

Ocean Planning in the Northeast Workshop on Ecosystem Based Management (EBM)

April 8, 2015

Squamscott Room, Holloway Commons
University of New Hampshire
75 Main Street
Durham, NH

MEETING SUMMARY

Prepared by the:



May 2015

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Executive Summary

On April 8 2015, approximately 80 participants from a variety of stakeholder groups attended a one-day workshop hosted by the Northeast Regional Planning Body (RPB) to discuss potential for incorporating Ecosystem Based Management (EBM) principles and practices into ocean planning in the Northeast US. The goals of the workshop included learning about EBM, developing a shared sense of EBM, identifying key questions, and exploring possible actions for moving forward on the topic.

An RPB representative began by providing background on EBM and summarizing key EBM principles from scientific literature: 1) humans are part of the ecosystem; 2) there is no singular path to EBM; and 3) there is a need for stakeholders to work together to develop EBM incrementally. The representative suggested that the RPB is focused on EBM at a regional scale and was interested in hearing tangible advice for the current ocean planning process.

A mix of small group and panel discussions followed this introduction. The panelists came from a variety of backgrounds, including agency, academia/research, tribal, and industry. They noted the following:

- EBM involves understanding interconnections and relationships among ecosystem components; a regional approach to EBM could seek to understand cumulative effects of ocean uses;
- A tribal perspective towards EBM involves thinking about future generations and recognizing that nature can heal itself if given the chance;
- Critical learning about EBM can come from working to restore individual species at a local level;
- EBM in the face of climate change requires an adaptable approach that recognizes uncertainty but does not let it become a barrier to effective action;
- To put EBM into practice within our existing regulatory framework, we need to change from thinking about managing human activities to managing interactions among those activities;
- For industry, it is important to demonstrate the practicality of EBM and ensure that it benefits user groups, is scientifically sound, and aligns with industry observations.

Participants and panelists discussed real world examples where EBM has been implemented; concerns about balancing protection of the natural world with social and economic benefits, along with difficult-to-quantify ecosystem benefits and values; and the extent to which implementing EBM is possible within the existing regulatory framework.

During the final portion of the meeting, RPB staff presented on ongoing ocean planning work, including characterization of human uses, characterization of natural resources, and data integration and synthesis. During small group breakout sessions, participants discussed key questions and actions the RPB could explore to further incorporate EBM into regional ocean planning. Participants came up with a variety of ideas, many of which were related to data gathering, monitoring, scenario planning, an EBM pilot project, governance and agency coordination, and further consideration of the qualitative values people place on ecosystem components.

I. Workshop Background, Workshop Goals, and Welcome

On April 8, 2015, the Northeast Regional Planning Body (RPB) hosted a one-day workshop to discuss ideas and options for incorporating Ecosystem Based Management (EBM) into ocean planning in the Northeast US. Approximately 80 participants from tribes, federal and state agencies, industry groups, academic institutions, nonprofit organizations, municipalities, and elsewhere attended the workshop.¹

The specific goals of the workshop were to:

- Jointly learn more about and discuss the principles, definitions, and frameworks of EBM;
- Develop a shared sense of EBM as a lens to understand shorter and longer term ocean planning and management;
- Identify key learning and research questions of interest to NE stakeholders; and
- Explore possible actions for moving this topic forward in 2015 and beyond.

Staff from the Consensus Building Institute (CBI) facilitated the workshop and drafted this workshop summary (with drafting assistance from SeaPlan). Patrick Field from CBI was the lead facilitator.² Presentation slides and other materials from the workshop are available at the following URL:
<http://neoceanplanning.org/events/>.

Mr. Field opened the meeting by welcoming participants. He explained that the decision to hold the workshop had emerged from the most recent RPB meeting on November 13th and 14th, 2014. There, participants expressed a strong interest in exploring both short-term and long-term opportunities to incorporate EBM into ocean planning in the northeast. Mr. Field reviewed the broad goals of the workshop (noted above) as developed by RPB members, the workshop ground rules, and the agenda.³

II. Why Discuss Ecosystem Based Management?

Betsy Nicholson, RPB Co-Chair and Northeast Lead for the National Oceanic and Atmospheric Administration (NOAA) Coastal Services Center, provided a short history of EBM, New England, and the Northeast RPB. Ms. Nicholson explained that the RPB is in the middle of its ocean planning process with a goal to develop the plan by 2016. She suggested that the RPB's intent with respect to EBM is to build on the good work that has already been done on the issue by states and other actors and consider how to apply it on a regional scale.

Ms. Nicholson reviewed the broader goals of the RPB:

- Healthy ocean and coastal ecosystems;
- Effective decision-making; and

¹ See Appendix A for a full list of participants.

² Additional Consensus Building Institute staff: Ona Ferguson, Doug Thompson, Toby Berkman, and Griffin Smith. SeaPlan staff: Kate Longley-Wood.

³ A copy of the workshop agenda is in Appendix A.

- Compatibility among past, current, and future ocean uses.

She suggested that the RPB could benefit from participants' focused feedback and advice on how it should consider EBM alongside other ongoing efforts, such as the marine life characterization project and consideration of composite ecological products or "hotspots" and the projects characterizing human uses. She noted that this advice and feedback would be useful to the RPB at its June 2015 meeting.

Next, Ms. Nicholson offered a slide presentation on the history, origins, and key elements of EBM.⁴ She noted literature references that describe the concept of EBM and then reviewed a series of key EBM principles, including:

- Focusing on protecting and restoring marine ecosystems;
- Considering cumulative effects;
- Facilitating connectivity among and within marine ecosystems;
- Incorporating measures that acknowledge the inherent uncertainties in EBM;
- Creating complementary and coordinated policies at global, international, national, regional, and local scales;
- Maintaining historical levels of native biodiversity in ecosystems to provide resilience;
- Requiring evidence that an action will not cause undue harm to ecosystem functioning;
- Developing multiple indicators to measure the status of ecosystem functioning; and
- Involving all stakeholders through participatory governance.

She summarized key takeaways from these EBM principles: 1) humans are part of the ecosystem; 2) there is no singular path to EBM; and 3) there is a need for stakeholders to work together to develop EBM incrementally. She reminded the group that EBM occurs at multiple scales and that the RPB work is focused on the regional (New England-wide) scale. Finally, she concluded by encouraging participants to think about EBM across multiple timelines and to be sure to include tangible, practical advice for the short-term alongside any longer-term suggestions.

III. What does Ecosystem Based Management Mean for Ocean Planning in the Northeast?

In the next session, participants were given an opportunity to discuss their perspective on the meaning of EBM for ocean planning in the northeast at their tables. A representative from each small table then reported briefly to the larger group on the substance of their conversation. The table representatives reported on the following topics of conversation:

- How, from a practical standpoint, can you apply EBM on a regional scale?
- How to focus on what is possible. This could involve:
 - 1) establishing a foundation of data on marine ecosystem and human uses, much of which is underway;

⁴ See the Appendix B for a copy of the presentation.

- 2) using that information to start to identifying important use areas and important ecological areas;
- 3) developing an approach for compatibility among uses as well as between uses and the marine environment that could be applied to decision-making; and
- 4) developing a system for monitoring the marine environment and adapting the ocean plan accordingly.
- The need to recognize the importance of the coastal zone and watersheds because of their critical role in the health of the ocean.
- How we determine the level of confidence we have in our ability to do EBM, and the need to test applications of EBM incrementally and transparently as knowledge and experience increase.

IV. EBM Principles, Concepts and Practice: Panelist Presentations

The next session involved presentations from two sets of three panelists. The six panelists provided various overviews on the concept and practice of EBM. The first panel consisted of Dr. Michael Fogarty, Northeast Fisheries Science Center; Chuckie Green, Mashpee Wampanoag Tribal Council; and Dr. Anamarija Frankic, University of Massachusetts-Boston. The second panel included Dr. Kathy Mills, Gulf of Maine Research Institute; Dr. Andrew Rosenberg, Union of Concerned Scientists; and Brent Greenfield, National Ocean Policy Coalition. Following each panel presentation, participants had an opportunity both to ask questions and to discuss at their tables.

A. Panel One

Dr. Michael Fogarty (Northeast Fisheries Science Center)

Dr. Fogarty's presentation provided background on EBM, its application to regional ocean planning, and use of EBM by the Northeast Fisheries Science Center (NEFSC).⁵ Mr. Fogarty made the following points:

- Although there are a number of different definitions of EBM, the US Commission on Ocean Policy (USCOP) created a particularly useful definition in 2004. The USCOP definition suggests that EBM is concerned with relationships among ecosystem components, considers humans as an integral part of ecosystem, seeks to understand the role of environmental change resulting from climate and other factors, and involves a place-based orientation specific to a particular area or region.
- EBM also involves thinking about ecosystem services or the benefits humans derive from interactions with coasts and oceans such as fisheries, natural products, ecotourism, aquaculture, recreation, and energy. The idea is that there cannot be sustainable delivery of these services without ensuring the health and integrity of ecosystems.
- A focus on EBM includes emphasis on the interconnections and relationships among ecosystem components. One example is the relationships among cod, herring, plankton, right whales, and human fishing.

⁵ The slides accompanying Mr. Fogarty's presentation are available in Appendix B.

- Regional ocean planning could incorporate EBM by looking at multiple ocean use patterns and considering potential cumulative effects of different activities. For example, combining maps of otter trawl efforts, proposed wind farm locations, and existing telecommunication cables might reveal cumulative effects.
- In practice, spatial management has been used to map the probability of whale ship strikes along the shipping lanes approaching Boston. This allowed regulators to make a small change in shipping routes to minimize the chances of ship strikes.
- The Integrated Ecosystem Assessment (IEA) process is a tool for making management decisions at an ecosystem level. It involves an iterative set of activities to develop and monitor ecosystem indicators, define EBM goals and targets, monitor ecosystem indicators, and evaluate and assess ecosystem outcomes.
- NEFSC has an array of modeling tools, including the ATLANTIS system.
- In the near future, people will be able to access information regarding the results of NEFSC work on this topic on the NEFSC webpage.

In response to a participant question, Mr. Fogarty addressed the issue of whether a sectoral approach to EBM, such as ecosystems-based fisheries management at NEFSC, needs to be distinguished from a more comprehensive, multi-sectoral EBM approach across sectors. Mr. Fogarty noted that the National Ocean Policy requires agencies to operate within existing management structures, even though theoretically it might be better to have a broad, multi-sectoral approach to EBM. NEFSC has a specific set of questions and objectives framed by the fisheries management council that are directed towards fisheries management.

Mr. Chuckie Green (Mashpee Wampanoag Tribal Council)

Mr. Green presented on EBM from a tribal perspective. Mr. Green noted that rather than looking at environmental issues from an individualistic perspective, the tribe tries to look at the broader perspective, recognize that every human action has an impact on the environment, and recognize that humans are brothers and sisters with all species. Protecting the environment means reflecting on the rapid pace of change and embracing the needs of future generations far into the future seven generations from now. It involves putting humans and the nature on the same footing and recognizes that nature can heal itself if given the chance. Mr. Green suggested that this long-term, holistic approach had led the Mashpee Wampanoag tribe to embrace a variety of successful environmental interventions, including:

- raising oysters as part of its wastewater treatment program to address high nitrogen levels.
- protecting the New England Cotton Tail rabbit, an endangered species that was used for many generations by the tribe, by restoring 37 acres of forest habitat as part of a project that created 1000 acres of contiguous habitat.
- After recognizing that phosphorous was causing fish kills every summer in one of the tribe's lakes, eliminating a phosphorous source at the bottom of the pond that was contributing 75% of the phosphorous.

- implementing a moratorium on fishing for herring.

In response to a question from another panelist, Mr. Green agreed that humans need to “listen more” to the ocean. He suggested that if we look deeply at the ocean, it will tell us what it needs to restore itself and recover.

Dr. Anamarja Frankic (University of Massachusetts-Boston)

Dr. Frankic’s presentation focused on her experience with EBM at both local and global levels and her experience with oyster reef restoration in Wellfleet as Director of the Green Harvest project at UMass-Boston.⁶ Dr. Frankic suggested that identification of an individual species’ habitat and its place in the ecosystem leads to an understanding of how all components of the ecosystem are deeply connected. Dr. Frankic described her personal history with EBM, which included many years working on restoration and conservation projects at a global level with the World Bank and elsewhere, and then more local work on oyster restoration on Cape Cod. She made the following points:

- Having worked both at the local level and at the global level, she has come to realize that problems on the local, regional, and global levels are all connected. Globally, for example, maps of coral, mangrove, and sea grass distribution suggest that each of these systems interacts with the others.
- More locally in New England, key interactive systems include salt marshes, oyster reefs, and eelgrass banks.
- Some global challenges might seem impossible to address, but it is possible to overcome them on a local scale and learn about how the different systems interact. For example, while 90% of oyster reefs have been lost globally, it is possible to make restorative changes cove-by-cove and harbor-by-harbor in New England.
- EBM is not a modern concept and does not necessarily require deep scientific knowledge to implement. The traditional system of “ahupua’a” in Hawaii, for example, involved recognizing how watersheds are connected to coasts and oceans.
- A key challenge is learning more about the natural world at a time when the natural world is constantly disappearing. The concept of “biomimicry” can help with this challenge. It involves looking at the system and studying how nature would solve the problem.
- Sometimes the best learning can occur from simply working with nature to try to solve a practical problem, rather than by writing scientific papers. Sometimes policies and regulations can be an impediment rather than an aid.
- Dr. Frankic and her students restored 6 million oysters on two acres of land in Wellfleet over the course of three years. Dr. Frankic suggested that she learned more about the connections among oyster beds, shellfish and salt marshes by working on these two acres than she did by reading any scientific studies of the issue.
- Our advanced technology can tell us a lot about what is in the oceans now, but it will not tell us what used to be in the oceans before we destroyed so much of it. To really understand the

⁶ The slides accompanying Dr. Frankic’s presentation are available in Appendix B.

environmental possibilities of a given region, we need a different approach. For example, historical data and existing maps suggest that Wellfleet Harbor used to have 34 billion oysters. Now we harvest only 6 million oysters per year.

