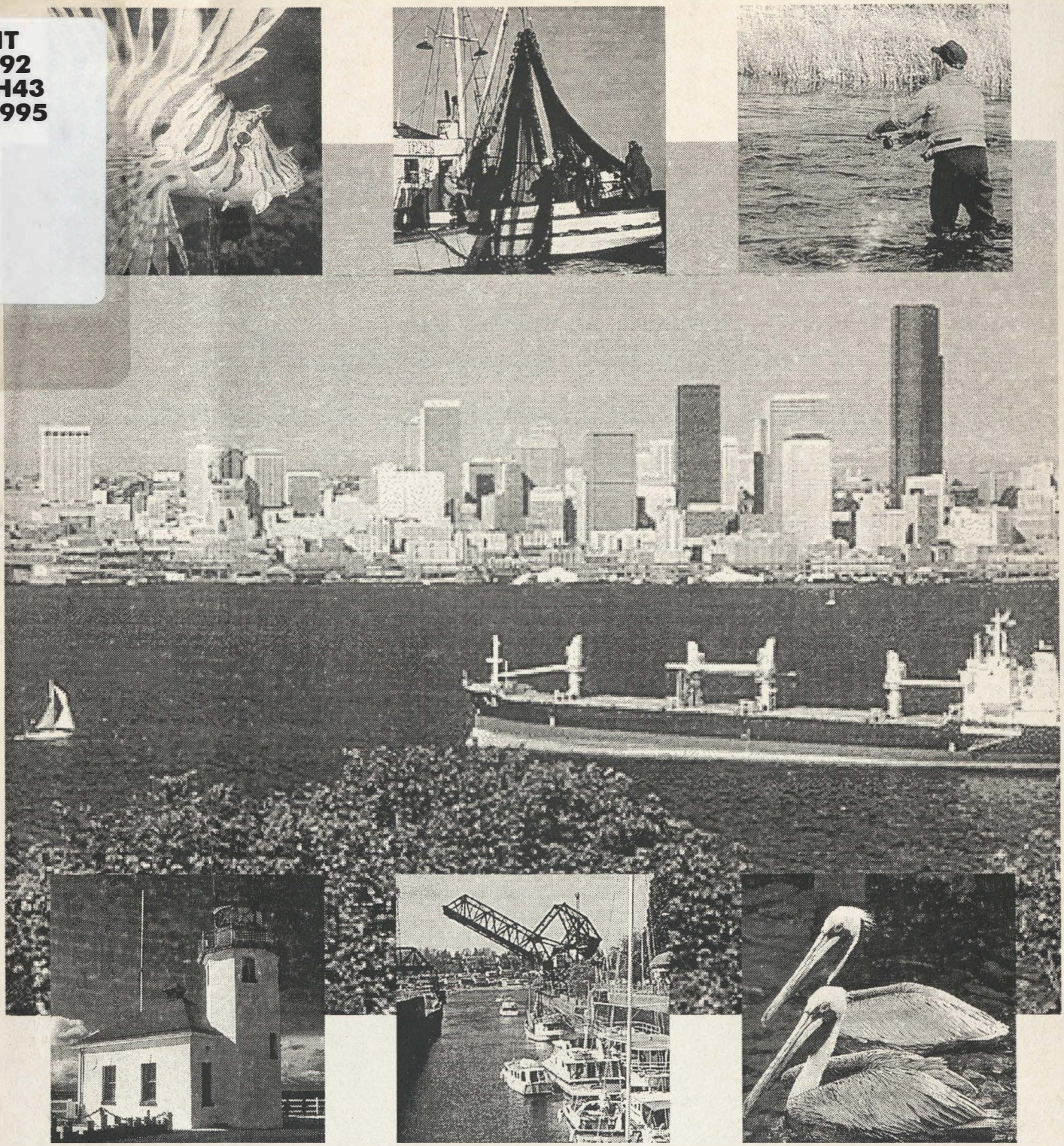

Healthy Coastal Ecosystems and the Role of Integrated Coastal Management

Healthy Coastal Ecosystems and the Role of Integrated Coastal Management

February 1995

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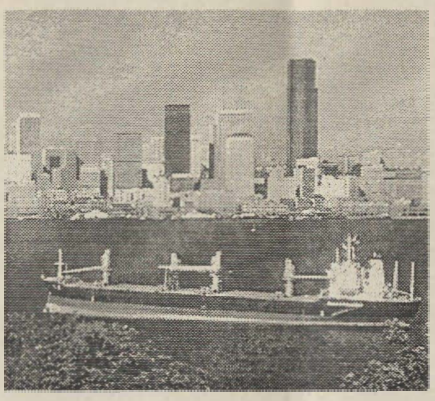

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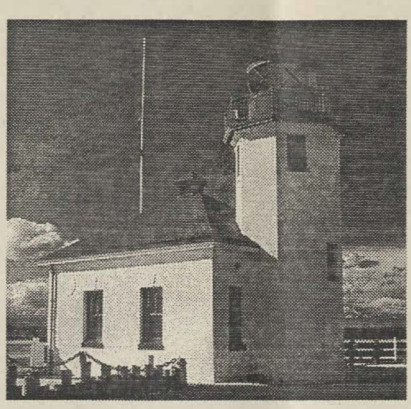


Integrated Coastal Management: An Overview

In July 1993, the National Oceanic and Atmospheric Administration published its *1995–2005 Strategic Plan*. The focus of one of the many sections in this document is developing and implementing a framework for building healthy coastal ecosystems. The vision articulated in that section is:

> a nation in which economic development in coastal ecosystems is managed in ways that maintain their biodiversity and long-term productivity for sustained use. To move toward this vision, the paradigm for managing coastal ecosystems must shift from a fragmented to an integrated and continuing process, from a site-specific to an ecosystem-wide context, and from a reactive to a preventive approach.

Toward this end, NOAA's National Ocean Service (NOS) developed a strategy of integrated coastal management (ICM), which is designed to strengthen and refocus NOAA's management, information development, and research activities to protect the integrity of coastal ecosystems. While proponents have billed this latest evolution in coastal management as the much-needed paradigm shift, ICM has sparked debate regarding its exact definition, and whether it is simply a new term for conducting business as usual.

In the fall of 1993, Dr. W. Stanley Wilson, Assistant Administrator of NOS, convened an ad hoc committee of managers and scientists from state coastal management and sea grant programs, federal and local government agencies, academia, marine laboratories, and interest groups. The Committee was tasked with reviewing and critiquing the ICM strategy presented in the *Strategic Plan* and providing constructive insights into how to strengthen the nation's coastal management and stewardship initiatives.

Rather than focusing on a definitional argument, the Committee concentrated on the essential characteristics of ICM and used them as guiding principles for carrying out its charge. It soon became apparent that truly implementing ICM required far more than simply verifying the presence of these characteristics by checking them off on a list. Rather, ICM requires a distinct framework so as to distinguish it from other planning or project models. For example, ICM can be implemented relative to a particular subject,

Essential Characteristics of ICM

- A dynamic and continuing process.
- Effective communications, coordination, and interaction among key actors within and between disciplines and programs relating to coastal and ocean management.
- Ongoing monitoring, evaluation, and adaptive management as appropriate (i.e., modification).
- Application and sharing of fiscal, human, and technical resources adequate to meet the needs of the mission and to maximize cost-effectiveness.
- Effective interaction between science and policy development and implementation.
- A process oriented toward producing results.

