National Coastal Zone Management Effectiveness Study: Protecting Estuaries and Coastal Wetlands

and
Marine Resource Management Program
College of Oceanic and Atmospheric Sciences
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Cover photo: North Carolina salt marsh (Sandra Good Alley photo)

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The Oregon State University Team

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Executive Summary

Estuaries and coastal wetlands are among the most important ecosystems in the coastal zone, providing goods and services that are vital to human society. The need for protecting, preserving, and restoring these valuable ecosystems was a major factor in passage of the Coastal Zone Management Act (CZMA) in 1972. Congress affirmed this in 1980 CZMA amendments, including a specific objective encouraging state coastal management programs to protect natural resources, including estuaries and coastal wetlands.

The purpose of this study, which is one part of the larger National CZM Effectiveness Study, is to determine the effectiveness of state CMPs in meeting this objective—*protection of estuaries and coastal wetlands*. Previous national evaluations of CZM have focused mainly on assessments of CZM processes or perceptions of effectiveness. This study goes a step further to determine the extent to which effectiveness can be demonstrated by on-the-ground outcomes of CZM policy implementation. For this part of the study, the principal research question was "How effective are state CMPs, individually and collectively, in protecting estuaries and coastal wetlands?"

Our approach to this research question involved extensive collaboration with the states. Data collection and state profile development were based on published information, a series of structured interviews with state officials, and unpublished information from reports, permit tracking databases, and other sources. Once all available data for the twenty-nine states were collected and state CZM profiles developed, individual state programs were evaluated for effectiveness in a four-step, structured process to determine: (1) the relative importance of the issue in the state; (2) the potential effectiveness of the program, based on analysis of the policies, processes and tools used; (3) the on-the-ground outcome effectiveness based on analysis of outcome indicators; and (4) overall context-based performance, based on comparison of outcome effectiveness results (from step 3) with issue importance results (from step 1) and potential effectiveness results (from step 2). Tidal and nontidal management efforts were evaluated separately for both ecological and legal-institutional reasons.

Findings

The principal objective of this study was to determine the on-the-ground effectiveness of state CMPs in protecting estuaries and coastal wetlands. To the extent that outcome data were available (and it was meager in many cases), we found that state CMPs are relatively effective and make significant contributions to this national CZMA objective. Among the various management tools used by states, regulatory programs rated the highest for their contributions to estuary and coastal wetland protection. But a variety of other strategies and tools, many built around state-local planning partnerships, also contributed significantly to state accomplishments. State CMP weaknesses were also apparent, including a general lack of organized outcome monitoring; relatively limited use of restoration as a management strategy in many states; and relatively weak nontidal, freshwater wetland management in many states. The principal study findings follow.

1. The importance of estuary and coastal wetland protection is relatively high for most states and for the nation as a whole. Based on the seven indicators used in this study, the importance of

estuary and coastal wetland protection as a CZM issue ranges from low to high among states, but is "moderately to highly important" overall. This suggests that most states would be expected to have relatively strong, comprehensive CZM policies, processes, and institutions in place and be operating effectively.

2. **The potential effectiveness of state coastal management programs in protecting estuaries and coastal wetlands looks good "on paper."** The *potential effectiveness* of state CMPs collectively, based on an assessment of process indicators, was judged to be "high" for estuaries and tidal wetlands—the saltwater coast—but just "moderate" for nontidal, freshwater wetlands. However, the limited use of available nontidal wetland management tools by some coastal states and too-narrowly drawn coastal zone boundaries in others means that states often lack sufficient jurisdiction to prevent the continued gradual loss of nontidal freshwater wetlands. Further, the fragmentation of wetland management responsibilities in many states and the incomplete networking of relevant authorities into state CMPs result in coordination problems, contribute to monitoring and record-keeping difficulties, and mask some state accomplishments

3. Outcome effectiveness of state coastal management programs in protecting estuaries and coastal wetlands gets moderate to high ratings for states with sufficient data. Eleven states could be assigned at least probable outcome ratings for tidal wetlands management. Of these, seven (64 percent) rated *high* in outcome effectiveness, with the remainder *moderate.* For nontidal wetlands, only seven states merited at least probable outcome ratings. Of these, effectiveness was *high* for two (29 percent), *moderate* for four (57 percent), and *low* for one. Combining tidal and nontidal, 50 percent rated high in *outcome effectiveness*, 44 percent moderate, and just 6 percent low. If it is assumed that these states are a representative sample of state programs, it is fair to conclude that nationally, outcome effectiveness is relatively high. Improved outcome data from more states are needed to prove or disprove this assertion.

4. The overall performance of state coastal management programs in protecting estuaries and coastal wetlands is relatively good for states with sufficient data. When on-the-ground outcome effectiveness in protecting estuaries and coastal wetlands is compared to issue importance-based expectations on one hand, or the "on-paper" potential as derived from process indicator evaluations on the other, 88 percent of state CMPs were judged to be performing at *expected* or *higher-than-expected* levels in the first case and 76 percent in the second case. As with outcome effectiveness, if we assume that the states for which we have sufficient data are representative, the overall performance of state CMPs nationally is fairly high.

5. Management of nontidal, freshwater wetlands needs CZM attention. The management of nontidal wetlands in state coastal zones is relatively weak compared to management of tidal areas. There are large areas of nontidal wetlands in many states that probably should be considered "coastal" for CZM purposes, but are located outside present state coastal zone boundaries. These CZM weaknesses pose significant threats to coastal and estuarine water quality, coastal ecosystem sustainability, and flood hazard mitigation.

6. Nonregulatory wetland restoration is an underutilized tool in CZM. Historic loss of estuarine and nontidal freshwater wetlands in many states is high. Although historical losses do not necessarily equate to restoration opportunities, especially in densely populated states where much wetland loss can be considered permanent, only a few states have systematically evaluated wetland restoration opportunities or developed action programs. Other states should follow these examples, working toward a goal of achieving a net gain in wetlands in the coastal zone, so as to reclaim some of the valuable ecosystem services sacrificed in the past.

7. OCRM and the states need to act quickly to standardize CZM performance evaluation. Outcome data for evaluating state performance in this study were limited, but this situation is changing at the state level. These changes present a "window of opportunity" for establishing a national CZM outcome monitoring and performance evaluation system. Because many states are gearing up for or are in the process of developing improved information management systems, the opportunity exists for OCRM and the states to ensure that nationally important state CZM outcome indicators are part of these state systems. The advent of new information-handling and sharing technologies—high-speed desktop computers, easy-to-use off-the-shelf software, GIS, and the Internet and World Wide Web—is another trend that increasingly makes a national monitoring and reporting system feasible. *The key need is for a well-designed set of policy-relevant outcome indicators*—ones that clearly indicate the degree to which decisions are leading toward desired policy goals. These are included in recommendations below.

8. Although the question of attribution for CZM outcomes may be important in some cases, it should be subsidiary to questions of CZM performance overall. Too much focus on who gets what share of credit for outcomes discounts one of CZM's chief strengths, namely its role in fostering collaboration and integration across artificial boundaries. Where shares of credit for CZM outcomes *must* be determined, however, case studies are the preferred methodology, rather than the systematic cataloging of relative contributions. We conclude that the systematic evidence needed to make definitive attribution statements about CZM outcomes is not available today and may never be. The massive effort needed to systematically assign credit for coastal management outcomes is not justifiable in the first place. Such a quest contradicts other explicit national objectives of CZM, namely objectives to foster integration, partnerships, and resource leveraging to achieve common objectives. We found that the "shared credit" nature of CZM outcomes is actually the result of wise investments of limited resources, with CZM resources often used as a catalyst for subsequent non-CZM actions.

Recommendations

Recommendation 1: Establish a National Performance Evaluation System

A national outcome monitoring and performance evaluation system should be developed by OCRM in collaboration with state coastal managers. In designing the estuary and coastal wetland protection component of that system, we recommend using the indicators and the four-step evaluation process used here to determine (1) issue importance, (2) potential effectiveness, (3) outcome effectiveness, and (4) overall performance. In addition, a fifth step is recommended—the comparison of CZM effectiveness results to the "state of the coast" to determine and evaluate gaps between them.

For the evaluation of estuary and coastal wetland protection, the issue importance indicators used in this study are recommended as a starting point, but additional indicators should be sought to make the statistic more robust and address the limitations noted in the results and discussion. Similarly, the process indicators used in this study are also recommended, but the list should be narrowed to the most important processes and tools, plus several others that were highly ranked by one or more states or were otherwise judged important. Recommended outcome indicators for evaluating estuary and coastal wetland protection are listed below:

- *Regulatory Outcome Indicators*: the six outcome indicators used for this study are recommended: (1) area of absolute permitted loss, (2) absolute violation loss, (3) absolute mitigation gain, (4) permitted loss trends, (5) violation loss trends, and (6) mitigation gain trends. For nontidal freshwater wetlands especially, these results need to factor in two process indicators—the extent of state CZM jurisdiction over the resource; and the relative strength of the policy or tool, including exemptions.
- *Planning Outcome Indicators*: the first three outcome indicators used for this study are recommended for a national system: (1) area given high protection by local plans, (2) high protection provided by Special Area Management Plans, and (3) high protection provided by other plans and designations, such as Geographic Areas of Particular Concern, or Areas of Environmental Concern, and critical areas.
- *Acquisition and Nonregulatory Restoration Outcome Indicators*: several of the indicators used for this study are recommended: (1) area acquired in fee-simple (with CZM's contribution specified), (2) area acquired using less-than-fee methods (with CZM's contribution specified), (3) area of wetland or other aquatic habitat restored through nonregulatory mechanisms (including CZM's contribution), and (4) area of wetland or other aquatic habitat created through nonregulatory mechanisms (with CZM's contribution). In addition, for nonregulatory restoration, it may be desirable to differentiate between former wetlands and degraded wetlands restored.

Regularly assessing the "state of the coast" and comparing it to CZM performance is a fifth and very necessary step in the evaluation model. Using national guidelines, states should establish a baseline and monitor change in relevant indicators, such as the change in area of tidal and nontidal wetlands in a state. When CZM outcomes and performance are compared to overall coastal change, gaps in program content or performance can be uncovered and management programs improved to address the gaps.

To begin the development of a national outcome-based evaluation system, OCRM should initiate a state-level audit of existing data collection methods, information management systems, and reporting methods. Improvements should be implemented that allow more effective identification, tracking, compilation, and reporting of the outcomes that can be attributed to CZM policy implementation. Again, the indicators recommended here serve as a starting point.

Recommendation 2: Improve Nontidal Freshwater Wetland Management

Improve nontidal freshwater wetland management in state coastal zones by expanding coastal zone boundaries as necessary to encompass all coastal wetlands, by strengthening wetland protection policies, and by applying a more robust set of wetland management tools.
OCRM and individual states should initiate a more intensive study of nontidal wetland protection needs, strategies, processes, and tools, ranging from more sophisticated statute-based programs to techniques that can administratively increase protection of these valuable resources.

Recommendation 3: Establish a Coastal Wetland Restoration Policy

OCRM should establish explicit national CZM policy goals for wetland restoration, including (1) no net loss of wetland area and function in the short term, implemented through regulatory programs; and (2) a net gain of wetland area and function over the long term, implemented through nonregulatory restoration programs.
State CMPs should implement a *no-net-loss* policy by requiring full mitigation of unavoidable losses permitted under state regulatory authorities. No net loss of wetland area is an inherent benchmark that can be assessed using regulatory outcome indicators and rating criteria recommended in this study. The *net-gain goal* of this recommended policy recognizes the substantial historic loss of coastal wetlands and the significant opportunities that exist to restore a portion of the lost or degraded functions, services, and values of these ecosystems. OCRM should encourage and support state nonregulatory initiatives for ecosystem restoration with a long-term goal to increase the quality and quantity of coastal wetlands as measured by acreage and function. CZMA Section 309 program enhancement guidance should also be amended to require more explicit assessment of restoration needs and opportunities. Implementing the *wetland "function"* part of the recommended coastal wetlands policy will be very challenging because standard methods for assessing wetland functions are just being developed and there is significant time and expense involved in adaptation of national methods to localities. Nevertheless, there are existing CZM examples that serve as models and other states' efforts should be supported by OCRM and explored by states using CZM technical and financial resources.

Introduction

This report is one part of the National Coastal Zone Management Effectiveness (CZME) Study, commissioned by the Office of Ocean and Coastal Resource Management (OCRM), National Oceanic and Atmospheric Administration (NOAA). The overall purpose of the study is to judge the effectiveness of the national coastal zone management (CZM) program, as implemented collectively by the states,[1] in addressing selected core objectives of the federal Coastal Zone Management Act (CZMA). In assessing effectiveness, particular emphasis is given to the systematic identification of the on-the-ground outcomes of policy implementation. The five core objectives studied include (1) protection of estuaries and coastal wetlands; (2) protection of beaches, dunes, bluffs, and rocky shores; (3) provision of public access to the shore; (4) revitalization of urban waterfronts; and (5) accommodation of seaport development (as an illustration of the policy to give priority to coastal-dependent uses). This report focuses on state coastal program effectiveness in protecting estuaries and coastal wetlands.

Estuaries and coastal wetlands are among the most ecologically important natural resources in our nation's coastal zones. This importance is reflected in the policy language of the federal Coastal Zone Management Act (CZMA), which states in Section 303(2)(A) that
"Congress finds and declares that it is the national policy to…encourage and assist the states to exercise effectively their responsibilities in the coastal zone through the development and implementation of management programs to achieve wise use of the land and water resources of the coastal zone, giving full consideration to ecological, cultural, historic, and esthetic values as well as the needs for compatible economic development, which programs should provide at least for…*the protection of natural resources, including wetlands, floodplains, estuaries, fish and wildlife and their habitat within the coastal zone*" (emphasis added).

One reason for the high priority given to protection of estuaries and coastal wetlands by the CZMA is our increasing understanding of the critical role these environments play in the overall health of the coast. Another important factor is the intense pressure placed on these resources as coastal population grows and more people make demands on the goods and services estuaries and coastal wetlands provide. Because of these values, pressures, and resulting conflicts, a wide array of federal, state, and local governmental programs have been established to protect, preserve, enhance, and restore these resources. At state and local government levels, many of these programs were initiated in response to the federal CZMA, or, where pre-existing, were networked as part of state coastal management programs (CMPs). But as these programs have matured over the past two decades, countervailing social, economic, and political trends have emerged. Pressures for deregulation, the private property rights movement, and increasing distrust of government officials and bureaucracy are examples. This mix of environmental, social, economic, and political forces has helped shaped each state CMP and the role it plays in estuary and coastal wetland protection.

In addressing this CZMA objective, most state coastal programs, like the CZMA itself, call for a "balancing" of objectives, with resource protection policies working in concert with policies designed to accommodate or even promote development, including port and other water-dependent development, public access, and revitalization. Coastal zone management (CZM) is founded on this

[1]Throughout the text, the term "states" means the thirty-five U.S. states and territories eligible to participate in the U.S. coastal zone management program.

balancing principle—that development and protection can go hand in hand, but only if there are clear policies, advance planning to improve predictability, appropriate development controls and standards, and the programmatic flexibility to incorporate new knowledge and accommodate changing societal goals. Such development has occurred in the past and is continuing. The question this study asks is "Have estuaries and coastal wetlands been protected in the process of ongoing coastal development and to what extent can state CMPs claim credit?" This national overview report responds to this question and is organized as follows:

Background and Context for CZM Evaluation provides an overview of estuaries and coastal wetlands in the United States, including the extent and importance of these resources, how they have changed over time, and how government has been involved, including the roles of states and their CZM programs.

Evaluation Methodology outlines the research questions addressed, the evaluation framework, and the methods used to collect and analyze the data.

Results and Discussion includes a national overview of the importance of estuary and coastal wetland protection as a state CZM issue, the policy response of states in terms of processes and tools used, the on-the-ground outcomes of policy implementation, and particularly successful or innovative case examples of processes and tools used by states.

Conclusions present the principal findings of the study and *Recommendations* includes suggestions for improving CZM policy, programs, and national and state evaluation procedures.

Appendices include data collection forms used for the study, a sample state CZM profile (Delaware), a sample state effectiveness evaluation (Delaware), summary evaluations for each of the twenty-nine state programs, case examples of successful use of CZM processes and tools, and a detailed analysis of outcome data availability. The summary evaluations (Appendix D) are especially important because they are the only place in this report where recommendations for individual state coastal programs are specified (with the exception of our example state, Delaware).

Complete profiles and evaluations for the other twenty-eight state CZM programs and a bibliography of materials reviewed for this study are *not* included in this report. However, for readers who want to explore the basis of evaluation ratings of one or more states in depth, the profiles are useful because they include both the primary and secondary data collected during the study that served as a basis for evaluation. State profiles, evaluations, and data sources are available from the authors[2] or from OCRM.

Background and Context for CZM Evaluation

Many environmental, economic, social, and political factors and conditions account for the relative importance given to estuary and coastal wetland protection as a state coastal management issue (Table 1). Examples include the types and extent of estuary and wetland resources in a state, the degree and

[2]State profiles, evaluations, and the bibliography may be ordered directly from Joy Burck, College of Oceanic and Atmospheric Sciences, 104 Ocean Admin Building, Oregon State University, Corvallis, OR 97331-5503. Ph: 541-737-0942; E-mail: jburck@oce.orst.edu There is a small charge for reproduction and mailing.

causes of historic resource impacts, present-day threats and development pressures, existing state and local governmental institutions and traditions, public attitudes, and the approach and structure that states have used to organize and operate their CZM programs. The relative importance of these and other factors varies from state to state. These differences are in part responsible for differences in how states have responded to federal CZM requirements to protect estuaries and coastal wetlands.

This part of the report describes the characteristics of estuaries and wetland resources in the US, including their functions and values to society, and their geographic extent and distribution. Historical losses, other impacts, and present-day threats are discussed, along with other coastal zone characteristics that influence state efforts to protect estuaries and coastal wetlands, such as coastal growth and development. Estuary and wetland protection efforts at the federal level are also described, followed by a brief review of state management efforts. Much of the information in this section, particularly the data in Table 1, is used later in the study, either as baseline data for assessing outcome effectiveness of individual state CMPs or for evaluating the national program as a whole.

Estuaries and Coastal Wetlands: A National Resource[3]

Estuaries are among the most productive natural systems on earth. This productivity is driven by nutrient-laden freshwater from rivers that mixes with salty ocean water as the tide ebbs and flows. The estuarine ecosystems that result are highly dynamic with daily, monthly, and seasonal cycles and are surprisingly resilient to perturbations. Within estuaries and just inland, vast interconnected tidal and nontidal water and wetland ecosystems serve as part of "nature's infrastructure," providing valuable goods and services that benefit human society. Fish and wildlife support, flood water conveyance and storage, shoreline erosion control, and water purification are just a few examples. Estuaries and coastal wetlands are also among the most stressed natural ecosystems, due mainly to the wide variety of demands society places on them for waste disposal, transportation, commercial and recreational fisheries, and other recreational activities; and as sites for ports, industries, and urban centers. Because protection of estuaries and coastal wetlands and the needs of human society often conflict, estuary and coastal wetland management has been a central issue in U.S. coastal zone management.

[3]The term *estuaries and coastal wetlands* is used throughout this article as "shorthand" for the combination of (1) tidal waters and wetlands up to the head of tide, including water surface area and submerged lands below mean low tide; vegetated and unvegetated tidal wetlands, such as mudflats, salt marshes, brackish marshes, and tidal freshwater marshes and swamps; and submerged aquatic vegetation; and (2) the nontidal freshwater wetlands, swamps, and waters within coastal regions (see footnote 4).

Table 1. Selected environmental-social indicators of estuary and coastal wetland issue importance for U.S. coastal programs.

States by Region	Shore Length	CZA and CZA as % of State		Tidal Wetland	Nontidal Wetland	All Coast Wetland	WET:CZA[1]	Wetland Loss %
New England	6,130	7,240	13	443	783	1226	0.17:1	31
Maine	3,478	3,700	12	250	346	596	0.16:1	20
New Hampshire	131	1,140	12	12	94	106	0.09:1	25
Massachusetts	1,519	1,000	13	143	50	193	0.19:1	28
Rhode Island	384	500	44	10	82	92	0.18:1	37
Connecticut	618	900	19	28	211	239	0.27:1	50
Mid-Atlantic	7,353	13,432	16	2,886	969	3,855	0.29:1	62
New York	1,850	3,600	8	1,880	127	2,007	0.56:1	60
New Jersey	1,792	1,200	16	452	156	608	0.51:1	27
Pennsylvania	140	175	1	1	19	20	0.11:1	96
Delaware	381	2,057	100	151	195	346	0.17:1	>40
Maryland	3,190	6,400	67	402	472	874	0.14:1	73
Southeast[2]	11,625[2]	43,300[2]	46[2]	6,956[2]	10,870[2]	17,826[2]	0.23:1[2]	47[2]
Virginia	3,315	8,700	22	1,015	781	1,796	0.21:1	42
North Carolina	2,625	9,400	19	457	1,982	2,439	0.26:1	51
South Carolina	2,876	7,800	26	858	2,687	3,545	0.45:1	27
Gulf Coast[2]	14,304[2]	44,400[2]	33[2]	6,223[2]	11,677[2]	17,900[2]	0.29:1[2]	48[2]
Florida	8,426	52,300	100	1,533	15,938	17,490	0.33:1	50
Alabama	607	500	1	62	130	192	0.38:1	50
Mississippi	359	1,800	4	97	1,027	1,124	0.62:1	12
Louisiana	7,721	7,300	17	5,037	0	5,037	0.69:1	46
West Coast	7,863	30,100	9	792	2,213	3,005	0.10:1	46
California	3,427	2,800	2	308	354	662	0.024:1	54–75
Oregon	1,410	8,400	9	102	100	202	0.02:1	38
Washington	3,026	18,900	28	382	1,759	2,141	0.11:1	33–70
Alaska	33,904	380,190	67	3,330	22,900	26,230	0.07:1	<1
Great Lakes	4,044	13,600	12	0	2,063	2,063	0.15:1	48
Michigan	3,224	2,900	5	0	165	165	0.06:1	59
Wisconsin	820	10,700	20	0	1,898	1,898	0.18:1	47
Islands	2,369	7,153	70	136	286	422	0.06:1	64
American Samoa	126	60	100	0.6	0.4	1	0.02:1	23
Guam	110	209	100	0.3	5.2	5.5	0.03:1	nd
Hawaii	1,052	6,366	100	15.2	158	173	0.03:1	12
Northern Marianas	206	190	100	0.1	0.8	0.9	0.01:1	64
Puerto Rico	700	193	6	117	122	239	1.24:1	75
Virgin Islands	175	135	100	3	0	3	0.02:1	>50
All States	87,592	539,515	38	20,766	51,761	68,943	0.13:1	38

[1]A ratio used here because consistent data were not available for all states to estimate the percent of entire coastal zone (land & water) that is combined tidal and nontidal wetland.