Small table discussions

Following the first set of panelist presentations, participants discussed the material at their tables. Representatives from each table then provided a summary to the larger group of the issues discussed. Table representatives reported the following key discussion items:

- Whether there is a role for marine protected areas or reference areas in EBM.
- Given that it is a lot easier to implement EBM through a local approach, whether EBM will fit with the ultimate goal of having a regional plan.
- Whether individual species efforts, such as those described in the presentations, constitute EBM or whether EBM is just an umbrella term to describe local efforts.
- Whether one approach to incorporating EBM into the regional plan could be to select a species that delivers multiple ecosystems services to multiple species including humans, such as river herring or oysters. The plan could start by focusing on just that one species to begin to help everyone understand EBM in a specific, particular context.
- How we turn the baseline data that we have now into a usable decision support mechanism that accounts for variability, given that it will be important to make sure the data is usable across different applications and regions.
- How the regional plan will map onto other management or agency plans, like that of the New England Fisheries Management Council, and how they will interrelate.
- How the landscape connectivity approach now under development through large landscape-scale collaboratives might work in an ocean-scape.
- Whether once you identify key areas to manage, it may be helpful to set up collaborative, multi-agency groups, given that having multiple agencies in a room may make it easier for communities to engage on management questions.

B. Panel Two

Dr. Kathy Mills (Gulf of Maine Research Institute)

Dr. Mills' presentation focused on climate change in the context of EBM. She emphasized that while climate change is often discussed as a problem to be addressed in the future, in reality there already is a changed ecosystem that has been shaped by past human uses, and the impacts of climate change (in the form of ocean warming and extreme events) overshadow our current management challenges. Climate change requires us to embrace a dynamic approach to EBM. We need to recognize the uncertainty inherent in our management decisions without letting this uncertainty become a roadblock to effective action. EBM also provides a new toolkit for thinking about not only responding to but also mitigating climate change by embracing new energy uses. Dr. Mills discussed the following points:

- The baseline ecological conditions of the present are unlikely to represent past conditions, and future conditions are unlikely to mirror the present.
- Even isolated climate change impacts can have long-lasting, ecosystem-wide ramifications, including impacts on species interactions, ecosystem services, and biodiversity. These far-reaching effects are particularly notable in fisheries.
- Current climate patterns present a short-term need to respond and adapt, and a long-term need for mitigation. This will likely require a new set of tools, including new energy sources.
- Management in the face of climate change needs to happen at a variety of scales. Factors that influence individual species might be different from those that impact systems as a whole.
- Planning should account for how different user groups need to use the ocean. Some industries, such as fishing, have a history of operating under changing ocean conditions, while newer uses such as aquaculture and energy rely on the ability to site and choose stable, long-term locations.
- Planning need not be paralyzed by the uncertainties related to climate change, as resources have always been managed in the face of uncertainty. Managers can focus on improving their capacity to track uncertainty, and incorporate adaptive management and scenario planning approaches that are robust in the face of uncertainty.
- The RPB can address some of the challenges associated with climate change by: 1) providing a structure for stakeholder engagement; 2) understanding future scenarios, especially when it comes to human use patterns; and 3) developing tools to evaluate outcomes associated with various decisions and scenarios, maintaining avenues for rapid, open-access to data, and developing new ways to work with data in real time.

Dr. Andy Rosenberg (Union of Concerned Scientists)

Dr. Rosenberg's presentation focused on practical avenues to put implement EBM. He emphasized that while the concept of interconnected and cumulative impacts of human activities on the ecosystem and ecosystem services is relatively simple, the challenge is changing the current system of management of human activities into one that manages interactions among those activities. Dr. Rosenberg made the following points:

- One of the most important areas of focus should be examining interactions between sectors of human activities at an ecosystem level by managing both the primary activities as well as their second order effects. Secondary areas of focus should include an examination of cumulative impacts and trade-offs.
- It is important to remember that human interactions are two-sided. For example, planners need to examine both how fisheries affect other activities as well as how they are affected by other activities. Managers should look for solutions that have benefits on both sides of those interactions.
- Integrated Ecosystem Assessments (IEAs) can be useful for modeling how various interactions across sectors play out across the ecosystem. They should be spatially explicit, but they need not be overly precise. Models only need to be able to predict whether it is reasonable to expect a benefit from a particular action.

- The planning effort should look for opportunities to re-engineer the regulatory process to increase efficiencies within the current framework using EBM tools. For example, an integrated ecological assessment could be used as a common basis for a lot of regulatory processes, eliminating the need to duplicate basic information for impact assessments across multiple projects.
- It is not necessary to address all possible interactions at once. The process should begin by trying to make progress by looking at one pairwise or tri-wise interaction within the current regulatory framework.

Brent Greenfield (National Ocean Policy Coalition)

Mr. Greenfield began his presentation by explaining the role of the National Ocean Policy Coalition in representing commercial and recreational interests over a variety of sectors including fishing, boating, ports, agriculture and homebuilders. The Coalition is trying to understand what particular goals and objectives these groups have when it comes to EBM. Mr. Greenfield presented some of the Coalition's initial ideas on the topic of EBM.

- It is important to make clear the need to move from traditional resource management to EBM by identifying the problems we are trying to solve and the deficiencies we are trying to address, especially over a regional scale. If consensus emerges, these goals and objectives can continue to define the EBM approach.
- From an industry perspective, it is important to demonstrate the practicality of an approach. Significant thought and time is needed to invest in data collection, monitoring, analysis, and quality control to demonstrate that the methodology is scientifically sound, and to make sure that the approach aligns with industry observations.
- There is a need to assess practical needs as part of this process. It is important to clarify where funding would come from and the associated impacts of that shift in funding on existing activities.
- There is a need to engage in transparent and candid public discussions in which user groups are actively engaged. User groups need to be able to see a net benefit from the process. This should be accomplished through a variety of outreach tools, including workshops, meetings, and webinars.

Questions

Following their individual presentations, members of the second panel addressed the following questions from participants.

- *What is the role of Marine Protected Areas (MPAs) in EBM?*

There was consensus among several panelists that MPAs fit well into the goal of place-based management and prioritization, but that current management areas don't always account for how their

boundaries may relate to one another. EBM provides an opportunity to look for efficiencies in creating MPAs that can be used to achieve multiple benefits across sectors.

Several panelists brought up the role of MPAs as an opportunity to collect data, monitor systems, and identify baseline conditions in comparison to other areas. One panelist urged the group to think of MPAs as reference areas that can be used to measure whether management decisions are having an impact. One cautioned that current protected areas may need to be reevaluated in the context of climate change (changing conditions may cause geospatial shifts). Another panelist emphasized that MPAs offer an opportunity not just to learn about impacts in specific areas but to look at the interconnectedness of these impacts.

Several panelists also touched on the issue of scale. Some emphasized the idea of looking at protected areas according to a hierarchy of spatial units, and looking to broad scale areas to achieve multiple benefits. Others thought that the size of the MPA was less of an issue as long as the appropriate data was being collected across a variety of ecosystems.

- *How should we think of about connectivity in terms of management?*

Several panelists agreed that there is an important distinction between ecosystem connectivity and connectivity among management actions. The latter focuses on determining how interactions occur across sectors of human effects on the ecosystem. While ecosystem connectivity cannot be ignored, there should be a greater focus on determining how human activities interact among and through connected ecosystems. Another panelist emphasized that connectivity is critical to ecosystem resilience. For example, dams have reduced ecosystem connectivity and, by extension, changed the flow of energy, reduced resources in coastal communities, and impacted fisheries. From this, we are learning that once connectivity is destroyed, it is difficult to restore.

One panelist stressed that connectivity is an especially important consideration in marine ecosystems, but we should extend our thinking on connectivity to consider how natural systems collaborate and communicate with one another by adapting and thriving in the face of change. EBM should learn from these concepts and incorporate them into management activities. For example, some cities mimic biological processes to manage waste so that it becomes an energy resource. In this case, the management action addresses human functions and services while also benefiting ecological processes.

- *How should we turn baseline data into a decision support tool that accounts for change over time and that is also adaptable?*

One panelist responded that how change is incorporated into management depends on being able to identify reference points. Finding a reference point will then depend on the length of the data series, the information content, and the magnitude of change; however, a reference point should be able to provide a metric as to how close a management action is to reaching its goal. Another important component of management involves identifying inflection points or thresholds at which changes or damages to a system become irreparable. In trying to define these points, managers should keep in

mind that most scientific measurements and observations have been collected after major changes have started to occur, so there isn't a long enough time series to know what the system "naturally" looks like.

Several panelists cautioned against information overload in EBM. One panelist suggested further development of map-based tools, but emphasized that in attempting to turn data into practical advice it is important not to be trapped by a need for excessive precision. Instead, tools should focus on predicting the likelihood of success of an action in a particular area. Another panelist focused on the need to clearly identify data needs for decision-making, and to isolate the critical data and/or contextual information that are directly relevant to the decision.

One panelist urged the group to look to traditional ecological knowledge as a way of understanding conditions that existed before the systematic collection of scientific data. For example, fishermen and tribes hold a wealth of inter-generational knowledge about historical conditions, and this information should be incorporated into decision-making tools to examine change.

Close of Session Summary

In closing the second panel session, Mr. Field urged workshop participants to begin thinking about practical options that the RPB could work on at its upcoming meeting in June. John Weber reminded participants that the RPB's actions must fall within the existing regulatory framework, so it is important to make sure that their advice fits within this framework.

V. Interactive Discussion with Panelists

The next workshop session involved an interactive discussion among participants and all six panelists. Participants asked the following questions and panelists offered the following responses.

- *Where are there examples of EBM working in practice?*

Panelists offered the following examples of effective EBM worldwide:

- Australia's management of the Great Barrier Reef system.
- Elements of the Antarctic Treaty, particularly the treaty's effort to preserve the food web structure for mammals and birds appears to be relatively effective.
- The Convention for the Protection of the Marine Environment of the North-East Atlantic (the OSPAR Convention), which has been implemented to some good affect.
- Baltic Sea Convention – an agreement among EU and non-EU states in the Baltics.
- Some of the Elkhorn Slough (California) agreements.

A panelist suggested that one reason there may be only a small number of concrete examples of successful EBM in practice is because there are relatively few contexts in which there is a regulatory and management authority in place that allows for EBM, combined with a "customer" who will take the available information on EBM and translate it into action.



OCEAN PLANNING IN THE NORTHEAST

Another panelist question what is meant by EBM “working,” and suggested that this is not a binary (“yes it is” vs. “not it is not”) determination. There are examples where there have been significant accomplishments towards EBM, such as fisheries management in the U.S., even if a lot remains undone. This panelist also suggested that there is substantial regulatory authority to do EBM in the U.S. Just because this authority is organized by sector in the U.S. does not mean that nothing can be done.

- *How can we best incorporate social and economic considerations into EBM, so that it is not exclusively focused on the natural environment?*

One panelist suggested that EBM involves recognizing the economic value provided by natural systems. This panelist brought up the example of appropriations by the European Commission to the Horizon 2020 program, which support green infrastructure and biomimicry. The goal is to build harbors, marinas, cities, and ocean structures that will be sustainable for both human and ecological uses. Another participant suggested that advancing technologies are enhancing the ability to protect the health of the ocean without sacrificing economic goals.

Another participant stressed both the challenge and importance of accounting for social and environmental impacts across sectors. This panelist argued that the goal should be to take management actions that improve overall effectiveness, and to ensure that efforts within one sector do not undermine those in another. He suggested we need a governance system that has positive results across the economy, not just the specific sectors or businesses that may have the most resources or influence. Another panelist agreed that the goal should be to find “win-win actions,” such as oyster restoration, which protects coasts, increases water quality, and provides water quality benefits.

- *How do we ensure that non-monetizable values related to ocean health that the public cares about are incorporated into EBM, so that they don't get left behind?*

One of the panelists responded that it is essential to step beyond the mindset that ocean resources are only valuable if we can tie them to a dollar amount. By “going local” and showing practical, effective examples of EBM, we can show the real long-term value of ocean resources that go beyond the short-term dollar value. This panelist suggested that we are running out of ocean resources and it is critical to look at managing ecology beyond the dollar.

Another panelist suggested that the key is to distinguish between profit and economic value, as there are methods for monetizing values beyond the direct returns to businesses. We can get the sentiment from communities in the region on what they think is most important, and place real quantitative or qualitative value on this sentiment to ensure that the management structure does not just respond to business interests. For this to work, however, it is key to have a robust stakeholder engagement process.

Another participant noted that a well-articulated theory of decision-making takes values and preferences into account and does not need to monetize everything. We as a society already do this through the Endangered Species Act and the Marine Mammal Protection Act by placing a premium on protecting species survival irrespective of the monetary value attached to it.

