VII. Action Plans

This section presents the sanctuary action plans. It explains what action plans are, what they are intended to do, and how they will be implemented. It presents funding scenarios and timelines, along with performance measures to gauge program effectiveness. It consists of eleven action plans that address priority needs identified in four programmatic areas: capacity building, ecosystem protection, marine mammal protection and maritime heritage management.

Introduction to Action Plans

What are Action Plans?

Action plans are detailed plans for addressing an issue or problem in the Stellwagen Bank National Marine Sanctuary (SBNMS or sanctuary) over the next five years. They are issue-driven not program- or theme-driven. You will not find a marine mammal action plan but you will find, for example, a plan to minimize behavioral disturbance of marine mammals and a plan to reduce entanglement of marine mammals.

Action plans are a collection of strategies sharing common management objectives. The plans provide an organized structure and process for implementing these strategies over the next five years, including a description of the requisite activities and requirements for implementation.

What is their origin?

Action plans arose from grassroots concerns about the sanctuary ecosystem solicited by NOAA during two separate public scoping comment periods in 1998–99 and 2002. In the latter period, NOAA received over 20,000 comments addressing issues such as water quality degradation, no-take areas, enforcement issues and whale entanglements in the sanctuary.

After reviewing the comments, the sanctuary advisory council, a 21-member citizen advisory committee established pursuant to the NMSA, grouped the comments by underlying issues and then prioritized the issues. The advisory council formed eleven working groups to develop draft recommended action plans to address these issues. The working groups were comprised of approximately 12–24 members representing users, citizens, academicians and agency representatives with relevant knowledge of the respective issues. (See Appendix F, Part 2 for a list of working groups and their membership.)

The working groups met over a period of approximately nine months (October 2003–July 2004) and formulated draft action plans for review and consideration by the advisory council. At their October and November 2004 meetings, the advisory council amended and voted to accept all draft action plans, as amended, and prioritized the strategies and activities. This advice was forwarded to the sanctuary superintendent who, with staff, developed final proposed action plans based on the advisory council's recommendations, taking into consideration budgetary and statutory constraints. The final action plans are presented in this document.

How are they prioritized?

The sanctuary has a limited budget and cannot simultaneously address all of the issues it faces. Consequently, it was necessary to prioritize the strategies within each action plan. To accomplish this task, the staff took the following into consideration: (a) advisory council recommendations, (b) statutory requirements, (c) budget constraints, (d) feasibility, and (e) prerequisites for implementation. The strategies were ranked as either High, Medium or Low priority based on staff assessments of these criteria.

Only strategies are prioritized, as activities are a subset of them. The implementation of strategies begins when this final management plan is released, unless activities are currently ongoing. Strategies are prioritized as follows:

- High (H): Strategies that are imperative and either underway or address the sanctuary's immediate needs. Work should be carried out within the first two years.
- Medium (M): Strategies that are important and need to be:
  - Initiated within three years and completed within five years; or
  - Accomplished as the opportunity arises or in conjunction with other work; or
  - Carried out if additional resources are provided (e.g., external research opportunities/funding).
- Low (L): Strategies that should be initiated within five years if additional human and financial resources are available (e.g., a post-doctoral student has extramural funding to address a particular issue).

The status of implementation of strategies and activities is noted in the action plans as either ongoing or planned with the corresponding year for initiation.

How are they evaluated?

Background. Implementation of each action plan will be evaluated through one or more performance measures. See Table 3 at the end of each action plan. These measures will demonstrate progress towards the desired outcomes stated for each action plan. With the performance measures in this management plan, the sanctuary is establishing a baseline of information that will be used by the sanctuary and the Office of National Marine Sanctuaries (ONMS) to evaluate effectiveness over time.

As part of the effort to improve overall resource management, ongoing and routine performance evaluation has become a national priority for the ONMS, and by extension, for the sanctuary. Both site-specific and national programmatic efforts are underway to better gauge the sanctuary's ability to meet its stated objectives and to address the issues identified in this management plan. Beyond these principal purposes, performance evaluation has other benefits, including:

- Highlighting successful (or not so successful) efforts to manage sanctuary resources;
- Keeping the public, Congress, and other interested parties apprised of program effectiveness;
- Helping program administration identify resource gaps;
- Improving accountability;

- Fostering the development of clear, concise and, when appropriate, measurable outcomes; and
- Providing a means to comprehensively evaluate sanctuary management in both the short and long term.

To help ensure these benefits are realized, the ONMS is developing tools for measuring and understanding the effectiveness of existing and new management programs, strategies and activities. Currently, these tools are primarily site specific and are being worked into the regular cycle of management at each of the thirteen sanctuaries through the management plan review process. Evaluation tools are also being applied at the national level to better understand the effectiveness of the entire ONMS. These tools combine results from site-specific evaluations with results from cross-site programs, strategies and activities.

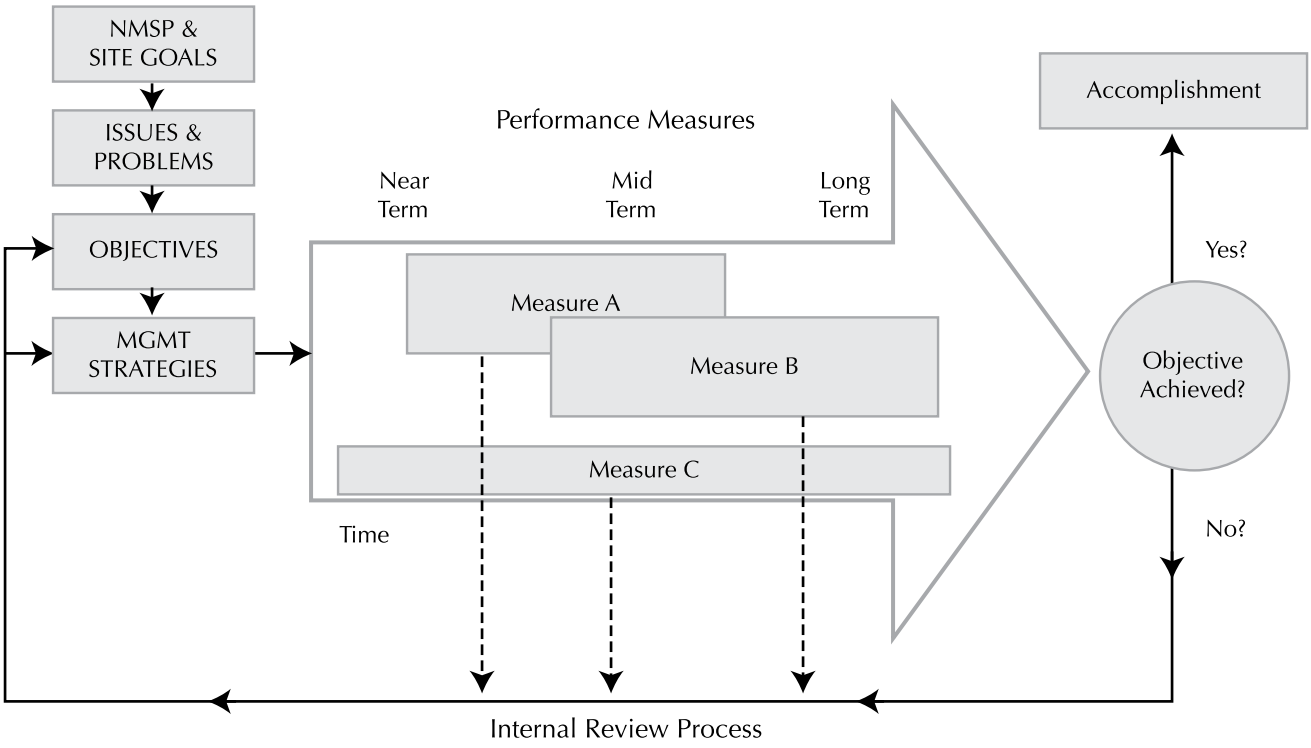
As this process matures, ONMS staff will continue to integrate new and improved methods for evaluating management effectiveness (at both the site-specific and national programmatic levels). Development and application of improved methods and approaches to evaluating and managing program effectiveness is a continuing and adaptive process in the ONMS. Figure 121 depicts the basic idea behind this process, which will be implemented in all sanctuaries undergoing management plan review.

Process. Issues and problems are identified during the scoping process relative to ONMS and site goals. Staff then works to develop objectives relative to proposed management strategies, as identified in each of the action plans. Performance measures are then drafted, which identify the means by which the sanctuary will evaluate its progress towards achievement of the objectives. As represented by the large arrow in Figure 121, measures are developed to provide information on results over time, from the near term (within one year or so) to the long term (over the span of ten years or more). As these measures are monitored over time, data are collected on progress towards the achievement of outcomes and the production of outputs (or products).

Objectives achieved and outputs produced are reported as accomplishments; inabilities to achieve objectives or produce outputs are also reported, but as areas falling short of targets. In these areas, staff will work to identify the issues preventing management from reaching targets (represented in Figure 121 by the arrow running along the bottom of the graphic). This internal review is one of the primary benefits of performance evaluation, as it provides an opportunity for staff to think carefully about why particular strategies are not meeting stated targets and how they can be altered to do so.

In the SBNMS management plan, each action plan contains a series of performance measures. Because it takes time and effort to track the information necessary to report on each performance measure, the sanctuary staff limited the number of performance measures. These measures are meant to be representative, not comprehensive, of all the activities planned by the sanctuary in the management plan. The sanctuary Superintendent is responsible for tracking all the performance measures and reporting the results of the performance evaluation. The task of gathering specific information for various measures is delegated to sanctuary staff.

Figure 121. ONMS performance evaluation logic model.



All performance measures for this management plan are found in a series of eleven tables (one for each action plan). Each table identifies: (1) the action plan's desired outcome, (2) the performance measure(s) to track the achievement of the desired outcome, (3) the specific means of evaluation for the performance measure, and (4) a link to ONMS performance measures.

In some cases, identifying the baseline may be the first order of action so that subsequent reporting is based on concrete information. Periodic reporting on the effectiveness of sanctuary management, as evaluated by the performance measures described in each action plan, will be conducted. There will be opportunities for public comment on the sanctuary's perception of its performance, as well as ideas on how to improve the effectiveness of management, when evaluation is on the agenda at sanctuary advisory council meetings.

How are they organized?

The eleven actions plans in this document are organized into four broad programmatic areas: capacity building, ecosystem protection, marine mammal protection and maritime heritage management. Action plans consist of issue statements, goals, objectives, strategies and activities. The issue statement summarizes why the action plan is necessary. The goal provides the purpose for the plan. Objectives establish requirements for achieving the goal. Strategies and activities are discrete, specific management actions designed to meet the requirements of the objectives. A table at the beginning of each action plan lists the objectives with their associated strategies and respective priority. Two tables at the end of each action plan detail estimated costs for implementing the strategies and provide performance measures related to achieving the desired outcomes.

What are the costs?

Sanctuary staff developed budgets for each action plan by evaluating the resources necessary for their complete implementation. Staff estimated the programmatic cost required to address each strategy, including the number of field-operation days required (boat, air, dive), as well as materials, supplies and travel time needed. Some strategies will be contracted to other parties, in which case the total cost of the contract was included in the budget estimate. Some other strategies would benefit from outside partner collaboration made possible by extracurricular grant support. Such funding is speculative and not considered here.

A summary of the cost estimated for each action plan and subtotal by programmatic area is included in Table 25. Budgets were developed assuming work would begin in the first year, while allowing for resource limitations and the time necessary for program and partner development to fully occur. Cost estimates reflect only programmatic costs and do not include federal labor. Programmatic costs include those that normally would be incurred against the sanctuary's base budget for operations, research and facili-

Table 25. Estimated Annual Costs for Action Plan Implementation.

Action Plan	Estimated Annual Cost (in thousands)*				
	YR 1	YR 2	YR 3	YR 4	YR 5
Capacity Building					
Administrative Capacity and Infrastructure	1151.0	920.7	2954.0	1906.9	1155.5
Interagency Cooperation	0.6	0.6	0.6	0.6	0.6
Public Outreach and Education	104.0	227.0	330	330	330
Compatibility Determination	0	0	0	0	0
Subtotal—Capacity Building	1255.6	1148.3	3284.6	2237.5	1486.1
Ecosystem Protection					
Ecosystem-Based Sanctuary Management	753.0	945.5	1103.5	1066.5	1051.5
Ecosystem Alteration	3.0	12.0	27.0	13.0	13.0
Water Quality	3.0	73.0	83.0	83.0	78.0
Subtotal—Ecosystem Protection	759.0	1030.5	1213.5	1162.5	1142.5
Marine Mammal Protection					
Behavioral Disturbance	647.0	671.0	660.0	575.0	570.0
Vessel Strike	20.0	30.0	60.0	5.0	40.0
Entanglement	65.0	77.0	110.0	95.0	95.0
Subtotal—Marine Mammal Protection	732.0	778.0	830.0	720.0	705.0
Maritime Heritage Management					
Maritime Heritage	291.0	253.0	258.0	252.0	257.0
Subtotal—Maritime Heritage	291.0	253.0	258.0	252.0	257.0
Total Estimated Annual Cost of All Action Plans	**3037.6**	**3209.8**	**5586.1**	**4372.0**	**3590.6**
* Cost estimates reflect only programmatic costs and do not include federal labor costs.					

Figure 122. Total five-year management plan costs by programmatic area.

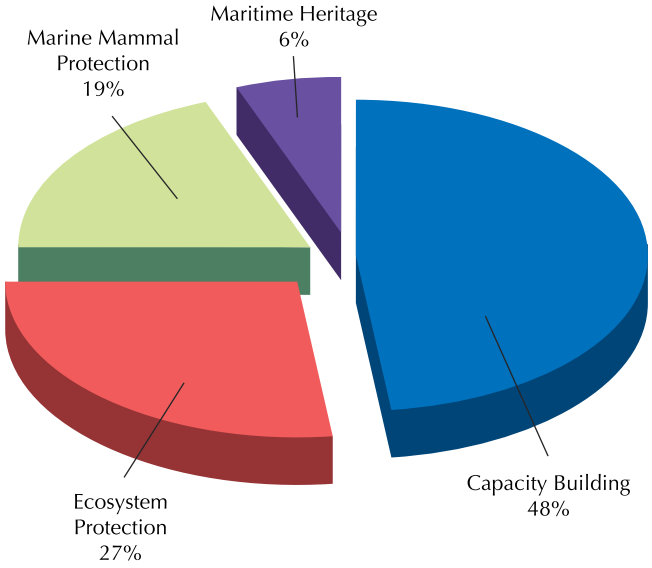
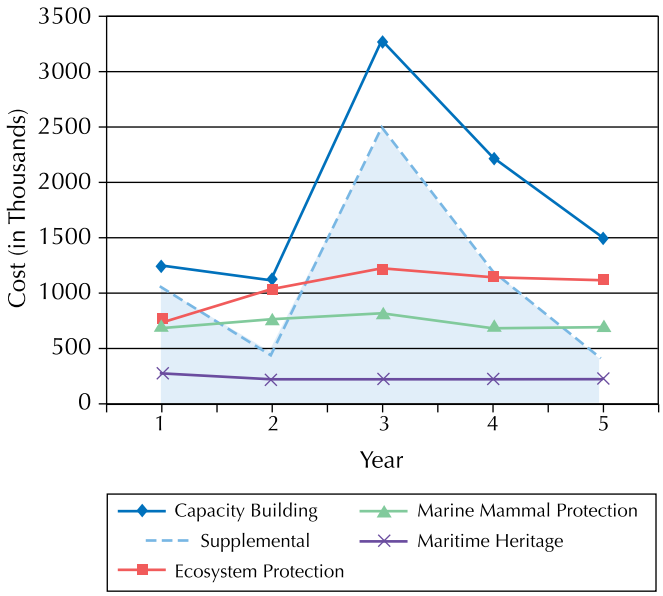


Figure 123. Yearly management plan costs by programmatic area.



ties (ORF) as well as supplemental costs for procurement, acquisition and construction (PAC). Costs are presented in 2009 dollars and the projections are not adjusted for inflation.

Figure 122 shows the management plan costs by programmatic area over five years. Capacity building encompasses significant supplemental budget costs for facilities renovation, new vessel acquisition and exhibit development. Figure 123 presents the yearly costs by programmatic area. The marked increases indicated for Year-3 and Year-4 supplemental spending are largely due to planned renovation of the boat house in order to convert it into a fully functioning marine operations center and acquisition of a new vessel to meet identified enforcement needs.

Figure 124 depicts the five-year costs by action plan. The estimated base budget costs are highest for administrative capacity and infrastructure, ecosystem-based sanctuary management, and marine mammal behavioral disturbance. The relatively high base budget costs estimated for administrative capacity and infrastructure derive from the stated need to hire additional staff. Supplemental budget costs are indicated for administrative capacity and infrastructure (site renovation and vessel acquisition) and public outreach and education (exhibit development) as noted above.

How are they implemented?

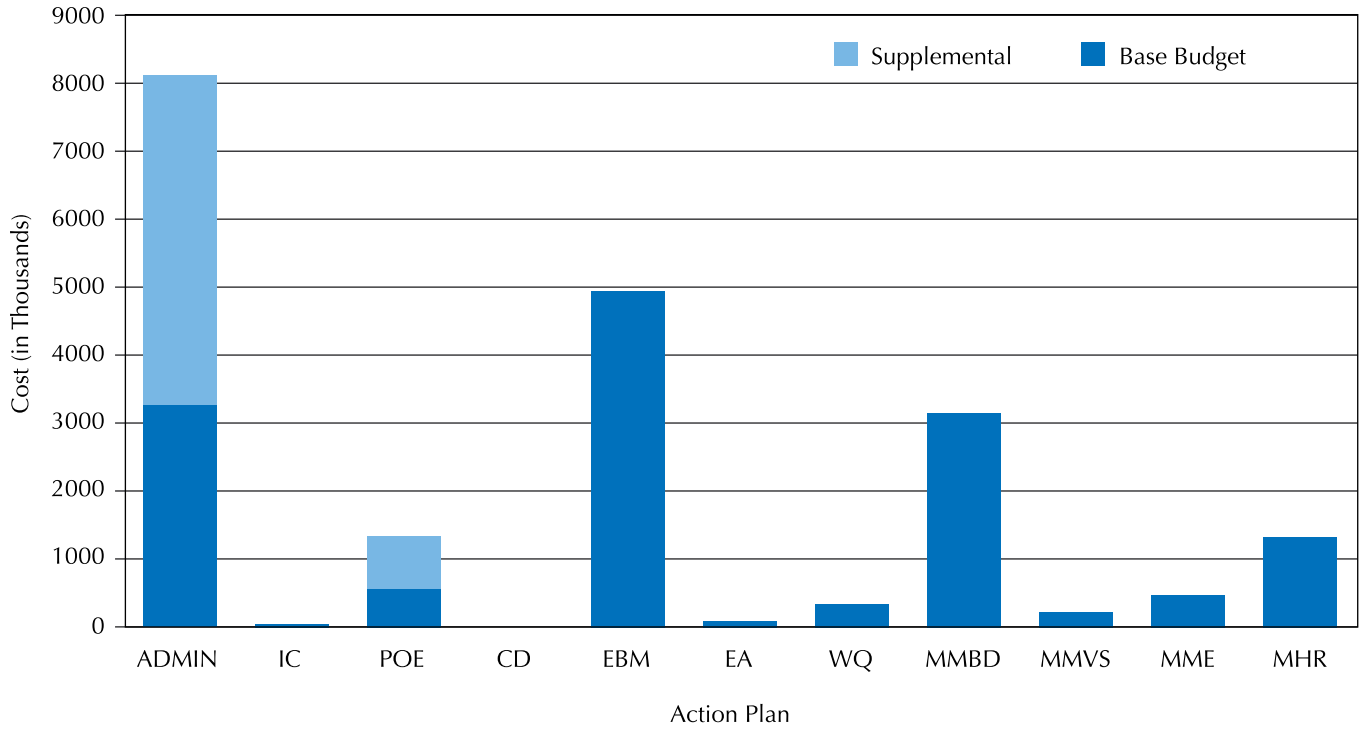
Appendix O provides an outline of how the various strategies in the management plan will be implemented. The implementation of the strategies depends on various factors including:

- priority of strategy implementation based on resources available;
- coordination level necessary with partners for implementation; and
- identification of funding source(s) for strategy implementation.

Certain strategies and activities have been partially or wholly implemented prior to or during the management plan review process. Other strategies are new aspects of the updated management plan or may be initiated pending funding. Full implementation of the management plan exceeds current resources available to the sanctuary therefore requiring some prioritization of the action plan or strategies. As more resources become available, a greater level of implementation will be possible.

Appendix O outlines how much implementation could occur with the existing amount of resources and how increases in resources would affect the amount of implementation possible for each strategy or action plan. Implementation of most of the strategies in this management plan will require some input or coordination from partners, particularly other government agencies, research institutions, and NGOs. The table outlines the level of involvement expected from partners to achieve full implementation of each strategy. Many action plans and strategies are completely dependent on involvement from other agencies or dependent on research conducted by a research institution. Funding for implementation of many of the strategies will require a mix of internal ONMS funds as well as funding from external sources such as grants, the National Marine Sanctuary Foundation or in-kind work from partner agencies.

Figure 124. Total five year management plan costs by action plan.



Explanation of Vision and Mission

Vision:

The Stellwagen Bank National Marine Sanctuary is teeming with a great diversity and abundance of marine life supported by diverse, healthy habitats in clean ocean waters. The ecological integrity of the sanctuary is protected and fully restored for current and future generations. Human uses are diverse and compatible with maintaining natural and cultural resources.

Mission:

To conserve, protect and enhance the biological diversity, ecological integrity and cultural legacy of the sanctuary while facilitating uses that are compatible with the primary goal of resource protection.

The sanctuary vision is a statement of desired outcome. It derives from public opinion and sentiment; it is realized by achieving the mission. The sanctuary mission is a statement of intrinsic purpose. It derives from the language and intent of the National Marine Sanctuaries Act and the specific guidance articulated by the sanctuary's original management plan, designation document and regulations. The mission is achieved by meeting the objectives and successfully implementing the strategies and activities in the action plans.

'Unpacking' the Vision

On July 11, 2005 the Stellwagen Bank National Marine Sanctuary Advisory Council formulated the vision statement given above. While there was consensus among the members on this vision, there was also considerable discussion as to the meaning and intent of various phrases and words in the vision. The following explanation 'unpacks' the vision so the public can better understand what the vision is for the sanctuary. In unpacking the vision, various phrases are highlighted followed by a synopsis of the discussion that occurred among advisory council members on their understanding and intent of the words and phrases.

"Stellwagen Bank National Marine Sanctuary"—Stellwagen Bank National Marine Sanctuary is an ecosystem. It is not just fish or lobsters or whales or sand lance; it is all of these and more. Physical habitat and associated physical-chemical factors such as temperature, salinity, and nutrients interact with biological organisms to create and sustain the ecosystem. The sanctuary is not an isolated ecosystem; it is part of the greater Gulf of Maine ecosystem and Atlantic Ocean. Because the sanctuary is not an isolated ecosystem, marine animals move into and out of the sanctuary throughout the year. Humans are connected to, not apart from, the

sanctuary ecosystem so recreational, historical, cultural and archeological resources, such as shipwrecks, are also part of the sanctuary. The sanctuary is a special place.

"Teeming with a great diversity and abundance of marine life"—A long-time fisherman on Stellwagen Bank said he could remember when you didn't need GPS or a latitude and longitude to know when you were on Stellwagen Bank. "You could see the flocks of seabirds for miles. On cloudless days, it looked like it was raining as the sand eels broke the surface of the water. Nets were full; whales and other marine life were all around you." The vision for the sanctuary is that it will be teeming with marine life—not only great abundance of individuals, but also great diversity of species. In addition, individuals within a species will be distributed over the range of sizes possible for that species: young to old, immature to mature, small to large reflecting a healthy population of organisms.

"supported by diverse, healthy habitats in clean ocean waters"—The ecosystem definition indicates that biological organisms are not divorced from their habitats. The rich diversity of marine life is dependent on, and supported by, diverse habitats (sand, gravel, boulders, mud, outcrops, etc.) that contribute to healthy biological populations. Significant progress has been made to clean up ocean waters through the passage of international marine laws and regulations, the U.S. Clean Water Act, Clean Air Act Amendments, and other legislation, policies and regulations. The sanctuary supports continued efforts to clean up ocean waters. Even though there currently are pollutants, invasive species, and other contaminants entering the marine environment, the vision is to have ocean waters that are clean, with the capacity to assimilate those contaminants and pollutants that continue to be emitted, released or discharged into the marine environment.

"ecological integrity"—The term 'ecological integrity' is part of the 1972 Clean Water Act and part of the National Marine Sanctuaries Act, yet it is neither well defined nor completely understood. Ecological integrity refers to the marine ecosystem and the structure (e.g., species diversity) and functions (e.g., ecological processes) needed to sustain not only the ecosystem, but also desired human uses over time. The Ecosystem-Based Sanctuary Management working group recognized that ecological integrity is an important, but poorly defined, attribute of the sanctuary. It recommended, as part of its action plan, that a separate working group be formed to: (1) define ecological integrity; (2) identify indicators that could be measured and monitored to determine how to protect ecological integrity; and (3) determine to what extent the ecological integrity of the sanctuary is degraded and needs to be restored. This working group has been formed and has developed a working definition of ecological integrity that will help guide the management of the sanctuary.

"protected and fully restored for current and future generations."—As indicated above, both the Clean Water Act and the National Marine Sanctuaries Act require the ecological integrity of the nation's waters be protected. A sanctuary such as SBNMS, by definition, offers protection to those residing there, whether as permanent residents or as transients. Some animals, such as the right whale for example, find sanctuary while in this ecosystem. Management actions focus on protecting ecological integrity and facilitating public and private uses of the resources compatible with protecting ecological integrity.

There is also a general agreement that the ecological condition of Stellwagen Bank has changed from what it was historically and that the ecological integrity of the sanctuary should be restored. The extent to which the sanctuary can be restored is dependent on the state that can be sustained within the greater Gulf of Maine and Atlantic Ocean, given the changes (some irreversible) that have occurred to ecosystems throughout the globe. The restoration, protection, and stewardship of the sanctuary are not just for current generations, but also for future generations. Our posterity should be able to also enjoy the beauty, complexity and resources of the sanctuary.

"Human uses are diverse"—Given its location offshore of a major metropolitan center, the sanctuary is an 'urban' marine sanctuary. The desired uses of the sanctuary range from research and education as a living laboratory to its aesthetic appeal for whale watching to recreational and commercial fishing through exploring undersea shipwrecks. These uses and others are recognized by the sanctuary and those uses compatible with the objectives of the National Marine Sanctuaries Act are considered in developing policy and management practices for the sanctuary.

"and compatible with maintaining natural and cultural resources."—In addition to the natural resources, there are also a variety of cultural, historical and archeological resources such as shipwrecks that are also maintained and sustained as part of the sanctuary.

The desired future state described and explained above is the vision for the sanctuary. The eleven action plans that follow are directed to achieving the sanctuary mission and moving this desired future state of the sanctuary from dream to reality, for current and future generations. The action plans are grouped into four thematic categories based on subject matter and/or functional relatedness: capacity building, ecosystem-based sanctuary management, marine mammal protection and maritime heritage management.

Capacity Building

1. Administrative Capacity and Infrastructure
2. Interagency Cooperation
3. Public Outreach and Education
4. Compatibility Determination

Capacity Building refers to the development of increased organizational capabilities achieved through infrastructure improvements, leveraged partnerships and improved inter-jurisdictional cooperation, as well as expanded volunteerism and supplemental external funding support. It includes the refinement of institutional mechanisms to guide decision-making and adoption of new protocols to better implement policies and procedures.

Four action plans underscore public scoping concerns regarding capacity building for the sanctuary. The Administrative Capacity and Infrastructure (ADMIN) Action Plan frames the organizational structure and programmatic support needed to effectively address marine resources management and enforcement, research and monitoring, and education and outreach regarding the sanctuary. The Interagency Cooperation (IC) Action Plan clarifies the roles, responsibilities and relationships among agencies having overlapping regional jurisdiction with the sanctuary in order to strengthen resource protection and improve interagency communication. The Public Outreach and Education (POE) Action Plan is predicated on developing outreach and education programs that serve to implement management policy, raise public awareness and understanding of sanctuary resources and encourage responsible stewardship. The Compatibility Determination (CD) Action Plan provides a structured approach and protocol for determining whether or not a use is compatible with the sanctuary's primary objective of resource protection.

Administrative Capacity and Infrastructure Action Plan

Issue Statement

The Administrative Capacity and Infrastructure (ADMIN) Action Plan (AP) provides recommendations to strengthen the sanctuary's base-level staffing, facilities infrastructure and program support to effectively meet the basic needs of sanctuary management. Emphasis is placed on the human and physical infrastructure and financial resource requirements of the site.

Overall administrative direction, program policy and budgetary control of the thirteen national marine sanctuaries and the monument reside with the Director of the ONMS. The ONMS provides general oversight and coordination for sanctuary management, sets overarching priorities, and directs general policy and program development. Related responsibilities, while more limited in scope, devolve to the sanctuary superintendents for resource management and day-to-day operations of the respective sites. These responsibilities are expressed in the form of goals, objectives, strategies and activities listed in the site management plans.

Individual sites vary in size, mix of uses and complexity of issues. These differences are reflected in staffing levels, budget allocations and facilities development. As sites update and revise management plans, they identify and evaluate needs for more effective management. Additional resources are required to meet the expanded public demands and expectations raised by the process and to respond to the changing legal mandates and policy (NOAA, 2004).

Recommendations from across the various sections of this management plan reflect the need for new or renewed emphasis in the areas of outreach, education, research, financial resource development, marine operations and law enforcement. Increases in program visibility, scientific capability and enforcement patrol frequency are essential. A basic administrative and infrastructural insufficiency underlies the site's ability to achieve full success in these areas.

Goal

The goal of the ADMIN AP is to ensure that the administrative, operational and financial capacities of the sanctuary are adequate to effectively implement the vision, mission, goals and objectives of the sanctuary.

Objectives

The ADMIN AP has four objectives and associated strategies to build the additional capacity necessary for the sanctuary to meet basic requirements for staffing, infrastructure support and program implementation (Table 26).

- ADMIN.1—Strengthen Site Staffing and Program Support Capabilities
- ADMIN.2—Maintain and Further Develop Site Infrastructure
- ADMIN.3—Develop a SBNMS Volunteer Program That Leverages Program Implementation and Increases Site Visibility

The estimated costs for implementation of the ADMIN AP are indicated in Table 27. The performance measures are listed in Table 28.

Table 26. Objectives, associated strategies, and priorities for ADMIN action plan.