[2]In regional totals, Florida's indicator values are split among two regions to approximate actual distributions, with 1/3 to the Southeast and 2/3 to the Gulf Coast.

KEY: COLUMN HEADINGS AND DATA SOURCES

Shore Length	Tidal or Great Lakes shoreline length in miles (NOAA 1985)
CZA and % of State	Coastal zone land area in sq. mi. and as a percent of entire state area (NOAA 1992)
Tidal Wetlands	Tidal freshwater wetlands area in coastal zone in square miles (NOAA 1991; state profiles)
Nontidal Wetlands	Nontidal freshwater wetlands area in coastal zone in square miles (NOAA 1991; state profiles)
All Coast Wetlands	Combination of tidal and nontidal wetlands in coastal zone in square miles
WET:CZA	Ratio of all coastal wetlands to coastal zone land area (NOAA 1991, NOAA 1992; state profiles)
% Wetland Loss	Percent of historic wetland loss (Dahl 1990; state profile sources)

Table 1. Selected environmental-social indicators of estuary and coastal wetland issue importance for U.S. coastal programs (continued).

States by Region	ESA	ESA:CZA[1]	TYPE CMP	IMPLE LEVEL	Coastal County Population 1990	Population Density	% Population Change 1970–90
New England	2,539	0.35:1			8,763,660	435	9
Maine	1,130	0.31:1	FNL	ST&L	885,703	73	29
New Hampshire	25	0.02:1	FNL	ST	350,078	307	67
Massachusetts	589	0.59:1	FNL	ST	4,494,398	1,271	6
Rhode Island	165	0.33:1	CCL	ST&L	1,003,464	943	6
Connecticut	630	0.70:1	ML	ST&L	2,030,017	889	8
Mid-Atlantic	10,818	0.81:1			28,980,043	322	1
New York	1,829	0.51:1	ML	ST&L	15,046,336	859	-3
New Jersey	920	0.77:1	FNL	ST	6,978,509	1,227	6
Pennsylvania	25	0.14:1	FNL	ST&L	2,949,974	1,701	-9
Delaware	365	0.18:1	CCL	ST	666,168	345	22
Maryland	7,679	1.20:1	CCL	ST&L	3,339,056	518	12
Southeast[2]	7,266[2]	0.11:1[2]			9,524,339[2]	230[2]	72[2]
Virginia	2,700	0.31:1	FNL	ST	3,861,122	433	40
North Carolina	3,460	0.37:1	CCL	ST&L	710,903	76	39
South Carolina	277	0.04:1	CCL	ST	833,519	92	57
Gulf Coast[2]	9,381[2]	0.16:1[2]			11,071,790[2]	233[2]	71[2]
Florida	2,455	0.05:1	FNL	ST	12,356,384	247	90
Alabama	644	1.29:1	ML	ST&L	476,923	169	27
Mississippi	600	0.33:1	FNL	ST	312,368	175	30
Louisiana	6,511	0.89:1	CCL	ST&L	2,044,910	195	16
West Coast	2,196	0.07:1			26,334,384	356	40
California	586	0.21:1	CCL	ST&L	21,859,416	611	39
Oregon	210	0.03:1	FNL	ST&L	1,085,935	56	46
Washington	1,400	0.07:1	CCL	ST&L	3,389,033	180	46
Alaska	36,589	0.10:1	ML	ST&L	457,932	1	89
Great Lakes	0	0			6,548,762	156	-4
Michigan	0	0	FNL	ST	4,640,981	148	-5
Wisconsin	0	0	FNL	ST	1,907,781	181	0
Islands	154	0.02:1			4,955,345	466	35
American Samoa	1.0	0.02:1	CCL	ST&L	46,773	615	72
Guam	1.4	0.01:1	FNL	ST	133,152	396	57
Hawaii	25	0.01:1	FNL	ST	1,108,229	172	44
Northern Marianas	7	0.04:1	FNL	ST	43,345	236	255
Puerto Rico	117	0.61:1	FNL	ST	3,522,037	1,018	30
Virgin Islands	3	0.023:1	ML	ST	101,809	754	63
All States	68,943	0.13:1			108,992,639	123	22

[1]A ratio was used here because consistent data were not available for all states to estimate the percent of entire coastal zone (land and water) that is estuary.

[2]In regional totals, Florida's indicator values are split among two regions to approximate actual distributions, with 1/3 to the Southeast and 2/3 to the Gulf Coast

KEY: COLUMN HEADINGS AND DATA SOURCES

ESA	Estuary surface area in square miles (NOAA 1985; state profiles)
ESA:CZA	Ratio of estuarine surface area to coastal zone land area (NOAA 1985; NOAA 1992; state profiles)
TYPE CMP	Type coastal management program (FNL—fully networked legislative basis; CCL—comprehensive coastal legislation; ML—mixed legislative basis) (Knecht and others 1996)
IMPLE LEVEL	Primary level of implementation for state coastal programs (ST—state level; ST&L—state & local level)
Coastal County Population	Coastal county population in 1990 (NOAA 1991; NOAA data sheet)
Population Density	Coastal county population density (per square mile) in 1990 (NOAA 1992; NOAA data sheet)
% Population Change	Percent coastal county population change, 1970 to 1990: (Culliton and others 1990; NOAA data sheet)

Estuaries and Coastal Wetlands in the U.S. The most recent and comprehensive national inventory of estuaries in the contiguous United States is NOAA's National Estuarine Inventory (NOAA 1985; 1987). This inventory describes nearly 100 estuarine systems in the Northeast, Southeast, Gulf Coast, and West Coast of the United States, including their physical dimensions and characteristics, their hydrology, and the distribution of land use. Other more detailed characterizations of some of the major U.S. estuaries have been completed under the National Estuary Program, administered by the U.S. Environmental Protection Agency, but these are not easily synthesized to provide a national picture. One of the most distinguishing features of estuarine ecosystems is their physical extent and geographic distribution (Table 1), illustrated regionally as estuarine surface area in Figure 1. Alaska's estuaries comprise 53 percent of the U.S. estuarine surface area total (Hall, Frayer, and Wilen 1994). Removing Alaska from the total, estuarine acreage is greatest in the Mid-Atlantic states (33 percent of the remaining), mainly due to Chesapeake Bay, Delaware Bay, and Long Island Sound. Following this region are the Gulf Coast (29 percent), the Southeast (22 percent), New England (8 percent), West Coast (7 percent), and the Island state and territory (<1 percent) regions.

The distribution of tidal and nontidal wetlands has a somewhat different regional pattern than that for estuaries, particularly within the coterminous U.S. (Table 1 and Figure 2) (NOAA 1991). Nationally, Alaska still dominates in terms of overall wetland acreage, with 26,230 square miles or 36 percent of the total (Hall, Frayer, and Wilen 1994). However, removing Alaska from the total, the Gulf Coast (39 percent of the remaining acreage) and Southeast (39 percent) dominate, followed by much lesser amounts for the Mid-Atlantic (8 percent), the West Coast (6 percent), New England (3 percent), and the Island state and territory (1 percent) regions. Louisiana alone has nearly 25 percent of the tidal wetlands in the U.S. (NOAA 1991). The area of freshwater, nontidal coastal wetlands, however, far exceeds the area of tidal wetlands nationally—51,761 versus 20,781 square miles[4] (Table 1). These nontidal coastal wetlands are no less important to the overall health of the coast than the estuaries they are connected to, yet they receive much less protection at the state level than do tidal wetlands. In fact, in many states, much of this area is not even included within state coastal zone boundaries.

Historic Loss and Continuing Threats to Estuaries and Coastal Wetlands. One of the legacies of Euro-American settlement of North America has been the large-scale conversion of all types of aquatic ecosystems—lakes, rivers and streams, estuaries, and wetlands—to other land types and uses through draining, diking, filling, dredging, excavation, damming, channelization, diversion, and other alterations. Much of the early wetland conversion was for agriculture, but later land filling for port and urban expansion dominated, particularly in wetland areas fringing estuaries. For wetland ecosystems nationally, about 53 percent of the 221 million acres present in

[4]Nontidal freshwater wetlands were considered "coastal" in the NOAA wetland inventory (NOAA 1991) if they were within U.S. U.S. Geological Survey hydrologic units (HUCs) that included the head of tide on coastal rivers and streams (NOAA 1991). This protocol uses the NOAA "coastal assessment framework" that was also used for the NOAA coastal zone boundary review required under CZMA Section 6217 (NOAA 1992).

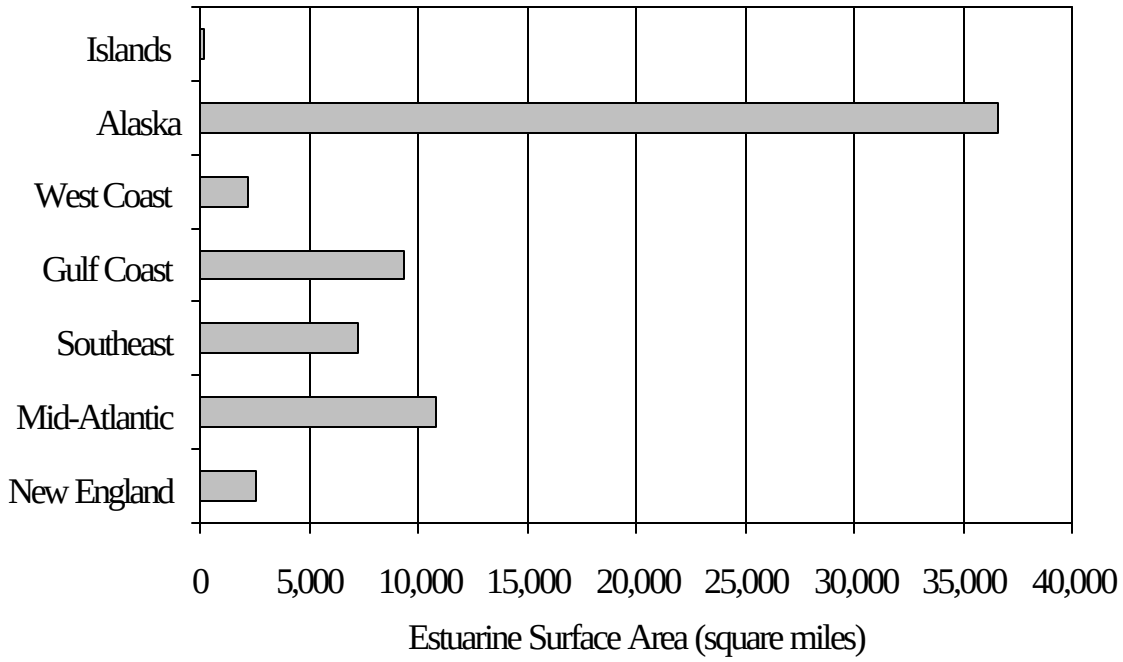


Figure 1. Estuarine surface area by US coastal region (sources: NOAA 1985; state profiles)

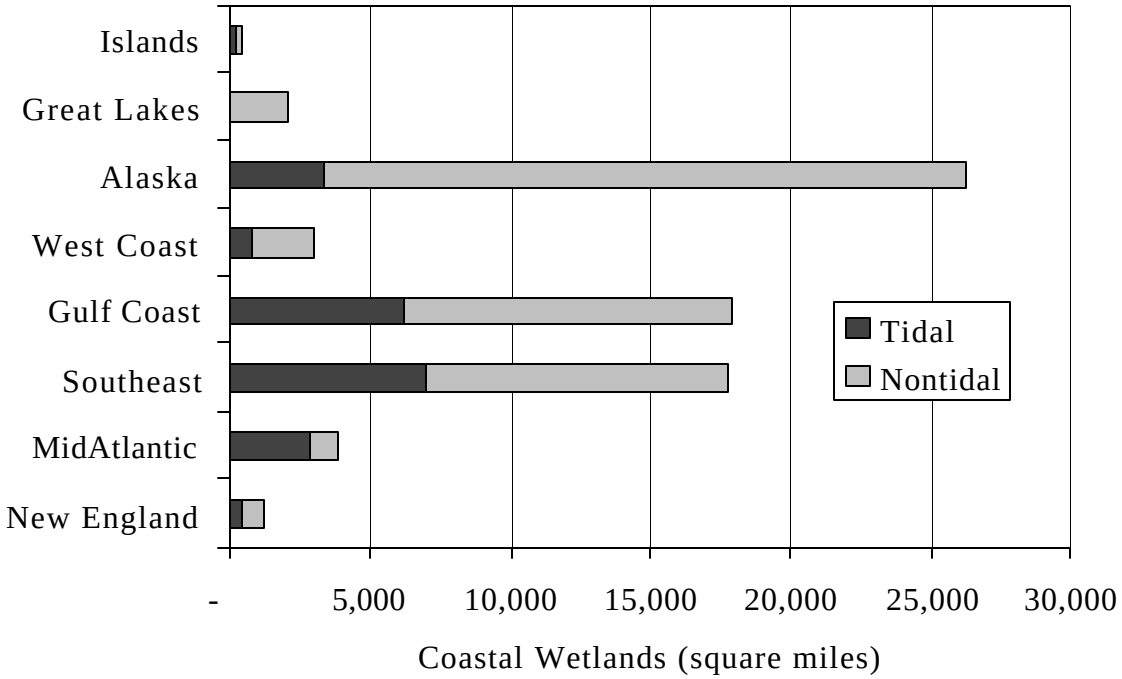


Figure 2. Coastal wetlands—tidal and nontidal combined—by US coastal region (sources: NOAA 1991; individual state profiles).

the 1780s in the coterminous United States have been lost (Dahl 1990). In coastal regions, based on a variety of state and national data collected for this study, estimated wetland loss is about 38 percent nationally (Table 1). Excluding Alaska, which has lost less than 1 percent of its wetlands, the loss is 49 percent. Combined loss of tidal and nontidal wetlands by U.S. coastal region is illustrated in Figure 3. Although all regions have significant loss, the Island states and territories and the Mid-Atlantic states have been particularly hard hit. At least ten coastal states have lost more than 50 percent of their wetlands statewide, led by Pennsylvania (94 percent), California (91 percent), Connecticut (74 percent), Maryland (73 percent), and New York (60 percent) (Dahl 1990). Besides these direct physical losses, estuaries and coastal wetlands historically have been subjected to other severe ecological stresses, including vast quantities of municipal and industrial waste, nonpoint source pollution from agriculture, urban construction and runoff, marine debris from land and ocean sources, intentional and inadvertent introduction of harmful exotic species, and more subtle impacts of habitat fragmentation and streamflow alteration. As a result, few pristine estuaries or coastal wetlands remain and many are seriously degraded. Although these wetland conversions and alterations have resulted in many benefits to society, the ecological and economic costs have also been great.

Since the late 1960s and 1970s, with the advent of wetland and waterway protection at the national level, estuaries and tidal wetlands have received relatively strong protection from direct physical alterations, particularly land filling and diking. Federal Clean Water Act Section 404 discharge limitations have played a major role in limiting tidal wetland loss, as have provisions in state CMPs, prompted by federal guidance described later. Public trust rights in these lands and waters, mostly public ownership, and public awareness of the value of estuaries has contributed to this turnaround.

One of the most significant threats to estuarine and coastal wetlands is loss associated with the gradual rise in global sea level (about one-half foot in the past century) combined with land subsidence in some coastal regions (IPCC 1992; Titus 1988). In the Mississippi delta region, for example, relative sea level has risen about 3 feet in the past century. This change, combined with the loss of marsh-nourishing sediments from Mississippi River overflow and other factors, has resulted in the loss of 25–35 square miles of wetlands per year in Louisiana alone (Titus 1988). Areas along the East Coast and in other parts of the United States, such as southern Puget Sound in Washington State, south San Francisco Bay, and the central Oregon Coast, are also experiencing a rise in relative sea level (Komar 1997). Scientists project gradually increasing rates of global sea level rise during the next century, if climate gradually warms as expected, resulting in significant loss of coastal wetlands (and upland) areas through land submergence (IPCC 1992). The ecological impacts of this scenario have received little attention.

Nontidal wetlands along our coasts are among the most threatened ecosystems today. These freshwater ecosystems are vital to coastal environmental health for a number of reasons. Connected to estuaries through surface and groundwater flow, they serve as the "kidneys" of the coastal landscape, storing and slowly releasing waters to help maintain stream flows and biodiversity, improve water quality, and recharge groundwater aquifers. During and after storms, nontidal wetlands store surface water, which helps moderate flooding and associated damage downstream. Their habitat functions for fish, birds, and other wildlife are also well documented (USGS 1996).

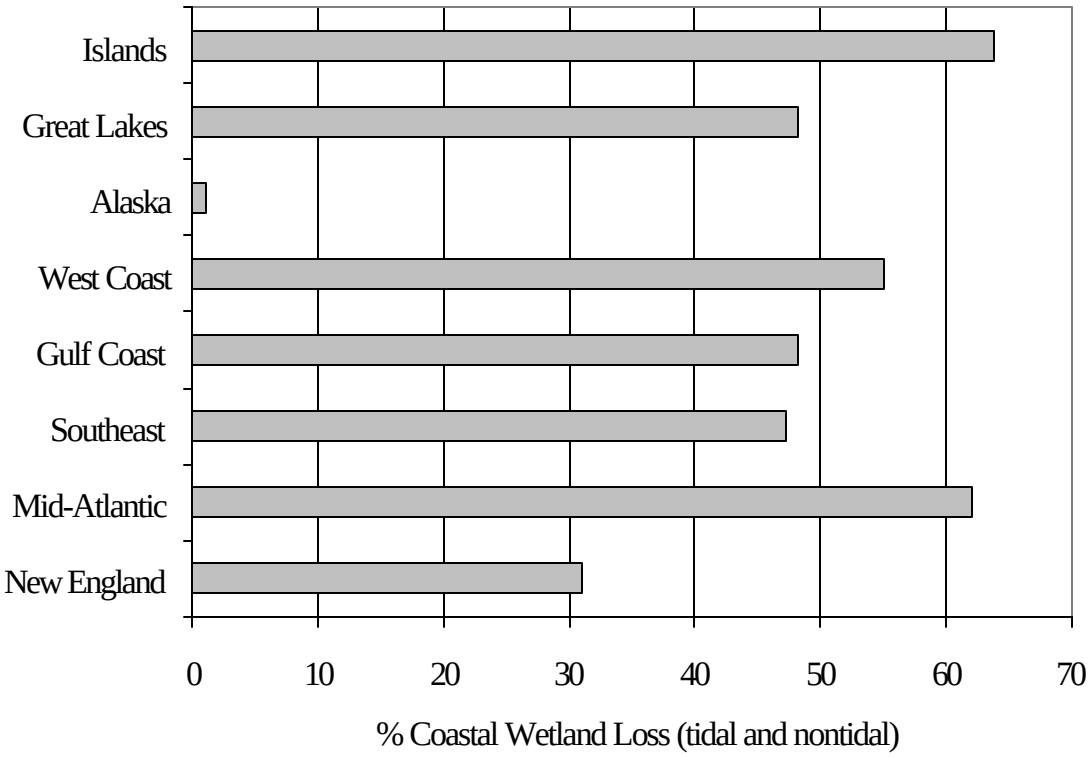


Figure 3. Coastal wetland loss—tidal and nontidal—by US coastal region (Dahl 1990; individual state profiles).

Threats to nontidal coastal wetlands are due mainly to development pressures brought on by a rapidly growing coastal population and the related demand for jobs, housing, improved transportation linkages, commercial services, and recreational facilities such as golf courses. These pressures and other factors present a variety of management challenges. Nontidal wetland inventories in many states are relatively poor, and there are gaps in our scientific understanding of how freshwater wetland ecosystems function, particularly at larger landscape scales. The amount and rate of loss of nontidal freshwater wetlands in U.S. coastal regions are also difficult to document, in part because of different interpretations as to what freshwater wetlands are actually "coastal." The physical and ecological criteria for defining what wetlands are "coastal" are much different from the criteria many states used to draw the inland boundary of their coastal zones, which often corresponded to a political unit boundary or a road or highway (NOAA 1992). Social and political factors contribute to the challenge of protecting nontidal freshwater wetlands. Most are in private ownership. Protection efforts sometimes raise the threat of private property "takings" lawsuits. There is also a general movement inside and outside government for less governmental regulation, which has led to efforts to limit resources devoted to maintaining existing programs, let alone implementing new measures. Finally, the sheer magnitude of

coastal nontidal freshwater wetland resources—estimated by NOAA (1991) at 52,000 square miles—makes their management a significant challenge.

Population and Growth Trends Affecting Estuaries and Wetlands. Many other stress factors affect states' responses to the CZMA's call for states protect estuaries and coastal wetlands. Some of the more important are demographic patterns and trends. Three of these discussed here are coastal population, population density, and population growth over the past two decades (Table 1).

Regional differences in coastal county population are strongly influenced by several individual states with very large populations, such as New York in the Mid-Atlantic region, California on the West Coast, and Florida in the Southeast and Gulf Coast regions (Table 1). But absolute population is not an adequate measure of development "intensity" in a state or region because the area within which that population lives is so variable. Population density is a better measure (Table 1). For example, despite having relatively small populations, the Island state and territory "region" generally make intensive use of coastal lands; population density is high. The same is true for most of the New England states and parts of the West Coast, where large population clusters in southern California and Puget Sound drive up overall population density regionally. One would expect that population density would be strongly correlated with historic wetland loss. This appears to be true in some cases (e.g., Pennsylvania—1,701 persons per square mile and 94 percent wetland loss, and Puerto Rico—1,018 and 75 percent loss), but it is not the case in other states (e.g., New Jersey—1,227 and 27 percent loss, and Massachusetts—1,271 and 28 percent loss) (Table 1).

Percent population change between 1970 and 1990 provides one good measure of recent coastal development pressure (Table 1). This time frame roughly corresponds to what might be considered the era of modern environmental policy, with 1970 being a good proxy for the beginnings of coastal management initiatives at state and federal levels. However, these growth rates as well as absolute population numbers do not account for the growth in seasonal populations associated with the coastal tourist trade, a mainstay of the local economy in many areas. Seasonal population in some coastal areas may be double or triple the number of permanent residents, resulting in greater development intensity and pressures than census data would suggest. One of the more interesting demographic trends is the "shift south" from the Great Lakes, Mid-Atlantic, and New England states to the Southeast and Gulf Coast. Much of this growth in the south has been in Florida, where population grew at a rate of about 4.5 percent per year between 1970 and 1990.