- *How can we involve stakeholders in making decisions on the value of different ecosystem services after the ocean plan is published, given the restrictions in the existing permitting process? How do we make sure that EBM helps us to include stakeholders in making real choices rather than just handing them off to the agencies to make on our behalf?*

One participant suggested that for the time being we will need to work through existing channels, such as fisheries management councils and coastal zone management councils, although this approach has limitations in not taking a broad enough view. One panelist suggested legislation might ultimately be needed to be most effective. Other panelists suggested that the status quo could be improved by demonstrating that agencies can achieve better results by doing things a different way within their existing statutory authorities. Improved agency decision-making could achieve broader community goals while still meeting legislative mandates. This will require changing ingrained decision and agency cultural patterns, which is challenging but not impossible.

Another panelist noted that from an industry perspective, a lot depends on what exactly is meant by EBM, as well as the objectives, funding sources, and scale of the effort. This panelist suggested that industry believes we must remain cognizant that we are operating under existing statutes and mandates.

VI. Review & Discussion of Current Northeast Planning Activities Related to EBM

In the next session on the agenda, ocean planning staff presented on ongoing northeast planning activities related to EBM.⁷

Characterization of human uses

Nick Napoli began the presentation by reviewing RPB activities related to characterizing human uses and activities such as shipping, fishing, and recreation. He noted that the RPB has focused on data analysis and outreach to different industries to refine maps of human activities. Mr. Napoli showed some examples of maps with data resulting from these projects. Other projects are also gathering existing information related to how determinations of compatibility among uses are made, and exploring examples of other basic information that is being compiled (e.g., economic baseline data). He provided examples of model output attempting to assess the economic value generated by various human activities, and noted that other models look at the economic benefits people obtain from ecosystem services.

Characterization of natural resources

Emily Shumchenia presented on RPB activities related to characterizing natural resources. Ms. Shumchenia noted that about a year ago the RPB started considering how to prepare datasets to

⁷ Slides from the presentation are available in Appendix B.

maximize their usefulness. The Marine Life Data and Analysis Team (MDAT) from Duke and NOAA (the Northeast Fisheries Science Center and National Center for Coastal Ocean Science) – who are producing habitat density models and other abundance products for marine mammals, turtles, birds, and fish – have considered EBM-related applications and perspectives when creating new products. For example, when determining the natural resource study area, it incorporated areas that are outside the formal ocean planning boundaries of the northeast region but that might still be ecologically important.

Ms. Shumchenia further noted that MDAT is guided by an expert work group with representatives from multiple stakeholder groups including academia, and its spatial models integrate animal observations with environmental and climatological features. The distribution and abundance models look at multiple temporal scales and include regional output from geographically wider datasets.

The RPB is also developing spatial products for other ecosystem components besides marine life, such as eelgrass, water quality, primary productivity, and restoration sites. The RPB is also compiling information depicting characteristics of ocean habitats such as sea floor geology and benthic and pelagic communities. These layers have been used in the past for ecosystem services analyses.

Data Integration and Synthesis

Mr. Napoli continued the presentation by discussing the RPB's approach to integrating and synthesizing data products. The goal is to bring the data together so it is usable under existing management and regulatory authorities. He noted that MDAT is planning on creating aggregated products on marine life such as abundance hotspots for certain bird species. However, the RPB has not decided how far it will be able to go in creating synthetic products, and it may be difficult to create a methodology to integrate highly variable data inputs on a regional scale.

The RPB has also been considering various potential approaches to considering use interactions and compatibility with correspondingly varying levels of complexity and utility. For example, a more straightforward approach could be to develop spatial data and related topic-specific information on future trends of a particular industry along with existing related guidelines and best practices. In other cases, the RPB could use spatial data to define and identify areas of interest based on consideration or particular interactions or use spatial data to define a geographic area. Multi-sector and resource matrices identifying levels of interaction or compatibility would be the most complex type of an approach.

Mr. Napoli explained that there have been several recent efforts in the region to address cumulative impacts. One such effort by NEFSC and the Natural Capital Project is looking at vulnerability or risk to marine life, building on species- and use-specific distribution, abundance, hotspot, and human use mapping. Over the long term, the project hopes to develop a framework for estimating impacts.

With respect to ecosystem services, the RPB has provided funding to the Woods Hole Oceanographic Institution (WHOI) to define ecosystem service categories and connect them to resource endpoints in the northeast. The WHOI team is developing a database of examples where ecosystem services have been assessed in specific projects.

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With respect to considering climate change implications, the RPB is engaged in a variety of activities. For example, the Gulf of Maine Research Institute is developing a database on scientific literature regarding research on climate change impacts, the Nature Conservancy and NEFSC are looking at changes associated with shifting patterns of fish assemblages over time, while NEFSC and Rutgers are developing the OceanAdapt webtool. In addition, NROC and NERACOOS are working on a system to understand and monitor climate change indicators over time through a sentinel monitoring effort.

In conclusion, Mr. Napoli noted the following:

- The RPB purposefully started with projects focusing on individual components (natural resources and human uses) of the ecosystem because it wanted to conduct extensive outreach, increase its understanding of foundational data and information limitations, and incorporate a focus on the management utility of its products. This work had to occur prior to more sophisticated data integration and synthesis discussions.
- Key decisions remain about composite ecological and human use products and topics such as the development of indicators.
- The RPB needs to identify specific, practical short- and long-term opportunities to augment its work.

Questions

Staff responded to the following questions from participants.

- *The economic analysis includes detailed tables on economic revenue, but the public does not value that approach. Where do public values fit in this picture?*

Mr. Napoli responded that the RPB is looking for opportunities to look at value in a different way through the ecosystem services analysis being conducted by the WHOI team. The team is compiling examples of use alternative value models. We will hear more about this at the June RPB meeting.

- *How far will the RPB go towards scenario analysis as an aid for decision-making? Under this approach, the maps are dynamic and reflect actual outcomes that might result from a management action.*

Mr. Napoli responded that the RPB would welcome input on how to do scenario analysis more effectively. John Weber noted that the upcoming RPB discussions will include illustrations of different approaches incorporating data resulting from the previously described human use and natural resource characterization efforts.

VII. Small Group Work: Furthering an EBM Approach

During the next session, participants broke into three subgroups to discuss a series of four questions:

- What elements of Northeast regional ocean planning are on track regarding EBM principles?
- What key elements or activities are potentially missing?

- What questions for further learning or research does this brief analysis surface for further consideration?
- Within existing RPB timelines and resources, what are the key EBM question/activities we can explore as a region short-term (12 to 18 months) and longer-term (many years to come)?

Mr. Field noted that the purpose of the group discussions was to get a variety of ideas on the table, not for group members to agree on the answers to all four questions. The responses from each subgroup are recounted below.

A. Group A

Participants noted the following elements of northeast regional ocean planning that are on track regarding EBM principles:

- *Data and information:*
 - The data development process of collecting baseline information is on track, and the RPB seems to be coming to terms with the idea that synthesis layers are needed in order to make sense of the hundreds of data layers that are being gathered.
 - Participants stressed that the key to durability is for these synthesis layers to serve existing authorities and improve agencies' permitting and management processes, with the goal of making people's jobs easier and decisions more effective.
- *Management:*
 - The RPB has done a good job bringing stakeholders together and building broad support for multi-sector decision-making. One participant pointed out that one of the major values of the process was empowering people to use data at a local level where some decision-making will take place.
- *Scale:*
 - The MDAT project has been able to identify trends and characteristics at regional scale, which is an important consideration for local level decisions when considering EBM principles.

Participants made the following comments on elements or activities that are potentially missing, grouped by theme:

- *Data and information:*
 - It would be helpful if there could be more clarity as to how EBM is being practiced effectively as part of the northeast ocean planning process. Once the plan is being implemented, it would be helpful to have a few general indicators to evaluate how well the plan is doing and whether initial assumptions are correct.
 - Identification of important Ecological Areas (IEAs) should be incorporated into the existing process. These areas are important to EBM and should be considered by the ocean planning process in the short term. There's uncertainty regarding the



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- methodology for identifying such areas, but the RPB needs to take advantage of the existing momentum and expertise to try to advance some of these concepts.
- Identification of benthic habitat hotspots should be a short-term data priority, leading to a long-term goal of producing integrated maps and data products depicting ecosystem hotspots.
 - The characterization of pelagic fish habitats is also a key data gap that should be developed over the long-term, especially given the sensitivity of pelagic species to changes in habitat.
 - *Visioning:*
 - Stakeholder visioning is an important component of ecosystem based management. The RPB needs to develop guidelines for stakeholder visioning with respect to environmental, social, and economic issues. Stakeholders should also have an opportunity to express how they would like the management structure to look in the future.
 - The Tampa Bay Estuary program is a potential example. This program involved developing a stakeholder vision to restore an estuary to conditions that existed in a specific year. This type of exercise allows planners to identify a variety of future scenarios envisioned by different stakeholders. Other participants cautioned that the RPB should be careful not to look to past conditions to establish goals, because conditions inevitably change.
 - *Scale:*
 - It is unclear whether the scale of the planning effort is appropriate for EBM. Because the region contains so many drastically different ecosystems (e.g. Downeast Maine and Long Island Sound), using similar tools and analysis across the region may not be appropriate.
 - The process should be structured in such a way that it empowers decision-making in small communities. Maps on a regional scale may be too generalized and lacking in contextual information to serve that purpose. For example, human use mapping for fisheries leaves out a lot of detail from the perspective of a fisherman in Maine.

The group made these suggestions for key EBM questions and activities over the short- and long-term:

- *Indicators:*
 - Develop a list of indicators to measure plan success and evaluate assumptions.
- *Data and information:*
 - Develop contextual data or assessments with a retrospective look at how ecosystems have changed over the last 100 years as well as a dataset that looks toward the future; explore ways to add to or create additional data products that incorporate a historical perspective and/or traditional knowledge. These products could be qualitative and could be used at a community level to review assumptions, goals, and decision-making processes based on observed changes in the system. While it is important to focus on



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- data needs from an agency perspective, the RPB should also identify datasets that communities need in order to interact with agency-level projects.
- Prioritize agency access to the best available data (i.e., that which incorporates EBM and climate change) to achieve agency buy-in. Identify situations where use of the Northeast ocean data portal would lead to faster or more effective decision making and clearly demonstrate that to the agency.
 - Identify current challenges with implementing EBM by prioritizing data gaps and other needed tools and information for the research community to address.
 - Develop interpretive data products such as IEAs and hotspot maps.
- *Agency coordination and staying power:*
 - Develop an inter-agency Memorandum of Understanding to help ensure that the plan has long-term staying power.
 - Develop a list of common goals and priorities (e.g. priority species) across the mandates and interests of various agencies. Identify whether there are major agency priorities that aren't part of the existing planning structure and address those gaps.
 - Develop a map or other visual showing scale and connectivity between watersheds, coastal systems, and the open ocean on a local to regional scale. It could also incorporate a visual of responsible agencies at each of these scales. The goal would be to visualize a better way of allocating authority over activities and improve agency efficiency by depicting how their activities overlap.
 - *Data maintenance:*
 - Develop a long-term strategy for the data portal that includes a plan for financial sustainability and ongoing collection and maintenance of.
 - *Communication on data limitations:*
 - Identify a strategy for clearly communicating data limitations to make sure that agencies use data appropriately. The operational scale of the datasets should be specified, and data at dissimilar scales should not be combined.
 - *Pilot project:*
 - Create momentum for future projects by developing a pilot or example project at a specified scale to demonstrate early success with EBM. As part of the pilot, identify datasets that are relevant at that particular scale.

B. Group B

Participants suggested the following elements of northeast ocean planning are on track:

- *Data products*
 - Broadly speaking, the creation of data portal and efforts to develop synthetic products on biological and use data will enhance understanding of how the environment works. The species and habitats data are creating a helpful foundation. Also helpful are efforts to identify data gaps, which characterization studies are starting to fill, as well as the sentinel monitoring program.
- *Human impacts*
 - Efforts to understand cumulative human impacts are positive and should be continued.
- *Planning goals*
 - The goal to maintain healthy oceans is another positive – it is an important signal for the direction of the group – as is the compatibility component.

The group identified a number of key elements that may be missing from the planning process, including the following:

- *Interconnectedness*
 - The RPB has started to address interconnectedness at the regional level, but it could do more. It should work to improve collaboration among state, federal, local, and tribal agencies so they can focus on a common goal instead of regulatory issues.
- *Climate change and restoration*
 - The RPB should clarify how restoration will fit in the larger plan.
 - The RPB should revisit climate change considerations and future trends in the areas such as ports, recreation, and aquaculture. We need more economic analysis of these issues and dynamic new thinking from other fields.
 - We need to take climate change seriously and avoid committing tracks of ocean over the long-term to activities that will not survive a changing climate. For example, aquaculture leases should be short-term in light of climate uncertainties.
- *Broad-based stakeholder engagement*
 - EBM suggests that everything is an ecosystem service, which means stakeholders from all backgrounds need to understand economic service concepts and its importance to the maintenance of a healthy ocean ecosystem.
- *Adding a social science perspective*
 - Ocean planning can lack a social science perspective. The plan should include the perspective and experience of people who work in traditional ocean related jobs.
- *Addressing uncertainty*
 - There should be more clarity on how to strike the right balance between precision and imprecision in decision-making. The plan should make it possible for people push new ideas in the face of uncertainty.
- *Including qualitative values and tradeoffs*
 - The RPB should work to better define what a successful outcome would look like and include goals in addition to monetary or economic value. It is key to quantify measures

- beyond economic value, because you inevitably will “get” what you measure.
- Valuing tradeoffs should incorporate values beyond dollars. One example where some of this may already occur might be Army Corps of Engineers public interest reviews, which consider multiple nonmonetary values covering issues like food production, societal integrity, etc.
- By using an integrative systems framework, we can think beyond tradeoffs and open up win-win opportunities; our thinking needs to recognize that the ocean could be abundant in multiple aspects (not just monetarily), and we need to consider how to ensure economic contributions and also protect ecosystems. At the same time, we need to be careful not to be too optimistic about win-win solutions; many assets like oyster reefs are still displacing something.
- *Make EBM more concrete and useful*
 - Operationalize the conceptual theories of EBM and make it useful and understandable to those making decisions. one approach might be through scenarios planning.
Scenarios can be more concrete and involve real world examples.

