

SUMMARY REPORT

FOR THE

COASTAL ECOSYSTEM-BASED MANAGEMENT

COURSE NEEDS ASSESSMENT

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA)
COASTAL SERVICES CENTER



NOAA Coastal Services Center
LINKING PEOPLE, INFORMATION, AND TECHNOLOGY

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Introduction

Coastal management is a complex process of balancing social, economic, ecological, and institutional concerns in decision making. Ecosystem-based management (EBM) provides a framework for integrating these decision elements, a mechanism for dealing with scientific uncertainties, and a process for managing stakeholder conflicts. EBM skills will benefit coastal professionals and other coastal stakeholders, especially those with regulatory and planning responsibilities, by providing a foundation of common principles and applications.

The National Oceanic and Atmospheric Administration (NOAA) Coastal Services Center is developing an EBM training course designed to expand the skill sets of coastal resource management professionals and improve their effectiveness in implementing EBM within their jurisdictions. The Center conducted an on-line survey of its customers to gauge the current knowledge base and application of EBM, as well as to guide the development of the course structure and content.

The survey was circulated to two groups using the on-line SurveyMonkey software. First, the survey was sent directly to 647 individuals on the Center's customer e-mail list. This list includes leads for the Coastal Zone Management programs, National Estuarine Research Reserves, Sea Grant programs, Fish and Wildlife Service regional coastal programs, Environmental Protection Agency National Estuary Programs, and National Marine Sanctuary Programs. We received 212 responses from the Center's customer e-mail list for a response rate of 33%. Additionally, the survey was circulated through the EBM Tools Network Listserv to its general customer base, and 42 responses were received. A response rate could not be calculated for this list because recipients were directed to pass the survey along to additional contacts who might be interested in participating. The survey was sent to these particular lists to gain a targeted sample of the Center's partners. Two-hundred-fifty-four responses were received through both distribution points, and the results are summarized in this report.

Summary of Results

I. Survey Respondents

- Our 254 respondents are characterized by a good diversity of regional locations, primary duties, and management levels. The responses were evenly spread across the U.S., with 34% from the Southeast/Gulf, 27% from the Northeast, and 26% from the Pacific. Respondents represented a good mix of management levels and included some field staff members and technicians. Most respondents had government affiliations: 44% with states and 26% with federal. Additional responses were received from various partnership organizations, Sea Grant, universities, and nongovernmental organizations (see responses to Questions 21-24 for details).

II. Knowledge, Attitudes, Use, and Obstacles to Use of EBM (see responses to Questions 1-8 for details)

- Survey participants reported having a solid knowledge base about EBM principles and applications, with 56% indicating that they have at least a working knowledge of EBM. When asked to provide a description of EBM, the results showed a range of answers that encompassed the major EBM concepts.
- Survey participants indicated frequent use of some EBM principles such as holistic (not single species) management and including humans as part of the ecosystem (> 80% often or always), and including stakeholders and using ecosystem or watershed boundaries (> 70% often or always). Lower numbers (< 64%) reported using adaptive management and integration of ecological, socioeconomic, and institutional perspectives in decision making.
- Lack of resources and administrative or political hindrances (jurisdictional or governance issues) were reported as the major factors influencing the ability of organizations to implement EBM.
- Approximately 45% of survey participants felt that the biggest benefit of using EBM involved some type of collaboration—either through directly working with partners or just the inclusion of people from different disciplines working together to solve an issue. Survey participants (72%) also said that getting different local, state, and federal agencies with different institutional climates and mandates to work together was the biggest obstacle to implementing EBM.

III. Data, Tools, and Training Needs (See responses to Questions 9-20 for details)

- Data and tool needs focusing on local-, species-, and ecosystem-level data appeared as the primary responses to a general data or tools need question. Most responses indicated a lack of resources (funding, training, and time) to use tools. A need for accurate and verifiable predictive models and spatial tools (geographic information system or GIS software, layers, and remote sensing) was also cited. Although responses indicated that decision-support tools are used for a range of decision making, many respondents said that they do not use decision-support software or tools at all.
- Approximately 80% of survey participants said they involve stakeholders in the collaborative process often during their work, and 77% said that they would like to apply improved skills from EBM training to resolving complex issues through the collaborative process. However, when asked to rate potential training elements in their order of importance, the three elements relating to stakeholders were only rated of medium importance.
- Eighty-eight percent of the survey's participants think their organization, or organizations with whom they work, are in need of EBM professional development training. Almost 92% of respondents indicated that they or someone in their organization would attend a two-to-four day EBM course.

- When asked of the potential elements of EBM they would like to see included in the training, survey participants rated what is probably the most complicated element first—how to incorporate dynamic ecosystem processes or ecological sustainability into EBM decision making. Two process-related elements followed at a very close second and third—how to plan/develop an EBM approach to management, and how to implement an EBM approach to management.
- Of the survey participants that answered the open-ended question for additional topics to be included in the training, the answers were heavily weighted toward the inclusion of practical applications and real-world examples of EBM. These include examples of success and failure, and how EBM worked, caused the problem, or may have thwarted a problem if implemented.
- Overall, the most preferred course format was for participants from a particular place to learn how to formulate a strategic plan for implementing EBM. This follows with other suggestions in the survey results that prefer specific, real-world examples be a primary technique for the training.
- The estuarine ecosystem was ranked the highest in the need for EBM training. Respondents indicated that multiple groups of coastal professionals were in need of the training. State natural resource management agency staff was the highest rated group for this need.

Detailed Results

I. Knowledge, Attitudes, Use, and Obstacles to Use of EBM (Questions 1-8)

Question 1: How familiar are you with ecosystem-based management? (check one)

Although EBM can be a complex process with a variety of elements, the data show that 56% of respondents said they have at least a working knowledge (Bars 1+2) and 86% said they are at least somewhat familiar with EBM concepts (Bars 1+2+3). The complete breakdown of responses is highlighted below in Figure 1.

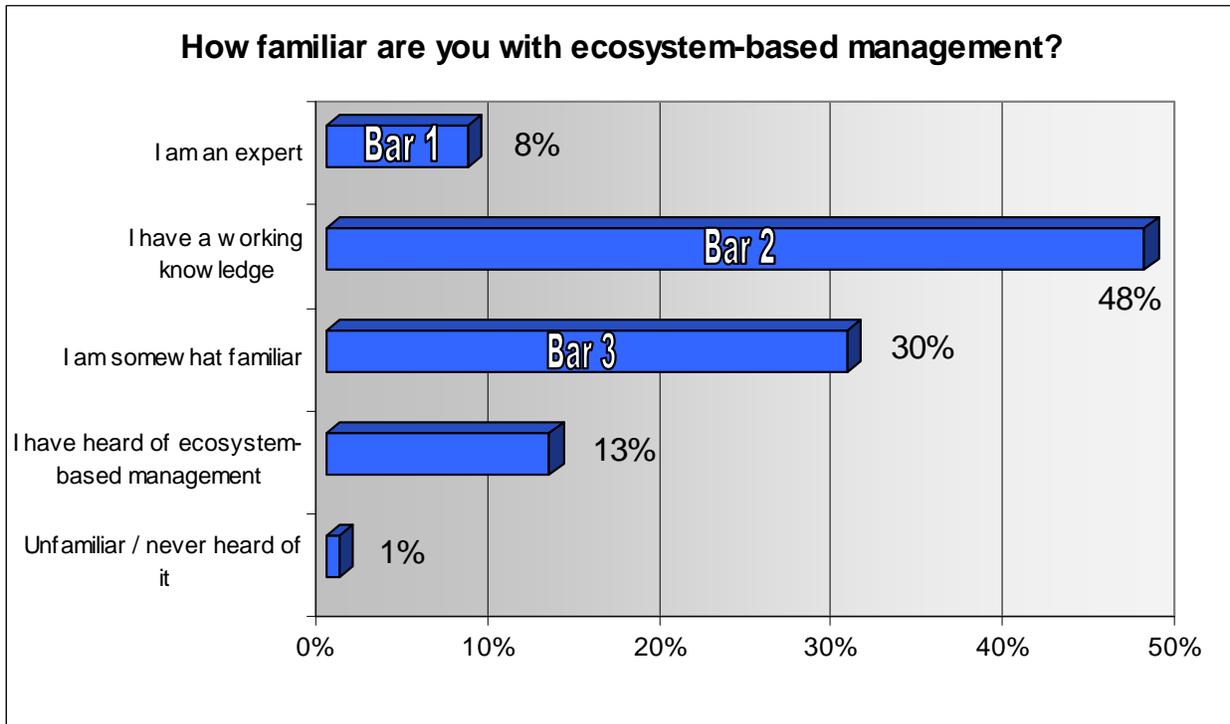


Figure 1. Familiarity with EBM

Question 2: How would you describe ecosystem-based management (briefly, in your own words)?

There were 233 responses to this question. Each time a respondent mentioned a specific aspect of EBM, the response was tallied. These responses were then organized into more general categories. The greatest number of responses (129) described EBM as incorporating **all aspects of the ecosystem** into decision making—not focusing management decisions on just a single species. This also includes responses that mentioned management of the whole system and understanding the linkages between systems. The next two highest mentioned categories of EBM (in order of priority) were **incorporating humans** (their impacts to and benefits from the resource) into natural resource management (68), and using a **holistic approach to management**, or the inclusion of several disciplines of science (chemical, biological, physical) and management (sociological, economic, cultural, anthropological), for understanding the ecosystem and making management decisions (60). Management based on **natural (ecosystem) boundaries** of time and space as opposed to political/human/jurisdictional boundaries followed with 47 responses. The least mentioned categories were **maintaining or preserving ecosystem function and use** (32); **sustainable management** (28); **adaptive management** (22); **collaboration or inclusion of stakeholders** (20); understanding or developing measurable **ecosystem indicators or metrics** (6); use for **conservation planning** (4); and **I don't know** (2).

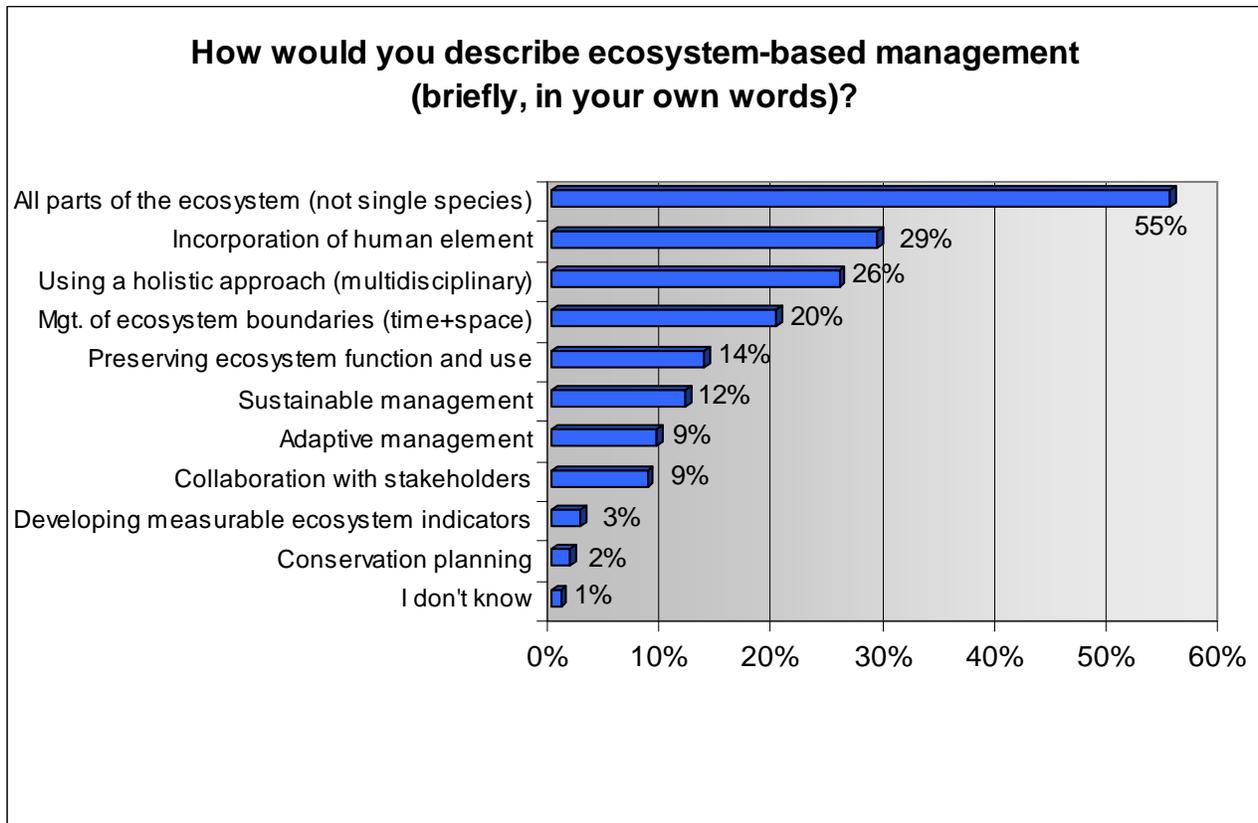


Figure 2. EBM Description

Question 3: To what extent does your organization practice/implement an ecosystem-based approach to natural resource management? (check one)

About 53% of respondents (Figure 3, Bars 1+2) said that they use EBM for more than half the time spent managing their natural resources. About 30% of respondents indicated a moderate use (Bar 3), while a small proportion (13%) reported practicing EBM 25% or less of the time (Bars 4+5).