National Efforts to Protect Estuaries and Coastal Wetlands

Historically, numerous federal and state government programs have contributed to and even promoted the conversion of estuarine and coastal wetland areas in the U.S. In 1849, Congress passed the first of the Swamp Land Acts, which granted all swamp and overflow lands in Louisiana—nearly 10 million acres—to the state for reclamation (Dahl and Allord 1996). This authority was extended to twelve other states in 1850 and two more in 1860. Of these fifteen states, twelve are coastal as defined by the federal CZMA and more than 43 million additional acres were ceded to them by the federal government for reclamation. Although most states did not immediately begin large-scale reclamation projects, these actions set the tone for federal policy for the next century (Dahl and Allord 1996).

There are still some federal programs that encourage or indirectly result in wetland conversion and estuarine alteration (Table 2). A number of these relate to highway and other transportation improvements, projects that represent a major continuing source of wetland loss, particularly nontidal, freshwater wetlands. Other programs related to agriculture, water development, and the navigation projects noted above continue to take their toll on wetlands and estuarine habitats. The U.S. Army Corps of Engineers (USACE), for example, has been the major player in the construction and maintenance of hundreds of Congressionally authorized and funded navigation projects in U.S. estuaries, with much of the dredged materials used to create new upland from estuarine wetland and shallow water areas. Over the past two decades, however, water projects have been drastically cut back. This trend continued with the 1990 Water Resource Development Act, which deactivated many navigation projects, established environmental protection as a primary Corps mission, and established an interim goal of "no net loss of the nation's remaining wetland base," and a long-term goal "to increase the quality and quantity of the nation's wetlands, as defined by acreage and function" (USDOI 1994).

Over the past quarter-century, probably the single most important piece of national legislation for estuary and wetland protection was the 1972 amendments to the Federal Water Pollution Control Act (now the Clean Water Act [CWA]). These amendments established the Section 404 permit program regulating discharges of dredge and fill material in the waters of the United States, including wetlands. Administered by the USACE with U.S. Environmental Protection Agency (USEPA) oversight, the 404 program works in concert with a number of other federal laws. These include the USACE-administered Section 10 permit program of the Rivers and Harbors Act or 1899; the National Environmental Policy Act of 1969, which requires environmental assessments; and the Fish and Wildlife Coordination Act of 1958, which requires fish and wildlife review of permits. The CWA Section 404 program, bolstered by these related laws, has been the cornerstone of federal estuary and coastal wetland protection in the U.S. for the past twenty-five years.

Numerous other federal programs provide additional kinds and levels of protection for estuaries and coastal wetlands. Some, such as the USEPA's National Estuary Program promote waterbody and watershed planning through a specified local-state-federal coordination process to address priority problems. These problems almost always include habitat loss and degradation. Other laws, such as the Coastal Barriers Resources Act, protect estuaries and wetlands by withdrawing federal development subsidies, while others provide funds for acquisition, preservation, and restoration, for example, the North American Wetlands Conservation Act of 1989.

Table 2. Selected federal programs that have significant effects on estuaries and coastal wetlands in the United States (USGS 1996; Kusler and Opheim 1996).

PROGRAM OR ACT	Implementing Agency	EFFECT OF PROGRAM
ENCOURAGE COASTAL WETLAND CONVERSION		
Executive Order 12630, Constitutional Takings	AFA	Provides a review process for agencies to protect against unintentional "takings" of private property.
Federal-Aid Highway Act of 1968	DOT	Highway construction can affect wetlands at every stage. Wetlands are often prime sites for highways.
National Flood Insurance Program	FEMA	Encourages development in flood plains, which contain wetlands, by providing low-cost federal insurance.
Surface Transportation Revenue Act of 1991 (P.L. 102-240)	DOT	Transportation projects directly and indirectly destroy wetlands.
U.S. Tax Code	IRS	Encourages farmer to drain and clear wetlands through tax deductions and credits for development activities.
Water Resources Development Act of 1976, 1986, 1988, 1990 (P.L.s 94-587, 99-662, 100-676, 101-640)	USACE	Water development projects directly and indirectly destroy wetlands.
DISCOURAGE COASTAL WETLAND CONVERSION THROUGH *REGULATION*		
Federal Water Pollution Control (P.L. 92-500) (Clean Water Act) Section 404 (1972)	USACE, EPA, FWS, NMFS	Regulates many activities that involve the disposal of dredged and fill materials in waters of the United States, including many wetlands.
Coastal Zone Management Act (P.L. 92-583) (1972)	NOAA	Provides federal funding for wetlands programs in most coastal states, including the preparation of coastal zone management plans.
Food Security Act of 1985 (*Swampbuster*) (P.L. 99-198)	FSA, , NRCS, FWS, FmHA	"Swampbuster" program suspends agricultural subsidies for farmers who convert wetlands to agriculture. Allows FmHA to eliminate some farm debts in exchange for long-term easements to protect wetlands.
Fish and Wildlife Coordination Act of 1956	DOI	Authorizes the development and distribution of fish and wildlife information and the development of policies and procedures relating to fish and wildlife.
Ramsar Convention (Treaty), adopted 1973, enforced from 1975.	FWS	Convention maintains a list of wetlands of international importance and encourages the wise use of wetlands.
DISCOURAGE COASTAL WETLAND CONVERSION THROUGH *ACQUISITION*		
Migratory Bird Conservation Act (45 Stat. 1222) (1929)	FWS	Established a commission to approve the acquisition of migratory bird habitat.
Emergency Wetlands Resources Act of 1986 (P.L. 99-645)	FWS	Pays debts incurred by FWS for wetlands acquisition, and provides additional revenue sources.
North American Waterfowl Management Plan (1986)	FWS, CWS	Establishes a plan for managing waterfowl resources by various methods such as acquiring wetlands.
North American Wetlands Conservation Act (1989) (P.L. 101-233)	FWS	Encourages public/private partnerships by providing matching grants to organizations for protecting, restoring, or enhancing wetlands.
Surface Transportation Revenue Act of 1991 (P.L. 102-240)	DOT	Authorizes funding for wetland mitigation banks for state departments of transportation.
Coastal Wetland Planning, Protection and Restoration Act (P.L. 101-646) (1990)	USACE, FWS, EPA, NMFS	Provides for interagency wetlands restoration/conservation planning and acquisition in Louisiana, other coastal States, and the Territories.
U.S. Tax Code Tax Reform Act of 1986 (P.L. 99-514)	IRS	Provides deductions for donors of wetlands and to some nonprofit organizations.
DISCOURAGE COASTAL WETLAND CONVERSION THROUGH *OTHER POLICIES*		
Endangered Species Act of 1973 (P.L. 93-205)	FWS	Provides for the designation and protection of wildlife, fish, and plant species that are in danger of extinction.
Executive Order 11990, Protection of Wetlands (1977)	AFA	Requires federal agencies to minimize impacts of federal activities on wetlands.
Fish and Wildlife Coordination Act (1965) (P.L. 89-72)	FWS	Requires federal agencies to consult with FWS before issuing permits for most water-resource projects.
Coastal Barriers Resources Act (P.L. 96-348) (1982)	NOAA	Designates various undeveloped coastal barrier islands for inclusion in the Coastal Barrier Resources System. Designated areas are ineligible for federal financial assistance that may aid development.
Food, Agriculture, Conservation, and Trade Act of 1990 (P.L. 101-624)	NRCS	Wetland Reserve Program purchases perpetual conservation easements on farmed wetlands. Subsidizes wetland restoration.
Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 (P.L. 101-646)	FWS, USCG, EPA, USACE, NOAA	Created a federal program to prevent and control the spread of species that are aquatic nuisances.
Oil Pollution Act of 1990 (P.L. 101-380)	DOE, DOI, NOAA	Enhanced the response to oil spills and required natural resource damage assessments.

In addition to federal programs, there are a variety of private and public-private cooperative ventures that play major roles in protecting and restoring wetlands and associated habitats along our coasts. Land trusts, for example, are private, non-profit corporations dedicated to preservation of land for scenic, recreational, ecological, historical, or other non-commercial values. They protect land primarily through the donation of conservation easements, although older trusts are often more experienced at raising capital for outright purchase of lands. Land donated to a trust yields the same tax benefits as would a donation to a government agency, but land trusts are more aggressive and successful in soliciting donations. Some land trusts and similar nonprofit groups operate nationwide, such as The Nature Conservancy and Ducks Unlimited. Others operate at the regional, state, or local level. Many such groups forge alliances with federal and/or state agencies to accept funds, purchase lands, and use their special tax-exempt status to accomplish protection and restoration that might not otherwise occur. These private groups often play a relatively low profile role in protecting coastal wetlands and other habitat, but their importance can be immense, especially to state CMPs that have neither the mechanisms or resources to mount major acquisition programs.

Estuary and Coastal Wetland Protection in State Coastal Management Programs

The Coastal Zone Management Act (CZMA) of 1972—the subject of this study—established a unique state-federal partnership designed to encourage states develop programs to more effectively manage coastal resources, including the protection of estuaries and coastal wetlands. In response to the CZMA, many coastal states developed new or enhanced programs to protect coastal wetlands; others with already-strong laws simply networked their existing programs with added coordination features. Several recent reports or studies have documented state wetland protection efforts in general (Kusler and others 1992; Crane 1995; USGS 1996), and CZM and wetlands in particular (McGilvray 1990). McGilvray (1990) offered a variety of anecdotal evidence for the increasing importance of coastal wetland protection in state CZM programs. She cited the establishment of coastal regulatory programs in response to CZMA requirements, wetland acquisition and restoration efforts, public education programs, and priority given in funding allocations (25 percent of the state program allocations were for wetlands in fiscal year [FY] 1990). Brower and others (1991) reported that 28 percent of state CZM expenditures for the 1982–1987 period—almost $53 million—were allocated to natural resource protection.

Another recent sign of the importance of the issue in state coastal programs was that twenty-six of twenty-nine states selected wetlands protection and restoration as a priority area under the Coastal Zone Enhancement Grants Program (Section 309, 1990 amendments to the federal CZMA). Through FY 1993, nineteen states were working on Section 309-funded wetland program improvement projects (Bernd-Cohen and others 1995). Examples cited include revised permit threshold requirements, mitigation rules, new federal consistency guidelines for freshwater wetlands, and delineation guidelines. An equal number of states selected secondary and cumulative impacts as areas for program improvement, sometimes integrating this issue with wetland concerns (e.g., California).

In the most recent comprehensive evaluation of state CMPs, Knecht, Cicin-Sain, and Fisk (1996) determined CZM effectiveness by surveying knowledgeable individuals from three groups—

coastal program managers, interest groups, and academics. One of the four CZM goals they examined was natural resource protection (which includes estuaries and coastal wetlands). Perceptions of the three groups were that state programs are performing *well* or *very well* in protecting natural resources.

Another issue addressed by Knecht, Cicin-Sain, and Fisk (1996) was the relative strength of a program as compared to its structure—particularly a program's legislative basis and the primary governmental level at which it is implemented. They proposed a hypothesis that state programs based on a single comprehensive coastal law and involving program implementation at the state and local levels would tend to perform at a higher level than other programs. To examine this hypothesis, they determined whether a program was based on a single comprehensive coastal law, on the bundling together of various state laws, or on a combination of these approaches. They also determined whether a program was implemented primarily at the state level or if it primarily used a mixture of state and local implementation—their data on these two program characteristics are included in Table 1. A *fully networked* classification (FNL) indicates a program that is based on a bundling of legal authorities found in several state laws, through an executive order or coordinating legislation. *Comprehensive coastal legislation* (CCL) indicates a program based primarily on a single comprehensive coastal law. *Mixed legislative* (ML) basis indicates a program that contained elements of both specialized coastal legislation and other state legislation that is "networked" into the program. They found no apparent relationship between these indicators of program structure and perceived performance of the programs (Knecht, Cicin-Sain, and Fisk 1996, 155).

A question for our study is whether available outcome data support the findings of Knecht, Cicin-Sain, and Fisk (1996) as well as those of other recent process-oriented evaluations (e.g., Brower and others 1991; McGilvray 1990) that suggest CZM is making a difference. Another question is whether outcome-based effectiveness evaluation—deemed problematic by Knecht, Cicin-Sain, and Fisk (1996) because outcome data are scarce and attributions of outcomes are difficult—is feasible and appropriate for state CMPs.

Evaluation Methodology

This study is different from previous national evaluations of coastal zone management (CZM) in its attempt to determine on-the-ground outcomes of state CZM policy implementation and to use this information to estimate program effectiveness and performance. CZM as implemented in the U.S. is largely "process" oriented, beginning with the CZMA itself, which emphasizes the need to balance competing interests in the coastal zone—protection, preservation, development, and restoration. This focus on process extends to the requirements states must meet to gain federal approval and to subsequent program implementation.

As might be expected, CZM program evaluation has also been largely process-oriented, both at national and state levels. At the national level, evaluations have been driven by legislative oversight and the reauthorization process (USGAO 1976; OCZM 1979; USGAO 1980; USDOC 1981; Brower and others 1991), although there have been important academic contributions as well (Sabatier and Mazmanian 1983; Lowry 1985; Archer and Knecht 1987; Owens 1992). At the state level, the impetus for evaluations has been CZMA Section 312 requirements that OCRM to conduct a

"continuing" review of state programs. In these Section 312 reviews, state programs are evaluated on the effectiveness of their organization and coordination mechanisms, the strength of their policies and the processes and tools used to implement and enforce them, and the perceptions of effectiveness of knowledgeable individuals (Allin, Menashes, and Wright 1996).

Several recent studies have sought to measure effectiveness, but are either relatively narrow in the examination of on-the-ground outcomes (Good 1994) or are based principally on perceptions of effectiveness, rather than outcomes (Knecht, Cicin-Sain, and Fisk 1996). The results of these various evaluations have led to meaningful process (and probably outcome) improvements in CZM at the national and state levels, but few address what has happened on the ground as a result of CZM.

Systematic, comparable outcome effectiveness evaluation applied to all the states and, by extension, to the national program, has been difficult for a number of reasons. One is that the states exhibit significant diversity, not only in their coastal management programs, but also in their environmental settings and resources; their social, economic, and political makeup; their institutional histories; and in many other ways. Data availability problems, uncertainty as to how to attribute responsibility for outcomes, and finding a basis for comparison of state programs have all made outcome evaluation problematic. Certain other trends, however, are causing coastal managers to examine the feasibility of outcome-based evaluation. One is an increasing interest and emphasis on accountability in terms of outcomes, not just process. Administration and congressional leaders are asking for clear explanations of program results and impacts on the ground (for example, see language in Public Law 103-62, the Government Performance and Results Act of 1993). The capacity to monitor, track, and report outcomes is also increasing, owing mainly to the rapid growth of high-speed personal computers, easy-to-use database software, geographic information systems (GIS), and the Internet and World Wide Web. Some or all of these information technologies are being used by virtually every state coastal program. This study is therefore timely and, while it has limitations, can be considered a prototype for combined process- and outcome-based evaluation of CZM program performance that takes issue importance into consideration. These three elements—issue importance, potential effectiveness based on process indicators, and outcome effectiveness—provide the framework for this CZM performance evaluation.

Study Objectives and Research Questions

The overall goal of the national CZM effectiveness study is to determine the on-the-ground effectiveness of state coastal management programs in addressing selected core objectives of the U.S. Coastal Zone Management Act (CZMA). The three principal study objectives designed to achieve this goal for evaluating estuary and coastal wetland protection are:

- To assess and evaluate the individual and collective contributions of the twenty-nine state coastal zone management programs in achieving the federal CZMA core objective *to protect estuaries and coastal wetlands*.
- To identify and describe state and local CZM program case examples that address core objectives in a particularly innovative and effective manner.
- To identify ways that federal and state CMPs might improve their effectiveness in addressing the core objectives of the CZMA.

Given the focus on on-the-ground outcomes of policy implementation, another implicit goal of the study is to contribute to the design of a systematic, outcome-based, national CZM performance evaluation system. The methods, indicators, results, and conclusions presented here must therefore be viewed as experimental, not as absolute conclusions about state and national CZM performance.

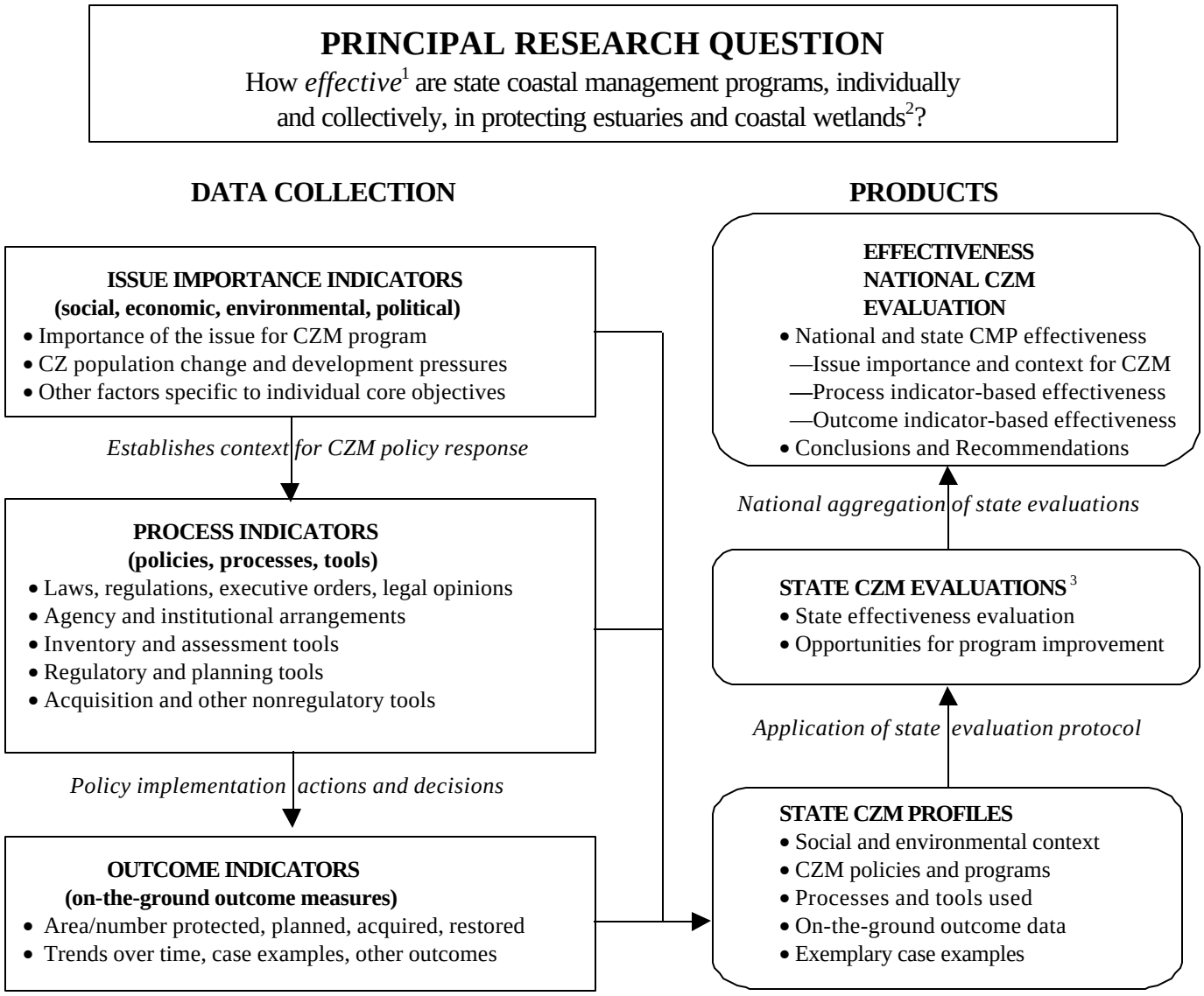
One of the first steps in the research process was to expand the objectives into a set of specific research questions to focus and organize the research. Most of the questions were equally important for both state and national program evaluation. Research questions identified include:

- How important is the issue of estuary and coastal wetland protection in each state or territory? How does it vary from state to state and region to region?
- What policies, processes, and tools does each state or territory use to protect estuaries and coastal wetlands, and what is their relative importance? Which are the most important policies, processes, and tools from a national perspective?
- Based on policies, processes, and tools states use to protect estuaries and coastal wetlands, what is the potential effectiveness of each state CMP "on paper"?
- What are the on-the-ground outcomes of estuary and coastal wetland protection policy implementation in each state and what level of CMP effectiveness do they demonstrate? How do these results add up nationally?
- Considering the answers to the above questions, how well is each state's CMP performing in protecting estuaries and coastal wetlands? How do these results add up nationally?
- How might each state's CMP be more effective in protecting estuaries and coastal wetlands?
- How might the national CZM program be more effective in promoting state efforts to protect estuaries and coastal wetlands?
- Is it feasible to develop a national CZM performance evaluation system that incorporates the monitoring and reporting of on-the-ground outcomes of program implementation? If so, what would it look like?

Overview of the Evaluation Process

The overall evaluation design for the CZME study is illustrated in Figure 4. The data collection process focused on three kinds of information: (1) environmental and social context data that provide a basis for estimating issue importance in a state; (2) policy, process, and tool data that provide a basis for estimating state CMP potential for achieving CZMA objectives; and (3) on- the-ground outcome data that document the results of state CZM policy implementation actions. On the right in Figure 4, study products are illustrated, including (1) profiles for each of the twenty-nine federally approved state programs, (2) effectiveness evaluations for each of the state programs, and (3) a national performance evaluation that synthesizes state results. The state-level and national-level data analysis—shown with connecting arrows between the products—are the heart of the evaluation process and are described more fully later.

Figure 4. General framework model for evaluating the effectiveness of the U.S. national coastal management program, as adapted to the estuary and wetland protection issue.



[1]*Effectiveness* is defined as the impact of state CMPs relative to national core objectives. *Effectiveness* is measured by the on-the-ground outcomes of CZM program actions and decisions, the processes used to achieve the outcomes, and the relative importance given to the issue by the CZM program.
[2]Other core objectives addressed in the overall study include protecting beaches, dunes, bluffs, and rocky shores; providing for public access; revitalizing underutilized waterfronts; and promoting seaport development.
[3]See Appendix D for summaries of individual state CZM program evaluations; each one addresses issue importance, potential effectiveness, outcome effectiveness, and overall performance.