Participants highlighted the following key EBM questions and activities to explore over the short- and long-term:

- *Gather traditional and qualitative knowledge*
 - The RPB should set up a clear mechanism for taking in traditional ecological knowledge, especially about historical conditions.
 - More contextual qualitative knowledge would also be useful and would fill the gaps in data sets.
- *Create an EBM/values working group*
 - The RPB should establish a values working group that would discuss tradeoffs and produce an explicit list of values as management objectives. At the last RPB meeting there was commitment consider how to integrate EBM into the whole ocean plan, but as of now there is only an RPB sub-group working on this and not a broader stakeholder group in some more sustained way than just today.
 - It might be helpful to think about modeling an ideal future, tease out the values of such a model, and tie these values back to the organic statutory authorizations of the relevant agencies. This effort could integrate historical/traditional knowledge and could also consider other frameworks to evaluate options without explicit tradeoffs.
 - The group should consider alternative, dynamic, crosscutting, and transformational approaches that stretch regulatory authority.
 - Whether or not there is a new working group, there need to be realistic expectations about what the RPB can accomplish between now and next July.
 - The group could look at public comments, results of industry and interest group outreach, and the ecosystem services work.
- *Develop data for use in regional scenario planning*

- Advance and synthesize the biological and habitat data as much as possible. The goal should be to go from static maps to dynamic visualizations.
- This could help us transition to full scenario analysis, and aid our understanding of what would happen regionally if certain actions were taken, for example like a salmon farm in Boston Harbor or an ocean wind build out.
- The goal is to understand regional implications of policy changes and actions, moving from project by project assessments to looking at how projects affect the whole region.
- For scenario planning, we should be careful to show only things that we can take actionable steps to change.
- For scenario planning, it is also important to provide concrete limits for what *won't* happen in the future.
- *Formalize public input*
 - Public workshops like this one are great but not sufficient. The RPB needs to formalize the public input process. People want to understand what these meetings are achieving and how their input is incorporated in a formal way.
- *Governance*
 - We need a better understanding of whether we are thinking about governance in the proper ways. The RPB should put a group together that will identify different governance models that exist, think through ocean management goals from a number of different perspectives (e.g., restoration, ecosystem, resilience), and consider how we can best mobilize agencies to achieve these various goals.

C. Group C

Participants noted the following elements of northeast regional ocean planning that are potentially missing:

- *Shared definition of EBM*
 - Not all RPB members think about EBM in the way the panelists were describing it.
- *Clarity on metrics of quality*
 - Provide clarity on the metrics of “quality,” and other less tangible ecosystem benefits, so that decisions will not be guided by economic metrics alone. An example might be the oyster beds/reefs in Wellfleet — they provide food, water quality, de-nitrification, and storm protection. All of those things should be included in quality metrics.
- *Detail on cumulative impacts and uncertainty*
 - Enhance accurate characterizations of both cumulative impacts and uncertainty.
- *A future desired condition*
 - More thought could be given to articulating a future desired condition. A lot of the focus seems to be on how to make the next decision better than the last one, but this is not the same as articulating future desired conditions.
 - In defining the desired state, many policy questions need to be asked and answered and it's not clear when that will happen. For example, we need to consider whether we are

- in pursuit of freezing the footprint — the level of quality we have now — or whether we are trying to restore it.
- Part of this could include developing an ecological health index. We could define a target and measure our progress towards it, like a report card.
- Based on the desired end state we should identify a smaller number of priority targets and focus our management and our data on those.
- *Anecdotal data*
 - The RPB should accumulate, isolate, and document anecdotal information from fishermen. This is particularly important because many fishermen with historical knowledge are retiring.
 - The RPB could also make more use of new video capture technology for fishing.
- *Composite maps*
 - Scientists should help layer data in a scientifically sound way to enable better understanding of what is ecosystem integrity, while making sure the individual maps are still available.
 - Any maps that are created as composites should have explanatory accompanying text.
- *Alignment of existing authorities*
 - Align existing statutory authorities and to create more efficiency among them through consultative processes.
- *Ensuring data relevance*
 - Ensure data has a straightforward nexus to tangible management questions. We need to be able to apply it to the particular issue we're trying to address.
- *Monitoring*
 - Ongoing monitoring should include constant hypothesis creation and hypothesis testing. User groups should be part of the ongoing monitoring effort, specifically fishermen.
- *Acoustic surveying*
 - The RPB should issue a statement on acoustic surveying for oil deposits and the resulting ecological harm. It's the elephant in the room — there is an industry push to get it done quickly.

In response to these suggestions, an RPB member summarized current RPB activities. He noted that the RPB is working on measures for valuing ecosystem services, and has identified monitoring and evaluation as one of the issues it needs to articulate. He also noted that while the RPB has not identified a desired “future state,” its goals suggest directions and trajectories for the ocean planning effort. He also suggested that the RPB has articulated a management focus, including offshore energy, offshore sediment resources, aquaculture, and carbon sequestration.

Participants suggested a number of short- and long-term actions, including the following:

- *Scenario planning pilot*
 - The RPB should conduct a well-defined scenario-planning pilot to demonstrate all the information that would be used to make a decision in an actual planning process. The

goal would be to design a useful decision-making exercise to prepare agencies for bolder work in the future.

- The pilot should be sufficiently constrained to a specific issue or area for a long-term scenario on a regional scale,
- Possible questions/scenarios for the pilot project include the following:
 - What would the ecosystem look like if we were producing a lot more biomass in the ocean? What would be the implications for the ecosystem?
 - What would it look like if we were doing a lot more energy extraction, like through wind power or wave?
 - What would it look like if we were to invest in trying to restore previous ecosystem conditions, for example through significant investments to reduce nutrient loading in coastal waters? A participant noted that this was actually done in Boston Harbor over the course of decades, where they transformed a very degraded ecosystem.
- *Focus monitoring efforts*
 - The RPB should identify what it wants to monitor, and choose indicators and metrics that will measure progress towards stated goals. The goal should be to select indicators that can show change against articulated desired conditions and goals. The details of this monitoring program should be reviewed publicly.
- *Clarify geographic scope*
 - The RPB should address questions of geographic scope. EBM doesn't respect artificial boundaries. For example, nitrogen from upland sources have real impacts on marine resource.
- *Emerging and new uses*
 - The RPB should analyze the compatibility of emerging and new uses. The priority should be on new uses since they are time sensitive. For example, the RPB could study the impact of sonar testing on fisheries, or the compatibility of oyster reefs and shellfish aquaculture
- *Presentation on monitoring programs*
 - In June, the RPB should be given a presentation on how ecosystem scenario modeling can capture complex data and show it in a dynamic way. There are two programs: MIMES (being developed by Les Kaufman) and Atlantis (being developed by Mike Fogarty and others).
- *Time to reflect*
 - The RPB should save time at the end of the process to reflect on how far it has gotten, the next six or so things it will do, and the next set of planning priorities. This will be important for continuing momentum.

VIII. Wrap Up

During the final session on the agenda, Betsy Nicholson reflected on the workshop and participants' contributions. She expressed appreciation that stakeholders want to be engaged. She expressed a desire for the RPB commit to moving toward on EBM, while recognizing that progress will be incremental. Other RPB members also offered reflections on the workshop. One member noted that he found the workshop to be very useful and informative, and expressed hope that the region could carry forward insights from this process during the implementation phase of ocean planning, after the RPB falls away. Another member reflected that, to him, the workshop had underscored the importance of a central monitoring effort. Finally, an RPB member expressed appreciation for the design of the workshop, which allowed people to feel like they were heard, and thanked members of the panel for their insights and stamina. He noted that he was especially looking forward to seeing the integrated data products at next RPB meeting.

Ms. Nicholson closed the meeting by thanking participants, the panelists, CBI, and ocean planning staff.

APPENDICES

- Appendix A1: Workshop Participants
- Appendix A2: Workshop Agenda
- Appendix B1: Opening Presentation on EBM, *NROC and RPB*
- Appendix B2: The ABCs of EBM, *Michael Fogarty, Northeast Fisheries Science Center*
- Appendix B3: Ecosystem Based Management from local to global, *Anamarja Frankic, UMass Boston*

Appendix A1

WORKSHOP PARTICIPANT LIST

Last Name	First Name	Organization
Asgeirsdottir	Aslaug	Bates College
Babb-Brott	Deerin	SeaPlan
Ball	Jackie	NERACOOS
Battista	Nick	Island Institute
Berkman	Tobias	Consensus Building Institute
Borggaard	Diane	NOAA Fisheries
Brooks	Priscilla	Conservation Law Foundation
Carlisle	Bruce	MA Office of Coastal Zone Management
Chapman	Erik	UNH Sea Grant
Chase	Alison	NRDC
Cicchetti	Giancarlo	U.S. EPA
Clark Uchenna	Rebecca	Island Institute
Colby-George	Judy	Spatial Alternatives
Coté	Melville	EPA
Cowie-Haskell	Ben	Stellwagen Bank National Marine Sanctuary
Crowe	Mike	The Fishermen's Voice
Curtice	Corrie	Marine Geospatial Ecology Lab, Duke University
Defrancesco	Andrea	Ironbound Island Seaweed
DesAutels	Michele	USCG
DeWitt	Ed	Association to Preserve Cape Cod
Dinoto	Dory	Consensus Building Institute
Farrell	Jill	Piscataqua Region Estuaries Partnership
Felt	Jennifer	Conservation Law Foundation
Ferguson	Ona	Consensus Building Institute
Field	Patrick	Consensus Building Institute

Fogarty	Michael	NOAA/NMFS
Ford	Kathryn	Mass. Division of Marine Fisheries
Frankic	Anamarija	University of Massachusetts-Boston
Gates	Melissa	Surfrider Foundation
Green	Chuckie	Mashpee Wampanoag Tribal Council
Greenfield	Brent	National Ocean Policy Coalition
Griffin	Robert	Natural Capital Project
Hawkins	Annie	Fisheries Survival Fund
Hubbard	Don	USCG
Kaufman	Les	Boston University
Kendall	Jim	New Bedford Seafood Consulting & Mass Fishermen's Partnership
Kennedy	Jen	Blue Ocean Society for Marine Conservation
Kite-Powell	Hauke	Woods Hole Oceanographic Institution
Kleisner	Kristin	NEFSC and The Nature Conservancy
LaBelle	Robert	BOEM DOI
Lapointe	George	George Lapointe Consulting
Leyden	Kathleen	Maine Coastal Program/NE Regional Planning Body
Longfellow	William	Sipayik Environmental Department
Longley-Wood	Kate	SeaPlan
Lund	Katie	NROC
Massaua	Meghan	Meridian Institute
McGee	Sally	The Nature Conservancy
McGuire	Christopher	The Nature Conservancy

Mendelson	Meredith	Maine Dept. of Marine Resources
Miller	Benjamin	Eastern Research Group, Inc.
Mills	Kathy	Gulf of Maine Research Institute
Moir	Rob	Ocean River Institute
Molton	Kyle	Penobscot East Resource Center
Moura	Stephanie	SeaPlan
Mulvaney	Kate	U.S. EPA Atlantic Ecology Division
Napoli	Nick	Northeast Regional Ocean Council
Nelson	Valerie	Water Alliance
Nelson	Richard	F/V Pescadero
Nestler	Eric	Normandeau Associates, Inc.
Nicholson	Betsy	NOAA Office for Coastal Management
Norton	Emily	Maine Coastal Program
Odell	Jay	The Nature Conservancy
Ozmon	Ivy	Maine Coastal Program
Pembroke	Ann	Normandeau Associates, Inc.
Randall	Noa	Ocean River Institute
Rosenberg	Andrew	Center for Science and Democracy, Union of Concerned Scientists
Shumchenia	Emily	NROC
Smith	Griffin	Consensus Building Institute
Stacey	Paul	Great Bay National Estuarine Research Reserve
Stowell	Colles	Cape Ann Fresh Catch, One Fish Foundation
Swasey	Jill	MRAG Americas
Thompson	Doug	Consensus Building Institute
Thompson	Brian	CTDEEP

Trice	Amy	Ocean Conservancy
Venno	Sharri	Houlton Band of Maliseet Indians
Weber	John	Northeast Regional Ocean Council
Williams	Lindsey	UNH Natural Resources Graduate Student
Williams	Christian	NH Coastal Program
Williamson	John	Sea Keeper Fisheries

Appendix A2

Ocean Planning in the Northeast
Workshop on Ecosystem Based Management (EBM)
April 8, 2015
9:00 AM to 4:30 PM

University of New Hampshire
Squamscott Room, Holloway Commons, UNH
75 Main Street
Durham, NH 03824

Meeting Goals

- Jointly learn more about and discuss the principles, definitions, and frameworks of EBM
- Develop a shared sense of EBM as a lens to understand shorter and longer term NE ocean planning and management
- Identify key learning and research questions of interest to NE stakeholders
- Explore possible actions for moving this topic forward in 2015 and beyond