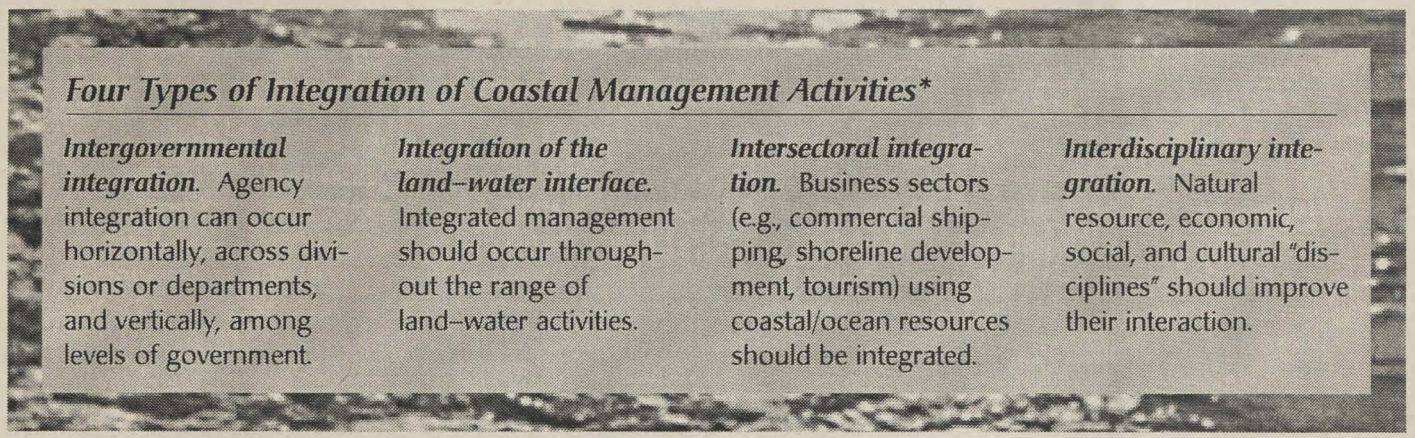
such as the establishment and implementation of a marine pollution-prevention program in a given area. Or it can be applied across a wide range of tasks within a given geographic area or to programs of statewide and national scopes.

As displayed in the box below, opportunities abound for integrating coastal management activities. In a time of sharply increased competition and demand for federal funds, these opportunities must be seized. The roles and functions at the federal, regional, state, and local levels must be evaluated and refined to eliminate redundancy and to promote further sharing of the responsibilities of achieving coastal management goals.

Toward this end, the institutionalization of ICM is essential. NOAA—and specifically NOS—should take the initiative to achieve both the effective integration of its own coastal and ocean stewardship functions, as well as integration with those of other federal agencies and coastal states.

The Committee believes that state coastal management programs, and the relationships they have developed, are the most immediate way to pursue ICM. They are comprehensive, seek to balance development and conservation in the coastal zone, and currently cover 95 percent of the nation's shoreline.

The observations, conclusions, and recommendations set forth in this report reflect the Committee's optimism and conviction that the substantial benefits of ICM can be realized within a relatively short period of time with a meaningful commitment by NOAA's leadership.



*Four Types of Integration of Coastal Management Activities**

Intergovernmental integration. Agency integration can occur horizontally, across divisions or departments, and vertically, among levels of government.

Integration of the land–water interface. Integrated management should occur throughout the range of land–water activities.

Intersectoral integration. Business sectors (e.g., commercial shipping, shoreline development, tourism) using coastal/ocean resources should be integrated.

Interdisciplinary integration. Natural resource, economic, social, and cultural "disciplines" should improve their interaction.

*Robert W. Knecht and Jack Archer, " 'Integration' in the US Coastal Zone Management Program," in *Ocean & Coastal Management*, vol. 21, special issue on "Integrated Coastal Management" (Essex, England: Elsevier Science Publishers, Ltd., 1993).

Summary of Recommendations of the Integrated Coastal Management Committee

NOAA should take immediate steps to improve the *Strategic Plan*.

The revised document should provide the framework for identifying actions to restructure and integrate NOAA's programs to achieve greater program efficiencies, to avoid duplication and conflict, and to be of greater practical use to coastal and ocean resource managers in NOAA and in the coastal states.

Implementation of NOAA's *Strategic Plan* must be a high priority.

NOAA is commended for developing its *1995–2005 Strategic Plan.* However, it is not apparent that the Plan has been or will soon be implemented in any meaningful or substantive manner. Most of the initiatives in the Coastal Ecosystems Health chapter have languished, apparently because of limited attempts to redirect existing programs to implement the initiatives and because of inadequate new funding.

Better integration of federal and state coastal management efforts is important and achievable, and should be implemented immediately.

The national framework for managing the nation's coastal and ocean resources exists and is distributed throughout numerous federal agencies. This leads to duplicative and wasted effort. Although Congressional mandates have provided states with a critical role in managing these resources, state efforts are often frustrated by a lack of useful and accessible federal scientific and technical expertise.

NOAA must better integrate its science, research, and management activities.

NOAA supports, undertakes, and produces high-quality science and research. There is an urgent need to more effectively integrate the existing and new knowledge from these efforts with NOAA's coastal and ocean management responsibilities. Furthermore, a significant gap at the science–policy interface, both within the agency and with NOAA's partners in the federal and state sectors, needs to be reduced as a matter of high priority.

NOAA's products and services must meet users' needs.

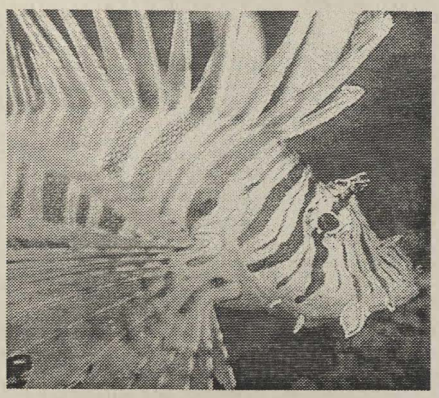
NOAA's products and services are not readily accessible to their users. In addition, a disconnect exists between what coastal managers need and what is produced for their use. Special emphasis is needed within the coastal management arena to provide technical assistance both on an ongoing and on a problem-driven basis. Finally, there must be a mechanism for evaluating those products and services.

The public and private sectors must integrate their coastal management activities.

The effective management of the nation's ocean and coastal resources requires that all levels of the public and the private sectors integrate their activities, both across economic sectors and throughout the land-water interface. Meaningful *evaluation, feedback, and adaptive management* are essential to making sustained progress.

A sustained national education and outreach campaign is needed.

As the nation's lead coastal and ocean agency, NOAA needs to develop and implement, in collaboration with its multiple partners, a sustained national education and outreach campaign that focuses on the significance of the nation's ocean and coastal resources.



Evaluating NOAA's Initiatives for Healthy Coastal Ecosystems

The ICM Committee initially explored the effectiveness of the Coastal Ecosystem Health Initiative, as presented in the *Strategic Plan*. As the Committee's work progressed, the scope of its review expanded to include the efforts of the Coastal Ecosystem Health Team, mechanisms for evaluating NOAA's programs, and outreach and education activities related to ICM.

The CEH Initiative: Solid Progress Despite Insufficient Funding

In 1993, NOAA launched its Coastal Ecosystem Health Initiative as a collaborative effort among program areas within the National Ocean Service (Office of Ocean and Coastal Resources Management and Office of Ocean Resources Conservation and Assessment); the National Marine Fisheries Service; Oceanic and Atmospheric Research; the National Environmental Satellite, Data, and Information Service; and the Coastal Ocean Program. This collaboration brought together into a conceptual framework disparate and independent coastal program elements being developed for the FY 1994 federal budget process.

This CEH Initiative sought to build on NOAA's more than twenty years of experience in managing coastal resources. It was to be a joint federal and state effort to better integrate management activities in an ecosystem-wide approach. It planned to increase monitoring in coastal areas, conduct assessments to provide better information for decision makers, and provide education and outreach to increase public understanding.

Developing an agencywide approach to achieve this vision implied a new paradigm for doing business in NOAA. NOAA senior management embraced this challenge and viewed it as a strategy for implementing elements of the Administration's coastal agenda. NOAA recognized that current fiscal resources were not adequate to pursue this new approach and proposed budget increases for FY 1994 and 1995.

As the ICM Committee reviewed the *Strategic Plan* and other NOS briefing materials, it became readily apparent that the CEH Initiative did not produce, in the federal budget process, the desired funding increase. Nevertheless, the initiative has set a policy course of action over the past two years and has encouraged NOAA staff to work collaboratively with other elements inside and outside of NOAA. The new paradigm appears to be working in some cases, and the Committee recognizes the several examples of positive progress, highlighted on the following page.

The CEH Team: A Concerted Effort With a Poorly Defined Mission

In the spring of 1994, the ICM Committee was invited to send a representative to observe and comment on the efforts of the Coastal Ecosystem Health (CEH) Team. The invitation was extended in response to the inquiries of the ICM Committee and also to the long-expressed wishes of members of the coastal management community to have input into NOAA's program and budget priority-setting activities.

