MARINE PROTECTED AREAS NEEDS ASSESSMENT FINAL REPORT

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**Prepared by the NOAA Coastal Services Center
in cooperation with the
National Marine Protected Areas Center**

NOAA Coastal Services Center
LINKING PEOPLE, INFORMATION, AND TECHNOLOGY

CONTENTS

EXECUTIVE SUMMARY

During the period from May 2001 to February 2002, the National Oceanic and Atmospheric Administration's (NOAA) Coastal Services Center (CSC) conducted a needs assessment to support the newly created National Marine Protected Areas (MPA) Center. The assessment aimed to identify information, skills, tools, and processes needed to foster effective MPAs. The results of the needs assessment will guide the National MPA Center as it begins to design services and products to support a national network of MPAs.

Overview of the Marine Protected Areas Needs Assessment
A 12-member planning team of individuals from NOAA and the Department of the Interior (DOI) advised CSC on the MPA needs assessment. Although numerous audiences may look to the National MPA Center for information and assistance, the team agreed that this initial, nine-month assessment should focus on the needs of coastal and marine resource managers. This target audience included both site managers and their staffs, as well as state, regional, and federal managers. A wide range of MPA stakeholders was consulted, since input from groups such as fishing interests and tourism providers gave important perspectives on management issues and processes. The assessment examined the gap between current and desired knowledge, skills, and tools needed for effective MPA management, and identified potential strategies and tools for filling those gaps.

Four objectives were defined for the assessment:
- *What*: Identify overall challenges surrounding MPA management, as well as specific gaps in existing knowledge and skills of marine resource managers regarding key MPA issues.
- *Why*: Determine attitudes, motivations, and disincentives that could impact managers' capacity to benefit from new information, training, or technical assistance.
- *Who*: Identify subgroups of MPA managers that may benefit most from information, training, and technical assistance.
- *How*: Identify formats and distribution methods that will maximize the utility of information, products, and services.

Recognizing the multidisciplinary, multijurisdictional nature of marine resource issues, the MPA needs assessment looked at needs across levels of government, across marine uses, and across the categories of science, education and outreach, and training and technical assistance. Similarly, identified needs cover multiple disciplines and call for action by different levels of government.

Methodology
Although a number of needs had been identified by the National MPA Center before this project began, a formal assessment provided a systematic approach to identifying and documenting managers' needs. Certain issues and stakeholder concerns have received a great amount of attention during individual MPA efforts, but the needs assessment provided an opportunity to hear from a wide range of stakeholders on a variety of MPA-related issues.

Multiple methods were used to gather information for the needs assessment, but the majority of ideas came from focus groups and phone interviews, since these formats allowed targeted, in-depth discussion of management needs. A traditional literature review was also performed, and CSC staff gleaned information from MPA-related meetings and from electronic discussion list

postings over the nine-month period. Finally, a computer-assisted content analysis of news media from the previous six years examined public opinion and awareness surrounding MPAs.

Results

Needs assessment results were organized under the three broad headings of 1) MPA-related policy and legal issues/responsible authorities, 2) MPA-related science and technology, and 3) MPA program implementation. Together these categories address 23 individual topic areas, and each is summarized briefly below:

Section I: MPA-related policy and legal issues/responsible authorities

- *Identifying MPA goals and defining MPA terminology*: Individuals across stakeholder groups repeatedly called for an articulation of MPA goals, and for clear and consistent definitions of MPA-related terminology. Site managers need clear direction from upper-level management on agency goals and involvement regarding MPAs.
- *Integrating management across jurisdictions*: MPA efforts are hindered by the current lack of integration and cooperation between agencies involved in different aspects of marine resource management. Integration is needed across levels of government, across the land/sea interface, and across pieces of ocean policy legislation.
- *Information sharing and management*: Managers need accessible, comprehensive information about coastal and marine resources and management.
- *Intra- and interagency coordination and cooperation*: Many MPA efforts are under way at local, state, national, and international levels, and there is an overwhelming need for coordination between the various public entities involved.
- *Fisheries management issues*: Long-standing fisheries issues were raised both as a reason why MPAs are needed, and as a reason why MPA development is incredibly complex and demands careful planning, stakeholder consultation, and adaptive management.

Section II: MPA-related science and technology

- *Inventorying and monitoring*: Existing MPAs need more resources for inventorying and monitoring, and any new MPA must incorporate these activities from the beginning.
- *Mapping and spatial analysis*: MPA managers need maps and spatial analysis tools to define boundaries and resource locations, to help with planning processes, and to contribute to public outreach and education efforts.
- *Natural science needs*: Four needs were raised repeatedly – comprehensive habitat information, larval transport research, evaluation of current closures, and modeling work.
- *Social science needs*: Social science work related to MPAs is extremely limited. Research is needed on topics such as socioeconomic impacts, public opinions, and cultural values.
- *Science in management*: To ensure that research is *applied*, scientists and managers need to collaborate, and managers need improved mechanisms for accessing research findings.
- *Climate change*: Sources felt managers are not dealing sufficiently with the topic of climate change, and recommended both more research and planning for potential impacts.

Section III: MPA program implementation
- *Public education and outreach*: There is an overwhelming need for public education about MPAs and about marine resources in general.
- *Planning methods for identifying MPAs*: Sources stressed the need for improved planning methods. Zoning and geographic information system (GIS) technology were highlighted as two specific tools that should be used in future planning efforts.
- *Stakeholder/community involvement*: Community participation needs to be made more meaningful by including more stakeholders and extending beyond a few public meetings.
- *Working with indigenous peoples*: Indigenous peoples' traditional connections to and knowledge of marine resources make them critical, valuable participants in MPA processes.
- *Working with fishermen*: Fishermen's reliance on marine resources demands that they be included in MPA processes and that efforts be made to enhance communication with them. Fishermen also can contribute unique and detailed natural and social science information to management efforts.
- *Managing visitor impacts*: MPA managers need to consider and address the ecological and social impacts of increasing marine and coastal recreation.
- *Historical and cultural issues*: Resources with historical and cultural significance need to be inventoried, monitored, and protected. Cultural knowledge is crucial to working effectively with users.
- *Enforcement*: Current managers need more resources to deliver adequate enforcement, and any new MPA efforts must plan for enforcement. New technologies need to be explored, and agencies must join forces to maximize the impact of existing enforcement resources.
- *Evaluating MPA effectiveness*: Current and future MPAs must be evaluated to see if they are meeting established goals, and to quantify impacts. Regional- and national-level evaluations are needed to examine the efficacy of MPA networks.
- *Funding*: Site and regional managers need more resources to address gaps identified throughout the assessment. Sustainable funding is a prerequisite for new MPA efforts, and it is essential to pursue innovative sources.
- *Growth and land-based threats*: Several sources raised growth as an important issue, and said that marine resource managers need to focus more on land-based threats.
- *Site- and sector-specific issues*: This final section presents several issues that did not receive extensive discussion but that bear mentioning as current challenges that were identified by individual areas, management entities, or user groups.

Two stand-alone sections of the report discuss managers' information sources and the results of the computer-assisted content analysis of MPA media. The needs assessment revealed that managers utilize a wide range of information sources, which in turn means that new information should be delivered in multiple formats. Content analysis findings reinforced the need for pubic education and outreach on MPAs, and demonstrated that marine areas are important for a host of environmental, social, commercial, and recreational values.

Discussion
The report concludes with a brief summary of overarching, crosscutting needs, followed by several possible areas for further assessment. (Please note that these topics are not in any priority order.)

Crosscutting needs
- *Partner wherever possible*: The results of the assessment demonstrate that a network of both public and private support must be identified, fostered, and coordinated to provide effective assistance to the resource managers who are working to protect our nation's marine resources. Collaboration is essential both to address existing conflicts and duplications of effort, and to maximize the resources directed toward long-term protection of marine ecosystems. Enhanced intra- and interagency cooperation are needed, and partnerships with stakeholders are important both to build trust and to take advantage of the skills and resources of various groups.
- *Pay attention to the human dimension*: Social science regarding MPAs is desperately needed, and there is universal agreement across the MPA community that stakeholder/community involvement is critical to success.
- *Connect managers with information, technical assistance, and funding that already exist*: Extensive information, technical assistance, and funding opportunities exist to help address management needs, but mechanisms are needed to identify and coordinate these resources for managers.
- *Take time to define MPAs and associated boundaries and authorities*: Managers and stakeholders alike are calling for more definition of MPA terms and goals. Beyond a basic definition of the concept, there is a need to clearly delineate authorities and boundaries of individual MPAs.
- *Learn from past processes*: There is much to be learned from existing MPAs and MPA planning processes. Case studies can demonstrate effective tools and techniques for achieving MPA goals, providing models for future development and management efforts.
- *Institute program evaluation*: Evaluation is essential to determine if MPAs are achieving identified goals, to identify and quantify impacts, and to allow adaptive management. Evaluation is needed both within individual sites and at regional and national levels.

Potential areas for future assessment work
- *Needs assessment targeting indigenous peoples*: Working with indigenous peoples is at once a critical and extremely complex component of MPA efforts. A targeted needs assessment could examine ways to create more meaningful involvement in MPA processes and to incorporate indigenous knowledge into marine management.
- *Needs assessment targeting recreational and commercial fishermen*: This initial assessment only scratched the surface of the particular concerns, desires, and knowledge of fishermen. A targeted needs assessment would examine how to better address fishermen's fears and involve them in MPA processes, as well as how to access fishermen's extensive knowledge of marine resources.
- *Review of MPA-related technology*: It would be valuable to identify current and potential uses of technology in MPA planning and implementation. A review might also examine managers' capacity to use technology and identify sources of technical assistance.
- *Review of stakeholder/community involvement processes*: Managers recognize the need for enhanced stakeholder/community involvement in MPA processes, but are unsure how to create this. Identifying "lessons learned" from past participatory processes is important both to avoid repeating mistakes and to document effective techniques.
- *Areas for further analysis within the computer-assisted content analysis*: Existing data could be used to examine how attitudes and issues vary across different types of management areas, and developing trends could be tracked by rerunning the content analysis in future years.

ACRONYMS

CBA	cost-benefit analysis
CEC	Commission for Environmental Cooperation
CINMS	Channel Islands National Marine Sanctuary
CSC	Coastal Services Center
DOD	Department of Defense
DOI	Department of the Interior
EFH	essential fish habitat
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FKNMS	Florida Keys National Marine Sanctuary
FMC	Fisheries Management Council
FMRI	Florida Marine Research Institute
GIS	geographic information system
IUCN	International Union for the Conservation of Nature and Natural Resources
MCBI	Marine Conservation Biology Institute
MLPA	Marine Life Protection Act (California)
MMPA	Marine Mammal Protection Act
MOA	memorandum of agreement
MOU	memorandum of understanding
MPA(s)	marine protected area(s)
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
NCDDC	National Coastal Data Development Center
NEMO	Nonpoint Education for Municipal Officials
NEP	National Estuary Program
NERR	National Estuarine Research Reserve
NGO	non-governmental organization
NMFS	National Marine Fisheries Service
NMS	National Marine Sanctuary
NOAA	National Oceanic and Atmospheric Administration
NOS	National Ocean Service
NPS	National Park Service
NWRs	National Wildlife Refuge
SAFMC	South Atlantic Fishery Management Council
TBNMS	Thunder Bay National Marine Sanctuary
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

INTRODUCTION

Executive Order No. 13158 on Marine Protected Areas

> *This Executive Order will help protect the significant natural and cultural resources within the marine environment for the benefit of present and future generations by strengthening and expanding the Nation's system of marine protected areas (MPAs)… For the purposes of this order: (a) "Marine protected area" means any area of the marine environment that has been reserved by Federal, State, territorial, tribal, or local laws or regulations to provide lasting protection for part or all of the natural and cultural resources therein.*
> – President William J. Clinton, May 2000

Executive Order No. 13158 on marine protected areas (MPAs) seeks to strengthen the protection of U.S. ocean and coastal resources. Signed in May of 2000, the order calls upon federal, state, local, and tribal governments and the private sector to work together to strengthen and expand the national system of MPAs. (Please see Appendix A for the full text of the order.)

To help fulfill this task, the order directs the Department of Commerce's National Oceanic and Atmospheric Administration (NOAA), working in partnership with the Department of the Interior (DOI), to establish a National Marine Protected Areas Center to provide the science, tools, and strategies to help build a national system of MPAs. Located in Silver Spring, Maryland, the National MPA Center will help build and support partnerships, fostering cooperation between and providing assistance to a range of governmental and nongovernmental entities working to develop, evaluate, and sustain a national MPA system.

Two MPA institutes are supporting the Center, broadening both the technical breadth and the geographic presence of MPA efforts. The National MPA Center's Science Institute is located in Santa Cruz, California, and the National MPA Center's Training and Technical Assistance Institute is located at the NOAA Coastal Services Center in Charleston, South Carolina.

Overarching Goals
The MPA Executive Order calls for a "scientifically based, comprehensive national system of MPAs representing diverse U.S. marine ecosystems, and the Nation's natural and cultural resources." The National MPA Center is charged with supporting such a network of federal, state, and tribal sites, and this entails both providing assistance to existing MPAs as well as supporting efforts to create a more comprehensive and coordinated set of protected areas. The order does not create any new authority for establishing areas, and the Center will be working with public and private partners to enhance and coordinate marine management within the context of existing legislation. As MPA efforts around the country develop and grow, the National MPA Center will add value as an entity that fosters coordination, supports needed research and education, and provides tools and technical assistance.

Within the National MPA Center, the two supporting institutes are designed to develop and provide specialized assistance and expertise. The Science Institute will address both natural and social science issues and needs. The institute will support a range of activities, from direct ecological and socioeconomic research, to holding expert workshops, to policy analysis of resource threats and user conflicts. The institute is in the process of drawing up strategies for

natural and social science, prioritizing research questions and identifying entities that may be able to conduct the needed work.

The Training and Technical Assistance Institute will work to provide resource managers with skills, products, and processes related to MPAs. Assistance might take the form of developing a new technology, providing issue-based education, or training individuals in process skills such as facilitation. The institute will both provide direct training and technical assistance, and operate as a referral service that connects managers and other stakeholders with a network of entities and individuals that offer MPA-related assistance and expertise. Creating this "network of service providers" will both broaden the range of assistance that can be provided, and ensure that the National MPA Center does not duplicate existing information and services.

As the National MPA Center and institutes move forward to put these ambitious goals into action and to begin creating products and services, it is essential that efforts be prioritized to address true and pressing needs of the MPA community. Given limited resources, the Center must identify critical issues and challenges that cut across MPA efforts. To this end, the NOAA Coastal Services Center (CSC), as the National MPA Center's Training and Technical Assistance Institute, initiated a needs assessment.

The Marine Protected Areas Needs Assessment, Phase I
Recognizing that a critical a priori task of the National MPA Center was the identification of needs within the MPA community, an initial nine-month assessment was conducted between May 2001 and February 2002. Broadly defined, the needs assessment aimed to identify information, skills, tools, and processes that are needed to foster effective MPAs. This initial assessment was seen as a first phase, with one purpose being to examine whether additional assessments were required.

The primary use of the needs assessment will be as an internal planning tool that will help the National MPA Center to target its resources, developing programs and projects that deliver immediate benefits to existing efforts while also fostering the development of an effective, coordinated national MPA network. In addition, it is hoped that the assessment will inform other stakeholder groups working on MPA issues and ideally foster the creation of partnerships amongst both governmental and nongovernmental entities to address identified needs.

The Interagency Planning Team
A 12-member planning team was assembled for the needs assessment, composed of individuals from NOAA and DOI. (See Appendix B for a list of members.) This team helped guide the assessment, providing advice and feedback to CSC staff over the nine-month period.

The planning team met three times during the course of the assessment. During the first meeting in June 2001, the team came to a consensus on a target audience for a first phase, and discussed specific questions the assessment should address. A second meeting in September allowed the team to review information-gathering activities under way and to suggest several ways to improve the efficacy of focus groups. The team met for a final time at the end of November to review initial findings and to discuss form, content, and potential uses of the final report.

In addition to meeting periodically, the planning team provided ongoing input and feedback via e-mails and phone conversations with staff at CSC. Members suggested individuals and entities to include in focus groups and individual interviews, as well as publications to review. The planning team also provided comments and suggestions on the draft report.

<u>Target Audience for Phase I</u>
Numerous audiences may look to the National MPA Center for information and assistance, including scientists, managers, fishermen, tourism interests, and educators. However, the initial, nine-month needs assessment could only examine a subset of those audiences with enough depth to be useful. For this reason, the planning team was asked to identify a target audience for the first phase, and the team agreed the assessment should begin by focusing on the needs of coastal and marine resource managers. This target audience included on-site managers and their staffs, as well as state, regional, and federal managers working to coordinate and enhance MPA efforts.

Although managers were selected as the target audience, a wide range of MPA stakeholders were consulted during the course of the assessment. It was clear that input from other groups could provide important insight into management needs, and the technique of "triangulation"— asking secondary groups for information about the needs of one's target audience—was an important component of the assessment. Input from groups such as fishing interests and tourism providers gave important perspectives on management issues and processes, and generated suggestions for ways to make management both more effective at protecting resources and better received and supported by various stakeholder groups.

<u>Goal, Audience, and Objectives for Phase I</u>
With the help of the planning team, CSC staff defined the following goal, audience, and objectives for the first phase of the needs assessment:

> <u>Goal</u>: Collect sufficient information about people involved with MPAs to design tools, products, and services that will build their capacity to effectively address MPA issues.
>
> <u>Audience</u>: MPA managers and staff, both on-site and regional.
>
> <u>Objectives</u>: The four objectives address the basic questions of what, why, who, and how.
> - *What*: Identify overall challenges surrounding MPA management as well as specific gaps in existing knowledge and skills of marine resource managers regarding key MPA issues.
> - *Why*: Determine attitudes, motivations, and disincentives that could impact managers' capacity to benefit from new information, training, or technical assistance.
> - *Who*: Identify subgroups of MPA managers that may benefit most from information, training, and technical assistance.
> - *How*: Identify formats and distribution methods that will maximize the utility of information, products, and services.

Needs assessments aim to identify and address gaps. In this case the assessment strove to look at the gap between current and desired knowledge, skills, and tools needed for effective MPA management. The assessment also identified possible ways to fill some of the gaps, whether via new research, a data clearinghouse, training workshops for managers, or some other tool or process.

As mentioned earlier, although managers were the target audience, a range of stakeholders were asked for input. A key value of the needs assessment process was this opportunity to listen to diverse concerns and ideas. A needs assessment is a methodological approach that allows one to sit and listen to a broad range of people, and in particular to individuals who may not be savvy about getting their voices heard in the policy-making process.

As a final element of the project, the phase I needs assessment sought to identify areas where additional, targeted assessment could be valuable. The discussion section includes several recommendations for audiences and topics that might be researched in a later phase.

Multidisciplinary Needs Require Multidisciplinary Solutions
Recognizing the multidisciplinary, multijurisdictional nature of marine resource issues, the MPA needs assessment looked at needs across sectors, across levels of government and nongovernmental entities, and across the categories of science, education and outreach, and training and technical assistance. The assessment captured issue-specific information, training, and technical assistance needs, as well as overarching communication, networking, and coordinating needs. As one reviews the results of the assessment, the multidisciplinary nature of needs is emphasized, since many of the individual topics discussed have clear links to other sections. For example, there are connections between the need for socioeconomic research on the impacts of MPAs and the need for providing more meaningful involvement for stakeholders.

These connections emphasize that solutions must also be multidisciplinary and crosscutting to be effective. Multiple partners with different areas of expertise and in different sectors of the MPA community will have to work together to address needs. This overarching finding highlights the utility of the National MPA Center as an entity that strives to coordinate activities and partners to craft effective solutions. At the same time, it reminds us that the Center cannot address the vast range of needs alone. A network of both public and private support must be identified, fostered, and coordinated to provide assistance to the resource managers who are working to protect our nation's marine resources.

Sharing the Results
The primary audience for the needs assessment report is the National MPA Center itself, since the assessment will serve as a planning tool. In addition, the report will be shared with individuals who were interviewed and/or participated in focus groups. Finally, the report will be placed on the Web site created under the MPA Executive Order (*www.mpa.gov*).

METHODOLOGY

The MPA needs assessment used a variety of methods to gather information. Existing publications were mined for needs, and new data were gathered using focus groups and interviews with individuals. A computer-assisted content analysis of popular news media added information about pubic opinion and interests, and CSC staff tracked needs articulated at MPA-related meetings and conference sessions and on an electronic discussion list. Each of these methods is described in more detail below.

Literature Review
A variety of publications speak to resource managers' needs. Several books and technical guides specifically on the topic of MPAs and their management have been published in recent years, and there are numerous articles in scientific journals about MPA-related research. In addition, there are a host of reports from governmental, nonprofit, and academic sources dealing in some manner with MPA management. Finally, the international newsletter *MPA News*, published monthly since the fall of 1999 by the University of Washington's School of Marine Affairs, provided a host of articles and contacts useful to the needs assessment (*http://depts.washington.edu/mpanews/*). (See the reference section of the report for a list of publications and *MPA News* articles specifically cited in the assessment.)

Focus Groups
Five focus groups provided extensive input to phase I of the needs assessment. Each group was held in a different region of the country, and CSC staff strove to have approximately a dozen people in each group. Participants ranged from protected area site managers to nonprofit organization members, researchers, and state-level coastal zone managers. (See Appendix C for a list of focus group locations and participants.)

Based on lessons learned from the initial group meetings and feedback from the planning team, the focus group methodology evolved over the course of the assessment. The first two groups were piggybacked onto existing meetings in an effort to make data-gathering as efficient and nonintrusive as possible, but this proved problematic as meetings frequently ran over schedule and participants did not always represent the range of interests desired. The remaining three focus groups were held as stand-alone meetings, and this change allowed more time for discussion and a better cross-section of participants. Also, the first two groups were asked to prioritize their discussion around nine pre-set discussion topics, but this methodology was too restrictive. The remaining groups worked together to generate issues and then proceeded through a prioritization exercise. Lastly, initial focus groups spent extensive time discussing the executive order and definitional issues, spurring CSC staff to create several handouts on the National MPA Center and institutes that helped to clarify federal efforts for future groups.

Phone Interviews
While the focus groups allowed staff to hear from public sector resource managers as well as nongovernmental entities, individual phone interviews were also employed to broaden the range of stakeholders included in the assessment and to increase the geographic diversity of participants (See Appendix D for a list of individuals interviewed.) Interviews were conducted using an informal format, with interviewees being asked to identify three priority topics for in-depth discussion. Within each topic, interviewees were asked to discuss current challenges or needs, and to suggest possible avenues for addressing those needs.

Computer-Assisted Content Analysis of News Media
Using specialized software developed by researchers at the University of Minnesota, CSC staff conducted a content analysis of news media stories related to marine protected areas. The intent of the analysis was to examine public awareness, and to identify uses, values, and stakeholder groups commonly discussed within MPA coverage. Initial findings are discussed in the results section of this report, and CSC will also be putting out a detailed technical report on the content analysis (Fish, Recksiek, and Fan 2002).

Computer-assisted content analysis has been used numerous times for natural resource planning, public opinion assessment, and policy analysis (Allen, Bengston, and Fan 2000; Bengston and Fan 1999; Pierskalla and Anderson 2000; Schroeder 1996) and has been shown to be an effective and reliable substitute for public opinion polls and attitude surveys (Fan 1994; Fan and Tims 1989; Lindenmann 1983). Unlike traditional polls and surveys, computer-aided content analyses provide an unobtrusive means of data collection. In addition, these analyses can be extended back in time to follow opinion time trends related to natural resource policy changes or replicated in the future to facilitate periodic monitoring of opinions. Given these attributes, CSC staff were attracted to computer-assisted content analysis as a technique that would be less intrusive and costly than a traditional public opinion poll, yet serve as an effective method for assessing public opinions associated with MPAs.

The analysis examined more than 25,000 on-line newspaper, news wire, and broadcast media stories from 1995 to 2001. Given the numerous management authorities responsible for MPA management, the terms used for selection of news stories reflected management units associated with federal (e.g., National Marine Sanctuaries, National Seashores, National Wildlife Refuges), federal-state partnership (e.g., National Estuarine Research Reserves), state and territorial, tribal, and local management areas. The search captured stories that contained specific national management units listed by name (e.g., Florida Keys National Marine Sanctuary) as well as those MPAs that have more generic descriptions (e.g., a state marine park) and units that occurred in close proximity to a coastal or marine descriptor word (e.g., coral reef preserve). The selected MPA-related stories were then analyzed for favorable and unfavorable attitudes, for expressions related to four categories of uses and values—commercial, recreational, social, and ecological—and for discussion of stakeholder groups.

Meetings, Conferences, and FISHFOLK Discussion List
During the course of the nine-month needs assessment, CSC staff attended several meetings and conferences where MPAs were discussed. (See Appendix E for a list of meetings attended.) A host of stakeholders attended these forums, and management needs heard at these meetings were included in the assessment. CSC staff also monitored FISHFOLK, an electronic discussion list run by the Massachusetts Institute of Technology (MIT) Sea Grant Marine Advisory Program and dedicated to fisheries issues. MPAs generated extensive discussion on FISHFOLK, including postings that spoke to management needs, and these ideas provided input to the MPA needs assessment.

RESULTS

The information sources outlined above generated a host of needs related to MPA management. To the extent possible, needs have been organized into distinct topic areas that were generated by focus groups and individuals interviewed. Topic areas include both management *issues*, such as visitor impacts and jurisdictional overlap, and management *functions*, such as monitoring and enforcement. Each topic area includes both broad needs (e.g., more monitoring) and specific information, tools, technical assistance, or training needs that are nested within the broad topic (e.g., monitoring guidelines for individual sites to follow). As mentioned in the introduction, many of the needs are interconnected, and there may be some duplication where a need is relevant to more than one topic.