Ground Rules

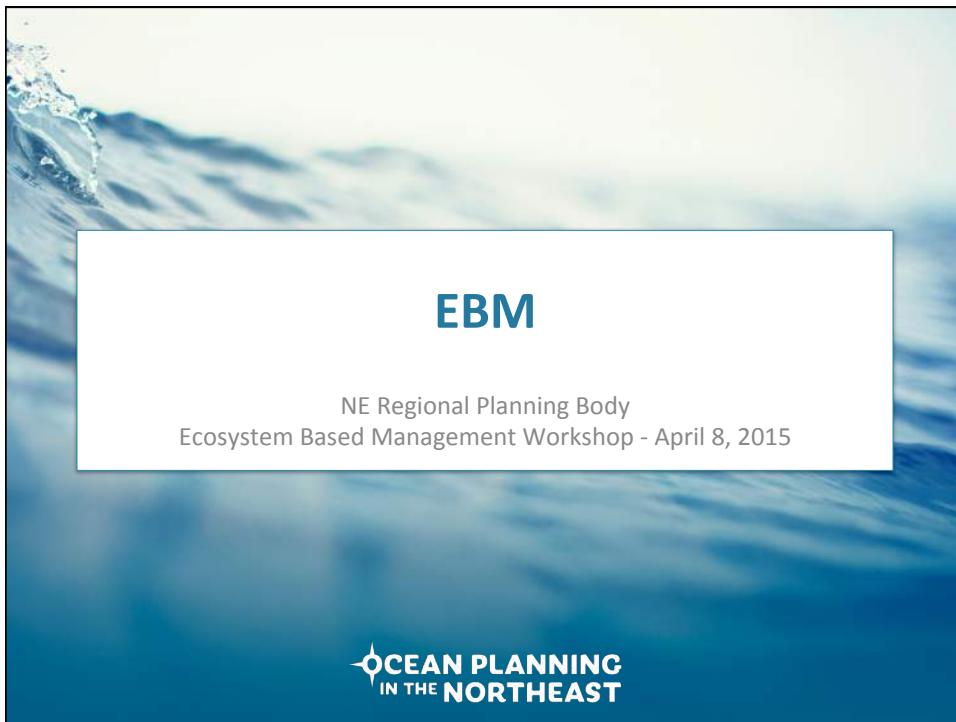
- Remember this is the just the beginning of joint conversation on a complex, long-term concept
- Stay on track with the agenda
- Please allow others time and space to speak
- Be respectful of others

Agenda

9:00	Welcome: <ul style="list-style-type: none">• Greetings and introductions• Review objectives, ground rules and agenda
9:10	Why Discuss Ecosystem Based Management (EBM)? <i>Presenter: Betsy Nicholson, RPB Co-Chair</i> <ul style="list-style-type: none">• A short history of EBM, New England, and the NE Regional Planning Body (RPB)
9:25	What's Ecosystem Based Management mean for Ocean Planning in the Northeast? <ul style="list-style-type: none">• Introductions at small tables• Small tables discuss their ideas briefly• Initial thoughts shared briefly with full group
9:45	EBM: Principles, Concepts and Practice <ul style="list-style-type: none">• Panelists overview of the concept and practice of EBM<ul style="list-style-type: none">○ Dr. Michael Fogarty, NE Fisheries Science Center○ Chuckie Green, Mashpee Wampanoag Tribal Council○ Dr. Anamarija Frankic, University of Massachusetts-Boston
10:20	Initial Small Group Discussion <ul style="list-style-type: none">• Introductions at small tables• Small tables discuss the ideas presented so far

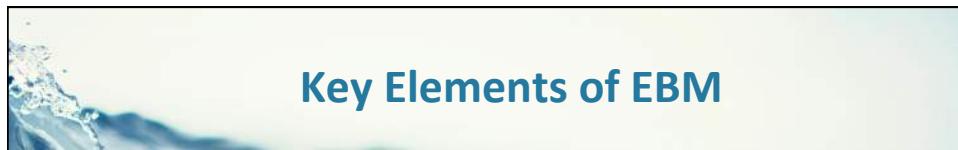
10:35	Break
10:50	<p>EBM: Principles, Concepts and Practice</p> <ul style="list-style-type: none"> • Panelists overview of the concept and practice of EBM <ul style="list-style-type: none"> ◦ Dr. Kathy Mills, Gulf of Maine Research Institute ◦ Dr. Andrew Rosenberg, Union of Concerned Scientists ◦ Brent Greenfield, National Ocean Policy Coalition
11:30	<p>What's Ecosystem Based Management mean for Ocean Planning in the Northeast?</p> <ul style="list-style-type: none"> • What similarities do you see across approaches? • What differences? • Considerations for our Northeast region? • Prepare questions for panel dialogue after lunch
12:15	LUNCH
1:15	<p>Interactive Discussion</p> <ul style="list-style-type: none"> • Small tables ask questions of panelists convened again after lunch • Facilitator summarizes key points, principles, barriers, and opportunities from the discussion
1:45	<p>Review & Discussion of Current Northeast Ocean Planning Activities related to EBM</p> <p><i>Presenter: NROC staff</i></p> <ul style="list-style-type: none"> • Brief presentation on key RPB activities related to, or as possible components, of EBM • Initial questions before moving to small group work
2:15 (including a break)	<p>Small Group Work: Furthering an EBM Approach</p> <p>Three groups, facilitated, with note taking, and panelists scattered across the groups. Given the “lens” we crafted from our morning discussions:</p> <ul style="list-style-type: none"> • What elements of Northeast regional ocean planning are on track regarding EBM principles? • What key elements or activities are potentially missing? • What questions for further learning or research does this brief analysis surface for further consideration? • Within existing RPB timelines and resources, what are the key EBM question/activities we can explore as a region short-term (12 to 18 months) and longer-term (many years to come)?
3:45	<p>Wrap Up</p> <ul style="list-style-type: none"> • Small Group Report outs • Discussion • RPB Co-Chairs summarize the day and identify next steps • Thanks and close
4:30	Adjourn

Appendix B1

The image shows a slide titled "Ecosystem Based Management (EBM)" with a background of ocean waves. The title is in a large, bold, blue font. Below the title is a bulleted list of references. The list includes:

- Pew Ocean Commission and US Commission on Ocean Policy; 2003-2004
- Scientific Consensus Statement on Marine Ecosystem-Based Management; 2005
- Numerous publications since that reference the Consensus Statement; some examples:
 - Ecosystem-based management in practice: Scientific and governance challenges, Ruckelshaus et al., 2008
 - Ecosystem-Based Management for the Oceans, McLeod & Leslie (eds.) 2009
 - Ecosystem-based management in practice, Yaffee 2012
 - Incorporating ecological principles into California ocean and coastal management: Examples from practice, Center for Ocean Solutions 2012
 - National Ocean Policy Implementation Plan, NOC 2013
 - Marine Ecosystem-Based Management, Fogarty & McCarthy 2014

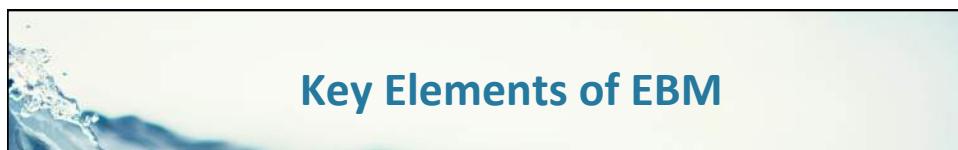
At the bottom of the slide is a dark blue footer bar with the text "OCEAN PLANNING IN THE NORTHEAST" in white. The "OCEAN PLANNING" part is in a larger, bold font, and "IN THE NORTHEAST" is in a smaller font below it.



Key Elements of EBM

- Make **protecting and restoring marine ecosystems** and all their services the primary focus, even above short-term economic or social goals for single services.
- Consider **cumulative effects** of different activities on the diversity and interactions of species.
- Facilitate **connectivity** among and within marine ecosystems by accounting for the import and export of larvae, nutrients, and food.
- Incorporate measures that acknowledge the inherent **uncertainties** in ecosystem-based management and account for dynamic changes in ecosystems, for example as a result of natural oscillations in ocean state or shifts in the frequency or intensity of storms. In general, levels of precaution should be proportional to the amount of information available such that the less that is known about a system, the more precautionary management decisions should be.





Key Elements of EBM

- Create complementary and coordinated policies at global, international, national, regional, and local **scales**, including between coasts and watersheds. Ecosystem processes operate over a range of spatial **scales**, and thus **appropriate scales for management will be goal-specific**.
- Maintain historical levels of native biodiversity in ecosystems to provide **resilience** to both natural and human-induced changes.
- Require evidence that an action will not cause undue harm to **ecosystem functioning** before allowing that action to proceed.
- Develop multiple **indicators** to measure the status of ecosystem functioning, service provision and effectiveness of management efforts.
- Involve all **stakeholders** through participatory governance that accounts for both local interests and those of the wider public.



Ecosystem Based Management (EBM)

Key takeaways:

- “EBM is an integrated, comprehensive approach to management that considers the entire ecosystem, including humans” (emphasis added; Source: Consensus Statement 2005)
- “Notably, there is no correct path to EBM” (Source: McLeod & Leslie 2009)
- “Working together, resource managers, ocean users, and other stakeholders can develop and apply ecosystem-based management incrementally, by learning and sharing effective practices as knowledge and experience increase.” (emphasis added; Source: NOP Implementation Plan 2013)

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Management at multiple scales



Estuary

- NEP Comprehensive Conservation and Management Plans
- National Estuarine Research Reserves

Marine Sanctuary

- Stellwagen Bank NMS

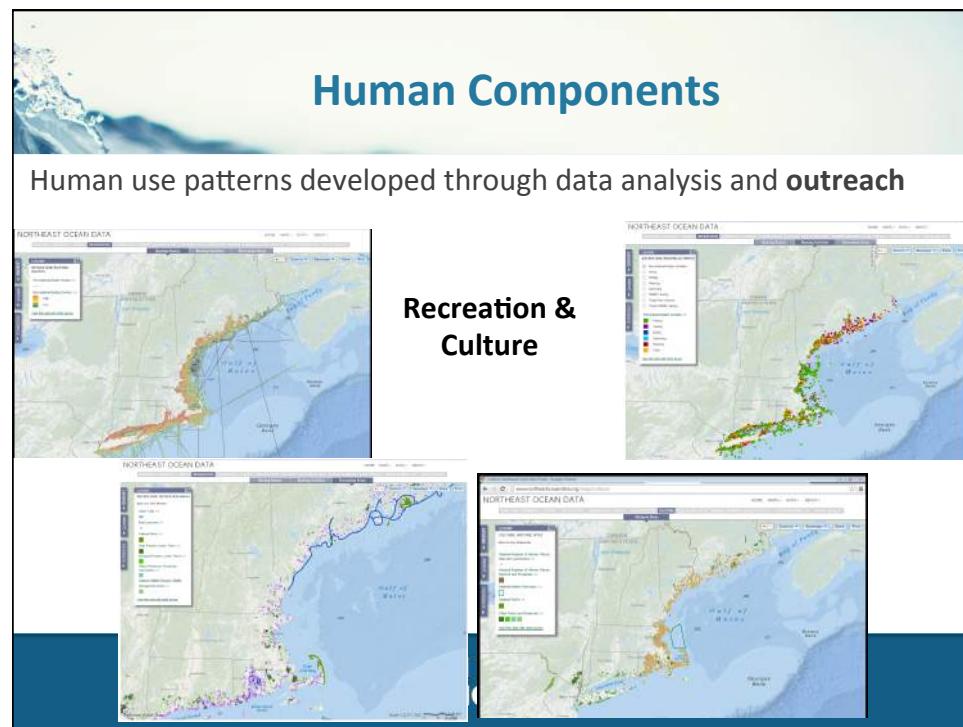
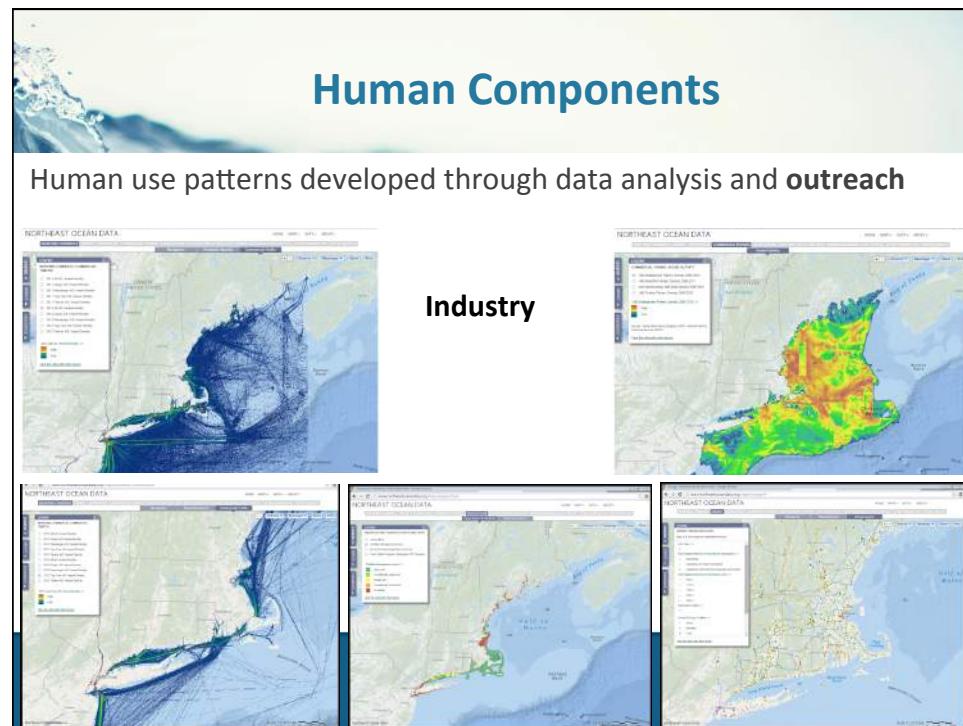
State ocean management plans