The study proceeded in stages. First, five test states were used to ground-truth our data needs and the collection process. This was followed by a long, intensive state data collection and profile development process that involved review of documents and structured interviews. Data analysis and synthesis was the final stage, focusing first on evaluation of individual state CMPs and then aggregation of results to the national level. Although the evaluation process is depicted as linear, it was actually an iterative learning process, with many feedback loops. The ex post facto nature of the study—essentially a reconstruction of the history of program operation and outcomes—made this a necessity. This was especially true for state data collection, which evolved throughout the project.

Definitions of Key Evaluation Terms. A number of terms are used throughout this report that are especially important in the research and evaluation process. One of these—*estuaries and coastal wetlands*—was defined in footnote 3. Other important definitions include:

Effectiveness—as defined for this study and for the CZME study as a whole, effectiveness is the impact of state CMPs relative to national core objectives; it is measured by the on-the-ground outcomes of CZM program actions and decisions, the processes used to achieve the outcomes, and the relative importance given to the issue by the CZM program.

Issue importance indicator—a single quantitative or qualitative measure that contributes to an overall assessment of the relative importance of estuary and coastal wetland protection as a CZM issue. Examples include the amount of wetland in a state's coastal zone versus the total area of the coastal zone, or the population growth rate as an indicator of development pressure. Issue importance indicators, taken together, represent the sum of environmental, social, economic, political, or other factors that influence a state's CMP development and implementation.

Process indicator—a qualitative, intermediate measure of effectiveness that contributes to the potential of a state CMP relative to CZMA goals. Examples include the scope and specificity of a policy, its geographic or jurisdictional reach (especially important for wetlands), its institutional strength (statute, administrative law, agency policy) and enforceability, and the perceptions of state experts as to its role and overall importance. For estuary and coastal wetland protection, an example of a process indicator is a regulatory permit program for wetland alterations or some of its specific components, such as exemptions, mitigation requirements, compliance monitoring and enforcement provisions, and so on. The process indicators used in this study are defined later.

Outcome indicator—a quantitative, on-the-ground measure of the results of CZM policy implementation decisions. The units of measure for on-the-ground outcome indicators may be area (square miles, acres, etc.), point (numbers), or line (miles, feet, or other lengths). Actual measures are related to baseline data (e.g., total wetland area) to normalize results and make them comparable among states (e.g., percent wetland loss attributed to permitting). Specific outcome indicators used in this study are defined later.

Potential effectiveness—an estimate of the promise exhibited by a state CMP's policies, processes, and tools as they appear "on paper." A state CMP's potential effectiveness for protecting estuaries and coastal wetlands is characterized by an overall process indicator rating (*High, Moderate,* or *Low*). The estimate is made by comparing state process indicator data (the use, importance, and ranking of processes and tools) to an idealized "model" program, using specified rating criteria. The rating criteria are themselves based largely on what the states collectively consider the most important

processes and tools for estuary and coastal wetland protection. Potential effectiveness ratings, when compared to outcome data, allow the evaluator to assess the "gap" between policy potential and on-the-ground implementation.

Outcome effectiveness—an estimate of the on-the-ground impact of state CMP decisions on the protection of estuaries and coastal wetlands; it is characterized in this study by an overall outcome indicator rating (*High, Moderate,* or *Low*). The outcome effectiveness estimate is made by aggregating the rating results of individual outcome indicators, first to the outcome indicator category level (regulatory, planning, acquisition, and restoration) and then to the overall state CMP level, using aggregation criteria developed by the researchers. Where good data were available for all rating categories, a conclusive overall rating is assigned. Where little or no data were available, inconclusive outcome ratings are assigned. Recognizing the ex post facto nature of this evaluation design and the stringent criteria for assigning conclusive ratings, a "probable" rating category was also invented for this study. This accommodated situations where available data strongly suggested a particular rating, but were still insufficient to be conclusive.

Program performance level—a context-based measure that rates programs as performing at either *higher-than-expected, expected, or less-than-expected levels* of effectiveness, considering issue importance ratings on one hand and potential effectiveness on the other. These ratings are "effectiveness in context" measures and are explained in detail later in the report.

The Data Collection Process

Five test states—Louisiana, Oregon, Pennsylvania, Rhode Island, and South Carolina— were selected for initial data collection and interviews. Test states were used to "ground truth" our data collection process, to test and refine our preliminary list of process and outcome indicators, and to identify additional information needed to develop state profiles and evaluate CZM effectiveness. OCRM provided a list of interview contacts for the states and an initial set of materials (original CZM program documents, Section 309 assessments and strategies, etc.). These were supplemented throughout the process by information from the states. A preliminary data collection form and proposed state "profile" outline were developed, sent to test states, and then used as the basis for initial phone interviews. The full study team met near the end of this stage to share results and work on continued development of the general framework for the study.

Preliminary state data analysis and evaluation methods were also developed at this stage, based in part on the types and amounts of outcome data available from test states. However, a decision was made early on not to limit the data search to just those indicators for which data were readily available, but instead to create an "ideal" set of outcome indicators—what data we would like to be able to collect. This had several purposes: it allowed for differences to emerge in record keeping among the states, including case examples of good record keeping; it provided an initial model of what a comprehensive outcome monitoring and record-keeping effort might look like; and it provided for a national assessment of how much effort might be involved in developing and implementing an national outcome indicator monitoring and reporting system. Identifying data gaps was therefore as important as identifying data availability.

Based on test state results, a final data collection form (DCF) was developed for estuary and coastal wetland protection (Appendix A). Published information, such as the initial CZM program

approval document, CZMA Section 309 assessments and strategies, and other reports and articles were initial data sources for completing the DCF, but the primary data were collected through a series of DCF-structured interviews. Interviews usually expanded beyond principal study contacts to specialists in different aspects of estuary and coastal wetland protection: research, mapping, record keeping, regulatory programs, planning elements, acquisition programs, wetland restoration efforts, education, and coordination. For example, see the state agency contacts list for Delaware in Appendix B. Agency contacts often provided additional unpublished information from reports, permit-tracking databases, and other sources. The data compiled in the DCF were converted to a standardized state CZM profile for estuary and coastal wetland protection for each of the twenty-nine states, following the template in Figure 5. A sample state profile for Delaware is provided in Appendix B. Detailed steps in the state data collection process included:

- OCRM provided information available from national files on the state CMP to the research team, which was then reviewed by the designated research team member.
- A research team member initiated the project by sending the state-designated contact person a blank copy of the DCF, followed by an introductory phone conversation to review the questions, identify and request additional information that might be available to answer the questions, and get a general idea of the state's program.
- The research team then filled out the data collection form using all the information now available, conducting one or more additional phone interviews as needed.
- A draft DCF completed by the research team was sent to the state-designated contact(s) for review, corrections, and additions, returning the modified DCF and supplemental information to the research team.
- The research team finalized the DCF form and developed a draft state profile following the template in Figure 5.
- The draft state profile is sent to the state for review, corrections, and additions; the state then returns the modified profile to the research team, which finalizes the profile. The final profile is then sent back to the state.

A. BACKGROUND AND CONTEXT (boundary, areas, shoreline, landforms, population, human use, etc.)

1. STATE'S ESTUARIES AND COASTAL WETLANDS

Estuaries and Tidal Wetlands
- Overview (number and areas of estuaries, tidal wetlands, etc.)
- Functions and Values
- Historic Losses
- Recent Losses and Development Pressures

Non-tidal Freshwater Coastal Wetlands
- Overview (data on area, distribution, and types of nontidal wetlands in the CZ, etc.)
- Functions and Values
- Historic Losses
- Recent Losses and Development Pressures

2. ISSUE IN THE STATE—IMPORTANCE OF ESTUARY AND COASTAL WETLAND PROTECTION

Issue Importance at CZM Approval (based on program content, etc.)

Evolution of Issue Importance (how issue importance changed from CZM approval to present)

B. KEY MANAGEMENT AUTHORITIES AND POLICIES

1. POLICIES *PRIOR* TO CZM PROGRAM

2. POLICIES *AT CZM PROGRAM APPROVAL*

3. POLICY *ADDITIONS & CHANGES* SINCE PROGRAM APPROVAL

C. MANAGEMENT PROCESSES AND TOOLS (Table: CZM Management Processes and Tools)

D. "ON-THE-GROUND" OUTCOMES OF POLICY IMPLEMENTATION

1. OUTCOME MONITORING AND RECORD KEEPING (extent/quality of data and record keeping)

2. REGULATORY PROGRAM OUTCOMES (tables and narrative)

3. PLANNING PROGRAM OUTCOMES (tables and narrative)

4. ACQUISITION PROGRAM OUTCOMES (tables and narrative)

5. NONREGULATORY PROGRAM OUTCOMES (tables and narrative)

E. CASE EXAMPLES OF SUCCESSFUL PROCESSES AND TOOLS

F. STATE DATA COLLECTION CONTACTS

G. REFERENCES

Figure 5. State CZM profile *template* for estuary and coastal wetland protection.

Steps in the State CMP Evaluation Process

Once all available process and outcome data for states were collected and state CZM profiles developed, individual state programs were evaluated for effectiveness in a four-step process to estimate issue importance, potential effectiveness based on process indicator evaluation, outcome effectiveness based on available outcome data, and overall performance. Each of the four steps in the state CMP effectiveness evaluation has a separate worksheet, including rating criteria and a summary table. For potential effectiveness, outcome effectiveness, and overall performance, tidal and nontidal management efforts were evaluated separately. This separation has an obvious ecological basis, but it also has a legal-institutional rationale, given differences in public trust responsibilities, ownership predominance, and jurisdictional boundaries. Appendix C is an example of the evaluation worksheets for the state of Delaware. Data for the worksheets were drawn from the state profiles and from baseline data in Table 1. The steps in the state evaluation process are outlined below and discussed further in the Evaluation Results and Discussion section.

Step 1: Assess Issue Importance. The importance of estuary and coastal wetland protection as an issue in each state was estimated based on the seven social and environmental indicators:

- ESA:CZA—Estuarine surface area compared to coastal zone land area (percent)
- WET:CZA—Area of wetlands in coastal zone compared to coastal zone land area (percent)
- %Loss—Percent historic (pre-CZM) wetland loss
- PopD—Population density of coastal counties in 1990
- %PopC—Percent population change from 1970 to 1990
- Impt1—Issue importance at the time of CZM program approval
- Impt2—How the importance of the issue evolved from the time of CZM approval to present

High, moderate, and low rating classes were defined for the first five of these indicators based on spreadsheet analysis of the data in Table 1, followed by categorization of states based on how they clustered. The last two indicators were rated during the state interview process. These results and the significance of each of the indicators are presented later in the Evaluation Results and Discussion. The value of a state's issue importance rating is that it establishes expectations for estuary and coastal wetland policy emphasis, scope, and detail. For example, if there are large estuary and wetland areas in a state's coastal zone compared to overall coastal zone land area, and coastal development pressure is high, the issue would likely be of high importance. In this case, one would expect the state to have robust estuary and wetland protection policies, use a range of tools, and implement them effectively as evidenced by on-the-ground outcomes. On the other hand, if a state has few wetlands with minimal historic loss, and there is low population and little growth, estuary and wetland protection, while still important because of the national prominence of the issue, may not be given as much attention as some other CZM issues.

Step 2: Evaluate process indicators to determine potential effectiveness. The processes and tools that states use to implement CZM policies and programs for estuary and wetland protection were defined as "process indicators." The use and importance of thirty-three different processes and tools in six categories—Resource Assessment, Regulatory, Planning, Acquisition, Nonregulatory, and Coordination—were examined (the complete list of processes and tools is presented later in the context

of results). During the state data collection process, the use of each process or tool was determined (*yes* or *no*), its importance for protection rated (*high, moderate,* or *low*), and the top five tools arranged in rank order. Process indicator ratings were used in several ways. First, once all states were evaluated, the final ranking results were aggregated to determine the *most important processes and tools* for estuary and coastal wetland protection from a national perspective. Next, these same processes and tools were used to characterize a *model state CMP,* and then to develop criteria and scaling factors for rating individual state CMPs. These criteria-based process indicator evaluations, in turn, serve as a rough measure of the *potential effectiveness* of state CMP for protecting estuaries and coastal wetlands. The process indicator evaluations also establish expectations for state CMP implementation and the kinds of outcome indicator data that might be available. For example, if a state rates its tidal wetland regulatory program as highly important for estuary and wetland protection, it would be expected that on-the-ground outcome data are available to support that, such as area lost through permitting, and area regained through compensatory mitigation (assuming they had a no-net-loss policy).

Step 3: Evaluate outcome effectiveness based on available data. Of the six categories of processes and tools examined in this study, only four result in on-the-ground outcomes as defined here: Regulatory, Planning, Acquisition, and Nonregulatory. Even within these four categories, only selected processes and tools were deemed to have outcome indicators that can be measured on the ground. For each of the indicators in each category—Regulatory, Planning, Acquisition, and Nonregulatory Restoration, available data were used to assign a rating based on outcome indicator criteria that are described as part of the Evaluation Results and Discussion section. In general, if a process or tool is used in a state, and good data were available that address a particular outcome indicator, a *high, moderate,* or *low* rating is assigned, based on how the data match up with the criteria. If a tool was used by a state and data were not available, it is assigned an *inconclusive* rating. In some cases where sufficient data were not available to make a conclusive determination but were highly suggestive of performance levels, a probable outcome rating—for example, *inconclusive (moderate)*—was assigned for that indicator. Data for rating outcome indicators were from the state profiles we compiled. It is important to note that we did not ask the states to do extensive work to develop new data sets just for this study; instead, we relied on available or easily compiled data. A sample state evaluation for Delaware is included as Appendix C.

Step 4*: *Synthesize and evaluate state CMP effectiveness and overall performance. For each state, summary ratings of issue importance, process indicators, and outcome indicators were compiled and a narrative evaluation prepared. In addition, an overall effectiveness rating was assigned, program strengths identified, and areas for program improvement suggested. Individual state effectiveness evaluations, summaries of which are included in Appendix D, are useful as a stand-alone product, especially for the state involved, but their principal use is in the overall national assessment of CZM effectiveness.

For the national synthesis of state CZM effectiveness prepared for estuary and coastal wetland protection (this report), evaluation results for all states were compiled into summary tables, analyzed, and compared. Issue importance was examined from regional and other perspectives to examine relationships and trends. Some national-level analysis fed into parts of the evaluation process discussed earlier. For example, process indicators were used to define *most important processes and tools* from

a national perspective, and these in turn were used to help define both a *model state CMP* for estuary and coastal wetland protection and process indicator evaluation criteria. Outcome effectiveness was examined nationally to determine patterns in data availability and regional trends. Case examples from states that use different processes and tools in particularly successful and innovative ways were summarized. All of the results were then compared—issue importance, potential effectiveness, and outcome effectiveness. Issue importance establishes expectations for state CZM policy; the process indicator evaluation suggests whether expectations were exceeded, met, or not met. When outcome effectiveness is added, there is a basis for assessing overall state CZM program performance. From the outset of the study, it was expected that outcome data would be sparse; consequently, an assessment of data availability from a national perspective is an important part of this analysis.

Limitations of the Study and Evaluation Methodology

This CZM effectiveness study presented a number of conceptual challenges and practical limitations. Some of these relate to the ex post facto nature of this evaluation study. Others have to do with the broad, yet often loose structure of state CMPs, especially the networked programs. Still others have to do with niche role that state CMPs play in some aspects of estuary and wetland management. Others simply relate to the limited funding and time available to conduct the study. Some of the challenges and limitations are discussed below.

Attribution of Policy Outcomes to CZM Versus Other Programs. A research design challenge that merits particular attention in a study focusing on outcome effectiveness is the "attribution question"—Was this outcome a result of CZM or was it more associated with some other program? How are relative contributions sorted out? Because the emphasis in this study was on examining outcomes of state CZM policy implementation, and not on comparing CZM policy outcomes to those of the many other public and private programs working toward similar goals, we could not fully address the attribution issue. However, our criteria for linking outcomes with CZM activities were fairly clear-cut. For CZM to get credit for an outcome, it needed to have a clear basis in state CZM policy, an associated investment of either federal or state CZM resources, and a direct or indirect outcome that could be linked back through a CZM process or tool. Nevertheless, it was clear that many of the outcomes we identified as "CZM" were based on partnerships with other governmental agencies and private organizations—the credit is shared. In many cases, this "shared credit" was the result of wise investments of limited resources. Often, CZM resources were used as a catalyst for subsequent non-CZM actions—for example, providing CZM funds to prepare a plan for acquisition of critical wetland habitat, but depending on other public and private sources to actually implement the plan. However, sorting out the relative contributions of different programs was not possible in our study, which focused exclusively on CZM.

Data Availability. Probably the most significant limitation of this study was the scarcity of data for some of the outcome indicators we identified as important. This situation was expected because no standardized, on-the-ground outcome monitoring protocol exists for assessing state CMP performance relative to national CZMA objectives. Indeed, one of the underlying purposes of this study was to identify a meaningful set of outcome indicators for each objective that might serve as a basis for

establishing a national performance monitoring system in the future. Even the initial request for proposals suggested that outcome data would likely be limited and that process indicators might serve as a fall-back for estimating effectiveness. Outcome data were indeed relatively scarce and when data were available, they often lacked comparability. Baseline data needed to evaluate some indicators were also of relatively poor quality in some cases. Despite these built-in limitations, there were sufficient data to draw some tentative conclusions about state and national CZM performance. These findings are presented later in this report.

Limited Scope and Depth of Study. State CMP effectiveness is examined principally in terms of how well estuaries and coastal wetlands are protected from direct physical alterations such as dredging, filling, and other conversions. Area measurements are thus the principal currency for outcome indicators. We did not attempt to address questions of estuarine or coastal wetland function or quality. Wetland managers will appreciate the reasons for this. Standard methods for assessing wetland function and quality are just being developed. States do not systematically address these issues in their decision making, relying more on case-by-case application of professional judgment. Records of these considerations are not kept. Similarly, we did not explicitly address the water quality aspects of protection, even though they are very important. This was in part because state CMPs are recent entrants to the water quality management arena; historically, other federal and state agencies and programs have dominated. It was also beyond the scope of this study, given available funding and time. Such evaluation should be considered for a future study.

State and Federal CZM Funding and Staffing Measures. We did not tabulate overall state and federal CZM funding and staffing inputs to estuary and coastal wetland protection. These might have enabled us to sort out those programs that were long on policy but short on implementation and enforcement. However, given the highly networked nature of CZM for this issue area, such tabulation would have added further complexity to an already major data collection effort. Furthermore, one relatively recent study (Brower and others 1991) has already summarized these data, albeit at a more general level (i.e., for natural resource protection in aggregate).

CZM Policy Outcomes versus State of the Coastal Environment. This study focused on the on-the-ground outcomes of CZM decisions and actions—for example, the area of wetlands lost due to development that required a CZM permit, or the area of wetland regained through compensatory mitigation. We did not systematically relate CZM policy outcomes to *overall* health of estuaries and coastal wetlands. Data for such comparisons, such as change detection analysis for wetlands, simply do not exist in most states. Nevertheless, linking CZM policy decision outcomes to overall changes on the ground should be the ultimate goal of program evaluation. Eventually, NOAA's "state-of-the-coast" project and similar programs in several states may be able to track key indicators of coastal environmental health and relate them to state CZM and other programs. Florida is one promising example of a state coastal health indicator framework that may have the potential to be linked to CZM program outcome indicators (www.fsu.edu~cpm/FACT/).

Would the Same Outcomes Have Occurred Without CZM? A final limitation of the research is that it is not possible to say whether or not the same outcome would have occurred without CZM. One

problem is that there are no states to serve as controls. States without federally-approved CZM programs might be considered candidates, but all are "contaminated" by their previous participation in the federal program. All have thus been influenced by national criteria or by examples from states with approved programs.

Evaluation Results and Discussion

Results of the effectiveness evaluation process are presented and discussed here using the same four steps followed in the evaluation process. Issue importance is discussed first, providing context for how significant estuary and coastal wetland protection as a policy issue for each states. Process indicator results are then presented, including the derivation of the model program that serves as the standard of comparison for estimating the potential effectiveness of each state CMP. Outcome effectiveness results follow, along with a discussion of data availability issues. Examples of states with relatively good record keeping for at least some outcome indicators are given. Next, overall performance results are presented—this is the final step in the evaluation process where outcome effectiveness is compared with issue importance on one hand and potential effectiveness on the other. This final step is designed to place outcome effectiveness results within the unique social, environmental, and institutional setting of each state. Finally, the role and importance of case examples in CZM evaluation is discussed.

Step 1: The Relative Importance of Estuary and Coastal Wetland Protection

Many factors contribute to the relative importance of *estuary and coastal wetland protection* in a state and, in turn, to the attention it gets in a state's coastal program. Some of these factors are environmental, while others are economic, social, or political in nature. Seven such factors, some of which were discussed earlier, were selected as *indicators of issue importance* for this study issue (Table 3). There are several reasons why this particular set of indicators was selected from the range of possible candidates. First, comparable national data were available; for many other variables, this is not the case. Second, the indicators appear to be relatively independent of one another—they do not measure the same things. Finally, the indicators represent a good balance of environmental factors (the first three), social-demographic factors (the next two), and policy leaders' perceptions (the final two). No doubt there are other factors that are just as important to those selected. For example, the unique institutional legacy of each state or territory—how it approaches environmental management generally and what approaches are socially and politically acceptable—is very important. So are funding and staffing levels for program implementation. Other social and political forces and trends and state CZM program response to them may also be significant factors. And there are more—Sabatier and Mazmanian (1983), in their evaluation of California's coastal program, identified as many as seventeen variables affecting implementation.

Table 3. Issue importance indicators for *estuary and coastal wetland* protection in coastal states, indicator significance, number of states in each rating class, and data sources for indicators.

