. The Atlas is an online mapping program that makes it possible to download data into Google Earth Geographic Information System (GIS) software that contains information on storm drains, wetland boundaries, underwater vegetation, park locations, and fisheries, among others from the coast out to 200 miles. The Atlas is built upon more than 1000 datasets from 57 different data resources, and includes a data gap analysis, viewer development, and a data catalog portal[9]. Next steps in the development of the atlas include a pilot project that focuses on energy and habitats, and is extended into federal waters and an offshore health index.

In April 2009, the New York Ocean and Great Lakes Ecosystem Conservation Council developed an action plan for achieving long-term sustainability of New York's ocean and Great Lakes. Among others, the report recommended actions to accommodate competing demands for limited offshore resources.

2.4.3 Marine Spatial Planning at the Regional Level

Efforts are also in progress toward establishing MSP at the regional level. Sarah Cooksey of the Delaware Coastal Programs presented an overview of how the governors of New York, New Jersey, Delaware, Maryland, and Virginia have committed to a new comprehensive, regional approach, creating the Mid-Atlantic Regional Council on the Ocean (MARCO). The five states aim at working together to maintain and improve the health and economic vitality of the ocean and its resources[10]. Mapping efforts are underway to focus on habitats, water quality, climate change effects and renewable energy in the Mid-Atlantic. The Council plans to hold a stakeholder summit during the late fall or early winter of 2009.

Kathleen Leyden of the North East Regional Ocean Council (NROC) highlighted NROC's commitment to move toward MSP through state and regional activities in the Northeast. Since MSP at a larger, regional scale quickly becomes more complicated; she emphasized NAM ERA as a potential starting point to build a regional scientific baseline for advancing MSP.

[9] More information is available at: www.nyoglatlas.org/
[10] More information available at: www.midatlanticocean.org

3. Identifying Principles for Marine Spatial Planning

MSP is not an end in itself. It is a process conducted to achieve ecological, economic, and social objectives that are typically set at the political level. To achieve these objectives, MSP should be guided by a set of principles that: (a) determine the nature and characteristics of the MSP process; and (b) reflect the results you want to achieve through MSP. Key principles should be incorporated in any new legislation (or executive order) that provides a mandate for the development of MSP.

Both workshops culminated in a discussion of the key principles necessary to conduct MSP in a result-oriented way and the potential next steps that could be taken to move MSP forward at the federal, state and regional level. The discussion was organized in three breakout sessions, each assembling about 30-35 participants. Tony McDonald of Monmouth University and Heather Leslie of Brown University each chaired one of the breakout sessions in the Mid-Atlantic and Northeast workshops, respectively.

Charles Ehler and Fanny Douvere introduced the discussion with an international perspective on MSP principles. They highlighted that MSP principles can be derived from a number of sources, including international treaties and agreements, national policy, and legislation, or examples of good practice. It is important to remember that principles do not stand by themselves, but should be reflected throughout the MSP process, and in particular in the goals and objectives identified for the area. Both workshops agreed that the following principles illustrated through MSP good practices from around the world are important:

1. Ecosystem integrity, including the use of best available scientific information to inform MSP.
2. Integration across all sectors and uses of the marine area, and between the land-water interface.
3. Strategic and participatory processes that enable pro-active decision making and involve stakeholders.
4. Trans-boundary cooperation that allows consistency across state plans and between federal and state plans.
5. Adaptive, e.g., capable of learning from experience and through good scientific, ecological monitoring.
6. Apply a precautionary principle.

Both in the Northeast and the Mid-Atlantic workshops, there was general consensus that the above principles are indeed important ones. However, particularly in the Mid-Atlantic other principles were emphasized, including:

1. Transparency, including clearly identified leadership and accountability;
2. Sustainability and funding.
3. Science-based decisions, particularly when trade-offs between use or non-uses are made.
4. Public trust doctrine, particularly vis-à-vis impact of one state upon the other.
5. User-pays for the use of public resources.

Because the Northeast is further along in its MSP activities participants in the Northeast workshop felt generally more need to discuss specific next steps instead of focusing on principles – particularly "hands-on" suggestions regarding new or improved authority for MSP - than an in depth exchange on MSP principles. Both workshops clearly emphasized the importance of getting started and applying a precautionary principle in developing MSP, instead of being paralyzed and waiting until "perfect data" become available.

Finally, it was pointed out that in addition to principles, it is key to set clear goals and specified objectives for MSP – the latter being much more difficult to agree upon.

4. Next Steps to Advance Marine Spatial Planning in the United States

A large part of the break-out discussions on principles (described in the previous section) was dedicated to potential next steps that could advance MSP in the United States. Lynne Hale, Director of the Conservancy's Global Marine Initiative closed the Northeast workshop with a summary of potential next steps for both the NAM ERA work and MSP as a whole. Discussions and conclusions of the two-day workshops illustrate that the NAM ERA can provide a scientific baseline to support the development of ecosystem-based MSP - or ocean governance efforts in general - at the regional (e.g., through MARCO and NROC), state, and federal level. In particular, the NAM ERA can help partners in identifying and implementing priority marine conservation strategies in the region, and support federal efforts in the development of an ocean policy and MSP framework.

Over the next months, plans to set up a publicly accessible online web mapping and data service where users will be able to download the NAM ERA data and use it to meet diverse goals regarding natural resource management. Simultaneously, the Conservancy will develop recommendations on priority places and strategies for conservation action within the Northwest Atlantic Marine region. Additionally, techniques will be explored to expand the socio-economic and ecosystem services part of the NAM ERA dataset, as well as identify methods to determine cumulative impacts of human uses on the ecosystem overtime.

The closure of the Mid-Atlantic workshop on June 12 coincided exactly with the announcement of President Barack Obama for a new Ocean Policy Task Force charged with the development of a framework for effective coastal and marine spatial planning by mid-December 2009.

Potential next steps proposed by participants in the Northeast concentrated more on mechanisms to exchange best practices and lessons learned from states that already embarked on MSP, primarily from Massachusetts and Rhode Island. Potential next steps in the Mid-Atlantic concentrated rather on the "how to" aspects of MSP, including issues as providing technical assistance to relevant authorities responsible for developing MSP, and the need to enhance advocacy for conflicts and impacts in the marine environment and MSP as part of a solution. The type of authority needed to

conduct MSP properly – including its development within an ecosystem context – was a key topic of discussion at both workshops. Strengthening capacity for cooperation among states and between states and the federal government was also a common topic of discussion at both workshops and was equally related to applying an ecosystem approach to MSP.

Potential next steps discussed at the Northeast workshop that could advance MSP in the United States include:

1. Issue a Federal Executive Order to create an MSP ocean council for all involved federal authorities and institutions. An Executive Order was proposed because of its potential to establish appropriate authority fairly quickly. Establishing appropriate authority now prevents loosing momentum that exists, not the least in the willingness of various relevant institutions to cooperate.
2. Enact Federal legislation or policies that set out a regional MSP framework and ensures that environmental, economic and cultural issues are all considered.
3. Facilitate efforts to share good practices and experiences with MSP state efforts that are going on in the region. It was stressed that internet exchanges were a preferred way to develop and share information exchanges because of their limitless accessibility.
4. Develop a regional cumulative impact assessment that include considerations of how reversible (or irreversible) certain impacts are likely to be.
5. Propose draft ecological, economic and social goals that illustrate “what we have”, “what we want”, and “how to get there”, considering different alternative management strategies.
6. Set up mechanisms that enables addressing conflicts or synergies across jurisdictions (e.g., state-state, state-federal, and international (US-Canada).
7. Strengthen the capacity for state-state and state-federal cooperation in the development of MSP, particularly in applying a more ecosystem approach to the development of MSP (political/administrative boundaries often don’t coincide with ecological boundaries). NROC’s decision-making capacity, for example, could be strengthened enabling to plan/manage beyond institutional boundaries to capture ecosystems in MSP.
8. Need to better understand and advocate ecosystem services and the threats posed to them.
9. Provide federal funds to states to help them implement MSP in state waters and beyond.