- MA Ocean Management Plan & RI SAMP

Regional ocean plans

- Northeast Marine Life Study Area
- Mid-Atlantic Marine Life Study Area

**OCEAN PLANNING
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Human Components

Future trends, guidelines, best management practices & use interactions

Figure 4: Vessel operation on the cable line

INTERACTIVE BOUNDARIES

A: Similar to the position of, or where an interactive boundary lies, either needs definition or agreement - which will require interactive flexibility, see diagram above where:

- A = Turbine boundary to the shaping route median or centre line
- B = Turbine boundary to nearest shaping route edge
- C = Turbine boundary to nearest shipping 90% traffic level*
- D = Turbine boundary to nearest adjacent shipping 90% traffic level*
- E = Turbine boundary to further shaping route edge

(* = or another % to be determined)

**OCEAN PLANNING
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Human Components

Economics

- Economic impact of ocean activities (below)
- Ecosystem services – benefits people obtain from ecosystems (more on this later)

Employment: Total Ocean Economy

QUICK SUMMARY:

- Total Employment: 66,402
- Farm: 11,918
- Manufacturing: 364
- Services: 12,282

EMPLOYMENT BREAKDOWN:

Industry Sector	Employment
Fisheries	11,918
Manufacturing	+ 364
Services	12,282
Total	66,402

Northeast Region 2013: Marine Sector Output, Employment, and Multipliers

OCEAN INDUSTRY SECTOR	TYPE	INPUT/OUTPUT INDUSTRY SECTOR	OUTPUT	TYPE B MULT	EMPLOYEE COUNT	TYPE B MULT
Fisheries	1 st	Commercial fishing	15M	1.85	15.8	1.58
	2 nd	Food processing, preparation and packing	1,102	1.72	1.6	2.08
	3 rd	Animal food, except seafood, poultry and eggs	165	1.24	1.8	2.11
Shipbuilding	1 st	Ship building and repairing	4,509	1.73	36.1	2.33
	2 nd	Repair, maintenance and supplies	760	1.49	3.7	2.05
	3 rd	Search, detection, and navigation instruments	5,114	1.85	1.6	2.08
Shipping, Water Quality	1 st	Marine transportation	2,135	1.54	1.1	1.07
	2 nd	Water, sewerage and other systems	443	1.58	1.6	2.03
Tourism	1 st	Full-service restaurants	10,617	1.85	206.5	1.28
	2 nd	Limited-service restaurants	7,430	1.05	221.7	1.27
	3 rd	All other food and drinking places	8,776	1.76	318.2	1.40
	4 th	Hotels and motels, including guest houses	8,716	1.75	62.9	1.05
	5 th	Other accommodation and services	208	1.77	4.1	1.30
	6 th	Assessment, research and analysis	100	1.65	1.5	1.27
	7 th	Gaming (including bingo rooms/halls)	1,795	1.82	26.5	1.27
	8 th	Other amusement and recreation industries	1,795	1.82	26.5	1.27
Real Estate	2 nd	Real Estate	5,247	1.32	251.3	5.89
TOTALS			106,764		819.3	
Subtotal			84,726		132.19	

1 \$1/billion (2013) 2 thousands of employees

5

Natural Resource Components

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Draft summary of marine life data sources and approaches to define ecologically important areas and measure ocean health
Developed in support of the Healthy Ocean and Coastal Ecosystem Goal for Ocean Planning in the Northeast
June 2014

IN-DEPTH ANALYSIS OF:

- What data are out there?
- What are the **scale(s)** and scope of analysis?
- How is science being applied to solve management and planning issues?

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Natural Resource Components

OCEAN PLANNING IN THE NORTHEAST

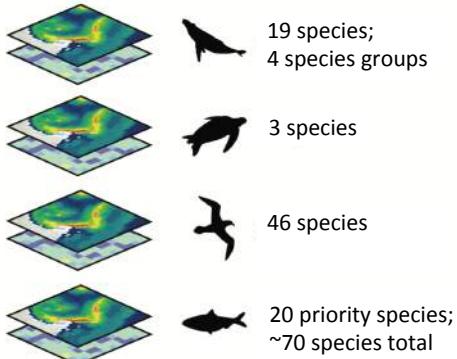
MDAT: Distribution and abundance of Marine mammals, turtles, birds and fish

- Study area is ecologically-focused, not entirely based on political boundaries
- Overlapping study area with Mid-Atlantic acknowledges connectivity

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Natural Resource Components

The Marine-Life Data & Analysis Team (MDAT) is producing habitat density models and other abundance products

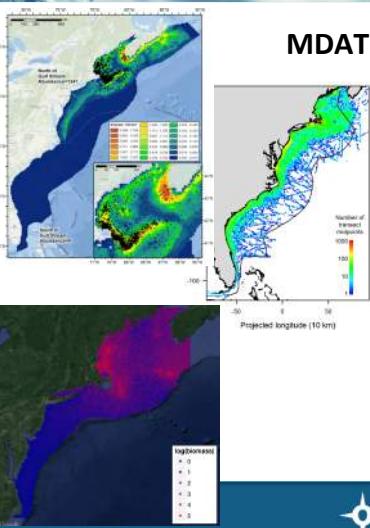


-  19 species;
4 species groups
-  3 species
-  46 species
-  20 priority species;
~70 species total

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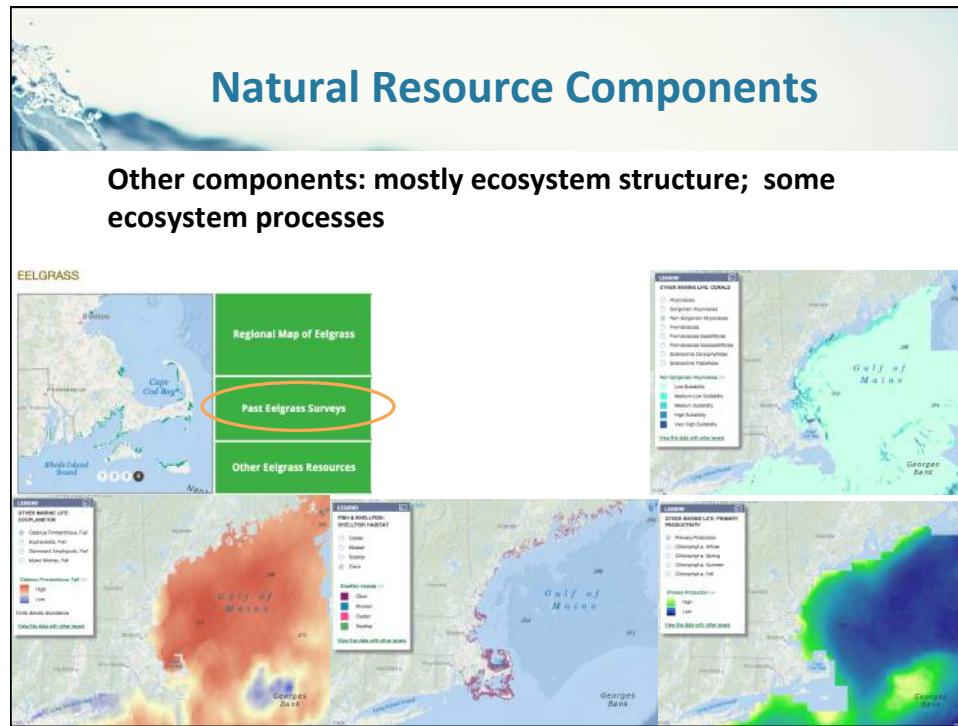
Natural Resource Components

MDAT: Marine mammals, turtles, birds and fish



- Guided by **expert work groups** composed of academic, private and agency scientists, tribes, managers, regulators, etc.
- Spatial models integrate animal observations with environmental and climatological features
- Distribution and abundance (for each species):
 - Multiple temporal **scales**
 - Persistence
 - Probability of occurrence
 - **Uncertainty**

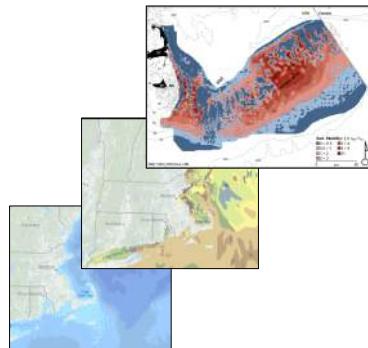
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Natural Resource Components

"Habitat" – Seafloor geology; benthic & pelagic communities

- Regional-scale data layers currently under development (built from efforts at multiple smaller scales)
- Offer the potential for proxies of **ecosystem processes, function and connectivity**
- Have been used as the base layer of:
 - Ecosystem services analyses
 - Spatial modeling of other marine life
 - Impact and cumulative impact analyses
- Guided by **expert work group**



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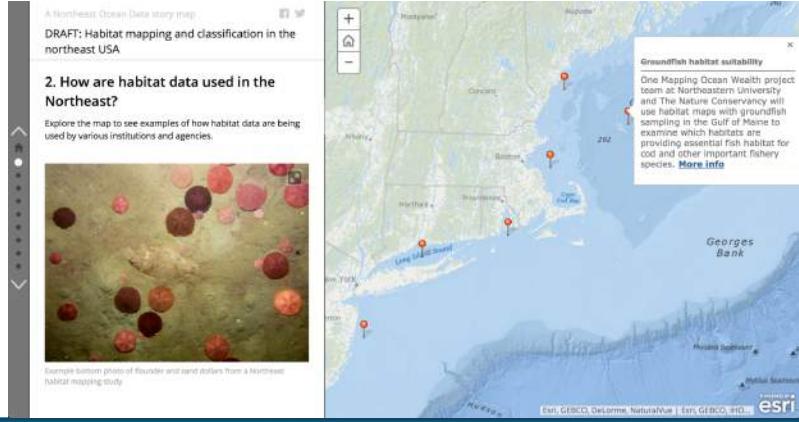
Natural Resource Components

Tools to learn what data we have, show what data we have, and determine what we need

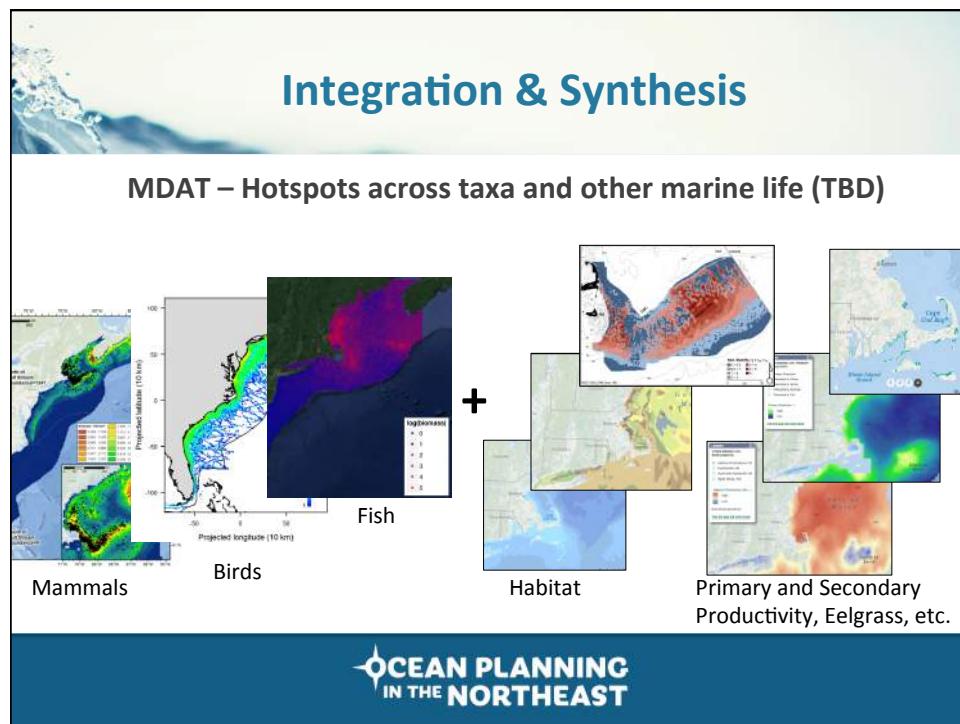
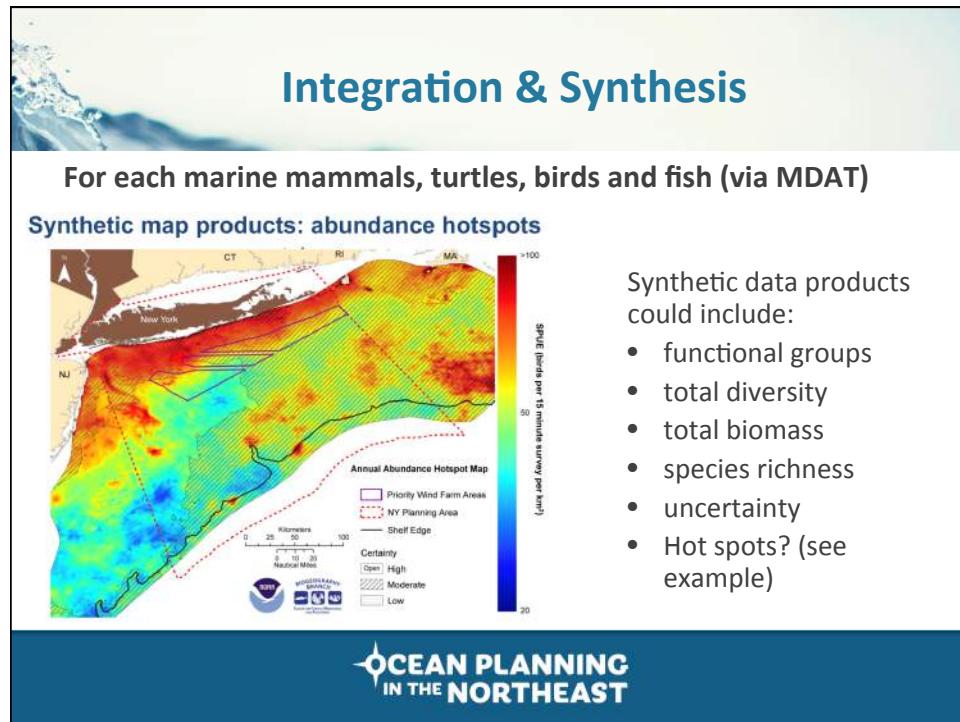
A Northeast Ocean Data story map
DRAFT: Habitat mapping and classification in the northeast USA

2. How are habitat data used in the Northeast?

Explore the map to see examples of how habitat data are being used by various institutions and agencies.