ISSUE IMPORTANCE INDICATOR	DEFINITION	SIGNIFICANCE AS AN INDICATOR	RATING CLASSES, CRITERIA AND NO. STATES IN CLASS[1]	PRINCIPAL DATA SOURCES
ESA:CZA[2]	Estuarine surface area compared to coastal land area (ratio)	Rough measure of the relative physical dominance and importance of services provided by estuaries in the coastal zone	HIGH: >0.35:1 (9) MOD: 0.06-0.35:1 (9) LOW: <0.06:1 (9)	NOAA (1985) NOAA (1992)
WET:CZA	Wetland area in coastal zone compared to coastal land area (ratio)	Rough measure of the relative physical dominance and importance of services provided by wetlands in the coastal zone	HIGH: >0.30:1 (8) MOD: 0.10-0.30:1 (12) LOW: <0.10:1 (9)	NOAA (1991) NOAA (1992)
%Loss	Historic wetland loss (%)	Rough measure of long-term direct impacts of human development of coastal zone	HIGH: >40%(17) MOD: 20-40% (8) LOW: <20% (4)	Dahl (1990) State profiles
PopD	Population density of coastal counties (1990)	Rough measure of historic and present urban development pressures in coastal zone	HIGH: >500/mi^2(11) MOD: 150-500/mi^2 (12) LOW: <150/mi^2 (6)	NOAA (1990)
%PopC	Population change 1970–1990 (%)	Rough measure of development pressures in coastal zone since CZM instituted	HIGH: >50% (8) MOD: 20-50% (11) LOW: <20%(10)	NOAA (1990)
Impt1	Issue importance at time state CZM program approved	Estimate of political attention given and perceived importance of issue at CZM approval	HIGH: (17) MOD: (10) LOW: (2)	State profiles
Impt2	Issue importance evolution to present	Estimate of political attention given to issue from CZM approval to present	HIGH: (25) MOD: (4) LOW: (0)	State profiles

[1]Rating classes were based on how states clustered in spread sheet analysis of data for each indicator (see Table 1 for data); the numbers of states in each rating class are in parentheses (for ESA:CZA, there are only twenty-seven states because Michigan and Wisconsin, both Great Lakes states, have no estuaries).

[2]Ratios were used because consistent data were not available to estimate the percent of entire coastal zone (land and water) that was either estuarine surface area or coastal wetland.

To simplify the results and allow easy comparisons among states, a simple data classification system was established, with high-moderate-low ratings for each indicator based on how states clustered into groups of approximately equal size (Table 3). The exceptions to this equal-size grouping criterion were the indicator for wetland loss and the two perception-based indicators. In the first case, because loss was relatively high in most states, rating class boundaries were such that a majority of states received a "high importance" rating for this indicator.

Aggregation of the seven indicator ratings for each state showed that estuary and coastal wetland protection as a state CZM issue was of *high importance* for thirteen of twenty-nine states or 45 percent (Table 4). Examples include Alabama and Puerto Rico (2.71 ratings) and Connecticut, New York, New Jersey, Florida, and California (all with 2.57 ratings). Issue importance was of *low importance* for just two states (Guam and Hawaii), with the remainder being rated of *moderate importance* (fourteen states or 52 percent). The mean rating for all twenty-nine state CMPs was 2.27 with a standard deviation of ±0.32. Mean scores for individual issue importance indicators show that three of the seven were of high importance. Perceived issue importance today (2.86) and perceived importance at CZM approval (2.52) were the highest rated indicators overall, followed by historic loss of coastal wetlands (2.45). The remaining indicators were of moderate importance overall.

As might be expected, there are some differences in *overall* issue importance for the indicators when aggregated to the regional level (Table 4). For none of the coastal regions was issue importance low overall; this is not surprising given the fact that estuary and coastal wetland protection has been a front-burner issue generally in the U.S. over the past twenty-five years. For three of the regions—Gulf Coast (2.50), Mid-Atlantic (2.46), and Southeast (2.43)—issue importance was high, and another was just below high (New England (2.29). The remaining three were clearly in the mid-range of moderate—West Coast (2.14), Great Lakes (2.08), and Islands (2.05). Among the individual states, just two in the moderate range fell below the mid-point—Alaska (1.71) and Oregon (1.86).

There are also many regional differences and patterns among the different indicators (Table 4). For example, a comparison of percent historic wetland loss with population density in the Mid-Atlantic region shows an apparent correlation between the two variables, probably because extensive urban development contributed significantly to wetland loss. But the same correlation does not show up in the Great Lakes states, perhaps because wetland loss there is more associated with agriculture than urbanization. Another example is that for all regions except the Southeast, perceptions of issue importance by coastal managers increased between the time of initial state CMP approval to present. In 1996, twenty-five of the twenty-nine state CZM programs (86 percent) perceived estuary and coastal wetland protection of high importance, whereas at the time of initial state CMP approval, fewer did—eighteen of twenty-nine, or 63 percent. For only one CZM program—the Northern Mariana Islands—did perceived issue importance decrease over this time.

Table 4. Issue importance ratings for estuary and coastal wetland protection by region.

STATE or REGION	ESA: CZA[1]	WET: CZA	% Loss	PopD	%PopC	Impt1	Impt2	OVERALL IMPORTANCE	
								Mean	Rating
Maine	M[2]	M	M	L	M	M	H	2.00	*Moderate*
New Hampshire	L	L	M	M	H	H	H	2.14	*Moderate*
Massachusetts	H	M	M	H	L	H	H	2.43	*High*
Rhode Island	M	M	M	H	L	H	H	2.29	*Moderate*
Connecticut	H	M	H	H	L	H	H	2.57	*High*
New England	2.2 *Mod.*	1.8 *Mod.*	2.2 *Mod.*	2.4 *High*	1.6 *Low*	2.8 *High*	3.0 *High*	2.29	*Moderate*
New York	H	H	H	H	L	M	H	2.57	*High*
New Jersey	H	H	M	H	L	H	H	2.57	*High*
Pennsylvania	M	M	H	H	L	M	H	2.29	*Moderate*
Delaware	M	M	H	M	M	M	H	2.29	*Moderate*
Maryland	H	M	H	H	L	H	H	2.57	*High*
Mid-Atlantic	2.6 *High*	2.4 *High*	2.8 *High*	2.8 *High*	1.2 *Low*	2.4 *High*	3.0 *High*	2.46	*High*
Virginia	M	M	H	M	M	H	H	2.43	*High*
North Carolina	H	M	H	L	M	H	H	2.43	*High*
South Carolina	L	H	M	L	H	H	H	2.29	*Moderate*
Florida	L	H	H	M	H	H	H	2.57	*High*
Southeast	1.75 *Mod*	2.5 *High*	2.75 *High*	1.5 *Low*	2.5 *High*	3.0 *High*	3.0 *High*	2.43	*High*
Florida	L	H	H	M	H	H	H	2.57	*High*
Alabama	H	H	H	M	M	H	H	2.71	*High*
Mississippi	M	H	L	M	M	M	H	2.14	*Moderate*
Louisiana	H	H	H	M	L	H	H	2.57	*High*
Gulf Coast	2.25 *Mod*	3.0 *High*	2.5 *High*	2.0 *Mod*	2.0 *Mod*	2.75 *High*	3.0 *High*	2.50	*High*
California	M	M	H	H	M	H	H	2.57	*High*
Oregon	L	L	M	L	M	H	H	1.86	*Moderate*
Washington	M	M	H	M	M	H	H	2.43	*High*
Alaska	M	L	L	L	H	M	M	1.71	*Moderate*
West Coast	1.75 *Mod*	1.5 *Low*	2.25 *Mod*	1.75 *Mod*	2.25 *Mod*	2.75 *High*	2.75 *High*	2.14	*Moderate*
Michigan	n/a[4]	L	H	L	L	H	H	2.00	*Moderate*
Wisconsin	n/a[4]	M	H	M	L	M	H	2.17	*Moderate*
Great Lakes	n/a[4]	1.5 *Low*	3.0 *High*	1.5 *Low*	1.0 *Low*	2.5 *High*	3.0 *High*	2.08	*Moderate*
American Samoa	L	L	M	H	H	L	H	2.00	*Moderate*
Guam	L	L	L	M	H	L	M	1.57	*Low*
Hawaii	L	L	L	M	M	M	M	1.57	*Low*
Northern Marianas	L	L	H	M	H	H	M	2.14	*Moderate*
Puerto Rico	H	H	H	H	M	M	H	2.71	*High*
Virgin Islands	L	L	H	H	H	M	H	2.29	*Moderate*
Islands	1.33 *Low*	1.33 *Low*	2.17 *Mod*	2.5 *High*	2.67 *High*	1.83 *Mod*	2.5 *High*	2.05	*Moderate*
All State Mean[3]	2.00 *MOD*	1.97 *MOD*	2.45 *HIGH*	2.17 *MOD*	1.93 *MOD*	2.52 *HIGH*	2.86 *HIGH*	2.27	*MODERATE*

[1]See Table 3 for definitions of issue importance indicators.

[2]H—Data indicate issue should be of *High Importance* in state/region (for mean scores H = 3).
M—Data indicate issue should be of *Moderate Importance* in state/region (for mean scores M = 2).
L—Data indicate issue should be of *Low Importance* in State or region (for mean scores L = 1).

[3] 1.0 to 1.67 = Issue is of *Overall Low Importance* in the state (row) or for indicator (column).
1.68 to 2.33 = Issue is of *Overall Moderate Importance* in the state (row) or for indicator (column).
2.34 to 3 = Issue is of *Overall High Importance* in the state (row) or for indicator (column).

[4] Neither Michigan or Wisconsin have estuaries (on the Great Lakes)

Another issue importance trend from initial program approvals (late 1970s and early 1980s) to present that is not apparent from the rating data, but clear in state profiles, is a shift in program development emphasis from estuaries and tidal wetlands to freshwater, nontidal coastal wetlands. Generally, by the early 1980s, estuarine and tidal wetland areas were relatively well protected from direct physical alterations through state and federal regulatory programs and other authorities. However, freshwater wetlands, mostly on private lands, do not enjoy the same strong protection. These wetlands are being converted to other uses at a relatively high rate as the numbers of new residents, visitors, and associated development mushroomed. Some states responded with new regulatory programs (e.g., New Jersey and Maryland) or, where such programs could not be enacted, with creative use of federal consistency (e.g., South Carolina), with improved Clean Water Act Section 401 certification procedures (e.g., Wisconsin) to provide increased state oversight within the coastal zone, or with special area planning designations and programs that increased protection (e.g., Rhode Island).

The significance of the issue importance ratings is that it establishes expectations for how much attention each state gives to estuary and coastal wetland protection in terms of policy emphasis, the processes and tools used to implement policy, and record keeping to track on-the-ground outcomes of policy implementation. Essentially, issue importance sets up a baseline for evaluating the effectiveness of a program in relative terms. For example, if issue importance is moderate, outcome effectiveness should be at least moderate in order for a state's program to be considered performing well or "as expected" for this core CZM objective. However, an overall issue importance rating is not a substitute for more detailed consideration of individual indicators and other factors that comprise the context for a state's coastal policies and their implementation.

Step 2: Potential Effectiveness of CZM Programs Based on Process Indicators

The next step in the CZM evaluation process was to estimate the potential effectiveness of each state's "on-paper" management program, based on the policies, processes, and tools they used to achieve estuary and coastal wetland protection objectives. We defined these policies, processes, and tools as "process indicators" (Table 5). But before potential effectiveness could be estimated, a consistent CMP evaluation method needed to be developed that could be applied to each state across the board. The approach we took was to compare each state's program to an empirically derived *model state CMP* developed using aggregated state process indicator results. The model CMP and its basis are described below, followed by a national overview of potential effectiveness results.

The Model State CMP and Evaluation Criteria. The first task in developing the model state CMP and process indicator evaluation criteria was to identify the policies, processes, and tools most important for estuary and coastal wetland protection from a national perspective. These were identified in a three-step assessment of process indicator use that relied heavily on state CMP documents and interviews with state coastal staff. In the first step, it was determined whether a process or tool was used in the state—simply a *yes* or *no*. Because most processes and tools were being used by most state CMPs (Table 6), these results did not contribute much to development of an idealized or model CMP.

Table 5. Process indicators—the processes and tools used by states to protect estuaries and coastal wetlands—and the ten *most importance processes and tools* (**bold**) based on aggregated state rankings of importance.

CZM POLICY, PROCESS, OR TOOL DEFINITIONS	Raw Score	Ranking
1. INFORMATION AND RESEARCH		
1a. Inventory and mapping	**25**	**5**
1b. Wetland functions assessment	6	
1c. Wetland change detection monitoring	0	
1d. GIS, database, automated records to track program actions	4	
2. REGULATORY		
2a. State tidal wetlands permit required	**100**	**1**
2b. State nontidal wetlands permit required	**62**	**2**
2c. Local government tidal or nontidal wetland permit required	21	
2d. General permits or exemptions for low-impact activities used	2	
2e. Federal consistency standards used *in lieu of* state-level permit	**23**	**8 (tie)**
2f. State consistency standards used *in lieu of* state-level permit	0	
2g. State CWA 401 certification used *in lieu of* state-level permit	10	
2h. State tideland leasing requirements used *in lieu of* state-level permit	0	
2i. Environmental impact assessment required	13	
2j. Non-water-dependent exclusion or limitations	6	
2k. Single-purpose dock exclusion or limitations	0	
2l. Other use exclusion or limitations	10	
2m. Compensatory mitigation required (no-net-loss policy)	**23**	**8 (tie)**
2n. Compliance monitoring and enforcement program	**24**	**6 (tie)**
2o. Mitigation banking permitted as compensatory mitigation	0	
2p. Development setback or buffer from wetlands required	10	
3. PLANNING		
3a. Land use planning and zoning protects wetlands	**37**	**3**
3b. Special area management plan (SAMP) protects wetlands	**23**	**8 (tie)**
3c. Critical Areas, other protected area designations	16	
3d. Advanced Identification Plans (EPA) protect wetlands	0	
4. ACQUISITION		
4a Fee simple acquisition with state or federal CZM funds	18	
4b. Less-than-fee acquisition with state or federal CZM funds	5	
4c. *Fee simple* acquisition with other than CZM funds	**29**	**4**
4d. *Less-than-fee ac*quisition with other than CZM funds	5	
5. NONREGULATORY		
5a. Nonregulatory restoration or enhancement	12	
5b. Education and technical assistance	**24**	**6 (tie)**
6. COORDINATION		
6a. Joint state-federal permit application	2	
6b. Interagency pre-application consultation process	9	
6c. Memoranda of agreement to promote cooperation	0	

The next step, therefore, was to ask, for each tool that was used, how important it was for protecting estuaries and coastal wetlands in the state—*high*, *moderate*, or *low*. Aggregating these importance ratings across all states provided a measure of relative importance of different tools, but with a bias toward tools with broad use. To help remove this bias, each state was asked to identify, in rank order, its top five tools for estuary and coastal wetland protection. These ranking data were then aggregated to identify the *most important processes and tools* from a national perspective. The final rankings for each state were arrived at through interviews with one or more state-level personnel, with final signoff by principal study contacts during state profile review.

The top ten processes and tools in rank order are identified in Table 5 (far right column). Five of the top ten are regulatory programs or elements of regulatory programs. This suggests that these tools are the underpinnings for estuary and coastal wetland protection at the state level, much the same as the Clean Water Act's Section 404 program is perceived as the lynchpin to federal wetland protection. Other processes and tools, however, were also deemed essential for a well-rounded estuary and coastal wetland management program. These included inventory and mapping efforts that accurately characterize wetland location and type; planning at the local or regional level to resolve land use conflicts and provide advance protection for critical resources; careful use of CZM resources to acquire or promote acquisition of critical areas that cannot otherwise be protected; and education and technical assistance for a variety of audiences.

Comparison of the results from the steps used to arrive at the list of *most important processes and* tools demonstrates the utility of the three-step approach. For example, just six of the most-used tools (Table 6) were among the ten most important (Table 5), and there are significant differences in their relative importance. The top-ranked tools—state tidal and nontidal permits—were not even among the ten most-used tools. Compliance monitoring and enforcement, and education and technical assistance were used by all states, but were ranked sixth among the most important processes and tools. Interagency pre-permit application meetings were used by all states, but did not rank among the ten most important. The point is that simple use of a tool does not determine its relative importance in achieving management objectives. The *most important processes and tools* also are useful for other purposes, serving as the foundation for a *model state CMP* for estuary and coastal wetland protection, as well as the basis for developing *process indicator evaluation criteria*. These are discussed next.

The ten *most important processes and tools* were the principal basis for defining elements of a *model state CMP* for estuary and coastal wetland protection (Figure 6). Other less important tools are included as well, such as nonregulatory restoration and various coordination features, but the most important processes and tools are at the core of the model program. An implicit

Table 6. The use of estuary and coastal wetland protection processes and tools in state coastal management programs.

PROCESS OR TOOL	AL	AK	AS	CA	CT	DE	FL	GU	HI	LA	ME	MD	MA	MI	MS	NH	NJ	NY	NC	NM	OR	PA	PR	RI	SC	VI	VA	WA	WI	Total Using
INFO/RESEARCH TOOL																														
1a. Inventory and mapping	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	28
1b. Wetland functional assessment	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓			✓	✓	✓	26
1c. Wetland change monitoring	✓	✓		✓	✓		✓		✓	✓	✓	✓	✓	✓	✓	✓		✓	✓			✓	✓				✓		✓	19
1d. GIS, database, computer-based records	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	28
REGULATORY TOOLS																														
2a. State tidal wetlands permit	✓		✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	na	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		na	24/27
2b. State nontidal wetlands permit	✓		✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓		✓	✓	✓		✓		✓			✓	21
2c. Local tidal/nontidal wetland permit		✓		✓	✓		✓		✓	✓	✓	✓	✓	✓		✓	✓	✓	✓			✓		✓	✓		✓	✓	✓	20
2d. General permits/exemptions	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓	✓	✓	26
2e. Federal consistency stds. *In lieu of* permit	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓			✓			✓	✓				✓		✓		✓			16
2f. State consistency stds. *in lieu of* permit	✓	✓				✓			✓	✓	✓				✓			✓	✓	✓							✓			11
2g. State CWA 401 certif. *in lieu of* permit	✓	✓			✓	✓		✓		✓			✓		✓		✓	✓	✓				✓		✓		✓	✓	✓	16
2h. State tideland leasing regs. *in lieu of* permit	✓	✓					✓	✓	✓	✓	✓			✓	✓		✓	✓		✓			✓	✓			✓			15
2i. Environmental impact assessment	✓		✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓		✓	✓	✓	✓		✓	✓	✓		✓	✓	✓	✓	24
2j. Non-water-dependent exclusion/limit	✓	✓	✓	✓	✓	✓				✓		✓	✓		✓	✓	✓	✓	✓	✓	✓	✓		✓	✓		✓	✓	✓	22
2k. Single-purpose dock exclusion/limit	✓					✓	✓					✓	✓			✓	✓		✓		✓			✓	✓		✓	✓	✓	14
2l. Other use exclusions/limits	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓		✓		✓	25
2m. Compensatory mitigation required	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		27
2n. Compliance monitoring/enforcement	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	29
2o. Mitigation banking				✓			✓			✓	✓	✓	✓	✓	✓		✓		✓		✓		✓				✓			13
2p. Development setback or buffer		✓	✓	✓	✓	✓	✓				✓	✓	✓		✓	✓	✓	✓	✓	✓	✓		✓	✓	✓		✓	✓	✓	22

Table 6. The use of estuary and coastal wetland protection processes and tools in state coastal management programs (continued).

PROCESS OR TOOL	AL	AK	AS	CA	CT	DE	FL	GU	HI	LA	ME	MD	MA	MI	MS	NH	NJ	NY	NC	NM	OR	PA	PR	RI	SC	VI	VA	WA	WI	Total Using
PLANNING TOOLS																														
3a. Land use planning or zoning	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓	✓	✓	✓	✓	✓	27
3b. Special area management plan (SAMP)		✓	✓	✓	✓		✓	✓	✓	✓		✓			✓		✓	✓	✓	✓			✓	✓	✓		✓	✓		19
3c. GAPC, AECs, Critical Areas, MPAs	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	28
3d. Advanced Identification Plans (EPA)	✓	✓	✓	✓			✓							✓	✓		✓		✓						✓				✓	11
ACQUISITION TOOLS																														
4a. *Fee simple*[2] acquisition with CZM$	✓			✓					✓		✓	✓				✓			✓		✓		✓		✓		✓	✓	✓	13
4b. *Less-than-fee*[2] acquisition with CZM$	✓			✓															✓								✓	✓	✓	6
4c. *Fee simple* acquisition with other $	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓			✓	✓			✓	✓	✓	22
4d. *Less-than-fee* acquisition with other $				✓	✓	✓	✓					✓		✓		✓	✓	✓	✓				✓	✓			✓	✓		14
NONREGULATORY TOOLS																														
5a. Restoration, creation, enhancement (non-regul.)		✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓		✓			✓				✓	✓	✓		✓	✓	✓	20
5b. Education and technical assistance	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	29
COORDINATION TOOLS																														
6a. Joint state-federal permit application	✓	✓	✓	✓	✓		✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓					✓	✓	✓	21
6b. Interagency pre-application meetings	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	29
6c. Memoranda of agreement	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓		✓	✓	✓	24

✓—The state or territory CMP uses this process or tool to implement estuary and/or coastal wetland protection policies; na means not applicable.

Information and Research Element

A **recent, accurate wetland inventory** and **GIS-based mapping** support regulatory, planning, and other program elements. The inventory integrates **wetland function assessment**, and the state periodically **monitors wetland change** on the ground.

Regulatory Element

The state has regulatory **permit programs** for tidal and nontidal waters and wetlands in the coastal zone, either through a coastal use permit or a resource-specific program. The programs are administered at the state level, or, if at the local level, there is strong state oversight. State permit decisions are the basis for **federal consistency** and **401 water quality certifications**. The program has streamlined its process using **general permits**, but there are no exemptions that lead to significant cumulative impacts. The state has a **no-net-loss** of wetlands policy implemented through a sequenced "avoid-minimize-compensate" wetland **mitigation** requirement. Mitigation priorities emphasize restoration over creation. There is also a strong compliance monitoring and enforcement program. **Reliable *outcome data*** is available through agency **databases and GIS** and demonstrate that permitted loss of habitat is low with favorable trends, that violations and related losses are low or decreasing. This is supported by independent on-the-ground wetland change analysis. Mitigation has replaced both area and functions lost through permitted projects at greater than a 1:1 ratio. Only water-dependent projects receive permits for wetlands adjacent to navigable waters, and single-purpose dock permitting has declined in favor of community moorage.

Planning Element

Local land use plans based in part on state standards to protect estuarine and wetland resources are in place. In areas with particularly important resources, many competing uses, and/or significant development versus conservation conflicts, other more intensive planning exercises have succeeded using **special area management planning** (SAMP) or similar processes. Alternatively, the state has designated **GAPCs, AECs, or critical areas** and, using similar processes, developed plans that protect coastal waters and wetlands. **Reliable *outcome data*** show that the most valuable estuarine and wetland areas are protected through zoning or special area designations that severely limit alterations; less important but still sensitive areas have moderate protection, while areas especially suited for port and other water-dependent development are set aside for these uses.