Potential next steps discussed at the Mid-Atlantic workshop that could advance MSP in the United States include:

1. Set up mechanisms that enable addressing conflicts or synergies across jurisdictions (e.g., state-state, state-federal, and international (US-Canada)), and that strengthen consistency between plans. Proposals were made to create planning, implementation, and regional enforcement authority for MSP within MARCO.

2. It was further proposed that the Council on Environmental Quality (CEQ) could take the lead in overseeing the development of MSP at the federal level, with ultimate enforcement authority when conflicts arise.
3. Strengthening authority within states to develop regional MSP planning and analysis initiatives beyond the 3-mile state jurisdiction to better ensure achieving EBM goals and objectives. The 3-mile limit is based on political and administrative boundaries rather than ecological ones, and therefore not always relevant in achieving EBM goals and objectives.
4. Developing better mechanisms (or strengthening existing ones) to enhance cooperation with offshore industries and the military in the development of MSP.
5. Enhancing advocacy and communication with relevant authorities to ensure incorporation of ecosystem goals and objectives in the development of MSP. Improved advocacy and communications is necessary to ensure that MSP is not limited to achieving economic objectives (e.g., improving security for maritime transport, streamlining siting and permitting of offshore renewable energy).
6. Establishing better financial resources to fund essential components of MSP (planning and analysis, but also implementation, monitoring, etc.). It was stressed that funding is critical to the development of MSP – a statement largely confirmed by international experiences with MSP. Potential ways to create better financial resources include revenue sharing, user fees for certain ocean uses, ship container charges, port fees, alternative energy lease block revenues, etc.
7. Ensuring the availability of technical expertise and training opportunities relevant for developing MSP at state, regional, and national governance scales.
8. Enabling methods for a bigger role for economic perspectives and opportunities when discussing MSP with offshore industry and sectors.
9. Implement a national policy framework that ensures environmental issues are considered as well as economics and cultural issues.

5. The Northwest Atlantic Ecoregion: Habitats and Inhabitants

5.1 Introduction

Experience from existing MSP practice around the world illustrates that it can only be accomplished successfully with a sound foundation of scientific information from which decisions can be made. This information is necessary at different scales, from within state boundaries to within federal boundaries, including the EEZ. On one hand, spatial and temporal data detailed enough to develop effective plans within state and federal jurisdictions. On the other hand, it is important to make sure that each of those plans is consistent with one another across boundaries (both state-state and state-federal) and that the combination of all management actions leads one toward a healthy and productive ocean in the region as a whole. The NAM ERA is especially useful for the latter purpose. It provides the best available biological, ecological, oceanographic, and human use information that can be used for MSP at the regional scale.

Mark Anderson, Conservation Science Director for the Conservancy's Eastern Division, presented a comprehensive overview of the methods, challenges and intermediary results of the NAM ERA. While Anderson concentrated on the ecological, biophysical

component of NAM ERA, Jay Odell, the Conservancy's Mid-Atlantic Program Coordinator, presented the human (or socio-economic) component of the NAM ERA. Both of their presentations were followed by questions and discussion among all participants. The strengths and limitations of the NAM ERA data were further discussed in more depth during a 2-hour data café, which was organized into four breakout groups. Overall, participants embraced the NAM ERA as a potential regional dataset for use with MSP. The general consensus was that the effort to collect available data was impressive and many of the modeling techniques (particularly the benthic and coastal models) were a useful starting point for regional decision making. The summaries below are largely based on the presentations and discussions from the data cafés. Several of the participants were deeply familiar with the datasets being discussed and there was great enthusiasm to offer useful suggestions to further enhance the data, modeling and products for use in the region.

The Northwest Atlantic Marine regions spans from Cape Hatteras in North Carolina to the northern limit of the Gulf of Maine, including Canadian waters, and extends seaward to the continental slope (depth of 2500 meters or 8200 feet). The NAM ERA study area includes the shorelines of 11 states and two provinces (with a total population of about 65 million people), including the major estuaries of Albemarle and Pamlico Sounds, Chesapeake Bay, Delaware Bay, Long Island Sound, Narragansett Bay, Penobscot Bay and the Bay of Fundy. The Northwest Atlantic study area is divided into three ecological sub-regions: the Gulf of Maine, Southern New England, and the Mid-Atlantic Bight. The total area encompasses 140,745 mi^2 or about 364,500 km^2 (Figure 7).

Figure 7: Northwest Atlantic Marine Ecoregional Assessment

Source: The Nature Conservancy, 2009

For over a year, the Conservancy's marine science staff has worked with a wide range of partners to compile integrated physical, ecological and human use datasets. The purpose and outcomes of the NAM ERA work are two-fold[11]:

1. Establish a publicly available, transparent and robust data baseline that includes physical, biological and human use information about the marine environment that can serve as a resource to marine decision makers and managers with a wide range of interests.
2. Assess the collected data and information to identify areas, species and ecological processes of biological significance that, if conserved, will protect biological diversity of the Northwest Atlantic marine region as whole. Additionally, it aims at starting the development of specific marine conservation strategies based on the assessments.

The NAM ERA process included the collection and consideration of over 1,200 datasets of biological, physical, oceanographic, and human use data, produced by federal and state government, academic, and non-profit institutions.

As discussed in the previous section, analyzing and defining spatial and temporal conditions and patterns of the coastal and marine environment are key components of any MSP process. By assessing ecosystem processes, physical structures and habitats that drive species patterns in the marine environment, the NAM ERA provides an important knowledge and information base for the development of MSP.

During the discussion at the Northeast workshop, a number of questions were related to the relevance of the scale of the NAM ERA data. It was illustrated - through comparisons with other areas around the world (Northwest Europe, in particular) where such information does not exist - that the NAM ERA information is invaluable for enabling coherence and consistency among current and future coastal and marine spatial plans, each developed by a variety of state or federal authorities. The international experience indicates that without a regional MSP context the potential for unintended negative "upstream" and "downstream" impacts between adjacent MSP planning entities is very high. Consistency among individual plans can ensure that their actions and measures support one another, and through that, enhance efficient and effective biodiversity conservation and sustainable economic development for the region as a whole.

5.2 The biological, ecological and oceanographic component

The complexity of natural processes in the ocean and the resulting mosaic patterns in space and time mean that a *'one size fits all'* management regime that treats the ocean as uniform or attempts to divide it in ways that do not reflect its real diversity is likely to fail. Successful marine management requires planners and managers who understand and work with the ocean's diversity in time and space.