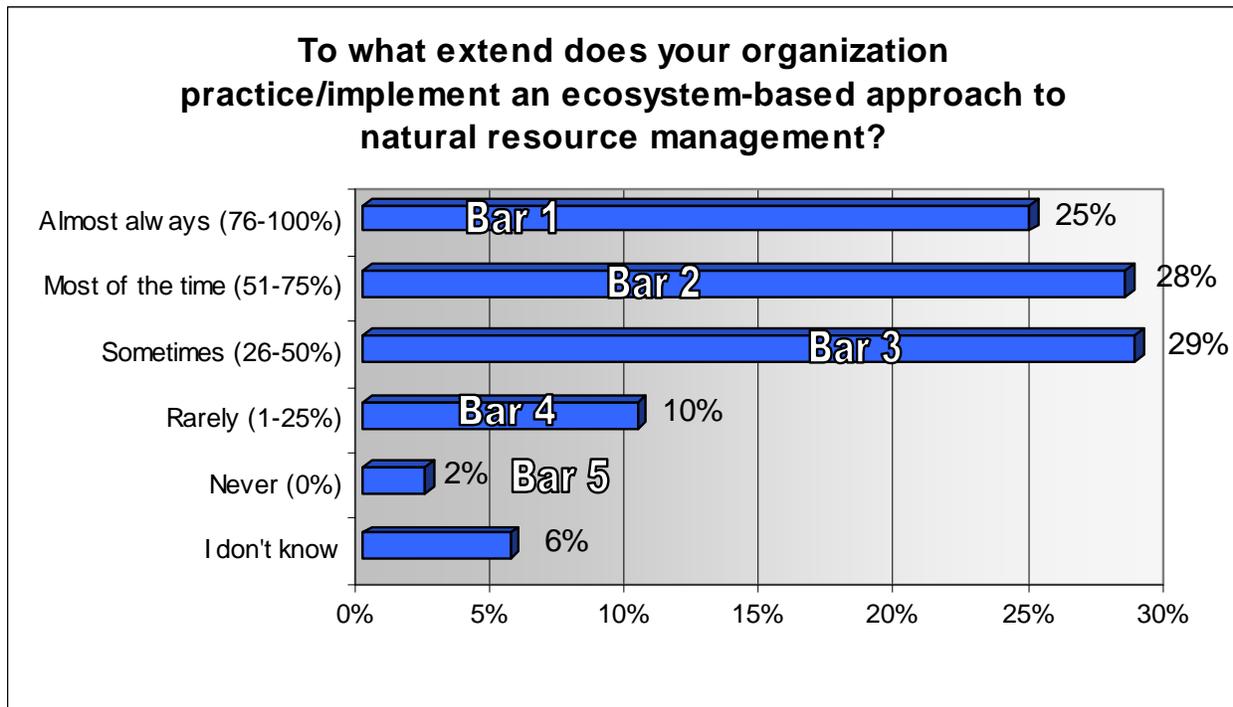


Figure 3. EBM Implementation

Question 4: What factors influence the extent to which an ecosystem-based approach to natural resource management is practiced/implemented by your organization?

The 201 responses to this question were analyzed to determine the major factors influencing the respondents' ability to implement EBM. The highest rated factor was the **lack of resources** (121), which includes time, money, staff, and staff knowledge for implementing EBM. The next highest mentioned factor was **administrational or political problems**, including hindrances from jurisdictional or political boundaries (89). Two moderately ranked categories were the **lack of scientific understanding** of ecosystems' general functions, specific interactions, or interconnectedness, including the lack of valid ecosystem models, which received 57 responses, and the **lack of education** of stakeholders, especially the public, or the lack of willing partners and public participation in the process, which received 50 responses. The next factor mentioned was more specific than the administration or political issues and focused on the resource managers' or agency leaders' **lack of long range planning** or the lack of established goals for EBM based on the correct time and space scales (21).

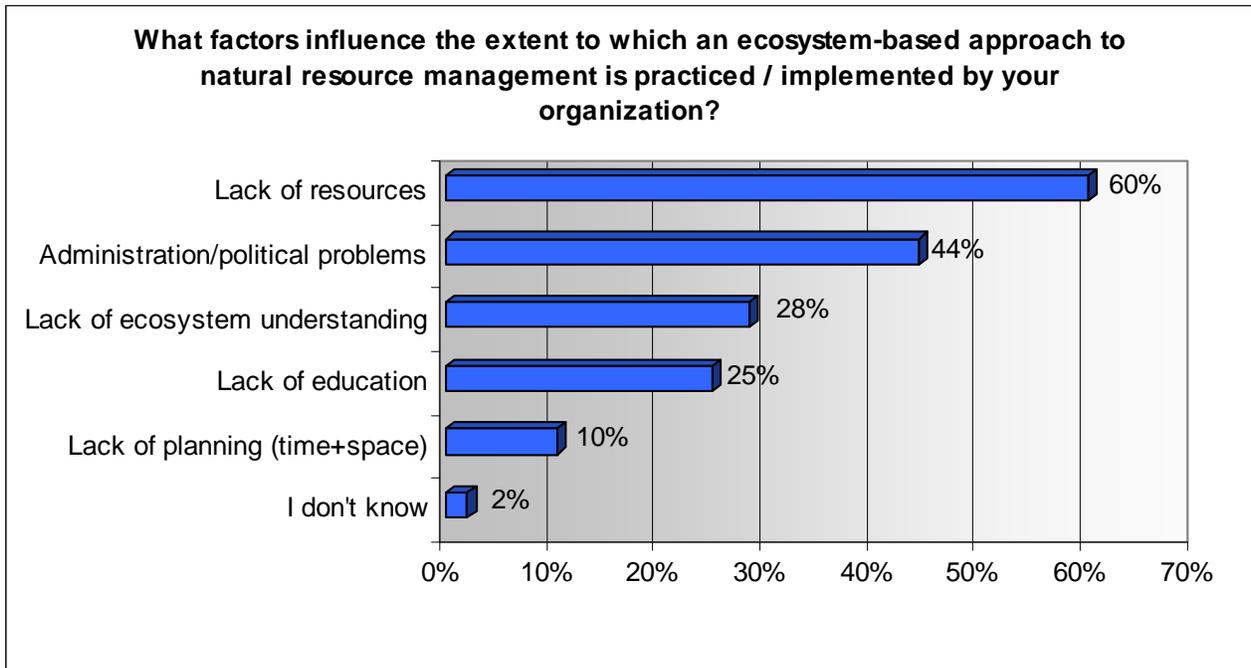


Figure 4. Factors to Implementing EBM

Question 5: How frequently do you practice each of the following elements in your work? (check one for each)

About 83% of the respondents said that they include humans as part of the ecosystem at least “often” in their work, with 43% of respondents indicating this is “always” done. Involving stakeholders and focusing on more than one particular species also had approximately 80% of respondents indicating this was done at least often; however, for both elements only 28% indicated these were always used.

Table 1. Frequency of Using EBM Elements at Work

Rating 1-5:	Never	Rarely	Sometimes	Often	Always	Rating Average
Including humans as part of the ecosystem	1% (2)	3% (8)	14% (35)	39% (100)	43% (109)	4.20
Focusing on more than one particular species (i.e., not a single species approach) in your management decisions	2% (4)	3% (7)	14% (37)	53% (135)	28% (71)	4.03
Involving stakeholders through collaborative processes	1% (3)	4% (10)	16% (41)	51% (130)	28% (70)	4.00
Working beyond political boundaries (e.g., using ecosystem boundaries, watershed boundaries)	2% (6)	4% (9)	22% (55)	50% (127)	22% (57)	3.87
Integrating ecological, socioeconomic, and institutional frameworks into a problem-solving approach	3% (7)	8% (20)	26% (66)	47% (119)	17% (42)	3.67
Addressing uncertainty through a learning process (e.g., adaptive management)	1% (3)	7% (17)	33% (84)	44% (111)	15% (38)	3.65

Question 6: We are trying to gain a better understanding of the different terms used to describe ecosystem-based management. If you use any of the elements listed in question #5 in your work, but do not consider this to be ecosystem-based management, what do you call your approach?

Eighty-six responses were offered to describe alternative titles for EBM practices. **Watershed based management or planning** was named most with 23 responses. There were 10 responses that mentioned **adaptive management** as an approach to resource management, but it does not necessarily have to be considered part of a full EBM strategy. The responses generally saw adaptive management as a piece of all types of natural resource management, that can and should be done, whether it's for management of a single species or an area based on an administrative boundary. Using the **collaborative approach** or involving stakeholders was mentioned by eight responses, which includes comments also saying it was performed but not considered part of a full EBM strategy. **Sustainable development** and **integrated resource management** were also terms mentioned in about eight responses, while the term **community based management** received six responses. There were other individual responses, such as Haida Land Use Vision, New Forestry, Integrated Collaborative Approach, and Best Management Practices. Finally, there were five eclectic answers that showed respondents' attitude toward describing a seemingly difficult process. These were "flying by the seat of our pants," "getting the job done," "using common sense," and others which we chose not to include for the sake of good taste.

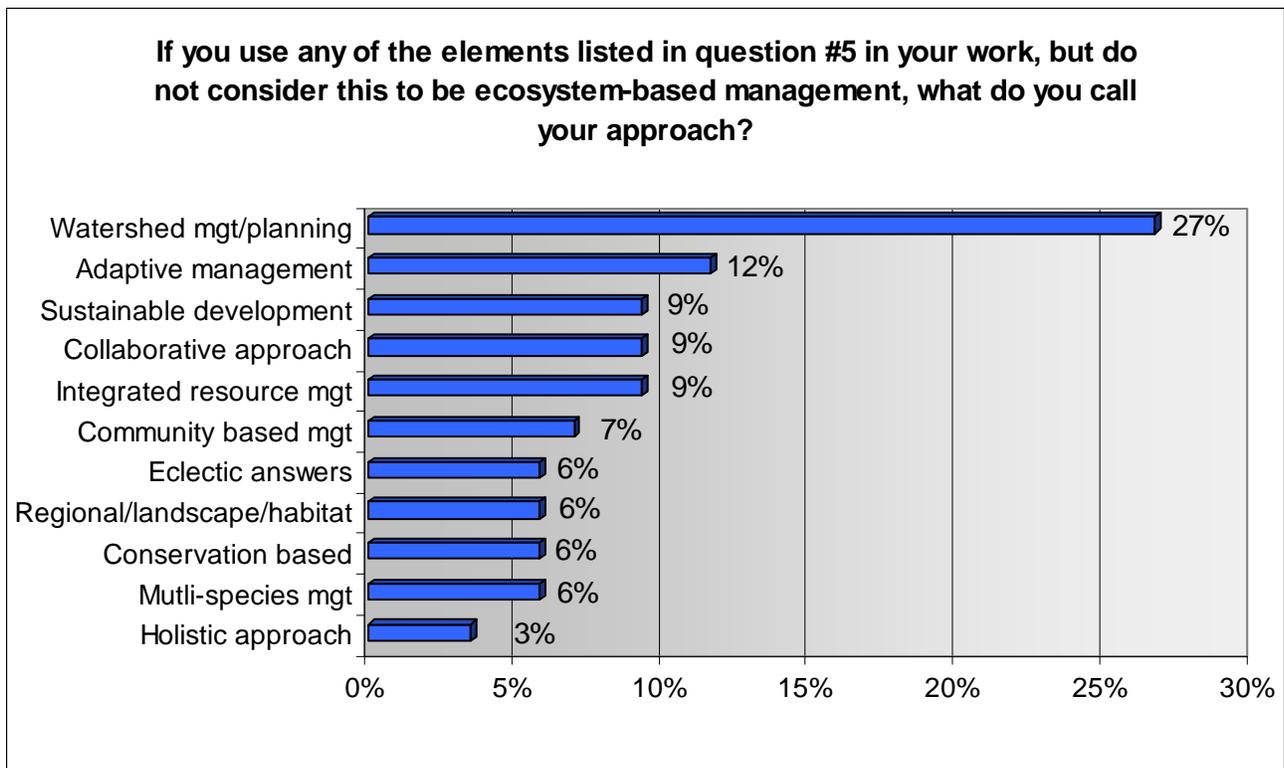


Figure 5. Alternative Descriptions for Approaches to EBM

Question 7: What do you see as the major benefits of using an ecosystem-based management approach to natural resource management?