Acquisition Element

Acquisition of estuarine and wetland areas has been an **important but limited program** focused on areas most at risk of loss. These include significant resource areas needed to preserve endangered species, critical habitat for other important fish and wildlife species, and other highly functional areas otherwise threatened with loss or degradation. **Fee-simple purchase**, mostly using **other-than-CZM funds** is the most important tool, with **CZM assisting** by identifying wetland areas for acquisition or facilitating transfers. Less-than-fee acquisition through **conservation easements** has been an important tool. **Reliable *outcome data*** show acreage and habitat types acquired using different tools and other information on subsequent management.

Nonregulatory Element

The state has **strong public, landowner, and continuing professional education programs** to support and promote wetland protection and nonregulatory restoration. Based on a **goal of net-gain-of-wetland area and function** over the long term, the state has mounted a **significant nonregulatory wetland restoration** program for degraded and former wetlands. **Reliable *outcome data*** show that a significant percentage of these wetlands have been restored and that there are plans for more as funding and willing landowners become available.

Coordination Element

Using **memoranda of agreemen**t, **joint permit applications and notices** with the federal Section 404 program, and **pre-application conferences**, the state CMP has built an effective intergovernmental coordination program and a communication link with the development community that **expedites the permit process and promotes compliance**.

Figure 6. Model State Coastal Management Program for Estuary and Coastal Wetland Protection

assumption in the model program is that issue importance is high across the entire suite of indicators, which of course is not the case for any of the actual state CMPs. Note also that the model program is forward-linked to outcome effectiveness evaluation (see Step 3 in the overall process), in that it assumes a strong program of outcome monitoring, record keeping, and reporting for ongoing effectiveness and performance evaluation. Again, this is an ideal that no actual state CMP approaches at this time.

The final step in developing the procedure for estimating potential effectiveness of individual state CMPs was to develop and weight process indicator evaluation criteria (Table 7). The *model state CMP* and the *most important processes and tools* upon which it is based are central to these criteria. For each category of tools, the criteria were weighted toward the most important processes and tools in that category (Table 7, top). For example, the regulatory category had five of the top ten processes and tools (Table 5). Criteria were weighted such that to receive a high process indicator rating for this category, a state would have to use all five tools and have high ratings for most of them. Overall process indicator ratings for each state were based on aggregating results from each of the six process and tool categories—Information and Research, Regulatory, and so on—using a set of combining rules (Table 7, bottom). To receive a *high* overall process indicator rating, the regulatory category also had to be *high*, again because of the importance of this category. For *moderate* or *low* ratings, criteria were more flexible. The overall evaluation criteria also took into account the issue importance indicator "percent wetland loss" to determine how the nonregulatory category would be considered in the evaluation process.

The principal purpose of the model program and associated evaluation criteria are to provide a common, consistent basis for evaluating the potential effectiveness of individual state CMPs. They could also serve as a simple self-evaluation framework for states wanting to improve their programs. Whatever the use, the strength of the model program rests on its basis in empirical data (process indicator results) provided by the states. In effect, collectively, states are saying "These are the processes and tools that really work." Clearly, however, the model is an ideal—no actual state CMP is likely to have all these features. In some cases, certain elements of the model program may not even be relevant. Alaska, for example, with very low historic wetland loss, would not be expected to have an extensive wetland restoration program. Each state has its special circumstances that may make one or another strategy or tool inappropriate. The point is that a state can have a strong, effective program without fully emulating the model program.

National Overview of the Potential Effectiveness of State CMPs. Process indicator ratings for all states, organized by region in Table 8, hint at the diversity of policies, processes, and tools used by state CMPs, much the same as issue importance indicator results illustrated social and environmental diversity. Generally, most states look good "on paper." Compared to the model program, six state CMPs rated *high* in potential effectiveness for both tidal (estuarine) and nontidal wetland management—New Hampshire, Massachusetts, New Jersey, Maryland, Florida, and Guam. Fourteen state CMPs have *moderate* ratings for both areas. The remaining nine state CMPs have mixed ratings. Just three CMPs have *low* ratings, and those are for nontidal wetlands management only. Collectively, as a national program, there is high potential effectiveness for

Table 7. Process indicator category and overall rating criteria for state CMPs (process and tool numbers are cross-referenced to Table 6; data for ratings come from each state's profile).

PROCESS INDICATOR CATEGORY RATING CRITERIA (if tools in a category are not used by a state, a "not applicable" is assigned)

INFO/RESEARCH TOOLS RATING:
HIGH
❒ If H for 1a, and H or M for one other tool or L for two tools
MODERATE
❒ If 1a is at least M and at least one other tool is M or L
❒ If 1b, 1c, 1d have at least one H and one M among them
❒ Other combinations not H or L
LOW
❒ If 1a is L, and M for one other tool or L for two or more tools
❒ If 1a is L, and only one other tool >L

REGULATORY TOOLS RATING (apply separately to tidal and nontidal)
HIGH
❒ 2a (and/or 2b) is H; 2m or 2n at least H and other M
❒ 2c is H; 2m or 2n at least H and other M
❒ 2e is H; 2m or 2n at least H and other M
❒ 2a (and/or 2b) or 2c or 2e are H, either 2m or 2n are H, and at least one other tool is H
MODERATE
❒ 2a (and/or 2b) is M; 2m and 2n at least M
❒ 2c is M; 2m and 2n at least M
❒ 2e is M; 2m and 2n at least M
❒ 2a (and/or 2b) or 2c or 2e is M, either 2m or 2n are H, and at least one other tool is M
❒ Other combinations not H or L
LOW
❒ 2a (and/or 2b) is M or less and no other M or higher
❒ 2c is M or L, and no other M or higher
❒ 2e is H, M or L, and no other M or higher

PLANNING TOOLS RATING:
HIGH
❒ If H for either 3a, 3b, or 3c
MODERATE
❒ If no H, and M for either 3a, 3b, 3c
❒ Other combinations not H or L
LOW
❒ If no H or M, and L for either 3a, 3b, 3c

ACQUISITION TOOLS RATING
HIGH
❒ If H for 4c
❒ If H for either 4 a, 4b, or 4d, and M for 4c.
MODERATE
❒ If M for 4c
❒ If at least M for either 4 a, 4b, or 4d; and L for 4c
❒ Other combinations not H or L
LOW
❒ If no H or M; and L for 4a, 4b, 4c, or 4d.

NONREGULATORY TOOLS RATING:
HIGH
❒ If H for either 5a or 5b and M or L for other
MODERATE
❒ If no H, and M for either 5a or 5b
❒ Other combinations not H or L
LOW
❒ If no H or M, and L for either 5a or 5b

COORDINATION TOOLS RATING
HIGH
❒ If H for either 6a, 6b, or 6c
MODERATE
❒ If no H; and M for either 6a, 6b, or 6c
❒ Other combinations not H or L
LOW
❒ If no H or M; and L for either 6a, 6b, or 6c

OVERALL PROCESS RATING CRITERIA

(apply separately for tidal and nontidal areas)

HIGH

- ❒ If Regulatory H and three of Info/Research, Planning, Acquisition, and Restoration are H; and Coordination M or L
- ❒ If Regulatory H and two of Info/Research, Planning, and Acquisition are H; Coordination M or L; and Issue Importance indicator "%LOSS" is L

MODERATE

- ❒ Regulatory M and three of Info/Research, Planning, Acquisition, and Restoration are at least M; and Coordination M or L
- ❒ If three of Info/Research, Regulatory, Planning, and Acquisition are all M; Coordination M or L; and Issue Importance indicator "%LOSS" is L
- ❒ Other combinations not HIGH or LOW

LOW

- ❒ If Regulatory L and at least two of Info/Research, Planning, Acquisition, Restoration, and Coordination are L or not used
- ❒ If at least two of Info/Research, Regulatory, Planning, Acquisition, and Coordination are L; and Issue Importance indicator "%LOSS" is L

Table 8. Regional summary of *process indicator* ratings, which serve as a measure of state and regional CZM *program potential* for effective estuary and coastal wetland protection.[1]

STATE or REGION	INFO RSCH	REGULATORY		PLAN	ACQU	NON-REGUL	COOR	OVERALL RATING[1]	
		Tidal	*Nontidal*					*Tidal*	*Nontidal*
Maine	H	M	M	H	M	M	M	*Moderate*	*Moderate*
New Hampshire	H	H	H	H	M	H	H	*High*	*High*
Massachusetts	H	H	H	H	H	H	H	*High*	*High*
Rhode Island	H	H	H	H	M	M	M	*Moderate*	*Moderate*
Connecticut	H	M	M	H	L	H	M	*Moderate*	*Moderate*
New England	3.0 *High*	2.6 *High*	2.6 *High*	3.0 *High*	2.0 *Mod.*	2.6 *High*	2.4 *High*	2.4 *HIGH*	2.4 *HIGH*
New York	H	H	H	H	L	L	M	*Moderate*	*Moderate*
New Jersey	H	H	H	H	H	L	H	*High*	*High*
Pennsylvania	H	H	H	L	L	M	H	*Moderate*	*Moderate*
Delaware	H	H	M	L	H	H	H	*High*	*Moderate*
Maryland	H	H	H	H	H	H	H	*High*	*High*
Mid-Atlantic	3.0 *High*	3.0 *High*	2.8 *High*	3.0 *High*	3.0 *High*	2.0 *Mod.*	2.8 *High*	2.6 *HIGH*	2.4 *HIGH*
Virginia	H	M	M	H	M	M	M	*Moderate*	*Moderate*
North Carolina	H	H	M	H	H	M	H	*High*	*Moderate*
South Carolina	L	H	H	M	M	M	H	*Moderate*	*Moderate*
Florida	L	H	H	H	H	M	H	*High*	*High*
Southeast	2.0 *Mod.*	2.75 *High*	2.5 *High*	2.75 *High*	2.5 *High*	2.0 *Mod.*	2.75 *High*	2.5 *HIGH*	2.25 *MOD.*
Florida	L	H	H	H	H	M	H	*High*	*High*
Alabama	H	H	H	M	M	L	H	*Moderate*	*Moderate*
Mississippi	H	H	M	H	H	M	H	*High*	*Moderate*
Louisiana	H	H	M	M	M	H	H	*Moderate*	*Moderate*
Gulf Coast	2.5 *High*	3.0 *High*	2.5 *High*	2.5 *High*	2.5 *High*	2.0 *Mod.*	3.0 *High*	2.5 *HIGH*	2.25 *MOD.*
California	H	H	M	H	H	H	H	*High*	*Moderate*
Oregon	H	H	H	H	M	M	H	*Moderate*	*Moderate*
Washington	L	M	L	H	M	H	M	*Moderate*	*Low*
Alaska	H	M	M	H	np	M	M	*Moderate*	*Moderate*
West Coast	2.5 *High*	2.5 *High*	2.0 *Mod.*	3.0 *High*	1.75 *Mod.*	2.5 *High*	2.5 *High*	2.25 *MOD.*	1.75 *MOD.*
Michigan	H	na	H	H	M	H	H	na	*High*
Wisconsin	H	na	M	H	H	H	M	na	*Moderate*
Great Lakes	3.0 *High*	*na*	2.5 *High*	3.0 *High*	2.5 *High*	3.0 *High*	2.5 *High*	*na*	2.5 *HIGH*
American Samoa	M	M	M	M	0	H	M	*Moderate*	*Moderate*
Guam	H	H	H	H	L	H	H	*High*	*High*
Hawaii	H	M	M	H	H	M	L	*Moderate*	*Moderate*
Northern Marianas	H	M	L	H	M	H	H	*Moderate*	*Low*
Puerto Rico	H	M	M	H	H	M	L	*Moderate*	*Moderate*
Virgin Islands	L	H	L	M	0	L	M	*Moderate*	*Low*
Islands	2.5 *High*	2.33 *High*	1.83 *Mod.*	2.67 *High*	1.5 *Low*	2.33 *High*	2.0 *Mod.*	2.17 *MOD*	1.83 *MOD*
All-state Mean	2.69 *HIGH*	2.67 *HIGH*	2.39 *HIGH*	2.69 *HIGH*	2.27 *MOD*	2.31 *MOD*	2.52 *HIGH*	2.37 *HIGH*	2.24 *MOD*

[1]Process indicator ratings: H—*high potential* for effectiveness, M—*moderate potential* for effectiveness, L—*low potential* for effectiveness; 0—no program in this category; "na" means not applicable because no tidal areas. The ratings are based on criteria developed from an assessment of the *most important processes and tools* for estuary and coastal wetland programs nationally and a *model state CMP* for this issue area (Figure 4). For determining mean scores for states or for indicator categories, H = 3, M = 2, L = 1, with rating categories the same as those used in note 3 of Table 3.

tidal waters and wetlands protection (2.37) and moderate potential effectiveness for nontidal areas (2.24). Differences between the two are due mainly to the lesser emphasis and more limited role some state CMPs play in freshwater wetland management.

Process indicator results for each of the six categories of processes and tools—information and research, regulatory, planning, acquisition, nonregulatory, and coordination—are discussed below. Exemplary case examples of the use of CZM processes and tools to protect estuaries or coastal wetlands are presented in Appendix E.

Information and Research Tools. This process and tool category includes many of the behind-the-scenes activities of state CMPs that are critical to the successful operation of the more visible parts of the program, such as planning and permitting. Important information and research tools include inventory and mapping; rapid assessment methods for assessing coastal wetland functions; on-the-ground analysis of wetland change; and the use of computers, databases, and integrated information technologies such as GIS to better understand and track agency actions and decisions and their impact on the ground. Among these tools, inventory and mapping was clearly the most important. Twenty-eight CMPs used this tool (Table 6), twenty-two rated it as highly important (76 percent), and compared to all other processes and tools for estuary and wetland protection, it ranked fifth of thirty-three in importance (Table 5). One interviewee summed the importance of a good inventory very simply by saying "You can't protect wetlands unless you know where they are."

Regulatory Processes and Tools. A regulatory program provides varying degrees of on-the-ground protection for estuaries and coastal wetlands. The amount of protection relates directly to the specific prohibitions, limitations, and exemptions written into regulatory policy; the geographic area of jurisdiction and the resources and activities controlled; the strength of enforcement provisions and the staff and effort devoted to the activity; the penalties for violations; and the support provided by agency leaders, the governor, the legislature, the courts, and the public.

Five of the top ten processes and tools for estuary and coastal wetland protection are in the regulatory category. *State-administered tidal wetland permits* (or more general coastal use permits that included tidal wetland protection standards) were far and away the top-ranked tool overall, scoring 61 percent higher than the second-ranked tool, *state-administered nontidal wetland permits.* Three other regulatory tools were also ranked among the top ten tools (Table 5)—*compliance monitoring and enforcement* programs (ranked sixth), *federal consistency standards* used in lieu of a separate tidal or nontidal permit (tied for eighth), and *compensatory mitigation* (tied for eighth). Although not in the top ten tools, *locally administered wetland permits* were also important (ranked eleventh overall) and picked up some of the slack in state programs (e.g., in Washington State and in Hawaii). For overall protection, it is clear that regulatory permit programs provide the foundation for state estuary and coastal wetland management.

Another finding is that tidal wetlands are much better protected through CZM regulatory (and other) mechanisms than are nontidal areas. For tidal wetlands—salt, brackish, and tidal fresh wetlands—virtually 100 percent of the resource is protected through CZM-related permit programs, often with very restrictive conditions for alterations and no-net-loss compensatory mitigation requirements. Regulatory jurisdiction and the degree of control over activities in nontidal wetlands is highly variable, however. Some states (New Hampshire, Oregon, and Pennsylvania) have integrated tidal-nontidal wetland regulatory programs that apply statewide. Others have state or locally administered land use permits with wetland standards (Massachusetts). Still others have separate tidal

and nontidal wetland laws (New Jersey and New York). Many, however, have little or no state-derived authority to regulate nontidal freshwater wetlands, and so must rely on Clean Water Act Section 401 certification procedures or CZMA Section 307 consistency to exert some control within the coastal zone. Examples of such states include Alaska, Delaware, Hawaii, Louisiana, Mississippi, North Carolina, Puerto Rico, South Carolina, and the Virgin Islands. Further, some states have jurisdiction over nontidal wetland alterations only within relatively narrow strips above mean high water. Examples include Washington State (200 feet), California (1,000 yards or 0.57 miles), Rhode Island (200 feet), and Wisconsin (areas adjacent to navigable waters). The use and regulatory effectiveness of 401 certification and 307 consistency varies. Wisconsin's 401 certification serves as a national model; so does South Carolina's use of federal consistency to shape federal Section 404 permit decisions (see case examples in Appendix E).

The relatively weak and fragmented management of nontidal, freshwater wetlands in the U.S. coastal zone suggests that this is an area warranting additional study. One of the key issues is the need to consider expanded jurisdiction over coastal areas to more fully encompass nontidal wetland resources with clear, unambiguous links to estuaries and coastal waters. On this question of expanded jurisdiction, the coastal assessment framework (CAF) developed by NOAA is a logical starting point for discussion (NOAA 1992). The CAF is a watershed-based spatial framework that is serving as the cornerstone of NOAA's efforts to develop a national estuarine assessment capability. This framework was used by NOAA to inventory the area of tidal and nontidal "coastal" wetlands on the National Wetland Inventory (NOAA 1991); many of the nontidal freshwater wetlands so defined are outside present state coastal zone boundaries. The CAF was also used by NOAA as the basis for its Section 6217 "coastal boundary review" process required under by the 1990 amendments to the CZMA that focused on nonpoint source pollution (NOAA 1992). Nine states were deemed to have adequate coastal zone boundaries to control nonpoint source pollution, sixteen states adopted expanded boundaries for improved nonpoint source control, and four were in negotiation with OCRM (Bill Millhouser, OCRM, personal communication, October 17, 1997). Expansion of jurisdiction over nontidal wetlands within the CAF would seem to be the next logical step, especially since freshwater, nontidal wetlands are a key element of "nature's infrastructure" for controlling nonpoint sources of pollution.

Another weakness in most state CMP wetland policies is the broad-based exemptions from regulations for normal farming and silviculture activities. This weakness is similar to exemptions in federal laws that many consider necessary to control workload and focus on large projects. Nevertheless, agriculture is still the principal cause of wetland loss in the U.S. (USFWS 1997). Agricultural exemptions likely play a significant role in these loss trends. In another example, the Chesapeake Bay Program reported in *Recent Wetland Status and Trends in the Chesapeake Watershed (1982–89)* that 37,000 acres of wetlands were lost in the watershed in that time frame, largely due to agricultural practices. Exemptions for these and other activities, such as the filling of wetlands for purposes of construction single-family dwellings, need to be evaluated for their cumulative impacts. Although the rate is declining, nontidal wetland loss in coastal zones remains one of the greatest threats to coastal and estuarine water quality, ecosystem sustainability, and flood hazard mitigation. This issue is much larger than state CMPs, but nevertheless needs CZM attention.

Planning Processes and Tools. Land use planning, critical areas, Areas of Environmental Concern (AECs), Geographic Areas of Particular Concern (GAPCs), and similar special management

designations provide on-the-ground protection *if* they are clearly linked to on-the-ground governmental decision-making, such as state or local regulatory permitting. If there is such a link, special planning designations often provide significant additional levels of protection for especially valuable estuarine or wetland resources, as compared to just having case-by-case regulatory controls.

Local land use planning and zoning for estuary and coastal wetland protection was the third-ranked tool nationally (Table 5). For state programs where this tool was important, units of local government were generally required to meet minimum state standards and be subject to oversight in subsequent permitting processes. The relatively high importance of local planning and zoning for wetland protection underscores the value of the federal-state-local partnership that CZM is in most states. It also suggests the value of increased attention to the local role and an emphasis on education and training for local coastal planners. *Special Area Management Plans* also ranked among the top ten tools nationally (tied for eighth), mainly for their role in serving as a multi-jurisdictional forum for regional problem solving that often includes wetland protection.

Nonregulatory Processes and Tools (including Acquisition). Nonregulatory processes and tools—education, technical assistance, acquisition, preservation, and restoration and enhancement—are increasingly the focus of many state CMPs, both to maintain support for protection efforts and to promote estuaries and wetlands for their own sake and value to human society. *Education and technical assistance* is a sometimes under-valued strategy, although for CZM-related wetland protection, it was ranked sixth nationally (Table 5). CZM programs focus a good deal of attention on education because it is perceived as a positive approach to protection. Examples include classroom and outdoor programs for K–12, "how-to" guides, videos and other multi-media programs, workshops for elected officials and professionals, and a wide variety of programs for the general public. Nevertheless, because education and technical assistance impacts accrue over the long term and because outcomes are difficult to measure, they are often the first to go when budgets are cut.

Acquisition programs, when combined with good land management, generally provide the best possible protection for estuary or coastal wetlands. The larger and more coherent the area and the more it is buffered from impacts outside the area, the more the natural resources are protected. National Estuarine Research Reserves (NERRs) serve as one model for this relatively comprehensive protection. *Outright, fee-simple purchase* provides the highest potential for protection and even restoration and enhancement, except it is very expensive and used as a last resort in most situations. *Fee-simple purchase of coastal wetlands where CZM provides assistance*, but other funds are used, was the fourth-ranked tool nationally (Table 5). *Less-than-fee techniques*, such as *conservation easements*, have sometimes been used for relatively large areas because they cost less. Although they may provide virtually the same degree of protection as fee-simple purchase, they are often limited in time frame or scope, giving private landowners significant latitude; this limits protection.

Often, acquisition programs are linked to *restoration and enhancement programs.* Many states have had significant historic loss or degradation of coastal wetland or estuarine resources (Table 1). Potential for restoring former or degraded wetlands is viewed by some states as the best strategy for increasing the resource base and quality. However, although twenty of twenty-nine state CMPs use nonregulatory restoration at a wetland management strategy, most programs' efforts are minimal. Some of the states with among the highest historic wetland losses are among the least active. Notable exceptions include Louisiana, Connecticut, Maryland, Delaware, and California, all of whom have made major commitments to restoration as an estuary and coastal wetland management strategy.