To provide additional structure, topic areas have been grouped into three broad categories:
- MPA-related policy and legal issues/responsible authorities,
- MPA-related science and technology, and
- MPA program implementation.

Within each topic area, results are presented in the following basic outline:
- Key Needs: While the assessment was not designed to produce quantitative data, needs that were raised repeatedly by multiple sources are presented at the beginning of each topic area. These tend to be overarching, priority needs.
- Connections to Needs Assessment Objectives: The needs assessment objectives— referenced by the basic "what, why, who, and how" questions—are addressed for each individual topic area.
- Specific Needs: This section lists specific ideas that came out of individual focus groups, phone interviews, meetings, or reports. In most cases these are information, products, or services that sources would like to see developed and/or provided, but in some instances an existing resource is identified as a potential way to address an identified need. (Note: Many of the bullets listed within "specific needs" sections are individual comments heard during focus groups and phone interviews. Editing of comments was minimized to convey ideas as articulated by sources.)
- Links to Other Topics: Some links to other topic areas are briefly outlined.

The following pages present results for 25 topic areas, grouped into the three broad categories mentioned above:
- Section I: MPA-related policy and legal issues/responsible authorities:
  - Identifying MPA goals and defining MPA terminology
  - Integrating management across jurisdictions
  - Information sharing and management
  - Intra- and interagency coordination and cooperation
  - Fisheries management issues
- Section II: MPA-related science and technology:
  - Inventorying and monitoring
  - Mapping and spatial analysis
  - Natural science needs
  - Social science needs
  - Science in management
  - Climate change

- Section III: MPA program implementation:
    - Public education and outreach
    - Planning methods for identifying MPAs
    - Stakeholder/community involvement
    - Working with indigenous peoples
    - Working with fishermen
    - Managing visitor impacts
    - Historical and cultural issues
    - Enforcement
    - Evaluating MPA effectiveness
    - Funding
    - Growth and land-based threats
    - Site- and sector-specific issues

As a final note, the reader will see that only some needs are referenced to a particular source. While published documents and meetings have been cited, information from focus groups and interviews does not have specific citations since participants were promised that their comments would remain anonymous.

Following the discussion of topic areas, two final sections address 1) the results of the computer-assisted content analysis of MPA media, and 2) information sources used by managers.

SECTION I: MPA-RELATED POLICY AND LEGAL ISSUES/RESPONSIBLE AUTHORITIES

Identifying MPA Goals and Defining MPA Terminology
Key Needs
Probably the most frequently articulated need was for definitions. Individuals across stakeholder groups repeatedly called for an articulation of MPA goals, and for clear and consistent definitions of MPA-related terminology. There is confusion and uncertainty among managers, user groups, and the general public as to how the term "marine protected area" is being defined, and as to the objectives of current MPA efforts. Site managers are looking to the federal level to provide definitions and goals that give direction to sites and that can be passed along to stakeholder groups and used in public education efforts.

Since multiple MPA efforts are already under way across the country, clear definitions and management goals are essential to minimize the development of misconceptions and personal agendas (Bridgewater and Coyne 1997). Needs assessment participants said that many people equate MPA with completely closed, no-take areas, and that some users may not support MPAs simply because they are unsure of how they will function or of what the goals of such areas might be. For example, when they evaluated marine reserves created by the Florida Keys National Marine Sanctuary (FKNMS) off of Key West, Dobrzynski and Nicholson (2001) found that user groups did not understand the purpose of reserves, and "this uncertainty…bred hostility and fear particularly among consumptive user groups because, left without an understanding of the reason behind the reserves, these groups assume that reserve creation was arbitrary and not based on science, but rather for the specific purpose of benefiting the Sanctuary or non-consumptive user groups."

Connections to Needs Assessment Objectives
- *What*: Managers need knowledge about the goals of MPAs, and they need common definitions for MPA terminology. Many managers have heard about the executive order on MPAs but do not have a clear understanding of its objectives or their role.
- *Why*: Managers clearly want to receive definition and direction on this topic. Site managers need the information both to guide their own management activities, and to pass along to stakeholder groups who are pressing them for information about MPAs.
- *Who*: Definitions and goals are needed across management agencies and levels, but managers of individual sites considered MPAs under the executive order are particularly in need of this information.
- *How*: Site-level managers want direction from upper-level management. Policy statements and definitions need to come down from the upper levels of NOAA and DOI. Since many stakeholders are also calling for definitions, it would be good to provide this information to managers in format(s) that can be subsequently used in education and outreach efforts.

Specific Needs
- If MPA efforts are part of DOI culture, that fact is not being well communicated to individual units. Upper-level management needs to communicate the agency's level of commitment.
- NOAA sites are hesitant to use the term MPA because of politics. Need a directive from above if are to use it "loud and proud."
- Some site managers see their marine areas as MPAs while others do not. Managers may worry that a "national system" implies their sites will be taken over by a new agency or federalized.

- Need to identify the legal authorities that can be used to create and manage MPAs, and to spell out what activities each can or does regulate.
- Need to define who can do what in areas that will be considered MPAs. This might take the form of a catalogue. The public just wants to know the rules.
- The message that federal efforts under the executive order are not about creating *new* MPAs or *new* authorities should be broadcast loud and clear, emphasizing that the National MPA Center is not creating a new layer of bureaucracy.
- Some people are only thinking about MPAs as a tool for restoration of commercial fish stocks. Need to discuss other goals and benefits, including habitat preservation, biodiversity conservation, and recreation benefits.
- Definition efforts need to emphasize that protection includes indirect activities. For example, a National Estuarine Research Reserve (NERR) may not have regulatory authority over the water, but it still promotes marine protection by doing research and informing decision makers.
- There is a need to identify specific problems that should be addressed by MPAs (New England Aquarium 2001).
- The National MPA Center should present a consistent message to all stakeholders about MPAs and about the center, and this message should include goals for MPAs, definition of MPAs, and risks and benefits of MPAs. This message should be both publicly announced and presented to federal and state agencies and stakeholder organizations for dissemination to other stakeholders (New England Aquarium 2001).
- The public needs definitions. There is a need for common terms that both managers and the public can consistently use. Too many words are being used to refer to the no-take concept.
- MPAs are mired in the fisheries management context, and they need to be separate.
- Definition is needed to combat the *misinformation* out there. Misinformation is causing managers to have to "do battle" before they can make any progress.
- In the Northeast, different groups are spreading different definitions, generating confusion among the public and angst amongst commercial and recreational fishermen. Need policy direction from above, and a way to effectively get out the message about what the MPA Executive Order will and will not do. NOAA needs an outreach plan to convey this information.
- Industry wants defined, consistent regulations and enforcement in the marine realm since this makes compliance easier.
- Need to define criteria for protection. For MPAs that seek to restrict fishing, criteria always seem to include whether outside areas will get bigger catches. This is a bizarre perspective in that we do not protect woods to make more lumber elsewhere. It is also a hard standard to meet, and hard to prove.
- An MPA conference for MPA managers at the outset would be very valuable. This could provide leadership support and define responsibilities up front.
- Need consistent and national messages. It is easier for local sites to enforce a national message than to create one from scratch.
- Need to communicate facts and definitions to recreational fishing organizations and other stakeholders. Need to explain the purpose of MPAs in order to foster stakeholder support and prevent false assumptions.
- Some elements of the fishing industry have the misperception that traditional fisheries management is being abandoned.
- Indigenous tribes in the Northwest are concerned that the various agencies involved in MPA processes are not taking time to define the problems they are trying to fix, or to define goals of the MPAs.

- Broadening the definition of MPA may dilute the impact or value. MPA has drifted from being offshore to being upland too, and while it is important to be inclusive, definitions should not dilute the impact of the effort for protecting *offshore* areas.

Links to Other Topics
- *Integrating management across jurisdictions*: Sources called for definition of federal vs. state roles and authorities regarding MPA establishment, funding, enforcement, and monitoring. State managers want to know what relationship they will have with NOAA, and they want to clarify the goals and objectives for the relationship between federal and state partners. In addition, roles of different federal entities need to be defined. For example, there is confusion surrounding the interrelationships and overlap between MPA activities of NOAA's National Ocean Service and fisheries management activities of NOAA's National Marine Fisheries Service (NMFS).
- *Public education and outreach*: A number of individuals called for an aggressive outreach campaign about MPA definitions and goals, and about federal plans under the executive order.
- *Working with fishermen*: Commercial fishermen are nervous about MPAs because no one has defined what areas are being talked about, leading some fishermen to assume the worst. Better definitions are needed to correct misperceptions and to give fishermen the certainty they need to sustain their businesses.

Integrating Management across Jurisdictions
Key Needs
Another topic raised repeatedly by a variety of sources is the need to define and integrate jurisdictions and responsibilities of the different agencies and levels of government involved in MPA management. There is confusion and frustration regarding current jurisdictions as they have been created by federal and state marine resource legislation, and sources expressed a strong desire to have clear definitions of authorities and responsibilities associated with sites that are to be considered MPAs. In addition, when new MPAs are created it is essential that jurisdictions and responsibilities be defined at the start, and management arrangements should be revisited periodically so that roles can be modified if the goals of the MPA are not being met. Given overlapping authorities and the reality that different agencies will have different capacities to provide various management functions, co-management arrangements are needed.

Multiple sources expressed frustration at the current lack of integration and cooperation between agencies involved in different aspects of marine resource management   Integration is needed across levels of government, across the land/sea interface, and across pieces of ocean policy legislation. Both federal and state level resource managers are frustrated by the lack of coordination between levels, and call for both clearer delineation of authorities and more cooperative action. Given the connections between land-based activities and marine resource health, sources call for more integration between agencies responsible for marine and terrestrial resources. Finally, agencies struggle to work within overlapping jurisdictions and competing demands laid out by ocean policy legislation. For example, NMFS must try to satisfy the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA), the Endangered Species Act (ESA), and the Marine Mammal Protection Act (MMPA), but Congress has not provided any guidance on how to balance these laws when conflicts arise between fisheries and protected species. As a second and related example, the National Marine Sanctuary Act does not provide clear or sole authority over fisheries issues, requiring sanctuaries to consult with the Fisheries Management Councils (FMCs).

Nested within the topic of integrating management across jurisdictions is the need for MPAs to be part of a larger integrated ecosystem management system (Bridgewater and Coyne 1997; Crosby and others 1997; Kelleher 1999). Managers need to consider this integration during both planning and implementation. The interconnected nature of marine resources means that MPA planning should be "developed at a broader spatial scale than the reserve itself" (Bridgewater and Coyne 1997), and recent recommendations from the National Research Council (2001) state, "Choices of sites for MPAs should be integrated into an overall plan for marine area management…because the success of MPAs depends on the quality of management in the surrounding waters." During implementation, MPA managers need to pay attention to how their sites fit into the coastal management context of the counties and state(s) in which they are located. "Successful management of MACPAs [Marine and Coastal Protected Areas] for long-term conservation and sustainable use of biological diversity can only occur if it is integrated with broader coastal zone management" (Crosby and others 1997).

Connections to Needs Assessment Objectives
- *What*: There is widespread frustration at the lack of integration. Increasing managers' knowledge about existing jurisdictions, laws, and agencies' activities at the ecosystem level, as well as providing information about how jurisdictions and roles will be established for any future MPAs, is key to addressing this problem. There is also a need for mechanisms and skills that enable managers to work cooperatively with other agencies.
- *Why*: Managers are motivated to work for increased integration because this will improve resource protection, limit duplication of effort, and mitigate or eliminate conflicts or tensions that currently exist between management entities. However, existing legislative mandates may make integration difficult, and agency cultures established under sectoral management may not reward individuals who pursue integration.
- *Who*: The need for integration crosses all agencies and levels of government involved in marine resource management. State managers expressed particular interest in integration with federal efforts as MPAs move forward, and federal site managers emphasized the need to work with the states in which they are located.
- *How*: In some cases legislative change may be required to truly solve jurisdictional conflicts and integrate management, but a range of tools can clarify roles and foster co-management. Training can increase managers' knowledge of existing jurisdictional arrangements, and processes such as interagency meetings and memorandums of understanding (MOUs) can be used either to bring integration to existing protected area management efforts or to establish integration from the beginning with new protected areas. Case studies of functioning co-management arrangements can demonstrate benefits and explain successful techniques for achieving integration.

Specific Needs
The following list provides examples of specific needs within this topic, as well as suggestions for ways to promote integration:
- Functional overlap in geographic areas and authorities of different groups leads to problems. Overlapping jurisdictions means we need coordination and involvement by all, and the *goals* should drive the process.
- State agencies need to be involved in federal agency planning for MPAs.
- U.S. MPA efforts should be coordinated with efforts in Canada and Mexico. (Note: Two international efforts are already working on this coordination—the Baja to Bering initiative and the Commission on Environmental Cooperation's (CEC) North American Marine Protected Areas Network project.)

- When a new MPA is created, that is the time to identify which agency has the resources for managing it. For both new and existing MPAs there should also be a process built in so that every five to ten years all of the involved agencies sit down and evaluate whether the current management arrangement is working, and there should be a mechanism to change management responsibilities without changing MPA boundaries. For example, the U.S. Fish and Wildlife Service (USFWS) might do a great job starting up a new preserve, but eventually they might want to turn over some of the management functions to states or counties since these might be more appropriate entities for activities such as monitoring, public education, or construction of access points.
- Need legal structure(s) for co-management arrangements. For example, MOUs and MOAs (Memorandums of Agreement) might be drawn up so county and state agencies can help with monitoring in a National Marine Sanctuary (NMS).
- Jurisdictional issues may be side-stepped by tools such as MOUs and MOAs. A lead agency and others can agree to cooperate without settling all of the turf wars.
- Need examples of successful joint management efforts.
- NERRs are federal/state partnerships that are supposed to be implementing integrated coastal management, but state agencies are not structured that way. Addressing multiple issues does not fit into states' administrative structure. MPA efforts will face this same issue since they will be striving to integrate management. A national-level effort is needed to convince state agencies to "get out of the box" and provide the administrative structures to support truly integrated management. An important role for the National MPA Center is educating state partners about this integrated approach, and encouraging them to participate.
- One way to encourage integration might be to get state commissioners from multiple states to meet with upper-level federal managers and to present case studies that show what an MPA is supposed to be like. This might get states excited about MPAs, and the competitive nature of states may spur their participation and cooperation. A state-by-state report card on MPAs could also be an incentive to do more. This report card should report on all the components of management (e.g., how much support given for staffing, for education, for enforcement, etc.)
- Agencies and councils should be encouraged to promote discussion of MPAs within existing procedures (e.g., the New England Fishery Management Council, the Gulf of Maine Council on Marine Environment, the Atlantic States Marine Fisheries Commission) (New England Aquarium 2001).
- Regional MPA "implementation teams" could facilitate integration. These teams would have to include representatives from all federal, state, and local agencies that have some responsibility for managing marine and coastal resources in the region (New England Aquarium 2001).
- National Park Service (NPS) units may both include and border on a host of other federal and state jurisdictions. Partnerships are essential, and managers need help with working with other entities. Cooperative management should involve state agencies, other federal agencies, nongovernmental organizations (NGOs), and universities.
- Joint research studies can foster cooperation.

- National Parks' missions can be hard to achieve without jurisdiction over submerged resources. MOUs/MOAs with states are possible, but individual states may be difficult to work with if they already know submerged treasure exists. Legislation that transfers ownership of submerged resources—just the resources, not the land—to the NPS would be helpful.
- Jurisdictional limitations are a real challenge. For example, in the Florida Keys water quality is a huge issue, but the FKNMS does not have jurisdiction over land-based sources of pollution. Co-management boards or other mechanisms are needed as a way to deal with issues like this where activities afar impact the resources that managers are charged with protecting. There is a need for mechanisms to figure out who relevant authorities are and to bring them together to address issues.
- The roles of different agencies in joint environmental impact statements are not clear.
- Agency staff could benefit from basic training on the various pieces of legislation relevant to marine policy (e.g., MSFCMA, ESA, Coastal Zone Management Act, etc.).
- Fishery management councils (FMCs) might be upset if they perceive other groups are making fisheries decisions, so coordination is needed on this topic.
- Consistency provisions of the Coastal Zone Management Act are a "latent authority" that should be considered by MPA efforts.
- Different processes were used to coordinate during the FKNMS process and the Channel Islands National Marine Sanctuary (CINMS) process. It would be helpful to have a standard process for coordination at the federal level.
- Often managers are so focused on their sites that they do not consider the context of the surrounding area, and they do not see threats that come from outside the site. Managers need to see that their site is part of a bigger whole. For example, an offshore MPA manager needs to be concerned with what is happening on the land.

Links to Other Topics
- *Historical and cultural issues*: NPS units with submerged cultural resources do not have fee simple ownership of bottomlands even though their boundaries extend over these areas. State laws apply to these areas, and sometimes states allow access to or use of submerged cultural resources that jeopardizes the resources' historical and/or cultural integrity.
- *Sharing and management of information* and *Intra- and interagency coordination and cooperation*: There are clear links to these next two topics. Regular information sharing and coordination and cooperation across agencies are a priori needs if jurisdictional integration is to become a reality.

Information Sharing and Management
Key Needs
During focus groups and at MPA-related meetings, issues surrounding data management and information sharing arose repeatedly. There is consensus that managers have a hard time getting standardized, comprehensive information about coastal and marine resources and management. Public agencies that have data are not doing a good job of sharing their information, and there is a pressing need for "clearinghouses" where data from multiple sources can be accessed. Both statewide and national clearinghouses are needed, and agencies need to increase data standardization efforts so information from multiple sources and/or scales can be analyzed together.

Improved information sharing and management are needed to avoid duplication of effort, and to support site-level managers who are too busy to spend extensive time tracking down and manipulating data. Natural and social science data are an obvious need, but managers are also

interested in knowing about projects undertaken by other entities. For example, a site developing a new volunteer monitoring program may be able to learn what does and does not work by contacting a site that already has such a program. As MPA efforts develop, there is great interest in ecological, socioeconomic, management, and policy information about both individual sites and MPA networks. Finally, the need for MPA case studies was raised repeatedly within multiple topic areas of the needs assessment.

New information technologies and traditional communication methods should both be employed to achieve better information management and sharing. Given that use of the Internet has become common practice, aforementioned clearinghouses can be Web-based. Spatial data should be provided this way, and clearinghouse sites should also be used to inventory management projects, to provide contacts, and to give links to other related sites. For example, specifically on the topic of MPAs, it would be useful to have a national site that has links to each of the states, and those links would contain state-specific MPA policy information, maps, etc. Electronic discussion lists are another technology that can be used to share information, and no list currently covers national and/or international MPA issues. In addition to Internet technologies, traditional methods such as newsletters and meetings also should be used to share information. Needs assessment participants felt that managers needed to talk more often to share lessons learned, and regional workshops were mentioned repeatedly as a useful tool.

Two final points made during discussions of information sharing are the need for a two-way flow of information and the potential for improving data management via partnerships. Too often information only flows *down* from the national level to the local or site level, but there is no avenue for information to travel back *up*. Individual managed areas and local communities may find data errors, and they frequently have information that can augment state or national data, but there are inadequate mechanisms for getting this information incorporated. Somewhat related is the problem of agencies having a lot of data on hand but no time to perform needed compilation and analysis. Partnerships can help get this work done, and agencies should explore working with academics and NGOs, who may be interested in analyzing existing data.

Connections to Needs Assessment Objectives
- *What*: Managers are always in need of more information about the natural resources and people they are influencing, and about the successes and failures of other management efforts. Unfortunately, sharing of both social and natural science data and project information is inadequate, and data are not standardized or easily accessible.
- *Why*: Site managers are busy and do not have time to hunt down and analyze data. Some managers believe "turf wars" between agencies are largely responsible for the lack of information sharing, and state and local level managers believe it is high time for the federal government to "get its act together" regarding data management.
- *Who*: Information-sharing needs cut across all levels and entities. Managers in states and at individual managed areas are particularly interested in better access to statewide and nationwide coastal and marine data clearinghouses, and in more exchange between individual managers to hear about lessons learned.
- *How*: Web-based clearinghouses are needed for research data, for management projects, and for MPA-specific efforts. Electronic discussion lists, regional workshops, newsletters, and Web sites are all useful for sharing information and information needs. New mechanisms or processes are needed to foster the *upward* flow on information from individual sites or localities to state and national databases.

Specific Needs

- Federal agencies must get organized regarding data management and sharing. A system needs to be created that is both effective and efficient. Right now different agencies are trying to be *the* repository, and they need to talk to each other and get beyond turf battles.
- When all the different agencies do not coordinate and standardize data, it hinders MPA advocacy and management efforts.
- There should be a Web-based clearinghouse where someone can click on a particular state and be routed to sites that describe that state's MPA activities. The clearinghouse could provide contact information for maps and other resources. The Web site created under the executive order (*www.mpa.gov*) might provide such a clearinghouse.
- Sites may undertake a new project (e.g., citizen monitoring of shoreline change) only to discover later that other areas have done similar projects and could have provided useful information. A clearinghouse that describes projects other groups and sites have done or are currently doing would be useful. It should include a list of projects and contacts.
- An international-scale MPA electronic discussion list is needed.
- Research needs to get to program managers. Multiple methods of information dissemination—newsletters, Web sites, meetings—should be used.
- Managers working with same resources need to meet more often (e.g., all Puget Sound managers). Regional workshops are a great idea.
- Site managers and traditional fisheries managers should learn more from each other. Joint workshops would be good. These two groups do not get together enough.
- Agencies have large amounts of data that they do not have time to organize or analyze, and staff frequently do not have time to respond to all of the data requests they receive. In some cases agencies may be receptive to having an NGO help with data analysis.
- Data travel *down* (e.g., from an agency to a community in a watershed), but there is no mechanism for information to travel back *up* (e.g., the community might be able to update, augment, or correct the data).
- Managers may not know about some data clearinghouses that already exist. Managers need to be told about efforts to pull together data.
- A spatial data clearinghouse is needed, and data need to be easily accessible for viewing. There cannot be one location with all the data, however. It will have to be a hierarchical system (i.e., a central location will link people to other sites that have relevant data.)
- A Dewey decimal-type cataloging system for geographic information system (GIS) data would be useful. This would allow one to look through what is available, and if someone edits or augments a layer it would receive a new identification number.
- Going to the original source for data is important for accuracy and to ensure the source knows the information is being used and thus will continue to collect the data (MPA Power Tools cConference 2001).
- The National Coastal Data Development Center (NCDDC), housed at NOAA's National Oceanographic Data Center, has an initiative under way to create a national clearinghouse for metadata. NCDDC is collecting metadata and pairing it up with a search engine.
- NPS is working on a taxonomic database that will be available.
- In Florida, the Fish and Wildlife Conservation Commission's Florida Marine Research Institute (FMRI) is working to be a statewide clearinghouse.
- One role of the National MPA Center could be identifying and collating data already available from state and local agencies.

- Regional data maps with compatible information and/or common formats would be useful. Arc software might be used to create these. Managers would need ArcView to look at trends and do analysis.

Links to Other Topics
- *Intra- and interagency coordination and cooperation*: Clearly, coordination between agencies at all levels is essential to effective information sharing. Multiple sources felt that federal agencies are not doing a good job with data management and sharing because of "turf battles." Agencies must work together to provide consistent and comprehensive information about coastal and marine resources.
- *Science in management*: During a discussion of information management needs, one focus group mentioned that scientists sometimes resist giving out biological data. Scientists may resist turning over data before they have been analyzed or when they do not know how data are to be used. Managers see this as a barrier to using science in management, and would like to learn how to address this issue. Establishing official data clearinghouses with standards may make scientists more comfortable sharing data.

Intra- and Interagency Coordination and Cooperation
Key Needs
"Integration of management across the array of federal and state agencies will be needed to develop a national system of MPAs that effectively and efficiently conserves marine resources and provides equitable representation for the diversity of groups with interests in the sea" (NRC 2001). There are currently a host of MPA efforts under way at local, state, national, and international levels, and there is an overwhelming need for coordination between the various public entities involved. MPA managers need help coordinating if their sites are to collectively form a network and if they are to learn from each other. Given the range of sites considered to be MPAs, needs assessment participants see coordination as a major function of a National MPA Center. An MPA "community" needs to be fostered and maintained. This community would share lessons learned, pool resources for greater gains, and provide support simply by making managers feel as if they are part of a bigger whole.

Different federal agencies, coastal states, and local governments all want to be informed about MPA activities, and state managers in particular expressed a strong desire to be active participants in national efforts developing in response to the executive order. As with information sharing, coordination needs to be both top-down and bottom-up. Policies are needed from above to provide guidance to individual managers, but it is crucial for national- and regional-level managers to consult with state, local, and site managers to ensure that these policies will be effective across locations.

Turning to process concerns, there is a need to establish mechanisms for greater coordination between agencies. Some of this may be achieved through the information sharing methods discussed in the previous topic area since several sources said they just need to know what other entities are working on. However, agencies also need to establish processes for working together on specific issues and for resolving conflicts. Creative mechanisms should be considered to achieve this cooperation since a number of individuals raised the problem of their being asked to attend too many meetings. For example, the current proliferation of MPA efforts is generating a lot of meetings, sometimes in a single region of the country, and individuals are unsure which meetings they really need to attend.