Objective	Strategy	Priority
ADMIN.1 Strengthen Site Staffing and Program Support Capabilities	(1.1) Integrate staff capabilities with program needs.	High
	(1.2) Hire additional staff and streamline organizational structure.	High
	(1.3) Enhance operation of the sanctuary advisory council.	High
ADMIN.2 Maintain and Further Develop Site Infrastructure	(2.1) Maintain and acquire vessels as necessary.	High
	(2.2) Work with ONMS headquarters to develop and implement a SBNMS long-range facilities plan that prioritizes partnering opportunities with the town of Scituate, MA.	High
	(2.3) Maintain a database for sanctuary permitting.	High
	(2.4) Maintain and enhance a SBNMS diving program.	High
	(2.5) Develop an effective enforcement program.	High
ADMIN.3 Develop a SBNMS Volunteer Program that Leverages Sanctuary Programs and Increases Site Visibility	(3.1) Develop SBNMS volunteer program.	High
	(3.2) Maintain and expand SBNMS volunteer diver corps activities.	High
	(3.3) Develop and support international exchange of volunteers between SBNMS and other MPAs.	Low

ADMIN.1 Objective—Strengthen Site Staffing and Program Support Capabilities

Background. The capability of SBNMS to implement the activities presented within the management plan necessitates an increase in staffing over the next five years, either through the addition of permanent positions or through the effective use of contract services. Existing part-time positions should become full-time. A review and if necessary re-description of existing positions is recommended to optimally apply knowledge, skills and abilities of existing staff. Organizational structure should be modified to accommodate added channels of communication and streamline command and control functionality. Staff positions and responsibilities in place at onset of management plan revision (Figure 125) include:

- Sanctuary Superintendent: Responsible for overall administration of SBNMS programs and activities;
- Operations and Program Coordinator: Responsible for marine operations, facilities renovation and maintenance, management plan review, emergency and contingency planning, permitting and dive unit supervision;
- Education Coordinator: Responsible for education, public awareness and exhibit programs, and communications;
- Research Coordinator: Responsible for research and monitoring programs;
- Advisory Council Coordinator: Responsible for sanctuary advisory council meeting planning, needs assessment and coordination (0.75 time);
- Program Support Specialist: Responsible for budgetary control, general procurement and office management;
- Administrative Assistant: Responsible for general office support and assistance (0.5 time);
- Geospatial Technology Coordinator: Responsible for Geographic Information Systems (GIS) management, information technology management, Automatic Information System (AIS) management and technical planning support;
- GIS/WEB Specialist: Responsible for GIS analysis, web site product development and updating, information technology and audio-visual support;

Figure 125. Organizational chart for the Stellwagen Bank sanctuary at onset of Management Plan revision.

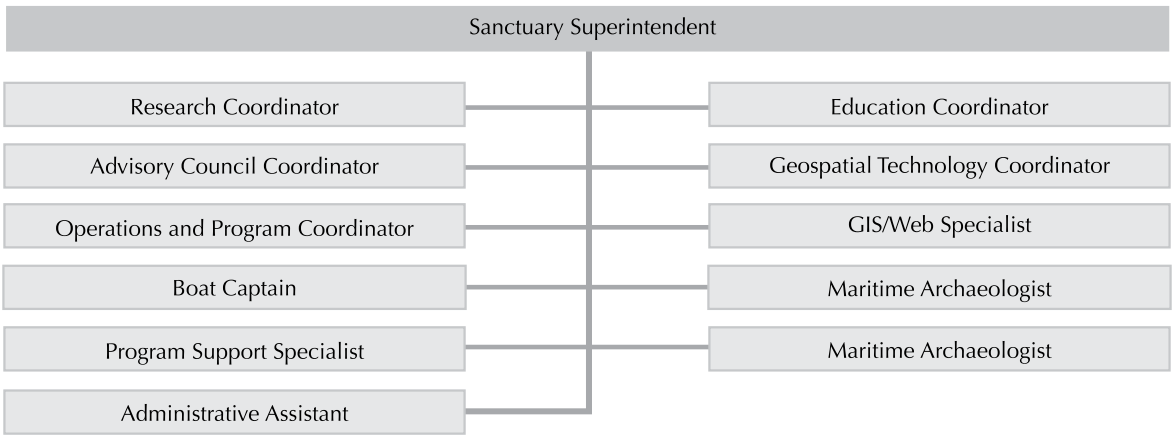
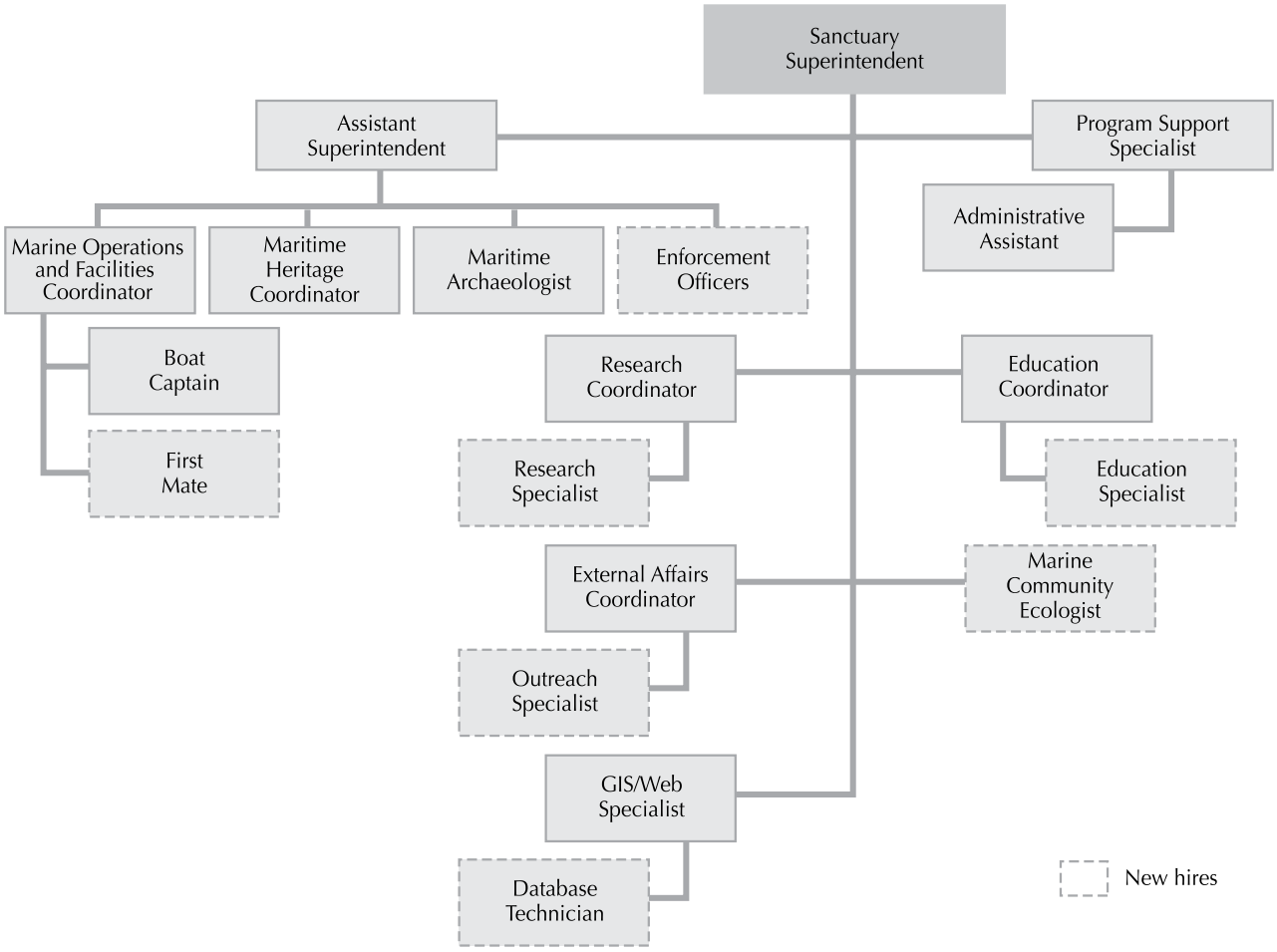


Figure 126. Organizational Chart—proposed.



- Maritime Archaeologists (2): Responsible for assessing, inventorying and documenting historic sanctuary resources (each 0.75 time); and
- Boat Captain: Responsible for maintenance and operation of sanctuary research vessels (RVs) (currently 0.5 time).

Strategies (3) To Strengthen Site Staffing and Program Support Capabilities

(1.1) Integrate staff capabilities with changing program needs. Current staffing (Figure 125) is responsible for existing project execution and day-to-day operations. Knowledge, skills and abilities of employees will be reviewed and evaluated to determine how staff may be tasked more effectively and what additional training may be necessary to improve operational effectiveness.

Priority: High
Status: Ongoing

(1.2) Hire additional staff and streamline organizational structure. Site staffing is inadequate to support new or expanded programs. At a minimum, the positions identified below are required to ensure that the sanctuary meets its priority obligations as identified in the management plan. Staffing structure would be reorganized to accommodate these positions, streamline communication and narrow the span of supervisory control (Figure 126).

Priority: High
Status: Planned, 2010
Activities:

1.2.1 Hire a Marine Community Ecologist. This position is required to effectively implement the objectives, strategies and activities included in the three ecosystem protection action plans: ecosystem-based sanctuary management, ecosystem alteration and water quality. SBNMS currently is unable to provide this specialized expertise to sufficient extent.
Status: Planned, 2010

1.2.2 Hire a Research Specialist. This position is required to effectively implement the objectives, strategies and activities included in the three marine mammal protection action plans: marine mammal behavioral disturbance, marine mammal vessel strike and marine mammal entanglement. Specialized technical expertise is needed to complement and expand existing core competencies.
Status: Completed, 2009

1.2.3 Hire an Outreach Specialist. This position is required to build capacity and effectively implement multiple action plan outreach objectives. Outreach and education functions of the sanctuary need to be separated to achieve strategic focus and apply specialized expertise. This position would raise public awareness and understanding of SBNMS, a stated high priority need.
Status: Planned, 2011

1.2.4 Hire an Education Specialist. This position is required to build capacity, effectively implement multiple action plan education objectives. This position would develop sanctuary programming to support formal and informal public education. As noted, education and outreach functions need to be separated to improve effectiveness and expand capabilities.
Status: Planned, 2011

1.2.5 Hire two Enforcement Officers. Two positions are required to provide regular dedicated enforcement patrols of SBNMS. Formerly, Massachusetts's marine enforcement officers were contracted under a Joint Enforcement Agreement by NOAA Office of Law Enforcement (OLE) to work on an elective overtime basis in the sanctuary. The arrangement proved inadequate in terms of patrol coverage and frequency.
Status: Planned, 2011

1.2.6 Hire a First Mate. The revised NOAA small boat policy requires that a U.S. Coast Guard (USCG) licensed captain and qualified first mate operate the SBNMS research vessel, RV AUK. The first mate position is mandatory by this policy.
Status: Completed

1.2.7 Hire a Database Technician. This position is required to help manage and provide client services for the data information system called for in several action plans, notably ecosystem-based sanctuary management.
Status: Planned, 2012

[Note: In addition to these new positions, organizational capabilities can be improved by re-describing several existing positions and assigning commensurate responsibilities without increasing their position count. These positions are indicated in the revised organizational chart and include: Assistant Superintendent to assist in supervising day-to-day activities and program planning; Marine Operations and Facilities Coordinator to plan and oversee all vessel operations and facilities support; and, External Affairs Coordinator to plan and coordinate all matters dealing with the advisory council, volunteer activities, sister sanctuary relationships and to liaison with 'Friends' organizations. The responsibilities of the prior Geospatial Technology Coordinator position will be subsumed under the GIS/Web Specialist positions as appropriate.]

(1.3) Enhance operation of the sanctuary advisory council. The advisory council serves as a conduit for community input and as a source of advice to the sanctuary superintendent. Adequate support of the advisory council ensures continued public input to management decision-making, while expanding public awareness of the sanctuary and the related marine resource management issues. Public involvement is vitally important to protect and manage sanctuary resources successfully. Additional funding is needed for workshops, working groups and related activities to ensure that the advisory council is provided the means to continue to provide relevant and timely advice on difficult and often controversial issues.
Priority: High
Status: Ongoing

ADMIN.2 Objective—Maintain and Further Develop Site Infrastructure

Background. The management and administration of sanctuary programs relies on adequate and fully functioning facilities, vessels and vehicles for support.

Facilities. The sanctuary's facilities are located on First Cliff in Scituate, Massachusetts approximately one hour south of Boston. They are comprised of an administrative office, meeting annex, boathouse and pier. The administrative offices and conference room occupy a 6,800-sq-ft, three-story building in the former Scituate USCG Station. An adjacent 2,200-sq-ft, two-story annex houses a meeting facility and office space for visiting scientists, post-doctoral students and graduate interns. Both buildings are climate-controlled using geothermal technology. Major renovation of the Administrative Building and the Annex was completed in 2004.

A 3,565-sq-ft two-story boathouse is built on pilings over the water and includes a 300-ft pier, with two floating docks attached. The docks have the capacity to berth one 50-ft vessel and three smaller boats simultaneously. The pier can berth an additional vessel up to 70 ft on an interim basis. Further, the sanctuary has two moorings adjacent to the pier. Renovations are planned for both the boathouse and pier to better utilize the existing capacity and to more fully accommodate other research vessels working in collaboration with the sanctuary.

Vessels and Vehicles. SBNMS currently operates a 50-ft research catamaran, the RV *Auk*, which was constructed and put into service in summer 2006, and a 16-ft RHIB inflatable boat for RV *Auk* mission support that was acquired in 2009. These platforms are the principal means for accessing the sanctuary and supporting research, monitoring and education activities. The sanctuary also operates three vehicles for passenger use, equipment transport and site maintenance including snow plowing. [Note: The RV *Sentinel* (41-ft utility boat) was surplused in 2006 and the RV *Gannet* (28-ft power boat) was surplused in 2009 due to the extensive major repairs both boats needed. Plans are for this class of vessel to be replaced by one suited for and dedicated to enforcement activities.]

Strategies (5) To Maintain and Further Develop Site Infrastructure

(2.1) Maintain and acquire vessels as necessary. Maintenance of existing vessels is required to ensure they are in safe, operating condition and meeting all warranty requirements. New vessels will have to be acquired over time to enhance sanctuary management capacity or replace aging vessels.

Priority: High
Status: Ongoing

(2.2) Work with ONMS headquarters to develop and implement a SBNMS long-range facilities plan that prioritizes partnering opportunities with the town of Scituate. In 2001, the ONMS released a long-range facilities report that prioritized renovation of the SBNMS administrative building and adjacent garage during 2003-2004. That report was updated and superseded by the 2009 final draft National Facilities Master Plan (for the Office of National Marine Sanctuaries). As directed by that plan, the marine operations center (MOC) is the next phase in renovation of the SBNMS facility. A draft Feasibility Study - NOAA Boathouse Renovation Plan (2009) was prepared to guide that phase. The MOC will be comprised of the following components: boathouse, pier and docks, boat moorings and parking lot. The MOC will be designed to accommodate:

- Vessel maintenance and repair
- Year-round vessel docking/mooring
- Dive locker
- Restroom facilities and shower
- Wet and dry labs
- Bunk accommodations for visiting scientists and students
- Equipment storage for Massachusetts Environmental Police
- Meeting space
- Parking space for vehicles, and
- Boat trailer storage

Associated requirements and possible solutions are described in the feasibility study. In 2009, two vacant lots adjacent to the boathouse were purchased by the US COE on behalf of NOAA as part of the MOC renovation and to provide overflow parking for the meeting annex. [Note: Strategy POE 1.3 refers to a related but separate exhibits planning process.]

Priority: High
Status: Planned, 2010

(2.3) Maintain a database for sanctuary permitting. The sanctuary issues permits for research, education and special-use activities in accordance with the NMSA. Maintenance of the ONMS's online permitting database (Online Sanctuary Permitting, Reporting, and Evaluation System: OSPREY) will facilitate the efficient and timely issuance of permits on an as-needed basis.

Priority: High
Status: Ongoing

(2.4) Meet the equipment needs of an expanded SBNMS diving program. The sanctuary operates an active diving program to inventory and document shipwrecks, conduct scientific research, characterize SBNMS resources and conduct emergency rescues as necessary. The equipment needs of the diving program will grow in support of expanded field programs, deployment of the new research vessel and renovation of the boathouse as a marine operations center (see Strategy ADMIN 4.2).

Priority: High
Status: Ongoing

(2.5) Develop an effective enforcement program. Enforcement of sanctuary laws and regulations is critically needed. The mission of sanctuary enforcement is to ensure compliance with the NMSA (16 USC §1431 et seq.) and the regulations of the sanctuary (15 CFR Part 922 Subpart N). The sanctuary's enforcement goal is to prevent harm to its living marine and maritime historical resources. The preferred approach emphasizes community-oriented policing and problem solving. Enforcement of sanctuary regulations should be supported as an ongoing activity through the Joint Enforcement Agreement (JEA) between NOAA's Office of Law Enforcement (OLE) and the sanctuary. The sanctuary needs to update its enforcement plan utilizing a database of use and user patterns to assess enforcement needs and help target enforcement actions.

Priority: High
Status: Ongoing
Activities:

2.5.1 Hire two full-time patrol officers dedicated to patrolling the sanctuary year-round. Patrol officers could be either NOAA OLE or Massachusetts Environmental Police (MEP) employees under hire to the sanctuary (see Strategy ADMN 1.2).
Status: Planned, 2011

2.5.2 Revise the cooperative enforcement plan between the SBNMS and NOAA OLE. The current plan allows for the cross-deputization of state MEP officers in order to patrol sanctuary waters and enforce sanctuary and other relevant federal laws and regulations. The existing cooperative enforcement plan needs to be updated to ensure that enforcement needs are being met and coordination of all available enforcement assets is occurring. SBNMS enforcement needs include:

- Routine patrols of the sanctuary waters;
- Detection, investigation and prosecution of violations;
- Twenty-four hour response capability (sea or air);
- Deputization training and updates;
- Inter/intra-agency coordination of enforcement assets;
- Administrative, legal and technical support; and

- Enforcement outreach and interpretive efforts to affected commercial and recreational users.

Status: Planned, 2010

2.5.3 Acquire and maintain a dedicated, year-round enforcement boat to conduct routine sanctuary patrols. There is high demand by the public for increased sanctuary patrols and interpretive enforcement activities.
Status: Planned, 2011

2.5.4 Expand patrol-related outreach and interpretive enforcement efforts. There are many reasons for high-visibility presence of an enforcement vessel within SBNMS including permit oversight, compliance monitoring with whale watch guidelines particularly during high use periods, and whale disentanglement and stand-by. As importantly, it is necessary to conduct interpretive enforcement and education. During patrols, officers can provide sanctuary information directly to users, and educational materials can be distributed selectively as appropriate. Related communications can be increased with constituents and user groups at marinas and community events.
Status: Ongoing

ADMIN.3 Objective—Develop a SBNMS Volunteer Program That Leverages Program Implementation and Increases Site Visibility

Background. The sanctuary lacks a structured volunteer program to plan, implement and properly oversee volunteer activities. Currently, SBNMS volunteers are few in number, although interest in volunteering is high; they support limited activities and functions on an as-needed basis. However, there are many opportunities where volunteers could contribute meaningfully if provided guidance, training and support. Such opportunities include, but are not limited to, general education and outreach in schools and communities, staff support, and research and scientific monitoring.

Strategies (3) To Develop a SBNMS Volunteer Program that Leverages Sanctuary Programs and Increases Site Visibility

(3.1) Develop a SBNMS volunteer program. Many functions of the SBNMS can be enhanced through establishment of a volunteer program that provides essential support for sanctuary projects and builds community support and commitment to the goals and strategies of the sanctuary. The program would focus on team-building, organized communication, project oversight and general support, including partnerships with other organizations.

Priority: High
Status: Planned, 2010
Activities:

3.1.1 Develop a volunteer operations plan. The sanctuary should identify and prioritize its volunteer program objectives. Programmatic areas may include education and outreach, science and monitoring, historic maritime resources and boater/diver corps. As part of this effort, developing criteria for a sanctuary docent program is essential. The docent program will provide a corps of knowledgeable volunteers, who will represent the sanctuary, as appropriate, at public events and other outreach functions.
Status: Completed, 2009

Table 27. Estimated costs for ADMIN action plan.

Strategy	Estimated Cost ($000)*					Total Estimated 5 Year Cost
	YR 1	YR 2	YR 3	YR 4	YR 5	
(1.1) Integrate staff capabilities with changing program needs.	0	0	0	0	0	0.0
(1.2) Hire additional staff and streamline organizational structure.	117.0	563.0	619.0	769.0	847.0	2915.0
(1.3) Enhance operation of the sanctuary advisory council.	10.0	10.0	15.0	15.0	15.0	65.0
(2.1) Maintain and acquire vessels as necessary.	150.0	150.0	150.0	1000.0	200.0	1650.0
(2.2) Work with ONMS to develop and implement a long-range facilities plan that prioritizes opportunities with the town of Scituate.	870.0	190.0	2100.0	30.0	0.0	3190.0
(2.3) Maintain a database for sanctuary permitting.	0.0	0.0	0.0	0.0	0.0	0.0
(2.4) Meet the equipment needs of an expanded SBNMS diving program.	1.0	3.0	3.0	4.0	4.0	15.0
(2.5) Develop an effective enforcement program.	0.0	0.0	60.0	80.0	80.0	220.0
(3.1) Develop SBNMS volunteer program.	2.0	2.0	3.0	4.0	5.0	16.0
(3.2) Maintain and expand the volunteer dive corps activities.	0.0	1.0	1.0	2.0	2.0	6.0
(3.3) Develop and support international exchange of volunteers between SBNMS and other MPAs.	1.0	2.0	3.0	3.0	3.0	12.0
Total Estimated Annual Cost	**1151.0**	**921.0**	**2954.0**	**1907.0**	**1156.0**	**8089.0**

*Cost estimates exclude federal labor costs.

Table 28. Performance measures for ADMIN action plan.

Desired Outcome(s) For This Action Plan			
Organizational and financial capacity is strengthened to implement the vision, mission, goals and objectives of the SBNMS.			
Performance Measures	**Means of Evaluation**	**Baseline**	**ONMS Measure**
By 2013, SBNMS will have sufficient capacity and adequate staffing to implement all priority strategies in the management plan.	SBNMS will annually report staffing levels and priority outcomes to the advisory council and ONMS.	Number of staff (combined federal and contract positions): 11	Build infrastructure
By 2013, enforcement patrols will be conducted in the sanctuary twice weekly from April to November.	SBNMS will track the number of hours logged in the sanctuary by enforcement officers.	Number of Patrol-hours conducted in the sanctuary: 0	Living marine resources, habitat, water quality
By 2013, creation of a Volunteer Program will increase the number of volunteer-hours contributed to sanctuary programs by 25%.	SBNMS will track the number of volunteers and respective hours.	Number of Hours contributed by Volunteer Program: 0	Volunteer
By 2013, the SAC will have formed and completed four working groups as specified in six action plans.	SBNMS will track the number of working group meetings held and action plans produced.	Number of meetings completed by Zoning WG: 2	Raise awareness

3.1.2 Develop a student internship program. The sanctuary could benefit from short-term specialized assistance, which leverages staff resources and provides education and training for high school and college level students pursuing careers in marine science.
Status: Planned, 2010

3.1.3 Develop a post-doctoral support program. The sanctuary needs highly specialized technical and scientific capability applied to short-term specific needs of programmatic areas. The sanctuary should partner with research and academic institutions to share costs for post-doctoral fellowship positions.
Status: Ongoing

(3.2) Maintain and expand SBNMS volunteer diver corps activities. Emphasis on recruitment and training of new diver corps volunteers will provide much-needed support for sanctuary historic maritime resource projects, research and monitoring activities and education and outreach programs. In particular, the diver corps could assist with historic shipwreck inventory and photo-documentation of biological communities. These activities have the potential to advance general understanding and greatly raise sanctuary visibility (see Strategy ADMIN 2.4).
Priority: High
Status: Ongoing

(3.3) Develop and support international exchange of volunteers between SBNMS and other MPAs. SBNMS in New England and Silver Bank Humpback Whale Sanctuary in the Dominican Republic (DR) share the same population of humpback whales. The humpback whales reproduce and calf in the DR and feed and nurse their young in SBNMS. A 'sister-sanctuary' volunteer exchange program between SBNMS and Silver Bank Humpback Whale Sanctuary will support education and research exchanges between the two countries. The programmatic exchange would promote visibility of cross-boundary sanctuary resources and could lead to increased support for joint education and outreach projects.
Priority: Low
Status: Ongoing.

Interagency Cooperation Action Plan

Issue Statement

The Interagency Cooperation (IC) Action Plan (AP) makes recommendations to clarify agency responsibilities that overlap those of SBNMS and to improve interagency coordination and effectiveness. The AP provides the framework to clarify the roles, responsibilities and relationships between agencies associated with SBNMS in order to strengthen resource protection within the sanctuary and improve interagency communication.

Goal

The goal of the IC AP is to foster and facilitate cooperation and coordination of planning and management actions in support of partnering state and federal agency missions, when consistent with the NMSA and bearing on sanctuary resources. SBNMS will communicate its purpose and findings to these agencies and seek opportunities to share information, resources and expertise with them.

Objectives

The IC AP has two objectives and associated strategies to foster interagency cooperation (Table 29).

- IC.1—Facilitate Cooperation and Coordination Between Agencies
- IC.2—Establish Mechanisms for Improved Information Sharing Between Agencies

The estimated costs for implementation of the IC AP are indicated in Table 30. The performance measures are listed in Table 31.

Table 29. Objectives, associated strategies, and priorities for IC action plan.

Objective	Strategy	Priority
IC.1 Facilitate Cooperation and Coordination Between Agencies	(1.1) Re-establish discussions regarding a Memorandum of Understanding (MOU) among SBNMS, NOAA Fisheries Service NERO and the NEFMC to facilitate cooperation and coordination.	High
	(1.2) Coordinate proposed activities with NOAA Fisheries Service NERO.	High
	(1.3) Facilitate cooperative research and outreach between SBNMS and NOAA Fisheries Service NEFSC.	High
	(1.4) Evaluate the Memorandum of Agreement (MOA) between the U.S. Army Corps of Engineers (USACE) and NOAA Fisheries Service for commenting on proposed activities occurring at the Massachusetts Bay Disposal Site (MBDS).	High
IC.2 Establish Mechanisms for Improved Information Sharing Between Agencies	(2.1) Provide information via the web on the responsibilities and activities of multiple agencies with roles pertinent to the SBNMS.	Medium
	(2.2) Provide regular updates to the USCG Area Contingency Plans.	Medium
	(2.3) Establish a mechanism for informal consultation with the EPA, NEFMC, MWRA, MADEP and MACZM Office on Water Quality Issues.	Medium
	(2.4) Update and continue to implement the sanctuary Cooperative Enforcement Program	High
	(2.5) Support continued meetings of the advisory council's Interagency Cooperation Working Group.	Low
	(2.6) Participate in the GoM Council and other regional initiatives.	Medium
	(2.7) Participate on relevant advisory panels of the NEFMC.	High
	(2.8) Depict sanctuary boundaries.	High

IC.1 Objective—Facilitate Cooperation and Coordination between Agencies

Background. SBNMS needs to foster and facilitate inter- and intra-agency coordination in order to better protect sanctuary resources as mandated by the NMSA. Numerous agencies operate pursuant to federal statutes (e.g., Marine Mammal Protection Act, Endangered Species Act, etc.) that have jurisdiction that spatially overlaps sanctuary boundaries. These Acts often complement the intent and purpose of the National Marine Sanctuaries Act.

The following are examples of agency activities pertinent to sanctuary management. NOAA National Marine Fisheries Service (Fisheries) is responsible for managing sustainable fisheries. The U.S. Environmental Protection Agency (EPA) is responsible for managing water resource quality. The Army Corps of Engineers is responsible for managing dredging and dumping activities. The Minerals Management Service is responsible for managing offshore wind, wave and solar energy projects except in sanctuaries. The United States Coast Guard (USCG) is responsible for enforcing federal fisheries regulations, among others, and ensuring safety at sea. These responsibilities are stated in their simplest terms but indicate why coordination with the sanctuary is essential.

While SBNMS has been coordinating with these agencies since sanctuary designation, more formal mechanisms for coordination need to be developed in many cases, and more frequent communication is appropriate. In all cases, it is expected that agencies that have overlapping management authority with SBNMS will cooperate and collaborate to protect sanctuary resources while achieving their respective missions.

Strategies (4) To Establish Cooperation and Coordination between Agencies

(1.1) Initiate discussions regarding a Memorandum of Understanding (MOU) between SBNMS and NOAA Fisheries Service to facilitate cooperation and coordination. The MOU would: (1) clarify agency roles and responsibilities for protecting biodiversity and biological communities, threatened and endangered species, and habitats within the SBNMS; (2) facilitate the exchange of information, advice and technical assistance between SBNMS and NOAA Fisheries Service Northeast Regional Office (NERO); (3) coordinate agency efforts concerning research, ecosystem protection and public outreach when pertinent to the management and protection of sanctuary resources; and (4) clarify responsibilities under Sections 304(a)(5) and 304(d) of the NMSA.

Priority: High
Status: Planned, 2010
Activities:

1.1.1 Meet with NOAA Fisheries Service NERO staff to scope details of an MOU that facilitates cooperation and coordination with SBNMS.
Status: Planned, 2010

1.1.2 Work with NOAA Fisheries Service NERO to execute final MOU.
Status: Planned, 2011

(1.2) Coordinate proposed activities with NOAA Fisheries Service NERO. This effort will clarify the roles and responsibilities of the two agencies regarding consultation, permit-

ting and outreach. The principal purpose is to improve communication by clarifying under what circumstances consultation between the two agencies is warranted.

Priority: High
Status: Planned, 2011
Activities:

1.2.1 Meet with NOAA Fisheries Service NERO staff to scope the details of a protocol.
Status: Planned, 2010

1.2.2 Draft and finalize the protocol with NOAA Fisheries Service NERO.
Status: Planned, 2011

(1.3) Facilitate cooperative research and outreach between SBNMS and NOAA Fisheries Service Northeast Fisheries Science Center (NEFSC). The purpose of this protocol is to facilitate cooperative research and outreach and leverage funding and technical expertise by both agencies.

Priority: High
Status: Planned, 2011
Activities:

1.3.1 Meet with NOAA Fisheries Service NEFSC staff to scope the details of a protocol.
Status: Planned, 2010

1.3.2 Draft and finalize the protocol with NOAA Fisheries Service NEFSC.
Status: Planned, 2011

(1.4) Evaluate the Memorandum of Agreement (MOA) between the U.S. Army Corps of Engineers (USACE) and NOAA Fisheries Service for commenting on proposed activities occurring at the Massachusetts Bay Disposal Site (MBDS). The U.S. Army Corps of Engineers (USACE) 1992 interagency MOA includes the requirement to coordinate disposal projects proposed for MBDS with NOAA Fisheries. This MOA was executed prior to the 1992 amendments of the NMSA requiring consultation by a federal agency conducting activities that may affect sanctuary resources. The effectiveness of the MOA in ensuring that SBNMS resources are not injured needs to be evaluated and, because of the concerns stated below, there needs to be a mechanism for the sanctuary to be notified about dumping activities at the MBDS. Due to the number of projects using the MBDS, thresholds for coordination between NERO and SBNMS should be considered.