Coordination Processes and Tools. Coordination processes and tools are some of the most important features of U.S. coastal zone management. Federal consistency under Section 307 of the CZMA, a principal impetus for state participation in the program, is the driving force behind much of the state-federal coordination that takes place. It requires that federal actions be consistent to the maximum extent practicable with the enforceable policies of federally approved state CMPs. In its regulatory context for estuary and coastal wetland protection, it ranked eighth overall (Table 5). Local-state coordination is also a key element in most state programs because local governments traditionally make many of the decisions that affect coastal resources. Many states have developed and implemented *memoranda of agreement* with other state agencies and with federal agencies, such as the USACE, to protect estuaries and coastal wetlands. *Joint permit applications and notices* are features many states use to streamline federal-state processes and reduce paperwork for applicants. *Pre-application conferences* are another central feature of coordinated permit processes, as are integrated review protocols. Monitoring and enforcement are another active area of coordination, as discussed earlier for Pennsylvania. Many of these processes and tools are standards for state CZM, but a variety of other innovative mechanisms are also being developed, such as American Samoa's village liaison/facilitator program, described in a case example in Appendix E.

Potential Effectiveness versus Issue-Importance-Based Expectations. Another way to look at process indicator data nationally is to compare the potential effectiveness of state CMPs "on paper" to what might be expected, given issue importance ratings. Comparison of the two sets of indicator results—issue importance from Table 4 and potential effectiveness from Table 8—identifies states whose potential effectiveness is exceeded, equaled, or not met, given issue importance (Table 9). As discussed earlier, the importance of estuary and coastal wetland protection as a CZM issue in a state creates expectations for program content, policy emphasis and strength, and the kinds of processes and tools used to implement policy. For example, if estuary and coastal wetland protection issue importance is *high*, as it is in Florida, then it would be expected that Florida's process indicator rating for tidal and nontidal areas would be *high*, which is indeed the case (Table 9).

Examining Table 9, we see that for five states (19 percent) and one region, and for the U.S. as a whole, potential effectiveness for protection of tidal waters and wetlands exceeds

Table 9. Potential effectiveness of state CMPs[1] (based on process indicators), *versus* the importance of estuary and wetland protection as a state CZM issue.

POTENTIAL EFFECTIVENESS OF STATE CMP

	High		Moderate		Low	
	Tidal	Nontidal	Tidal	Nontidal	Tidal	Nontidal
High	CA, FL, MA, MD, NJ, NC Mid-Atlantic Southeast Gulf Coast	FL, MA, MD, NJ Mid-Atlantic	AL, CT, LA, NY, PR, VA, WA	AL, CA, CT, LA, NY, NC, VA Gulf Coast Southeast		PR, WA
Moderate	DE, MS, NH New England	NH, MI New England Great Lakes	AK, AS, ME, NM, OR, PA, RI SC, VI West Coast Islands	AK, AS, DE, ME, MS, NM, OR, PA, RI, SC, WI USA West Coast Islands		VI
Low	GU	GU	HI	HI		

States where potential effectiveness of CZM programs compared to the model program is greater than issue importance (PE>IS)

States where potential effectiveness of CZM programs compared to the model program is equal to issue importance (PE=IS)

States where potential effectiveness of CZM programs compared to the model program is less than issue importance (PE<IS)

[1]State CMP abbreviations for Tables 9, 12, 13, 14, and 15 are listed below:

AL Alabama
AK Alaska
AS American Samoa
CA California
CT Connecticut
DE Delaware
FL Florida
GU Guam
HI Hawaii
LA Louisiana
ME Maine
MD Maryland
MA Massachusetts
MI Michigan
MS Mississippi
NC North Carolina
NH New Hampshire
NJ New Jersey
NM Northern Marianas
NY New York
OR Oregon
PA Pennsylvania
PR Puerto Rico
RI Rhode Island
SC South Carolina
VA Virginia
VI Virgin Islands
WA Washington
WI Wisconsin

expectations, given issue importance. For nontidal areas, four states (14 percent) and two regions exceed expectations. However, seven states (26 percent) for tidal and ten (34 percent) for nontidal exhibit potential effectiveness lower than expected. For the rest of the states—fifteen for tidal (56 percent) and fifteen for nontidal (52 percent)—potential effectiveness is about what as expected, given issue importance.[5]

Why might states' potential effectiveness be greater than or less than issue importance-based expectations? In the case of New Hampshire, for instance, issue importance was just moderate but potential effectiveness was high. The moderate issue importance rating can be attributed mainly to the limited amount of estuarine and wetland area in the state's coastal zone (Table 3, issue importance indicators 1 and 2), resulting in a low rating for those indicators. Nevertheless, New Hampshire values its limited estuarine and wetland acreage sufficiently to have enacted relatively strong, comprehensive protection measures that compare well, at least on paper, to the model program. Hence, New Hampshire achieved a high potential effectiveness rating (Table 8). In Washington State, however, moderate (tidal) and low (nontidal) ratings for potential effectiveness contrast with a high rating for issue importance. Issue importance rated high because of the significant estuarine and wetland acreage in the coastal zone, high historic loss, and perceived importance of the issue (Table 4). Nevertheless, Washington has a relatively weak wetland protection program as compared to the model, relying mostly on nonregulatory education efforts to achieve its goals. Other reasons for differences between issue importance and potential effectiveness can be gleaned from individual state profiles and evaluations.

Step 3: On-the-ground Effectiveness Based on Outcome Indicators

Outcome effectiveness is defined here as an estimate of the on-the-ground impacts of CZM policy implementation over time. This step in the process—systematically evaluating these on-the-ground CZM impacts using outcome indicators—is what differentiates the CZME study from previous evaluation efforts. In designing this part of the evaluation process, we first recognized that just four of our six categories of policies, processes, and tools had the potential to generate on-the-ground outcomes that related to estuary and coastal wetland protection. These were the Regulatory, Planning, Acquisition, and Nonregulatory tools. Nineteen outcome indicators within these four categories were identified, defined, and linked back to the specific processes and tools that had the potential to provide data to address each indicator (Table 10). Using these indicatorsas a guide, we collected available outcome and baseline data from each of the state coastal programs. As expected, outcome data were limited in most states—the reasons for this are

[5]Percentages are different for tidal and nontidal because only twenty-seven of the twenty-nine CMPs have tidal wetlands, whereas all twenty-nine, including Michigan and Wisconsin, have nontidal wetlands.

Table 10. On-the-ground outcome indicators, rating criteria, and processes and tools that serve as outcome indicator data sources.

OUTCOME INDICATOR[1]		OUTCOME INDICATOR RATING CRITERIA			PROCESSES/TOOLS USED AS OUTCOME DATA SOURCES[2]
		High	Mod.	Low	
RG1	Area of annual permitted loss/yr as percent of all regulated waters & wetlands *(separately for Tidal and Nontidal)*	<0.1%	0.1-1.0%	>1.0	2a, 2b, 2c, 2d, 2e, 2f, 2g, 2h
RG2	Area of violations loss/yr as % of all regulated waters & wetlands *or* number/yr as % of all permits *(separately for Tidal and Nontidal)*	<0.1% area or <5% number	0.1-1.0% area or 5-10% number	>1.0 area or >10% nr.	2n
RG3	Area of wetland compensatory mitigation (WCM) as a % of RG1 losses *(separately for Tidal and Nontidal)*	>90%	75-90%	<75%	2m, 2o
RG4	Trend in permitted losses (change in acres lost/yr over at least 5 years) *(separately for Tidal and Nontidal)*	>60% decrease	30-60% decrease	<30% decrease	2a, 2b, 2c, 2d, 2e, 2f, 2g, 2h
RG5	Trend in violations losses (change in area lost/yr *or* number violations/yr) *(separately for Tidal and Nontidal)*	>60% decrease	30-60% decrease	<30% decrease	2n
RG6	Trend in WCM replacements (change in % mitigated/yr) *(separately for Tidal and Nontidal)*	>60% increase	30-60% increase	<30% increase	2m, 2o
PL1	Area afforded *high* protection by local planning & zoning as % of all water/wetland area under control	>75%	50-75%	<50%	3a
PL2	Area afforded *high* protection by SAMPs as % of all water/wetland area under SAMPs	>75%	50-75%	<50%	3b
PL3	Area afforded *high* protection by GAPC, AEC, Critical Area Plan as % of all water/wetland area under control	>75%	50-75%	<50%	3c, 3d
PL4	Area afforded *moderate* protection by local plans & zoning as % of all water/wetland area under control	>75% not high prot.	50-75% not high prot.	<50% not high prot.	3a
PL5	Area afforded *moderate* protection by SAMPs as % of all water/wetland area under SAMPs	>75% not high prot.	50-75% not high prot.	<50% not high prot.	3b
PL6	Area afforded *moderate* protection by GAPC, AEC, Critical Area Plan as % of all water/wetland area under control	>75% not high prot.	50-75% not high prot.	<50% not high prot.	3c, 3d
AQ1	Area fee simple acquisition with federal or state CZM $ as % of tidal/nontidal wetlands not in public ownership	>5%	1-5%	<1%	4a
AQ2	Area less-than-fee acquisition with federal or state CZM $ as % of tidal/nontidal wetlands not in public ownership	>5%	1-5%	<1%	4b
AQ3	Area fee simple acquisition with other $ but with CZM assist as % of tidal/nontidal wetlands not in public ownership	>10%	5-10%	<5%	4c
AQ4	Area less-than-fee acquisition with other $ but with CZM assist as % of tidal/nontidal wetlands not in public ownership	>10%	5-10%	<5%	4d
NR1	Area of former or degraded *coastal* wetlands restored by nonregulatory means as a % of acres historic coastal wetland loss	>10%	5-10%	<5%	5a
NR2	Area of former or degraded *tidal* wetlands restored by nonregulatory means as % of historic tidal wetland loss	>10%	5-10%	<5%	5a
NR3	Area of former or degraded *nontidal* wetlands restored by nonregulatory means as % of historic nontidal wetland loss	>10%	5-10%	<5%	5a

[1]RG1-RG6 are Regulatory outcome indicators—they are applied to both tidal and nontidal areas (resulting in twelve Regulatory indicators overall); PL1-PL6 are Planning-related outcome indicators; AQ1-AQ4 are Acquisition-related outcome indicators; and NR1-NR3 are Nonregulatory Restoration-related indicators.

[2]Numbers identifying processes and tools in far right column may be cross-referenced to Table 4 for detailed definitions

addressed later. Nevertheless, collectively there were sufficient numbers of states with outcome data to define a set of rating criteria for each indicator (Table 10) and rules for combining indicator ratings to arrive at overall outcome effectiveness ratings (Table 11).[6]

Three of the most important outcome indicators in Table 10 from the standpoint of national policy are RG1 (area of permitted wetland loss), RG3 (area of compensatory wetland mitigation), and NR1 (area of nonregulatory wetland restoration). A state achieving a high outcome rating for the first two of these indicators would be approaching a "no-net-loss" goal for wetlands. Further, a high rating for NR1 (or NR2 or NR3) from Table 10 would most likely correspond to an overall net gain of coastal wetlands for a state. These particular sets of indicators are thus among the most important from a national perspective and will be further discussed later.

Once rating criteria and combining rules were in place, each state was evaluated for each relevant indicator (Table 12). Two overall outcome effectiveness ratings assigned to each state—one for tidal waters and wetlands protection (excluding Wisconsin and Michigan), and the other for nontidal waters and wetlands (Table 12). Where sufficient data were available, conclusive outcome ratings of *High, Moderate,* or *Low* effectiveness were assigned. Where there were significant state outcome data available, but insufficient to warrant a conclusive rating, *Probable High, Probable Moderate,* or *Probable Low* ratings were assigned based on the judgment of the investigators. Where data were insufficient for conclusive or probable outcome determinations, an *Inconclusive* effectiveness rating was assigned. Because we did not explicitly address water quality issues in our study, most of the emphasis was on wetland habitats, not subtidal or deep-water areas. Outcome effectiveness ratings (and issue importance and process indicator ratings) for each state are summarized in Appendix D, with accompanying narratives that make recommendations for program improvements.

National Overview of Outcome Effectiveness. For those states with sufficient data to determine either conclusive or probable outcome ratings, seven (64 percent) rated *high* in outcome effectiveness for tidal management, and the remainder rated *moderate* (Table 13). For nontidal management, effectiveness was rated *high* for two (29 percent), *moderate* for four (57 percent), and *low* for one. This left seventeen states (61 percent) with *inconclusive* outcome effectiveness ratings for tidal wetland management and twenty-three states (77 percent) *inconclusive* for nontidal wetland management (Table 13). The predominance of *inconclusive* ratings reflects the lack of sufficient outcome indicator data. Another obvious pattern is that data availability was somewhat better for evaluating outcomes of tidal area management than for nontidal area management—eleven states for tidal (39 percent of state programs evaluated) versus seven (23 percent) for nontidal could at least be assigned a *probable* overall outcome effectiveness rating

[6]Outcome rating criteria were developed using the model state coastal program as a guide (Figure 6). Outcome indicator "reference standards" were established based on examination of individual or sets of states that, in the judgment of the investigators, were highly effective. For example, as of 1996, Delaware, a state where more than 40 percent of its historic coastal wetlands have been lost or severely degraded, had restored about 19 percent of lost or degraded wetlands. Using Delaware and several other similar states as a guide, the reference standard for a High rating for nonregulatory restoration was fixed at >10 percent restoration of historically lost or degraded wetlands.

Table 11. Outcome indicator category and overall outcome indicator rating criteria for state CMPs (indicator codes—e.g., RG1—are defined in Table 10).

CRITERIA FOR OUTCOME INDICATOR CATEGORY RATINGS

REGULATORY
(apply separately to tidal and nontidal)

HIGH
❒ If H for either RG1 or RG4; and at least M for RG2 and RG3, or RG5 and RG6
❒ If H for either RG2 or RG5, and H for RG3 or RG6
MODERATE
❒ If M for either RG1 or RG4, and H or M for one other indicator
❒ If one H for other than RG1 or RG4, and one other M
❒ Other combinations not resulting in H or L
LOW
❒ If no H, and M for either RG1 or RG4, and no other M
❒ If no H and M and L other indicators
INCONCLUSIVE
❒ Tool used, but insufficient data to make determination

PLANNING
❒ If H for either PL1, PL2, or PL3
❒ If M for PL1, PL2, and PL3, or H for at least two of PL4, PLO, or PLO
MODERATE
❒ If M for either PL1, PL2, or PL3 or H for either PL4, PLO, or PLO
❒ Other combinations not resulting in H or L
LOW
❒ If L for either PL1, PL2, or PL3 or M for PL4, PLO, or PLO
INCONCLUSIVE
❒ Tool used, but insufficient data to make determination

ACQUISITION
HIGH
❒ If H for either AQ1 or AQ3
❒ If M for three of AQ1, AQ2, AQ3, and AQ4
MODERATE
❒ If M for either AQ1 or AQ3
❒If M for AQ2 or AQ4, and L for one of AQ1 or AQ3
❒ Other combinations not resulting in H or L
LOW
❒ If L for either AQ1, AQ2, AQ3, or AQ4
INCONCLUSIVE
❒ Tool used, but insufficient data to make determination

NONREGULATORY RESTORATION
HIGH
❒ If H for either NR1, NR2, or NR3
MODERATE
❒ If M for either NR1, NR2, or NR3
Other combinations not resulting in H or L
LOW
❒ If L for either NR1, NR2, or NR3
INCONCLUSIVE
❒ Tool used, but insufficient data to make determination

OVERALL RATING CRITERIA

(apply separately to tidal and nontidal)

HIGH
❒ If Regulatory, Planning, Acquisition, and Restoration are all H
❒ If Regulatory, Planning, Acquisition are H, and Issue Importance indicator "%LOSS" is L (Table 1b)

MODERATE
❒ If Regulatory, Planning, Acquisition, and Restoration are all M
❒ If Regulatory, Planning, Acquisition are M, and Issue Importance indicator "%LOSS" is L (Table 1b)
❒ Other combinations not HIGH or LOW

LOW
❒ If Regulatory, Planning, Acquisition, and Restoration are all L
❒ If Regulatory, Planning, Acquisition are L, and Issue Importance indicator "%LOSS" is L (Table 1b)

INCONCLUSIVE
❒ Tools used, but insufficient data available to make above determination

Table 12. State outcome indicator ratings for estuary and coastal wetland protection.

State	Regulatory Outcome Indicators[1]														Acquisition Outcome Indicators[1]				
	RG1		RG2		RG3		RG4		RG5		RG6		REG SUMMARY		AQ1	AQ2	AQ3	AQ4	ACQUISITION
	T	N	T	N	T	N	T	N	T	N	T	N	Tidal	Nontidal					SUMMARY
AL	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	NA	I
AK	I(M)	I(M)	I	I	I	I	I(H)	I(H)	I	I	I	I	I(M)	I(M)	NA	NA	NA	NA	NA
AS	I	I	I	I	I	I	I	I	I	I	I	I	I	I	NA	NA	NA	NA	NA
CA-B[2]	H	H	I	I	H	H	H	H	I	I	H	H	H	H	H	M	I	I	H
CA-C[2]	I	I	I	I	I	I	I	I	I	I	I	I	I	I	H	M	I	I	H
CT	I	I	I	I	I	I	I	I	I	I	I	I	I	I	NA	NA	I	I	I
DE	I	I	I	I	NA	NA	I	I	I	I	NA	NA	I	I	NA	NA	M	I	M
FL	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
GU	I	I	I	I	I	I	I	I	I	I	I	I	I	I	NA	NA	I	NA	I
HI	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	NA	I	NA	I
LA	H	H	I	I	I	I	H	H	I	I	I	I	I(H)	I	NA	NA	L	NA	L
ME	H	H	I	I	I	I	H	H	I	I	I	I	I(H)	I(H)	I	NA	I	NA	I
MD	H	H	I	I	H	H	H	L	I	M	H	H	M	H	I	NA	I	I	I
MA	I	I	I	I	I	I	I	I	I	I	I	I	I	I	NA	NA	I	M	M
MI	NA	I	NA	I	NA	I	NA	I	NA	I	NA	I	NA	I	NA	NA	L	I	L
MS	I	I	I	I	I	I	I	I	I	I	I	I	I	I	NA	NA	I	NA	I
NH	H	H	I	I	H	I	I	I	I	I	I	I	I(H)	I(H)	L	NA	L	I	L
NJ	I(H)	H	I	I	I	L	I(H)	I(H)	I	I	I	I(H)	I(H)	I(H)	NA	NA	I	I	I
NY	I	I	I	I	I	I	I	I	I	I	I	I	I	I	NA	NA	NA	I	I
NC	H	I	I	I	I	I	I	I	I	I	I	I	I(H)	I	H	I	H	I	H
NM	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
OR	H	I	I	I	L	I	H	I	I	I	H	I	M	I	L	NA	NA	NA	L
PA	I	I	H	H	I	I	I	I	H	H	I	I	M	M	NA	NA	NA	NA	NA
PR	I(H)	I	I	I	I	I	I(H)	I	I	I	I	I	I(H)	I	H	NA	I	I	H
RI	I	I	I	I	I	I	I	I	I	I	I	I	I	I	NA	NA	I	I	I
SC	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I(M)	NA	NA	NA	I(M)
VI	I	I	I	I	I	I	I	I	I	I	I	I	I	I	NA	NA	NA	NA	NA
VA	I(H)	I	I	I	I	I	I	I	I	I	I	I	I(H)	I	I	I	I	I	I
WA	I	I	I	I	I	I	I	I	I	I	I	I	I	I	M	M	I	I	M
WI	NA	H	NA	I	NA	NA	NA	H	NA	I	NA	NA	NA	M	I	NA	I	NA	I

[1]See Table 10 for definitions of outcome indicators; Outcome Ratings: H—high effectiveness for this indicator; M—moderate effectiveness; L—low effectiveness; I—inconclusive due to insufficient data; I (H)—inconclusive, but the limited data available suggest probable high (or M or L) rating; NA—not applicable because the process or tool is not used by the state. In column headings, T = Tidal and N = Nontidal.

[2]California outcomes are reported separately for CA-B: San Francisco Bay (BCDC and CSCC); and CA-C: the outer coast (CCC and CSCC).

Table 12. State outcome indicator ratings for estuary and coastal wetland protection (continued).

State	Planning Outcome Indicators[1]							Nonregulatory Restoration Indicators[1]				OVERALL OUTCOMES	
	PL1	PL2	PL3	PL4	PL5	PL6	PLANNING SUMMARY	NR1	NR2	NR3	NONREG SUMMARY	TIDAL	NONTIDAL
AL	I	I	I	I	I	I	I	NA	NA	NA	NA	I	I
AK	I	L	NA	I	L	NA	L	I	I	I	I	I	I
AS	I	NA	I(M)	I	NA	I	I(M)	NA	I	I	I	I	I
CA-B[2]	NA	H	NA	NA	I	NA	H	H	NA	NA	H	H	H
CA-C[2]	I	NA	I	I	NA	I	I	H	NA	NA	H	I(M)	I
CT	I	I (L)	I	I	I	I	I(L)	NA	M	NA	M	I	I
DE	I	NA	I	I	NA	I	I	NA	H	I	H	I(M)	I
FL	I	I	I	I	I	I	I	I	NA	NA	I	I	I
GU	I	I	I	I	H	I	M	I	NA	NA	I	I	I
HI	I	I	I	I	I	I	I	I	I	I	I	I	I
LA	I	I	NA	I	I	NA	I	H	NA	NA	H	I(H)	I
ME	I	NA	I	I	NA	I	I	NA	NA	NA	NA	I	I
MD	NA	NA	H	NA	NA	H	H	I	L	I	L	I(H)	I(H)
MA	I	NA	M	I	NA	I	M	I	NA	NA	I	I	I
MI	I	NA	L	I	NA	I	L	NA	NA	I	I	NA	I
MS	I	NA	M	I	NA	I	M	NA	NA	NA	NA	I	I
NH	I	NA	I	I	NA	I	I	NA	L	I	L	I(H)	I(M)
NJ	I	L	I	I	I	I	L	NA	NA	NA	NA	I(H)	I(M)
NY	I	I	I	I	I	I	I	NA	NA	NA	NA	I	I
NC	I	I	I(H)	I	I	I	I(H)	I	NA	NA	I	I(H)	I
NM	NA	I	M	NA	I	I	M	NA	NA	NA	NA	I	I
OR	M	NA	I	H	NA	I	M	NA	NA	NA	NA	M	I
PA	NA	NA	I	NA	NA	I	I	NA	NA	NA	NA	I(M)	I(M)
PR	I	I	H	I	I	I	H	I	I	I	I	I(H)	I(L)
RI	I	H	I	I	I	I	H	I	NA	NA	I	I	I
SC	I	I	I	I	I	I	I	I	NA	NA	I	I	I
VI	I	NA	I	I	NA	I	I	NA	NA	NA	NA	I	I
VA	I	I	I	I	I	I	I	NA	L	I	L	I	I
WA	I	I	I	I	I	I	I	I	L	I	L	I	I
WI	L	NA	L	I	NA	I	L	I	NA	I	I	NA	I(M)

Table 13. State program *outcome effectiveness* ratings[1] for each outcome category and for overall tidal and nontidal water and wetland management.