[11] TNC NAM ERA Fact Sheet II, 2009

The NAM ERA was grouped into eleven categories focusing on the biological, ecological and oceanographic components of the region. There were 11 technical science teams made up of experts. The teams included:

1. *Benthic habitats*: seafloor areas where species like bivalves and cold-water corals live.
2. *Coastlines and estuaries*: coastal areas like tidal marshes and sea grass beds.
3. *Oceanographic processes*: ocean processes like sea surface temperature and ocean mixing.
4. *Demersal fish*: bottom dwelling fish like cod and flounders.
5. *Diadromous fish*: fish like alewife and Atlantic sturgeon that live in both fresh and saltwater.
6. *Marine mammals*: large mammals like whales and dolphins.
7. *Nearshore shellfish:* bivalves like oysters and mussels.
8. *Large pelagic fish:* highly migratory species like tunas and sharks.
9. *Small pelagic fish:* forage or prey species like menhaden and squid.
10. *Sea turtles:* marine turtles like loggerheads and leatherbacks.
11. *Shorebird and sea birds:* birds like piping plovers, terns and red knots.

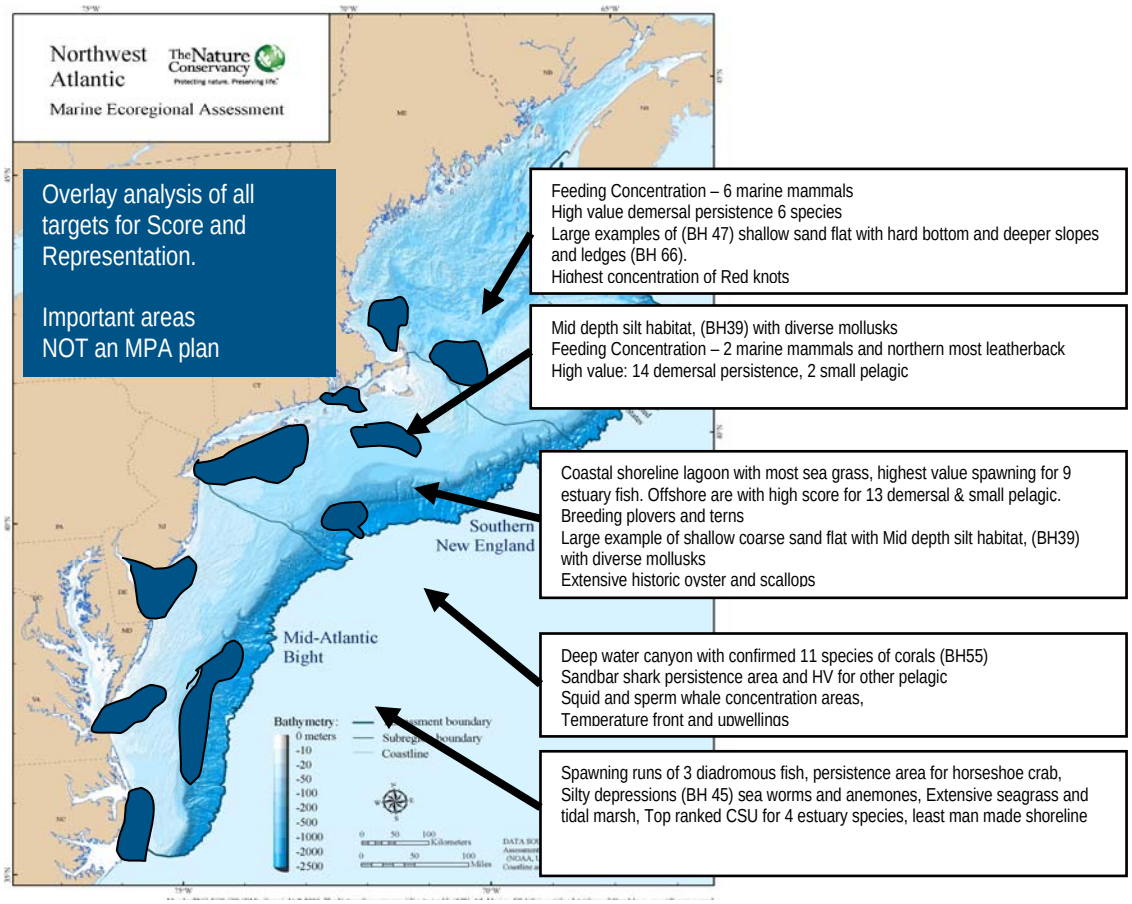
What makes an area important for maintenance of biological diversity? There are several aspects to consider, such as:

1. *Heterogeneity / representation*: Does the area represent a particular marine habitat? The NAM ERA used a combination of bathymetry, seabed forms, and sediment grain size to identify approximately 90 distinct benthic habitats.
2. *Diversity, endemism, and outstanding characteristics*: Does the area contain species only found in a few restricted places or does it have a particularly rich assemblage of species? For example, most canyons in the region contain only one or two species of coral, but a few canyons have many different coral species.
3. *Key breeding or nursery areas with an eye toward sources and sinks*: Some areas consistently produce surplus juvenile species, exporting organisms to the larger region. While it is not possible to easily identify these source areas, the spatially explicit nature of demography and connectivity in the life history of marine organisms makes source-sink theory critical to the goals of conservation.
4. *Concentrated resources*: Certain areas concentrate seasonal resources such as zooplankton or phytoplankton. These in turn, predictably attract species that use these resources based on seasonal availability (e.g. right whales), or secondary predators for which the attractors are prey (e.g. humpback whales and herring).
5. *Fronts and linkages*: Important links that connect geographically separate areas, such as migration routes or temperature fronts.

In the second, ongoing phase of the NAM ERA the Conservancy is using a combination of these attributes to identify the areas, species and ecological processes of biological significance that, if conserved, will protect biological diversity of the Northwest Atlantic. This begins with the overlay across all categories and criteria described above. Some areas have many of these characteristics while other may only be important for one

reason. Figure 8 shows an illustrative example of a possible distribution of important biological and ecological areas.

Figure 8: Illustrative example of what the distribution of biological and ecological areas of relative importance might look like (not based on real data), illustrating how areas may be important for multiple reasons.



Source: The Nature Conservancy, 2009

Figure 8 is an example that illustrates the process underway to identify priority conservation areas. The shapes, locations, and sizes of the areas shown above are completely random. Final maps showing priority conservation areas will be presented as part of a decision support tool that does not presume a uniformly high level of protection is needed for all priority areas. The Conservancy is currently working with external advisors to develop a suite of maps that identify priority areas in consideration of the factors outlined above.

Further planning and analysis for each of the priority conservation areas we will be identifying needs to include an assessment of the relative sensitivity of each type of area to a suite of disturbance types (human uses), finer scale data on levels of human uses and ecological stress at each site, a measure of the cultural and economic importance of each area, and identification of area specific strategies needed to sustain biological diversity and ecological function.

5.2.1 Spatial information about demersal, small pelagic, and diadromous fish

Jay Odell and Kate Killerlain Morrison of The Nature Conservancy presented a short introduction to the methods and results of the NAM ERA fisheries data and facilitated four small group discussion sessions with approximately 20-25 participants each.

Spatial information on the distribution and abundance of over five hundred fish species from NOAA's ground fish trawl survey was provided by the Northeast Fisheries Science Center. In consultation with fish experts, the Conservancy focused its analysis on 52 species in several guilds[12], representing different regions of the Northwest Atlantic. The selection of species was based on criteria including association with particular habitats, food web interactions, trophic links between nearshore and offshore, and links between habitat types. The species were categorized as (a) demersal fish (e.g., close association with seafloor habitats for feeding, post-larval settlement, and juvenile nurseries), (b) small pelagic fish (e.g., transfer energy from primary and secondary producers like forage fish to higher order predators and from nearshore environments to the open ocean), and (c) diadromous fish (e.g., whose lifecycles transfer energy and nutrients from marine to freshwater systems and vice versa.) Key questions of the analysis included general distribution and relative abundance of target species, trends in relative abundance of target species over time, spatial differentiations in these trends, and areas demonstrating relatively higher number of target species over time.