The MBDS is located directly adjacent to the western boundary of the SBNMS. The disposal site receives approximately one to two hundred thousand cubic yards of clean dredge material per year and is the USACE's most active dumpsite in New England. The sanctuary has two concerns over this activity: (1) the risk of disposed dredged material entering and injuring sanctuary resources, and (2) the disturbance of historic radioactive and toxic waste in the inactive foul area that could enter and injure sanctuary resources. Under the existing MOA, the USACE is required to notify the NOAA Fisheries Service NERO of when dredged material is going to be deposited at the disposal site but not the SBNMS. However, the consultation provision of the NMSA still applies even if this MOA is not updated and consultation by USACE with SBNMS is required.

Priority: High
Status: Planned, 2010
Activities:

1.4.1 Ensure that SBNMS is placed on the USACE public notice electronic mailing list and develop an internal protocol for following up on these notices.
Status: Planned, 2010

1.4.2 Develop a NOAA intra-agency protocol for consultation by NOAA Fisheries Service with SBNMS for dredged material disposal activities at the MBDS that may affect sanctuary resources.
Status: Planned, 2011

1.4.3 Work with the USACE to consider requiring Automated Identification System transponders on all dredge barges to facilitate tracking of their routes to ensure they do not inadvertently dump materials in the SBNMS.
Status: Completed, 2009

IC.2 Objective—Establish Mechanisms for Improved Information Sharing between Agencies

Background. One of the policies of the NMSA is to foster comprehensive and coordinated conservation and management of sanctuaries and activities affecting them, in a manner which complements existing regulatory authorities. To further this policy, it would be useful for SBNMS to serve as a clearinghouse for agency information and be a catalyst for information sharing.

Strategies (8) To Establish Mechanisms for Improved Information Sharing between Agencies

(2.1) Provide information via the web on the responsibilities and activities of multiple agencies that have roles pertinent to the SBNMS. This strategy will assist the public and agency personnel in determining what agencies have shared jurisdiction in the sanctuary, over what resources, and where to go for detailed information.

Priority: Medium
Status: Ongoing
Activities:

2.1.1 Establish a SBNMS webpage that serves as a clearinghouse for pertinent fishing regulations in the sanctuary by providing web links to appropriate regulatory agencies. The purpose of this web page is to facilitate regulatory compliance by the public by directing them to the appropriate regulatory agency for details.
Status: Ongoing

2.1.2 Establish a SBNMS webpage that serves as a clearinghouse for agency contact information to inform the public about the roles of the various agencies that have authority overlapping the

sanctuary and provide web links to these agencies.
Status: Ongoing

2.1.3 Establish a SBNMS webpage that informs the public of the latest results of research and other activities conducted within the sanctuary by other agencies and provide web links to these agencies.
Status: Ongoing

(2.2) Provide regular updates to the USCG Area Contingency Plans. The sanctuary worked with the USCG First District during 2003 to develop an annex to the applicable Area Contingency Plan (ACP) that covers the SBNMS vicinity (Appendix P). ACPs are USCG incident response plans, which provide guidance for the protection of people, natural resources, and property from the impacts of oil spills or hazardous substance releases. The ACP presents a strategy for coordination of federal, state and local agencies with industry, response contractors and the local community for unified responses to discharges or substantial threats of discharge of oil or release of hazardous substances. The annex to the ACP is specific to the SBNMS and details sensitive resources as well as any recommended mitigation measures (see Strategy WQ 2.4).
Priority: Medium
Status: Ongoing
Activities:

2.2.1 Update the sanctuary's annex to the Plymouth to Salisbury, MA Area Contingency Plan and the Rhode Island/Southeastern Massachusetts Area Contingency Plan.
Status: Planned, 2010

(2.3) Establish a mechanism for informal consultation with the EPA, NEFMC, Massachusetts Water Resources Authority (MWRA), Massachusetts Department of Environmental Protection (MADEP) and Massachusetts Office of Coastal Zone Management (MACZM) on water quality issues. The purpose of this protocol is to facilitate communication on water quality issues related to the watersheds and coastal and ocean waters that may affect sanctuary resources.
Priority: Medium
Status: Planned, 2011
Activities:

2.3.1 Develop an informal mechanism that facilitates communication among the SBNMS, EPA, NEFMC, MWRA, MADEP, and MACZM on water quality issues that may affect the sanctuary.
Status: Planned, 2011

Table 30. Estimated costs for IC action plan.

Strategy	Estimated Cost ($000)*					Total Estimated 5 Year Cost
	YR 1	YR 2	YR 3	YR 4	YR 5	
(1.1) Re-establish discussions regarding a possible MOU between the NOAA/SBNMS, NOAA Fisheries Service NERO and the NEFMC to facilitate cooperation and coordination.	0.0	0.0	0.0	0.0	0.0	0.0
(1.2) Coordinate proposed activities with the NOAA Fisheries Service NERO.	0.0	0.0	0.0	0.0	0.0	0.0
(1.3) Facilitate cooperative research and outreach between NOAA/SBNMS and the NOAA Fisheries Service, NEFSC.	0.0	0.0	0.0	0.0	0.0	0.0
(1.4) Evaluate the MOA between the USACE and NOAA Fisheries Service for commenting on proposed activities occurring at the MBDS.	0.0	0.0	0.0	0.0	0.0	0.0
(2.1) Provide information via the web on the responsibilities and activities of multiple agencies that have roles pertinent to the SBNMS.	0.0	0.0	0.0	0.0	0.0	0.0
(2.2) Provide regular updates to the USCG Area Contingency Plans.	0.0	0.0	0.0	0.0	0.0	0.0
(2.3) Establish a mechanism for informal consultation with the EPA, NEFMC, MWRA, MADEP and MACZM Office on water quality issues.	0.0	0.0	0.0	0.0	0.0	0.0
(2.4) Update and continue to implement the sanctuary cooperative enforcement program.	0.0	0.0	0.0	0.0	0.0	0.0
(2.5) Support continued meetings of the sanctuary advisory council's Interagency Cooperation Working Group.	0.0	0.0	0.0	0.0	0.0	0.0
(2.6) Participate in the GoM Council and other regional initiatives.	0.3	0.3	0.3	0.3	0.3	1.5
(2.7) Participate on relevant advisory panels of the NEFMC.	0.3	0.3	0.3	0.3	0.3	1.5
(2.8) Depict sanctuary boundaries.	0.0	0.0	0.0	0.0	0.0	0.0
Total Estimated Annual Cost	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**	**3.0**

*Cost estimates exclude federal labor costs.

Table 31. Performance measures for IC action plan.

Desired Outcome(s) For This Action Plan			
Sanctuary protection is increased through coordination with agencies that have jurisdiction overlapping the sanctuary.			
Performance Measures	**Means of Evaluation**	**Baseline**	**ONMS Measure**
By 2011, the sanctuary will have formalized an effective working relationship with NOAA Fisheries Service NERO and the NEFMC.	SBNMS will execute a signed MOU with the affected parties.	Number of signed MOUs: 0	Partnerships
By 2011, a process for formal consultation by the USACE with the sanctuary pursuant to section 304(d) of the NMSA will be in effect.	SBNMS will document a formal consultation process.	Number of consultations completed: 1	Partnerships
By 2013, the sanctuary will hold three issue-driven, problem-solving forums with other affected agencies, the findings of which will be entered into a record.	SBNMS will record the minutes of each forum and disseminate information pertinent to initiate next step to the respective agencies. The findings of each meeting will be entered into a record to document the occurrence and outcome.	Number of forums organized since publication of management plan: 0	Partnerships

(2.4) Update and continue to implement the Sanctuary Cooperative Enforcement Program. The primary agencies involved in the current sanctuary cooperative enforcement program are the SBNMS and the NOAA OLE (Appendix Q). The USCG and the Massachusetts Environmental Police (MEP) have been part of the sanctuary enforcement program to varying degree depending on their resources and priorities.

Priority: High
Status: Ongoing
Activities:

2.4.1 Update and fully implement the cooperative enforcement agreement between SBNMS and NOAA OLE working with the USCG and MEP to ensure adequate enforcement presence and prosecution regarding the sanctuary. Whereas the existing agreement is considered functional in its protocols and purpose, effective implementation will require that SBNMS have regular dedicated on-the-water enforcement capabilities not currently available (see Activity ADMIN 2.6.1).
Status: Planned, 2010

(2.5) Support continued meetings of the sanctuary advisory council's Interagency Cooperation Working Group (WG). The WG has proven effective as a forum to initiate dialogue on matters of mutual interest among agencies that have regional federal or neighboring state jurisdiction associated with the sanctuary. The WG would be reconvened on an as-needed basis to address specific issues or to share relevant information.

Priority: Low
Status: Planned, 2010

(2.6) Participate in the Gulf of Maine (GoM) Council and other regional initiatives. The GoM Council on the Marine Environment is a U.S.-Canadian partnership of government and non-government organizations. The organization works to maintain and enhance environmental quality in the GoM to allow for sustainable resource use by existing and future generations. NOAA Fisheries Service currently represents SBNMS interests on the GoM Council.

Priority: Medium
Status: Ongoing
Activities:

2.6.1 Participate in GoM Council meetings and continue to host the Gulf of Maine Marine Protected Areas (GoMMPAS) list serve.
Status: Ongoing

2.6.2 Participate in GoM Council and other regional initiatives regarding the establishment of a marine protected area (MPA) network within the GoM.
Status: Ongoing

(2.7) Participate on relevant advisory panels of the NEFMC. The NEFMC operates numerous advisory panels that advise on managing fisheries, many of which occur within SBNMS. The advisory panels are a critical mechanism by which the sanctuary can provide input and express concerns over fishing activities in the sanctuary.

Priority: High
Status: Ongoing

(2.8) Depict sanctuary boundaries in fishery management plans and related documents. On December 4, 2003 the Sanctuary Advisory Council passed a motion requesting that the NEFMC include the sanctuary boundaries on all future charts, maps and relevant fisheries documents in the Gulf of Maine. Depiction of the sanctuary boundaries will establish a more informed context for Council decision-making while enabling sanctuary managers to better understand the potential implications of Council actions. This strategy supports that motion.

Priority: High
Status: Planned, 2010

Public Outreach and Education Action Plan

Issue Statement

The Public Outreach and Education (POE) Action Plan (AP) makes recommendations to resolve issues including low name recognition of SBNMS, need for better information dissemination through leveraged partnerships and public education through programming support. The POE AP is predicated on developing outreach and education tools that serve to help achieve sanctuary management goals and objectives.

Goal

The goal of the POE AP is to increase public awareness and understanding of the sanctuary, and encourage responsible stewardship of its resources.

Objectives

The POE AP has two objectives and associated strategies to enhance public awareness, understanding and appropriate use of the sanctuary through development and implementation of outreach and educational programs (Table 32).

- POE.1—Build Capacity for Outreach Programs that Increase Sanctuary Visibility, Awareness and Stewardship
- POE.2—Build Capacity for Formal and Informal Education Programs That Support Sanctuary Management Goals

The estimated costs for implementation of the POE AP are indicated in Table 33. The performance measures are listed in Table 34.

Table 32. Objectives, associated strategies, and priorities for POE action plan.

Objective	Strategy	Priority
POE.1 Build Capacity for Outreach Programs that Increase Sanctuary Visibility, Awareness and Stewardship	(1.1) Produce public outreach products and programs that best address sanctuary visibility needs.	High
	(1.2) Develop and implement outreach programs with stakeholder groups to increase sanctuary visibility and promote sanctuary stewardship.	High
	(1.3) Work with the ONMS headquarters to develop and implement a SBNMS long-range facilities plan that prioritizes partnering opportunities with interpretive centers and articulates federal funding needs.	High
	(1.4) Establish a Media Outreach Program.	High
POE.2 Build Capacity for Formal and Informal Education Programs That Support Sanctuary Management Goals	(2.1) Develop an action plan for establishing education partnerships and identify the types of programs and objectives that would best be achieved.	High
	(2.2) Support K-12 Educational Programming.	Medium
	(2.3) Support Undergraduate and Graduate Education Programming.	Medium
	(2.4) Support Adult Education Programming.	High

POE.1 Objective—Build Capacity for Outreach Programs that Increase Sanctuary Visibility, Awareness and Stewardship

Background. The purpose of this objective is to build greater awareness of SBNMS among the general public to: (1) generate name recognition; (2) create a sense of ownership and stewardship that leads to personal involvement in the protection of sanctuary resources; and (3) develop an infrastructure that includes affiliate organizations and volunteers to build partnerships and leverage capacity for sanctuary outreach activities. A million or more visitors travel to the SBNMS each year on whale watch and recreational fishing boats without realizing that they are in a federal marine protected area. Neighboring communities are mostly unacquainted with the sanctuary, as it is offshore and out-of-sight. And despite a historic relationship to the marine environment, many residents of coastal New England are unaware of the sanctuary and the diverse living marine and maritime heritage resources it shelters.

Strategies (4) To Build Capacity for Outreach Programs to Increase Sanctuary Visibility, Awareness and Stewardship

(1.1) Produce public outreach products and programs that best address sanctuary visibility needs. Develop appropriate pubic outreach/visibility products and programs that create name recognition and brand identity for the sanctuary to better inform the public of its existence, location, resource characteristics and programs. Table 2 lists some of the outreach and education products produced to date.

Priority: High
Status: Ongoing
Activities:

1.1.1 Ask the advisory council to form an outreach working group of the advisory council, consisting of representatives from interest groups, as well as experts in public relations, advertising and marketing to advise the advisory council, which in turn will advise the sanctuary superintendent on the development of outreach campaigns for SBNMS.
Status: Planned, 2010

1.1.2 Assess the level of public awareness of the sanctuary and determine the communication tools and venues that are likely to be most effective in reaching the various constituencies and geographic areas.
Status: Planned, 2010
[Note: With information gained from Activities 1.1.1 and 1.1.2 above, refine and undertake Activities 1.1.3 through 1.1.5 following.]

1.1.3 Produce periodic newsletters and other printed or electronic publications to provide information to the general public, elected officials, and user groups.
Status: Ongoing

1.1.4 Develop a website that provides a central location for all information about the sanctuary and links to affiliated organizations. The web site will provide 'one-stop shopping' for information needs from any stakeholder group or member of the general public.
Status: Ongoing

1.1.5 Develop traveling exhibits and speakers' bureau to provide outreach programs to various audiences.
Status: Ongoing

1.1.6 Work with ONMS headquarters to provide street signage at appropriate places indicating the location of the SBNMS headquarters office in Scituate, Massachusetts.
Status: Planned, 2010

(1.2) Develop and implement outreach programs with stakeholder groups to increase sanctuary visibility and promote sanctuary stewardship. This strategy will open lines of communication between stakeholder groups and the sanctuary, and involve these groups in the design and

implementation of collaborative outreach projects. Communication objectives will include responsible stewardship, conservation of biological diversity, water quality protection, maritime heritage preservation and marine mammal protection. Products and programs will be developed with partners as appropriate and address the informational needs of the general public and stakeholder constituencies. Messages will be determined in consultation with sanctuary staff, stakeholder group representatives and other partners. Examples of user groups and actions include the following:

- Whale Watch Industry—boat signage, naturalist training, passenger handouts;
- Commercial Fishing—trade show workshops and exhibits, guest speakers at meetings, articles in industry association publications;
- Party/Charter Fishing Boats—passenger handouts, boat and dock signage, speakers at meetings, articles in trade magazines, information in saltwater fishing guides;
- Recreational Fishing—articles in fishing magazines, speakers at meetings, handouts at fishing supply/bait shops;
- Recreational Boaters—boat show exhibits, signage at marinas and fuel docks, speakers at boat clubs;
- Recreation and Technical Divers—programs at dive clubs, handouts at dive shops, magazine interviews, presentations at conferences;
- Cruise Industry—exhibits at cruise ship terminals, signage on boats, handouts and in-room videos for passengers, speakers programs for passengers; and
- Researchers—on-line permit application, on-line databases, science forums, and web index to sanctuary research.

Priority: High
Status: Ongoing
Activities:

1.2.1 Assess existing sanctuary outreach programs and those of stakeholder groups and develop/prioritize new or revised outreach programs, utilizing partnerships where appropriate.
Status: Planned, 2010

(1.3) Work with ONMS headquarters to develop and implement a SBNMS long-range facilities plan that prioritizes partnering opportunities with interpretive centers and articulates federal funding needs. Interpretive facilities—visitor centers, exhibits and kiosks at museums and aquariums and signage at selected locations—raise sanctuary visibility by reaching large sectors of the general public. These venues provide centralized distribution points for sanctuary outreach materials while offering a suitable and cost-effective means for the communication of sanctuary messages. [Note: Strategy ADMIN 2.2 refers to a related but separate facilities planning process.]
Priority: High
Status: Ongoing
Activities:

1.3.1 Identify and prioritize new areas and locations for installation of sanctuary exhibitry within the greater Boston metropolitan area.
Status: Planned, 2010

1.3.2 Develop or upgrade sanctuary visitor centers/exhibits in gateway cities, including but not limited to Gloucester, Boston, Plymouth and Provincetown.
Status: Planned, 2010

1.3.3 Develop exhibits and signage at New England regional and national public outreach centers, including aquariums, zoos, science museums, maritime heritage facilities and art institutions.
Status: Planned, 2011

(1.4) Establish a Media Outreach Program. Print and electronic media can be an effective and efficient means to reach vast numbers of the general public as well as targeted stakeholder groups. SBNMS will provide information to the media on sanctuary resources and resource protection activities through the use of press releases, media advisories, web sites, still images, video footage, editorial board visits, media tours and other products and programs.
Priority: High
Status: Ongoing
Activities:

1.4.1 Develop an updated media list of regional and national print, radio, and television outlets, including phone, fax and e-mail addresses to identify media contacts with interests in sanctuary-related stories.
Status: Ongoing

1.4.2 Develop a long-term sanctuary media plan including short-term event-driven media plans when appropriate. The plans will include messages and talking points. The extent of each plan will be determined on a case-by-case basis and in consultation with NOAA and ONMS headquarters.
Status: Planned, 2010

1.4.3 Prepare advisories, press releases and articles on a timely basis for distribution to the media; produce and distribute still and video images when appropriate; organize press conferences when appropriate; work with partners when applicable.
Status: Ongoing

1.4.4 Develop a web-based photo and map gallery for media use (may also be accessed by educators and other members of the general public).
Status: Ongoing

1.4.5 Organize media visits to the sanctuary, including research cruises and site visits, and staff visits to media outlets, including editorial boards, local radio talk shows, and community cable television, through a scheduled sanctuary speakers' bureau.
Status: Ongoing

1.4.6 Assess potential themes and slogans that are likely to be most successful in attracting media and reader attention. Incorporate these findings into media planning and written/audio-visual materials.
Status: Ongoing

POE.2 Objective—Build Capacity for Formal and Informal Education Programs That Support Sanctuary Management Goals

Background. The purpose of this objective is to develop and maintain leveraged partnerships that build capacity for formal and informal education programs while supporting SBNMS management goals. Educational programming for ocean science can benefit from sanctuary products and activities that highlight SBNMS as a laboratory for learning. Leveraged partnerships require that all parties find value in the results, which necessitates care in product/program design and implementation. The supplemental funding, joint staffing and/or resources generated by partnerships contribute to the success of the initiative, the ability to reach the intended audience, and project viability over time.

Strategies (4) To Improve Capacity for Formal and Informal Education Programs That Support Sanctuary Management Goals

(2.1) Develop an action plan for establishing education partnerships and identify the types of programs and objectives that would best be achieved. This effort will guide the process for forming partnerships having the highest likelihood of success for the development and delivery of effective educational programming.
Priority: High
Status: Planned, 2011
Activities:

2.1.1 Ask the advisory council to form an education working group of the advisory council comprised of teachers in grades K-12, university faculty, grade school and college administrators, informal educators, homeschoolers and other interested parties to advise the advisory council, which will in turn advise the sanctuary superintendent, in addressing education needs and trends.
Status: Planned, 2011

2.1.2 Assess the needs and availability of potential partners for sanctuary programs, especially in areas where limited sanctuary funding and staffing are inadequate to achieve project goals. This effort will broaden the scope of outside interest in and support for sanctuary programs and identify how sanctuary efforts can best support shared organizational goals.
Status: Planned, 2011

2.1.3 Develop criteria for the selection and types of contributions required of SBNMS partners for education, including other NOAA offices, other government agencies, public and private institutions and non-governmental organizations. This effort will bring strategic focus to the development of rationales for effective collaborations with partners in the educational community.
Status: Planned, 2011

(2.2) Support K–12 Educational Programming. The sanctuary's proximity to major population centers, educational institutions and research facilities makes it accessible as a living laboratory for marine science and maritime studies. SBNMS will address the needs of educators for sanctuary-related materials and programs by working with regional organizations and specialists to address how content connects with K–12 learning standards in various disciplines at state and national levels.
Priority: Medium
Status: Planned, 2012
Activities:

2.2.1 Assess needs of K-12 educators and develop products and programs deemed appropriate to further SBNMS goals for heightened understanding of sanctuary resources, stewardship, science and management issues. The assessment will link materials to state and national standards as required and wherever possible.
Status: Planned, 2012

2.2.2 Provide creative programs for student participation that encourage discovery learning about sanctuary resources, stewardship and programs, including but not limited to poster/art contests, poetry contests, photo contests, debates, junior naturalist program, and student-at-sea research.
Status: Planned, 2012

2.2.3 Post education products and programs on the sanctuary website and provide additional background materials for student and general public review.
Status: Planned, 2012

(2.3) Support Undergraduate and Graduate Education Programming. By providing access to sanctuary information and creating work study opportunities for students, SBNMS furthers NOAA's education goals, which include integrating NOAA science into high-quality educational materials and promoting participation in NOAA-related sciences and careers, particularly by members of underrepresented groups. Sanctuary programming can enhance formal and informal environmental science education. Concomitantly, the sanctuary can gain new insights and benefits from these additional participatory efforts.
Priority: Medium
Status: Planned, 2012
Activities:

2.3.1 Work with academic institutions and foundations to support appropriate undergraduate, graduate and post-doctoral research in the sanctuary.
Status: Planned, 2012

Table 33. Estimated costs for POE action plan.

Strategy	Estimated Cost ($000)*					Total Estimated 5 Year Cost
	YR 1	YR 2	YR 3	YR 4	YR 5	
(1.1) Produce public outreach products and programs that best address sanctuary visibility needs.	48.0	52.0	55.0	55.0	55.0	265.0
(1.2) Develop and implement outreach programs with stakeholder groups to increase sanctuary visibility and promote sanctuary stewardship.	6.0	20.0	20.0	20.0	20.0	86.0
(1.3) Work with ONMS headquarters to develop and implement a long-range facilities plan that prioritizes partnering opportunities with interpretive centers and articulates federal funding needs.	50.0	100.0	200.0	200.0	200.0	750.0
(1.4) Establish a Media Outreach Program.	0.0	10.0	10.0	10.0	10.0	40.0
(2.1) Develop an action plan for establishing education partnerships and identify the types of programs and objectives that would best be achieved.	0.0	0.0	0.0	0.0	0.0	0.0
(2.2) Support K-12 Educational Programming.	0.0	15.0	15.0	15.0	15.0	60.0
(2.3) Support Undergraduate and Graduate Education Programming.	0.0	15.0	15.0	15.0	15.0	60.0
(2.4) Support Adult Education Programming.	0.0	15.0	15.0	15.0	15.0	60.0
Total Estimated Annual Cost	**104.0**	**227.0**	**330.0**	**330.0**	**330.0**	**1321.0**
*Cost estimates exclude federal labor costs.						

2.3.2 Work with educator organizations and foundations to create summer internships at SBNMS for education, outreach, marine management, maritime heritage, GIS and other sanctuary-related disciplines.
Status: Planned, 2010

2.3.3 Develop sanctuary components for a pre-service teacher education course, which incorporates information about sanctuary marine resources and resource management issues.
Status: Planned, 2011

2.3.4 Provide speakers and/or background information on the sanctuary to supplement school programming (e.g., in marine resource management, marine science, marine professions, maritime archaeology, etc.).
Status: Ongoing

(2.4) Support Adult Education Programming. There is a large segment of the adult population interested in continuing education programs, both locally (often through on-site lectures and courses) and nationally (via the web). This educated audience is a potential source of sanctuary volunteers and donors. The development of adult education content based on sanctuary science and activities can contribute to leveraged partnerships with regional educational institutions, museums, aquariums and other organizations that offer such types of programming.

Priority: High
Status: Planned, 2011
Activities:

2.4.1 Develop and implement a series of special lectures on sanctuary issues and resources, including, but not limited to: sea birds, whales, boating etiquette, fishing, fish identification, marine management.
Status: Ongoing

2.4.2 Develop education materials linked to sanctuary research cruises for distribution via the sanctuary web site and other outreach avenues including telepresence.
Status: Planned, 2010

2.4.3 Investigate the potential for web-based and/or remote-learning courses on the sanctuary, its resources and marine management issues. Develop courses that can reach large segments of the general population.
Status: Planned, 2010

2.4.4 Assess the potential for associations with adult education programs such as Elder Hostel and Earthwatch and coordinate partnerships where deemed appropriate.
Status: Planned, 2011

2.4.5 Develop a full semester college course on sanctuary resources and management that provides content suitable for continuing education credit. Make classes available via digital videodisk (DVD) and video home systems (VHS) tapes for distance learning purposes.
Status: Ongoing

Table 34. Performance measures for POE action plan.

Desired Outcome(s) For This Action Plan			
Public interest and understanding of sanctuary issues and opportunities are mobilized to encourage responsible stewardship.			
Performance Measures	**Means of Evaluation**	**Baseline**	**ONMS Measure**
By 2012, personnel will be in place to effectively implement outreach activities and educational programming.	An outreach specialist and an education specialist will be hired.	Program personnel dedicated to outreach and education: 1	Raise Awareness
By 2011, an action plan to guide sanctuary programs in formal and informal education will be developed.	SBNMS will have begun to implement the action plan.	Number of action plans developed: 0	Raise Awareness
By 2012, sanctuary visitor centers and traveling exhibits will reach two million people.	SBNMS will track the number of exhibition locations and visitor exposure.	Number of people reached by exhibits: 1 million	Raise Awareness
By 2012, sanctuary outreach efforts will reach six million people.	SBNMS will track the viewership of sanctuary publications and media outreach venues.	Number of people reached by outreach efforts: 1 million	Raise Awareness
By 2012, visitation to the sanctuary website will reach four million people.	SBNMS will track the number of unique visitors to the sanctuary website.	Number of people reached by website: 1 million	Raise Awareness
By 2012, the sanctuary will implement formal and informal educational programming reaching one million people.	SBNMS will track the number of people accessing information from sanctuary educational programming.	Number of people reached: 2500	Raise Awareness

Compatibility Determination Action Plan

Issue Statement

The Compatibility Determination (CD) Action Plan (AP) recommends a process by which to determine what constitutes a compatible use of sanctuary resources. The NMSA has as a purpose and policy to facilitate uses that are compatible with the primary objective of resource protection, but is silent on how compatibility should be determined. This AP describes a framework for developing a sanctuary compatibility analysis. The AP only recommends a process; it does not determine the appropriateness of any specific sanctuary use, current or potential, nor does it recommend any actions that could affect the outcome of other action plans in this publication. Background information on compatible use determination is available at http://stellwagen.noaa.gov/management/mpr/workinggroups.html.

Goal

The goal of the CD AP is to develop a framework to assess and evaluate whether existing or proposed human uses are compatible with the sanctuary's primary objective of resource protection.

Objectives

The CD AP has one objective and associated strategies to address the issues regarding compatible use (Table 35).

- CD.1—Develop a Framework for Sanctuary Compatibility Determination.

The estimated costs for implementation of the CD AP are indicated in Table 36. The performance measures are listed in Table 37.

Table 35. Objectives, associated strategies, and priorities for CD action plan.

Objective	Strategy	Priority
CD.1 Develop a Framework for Sanctuary Compatibility Determination	(1.1) Demonstrate the application of S-CAP.	High
	(1.2) Refine S-CAP by incorporating results of ongoing sanctuary monitoring.	Medium

CD.1 Objective—Develop a Framework for Sanctuary Compatibility Determination

Background. SBNMS is considering using a Sanctuary Compatibility Analysis Process (S-CAP) to clarify and resolve compatibility issues. S-CAP uses a hierarchical approach, which flows from broad statements of SBNMS 'vision' and 'mission' to more specific management 'goals' and 'objectives' to determine whether uses are compatible with sanctuary resource protection. Figure 127 provides a hypothetical application of S-CAP to sanctuary management.

S-CAP is a means to screen whether a use is compatible, or how it could be made compatible, and thus consistent with the site's vision, mission, goals and objectives. It is a potential decision-making tool for application in sanctuary management, including performance planning (such as in management plan reviews), and for addressing questionable situations regarding specific uses. S-CAP has the following objectives:

- Define the role of stakeholders and managers;
- Define the decision-making process, such that decisions are rational and transparent; and
- Address current uses, new uses, the scale of use, and the cumulative impacts of multiple uses.

[Note: Issues regarding conflicting uses that have no impact or risk of impact to sanctuary resources are not intended to be resolved by S-CAP or any other compatibility approach, as such issues present conflicts between uses, not between a use and resource protection].

Strategies (2) To Develop a Framework for Sanctuary Compatibility Determination

(1.1) Demonstrate the application of S-CAP. S-CAP will be used to answer specific questions regarding whether a use(s) is/are compatible with the sanctuary's primary objective of resource protection. Note that the NMSA prohibits the destruction, loss or injury of any sanctuary resource managed under law or regulation for the sanctuary. The SBNMS vision, mission, goals and management objectives will provide guidance for S-CAP deliberations.

Priority: High
Status: Planned, 2013
Activities:

1.1.1 The ONMS will evaluate the application of S-CAP and determine its usefulness as a decision-making tool. The process is an objective approach, which seeks to incorporate the best available scientific information, allows for stakeholder involvement and should be easy to understand and apply. It can incorporate measurable standards and indicators as thresholds for decision-making, if advisable. Ultimately, a pilot study or monitoring program, preferably utilizing collaborative research, may be necessary to properly evaluate and refine the application of this tool in certain cases.

[Note: S-CAP should first consider whether a use is already prohibited or subject to regulation. A use in the sanctuary permitted or regulated by another agency pursuant to a different authority may still be found to be incompatible with the SBNMS vision, mission, goals and objectives. It is important at this point that the S-CAP clearly guide how to decide if and how a use can be made compatible by imposing mitigations and what those mitigations would be.]

Status: Planned, 2011

(1.2) Refine S-CAP by incorporating results of ongoing sanctuary monitoring. Regularly update monitoring information. Make the updated information available for S-CAP evaluation to ensure that the process remains applicable under changing environmental conditions and evolving uses of sanctuary resources.

Priority: Medium
Status: Planned, 2014

Figure 127. Hypothetical application of S-CAP process.

Issue: Does 'x' activity in the SBNMS harm marine mammals? Is it a use compatible with the sanctuary's purpose?

Vision: Ecological integrity is protected.

Mission: Resource protection

Goal: Protect assemblages of marine mammals

Objective: Strengthen the protection of marine mammals by assessing and minimizing behavioral disturbance, including vessel strikes to and entanglement of marine mammals, and by fostering cooperation with cross-jurisdictional partners whose activities could impact marine mammals.

Standard: Marine mammal behavior is not altered and marine mammals are not struck or entangled by 'x' activity.