Of 235 responses, the greatest number (69) mentioned that **more complete ecosystem protection**, a better overall environment, or better management of the entire ecosystem would result from using EBM. The next most mentioned benefit to using EBM was the use of **holistic solutions** that are comprehensive and inclusive of multiple disciplines (54). Fifty-one respondents mentioned a major benefit in **stakeholder involvement** and using a collaborative process to get everyone working together, which results in more involvement or understanding from the public, agencies, and scientists. The next five benefits that were mentioned all had similar scores: **achieving long term goals** or outcomes for future generations (35); ability to make **better decisions** due to greater inclusion of science in the process and a better understanding of how one decision impacts other parts of the ecosystem (cumulative impacts) (30); recognize the relationships or **interconnectedness** within the ecosystem and between resources and people/managers (29); **greater probability of success of management actions** and greater chance of implementation and compliance with decisions (28); and management decisions are based on **sustainability** (28).

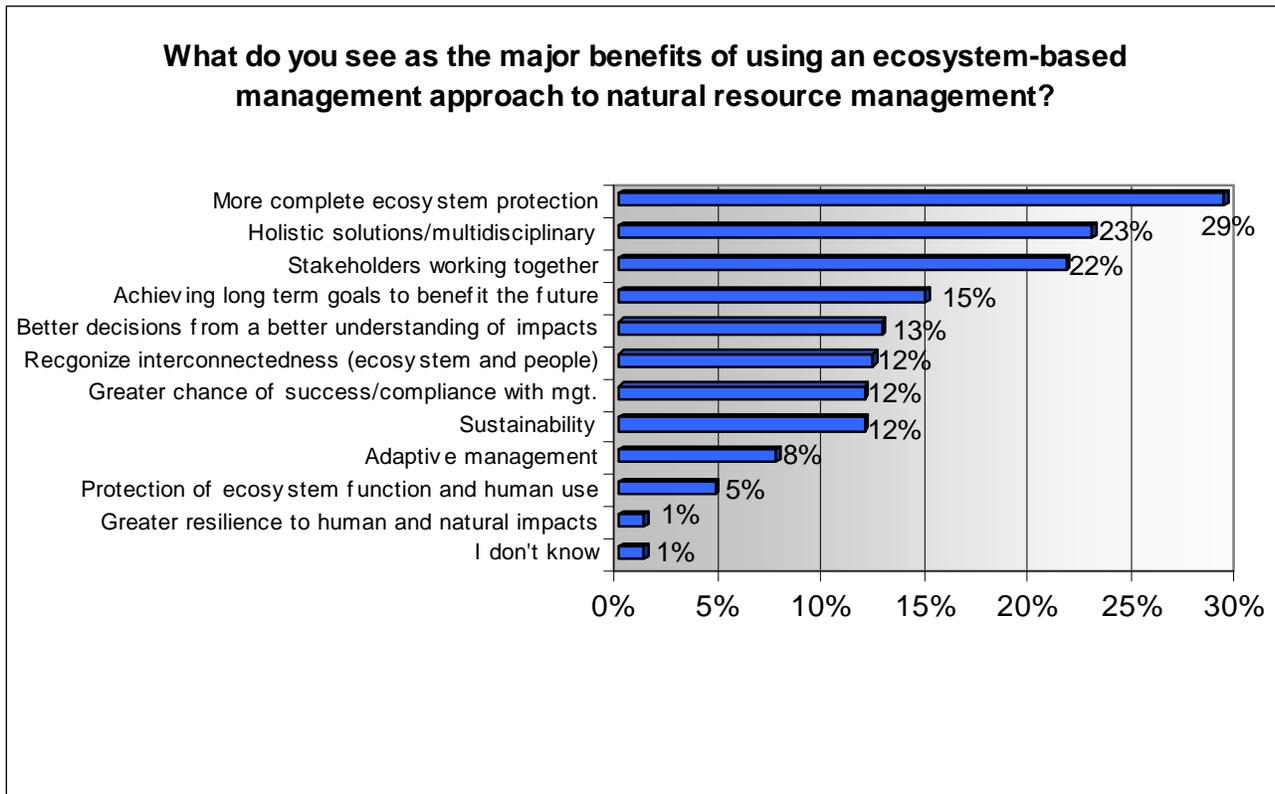


Figure 6. Benefits to using EBM

Question 8: When using (or considering) such an approach, what are the biggest obstacles you encounter or imagine? (check all that apply)

The greatest number of respondents (182) said that **getting different local, state, and federal agencies with different institutional climates and mandates to work together** was the biggest obstacle to using EBM. Almost half the respondents (123) thought that **not having sufficient data** to complete EBM was one of the biggest obstacles (see Question 9 for expansion on “data”). Having **too much other work** was listed by 115 respondents and 106 said that **lacking commitment from leaders or supervisors** to do EBM was their biggest obstacle. The next five categories all received a similar number of responses: not knowing enough about it to make a well-informed decision (93); not having the will or motivation to go beyond current practices (i.e., set in our ways) (87); issues or decisions not amenable to ecosystem-based management (e.g., scale too small) (85); and not having the knowledge to do it (83).

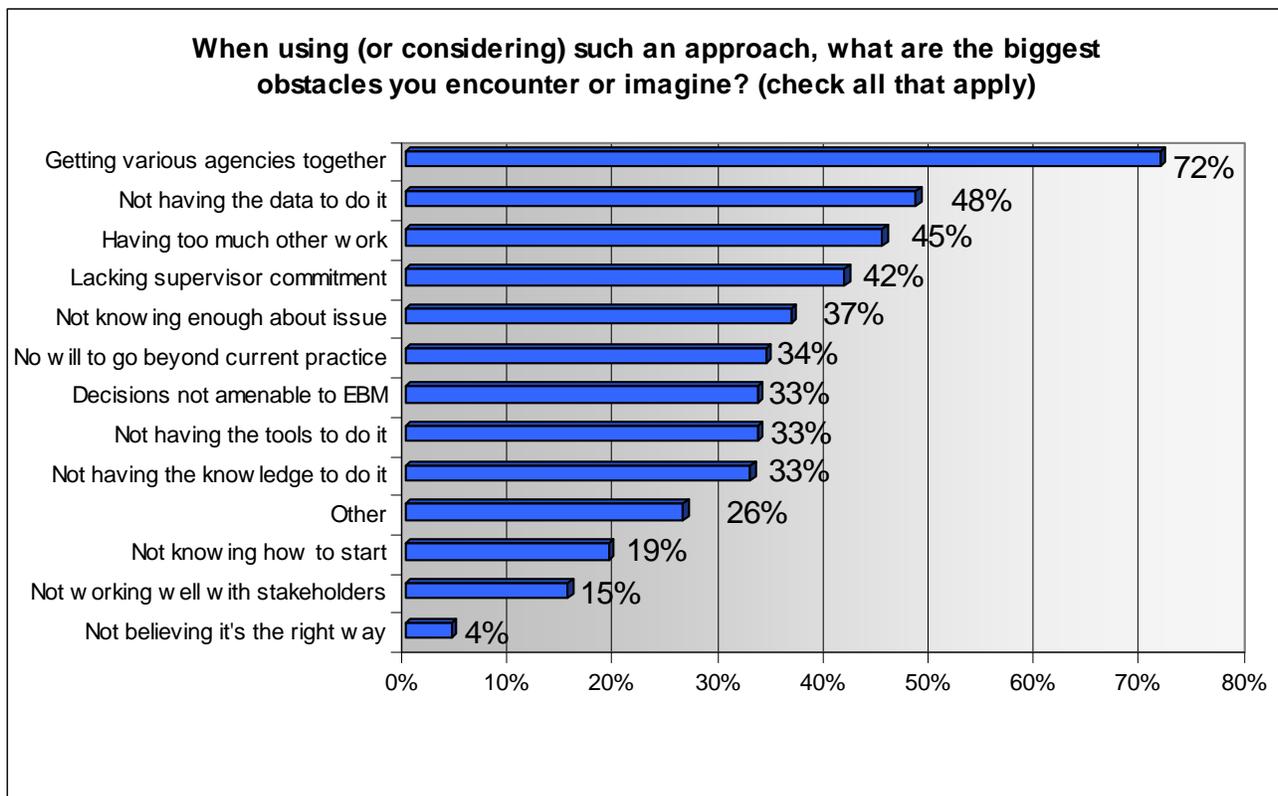


Figure 7. Obstacles to Using EBM

II. Data, Tools and Training Needs (Questions 9-20)

Question 9: Follow-up from question #8: What data or tools do you need?

The respondents generally described specific data that were crucial to their specific work. The 102 responses were put into more general categories with more local or **species level data** getting the greatest number of responses (39). These responses described the desire for local environmental data, including land use, population, local resource inventories, baseline data, and site-specific data. There were 38 responses for **ecosystem level data** or more general information regarding systems and their function, processes, services, and the linkages between them. There were 14 responses for more **data on indicators and monitoring**. This includes responses for long-term monitoring data and data necessary to make accurate assessments. The responses included in the **socioeconomic** category described data to gauge human use, benefits of using a resource, and the cost-benefit of using EBM.

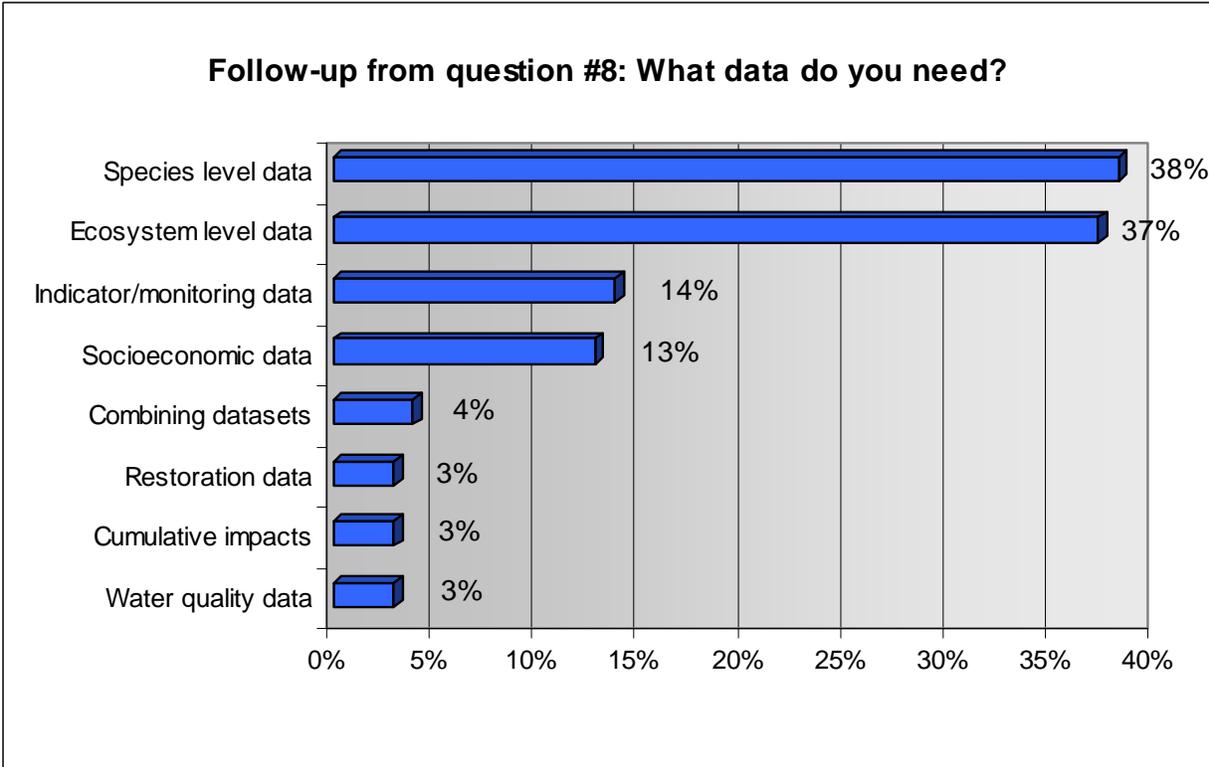


Figure 8. Types of Data Needs to Use EBM

Most of the 89 responses for tools described their **lack of resources** regarding potential tools. Their responses (26) included the lack of funding, the lack of training, and the lack of time to use tools in their work. There were 23 responses that described the need **for accurate models** based on applicable data, models that are verifiable, and the need for general prediction tools. Seventeen responses described the need for more **spatial tools**, including GIS software, layers, and remote sensing.