Key points raised during the Northeast data café discussion included:

- Importance of considering size and age of fish caught when estimating abundance trends.
- Enabling continuous updating of the data to illustrate trends dynamics over a longer period of time.
- Integrate fisheries knowledge to make finer scale predictions and assumptions.
- Incorporate existing conservation measures (e.g., fish closures, non-trawling areas) to make estimates of their performance effectiveness.

Key points raised during the Mid-Atlantic data café discussion included:

- The importance of incorporating inter-annual climate variability and effects on fish species.
- Linking salt marsh and sea grass values to proximity in offshore fisheries areas.
- Develop benthic-pelagic coupling studies that evaluate the degree to which distribution and abundance of pelagic fishes is correlated to benthic habitat characteristics.

5.2.2 Spatial information about benthic communities

Mark Anderson and Jennifer Greene of The Nature Conservancy presented a short introduction to the methods and results of the NAM ERA benthic community data and facilitated four 30-minute discussion sessions with approximately 20-25 participants each.

[12] Guilds are groups of species that exploit the same resources in the same way, and therefore share a similar ecological niche.

The data and maps shown represent an initial effort to define and map benthic habitats directly from information on organism distributions integrated with newly available physical data on bathymetry, sediments grain size and seafloor topography. The map of benthic habitats was created using spatial information on benthic organisms from over 11,000 grab samples, taken over a time span of 40 years provided by the National Oceanic and Atmospheric Administration (NOAA). The samples were taken on a square meter basis and both sediment and organisms were identified. The sample information was categorized into 70 different benthic communities, based on the similarities in their organism composition (approximately 20-30 groups per subregion using cluster analysis). Statistical analyses (classification trees) were used to determine the depth, sediment type, and bottom topography - the benthic habitat where the community is typically found. The resulting maps illustrate clear spatial and temporal distributions of larger habitats, although exact lines between habitats are not as distinct in reality as they appear on the map.

Key points raised during the Northeast data café discussion included:

- Ability to identify important areas when spatial variations occur as a result of temperature or environmental change.
- Importance of transparency in the methods (e.g., correlations, assumptions) used for interpolations of the data, delineation of boundaries for important areas, etc., to ensure appropriate use and application of the information in planning and decision making.
- Consider how trends in the state of habitats have changed over time as a result of human use, contamination, carbon loading, and how this might affect organisms today.
- Ensure potential users understand what the data and information can and cannot be used in decision making.

Key points raised during the Mid-Atlantic data café discussion included:

- Incorporate data on human use and impacts, including cumulative impacts, pollution tolerance, and contaminated sediments for each habitat type.
- The importance of defining and communicating the appropriate use of the data products to end users, including measures of uncertainty and margins of error.
- Consideration of the value of incorporating hard bottom data and bottom temperatures for improvement of the sediment models.
- Consideration of additional evaluation and definition regarding how habitats repeat from subregion to subregion.

5.2.3 Spatial information about coastal ecosystems

Marci Bortman, Barbara Vickery and Arlene Olivero of The Nature Conservancy presented a short introduction to the methods and results of the NAM ERA coastal ecosystems data and facilitated four 30-minute discussion sessions with approximately 20-25 participants each.

To assess and compare coastal ecosystems spatial and temporal information, the coast was divided into discrete stretches of shoreline and nearshore habitat (Coastal Shoreline Units or CSUs), reflecting five types of coastal ecosystem classes, including:

a. Lagoons (7 examples)
b. Embayments (10 examples)
c. River-dominated (20 examples)
d. Fjards (18 examples)
e. Bay of Fundy (7 examples)

Comparisons were made across three subregions, the Gulf of Maine, Southern New England, and Mid-Atlantic Bight. Each CSU was characterized by summarizing features that have direct relevance to how the coastline contributes to marine productivity and biodiversity. These characteristics included size (length of shoreline), habitat type (vegetated tidal marsh, seagrass beds, flats, rocky shores, beaches and coastal salt ponds), condition, and linkages with other marine targets (e.g., types of shellfish beds, estuarine-dependent fish species, etc.). The Coastal Analysis also included a review of historical changes along the NAM coast which showed that 21 of the Nation's 25 most densely populated coastal counties are in the Mid-Atlantic and that there have been serious losses in the amount of salt marsh, eelgrass, oyster reefs, and diadromous fish, since European settlements. Next steps of the analysis will to focus on vulnerability and resilience of coastal ecosystems with respect to climate change and sea level rise.

Key points raised during the Northeast data café discussion included:

- Possibility of developing a vulnerability index or prioritization that correlates importance of the coastal shoreline units (CSU) to offshore fauna;
- Connect coastal ecosystem data with social and economic data, e.g., which parts of the coast bring most value (monetary, esthetics, etc.) to people.

Key points raised during the Mid-Atlantic data café discussion included:

- Consider linking coastal ecosystems data to both marine and terrestrial realms, particularly with linkages to the National Fish Habitat Initiative and NOAA's nearshore fisheries analysis efforts;
- Consider adding new data layers, including, groundwater and hydrologic change, harmful algae blooms, shellfish closure areas, anoxic areas, governance units (estuary programs), open ocean coastline habitat targets, nearshore temperature.

5.2.4 Spatial information about migratory species

Caroly Shumway, Adam Whelchel and Sally Yozell from The Nature Conservancy presented a short introduction to the methods and results of the NAM ERA migratory species data and facilitated four 30-minute discussion sessions with approximately 20-25 participants each.

The spatial and temporal analysis of migratory species was developed around four categories, including (a) pelagic fish, (b) marine mammals, (c) sea turtles, and (d)

seabirds. The pelagic fish analysis incorporated 14 species (five bony fish and nine sharks) and was based on 10-minute square grids (in addition to point data). Analysis of marine mammal data included baleen whales, non-baleen whales, and dolphins/porpoise and used data primarily from the U.S. Navy's Marine Resource Assessment (data was available for the period 1979-2007, sightings per unit effort (SPUE), using ship and aerial surveys). Mapping results for the North Atlantic Right whales, for example, show high concentrations in the Northwest Atlantic during spring. Spatial analysis for sea turtles included loggerhead, leatherback, and green turtles and was also based on the Navy's Marine Resource Assessments (data available for 1979-2007). Finally, the data for sea birds came from a variety of sources and was limited in years, abundance and overall information. Data from ten seabird species were examined and mapped. Key questions of the migratory species analysis focused on sites that are more species rich than others, areas essential as fish habitats, areas where species are consistently found over time, and changes in concentrations.

The resulting maps showed considerable seasonal changes. Mapping results for loggerhead turtles, for example, illustrate high concentrations in the southwest Atlantic during spring and summer. Ongoing analysis to make these data more useful for MSP includes development of species specific pelagic habitat models based on the relationship of the observed distribution of each species to oceanographic factors such as sea surface temperature and zooplankton concentrations.

Key points raised during the Northeast data café discussion included:

- Consider how areas of importance might be shifting over time and to what extent this translates in spatial and temporal flexibility when defining use of marine space;
- Importance of large-scale spatial information to engage and educate the general public regarding ecosystem complexity;
- Incorporate to the extent possible spatial information on species that migrate from or to waters outside the northwest Atlantic region.