Indicators that standard is being achieved:

- No marine mammals are struck or entangled by 'x' activity.
- No change in marine mammal distribution due to 'x' activity.
- Surface-to-dive time ratio for marine mammals is within normal range and unaffected by 'x' activity.
- Marine mammal communication is unimpeded by 'x' activity.

Table 36. Estimated costs for CD action plan.

Strategy	Estimated Cost ($000)*					Total Estimated 5 Year Cost
	YR 1	YR 2	YR 3	YR 4	YR 5	
(1.1) Demonstrate the application of S-CAP.	0.0	0.0	0.0	0.0	0.0	0.0
(1.2) Refine S-CAP by incorporating results of ongoing sanctuary monitoring.	0.0	0.0	0.0	0.0	0.0	0.0
Total Estimated Annual Cost	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
*Cost estimates exclude federal labor costs.						

Table 37. Performance measures for CD action plan.

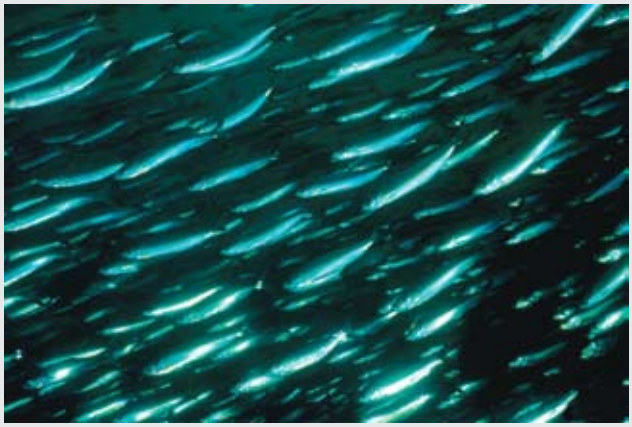
Desired Outcome(s) For This Action Plan			
Framework is established to assess and evaluate whether human uses are compatible with the sanctuary's primary objective of resource protection.			
Performance Measures	**Means of Evaluation**	**Baseline**	**ONMS Measure**
By 2013, demonstrate the application of the Sanctuary Compatibility Analysis Process (S-CAP).	SBNMS advisory council will form a working group, which will file a report on the utility of the process as a decision-making tool.	Application of S-CAP: 0	Living marine resources, habitat, and water quality.

Ecosystem Protection

1. Ecosystem-Based Sanctuary Management
2. Ecosystem Alteration
3. Water Quality

The National Marine Sanctuaries Act provides that the primary objective of sanctuary management is resource protection. Ecosystem protection in SBNMS requires the preservation/enhancement of biological and habitat diversity and care for the associated physical environment. The sanctuary's challenge is to restore and maintain the ecological integrity of the site in the face of human-induced impacts and environmental uncertainty while facilitating compatible use.

Three action plans underscore public scoping concerns regarding ecosystem protection. The Ecosystem-Based Sanctuary Management (EBM) Action Plan establishes a framework and supporting infrastructure to integrate knowledge of ecological relationships with societal values to minimize human impacts to sanctuary resources. The Ecosystem Alteration (EA) Action Plan addresses the means to work with various agencies and user groups to reduce the alteration of benthic habitats by various uses and mitigate the ecological impacts of biomass removal by fishing. The Water Quality (WQ) Action Plan assesses and conserves water quality in the sanctuary by developing monitoring and contingency plans to examine and reduce pollution discharges, waste streams and catastrophic events that may adversely impact sanctuary resources.



Ecosystem-Based Sanctuary Management Action Plan

Issue Statement

The Ecosystem-Based Sanctuary Management (EBSM) Action Plan (AP) makes recommendations for comprehensive ecosystem protection, preservation/enhancement of biological diversity, zoning including no-take zones, ecosystem-based management practices and consideration of boundary modification.

Ecosystem-based management arose in the late 20th century to address the scientific uncertainty inherent in natural systems and the failures of single-species management approaches to adequately address that scientific uncertainty. In simplest terms, an ecosystem is a set of inter-related biological communities and their associated physical environment. It includes all marine organisms together with the abiotic properties of the water column and seafloor and is connected to the human users. Over the past decade, marine ecosystem-based management has been variously practiced (Arkema *et al.,* 2006); Leslie *et al.,* (2008) discuss the broader aspects of implementation.

Since SBNMS is not a singularly discrete ecosystem unto itself, but rather part of the much larger GoM ecosystem, the application of EBSM to the SBNMS will be approached in two ways. First, EBSM will involve intensive collaboration with agencies charged with managing components of the ecosystem on a regional scale that overlaps with and goes beyond sanctuary boundaries. Second, EBSM will involve intensive research and monitoring within sanctuary boundaries, where an obvious sub-set of the larger GoM ecosystem is being managed.

There are no comprehensive ecosystem-based management plans in place for the southern GoM at this time. For example, SBNMS regulates the mining of sand and gravel, disturbance of the seafloor (with the exception of fishing activity), and discharge of matter within its boundaries. Fisheries management in the Federal waters of the region is directed at species of concern, while considering the effects on other ecosystem components and issues. Even though the NOAA Fisheries Service Atlantic Large Whale Take Reduction Team has grouped a number of large cetaceans under its auspices, the Marine Mammal Protection Act is enforced on a species-by-species basis.

Goal

The goal of the EBSM AP is to protect the ecological integrity of SBNMS including that the sanctuary contributes to the healthy functioning of the larger GoM ecosystem. Effective implementation should: consider ecological processes that operate both inside and outside sanctuary boundaries; recognize the importance of genetic, species and habitat diversity; and accommodate human uses within the sanctuary to the extent compatible with the primary goal of resource protection. EBSM will integrate knowledge of ecological interrelationships with societal values to minimize human impacts to sanctuary resources.

Objectives

The EBSM AP has five objectives and associated strategies to implement EBSM and establish the infrastructure and framework for its continued development (Table 38).

- EBSM.1—Establish a Science Review Framework
- EBSM.2—Establish an Information Management System
- EBSM.3—Understand Ecosystem Structure and Function
- EBSM.4—Protect Ecological Integrity
- EBSM.5—Evaluate the Need and Feasibility for Modifying the Sanctuary Boundary

The estimated costs for implementation of the EBSM AP are indicated in Table 39. The performance measures are listed in Table 40.

Table 38. Objectives, associated strategies, and priorities for EBSM action plan.

Objective	Strategy	Priority
EBSM.1 Establish a Science Review Framework	(1.1) Work with the advisory council to establish a science advisory working group.	High
	(1.2) Convene a sanctuary science symposium.	High
	(1.3) Form a science consortium.	Low
EBSM.2 Establish an Information Management System	(2.1) Design and implement an information management system.	High
	(2.2) Design and implement a web portal for public access to databases.	Low
EBSM.3 Understand Ecosystem Structure and Function	(3.1) Define and operationalize the term ecological integrity.	High
	(3.2) Develop programs to monitor and evaluate ecological integrity within the sanctuary.	High
	(3.3) Establish research programs directed at informing EBSM.	High
	(3.4) Develop models that afford a predictive capability to better understand sanctuary dynamics and to guide EBSM.	Medium
EBSM.4 Protect Ecological Integrity	(4.1) Continue to convene the zoning working group of the advisory council to: (1) evaluate the adequacy of existing zoning schemes in SBNMS, (2) address the scientific requirements to meet the goals of EBSM, and if needed (3) develop a modified zoning scheme including consideration of fully protected reserves.	High
EBSM.5 Evaluate the Need and Feasibility of Modifying the Sanctuary Boundary	(5.1) Evaluate the need and feasibility for modifying the sanctuary boundary.	Low

EBSM.1 Objective—Establish a Science Review Framework

Background. A science review framework is needed to ensure that the sanctuary is using the best available, highest quality science for decision-making. The framework will consist of three parts: a science advisory working group, a sanctuary science symposium and a research consortium.

Strategies (3) To Establish a Science Review Framework

(1.1) Work with the advisory council to establish a science advisory working group. A science working group of the advisory council will assist in developing a science plan, thereby setting parameters for identifying and meeting key science needs. Scientific and technical membership will be drawn from area universities, research organizations and government agencies and will have representation covering the biological, geo-physical and societal disciplines. The working group will advise the advisory council, which will in turn advise the sanctuary superintendent on research and monitoring issues and provide assistance with developing a research and monitoring plan.

Priority: High
Status: Planned, 2011
Activities:

1.1.1 Develop a science plan that details the research, monitoring, and modeling activities necessary to carry out the sanctuary mission and inform management decisions (see Strategies EBSM 3.1-3.4).
Status: Planned, 2011

(1.2) Convene a sanctuary science symposium. SBNMS will organize a symposium on sanctuary science to assist with reviewing the results of research in the sanctuary on essential protection issues that inform EBSM. The science symposium will further knowledge of the sanctuary ecosystem by fostering interaction and appropriate collaborative research between users and researchers on topics such as marine mammal acoustics, prey dynamics, oceanography, water quality, fish movement, etc. This should be a biennial symposium in which to share knowledge with the advisory council, SBNMS staff, academic and government scientists, stakeholder organizations and other interested parties on a regular and timely basis.

Priority: Medium
Status: Planned, 2011

(1.3) Form a science consortium. SBNMS will serve as secretariat for an informal body that will ensure productive collaboration through timely dissemination of the research and monitoring results produced by the sanctuary. The consortium will be open to individuals who are committed to understanding how the sanctuary functions and who can contribute to furthering that understanding. An email/list serve or website will foster the sharing of ideas and posting of results (see Strategy EBSM 2.2).

Priority: Low
Status: Planned, 2011

EBSM.2 Objective—Establish an Information Management System

Background. An information management system will be established to process, synthesize, and analyze scientific data by building upon the sanctuary's existing infrastructure capacity with outside software expertise. The objective is to develop a well-designed information management and dissemination tool to facilitate science-based EBSM. The system should be designed so that information can be widely

accessible to sanctuary staff, scientists, decision makers and the public. By setting up a database on an in-house server, SBNMS will expand the range and uses of existing data.

Strategies (2) To Establish an Information Management System

(2.1) Design and implement an information management system. The system will need to meet specified requirements related to data input, data access by various users, metadata, analysis, etc. It will afford internal use by SBNMS staff and subsequent access by the public (see Strategy EBSM 2.2).

Priority: High
Status: Planned, 2012
Activities:

2.1.1 Establish a quality assurance/quality control program. The program will ensure the integrity and quality of the data from collection to archiving.
Status: Planned, 2012

2.1.2 Establish a full-time database technician position. A database technician is needed to manage and administer this system.
Status: Planned, 2012

(2.2) Design and implement a web portal for public access to databases. This tool will make data accessible to the public within a reasonable timeframe, while maintaining the security of the NOAA network.

Priority: Low
Status: Planned, 2012

EBSM.3 Objective—Understand Ecosystem Structure and Function

Background. Ecosystem structure refers to the arrangement of ecosystem components (physical and biological) over spatial and temporal scales. Ecosystem function refers to the processes of the ecosystem such as predation, succession and competition that in turn can mediate ecosystem structure. EBSM requires knowledge of what components make up the sanctuary ecosystem and what processes influence the arrangement of the components.

Strategies (4) To Understand Ecosystem Structure and Function

(3.1) Define and operationalize the term ecological integrity. As a concept, ecological integrity is location and scale dependent; it implies a sound or whole condition in both an intuitive and technical sense. It refers to the structural status and functioning of an ecological system (e.g., SBNMS). It considers human interactions and is the central concept to applying EBSM.

[Note: A working definition of ecological integrity has been proposed by the Zoning Working Group for advisory council consideration: "Ecological integrity is defined as the degree to which the system is structurally intact and functionally resilient within the context of historical baselines. Structurally intact means that the native parts of the system are maintained as well as their relationships. Functional resilience is the system's ability to resist changes caused by human or environmental perturbations, or should change occur, to recover over time".]

Priority: High
Status: Ongoing
Activities:

3.1.1 Develop an operational definition of ecological integrity that can be evaluated and monitored over time. The definition requires sufficient objectivity and specificity, such that its measurement can be quantified and the determination of status can be unequivocal.
Status: Ongoing

3.1.2 Develop metrics for monitoring and evaluating ecological integrity. This activity involves developing biological and socio-economic indices based on the definition that are sufficiently robust for routine application, yet reliable across some set scale of the sanctuary and in the face of environmental variability.
Status: Ongoing

3.1.3 Develop appropriate measures of biological diversity and identify those processes that mediate patterns of diversity. This activity aims to evaluate various measures of diversity and to determine which ones most appropriately reveal the effectiveness of management actions.
Status: Ongoing

(3.2) Develop programs to monitor and evaluate ecological integrity within the sanctuary. The suite of metrics developed will be monitored periodically to reveal the status of diversity measures, key ecological processes and human uses in the sanctuary.

Priority: High
Status: Ongoing
Activities:

3.2.1 Develop an ecological monitoring program that will discern changes in the natural systems of the sanctuary and which will afford a comprehensive understanding of the site's ecological integrity. Two objectives of the monitoring program will be to determine the efficacy of any zones implemented in the sanctuary for purposes of EBSM and to discern effects caused by climate change.
Status: Ongoing

3.2.2 Develop a human-use monitoring program to fully understand the types and level of use of the sanctuary, the spatial and temporal distribution of use, the use adjacent to currently closed areas and the impacts of regulations on use patterns. The program should provide adequate spatial resolution to reconstruct with statistical confidence the distribution of human impacts relative to habitat. The program should discern socio-economic

impacts and incorporate traditional knowledge so that social capital can be an integral component of EBSM. Monitoring could be done by automated information systems (AIS), vessel monitoring systems (VMS), radar, refinement of vessel trip reports (VTR), call-in systems and standardized shipboard surveys. Activities will be implemented in cooperation with NOAA Fisheries Service, USCG and the affected public.
Status: Ongoing

3.2.3 Establish an integrated ocean observing system in the sanctuary to collect real-time information at multiple depths on oceanographic and biological variables identified to aid EBSM and discern the effects of climate change. The observing system could be a subset of the Gulf of Maine Ocean Observing System (GoMOOS) and would be implemented remotely through a combination of component surface and seafloor sensors and satellites.
Status: Ongoing

(3.3) Establish research programs directed at informing EBSM. Research programs will complement monitoring programs by investigating ecological processes that explain the patterns identified from monitoring. The science advisory working group should advise on questions to be answered by various research programs (see Strategy EBSM 1.1).
Priority: High
Status: Ongoing
Activities:

3.3.1 If appropriate, develop collaborative research programs with recreational and commercial fishing organizations. Collaborative programs will help answer specific questions about the ecology of the sanctuary and its use. Potential examples include the Massachusetts Fishermen's Partnership (MFP) Fishermen's Initiative for Scientific Habitat and Ecosystem Research (FISHER) project within the SBNMS.
Status: Ongoing

3.3.2 Classify and map benthic habitats. The SBNMS currently has high-resolution multi-beam imagery of the entire sanctuary. However, benthic habitats have not been classified or mapped based on the multi-beam data and ground-truthing data (e.g., video, sediment sampling and other means). Habitat classification and mapping would greatly facilitate planning and resource management efforts.
Status: Ongoing

3.3.3 Conduct research to understand movements of organisms relative to seascape features within the sanctuary and movement between the sanctuary and surrounding waters. This effort would include completing ongoing research, including cooperative research to tag and track Atlantic cod and expand the research to include other species.
Status: Ongoing

3.3.4 Conduct research to understand the effects of natural disturbance (e.g., storm and tidal events) on seascapes and seafloor habitats. Topographic complexity is mediated by natural as well as anthropogenic disturbance. This research will discern the characteristics of natural disturbance, such as the maximum depth affected by storm waves.
Status: Planned, 2011

3.3.5 Conduct research to quantify the impacts of climate change on ecosystem structure and function**.** This research will be directed at collecting specific information for the parameterization of ecosystem models, which will be used to assess the effect of climate change, including ocean acidification, on overall ecosystem productivity, biodiversity and the provision of environmental services.
Status: Planned, 2011

3.3.6 Quantify pollutant loadings to sanctuary waters and apply findings to EBSM. See objectives and strategies in the Water Quality action plan for related context.
Status: Planned, 2012

(3.4) Develop models that provide a predictive capability to better understand sanctuary dynamics and to guide EBSM. Models are powerful tools for synthesizing and visualizing data from monitoring and directed research and for simulating past, current or future conditions in SBNMS. As our knowledge of the marine environment is often limited by the difficulties and costs associated with both vessel-based and underwater research, it is important to maximize the predictive utility of the data we do gather and characterize the uncertainty surrounding our samples. These tasks are best addressed through modeling, which allows managers to utilize empirical data to form conclusions and quantify the associated level of uncertainty.

Because threats to sanctuary resources are often immediate, managers often need to make decisions based on the best available data. Models can help to identify directions for future research that will reduce uncertainty in areas important to decision-making. Models are useful in guiding both sanctuary-sponsored research and proposals from the greater research community towards the creation of substantive policy.
Priority: Medium
Status: Planned, 2013
Activities:

3.4.1 Develop a dynamic ecosystem model linking patterns of habitat and species diversity with ecological processes. The science advisory working group and advisory council will review the model and make recommendations to the sanctuary superintendent on its limits and capabilities.
Status: Planned, 2013

3.4.2 Develop a model(s) that predict(s) larval recruitment, dispersal and connectivity between habitats within, and to and from habitats external to, the sanctuary. The model should clarify the role that SBNMS plays in larval recruitment by identifying sources, sinks, rates of movement and concentrations of larvae using data from various sources.
Status: Planned, 2013

3.4.3 Develop an internal oceanographic circulation model for the sanctuary that interfaces with other models to tie together local, regional and larger-scale patterns. Development of this model is essential to understand and predict egg and larval transport, and the fate and effect of nutrients and pollutants.
Status: Planned, 2013

EBSM.4 Objective—Protect Ecological Integrity

Background. The primary goal of EBSM is to protect the ecological integrity of the sanctuary. This goal is akin to protecting ecosystem health (e.g., Costanza *et al.,* 1992). No single action is sufficient to protect the integrity of the system short of making the entire sanctuary a no-take wilderness area, which is not the intention. The purpose of this objective is to implement a set of complementary strategies that together will ensure the integrity of the ecosystem.

Strategy (1) To Protect Ecological Integrity

(4.1) Continue to convene the zoning working group of the advisory council established in 2004 to: (1) evaluate the adequacy of existing zoning schemes in SBNMS, (2) address the scientific requirements to meet the goals of EBSM and, if needed (3) develop a modified zoning scheme including consideration of fully protected reserves. The zoning working group will review and evaluate data and information, as it becomes available through various venues (e.g., Omnibus Essential Fish Habitat process, sanctuary efforts) and will make recommendations to the advisory council. The advisory council will evaluate the recommendations and advise the sanctuary superintendent regarding the adequacy of existing zoning measures. The working group will be asked to make its recommendations within two years of the publication date of the Federal Register Notice notifying the public of the availability of the final management plan. [See Strategy EA 2.1] Appendix R provides details on the membership and charge of the zoning marking group. Appendix S provides information on existing marine resources management zones that overlap the sanctuary.
Priority: High
Status: Ongoing

EBSM.5 Objective—Evaluate the Need and Feasibility of Modifying the Sanctuary Boundary

Background. The southern end of Jeffreys Ledge is included within the boundary of the SBNMS, whereas the majority of Jeffreys Ledge lies outside of the sanctuary. Jeffreys Ledge is an important habitat and resource area for many of the same species that frequent the sanctuary, but it is a profoundly different habitat type. The seafloor habitat of Jeffreys Ledge consists primarily of bedrock rather than the sand, gravel and mud habitats that principally comprise the SBNMS. Those differences aside, large pelagic fish will in the course of a feeding season frequent both the sanctuary and Jeffreys Ledge in search of forage species particularly herring. Many of the groundfish species do the same. The two geographic areas are ecologically intertwined and could be considered one integral system. Based on this rationale, much public comment during scoping called for expanding the boundary of the sanctuary to include Jeffreys Ledge.

The SBNMS is well-suited as a sanctuary in that it was established in an area used preferentially by humpback whale juveniles and reproductively mature/active females (Robbins, 2007). These natal classes typically play important roles in large mammal population dynamics (Robbins, 2007), the first because of the sensitivity of juveniles to environment and/or population density and the second because of the importance of reproductively mature females to population growth. While humpback whales presently have broad legislative protection in the U.S. waters of the GoM, the sanctuary provides an opportunity for focused management, including research, monitoring and enforcement. However, despite the appropriateness of its location, the size of SBNMS does not encompass the range of any individual humpback whale.

Proposals have been made to extend the SBNMS boundaries to the north to include more of Jeffreys Ledge (as noted above). However, Robbins (2007) indicates that the choice of areas would not have equal results where humpback whales are concerned. Adults move between all of the GoM areas studied, but the areas of particular importance to SBNMS whales were the Great South Channel and western Georges Bank. An extension to the south would incorporate the most common alternate summer habitat of SBNMS humpback whales, as well as an important habitat for juveniles and an area of routinely high humpback whale density (Figure 52a this document). Extension to the north would encompass fewer humpback whales, but a slightly different demographic than is presently observed in the sanctuary. Although both areas are in proximity to the SBNMS, the relative importance of each area should be considered when evaluating the need for sanctuary boundary modification.

During management plan preparation, suggestions were made to extend the sanctuary boundary to the east and north to include all or more of the "Level 3" habitat closed area established within the Western Gulf of Maine Closure Area (WGoMCA) (Figure 17). The WGoMCA is closed indefinitely on a year-round basis to all bottom-tending mobile gear, bottom-tending gillnets, clam and scallop dredges, and shrimp trawls and includes a sizeable portion (approximately 50%) of Jeffreys Ledge. The WGoMCA currently overlaps 22% of the sanctuary along the eastern boundary

and is serving as a relatively unimpacted reference site for sanctuary research. Refer to the sidebar "Seafloor Habitat Recovery and Monitoring Project" in the section on Resource States.

In considering sanctuary boundary modification to include the "Level 3" portion of the WGoMCA, the following relationships could apply. Total boundary length and boundary-to-area ratio are smaller for conservation strategies that emphasize a single protected area versus those that allocate the same amount of habitat area among two or more sites (Cooke and Auster, 2006). A single large protected area in the sanctuary might be favored over several smaller ones for a number of reasons (Fogarty, 1999; Dayton *et al.,* 2000), including reduced socio-economic impact of habitat protection. Smaller boundary-to-area ratios also tend to reduce movement rates of mobile organisms from inside an area to outside (Polacheck, 1990; Lindholm *et al.,* 2001). Thus larger areas may offer more protection to their inhabitants, particularly if exploitation occurs right on the boundary, as is occurring in the sanctuary (Figure 101, 2001–2002 survey period). On the other hand, multiple sites increase both redundancy and the likelihood of including greater biodiversity.

The examples provided above are not specific recommendations. Instead, the discussion serves as a framework for fostering dialogue and envisioning some criteria that might be considered in evaluating sanctuary boundary modification within the context of ecosystem-based sanctuary management.

Strategies (1) To Evaluate the Need and Feasibility of Modifying the Sanctuary Boundary

(5.1) Evaluate the need and feasibility of modifying the sanctuary boundary to be more effective in achieving EBSM. The purpose of this strategy is to determine whether said or pertinent other modifications in the sanctuary boundary are warranted to better achieve ecosystem-based sanctuary management.

Priority: Low
Status: Planned, 2011

Table 39. Estimated costs for EBSM action plan.

Strategy	Estimated Cost ($000)*					Total Estimated 5 Year Cost
	YR 1	YR 2	YR 3	YR 4	YR 5	
(1.1) Ask the advisory council to establish a science advisory working group.	0.0	0.5	0.5	0.5	0.5	2.0
(1.2) Convene a sanctuary science symposium.	0.0	2.0	0.0	2.0	0.0	4.0
(1.3) Form a science consortium.	0.0	1.0	1.0	1.0	1.0	4.0
(2.1) Design and implement an information management system.	2.0	2.0	70.0	50.0	40.0	164.0
(2.2) Design and implement a web portal for public access to databases.	0.0	0.0	2.0	0.0	0.0	2.0
(3.1) Define and operationalize the term ecological integrity.	0.0	50.0	30.0	0.0	0.0	80.0
(3.2) Develop programs to monitor and evaluate ecological integrity within the sanctuary.	700.0	800.0	900.0	900.0	900.0	4200.0
(3.3) Establish research programs directed at informing EBSM.	50.0	80.0	80.0	70.0	70.0	350.0
(3.4) Develop models that afford a predictive capability to better understand sanctuary dynamics and to guide EBSM.	0.0	0.0	20.0	40.0	40.0	100.0
(4.1) Continue to convene the zoning working group of the advisory council to: (1) evaluate the adequacy of existing zoning schemes in SBNMS, (2) address the scientific requirements to meet the goals of EBSM, and if needed (3) develop a modified zoning scheme including consideration of fully protected reserves.	1.0	10.0	0.0	0.0	0.0	11.0
(5.1) Evaluate the need and feasibility of modifying the sanctuary boundaries to include Jeffrey's Ledge.	0.0	0.0	0.0	3.0	0.0	3.0
Total Estimated Annual Cost	**753.0**	**945.5**	**1103.5**	**1066.5**	**1051.5**	**4920.0**

*Cost estimates exclude federal labor costs.

Table 40. Performance measures for EBSM action plan.

Desired Outcome(s) For This Action Plan			
The ecological integrity of the SBNMS is restored as a subset of a healthy functioning Gulf of Maine ecosystem.			
Performance Measures	**Means of Evaluation**	**Baseline**	**ONMS Measure**
By 2012, personnel and projects will be in place to implement an ecosystem-based management program.	A community ecologist and database management technician will be hired.	Program personnel dedicated to ecosystem-based management: 0	Protect Resources
By 201, a science advisory working group will be convened to help develop a revised science plan.	A revised SBNMS science plan will be developed.	Revision of existing science plan: 0	Protect Resources
By 2012, management protocols are in place to ensure that the ecological integrity of 22%* of the sanctuary will be fully restored.	Ecosystem-based management indicators will be established and monitored.	Percent of the sanctuary that is fully protect: 0	Protect Resources
* The WGoMCA restricting the use of bottom mobile fishing gear and gillnets overlaps with approximately 22% of the eastern portion of the sanctuary.			

Ecosystem Alteration Action Plan

Issue Statement

The Ecosystem Alteration (EA) Action Plan (AP) makes recommendations to reduce or mitigate anthropogenic perturbations in SBNMS, as distinguished from impacts due to natural disturbance. Anthropogenic or human imposed impacts include the laying of submarine pipelines and cables, fishing activities, pollution and degradation of water quality, ocean dumping and marine debris, disposal of dredged materials, introduction of exotic species, offshore mariculture and coastal development activities. This action plan focuses on the laying of pipelines and cables and fishing activities. Other sources of ecosystem alteration are treated variously in other action plans, such as for ecosystem based management, water quality and interagency cooperation.

Goal

The goal of the EA AP is to reduce or mitigate identifiable impacts on key sanctuary resources due to human activities.

Objectives

The EA AP has three objectives and associated strategies to reduce or prevent ecosystem alteration (Table 41).

- EA.1—Reduce Ecological Impacts from the Laying of Submarine Cables and Pipelines
- EA.2—Reduce Alteration of Benthic Habitat by Mobile Fishing
- EA.3—Reduce Ecological Impacts of Biomass Removal by Fishing

The estimated costs for implementation of the EA AP are indicated in Table 42. The performance measures are listed in Table 43.

Table 41. Objectives, associated strategies, and priorities for EA action plan.

Objective	Strategy	Priority
EA.1 Reduce Ecological Impacts from the Laying of Submarine Cables and Pipelines	(1.1) Establish minimum criteria for special use permit applications for the laying of cables and pipelines.	Low
EA.2 Reduce Alteration of Benthic Habitat by Mobile Fishing	(2.1) Develop a process to establish reference areas that serve as benchmarks for discerning human and natural impacts on habitat.	High
	(2.2) Develop a science plan to assess and mitigate benthic habitat alteration.	High
EA.3 Reduce Ecological Impacts of Biomass Removal by Fishing Activity	(3.1) Minimize bycatch and discard of all species, in all fisheries (commercial and recreational), by all gear types.	High
	(3.2) Determine the effects of biomass removal of targeted species by commercial and recreational fishing on the ecological integrity of the sanctuary.	High
	(3.3) Develop a management strategy with NOAA Fisheries Service and the NEFMC to evaluate and protect an optimal forage base to maintain the ecological integrity of the sanctuary.	High

EA.1 Objective—Reduce Ecological Impacts from the Laying of Submarine Cables and Pipelines

Background. Public scoping raised concerns over the appropriateness of laying submarine cables and pipelines in the sanctuary. The proximity of the SBNMS to Boston increases the probability that the sanctuary will face future cable or pipeline proposals. The laying of cables and pipelines results in permanent or long-term emplacement of equipment and materials on or in the seabed. The risk of ecosystem alteration posed by pipelines is often considered several orders of magnitude greater than that posed by fiber optic cables, because pipelines are not as easily buried as cables and because the material they carry could pose harm if leaked to the environment.

The laying of cables and pipelines is a prohibited activity in the SBNMS under the existing alteration of the seabed regulation. However, prohibited activities can be permitted on a case-by-case basis if they meet the regulatory/statutory criteria. In August of 2000, the ONMS issued an Authorization/Special Use Permit (SUP) to 360Networks, Inc. [dba 360atlantic (USA) Inc.] to allow the laying of a high-capacity fiber optic cable to traverse approximately 12.1 miles (19.8 kilometers) within the sanctuary. The high resolution, multibeam topography map of the sanctuary was utilized to route the cable through soft sediments. An environmental impact statement was prepared prior to the issuance of the permit. In 2002, 360Networks Inc. filed for bankruptcy. The cable was later purchased by Columbia Ventures Corporation [dba Columbia Ventures US Acquisition LLC ("CVC USA")] and is currently permitted to that firm.

[Note: The spatial extent of impacts from the laying of the fiber optic cable in SBNMS has been assessed and compared to the spatial extent of impacts from a single 4.5m width scallop dredge towed at 2.5m per second fished in the sanctuary. The total spatial extent of the area impacted by the laying of the fiber optic cable (0.0594 sq km) is the equivalent to 88 minutes spent fishing with a standard scallop dredge in the GoM. This represents 0.0027% of the sanctuary area. By comparison, work by Auster *et al*. (1996) for the entire GoM suggests that for 78% of the sanctuary area, i.e., excluding the WGoMCA overlap within the sanctuary, nearly every square kilometer is dragged by mobile fishing gear at least once per year on average. Refer to Figure 117a in this document for corroborating findings specific to the SBNMS and to Objective EA.2].