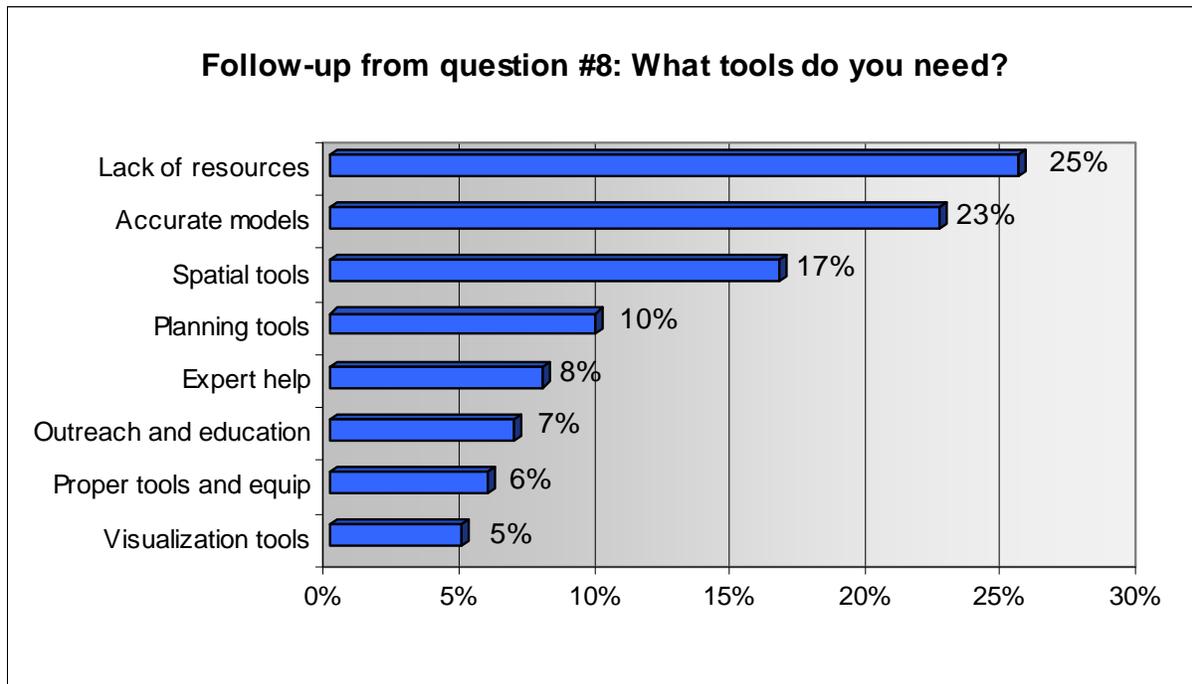


Figure 9. Types of Tools Needed to Use EBM

Question 10: For which of the following do you apply decision-support software or tools? (check all that apply)

Responses are organized from highest to lowest response number (out of 254 respondents) and indicate a wide array of application purposes.

Table 2. Response Choices for Application of Decision-support Software of Tools

<u>Label</u>	<u>Category</u>	<u>Response#</u>	<u>Label</u>	<u>Category</u>	<u>Response#</u>
1	To identify areas for conservation and restoration	118	9	To assess the vulnerability of our community to natural and man-made hazards	67
2	To support natural resource planning or management plan development	108	10	To forecast future land use change	61
3	To assess current landscape or ecosystem conditions	103	11	To compare and contrast alternative management scenarios	60
4	To facilitate communication among managers, scientists, and stakeholders	101	12	To predict the impact of management actions on terrestrial and aquatic ecosystems	60
5	To manage coastal and marine data or projects	101	13	To incorporate stakeholder input into decisions	58
6	I do not use decision-support software or tools	87	14	To prioritize specific management actions	58
7	To determine the impact of land use changes on environmental management objectives (e.g., habitat protection, water quality)	85	15	To incorporate economic information into decisions	43
8	To depict or visualize land use scenarios	82	16	Others (please describe)	39
			17	To prepare for emergencies and emergency response	34
			18	I am not interested in using decision-support software or tools	5

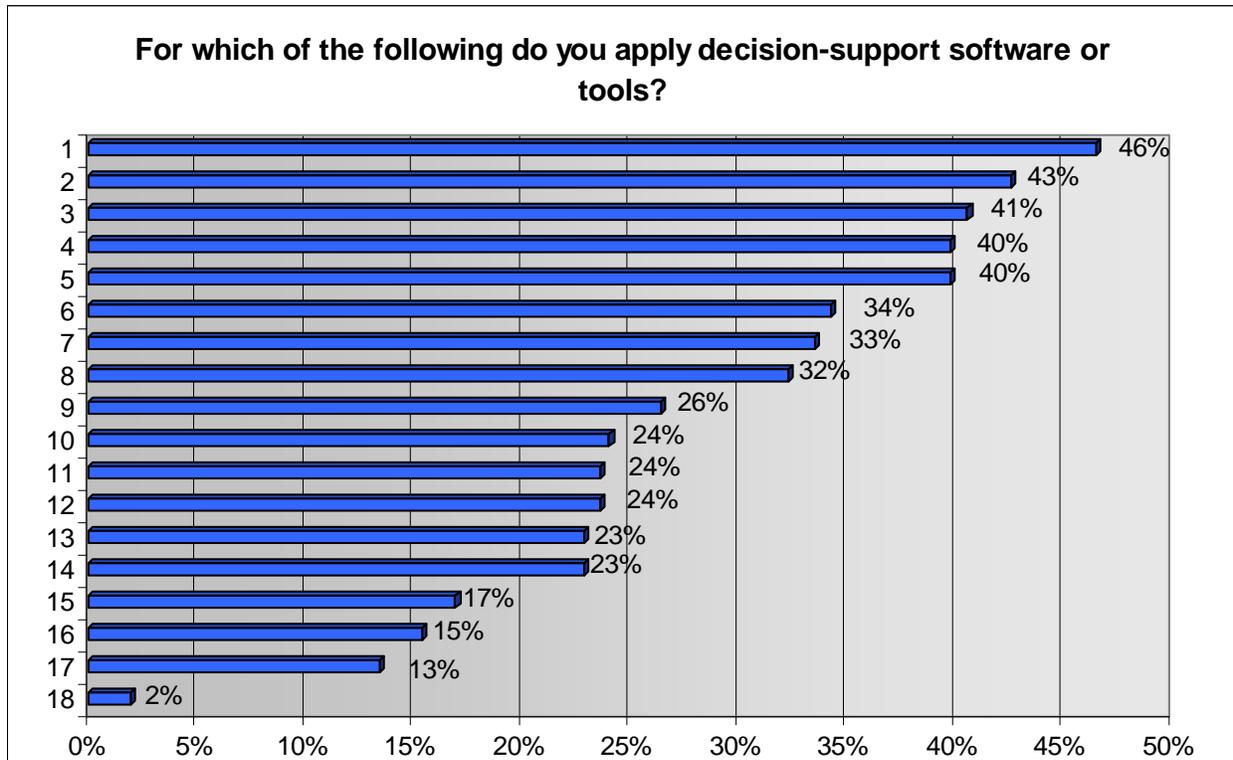


Figure 10. Level of Response Choices from Table 2

Seven additional responses indicated that they were unsure of the definition of decision-support software and tools. Three responses described their daily operations—in permit reviews, fisheries management, and land cover analysis—as how they used decision-support software or tools. Two responses said they just used GIS, and two others said they use information from other sources. Another two responses described their own system for using decision-support software and tools. The first said that the Florida Coastal Zone Management Program is leading an initiative to develop bioindicators in coastal waters. The indicators would be used to inform land use and regulatory decisions in related watersheds. The second response said that many of the tools were used to develop their comprehensive conservation and management plan, which is now considered the primary management tool for their system.

Question 11: Which of the following decision-support software or tools do you use? (check all that apply)

Over half the respondents (130) said that they use **custom GIS applications** to support their work. However, 102 respondents said that they **do not use decision-support software or tools** at all. In analyzing the responses from the “Others” category, there were four responses that said they did not know or understand what was meant by decision-support software or tools. An additional four responses said that they used a combination of GIS and other tools (e.g., decision charts, SAS, SurveyMonkey, TNC CAP). (*See below for acronym definitions from this paragraph.) Three responses specifically said they use The Nature Conservancy’s custom tools, such as growth trajectories, biodiversity indexing, ecoregional assessments, and conservation action plans. Three responses each, listed N-SPECT and general engineering software as additional tools. Other individual tools listed were Trout Headwaters Institute River Rapid Assessment System, water quality models SPARROW and AVGWLF, Primer-E, C-CAP, NCCOS Biogeographic Assessment, NatureServe Vista, MCDA Models, HSPF, PHABSIM, TIPSY Growth and Yield AAC calculation software, and L-THIA.

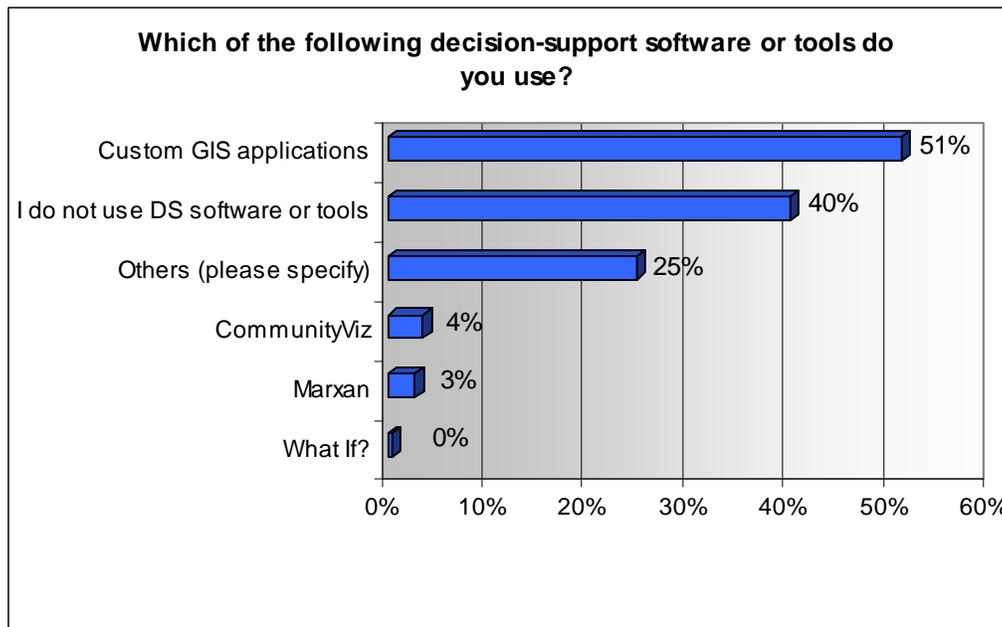


Figure11. Types of Decision-support Software Tools Used

***Acronym Definitions**

- TNC – The Nature Conservancy
- CAP – Conservation Action Planning
- N-SPECT – Nonpoint-Source Pollution and Erosion Comparison Tool
- SPARROW – Spatially Referenced Regressions on Watershed Attributes
- AVGWLF – ArcView Generalized Watershed Loading Functions
- C-CAP – Coastal Change Analysis Program
- NCCOS – National Centers for Coastal Ocean Science
- MCDA – Multi-Criteria Decision Analysis
- HSPF – Hydrologic Simulation Program Fortran
- PHABSIM – Physical Habitat Simulation System
- TIPSY – Table Interpolation Program for Stand Yields
- L-THIA – Long-Term Hydrologic Impact Assessment

Question 12: Do you think there is a need for professional development training on ecosystem-based management within your organization or other organizations with whom you work?