Organized by NOAA's Office of the Under Secretary, the CEH Team was composed of mid-level managers from several of NOAA's program offices. The team had the mandate of revising and refining the CEH component of NOAA's *Strategic Plan* and proposing in the President's FY 1996 budget the necessary funding for its implementation.

Some Successes Stemming From the CEH Initiative

- Creation of a new partnership between NOAA's Office of Ocean and Coastal Resources Management and the U.S. Fish and Wildlife Service to cooperate on resource management, education, and research.
- Formation and implementation of the Center for Coastal Ecosystem Health, in collaboration with NOAA's coastal stewardship partners.
- Continuation of work on an integrated NOAA-wide strategy for watershed-based, ecosystem management-oriented outreach and education.
- Transfer of technology to marine-related industries and businesses to achieve sustainable development in the coastal zone.
- Development of a coordinated strategy with all relevant NOAA components and the U.S. Environmental Protection Agency to implement the National Coastal Monitoring Act.
- Continuation of the application and demonstration of integrated coastal management principles in developing a water-quality protection program for the Monterey Bay National Marine Sanctuary, a partnership activity with federal, state, and local governments and academia.
- Initiation, in partnership with others, of geographically focused activities in coastal ecosystem management, such as NOAA's adaptive ecosystem management plan for Florida Bay.
- Establishment of a standardized, systemwide National Estuarine Research Reserve monitoring program to provide information on national estuarine environmental trends.
- Invitation of the coastal management community to assist in making progressive changes to Section 309 of the Coastal Zone Management Act.

The convening of the CEH Team was a positive indicator of NOAA's interest in taking steps to improve the way it does business, using an approach consistent with integrated coastal management. Unfortunately, the CEH Team was asked to advance an initiative to be funded solely with "new money" (i.e., additional appropriations above base funding). Additionally, the close of the budget cycle ended the team's mandate, probably postponing for one or possibly two years the prospect of significantly advancing the CEH component of the *Strategic Plan*.

The Committee commends NOAA for bringing together on the CEH Team the mid- and upper-level managers whose work does or could relate to the many goals outlined in the CEH component. This was a very constructive step for several reasons:

1. These were the very managers who need to work together to help identify program priorities and opportunities to eliminate costly duplication.
2. The initiative represents a team approach, which is essential to achieving greater efficiencies and more useful and lest costly information sharing.
3. Many members of the CEH Team embraced the logic of this integrated approach to carrying out their work and demonstrated a strong interest in making NOAA's work more directly useful to coastal managers.

Unfortunately, this potential for achieving multiple benefits was not realized. Absent clear and firm direction from NOAA's leadership to do otherwise, the whole effort began and ended with assembling an FY 1996 budget proposal. The task of evaluating and revising the CEH component of the *Strategic Plan* was jettisoned without comment, and the CEH Team disbanded once FY 1996 budget decisions were made. The urgent imperatives of the budget process fully eclipsed any opportunity for a deliberative review and thoughtful discussion of the issues relating to the CEH component, and thereby prevented the participants from developing any well-conceived proposals.

The CEH Team did not have the time or the direction to solicit input from NOAA's external partners in order to identify priorities relative to the CEH Initiative. In the long term, such priorities should not be set in isolation. In addition, there was no effort or opportunity to examine or recommend the restructuring of existing base programs to achieve CEH goals. It was unrealistic, at best, to expect that the CEH element would be

implemented with new money alone. Based on the evolution and handling of the CEH element, the ICM Committee has concluded that NOAA's leadership saw it merely as a secondary or "add-on" goal to be taken seriously and implemented only if the Office of Management and Budget approved an FY 1996 budget initiative for new money.

At the conclusion of their inadequately defined mission, CEH Team members were understandably frustrated that their time commitment and diligent efforts to "get the job done" within unrealistic deadlines, were, in the end, seemingly wasted. The principal message they received from this experience can only have been that NOAA's leadership does not value this new way of doing business.

In conclusion, the ICM Committee recognizes that developing the *Strategic Plan* was an enormous undertaking and commends NOAA for committing human and financial resources to the task. The product represents a valuable first effort. However, the *Strategic Plan,* as written, is excessively vague, is insufficiently linked to NOAA's legislatively mandated programs, and cannot be meaningfully implemented without substantial revisions and refinements. By virtue of its approach to the FY 1996 budget process, NOAA missed an important opportunity to effectively initiate the implementation of the CEH element. Only timely and deliberate action by NOAA's leadership will avoid a similar outcome in the FY 1997 budget development process.

In the context of current political and fiscal realities, NOAA will most likely have to operate within the constraints of lower levels of fiscal resources. Accordingly, NOAA should take immediate steps to improve the *Strategic Plan.* The revised document should provide the framework for identifying actions to restructure and integrate NOAA's programs to achieve greater program efficiencies, to avoid duplication and conflict, and to be of greater practical use to coastal and ocean resource managers in NOAA and in the coastal states.

Promoting Sustainable Development Through the Center for Coastal Ecosystem Health

NOAA's new Center for Coastal Ecosystem Health in Charleston, South Carolina, presents a unique opportunity for advancing integrated coastal management. In FY 1994, NOAA received new federal appropriations directed toward enhancing coastal management decision making, while ensuring environmental stewardship and environmentally sustainable economic growth in the coastal zone. A special focus was on the need for bridging the gap between science and management.

Although NOAA will manage the Center, its program will be developed, conducted, and carried out in partnership with the academic community; with federal, state, and local agencies; and with private enterprise concerned with coastal ecosystem management, research, and technology. The Center will contribute to improved management strategies for achieving environmentally sustainable and balanced ecological, cultural, and economic health in the coastal zone by collecting data, synthesizing information, and developing technologies.

The Center will work in close partnership with its users to ensure the effective development, translation, and delivery of its products. The Center's objectives are supportive of the ICM concept and are consistent with the Committee's recommendations for changing the way NOAA does business. While the Center has involved the user community in its initial planning activities (over eighty state and federal coastal resource mangers attended a workshop in April 1994 to provide input on their needs for products and services from the Center), the Committee cannot state strongly enough that this collaborative process must be institutionalized.

The CEH Team Approach

In contrast to the standard way of doing business, in which individual line offices simply "send up" (to top management) independently conceived budget requests, the CEH Team approach has clearly demonstrated the advantages of:

- productive partnerships,
- the potential for ensuring problem-driven priority setting, and
- the benefits of pooling resources.

The NOS Internal Review: Measuring Program Effectiveness

During the Committee's deliberations it became apparent that no mechanisms existed for measuring the effectiveness of NOS's products and services. Absent any formal program review process, the Committee could clearly see why disconnects between NOS and its users exist.

The Committee was advised that NOS planned to institute reviews of all NOS program components. In the fall of 1994, NOS assembled external review panels of four to six members, representing user groups, academia, industry, and government agencies. With extensive NOS program interaction, the review process focused on the twelve divisions within NOS and covered one-third of each division's yearly activities. The reviewers submitted written comments and recommendations, and the divisions developed action plans and timetables for implementing the recommended changes. However, the reports are not available as of the printing of this report.

The Committee applauds NOS for its initiative. If this review process is implemented throughout NOAA, the reviewers should assess the value of NOAA's products and services to the coastal/ocean management and scientific communities and to others. In particular, the assessment should document how these products and services are used, how accessible they are, and how they can be improved.

Promoting ICM Through Outreach and Education

The quality of life, economic prosperity, and the productivity of commercial and recreational fisheries all depend on maintaining healthy coastal environments and ecosystems. To improve the public's understanding of these interrelationships and their importance to their daily lives, NOAA has proposed to harness the capabilities and resources of the Coastal Management Program, the Sea Grant Marine Advisory Services of the National Sea Grant College Program, and the Center for Coastal Ecosystem Health.

The Committee supports these outreach and education efforts, and believes they are essential to the success of the CEH Initiative. However, the Committee is concerned about the lack of coordination among these program elements, as well as with the user community. Such coordination is critical to avoid duplication and ensure effectiveness.