Connections to Needs Assessment Objectives
- *What*: Coordination is needed across MPA efforts so managers can learn from each other and work together to create the national network called for in the executive order.
- *Why*: Managers are expressing frustration at the lack of coordination because the variety of MPA efforts generates confusion and duplication of effort. Some managers seem to be looking for policy direction from upper-level management before they actively engage in MPA-related activities.
- *Who*: Cooperation and coordination needs to happen across federal, state, local, and tribal agencies. Upper-level managers need to provide policy direction for sites, and site managers need to strive to coordinate across all of the jurisdictions impacting their site.
- *How*: Basic information sharing can enhance coordination and intra- and interagency communication, but additional mechanisms are needed to help multiple agencies work cooperatively on issues and resolve conflicts. Interagency working groups and formal mediation procedures are two mechanisms that might be used. Examples of successful interagency projects should be used as models.

Specific Needs
- Communication between states and the federal level needs to be greatly enhanced. States want significant representation on the MPA Federal Advisory Committee.
- MPA-related activities are under way at multiple sites and levels, but there is extensive confusion about how to coordinate these efforts. Coordination between agencies is particularly important because of the fluid nature of marine systems and because upland activities impact coastal and marine resources.
- There are lots of MPA meetings going on, and it is getting confusing as to who is doing what and which meetings are important to attend. It is important to engage people in the discussion, but people cannot attend a million meetings.
- Individuals working on MPAs need to be brought together in a community that shares experiences, research needs, etc. Partnerships need to be fostered.
- The Partners-in-Flight program (*http://www.partnersinflight.org/*) might be a useful model for developing partnerships.
- In the U.S. Fish and Wildlife Service (USFWS), the regulatory arm is not talking to the refuge arm. People in DOI may not have *time* to talk and share information.
- Upper management needs to identify research priorities to provide consistency for site managers.
- USFWS ecological services offices need a directive from above about how responsibility is to be divided between USFWS and NMFS.
- Florida's sunshine laws (*http://legal.firn.edu/sunshine/*) sometimes make communication difficult. Managers need to figure out how to get policy makers' support, and rules about who one can contact, and how, can make communication difficult.
- A federal policy with White House support is needed on the topic of cross-agency coordination.
- More communication is needed between and *within* agencies. People in the NPS and the DOI may not talk enough.
- On the one hand conflicts need to be resolved at upper levels by creating national policies. On the other hand national level regulations may not be sensitive to local differences (e.g., whale-watching issues in Hawaii and Maine may be very different), so there must be cooperation and discussion with the local level.
- When two agencies disagree about a proposed management action, the lack of established processes or patterns for conflict resolution and cooperation can stop the entire process.

- Each entity needs to know what the others are doing. For example, NMFS needs to know about EPA, the Army Corps of Engineers (ACOE), state agencies, etc. No one coordinates this information.
- Where it is not possible to change laws or administrative frameworks to enhance coordination, special initiatives can be an effective tool.

Links to Other Topics
- *Integration management across jurisdictions*: As mentioned earlier, one of the most compelling reasons for agencies to cooperate is to integrate management across jurisdictions. Congress has often set up duplicative or competing objectives for agencies, and coordination is essential to minimize duplication of effort and to resolve conflicts.
- *Public education and outreach*: It is hard for the public to keep track of all the different management agencies and units that exist. For example, the public confuses National Forests with National Parks. As agencies work to increase cooperation and communication between and within their own organizations, they should keep in mind the need to communicate with the public as well. Agency authorities and roles need to be clearly articulated both within the management community and to the general public.

Fisheries Management Issues
Key Needs
As defined in the executive order, MPAs may allow varying levels of use and extraction in order to pursue varied goals, including habitat protection, biodiversity conservation, and preservation of existence value. However, a significant amount of the discussion surrounding MPAs has focused in on the use of no-take "marine reserves" as a fisheries management tool. Both positive and negative fisheries-related impacts of no-take MPAs are being hotly debated. In addition, a number of fisheries management councils (FMCs) are either already using MPAs or exploring the development of MPAs, spurring more discussion of their appropriate use within fisheries management.

During the needs assessment, long-standing fisheries management issues were raised both as a reason why MPAs are needed, and as a reason why MPA development is incredibly complex and demands careful planning, stakeholder consultation, and adaptive management. As indicated above, sources were typically referring specifically to no-take MPAs when fisheries topics were raised. Issues such as overfishing, habitat damage by certain gear types, and bycatch need to be addressed, and fisheries managers need to pursue multispecies, ecosystem-wide approaches. At the same time, fishing is a livelihood for many, a driver of numerous local economies, and an important aspect of the culture. Sources raising fishing issues recognize that there is a need for management solutions that sustain both ecosystems and people.

Two key points raised within the topic of fisheries management are that 1) managers and policy makers alike should see MPAs as only one of many tools, and 2) potential unintended consequences of MPAs must be considered. Although MPAs may be an effective tool in some situations, traditional fisheries management tools such as gear and seasonal restrictions should not be abandoned, and managers should consider consequences outside of MPAs. For example, the potential impacts of concentrating fishing effort in non-MPA areas were raised at several meetings (Marine Conservation Biology Institute (MCBI) Symposium 2001; Pacific MPA Science And Coordination Workshop 2001; MPA Power Tools conference 2001).

Turning specifically to the FMCs, some sources believe the council process is flawed, and this hinders overall fisheries management, as well as MPA efforts. FMCs may be perceived as being overly dominated by a particular sector or state, and individual representatives may not have the freedom to compromise on reasonable solutions that are based on the best science. Needs assessment participants said the FMCs need education on MPAs, but again emphasized that MPAs should be seen as only one tool within the larger fisheries management toolbox.

Connections to Needs Assessment Objectives
- *What*: Managers need knowledge of both existing fisheries management issues, and of the fisheries management aspects of MPAs.
- *Why*: One motivation driving managers to learn about and use MPAs is that they are seen as a tool that can improve fisheries management. However, fishing interests worried about potential negative or inequitable impacts of MPAs may put extensive pressure on managers not to use MPAs.
- *Who*: Fisheries managers need information about MPAs as a potential tool they can use, and non-fisheries managers working on MPAs need to know about fisheries issues, interests, and processes since these are inextricably tied to MPA processes.
- *How*: Fisheries management issues need to be addressed using both MPAs and traditional tools (seasonal closures, gear restrictions, bycatch reduction devices, etc.). Educational information about MPAs might be provided to FMCs via presentations by academics and managers or in MPA guidebooks and/or case studies. Again, standard definitions should be used so everyone concerned with fisheries management decisions will be using a common language.

Specific Needs
- It is a mistake to act as if fishing is benign. Overfishing, gear conflicts, marine mammal issues, overcapitalization, and bycatch are all issues that must be addressed more. At the same time, fishing is "everything" in New England, and economic troubles are significant. Fishing is the biggest issue for MPAs in New England and the Gulf of Maine.
- MPAs may be the only effective tool in some cases, but traditional fisheries management should not be abandoned.
- FMCs need to integrate MPAs into current species management efforts.
- FMC representation is imbalanced. The commercial sector feels councils have become dominated by state directors and the sport sector.
- State managers on FMCs are told how to vote (e.g., by a state wildlife commission), which means they cannot weigh the evidence and make balanced decisions.
- FMCs should be a key audience for education efforts, both about MPAs and about marine ecosystems in general.
- The science used to develop fisheries management regulations is insufficient and too often designed to find a predetermined result, and there is a lack of peer review. Congress gives NMFS too short a time frame for management decisions, and no time or money for the science that should be done before those decisions are made. It is not that fisheries managers have bad intentions, it is just a question of not having the time and resources to do it right, and they end up doing premeditated science.
- Managers recognize the *need* to be doing ecosystem management, but are not sure how to do it. Experience has revealed that different species are connected via food webs and that single-species approaches lead to unintended consequences, but tools for multispecies management are not yet available.

- Managers who grew up in a single-species management world may need to be convinced to move to ecosystem management. One way to do this is to demonstrate the benefits of an ecosystem approach via case studies.

Links to Other Topics
- *Identifying MPA Goals and Defining MPA Terminology*: A lack of consistent, clear definitions has exacerbated confusion about how MPAs may be used to address fisheries management issues. The multiple goals and designs of MPAs need to be better articulated since some people have assumed that all MPAs are no-take areas developed for fisheries management purposes.
- *Natural science needs* and *Social science needs*: Several identified science needs specifically relate to fisheries management issues. For example, sources call for the inclusion of fishermen in food web models, and for research on the economic impacts of MPAs on fishermen.
- *Working with fishermen*: As will be discussed in this topic area, it is crucial to involve fishermen in fisheries management issues, including MPAs. Not only do fishermen have an obvious economic interest, their knowledge of both the natural resources and the fishing industry itself can help design management measures that are both effective for conservation and feasible and fair for fishermen.
- *Evaluating MPA effectiveness*: Individuals involved in fisheries management issues are particularly concerned with evaluating MPA effectiveness. This is important both to see the fisheries-specific impacts of MPAs, whether positive, neutral or negative, and to see whether the overall benefits of MPAs justify costs that may be born disproportionately by the fisheries sector.

SECTION II: MPA-RELATED SCIENCE AND TECHNOLOGY

Inventorying and Monitoring

Key Needs

The need for more inventorying and monitoring is a longstanding issue in marine management, but merits new emphasis as MPAs and MPA networks are discussed. Existing managed areas do not have adequate resources to do the current inventorying and monitoring that managers desire, let alone new monitoring to measure how their sites fit into a larger MPA network. Managers reported that many sites do not have the baseline inventories and monitoring programs needed to track changes in resource conditions and human impacts.

Managers, scientists, environmental groups, and fishermen alike are frustrated at the lack of monitoring in protected areas, since this means no one knows whether those areas are meeting their intended goals or what unanticipated impacts might be occurring. In addition to calling for more monitoring of existing closures, numerous sources emphasized that planning for inventorying and monitoring must be in place before any new MPA is created. Once an MPA is established, monitoring needs to be long-term and incorporate the development or identification of tools and methods for analysis and synthesis of data.

MPA inventorying and monitoring efforts need to examine cultural and historical resources and socioeconomic variables, as well as natural resource health and function. The National Research Council (2001) recommends that MPA monitoring include four categories of information: "(1) Structure of marine communities (abundance, age structure, species diversity, and spatial distribution); (2) habitat maintenance or recovery; (3) indicators of water quality or environmental degradation (e.g. pollutants, nutrient levels, siltation); and (4) socioeconomic attributes and impacts."

As indicators are identified across these categories for monitoring, a major challenge is to identify topics that have meaning at multiple levels. MPA managers working at the regional or national levels need indicators that allow them to evaluate the effectiveness of a network of sites, and that provide summary statistics that speak to the collective impact of those sites. At the same time, MPA site managers need indicators to be meaningful at their level, which means that some degree of local tailoring is essential. Thus while national monitoring standards and indicators are needed—and indeed desired by individual sites seeking consistency and help with their monitoring efforts—these must have the flexibility to incorporate monitoring that speaks to local issues and concerns. Finally, it is important to note the distinction between monitoring programs that enable change and trends analysis for scientific purposes and management applications, and those that might be used for program evaluation.

Connections to Needs Assessment Objectives
- *What*: More inventorying and monitoring is needed of ecological and socioeconomic resources, conditions, functions, and impacts.
- *Why*: Managers want to be doing more monitoring, but funding is inadequate. Site managers are busy, and it is easy to get caught up in the day-to-day and not think about long-term monitoring for program evaluation. National standards are desired both by managers interested in looking at regional and national conditions and trends and by managers at individual sites who desire the consistency and guidance that such standards could bring.

- *Who*: Managers in coastal MPAs need help monitoring the impacts of surrounding development and tourism activities. National managers need help developing indicators that are meaningful to individual sites but that also allow national-level analysis. Some site managers have terrestrial backgrounds and need training in marine systems. NOAA and DOI sites considered to be MPAs need to coordinate their monitoring efforts.
- *How*: Interagency and intersite coordination via workshops and personnel exchanges can minimize duplication of effort and facilitate the sharing of monitoring skills and resources. Creating national-level monitoring guidelines can help standardize monitoring, and publishing guidebooks and/or providing training on how to apply these guidelines would be valuable technical assistance for site managers.

Specific Needs
- It is important to inventory first and then decide what to monitor.
- Inventorying needs to include *historical* information. For example, an inventory might document the historical loss of seagrass habitat to identify restoration needs.
- Inventorying should look at habitat *quality* (e.g., chemical degradation of habitats).
- Anecdotal data on the benthic community on beaches needs to be verified.
- National Wildlife Refuges (NWRs) need more inventorying of aquatic resources such as submerged vegetation.
- Little funding or emphasis is given to monitoring before a preserve is established or a restoration project is begun. Lots of coastal restoration is being done but it is hard to say if this is creating *functional* areas. There needs to be a push for more monitoring.
- Managers in the "boonies" do not have resources for monitoring.
- Invasive species monitoring is needed.
- An appropriate, replicable methodology to assess ecosystem health needs to be found.
- Residential development is increasing around coastal parks, and impacts of this development need to be monitored.
- Cross-agency coordination is needed. NPS is developing new monitoring protocols, and more contact with other coastal and marine units managed by other agencies is needed.
- Some units need basic inventorying information. For example, Thunder Bay National Marine Sanctuary (TBNMS) needs to search for additional shipwrecks that likely lie within the sanctuary, as well as to gather archaeological information on identified wrecks. And in Alaska's parks, vast stretches of coast still need a basic inventory.
- Fishermen are calling for monitoring of both existing closures and new MPAs (Skinder 2001), and monitoring must be long-term (New England Aquarium 2001).
- Many managers would love to be doing monitoring, but they just do not have the money, so they do not know if the MPA is meeting its goals.
- Managers tend to get caught up in the day-to-day and not think long-term. Managers need to take monitoring very seriously and think about it relative to the original goals and five-year plan of an MPA.
- There are wasted opportunities for managers to pool resources to do monitoring.
- Managers have not figured out how to enlist grad students or locals, and they need to tap into these low-cost monitoring possibilities more. Managers should approach local higher education institutions, conservation organizations, and fishermen. People who are already on the water can do monitoring for minimal new cost.

- In the EPA's National Estuary Program (NEP), national-level managers need a suite of indicators that can be used across all NEP programs but that are also meaningful at the local level. Indicators need to be suitable for national-level analysis and they need to be variables that the public will understand. For example, people do not know what turbidity means, but they are interested in knowing whether it is safe to eat local fish. Experts might facilitate dialogue in each program to figure out what is meaningful for the public.
- Barriers to monitoring include both money and staff capacity. Only in the last 15 years has there been a push to have a biologist on staff in the NWRs, and frequently they are trained only in terrestrial systems. There is a need for training in marine systems.
- The restrictions on federal employees regarding diving are another barrier to monitoring.
- Partnerships can help with monitoring since basic data are available in various state and local agencies and NGOs. For example, South Carolina's Department of Natural Resources collects a lot of biological information that could help NWRs and the regional USFWS Ecological Services office.
- Existing tools for monitoring marine resources need to be identified and shared (e.g. Caroline Rogers in St. John has developed a manual for monitoring corals.)

Links to Other Topics
- *Intra- and interagency coordination and cooperation*: Agencies need to work together on inventorying and monitoring for several reasons. In some cases agencies may be working with the same or adjoining resources, and should join forces. Agencies also have existing monitoring experience and protocols that can inform new efforts. Finally, since a national network of MPAs will include units managed by numerous agencies, coordination of monitoring is essential so results can be analyzed at the national level.
- *Working with fishermen*: Both recreational and commercial fishermen have tremendous potential to contribute to marine inventorying and monitoring efforts. Since fishermen are already on the water, they may be able to incorporate monitoring activities for a relatively low cost. Cooperative monitoring and inventorying efforts can build trust between managers and fishermen.
- *Social science needs* and *Historical and cultural issues*: When inventorying and monitoring of MPAs are discussed, ecological variables frequently dominate the conversation. However, numerous sources emphasized that monitoring of socioeconomic variables and of historical and cultural resources is equally important for meeting MPA goals.
- *Funding*: Inadequate funding was mentioned again and again as the key barrier to more comprehensive inventorying and monitoring.
- *Evaluating MPA effectiveness*: Monitoring both natural resource health and functions and socioeconomic factors is essential to evaluating MPA effectiveness.

Mapping and Spatial Analysis
Key Needs
"Maps play an integral role in the operation of marine protected areas. Used to define boundaries and to mark the locations of marine resources, human uses, and natural processes, maps provide essential information for planning and management" (Davis 2000b).

Managers need spatial analysis tools and techniques, including hard-copy and digital maps, to support both the MPA development process and MPA implementation. During the planning phase, maps allow the visualization and overlay of ecological and socioeconomic information. Spatial analysis can also be valuable during stakeholder processes, facilitating review of different management options. Once MPAs are established, maps define outer boundaries, as

well as any internal zoning that may exist, and maps are also useful for general outreach and education during all phases of an MPA. During implementation, spatial analysis can help with contingency planning (e.g. oil spill response planning) and can serve as a monitoring tool by establishing a baseline and developing methodologies for conducting change analysis over time. Needs assessment sources emphasized the need for more extensive and detailed habitat mapping and analysis, and for human use mapping that would strive to quantify and identify the locations of both commercial and recreational activities.

GIS and remote sensing technologies have revolutionized spatial analysis. However, advancing technology means managers need resources and training to use these tools, and there is consensus that the management community needs greater GIS expertise. Since capacity currently varies widely across sites and agencies, technical assistance can be critical to help managers respond to immediate spatial analysis and mapping needs.

Connections to Needs Assessment Objectives
- *What*: Spatial analysis is needed in all phases of an MPA, and managers need skills to create and/or interpret maps, and to use those maps in stakeholder processes.
- *Why*: Managers recognize the value of spatial data analysis and want to use maps for a variety of purposes. There is particular interest in maps of habitat and human use.
- *Who*: Managers at all levels need maps to facilitate MPA development and management. As use of GIS increases, managers across all levels need to develop basic skills. Although not all managers need to have extensive GIS training, the more sites with a GIS specialist the better, and where site-level expertise cannot be developed, regional technical assistance should be available.
- *How*: Some management offices still need basic hardware and/or software to create maps and perform spatial analysis. Existing GIS training offered by the Coastal Services Center has received excellent reviews from managers, and more are interested in receiving such training. National and regional entities that can help with spatial analysis and map generation should monitor MPA efforts for mapping needs. Maps tailored to different audiences are needed, and whenever possible maps should be placed on the Web to expand their availability.

Specific Needs
- Baseline mapping is needed for small areas.
- Mapping via remote sensing should be expanded.
- Managers need to use GIS since it is an extremely useful tool that provides visualization of ecological resources, oceanographic processes, human uses, and regulations.
- Digital maps are needed to clarify boundaries. "The thickness of a boundary line on an existing, non-digitized map can cover kilometers of actual space, depending on the map's scale" (Davis 2000b).
- Digital data sets may be hard to get and hard to combine. Managers may face confidentiality issues as well as inconsistent methodologies, formats, and scales.
- Human uses need to be mapped, and enough crude data already exist to start building these maps (e.g., maps of fishing activity).
- Maps need to be tailored to different audiences, including biologists, managers, the public, and social scientists.
- GIS training is needed for managers both on how to make maps and on how to read and interpret them. Fishermen gathering data for research projects could also use training.
- It would help if a National MPA Center could produce both maps for the public and highly technical maps. Maps might be provided via the Web.

- EPA managers need tools and training to help them georeference areas. Under the Government Performance and Results Act, EPA reports on acres protected or restored in NEPs each year, and it would be good if these sites were georeferenced to create a national map that could be on the Web. Managers need to be able to analyze data at the national level, as well as for individual sites, determining how much area has been gained or lost and how much is available to be restored and/or protected.
- More mapping of TBNMS is needed to address navigational issues. The outside boundaries and the locations of all the wrecks need to be charted.
- As the South Atlantic Fishery Management Council (SAFMC) considers the development of MPAs, maps of bottom types, habitats, and species distributions are needed. New data on benthic habitats are needed, but the council and its staff also do not have the capacity to map data they do have (SAFMC Advisory Panels Meeting 2001).
- There is a high demand for maps, and sharing maps leads to increased public participation. Members of the public have been calling the SAFMC looking for maps, and during California's recent MPA process the state Department of Fish and Game could not keep up with citizen requests for maps (SAFMC Advisory Panels Meeting 2001; Pacific MPA Science And Coordination Workshop 2001).

<u>Links to Other Topics</u>:
- *Public education and outreach*: Needs assessment participants adamantly agreed with the old adage that a picture is worth a thousand words. Maps are invaluable for communicating with the public.
- *Stakeholder/community involvement*: Maps can facilitate stakeholder involvement in MPA processes by presenting data in a visual format and by clarifying management options. Community participation in mapping can provide valuable data not available anywhere else, as well as foster community buy-in.

Natural Science Needs
<u>Key Needs</u>
Several recent symposia have discussed science needs relating to MPA development, management, and evaluation (Pacific MPA Science And Coordination Workshop 2001; MCBI Symposium 2001; Gulf & Caribbean Fisheries Institute Annual Meeting 2001). Reports from these meetings discuss natural science needs in detail, and the needs assessment was not designed to cover this topic comprehensively. However, given the range of sources consulted, it is valuable to highlight those natural science needs that were raised frequently during the assessment, since this may indicate priority needs.

Four research topics were raised repeatedly during the assessment. First, both scientists and managers say there is a pressing need for more comprehensive and detailed habitat information. Sources also call for a uniform habitat classification system, and more research is needed on habitat-species links and on the connections between habitat complexity and species diversity and abundance. A second topic repeatedly discussed at MPA forums is larval transport. Various research projects on this topic are under way, but more work is needed to explore transport and recruitment and how physical oceanography impacts these processes.

The third and fourth areas mentioned by multiple sources—evaluation of current closures and modeling work—are more broad and speak more to approach than to a specific research topic. Evaluation of current closures is needed both to learn more about how these areas function and to address concerns and/or nay-saying by stakeholder groups. Multispecies modeling work can enhance understanding of existing MPAs, predict long-term impacts, and explore the connections between MPAs.

In addition to discussing research topics, needs assessment participants also called for efforts to collect and inventory existing MPA-related science, and to identify gaps that research should be addressing. There is also a need for mechanisms that bring together MPA managers who have science needs, researchers who can do this work, and appropriate funding sources.

<u>Connections to Needs Assessment Objectives</u>
- *What*: MPA efforts need information on habitats, larval transport, and the effectiveness of existing MPAs. Multispecies and long-term modeling should be expanded.
- *Why*: Managers need scientific information both to inform management actions and to respond to the questions and concerns of stakeholder groups. Managers are frustrated by current data gaps, particularly the lack of fine-scale habitat and species information.
- *Who*: Research on the identified natural science needs will inform managers at all levels, but is perhaps particularly relevant to managers working on MPA planning and design efforts and on the concept of MPA networks.
- *How*: On-line bibliographies of existing MPA-related science references, with links to full articles wherever possible, would be useful. A coordinating mechanism needs to be developed to connect managers, researchers, and funding opportunities.

<u>Specific Needs</u>
A. Research topics
- Fine-scale information on habitat types and species distribution is needed. There are some pockets of information, but nothing big enough to extrapolate. Information on critical habitats is also needed.
- The U.S. Geological Survey (USGS) does great habitat characterizations (i.e., scans), but use of this service is limited since it is so expensive and time-intensive. USGS tends to map in existing sanctuaries rather than in new areas.
- The lack of integrated, consistent habitat data is a major impediment to management actions such as MPA designation. Standards and protocols for habitat data need to be created that will apply across the region (SAFMC Advisory Panels Meetings 2001).
- A uniform habitat classification system is needed, and additional habitat mapping should be supported.
- The Florida Marine Research Institute (FMRI) is working with the National Ocean Service (NOS) on consistent benthic habitat classification.
- More research is needed on the relationship between habitat complexity and species richness/diversity.
- Ecosystem-scale research should be encouraged. This work should examine changing food webs as well as spawning areas.
- More research is needed on larval transport and recruitment and, in particular, on the role of physical oceanographic conditions and processes.
- Fishermen need to be included in food web models since they consume fish.
- Research is needed on the export function. Research needs to examine how applicable the Cape Canaveral research (Bohnsack, Johnson, and Funicelli 1999) is to different ecosystems and resource types.
- Research done in St. Lucia and Cape Canaveral (Roberts and others 2001) is being held up as proof of MPA efficacy, but it is hard to generalize findings from these specific areas. More research is needed on a wider range of areas and conditions.
- In Maine, research is needed on the impacts of rockweed harvesting. Harvesters are moving south as New Brunswick begins to regulate this activity.

- Numerous sources called for research on "proof of concept." This research is needed to counteract anti-MPA arguments.
- A major issue for the North American cruise industry is waste water discharge, and more science is needed on the impacts of this discharge. Research is needed on the impact of bacteria coming from a ship under way at six knots or better. The industry wants more science since it is hard for it to respond to potential impacts.
- MPA research needs include study of pristine reference areas.
- Current closures are not being adequately evaluated to see if MPA goals are being met. There is a big call for information on existing closures before any new MPAs are created.

B. *The need for modeling*
- "Development of better models and empirical data to demonstrate the long-term advantages of MACPAs [Marine and Coastal Protected Areas] may help eventually gain support among the current opponents" (Crosby, Geenen, and Bohne 2000).
- "Modeling studies are needed both to generate hypotheses and to analyze outcomes for different reserve designs and applications… Efforts to develop multispecies models are one of the next frontiers in modeling the biological properties of marine reserves" (NRC 2001).