Strategies (2) To Reduce Ecological Impacts from the Laying of Cables and Pipelines

(1.1) Establish minimum criteria for authorizations for the laying of cables and pipelines. The following conditions for issuance of an authorization (if granted) should apply for the laying of cables or pipelines within SBNMS:

- Appropriate mitigation and pre- and post-monitoring to assess impacts to sanctuary resources will be performed by an independent contractor hired by the sanctuary at permittee expense.
- The Environmental Impact Statement required of the applicant for a permit should ensure that cable and pipeline routing does not hinder pre-existing compatible uses.
- The sanctuary shall have the option of having the cable or pipeline removed at permittee expense, rather than leaving it *in situ* at end of serviceable life and in cases of authorization/permit violation.
- The applicant should be required to post a performance bond to ensure that permit safeguards are met.
  Priority: Low
  Status: Planned, 2010

EA.2 Objective—Reduce Alteration of Benthic Habitat by Mobile Fishing

Background. Review of scientific literature and preliminary results of related studies indicates that bottom mobile gears (scallop dredges and groundfish otter trawls) commonly fished in the SBNMS impose the greatest anthropogenic impact on benthic habitats. This impact is evidenced by the loss or dispersal of physical features (e.g., piled boulder reefs and sand waves) or the loss of structure-forming organisms

(e.g., hydroids, sponges, anemones, and bryozoans). Generally, these alterations have led to changes in the biomass, species diversity, age and size composition and productivity of the associated biota (Jennings and Kaiser, 1998; Collie, *et al*. 2000), changes that substantially alter the structure and function of biological communities.

Key factors affecting such changes include the type of bottom fishing gear, level of fishing effort, the spatial distribution of the fishing effort and the physical and biological characteristics of the bottom where fishing is conducted (McGee, 2004; Stevenson, 2004). Once a benthic habitat has been degraded by initial fishing pressure, it is not necessarily continuously degraded by continued fishing pressure. Although continued pressure does not allow the habitat to recover, it might retain sufficient productivity to remain viable as a commercial fishery (M. Kaiser, University of Wales, presentation to EA WG, 2004) but not fulfill all of its prior ecological functions.

Among specific benthic habitats, hard bottom (boulder and gravel) and mud substrata appear to be the most sensitive to the removal of physical and biological structure by mobile fishing gear, with coarse sand demonstrating the least impact (McGee, 2004; Stevenson, 2004). In SBNMS, the make-up of substratum type is approximately 38% boulder and gravel, 28% mud and 34% sand (SBNMS, unpublished data). By this measure, approximately two-thirds (66%) of the sanctuary's benthic habitat is particularly vulnerable to the disturbance of bottom mobile fishing gear.

Typically, winter storms with strong winds from the northeast generate sufficient bottom currents to re-suspend sediments only at depths less than 85 m (NOAA, 2006). The majority (75%) of SBNMS is below the zone of natural perturbation by storm events. This means that direct physical disturbance of benthic habitats in the majority of the sanctuary occurs by anthropogenic activities (e.g., cable laying, bottom mobile fishing gear) rather than natural causes.

Groundfishing Effort within SBNMS. Substantial changes have occurred to groundfish fisheries since SBNMS was designated in 1992. At the time of designation, there was no limit to the number of days a vessel could fish. In 2004, on average, groundfish fleet permit vessels were reduced to approximately 53 groundfish days-at-sea (DAS) annually; that number was reduced to approximately 48 DAS in 2006 through 2008 and down to 40 DAS in 2009.

Effort reduction actions taken by NOAA Fisheries Service and the NEFMC have likely decreased the frequency with which bottom otter trawl vessels fish the sanctuary. This could decrease the frequency with which some bottom habitats are trawled. Alternatively, DAS reductions could cause the larger vessels that currently bypass the sanctuary to fish closer to shore to reduce transit time. This could increase their fishing activities in the sanctuary.

Fishing restrictions have also reduced the spatial area available to bottom otter trawlers and probably provide a greater degree of protection to certain key habitats. However, the deep mud habitat (greater than 85 meters depth) is particularly sensitive and vulnerable to constant disturbance by bottom trawling and is not well represented within the areas closed to bottom impact gear within the sanctuary.

A series of 'rolling closures' limits groundfishing in all or parts of SBNMS during certain specified months. The Western Gulf of Maine Closure Area (WGoMCA) prohibits bottom otter trawling and scallop dredging year-round in approximately 22% of the sanctuary. The Western GoM Habitat Closure, an area contained within the WGoMCA, provides additional restrictions.

While the substantive steps taken by NOAA Fisheries Service and the NEFMC to rebuild over-fished groundfish stocks in the WGoM may have the additional benefit of reducing benthic habitat alteration by mobile bottom fishing gears in the sanctuary, these measures are not entirely adequate to protect the structure and functional integrity of biological communities in the sanctuary.

For example, research conducted by the sanctuary within the "sliver" (i.e., area of sanctuary that overlaps with the WGoMCA) indicates that recovery from fishing of biological communities associated with mud seafloor habitat occurs on the order of a decade. And yet, seasonal "rolling closures" overlapping the sanctuary allow bottom dragging over sanctuary mud habitats annually. The rate of perturbation that occurs under rolling closures does not protect the structure and integrity of the biological communities associated with this habitat in the sanctuary. However, the rolling closures may be effective as a management tool to rebuild groundfish stocks.

Strategies (2) To Reduce Alteration of Benthic Habitat by Mobile Fishing

(2.1) Develop a process to establish reference areas that serve as benchmarks for discerning human and natural impacts on habitat. There currently are no places within the sanctuary that can serve as true reference areas in the absence of direct human impacts. The WGoMCA, while serving as a relatively unimpacted site, is still subject to some fishing activities (Figure 117). The lack of reference areas compromises NOAA's ability to effectively manage, because there is no undisturbed, 'research' or 'control' area to serve as a baseline for differentiating the effects of human activities from natural disturbance. Reference areas are also needed to understand the processes of habitat recovery and the associated mechanisms of biological succession that lead to the establishment of mature benthic communities. [Note: This strategy will be addressed by the outcome of Strategy EBM 4.1 which addresses establishing a zoning working group to consider issues including reference areas.]

Priority: High
Status: Ongoing

(2.2) Develop a science plan to assess and mitigate benthic habitat alteration. Conduct and/or encourage research resulting in a greater understanding of benthic habitat alteration and ways to mitigate impacts from mobile bottom fishing gears. The research should be directed at determining how benthic habitats and their associated biological

communities are structured and function in the presence and absence of fishing.

Priority: High
Status: Planned, 2011
Activities:

2.2.1 Continue to conduct and encourage additional research on the impacts of bottom mobile gears on ecosystem alteration compared to other anthropogenic impacts and natural disturbance.
Status: Ongoing

2.2.2 Continue to conduct and encourage research to determine spatial patterns of fishing effort in the sanctuary, identify changes in effort over time and space, and assess how those changes may have impacted sanctuary resources.
Status: Ongoing

2.2.3 Conduct and/or encourage research to determine how changes in benthic habitat impact the recruitment and survival of commercial and non-commercial species.
Status: Planned, 2010

2.2.4 Encourage research on the development or improvement of low-impact mobile bottom fishing gear that is 'environmentally sustainable'. Gear mitigations that leave benthic habitats and their associated physical and biogenic structure largely intact are more likely to be compatible with the mission, goals and objectives of the sanctuary.
Status: Planned, 2010

EA.3 Objective—Reduce Ecological Impacts of Biomass Removal by Fishing Activity

Background. Biomass removal includes the targeted capture of commercial species above legally set minimum size/age thresholds; the bycatch and discard of unintended species caught across all size/age classes; and, the removal of species that function as important prey within the ecosystem. Biomass removal also includes structure-forming invertebrates comprising biogenic habitats damaged by fishing. The degree of ecosystem alteration by fishing depends on the scale of total biomass removal, the species-specific survival rate of the bycatch discarded, and the relative abundance of those species constituting both catch and bycatch.

Current information is inadequate to sufficiently understand the specific effects of biomass removal by fishing on the structuring and functioning of biological communities within SBNMS. However, it is highly likely that extraction has caused severe declines or shifts in some, but perhaps not all, ecosystem components and reduced the ecological integrity of the sanctuary. In a study of changes in piscivory associated with fishing induced changes to the finfish community on Georges Bank, Link and Garrison (2002b) assert that a major effect of intense fishing pressure is a shift in energy flow for marine ecosystems. A fishery-independent, long-term, standardized database collected on the eastern Scotian Shelf off Nova Scotia revealed that during the past four decades, coherent, community-level reduction in body size, biomass and physiological condition have occurred in the resident demersal fish species (Choi *et al.,* 2004). One of the leading hypotheses offered by the authors to explain the poor health of the resident groundfish was energy depletion in the system associated with the enormous biomass removal due to fishing.

Predators. The selective removal of top predators in large numbers (with attendant reduction in size and age structure of the species population) by commercial and recreational fishing has cascading effects on trophic (food web) dynamics that reshape the structure of biological communities and reduce ecological integrity. This effect is well documented in the scientific literature generally (e.g., Pauly *et al.,* 1998; Tegner and Dayton, 1999) and the North Atlantic specifically (Myers and Worm, 2003; Pauly and McLean, 2003; Lotze and Milewski, 2004; Frank *et al.,* 2005). The pervasive and disproportionate removal of larger, older fish among groundfish species in the GoM is indicated as a source of ecosystem dysfunction (e.g., Jackson *et al.,* 2001; Steneck *et al.,* 2004). In this larger context it is crucial to recognize that, while being commercially valuable, groundfish species function as ecologically important predators.

Atlantic cod act as keystone predators and formerly dominated northern hemisphere marine ecosystems (Frank *et al.,* 2005). As a marketable commodity, this species has been heavily exploited for centuries, particularly so in the last 50 years. The modeling of cod biomass on Canada's Scotian Shelf using historical records indicates that adult biomass today is a mere remnant (4%) of what it was in 1852, in an area known to have been fished since at least 1539 (Rosenberg *et al.,* 2005). Stellwagen Bank has been fished for cod since at least 1614 (Claesson and McKenzie, 2005) and cod stocks there today are over-fished by current standards. Cod preferentially feed on sand lance, Atlantic herring and Cancer spp. crabs on the northeast U.S. continental shelf (Link and Garrison, 2002a).

Examination of fish size-structure in SBNMS over a 38-year period (1963-2000) revealed that the maximum length of 15 species of commercially and biologically important groundfish species all showed decreasing trends (Figure 43 this plan). For seven of the species (white hake, goosefish, winter flounder, silver hake, cod, yellowtail flounder, and haddock), decreases in maximum length ranged from 15% to 49%; maximum length of cod decreased by 27% . When later data were added (2001-2005), there was improvement in the abundance of large individuals of cod and haddock that is consistent with lower fishing mortality (Figure 44 this plan). Other species (particularly the flatfishes) showed signs of a reversing trend in maximum size but are still of concern.

Prey. Atlantic herring (Clupea harengus), American sand lance [sand eel] (Ammodytes dubius) and Atlantic mackerel (Scomber scombrus) are key prey components of the SBNMS food web. The harvest of these prey species and the unintended impacts such removals might have on the

local abundance of higher trophic level predators is likely consequential (Overholtz and Link, 2006). These predator species include marine mammals (numerous of which are threatened or endangered), seabirds, and medium and large fishes (e.g., cod [Gadus morhua], Atlantic bluefin tuna [Thunnus thynnus]). Many of these predators are drawn to, and depend heavily on, the forage base that the sanctuary affords.

While managed fisheries for Atlantic herring and Atlantic mackerel exist in the GoM, there is no directed management of American sand lance in the western North Atlantic, nor does a commercial fishery for sand lance exist in that area (Overholtz *et al.,* 2000). Because these prey species are important forage for whales, sea birds and popular fish species (Overholtz and Nicolas, 1979; Chase, 2002; Overholtz and Link, 2006), their being available and abundant in the sanctuary bears greatly on ecosystem function and the successful provision of ecosystem services (among them whale watching, commercial, charter/party boat, and recreational fishing).

Local depletion of Atlantic herring as a critical food source attracting and sustaining sanctuary wildlife is not a primary consideration in the development of regional fishery management plans. Trophic interactions and total consumption requirements of dependent wildlife are not explicitly considered in stock assessment models underlying these plans, rather predation is subsumed within the natural mortality rate. Yet the consumption of herring by upper trophic level predators (marine mammals, seabirds and piscivorous fish) in the GoM may have exceeded the estimate of natural mortality used in stock assessment models by more than fourfold in 1991 (Read and Brownstein, 2003).

While the amount of herring harvested from the sanctuary varies greatly year-to-year, landings can be relatively large (1mil.–17mil. lbs.) (NMFS/NEFSC VTR data, 1997-2005). Refer to Section IV. Resource States - Reduced Forage Base in this document for an expanded rationale why fishing for herring in the sanctuary is a concern. The sanctuary's goal is not management of the herring stock. However, the sanctuary has concerns relating to: (1) the potential disruption and depletion of prey fields by fisheries in this local area of critically important whale foraging habitat, and (2) the need to assure functional redundancy among major alternative prey species. These concerns extend to sand lance as well.

Sand Lance. Sand lance availability is dependent on environmental conditions and predator-prey interactions, which can be highly variable and difficult to predict (Fogarty *et al.,* 1991; Nelson and Ross, 1991). The availability of sand lance is associated with the species mix and abundance of its principal larval predators - herring and mackerel (Sherman *et al.,* 1981). Herring has exhibited a dramatic increase in population in recent years, and it is uncertain how the ecosystem-shift favoring small pelagic species factors into the rate of predation on sand lance. While two species of sand lance frequent Massachusetts waters (Winters and Dailey, 1988), Ammodytes dubius predominates offshore within the sanctuary (L. Kaufman, Boston Univ., personal communication, 2006). Meyer *et al.* (1979) provide an early account of the relative abundance, behavior and food habits of sand lance on Stellwagen Bank.

There is the possibility that sand lance spawn in the sanctuary, where they deposit their eggs in sand habitats. What is seen as cyclic availability commonly attributed to coast-wide movement, may partly be due to variations in year-class strength associated with local inter-annual spawning and recruitment success. While the principal offshore species of sand lance differ between the western (A. dubius) and eastern North Atlantic (A. marinus), their known biology is similar. Although sand lance larvae drift with currents, once metamorphosed at around six months, sand lance do not show extensive horizontal movements, but tend to remain associated with a particular patch of substrate (Gauld and Hutcheon, 1990; Pedersen *et al.,* 1999), where they are susceptible to local depletion by fishing.

As noted in the Resource States subsection on Reduced Forage Base in this plan, the sand lance (A. marinus) is the target of the largest single-species fishery in the North Sea with the total allowable catch (TAC) being set at 1 million tons per year (ICES, 1998). The Department of Fisheries and Oceans Canada has identified sand lance (A. dubius) as one of the major unexploited fish resources of the northwest Atlantic (http://www.dfo-mpo.gc.ca/zone/underwater_sous-marin/SandLance/sandlanc_e.html). While there is yet no fishery for sand lance in the GoM, if one were to develop the sanctuary area would certainly be targeted because of its historical high level of sand lance abundance. Sand lance occur within the SBNMS at higher levels of abundance than in any other area of the southern GoM (Figure 50 this plan).

The facts that (1) metamorphosed sand lance do not make extensive horizontal movements and are susceptible to local depletion, that (2) they are a keystone prey species and a principal component of the sanctuary ecosystem forage base important to demersal and predatory pelagic fishes, seabirds and marine mammals, that (3) they are an important predictor of the relative abundance of important cetacean species (endangered humpback and fin whales and protected minke whales) which frequent the sanctuary, and that (4) their abundance is an important factor in humpback whale calf survival all make it prudent to consider prohibiting fishing for sand lance in the sanctuary. The sanctuary merits and requires a higher standard of resource protection than other parts of the GoM, and the lack of a current fishery for sand lance should be seen as an advantage where important protection of an entire food web can be taken at no economic cost.

Bycatch. Bycatch is the unintentional capture of non-target species of fish, marine mammals, turtles, sea birds and invertebrates. Bycatch and discarding is a major component of the impact of fisheries on marine ecosystems and a significant source of collateral biological damage. Not only are the stocks of discarded species affected, but entire trophic webs and habitats may be disrupted to the point of greatly altering their structure and function at the community and

ecosystem levels (Alverson and Hughes, 1996; Crowder and Murawski, 1998; Morgan and Chuenpagdee, 2003). The conservation problems associated with bycatch are well documented by the scientific community (e.g., Alversen *et al.,* 1994; Hall, 1996; Kaiser and de Groot, 2000; Kelleher, 2005).

An analysis of discarded bycatch in the USA in 2002-2003 indicates that the shrimp and bottom trawl fisheries were responsible for 72 percent of the total discards by gear type, and the crustacean and demersal (groundfish) fisheries were responsible for 86 percent of the discards by target species type (Harrington *et al.,* 2005). These gear types and target species types are prevalent among the fisheries prosecuted in the SBNMS. The northeast fisheries discard to landings ratio was 0.49 overall, among the highest in the nation, while the northeast groundfish discard to landings ratio was 1.790 (Harrington *et al.,* 2005). This ratio indicates that discards of groundfish (e.g., spiny dogfish, skates, monkfish, hake) on a tonnage basis amounted to almost two times the landed catch.

Unfortunately, high bycatch rates can be found in fisheries that are currently struggling to rebuild, such as the New England groundfish fishery (Murawski *et al.,* 1997), and some of the discard can be due to management requirements, not just fishing practices (Harrington *et al.,* 2005). The most pressing and effective means of addressing problems of bycatch and associated ecosystem impacts is eliminating over-capitalization and over-fishing (Pauly *et al.,* 2002). The most successful programs include clear financial incentives for fishermen to minimize bycatch by reducing costs or increasing value (Branch *et al.,* 2005; Gilman *et al.,* 2005). Change to more selective fishing gear continues to be an essential element of bycatch reduction programs.

More selective gear can mean higher-value landings for fishermen at potentially lower costs (Clucas and James, 1997; Crowder and Murawski, 1998). Examples of gear changes that improve catch value and reduce bycatch in certain circumstances are the conversion of trawl fisheries to traps, switching from dragging to longlining in selected areas (NMFS, 2003), and the mandated use of larger mesh throughout the net or in panels to release certain sizes or species (Kelleher, 2005). Different gear modifications can have strikingly different impacts on catch rates for both bycatch and target species (Hall and Mainprize, 2005). The use of more selective gear requires specific incentives to improve selectivity and disincentives to limit unwanted levels of bycatch.

Strategies (3) To Reduce Ecological Impacts of Biomass Removal by Fishing Activity

(3.1) Minimize bycatch and discard of all species, in all fisheries (commercial and recreational), by all gear types. Bycatch of target and non-target species should be minimized in the SBNMS to help restore species populations, food web complexity and the structure and function of biological communities.

Priority: High
Status: Planned, 2012
Activities:

3.1.1 Promote cooperative research with fishing organizations and fishery management agencies into methods to greatly reduce or eliminate all types of bycatch through gear modification.
Status: Planned, 2012

3.1.2 Convene periodic workshops to gather, assess and disseminate information concerning the ability of particular gear modifications to achieve desired goals in bycatch reduction.
Status: Planned, 2012

3.1.3 Ask the advisory council to form a working group to recommend criteria for 'environmentally' sustainable fishing gear.
Status: Planned, 2012

3.1.4 Develop and implement outreach and education programs, in partnership with relevant fishery organizations to promote environmentally sustainable gear methodologies as determined by SBNMS.
Status: Planned, 2012

3.1.5 Explore incentives to encourage fishermen to demonstrate the use of environmentally sustainable gear, such as through purchase assistance, operating subsidies or providing other means of acquisition.
Status: Planned, 2012

3.1.6 Coordinate with fishery management agencies, fishing groups and nongovernmental organizations (NGO's) to develop a 'study fleet' of all vessel types fishing in the sanctuary. The purpose of the fleet would be to understand the differential rate of capture and composition of bycatch, and how the bycatch differs spatially and temporally. Data could be made available directly to the sanctuary or through a third party entity that would protect the individual identity of the contributors.
Status: Planned, 2012

(3.2) Determine the effects of biomass removal of targeted species by commercial and recreational fishing on the ecological integrity of the sanctuary. NOAA Fisheries Service has employed closed areas, effort reduction and gear modifications as tools to rebuild stocks of marketable species. These tools directly address population level effects of fishing as measured by rates of mortality, growth, reproduction and recruitment, for example. There is little to no understanding of how the removal of commercially and ecologically important fish/shellfish species, notably groundfish and lobsters, impacts the structure and functioning of biological communities within the sanctuary (e.g., how is biological diversity mediated by predation and competition, what habitat-related species assemblages constitute climax communities, etc.).

Priority: High
Status: Planned, 2012
Activities:

3.2.1 Establish historical baselines for fish populations in the sanctuary to develop the historical context for the area's marine ecology and to assess the degree of ecosystem alteration. Determination of baselines will require archival research and study of the historical ecology of the sanctuary area back to colonial times and will draw on five primary sources: (1) early exploration narrative accounts, (2) scientific survey logbooks, (3) U.S. Fish Commission publications, (4) monthly fishery statistical bulletins for the northwest Atlantic, and (5) fishermen accounts and interviews.
Status: Ongoing

3.2.2 Coordinate with NOAA Fisheries Service and NEFMC in their attempts to rebuild and manage viable species populations of commercial fish/ shellfish in the sanctuary area. Work to ensure that stock rebuilding efforts also help restore the biological communities associated with these species and the ecological integrity of the sanctuary.
Status: Planned, 2011

3.2.3 Coordinate with NOAA Fisheries Service and NEFMC to conduct/encourage research into the characteristics (e.g., species, size, number, and degree of discard) of fish caught by recreational fishing within the sanctuary.
Status: Planned, 2011

(3.3) Develop a management strategy with NOAA Fisheries Service and the NEFMC to evaluate and protect an optimal forage base to maintain the ecological integrity of the sanctuary. Forage species such as Atlantic herring, squid, sand lance (sand eels) and Atlantic mackerel are an essential trophic resource for larger fishes, marine mammals and sea birds. Historically these prey species have been seasonally abundant in the sanctuary and have attracted numerous major predator species. The abundance of these predator species (e.g., large whales, bluefin tuna and cod) is central and crucial to supporting commercial fishing, ecotourism and recreation in the sanctuary. Directed fisheries on these prey species may be decreasing local abundance of both prey and predators, thereby degrading the ecological integrity of SBNMS and diminishing the sanctuary's fuller utility.
Priority: High
Status: Planned, 2011
Activities:

3.3.1 Recommend that NOAA Fisheries Service consider implementing a permanent ban on the exploitation of sand eels (Ammodytes spp.) within the SBNMS to ensure that a sand lance fishery is not developed.
Status: Planned, 2010

3.3.2 Monitor and assess updated Amendments to the Atlantic Herring Fishery Management Plan as they relate to reduced prey availability due to extraction from the sanctuary.
Status: Planned, 2010

3.3.3 Conduct/encourage research to determine the functional importance of prey species within the sanctuary environment and to ascertain how the fisheries for prey species affect the ecological integrity of the sanctuary.
Status: Planned, 2010

3.3.4 Conduct/encourage research to understand the inter-relationships between, and the population dynamics of, sand lance, mackerel and herring within the sanctuary.
Status: Planned, 2010

3.3.5 Conduct/encourage research to understand the inter-annual variability in abundance of sand lance and what environmental factors drive this variability within the sanctuary.
Status: Planned, 2010

Table 42. Estimated costs for EA action plan.

Strategy	Estimated Cost ($000)*					Total Estimated 5 Year Cost
	YR 1	YR 2	YR 3	YR 4	YR 5	
(1.1) Establish minimum criteria for permit applications for the laying of cables and pipelines.	0.0	0.0	2.0	1.0	1.0	4.0
(2.1) Develop a process to establish reference areas that serve as benchmarks for discerning human and natural impacts on habitat.	1.0	2.0	15.0	2.0	2.0	22.0
(2.2) Develop a science plan to assess and mitigate benthic habitat alteration.	0.0	0.0	0.0	0.0	0.0	0.0
(3.1) Minimize bycatch and discard of all species, in all fisheries (commercial and recreational), by all gear types.	0.0	0.0	0.0	0.0	0.0	0.0
(3.2) Determine the effects of the biomass removal of targeted species by commercial and recreational fishing on the ecological integrity of the sanctuary.	2.0	10.0	10.0	10.0	10.0	42.0
(3.3) Develop a management strategy with NOAA Fisheries Service and the NEFMC to evaluate and protect an optimal forage base to maintain the ecological integrity of the sanctuary.	0.0	0.0	0.0	0.0	0.0	0.0
Total Estimated Annual Cost	**3.0**	**12.0**	**27.0**	**13.0**	**13.0**	**68.0**

*Cost estimates exclude federal labor costs.

Table 43. Performance measures for EA action plan.

Desired Outcome(s) For This Action Plan			
Ecosystem alteration resulting from human activities is reduced.			
Performance Measures	**Means of Evaluation**	**Baseline**	**ONMS Measure**
By 2011, the sanctuary will complete study on the relative impact of mobile bottom gear on seafloor habitats compared to other anthropogenic impacts and natural disturbances over a decade.	SBNMS will finalize report on the results of the Seafloor Habitat Recovery Monitoring Program (SHRMP).	Years of results from SHRMP: 6 of 10 planned	Protect Resources
By 2013, 50% of the bottom otter-trawl and dredge fishermen in the sanctuary will be using fishing gear that reduces bycatch and habitat impacts.	SBNMS will partner with NMFS and NEFMC to keep track of the number of commercial fishing vessels using reduced-impact gear.	Percent of bottom otter-trawl and dredge fishermen using reduced-impact gear: 0*	Protect Resources
By 2011, the key forage species in the sanctuary, sand lance (sand eels) and Atlantic herring, will be protected from local depletion.	SBNMS will document results of consultation with NMFS NERO and NEFMC on steps taken to prevent local depletion of key forage species within the sanctuary.	Controls to prevent local depletion of key forage species within the sanctuary: 0	Protect Resources
* It is understood that gear currently in use in these fisheries represents a reduction in impact relative to the recent past. However, the baseline is calculated with respect to current conditions and efforts to improve upon them.			

Water Quality Action Plan

Issue Statement

The Water Quality (WQ) Action Plan (AP) makes recommendations to address water quality concerns within SBNMS. Point and non-point sources of pollution, both sea and shore-based, may be degrading the quality of the sanctuary's waters. NOAA must ensure that the quality of water within its boundary and in surrounding areas does no harm to the site's living marine and cultural resources. The following two needs were identified: to assess water quality and circulation to characterize baseline conditions, and to reduce pollutant discharges and waste streams that may be negatively impacting sanctuary resources.

Goal

The goal of the WQ AP is to monitor, assess and maintain water quality in the sanctuary for the protection of living and cultural resources and to foster cooperation with cross-jurisdictional partners that are charged with understanding, protecting and enhancing water quality.

Objectives

The WQ AP has two objectives and associated strategies to assess and improve water quality in the sanctuary (Table 44).

- WQ.1—Assess Water Quality and Circulation
- WQ.2—Reduce Pollutant Discharges and Waste Streams that Affect the Sanctuary

The estimated costs for implementation of the WQ AP are indicated in Table 45. The performance measures are listed in Table 46.

Table 44. Objectives, associated strategies, and priorities for WQ action plan.

Objective	Strategy	Priority
WQ.1 Assess Water Quality and Circulation	(1.1) Develop and Implement a Water Quality Monitoring Plan.	High
	(1.2) Characterize the contaminant loading to the sanctuary from sources.	Low
	(1.3) Encourage research and monitoring of endocrine disrupters and their effects on sanctuary resources.	Low
WQ.2 Reduce Pollutant Discharges and Waste Streams That May Affect the Sanctuary	(2.1) Reduce threats to sanctuary water quality from vessel wastewater discharges (other than ballast water).	High
	(2.2) Reduce ballast water exchanges in the sanctuary.	High
	(2.3) Reduce impacts of municipal and other shore-based waste water streams.	Low
	(2.4) Develop contingency plans to address actions and responsibilities to Remediate catastrophic water quality events in the sanctuary and support programs that prevent water pollution events.	Medium

WQ.1 Objective—Assess Water Quality and Circulation

Background. The sanctuary's water quality monitoring program (albeit limited) was in place for several years primarily to determine whether the MWRA outfall, which began operating in September 2000, was causing increased nutrient loading and eutrophication in the sanctuary. The MWRA outfall discharges over 300 million gallons daily; it is located twelve miles offshore of the mouth of Boston Harbor and nine miles from the western boundary of the sanctuary. Several other waste water treatment facilities discharge into Massachusetts Bay to the north and west of the sanctuary as well. In 2001, SBNMS added four stations to MWRA's existing five stations within the sanctuary to leverage resources and standardize information for integration with ongoing monitoring. The four additional stations were sampled in August and October, coincident with two of the six MWRA surveys conducted each year. In 2007, SBNMS discontinued funding support for its added stations due to budgetary constraints. Currently, MWRA is evaluating whether to continue sampling its far field stations within the sanctuary.

The water quality sampling includes measurements of physical variables (salinity, temperature, density), nutrients, chlorophyll and dissolved oxygen, as well as phytoplankton and zooplankton. The four additional sanctuary stations were strategically placed to detect nutrient inputs to the sanctuary from the GoM (notably discharges from the Merrimack River) to the north and from the MWRA outfall to the west. The data contribute to inferences about fine scale ocean circulation patterns and water column productivity in SBNMS, and were used in the 3-dimensional model that has been developed by MWRA to understand how the system might respond to increased or decreased levels of nutrients, dilution of outfall discharge and dispersion.

Much of the pollution reaching the sanctuary comes from non-point sources or from distant point sources that are not easy to control. Air pollution from power plants, some as far away as the Midwest, discharge a variety of chemicals onto the Massachusetts Bay, some of which are accumulated by organisms. In addition, the sanctuary area is heavily traveled by commercial and recreational vessels and cruise ships that discharge wastes during their voyages. Other sources of contamination include clean dredged material dumped under EPA permit at the MBDS located adjacent to the sanctuary's western boundary, and disturbances during the laying of underwater pipes and cables (only one of which crosses the sanctuary). Of concern are the cumulative impacts of these multiple sources that may affect the resources of the sanctuary.

Strategies (3) To Assess Water Quality and Circulation

(1.1) Develop and Implement a Water Quality Monitoring Plan. A water quality monitoring plan for SBNMS will: (1) highlight priority areas for implementation of a monitoring program, (2) review current oceanographic modeling and new technologies that may provide additional supporting information, (3) integrate data into models to assess the health of the sanctuary, and (4) identify the need to translate scientific data into information for managers and the public. The decision pending by MWRA, whether to discontinue its far field sampling stations in the sanctuary may bear heavily on the implementation of this strategy.