Key points raised during the Mid-Atlantic data café discussion included:

- Importance of mapping spatial data by season and across time frames for sound planning, which can be particularly helpful to determine management measures for migratory species such as time closures during migration, or limitations for offshore construction and ship movements during peak seasonal events;
- Consider adding other information, including visual impacts,(distance and aesthetics of wind farms or other offshore infrastructure) and add data on pollutants;
- Consider incorporating anecdotal data for birds from birdwatchers to fine-tune the data;
- Governments should seek to streamline management approaches and regulations in cases where current permits and regulatory process is unnecessarily complex.

5.3 The human use component

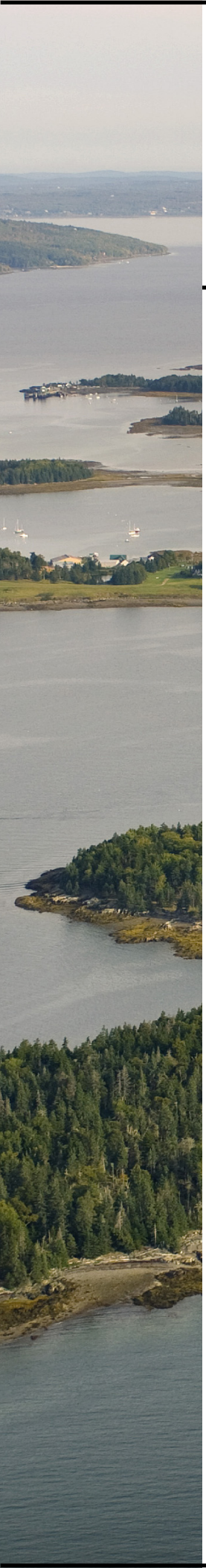
In addition to assessing biological, ecological, physical, and oceanographic characteristics, analyzing human activities in the marine area is essential. Analyzing and mapping human activities enables identification of conflicts (or compatibilities) between use and the environment (e.g., impact and stressors), or among uses (e.g., maritime transport and offshore wind energy facilities) themselves. Traditionally, the Conservancy's ecoregional assessments focus on the analysis of ecosystems and include characterization of human uses in an ecoregion; however, the NAM ERA is beginning to incorporate spatially explicit economic information into its assessment and mapping exercises. This is still in an early phase and future work will need to focus on identifying and valuing ecosystem services. In addition new work is being planned to develop a cumulative impact assessment. Preliminary maps have been developed for several human activities including recreational fishing, commercial fishing effort for 29 gear types, maritime traffic and separation schemes, coastal sand mining, coastal eutrophication, and potential areas for offshore wind energy.

The Atlantic seaboard is home to dense human populations that increasingly require and desire access to and use of marine resources. The Northwest Atlantic generates an estimated 3 million jobs and derives approximately $623 billion (including indirect induced values) annual value from a variety of ecosystem services, including:

1. *Provisioning services*: tourism, seafood, energy, shipping, among others;
2. *Regulating services*: climate, erosion control;
3. *Supporting services*: primary production, pollution control;
4. *Cultural services*: recreation, non-material benefits.

Stressors and impacts resulting from human use in the Northwest Atlantic include global climate change (increased ocean temperature, altered currents, and acidification) ecologically incompatible fishing, toxins, oil spills, eutrophication, sand mining, dredging, coastal habitat loss, and energy development.

Appendix I -
Meeting Agendas



Marine Spatial Planning Regional Workshop & Roll Out of Northwest Atlantic Marine Ecoregional Assessment Agenda

June 8-9, 2009
Crowne Plaza Hotel
Warwick, Rhode Island

Day One

8:00	Registration & Breakfast	
9:00	Welcome – Regional Overview S. Yozell (TNC), S. Murawski (NOAA), K. Leyden (NROC)	
9:30	Meeting Objectives	F. Douvere, B. Ehler (UNESCO)
9:45	Setting the Stage: An Introduction to Marine Spatial Planning (MSP)	F. Douvere, B. Ehler
10:30	*Break*	
10:45	The Northwest Atlantic Ecoregion: Habitats and Inhabitants	M. Anderson (TNC)
11:45	Charge to Breakout Sessions	F. Douvere, B. Ehler
12:00	*Lunch - Special Guest Speaker, U.S. Senator Sheldon Whitehouse* (RI)	
1:00	NAM ERA Data Cafe – 4 Breakout Sessions (30 min each) Review of regional data and maps - Fish (demersal, small pelagics, diadromous) - Benthic Communities - Coastal Ecosystems - Migratory Species (marine mammals, sea birds, large pelagics, sea turtles)	
3:30	*Break*	
3:45	Breakout Session Reports and Discussion	F. Douvere, B. Ehler
5:45	*Adjourn*	

Please join us for a reception at the Crowne Plaza Hotel from 6:00 - 8:00pm

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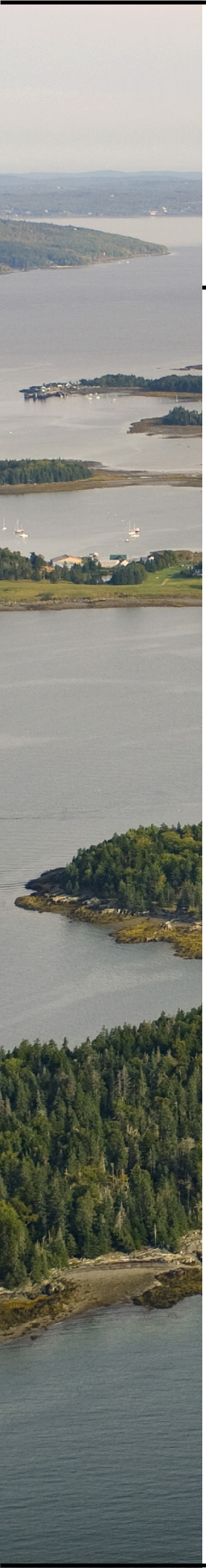

Marine Spatial Planning Regional Workshop & Roll Out of Northwest Atlantic Marine Ecoregional Assessment Agenda

June 8-9, 2009
Crowne Plaza Hotel
Warwick, Rhode Island

Day Two

8:00	Breakfast	
8:30	Overview of Day	F. Douvere, B. Ehler
8:45	Linking Human Use Data With Marine Ecosystems	J. Odell (TNC)
9:45	*Break*	
10:00	First Steps for Identifying MSP Principles: - International examples - Case studies and lessons learned B. Carlisle (MA CZM) G. Fugate (RI SAMP) D. Kaiser (NOAA) R. Orr (MMS) - Illustrative examples using NAM ERA data	F. Douvere, B. Ehler
12:00	*Lunch (catered on site)*	
1:00	Principles and Concepts: Facilitated breakout groups discussing a multi-objective approach to MSP	F. Douvere, B. Ehler H. Leslie (Brown U.)
3:00	*Break*	
3:15	Breakout Reports/Final Group Discussion	Breakout Leaders
4:45	Summary Next Steps	L. Hale (TNC)
5:00	*Adjourn*	

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Marine Spatial Planning Regional Workshop & Roll Out of Northwest Atlantic Marine Ecoregional Assessment Agenda