C. *Methods for fostering needed research*
- It would be valuable to have a database of MPAs by region that would include scientific information available for each MPA and that would identify gaps in scientific information.
- Partnering can facilitate critical research, and a mechanism is needed that brings together information on 1) sites' research needs, 2) researchers/organizations interested in and capable of doing needed research, and 3) grants/foundations with funding for this work. There are Web sites that list grant opportunities, but it takes too much time to sort through these to figure out who is eligible. There is a pressing need to match up grant opportunities with people who can do the projects and who are eligible for the funding.
- There are several impediments to evaluating closed areas. Pre-protection information is hard to get, and it is hard to get a permit to do research in a federal closure. When closures are evaluated in a fisheries management context, information must be *credible* (i.e., the source must be trusted) and *relevant* (i.e., the area evaluated should be similar to new areas being discussed).

Links to Other Topics
- *Information sharing and management*: Discussions of science needs are frequently tied to calls for enhanced information sharing and data management. All too often the science that managers are interested in has been done by someone somewhere, but either they do not know the information is available, or they cannot access the data in a useable format.
- *Mapping and spatial analysis*: Spatial analysis can contribute to research efforts in multiple ways. For example, spatial models of larval transport and settlement might be created, and habitat maps can be analyzed to determine the amount and diversity of habitat types. Use of remote sensing and GIS technologies is already extensive in marine research efforts.
- *Social science needs*: One specific need—including fishermen in food web models—includes both natural and social science elements. Economists are needed to help model/predict how fishermen will change their behavior in the face of changing regulations.

- *Working with fishermen* and *Stakeholder/community involvement*: As will be discussed in these topic areas, local knowledge can greatly expand and enhance research and characterization efforts. Fishermen are an invaluable resource both for their existing knowledge of marine resources and processes, and for their potential to participate in cooperative research.
- *Science in management*: Numerous sources emphasized the need for *applied* research and for translating science into a form that is useful for management.
- *Evaluating MPA effectiveness*: As the above needs indicate, a key topic for research is evaluating current MPAs, and specifically no-take areas, to see if management goals are being met and to evaluate overall impacts.
- *Funding*: One need identified under the science topic is a mechanism for matching up grant opportunities with eligible recipients who can do needed research. This need applies across all of MPA management; funding opportunities for a host of management activities need to be connected to entities that can perform those activities, whether the entities are public agencies, NGOs, or even private businesses.

Social Science Needs
Key Needs
As MPA efforts move forward, it is critical to "include human motivation and response as part of the system to be studied and managed" (Crosby, Geenen, and Bohne 2000). Unfortunately, social science research related to MPAs is extremely limited. "While numerous studies document the ecological and biological impacts of marine reserves, very little exists in the published literature regarding their socioeconomic impacts, particularly in terms of their practical costs and benefits" (Dobrzynski and Nicholson 2001). The needs assessment identified a host of specific research topics, but the overriding sentiment was that much more social science is needed.

"Systematic social and economic studies will be required to recognize stakeholder groups, to assess the potential economic impacts of the MPA, and to determine community attitudes and goals" (NRC 2001). Specific topics raised during the needs assessment include Cost Benefit Analysis (CBA) of MPAs; analysis of socioeconomic impacts on local communities and fishermen; cultural assessments; studies of stakeholder attitudes and beliefs; public opinion research regarding MPAs and MPA processes; and behavioral research on compliance.

Research on these topics is needed both to guide management actions and to respond to existing concerns about the impacts of MPAs. For example, socioeconomic studies can help address equity issues by identifying who will bear costs and/or receive benefits, and this may help address some current false assumptions among stakeholder groups. Social science can also help managers evaluate the efficacy of management actions for changing behavior, or investigate which public involvement strategies work the best.

As with natural science, there is a need to collect and organize existing social science research so that it can be accessed by managers. In addition, managers can benefit from training in socioeconomic research methods and techniques such as economic valuation and survey research. This training can help managers either conduct research themselves or analyze and use the findings of external studies.

Connections to Needs Assessment Objectives
- *What*: Managers need knowledge about the economic impacts of MPAs, demographics and opinions of user groups, the histories of local cultures, and a host of other social science variables. Extensive new social science research is needed, and managers need skills to conduct and/or access and interpret this research.
- *Why*: Managers recognize the utility of many types of socioeconomic research. However, they may be less familiar with specialized social science techniques such as contingent valuation, and agency cultures may discourage discussing environmental resources and functions in terms of economic value.
- *Who*: Managers at all levels need information on the socioeconomic impacts of MPAs. Education and outreach staff may benefit in particular from research that characterizes public opinions and evaluates public processes. Site managers can learn a lot from research on local user groups, local cultures, and efficacy of site-specific regulations.
- *How*: It would be valuable to have national-level staff with social science expertise whom managers could contact for technical assistance, as well as a clearinghouse of existing social science research. Managers can also benefit from training in social science research methods.

Specific Needs
- As MPAs are considered, socioeconomic research is needed to examine impacts on fishermen and their families, and on fishing communities. Specific issues that should be investigated include 1) concentration of effort in non-MPA areas and associated increases in gear conflict and competition, 2) safety issues that may arise if fishermen are forced to move further offshore, 3) economic impacts on fishermen and on support industries, and 4) social impacts on fishing families and communities (e.g., economic loss can lead to other social issues such as increased substance abuse, family violence, divorce, and mental health problems) (Skinder 2001, New England Aquarium 2001).
- Research is needed to quantify the true impacts of MPAs on fishing interests. Evidence is building that MPAs will not have negative impacts on fishing, and may even help, but fishing interests still maintain that closing 20 percent of an area will result in a 20 percent reduction in income. Independent socioeconomic analysts can explore this topic, but the fishing community should also be involved in the research. Fishermen should be compensated if there is a negative impact, but evidence of that impact must by provided.
- Managers need to learn how to monitor economic impacts on the community. There's a lack of capacity for doing nonmarket valuation. Training and case studies are needed.
- Economic valuation information may be needed, but often the USFWS feels restricted in talking about that side of things.
- Crosby, Geenen, and Bohne (2000) recommend a CBA of proposed management actions that includes both use value (direct, indirect, and option value) and non-use value (quasi-option, existence, and bequest value). CBA should evaluate how the distribution of costs and benefits among stakeholders may shift over time, and include both direct costs and opportunity costs associated with implementation.
- Research is needed on the ecotourism benefits of MPAs.
- Market incentives and disincentives should be explored to figure out what does and does not work (e.g., mitigation funds, conservation easements, user fees, etc.) MPA managers need "a menu of best practices using economic motivators" (CEC 1999).
- Social science should be used to examine the efficacy of a range of MPA management actions. For example, a study might map out the various interventions used to address violations of MPA regulations, identifying what did and did not work to change behavior.

- Impact analysis should include economic and social variables. For example, a recent study on the impacts of marine reserves in the FKNMS on Key West user groups found that "reserves had a low economic impact and a higher relative social/psychological impact, in the form of increased crowding and user conflicts on the water and a heightened sense of uncertainty for the future" (Dobrzynski and Nicholson 2001).
- Socioeconomic impact analyses are needed because without that research people make decisions about whether to support or fight an MPA based on false assumptions or based on *possible* threats to their interests. This phenomena was seen in the Florida Keys where a 1999 study found that different user groups had very different perceptions of the social and economic impacts of no-take zones (Suman, Shivlani, and Milon 1999).
- "Impact assessment will require analysis of multigenerational attitudes, rather than 'snapshot' surveys, to determine the cultural commitments to marine areas" (NRC 2001).
- Cultural assessments must be included in MPA efforts. "Cultural parameters are especially important to consider in areas having significant populations of indigenous peoples with traditional connections to the marine environment" (Crosby, Geenen, and Bohne 2000).
- Research is needed to increase our understanding of how different cultures change the coast (e.g., impacts of clam harvesting by Vietnamese people).
- Once an MPA is established, socioeconomic variables relating to public use should be monitored (e.g., number of people participating in recreational activities, demographics of users, and economic benefits to the surrounding areas from tourism dollars).
- Research is needed to make sure that benefits from no-take areas are not being offset by overuse by nonconsumptive users (Dobrzynski and Nicholson 2001).
- Need to think about both social carrying capacity and social equity when have many users who want access (Brodie and McPhail 1997).
- Qualitative social science surveys are needed to collect information on stakeholder perceptions of MPAs. Tracking public perceptions through pre-designation, designation, and implementation can help managers assess acceptance and target educational efforts (Crosby, Geenen, and Bohne 2000).
- Local perceptions and attitudes can be evaluated using focus groups, interviews with key stakeholders, and random-sample phone surveys of residents. Demographic information about local residents and user groups, such as age, ethnicity, education, length of residence in the community, and membership in environmental organizations, can also be useful (Crosby, Geenen, and Bohne 2000).
- Managers can learn a lot about user groups using surveys. For example, the Texas Parks and Wildlife Department runs an artificial reef program, and survey research provided information on recreational divers' demographics and use patterns, their economic impacts on the area, and their attitudes towards different management strategies such as prohibiting spearfishing in some areas (Ditton and Baker 1999).
- The National MPA Center should provide social science expertise. It would be great to have a technical resource person, and a searchable database of social science publications.
- Behavioral research is needed to evaluate how effective MPAs are in influencing and changing behavior (CEC 1999).

Links to Other Topics
- *Public education and outreach* and *Stakeholder/community involvement*: Social science research can inform public education, as well as efforts to work with specific stakeholder groups. For example, research can be done on techniques for engaging people, and on effective strategies for fostering compliance. Outreach efforts can also benefit from using "economic terms to show that MPAs are not idle areas but are the engines or triggers for economic development in the region" (CEC 1999).
- *Working with indigenous peoples* and *Cultural and historical issues*: MPA managers need to consider the impacts of new regulations on indigenous peoples and their cultures. "Any change in the quality, amount, integrity, accessibility, boundaries, buffers, or ownership of a marine or coastal resource can potentially have an impact on the indigenous population of the coastal region. Hence, cultural values and historical indigenous uses should be an integral consideration" (Crosby, Geenen, and Bohne 2000).
- *Evaluating MPA effectiveness*: Evaluation must include socioeconomic impact analysis.
- *Fisheries management issues*: "One of the most critical areas for future research is comparative CBA of conventional fisheries management relative to marine reserves alone or with marine reserves as a supplementary tool" (NRC 2001).
- *Visitor impacts*: Efforts to characterize visitor impacts must include social science components such as evaluating visitor experience and quantifying economic impacts.

Science in Management
Key Needs
Hand in hand with the need for more natural and social science is the need to have both existing and new research *applied* to management efforts. Both managers and scientists need to work toward this goal, and mechanisms need to be created to connect the two groups. Existing MPA-related research needs to be compiled and made accessible, and several sources suggested creating "translator" positions—staff who review research findings to identify management applications, and then communicate those ideas to managers. Such positions could also contribute to education and outreach efforts by translating research into terms that are easily understood by nonscientists. Sources also said that agencies often have significant amounts of unanalyzed data, and suggested that new resources and innovative partnerships with NGOs or academic institutions are needed to ensure that these data are mined.

In addition to needing access to existing work, managers need to be involved in designing new studies. For example, states want to be more involved in setting national research agendas, and they want state managers to be involved in both conducting research and delivering information to those who can use it. Managers and scientists need to communicate more, and mechanisms such as regional meetings should be used to discuss current management questions and ways in which research might address those questions.

In an interesting twist, one question MPA managers need to ask is what impact will proposed research have on the MPA itself. Just like any other activity, research has the potential to impact sites, and managers also need to consider conflicts that might arise between different studies or between researchers and other users.

Connections to Needs Assessment Objectives
- *What*: Managers need access to existing science as well as new research specifically designed to address management questions. Managers need skills to communicate questions to researchers, and to analyze studies for management applications.

- *Why*: Site managers are too busy to keep track of all the research being done.
- *Who*: Both current site managers and those designing new MPAs need applied science. State managers are particularly interested in accessing national research and data from other states, and in making sure that future federally sponsored science is applied.
- *How*: "Translator" positions and clearinghouses of existing studies would help managers access research. Meetings and other communication methods should be used to bring scientists and managers together more often. And, as mentioned in the natural science topic, mechanisms are needed to link managers, researchers, and funding opportunities.

Specific Needs
- "Managers must learn to formulate questions to which science can respond" (Brodie and McPhail 1997).
- Scientists and managers need to come together to discuss the management implications of existing research and to identify research needs. Regional meetings might be useful for this purpose.
- People are needed whose job is to transfer research results to coastal decision makers. Managers cannot keep track of all research being conducted, so they need a person to play a "brokering role" between scientists and managers (Gault 1997).
- Summaries of MPA projects from around the world should be assembled (New England Aquarium 2001).
- The National MPA Center should take an active role in communicating applied science pertaining to MPAs.
- Managers should not automatically assume that MPAs are the savior of fisheries, but rather should seek out balanced materials and the less-publicized science.
- States need management-oriented research and monitoring, and research findings need to reach program managers. Federal/state interactions regarding research need to improve, and states need to be more involved in research, helping to collect, maintain, and distribute information.
- State managers are not getting information about offshore activities, and they do not know what impacts those activities may be having.
- Research within MPAs needs to be controlled since the research itself can have impacts. In addition, "conflicts may arise between groups of scientists who have different research objectives and experimental approaches… Mechanisms for resolving conflicts between researchers with divergent interests will be needed" (NRC 2001). MPA research oversight committees can be useful, and some sanctuaries already have committees for this purpose (NRC 2001).
- Staff may need basic marine ecology training (e.g., someone with a terrestrial background may transfer to a new office or site that works with marine resources.)
- Managers need to be able to make decisions and move forward in the face of scientific uncertainty. "It is of the utmost importance to have the technical background necessary to assess the implications of the scientific uncertainty that swirls around all important issues in ecosystem management and then being able to formulate a responsible course of action" (Olsen 1995).

Links to Other Topics
- *Natural science needs* and *Social science needs*: New research undertaken to address science needs should be designed in consultation with managers, and mechanisms for communicating results to managers should be built into the research process.

Climate Change

<u>Key Needs</u>

A final topic within the MPA science and technology heading is the issue of climate change. Several sources raised this issue as a key concern both for managers at individual sites, and for national MPA planning efforts. The predicted attributes of climate change—increasing sea temperatures, sea level rise, more frequent and severe flooding—would have dramatic impacts on both marine resources and human populations in coastal areas. In addition, climate change could ultimately shift entire marine ecosystems, meaning that previously effective MPA networks no longer function as designed. Sources felt managers are not dealing sufficiently with the topic of climate change, and recommend both more research and planning for potential impacts.

Within this topic the idea was raised that marine managers should be fostering the use of renewable energy. Since science has identified the burning of fossil fuels as a major cause of climate change—and of specifically marine impacts such as atmospheric nitrogen deposition—it can be argued that marine managers need to actively advocate for the conversion to renewables. An interesting addition to this idea, however, is the concern that one renewable energy source—offshore wind farms—may create new marine management issues by increasing conflicts over the use of ocean space.

<u>Connections to Needs Assessment Objectives</u>
- *What*: Managers need more knowledge about the impacts of climate change, and skills to plan and implement responses to these impacts.
- *Why*: Few managers are discussing climate change because the issue is seen as "too big" and out of their control.
- *Who*: Site managers need to consider both short- and long-term impacts relative to the specific resources they manage, and managers planning MPA networks need to think about the potential for long-term changes across entire marine ecosystems.
- *How*: Training and communication methodologies such as newsletters and Web sites can increase managers' knowledge about climate change and about ways to respond to specific impacts such as increased flooding. New research and monitoring can inform network planning efforts by increasing our understanding of short- and long-term impacts.

<u>Specific Needs</u>
- Multidisciplinary research is needed on climate change, with more work in particular devoted to examining biological impacts. (Davis 2001a).
- Managers must think about climate change. Sea level rise has the potential to increase flooding and erosion damage, and to destroy existing critical habitats such as wetlands and mangroves. Higher sea temperatures may lead to coral bleaching. And, in the short term, greater climate variability (e.g., bigger storms, more droughts) brings management challenges. Managers need to study these impacts and plan how to respond.
- Renewable energy is an important coastal management tool since fossil fuels are contributing to sea level rise, coastal hazards, harmful algal blooms, and eutrophication. This is an overarching issue, but managers are not dealing with it. Few people talk about climate change, and no one traces the issue to its source and argues that managers should be advocating renewable energy.

- A large wind-farm is being proposed five miles off Cape Cod. A private energy company wants to insert turbines in the ocean floor, and the company says it can provide energy for the Cape and islands during peak season. Europe is way ahead on this, and there may be increasing pressure for using ocean space for these types of development.

<u>Links to Other Topics</u>
- *Inventorying and monitoring*: The prospect of climate change is a compelling reason to increase inventorying and monitoring efforts. Inventorying can identify resources that may be at risk to impacts, and monitoring can help demonstrate whether changes in resource conditions are temporary or indicative of a long-term trend.
- *Mapping and spatial analysis*: Maps can help both managers and the public visualize existing and potential impacts of climate change. Spatial analysis of erosion impacts over time can inform management efforts.

SECTION III: MPA PROGRAM IMPLEMENTATION

Public Education and Outreach
Key Needs
As the extensive list of specific ideas below reveals, many public education and outreach needs were raised in the course of the needs assessment. The general citizenry is "the ultimate stakeholder group" since marine resources belong to everyone, yet the public has relatively little knowledge about these resources. Sources said there is an overwhelming need for public education about MPAs and about marine resources in general. This education can improve popular understanding and buy-in, lead to increased compliance with regulations, and develop a constituency for marine resources.

Multiple topics were identified for outreach efforts. The MPA definitions and goals discussed earlier need to be widely shared, and the pros and cons – or benefits and costs – of MPAs need to be articulated. Sources call for an outreach campaign on the MPA Executive Order and resulting federal activities, and on existing MPAs and the activities undertaken at those sites. Beyond MPA-specific information, there is a large need for basic marine resource education. Outreach efforts should cover the diversity of marine systems, the vulnerability of those systems, cultural resources, and the impacts of land-based activities.

The overriding message within this topic area, however, was not so much about the information that is needed as it was about just expanding the overall *quantity* of education and outreach on marine resources and their management. Sources urge managers to do education and outreach wherever an opportunity exists, and emphasize that MPA education must get down to the local level. Multiple communication methods should be used to spread information, and discussions should be held at existing local forums such as town meetings, homeowner association meetings, and fishing cooperative meetings.

The National MPA Center might help both by creating fact sheets and other standardized outreach materials, and by serving as a clearinghouse for existing materials. Visuals and graphics should be incorporated in education and outreach, including graphical explanations of MPA concepts and images of underwater resources. In addition to developing and coordinating outreach materials, federal efforts can also add value by training managers in public education skills and in how to work effectively with the press.

Links to Needs Assessment Objectives
- *What*: There is an overwhelming need for more education and outreach on marine resources and their management. Managers need clear information about MPAs and about federal efforts under the executive order that they can communicate to the public, and they need skills for doing outreach and interacting with the media.
- *Why*: Managers want more public education since they recognize that this is critical to building constituencies for marine resources and for individual sites. However, managers are again limited by time and resources, so they are interested in ready-made outreach materials and nationally or regionally coordinated education campaigns.
- *Who*: While education specialists and targeted outreach campaigns are needed, sources emphasized that managers across agencies and levels should be involved to maximize educational efforts. It is particularly important to use managers at the local level who are familiar with local issues and interests and who can combat fears that MPA efforts will be completely top-down.

- *How*: All available outreach methods should be used (e.g., newspaper articles, newsletters, Web sites, e-mails, radio announcements, town hall meetings, homeowners association meetings, fact sheets at libraries, etc.) Boilerplate information that can be used by any site is needed. Electronic versions of materials facilitate sharing. Graphics that explain MPA-related concepts such as spillover, and multimedia materials showing the diversity of marine systems and submerged resources are needed.

Specific Needs
A. Reasons education is needed, and topics that should be covered
- The message about what the MPA Executive Order will and will not do must be spread to combat existing confusion. An outreach plan is needed to bring clarity to chaos.
- There is a pressing need for education on the pros and cons of MPAs, and for sharing information about what is and is not known regarding the effectiveness of MPAs for conserving fish stocks. For example, scientific information about the effectiveness of closures in the Northeast needs to be spread.
- Efforts to raise public awareness about the economic benefits of MPAs are needed. Information about benefits needs to get out to the people working on MPAs so they can use it in their outreach efforts (CEC 1999).
- The public needs to know about the wide range of species, ecosystems, and habitats NOAA is charged with protecting. Currently NMS programs do not focus on biodiversity enough. For example, Monterey Bay NMS' state of the sanctuary report does not cover the diversity of the bay and what is happening to it. Education is needed, and managers need to take time to pull together information on the range of species and habitats they are protecting. State of the sanctuary reports should focus on diversity, describing the ecosystems and their states.
- People frequently do not know about managed areas right in their back yard. For example, many people in Florida do not know about the state's aquatic preserves even though they have existed since the 1970s. Extensive outreach is needed to inform people about these areas.
- Public education about the impacts from land-based activities is needed (e.g., education about nonpoint pollution from fertilizers), and this information needs to be delivered at the local level (e.g., to homeowner organizations). Existing education on this topic is very splintered, and a broad, unified effort is needed. A new program may not be necessary, but someone needs to coordinate what is available. A clearinghouse might maintain a list of videos, presentations, and contact people.
- People do not understand the heterogeneity of marine ecosystems, and still do not think that they can damage the ocean. Broad education is needed about the nature of marine systems. This education needs to explain that the oceans are not just even distributions of sand and fish, and it needs to convey that people have already harmed marine systems.
- Education is needed to address the popular misconception about the amount of marine area that is truly protected.
- "Capacity-building on the individual level can be as basic as helping develop a general environmental awareness among a coastal community's residents" (Davis 2000a).
- Education is key to increasing awareness of and appreciation for submerged cultural resources. For example, at Thunder Bay National Marine Sanctuary (TBNMS) people cannot see the shipwrecks when they look out over the water, and there is a pressing need to make these resources accessible to nondivers. A physical building with displays is needed.

- Good work being done by managed areas is not being publicized. Units need reasonable budgets for self-promotion. It is important to tell people about management activities to develop a constituency that will support the unit when a threat arises.
- The lack of an informed, engaged constituency is the single biggest challenge most marine site managers face. Managers hear from fishermen and maybe some other users, but not from a broader constituency.
- People value oceans and say they like to visit the coast, but this sentiment has not translated to a constituency fighting to protect the oceans. People will write to protect forests but not against a paper and pulp mill upstream of a NERR.
- Compared to terrestrial resources, there is lower public awareness and less of a sense of ownership. General education needs to convey that marine resources are public resources that belong to everyone and that we all have a right to care about and protect them.
- "Education and outreach campaigns are one of the most effective investments in resource protection because they can create political and public enthusiasm" (Crosby, Geenen, and Bohne 2000)
- Education of recreational anglers is needed. For example, anglers should understand the danger of sending a party (i.e., charter) boat into a closed area.

B. How and where outreach should be done

- Stakeholders control the process since the public is not engaged, and this needs to change. A local-level educational campaign is needed, using community forums to generate dialogue. All elements of the management and outreach communities should be mobilized for this local effort (e.g., use state coastal zone management staffs and the Sea Grant networks). It is wise to get local people to *start* the discussion, and then bring in upper-level managers from NOAA. When upper-level individuals arrive first, fishermen fear the process will be completely top-down.
- A presentation should be done for the Coastal States Organization.
- Workshops and extension networks are a good way to get information to decision makers. Decision makers need information on where to go when they have a question, so it would be valuable to provide them with a list of who does what.
- Information should be placed on the Internet, but it is important to remember that this medium may not be good for communicating with low-income areas. Radio and small local meetings are good for reaching people who do not have access to the Internet.
- Outreach methods regarding MPA efforts in New England need to be expanded and should include newsletters, newspapers, e-mails, phone calls, information at public places, NOAA news radio, and the Coast Guard station (New England Aquarium 2001).
- Graphics/visuals are needed that can help the public understand complex issues surrounding MPAs. For example, MPA benefits such as increased abundance, diversity, colonization, spillover, and increased reproduction need to be shown visually.
- Outreach should be done at times that are convenient for stakeholders (e.g., in winter for fishermen, during school breaks for academic researchers) (New England Aquarium 2001; MPA Power Tools conference 2001).
- NOAA representatives should go to communities throughout New England with information about MPA efforts under the executive order. Information should be provided at monthly meetings of local organizations, on the docks, and at FMC meetings (New England Aquarium 2001).
- User groups need to be educated in a proactive way rather than waiting for information to travel through the grapevine. For example, sanctuaries going through management plan reviews and considering new zoning need to make sure people are familiar with the process, with local issues, and with who is involved before the review ever starts.

- It is good to have experts come in to speak to local communities, to stakeholders.
- A clearinghouse of communication tools and materials related to an ocean ethic should be created.
- Managers and staff could use a handbook on how to interact with the public.
- Too often managers are doing repair work to address misinformation rather than taking a proactive approach. Managers end up "doing battle" because misinformation has been spread and people have made assumptions about what MPAs mean.
- Basic outreach and communication tools are needed. In the Philippines, MPA efforts used "comic book" publications that were very effective; these were simple and contained lots of information and pictures. Basic science needs to be communicated, but existing publications frequently use too much jargon to be broadly accessible.
- Education about MPAs needs to be free of a political agenda. If an environmental nonprofit does education, it is suspect. A big function of implementing the executive order could be providing education, since federal entities do not have a vested interest.
- Education specialists can identify appropriate techniques.
- Language is important. Too often the marine environment in discussed only in terms of resources for human use.
- Education about marine systems and MPAs should be done *wherever* there is an opportunity. The extent of ignorance about marine ecosystems in the broadest sense is just enormous. General education blurbs about marine systems and MPAs are needed, and it would be great if outreach efforts got to the level of speaking to Audubon clubs.
- Crosby, Geenen, and Bohne (2000) suggest a host of educational tools that can be used by marine managers: visitor centers, interpretive signs and displays, education coordinators, literature, public announcements, public meetings, interpretive programs, field trips, volunteer programs, Internet sites, and interpretive law enforcement
- Standardized versions, electronic versions, and boilerplate information would be useful. If these pieces are created at the national level, all sites can use them.
- *Showing* impacts on resources is a good way to raise awareness (e.g., photos of seagrass scarring).
- "While there is excellent material on coral reefs, there are few images on other parts of the ocean. A collection of images or a library of taped images would be useful for media presentations" (CEC 1999). A clearinghouse including slides, videos, digital imagery, and maps would be very useful.
- Florida has lots of tourists and newcomers who do not understand the state's history. Sea Grant is developing historical geographies and these are proving to be valuable communication tools. Images such as aerial photographs of dredging impacts are effective.
- Managers need help interacting with the press. People working on MPA efforts will give the press full and accurate information, but the press continually spins the story.