The Coastal Management Program's National Campaigns

During its deliberation, the Committee learned that NOAA is proposing to implement four national campaigns within its Coastal Management Program:

1. A grassroots campaign designed for communitywide action that will create a year-round message that is now communicated by Coastweeks.
2. A national awareness campaign to increase participation in NOAA's Coastweeks activities. In 1995, this campaign will capitalize on NOAA's 25th anniversary, the Year of the Environment, the 20th anniversary of the first National Marine Sanctuary, and the 20th anniversary of the first National Estuarine Research Reserve.
3. A two-pronged educational campaign for coastal stewardship, consisting of workshops environmental professionals (e.g., city planners and developers) and youth-oriented educational materials developed by program partners, such as the curriculum designed and field-tested by the Wells National Estuarine Research Reserve.
4. A partnership program for businesses and nongovernmental organizations to provide the in-kind services necessary to carry out the other three campaigns.

Goals of NOS's Program Review

- To foster communication and interaction throughout NOS, thereby enhancing program cooperation, integration, and coordination.
- To measure progress, identify program accomplishments, and evaluate NOS's contributions to NOAA's goals.
- To evaluate program directions, priorities, and quality.
- To provide analysis that will enhance public recognition of NOAA's programs.

Work in progress on these campaigns includes award of contracts to survey local government officials on their views regarding coastal and ocean management; collate and create a data base of existing coastal economic indicators; and identify and secure potential private and nonprofit partners in a Coastweeks national awareness campaign.

National Sea Grant College Program

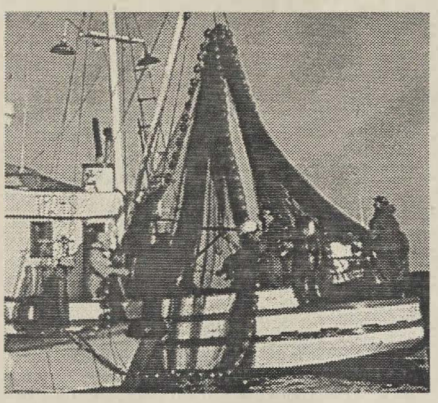
The National Sea Grant College Program is designing a multifaceted program that will include a technical assistance component. Activities will target state and local government officials, coastal businesses and resource users, and citizen action groups. Focus areas being considered include support for citizen-driven programs for monitoring water quality and ecosystem health; demonstration projects evaluating the effectiveness of Best Management Practices and habitat-restoration methodologies; and assistance in using such tools and products as models for screening water quality, watershed-scale land-cover characterization, geographic information systems, and environmental valuation techniques.

Effective watershed management must involve a wider range of interest groups than the usual mix of state and federal regulators. Thus, the Sea Grant program is also considering providing policy and planning assistance to enable nontraditional partners to take part in the collaborative process. In addition to the traditional role of providing a technology transfer link between researchers and various constituencies, the Advisory Service will assist both in developing and using interest-based strategies for coastal ecosystem management and in providing conflict-resolution techniques to help solve intractable problems.

The third vehicle being considered for educating target audiences and the general public is the use of a wide range of media techniques. These would include newspapers, radio, television, videotape, and computer technology.

Center for Coastal Ecosystem Health

The newly formed Center for Coastal Ecosystem Health has training, outreach, and education capabilities housed within its coastal management services function. The Center is developing a detailed communications plan for publicizing its products and services. The plan will include a component for providing and facilitating technical training and education through such formal mechanisms as courses and seminars, conferences, workshops, and symposia. An example would be to conduct a workshop in collaboration with the South Atlantic and Caribbean Regional Marine Research Program, the South Carolina Sea Grant Consortium, and state managers and scientists on the application of economics in environmental management.



The User Survey: Determining the Needs of State Coastal Managers

During the ICM Committee's deliberations, it became obvious that a considerable information gap exists regarding the needs of NOAA's users. The Committee also suspected a similar gap on the part of state coastal zone management programs about NOAA's services, capabilities, and resources.

To determine just how extensive this gap was, the Committee developed a needs survey of all coastal states, territories, and commonwealths to generate information about the states' greatest coastal zone management problems, the scientific and technical information needed to resolve those problems, and whether NOAA's current products and services are, or can be, of assistance in addressing them. Underlying this quest is the premise that integrating NOAA's internal resources to better support coastal management activities, and improved integration of efforts between NOAA and state coastal management agencies, are crucial to advancing NOAA's goal of creating healthy coastal ecosystems.

Survey Methodology

The survey was drafted and conducted under severe time constraints, resulting in the sacrifice of some methodological soundness for the sake of expediency. With help from NOS's Strategic Environmental Assessments Division, the Committee developed and sent a questionnaire (in the appendices of this document) to thirty-four coastal program managers, twenty-eight of whom responded. Although the surveys were sent only to state coastal managers, the problems and needs identified are also priorities for other partners in coastal management, such as local governments.

The nation's thirty-four coastal states' physical and social characteristics, program mandates, and jurisdictions vary greatly. Therefore, the analysis of survey results is focused on identifying the problems and types of assistance common to a majority of

Coastal Management Problems Listed in the Survey

- Managing coastal development to avoid erosion/storm damage
- Mediating multiple-use conflicts
- Preventing wetland habitat loss
- Direct vessel traffic impacts
- Oil and hazardous material spill prevention
- Point-source pollution control
- Expanding recreation opportunities
- Marine species decline
- Water supply
- Lack of scientific data linking development activity to adverse resource impacts
- Nonpoint-source pollution control
- Endangered species protection
- Conflicting management/regulation
- Hazardous waste sites
- Preventing upland habitat loss
- Other

states. In addition, states may have interpreted the choices of answers provided differently both from each other and from the way NOAA may understand them. Given the short turnaround time both for assembling the survey and for states to respond, providing respondents with background information that would ensure the comparability of their responses was infeasible. Nevertheless, this was a useful step in the correct direction of soliciting this type of input from the coastal states.

Analysis of Survey Results

A theme that appears with some regularity in the responses is that program managers have little or no knowledge about the information and services NOAA is capable of providing that could be of assistance to coastal states. This suggests that NOAA—and specifically NOS—needs to do a better job needs of informing coastal managers about its various programs. While the state responses indicate a lack of specific knowledge of NOAA's products and services, they did not reflect an

Application of NOAA's Products and Services to State Problems

Priority Problem	Number of States Citing Problem	Types of Products and Services Needed (No. of Times Cited)	Areas Where Assistance Is Most Needed
Nonpoint-source pollution control	20	Data (14 times) Expert consulting (6 times) Technology (5 times)	Pollution discharge estimation (7 states) Monitoring (6 states) Satellite imagery (5 states)
Preventing wetland habitat loss	17	Data (10 times) Expert consulting (10 times)	Resource assessments (6 states) Monitoring (5 states) Damage assessments (4 states) Management planning (4 states)
Lack of scientific data linking development activity to adverse impacts	15	Data (23 times) Technology (10 times)	Marine resource management (10 states) Resource assessments (10 states) Photogrammetric products (9 states) Damage assessments (8 states) Pollution discharge estimation (7 states)
Managing development impacts to avoid erosion/storm damage	15	Data (14 times) Expert consulting (6 times) Technology (5 times)	Resource assessments (6 states) Satellite imagery (4 states) Photogrammetric products (4 states)
Mediating multiple-use conflicts	13	Expert consulting (3 times)	—

indiscriminate demand for support from NOAA. NOAA was seen to play—or potentially play—a role with respect to selected issues and types of assistance.

Many respondents also reported that NOAA does not generate information on a scale that is useful at the management (e.g., watershed) level. This suggests that NOAA needs to examine whether its current coastal and ocean research, assessment, and monitoring activities can generate management-level information products, and/or whether some of these activities need to be restructured to generate management information on other than a national scale.

Following are the survey results regarding the relevance of NOAA's products and services to state problems, the obstacles to obtaining NOAA's products and services, and the products and services not available from NOAA that the states need. A detailed compilation of the states' responses and copies of each state's individual survey responses are available upon request.

Relevance of NOAA's Products and Services to State Problems

The coastal states think NOAA's products and services could be very helpful in addressing four of their five priority problems. The following table shows the major problems identified by the states, the types of products and services available from NOAA that the states think would be most useful in resolving those problems, and the areas where those products and services are most needed. The provision of data was the type of assistance most frequently requested by the states. That NOAA's products and services were only identified three times as being useful for mediating multiple-use conflicts may reflect the belief that such conflicts are largely resolved through a political process at the state and local levels.