An overwhelming 88% of the responses think their organization or organizations with whom they work are in need of EBM professional development training.

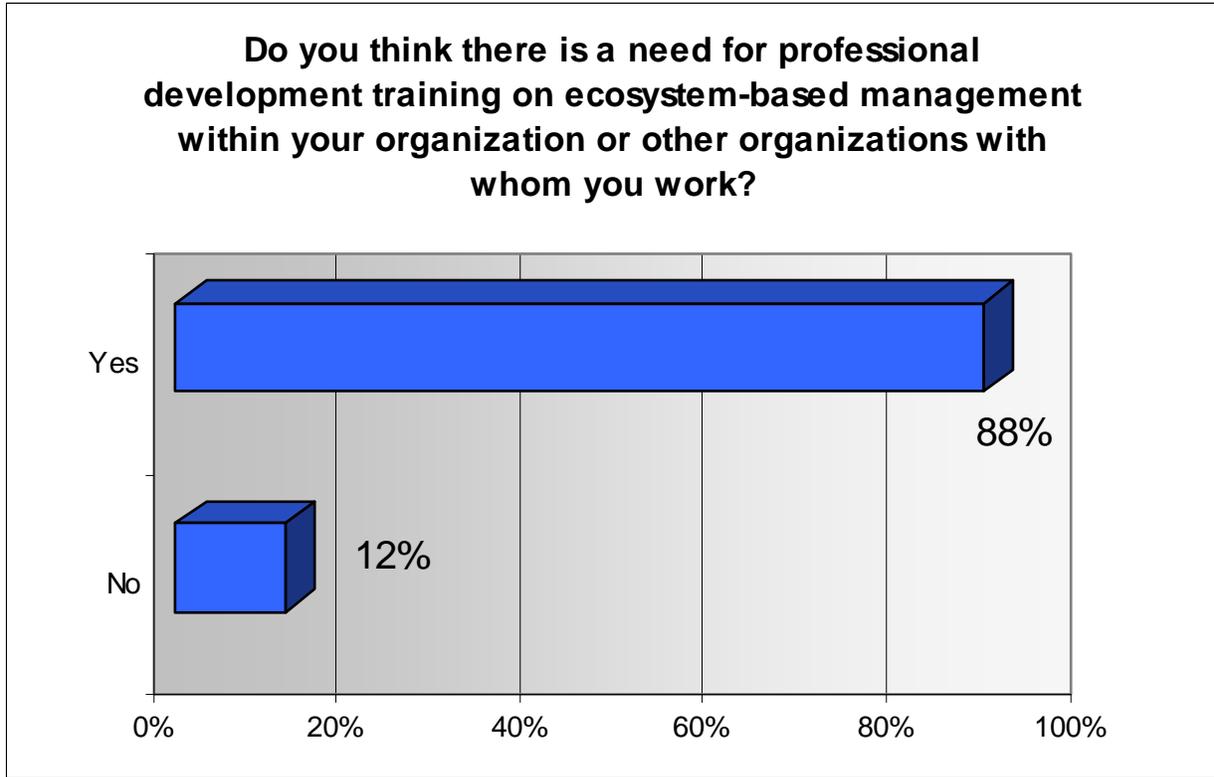


Figure 12. Need for Professional Development Training

Question 13: The following items have been suggested as elements to include in training on ecosystem-based management. How important (high, medium, low, not at all) do you feel each of the following elements are for you and others with whom you work? (check one for each)

The three elements rated highest for needed training, all with greater than 60% of respondents rating them high and with a rating average greater than 3.5, were as follows: how to plan or develop an EBM approach; how to incorporate dynamic ecosystem processes or sustainability into EBM decision making; and how to implement an EBM approach.

All the elements were given an overall rating greater than medium importance, so there were no elements that could be discounted. The three elements relating to stakeholders were the only elements that had a greater number of respondents rating them of medium importance.

Table 3. Elements for EBM Training

Rating 1-4	Not at all	Low	Medium	High	Rating Average
How to plan / develop an ecosystem-based approach to management	<1% (1)	9% (22)	25% (63)	66% (168)	3.57
How to incorporate dynamic ecosystem processes or ecological sustainability into ecosystem-based management decision making	1% (2)	4% (10)	34% (86)	61 % (156)	3.55
How to implement an ecosystem-based approach to management	1% (2)	9% (24)	25% (63)	65% (165)	3.54
How to evaluate an ecosystem-based approach to management	1% (2)	9% (22)	32% (80)	59% (150)	3.49
How to overcome real or perceived barriers to implementation of an ecosystem-based approach to management	<1% (1)	11% (29)	36% (92)	52% (132)	3.40
How to integrate the human dimension into our thinking about ecosystems	1% (2)	11% (27)	40% (101)	49% (124)	3.37
How to choose the appropriate scale and boundary for a particular problem (e.g., open ocean, coastal region, watershed, harbor)	1% (3)	15% (37)	35% (89)	49% (125)	3.32
How to use decision-support software or tools to help implement ecosystem-based management	2% (4)	14% (35)	39% (98)	46% (116)	3.29
How to put the idea of adaptive management to work	1% (3)	148% (35)	41% (105)	44% (111)	3.28
How to integrate and respect the knowledge, values, and perspectives of all stakeholders	1% (2)	18% (46)	43% (110)	38% (96)	3.18
How to collaborate with stakeholders	1% (3)	20% (50)	42% (107)	37% (94)	3.15
How to balance my organization's expectations with those of other stakeholders	2% (4)	19% (48)	45% (114)	35% (88)	3.13

Question 14: What other topics would you like to see included in a training course on ecosystem-based management?

There were 59 topic suggestions for inclusion in the EBM training. Most of the responses (19) focused on the **practical application of real world scenarios**. This includes depictions of success and failure either explained through a regional or program context. Suggested examples were a species or system lost because of lack of proper EBM, agencies that have successfully completed the process for an issue, or a situation in which EBM was not used and resulted in some environmental loss where some facets of EBM could have changed the outcome. The **economics of EBM** was mentioned by eight respondents. The responses suggested economic examples for why or why not to use EBM, analysis to show EBM is cost beneficial, and learning more about funding sources to complete EBM. The **working with politics** category had six responses that all captured the idea that implementing EBM can require a shift from the current paradigm of natural resource management. The examples given encompassed a summary of current laws and regulations that detract from and foster EBM and how to encourage the regulatory agencies to redefine management and use EBM concepts.

Other topic suggestions included the specific tools used in EBM and how they worked or didn't work in that scenario (5); how to communicate with stakeholders not directly involved in the process (legislators, elected officials) and teach the public about EBM to create more buy-in (5); how to use EBM to address impacts from climate change (4); how to identify and monitor indicators, and how to conduct assessments of EBM (4); how to integrate scientific, political, and sociological disciplines to promote information sharing, strategic planning, and gap identification (4); how to gauge their ecosystem or develop simple models to better understand interconnectedness (2); and how to prioritize goals and objectives, or how to focus research and monitoring to achieve EBM (2). Two respondents said less of a focus was placed on stakeholders and the collaborative process because these concepts are already captured in other Center trainings.

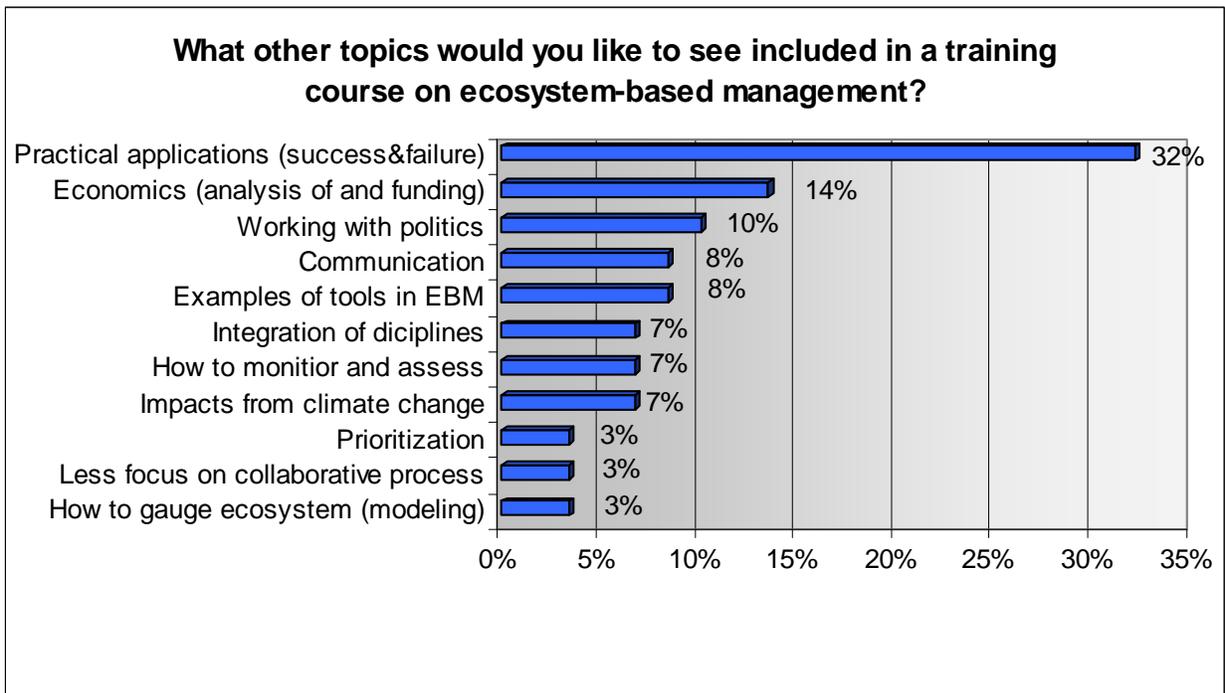


Figure 13. Additional Topics for EBM Training

Question 15: In which ecosystem context do you see a need for training on ecosystem-based management? (Check the response(s) that most closely reflect(s) the needs of your organization and those organizations with whom you work.)

The greatest number of responses (198) indicated **estuarine systems** as the most important ecosystem type for the EBM training. Two **river catchment/watershed and wetland ecosystem** types drew the same number of responses (157) as the second greatest areas of need. Also highly indicated were **protected area management** (127) and **marine fisheries** (124). There was much less of a response for **forest** (64) and **coral reef** (47) ecosystems.

The “Others” category included seven responses that would prefer to focus on the physical coastal environment, including barrier islands and maritime forests. Six responses did not describe a type of ecosystem but indicated that the focus should be on the town level where planning activities take place because these areas assume the costs and benefits from the misuse or use of each of the ecosystem types. Five responses described a focus on marine habitats, not just fisheries, but those such as the open ocean, kelp forests, and the continental shelf. Four responses mentioned a combination of the choices and four mentioned grasslands. Two individual responses mentioned cultural resources/ecotourism, and one mentioned aquaculture.