Priority: High
Status: Planned, 2011
Activities:

1.1.1 Work with the advisory council to establish a science and technical working group of the advisory council to advise the advisory council, which will in turn advise the sanctuary superintendent, on water quality issues. The working group will review the existing monitoring program and related collaborations, identify specific monitoring questions and help the sanctuary develop a monitoring and research plan. The plan will: (1) evaluate the MWRA outfall and other sources of contaminants and pollutants; (2) present the results and analysis of the current monitoring program and incorporate findings into recommended management actions, as appropriate; (3) coordinate water quality monitoring with other monitoring and research activities within the sanctuary and the sanctuary

system (e.g., system-wide monitoring); (4) develop a monitoring program to sample sanctuary waters after episodic pollution events (such as a MWRA failure and/or storm-water overflows); (5) examine the cause and effect relationship between shore-based point source discharges and impacts to the sanctuary ecosystem, including discussion of air deposition and non-point source urban runoff, and (6) evaluate the use and utility of models (e.g., harmful algal blooms [HAB], Bays Eutrophication Model [BEM]).
Status: Planned, 2010

(1.2) Characterize the contaminant loading to the sanctuary from respective sources. Monitoring programs are most effective when they are designed around specific questions. Without understanding the loading of nutrients, metals, organic chemicals and other pollutants from respective sources (air, vessels, outfalls, and other activities), it is difficult to develop a monitoring program that will provide useful results and identify ways to answer some of the more challenging ecosystem-based questions.
Priority: Low
Status: Planned, 2012

(1.3) Encourage research and monitoring of endocrine disrupters and their effects on sanctuary resources. Current research indicates that endocrine disruptors (e.g., polychlorinated biphenyls [PCBs], polynuclear aromatic hydrocarbons [PAHs], pesticides) may pose detrimental effects on sanctuary resources and suggests the need for vigilance and continued research. Endocrine disruptors may enter the sanctuary through numerous sources, including sewage outfalls, runoff and air deposition.
Priority: Low
Status: Planned, 2013

WQ.2 Objective—Reduce Pollutant Discharges and Waste Streams that May Affect the Sanctuary

Background. Recognizing that the sanctuary is home to many endangered marine mammals, seabird, turtle and fish species, and is a place where fish are caught for human consumption and where visitors seek recreation, it is critical to protect water quality. The first two strategies that follow discuss efforts to reduce water pollution threats from vessel discharges that are part of regular vessel operation. The third strategy addresses sanctuary involvement in the reduction of threats from sewage effluents and other shore-side wastewater streams. The fourth strategy focuses on response to or prevention of catastrophic events, such as oil and other hazardous spills or releases of raw sewage.

Strategies (4) To Reduce Pollutant Discharges and Waste Streams that Affect the Sanctuary

(2.1) Reduce Threats to sanctuary water quality from vessel wastewater discharges (other than ballast water). The sanctuary is an area of special national significance and has the responsibility to maintain the highest possible water quality. Any contribution of pollutants from waste streams constitutes potential threats to the safety of sanctuary resources. Understanding the potential impacts of these waste streams is critical in the development of best management practices for water quality.
Priority: High
Status: Planned, 2011
Activities:

2.1.1 In addition to disseminating information on the current sanctuary regulations addressing discharge of black water, oily bilge water, hazardous chemicals, solid wastes, and fish wastes in excess of quantities produced by traditional fishing methods within the sanctuary, encourage vessels transiting sanctuary waters to abstain from other discharge through voluntary compliance. Include a reporting component within the guidelines for vessels to provide documentation on discharge locations.
Status: Planned, 2011

2.1.2 Seek designation of the sanctuary as a No Discharge Area (NDA) under relevant law.
Status: Planned, 2011

2.1.3 Develop an outreach campaign with industry and recreation organizations to encourage 'green' or environmentally sustainable boating and cruising. The objective is to obtain compliance on a voluntary SBNMS NDA for all waste streams except engine cooling water.
Status: Planned, 2012

2.1.4 Support development of pump-out facilities for both large and small vessels and support creative solutions in ports and harbors that host vessels that visit the sanctuary.
Status: Ongoing

2.1.5 Develop a directed research program that examines the cause and effect relationship between discharges/waste water streams and impacts to the ecosystem.
Status: Planned, 2013

(2.2) Reduce ballast water exchanges in the sanctuary. Current efforts in the Northeast are focusing on a regional ballast water management plan which includes identification of scientifically based alternative ballast water exchange zones, actions for ports and harbors and increased pressures for compliance with current voluntary ballast water management efforts. Because of the potential introduction of exotic species and other threats to the ecological integrity of the sanctuary, it is important to reduce (if not outright prohibit) ballast water exchanges near the sanctuary. Ballast water discharge in the SBNMS already is prohibited by sanctuary regulation.
Priority: High
Status: Planned, 2011
Activities:

2.2.1 Encourage prevention of introductions of invasive species through development of ballast water exchange guidelines for the sanctuary through memorandum of understanding with cruise lines and the shipping industry and other shipping related sources.
Status: Planned, 2011

(2.3) Reduce impacts of municipal and other shore-based waste water streams. The MWRA outfall is the largest anthropogenic point source of nutrient inputs to the Massachusetts Bay system. While scientific studies indicate that effluent discharges from the MWRA outfall are not a nutrient concern to Massachusetts Bay and SBNMS, there is discussion and concern over levels of chlorine discharge in the immediate area of the outfall diffusers. Added demands on this system, and/or the addition of new sewage outfalls into Massachusetts Bay; however, may introduce additional nutrients and pollutants that could affect the sanctuary. Cumulative impacts of all waste streams are also unknown at this time and should be monitored.

MWRA's NPDES permit requires an annual report to the sanctuary reviewing any effects on sanctuary resources by the MWRA outfall effluent. Any new or expanded waste streams entering Massachusetts Bay, which might affect sanctuary resources, will need a National Pollutant Discharge Elimination System (NPDES) permit and should incorporate sanctuary monitoring and reporting components developed in consultation with the sanctuary.

Priority: Low
Status: Planned, 2012
Activities:

2.3.1 Review and comment on all NPDES requests for municipal wastewater streams that may impact sanctuary waters, and require sanctuary monitoring and reporting components to any NPDES permit.
Status: Planned, 2011

2.3.2 Continue to provide representation on the MWRA Outfall Monitoring Science Advisory Panel (OMSAP) to track actions that may have impacts on the sanctuary.
Status: Ongoing

(2.4.) Develop contingency plans to address actions and responsibilities to remediate catastrophic water quality events in the sanctuary and support programs that prevent water pollution events. The sanctuary has worked with the USCG and NOAA's Office of Response and Restoration, Emergency Response Division to develop contingency plans for oil spills and other hazardous material spills that may occur in SBNMS (see Strategies IC 2.2 and 2.3). Continued coordination in this effort is essential for the future protection of sanctuary water quality and resources in the event of a spill.

Other significant and possibly catastrophic events may occur involving other pollutants, most significantly the MWRA outfall and the release of partially treated or raw sewage. MWRA's emergency response plan for the outfall covers the possibility of catastrophic failure from natural hazards, including coastal storms (e.g., hurricanes, tornadic events, northeasters and earthquakes).

[Note: The cumulative effects of even small events may also have a detrimental effect on sanctuary water quality, including such activities as lightering (the transfer of petroleum-based matter, which is illegal in the sanctuary) and small vessel collisions with the accompanying release of stored fuel products. In these cases, prevention is the preferred route as opposed to containment and cleanup.]

Priority: Medium
Status: Ongoing
Activities:

2.4.1 Continue to work with the USCG and NOAA Office of Response and Restoration, Emergency Response Division in the updating of oil spill and hazardous material spill contingency plans for the sanctuary.
Status: Ongoing

2.4.2 Work with MWRA to develop a sanctuary component to its emergency response plan for the outfall and make this information transparent to the public.
Status: Planned, 2011

Table 45. Estimated costs for WQ action plan.

Strategy	Estimated Cost ($000)*					Total Estimated 5 Year Cost
	YR 1	YR 2	YR 3	YR 4	YR 5	
(1.1) Develop and implement a water quality monitoring plan	0.0	30.0	30.0	30.0	30.0	120.0
(1.2) Characterize the contaminant loading to the sanctuary from sources.	0	15.0	10.0	10.0	10.0	45.0
(1.3) Encourage research and monitoring of endocrine disrupters and their effects on sanctuary resources.	0.0	15.0	25.0	25.0	20.0	85.0
(2.1) Reduce threats to sanctuary water quality from vessel wastewater discharges (other than ballast water).	0.0	10.0	15.0	15.0	15.0	55.0
(2.2) Reduce ballast water exchanges in the sanctuary.	3.0	3.0	3.0	3.0	3.0	15.0
(2.3) Reduce impacts of municipal and other shore-based waste water streams.	0.0	0.0	0.0	0.0	0.0	0.0
(2.4) Develop contingency plans to address actions and responsibilities to remediate catastrophic water quality events in the sanctuary and support programs that prevent water pollution events.	0.0	0.0	0.0	0.0	0.0	0.0
Total Estimated Annual Cost	**3.0**	**73.0**	**83.0**	**83.0**	**78.0**	**320.0**

*Cost estimates exclude federal labor costs.

Table 46. Performance measures for WQ action plan.

Desired Outcome(s) For This Action Plan			
Water quality in the sanctuary is monitored, assessed, and improved for the protection of living marine and cultural resources.			
Performance Measures	**Means of Evaluation**	**Baseline**	**ONMS Measure**
By 2012, 50% of documented commercial passenger vessels will adhere to new guidelines on reducing discharges in the sanctuary.	SBNMS will track the number of companies that adhere to guidelines by contacting them directly.	Commercial passenger vessels adhering to guidelines: 0	Water Quality
By 2011, data from the water quality monitoring program will be made available to the public via internet by at most six months after collection.	SBNMS will track the time elapsed between collection of water quality monitoring data and posting of same data online.	Water quality monitoring data available to public: 0	Water Quality
By 2011, a science and technical working group will be convened to help develop a water quality monitoring plan.	A SBNMS water quality monitoring plan will be developed.	Existing water quality monitoring plan: 0	Water Quality
By 2012, the sanctuary will be designated as a No Discharge Area (NDA)	NDA status will be achieved.	Provisions to control vessel wastewater discharges in sanctuary: 0	Water Quality
By 2012, ballast water exchange guidelines to prevent introduction of invasive species will be established.	SBNMS will enter into formal agreements with cruise line and shipping interests that transit the sanctuary.	Provisions to control ballast water exchanges in sanctuary: 0	Water Quality

Marine Mammal Protection

1. Marine Mammal Behavioral Disturbance
2. Marine Mammal Vessel Strike
3. Marine Mammal Entanglement

The marine mammal fauna of SBNMS are diverse and have significant ecological, aesthetic and economic value to the communities of New England. For many of these species, some of which are threatened or highly endangered, waters of the sanctuary serve as primary habitat for critical activities that include feeding and nursing. The sanctuary is a high-use area for commercial and recreational vessel traffic that can cause disturbance to or collide with whales, and commercial fisheries in the sanctuary are identified entanglement risks.

Three action plans underscore public scoping concerns regarding marine mammal protection in the sanctuary. The Marine Mammal Behavioral Disturbance (MMBD) Action Plan establishes a framework to address the potential for marine mammal harassment and behavioral disturbance resulting from whale watching, tuna fishing, aircraft overflights and noise pollution. The Marine Mammal Vessel Strike (MMVS) Action Plan identifies means to assess and reduce marine mammal vessel collision that cause serious injury and mortality. The Marine Mammal Entanglement (MME) Action Plan characterizes the threat of marine mammal entanglement with fishing gear. Each plan formulates methods to work with user groups and cross-jurisdictional partners to minimize risk.

Marine Mammal Behavioral Disturbance Action Plan

Issue Statement

The Marine Mammal Behavioral Disturbance (MMBD) Action Plan (AP) makes recommendations to reduce the risk of behavioral disturbance and harassment of marine mammals resulting from the following activities: whale watching, tuna fishing, aircraft overflights and noise pollution. SBNMS serves as a major feeding ground for seven species of endangered, threatened and protected whales and smaller cetaceans. The sanctuary is also a high use area for commercial and recreational vessel traffic and, consequently, a high-risk area for marine mammal disturbance by human-induced activities within and around the sanctuary.

Goal

The goal of the MMBD AP is to strengthen the protection of marine mammals, particularly the threatened and endangered large whales, by assessing and minimizing behavioral disturbance and harassment and by fostering cooperation with agencies having cross-jurisdictional responsibilities that affect them.

Objectives

The MMBD AP has three objectives and associated strategies to reduce the risk of behavioral disturbance and harassment of marine mammals (Table 47).

The objectives are as follows:

- MMBD.1—Reduce Marine Mammal Behavioral Disturbance and Harassment by Vessels
- MMBD.2—Reduce Marine Mammal Behavioral Disturbance and Harassment by Noise
- MMBD.3—Reduce Marine Mammal Behavioral Disturbance and Harassment by Aircraft

The estimated costs for implementation of the MMBD AP are indicated in Table 48. The performance measures are listed in Table 49.

Table 47. Objectives, associated strategies, and priorities for MMBD action plan.

Objective	Strategy	Priority
MMBD.1 Reduce Marine Mammal Behavioral Disturbance and Harassment by Vessels	(1.1) Develop and implement management measures that mitigate behavioral disturbance and risk to whales due to vessel speed and close approach.	High
	(1.2) Develop a process to consider prohibiting vessels from transiting through humpback whale bubble clouds and/or nets.	High
	(1.3) Conduct risk assessment on other activities that could disturb marine mammals.	Low
	(1.4) Develop a research program to better understand vessel interactions with whales.	High
MMBD.2 Reduce Marine Mammal Behavioral Disturbance and Harassment by Noise	(2.1) Establish a Marine Noise Consortium to identify noise sources and possible effects.	High
	(2.2) Develop a marine acoustics research program to establish baseline noise levels and long-term noise budgets.	High
	(2.3) Develop a policy framework for investigating and mitigating noise impacts within SBNMS.	High
MMBD.3 Reduce Marine Mammal Behavioral Disturbance and Harassment by Aircraft	(3.1) Identify information gaps and gather data on overflight activities to determine whether they disturb marine mammals.	Low
	(3.2) Develop outreach advisories with NOAA Fisheries Service to inform the aviation community regarding overflight in proximity to whales.	Low

MMBD.1 Objective—Reduce Marine Mammal Behavioral Disturbance and Harassment by Vessels

Background. This objective is principally directed at the activities of vessels less than 300 gross tons, which include whale watching, certain commercial fishing (e.g., tuna harpoon and trolling), and recreational vessels that actively seek to approach whales. This does not imply that larger vessels are of no concern, and they are addressed more directly under the Marine Mammal Vessel Strike action plan. Noise disturbance is addressed under MMBD.2.

There are more than fifteen commercial whale watch companies operating in SBNMS, with more than twenty boats departing multiple times daily from April through November. Commercial whale watching has the potential to be the most effective means of providing experiential education to visitors in the sanctuary and, thereby, further the sanctuary's conservation and outreach goals. More than a million people visit the sanctuary yearly aboard these platforms, which is approximately the same number of people that annually visit the New England Aquarium (NEAQ) in Boston.

There is increasing concern regarding the short-and long-term impacts of whale watching on the targeted large whales. Impact studies worldwide have shown: changes in ventilation rate (Baker, 1988), avoidance behavior (Donovan, 1986), changes in habitat use (Corkeron, 1995) and abandonment of key habitat (Glockner-Ferrari and Ferrari, 1990) in relation to whale watching. There is also the risk of whales being struck by vessels that approach too close. These concerns are compounded by the increase in popularity of whale watching, not just on commercial vessels, but privately owned recreational vessels as well.

In an attempt to minimize the impacts of whale watching, NOAA established regional guidelines in the Northeast in 1985. The guidelines were published in 1999 and remain in effect today; the guidelines are voluntary and difficult to enforce. A recent study conducted over several years in the sanctuary indicates that compliance with the guidelines is extremely low across the commercial whale watch fleet (Wiley *et al.,* 2006). Because the fleet did not adhere to the guidelines, it was not possible to determine if the guidelines were effective. The high degree of non-compliance, however, indicates that whale watching 'guidelines' cannot be relied upon as a voluntary measure to reduce the risk of behavioral disturbance within the sanctuary.

While the compliance study was directed at commercial whale watch vessels, behavioral disturbance is understood to be a larger problem including whale watching by privately-owned vessels as well. Recreational vessels are often sighted in close proximity to whales. The fast speed at which these vessels can travel impairs the operator's ability to respond quickly and safely to surfacing whales. The vessel's low height above the water reduces the horizon for observation and, therefore, is more susceptible to glare, which further impedes timely detection.

Other activities that may contribute to behavioral disturbance of large whales, based on reports and observations of whale watch naturalists, include tuna fishing and recreational vessels moving through bubble clouds and bubble nets made by feeding humpback whales, and close approaches by recreational watercraft. Tuna fishermen have stated that they target whales and whale watching boats in the sanctuary because of the possible presence of sand lance and herring on which baleen whales and tuna feed (pers comm. MMBD WG, 2004).

Strategies (4) To Reduce Marine Mammal Behavioral Disturbance and Harassment by Vessels

(1.1) Develop and implement management measures that mitigate behavioral disturbance and risk to whales due to vessel speed and close approach. Marine mammals within the SBNMS are the focus of both commercial and recreational whale watching. SBNMS will consider regulating whale watching in the sanctuary based on the following concerns: (1) past incidents in which commercial whale watch vessels and private boaters have struck whales; (2) complaints that vessel operations appeared to disrupt patterns of normal behavior (e.g., separating mothers from dependent calves, preventing whales from surfacing in 'bubble clouds' made during foraging bouts, etc.), and (3) the documented non-compliance with NOAA whale watching guidelines by the commercial whale watch fleet.

Regulations seem warranted because the sanctuary was created in large part to safeguard Stellwagen Bank's historic importance as a feeding area and nursery for threatened and endangered whales. Existing technology has proven reliable and effective in measuring vessel speed and distance relative to whales and can be used in enforcement. Regulation by SBNMS would be conducted in cooperation and consultation with NOAA Fisheries Service NERO.

Priority: High
Status: Planned, 2011
Activities:

1.1.1 Establish criteria for speed controls/restrictions. Document, analyze and assess information pertinent to understanding the relationship between vessel speed and whale strike. Consider amending sanctuary regulations to include resource protection measures associated with vessel speed.
Status: Planned, 2011

1.1.2 Establish criteria for close approach. Document, analyze and assess information pertinent to risk to whales due to close approach of vessels. Consider amending sanctuary regulations to include resource protection measures associated with close approach distance.
Status: Planned, 2011

1.1.3 Establish a SBNMS Naturalist Certification program. Sanctuary-certified naturalists on commercial whale watch vessels would provide the sanctuary with a corps of trained experts, who can provide sanctuary outreach to a large segment of the public. Development of a sanctuary-certified naturalist program would benefit from the cooperation and involvement of education partners and the whale watch industry in project design and implementation. Sanctuary naturalist certification would create added market value for participating companies.
Status: Planned, 2011

1.1.4 Establish a SBNMS Commercial Whale Watch Operator Certification program. The safe operation of commercial whale watch vessels in proximity to endangered/threatened whales is needed to guard against behavioral disturbance and vessel strike. The development of a sanctuary-certified operator program would be based on the cooperation and involvement of vessel captains/owners to benefit from their experience, critical skills and knowledge. Sanctuary operator certification would create added market value for participating companies.
Status: Planned, 2011

1.1.5 Consider establishing a SBNMS Commercial Whale Watch Special Use Permit (SUP). The SUP would require that all permittees acquire and hold both the SBNMS Commercial Whale Watch Naturalist Certificate and the SBNMS Commercial Whale Watch Operators Certificate. If the sanctuary were to adopt whale watch regulations, the SUP would allow permittees limited close approach to whales in a manner similar to that prescribed in the current NOAA whale watch guidelines.
Status: Planned, 2011

1.1.6 Consider establishing a SBNMS Education Partnership Accord with commercial whale watch companies whose vessels operate under the SBNMS Commercial Whale Watch SUP. The SBNMS Education Partnership Accord would provide the means to leverage and promote sanctuary outreach through cooperative product branding and cross-merchandizing with participating whale watch companies operating under terms of the SBNMS SUP. The program would be conducted under the symbol-use authorizing provisions of the National Marine Sanctuaries Act, in cooperation with the non-profit National Marine Sanctuary Foundation. Outreach products could potentially include, but not be limited to, CDs, books, posters, logo mementos and apparel, etc. Standards for content and quality assurance would be established by the ONMS, in consultation with DOC.
Status: Planned, 2011

1.1.7 Investigate the possibility of establishing a SBNMS Small-Grants Whale Watch Education/ Outreach program. A competitive, annual small-grants program would be explored for sanctuary-certified naturalists working on vessels operating under the SBNMS Commercial Whale Watch SUP. The grants would be awarded as an incentive to improve education and outreach aboard sanctuary certified whale watch boats.
Status: Planned, 2011

(1.2) Develop a process to consider prohibiting vessels from transiting through humpback whale bubble clouds and/or nets. Vessels transiting bubble clouds or bubble nets may strike large whales or disrupt critically important feeding behaviors. Whales actively engaged in capturing elusive

prey by these behaviors may be inattentive to other activities in their environment and could be particularly susceptible to being struck by a transiting vessel.

Priority: High

Status: Planned, 2012

(1.3) Conduct risk assessment on other activities that could disturb marine mammals. Additional activities that have the potential to affect critical whale behaviors include motorized personal watercraft and kayaks in proximity to whales, and planes and airships. Many of these activities have been managed in other areas (e.g., Alaska, Hawaii). The sanctuary should assess and understand their possible impacts and, if necessary, manage these activities in SBNMS.

Priority: Low

Status: Planned, 2012

(1.4) Develop a research program to better understand vessel interactions with whales. Research can provide necessary information to inform future protective efforts by the sanctuary. [Note: Information on short-and long-term impacts of vessels and their associated noise on whales is particularly needed (see Objective MMBD.3—Establish Protocols for Noise Disturbance in the Vicinity of Whales).]

Priority: High

Status: Ongoing

Activities:

1.4.1 Monitor the number of whale watch vessels (e.g., commercial and recreational) using the sanctuary to determine trends in whale watching activity over time. Continue to conduct standardized trackline survey studies to monitor the spatial and temporal distribution of whales and vessels in the sanctuary.

Status: Ongoing

1.4.2 Encourage species recognition and individual identification studies of whales, as such studies provide an opportunity to determine the long-term impacts of behavioral disturbance.

Status: Ongoing

1.4.3 Encourage partner institutions and agencies to consider how existing data and shared scientific interests might be better applied to understanding the impacts of behavioral disturbance on whales.

Status: Ongoing

1.4.4 Investigate research strategies to determine short-term and cumulative impacts of human activities on whales, including but not limited to assessing harassment and disruption of marine mammals (i.e., to better define approach protocols).

Status: Ongoing

1.4.5 Investigate non-invasive tagging programs to provide a more continuous record of whale behavior.

Status: Ongoing

MMBD.2 Objective—Reduce Marine Mammal Behavioral Disturbance and Harassment by Noise

Background. People and marine animals use sound in the sea to accomplish many tasks. Because light travels relatively short distances in the ocean, sound is often used for such basic activities as finding food or a mate, navigating and communicating. For that reason, the oceans are filled with sound generated by a variety of natural sources, including not only marine life but also abiotic sources such as breaking waves, earthquakes, wind and rain. Underwater sound is also generated by a variety of anthropogenic sources, such as vessels, military sonar, oil and gas drilling and some oceanographic research technologies. The background 'omnipresent' sound in the ocean is called ambient noise. The primary sources of ambient noise vary with the frequency. For example, vessels primarily generate noise between 20-500 Hz, whereas ambient noise between 500-100,000 Hz is mostly due to spray and bubbles associated with breaking waves.

Current knowledge about the effects of sound on marine animals relies heavily on experimentation with small numbers of individuals in captivity and/or post-hoc evaluation of mortality events in the wild, in which cause-and-effect is often impossible to determine. Due to their charismatic nature, their use of sound for communication, and their protected status, marine mammals have been the focus of increasing levels of attention and controversy associated with the possible adverse effects of noise in the marine environment. Marine mammals have been shown to manifest behavioral changes in the presence of certain types of noise (Erbe C., 2002; Frankel and Clark, 2002; Patenaude *et al.,* 2002; Richardson and Wursig, 1997). Exposure to anthropogenic noise can impact cetaceans by masking biologically important sounds (e.g., intraspecific communication and localization of prey resources), provoking avoidance or attraction, causing temporary or permanent hearing damage and, in extreme cases, death (Yost, 1994; Richardson *et al.,* 1995).

In its 2003 report (one of three devoted to sound sources and marine mammals), the U.S. National Research Council (NRC) Committee on the Potential Impacts of Ambient Noise in the Ocean on Marine Mammals concluded that concern surrounding anthropogenic sound and marine mammals was warranted, given: (1) the threatened and endangered status of many marine mammals; (2) the identified importance of sound in the lives of marine mammals; (3) the potential for harm from excessive noise; and (4) the paucity of data with regards to the amount of sound introduced into the oceans by human activity and its potential impact on marine mammals (National Research Council of the National Academies, 2003).

The NRC's report recommended the establishment of 'noise budgets', defined as the sum of the relative contributions made by identified sound sources to the total sound field (National Research Council of the National Academies,

2003). The report further recommended that 'noise budget' determinations for various parts of the ocean should include representations of seasonal and spatial/temporal differences. Finally, the NRC specifically identified the need to define the sound contribution of different vessel types within the major category of shipping. While the report's focus was global, many of its insights and recommendations are applicable at the sanctuary level to provide a local understanding of the issue. Insights achieved at the local level can then be used to inform the larger issue at national and international levels.

Numerous anthropogenic sources of underwater sound produced both within and in the waters surrounding SBNMS contribute to the sanctuary's ambient noise budget. Commercial, recreational, military and research vessels all contribute to ambient underwater noise in the sanctuary, whether directly through their marine operations (e.g., engines, props and electronics) or indirectly through the activities they perform (e.g., towing and dredging). Whales are known to aggregate in and near the existing traffic separation scheme (i.e., shipping lanes to and from the Port of Boston) and their long-term acoustic exposure to vessel traffic may represent a source of chronic impact. The operations of fishing vessels regularly overlap the distribution of cetaceans in the sanctuary and may be an additional source of repeated acoustic disturbance. In addition, some vessels, such as commercial and private whale watching boats, preferentially expose large whales to noise as a byproduct of routine and frequent close approaches, creating another opportunity for chronic exposure. Finally, because low-frequency sounds from industrial and commercial activities taking place or proposed within the waters of Massachusetts and Cape Cod Bays, and even the greater GoM, can retain their intensities over long distances, such activities contribute or will contribute to the levels of low frequency sound in the sanctuary.

Characterizing the status of the sanctuary's acoustic environment and identifying potential threats to sanctuary resources are essential, both to meeting the NMSA objectives for each site and to developing partnerships both within NOAA and between agencies to implement ecologically-holistic, ecosystem-based management of sanctuary resources. The following strategies provide the framework to assess and mitigate anthropogenic noise in SBNMS occurring at levels: (1) where behavioral disturbance is clearly evident; and (2) when behavioral disturbance is not apparent, but where animals have habituated to detrimental noise levels.

Strategies (3) To Reduce Marine Mammal Behavioral Disturbance and Harassment by Noise

(2.1) Establish a Marine Noise Consortium to identify noise sources and possible effects. The sanctuary will sponsor a Marine Noise Consortium (or work with other potential sponsoring agencies or institutions) to examine and promulgate research on noise in and around the sanctuary and its effects on marine mammals. Recognizing the need for independent targeted research and for maintaining the scientific integrity of data sets, members of the Marine Noise Consortium would agree to partner with the sanctuary and would make raw data available through an established data-use policy.

Priority: High
Status: Ongoing

(2.2) Develop a marine acoustics research program to establish baseline noise levels and long-term noise budgets. Measure and evaluate baseline values and variation in background noise levels from sources (activities) within or propagating into the sanctuary. The marine acoustic research program should be an extension of the sanctuary's current ocean observing system (2005) for large scale monitoring and mapping of noise within SBNMS, identifying noise sources and evaluating potential impact on marine mammals.

Priority: High
Status: Ongoing
Activities:

2.2.1 Install and monitor a hydrophone array on the seafloor covering at least 50% of the sanctuary area and maintain and manage the resulting data set to: (1) determine current noise levels; (2) monitor and document long-term noise budgets; and (3) provide a record of noise levels coincident with critical events such as ship strikes and cetacean strandings to evaluate the potential impact from specific noise sources on marine mammals.
Status: Ongoing

2.2.2 Implement a tagging program to evaluate the potential for acoustic exposure and animal responses to acoustic stimuli.
Status: Ongoing

(2.3) Develop a policy framework for investigating and mitigating noise impacts within SBNMS. Given increased scientific and public concern over the impact of anthropogenic sounds on marine mammals, develop a marine acoustics policy framework for SBNMS that: (1) addresses the potential for harm to marine mammals from excessive noise; (2) contends with the paucity of data on the amount of sound introduced into the oceans by human activity and its associated impacts on marine mammals; (3) identifies opportunities for collaboration with sound producers (e.g., vessel owners/operators) in mitigating and/or monitoring their impacts on sanctuary resources; and (4) highlights the possible utility of sanctuaries as case studies for establishing domestic and international policies pertaining to noise in the marine environment.

Priority: High
Status: Ongoing

MMBD.3 Objective—Reduce Marine Mammal Behavioral Disturbance and Harassment by Aircraft

Background. Submarine sound levels generated by aircraft overflight depend on receiver depth underwater and altitude, aspect and strength of the noise source. The auditory

systems of baleen whales are thought to be sensitive to low-frequency underwater sounds, based on the predominantly low frequency of their calls, their auditory anatomy and their observed reactions to various low frequency sounds (Ketten, 2000).

In contrast, dolphins have insensitive underwater hearing below 1 kHz, but acute hearing at frequencies greater than 10 kHz. Dolphins received levels of low-frequency tones 18 meters below the sea surface from aircraft flying directly overhead at an altitude of 160 meters; these tones were well below their auditory thresholds and presumably inaudible (Ketten, 2000). Acoustic research associated with overflight noise should be directed at acoustic impacts on large baleen whales in the sanctuary.

SBNMS has no overflight restrictions and no studies on aircraft disturbance have been conducted in the sanctuary area. Overflight concerns include fixed-wing aircraft, helicopter and airship disturbance. The lack of overflight restrictions may result in undue disturbance to marine mammals.

Strategies (2) To Reduce Marine Mammal Behavioral Disturbance and Harassment by Aircraft

(3.1) Identify information gaps and gather data on overflight activities to determine whether they disturb marine mammals. No studies on aircraft disturbance due to overflight have been conducted in the vicinity of SBNMS and no baseline data exist.

Priority: Low
Status: Ongoing
Activities:

3.1.1 Work with the FAA to produce a descriptive database to document and portray overflight patterns in the vicinity of SBNMS by planes, helicopters, airships and other aircraft.
Status: Planned, 2012

(3.2) Develop outreach materials or messages with NOAA Fisheries Service to inform the aviation community regarding overflight in proximity to whales. There are no site-specific overflight regulations in SBNMS. However, the NOAA Northeast Regional Guidelines on approach to marine mammals cover both vessels and aircraft (see Background MMBD 1). The NOAA approach guidelines stipulate that aircraft should maintain a minimum altitude of 1,000 feet over water. Additionally, the Code of Federal Regulations (50 CFR 224.103 (c)) for North Atlantic right whales prohibit "approach (including by interception) within 500 yards (460 meters) of a right whale by vessel, aircraft, or any other means." The NOAA approach guidelines and regulations are not reflected in FAA publications.

Priority: Low
Status: Planned, 2011
Activities:

3.2.1 NOAA National Ocean Service and NOAA Fisheries Service should approach the FAA to change FAA Overflight Regulations Title 14, Part 91 Subpart B (Flight Rules) section 91.119 (c). The flight rule reads: "(c) Over other than congested

Table 48. Estimated costs for MMBD action plan.