Obstacles to Obtaining NOAA's Products and Services

Three major obstacles to obtaining NOAA's products and services were cited:

- States don't know what data and technical assistance are available from NOAA (22 states).
- The data are not disaggregated or collected for use at the relevant management level (20 states).
- States don't have input into the design of research, monitoring, and assessment projects to ensure they answer coastal management questions (15 states).

Other problems cited included a perception that NOAA lacks expertise in certain fields like protecting wetlands, that there is no direct mechanism for obtaining information when it is needed, and that the data and issues NOAA focuses on are irrelevant to the needs of tropical islands.

Needed Products and Services Not Available from NOAA

A majority of states agreed that scientifically supported methodologies for addressing the impacts of coastal development—particularly the cumulative impacts—are a necessary and appropriate form of assistance from NOAA. The provision of regional seminars and workshops, technical assistance on specific coastal issues, and training on state-of-the-art technologies and methodologies was cited as being of great assistance to state coastal management efforts. Also, some type of information clearinghouse was repeatedly identified as sorely needed. (The Committee thinks that perhaps the new Center for Coastal Ecosystem Health can perform this function.)

ICM and the Science–Management Interface

Central to the concept of integrated coastal management is the role that scientific research plays in providing data and frameworks for sound resource management decisions. It is increasingly clear that science (in all its permutations and interpretations) will play a greater role in both the formulation and the evaluation of resource management decisions. Already, we have seen an increase in its use by both those seeking and those contesting certain resource management decisions. As the environmental and ecological sciences mature, our understanding of natural systems and their interactions with human systems will grow. The challenge is to ensure that scientific information is interpreted without bias.

The degree to which decisions are affected by political exigencies is separate from the need for sound scientific bases. Nevertheless, the relationship between science and resource management is complicated by differences in scale (temporal and spatial) and in culture. For example, the scientific and management communities may understand the same descriptions of ecological processes, but their interpretations and resultant applications may vary dramatically.

A series of regional workshops being sponsored by the National Academy of Sciences in 1994–95 and the 1994 workshop to define the mission of the Center for Coastal Ecosystem Health are a few examples of how this science–policy interface is being examined. However, it is important to note that the technical work generally supported by NOS is monitoring coastal zone management problems on a national scale. While the information this monitoring yields has some utility for state coastal managers, such as providing some insights on general trends, its use as an aid to their specific decision-making processes is marginal, at best.

How Resource Managers Can Facilitate Scientific Investigation

The extent to which resource managers understand science and its relationship to decision making will greatly influence both their appreciation for and application of scientific information. Resource managers need to improve their knowledge of the philosophy, nature, and methods of scientific investigations, along with the possibilities and limits of scientific research. Credible, unbiased research scientists will not be able to directly answer many policy and management questions with absolute certainty.

Resource managers also need to clearly define the problem at hand early in the process and should frequently articulate the specifics of their resource management goals. For example, they should explain how the scientific information is to be used, how much time and funding is provided for the research, and whether there is time for a credible peer review process to evaluate the quality of the science.

Agencies should build their in-house resource management capabilities to access and apply the technical information available from research scientists. Resource managers who are most comfortable with scientific processes should cultivate and maintain relationships with scientists.

Resource management decisions often require information to be provided on a relatively short time scale. This need is contrary to the substantial lead time necessary for conducting the studies that will produce the requested information. And yet, there is often a strong relationship between the short-term information requirements of resource managers and

the longer investigative horizons of scientists. For example, scientific work on interannual and decadal climatic events, such as El Niño, is closely related to an improved ability to forecast short-term coastal storm events.

Managers need to recognize that scientific knowledge is continuously evolving. Original investigations that yield basic data lead to more specific and applicable data. Consequently, both basic and applied scientific investigations need to be supported.

Principles for Using Science in Resource Management

- Scientists need to be objective, unbiased "translators" of the facts that they have rigorously and reliably gathered and to provide tools with which to assess and predict impacts on natural processes. To protect their credibility, scientists should not be expected to be advocates or policymakers.
- Scientists can explain the processes, make projections about the impacts of activities and alterations, and discuss the potential results of various decisions. Scientists and resource managers should work together to ensure the proper understanding of data and technology.
- Policymakers and policy implementors should use science to inform, rather than rationalize, their decision processes. Science is part of the framework for the decision process; it is not the decision process itself.
- Policymakers and implementors need to be sensitive to the different time-scale requirements of political and scientific processes. Most often, a thorough and rigorous scientific investigation requires far more time than the political process allows. Management agencies must work to continuously modify both their short- and long-term data requirements.

How Scientists Can Support Resource Management

Scientists need to understand the imperatives of the resource management process. Decision makers will not fully understand the implications of scientific work, nor will they always follow the logical conclusions of the research throughout the decision process. Decisions are often incremental or made on a case-by-case basis.

Decision makers expect the science to be responsive to the questions asked. All too often, scientific reports may be technically correct but may be perceived as failing to address the specific questions at issue. Scientists need to ask more detailed and practically oriented questions to ensure that their work is correctly interpreted and applied. They also need to clearly explain the conclusions that can be drawn from their work and understand the constraints of the policy environment.

Finally, scientists need to provide information about what is needed to carry out a scientific inquiry, including cost estimates, timelines, and the personnel they need to conduct and review the work.

Committee Findings and Recommendations

NOAA's vision for the year 2005 is to promote healthy coastal ecosystems by ensuring that economic development in U.S. coastal ecosystems is managed in ways that maintain biodiversity and the long-term productivity of coastal and ocean resources.

There are many compelling reasons to embrace ICM as a way to improve the nation's ocean and coastal stewardship programs. Among these are the public's demand for greater efficiency in and relevance of government programs to solve real problems, and increased competition among programs for fewer tax dollars. The Committee believes that the stakes are high and of considerable consequence. At risk is the credibility of the federal government and the long-term effectiveness of the nation's most comprehensive and successful land- and water-management program.

To fully realize its promise, ICM will require an unaccustomed level of coordination and cooperation and an evolution and integration of the cultures of NOAA and of the state coastal management programs. It will also require the investment of existing and new resources. Even with these changes, however, the mission of coastal management will remain the same: to encourage and sustain economic development that protects coastal environmental quality and natural resources for current and future generations.

The Committee has organized its findings and recommendations based on the chapters of the Coastal Ecosystem Health section of the *Strategic Plan*. This format facilitates NOAA's pending revision of the Plan and provides a relatively easy way for NOAA's users to check whether the following recommendations were subsequently incorporated.

Integrating NOAA's Coastal and Ocean Agenda

A top priority for NOAA must be to ensure effective integration:

- between NOAA's Congressional coastal and ocean mandates;
- within its science, technical, and management expertise and related infrastructure; and
- with its external partners (e.g., state agencies, research partners, federal agencies, and others interested in coastal management).

The NOAA Strategic Planning process offers an effective vehicle for NOAA to forge a coherent agency agenda. Follow-on implementation is crucial.

Improving Interaction Within NOAA

- An NOS Standing Team charged with effectively integrating NOAA's coastal and ocean management operations should be organized and supported (e.g., staffed and funded). Measurable goals and objectives for the team should be developed, monitored, and modified as appropriate.
- NOAA needs to significantly strengthen its internal communications process. An initial action should be to survey NOS staff to learn of their perceptions of communication problems and obstacles. Elements of an internal communications strategy should address:
  - management's communication with the staff on agency priorities, policies, and approaches; and
  - active participation of staff in internal program planning, strategic planning, and budgeting.

- In developing annual budget requests that respond to the Strategic Plan, NOS needs to provide adequate time and staff resources to ensure specific goals and objectives are articulated and successful proposals are developed. A feedback loop should be established to ensure that staff are informed of the status of the proposals and that suggestions are made to strengthen future proposals. Finally, NOAA needs to make a commitment to ensure that this proactive planning occurs throughout the year and not just when the budget is being developed.