Links to Other Topics
- *Identifying MPA goals and defining MPA terminology*: Sources call for an aggressive outreach campaign about MPA definitions and goals. This is critical to combat the misinformation that is being spread and to engage the public in the debate. National outreach is needed on the idea that there are different *kinds* of MPAs, and on the idea that the various agencies involved each manage their units differently.
- *Stakeholder/community involvement*: As mentioned above, the "public" is the ultimate stakeholder group. Beyond that, general educational efforts are a key component of working with stakeholder groups, since they can increase the base knowledge of everyone.

- *Cultural and historical issues*: Several sources raised the need for education and outreach materials tailored to different cultures, and this involves both creating special content and translating materials into other languages. "Communications materials have to be culturally distinct and sensitive" (CEC 1999).

Planning Methods for Identifying MPAs
<u>Key Needs</u>
The need for good quality MPA planning methods builds on several other topic areas—more extensive mapping, new natural and social science, and more effective stakeholder involvement processes are all critical elements of better planning. Sources stressed the need for improved planning methods for identifying MPAs, and suggested careful review of recent processes such as Tortugas 2000 (*http://www.fknms.nos.noaa.gov/tortugas/welcome.html*) and the Channel Islands process (*http://www.cinms.nos.noaa.gov/nmpreserves.html*) for lessons learned.

Although past planning processes can inform new efforts, sources also said that each process is and should be unique. Each new planning effort will face different ecological conditions, human use patterns, and stakeholder groups, meaning that new initiatives need to be prepared to tailor their planning process to meet these local circumstances.

Zoning and GIS technology were highlighted as two specific tools that should be used in future planning efforts. Zoning is an effective tool for protecting core areas, for preventing user conflicts, and for researching the impacts of different management approaches (Kelleher 1999; NRC 2001). GIS technology can be used to produce maps showing both natural and social science data layers, as well as maps showing different management options under consideration. The recent Channel Islands process also demonstrated the utility of GIS-based decision-support tools. These can perform functions such as analyzing the minimum area required to included representative habitats. Sources say there is a need for both increased use and new development of these decision-support tools.

<u>Connections to Needs Assessment Objectives</u>
- *What*: Managers need information about and training in effective planning methods.
- *Why*: MPA planning is a new endeavor for most managers. Managers are interested in methods that will help them incorporate the best science and that will mitigate conflict with and between stakeholder groups.
- *Who*: Managers involved in or contemplating MPA planning efforts. Both FMCs and NMS programs have expressed interest in planning tools.
- *How*: Case studies of past planning processes can provide lessons learned, and decision-support tools, zoning plans, and maps can support new initiatives.

<u>Specific Needs</u>
A. Goals for planning
- Planning methods must be objective, and managers need planning processes that are transparent (NRC 2001).
- "Socio-economic considerations usually determine the success or failure of MPAs. In addition to biophysical factors, these considerations should be addressed from the outset in identifying sites for MPAs, and in selecting and managing them" (Kelleher 1999).

- Some of the best planning methods to date were those used in the Channel Islands process. Tortugas [2000] was less contentious so people liked it, but from a planning standpoint Channel Islands was more advanced; the FKNMS was drawing circles on a map. It is crucial to analyze what was and was not successful within each process. Some people said the Channel Islands science was not good because they did not like the outcome, but it *was* good and should be used more elsewhere.

B. Specific tools that should be used in planning
- GIS-based decision-support tools are valuable to MPA planning processes, and work to develop and refine these tools should be supported. Further research is needed to explore the use of iterative computer algorithms to identify the smallest area and/or number of reserves needed to achieve MPA goals (e.g., the smallest area required to include representative habitats or species).
- GIS tools are needed that will help the SAFMC and its advisory panels understand the data that are available and how these data can help with the MPA process (SAFMC Advisory Panels Meeting 2001).
- "Zoning plans will be needed for all but the smallest MPAs because they avoid unnecessary restrictions and facilitate cooperation between managers and users" (NRC 2001).
- "Zoning can be useful as an experimental tool… By utilizing different sets of restrictions for different areas, experimental zoning schemes can help determine the impacts of different activities and avoid potential conflicts over allocation" (NRC 2001).
- Training in basic management skills can help with MPA planning. Managers are often scientists and do not know how to set up a maintenance schedule, develop a work plan, write a budget, manage personnel, etc.

Links to Other Topics
- *Science in management*: MPA planning needs to be science-based, utilizing the best natural and social science data available.
- *Mapping*: As the call for more GIS-based tools indicates, maps are a crucial component of planning processes since they can help managers, stakeholders, and the general public visualize existing conditions as well as proposed management options.
- *Stakeholder/community involvement*: Part of better planning is creating more meaningful community involvement. Decision-support tools can facilitate significant, constructive engagement of stakeholders in planning efforts.

Stakeholder/Community Involvement
Key Needs
There is broad consensus that participation of all stakeholders, including the local community, is critical if MPAs are to be effective. Achieving that participation, however, has proven challenging, and numerous sources said involvement needs to be more *meaningful* than it has been to date (Crosby, Geenen, and Bohne 2000; MPA Power Tools conference 2001; GCFI Annual Meeting 2001). More stakeholders need to be considered and included, and participation needs to extend beyond attending a couple of public meetings. Sources noted that working with communities and stakeholder groups requires skills that resource managers do not traditionally have, such as facilitation and conflict resolution, meaning managers will need technical assistance and/or training. In addition, public involvement processes have become increasingly complex over time as the number of stakeholders concerned with marine management has increased.

Stakeholder involvement needs to be initiated at the earliest possible juncture, and should continue throughout MPA processes. Kelleher (1999) writes that, "Local people must be deeply involved from the earliest possible stage in any MPA that is to succeed," and the National Research Council (2001) concluded that "There is no formula that can be applied across the diversity of situations for planning MPAs. Therefore, involving stakeholders in every step of the process, from providing their knowledge of the environment and its resources, to making decisions about how to score sites relative to each criterion, is the most effective way to develop a cooperative, informed, MPA management plan."

Needs assessment sources emphasized that, in addition to initiating involvement at the earliest stages, MPA processes need to allow significant *time f*or stakeholder education and dialogue. Managers also need to strive to make stakeholders feel as if all the different groups are being treated equitably. Davis (1999) stresses that MPA efforts must "Equalize among stakeholders the opportunity to influence the process." To this end, an a priori need of MPA processes is to identify all relevant stakeholders. Some sources said the range of interests considered needs to be broadened, and that communities defined by factors other than residence in a particular place (e.g., fishermen in a particular sector of the fishery, the tourism community) should be considered (MPA Power Tools conference 2001; New England Aquarium 2001).

The reasons for community/stakeholder participation may seem obvious, but information gathered in the needs assessment emphasizes that both managers and stakeholders benefit from this involvement. In the planning phase, stakeholders learn about MPA goals, plans, and impacts, and have an opportunity to express their concerns, as well as to contribute to MPA design. At the same time, stakeholder processes help managers access local knowledge about both resources and human uses, and meaningful involvement fosters buy-in and support, meaning that compliance with regulations will be higher and social control may contribute to enforcement. In the implementation phase, stakeholders can become directly involved in monitoring, education, and other management activities. This helps managers facing limited resources, and gives stakeholders firsthand knowledge of MPA impacts. Working together, managers and stakeholders can design adaptive management measures that both increase MPA efficacy and address user group concerns.

The specific needs listed below include a host of approaches, methods, and tools for improving community and stakeholder involvement. Overarching themes were 1) more *Local-level* meetings are needed, 2) multiple methods should be used for disseminating information to reach the greatest number of people, and 3) managers need training and technical assistance in processes ranging from meeting management and facilitation to interacting with the media. One interesting need that bears further exploration is the call for community building; sources felt that some stakeholder groups do not currently have the capacity for effective involvement.

A final idea raised in this topic area is that although MPA processes must include extensive community involvement, "top-down" elements are also needed. There must be "a balance between the 'top down' legislative agency and the 'bottom up' community involvement approaches to planning and management" (Bridgewater and Coyne 1997). Davis (1999) explains that this balance will "take advantage of government's strength in providing legal protection while allowing community stakeholders to contribute local knowledge."

<u>Connections to Needs Assessment Objectives</u>
- *What*: Managers need skills and processes to increase the quantity and quality of community involvement. Managers need knowledge about stakeholder groups, and skills ranging from listening and communicating effectively to facilitating meetings to responding to media inquiries.
- *Why*: Managers know that stakeholder/community involvement is critical, and that current processes are inadequate, but they are unsure how to improve the situation. It takes extensive time and resources to "do it right," and managers may not have either.
- *Who*: Efforts to increase and improve community involvement should take place across all levels of government and across MPA efforts. Education and outreach staff have a special role to play since they have experience with and skills in public involvement.
- *How*: A host of specific tools, processes, and approaches can improve involvement. The following are a few specific suggestions: hold discussions at local forums; have existing MPA managers and users give presentations; form citizen advisory groups; train managers in meeting management, conflict resolution, team building, presentations, and media interaction; provide facilitators at the national level who are familiar with MPA issues; and develop case studies of previous community involvement processes.

<u>Specific Needs</u>
A. Why involvement is critical, and challenges managers face
- "Effective implementation of marine reserves and protected areas depends on participation by the community of stakeholders in developing the management plan" (NRC 2001).
- "Simple public meetings are usually not enough to generate support from all user groups. Local communities should be given real tangible responsibility through the process so that they develop a sense of ownership for the [protected area] and are motivated to observe the regulations that they helped establish" (Crosby, Geenen, and Bohne 2000).
- Equitable treatment of stakeholders is important. For example, in a recent study of socioeconomic impacts of reserves in Key West, Dobrzynski and Nicholson (2001) found that "One of the greatest reasons for consumptive user groups' opposition to the current reserves is the perception that it creates a system of winners (nonconsumptive user groups) and losers (consumptive user groups). This perceived lack of equal sacrifice created a strong feeling of disenfranchisement among the commercial fishers and charter fishing operators we interviewed."
- Working with stakeholders has become more complex, and involves more use conflicts, because many more stakeholders are involved in federal ocean management than 20 years ago. Ocean management has blossomed in terms of complexity of the human system, and there are increasing resource allocation issues to solve.
- Stakeholders need to be educated about *other stakeholders*. Everyone needs to recognize that there are a lot more interests now.
- "If citizens feel like they are excluded from the process or are not receiving good information from the outset, they will be more likely to oppose the management strategy later" (Crosby, Geenen, and Bohne 2000).
- Managers need to learn from previous processes. The first FKNMS experience demonstrated the need for extensive involvement before drawing lines, but the SAFMC is repeating the same mistakes. The FKNMS did have extensive public involvement and input during the Tortugas 2000 process, and this fostered support and lessened opposition, and people actually ended up telling them to move faster.

- It is hard to *sustain* public involvement. For example, a National Estuary Program (NEP) planning process will have good participation since this phase is very goal-oriented, but it is hard to sustain involvement through the implementation phase, which does not have a set end date. It is a challenge for managers to keep involvement fresh, particularly in small communities.
- Community involvement can provide managers with valuable information regarding traditional resource use, as well as help to predict "road blocks."

B. *Groups that need to be involved*
- Crosby, Geenen, and Bohne (2000) list the following stakeholders as essential participants: commercial users, government agencies, indigenous peoples, interested citizens, local communities, nongovernmental organizations, recreational users, university research community, and volunteers.
- The categories of stakeholders need to be broadened to include charter boat fishermen, wastewater dischargers, oil and gas developers, representatives from sand and gravel mining, shippers, yachters, Canadian agencies, divers, and other users (New England Aquarium 2001).
- Fishermen, tourism groups, environmental groups, and citizens must be involved. Average citizens care about Alaska.
- "Communities" may not be tied to a *place*. For example, fishing communities may be differentiated by vessel size or gear type, and the oil "community" wants to know the rules so it can predict the future (MPA Power Tools conference 2001).

C. *Methods, strategies, and skills*
- "The lead agency will need to first identify all stakeholders, both on- and off-site, and then utilize methods of communication appropriate for various user groups" (NRC 2001).
- Lots of *local* forums are needed so people can really get there, and these forums should include extensive dialogue. It is imperative to engage people and ask what they think. "Town Hall" type meetings are needed.
- MPA discussions should be held at existing local forums. For example, a New England Aquarium report (2001) calls for a "multi-stakeholder discussion at the Maine Fishermen's Forum."
- Presentations by national and international MPA practitioners and users are needed so that stakeholders can hear how MPAs have performed and how stakeholders have been impacted (New England Aquarium 2001).
- Community organizing is needed to give stakeholders the capacity to have meaningful involvement.
- MPA curricula need to be developed for high schools and aquariums.
- Decision-support tools like the GIS tool used in the CINMS process should be part of every MPA process. This tool lays out data in layers so someone can click on a place and see what is going on there. This means everyone can have the same information. People relate to places, so tools like this should be a component of every community-involvement process.
- A set of standard operating procedures for public participation should be developed from lessons learned in Tortugas 2000 and the Channel Islands process.
- Multiple methods can be used for informing the public of agencies' intentions and for soliciting input. Information dissemination can be done via newspapers, radio, public access television, city mailings, the Internet, and notices in public buildings.
- Suman, Shivlani, and Milon (1999) learned that stakeholders found the FKNMS draft management plan too large and complex to be useful, and they recommend that management agencies develop "abbreviated planning documents that would be more 'user friendly' and tailored to the interests of different user groups."

- Public meetings and citizen advisory groups are needed.
- Meeting notices "should be posted for at least two weeks before the meeting and should also be translated into foreign languages in areas where large immigrant groups reside" (Crosby, Geenen, and Bohne 2000). Translators may be needed at public meetings.
- Sea Grant Extension can be a valuable resource for MPA work. Extension agents are well positioned to access local knowledge, to provide MPA information and training, and to organize local and state-level conferences on protected areas.
- "Perhaps NOAA could employ Sanctuary 'extension' agents (community workers) to interact directly with small focus groups of resource users at convenient locations and times. For example, NOAA might develop a joint extension process through commercial fishing organizations and meet commercial fishers at nearby fish houses during non-fishing hours" (Suman, Shivlani, and Milon 1999)
- "Having the right people in the right place to communicate with the community and 'sell the concept' is extremely valuable. Therefore a higher degree of success is likely when such people engender public respect due to their skills of listening, discussing and clear communication of ideas, concepts and concerns and translation of communication into action" (Bridgewater and Coyne 1997).
- Managers need training to prepare them for communication with stakeholders, and to prepare them to work together to present a unified message. A communication plan developed by NOAA National Marine Sanctuaries (2001) states that managers need training in the following skills:
  - Meeting management (conducting effective meetings, facilitation, recording)
  - Conflict resolution (facilitation, community-based consensus building, multi-stakeholder processes, decision making, or problem solving)
  - Team building (effectiveness, communication, interpersonal skills, leadership)
  - Researching audiences (constituent building, targeting audiences, developing and working with friends groups, reaching new and multi-lingual audiences)
  - Presentations (effective presentations, public speaking, and public outreach)
  - Media training (establishing media relations, defining key press contacts, working proactively with the media, developing messages and talking points, responding to media inquiries, developing communication plans, what to expect from the press, and on-camera practice)
- Basic training for scientists is needed. Approach is key, and often scientists do not know how to talk to different people (e.g., developers). Too often they are condescending.
- *Approach* to public involvement is critical. Stakeholders need to be approached in a nonconfrontational manner (e.g., commercial fishermen often see themselves as being blamed). Managers must see a project from the stakeholders' point of view. Managers must also avoid approaching the process with a "we have the solution" attitude. A better approach is to say, "We want to hear your ideas and your local knowledge."
- Unfortunately the approach to public involvement frequently is not good because of cost and time. It takes a lot of time and resources to do it right. Managers needs to allow time for education and for representatives to take messages back to their groups. "Time spent in preparation is an essential investment that will be repaid many times over. Proponents of MPAs have to show demonstrable benefits for stakeholders, and this takes time and diplomacy" (Kelleher 1999).
- Sometimes individuals support MPA work personally, but that does not translate into a willingness to express support "on the record" or for the group that they represent.

- Stakeholder processes will be more successful when a win-win solution is sought, but this must be actively pursued. Managers could use training on how to negotiate as one would on a business deal. Managers need to know how to negotiate to protect their agencies' interests.
- "There is a demand for individuals with a different set of skills that emphasizes nonregulatory and voluntary approaches to management" (Crawford, Cobb, and Ming 1995).
- Managers need to learn about techniques beyond holding meetings. They need to learn to target key people and to be time-effective.
- It is good to give concrete numbers when talking to stakeholders.
- Stakeholders/communities need greater capacity for involvement. Management can help build this capacity by helping build networks, and by holding workshops and seminars. Management needs to help leadership lead.
- The methods managers use to interact with stakeholders are very important. For example, if a public meeting is held in Newfoundland, grandstanding is unavoidable. However, the Tortugas 2000 process avoided grandstanding by having people break into small groups for discussion and submitting comments for the record via on-site recorders and via the Internet (MPA Power Tools conference 2001).
- Conflict resolution will be needed. Managers typically do not have these skills, so technical assistance and training should be available. FMCs could use training in conflict resolution.
- Individual sites might not need someone on staff with facilitation skills, but it would be good to have someone to call on. Right now when managers hire facilitators, they have to spend time educating them on the issues, so it would be great to have facilitators available from a national MPA Center who are familiar with the terms and issues.
- A variety of opportunities must be provided for input/feedback from the very beginning (e.g., Web site, forms at kiosks, attaching a response sheet to published documents).
- Local marine advisory committees can get the word out and create a "snowball" effect since they include a lot of local stakeholders.
- Another way to increase involvement of stakeholders might be small grants to user groups to conduct research on the impacts of MPAs (Suman, Shivlani, and Milon 1999).

Links to Other Topics
- *Identifying MPA goals and defining MPA terminology*: Just as goals and definitions are critical to public education and outreach efforts, they are a priori needs for improving communication with stakeholders.
- *Mapping*: Discussions about stakeholder involvement frequently include wishes for better ways to view and present existing data, as well as proposed management options. Maps are seen as invaluable to meaningful participation.
- *Natural science needs* and *social science needs*: Research on ecological impacts and on the economic benefits and costs of MPAs is key to addressing stakeholder concerns. Sources felt that some current opposition (e.g., from recreational fishing interests) may be a result of a lack of information.

Working with Indigenous Peoples
Key Needs
Indigenous peoples bear extra discussion as a stakeholder group for four reasons. First, indigenous societies' traditional and current connections to and use of marine resources means they are uniquely concerned with both the status of and threats to marine resources, and with potential restrictions on their traditional access under MPAs. (Another way of looking at this is that indigenous peoples are worried because declines in marine resources threaten their

traditional cultures and practices, as well as current livelihoods, and they are worried about MPAs for exactly the same reasons.) Second and related, indigenous peoples have unique knowledge about marine systems, including historical information which may not be available anywhere else. Third, managers need to learn about cultural variables such as traditional power structures and decision-making methods since these factors influence how indigenous peoples will—or will not—participate in MPA processes. And fourth, legal issues will arise if creation of an MPA seeks in any way to limit rights established by treaties.

Connections to Needs Assessment Objectives
- *What*: Managers need more knowledge about indigenous peoples' cultures and concerns, and they need skills for fostering substantive involvement by these groups in MPA processes. Managers can also gain valuable knowledge about marine ecosystems from indigenous peoples.
- *Why*: Managers know it is important to involve indigenous peoples, but as with overall stakeholder involvement, they are unsure of how to make this involvement more meaningful and more satisfying for native groups. Managers sometimes generalize across indigenous peoples, failing to notice or give proper weight to differences between groups (MPA Power Tools conference 2001).
- *Who*: MPA managers in some parts of the country will have minimal interaction with indigenous peoples, while others must consider multiple nations. Treaty arrangements also vary across the country, meaning that different legal factors will apply.
- *How*: Many of the same tools and methods suggested for general stakeholder involvement apply. However, specific strategies are needed for learning more about indigenous cultures, and involvement processes may be made more effective by tailoring them to accommodate cultural variables.

Specific Needs
- It is critical to involve indigenous peoples in MPA processes, and their involvement must be substantive. Including one representative on an advisory body is not sufficient.
- "Governments still have many problems in understanding fundamental issues surrounding traditional use rights, traditional management, and traditional institutions vis-à-vis the existing protected-area laws, policies, and practices" (Davis 2001b).
- "When MPAs are established, it is generally because of the perception of environmental threats, which are also threats to traditional cultures and practices. So involving traditional communities is a way to protect their traditional practices and ensure that they continue to be attuned to, or get back on track with, the natural functioning of their areas" (Davis 2001b).
- Too often the traditional knowledge of indigenous groups is neglected. Biologists are not used to asking indigenous peoples questions, and social scientists do not know enough about ecology to apply indigenous information about resources. "[Multidisciplinary] centers for the study of the indigenous knowledge of fishers and other coastal resource users [are needed]…Of 37 formal institutions established worldwide to study indigenous knowledge, none focuses on marine knowledge" (Johannes 2001).
- "Indigenous fishers often possess unique and important knowledge about their local marine environments and its inhabitants…Fishers often know, for example, the timing and location of important and especially vulnerable life history events such as migratory and spawning aggregations, recruitment and nursery areas, or the location of rare or endangered species" (Johannes 2001). Talking with indigenous people is also important for learning whether a conservation ethic exists, and for identifying possible impediments to proposed management strategies (Johannes 2001).

- Tribes can be heavily impacted by MPAs because 1) they are limited to traditional areas and cannot just move to new areas, and 2) individuals living in rural areas cannot easily move to other jobs.
- MPA processes are under way in various agencies, and tribes are concerned that they are not involved enough. It is critical to talk to tribes about the resources and areas that are important to them.
- In the Pacific Northwest some indigenous communities are experiencing economic hardship with or without MPAs, and identifying other values of marine resources may help them (MPA Power Tools conference 2001).
- Some indigenous communities may need resources to help them have meaningful involvement in MPA processes.
- Traditional practices that were sustainable in times of small populations and few other users may have become unsustainable.
- When working with indigenous peoples, managers need to understand how culture influences how they interact with the process. "Sustainable, useful involvement in the management of MPAs by traditional communities is possible only through cultures and practices of synthesis, and this requires a completely new (for traditional societies) practice of learning, combining systems, and trying innovation" (Davis 2001b).
- In the Northeast there are cases where a state agency has the authority to close fisheries, but tribes say that they will continue to fish.
- "In BC [British Columbia], it's problematical whether MPA advocates are going to be able to sell First Nations on the idea of Marine Parks, especially when the commercial and sport sectors have strongly stated their possible support for MPAs would rely on First Nations being restricted to the same degree as their sectors, irrespective of their different rights under the Canadian constitution. If I was a First Nations person on the coast, you would have a hard time convincing me to forever abandon harvesting opportunities out my front door because the trawl…or sport fishery has nearly eradicated groundfish there. Instead, I would pursue remediative action through the courts, i.e., fisheries closures" (FISHFOLK Listserv, Bruce Hill 29 May 2001).
- Managers are frustrated when native representatives do not attend meetings after being invited, but this happens because past experiences have taught them that they will not really be given any *meaningful* involvement. There have been too many cases where a "token Indian" was included for appearances only (MPA Power Tools conference 2001).

Links to Other Topics
- *Historical and cultural issues*: There is clear overlap with this topic area since working with indigenous peoples is key to preserving their cultures and to developing accurate and meaningful interpretive materials about their cultures and their histories.

Working with Fishermen
Key Needs
Fishermen are another stakeholder group that bears special discussion. As with indigenous peoples, fishermen's use of marine resources means both that they are uniquely concerned with management and that they can provide important natural and social science information.

As the sections below on commercial and recreational perspectives demonstrate, fishermen are dissatisfied with the amount and breadth of MPA information reaching them, and with current processes for participation. For example, commercial fishermen often cannot get to FMC meetings because they are busy making a living. Recreational fishermen may be nervous about MPAs largely due to inadequate and confusing explanations of the goals and impacts.

Managers need to be cognizant of both the fears and desires of fishermen, striving to provide more outreach and to address misperceptions, as well as creating more effective avenues for participation.

In addition to addressing their concerns, working with fishermen has the potential to deliver substantial gains in scientific understanding, as well as foster critical support of MPAs. Given their time on the water, fishermen have information about habitats, species, and ecological processes that agencies do not have the resources to document, and this knowledge needs to be incorporated more in MPA planning, design, and management. Fishermen can also tell social scientists about current use patterns, and about their personal experience with socioeconomic impacts from changes in resources and/or in management. Finally, fishermen can help conduct new research. Several sources cited the need for more joint research that involves both commercial and recreational fishermen. In addition to providing needed science, collaborative research can establish buy-in that is critical to MPA success.