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Integration & Synthesis - Options

Potential for further synthesis (hotspots) across taxa and other marine life?

- Potential composite summary layer(s)
 - Can be separated into constituent parts
 - Can be queried/examined via data portal
 - Transparent weighting/additive scheme
- Challenges:
 - Variability of data inputs, especially as more species and habitats are considered
 - Incorporating ecosystem processes
 - Agreement on methodology
 - RI and MA plans were unable to use composite indices at that scale of decision making

OCEAN PLANNING IN THE NORTHEAST

Integration & Synthesis – Options

Potential Compatibility Approaches (Specific approach TBD by the RPB)

Increasing complexity, uncertainty, & data/research needs →

Ocean planning data products used in relevant regulatory authorities and permitting activities	Spatial data + research about future trends, guidelines, interactions and best practices <img alt="Figure 4: Vessel operation on the cable line. A map showing a cable route with a vessel operating near it. Labels include '800 m ± 3200 m', '50m', '100m', '150m', '200m', '300m', '400m', '500m', '600m', '700m', '800m', '900m', '1000m', '1100m', '1200m', '1300m', '1400m', '1500m', '1600m', '1700m', '1800m', '1900m', '2000m', '2100m', '2200m', '2300m', '2400m', '2500m', '2600m', '2700m', '2800m', '2900m', '3000m', '3100m', '3200m', '3300m', '3400m', '3500m', '3600m', '3700m', '3800m', '3900m', '4000m', '4100m', '4200m', '4300m', '4400m', '4500m', '4600m', '4700m', '4800m', '4900m', '5000m', '5100m', '5200m', '5300m', '5400m', '5500m', '5600m', '5700m', '5800m', '5900m', '6000m', '6100m', '6200m', '6300m', '6400m', '6500m', '6600m', '6700m', '6800m', '6900m', '7000m', '7100m', '7200m', '7300m', '7400m', '7500m', '7600m', '7700m', '7800m', '7900m', '8000m', '8100m', '8200m', '8300m', '8400m', '8500m', '8600m', '8700m', '8800m', '8900m', '9000m', '9100m', '9200m', '9300m', '9400m', '9500m', '9600m', '9700m', '9800m', '9900m', '10000m', '10100m', '10200m', '10300m', '10400m', '10500m', '10600m', 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Integration & Synthesis

Cumulative Impacts

- Several recent efforts in the region
- New effort by Northeast Fisheries Science Center & The Natural Capital Project
 - First Phase – potential to inform first marine plan: vulnerability or risk to marine life building on distribution, abundance, hot spot, and human use mapping
 - Longer term: Develop framework for estimating impacts

Integration & Synthesis

Ecosystem Services

- Millennium Ecosystem Assessment (early 2000s):
 - Supporting (primary production),
 - Provisioning (food and raw materials),
 - Regulating (carbon sequestration),
 - Cultural (ecotourism)
- WHOI – Porter Hoagland
 - Defining ecosystem service categories and connecting them to resource/infrastructure “endpoints” in the northeast

**OCEAN PLANNING
IN THE NORTHEAST**

Integration & Synthesis

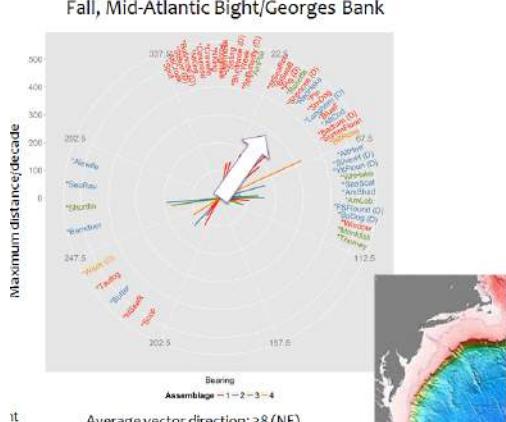
Ecosystem Services

Types of Specific Ecosystem Service Values found in de Groot <i>et al.</i> (2012) General Categories		
MARINE Biodiversity protection Biological control Carbon sequestration Climate regulation Food (fisheries) Nutrient cycling Raw materials [unsp.] Tourism	COASTAL Biological Control Biodiversity Protection Food Hazard Protection Nursery Nutrient Cycling Raw materials Recreation Science/Research Water	WETLANDS Biodiversity protection Carbon sequestration Flood prevention Food (fisheries) Food (plants/vegetables) Fuel wood and charcoal Hunting/fishing Nursery Recreation (general) Waste treatment Water purification

- Developing a **database** comprising Northeast regional studies
- Identifying issues and gaps, some examples:
 - Possible double counting with provisioning services
 - Uncertainty of passive uses (existence value)
 - Variable methods for estimating values

OCEAN PLANNING IN THE NORTHEAST

Climate Change



Fall, Mid-Atlantic Bight/Georges Bank

Maximum distance/decade

Bearing Assemblage ~1-2-3-4

Average vector direction: 38 (NE)

- GMRI: Assessing utility of fisheries dependent data (VTR) to corroborate trends in fisheries independent data (trawl surveys)
- TNC/NEFSC: Goal of making relatively long-term projections of assemblage distributions based on climate scenarios
- NEFSC/Rutgers: Developing OceanAdapt webtool to explore changes in marine fish and invertebrate distributions

OCEAN PLANNING IN THE NORTHEAST

Climate Change/Indicators

Integrated Sentinel Monitoring for the Northeast Region

- NROC/NERACOOS led project. Co-Chairs: Mel Cote (EPA), Brian Thompson (CT), and Jeffrey Runge (UMaine)
- Vision: An adaptive sentinel monitoring program that informs researchers, managers and the public about ecosystem vulnerabilities and supports an integrated, ecosystem-based management framework that promotes human and ecosystem resiliency from climate change and related stressors.
- Goal: To implement an adaptive sentinel monitoring program in the Northeast coastal regional that integrates existing regional monitoring efforts, assets, and resources for the purpose of revealing the status and trends of key indicators at select sites and geographic subregions.

**OCEAN PLANNING
IN THE NORTHEAST**

Indicators

Other Options for Indicators (Discussed at last RPB Meeting)

MEASURING OCEAN HEALTH

The score given to our oceans—out of 100—by the ocean health index

Overall Condition: U.S. Coastal Waters

Condition	Score
Good	24
Fair	75
Poor	10

POLLUTION

Year	2003	2007	2011
Habitat	52	56	53
Oil	55	57	52
Toxic Pollutants	49	47	52

WATERSHED HEALTH

Year	2003	2007	2011
Eutrophication	76	78	79
Climate Change	69	67	71
Watershed Health	60	60	40

LIVING RESOURCES

Year	2003	2007	2011
Fisheries	24	25	25
Shoreline	12	10	5
Marine Mammals	5	1	1

OVERALL SCORE

Year	2003	2007	2011
Overall Score	48	45	45

The Buzzards Bay Coalition

EPA National Coastal Condition

Ecosystem Indicator Partnership



Conclusions

- We spent a lot of time on detailed components due to need for:
 - extensive outreach,
 - increased understanding of data/info limitations,
 - increased management utility, and
 - to support a more robust integration & synthesis (and draft plan)
- Decisions remain about composite ecological products (hot spots), compatibility, and indicators
- We need to identify specific, practical short & long term opportunities to augment

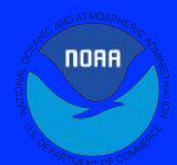


Appendix B2

The ABCs of EBM

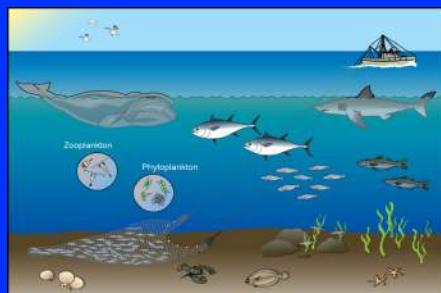
Michael J. Fogarty
Ecosystem Assessment Program
Northeast Fisheries Science Center
Woods Hole, MA