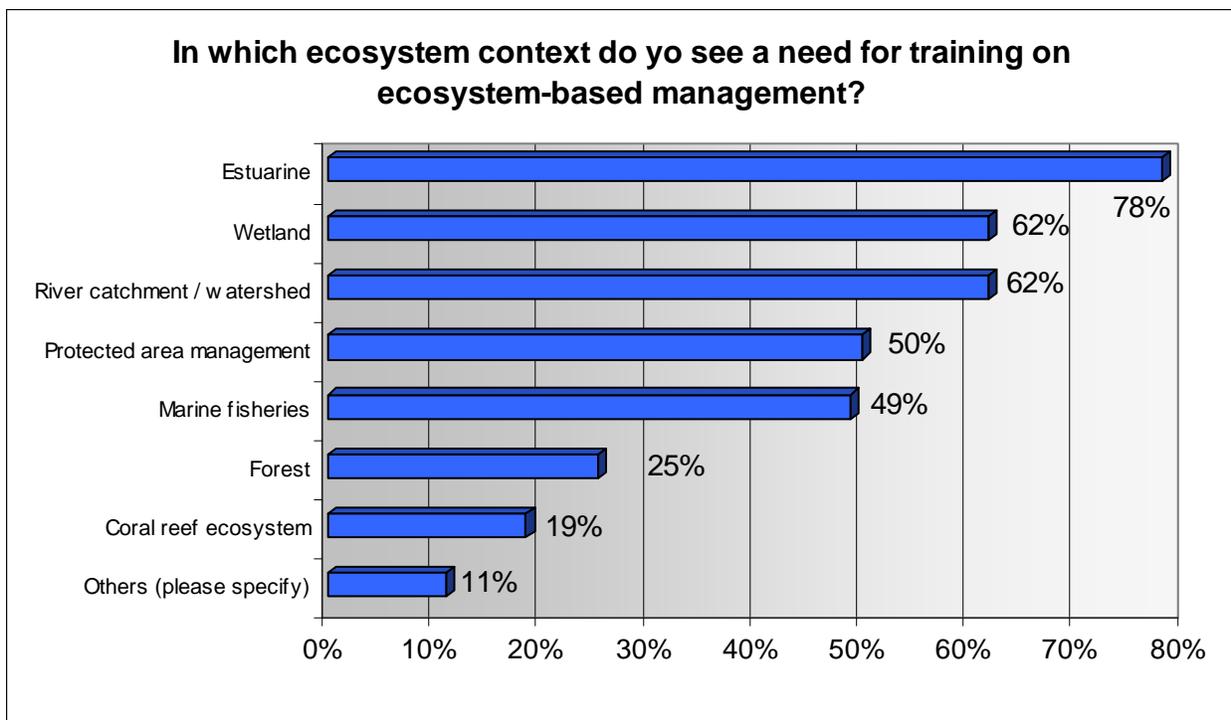


Figure 14. Context of EBM Training

Question 16: Indicate the need for ecosystem-based management training (from 1 = "no need" to 5 = "great need") for each of the following groups. (check one for each)

The overall ratings indicate the respondents thought that every group was in need of at least an average amount (a score of 3) of EBM training, with the lowest overall need for the public. The highest rated group was state **natural resource management agency staff**. Natural resources management agency staffs at both the local and federal levels were also perceived as having a high need for training. Although natural resource management agency leaders had the greatest number of respondents rate them as having the greatest need, they only had the second highest overall rating.

Table 4. Level of Need for EBM Training

	1-No need	2	3	4	5-Great need	Rating Average
State natural resource management agency staff	1% (2)	3% (7)	14% (36)	39% (98)	44% (111)	4.22
Natural resource management agency leaders	<1% (1)	4% (11)	18% (45)	30% (77)	48% (120)	4.20
Local or regional land use planners	<1% (1)	6% (14)	14% (36)	38% (96)	42% (107)	4.16
Local (county, municipal) natural resource management agency staff	1% (2)	8% (21)	17% (44)	29% (73)	45% (114)	4.09
Local or regional permitting or regulatory staff	<1% (1)	7% (18)	15% (37)	39% (100)	39% (98)	4.09
Federal natural resource management agency staff	1% (2)	7% (18)	18% (46)	32% (81)	42% (105)	4.07
Industrial or commercial landowners / resource users (e.g., forestry, fishing, farming, energy, tourism)	1% (2)	6% (15)	20% (50)	38% (96)	36% (91)	4.02
Elected (county, municipal) officials	2% (4)	11% (29)	18% (45)	28% (72)	41% (104)	3.96
Nongovernmental environmental organization staff	<1% (1)	13% (32)	25% (64)	41% (105)	20% (52)	3.69
Private non-industrial landowners	2% (4)	15% (39)	30% (75)	26% (67)	27% (69)	3.62
Other nongovernmental or special interest groups	<1% (1)	12% (31)	36% (92)	32% (82)	19% (48)	3.57
Public	3% (7)	15% (39)	32% (80)	27% (69)	23% (59)	3.53

Question 17: How would you like to apply/use the information or skills gained from a training on ecosystem-based management? (check all that apply)

The greatest number of respondents (198) said that they would like to apply the skills from the EBM training to **resolve complex issues through the collaborative process**. The next three categories, writing **special area management plans**, **responding to stakeholder requests**, and **daily operations** all had similar responses of 124, 122, and 117, respectively.

From the additional ideas, the greatest number of responses (7) mentioned education and outreach of others on EBM as an important way to use the information from the training. There were five responses that indicated they would work at developing new policies or new practices either in large-scale municipalities or in small-scale rural communities. Other responses were the use in strategic planning (3), prioritizing needs or program goals (2), integration of the choices (2), and the implementation of existing plans (1).

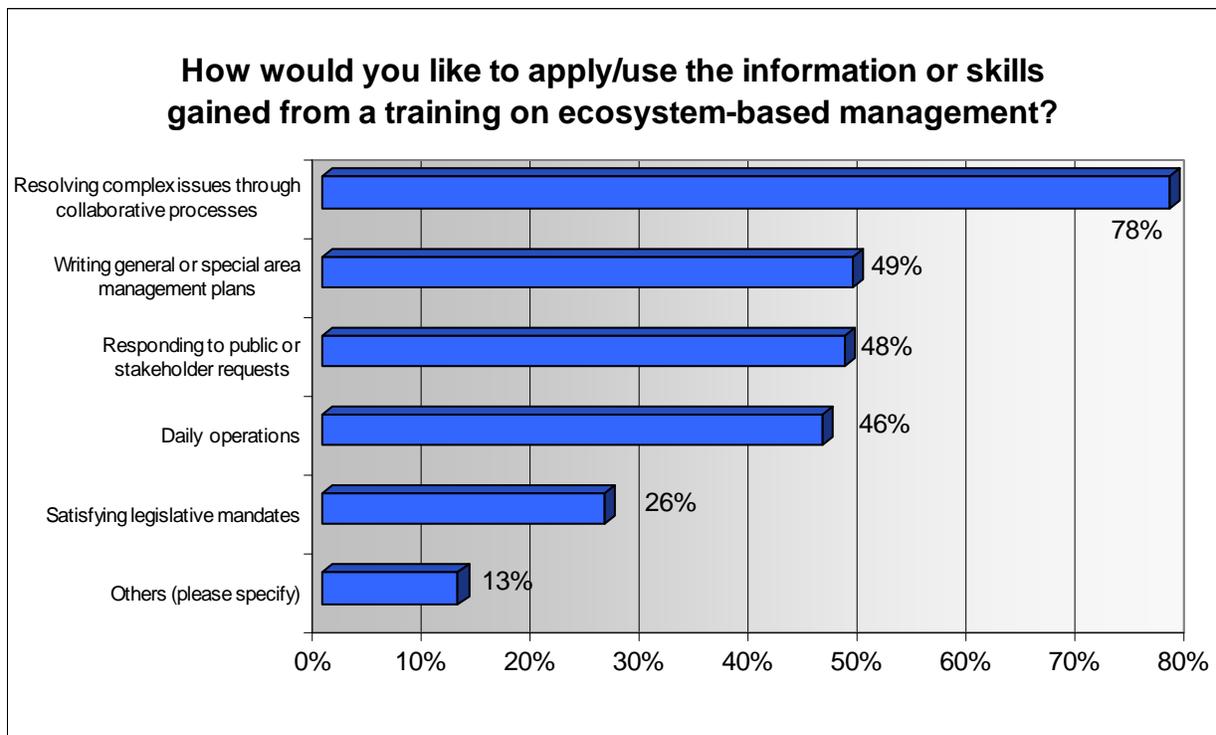


Figure 15. Applying Skills Gained From EBM Training

Question 18: Would you or others from your organization attend a 2-3 day professional development course on ecosystem-based management? (check one)

Approximately 92% of the respondents said they (or others from their organization) would attend a 2-3 day EBM course.

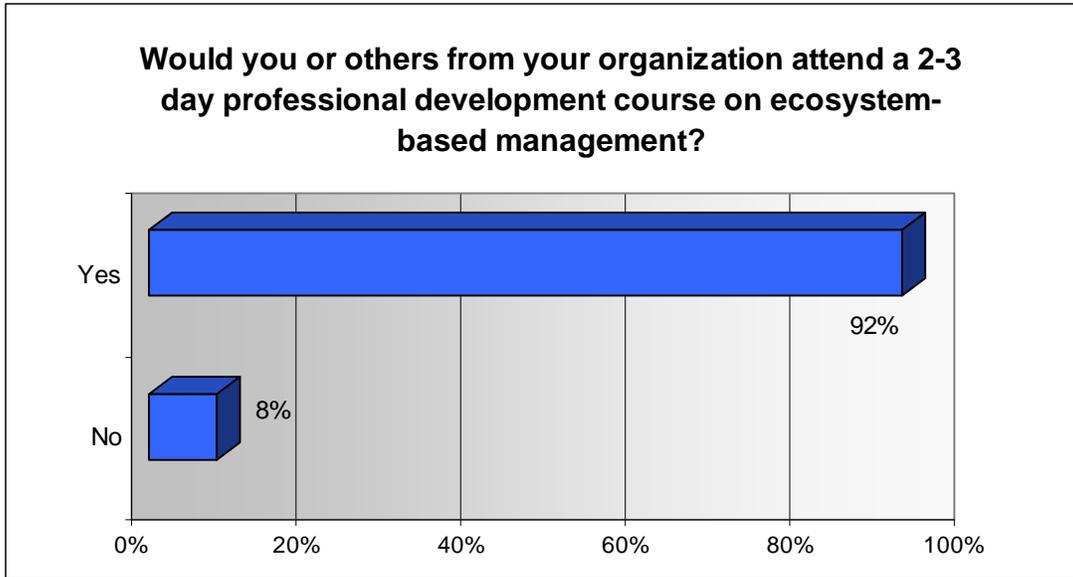


Figure16. Attendance for EBM Training

Question 19: Rank-order the following course formats (from 1 = "least useful" to 5 = "most useful") in terms of how useful they would be for you or others with whom you work. (check one for each)

The highest rated course format was **for participants from a particular area to learn to formulate a strategic plan for implementing EBM**. Approximately 36% of respondents rate it as possessing moderate importance (a ranking of 3). However, an additional 29% rated it as the most useful course format, which was the greatest number given to any of the choices. The second highest rated course format is a course **to gain skills on implementing EBM**. The greatest number of respondents rated implementation below average; however, 23% indicated this course format as above average and another 23% as the most useful format.

Table 5. Most Useful EBM Course Formats

	1-Least useful	2	3	4	5-Most useful	Rating Average
Course to assist teams/groups from a particular place or protected area in formulating a strategic plan for implementing ecosystem-based management for a particular site or situation	3% (8)	14% (33)	36% (87)	19% (46)	29% (70)	3.56
Course for individuals interested in gaining skills for implementing ecosystem-based management	5% (12)	37% (89)	12% (29)	23% (56)	23% (57)	3.23
Course to assist teams/groups from a particular place or protected area where teams can gain skills on particular (requested) elements of implementing ecosystem-based management for a particular site or situation	20% (49)	18% (44)	22% (54)	17% (43)	24% (59)	3.08
Course to assist teams/groups from a particular place or protected area where teams gain skills that they can apply to ecosystem-based management initiatives already underway	11% (28)	23% (56)	25% (61)	31% (76)	10% (25)	3.06
Other (describe below in question #20 text box)	56% (18)	3% (1)	3% (1)	9% (3)	28% (9)	2.5
Course for individuals interested in gaining general knowledge about ecosystem-based management	55% (135)	11% (28)	9% (21)	11% (28)	13% (33)	2.17

Question 20: Describe other course format(s) that would be useful for you or others with whom you work.