June 11-12, 2009
Wilmington/Christiana Hilton
Newark, Delaware

Day One

8:00	Registration & Breakfast	
9:00	Welcome – Regional Overview	Sally Yozell (TNC), Peyton Robertson (NOAA)
9:30	Meeting Objectives	Fanny Douvere, Bud Ehler (UNESCO)
9:45	Setting the Stage: An Introduction to Marine Spatial Planning (MSP)	Fanny Douvere, Bud Ehler
10:30	*Break*	
10:45	The Northwest Atlantic Ecoregion: Habitats and Inhabitants	Mark Anderson (TNC)
11:45	Charge to Breakout Sessions	Fanny Douvere, Bud Ehler
12:00	*Lunch (catered on site)*	
1:00	NAM ERA Data Cafe – 4 Breakout Sessions (30 min each) Review of regional data and maps - Fish (demersal, small pelagics, diadromous) - Benthic Communities - Coastal Ecosystems - Migratory Species (marine mammals, sea birds, large pelagics, sea turtles)	
3:30	*Break*	
3:45	Breakout Session Reports and Discussion	Fanny Douvere, Bud Ehler
5:45	*Adjourn*	

Please join us for a reception at the Hilton Hotel at 6:00 pm

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Marine Spatial Planning Regional Workshop & Roll Out of Northwest Atlantic Marine Ecoregional Assessment Agenda

June 11-12, 2009
Wilmington/Christiana Hilton
Newark, Delaware

Day Two

8:00	Breakfast	
8:30	Overview of Day	Fanny Douvere, Bud Ehler
8:45	Linking Human Use Data with Marine Ecosystems	Jay Odell (TNC)
9:45	*Break*	
10:00	First Steps for Identifying MSP principles: - International examples - Case studies and lessons learned Maureen Bornholdt (MMS) Lauren Wenzel (NOAA MPA) Brian Smith (NOAA) Jeffrey Herter (NYSOP) - Illustrative examples using NAM ERA data	Fanny Douvere, Bud Ehler
12:00	*Lunch (catered on site)*	
1:00	Principles and Concepts: Facilitated breakout groups discussing a multi-objective approach to MSP	Fanny Douvere, Bud Ehler, Tony MacDonald (Monmouth Univ.)
3:00	*Break*	
3:15	Breakout Reports/Final Group Discussion	Breakout Leaders
4:45	Summary Next Steps	Fanny Douvere, Bud Ehler
5:00	*Adjourn*	

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U.S. DEPARTMENT OF COMMERCE

Appendix II -
Workshop Participants

Northeast Participants

Jim Ammerman
New York Sea Grant
james.ammerman@stonybrook.edu
631-632-6905

Jennifer Anderson
NOAA Fisheries
Jennifer Anderson@noaa.gov

Mark Anderson
The Nature Conservancy, Eastern Division
manderson@TNC.org
617-542-1908 x215

Paul Anderson
Marine Sea Grant
panderson@maine.edu
207-581-1435

Peter August
University of Rhode Island
URI Coastal Institute
pete@edc.uri.edu
401-874-6513

Michelle Bachman
New England Fishery Management Council
mbachman@nefmc.org
508-495-2185

James Bennett
U.S. Department of the Interior
Minerals Management Service
jfbennett@mms.gov

Marci Bortman
The Nature Conservancy, LI, NY
mbortman@tnc.org
631-367-3384 x112

Priscilla Brooks
Conservation Law Foundation
pbrooks@clf.org
617-850-1737

Patrick Campfield
Atlantic States Marine Fisheries Commission
pcampfield@asmfc.org
202-289-6400

Bruce Carlisle
MA Office of Coastal Zone Management
bruce.carlisle@state.ma.us
617-626-1205

Giancarlo Cicchetti
U.S. EPA, Atlantic Ecology Division
cicchetti.giancarlo@epamail.epa.gov
401-782-9620

Melissa Clark
The Nature Conservancy, Eastern Division
melissa_clark@tnc.org
617-542-1908

Jack Clarke
Mass Audubon
jclarke@massaudubon.org
617-962-5187

Janet Coit
The Nature Conservancy, RI
jcoit@tnc.org
401-331-7110 x19

Phil Colarusso
US EPA
colarusso.phil@epa.gov
617-918-1506

Ames B. Colt
RI Bays, Rivers, and Watersheds Coordination Team
ames.colt@dem.ri.gov
401- 222-4700 x7273

Mary Conley
The Nature Conservancy, SC
mconley@TNC.org
843-937-8807 x20

Barry Costa-Pierce
Rhode Island Sea Grant
bcp@gso.uri.edu
401-874-6800

Ben Cowie-Haskell
NOAA
Stellwagen Bank National Marine Sanctuary
ben.haskell@noaa.gov
781-545-8026 x207

Sylvain De Guise
Connecticut Sea Grant
sylvain.deguise@uconn.edu
860-922-5391

Richard Delaney
Provincetown Center for Coastal Studies
delaney@coastalstudies.org
508-487-3622 x 111

Fanny Douvere
Intergovernmental Oceanographic Commission UNESCO
Paris, France
fanny.douvere@mac.com
0033 6 7413 9361

Charles (Bud) Ehler
Ocean Visions
Paris, France
charles.ehler@mac.com
0033 6 70 44 71 63

Kevin Essington
The Nature Conservancy, RI
kessington@TNC.org
401-331-7110

Susan Farady
Roger Williams University School of Law
Marine Affairs Institute
sfarady@rwu.edu
401-254-5392

Timothy Feehan
Tetra Tech EC
timothy.feehan@tteci.com
617-457-8411

Zach Ferdana
The Nature Conservancy
zferdana@tnc.org
206-409-0041

Kathryn Ford
Massachusetts Division of Marine Fisheries
kathryn.ford@state.ma.us
508-990-2860 x145

Kevin Friedland
NOAA National Marine Fisheries Service
kevin.friedland@noaa.gov
401-782-3236

Grover Fugate
RI Coastal Resources Management Council
gfugate@crmc.ri.gov
401-783-3370

Jonathan H. Grabowski
Gulf of Maine Research Institution
jgrabowski@gmri.org
207-228-1628

Jennifer Greene
The Nature Conservancy, Eastern Division
jgreene@tnc.org
617-542-1908 X213

Lynne Hale
The Nature Conservancy
lhale@tnc.org
401-874-6872

Bradley Harris
UMASSD-SMAST
Dept. of Fisheries Oceanography
bharris@umassd.edu
508-910-6359

Adrianne Harrison
NOAA Coastal Services Center
Adrianne.harrison@noaa.gov
603-862-4272

Megan Higgins
Roger Williams University School of Law
RI Sea Grant Legal Program
mhiggins@rwu.edu
401-254-5734

Porter Hoagland
Woods Hole Oceanographic Institute
phoagland@whoi.edu

Robert Houston
Gulf of Maine Coastal Program
US Fish & Wildlife Service
Robert_Houston@fws.gov
207-781-8364 x11

William Hubbard
USACE-New England District
william.a.hubbard@usace.army.mil
978-318-8552

Alex Jospe
The Nature Conservancy, Eastern Division
ajospe@tnc.org

Jon Kachmar
The Nature Conservancy, CT
jkachmar@tnc.org
860-344-0716 x314

David Kaiser
NOAA Office of Coastal Resources Management
David.Kaiser@noaa.gov
603-862-2719

Ernst Kastning
New Hampshire Geological Survey
NH Department of Environmental Services
ernst.kastning@des.nh.gov
603-271-2875

David Keeley
Northeast Regional Ocean Council
Gulf of Maine Council
David@thekeeleygroup.com
207-549-3598