Enhancing Communication With External Partners and Others Interested in Coastal Management

- NOAA must describe its coastal and ocean management responsibilities so that people understand they include active management and advisory functions.
- NOAA needs to systematically review who its partners are, including those within the agency, within other federal, state and local agencies, and within the research community and the general public.
- NOAA must develop and expand existing efforts to identify users' needs and adopt a focus on users' needs as an operating philosophy.
- NOAA needs to act on Congress's mandate that NOAA be the nation's lead agency on coastal and ocean management by developing, with its external partners, a coastal/ocean agenda. An initial action should be to review federal coastal and ocean management activities and responsibilities. The product would be a shared vision by the agencies on their collective goals and objectives over a defined period of time.
- NOS staff members need to develop and maintain effective working relationships with agencies that have complementary missions.
- NOAA needs to make its skills and services more widely known and to substantively involve their users in its decision-making process.

Strengthening Management and Science Linkages

- NOAA should strive to become the most effective federal agency in forging management–science relationships, both internally and with its external partners. As an initial step, NOS should aggressively develop and support an external coordination mechanism (e.g., Roundtable) that routinely convenes NOAA's management and science users, including other federal agencies.
- The Office of Ocean and Coastal Resources Management and the National Sea Grant College Program should develop and maintain a mutually supportive relationship with the Center for Coastal Ecosystem Health that links the management and science communities and that stimulates their interaction.
- NOAA, in collaboration with the users of its products and services, needs to prepare a series of implementation actions as a follow-up to the National Academy of Sciences management–science workshops in California, the Gulf of Maine, and the Gulf of Mexico.

Assessing and Monitoring Coastal and Ocean Programs

Integrated coastal management requires periodic assessment and monitoring of the mechanisms used to manage coastal resources. Special emphasis must be placed on assessing the effectiveness of these mechanisms in achieving the desired outcomes, and changes should be made as needed.

Placing a Priority on Evaluations

- NOAA needs to provide for routine evaluation and feedback on its science, research, education, and management activities. This effort should focus on the success of these activities in meeting desired outcomes and on the quality of the agencies' relationships with their user communities (e.g., managers, scientists). The users of NOAA's products and services must be substantively involved in the creation, development, and periodic evaluation of programs that are conducted for them, such as applied research programs and strategic assessments.
- NOAA, with its state partners and others, needs to assess the public's perceptions of coastal issues and needed management responses.
- NOAA needs to assess the value of its products and services to the coastal/ocean management and science communities and others. In particular, this assessment must document how the products and services are used by managers, must evaluate the

accessibility of the materials, and should solicit managers' recommendations on how to improve these products and services.

Emphasizing Collaborative Relations

- NOAA must embrace the concept that its coastal/ocean management and science missions are complementary, are individually valuable, and must be effectively integrated. A shared vision and true partnership must be formed and accepted as the agency's corporate culture.

Assessing Program Effectiveness

- NOAA should assist coastal states in evaluating the effectiveness of coastal and ocean laws in achieving their stated objectives and should provide for the effective integration of science in these evaluations.
- NOS needs to refocus its annual evaluation of state coastal management programs and research reserves to determine the effectiveness of coastal management actions in meeting stated outcomes as they relate to federally approved programs. A broad spectrum of management and science interests should be solicited to review the current evaluation process, with an eye toward the 1995 reauthorization of the Coastal Zone Management Act..

Enhancing Technical Assistance and Understanding

NOAA, in collaboration with its partners, needs to support integrated coastal management on a regional scale. It must use its technical assistance capabilities to support its partners and ensure that a solid link exists between management actions and the science that is available to support them.

Demonstrating Integrated Coastal Management

- NOAA needs to encourage and support regional (i.e., intrastate and interstate) pilot projects to demonstrate, promote, and learn more about the principles of integrated coastal management. Specific and measurable goals must be developed at the inception of projects and must be periodically evaluated. One aspect of these efforts is to work with the coastal/ocean management and science communities in synthesizing existing management and science initiatives and programs (all levels and agencies) into a coherent, integrated approach that all partners understand.
- NOAA needs to institutionalize the integration of science (e.g. photogrammetry shoreline profiles, charting, geodesy) and management programs in its annual budgeting and planning process, so that work valuable to state coastal management programs and research reserves is made available in a timely and useful manner.

Strengthening NOS's Ability to Provide Technical Assistance

- Technical assistance on a wide range of coastal issues is a priority need of state coastal programs that NOS can most effectively fill. Recent NOS efforts, such as the User's Guide to NOAA Products and Services and the CZMA Section 310 Technical Assistance Strategy, are examples of the initiatives NOAA needs to develop and fund.
- NOAA needs to work with its state partners in applying information technology and approaches to priority coastal/ocean issues (e.g., cumulative impact analysis and mitigation).
- NOAA needs to develop and support several highly focused, technical assistance teams (e.g., HAZMAT) that can respond in a timely manner to requests for assistance. An immediate need of NOS's state partners is technical assistance on nonpoint-source pollution issues. This "strike-ready" team of technical and scientific advisors would draw on the expertise of NOAA and other federal agencies to address complex issues. This function might reside within the Center for Coastal Ecosystem Health.

  An initial action should be to ensure that individual line offices are directed to provide time and resources for rapid responses to acute and emerging issues. This can be done through a variety of mechanisms, including:

  - interagency teams (e.g., OAR and NOS) that foster substantive and effective interaction within the agency;
  - "scientific rotators" or IPAs that augment and strengthen the breadth (e.g., natural/social sciences, policy, and management) and the types (e.g., international, federal, state, local, and private) of NOAA's expertise;

- temporary assignments for NOS staff in state program offices; and
- expedited processes for issuing grants and contracts.

IPAs among NOS, research, state, and local personnel will have the added benefit of promoting an understanding of the needs and capabilities of all NOAA's partners.

- NOS should develop and sustain interactive relationships with other elements of NOAA (e.g., National Sea Grant College Program, the National Marine Fisheries Service) that support priority scientific investigations directed at management issues.

Organizing Coastal Management With NOAA's Science Partners

- NOS and the Center for Coastal Ecosystem Health should hold regular forums for discussions and interactions among scientists, resource managers, and engaged citizenry. Among the areas of investigation, the Center should:
  - work with the science and management communities to define achievable and ongoing processes for supporting, reviewing, accessing, and transferring the results of scientific investigations; and
  - strengthen interaction between science and management by gathering people together to develop shared agendas.

Expanding Education, Outreach, and Information Transfer

An essential element of integrated coastal management is making data and information widely accessible to NOAA's user community. The roles NOAA must fill in meeting its users' needs include:

- educating the public about coastal and ocean issues;
- assisting its users by coordinating and integrating their science and management activities; and
- providing information transfer between its users by synthesizing the information and data, showing their applicability, and making them accessible.

Strengthening NOAA's Coastal and Ocean Public Education Outreach

- NOS should strengthen its public education activities. NOAA should initiate a sustained effort in preparing issue-driven materials in collaboration with its partners. These materials will help build a stronger, more articulate constituency for ocean and coastal management. Within this educational context, NOAA should describe its role as the nation's lead agency for coastal and ocean stewardship.

  An initial effort should be to review and coalesce NOAA's many different coastal and ocean public education mandates into an effective agencywide public education strategy. Emphasis must be placed on developing specific, measurable goals and articulating the benefits of the improved interaction that should result from the intended educational efforts.

Improving NOAA's Information Transfer Activities

- NOAA needs to emphasize that, in addition to management and science, education and technology transfer are critical components of its coastal and ocean mandate. This work would enable managers to better understand and access scientific tools, as well as assist scientists in understanding the political decision-making processes.
- NOAA needs to coordinate its data and information functions, make them more accessible, and use the Charleston Center for Coastal Ecosystem Health as a conduit (e.g., librarian, facilitator) for this information. This clearinghouse function would coalesce data and information generated by NOAA and other federal partners, by researchers, and by coastal managers. A key component would be the synthesis of the data and research for use through aggressive, proactive, outreach efforts with NOAA's state coastal managers.
- NOS and the National Sea Grant College Program should maintain a cadre of trained, knowledgeable technical translators who are available to work with state coastal management programs in adapting the data and information available through the Center. In addition, a science resource list should be developed, as proposed through the Center, identifying natural and social scientists who are available on short notice to respond to pressing environmental issues.