Strategy	Estimated Cost ($000)*					Total Estimated 5 Year Cost
	YR 1	YR 2	YR 3	YR 4	YR 5	
(1.1) Develop and implement management measures that mitigate behavioral disturbance and risk to whales due to vessel speed and close approach	35.0	50.0	50.0	50.0	50.0	235.0
(1.2) Develop a process to consider prohibiting vessels from transiting through humpback whale bubble clouds and/or nets.	2.0	2.0	1.0	1.0	1.0	7.0
(1.3) Conduct risk assessment on other activities that could disturb marine mammals.	0.0	0.0	0.0	0.0	0.0	0.0
(1.4) Develop a research program to better understand vessel interactions with whales.	30.0	40.0	30.0	20.0	15.0	135.0
(2.1) Establish a Marine Noise Consortium to identify noise sources and possible effects.	5.0	4.0	4.0	4.0	4.0	21.0
(2.2) Develop a marine acoustics research program to establish baseline noise levels and long-term noise budgets.	500.0	500.0	500.0	500.0	500.0	2500.0
(2.3) Develop a policy framework for investigating and mitigating noise impacts within SBNMS.	75.0	75.0	75.0	0.0	0.0	225.0
(3.1) Identify information gaps to gather additional data on overflight activities to understand the potential disturbance of marine mammals.	0.0	0.0	0.0	0.0	0.0	0.0
(3.2) Develop outreach materials or messages with NOAA Fisheries Service to inform the aviation community regarding overflight in proximity to whales.	0.0	0.0	0.0	0.0	0.0	0.0
Total Estimated Annual Cost	**647.0**	**671.0**	**660.0**	**575.0**	**570.0**	**3123.0**

*Cost estimates exclude federal labor costs.

Table 49. Performance measures for MMBD action plan.

Desired Outcome(s) For This Action Plan			
The behavioral disturbance and harassment of marine mammals by human activities is minimized.			
Performance Measures	**Means of Evaluation**	**Baseline**	**ONMS Measure**
By 2012, the sanctuary will develop and implement a whale watching management program that reduces the risk of behavioral harassment.	Management measures will be in effect that could include regulatory controls, certification requirements, special use permitting and partnership accords.	Number of management measures: 1 (approach guidelines and MMPA and ESA)	Protect Resources
By 2011, SBNMS will complete implementation of a noise-monitoring program covering 50-85% of the sanctuary, with a representative noise budget subsequently being calculated within two-five years.	SBNMS will deploy up to ten Automatic Recording Units (ARUs) for at least 12 months with data collected, managed, and analyzed.	Number of ARUs : 0	Characterize Site
By 2013, SBNMS will complete most fieldwork and analyses associated with non-invasive whale tagging projects.	Data analyses will provide a more continuous record and understanding of whale behavior relative to vessels and noise.	Number of completed studies: 0	Protect Resources

areas. An altitude of 500 feet above the surface, except over open water or sparsely populated areas. In those cases, the aircraft may not be operated closer than 500 feet to any person, vessel, vehicle, or structure." FAA should consider revising the rule, for example, to delete the word 'or' following the word 'vehicle' and insert "or marine mammal, except where more restrictive regulations prevail." The agency differences in minimum overflight altitude also need to be addressed and resolved.
Status: Planned, 2012

3.2.2 Work with pilot associations to include SBNMS notation and current NOAA Fisheries Service Northeast Region overflight guidelines on aeronautical charts and information materials.
Status: Planned, 2012

3.2.3 Evaluate the need for sanctuary regulations to govern the operation of airplanes, helicopters, airships, and other aircraft in the presence of marine mammals.
Status: Planned, 2012

Marine Mammal Vessel Strike Action Plan

Issue Statement

The Marine Mammal Vessel Strike (MMVS) Action Plan (AP) makes recommendations to reduce the risk of collision between vessels and marine mammals that cause injury or mortality to the animals, harm to operators and damage to vessels. Ship strikes represent one of the two major threats that are likely to prevent the recovery of critically endangered North Atlantic right whales and endangered humpback whales. Vessel strikes continue to pose a risk to endangered whales wherever they overlap with ship traffic.. Concern in recent years has intensified as marine traffic has come to involve larger and faster vessels.

Goal

The goal of the MMVS AP is to assess the occurrence and potential of collision to marine mammals; determine the means to mitigate collision through research, education and appropriate management; and foster cooperation with cross-jurisdictional agency partners that affect marine mammals.

Objectives

The MMVS AP has three objectives and associated strategies to reduce collision, and the potential for collision, to marine mammals by commercial ships as well as those vessels not actively engaged in approaching whales for viewing (Table 50). [Note: Vessels actively engaged in viewing are discussed in Objective MMBD.1.]

- MMVS.1—Reduce Risk of Vessel Strike between Large Commercial Ships and Whales
- MMVS.2—Reduce Risk of Vessel Strike through Speed Restrictions
- MMVS.3—Support and Develop Research Programs to Reduce the Risk of Vessel Strike

The estimated costs for implementation of the MMVS AP are indicated in Table 51. The performance measures are listed in Table 52.

Table 50. Objectives, associated strategies, and priorities for MMVS action plan.

Objective	Strategy	Priority
MMVS.1 Reduce the Risk of Vessel Strike between Large Commercial Ships and Whales	(1.1) Consult with NOAA Fisheries Service on their proposed strategy to reduce ship strike to North Atlantic right whales and evaluate how such measures would affect the sanctuary.	High
	(1.2) Develop, demonstrate and evaluate the SBNMS Information and Reporting Center.	High
	(1.3) Determine the conservation benefit of reconfiguring the existing Traffic Separation Scheme (TSS) within the sanctuary to reduce the risk of ship strike to whales.	High
MMVS.2 Reduce the Risk of Vessel Strike through Speed Restriction on Vessels	(2.1) Institute year-round voluntary speed restrictions for all vessels operating in the sanctuary.	High
MMVS.3 Support and Develop Research Programs to Reduce the Risk of Vessel Strike	(3.1) Work with NOAA Fisheries Service to support their ongoing database of all known vessel strikes in and around the sanctuary.	High
	(3.2) Work with NOAA Fisheries Service to institute a toll free number to enable callers to anonymously report vessel strikes in the sanctuary.	Medium
	(3.3) Investigate research strategies to determine responses of whales to approaching vessels.	High
	(3.4) Conduct year-round monitoring to identify type, size, route and speed of vessels in the sanctuary.	High
	(3.5) Investigate use of forward-looking sonar or other real-time detection technologies.	Low

Background. Data from Jensen and Silber (2003) indicate that the SBNMS area is a 'hot spot' for vessel strikes along the eastern seaboard of the United States, with approximately nine percent (26/292) of the world-wide data reported from the sanctuary area (including Cape Cod Bay and Boston Harbor). In SBNMS, reported vessel collisions occur with four endangered species (humpback, finback, sei and North Atlantic right whales) and one protected species (minke whales). Most strikes involve humpback whales (39%, 13/33) and fin whales (27%, 9/33). Notably, vessel strikes are the leading cause of human-induced mortality in critically endangered right whales (Knowlton *et al.,* 2001).

Vessel strikes in the sanctuary are reported throughout the year. However, 76% (25/33) occur between May and August, a time when whales and opportunistic observations increase; 39% (13/33) of these reported strikes resulted in mortality or serious injury. Commercial whale watch vessels were involved in 27% (9/33) of the strikes; private recreational boats were involved with 12% (4/33); and, large commercial ships (e.g., container ship or ferry) struck 9% (3/33) (Jensen and Silber, 2003). Observations of ship struck whales, other than those actually hit by commercial whale watching vessels, are not biased by observations made possible by observers on whale watching trips because most records are generated from beach cast carcasses or carcasses floating at sea.

Possible factors contributing to vessel strikes include: (1) the density of whales and vessels; (2) the ability of whales and vessel operators to detect each other; and (3) the ability of whales or vessel operators to maneuver to avoid collisions. Any type of vessel is capable of causing a fatal strike, but the intensity of the collision depends on the size (tonnage) of the vessel and the speed at which it is traveling.

Where vessel type is known, the majority of reported whale collisions on a world-wide basis are from the U.S. Navy/USCG (14.9% of the 292 strikes) and commercial whale watch boats (14.2% of the 292 strikes) (Jensen and Silber, 2003). These data are affected by disproportionate reporting. For example, it is standard operating practice for the U.S. Navy and USCG to report a strike, and commercial whale watch vessel operators or passengers are more likely to be aware of, and report, a collision than other sources.

Apart from this information, there is a paucity of specific data regarding vessel collisions with whales, as the vast majority of strikes go undetected or unreported. When whale mortality is recognized as resulting from vessel strike, (i.e., as determined by necropsy of a beached whale) identifying the specific vessel or vessel type is difficult.

MMVS.1 Objective—Reduce the Risk of Vessel Strike between Large Commercial Ships and Whales

Background. Large commercial ships—defined as those vessels with a weight of greater than 300 gross tons, or tugs and barges with a combined weight of more than 300 gross tons—represent a distinct class of vessels. In this action plan, large commercial ships are separated from other vessel types due to issues of maneuverability (i.e., their inability to take sudden actions to avoid collisions with whales).

Strategies (3) To Reduce the Risk of Vessel Strike between Large Commercial Ships and Whales

(1.1) Continue to consult with NOAA Fisheries Service on their strategy to reduce ship strikes to North Atlantic right whales and evaluate how such measures affect the sanctuary. North Atlantic right whales are critically endangered and

should be accorded special consideration. NOAA Fisheries Service has implemented a Ship Strike Reduction Program to reduce collision risk between North Atlantic right whales and commercial ships while minimizing adverse impacts on the shipping industry. This program includes seasonal management areas (SMAs) within which all vessels 65 feet and over are required to reduce their speed to 10 knots or less during specific time periods. Two of these SMAs overlap SBNMS boundaries (Cape Cod Bay Seasonal Management Area and Off Race Point Seasonal Management Area).

Priority: High
Status: Ongoing
Activities:

1.1.1 SBNMS should continue to work with NOAA Fisheries Service on measures to reduce vessel strike risk for large whales in the sanctuary.
Status: Ongoing

(1.2) Develop, demonstrate and evaluate the SBNMS Information and Reporting Center. The SBNMS should create a pilot project to assess the feasibility of developing the SBNMS Marine Mammal Information and Reporting Center (MMIRC) based on use of the Automatic Identification System (AIS). The project would: (1) investigate the ability of the MMIRC to identify and provide information to ships entering the SBNMS; (2) identify the actions of the vessels based on the information provided; (3) assess the adequacy of whale sighting and reporting information; and (4) evaluate the efficacy of the MMIRC for reducing the risk of vessel/whale collisions. If the pilot project determines the MMIRC to be an effective way of reducing risk of collision, the sanctuary should consider establishing the program as an ongoing management tool.

Priority: High
Status: Planned, 2011

(1.3) Determine the conservation benefit of reconfiguring the existing Traffic Separation Scheme (TSS) within the sanctuary to reduce the risk of ship strike to whales. An effective way to reduce vessel collisions with whales is to separate them in space and/or time. Moving the TSS in the sanctuary from high whale use areas to low use areas would achieve that objective.

Priority: High
Status: Completed
Activities:

1.3.1 Conduct analyses to determine whether safer routes could be recommended for large commercial ship passage through the SBNMS. Identify routing to reconfigure the existing TSS into the Port of Boston and, thereby, reduce potential whale strikes by large commercial vessels transiting the sanctuary.
Status: Completed

1.3.2 Collaborate with the NOS General Counsel International, NOAA Fisheries Service and the USCG to develop a proposal to the International Maritime Organization (IMO) to reconfigure the current TSS and reduce the potential for whale strikes by large commercial vessels transiting the sanctuary.
Status: Completed

MMVS.2 Objective—Reduce the Risk of Vessel Strike by Speed Restrictions

Background. Fast moving vessels pose inherent risks to marine mammals and other sanctuary resources. The SBNMS wants to consider a range of ways to restrict vessel speed to prevent interactions with and damage to those resources. The sanctuary also wants to evaluate a range of speeds that may be appropriate under different conditions while recognizing that vessel safety considerations are important.

When aggregations of right whales are known to be present in an area, NOAA Fisheries Service establishes a Dynamic Management Area (DMA) for a period of 15 days and requests that mariners travel at 10 knots or less through the zone. Establishing these zones requires confirming the presence of endangered whales by conducting aerial surveys or receiving sighting reports from experienced individuals.

The SBNMS is considering developing generic voluntary speed restrictions that would apply to all vessels operating within the sanctuary. These would likely allow for faster speeds than specific guidance when DMAs are in place or when other endangered whales are known or likely to be present. At those times, the more restrictive speed limits would apply. Voluntary SBNMS restrictions would augment measures by (1) NOAA Fisheries Service (i.e., measures to reduce interactions between North Atlantic right whales and large commercial ships), and (2) possible SBNMS speed controls/restrictions addressing marine mammal behavioral disturbance by whale watching and other vessels (see Strategy MMBD 1.1). The sanctuary would review and evaluate the effectiveness of the voluntary speed restriction at the end of five years or sooner if new information becomes available.

Strategy (1) To Reduce the Risk of Vessel Strike across all Vessel Categories

(2.1) Institute year-round voluntary speed restrictions for all vessels operating in the sanctuary. Examination of available data on vessel speeds representing customary practice in the sanctuary indicates that 20 knots is an approximate mean maximum cruising speed for most whale watch vessels, commercial fishing boats, party and charter fishing vessels, and many of the larger personal recreation boats. Data examined include 20-year records maintained by the Whale Center of New England for the commercial whale watch fleet and recent evaluation of Automatic Identification System vessel tracks for large commercial vessels collected by SBNMS.

A voluntary recommendation to reduce all vessel speeds throughout the year in SBNMS waters would serve to complement regulatory measures by NOAA Fisheries Service as part of the NOAA Ship Strike Reduction Program as well as NOAA Fisheries Service and USCG notices to mariners. The regulations require vessels greater than or equal to 65 feet

in overall length and subject to the jurisdiction of the U.S., or entering or departing a port or place under the jurisdiction of the U.S., to reduce speed to 10 knots or less within specific Seasonal Management Areas (SMAs) along the US east coast (50 CFR 224.105). The SMAs include the areas and times where right whales occur predictably from year to year. There are certain exemptions to the speed restrictions for navigational safety, as well as Federal vessels and law enforcement vessels. The rule is set to expire on December 9, 2013.

Two of the Seasonal Management Areas in the ship strike regulations overlap the SBNMS, and result in speed restrictions within a maximum of 63% of the sanctuary during 2 months of the year and have no coverage in the sanctuary during 7.5 months of the year. The SBNMS's collaborative passive acoustic research efforts with NOAA Fisheries Service (NEFSC and NERO) and Cornell University's Bioacoustics Research Program is providing increasing evidence that right whales predictably utilize sanctuary waters during periods and within areas for where speed restrictions do not currently apply. In addition, the SBNMS is concerned with risks of injury associated with smaller vessel traffic operating at higher overall speeds and largely outside of the recently shifted TSS. Thus, year-round generic guidelines for all vessels operating within the sanctuary would supplement NOAA Fisheries Service's ship strike strategy within sanctuary waters.

The voluntary speed restriction complements a suite of possible new and existing management actions that together would lower the risk of collision further. These include: (1) requiring vessels to reduce speed within proximity of whales (see Strategies MMBD 1.1 and MMVS 1.1); (2) prohibiting vessels from transiting through humpback whale bubble clouds and/or nets (see Strategy MMBD 1.2); (3) realignment of the TSS in the sanctuary (see Strategy MMVS 1.3); and, (4) vessel speed restrictions implemented through the NOAA Ship Strike Reduction Program. Implementation of this voluntary speed restriction would be by means of Strategy POE 1.2.

Priority: High
Status: Planned, 2011

MMVS.3 Objective—Support and Develop Research Programs to Reduce the Risk of Vessel Strikes

Background. There is a paucity of detailed data regarding vessel collisions with whales. In order to minimize the risk of collision to whales, it is important that the sanctuary gain a greater understanding of the nature of the risk to both the whales and vessels. This can be accomplished by investigating the behavior of whales, the behavior of ships, and their behavioral interaction.

Strategies (5) To Support and Develop Research Programs to Reduce the Risk of Vessel Strikes

(3.1) Work with NOAA Fisheries Service to support their ongoing database for all known vessel strikes in and around the sanctuary. It is necessary to continue monitoring and

Table 51. Estimated costs for MMVS action plan.

Strategy	Estimated Cost ($000)*					Total Estimated 5 Year Cost
	YR 1	YR 2	YR 3	YR 4	YR 5	
(1.1) Consult with NOAA Fisheries Service on their proposed strategy to reduce ship strike to North Atlantic right whales and evaluate how such measures would affect the sanctuary.	0.0	0.0	0.0	0.0	0.0	0.0
(1.2) Develop, demonstrate and evaluate the SBNMS Information and Reporting Center.	20.0	20.0	25.0	10.0	10.0	85.0
(1.3) Determine the conservation benefit of reconfiguring the existing TSS within the sanctuary to reduce the risk of ship strike to whales.	0.0	0.0	0.0	0.0	0.0	0.0
(2.1) Institute year-round voluntary speed restrictions for all vessels operating in the sanctuary.	5.0	5.0	3.0	3.0	3.0	19.0
(3.1) Work with NOAA Fisheries Service to support their ongoing database of all known vessel strikes in and around the sanctuary.	0.0	0.0	0.0	0.0	0.0	0.0
(3.2) Work with NOAA Fisheries Service to institute a toll free number to enable callers to anonymously report vessel strikes in the sanctuary.	0.0	2.0	2.0	2.0	2.0	8.0
(3.3) Investigate research strategies to determine responses of whales to approaching vessels.	0.0	50.0	50.0	50.0	50.0	200.0
(3.4) Conduct year-round monitoring to identify type, size, speed, and route of vessels in the sanctuary.	40.0	0.0	0.0	0.0	0.0	40.0
(3.5) Investigate use of forward-looking sonar or other real-time detection technologies.	0.0	0.0	30.0	30.0	30.0	90.0
Total Estimated Annual Cost	**65.0**	**77.0**	**110.0**	**95.0**	**95.0**	**442.0**

*Cost estimates exclude federal labor costs.

Table 52. Performance measures for MMVS action plan.

Desired Outcome(s) For This Action Plan			
The occurrence of vessel collisions with marine mammals is minimized.			
Performance Measures	**Means of Evaluation**	**Baseline**	**ONMS Measure**
By 2012, SBNMS will monitor 100% of large ships (>300 gross ton) traversing the Sanctuary, including their location, speed, time of arrival at and departure from port.	SBNMS will track ship traffic traversing the sanctuary using Automatic Identification System (AIS) data and analyze compliance with ship strike mitigation strategies (NMFS.)	Percent of large ships being monitored: 0	Living Marine Resources
By 2010, SBNMS will propose new routing measures for large ships to reduce by 50% or more the risk of ship strikes to large whales in the Traffic Separation Scheme (TSS) for the Port of Boston	SBNMS will keep track of the development of new routing measures in collaboration with the U.S. Coast Guard and the IMO.	Present risk of ship strikes within the TSS (as measured by the number of whales seen in the TSS).	Living Marine Resources
By 2011, SBNMS will institute voluntary speed restrictions for all vessels operating in the sanctuary.	SBNMS will track vessel speed remotely by AIS and on-the-water monitoring.	Existing speed controls (other than whale watch approach guidelines): 0	Living Marine Resources

recording vessel strikes to determine trends and develop detailed baselines to assess effectiveness of management actions.

Priority: High
Status: Ongoing

(3.2) Work with NOAA Fisheries Service to institute a toll free number to enable callers to anonymously report vessel strikes in the sanctuary. Currently, an 800-number is not available to the public to assist the reporting of vessel strikes.

Priority: Medium
Status: Planned, 2010

(3.3) Investigate research strategies to determine responses of whales to approaching vessels. Research is needed to understand how whale behavior relates to the probability of vessel collisions. Such information would help prescribe management approaches to mitigate the risk of vessels striking whales.

Priority: High
Status: Ongoing

(3.4) Conduct year-round monitoring to identify type, size, route and speed of vessels in the sanctuary. The sanctuary (1) will continue periodic trackline survey studies to monitor the spatial and temporal distribution of whales and all vessel types in the sanctuary; (2) it will continue to implement its AIS to record speed and routing of large commercial ships in real time and to archive data acquired for systematic analysis; and (3) it will monitor trends in vessel use (e.g., vessel types and numbers using the sanctuary, new vessel designs, etc.) over years.

Priority: High
Status: Ongoing

(3.5) Investigate use of forward-looking sonar or other real-time detection technologies. This effort would notify vessels of whales in their path; however, potential issues of concomitant behavioral harassment would have to be addressed.

Priority: Low
Status: Planned, 2012

Marine Mammal Entanglement Action Plan

Issue Statement

The Marine Mammal Entanglement (MME) Action Plan (AP) makes recommendations to reduce the risk of entanglement of marine mammals in fishing gear in the sanctuary. The concern extends to sea turtle and sea bird entanglement. The immediate effects of entanglement can include mortality, serious injury, minor injury, or possibly no injury. The long-term effects can include deteriorating health, behavioral disruptions, decreased reproductive ability, or may have no impact.

Goal

The goal of the MME AP is to assess and minimize the risk of entanglement of marine mammals, sea turtles and sea birds in the sanctuary; promote methods to successfully disentangle animals; foster cooperation with cross-jurisdictional agency partners; and educate sanctuary users regarding the issue.

Objectives

The MME AP has three objectives and associated strategies to improve the success of disentanglement efforts and to reduce the risk of entanglement of marine mammals (Table 53).

- MME.1—Aid Disentanglement Efforts
- MME.2—Reduce Marine Mammal Interaction with Trap/Pot Fisheries
- MME.3—Reduce Marine Mammal Interaction with Gillnet Fisheries

The estimated costs for implementation of the MME AP are indicated in Table 54. The performance measures are listed in Table 55.

Table 53. Objectives, associated strategies, and priorities for MME action plan.

Objective	Strategy	Priority
MME.1 Aid Disentanglement Efforts	(1.1) Maximize the degree to which entangled animals in the sanctuary are sighted and reported.	High
	(1.2) Maximize ability of vessels and aircraft to stand-by entangled animals.	High
	(1.3) Undertake activities leading to improved understanding and prevention of entanglement events in SBNMS and improvements in disentanglement technology.	Medium
MME.2 Reduce Marine Mammal Interaction with the Trap/Pot Fishery	(2.1) Obtain gear modifications.	High
	(2.2) Serve as test-bed to develop and demonstrate low-risk fishing gear.	Medium
MME.3 Reduce Marine Mammal Interaction with the Gillnet Fishery	(3.1) Obtain gear modifications.	High
	(3.2) Develop research programs.	Medium

MME.1 Objective—Aid Disentanglement Efforts

Background. Entanglement in fishing gear is a primary threat to endangered, threatened and protected whales in the western North Atlantic. While it is not always apparent where a whale became entangled, there is a high co-occurrence of baleen whales and fixed fishing gear within the sanctuary (Wiley *et al.,* 2003). Between 1985 and 2004, 57 confirmed large whale entanglements were reported within the SBNMS boundaries including a five-mile buffer around the borders (Morin, personal communication, 2004; NOAA Fisheries Service Large Whale Entanglement Reports).

The marine mammal species reported to interact with fisheries include: baleen whales and trap (e.g., lobster, crab, and hagfish) and gillnet fisheries; small cetaceans (e.g., harbor porpoise or white-sided dolphin) and gillnet fisheries; and pinnipeds (e.g., harbor seals) and gillnet and trap fisheries. Because of potential impacts to marine mammals from entanglements, most fixed-gear fishermen (e.g., trap and gillnet fisheries) are required under Federal Take Reduction Plans to use modified gear and comply with time and area closures to reduce entanglements.

Approximately half (48-65%) of Gulf of Maine (GOM) humpback whales (Robbins and Mattila, 2001) and three quarters (76%) of critically endangered North Atlantic right whales (Knowlton *et al.,* 2005) display scars indicative of past entanglement. Seabirds and sea turtles are also at risk. Entanglements can result in fatalities due to drowning, infection, restricted mobility, starvation and stress. Entanglement can potentially reduce the reproductive success of animals surviving the event (Robbins and Mattila, 2001).

In some cases, whales can be released from entanglements. This process is known as "disentanglement" and NOAA Fisheries Service authorized the Atlantic Large Whale Disentanglement Network (ALWDN) to facilitate disentanglement success. The Provincetown Center for Coastal Studies (PCCS) holds a NOAA Fisheries Service permit (as part of ALWDN) to disentangle large whales within Massachusetts state waters and adjacent Federal waters including the SBNMS. Disentanglement success is highly dependent on vessels maintaining contact with or 'standing-by' entangled animals. Without such stand-by, disentanglement teams have great difficulty relocating animals reported as entangled, greatly increasing the cost and risk of the effort.

Seventy-four percent of entangled whale sightings originate from the commercial whale watch fleet. Other reporting groups include fishermen, aerial surveys and existing entanglement network members (D. Morin, personal communication, 2004). Disentanglement can be aided by sanctuary-specific efforts such as increasing sighting and reporting efficiencies, and by developing incentives (or requirements) that increase the likelihood that passing vessels will stand-by entangled whales.

Public scoping comments indicated that marine mammal entanglement in the SBNMS was a serious problem and suggested that fishermen should be involved in the mitigation process. The sanctuary will work in partnership with various agencies, industries and organizations to report and respond to entangled whales. This effort will increase the degree to which entangled whales within the SBNMS are sighted, reported, and assisted.

Strategies (3) To Aid Disentanglement Efforts

(1.1) Maximize the degree to which entangled animals in the sanctuary are sighted and reported. Animals can only be released from gear if they have been observed and then reported to the proper authorities. The sanctuary should develop policies and practices that encourage the sighting and reporting of entangled animals to NOAA Fisheries Service's ALWDN. In addition, a complete record of entanglements is needed to properly document the severity of the problem and to implement timely mitigation measures.

Priority: High
Status: Ongoing
Activities:

1.1.1 Collaborate with NOAA Fisheries Service NERO on the development of a procedure that allows commercial whale watching vessels operating under the proposed SBNMS special use permit (see Activity MMBD 1.1.5) to approach right whales within the 500-yard (460 m) exclusion zone for the purposes of assessing possible entanglement. The procedure will be consistent with

the exceptions to the right whale approach regulations found at §224.103(c)(3)(iii).
Status: Planned, 2011

(1.2) Maximize ability of vessels and aircraft to stand-by entangled animals. Without adequate capacity to track the location of an entangled animal, visible contact with the animal may be lost, rendering disentanglement impossible.
Priority: High
Status: Planned, 2010
Activities:

1.2.1 Convene a meeting of the PCCS, NOAA Fisheries Service NERO, commercial whale watch operators, and naturalists to provide training and informational materials for standing by entangled whales.
Status: Planned, 2010

1.2.2 Provide incentives for commercial whale watch boats to stand-by an entangled whale for a minimum of 45 minutes as a means to ensure adequate documentation and to reduce the search area for the network responder. Incentives having potential market value for participating companies may include official certificates of appreciation, photographs of vessels standing by entangled whales, postings on the sanctuary website, etc.
Status: Planned, 2010

1.2.3 Develop a protocol by which research, state or federal government vessels or aircraft working in the SBNMS report their presence to the PCCS and are available to standby.
Status: Planned, 2010

1.2.4 Encourage NOAA Fisheries Service to continue Level One ('eyes-on-the-water') funding to train the public in order to aid disentanglement efforts through sighting and standing by entangled whales.
Status: Ongoing

1.2.5 Work with NOAA Fisheries Service and NEFMC to allow commercial fishing vessels to stand-by entangled whales without losing Days at Sea (DAS) time. Fishermen can play a critical role in the detection and stand-by of entangled whales in the sanctuary. However, new fishery management regulations to reduce fishing effort limit how much time a fisherman can spend at sea. A fisherman, who stands-by an entangled whale, is using his/her time allotment of DAS, making such stand-by activity unlikely to occur. If time used by fishermen standing-by entangled whales did not count against their DAS allotment, participation by fishermen would be improved.
Status: Ongoing

(1.3) Undertake activities leading to improved understanding and prevention of entanglement events in SBNMS and improvements in disentanglement technology. Activities should be conducted to improve ability to identify gear types involved in specific entanglement events, provide data to support case documentation and lead to improvements in disentanglement technology. All activities involving gear marking would be conducted in collaboration with NOAA Fisheries Service to coordinate with systems already in place.
Priority: Medium
Status: Planned, 2011
Activities:

1.3.1 Investigate a gear marking system to identify the type of gear in which whales are entangled.
Status: Planned, 2011

1.3.2 Work with the appropriate fishery management agencies to require that surface indicators of fishing gear are marked to aid in quick and unambiguous identification of gear type.
Status: Planned, 2012

1.3.3 Partner with PCCS, NOAA Fisheries Service and other parties to support research, development and demonstration of improved disentanglement technology.
Status: Planned, 2012

MME.2 Objective—Reduce Marine Mammal Interaction with the Trap/Pot Fishery

Background. Trap/pot directed fisheries that co-occur with large numbers of baleen whales in the SBNMS are identified entanglement risks (Wiley *et al.,* 2003a; 2003b). The American lobster and mixed species (e.g., whelk, hagfish and Jonah crab) trap/pot fisheries, a subset of which occurs within the SBNMS, are classified by NOAA Fisheries Service as Category I and II fisheries, respectively. Category I fisheries are those that have frequent mortality or serious injury of one or more species of marine mammals. Category II fisheries are those that have occasional mortality or serious injury of one or more species of marine mammals. Marine mammals that are known to or have the potential to interact with these fisheries include four species that utilize the sanctuary: finback whales, humpback whales, minke whales, and North Atlantic right whales—all of which are threatened or endangered, and/or protected.

Strategies (2) To Reduce Marine Mammal Interaction with the Trap/Pot Fishery

(2.1) Obtain gear modifications. The goal of gear modification is to reduce the probability of entanglement and/or reduce serious injury or mortality of large whales that become entangled in trap/pot fisheries. By restructuring the fishing gear or modifying the way it is used, the safety of marine mammals can be increased without restricting access of the fisheries to target resources (e.g., shellfish or finfish).
Priority: High
Status: Planned, 2010
Activities:

2.1.1 Work with NOAA Fisheries Service and other appropriate fishery management agency(s) to

promulgate new regulations requiring, within five years, all current and future trap/pot fisheries to use sinking groundline within the SBNMS.

Status: Completed. Sinking groundline requirements along the entire Atlantic coast, including year round requirements within the SBNMS, became effective on April 5, 2010.

2.1.2 Work with NOAA Fisheries Service and other appropriate fishery management agency(s) to promulgate new regulations requiring 600 lb breaking strength of buoy weak links in trap/pot gear fished in SBNMS. This measure would complement existing state and federal regulations applying to the Cape Cod Bay critical habitat for right whales.

Status: Planned, 2010

(2.2) Serve as test-bed to develop and demonstrate low-risk fishing gear. The sanctuary should serve as a test-bed for developing and demonstrating innovative, low-risk fishing gear to reduce the risk of entanglements. Effective gear modification could then be exported to other areas of concern within the Gulf of Maine. For example, the GoM Ocean Observing System (GoMOOS) buoy data were used to provide current values in a study in the sanctuary that looked at the profiles and dynamics of ground-lines and end-lines, both as scaled-models in the laboratory and at full-scale in the field (Lyman and McKiernan, 2004).