Bob Kenney
URI Graduate School of Oceanography
rkenney@gso.uri.edu
401-874-6664

Kate Killerlain Morrison
The Nature Conservancy, MA
kkmorrison@tnc.org
617-227-7017 x322

Ray Konisky
The Nature Conservancy, NH
rkonisky@tnc.org
603-659-2678 x13

Scott D. Kraus
New England Aquarium
skraus@neaq.org
617-973-5457

Heather Leslie
Brown University
Center for Environmental Studies
heather_leslie@brown.edu
401-863-6277

Kathleen Leyden
Maine Coastal Program
Maine State Planning Office
kathleen.leyden@maine.gov
207-287-3144

Andy Lipsky
USDA Natural Resources
Conservation Service
Rhode Island
andrew.lipsky@ri.usda.gov
401-822-8842

Chris Littlefield
The Nature Conservancy, RI
clittlefield@TNC.org
401-466-2129

Chris Mantzaris
NOAA National Marine Fisheries
Service
chris.mantzaris@noaa.gov
978-281-9311

Jennifer McCann
URI Coastal Resources Center
Rhode Island Sea Grant
mccann@crc.uri.edu
401-874-6127

Leslie-Ann McGee
Waquoit Bay National Estuarine
Research Reserve
leslie-ann.mcgee@state.ma.us
508-457-0495 x103

Linda Mercer
Maine Department of Marine
Resources
linda.mercer@maine.gov
207-633-9565

Ru Morrison
NERACOOS
Ru.Morrison@neracoos.org
603-957-0998

Stephanie Moura
Massachusetts Ocean Partnership
smoura@massoceanpartnership.org
617-287-7542

Steve A. Murawski
NOAA National Marine Fisheries
Service
steve.murawski@noaa.gov
301-713-2239 X 205

Nicholas Napoli
Massachusetts Ocean Partnership
nnapoli@massoceanpartnership.org
617-287-3926

Betsy Nicholson
NOAA Coastal Services Center
betsy.nicholson@noaa.gov
617-869-9148

Matthew Nixon
Maine State Planning Office
Dept of Marine Resources
Matthew.E.Nixon@maine.gov
207-287-1491

Heidi Nutters
Brown University
hnutters@gmail.com

Christine O'Connell
School of Marine and Atmospheric Sciences
Stony Brook University
caoconne@ic.sunysb.edu
631-632-8641

Jay Odell
The Nature Conservancy, VA
jodell@TNC.org
804-644-5800 x124

Susan Olcott
Ocean Conservancy
solcott@oceanconservancy.org
207-879-5444

Arlene Olivero
The Nature Conservancy, Eastern Division
arlene_olivero@tnc.org
617-542-1908 X249

Renee Orr
U.S. Department of the Interior
Minerals Management Service
renee.orr@mms,gov
703-787-1215

John Pappalardo
New England Fishery Management Council
johnp@ccchfa.org
508-945-2432

Robbin Peach
Massachusetts Ocean Partnership
robbin.peach@umb.edu
617-287-3967

Jonathan Pennock
New Hampshire Sea Grant
jonathan.pennock@unh.edu
603-862-2921

David Perkins
U. S. Fish and Wildlife Service
david.perkins@fws.gov
413-352-8405

Christine Reynolds
Applied Science Associates
creynolds@asascience.com
401-789-6224

Paul M. Rich
Deepwater Wind
prich@dwwind.com
207-319-5131

Kenneth Rocha
U. S. Environmental Protection Agency
rocha.kenneth@epa.gov
401-782-9612

Dr. Julie Rose
NOAA, Long Island Sound Study
US EPA
rose.julie@epa.gov
203-977-1541

Andrew A. Rosenberg, Ph.D.
University of New Hampshire
Andy.rosenberg@unh.edu
603-862-2020

Kevin Ruddock
The Nature Conservancy, RI
kruddock@tnc.org
401-331-7110

Dan Sampson
MA Office of Coastal Zone Management
daniel.sampson@state.ma.us
978-526-2490

Melanie Schroeder
Applied Science Associates
mschroeder@asascience.com
401-789-6224 x330

Caroly Shumway
The Nature Conservancy, RI
cshumway@tnc.org
401-331-7110 x13

Geoffrey Smith
The Nature Conservancy, ME
geoffrey_smith@tnc.org
207-373-5219

Robert Snyder
Island Institute
rsnyder@islandinstitute.org
207-594-9209 x142

Dr. David Stevenson
NOAA National Marine Fisheries Service
David.Stevenson@noaa.gov
978-281-9118

W. Michael Sullivan
Rhode Island Department of Environmental Management
michael.sullivan@dem.ri.gov
401-222-4700 x2409

Christine Taylor
U.S. Department of the Interior
U.S. Minerals Management Service
Mapping and Boundary Branch
Christine.Taylor@mms.gov
703- 787-1606

Marilyn ten Brink
US EPA / MIT DUSP
Tenbrink.Marilyn@epamail.epa.gov
401-782-3078

Timothy Timmerman
EPA New England
Timmermann.Timothy@epamail.epa.gov
617-918-1025

Susan Tuxbury
NOAA National Marine Fisheries Service
susan.tuxbury@noaa.gov
978-281-9176

Page Valentine
U.S. Department of the Interior
U.S. Geological Survey
pvalentine@usgs.gov
508-457-2239

Barbara Vickery
The Nature Conservancy, ME
bvickery@TNC.org
207-373-5210

Kathleen Wainwright
The Nature Conservancy
kwainwright@tnc.org

Hal Weeks
Shoals Marine Laboratory
hjw7@cornell.edu
603-430-5220

Adam Whelchel
The Nature Conservancy, CT
awhelchel@tnc.org
860-344-0716 x340

Sandra Whitehouse
Ocean Conservancy
sandrawhitehouse@cox.net
207-879-5444

Jack Wiggin
Urban Harbors Institute
UMass Boston
jack.wiggin@umb.edu
617-287-5570

John Willamson
Ocean Conservancy
Jwilliamson@oceanconservancy.org
207-879-5444 x 13

Sally Yozell
The Nature Conservancy, Eastern Division
syozell@tnc.org
617-542-1908

Roman Zajac
University of New Haven
Dept Biology & Environmental Science
rzajac@newhaven.edu
203-932-7114

Mid-Atlantic Participants

Mark Anderson
The Nature Conservancy, Eastern Division
manderson@tnc.org
617-542-1908 X215

Dr. Mariam Balgos
University of Delaware - Center for Marine Policy
mbalgos@udel.edu
302-831-8086

Dr. Michael Beck
The Nature Conservancy, GMI
mbeck@tnc.org
831-459-1459

Marcia Berman
Virginia Institute of Marine Science
marcia@vims.edu
804-684-7188

Marci Bortman
The Nature Conservancy, NY
mbortman@tnc.org
631-425-7457

Maureen Bornholdt
Minerals Management Service
Maureen.bornholdt@mms.gov
703-787-1300

Steve Brown
National Marine Fisheries Service
Stephen.K.Brown@noaa.gov
301-713-2363

Chris Bruce
The Nature Conservancy, VA
cbruce@tnc.org
434-951-0565

Steve Bunker
The Nature Conservancy, MD
sbunker@tnc.org
301-897-8570

Michelle Canick
The Nature Conservancy, MD
mcanick@tnc.org
301-897-8570

Greg Capobianco
New York - Department of State
gcapobia@dos.state.ny.us
518-474-8811