- The Center for Coastal Ecosystem Health should play a lead role in demonstrating and providing training in technologies that would enable state managers to use the national-scale research conducted by NOAA.

Enhancing Interaction With Other Federal Agencies' Educational Efforts

- NOAA needs to ensure that there is effective communication and interaction with other federal agencies that have shared or complementary coastal and ocean missions to attain and sustain a coordinated national education effort.
- NOS should aggressively develop partnerships with other organizations to coordinate education efforts and to leverage external funding.

Appendices

Definitions of Integrated Coastal Management

Water Science and Technology Board, Commission on Engineering and Technical Systems, National Research Council, *Managing Wastewater in Coastal Urban Areas* (Washington, D.C.: National Academy Press, 1993), p. 14:

> *"an ecologically based, iterative process for identifying, at a regional scale, environmental objectives and cost-effective strategies for achieving them. Through ICM, environmental and human resources that require protection can be identified, the multitude of factors that may contribute to adverse impacts can be considered, and the relative importance of various impacts and contributors can be weighed."*

Jen Sorensen and Scott McCreary, "Institutional Arrangements for Managing Coastal Resources and Environments," *Coastal Publications* No. 1, Renewable Resource Information Series (Washington, D.C.: National Parks Service, U.S. Agency for International Development, 1990), p. 17:

> *"a dynamic process in which a coordinated strategy is developed and implemented for the allocation of environmental, sociocultural, and institutional resources to achieve the conservation and sustainable multiple use of the coastal zone."*

Robert Knecht, Biliana Cicin-Sain, and Hernan Perez Nieto, *Summary of Workshop on Integrated Coastal Management and Sea Level Rise*, Caracas (University of Delaware: Center for the Study of Marine Policy, February 1992):

> *"a process by which decisions are taken for the use, development, and protection of coastal areas and resources to achieve goals established in cooperation with user groups and national, regional, and local authorities. ICM recognizes the distinctive character for the coastal zone–itself a valuable resource–for current and future generations. ICM is multiple-purpose oriented, it analyzes implications of development, conflicting uses, and interrelationships between physical processes and human activities, and it promotes linkages and harmonization between sectoral coastal and ocean activities."*

World Bank, *Noordwijk Guidelines for Integrated Coastal Management* (Noordwiijk, The Netherlands: World Coast Conference 1993), 1–5 November 1993, p. 123:

> *"is a governmental process and consists of the legal and institutional framework necessary to ensure that development and management plans for coastal zones are integrated with environmental (including social) goals and made with the participation of those affected."*

Survey Summary: State Coastal Program Questionnaire

We coastal program managers want the National Oceanic and Atmospheric Administration to improve its support to coastal states for implementing our management programs. This questionnaire is an initial step toward helping NOAA and coastal states better understand how this support can be directed and where relationships between state and federal programs can be strengthened. This questionnaire is focused on technical and scientific support needs (leaving aside, for the purposes of this questionnaire, the issue of increased funding).

I. Problems

Please **rank** in order of **priority** the problems facing your coastal management program.

_____ Managing development to avoid erosion/storm damage

_____ Point-source pollution

_____ Nonpoint-source pollution control

_____ Mediating multiple-use conflicts

_____ Expanding recreation opportunities

_____ Endangered species protection

_____ Preventing wetland habitat loss

_____ Marine species decline

_____ Conflicting management/regulation

_____ Direct vessel traffic impacts

_____ Water supply

_____ Hazardous waste sites

_____ Oil & hazardous material spill prevention

_____ Lack of scientific data linking development activity to adverse resource impacts

_____ Preventing upland habitat loss

_____ Sea level rise

Other *(Specify)*: _____

_____

II. NOAA Service/Products

For each of your top three problems identified above, please indicate which NOAA-provided services and products are of use in furthering your state's effort to meet state and national coastal management priorities. (**1 = Training**–e.g., provide dive or integrated coastal management training; **2 = Technology**–e.g., GIS software for resource management; **3 = Expert Consulting**–e.g., provide assistance in developing management plans or desktop information systems; **4 = Data**–e.g., charting products, data bases on pollutant loads, resource distributions, or bathymetry.

Problem 1: Nonpoint-Source Pollution Control

_____ Marine resource management
_____ Weather/climate forecasting
_____ Weather/climate reports
_____ Damage assessments
_____ Resource assessments
_____ Management plans
_____ Pollution discharge estimation
_____ Geodetic control
_____ Fisheries research
_____ Photogrammetric products
_____ Satellite imagery
_____ Permit review
_____ Nautical charts/navigation aids
_____ Monitoring program
Other *(Specify)*: _____

Problem 2: Preventing Wetland Habitat Loss

_____ Marine resource management
_____ Weather/climate forecasting
_____ Weather/climate reports
_____ Damage assessments
_____ Resource assessments
_____ Management plans
_____ Pollution discharge estimation
_____ Geodetic control
_____ Fisheries research
_____ Photogrammetric products
_____ Satellite imagery
_____ Permit review
_____ Nautical charts/navigation aids
_____ Monitoring program
Other *(Specify)*: _____

Problem 3: Lack of Scientific Data Linking Development Activity to Adverse Resource Impacts

_____ Marine resource management
_____ Weather/climate forecasting
_____ Weather/climate reports
_____ Damage assessments
_____ Resource assessments
_____ Management plans
_____ Pollution discharge estimation
_____ Geodetic control
_____ Fisheries research
_____ Photogrammetric products
_____ Satellite imagery
_____ Permit review
_____ Nautical charts/navigation aids
_____ Monitoring program
Other *(Specify)*: _____

Problem 4: Managing Development to Avoid Erosion/Storm Damage

_____ Marine resource management
_____ Weather/climate forecasting
_____ Weather/climate reports
_____ Damage assessments
_____ Resource assessments
_____ Management plans
_____ Pollution discharge estimation
_____ Geodetic control
_____ Fisheries research
_____ Photogrammetric products
_____ Satellite imagery
_____ Permit review
_____ Nautical charts/navigation aids
_____ Monitoring program
Other *(Specify)*: _____

III. Other Needed Services/Products

What services not currently provided by NOAA would be of greatest assistance to your state's coastal management effort?

_____ Legally defensible, scientifically supported methodologies/techniques for preventing the adverse impacts of coastal development (e.g., development buffers, bluff setbacks).

_____ Methodologies for assessing cumulative impacts.

_____ Other *(examples)*: _____

_____

IV. Obstacles to Obtaining NOAA Services/Products

Please indicate problems that you have experienced or have perceived in trying to obtain technical assistance or scientific data from NOAA.

_____ Don't have input into design of research, monitoring, and assessment projects to ensure they answer coastal management questions.

_____ Data aren't desegregated for use at the relevant management level (e.g., ecosystems, watersheds).

_____ Don't know what data and technical assistance are available.

_____ Other *(examples)*: _____

_____

V. The Status of Your State's Program

To better understand your needs, NOAA would like to obtain some information on your state's coastal zone program.

- How many staff are directly employed in the coastal zone program? _____
- What types of expertise do the program staff have? (1 = college degree, 2 = on-the-job experience)

_____ Planning
_____ Economics
_____ Business management
_____ Marine/coastal ecology
_____ Engineering
_____ Oceanography
_____ Remote sensing
_____ Political science
_____ Geography
_____ Geology
_____ Biology
_____ Computer programming
_____ Mathematics
_____ Chemistry
_____ Agriculture
_____ Natural resource management
_____ Agronomy
_____ Botany
_____ Fisheries management

- What is the base state funding for your program for FY 1994? _____
- What do you consider to be the three most important activities conducted by your program?

_____

_____

_____

Summary of Responses to Survey Question V: The Status of State Programs

Following are the states' responses to question V, concerning the status of their coastal zone programs. The results reveal that the average number of employees in the state coastal programs is 25, and the average FY 1994 funding is $1.7 million, ranging from $0 to $10 million. The expertise of staff with college degrees is in the areas of natural resource management, marine/coastal ecology, botany, and biology. Other staff have acquired their expertise through on-the-job training in the areas of business management, computer programming, planning, and remote sensing. The three most important activities conducted by coastal zone programs for FY 1994 were regulating (permitting and enforcement), public education/outreach, resource protection, and nonpoint-source pollution control.