Connections to Needs Assessment Objectives
- *What*: Managers need knowledge about fishermen's perspectives in order to address their concerns and to improve the quantity and quality of communication. Managers need skills for talking to and gathering information from fishermen, and for developing collaborative research projects.
- *Why*: Legislatively established time frames and limited resources restrict managers' ability to provide meaningful involvement, and inadequate funding also limits the ability to do all kinds of science, including collaborative research. Managers may not interact enough with fishermen because they are unsure how to approach them, and because they fear fishermen will be accusatory.   Traditional research methods and data protocols can make it difficult to incorporate fishermen's knowledge.
- *Who*: Managers at all levels and across all agencies involved with MPAs need to work more with both commercial and recreational fishermen; increased dialogue and collaboration will help both sides. Managers specifically involved with fisheries issues obviously need to pay particular attention to needs in this area.
- *How*: Collaborative research programs need to be expanded. Training might be designed to help managers talk to fishermen and gather their local knowledge. Meeting times and locations need to be sensitive to fishermen's schedules and resources. Outreach to the recreational sector—and specifically to the average citizen angler— needs to increase so new regulations do not come as a surprise.

Specific Needs
A. Commercial fishermen's perspectives
- Fishermen want to be part of the management decision process regarding MPA definitions, goals and placement.
- Fishermen do not feel represented, and FMC meetings are too far and too costly to attend. Fishermen fear both that they will not be heard as much as environmental groups, and that there are elements of the fishing industry that may pursue their own special interests that are contrary to overall conservation (Skinder 2001).
- Fishermen are very concerned about equity, both across industry sectors and across all user groups. If areas are closed for one, they should be closed for all, and MPA management should address land-based issues such as coastal development and nonpoint source pollution that impact important nursery habitats (FISHFOLK Listserv 2001).

- Commercial fishermen need certainty, and one reason they are so nervous about MPAs is that nobody has defined what areas are being talking about.
- Fishermen hear environmentalists talk and it sounds as if these groups want to shut down whole sections of the ocean to some gear types. Some fishermen have a lot of contempt for environmental groups.
- Fishermen believe they are easy targets compared to other, more politically powerful interest groups. For example, they see essential fish habitat (EFH) processes impacting fishermen while ignoring power plants and coastal development.
- Generally fishermen see MPAs as more political than scientific.
- Fishermen want more research on the "spillover" concept, and they are frustrated that local ecological knowledge is not given more weight.
- Fishermen criticize the quality and timeliness of NMFS data. Some fishermen turn in inaccurate data to NMFS because they fear it will be used against them.
- Fishermen "do not see MPAs as a cure-all but as one part of a management package, to be used in conjunction with zoning and restricted access and fishermen's cooperatives" (Skinder 2001).
- There is some support for closures within the commercial sector. For example, some fishermen in the Northeast have become more supportive of closures after witnessing the scallop population increases on Georges Bank (Skinder 2001). Fishermen understand the value of protecting special habitats such as nursery and spawning areas (MPA Power Tools conference 2001; GCFI Annual Meeting 2001)

B. *Recreational perspectives*
- There is a great deal of confusion within the recreational community as to what MPAs are, and what their scope and application will be. MPAs are scaring a lot of recreational fishermen, and much of this is because MPAs are so nebulous.
- Recreational fishermen see MPAs as a "broad brush" tool that is being used to manage people rather than to manage resources.
- The average recreational fisherman knows the limits for his or her target species, but does not pay a lot of attention to regulatory developments. Because of this, it is difficult to get recreational voices to meetings.
- Recreational anglers have not had enough involvement in MPA processes.
- More people would get involved if they knew what MPAs were really about. Recreational fishermen do not see MPAs coming, and then all of a sudden find out they will not be able to fish in a favorite area anymore. This phenomenon explains some of the recent backlash.
- In California, the process needed to be more transparent. People complained that meeting times changed, and there was a perception that decisions had been made before recreational input was given.

B. *Ways to address fishermen's concerns and improve involvement*
- Managers need to gather and use fishermen's knowledge. This knowledge "fills data gaps… Their information is, geographically, usually of a much finer scale than government info. And collectively it's much more complete for a given commercial species than anything government or academia can produce because fishermen spend so much time on the water" (Burrows 2001).
- Gathering and using fishermen's knowledge will help establish the buy-in that is needed for establishment and enforcement (Burrows 2001).
- Fisheries science needs to be reviewed by independent scientists not associated with agencies or the fishing industry.

- Commercial and recreational fishers need to be involved in science for fisheries management and biodiversity preservation. This can help address fishermen's concerns or doubts, as well as gather needed data (Burrows 2001; MPA Power Tools conference 2001; GCFI Annual Meeting 2001; Skinder 2001).
- There is a program to do cooperative research with commercial fishermen in the Northeast, but a similar program is needed for recreational fishermen. If recreational fishermen understood the science better, they might understand management more. Cooperative research could promote buy-in of the results and their implications for management.
- Research collaboration is a good way both to address the communication gap between scientists and fishermen and to access traditional ecological knowledge (MPA Power Tools conference 2001, Skinder 2001.)
- Policy makers and agency managers need to demonstrate to the fishing community that decisions will be science-based, and that environmental groups will not be "calling the shots" regarding MPAs. Policy makers should acknowledge that political pressures exist, but convince fishermen that the process will be based on science.
- Policy makers should also make reasonable assurances that some areas will stay open, identifying areas that fishermen will be able to fish forever.
- Management effort needs to be directed toward protecting spawning and nursery habitats via pollution control and limiting of coastal development.
- Managers need to recognize that inshore closures may create inequities since big boats can go further offshore, but smaller boats do not have that flexibility (Skinder 2001)
- Management needs to recognize and acknowledge the things commercial fishermen have already done to support conservation. For example, commercial shrimpers voluntarily stopped trawling in a nursery area by the Dry Tortugas.
- Many managers do not know how to communicate with or gather information from commercial fishermen. Bruce Burrows (2001), a former fishermen who is now fisheries outreach coordinator for the Living Oceans Society, writes that managers interacting with fishermen should do the following things: explain what they are doing; describe the benefits for fishermen; provide evidence for the benefits of MPAs; be up front about possible negative impacts on fishermen; be respectful; build trust by helping with other issues; do not use bureaucratic or academic language, but also do not patronize.
- Managers need to recognize that fishing communities are like tribes, with unique histories, leaders, and protocols. They must also be sensitive to fishermen's fears that data they turn over may be used by competitors or used by agencies to close areas.
- Meetings need to be scheduled at times when commercial fishermen are not on the water, and some of them should be held on the fishermen's "turf." Other mechanisms for involvement are also needed since fishermen cannot attend numerous meetings.
- More definition and articulation of MPA goals, as well as more overall outreach, are critical to getting recreational anglers more involved.
- Recreational fishermen did not understand the California Marine Life Protection Act (MLPA) and its impacts before the bill was passed. Improved education and outreach are needed so impacts are understood, and materials need to be in laymen's terms.
- Managers need to seek out individual fishermen—both recreational and commercial— who can foster collaboration with and trust from their communities.
- Fishermen's experience and creativity can help managers devise solutions to a range of issues. For example, they can help design gear modifications that limit seabird bycatch.

Links to Other Topics
- *Identifying MPA goals and defining MPA terminology* and *Public education and outreach*: Goals and definitions are needed to clarify existing confusion in both the recreational and commercial sectors, and to give commercial fishermen more certainty about the future. Recreational fishermen would be more involved if they had more definition and if there were more overall awareness of MPA issues.
- *Natural science needs* and *Social science needs*: Both recreational and commercial fishermen are calling for more and better MPA science, ranging from biological research to explore the "spillover" effect, to better quantification of economic benefits and costs. And as this new research is done, fishermen need to be involved. Fishermen frequently can provide ecological information at finer scales and across larger areas than is currently available, and they must be consulted for information about their own use of marine areas, and about the economic impacts of changes in resource conditions or regulations. Collaborative research projects can address a range of science needs.
- *Evaluating MPA effectiveness*: Fishermen are understandably concerned about evaluating MPAs since they feel there is still great uncertainty about their benefits and costs. Fishermen want to be sure these areas are working, and that they are not having unintended negative consequences. Both existing closures, as well as any new MPAs, must be evaluated to address fishermen's concerns.

Managing Visitor Impacts

Key Needs

Managers of public lands and waters need to balance public access with the protection of sensitive resources. This balance becomes harder to achieve as visitation increases, and MPA managers need to consider and address the ecological and social impacts of growing marine and coastal recreation. Nonconsumptive activities are not without impacts, and these must be monitored as visitation to sites increases. For example, visitors may unintentionally disturb or displace species, or damage habitat (e.g., divers accidentally breaking off pieces of coral). Social impacts include increased crowding and conflicts between users. Methods for evaluating impacts need to be developed and implemented, and education and outreach efforts need to include information about impacts—both to encourage awareness of "best visitor practices," and to explain why regulations to limit visitation may be necessary. Appropriate management responses need to be planned for at individual sites and at the agency level.

Connections to Needs Assessment Objectives
- *What*: MPA managers need knowledge about current and potential visitor impacts, and they need skills for monitoring and mitigating negative impacts.
- *Why*: Ecological impacts of visitation are much discussed, but managers may not be as used to considering social impacts such as crowding, declining visitor satisfaction, etc.
- *Who*: Site-level managers will have to deal directly with visitor impact issues, but upper-level managers need to consider agency-wide policies and provide technical assistance to sites that need help monitoring and controlling impacts. Education and enforcement staff will work directly with visitors on these issues.
- *How*: Visitor surveys can help track both ecological and social impacts. Case studies of existing efforts—both regulatory and nonregulatory—to minimize or prevent impacts are needed. Education and outreach materials are needed that discuss visitor impacts and management responses.

Specific Needs
- The increasing numbers of visitors to coastal parks impact natural resources. Birds are disturbed by kayakers, vegetation is trampled, and there is Illegal camping on islands.
- Increased visitation also has social impacts. The quality of the visitor experience is changing in the face of rapidly expanding use, both recreational and commercial. There are more use conflicts, and more crowding.
- Visitors can bring significant economic gains to area communities, but local residents may feel they are being displaced from areas where they have traditionally fished, swum, boated, etc.
- DOI has been looking at carrying capacity issues, but this process does not have a marine focus, and it would be good to have a dialogue on this issue for coastal units.
- When multiple agencies manage an area, it would be good for them to coordinate regulations across jurisdictions since it can be hard for visitors to keep track of the differences. For example, if several agencies manage a group of sea islands, they may close areas for birds at different times of the year.
- There is increasing recreation in the coastal zone in Alaska. Kayakers like to camp on beaches used by coastal black bears, and this increases the potential both for interaction between visitors and bears, and for pushing the bears out of their native habitat.
- Tourists are more physically active, more adventurous now. For example, cruise ship passengers are likely to rent a jet-ski or go diving or take a small-boat tour when the ship stops in a port. This trend means there is an increasing impact from such activities, although most commercial operators are mindful of environmental issues.

Links to Other Topics
- *Intra- and interagency coordination and cooperation:* Agencies and/or individual sites should learn from each other's experience with monitoring and controlling visitor impacts. Wherever possible, regulations should be coordinated across jurisdictions to make them easier for visitors to learn and follow.
- *Inventorying and monitoring:* Monitoring is essential to identify and track visitor impacts.
- *Social science needs*: One goal of MPAs may be to provide high quality recreational experiences, and social science research is needed to examine how visitor experiences change with increasing numbers of people or with the addition of new uses.
- *Evaluating MPA effectiveness*: MPA evaluation must include recreational impacts. It is important to evaluate nonconsumptive uses both because these activities can have impacts, and to address equity concerns among user groups.

Historical and Cultural Issues
Key Needs
Historical and cultural issues arise for marine resource managers both in regard to physical resources and in regard to interactions with local communities and user groups. Physical resources with historical or cultural significance need to be inventoried, monitored, and managed. Erosion, corrosion, and human disturbance are all threats that need to be considered and addressed. In particular, sources called for more inventorying, enhanced law enforcement, and education of key user groups such as divers to improve the protection of submerged cultural resources. Extensive archaeological and cultural research is needed to fully document and interpret resources that include shipwrecks and submerged Native American sites.

Cultural knowledge is also critical to working with people. Indigenous peoples may still use managed areas for subsistence or consider these areas sacred, and users from different ethnic

groups respond differently to outreach efforts and to regulations. Learning about these cultures is critical to creating effective education, enforcement, and public involvement processes. While publishing materials in different languages and having translators at meetings are important elements of effective interaction, sources emphasized that cultural literacy needs to extend beyond language.

A final issue raised within this topic area relates to both physical resources and working with people. This is the question of whether and how much to restore cultural landscapes. A site's mission may include interpreting the history of the area, but actual restoration of cultural landscapes may involve considerable changes to the environment (e.g., restoring a forested sea island to show an historical agricultural settlement). Large changes to the environment will have ecological ramifications, and may be opposed by local communities.

Connections to Needs Assessment Objectives
- *What*: Managers need resources and skills to identify and protect cultural and historical resources within MPAs. Managers also need knowledge of different cultures to interact effectively with local communities and user groups.
- *Why*: Managers are frustrated that they do not have the resources to do more with cultural and historical resources. Enforcement personnel may not take protection of these resources as seriously as other duties. Managers are noticing cultural issues that limit the efficacy of educational and regulatory activities, and they realize that these issues extend beyond language barriers.
- *Who*: Agencies may have special units or staff positions devoted to cultural and historical resources, and these managers have a special role providing technical assistance to sites. Upper-level managers need to consider agency-wide policies for improving protection of these resources. Managers at all levels can benefit from enhanced cultural literacy, but it may be most important 1) for site managers who interact with different groups on a day-to-day basis, and 2) for managers initiating new planning processes that need to involve different cultures.
- *How*: Since protecting historical and cultural resources frequently involves special skills and expertise, managers can benefit from technical assistance at the national level such as that provided by the NPS' Submerged Resources Unit. To prevent disturbance of submerged resources, training is needed both for enforcement staff and for user groups such as divers. Managers' cultural literacy can be enhanced by direct training, and by the creation of more formal forums for interaction (e.g., workshops that bring together managers and subsistence users to discuss impacts).

Specific Needs
- Native groups may wish to collect plants for traditional ceremonies, or management units may contain sacred sites.
- In Alaska there are Native Americans leading subsistence lives who harvest resources in the parks, and managers do not even have the basic inventorying and monitoring to know what the impacts are. Facilitated meetings between managers and native groups might be useful for addressing subsistence issues.
- Over a hundred shipwrecks probably lie within the Thunder Bay NMS, but only 40 have been documented. The entire sanctuary needs to be inventoried, and detailed archaeological documentation is needed for individual wrecks.

- Just putting materials into other languages will not address cultural issues. For example, sometimes people know about fishing regulations such as slot limits, but do not follow them because they believe fish were put on earth to help them provide for their families. People have been fishing in areas for years and think they are exempt. Cultural studies are needed to find out *why* people break the rules.
- More outreach and education is needed about submerged cultural and historical resources.
- Some managers are working with diving operations to train divers about the cultural environment, creating training modules that outline rules and regulations and good practices for divers.
- Better cooperation is needed from law enforcement to protect cultural and historical submerged resources. Too often these resources are "out-of-sight, out-of-mind," and officers do not take enforcement seriously. In Florida, a 1993 law made it a third-degree felony to take a resource if digging was involved, but there has not been a conviction for an underwater violation to date. Many officers do not know the difference between an artifact and a fossil, and when training is offered, enforcement staff may not participate since they are incredibly busy.
- Traditional fishing cultures are being lost. "No one wants to take up fishing anymore… In addition, property taxes are increasing for year-round locals because of out-of-state buyers. Resident fishermen are finding it exceedingly difficult to be able to afford to stay in their home ports" (Skinder 2001).
- More basic survey work (i.e., research, inventorying) is needed in underwater archaeology, and resources should be mapped on a GIS. More staff are needed to do this work. Doing surveys is valuable both for gathering information about sites and for doing outreach and education. Surveyors meet people who tell them about other sites and who want to contribute to conservation efforts.
- Archaeological resources are eroding in places. Managers need help protecting these resources in a dynamic marine environment.
- Sanctuaries have less-stringent protection for cultural resources than parks. NOAA does not protect site location information, which makes the NPS hesitant to share data. If information about fragile sites ends up on a database that the outside world can access, resources are endangered. Archaeologists may actually be violating their ethics code if they share data because NOAA/NMS will give out locational information. To really work cooperatively with NOAA, the NPS would have to be assured there would be strong protection of site location information.
- Parks with submerged cultural resources do not have fee simple ownership of bottomlands, and states sometimes do not give these resources adequate protection.
- Units need the capacity to protect cultural resources once they are identified. Inventorying work is only worthwhile if the resources can be protected once found. In many cases, parks do not have adequate staff or resources to provide necessary law enforcement.
- The NPS Submerged Resources Unit, located in Santa Fe, helps parks with a range of activities, including locating and inventorying resources. When fully staffed, the research team includes law enforcement personnel who can do undercover work (e.g., taking an ecotour to verify that guides are following the rules). In some cases the unit will recommend putting in buoys to mark interesting sites for divers, but it may recommend not publicizing particularly fragile areas.
- An "ethic of respect" for protected shipwreck areas needs to be cultivated to prevent disturbance; the kinds of artifacts present and the spatial relationships between artifacts is important for learning about history (Davis 2001c).

- Erosion and corrosion are serious threats to submerged cultural resources. "The gradual deterioration of shipwrecks can be the most significant challenge to managers" (Davis 2001c). Some artifacts should be recovered before they are lost, and available technologies should be used to slow sites' degradation (e.g., cathodic protection, which uses metal anodes to divert corrosion away from ships) (Davis 2001c).
- State-level managers are good contacts for information about cultural and historical resources (e.g., state archaeologists, underwater archaeology divisions).
- MPAs could be important for researching the historical condition of resources, and the importance of those resources to early societies. This function would probably develop as areas are designated.
- Managers need to incorporate knowledge of the cultures they are trying to manage into their approach. "A coastal manager…[can] fail miserably as an effective practitioner if he or she does not, or cannot, appreciate the importance for the culture and traditions of the people they are attempting to serve" (Olsen 1995).
- Language training is important, but additional knowledge is needed for true cultural literacy. "Understanding religious thought or the history and art of a society will do much to make an ecosystem manager effective" (Olsen 1995).

Links to Other Topics
- *Enforcement*: Enforcement is an essential component of protecting cultural and historical resources. Laws preventing disturbance and salvage must be enforced, and on-the-water enforcement officers may need special training on submerged cultural resources.
- *Working with indigenous peoples*: As was discussed in this topic area, knowledge of indigenous peoples' cultures and histories is needed to develop effective involvement of and support from these groups in MPA processes.

Enforcement
Key Needs
Sources stressed that new MPA efforts must plan for and develop enforcement capacity from the beginning. There is well-justified concern that enforcement will be inadequate for new efforts since there is an overriding shortage of resources to support *existing* marine enforcement needs. Violations increase as people learn they can break the law with impunity, and capacity limitations lead to inequitable enforcement that angers user groups. The nature of the marine environment makes enforcement challenging, and managers need more staff and equipment. New technologies such as satellite tracking need to be explored, and agencies must join forces to maximize the utility of existing enforcement resources.

In addition to the overriding need for more resources, the assessment also revealed several specific roadblocks to effective enforcement. First, officers need training, both on natural and cultural resources, and on the laws and regulations they are enforcing. Second, enforcement actions often do not make it through the courts, and officers are reluctant to pursue violators if the charges will just get dismissed. Third, unclear boundaries make both compliance and enforcement difficult.

Within enforcement discussions, outreach and education were raised as important tools. Tourists are often unfamiliar with both the ecology and regulations of a marine area they are visiting, and complex regulations may be difficult for even regular users to follow, meaning that education can prevent a significant number of violations. Education and outreach can also foster buy-in and compliance as people gain a better understanding of the purpose and benefits

of regulations. Ultimately education can reduce the need for other enforcement actions by encouraging user groups to practice self-regulation.

Connections to Needs Assessment Objectives
- *What*: Managers need considerable resources for enforcement, and they need clear legal boundaries for MPAs. Enforcement staff need training on resources and rules, and information is needed on the utility and feasibility of new technologies such as satellite tracking.
- *Why*: Managers are frustrated by resource limitations that lead to inadequate and inequitable enforcement, and they worry about the ability to provide enforcement for new areas or regulations. Managers are also concerned that enforcement officers do not have the ecological knowledge and familiarity with statutes that they need, and officers are frustrated by the lack of legal follow-through in the courts.
- *Who*: Upper-level managers need to examine intra- and interagency enforcement capacities, cooperate to maximize the use of current resources, and bring in new resources where possible. Enforcement staff can benefit from training on resources and regulations.
- *How*: MOUs and MOAs can formalize cooperative enforcement arrangements, and legal and mapping work are needed to produce clear MPA boundaries. Satellite and radar technologies should be studied and implemented when feasible. Training on natural and cultural resources, and on statutes, is needed for enforcement officers unfamiliar with these topics. Laminated fact sheets on regulations, critical habitats, and species can help officers on the water. Various education and outreach strategies such as fliers at marinas, diver training, and on-the-water recreational boater education should complement enforcement actions.

Specific Needs
- There are never enough resources for enforcement. Money, staff, boats, aircraft, and new technologies are all needed.
- Quantity of officers is the key factor. 80 percent of people will do the right thing, 15 percent will do the right thing when watched, and 5 percent are poachers. The 15 percent is the key group because they will migrate toward the 5 percent when they see that enforcement is not happening.
- Good enforcement is essential to get buy-in from user groups. People want to know there will be equitable enforcement for all groups.
- NMFS only looks at major cases, and this is problematic. NMFS does not have time to handle recreational cases, but the impacts of these add up, and communities are starting to learn that they will get away with minor infractions.
- Selective law enforcement is a real problem. NMFS will use extensive resources to catch a commercial fisherman, but ignore recreational violations (e.g., charter fishermen selling their catch.)
- Fishermen report that the Coast Guard is not well trained in enforcement, and much escapes them (Skinder 2001).
- Coast Guard enforcement has declined dramatically in the wake of the September 11 tragedy.
- Enforcement is a real challenge with a shipwreck sanctuary. There are not a lot of "bad apples," but there are a few, and some go out at night. Just being on the water helps, and a bigger presence on the water is needed.
- Outreach is really important for fostering understanding of and compliance with protective measures. Meetings with dive clubs and fishermen are valuable.

- In some cases NOAA relies on the Coast Guard, state natural resources departments, and local marine sheriffs for enforcement. Partnerships are key for making these arrangements effective, and cross-deputization of agents is needed.
- When enforcement is done by other agencies, it is important to make sure everyone is operating with same "culture." Officers need a basic level of understanding of the regulations, and sensitivity training may be needed.
- The NMS program is "developing a national method to creatively design new ways to provide enforcement in partnership with NGOs and State governments" (CEC 1999).
- Enforcement officers need training and reference materials on the rules and statutes. It would be helpful for officers to have "cheat sheets" about statutes and about specific resources such as submerged aquatic vegetation. Since officers do not know all the different species of groupers, laminated identification guides would be useful.
- Training on both natural and cultural resources should be included in the initial training for enforcement officers, as well as part of continuing education programs.
- Education is needed for boaters and coastal residents to explain why regulations exist.
- Ethics can be an enforcement tool. Fishermen complain that MPAs just create areas for poaching, and outreach is needed regarding the values of MPAs and the idea that poaching is stealing from the public. Fishermen need a code like the one hunters follow. If fishermen buy in to the rules, they will self-enforce.
- Enforcement staff want penalties to include forfeiture of vessels and gear (SAFMC Advisory Panels Meeting 2001).
- There is inadequate follow-up by the judicial system, and enforcement officers say they would pursue more violators if the courts would do more. Charges often do not make it through litigation.
- On the water it is difficult to see boundaries, and landmarks are needed so boaters will know when they have crossed a boundary. A lot of the damage in Florida is done by tourists who do not have the local knowledge to know areas and to know where boundaries lie. Better marking and maintenance of channels are also needed, and boater guides and charts need to show boundaries.
- Boundary issues differ for inshore and offshore areas, and outreach may need to target very different groups.
- Boundary definitions are problematic because they are written in different metrics (i.e., laws use different precisions, and the lines do not match up). Enforcement follows what is marked on the water, but that may not match the law, or the law may be going through an update. Laws need to use one scale, and updates must happen quickly.
- Based on their study in the FKNMS, Dobrzynski and Nicholson (2001) recommend that managers "develop a more effective outreach plan to educate out-of-town private recreational boaters about the regulations pertaining to marine reserve areas." Possible outreach strategies might include posting regulations on mooring buoys, asking local boating facilities to hand out flyers, and publicizing regulations on popular recreational boating Web sites and at marinas (Dobrzynski and Nicholson 2001).
- "Enforcing offshore MPAs will be a challenge, but the development of satellite tracking technology for fishing vessels (vessel monitoring systems) and other technologies may solve these problems" (NRC 2001).
- Satellite tracking raises privacy issues. People do not want transponders on their boats.
- The marine electronics industry may be a source of help as technical advances occur. The MPA center might facilitate communication with the industry regarding enforcement.
- In the Tortugas, radar monitoring is being linked to enforcement offices, and this would be useful for other areas as well.