Sarah Carr
Nature Serve
Sarah_Carr@natureserve.org
703-908-1892

David Carter
Delaware Coastal Programs
david.carter@state.de.us
302-739-9283

Alison Chase
Natural Resources Defense Council
achase@nrdc.org
212-727-4551

Sarah Chasis
Natural Resources Defense Council
schasis@nrdc.org
212-727-4423

Karen Chytalo
New York - Department of Environmental Conservation
knchytal@gw.dec.state.ny.us
631-444-431

Melissa Clark
The Nature Conservancy
melissa_clark@tnc.org
617-542-1908

Sarah Cooksey
Delaware Coastal Programs
Sarah.cooksey@state.de.us
302-739-9283

Chris Cortina
Maryland Department of Natural Resources
ccortina@dnr.state.md.us
410-260-8774

Gwynn Crichton
The Nature Conservancy, VA
gcrichton@tnc.org
434-295-2233

Fanny Douvere
Intergovernmental Oceanographic Commission (UNESCO)
fanny.douvere@mac.com
0033 6 7413 9361

Ruth Ehinger
New Jersey - Department of Environmental Protection
Ruth.Ehinger@dep.state.nj.us
609-633-2201

Charles (Bud) Ehler
Ocean Visions
charles.ehler@mac.com
0033 6 70 44 71 63

Darlene Finch
National Oceanic and Atmospheric Administration
Darlene.Finch@noaa.gov
410-267-5659

Andrea Geiger
Coastal States Organization
ageiger@coastalstates.org
202-508-3862

Andrew Gohn
Maryland Energy Administration
agohn@energy.state.md.us
410-260-7190

Jennifer Greene
The Nature Conservancy, Eastern Division
jgreene@tnc.org
617-542-1908 X213

Wayne Grothe
The Nature Conservancy
wgrothe@tnc.org
631-329-7689 ext 25

Jeffrey Halka
Maryland Geological Survey
jhalka@dnr.state.md.us
410-554-5503

Troy Hartley
Virginia Sea Grant
thartley@vims.edu
804-684-7248

Kevin Hassell
New Jersey - Department of Environmental Protection
kevin.hassell@dep.state.nj.us
609-633-2201

Monty Hawkins
Morningstar Fishing
mhawkins@siteone.net
410-520-2076

Jeff Herter
New York - Department of State
jeff.herter@dos.state.ny.us
518-486-7942

Tom Hourigan
National Oceanic and Atmospheric Administration
tom.hourigan@noaa.gov
301-713-3459 X122

Roger Jones
The Nature Conservancy, DE
rjones@tnc.org
302-654-4707 ext 126

Alexandra Jospe
The Nature Conservancy
ajospe@tnc.org
617-542-1908 ext 239

Brian Kelly
Delaware Coastal Programs
Brian.Kelly@state.de.us
302-739-9283

Kate Killerlain Morrison
The Nature Conservancy, MA
kkmorrison@tnc.org
617-227-7017 X322

Matthew Kroll
National Oceanic and Atmospheric Administration
Navigation Services Division
matt.kroll@noaa.gov
301-713-2730 X162

Chad Lopez
Fugro Earth Data
clopez@earthdata.com
301-948-8550

Susan Love
Delaware Coastal Programs
susan.love@state.de.us
302-739-9283

Remy Luerssen
Virginia Coastal Energy Research Consortium
luerssrm@jmu.edu
540-568-8768

Tony MacDonald
Urban Coast Institute - Monmouth University
amacdona@monmouth.edu
732-263-5392

Andrew Manus
The Nature Conservancy, DE
amanus@tnc.org
302-584-5683

Catherine McCall
Chesapeake and Coastal Program
Maryland Department of Natural Resources
cmccall@dnr.state.md.us
410-260-8737

Nick Meade
VA Coastal Zone Management Program
nick.meade@deq.virginia.gov
804-698-4297

Thomas Noji
Ecosystems Processes Division
National Marine Fisheries Service
thomas.noji@noaa.gov
732-872-3025

Jay Odell
The Nature Conservancy, Mid-Atlantic
jodell@tnc.org
804-644-5800

Arlene Olivero
The Nature Conservancy, Eastern Division
arlene_olivero@tnc.org
617-542-1908 X249

Angela Padeletti
Partnership for the Delaware Estuary
apadeletti@delawareestuary.org
302-655-4990 X103

Roger Parsons
National Oceanic and Atmospheric Administration
roger.parson@noaa.gov
301-713-2776 X205

Doug Pfeister
Bluewater Wind - A Babcock & Brown Company
doug@bluewaterwind.com
201-420-1195

Robert Propes
Bluewater Wind - A Babcock & Brown Company
rob@bluewaterwind.com
302-731-7020

Peyton Robertson
National Oceanic and Atmospheric Administration
peyton.robertson@noaa.gov
410-267-5652

Peter Rowe
NJ Marine Science Consortium/New Jersey Sea Grant
prowe@njmsc.org
732-872-1300 X31

Jennifer Samson
Clean Ocean Action
jsamsonphd@gmail.com
732-872-0111

Dave Sanford
American Association of Port Authorities
dsanford@aapa-ports.org
703-706-4715

Adam Schempp
Environmental Law Institute
schempp@eli.org
202-939-3864

Robin Schlaff
New York State - Dept of Environmental Conservation
rxschlaf@gw.dec.state.ny.us
518-402-8448

Cornelia Schlenk
New York Sea Grant
cornelia.schlenk@stonybrook.edu
631-632-6907

Gwynne Schultz
Maryland Department of Natural Resources
gschultz@dnr.state.md.us
410-260-8735

Brad Sewell
Natural Resources Defense Council
bsewell@nrdc.org
212-727-4419

Caroly Shumway
The Nature Conservancy
cshumway@tnc.org
401-331-7110 X13

H. Ward Slacum Jr.
Versar, Inc.
wslacum@versar.com
410-740-6046

Brian Smith
National Oceanic and Atmospheric Administration
brian.m.smith@noaa.gov
843-740-1268

Mike Snyder
New York - Department of State
Michael.Snyder@dos.state.ny.us
518-486-4644

Mark Swingle
Virginia Aquarium
mswingle@virginiaaquarium.com
757-385-0326

Jeffrey Tinsman
Delaware - Division of Fish and Wildlife
jeffrey.tinsman@state.de.us
302-739-4782

Marek Topolski
Maryland Department of Natural Resources
mtopolski@dnr.state.md.us
410-260-8263

Matt Unger
Energy Research Specialist
Virginia Tech
ungerm@vt.edu
757-273-7706

Dr. Ian Voparil
Shell
ian.voparil@shell.com
281-544-6909

Tom Wells
The Nature Conservancy
twells@tnc.org
908-955-0349

Lauren Wenzel
National Marine Protected Areas Center
lauren.wenzel@noaa.gov
301-563-1136

Meredith Westington
National Oceanic and Atmospheric Administration/Nation Ocean Service
meredith.westington@noaa.gov
301-713-2780 X127

Nat Williams
The Nature Conservancy, MD
nwilliams@tnc.org
301-897-8570

Bart Wilson
Delaware Coastal Programs
Bartholomew.Wilson@state.de.us
302-739-9161

James Wilson
James Madison University
wilsonjw@jmu.edu
540-568-2757

Kate Wing
Moore Foundation
kate.wing@moore.org
650-213-3144

Sally Yozell
The Nature Conservancy, Eastern Division
syozell@tnc.org
617-542-1908 X232

Suzanne Young
Natural Resources Defense Council
syoung@nrdc.org