State	Staff Employed in CZ Programs	Staff Expertise*	Funding for FY 1994**	Three Important Activities Conducted
Alabama	14	1—Marine/Coastal Ecology, Natural Resource Management 2—Remote Sensing, Chemistry, Agronomy, Oceanography, Botany, Agriculture	$324,000	Work with local government to implement resource protection at local level. Protection of wetlands and shoreline. Research.
Alaska	25 Office 9 State	1—Geology, Chemistry, Agronomy 1,2—Marine/Coastal Ecology, Natural Resource Management 2—Fisheries Management	$2,130,000	Coordinated state-local review of coastal projects for consistency. State liaison/planning assistance/funding for local government. Coordinated state position on federal coastal/marine/environmental policy or regulatory initiatives
America Samoa	15	1—Planning, Natural Resource Management, Fisheries, Biology 2—Marine/Coastal Ecology, Geology, Economics, Botany	$607,800	Public education. Resource protection. Public safety/protection from coastal hazards.
California (Bay City Development Commission)	25	1/2—Planning, Marine/Coastal Ecology, Geology, Natural Resource Management, Biology	$2,000,000	Planning /assessment. Long-term management strategy (dredging/disposal). Regulation (permits and enforcement).

* 1 signifies a college degree; 2 signifies on-the-job experience.

** Combination of state and federal funding.

State	Staff Employed in CZ Programs	Staff Expertise*	Funding for FY 1994**	Three Important Activities Conducted
California (California Coastal Commission)	110+	1—Marine/Coastal Ecology, Political Science, Geography 1,2—Planning, Natural Resource Management, Business Management	$10,000,000	Regulating of coastal development. Protection of natural resources of the coastal zone. Maintaining and enhancing public access to the shoreline.
Connecticut	30	1,2—Planning, Marine/Coastal Ecology, Remote Sensing, Natural Resource Management, Biology, Botany 2—Business Management, Computer Programming	$835,000	Coastal permitting and management of public trust resources. Protection and restoration of wetland and aquatic/coastal habitat. Management of future growth and redevelopment of existing urban uses for water-dependent activities.
Delaware	6	1,2—Marine/Coastal Ecology, Natural Resource Management, Computer Programming, Biology 2—Planning, Remote Sensing, Geology, Political Science	$564,000	Non-point source pollution control. Wetland restoration and management. Cumulative and secondary impact program development.
Florida	17	1,2—Planning, Marine/Coastal Ecology, Remote Sensing, Natural Resource Management, Business Management, Political Science	N/A	Interagency coordination (includes federal consistency). Public outreach. Planning and policy development.
Guam	10	1—Planning	$0	Public education. Coordination of concerns and activities through "networked" program. Input to governor on coastal concerns.
Hawaii	29	1,2—Planning, Marine/Coastal Ecology, Remote Sensing, Natural Resource Management, Political Science, Business Management	$630,000	Promoting integrated management in government programs and public outreach. Ensuring respect of coastal resources in permit and approval decisions on development proposals. Planning for future use and preservation of resources
Louisiana	36	1—Marine/Coastal Ecology, Remote Sensing, Natural Resource Management	N/A	N/A

* 1 signifies a college degree; 2 signifies on-the-job experience.

** Combination of state and federal funding.

State	Staff Employed in CZ Programs	Staff Expertise*	Funding for FY 1994**	Three Important Activities Conducted
Maine	25	1—Planning, Marine/Coastal Ecology, Economics, Natural Resource Management, Oceanography, Botany	$2,500,000	State and local land use and environmental permitting. Technical assistance to local government to manage resources. Coastal policy development.
Mariana Islands	17	1—Planning, Marine/Coastal Ecology, Remote Sensing, Natural Resource Management, Biology, Botany, Computer Programming	N/A	Permitting. Intergovernmental coordination/special projects.
Maryland	16	1—Marine/Coastal Ecology, Geography 1,2—Planning, Natural Resource Management, Biology 2—Remote Sensing, Geology	$2,300,000	Nonpoint-source pollution control. Habitat protection. Growth management.
Massachusetts	25	1,2—Planning, Marine/Coastal Ecology, Remote Sensing, Natural Resource Management	N/A	Policy development and implementation. Technical assistance. Public education.
Michigan	20	1—Marine/Coastal Ecology, Natural Resource Management 1,2—Planning 2—Engineering, Political Science, Business Management	$2,180,000	Regulation of activities in coastal areas, environmental protection. Local planning and construction projects/technical assistance. Development of coastal nonpoint-source program.
Mississippi	6	1—Planning, Marine/Coastal Ecology, Natural Resource Management 1,2—Biology	$540,000	Wetland protection. Facility planning.
New Hampshire	13	1—Botany 1,2—Planning, Marine/Coastal Ecology, Natural Resource Management 2—Remote Sensing, Oceanography, Business Management, Geography	$294,000	Enforcement of state law and rules. Developing new rules or laws to enhance the program. Addressing needs of nonpoint-source pollution control programs.
New Jersey	25	1—Planning, Marine/Coastal Ecology, Remote Sensing, Natural Resource Management, Political Science, Biology	$2,400,000	Development of coastal nonpoint-source pollution control programs. Protection of coastal resources through state regulatory program. Update of New Jersey's Shore Protection Program.

* 1 signifies a college degree; 2 signifies on-the-job experience.

** Combination of state and federal funding.

State	Staff Employed in CZ Programs	Staff Expertise*	Funding for FY 1994**	Three Important Activities Conducted
New York	51	1—Landscape Architecture 1,2—Planning, Natural Resource Management 2—Marine/Coastal Ecology, Fisheries Management, Chemistry	$2,500,000	Regulatory decisions. Resource management conflict resolution. Local and regional coastal programs.
North Carolina	50	1—Planning, Marine/Coastal Ecology, Computer Programming, Natural Resource Management	$1,400,000	Permitting and enforcement. Planning and policy. Resource management.
Oregon (Hout)	11	1—Planning, Marine/Coastal Ecology, Economics, Natural Resource Management, Botany	$1,099,000 (federal) $874,000 (state)	Comprehensive land-use planning. Ocean resource planning and management. Federal consistency review.
Oregon (Klorin)	8	1—Fisheries Management 1,2—Planning, Marine/Coastal Ecology, Natural Resource Management 2—Geology, Business Management	$806,000	Interagency coordination/policy implementation. Planning and policy development. Communication, information, data distribution.
Pennsylvania	13	1—Planning, Marine/Coastal Ecology, Natural Resource Management, Biology, Geography 2 - Business Management	$252,300	Coastal hazards. Wetlands protection. Federal consistency.
Puerto Rico	48	1—Planning, Marine/Coastal Ecology, Geology, Natural Resource Management, Oceanography, Biology	0	Monitoring and enforcement. Section 6217 planning. Wetland policy development.
Rhode Island	29	1,2—Planning, Marine/Coastal Ecology, Business Management, Natural Resource Management, Oceanography, Botany 2—Remote Sensing, Computer Programming	$900,000	Planning and management. Permitting. Public access.
South Carolina	45	1—Planning, Marine/Coastal Ecology, Remote Sensing, Biology, Geology, Geography	$1,800,000	Planning—master planning of new development. Education—direct permitting. Regulation—storm-water permitting.

* 1 signifies a college degree; 2 signifies on-the-job experience.

** Combination of state and federal funding.

State	Staff Employed in CZ Programs	Staff Expertise*	Funding for FY 1994**	Three Important Activities Conducted
Texas	14	1—Economics, Political Science, Oceanography 1,2—Planning, Marine/Coastal Ecology, Geology, Natural Resource Management, Biology, Geography	N/A	Program planning stage—no implementation as yet.
Washington	36	1 - Marine/Coastal Ecology, Remote Sensing, Geology, Botany, Law 1,2—Planning, Natural Resource Management 2—Public Administration	$2 million	Technical and policy assistance to local government. Review of local Shoreline Permit decision. Public education and outreach.
Wisconsin	7	1—Mathematics, Natural Resource Management, Business Management, Biology, Economics 1,2—Planning 2—Marine/Coastal Ecology	$899,000	Provide financial assistance. Information and education. Technical assistance.

* 1 signifies a college degree; 2 signifies on-the-job experience.

** Combination of state and federal funding.