Northeast Regional Planning Body
Portsmouth, NH
April 8, 2015



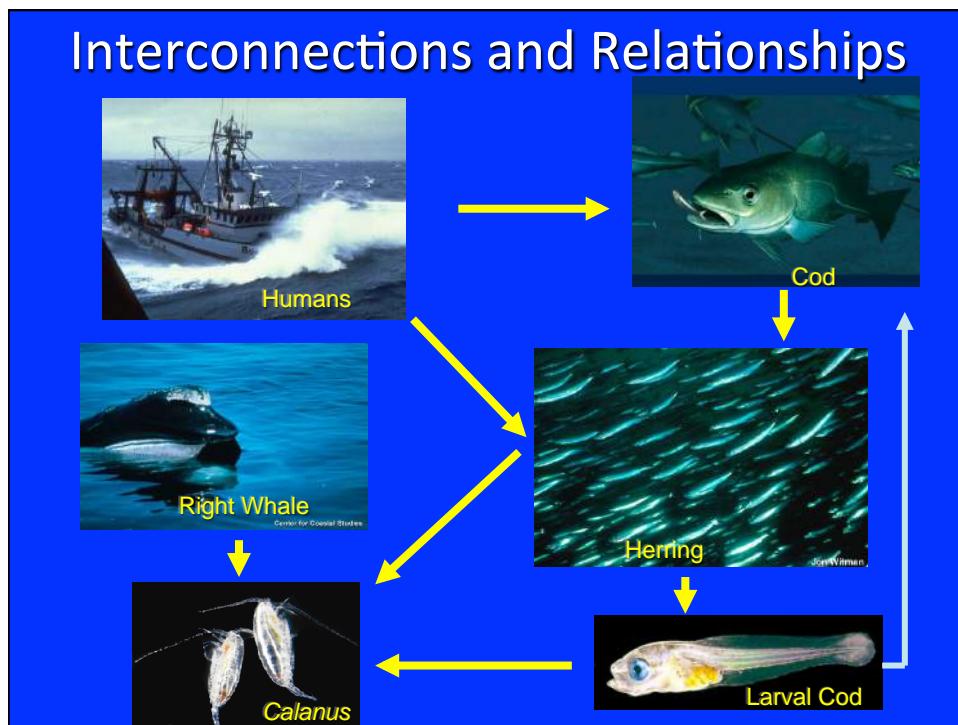
Ecosystem-Based Management

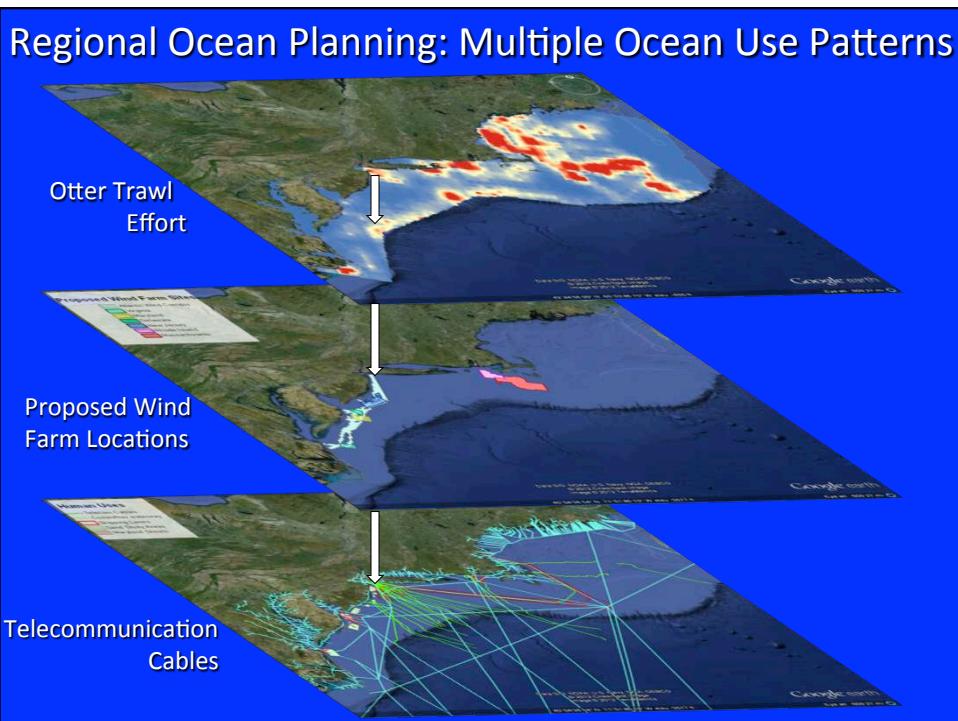
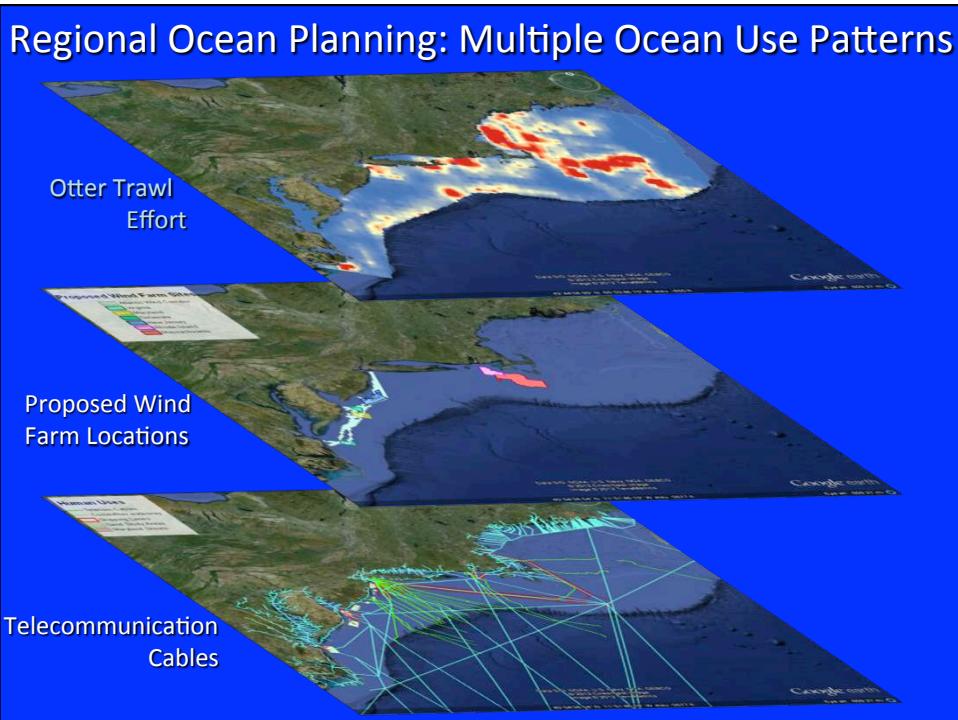
“U.S. ocean and coastal resources should be managed to reflect the *relationships* among all ecosystem

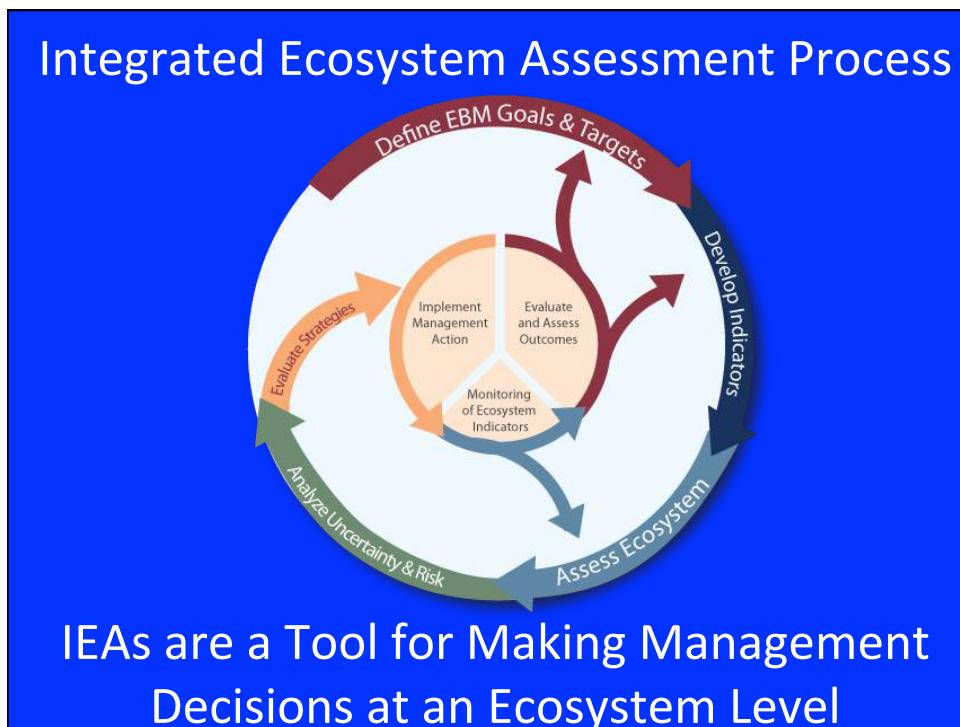
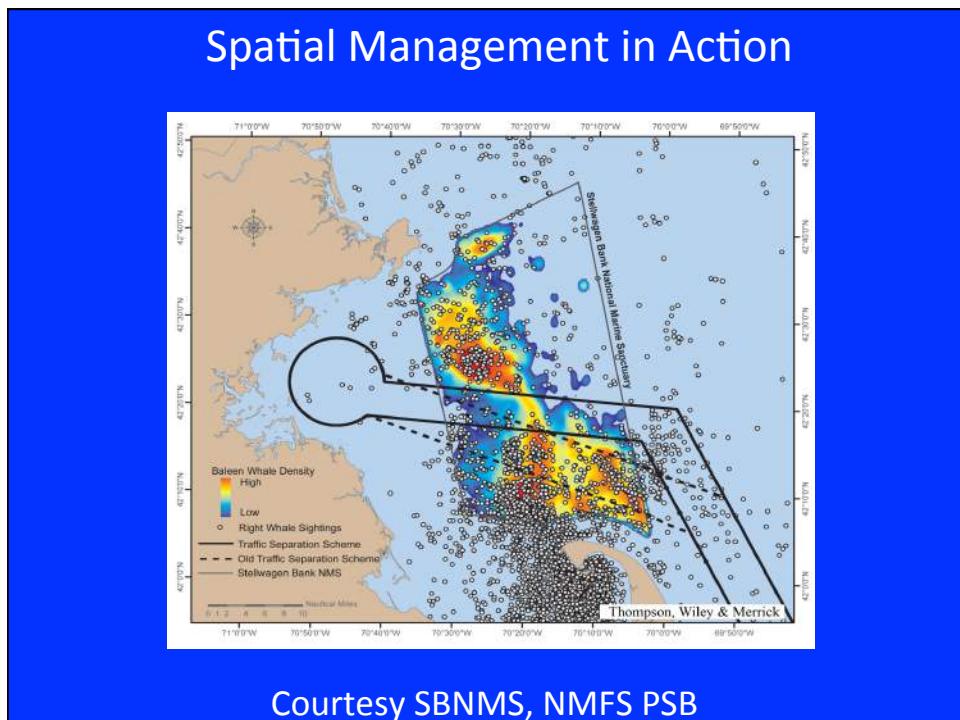


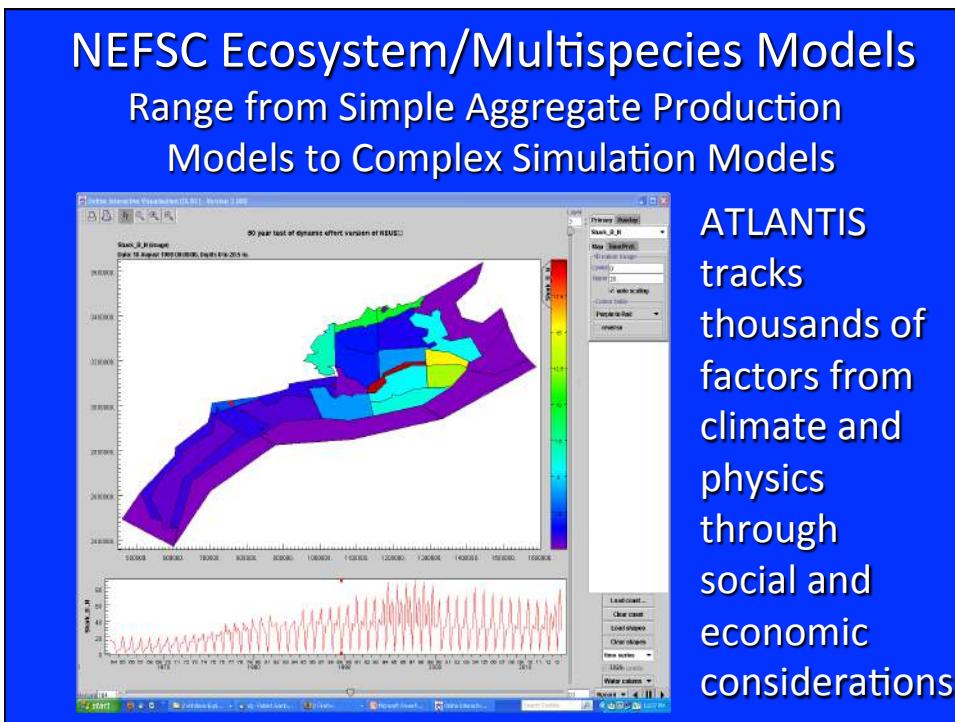
components, including *human* and nonhuman species and the *environments* in which they live. Applying this

principle will require defining relevant *geographic management areas* based on ecosystem, rather than political, boundaries (USCOP 2004)”









Northeast Fisheries Science Center
Ecosystem Considerations

[EcoAp Links](#) [NEFSC Links](#)

Ecology of the Ecosystem
Background information on the structure and function of the Northeast Shelf Ecosystem

Climate Change
Impact of Climate Change on the Ecosystem and Fisheries Species

Ecosystem Status
Assessment of Ecosystem Condition and Socioeconomic Impacts

Current Conditions
Semianual Review of the Physical and Biological Status of Ecosystem

Spatial Analyses
Species Distribution Patterns and Related Consideration

There is now broad agreement that we need to adopt a more holistic approach to marine resource management at both the national and international levels. To accomplish this goal, the foundation of marine Ecosystem-based Management is now being developed and refined. Virtually all specifications of marine EBM share at least three common elements: (1) a commitment to establishing spatial management units based on ecological rather than political boundaries, (2) consideration of the relationships among ecosystem components, the physical environment, and human communities, and (3) the recognition that humans are an integral part of the ecosystem. We need to account for the important goods and services derived from marine ecosystems and the diverse and cumulative impacts of human activities in these systems (Figure 1) to forge a sustainable future.

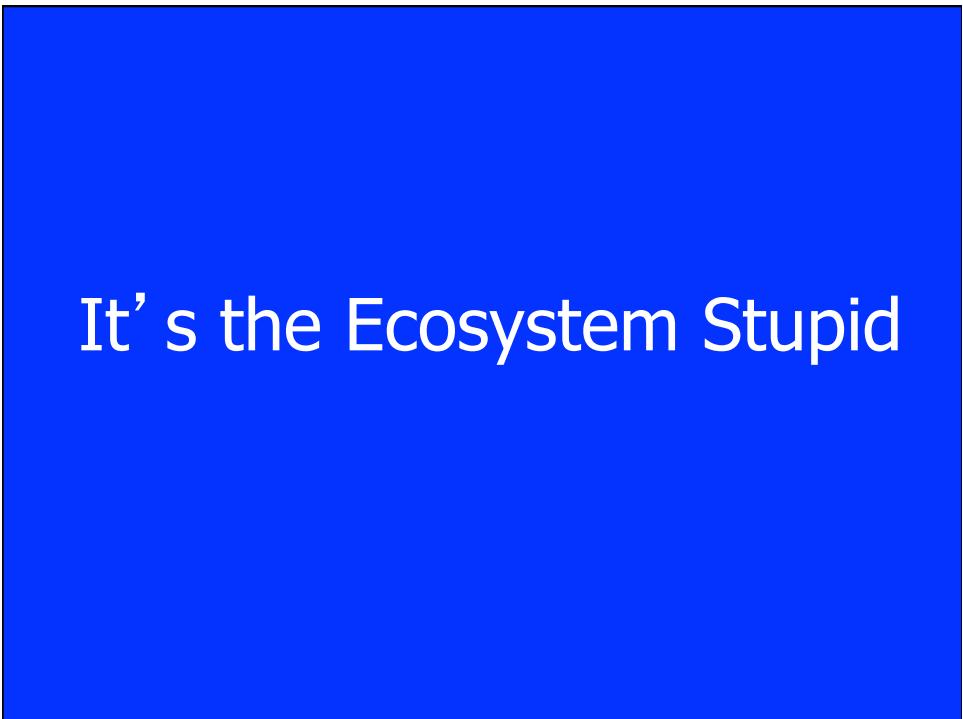
The importance of implementing marine Ecosystem-based Management in the United States has recently been highlighted with the adoption of a new National Ocean Policy, established under



Figure 1. Examples of some important ecosystem services (blue icons), stressors (red), adverse effects (yellow), and issues of special concern (green) that will be considered in Ecosystem-Based Management on the Northeast U.S. Continental Shelf (adapted from image by Barbara Ambrose, National Coastal Data Development Center).



It's the Economy
Stupid



It's the Ecosystem Stupid



#EcoStupid

Appendix B3