- The wording of rules is important. For example, language in a law can distinguish whether violators have to be caught at sea or if a vessel-tracking system can be used with arrests occurring at the dock.
- Managers interested in trying a new access-management strategy need to understand the legal framework for establishing protection (Crosby, Geenen, and Bohne 2000). Managers may need legal training in order to identify possible options.
- There can be an attitude among FMC managers that enforcement is not a fisheries issue, that "it's not our problem to figure out how to enforce the regulations."
- There is a lack of political will to devote enforcement resources to remote areas. Officers are placed in busy areas where they will address safety concerns.
- "The focus in [the] Florida Keys Sanctuary is on interpretive enforcement: i.e., the use of education first before giving an offender a ticket" (CEC 1999).

Links to Other Topics
- *Intra- and Interagency coordination and cooperation*: In some cases an MPA manager may not have adequate resources and/or staff to provide necessary enforcement, meaning that coordination with other offices and/or agencies is essential. In other situations coordination can avoid duplication of effort, consolidating enforcement activities that serve the interests of multiple entities.
- *Fisheries management issues*: Several sources stated that fisheries enforcement focuses on commercial interests while ignoring recreational violations. While this may seem to make sense given limited enforcement resources and given that individual commercial violations are bound to be larger, recreational infractions mount up, and selective enforcement angers commercial fishermen.
- *Public outreach and education* and *Stakeholder/community involvement*: Numerous sources touted the benefits of outreach to the public and to specific stakeholder groups for fostering compliance. Ideally, outreach and participatory processes can decrease the need for enforcement by generating buy-in and fostering social control. Once an MPA has been created, law enforcement records can be used to better target educational programs by identifying types of violations and characteristics of people who are charged (e.g., data might show larger impacts from locals or from tourists, or might reveal habitual violations by a particular user group or demographic within a user group).

Evaluating MPA Effectiveness
Key Needs
Managers, researchers, and user groups all emphasized the need to evaluate MPA effectiveness. Current MPAs must be evaluated to see if they are meeting established goals, and to quantify ecological and socioeconomic impacts. Program evaluation also must be built into all new MPA efforts, and regional and national-level evaluations are needed to examine the efficacy of existing or proposed MPA networks.

Sources call for standardized evaluation frameworks and criteria, and suggest that the National MPA Center can play an important role in developing these and in instituting evaluation as a formal process within all MPA efforts. The National MPA Center and supporting institutes are also being looked to for technical assistance to help individual sites implement program evaluation, and for regional and national-level analysis of MPA effectiveness.

In addition to providing accountability and identifying adaptive management measures needed to achieve MPA missions, evaluation gathers information that managers can use in outreach

and education activities. Monitoring for evaluation gives managers data to address specific stakeholder concerns, and to demonstrate the benefits of MPAs.

Connections to Needs Assessment Objectives
- *What*: Knowledge is needed on the effectiveness of existing MPAs for achieving stated goals, and managers need to know about both intended and unanticipated impacts. Managers need processes and skills to institute formal, ongoing evaluation of MPAs.
- *Why*: Sources suggested that some people have a philosophical attitude that evaluation is unnecessary since an MPA is bound to bring benefits, but managers involved in the needs assessment advocated increased and improved evaluation. Managers are looking to the national level to provide direction, standardization, and assistance in implementing evaluation, as well as in analyzing results at regional and national scales.
- *Who*: Regional and national-level managers are positioned to review current evaluation methodologies and develop standardized guidelines, criteria, and indicators. Site managers also need to contribute to this work, both by identifying current evaluation practices and data, and by providing feedback on whether criteria and indicators will be meaningful at the site level. Site managers need to formalize evaluation, tracking progress on site missions and plans over time. Regional and national managers need to analyze effectiveness at the network level.
- *How*: Existing ecological and socioeconomic evaluation techniques should be applied to do some immediate assessment of the effectiveness and impacts of current MPAs. A study to compile and review current evaluation processes and indicators could be a first step in developing standardized program evaluation for MPAs. Technical assistance could be provided to individual sites via a federal team of evaluation experts, and via training on any standardized guidelines that are generated. Electronic forms can make it easy for individual managers to submit evaluation information, and electronic forms can facilitate national-level analysis.

Specific Needs
- Evaluation is needed to see if existing MPAs are meeting their overall goals.
- A lot of managers who have been at sites a long time will do "seat-of-the-pants" evaluations, but the process needs to be more formal. A national MPA center should promote effectiveness monitoring
- Broad review of existing MPA goals, evaluation criteria, and monitoring methods are needed.
- Consistent evaluation guidelines are needed for measuring MPA effectiveness, and there should be criteria and indicators for each class/kind of MPA (CEC 1999).
- Evaluation criteria need to be clear, demonstrated, and measurable.
- A common framework should be used to evaluate effectiveness, and It would be useful to have "an annual report on the state of our MPAs which would set out how we are doing to benchmark each year" (CEC 1999).
- When evaluation standards are developed, managers need to sit down and *apply* them to their management plans.
- Standards should address appropriate time frames since not everything can be measured every year.
- Outside review can be valuable.
- Evaluation can help managers stay focused on the original goals of an MPA. Often goals morph over time but this is never addressed or analyzed because managers are so busy with the day-to-day. Evaluation should be based on an MPA's mission or plan.

- Good evaluation methods exist (e.g., the International Union for the Conservation of Nature and Natural Resources has some good frameworks).
- Evaluation is needed both for accountability and to help "tell the story" of a site. Environmental and process indicators need to be developed that can be tracked over time, and mangers need to figure out how to convey this information to the public. Managers need to explain what they are doing and where they are succeeding, but they also need to be careful not to raise false expectations.
- Indicators are needed that will allow nationwide evaluation of MPAs but that are also meaningful at the local level.
- Evaluation needs to include the human element of what is effective (e.g., measuring compliance with regulations and economic impacts on communities).
- Evaluation is essential to determine whether and when fisheries benefits will occur.
- Some people believe just leaving an area alone will be good, and they do not think it is necessary to measure MPA effectiveness.
- There is a lot of evaluation work under way that should be examined. For example, NOAA is working on international MPA indicators, and on establishing criteria for sanctuaries. Parks Canada has a system whereby units are required to submit information on a number of indicators, and then a report is produced that presents information for individual sites as well as national-level analysis.
- A national MPA center could establish expert panels to help with evaluation at individual sites. This would be a kind of "consulting function" at the national level.
- A national MPA center could look at larger systems, integrating data from various sites.
- Regional analysis is needed to examine to what degree an MPA network exists, and to evaluate the effectiveness of that network for habitat and biodiversity protection.
- A national inventory of state and territorial sites will rely on managers to supply and update information. Mechanisms for updating must be easy to use, and managers will need to see clear benefits to providing their information.

Links to Other Topics
- *Intra- and interagency coordination and cooperation*: When evaluations are done, interagency consultation should be used to ensure that different agencies can benefit from the data that are gathered.
- *Inventorying and monitoring*: Program evaluation requires both baseline inventories and ongoing monitoring of ecological and socioeconomic conditions.
- *Natural science needs*: Multiple sources stated that the lack of reliable basic science on topics such as larval dispersal is a major barrier to evaluating MPA effectiveness.

Funding
Key Needs
When people familiar with marine resource management are questioned about needs, funding is frequently the first thing mentioned. More resources are clearly needed to address many of the needs identified throughout the assessment, and managers repeatedly cited inadequate funding as a roadblock to specific activities such as monitoring, enhanced stakeholder participation, and enforcement. When new MPA efforts are discussed, sustainable funding is listed as a prerequisite. Within the general need for funding, however, there is a need to get managers thinking about innovative sources, and to provide managers with the capacity to pursue those sources.

Managers are frequently so busy with day-to-day activities that they do not focus on finding new funding sources, but needs assessment participants felt that managers must start devoting more time to this issue. Specifically, managers need to look to more nonfederal funding sources, and they need to take advantage of innovative strategies such as fund-raising through friends groups and implementing user fees. Since managers typically do not have experience in this area, training and technical assistance are needed to raise their capacity to pursue and utilize innovative funding avenues.

Connections to Needs Assessment Objectives
- *What*: MPA managers need greater, sustainable funding. Managers need to learn about the range of sources that can provide support, and they need the skills and freedom to pursue nontraditional funding opportunities.
- *Why*: All managers are keenly aware of the need for additional funding. Some still feel as if all they can do is document the need for monies and staff and hope that more public dollars will be devoted, but an increasing number are starting to utilize innovative funding mechanisms.
- *Who*: The need for funding is found across management entities and levels. As with evaluation, national-level managers might provide help by surveying potential funding sources and providing training and technical assistance to raise sites' capacities to access new funding.
- *How*: Potential funding mechanisms include user fees, merchandise, and conservation license plates. NGOs can help with fund-raising, and friends groups already help a significant number of managed areas. EPA has developed a training course for managers on funding mechanisms, and case studies from international MPAs can demonstrate successful use of innovative funding sources.

Specific Needs
- There are ways of finding money, and MPA managers need to realize that thinking about funding mechanisms is important. Managers get caught up in the day-to-day and may not be taking advantage of opportunities.
- User fees are one funding source. Both Bonaire and an Indonesian national park have had good experiences with user fees. However, issues may arise when increasing tourism increases revenues.
- "Tourism often has the most to gain from an MPA and can generate the greatest economic activity from it" (Kelleher 1999).
- "Friends groups" are useful for fund-raising. NGOs can accept donations, and people get a tax write-off when they donate to 501(c)3s (i.e., nonprofit organizations.)
- Merchandise such as clothing and coffee-table books can be used to raise money.
- Currently there is heavy reliance on federal money. This may limit projects, but managers do not have the financial planning knowledge and skills to pursue other sources. Managers need to be taught about tools such as user fees, taxes, fines, and public-private partnerships. EPA has done a training course to encourage managers to look at nonfederal sources.
- "If MACPAs [Marine and Coastal Protected Areas] are to function effectively in the long term, partnerships and innovative funding mechanisms must be established to supplement governmental funding" (Crosby, Geenen, and Bohne 2000).
- "Lack of funds is a critical problem for many MPAs. Managers therefore need the freedom to raise funds in as many ways as possible, such as user fees, donations and environmental funds, and to retain those funds for management of the MPA" (Kelleher 1999).

Links to Other Topics

- *Natural science needs*: As mentioned in this topic area, there is a need to connect the three elements of 1) managers with science needs, 2) capable, interested researchers, and 3) appropriate funding sources.
- *Science in management*: It is often easier to find money for collecting data than for analyzing data. More resources are needed to mine data for management ramifications.

Growth and Land-Based Threats
Key Needs
Several sources raised growth as an important issue, and said that marine resource managers need to focus more on land-based threats. New development directly destroys coastal habitats, as well as creates significant threats to marine resources, such as increasing eutrophication, loss of nursery habitat, and disturbance of sea turtle nesting from light pollution. Upstream sources generate sediment, nutrients, and pollutants that all flow to the ocean, and dramatic negative impacts of these are seen in growing "dead zones" and in the loss of coral reefs.

Managers need to be more educated about secondary and cumulative impacts, and about smart growth techniques and benefits. Tools are needed to help managers engage local communities and decision makers in growth issues, and managers need to learn how to advocate for marine resources within growth management discussions. Managers working in MPAs with a terrestrial component can benefit from legal training in land acquisition and conservation easements.

Connections to Needs Assessment Objectives
- *What*: Managers need a greater general knowledge of growth issues, and specifically of secondary and cumulative impacts. Managers need skills to communicate these impacts, and specific tools and approaches for addressing land-based threats.
- *Why*: Managers feel overwhelmed by growth-related issues. They may feel powerless to address land-based threats since they do not have authority over terrestrial use, because nonpoint sources are hard to address, and because pro-development interests are financially and politically powerful.
- *Who*: Managers at the state and local level are likely to be most engaged with growth issues since state and local governments typically regulate land use. Coastal site managers need tools for encouraging watershed management in communities, and for preserving undeveloped habitats. Managers at all levels can contribute to efforts to raise people's awareness of land-based threats.
- *How*: Considerable training resources on growth issues and on tools to address land-based threats already exist, but managers may need help identifying and accessing these resources. General outreach and education materials also exist, but developing a clearinghouse of information might increase their use. Futures analysis and nitrogen loading management plans were two specific tools mentioned by sources.

Specific Needs
- The vast majority of MPAs, as broadly defined, are facing growth issues in their area. Tools are needed to help managers understand and address secondary and cumulative impacts, and to help managers communicate these issues to local decision makers.
- Managers need to understand smart growth concepts and specific issues such as brownfield reclamation, atmospheric deposition, and shellfish contamination from polluted runoff. Managers need help addressing growth-related issues because they feel overwhelmed by the task.

- Training initiatives such as the Nonpoint Education for Municipal Officials (NEMO) program are needed. Managers need watershed management tools.
- Addressing growth issues requires managers to work directly with local decision makers.
- Tools such as futures analysis could help managers foster discussion of growth issues within local communities.
- Too often marine resource management efforts lack a general appreciation of the watershed concept. Upstream sources of nutrients and sediments are not addressed.
- Managers need legal training in land acquisition and boundary expansion.
- Managers need to be involved in local land-use decisions, to "have a seat at the table." It is important to convey a site's interests without stepping beyond one's authority.
- Land-based problems are important. If funding were available, NERRs could help local communities develop nitrogen-loading management plans.
- Focusing on restricting fishing while ignoring land-side problems is unfair, and ultimately marine conservation will fail unless land-based threats are addressed (MPA Power Tools conference 2001; FISHFOLK Listserv 2001).
- In the Great Lakes a lot of pollutants are still coming downstream, and there is also considerable air pollution from cities. A lot of paper plants are upstream, PCBs and heavy metals have been in the water for years, and Lake Michigan residents are advised to only eat fish from the lake once a month.

Links to Other Topics
- *Working with fishermen*: Fishermen repeatedly raise the concern that MPAs will create new restrictions on fishing but not address issues such as coastal development and land-based pollution, which are leading to declines in nursery habitats, shellfish contamination, etc. A post from the FISHFOLK Listserv articulates these fears, and suggests the challenge that managers face both to address fishermen's concerns and to actually make progress on issues associated with growth: "The proponents of marine reserves are engaged in mass deception when they tell fishermen that there will be increased restrictions on coastal pollution, air pollution, oil and gas extraction, shipping, etc. if an area is designated a "marine reserve." The plain and simple fact is that the proponents of "marine reserves" lack the clout to deal successfully with the other issues, so they are content to satisfy themselves, and the foundations that fund them, if they can just prohibit fishing" (FISHFOLK Listserv, Jay Johnson 28 June 2001).
  - *Public education and outreach* and *Working with communities/stakeholders*: Outreach to the general public and to communities is key to addressing growth issues. Education is needed since people do not typically think about the secondary and cumulative impacts of development, or about the impacts of upstream activities on marine resources. Land-based issues also represent a unique opportunity to involve people in marine protection efforts since these issues make connections between people's day-to-day lives and the health of marine resources.

Site- or Sector-Specific Issues
During the needs assessment, several issues were raised that did not receive sufficient discussion to warrant coverage as detailed topic areas, but that bear mentioning as current challenges that individual areas, management entities, or user groups are facing. Each of these issues is discussed briefly below.

Aquaculture of marine finfish
Finfish aquaculture is increasing in some areas, and this can impact protected area management in several ways. Significant ecological issues arise since aquaculture essentially creates a feedlot. Circulation is counted on to disperse the resultant pollution, but current

patterns are not well understood. Aesthetic issues also arise as large-scale industrial operations produce noise, light, and debris pollution, and local communities are complaining. Increasing aquaculture development can generate competition for ocean space, and impacts need to be carefully monitored. Finally, the process for issuing aquaculture permits is unclear and tends to generate conflict.

Atmospheric deposition and offshore sources of nitrogen
Sources believe that efforts to model nitrogen in the Gulf of Maine are not giving adequate consideration to atmospheric deposition and offshore sources. Data from a number of estuaries on the East coast support the belief that atmospheric deposition and nitrogen coming into coastal areas from offshore are significant contributors to total nitrogen loads.

U.S. Navy working to protect marine mammals and coral reefs
Naval activities may impact a number of marine mammals, and the Navy has special responsibilities regarding protection of northern right whales along the East coast. The Navy is working to prevent negative impacts (e.g., a video has been created for all Navy ships that demonstrates correct procedures), but the challenge is to identify what else can be done to train and raise awareness among both service members and civilian employees. An innovative way in which the Navy might help marine mammals is by fostering use of propeller guards. The Navy created these guards for some of its ships, and doing outreach and making guards available to the general public at low cost could provide benefits in manatee areas.

Coral reef issues are another area where the Navy strives to raise awareness and prevent damage. The Department of Defense (DOD) produced a guide on the coral reef initiative called the "Coral Reef Implementation Plan." All affected regions and ships are supposed to follow this guide, and it also provides general awareness to service members, but there was not enough money to adequately distribute it. Downloaded copies are not clear, so hard copies need to be more widely distributed.

Softening hardened shorelines
Estuarine restoration efforts may include modifying hardened shorelines to restore more natural communities. Since this is a new activity for most managers, it would be valuable to synthesize the literature on techniques for softening hardened shorelines. In some instances, managers will need to balance ecosystem enhancement with pragmatic needs for sediment retention. This issue is especially relevant to waterfront revitalization programs.

Port recycling facilities
The cruise ship industry has found that ports have inadequate recycling facilities. A ship will separate and package all of its recyclables only to find that a port is not equipped to handle all mediums, meaning items end up in a landfill. This is a problem at ports in Alaska and Hawaii.

Oil drilling, mercury, pipeline construction, and invasive species
These issues were mentioned during a focus group or phone interview, but did not receive enough discussion to identify management needs.

Information Sources Currently Used by or Suggested by Managers
As described in the introduction, one of the objectives of the needs assessment was to identify *how* managers' needs might be best addressed, identifying specific tools or mechanisms for filling gaps. Since many needs of marine resource managers revolve around getting and analyzing information, CSC staff conducting the assessment were interested in finding out how and where current managers get their information, and in managers' suggestions for future delivery mechanisms. To this end, many of the managers who participated in focus groups and phone interviews were asked how they currently get information and how needed information might be provided most effectively.

The overwhelming finding from this line of inquiry was that marine resource managers utilize a wide range of information sources, with different individuals preferring different methods. This in turn means that any attempts to provide new information will have to use a range of methods in order to reach the entire management community. Managers themselves recognize this and, when questioned about how to provide new information, often suggested using multiple formats and delivery mechanisms.

The following two sections provide 1) a sampling of managers' comments about individual information sources, and 2) suggestions for how to deliver and foster the use of new information, including recommendations for specific information products and services.

Comments about individual information sources
- *Phone calls to academic experts and established agency contacts*: A number of managers said the easiest way for them to get information is to phone a researcher with expertise on the issue in question, or to call an existing contact in another agency. Managers develop "professional networks," and they call their established contacts when they are preparing to comment on a project or are exploring a policy question.
- *Journals*: Some managers subscribe to journals, but have trouble finding time to read them. Others go to the library, or send an intern, to find specific articles.
- *The Internet and e-mail*: Many managers mentioned the Internet when asked about their information sources. They use the Internet to get marine resource management news, including information about MPAs, but do not usually get data from the Internet. Reading Web sites is a good way for managers to learn about the views of different stakeholder groups. Some managers like e-mail, and in fact prefer getting an e-mail to visiting a Web site. However, other managers said they feel overwhelmed by the quantity of e-mails, but that they like the Internet since they can browse when they have time. Managers get a lot of information via e-mail, but look to Web sites for specific technical information. Several managers said they like e-mails that include hotlinks to Web sites so they can get more information if the topic interests them.
- *Newsletters*: As with journals, busy managers have trouble finding time to read all of the newsletters that arrive. One manager said newsletters are ineffective since there is no time to read, but others reported liking newsletters, even if they cannot always keep up with all the reading. Several managers said they like having the option of getting newsletters electronically, but emphasized that hard copies should also be available.
- *Meetings*: A number of managers said meetings are particularly valuable because attendees are away from their desks and can focus on the topic at hand. However, managers warned that a lot of time can be wasted in meetings and emphasized that they like meetings where they have the opportunity to *discuss* topics rather than simply listen to "talking heads." Busy managers have trouble attending all the meetings to which they are invited, and many managers face limited travel budgets.

- *Video-conferencing*: Managers reported that the capacity for video-conferencing is still limited, particularly at the site level. Some managers do not like the format, although that could change as the technology improves and people get more used to using it.
- *Conferences*: Managers reported that regional and national conferences are extremely valuable for figuring out who is doing what project, and for learning about data sources. As with meetings, conferences get managers out of their offices so they can focus, but may be difficult to attend depending on time and funding limitations.
- *Workshops*: Several managers called specifically for regional workshops, saying that workshops are good for networking and for seeing how other agencies tackle issues. One source said the pace of workshops can be frustratingly slow. Again, managers can only attend a limited number of workshops due to time and resource constraints.
- *Advisory committees and working groups*: Managers with advisory committee experience reported liking this format, and said that they got a lot of information from their committee experience. Managers also said that small working groups can be an effective way to share information on a particular topic (e.g., bringing together representatives from multiple agencies doing enforcement).
- *CD-ROMs*: Managers gave both favorable and unfavorable reviews of CD-ROMs. Some said CDs are useful for agencies, while others said they rarely look at CDs they receive.

Specific Suggestions for How to Deliver Information to Managers
- "Translating research results to managers involves an educational process… Recognizing that people learn through different modes such as visual, aural, and kinesthetic, the information needs to be presented in a variety of forms… Also the information needs to be presented several times before most people will assimilate it into their knowledge base" (Gault 1997).
- Newsletters should be available in hard-copy and electronic formats. Managers should be able to sign up to receive an e-mail that notifies them when an issue comes out, and the e-mail should provide a link to a printable version on the Internet.
- MPA bibliographies on the Internet should have links to full articles and/or additional publication details whenever that information is available on-line.
- Agencies can learn a lot from each other via technical assistance, training, and consultation.
- Personnel exchanges with established MPAs or with areas experienced in particular management skills or issues can be very useful. Managers can "go see how it's done," or experienced staff can visit a new site to make recommendations or help with implementation (Davis 2000a).
- Case studies should be used to share success stories and to learn what does and does not work.
- The "train the trainers" approach is efficient, and it has proven effective in the Caribbean. The United National Environment Programme (UNEP) and The Nature Conservancy (TNC) created a 10-day course on ecology, management, monitoring, and communication, and individuals who attend the course must commit to doing their own training session when they return home (Davis 2000a)
- To get information to program managers, all methods of information dissemination should be used (e.g., newsletters, Web sites, meetings). NOAA's CSC should provide training on new ways of doing business, demonstrating how NOS tools can be applied.
- Training workshops should be joined onto existing meetings or conferences. This can save managers time and money, and it may make it easier to justify travel requests.
- It would be useful to have periodic regional meetings to exchange ideas.

- A definitive MPA Web site with up-to-date information and data is needed. This site should serve as a "clearinghouse" where someone can click on a map and be routed to state-specific MPA activities, management entities, data, etc. The site should provide points of contact for requesting maps and other information.
- An Internet-based discussion network could be a great way to share MPA information.
- There may be enough MPA discussion now to fill a high-quality journal.
- It would be great to have a service that does library searches for journal articles.
- MPA bibliographies on the Internet should be searchable.

Findings of the Computer-Assisted Content Analysis of MPA Media Coverage

As a final component of the needs assessment results, the content analysis findings add insight into public opinion and interests. As discussed in the introduction, CSC staff conducted a computer-assisted content analysis of news media stories related to MPAs, examining general public awareness, as well as identifying uses, values, and stakeholder groups commonly discussed within MPA coverage (Fish, Recksiek, and Fan 2002). Over 25,000 news stories from the past six years were analyzed, and these stories covered management units associated with federal, federal-state partnership, state and territorial, tribal, and local management areas. Selected stories were analyzed 1) for favorable and unfavorable attitudes, 2) for expressions related to four categories of uses and values—commercial, recreational, social, and ecological – and 3) for discussion of stakeholder groups.

The following section outlines key findings of the content analysis that speak to the state of public knowledge and belief regarding MPAs. These findings in turn suggest needs or gaps that can inform ongoing and future management efforts.

Key findings and implied needs

Perhaps the most obvious finding of the content analysis is that even though "marine protected area" has become a common term within the management and academic communities, it is not widely used in the public discourse. Less than one percent of paragraphs identified as relating to the broad definition of MPAs actually used the term itself, and there were only 260 total uses of the term between 1995 and mid-2001. In addition, while "marine reserve(s)" were mentioned more frequently (1616 references), media references do not necessarily define these areas as being "no-take," even though this has become the established definition within the academic community. This basic finding about use of terms indicates that one cannot assume that "marine protected area" and "marine reserve" are commonly understood and consistently defined terms. Furthermore, this finding indicates a need for broad outreach to foster public understanding of the terminology and issues surrounding MPAs. This reinforces needs assessment participants' calls for definitions and goals, and for public education and outreach. Clear definitions and common use of terminology are essential if the public is to effectively engage in the public policy process.

Similar to the analysis of use of terms, findings about favorable and unfavorable expressions in coverage related to MPAs were more remarkable for what was not there than for what was. Less than 14 percent of paragraphs contained these expressions. To some extent this is expected, since media coverage strives to be unbiased about issues, but it is also an important reminder to individuals engaged in current MPA processes who might assume there is extensive public sentiment—whether positive or negative—about these areas simply because individual processes have generated lots of local debate. The content analysis approach allows researchers to look at the entire country and see that neither positive nor negative feelings are dominating the public discourse, but that overall favorable expressions appear more frequently than unfavorable, and that these favorable expressions have increased in number since 1995.