Priority: Medium

Status: Planned, 2011

Activities:

2.2.1 Conduct surveys to determine areas of potential interaction between marine mammals and fisheries. This effort will serve as the foundation for a risk assessment of entanglement in the sanctuary, and identify high-risk areas where low-risk fishing gear should be tested.

Status: Ongoing

2.2.2 Help develop and demonstrate new low-risk technologies in collaboration with NOAA Fisheries Service, MADMF, fishermen and conservationists. The sanctuary could act as a testing ground for promising new risk-reduction technologies.

Status: Planned, 2012

2.2.3 Assess the feasibility of modifying vertical lines (e.g., breaking strength, number) to minimize the risk of entanglement.

Status: Planned, 2011

MME.3 Objective—Reduce Marine Mammal Interaction with the Gillnet Fishery

Background. NOAA Fisheries Service observer data indicates that several species of pinnipeds (seals) and odontocetes (dolphins and porpoises) are taken incidentally by gillnets within SBNMS. Additionally, large whales are known to interact with gillnets; published and anecdotal evidence indicate that these entanglements occur within the SBNMS (Weinrich, 1999).

NOAA Fisheries Service classifies the northeast sink gillnet fishery as a Category I fishery. Category I fisheries are those which have frequent mortality or serious injury of one or more species of marine mammals. Known marine mammals killed or injured in gillnets include: North Atlantic right whales, humpback whales, Atlantic white-sided dolphins, common dolphins, harbor porpoise and several species of seals, all of which inhabit the SBNMS and some of which are endangered.

Approximately 40 day-boat, gillnet vessels departing from southern Maine to Plymouth, MA, fish primarily in the northern section of the sanctuary (gillnet fishermen's estimate, MME Working Group Action Plan, 2004). Historically, gillnet fishing within SBNMS has occurred year-round, with the height of fishing activity during the summer months. Currently, federal fishing regulations restrict or prohibit gillnet fishing within SBNMS at various times of the year. In order to assess the entanglement risk, the sanctuary should work in partnership with various agencies, industries, and organizations to address and investigate the entanglement risk posed by the northeast sink gillnet fishery.

Strategies (2) to Reduce Marine Mammal Interaction with Gillnet Fisheries

(3.1) Obtain gear modifications. The goal of gear modification is to reduce serious injury or mortality of marine mammals entangled by the northeast sink gillnet fisheries. In this way, the safety of marine mammals is increased without restricting access of the fisheries to their target resource.

Priority: High

Status: Planned, 2011

Activities:

3.1.1 Work with NOAA Fisheries Service on an expedited basis to implement gillnet modifications consistent with the modifications required in the regulations implementing the ALWTRP. The modifications would apply to sinking groundlines, weak link breaking strength, and use of weak links in gillnet panels. The modifications should be required throughout the SBNMS on a year-round basis, not just seasonally.

Status: Completed. Year round gillnet gear modifications in the Northeast, including the SBNMS, became effective on October 5, 2008.

3.1.2 Work with NOAA Fisheries Service to develop an incentive program for gillnet fishermen to help them convert their gear to incorporate weak links and sinking groundlines.

Status: Ongoing

(3.2) Develop research programs. The sanctuary should serve as a test-bed for innovative research. For example, data from the GoMOOS buoy in the sanctuary were used to provide current values in a study that looked at the profiles and dynamics of groundlines and endlines both as scaled-models in the laboratory and at full-scale in the field (Lyman

and McKiernan, 2004). Gear modifications that appear to be functional in this type of controlled setting could be tested within the SBNMS for a more realistic assessment of its operation. Gear modifications found effective within the SBNMS could serve as an example to the Atlantic Large Whale Take Reduction Team for possible use on a regional scale.

Priority: Medium
Status: Planned, 2011
Activities:

3.2.1 Assess the feasibility of using reduced-strength weak links (e.g., 600 lbs.) in gillnet panels.
Status: Planned, 2011

3.2.2 Investigate the feasibility of reducing the vertical profile of gillnets in the water column as an entanglement risk-reduction measure (e.g., tie-downs, fewer vertical meshes, replacing float line with lead line) in collaboration with gillnet fishermen and other agencies.
Status: Planned, 2011

3.2.3 Research whale behaviors in the water column to better understand the mechanism of entanglement.
Status: Ongoing

3.2.4 Evaluate the risk reduction contributed by harbor porpoise take-reduction measures versus fisheries management time-and-area closures.
Status: Planned, 2011

3.2.5 Assess the feasibility of modifying vertical lines (e.g., breaking strength, number) to minimize entanglement risk.
Status: Planned, 2011

3.2.6 Develop new low-risk technologies in collaboration with NOAA Fisheries Service, Massachusetts Dept. of Marine Fisheries (MADMF), fishermen and conservationists. The sanctuary could act as a testing ground for promising new risk-reduction technologies.
Status: Planned, 2012

3.2.7 Conduct surveys to identify areas of potential interaction between marine mammals and gill net fishing to identify temporal, seasonal, and effort trends. The survey should identify high-risk times and locations where low-risk fishing gear should be tested.
Status: Ongoing

Table 54. Estimated costs for MME action plan.

Strategy	Estimated Cost ($000)*					Total Estimated 5 Year Cost
	YR 1	YR 2	YR 3	YR 4	YR 5	
(1.1) Maximize the degree to which entangled animals in the sanctuary are sighted and reported.	10.0	10.0	10.0	10.0	10.0	50.0
(1.2) Maximize ability of vessels and aircraft to stand-by entangled animals.	0.0	0.0	0.0	0.0	0.0	0.0
(1.3) Undertake activities leading to improved understanding and prevention of entanglement events in SBNMS and improvements in disentanglement efforts.	10.0	20.0	50.0	40.0	30.0	150.0
(2.1) Obtain gear modifications.	0.0	0.0	0.0	0.0	0.0	0.0
(2.2) Serve as test-bed to develop and demonstrate low-risk fishing gear.	0.0	0.0	0.0	0.0	0.0	0.0
(3.1) Obtain gear modifications.	0.0	0.0	0.0	0.0	0.0	0.0
(3.1) Obtain gear modifications.	0.0	0.0	0.0	0.0	0.0	0.0
Total Estimated Annual Cost	**20.00**	**30.0**	**60.0**	**50.0**	**40.0**	**200.0**

*Cost estimates exclude federal labor costs.

Table 55. Performance measures for MME action plan.

Desired Outcome(s) For This Action Plan			
The entanglement of marine mammals in commercial fishing gear is minimized and methods to successfully disentangle animals are operationalized.			
Performance Measures	**Means of Evaluation**	**Baseline**	**ONMS Measure**
By 2012, 85% of detected entangled whales will have vessels standing by until the disentanglement team arrival.	SBNMS will work with the Provincetown Center for Coastal Studies to track the rate of stand by.	Percent of entangled whales having vessels standing by until the disentanglement team arrival: 65	Living Marine Resources
By 2012, 100% of fixed gear fishermen using the sanctuary will be required to use gear that minimizes entanglement risk with marine mammals, as a result of coordination with NMFS.	SBNMS will partner with NMFS, USCG, and MEP to monitor the participation rate of commercial fishermen in programs aimed at replacing fishing gear with low-entanglement-risk gear.	Percent of fixed gear fishermen using the sanctuary that are required to use gear that minimizes entanglement risk with marine mammals: 0	Living Marine Resources

1. MARITIME HERITAGE

Maritime heritage focuses on understanding humanity's involvement in the sanctuary's past and the broader connections to U. S. and World history. Humanity's first association with the sanctuary began around 12,000 years ago, when Native Americans likely visited dry portions of Stellwagen Bank exposed by lower sea levels. These Paleoindian peoples took advantage of the rich ecosystems of its littoral zone and hunted the land animals living on the forested peninsula. Native American activity in the sanctuary likely decreased after sea levels inundated the dry land. A period of 10,000 years separates the first human activity with the explosion of human use that began with the European exploration and settlement of North America. SBNMS sits astride the gateway to historic ports that surround Massachusetts Bay, ports that have been centers of maritime activity in New England for over 400 years. The sanctuary's shipwrecks and submerged archaeological sites are tangible connections to New England's history; they are nonrenewable gateways to the past that need protection for current and future generations.

The Maritime Heritage (MH) Action Plan affirms NOAA's dedication to conserving America's maritime heritage by conducting scientific research, monitoring, exploration and educational programs. The action plan: (1) formalizes the foundation of a maritime heritage program at the sanctuary; (2) addresses the need to systematically inventory, assess, and characterize historical resources; (3) establishes a management framework for protecting maritime heritage resources while facilitating compatible use; (4) focuses attention on interpreting maritime heritage to the public; and (5) responds to historical resources which might be environmental threats.

Maritime Heritage Action Plan

Issue Statement

The Maritime Heritage (MH) Action Plan (AP) makes recommendations for the inventory and assessment of historical resources, the management and protection of historical resources, and MH interpretation. The AP addresses sanctuary-specific historical resource assessment, management, protection, and MH outreach and education requirements; it fulfills the NOAA ONMS and the ONMS Maritime Heritage Program (MHP) strategic plans; and it complies with the President's Preserve America Executive Order (E.O.13287) tasking NOAA with preserving and protecting historic resources in the agency's care, including shipwrecks.

Goal

The goal of the MH AP is to inventory, assess, protect, manage, and interpret Native American and historic archeological resources in the sanctuary.

Objectives

The MH AP has five objectives and associated strategies to achieve its goal (Table 56).

- MH.1—Establish a Maritime Heritage Program
- MH.2—Inventory, Assess, and Characterize Historical Resources
- MH.3—Protect and Manage Historical Resources
- MH.4—Develop and Implement a MH Outreach and Education Program
- MH.5—Assess Shipwrecks and other Submerged Objects for Potential Hazards
- MH.6—Facilitate Access to Modern Shipwrecks

The estimated costs for implementation of the MH AP are indicated in Table 57. The performance measures are listed in Table 58.

Table 56. Objectives, associated strategies, and priorities for MH action plan.

Objective	Strategy	Priority
MH.1 Establish a Maritime Heritage Program	(1.1) Develop the foundation and infrastructure for a MH program and integrate the MH program into existing sanctuary programs.	High
	(1.2) Identify and pursue additional sources of funding beyond the ONMS.	High
	(1.3) Identify and form partnerships, relationships, and MOU with entities that have specialized knowledge and abilities that support the documentation and interpretation of the sanctuary's MH.	Medium
MH.2 Inventory, Assess and Characterize Historical Resources	(2.1) Characterize prehistoric and historic use patterns to assist with the location of historical resources through the identification and collection of historical, archaeological, and anthropological documentation.	High
	(2.2) Conduct systematic field surveys to locate, identify, and inventory historical resources.	High
	(2.3) Assess historical resources for their NRHP eligibility and nominate appropriate sites to the NRHP.	High
	(2.4) Characterize historical resources within SBNMS.	High
MH.3 Protect and Manage Historical Resources	(3.1) Implement a management system that protects historical resources while allowing for uses compatible with resource protection.	High
	(3.2) Implement an assessment protocol to assign sanctuary historical resources to the appropriate category.	High
	(3.3) Identify and implement partnerships and relationships for site monitoring and compliance with historical resource regulations.	Medium
	(3.4) Develop and implement an interpretive enforcement program.	High
	(3.5) Develop and implement a mooring system on historical resources in collaboration with affected parties, regional recreational SCUBA diving organizations and regional SCUBA diving charter operators.	Medium
	(3.6) Implement the ONMS Permitting Guidelines for archaeological research (i.e., survey and inventory permit and archaeological research permit).	High
	(3.7) Develop and implement collection and conservation policies for artifacts previously recovered from SBNMS before and after designation.	Low
MH.4 Develop and Implement a Maritime Heritage Outreach and Education Program	(4.1) Identify and partner with regional organizations to conduct MH exhibits and other outreach programs.	High
	(4.2) Develop and implement an artifact documentation and curation program through partnerships and relationships with local or regional maritime museums.	Low
MH.5 Assess Shipwrecks and Other Submerged Objects for Potential Hazards	(5.1) Establish an inventory of shipwrecks and submerged objects, inside and outside of SBNMS boundaries that may pose environmental threats to resources.	Medium
	(5.2) Coordinate information exchanges pertaining to shipwrecks and other submerged objects as environmental threats with NOAA's HAZMAT division and the ONMS for the development of the SHIELDS and RUST database systems.	Medium
	(5.3) Identify shipwrecks and other submerged objects to be examined with remote sensing technology and report findings to state and federal trustees.	Medium
	(5.4) Establish a monitoring program for shipwreck and submerged objects that have been located and are considered a threat to SBNMS.	Medium
MH.6 Facilitate Access to Modern Shipwrecks	(6.1) Disseminate information about modern shipwrecks.	High
	(6.2) Develop and implement a mooring system on modern shipwrecks in collaboration with affected parties, regional recreational SCUBA diving organizations and regional SCUBA diving charter operators.	High

MH.1 Objective—Establish a Maritime Heritage Program

Background. SBNMS holds a rich variety of historical resources. In the past, fishermen in the sanctuary have recovered paleontological remains representing a period when portions of Stellwagen Bank were dry land during the last ice age approximately 14,000 years ago. These findings suggest that there is also the potential for discovering prehistoric cultural remains. However, most of the known historical resources consist of historic shipwrecks.

Spanning the mouth of Massachusetts Bay, SBNMS represents the current and historic gateway to several of America's oldest ports. Vessels entering and leaving Gloucester, Salem, Boston, Plymouth and Provincetown traversed the sanctuary's waters. As such, historical records indicate that several hundred vessels sank in the vicinity of the sanctuary.

The extent of SBNMS's archaeological inventory is just beginning to be known. Archaeological remote sensing research has located historical resources and local researchers have also divulged the locations of several sites, including the Portland, Frank A. Palmer, and Louise B. Crary. In total, forty shipwrecks have been located, many of which are potentially eligible for or listed on the NRHP.

The ONMS is placing increased emphasis on the development of MH programs to inventory, assess, manage, and protect historical resources within the sanctuaries. This AP initiates a comprehensive MH program that will systematically fulfill the NMSA mandate, while fostering cooperative relationships with other groups conducting similar or compatible research.

ONMS regulations (§ 922.3 Definitions) define historical resource as, "Any resource possessing historical, cultural, archaeological or paleontological significance, including sites, contextual information, structures, districts, and objects significantly associated with or representative of earlier people, cultures, maritime heritage, and human activities and events. Historical resources include ''submerged cultural resources'', and also include ''historical properties,'' as defined in the National Historic Preservation Act, as amended, and its implementing regulations, as amended."

Strategies (3) To Establish a Maritime Heritage Program

(1.1) Develop the foundation and infrastructure for a MH program and integrate the MH program into existing sanctuary programs. This effort will provide a framework for the development, operation and future expansion of SBNMS's maritime heritage program pursuant to the NMSA and in coordination with the National Historic Preservation Act (NHPA). This includes at the least a full-time maritime archaeologist on staff and the familiarization of all SBNMS staff with MH.

Priority: High
Status: Ongoing

(1.2) Identify and pursue additional sources of funding beyond the ONMS. Due to limited funding, it is necessary to pursue external sources of funding to support MH efforts such as: exhibitry; historical, anthropological and archaeological research; archaeological fieldwork; outreach and education; and, curation and conservation.

Priority: High
Status: Ongoing

(1.3) Identify and form partnerships, relationships, and Memoranda of Understanding (MOU) with entities that have specialized knowledge and abilities that support the documentation and interpretation of the sanctuary's MH. Developing relationships will facilitate the documentation and interpretation of the sanctuary MH by bringing together advanced technologies and abilities not otherwise available to the sanctuary. For example, the sanctuary seeks to establish cooperative relationships with the technical SCUBA diving community to further archaeological site documentation.

Priority: Medium
Status: Ongoing

MH.2 Objective—Inventory, Assess and Characterize Historical Resources

Background. The NHPA requires federal agencies, such as NOAA, to inventory historic and archaeological resources under their jurisdiction and to nominate potentially eligible sites to the NRHP. SBNMS will follow the guidelines of the NHPA and the NMSA to methodically research, survey, document, assess, and characterize the heritage resources within its jurisdiction.

Strategies (4) To Inventory, Assess and Characterize Historical Resources

(2.1) Characterize prehistoric and historic use patterns to assist with the location of historical resources through the identification and collection of historical, archaeological, and anthropological documentation. Prior to conducting expensive fieldwork to locate historical resources, SBNMS will expand its knowledge of human use patterns to refine its search methodology. See Claesson and Rosenberg (2009) for an example of characterizing the sanctuary's historical uses.

Priority: High
Status: Ongoing
Activities:

2.1.1 Establish relationships and partnerships with foreign, federal, tribal, state, local, non-governmental and private organizations and individuals to identify historical resources within SBNMS.
Status: Ongoing

2.1.2 Conduct historical, archaeological, and anthropological research to identify potential historical resource locations, including soliciting oral histories and information from divers, researchers, and fishermen.
Status: Ongoing

2.1.3 Establish a spatial database to inventory, assess and characterize historical resources.
Status: Ongoing

(2.2) Conduct systematic field surveys to locate, identify and inventory historical resources. Utilizing research conducted in Strategy 2.1, potential historical resources will be investigated using appropriate methodologies.
Priority: High
Status: Ongoing
Activities:

2.2.1 Establish partnerships and relationships with federal, tribal, state, local, non-governmental and private organizations and individuals to utilize the most sophisticated and appropriate technologies available to conduct historical resource surveys.
Status: Ongoing

2.2.2 Record archaeological site positions in the historical resources database and NOAA's Archaeological Database (ARCH).
Status: Ongoing

2.2.3 Periodically reassess known archaeological sites to record changes to the site from biologic, oceanographic, and/or anthropogenic processes.
Status: Ongoing

(2.3) Assess historical resources for their NRHP eligibility and nominate appropriate sites to the NRHP. The NHPA requires federal agencies, such as NOAA, to inventory historic and archaeological resources under their jurisdiction and to nominate potentially eligible sites to the NRHP. Listing on the NRHP provides formal recognition of an archaeological resource's significance. Additionally, Federal agencies must consider the effects of their undertakings on the resource. SBNMS has successfully listed four archaeological sites on the NRHP, the steamship Portland, the collided coal schooners *Frank A. Palmer* and *Louise B. Crary*, the coal schooner *Paul Palmer,* and the eastern rig dragger *Joffre*.
Priority: High
Status: Ongoing

(2.4) Characterize historical resources within SBNMS. Characterization synthesizes the results of the inventory and assessment to understand the overall significance of historical resources in the sanctuary and how they relate to broad patterns of history.
Priority: High
Status: Ongoing

MH.3 Objective—Protect and Manage Historical Resources

Background. One of the purposes and policies of the NMSA is "to enhance public awareness and understanding, appreciation, and wise and sustainable use of the marine environment and the natural, historical, cultural, and archaeological resources of the National Marine Sanctuary System." To carry out this policy, SBNMS will develop and implement a maritime heritage management system to provide archaeological sites an increased level of protection from human impacts. To the extent compatible with the primary goal of resource protection, use of these resources will be facilitated by allowing access to appropriate sites and by mitigating the impacts of human uses through permitting.

Strategies (7) To Protect and Manage Historical Resources

(3.1) Implement a management system that protects historical resources while allowing for uses compatible with resource protection. The management system will consist of two parts based on specific goals and criteria. Sanctuary historical resources will be managed as a 'historic site' or a 'heritage preserve' as follows:
Priority: High
Status: Planned, 2011
Activities:

3.1.1 Establish historic sites. A 'historic site" must be a sanctuary historical resource that may be eligible for or listed on the National Register of Historic Places. The site must be structurally stable, durable and capable of hosting increased visitation without adversely impacting the site's structural or archaeological integrity. Public access will be facilitated to the extent practicable and to the extent compatible with maritime heritage resource protection.

Adequate measures will be developed to protect historic sites from activities that have high potential for harming the sites' archaeological or structural integrity. At a minimum, voluntary guidelines for site avoidance will be issued for traditional and experimental fishing operations. Amendment of sanctuary regulations will be considered to include resource protection measures for historic sites.
Status: Planned, 2011

3.1.2 Establish heritage preserves. A sanctuary historical resource must be listed on the NRHP to qualify for a 'heritage preserve'. Human activities must have a high potential for negatively impacting the site's archaeological and/or structural integrity. Additional protection for exceptional historical resources having a high degree of fragility and archaeological integrity will be provided.

Heritage preserves will delimit an area around exceptional historical resources within which human activities that have a high potential for harming the sites' archaeological or structural integrity will be restricted or prohibited. Amendment of sanctuary regulations will be considered to include resource protection measures for heritage preserves.
Status: Planned, 2011

(3.2) Implement an assessment protocol to assign sanctuary historical resources to the appropriate category. SBNMS will develop a rigorous site assessment protocol to determine the maritime heritage management category (established in Strategy 3.1) in which a newly discovered sanctuary historical resource should be placed.

Priority: High
Status: Planned, 2011

(3.3) Identify partnerships and relationships for site monitoring and compliance of historical resource permits and regulations. The constant on-the-water presence of state and federal law enforcement agencies, researchers, divers, whale watchers and fishermen extends the sanctuary's surveillance capabilities.
Priority: Medium
Status: Planned, 2011

(3.4) Develop and implement an interpretive enforcement program. Interpretive law enforcement will inform users about the sanctuary and its regulations through the distribution of educational outreach information. A greater MH focused enforcement effort should lead to consistent enforcement awareness and compliance in the sanctuary.
Priority: High
Status: Ongoing

(3.5) Develop and implement a mooring system on historic sites in collaboration with affected parties, regional recreational SCUBA diving organizations and regional SCUBA diving charter operators. Moorings may be emplaced to protect historic sites from anchor damage and facilitate safe SCUBA diving.
Priority: Medium
Status: Planned, 2011

(3.6) Implement the ONMS Permitting Guidelines for archaeological research (i.e., survey and inventory permit and archaeological research permit). Permits are a management tool to ensure that archaeological research is conducted to the standards set forth in the Secretary of the Interior's Standards and Guidelines for Archaeological Documentation. See 43CFR7-Protection of Archaeological Resources. Permits of this type would not be used to regulate access to a historical resource.
Priority: High
Status: Planned, 2010

(3.7) Develop and implement collection and conservation policies for artifacts previously recovered from SBNMS before and after designation. Policies need to be developed that clarify the disposition of these artifacts and their conservation.
Priority: Low
Status: Planned, 2011

MH.4 Objective—Develop and Implement a Maritime Heritage Outreach and Education Program

Background. MH presents a unique avenue to educate the public about broader cultural themes and traditions of the GoM through the use of websites, exhibits, and other outreach tools. (For additional outreach and education strategies, see the Outreach and Education AP.)

Strategies (2) To Develop and Implement a MH Outreach and Education Program

(4.1) Identify and partner with regional organizations to conduct MH exhibits and other outreach programs. Partnerships will provide a means for information-sharing to the public and user groups on the importance of resource protection and stewardship ethics. An example of just such a relationship is the ongoing collaboration with the Massachusetts Board of Underwater Archaeological Resources to interpret maritime heritage during Massachusetts Archaeology Month.
Priority: High
Status: Ongoing

(4.2) Develop and implement an artifact documentation and curation program through partnerships and relationships with local or regional maritime museums. This program will solicit information from the public and document artifacts previously recovered from the SBNMS.
Priority: Low
Status: Planned, 2011

MH.5 Objective—Assess Shipwrecks and Other Submerged Objects for Potential Hazards

Background. SBNMS is required to identify, assess and monitor MH sites that may pose an environmental threat to resources inside and outside of the sanctuary. Information pertaining to submerged sites as environmental threats is provided to: (1) NOAA's Office of Response and Restoration, Emergency Response Division; (2) the ONMS for the development of the Sanctuaries Hazardous Incident Emergency Logistics Database System (SHIELDS); and (3) the Resources and Under Sea Threats (RUST) database systems.

Strategies (4) To Assess Shipwrecks and Other Submerged Objects for Potential Hazards

(5.1) Establish an inventory of shipwrecks and submerged objects, inside and outside of SBNMS boundaries that may pose environmental threats to resources. This effort will coordinate with affected and associated parties while taking into account that some of these threats might be historical resources. Information relating to environmental threats will be shared with user groups, such as divers or fishermen, who may inadvertently disturb the shipwrecks or submerged objects.
Priority: Medium
Status: Ongoing
Activities:

5.1.1 Review documentation from established databases.
Status: Ongoing

5.1.2 Identify, develop, and collaborate with partners doing similar research.
Status: Ongoing

5.1.3 Interview researchers, divers, and fishermen.
Status: Ongoing

(5.2) Coordinate information exchanges pertaining to shipwrecks and other submerged objects as environmen-

Table 57. Estimated costs for MH action plan.

Strategy	Estimated Cost ($000)*					Total Estimated 5 Year Cost
	YR 1	YR 2	YR 3	YR 4	YR 5	
(1.1) Develop the foundation and infrastructure for a MH program and integrate the MH program into existing sanctuary programs.	125.0	125.0	125.0	125.0	125.0	625.0
(1.2) Identify and pursue additional sources of funding beyond the ONMS.	0.0	0.0	0.0	0.0	0.0	0.0
(1.3) Identify and form partnerships, relationships, and MOU with entities that have specialized knowledge and abilities that support the documentation and interpretation of the sanctuary's MH.	0.0	0.0	0.0	0.0	0.0	0.0
(2.1) Characterize prehistoric and historic use patterns to assist with the location of historical resources through the identification and collection of historical, archaeological, and anthropological documentation.	0.0	0.0	0.0	0.0	0.0	0.0
(2.2) Conduct systematic field surveys to locate, identify, and inventory historical resources.	150.0	75.0	75.0	75.0	75.0	450.0
(2.3) Assess historical resources for their NRHP eligibility and nominate appropriate sites to the NRHP.	0.0	0.0	0.0	0.0	0.0	0.0
(2.4) Characterize historical resources within the SBNMS.	0.0	0.0	0.0	0.0	0.0	0.0
(3.1) Implement a management system that protects historical resources while allowing for uses compatible with resource protection.	0.0	0.0	0.0	0.0	0.0	0.0
(3.2) Implement an assessment protocol to assign sanctuary historical resources to the appropriate category.	0.0	0.0	0.0	0.0	0.0	0.0
(3.3) Identify partnerships and relationships for site monitoring and compliance of historical resource permits and regulations.	0.0	0.0	0.0	0.0	0.0	0.0
(3.4) Develop and implement an interpretive enforcement program.	1.0	1.0	1.0	1.0	1.0	5.0
(3.5) Develop and implement a mooring system on historical resources in collaboration with affected parties, regional recreational SCUBA diving organizations and regional SCUBA diving charter operators.	5.0	15.0	15.0	10.0	10.0	55.0
(3.6) Implement the ONMS Permitting Guidelines for archaeological research (i.e., survey and inventory permit and archaeological research permit).	0.0	0.0	0.0	0.0	0.0	0.0
(3.7) Develop and implement collection and conservation policies for artifacts previously recovered from SBNMS before and after designation.	0.0	0.0	0.0	0.0	0.0	0.0
(4.1) Identify and partner with regional organizations to conduct MH exhibits and other outreach programs.	0.0	10.0	15.0	15.0	15.0	55.0
(4.2) Develop and implement an artifact documentation and curation program through partnerships and relationships with local or regional maritime museums.	0.0	0.0	5.0	10.0	15.0	30.0
5.1) Establish an inventory of shipwrecks and submerged objects, inside and outside of SBNMS boundaries that may pose environmental threats to resources.	0.0	0.0	0.0	0.0	0.0	0.0
(5.2) Coordinate information exchanges pertaining to shipwrecks and other submerged objects as environmental threats with NOAA's Emergency Response Division and the ONMS for the development of the SHIELDS and RUST database systems.	0.0	0.0	0.0	0.0	0.0	0.0
(5.3) Identify shipwrecks and other submerged objects to be examined with remote sensing technology and report findings to state and federal trustees.	0.0	2.0	2.0	1.0	1.0	6.0
(5.4) Establish a monitoring program for shipwrecks and submerged objects that have been located and are considered a threat to SBNMS.	0.0	15.0	10.0	10.0	10.0	45.0
(6.1) Disseminate information about modern shipwrecks.	0.0	0.0	0.0	0.0	0.0	0.0
(6.2) Develop and implement a mooring system on modern shipwrecks in collaboration with affected parties, regional recreational SCUBA diving organizations and regional SCUBA diving charter operators.	10.0	10.0	10.0	5.0	5.0	40.0
Total Estimated Annual Cost	**291.0**	**253.0**	**258.0**	**252.0**	**257.0**	**1311.0**

*Cost estimates exclude federal labor costs.

Table 58. Performance measures for MH action plan.

Desired Outcome(s) For This Action Plan			
Native American and historic archaeological resources are managed and protected.			
Performance Measures	**Means of Evaluation**	**Baseline**	**ONMS Measure**
By 2012, six eligible historical resources will be nominated to the National Register of Historical Places (NRHP).	SBNMS will track the number of eligible resources that are nominated to the NRHP.	Number of historical resources nominated to the NRHP: 4	Shipwrecks
By 2012, as part of the Maritime Heritage (MH) management program, all located historical resources will be categorized through SBNMS site assessment protocol.	SBNMS will track the number of identified shipwrecks that have been categorized through the MH management program.	Number of categorized shipwrecks: 0	Shipwrecks

tal threats with NOAA's Emergency Response Division and the ONMS for the development of the SHIELDS and RUST database systems. The SHIELDS and RUST database systems are being developed to provide a clearinghouse for all submerged environmental threats.

Priority: Medium
Status: Ongoing

(5.3) Identify shipwrecks and other submerged objects to be examined with remote sensing technology and report findings to state and federal trustees. Once suspected environmental threats are identified SBNMS will investigate them with remote sensing technology.

Priority: Medium
Status: Planned

(5.4) Establish a monitoring program for shipwrecks and submerged objects that have been located and are considered a threat to SBNMS. Develop protocols for threat evaluation and a timeline for future monitoring. Monitoring of suspected environmental threats will provide the sanctuary with a baseline by which changes can be assessed and appropriate action taken before environmental damage.

Priority: Medium
Status: Planned

MH.6 Objective—Facilitate Access to Modern Shipwrecks

Background. In the process of inventorying the sanctuary's historical resources, SBNMS researchers have located modern shipwrecks that are not historical resources. More modern shipwrecks are expected to be encountered in the future. The sanctuary recognizes that these vessels have value as recreational fishing and diving attractions. Furthermore, modern shipwrecks have the ability to illustrate stories about the more immediate past. In addition, commercial fishermen seek to avoid these shipwrecks to prevent the loss of their fishing gear. As such the sanctuary seeks to codify its treatment of modern shipwrecks

Strategies (2) To Facilitate Access to Modern Shipwrecks

(6.1) Disseminate information about modern shipwrecks. This effort will provide the public with information about the geographic coordinates and character of modern shipwrecks. Information will be disseminated through the sanctuary's website, publications, other NOAA resources, and through other means as available.

Priority: High
Status: Ongoing

(6.2) Develop and implement a mooring system on modern shipwrecks in collaboration with affected parties, regional recreational SCUBA diving organizations and regional SCUBA diving charter operators. Moorings facilitate access for SCUBA divers and prevent anchor damage to shipwrecks

Priority: High
Status: Planned, 2010