A number of suggested formats or suggested topics that should be included were listed by the respondents. Four responses all generally described a course format based on a specific region that would incorporate a diverse group of attendees (e.g., from various agencies that could potentially work together on pressing issues). Four responses also mentioned that the course should incorporate exercises, case studies, real-life scenarios, and fieldwork. Three responses indicated that travel or taking time off work for the training would be difficult, so a Web-based learning tool would be beneficial.

The following are individual responses that suggest a course format or target theme:

- Conflict management or communication workshops
- One day course for managers to address skills and procedures needed to do EBM
- Course for decision-support software
- Course on the regulatory framework—hear how regulators can and cannot execute EBM concepts.
- Course on evaluation of EBM projects
- Target policy makers so they can learn more about EBM in the hope that they implement it more often
- Course targeted at various stakeholder groups

The following are individual responses that suggest information that should be included in the training:

- Eco-tourism and its effects on the natural resources
- Facilitation of the EBM process
- Involvement of scientists and academics
- Limit general information
- How to get adaptive management permitted
- Understanding connectivity within the ecosystem and between ecosystems

III. Survey Respondents

Question 21: Which of the following best reflects the primary duties for your position? (check one)

Figure 17 shows a wide range of the respondents' primary duties. Their diversity is encouraging that the information received will be representative of the target audience for the EBM training. The greatest number of respondents chose research, science, or engineering (59) as their primary duty. The next greatest number of responses was for policy development (38) and education/extension (33). Communication, public relations, outreach also had a significant number of responses with 25. Fewer respondents chose GIS/remote sensing (12), land use planning (12), and permitting/regulation (11) as their primary duty.

There were 64 responses that answered "Other" when given the list of duties to describe their position. These responses were broken down into categories and included in Figure 17. The greatest number of these responses (17) only listed their primary duty as Natural Resource Management. Fifteen responses said their duties were a combination of, or some of, the primary duties listed. There were nine responses that said their primary duty was administration for a natural resource management organization. There were seven responses for habitat restoration, five responses for coordination, and three responses for MPA planning, site operations, and research. Finally, there were 2 responses for program evaluation.

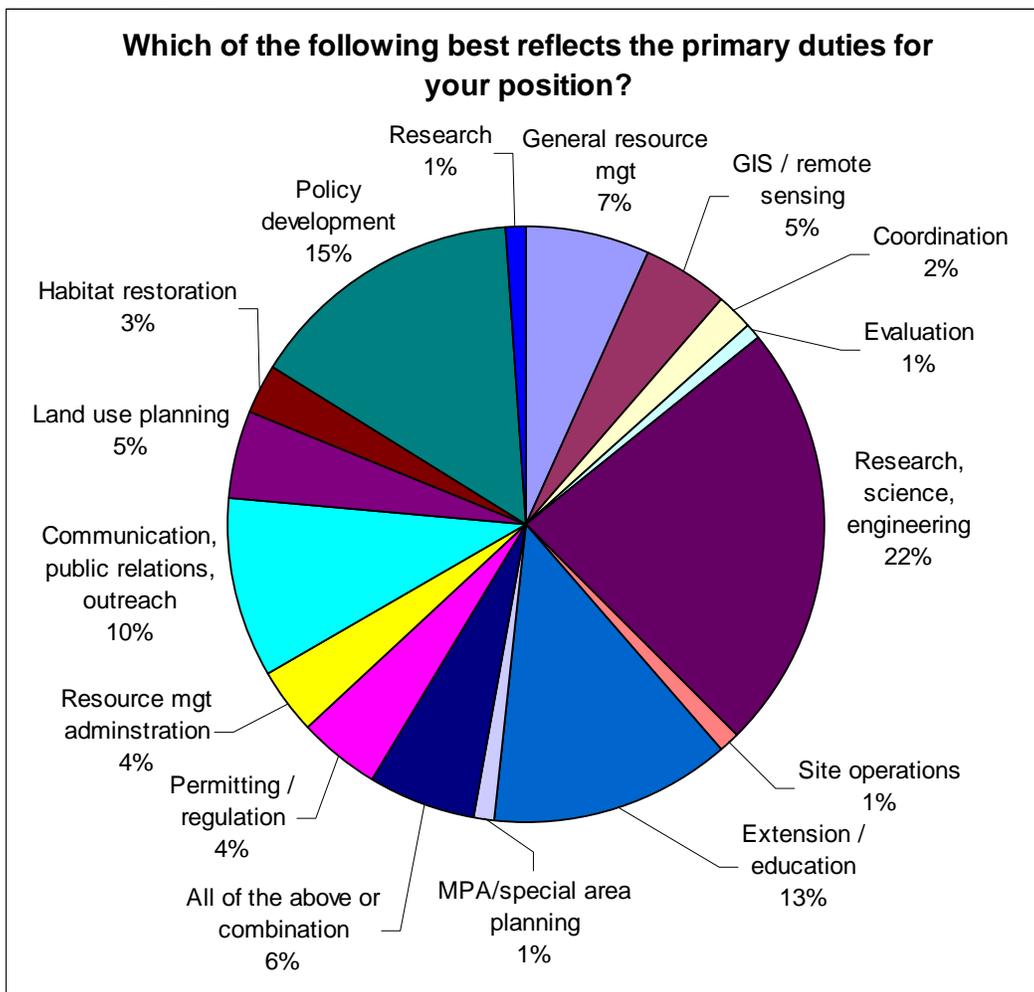


Figure 17: Primary Duties of Respondents

Question 22: How would you characterize your position? (check one)

Respondents were a good mix of management levels and included some field staff members and technicians. The majority of the respondents were project managers (96) and mid-level managers (78), which would be the types of natural resource management professionals implementing EBM. A good number of upper level managers (39) and field staff members or technicians (32) participated in the survey.

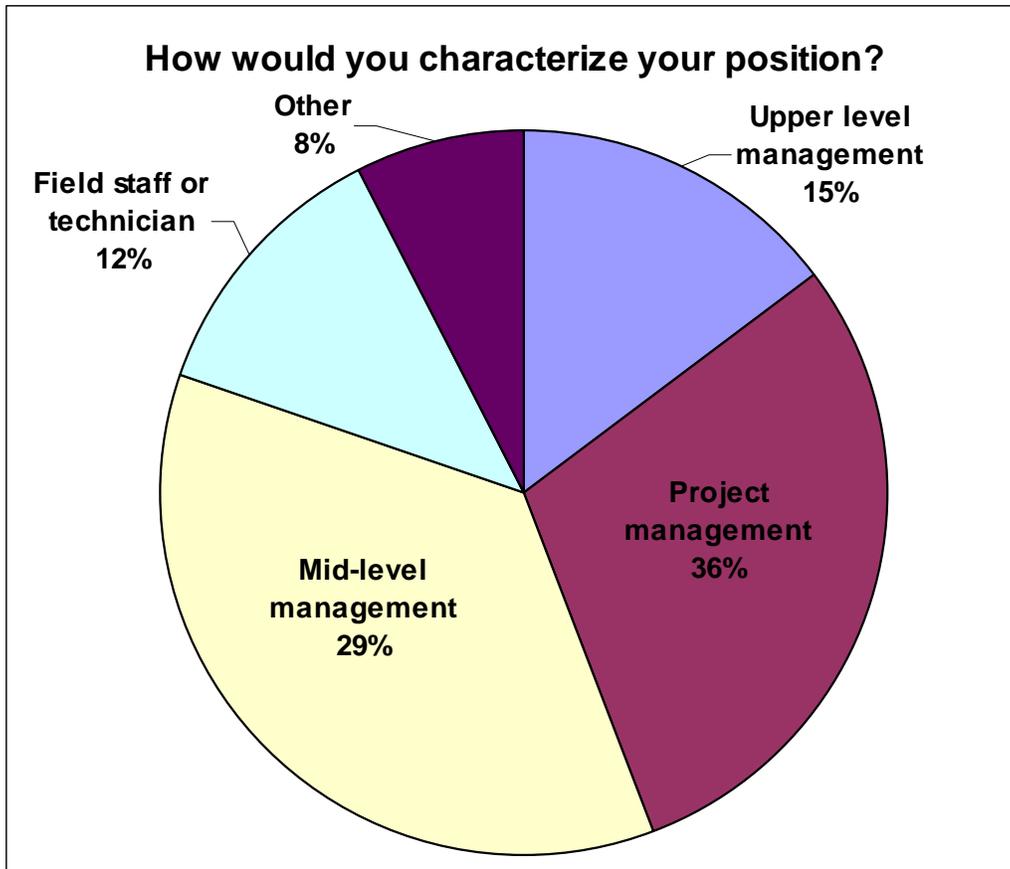


Figure 18. Position Level of Respondents

Question 23: Which of the following best represents your professional affiliation? (check one)

Overwhelmingly, respondents were from state (113) and federal (66) government. However, academia, and nongovernmental organizations were also represented. In addition to the breakdown in Figure 19, twelve respondents indicated that their professional affiliation was best described by a federal-state partnership. Four respondents indicated a university-government partnership and the private sector as their affiliation. There were two responses each for National Estuarine Research Reserve, foreign, and regional affiliations.

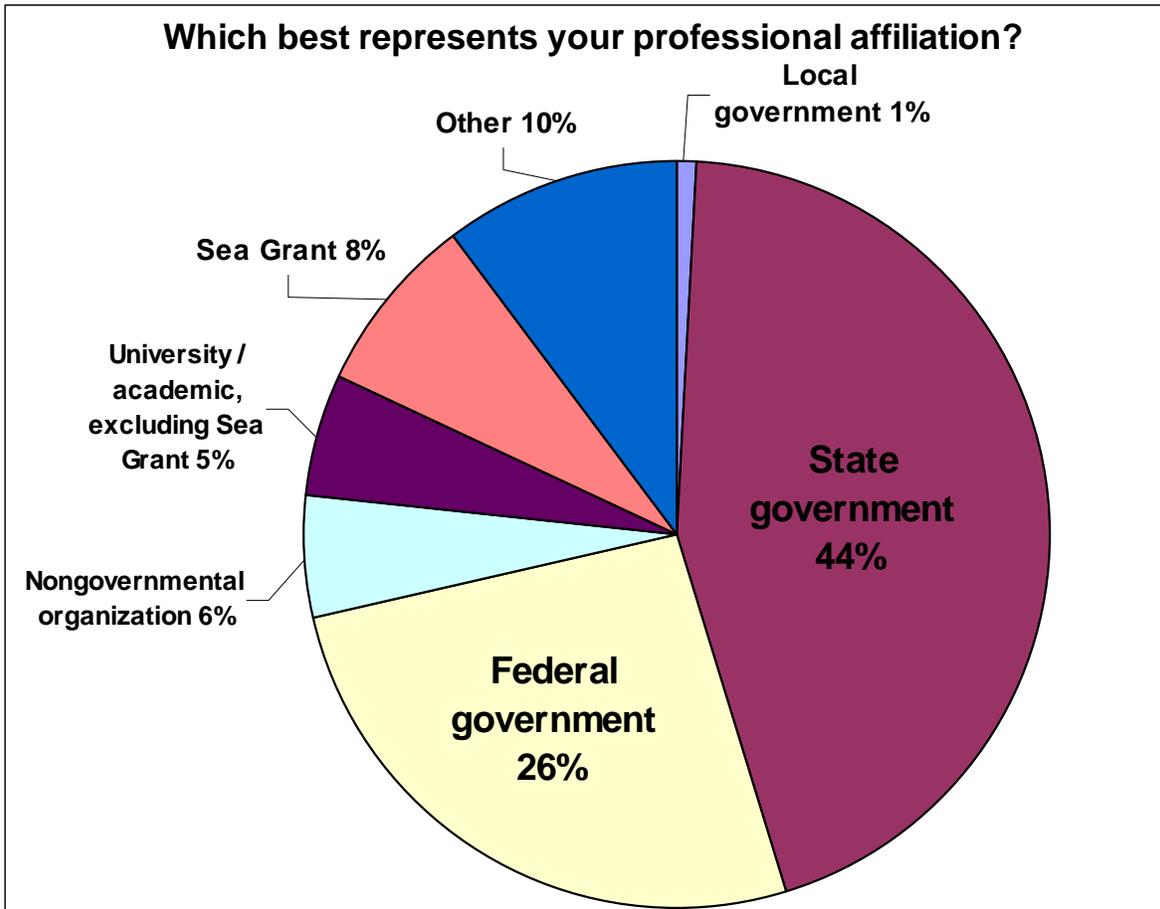


Figure 19. Professional Affiliation of Respondents

Key Points for Training Development Strategies

These key points were developed with information from this survey, along with information from two similar, earlier efforts focusing on EBM tool needs. One survey was done by the Gulf of Maine Council (GOMC) (Taylor 2008) and the other by the EBM Tools (EBMT) Network (2007).