A final way in which the content analysis provides insight into both the public's interests and management needs is in the sheer variety of values and uses discussed in the media. Although the relative coverage of ecological, social, recreational, and commercial uses and values is interesting, what is most notable is that all received significant discussion. Approximately a fifth of all paragraphs included commercial concepts, recreational and social concepts appeared in approximately a third, and ecological concepts were in nearly one half of all paragraphs. The analysis demonstrates that the public interest in marine areas is based on a diverse set of individual uses and values, from direct water-dependent commerce to ecological services provided by marine ecosystems, to cultural and aesthetic values associated with marine areas and traditions. For marine resource managers, this means that the areas they work with support a host of uses and provide a wide array of benefits, making them of interest to many different stakeholder groups. The implied need is for management efforts that strive to preserve and sustain this range of benefits, and that include the different stakeholders.

Similar to the finding about favorable and unfavorable expressions, the diversity of uses and values discussed in the media serves as an important reminder that while certain uses or stakeholder groups may be very prominent in individual marine protected area efforts, the public overall is concerned about a broad range of values and uses. For example, while commercial and recreational fishing interests have been very vocal participants in MPA processes, less than 15 percent of paragraphs related to MPAs in the mass media mention fishing of any kind. Thus, while the fishing community is a key stakeholder that managers must include in the MPA process, there are other groups whose interests must be of concern as well.

Taken together, the findings of the content analysis speak both to the state of public understanding about the specific concept of MPAs, and to public concerns surrounding and interests in marine area management. While the term "marine protected area" may not have become commonplace in the mass media, there is no doubt that marine areas are valued for a host of environmental, social, commercial, and recreational values. Marine resource managers are challenged not only with responding to the need for outreach and education on the concept of MPAs, but also with striving to work with multiple stakeholder groups and pursuing management regimes that protect the multitude of benefits the public derives from marine systems.

DISCUSSION

The marine protected areas (MPA) needs assessment was conducted to inform the National MPA Center and institutes as these entities move forward to implement the MPA Executive Order. The results of the assessment will contribute to planning efforts, helping the National MPA Center address true and pressing needs of the MPA community.

This final section of the report highlights several overarching needs that cut across different topic areas and discusses possible areas for future assessment work. The reader should note that the needs and topics in these sections are not listed in any kind of priority order.

Crosscutting needs
Reviewing the 23 individual topic areas presented in the results section, a number of crosscutting needs emerge. These are broad issues that speak to multiple topic areas. The National MPA Center and its institutes are uniquely positioned to work on these needs since they can foster collaboration, promote and use a multidisciplinary approach, and gather, synthesize, and share information. Six crosscutting needs are listed below.

Partner wherever possible
Collaboration is key to improving management. Different jurisdictions must work together, and creative partnerships between managers and stakeholders should be pursued. Collaboration is needed both to address existing conflicts or duplications of effort, and to maximize the resources directed toward long-term protection of marine ecosystems. Looking at jurisdictional issues, the relevant agencies need to collectively make decisions about who can and will conduct specific activities in what locations, and then agencies should periodically review and adapt these management arrangements as necessary. In addition to the need for enhanced intra- and interagency collaboration, partnerships with stakeholders are important both to build trust and to take advantage of the skills and resources of various groups. There are numerous avenues for building such partnerships, including conducting collaborative research with fishermen, raising funds through a friends groups, using nongovernmental organization volunteers to help with education and outreach, and employing members of the local community as enforcement officers.

Pay attention to the human dimension
An overriding message heard from both managers and stakeholder representatives is that the "people stuff" is important. Social science regarding MPAs is desperately needed, and there is universal agreement across the MPA community that stakeholder/community involvement is critical to success. Managers need information and training on *processes* as well as on issues, and specifically they need to know how to inform and include people and people issues during planning, implementation, and evaluation. The needs to examine cultural variables and to manage visitor impacts also highlight the importance of the human dimension. Finally, the issue of equity is important both within participatory processes and in regard to socioeconomic impacts of management. For example, people may be willing to accept new regulations, even when those bring costs, as long as they feel that both costs and benefits are being distributed fairly.

Connect managers with information, technical assistance, and funding that already exist
Extensive information, technical assistance, and funding opportunities exist to help address management needs, but managers may not be aware of these resources, and it may be difficult or impossible to access them. Thus a major challenge is simply connecting managers with what

is already available. On the information side, lots of good research never reaches managers, and agencies have a store of unanalyzed data waiting to be mined. Regarding technical assistance, a wide range of expertise is available within the broad marine management and academic communities, and sharing knowledge and experiences could be tremendously valuable. For example, site managers know local players and resources, and have hands-on experience with different enforcement approaches, while regional and national managers may have more media experience and mapping capacity. In terms of funding, there are a host of nonfederal and innovative funding sources that can contribute to MPA research, planning, and implementation, but managers may not have the capacity to take advantage of these sources.

Mechanisms are needed to identify and coordinate MPA-related information, technical assistance, and funding opportunities to facilitate their use. One such mechanism is the "clearinghouse" concept. Needs assessment sources called for clearinghouses of MPA-related scientific data, of researchers and experts, of funding opportunities, and of outreach and educational materials. The increasing use of the Internet means that electronic clearinghouses can be very effective. However, it is important to keep in mind that different individuals prefer to access information in different ways, meaning multiple mediums must be used to communicate the existence of clearinghouses themselves and, where feasible, clearinghouse information should be available in multiple formats.

Take time to define MPAs and associated boundaries and authorities
The need for definitions permeates MPA discussions. Managers and stakeholders alike want to know how MPAs are being defined within federal efforts, and site manages want to know specifically which types of existing marine managed areas will be considered MPAs. Beyond the basic definition of the concept, there is a need to clearly delineate authorities and boundaries of individual MPAs. Areas may have multiple layers of protection originating from different laws and agencies, and these overlapping authorities can be beneficial, as well as generate problems. For example, agencies may be reluctant to enforce boundaries that are unclear, resources are wasted through duplication of effort, and users have trouble complying with varied regulations coming out of multiple agencies.

Learn from past processes
There is much to be learned from existing MPAs and from past MPA planning processes. Case studies can reveal both successes and failures, and they can provide models for future efforts. Case studies also allow comparisons across MPA efforts to identify not only what works, but what works *best*. Existing MPAs and past planning processes can demonstrate effective tools and techniques for achieving MPA goals, as well as show the benefits that are achieved when those goals are reached.

Institute program evaluation
Numerous sources called for more and better program evaluation of both individual MPAs and MPA networks. Inherent within this is the need for measurable goals related to both ecological and human dimension issues. Evaluation is essential to determine whether MPAs are achieving identified goals, to identify and quantify impacts, and to allow adaptive management. Evaluation can help managers respond to stakeholder and community concerns, as well as provide information for public outreach and education efforts. More comprehensive inventorying and monitoring are critical for instituting program evaluation, and both natural and social science variables must be tracked. Evaluation is needed both within individual sites and at regional and national levels.

Potential areas for future assessment work
Future work might delve deeper into issues identified in this initial nine-month MPA needs assessment. New efforts might focus on audiences beyond marine resource managers, or explore a specific category of needs such as training or technology needs. Additional analyses might also be performed on data generated by the computer-assisted content analysis. Based on what was learned in the first phase, several suggestions for future work are listed below.

Needs assessment targeting indigenous peoples
This initial assessment revealed that working with indigenous peoples is at once a critical and extremely complex component of MPA efforts. A needs assessment targeting this audience could examine ways to create more meaningful involvement in MPA processes for indigenous groups, and ways to incorporate indigenous knowledge into marine management. Such an assessment should seek to identify indigenous concerns surrounding MPAs and MPA processes, and to examine cultural factors that impact how indigenous groups will interface with management efforts. To do such an assessment well and thoroughly, however, would require significant time and resources, since there are many indigenous groups that use marine resources, and it is a mistake to generalize across these groups. Finally, success in a needs assessment of indigenous groups would also depend on less tangible variables such as cultural sensitivity and overcoming negative perceptions created by previous processes.

Needs assessment targeting recreational and commercial fishermen
Fishermen are another audience that bears focused study. CSC staff heard some recreational and commercial fishing perspectives in the course of this initial assessment, but this work only scratched the surface of the particular concerns, desires, and knowledge of fishermen. As with indigenous peoples, a targeted needs assessment would strive to learn how better to address fishermen's fears and to involve fishermen in MPA processes, as well as to learn how to access their knowledge of marine resources. For example, an assessment might examine ways in which commercial and recreational fishermen could be recruited for collaborative research on natural and social science topics. Collaborative projects provide an opportunity for fishermen to see MPA impacts firsthand while also addressing science needs. Since commercial and recreational perspectives on MPAs are different, one goal of a new assessment might be to examine conflicts between the two groups and to explore possible areas of common ground.

Review of MPA-related technology
Another project that could be valuable is a review of MPA-related technology. It would be useful to identify ways in which technology is already being used in MPA planning and implementation, as well as to explore future technology needs and possibilities. A review of technology might also look at existing capacity to *use* technology within the management community, and identify ways in which this capacity could be raised. Finally, it would be useful to identify technology manufacturers or providers, as well as sources of technology-related technical assistance.

Review of stakeholder/community involvement processes
As mentioned above, managers should be learning from past MPA processes. Given the need to improve stakeholder/community involvement, and managers' uncertainty about how to do this, a review of this particular element of past MPA processes would be particularly valuable. Identifying "lessons learned" is important both to avoid repeating mistakes, and to document useful tools and approaches. Although each new MPA process must be tailored to local stakeholders and environmental conditions, a review of past processes might begin to map out an overall framework for involvement, and to identify "best practices" for participatory processes.

<u>Areas for further analysis within the computer-assisted content analysis</u>
While the units included in the media content analysis all fit within the broad definition of MPAs, the variations in level of coverage suggest that a key area for future analysis should be exploring coverage of individual types of managed areas to determine if attitudes and issues vary across units and/or management entities. In addition, analyses might be performed to delve deeper into the relationships between commercial, recreational, social, and ecological concepts and individual stakeholder groups, and developing trends could be tracked by rerunning the content analysis in future years. An analysis comparing the frequency of coverage in different regions of the country might prove interesting given the range of MPA efforts under way. Finally, new content analyses could be performed on industry trade publications and NGO reports to further explore the attitudes of individual stakeholder groups.

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Appendix A
Executive Order No. 13158 on Marine Protected Areas

Presidential Documents
Executive Order 13158 of May 26, 2000
Marine Protected Areas

By the authority vested in me as President by the Constitution and the laws of the United States of America and in furtherance of the purposes of the National Marine Sanctuaries Act (16 U.S.C. 1431 et seq.), National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668dd-ee), National Park Service Organic Act (16 U.S.C. 1 et seq.), National Historic Preservation Act (16 U.S.C. 470 et seq.), Wilderness Act (16 U.S.C. 1131 et seq.), Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. 1801 et seq.), Coastal Zone Management Act (16 U.S.C. 1451 et seq.), Endangered Species Act of 1973 (16 U.S.C. 1531 et seq.), Marine Mammal Protection Act (16 U.S.C. 1362 et seq.), Clean Water Act of 1977 (33 U.S.C. 1251 et seq.), National Environmental Policy Act, as amended (42 U.S.C. 4321 et seq.), Outer Continental Shelf Lands Act (42 U.S.C. 1331 et seq.), and other pertinent statutes, it is ordered as follows:

Section 1. Purpose. This Executive Order will help protect the significant natural and cultural resources within the marine environment for the benefit of present and future generations by strengthening and expanding the Nation's system of marine protected areas (MPAs). An expanded and strengthened comprehensive system of marine protected areas throughout the marine environment would enhance the conservation of our Nation's natural and cultural marine heritage and the ecologically and economically sustainable use of the marine environment for future generations. To this end, the purpose of this order is to, consistent with domestic and international law: (a) strengthen the management, protection, and conservation of existing marine protected areas and establish new or expanded MPAs; (b) develop a scientifically based, comprehensive national system of MPAs representing diverse U.S. marine ecosystems, and the Nation's natural and cultural resources; and (c) avoid causing harm to MPAs through federally conducted, approved, or funded activities.

Sec. 2. Definitions. For the purposes of this order:
   a. "Marine protected area" means any area of the marine environment that has been reserved by Federal, State, territorial, tribal, or local laws or regulations to provide lasting protection for part or all of the natural and cultural resources therein.
   b. "Marine environment" means those areas of coastal and ocean waters, the Great Lakes and their connecting waters, and submerged lands thereunder, over which the United States exercises jurisdiction, consistent with international law.
   c. The term "United States" includes the several States, the District of Columbia, the Commonwealth of Puerto Rico, the Virgin Islands of the United States, American Samoa, Guam, and the Commonwealth of the Northern Mariana Islands.

Sec. 3. MPA Establishment, Protection, and Management. Each Federal agency whose authorities provide for the establishment or management of MPAs shall take appropriate actions to enhance or expand protection of existing MPAs and establish or recommend, as appropriate, new MPAs. Agencies implementing this section shall consult with the agencies identified in subsection 4(a) of this order, consistent with existing requirements.

Sec. 4. National System of MPAs. (a) To the extent permitted by law and subject to the availability of appropriations, the Department of Commerce and the Department of the Interior, in consultation with the Department of Defense, the Department of State, the United States Agency for International Development, the Department of Transportation, the Environmental Protection Agency, the National Science Foundation, and other pertinent Federal agencies shall develop a national system of MPAs. They shall coordinate and share information, tools, and strategies, and provide guidance to enable and encourage the use of the following in the exercise of each agency's respective authorities to further

enhance and expand protection of existing MPAs and to establish or recommend new MPAs, as appropriate:

1. science-based identification and prioritization of natural and cultural resources for additional protection;
2. integrated assessments of ecological linkages among MPAs, including ecological reserves in which consumptive uses of resources are prohibited, to provide synergistic benefits;
3. a biological assessment of the minimum area where consumptive uses would be prohibited that is necessary to preserve representative habitats in different geographic areas of the marine environment;
4. an assessment of threats and gaps in levels of protection currently afforded to natural and cultural resources, as appropriate;
5. practical, science-based criteria and protocols for monitoring and evaluating the effectiveness of MPAs;
6. identification of emerging threats and user conflicts affecting MPAs and appropriate, practical, and equitable management solutions, including effective enforcement strategies, to eliminate or reduce such threats and conflicts;
7. assessment of the economic effects of the preferred management solutions; and
8. identification of opportunities to improve linkages with, and technical assistance to, international marine protected area programs.

(b) In carrying out the requirements of section 4 of this order, the Department of Commerce and the Department of the Interior shall consult with those States that contain portions of the marine environment, the Commonwealth of Puerto Rico, the Virgin Islands of the United States, American Samoa, Guam, and the Commonwealth of the Northern Mariana Islands, tribes, Regional Fishery Management Councils, and other entities, as appropriate, to promote coordination of Federal, State, territorial, and tribal actions to establish and manage MPAs.

(c) In carrying out the requirements of this section, the Department of Commerce and the Department of the Interior shall seek the expert advice and recommendations of non-Federal scientists, resource managers, and other interested persons and organizations through a Marine Protected Area Federal Advisory Committee. The Committee shall be established by the Department of Commerce.

(d) The Secretary of Commerce and the Secretary of the Interior shall establish and jointly manage a website for information on MPAs and Federal agency reports required by this order. They shall also publish and maintain a list of MPAs that meet the definition of MPA for the purposes of this order.

(e) The Department of Commerce's National Oceanic and Atmospheric Administration shall establish a Marine Protected Area Center to carry out, in cooperation with the Department of the Interior, the requirements of subsection 4(a) of this order, coordinate the website established pursuant to subsection 4(d) of this order, and partner with governmental and nongovernmental entities to conduct necessary research, analysis, and exploration. The goal of the MPA Center shall be, in cooperation with the Department of the Interior, to develop a framework for a national system of MPAs, and to provide Federal, State, territorial, tribal, and local governments with the information, technologies, and strategies to support the system. This national system framework and the work of the MPA Center is intended to support, not interfere with, agencies' independent exercise of their own existing authorities.

(f) To better protect beaches, coasts, and the marine environment from pollution, the Environmental Protection Agency (EPA), relying upon existing Clean Water Act authorities, shall expeditiously propose new science-based regulations, as necessary, to ensure appropriate levels of protection for the marine environment. Such regulations may include the identification of areas that warrant additional pollution protections and the enhancement of marine water quality standards. The EPA shall consult with the Federal agencies identified in subsection 4(a) of this order, States, territories, tribes, and the public in the development of such new regulations.

Sec. 5. Agency Responsibilities. Each Federal agency whose actions affect the natural or cultural resources that are protected by an MPA shall identify such actions. To the extent permitted by law and to the maximum extent practicable, each Federal agency, in taking such actions, shall avoid harm to the natural and cultural resources that are protected by an MPA. In implementing this section, each Federal agency shall refer to the MPAs identified under subsection 4(d) of this order.

Sec. 6. Accountability. Each Federal agency that is required to take actions under this order shall prepare and make public annually a concise description of actions taken by it in the previous year to implement the order, including a description of written comments by any person or organization stating that the agency has not complied with this order and a response to such comments by the agency.

Sec. 7. International Law. Federal agencies taking actions pursuant to this Executive Order must act in accordance with international law and with Presidential Proclamation 5928 of December 27, 1988, on the Territorial Sea of the United States of America, Presidential Proclamation 5030 of March 10, 1983, on the Exclusive Economic Zone of the United States of America, and Presidential Proclamation 7219 of September 2, 1999, on the Contiguous Zone of the United States.

Sec. 8. General.
   a. Nothing in this order shall be construed as altering existing authorities regarding the establishment of Federal MPAs in areas of the marine environment subject to the jurisdiction and control of States, the District of Columbia, the Commonwealth of Puerto Rico, the Virgin Islands of the United States, American Samoa, Guam, the Commonwealth of the Northern Mariana Islands, and Indian tribes.
   b. This order does not diminish, affect, or abrogate Indian treaty rights or United States trust responsibilities to Indian tribes.
   c. This order does not create any right or benefit, substantive or procedural, enforceable in law or equity by a party against the United States, its agencies, its officers, or any person.

William J. Clinton
THE WHITE HOUSE,
May 26, 2000.

APPENDIX B
Planning Team Members

Kate Barba, National Education Coordinator, NOAA Estuarine Reserves Division

Brad Barr, Senior Policy Advisor, NOAA National Marine Sanctuaries

Mary Lou Cumberpatch, Reference Librarian, NOAA National Environmental Satellite, Data, and Information Services

Roger Griffis, Policy Advisor, NOAA National Ocean Service

Ginger Hinchcliff, Acting Director, National MPA Center's Training and Technical Assistance Institute

Ralph Lopez, NOAA National Marine Fisheries Service

Jim Murray, Ph.D., Team Leader for Outreach Division, Sea Grant, NOAA Oceanic and Atmospheric Research

Brady Phillips, NOAA National Marine Sanctuaries

Paul Scholz, Branch Chief, Coastal Management Services, NOAA Coastal Services Center

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Joseph Uravitch, Acting Director, National MPA Center

Charles Wahle, Ph.D., Acting Director, National MPA Center's Science Institute

Susan White, Refuge Marine Resource Specialist, U.S. Fish & Wildlife Service

APPENDIX C
Focus Group Locations and Participants

August 1, 2001 – Monterey, California
Liam Antrim, Olympic Coast National Marine Sanctuary
Todd Jacobs, National Ocean Service, Special Projects Office
Sabine Jessen, Canadian Parks and Wilderness Society, Baja to Bering Project
Lance Morgan, Marine Conservation Biology Institute
Brady Phillips, National Ocean Service, National Marine Sanctuaries
Cindy Thompson, National Marine Fisheries Service, Southwest Fisheries Science Center
Ann Walton, Channel Islands National Marine Sanctuary
Lani Watson, National Ocean Service, International Programs Office
Nancy Wright, California Department of Fish and Game

August 20, 2001 – Gulf Shores, Alabama
Trish Adams, U.S. Fish & Wildlife Service (USFWS) Ecological Services, Vero Beach, Florida
Mike Brim, USFWS Ecological Services, Panama City, Florida
Lisa Marie Carrubba, National Marine Fisheries Service, Puerto Rico
Terry Doyle, USFWS, Ten Thousand Islands NWR, Naples, Florida
James Harris, USFWS, Southeast Louisiana Refuges, Slidell, LA
Steve Harrison, National Park Service, Cape Hatteras National Seashore
Ken Lindeman, Environmental Defense
Bill Lynn, USFWS Ecological Services, Panama City, Florida
Rebecca Schapansky, USFWS Ecological Services, Brunswick, Georgia
Paula Sisson, USFWS Ecological Services, Charleston, South Carolina
Elizabeth Souheaver, USFWS, Southeast Louisiana Refuges, Slidell, LA
Beverly Yoshioka, USFWS Ecological Services, Puerto Rico

October 5, 2001 – Portsmouth, New Hampshire
Paul Dest, Wells National Estuarine Research Reserve, Wells, Maine
Ward Feurt, Rachel Carson National Wildlife Refuge, Wells, Maine
Mike Gildesgame, Massachusetts Dept. of Environmental Management, Boston, Massachusetts
Dave Hartman, New Hampshire Coastal Program, Portsmouth, New Hampshire
David Keeley, Gulf of Maine Council, Maine State Planning Office, Augusta, Maine
Caroline Kurrus, NOAA Coastal Services Center, Freeport, Maine
Linda Mercer, Maine Department of Marine Resources, West Boothbay Harbor, Maine
Mike Pentony, New England Fishery Management Council, Newburyport, Massachusetts
Laura Taylor Singer, Gulf of Maine Reserve, Gulf of Maine Aquarium, Portland, Maine
Brian Smith, New Hampshire Fish & Game, Great Bay NERR, Portsmouth, New Hampshire
Anne Smrcina, Stellwagen Bank National Marine Sanctuary, Scituate, Massachusetts
Peter Wellenberger, Great Bay National Estuarine Research Reserve, Portsmouth, NH

November 5, 2001 – St. Petersburg, Florida
Steven Atran, Gulf of Mexico Fishery Management Council
Luiz Barbieri, Florida Marine Research Institute
Bob Bendick, The Nature Conservancy
Stephania Bolden, National Marine Fisheries Service, Southeast Regional Office
Coralette Damme, The Ocean Conservancy
Dick Eckenrod, Tampa Bay Estuary Program
David Fann, Florida Sea Grant
Kevin Grant, Florida Marine Research Institute, Apalachicola Field Lab
Peter Hood, Gulf of Mexico Fishery Management Council
Henry Norris, Florida Marine Research Institute
Matt Patterson, National Park Service, South Florida / Caribbean Network
Randy Runnels, Florida Dept. of Environmental Protection, Aquatic Preserves and National
    Estuarine Research Reserves
Charles Sidman, Florida Sea Grant
Kristin Sundberg, The Ocean Conservancy
Bob Swett, Florida Sea Grant
David White, The Ocean Conservancy

APPENDIX D
Individuals Interviewed by Phone

Peter Armato, Director, Ocean Alaska Science & Learning Center, Kenai Fjords National Park

Mike Beck, Director, Coastal Waters Program, The Nature Conservancy

Ellen Brody, Acting Sanctuary Manager, Thunder Bay National Marine Sanctuary

Darryl Brown, Chief, Coastal Management Branch, Environmental Protection Agency

Larry Crowder, Ph.D., Nicholas School of the Environment, Duke University Marine Lab

Cathie Cunningham, Michigan Coastal Management Program, Land and Water Management Division, Michigan Department of Environmental Quality

Forbes Darby, Director of Communications, American Sport Fishing Association

John B. Davis, Editor, *MPA News*

David Dow, Marine Recreational Fisheries Coordinator, Northeast Fisheries Science Center, NOAA National Marine Fisheries Service

Tom Dow, Vice-President of Public Affairs, Princess Cruises

Christine Gault, Reserve Manager, Waquoit Bay National Estuarine Research Reserve

Lynne Hale, Associate Director, Coastal Resource Center, University of Rhode Island

Philip L. Hoffman, Environmental Specialist, Pinellas County Department of Environmental Management

Al Hulsebosch, President, Neptune's Nimrods SCUBA Diving Club of Green Bay

Bob Jones, Executive Director, Southeast Fisheries Association

Nancy Laurson, National Estuary Program Coordinator, Coastal Management Branch, Environmental Protection Agency

Dan Lenihan, Archaeologist, Submerged Resources Unit, National Park Service

Brian Link, Great Lakes Regional Navigation Manager, NOAA Office of Coast Survey

John Lopez, Policy Analyst, Coastal States Organization

Danielle Luttenberg, Environmental Defense, Oceans Program

David Manski, Chief of Resource Management, Acadia National Park

Pat Murray, Communications Director, Coastal Conservation Association

Commander Gary Petrae, Acting Deputy Regional Administrator, Southeast Regional Office, NOAA National Marine Fisheries Service

Cheri Recchia, Ph.D., Director of Marine Protected Areas Program, The Ocean Conservancy

Annie Simpkins, Natural Resource Manager, U.S. Navy Seabee Base

Roger Smith, Underwater Archaeology Program, Division of Historical Resources, Florida Department of State

Mary Tagliareni, Education and Outreach Coordinator, Florida Keys National Marine Sanctuary

Dexter Van Zile, Northeast Bureau Chief, *National Fisherman*

APPENDIX E
MPA-Related Conferences and Meetings Attended

Marine Conservation Biology Institute (MCBI) Symposium – San Francisco, California, June 2001.

Pacific MPA Science And Coordination Workshop – Monterey, California, August 2001.

South Atlantic Fishery Management Council (SAFMC), Advisory Panels and MPA Committee Meetings – Charleston, South Carolina, August 2001.

MPA Power Tools conference – White Rock, British Columbia, Canada, October 2001.

National Estuarine Research Reserves Meeting – Puerto Rico, October 2001.

Gulf & Caribbean Fisheries Institute (GCFI) Annual Meeting – Turks & Caicos, November 2001.