I. Need for Training

The results from this survey show that 88% percent of participants think their organizations, or organizations with whom they work, are in need of EBM professional development training. Almost 92% of respondents indicated that they or someone in their organization would attend a two-to-four day EBM course. The GOMC and EBMT survey results both confirm this need for EBM training.

II. Training Format

The preferred course format indicated in this survey was for participants from a particular place to learn how to formulate a strategic plan for implementing EBM. This follows closely with the findings in the EBMT survey. The EBMT reported that the training venue of most interest is a multi-day training customized for specific projects and held in local communities. While it may not be possible to conduct all trainings in this manner, it would seem that the most benefit might derive from structured interactive workshops. These could be structured as part of training for community members, science experts, and relevant agency staff members from a defined area, followed by an interactive problem-solving workshop to actually identify and address locally relevant issues.

Another format suggestion in our survey results was a preference for specific, real-world examples as the primary technique for the training: “...*the inclusion of practical applications and real-world examples of EBM. These include examples of success and failure, and how EBM worked, caused the problem, or may have thwarted a problem if implemented.*” This tracks with a similar request from the GOMC survey results for case studies on how EBM could be or has been applied.

III. Training Content

This survey indicated a wide array of training needs, while the EBMT survey found a strong interest in developing capacity in almost all EBM sectors and processes. The following content areas were prevalent and may serve as the beginning focus of content development areas.

1. Collaborative Process

Seventy-seven percent of respondents from this survey said that they would like to apply improved skills from EBM training to resolving complex issues through the collaborative process. The EBMT survey reported a strong interest in developing capacity in engaging community and stakeholders in group decision making. The GOMC survey reported stakeholder or community engagement as both an important management issue and capacity need. Collaborative process may also be a useful tool to help with a key reported obstacle to implementation of EBM. In this survey, 72% of respondents said that getting different local, state, and federal agencies with different institutional climates and mandates to work together was the biggest obstacle to implementing EBM. The focus on a common vision and goal established through collaborative process can foster positive governance and institutional relationships. This call for collaborative process capacity building fits well with

existing NOAA Coastal Service Center strengths and reinforces a section of course development the Center began before gathering the survey information.

2. Ecosystem Function and Sustainability

The highest training need in this survey was how to incorporate dynamic ecosystem processes or ecological sustainability into EBM decision making. The EBMT survey identified the need for better understanding ecosystem functions, while the GOMC survey reported the lack of understanding or information on the ecosystem as an obstacle to EBM implementation. One approach that training could take to address these issues is to include instruction that would facilitate the development of conceptual ecological models—models that would help identify desired ecosystem attributes and services, the primary drivers and stressors on the system, and the connections of stressors to attributes and services through causal linkages. These models would help practitioners identify what they know and don't know about the system, become the basis for adaptive management actions, and provide a way to move forward without complete ecosystem function knowledge (which we will never have).

3. EBM Process

Also very high on the list of training needs of survey respondents were how to plan and develop an EBM approach to management, and how to implement an EBM approach to management. The EBMT and GOMC surveys both reported the lack of established methods for implementing EBM as one of the most severe implementation obstacles. The GOMC survey went on to report the need for training to understand the conceptual framework of EBM and general approaches for putting EBM into practice. A conceptual EBM procedural framework is currently under development and should soon be available for use (Kimberly Heiman, Communication Partnership for Science and the Sea, personal communication). Draft versions of the framework indicate that it will work well as a training aid and as the center of a module on a practical EBM process.

References

EBM Tools Network. 2007. "Needs for Tool Training for Coastal-Marine Ecosystem-Based Management: Results of a Practitioner Needs Assessment." Arlington, VA.

Taylor, Peter H. 2008. "Gulf of Maine Ecosystem-Based Management Toolkit Survey Report." Gulf of Maine Council on the Marine Environment.

Appendix: Original Survey Questions and Response Choices

The following are the original survey questions and their response choices.

Question 1: How familiar are you with ecosystem-based management? (check one)

- Unfamiliar/ Never heard of it
- I have heard of ecosystem-based management
- I am somewhat familiar
- I have a working knowledge
- I am an expert

Question 2: How would you describe ecosystem-based management (briefly, in your own words)?

Question 3: To what extent does your organization practice / implement an ecosystem-based approach to natural resource management? (check one)

- Never (0%)
- Rarely (1-25%)
- Sometimes (26-50%)
- Most of the time (51-75%)
- Almost Always (76-100%)
- I don't know

Question 4: What factors influence the extent to which an ecosystem-based approach to natural resource management is practiced / implemented by your organization?

Question 5: How frequently do you practice each of the following elements in your work? (check one for each)

	<i>Never</i> (0%)	<i>Rarely</i> (1-25%)	<i>Sometimes</i> (26-50%)	<i>Often</i> (51-75%)	<i>Always</i> (76-100%)
Dealing with uncertainty through a learning process (e.g., adaptive management)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Working beyond political boundaries (e.g., using ecosystem boundaries, watershed boundaries)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Focusing on more than one specific species (i.e., not a single species approach) in your management decisions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Integrating ecological, socioeconomic, and institutional frameworks into a problem-solving approach	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Involving stakeholders through collaborative processes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Question 6: We are trying to gain a better understanding of the different terms used to describe ecosystem-based management. If you use any of the elements listed in question #5 in your work, but do not consider this to be ecosystem-based management, what do you call your approach?

Question 7: What do you see as the major benefits of using an ecosystem-based management approach to natural resource management?

Question 8: When using (or considering) such an approach, what are the biggest obstacles you encounter or imagine? (check all that apply)

- Not having the knowledge to do it
- Not knowing how to work effectively with people and groups (i.e., stakeholders)
- Lacking commitment from leaders or supervisors to do it
- Not having the will or motivation to go beyond current practices (i.e., set in our ways)
- Having too much other work to do
- Not believing it is the right thing to do
- Issues or decisions not amenable to ecosystem based management (e.g., scale too small)
- Not knowing enough about it to make a well-informed decision
- Not having the data to do it (please specify below in question #9)
- Not having the tools to do it (please specify below in question #9)
- Not knowing how or where to start
- Getting different local, state, and federal agencies with different institutional climates and mandates to work together
- Others (please specify)

Question 9: Follow-up from question #8: What data or tools do you need?

Question 10: For which of the following do you apply decision-support software or tools? (check all that apply)

- I am not interested in using decision-support software or tools
- I do not use decision-support software or tools
- To assess current landscape or ecosystem conditions
- To assess the vulnerability of our community to natural and man-made hazards
- To compare and contrast alternative management scenarios
- To depict or visualize land use scenarios
- To determine the impact of land use changes on environmental management objectives (e.g., habitat protection, endangered species recovery, water quality)
- To facilitate communication among managers, scientists, and stakeholders
- To forecast future land use change
- To identify areas for conservation and restoration
- To incorporate economic information into decisions
- To incorporate stakeholder input into decisions
- To manage coastal and marine data or projects
- To predict the impact of management actions on terrestrial and aquatic ecosystems
- To prepare for emergencies and emergency response
- To prioritize specific management actions
- To support natural resource planning or management plan development
- Others (please describe)

Question 11: Which of the following decision-support software or tools do you use? (check all that apply)

- I do not use decision-support software or tools
- Community Viz
- What If?
- Marxan
- Custom GIS applications
- Others (please specify)

Question 12: Do you think there is a need for professional development training on ecosystem-based management within your organization or other organizations with whom you work?

- Yes
- No (please explain why you feel there is not a need for training)

Question 13: The following items have been suggested as elements to include in training on ecosystem-based management. How important (high, medium, low, not at all) do you feel each of the following elements are for you and others with whom you work? (check one for each)

	<i>High</i>	<i>Medium</i>	<i>Low</i>	<i>Not at all</i>
How to plan / develop an ecosystem-based approach to management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
How to choose the appropriate scale and boundary for a particular problem (e.g., open ocean, coastal region, watershed, harbor)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
How to use decision-support software or tools to help implement ecosystem-based management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
How to integrate the human dimension into our thinking about ecosystems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
How to collaborate with stakeholders	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
How to integrate and respect the knowledge, values, and perspectives of all stakeholders	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
How to balance my organization's expectations with those of other stakeholders	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
How to incorporate dynamic ecosystem processes or ecological sustainability into ecosystem-based management decision making	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
How to implement an ecosystem-based approach to management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
How to overcome real or perceived barriers to implementation of an ecosystem-based approach to management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
How to put the idea of adaptive management to work	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
How to evaluate an ecosystem-based approach to management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Question 14: What other topics would you like to see included in a training course on ecosystem-based management?

Question 15: In which ecosystem context do you see a need for training on ecosystem-based management? (Check the response(s) that most closely reflect(s) the needs of your organization and those organizations with whom you work.)

- Marine fisheries
- Estuarine
- Coral reef ecosystem
- River catchment / watershed
- Forest
- Wetland
- Protected area management
- Others (please specify)

Question 16: Indicate the need for ecosystem-based management training (from 1 = "no need" to 5 = "great need") for each of the following groups. (check one for each)

	<i>1 = No Need</i>	2	3	4	<i>5 = Great Need</i>
Local (county, municipal) natural resource management agency staff	1	2	3	4	5
State natural resource management agency staff	1	2	3	4	5
Federal natural resource management agency staff	1	2	3	4	5
Natural resource management agency leaders	1	2	3	4	5
Elected (county, municipal) officials	1	2	3	4	5
Local or regional land use planners	1	2	3	4	5
Local or regional permitting or regulatory staff	1	2	3	4	5
Nongovernmental environmental organization staff	1	2	3	4	5
Other nongovernmental or special interest groups	1	2	3	4	5
Private non-industrial landowners	1	2	3	4	5
Industrial or commercial landowners / resource users (e.g., forestry, fishing, farming, energy, tourism)	1	2	3	4	5
Public	1	2	3	4	5

Question 17: How would you like to apply / use the information or skills gained from a training on ecosystem-based management? (check all that apply)

- Daily operations
- Writing general or special area management plans
- Satisfying legislative mandates
- Resolving complex issues through collaborative processes
- Responding to public or stakeholder requests
- Others (please specify)

Question 18: Would you or others from your organization attend a 2-3 day professional development course on ecosystem-based management? (check one)

- Yes
- No

Question 19: Rank-order the following course formats (from 1 = "least useful" to 5 = "most useful") in terms of how useful they would be for you or others with whom you work? (check one for each)

	<i>1 = Least Useful</i>	2	3	4	<i>5 = Most Useful</i>
Course for individuals interested in gaining general knowledge about ecosystem-based management	1	2	3	4	5
Course for individuals interested in gaining skills for implementing ecosystem-based management	1	2	3	4	5
Course to assist teams/groups from a particular place or protected area in formulating a strategic plan for implementing ecosystem-based management for a particular site or situation	1	2	3	4	5
Course to assist teams/groups from a particular place or protected area where teams gain skills that they can apply to ecosystem-based management initiatives already underway	1	2	3	4	5
Course to assist teams/groups from a particular place or protected area where teams can gain skills on particular (requested) elements of implementing ecosystem-based management for a particular site or situation	1	2	3	4	5

Question 20: Describe other course format(s) that would be useful for you or others with whom you work.

Question 21: Which of the following best reflects the primary duties for your position? (check one)

- Extension / education
- Land use planning
- Research, science, engineering

- Policy development
- Permitting / regulation
- GIS / remote sensing
- Communication, public relations, outreach
- Other (please specify)

Question 22: How would you characterize your position? (check one)

- Upper level management
- Mid-level management
- Project management
- Field staff or technician
- Other (please specify)

Question 23: Which of the following best represents your professional affiliation? (check one)

- Local government (county, municipal)
- State government
- Federal government
- Nongovernmental organization
- University / Academic, excluding Sea Grant
- Sea Grant
- Other (please specify)

Question 24: Which state or territory are you currently working in?