OUTCOME EFFECTIVENESS RATING	OUTCOME INDICATOR CATEGORIES						
	Regulatory Tidal	Regulatory Nontidal	Planning	Acquisition	Nonregulatory Restoration	TIDAL OVERALL	NONTIDAL OVERALL
HIGH	CA-B[1], MD	CA-B, MD	CA-B, MD, PR, RI	CA-B, CA-C, NC, PR	CA-B, CA-C, DE, LA	CA-B	CA-B
MODERATE	OR, PA	PA, WI	GU, MA, MS, OR, NM	DE, MA, WA	CT	OR	none
LOW	none	none	AK, MI, NJ, WI	LA, MI, NH, OR	NH, MD, VA, WA	none	none
PROBABLE HIGH	LA, ME, NC, NH, NJ, PR, VA	ME, NH, NJ	NC	none	none	LA, MD, NH, NC, NJ, PR	MD
PROBABLE MODERATE	AK	AK	AS	SC	none	CA-C, DE, PA	NH, NJ, PA, WI
PROBABLE LOW	none	none	CT	none	none	none	PR
INCONCLUSIVE	AL, AS, CA-C, CT, DE, FL, GU, HI, MA, MS, NM, NY, RI, SC, VI, WA	AL, AS, CA-C, CT, DE, FL, GU, HI, LA, MA, MI, MS, NC, NM, NY, OR, PR, RI, SC, VA, VI, WA	AL, CA-C, DE, FL, HI, LA, ME, NH, NY, PA, SC, VA, VI, WA	AL, CT, FL, GU, HI, MD, ME, MS, NJ, NM, NY, RI, VA, WI	AK, AS, FL, GU, HI, MA, MI, NC, PR, RI, SC, WI	AL, AK, AS, CT, FL, GU, HI, MA, ME, MS, NM, NY, RI, SC, VA, VI, WA	AL, AK, AS, CA-C, CT, DE, FL, GU, HI, LA, MA, ME, MI, MS, NC, NM, NY, OR, RI, SC, VA, VI, WA
NOT APPLICABLE	MI, WI	none	none	AK, AS, PA, VI	AL, ME, MS, NJ, NM, NY, OR, PA, VI	MI, WI	none

[1]Outcome effectiveness ratings for process and tool categories and for overall ratings are based on aggregating the ratings of individual indicators (see Table 7), first to the category level, and then to the overall level.
[2]California outcomes are reported separately for the San Francisco Bay program (CA-B) and the outer coast program managed by the California Coastal Commission (CA-C).

KEY OUTCOME INDICATOR RATINGS:
HIGH—high outcome effectiveness for this indicator
MODERATE—moderate outcome effectiveness
LOW—low outcome effectiveness
INCONCLUSIVE—inconclusive due to insufficient data
PROBABLE HIGH—inconclusive, but limited data suggest probable high (or probable moderate or low) rating
NOT APPLICABLE—not applicable because the associated process or tool category is not used by the state

(Table 13). Examples of states with conclusive and probable outcome ratings below, along with the data that serve as the basis for the ratings, paint a more colorful picture of CZM accomplishments and impacts than do the simple ratings.

States With Conclusive Outcome Effectiveness Ratings. Two state CMPs had sufficient data to be assigned conclusive outcome indicator ratings—the San Francisco Bay portion of California's programs, and Oregon. San Francisco Bay was assigned high effectiveness ratings for both tidal and nontidal wetlands management, although relatively small areas of nontidal wetlands are under their jurisdiction. Good data on the strong BCDC regulatory program, additional data on protection provided through planning initiatives, and acquisition and restoration efforts of the California State Coastal Conservancy figured in the evaluation. Oregon received a moderate effectiveness rating for its tidal wetlands management and inconclusive for nontidal. Examples of outcome data leading to these ratings are outlined below.

San Francisco Bay—high outcome effectiveness for tidal and nontidal management. One of the best examples of CMPs that have relatively good, long-term records of outcomes for estuary and coastal wetland protection was the San Francisco Bay Conservation and Development Commission (BCDC). BCDC has maintained detailed records of its permit actions since well before its 1978 federal CZM approval. Key data they track include numbers of permit actions, approvals and denials, acreage filled, and acreage gained though compensatory mitigation. Detailed wetland mapping serves as baseline data for estimating relative losses and gains. Permit records were computerized by BCDC in the mid-1980s and are now being moved into a GIS-based system. Wetland loss due to filling has dramatically reversed, from 2,300 acres/year from 1940 to 1965 (before BCDC), to 20 acres/year from 1965 to 1986 (post-BCDC and early CZM), to 4 acres/year from 1987 to 1991 (recent CZM). Mitigation has more than compensated for these losses, with more than 30 acres/year net gain since 1987. The entire Bay is in a high protection zone, and four special area management plans provide for more detailed protection and restoration.

Oregon—moderate outcome effectiveness for tidal management. Oregon's estuary GIS database represents one of the best examples of documentation of resource protection through local-state-federal collaborative planning. The GIS data and maps, published in *The Oregon Estuary Plan Book* (ODLCD 1987), documents estuarine zoning (Natural, Conservation, and Development management units) and estuary and tidal wetland habitats. Although the book serves as a valuable resource for local and state regulators, recording of permit actions since plan development are *not* part of the system, limiting its utility. Nevertheless, based on these and other data, Oregon gained a conclusive *moderate* outcome effectiveness rating for tidal wetland management. Based on its estuary plans, 64 percent of Oregon's tidal wetlands are in a high protection zone (Natural) and 34 percent additional in a moderate protection zone (Conservation) (ODLCD 1987). These plans are implemented through local zoning ordinances and through the state's strong regulatory permit program. From 1983 to 1987 period (subsequent data were not available), tidal wetland loss associated with state permits amounted to about 0.02 percent/year, of which 84 percent was mitigated through restoration or creation program (Fishman Environmental Services 1987). Loss reduction from pre-CZM to the same post-CZM evaluation period (1983-87) was 70 percent.

States with "Probable" Outcome Effectiveness Ratings. States with *probable high* ratings for tidal areas included Louisiana, Maryland, North Carolina, New Hampshire, New Jersey, and Puerto Rico, whereas only Maryland rated *probable high* effectiveness for nontidal area management (Table 13). California's outer coast program, Delaware, and Pennsylvania merited *probable moderate* ratings for tidal wetlands; New Hampshire, New Jersey, Pennsylvania, and Wisconsin were judged *probable*

moderate for nontidal wetlands. One state, Puerto Rico, merited a *probable low* rating for nontidal. Many of these state programs had excellent data for one or more categories of outcome indicators, but data were incomplete for other categories. A sample of these states serves to illustrate the bases for probable ratings.

Louisiana—probable high effectiveness for tidal management. Louisiana established a geologic review process for oil- and gas-related permit applications, resulting in an 87 percent decrease in annual rate of loss of tidal wetlands between 1982 (1,500 acres/year) and 1990 (200 acres/year); annual losses today amount to less than 0.01 percent of the resource (Harder, Rives, and Wellman 1991). Insufficient data for wetland mitigation and planning outcomes prevented assignment of a conclusive rating.

Maryland—probable high outcome effectiveness for tidal and nontidal management. Maryland's tidal wetlands program, total permitted losses amounted to less than one acre for the 1990–1995 period. Nontidal wetland losses are higher (138 acres for the 1991–1995 period), but wetland mitigation has replaced these losses at a greater than 1:1 ratio. Maryland's Critical Area planning program included nearly 95,000 acres of land and associated wetlands adjacent to tidal waters in a limited development zone—77 percent of the entire critical area. Of states with probable ratings, Maryland is as close as any to moving over to the conclusive category.

New Jersey—probable high effectiveness for tidal and moderate for nontidal management. Tidal wetland loss is estimated to be near zero for New Jersey, but good computer-based records were not available to confirm this. However, New Jersey has published high-quality data illustrating how its freshwater wetlands protection program has dramatically reduced losses since its inception in 1987. Permit-related losses of freshwater wetlands for the entire state were just 109 acres/year from 1988 to 1993, or 0.03 percent of the resource base (Torok, Lockwood, and Fanz 1996). Most of this loss was mitigated, with 1.3:1 mitigation ratios for individual permits issued. Lack of outcome data for planning and acquisition programs prevented a conclusive rating, and state CZM is not involved in restoration programs.

New Hampshire—probable high effectiveness for tidal management; probable moderate for nontidal management. New Hampshire's regulatory program has reduced tidal wetland loss to near zero over the past ten years, and the small amount of loss associated with high-profile public port and transportation projects has been mitigated at greater than 1:1 ratios. Nontidal wetland loss has amounted to just 0.06 percent of the resource base. Incomplete data on contributions of planning efforts to protection prevented a conclusive determination.

Puerto Rico—probable high effectiveness for tidal management. Although data are not conclusive, the protection provided by Puerto Rico's Special Management Area designation for 22,000 remaining acres of mangroves in the Commonwealth apparently have reduced mangrove loss to near zero. Change detection analysis suggests mangrove acreage might actually be expanding. Data for Puerto Rico's regulatory program is needed to ascertain whether protection provided by plans is actually working as well as change detection analysis suggests.

Wisconsin—probable moderate effectiveness for nontidal management. Compared to total wetland area, Wisconsin's regulatory losses are the lowest of any state CMP we evaluated—0.005 percent/year (62 acres/year) between 1991 and 1995. This represents a 77 percent reduction since early CZM (1982–1991) and is attributable to the Wisconsin Water Quality Wetland Standards, implemented mainly through the state's Clean Water Act Section 401 certification process. Lack of a

mitigation requirement bumped the state down to a moderate rating, and the lack of planning and acquisition data prevented a conclusive determination.

States with Inconclusive Outcome Effectiveness Ratings. Many of the state programs with *inconclusive* ratings—seventeen for tidal and twenty-three for nontidal (Table 13)—had either *high* or *moderate potential effectiveness* (Table 8), but there were simply insufficient outcome data to warrant even probable outcome ratings. Some of the reasons for this data gap and prospects for improved monitoring of outcome indicators are discussed next.

The Outcome Data Availability Gap. The limited availability of outcome data, illustrated by the predominance of inconclusive ratings in Tables 12 and 13, made it impossible to develop a definitive national picture of CZM outcome effectiveness in protecting estuaries and coastal wetlands. Data availability to address outcome indicators is further detailed in Appendix F. The lack of sufficient outcome data for most states is attributable in part to the fact that there are no national requirements for outcome monitoring and reporting. Without such requirements, and in the face of many competing demands for time and resources, few states have independently set up the necessary record-keeping systems to track on-the-ground outcomes. Generally, state priorities are more forward-looking than retrospective. Although most acknowledge the value of outcome monitoring, they simply lack the time, resources, or expertise to carry out a systematic program.

Highlighting this gap in outcome data availability is not meant as an indictment of state coastal programs. Remember that the CZME is an ex post facto study—a retrospective search for data for outcome indicators we identified at the outset of the study. OCRM pointed this out from the start in their 1995 request for proposals, stating that outcome data was likely to be limited for some areas and that process indicators might need to be substituted as measures of effectiveness. Understanding these limitations and the competing demands on coastal managers, data availability was probably about as good as could be expected. The implication here is that the CZME was as much a prototype design effort for a national outcome-monitoring and performance-evaluation system as it was an evaluation study. In this regard, it is worth noting that several states have relatively good, long-term records of outcomes for estuary and coastal wetland protection, although none were comprehensive with respect to the range of indicators in this study. A number of these "role model" states were highlighted earlier—BCDC, Louisiana, and Wisconsin with their regulatory program databases; New Jersey with its mitigation database; and Oregon with its estuary and wetland planning GIS. Another state with good records was Maryland, which has kept records of permit-related acreage loss and gain since 1981 for its estuary and tidal wetland program, and since 1991 for its nontidal wetland programs. Maryland also has an excellent GIS-based statewide wetland inventory that serves as a baseline for measuring progress.

Many other states have some kind of permit tracking system, but they are mostly for administrative purposes—permit status, processing time performance, and so on. Few have kept records of on-the-ground outcomes of their actions. This is changing rapidly, in part due to increased emphasis on accountability, but also because of dramatic advances in information systems technology, particularly powerful desktop computers, database software, and GIS. Record keeping is simply becoming easier, and many states are now in the process of upgrading their capacity for monitoring

CZM outcomes. Requiring consistency among states in outcome indicators monitored would provide a basis for an improved understanding of national CZM outcome effectiveness.

Caveats Regarding Outcome Effectiveness Determinations. Several caveats apply to the effectiveness evaluations based on the outcome-indicator rating criteria and combining rules we developed and applied in this study. Most important is that the criteria and rules are preliminary—whether for individual indicators (Table 10), aggregation of indicator results by category (Table 11, top), or aggregation of results to overall effectiveness estimates (Table 11, bottom). The rating criteria are based on outcome data from a few "reference states" and the investigators' best professional judgment. They are therefore open to criticism and modification, especially if the indicators are included in some future national outcome-indicator monitoring system. Such modification may result in changes in the outcome effectiveness ratings for individual states. *Consequently, state outcome effectiveness estimates using this evaluation model must be considered preliminary*. This said, the authors do believe that the criteria and rules, and the resulting evaluations, are good and reasonable first estimations.

A second caveat is that a good number of state CMPs were assigned *probable* outcome effectiveness ratings, as opposed to *conclusive.* Although available data strongly suggested particular ratings, data were incomplete and the effectiveness ratings should be considered preliminary in this sense as well. More outcome data are needed to determine whether these probable outcome effectiveness ratings hold up.

Finally, because the outcome indicators used here focus mainly on area measurements, little can be said about the relative quality of resources protected, preserved, or restored through CZM, or about the ecosystem services they provide, even though these kinds of considerations may figure into state management decisions. Similarly, none of the indicators dealt with water quality, a particularly important aspect of estuary and coastal wetland protection. These questions were simply beyond the scope of this study. These points were made earlier, but are restated for emphasis.

Step 4: Estimating State CMP Performance in Context

Outcome effectiveness ratings (Table 13) are one possible end point of the CZM effectiveness evaluation process. Implicit in this approach is the establishment of uniform performance standards for all states (as in Table 10), whatever the local situation or the nature of the state's program. We believe that such a "one-size-fits-all" outcome-effectiveness standard does not make sense, given the diversity among U.S. coastal states and CMPs.

The approach used here takes the evaluation process a step further to put outcome effectiveness "in context." First, outcome effectiveness is compared to issue importance, which earlier we suggested establishes expectations for a state CMP. Second, outcome effectiveness is compared to potential effectiveness—the "on-paper" promise exhibited by a state's CMP. These comparisons place a state's outcome effectiveness ratings within its unique context—the social and environmental setting in the first case, and institutional and policy setting in the other. The result is two complementary, context-based performance measures.

Outcome Effectiveness Compared to Issue Importance Ratings. Comparison of outcome effectiveness with issue importance provides one measure of context-based performance for state CMPs in protecting estuaries and coastal wetlands. It suggests that if a state CMP is performing at a higher level (based on outcome effectiveness) than might be expected (given how important the issue is in the state), the program can be judged to have a *Higher-than-expected Performance* level. If outcome effectiveness and issue importance are the same, the program is achieving the *Expected Performance* level, be it high, moderate, or low. If outcome effectiveness is rated lower than issue importance, then the program is achieving *Lower-than-expected Performance*—improvement is needed.

When outcome effectiveness is compared to issue importance (Table 14) for tidal area management, just one program—New Hampshire—performs at a higher-than-expected level, and nine (33 percent) states perform at about the same level as expected (New Jersey, Pennsylvania, Delaware, Maryland, North Carolina, Louisiana, the San Francisco Bay program, Oregon, and Puerto Rico). One program—the California outer coast—performed at a less-than-expected level. The remainder (60 percent) had inconclusive outcome results and could not be compared. For nontidal area management, fewer states did well compared to issue importance. None performed at a higher-than-expected level, and only five programs (17 percent) performed about the same as issue importance might suggest (New Hampshire, Pennsylvania, Maryland, the San Francisco Bay program, and Wisconsin). Two performed at levels less than were expected (New Jersey and Puerto Rico). The remainder (77 percent) had inconclusive outcome results for nontidal areas and could not be compared. Despite the fact that most states have inconclusive ratings, it is a positive sign for U.S. CZM as a whole that of those states that did receive at least a probable outcome rating, most were performing at expected performance levels with respect to issue importance-based expectations.

Outcome Effectiveness Compared to Potential Effectiveness. Comparison of outcome effectiveness with potential effectiveness provides a second measure of overall state CMP performance. This comparison asks whether or not a CMP's outcome effectiveness measures up to its potential "on paper." The rating structure is the same as for the first comparison: if outcome effectiveness is greater than potential effectiveness, a program can be judged as having *Higher-than-expected Performance*. If potential effectiveness and outcome effectiveness are the same, the program is achieving the *Expected Performance* level. Finally, if outcome effectiveness is rated lower than the program's potential suggests, then the program is achieving *Lower-than-expected Performance* and improvement is needed.

Table 14. Performance levels of state CMPs based on a comparison of the importance of estuary and wetland protection in a state *versus* outcome effectiveness ratings.

OUTCOME EFFECTIVENESS OF STATE CMPS

	High		Moderate		Low		Inconclusive	
	Tidal	Nontidal	Tidal	Nontidal	Tidal	Nontidal	Tidal	Nontidal
High	**CA-B,** LA, MD, NC, NJ, PR	**CA-B,** MD	CA-C	NJ		PR	AL, CT, FL, MA, NY, VA, WA	AL, CA-C, CT, FL, LA, MA, NY, NC, VA, WA
Moderate	NH		DE, **OR**, PA	NH, PA, WI			AK, AS, ME, MS, NM, RI, SC, VI	AK, AS, DE, ME, MI, MS, NM, OR, RI, SC, VI
Low							GU, HI	GU, HI

Notes: For states highlighted in **BOLD**, outcome ratings were based on conclusive data; the remaining states had only limited data and outcome ratings are only probable; a key to abbreviations for state CMPs used in this table is found in Table 7. California's two programs were evaluated separately for outcome effectiveness (CA-B is the San Francisco Bay Program, CA-C is the outer coast program).

States where outcome effectiveness of CZM programs is greater than issue importance (OE>IS); *overall*, these state CMPs are judged to have ***Higher-Than-Expected*** performance, considering the importance of the issue in the state.

States where outcome effectiveness of CZM programs is equal to issue importance (OE=IS); *overall*, these state CMPs are judged to have ***Expected*** performance, considering the importance of the issue in the state.

States where outcome effectiveness of CZM programs is less than issue importance (OE<IS); *overall*, these state CMPs are judged to have ***Lower-Than-Expected*** performance, considering the importance of the issue in the state.

States where outcome effectiveness of CZM programs is inconclusive due to insufficient data (OE=I); *overall*, these state CMPs are judged to have ***Inconclusive*** performance levels, compared to issue importance in the state.

When outcome effectiveness is compared to the potential of a program as predicted by process indicators (Table 15), the results are very similar to those for the outcome effectiveness versus issue importance comparison (Table 14). For tidal areas, Louisiana and Puerto Rico were the only states whose outcome-based performance for tidal areas exceeded the expected performance level; no states exceeded expected performance levels for nontidal areas. Seven states performed about as expected for tidal areas (New Hampshire, New Jersey, Pennsylvania, Maryland, North Carolina, the San Francisco Bay program, and Oregon), and six for nontidal (Maryland, New Jersey, Pennsylvania, the San Francisco Bay program, Wisconsin, and Puerto Rico). California and Delaware programs for tidal areas performed at a lower-than-expected effectiveness level. For nontidal wetlands, two state programs—New Hampshire and New Jersey—performed at lower-than-expected effectiveness levels. The same 60 percent of states for tidal and 77 percent for nontidal had inconclusive outcome results and could not be compared (Table 15).

Which of these two context-based performance measures has the most utility? The first—issue importance compared to outcome effectiveness—is useful because it is based more on on-the-ground expectations, such as the development pressures on wetlands and relative predominance of estuaries and wetlands in a state's coastal zone. But many other factors than those considered in our issue-importance determination go into the design and implementation of a state CMP. The "on-paper" potential of a state CMP may more accurately reflect these other factors; for example, what management institutions already existed when the state began to develop its CZM program. From this perspective, the second measure of program performance—potential effectiveness compared to outcome effectiveness—is the more useful one. Probably the most informative approach is to examine both relative performance measures, considering their results as complementary. The first is what might be expected, while the second is what the state is working toward. However, outcome effectiveness on its own (Table 13), independent of issue importance or process ratings, is also useful when comparing state performance. This is especially true when national policy is taken into account, such as the no-net-loss and net-gain of wetland policies being promoted by the current administration (WHOEP 1993).

The Role of Case Examples in Understanding State CMP Effectiveness

Case examples provide the richness and detail not apparent in the dry numbers and ratings of the evaluation process. One or more case examples are included in each of the state profiles for estuary and coastal wetland protection. Particularly noteworthy examples of these are included in Appendix E to this report. Case examples were particularly valuable in this study because most states did not have sufficient outcome data to be rated for outcome effectiveness. Notwithstanding this and other shortcomings of state CMPs noted above, state coastal managers have invented, adapted, or creatively applied a variety of policies, processes, and tools to protect estuaries and coastal wetlands that are worthy of emulation.

Table 15. Performance levels of state CMPs based on a comparison of the potential effectiveness (based on process indicators) *versus* outcome effectiveness ratings.

OUTCOME EFFECTIVENESS OF THE STATE CMP

	High		Moderate		Low		Inconclusive	
	Tidal	Nontidal	Tidal	Nontidal	Tidal	Nontidal	Tidal	Nontidal
High	**CA-B,** MD, NC, NH, NJ	**CA-B,** MD, NJ	CA-C, DE	NH, NJ			FL, GU, MA, MS	FL, GU, MA, MI
Moderate	LA, PR		PA, **OR**	PA, WI			AL, AK, AS, CT, HI, ME, NM, NY, RI, SC, VA, VI, WA	AL, AK, AS, CA-C, CT, DE, HI, LA, ME, NC, NY, MS, OR, RI, SC, VA
Low						PR		NM, VI, WA

Notes: For states highlighted in **BOLD**, outcome ratings were based on good data; the remaining states had only limited data, and outcome ratings are only probable; California's two programs were evaluated separately for outcome effectiveness (CA-B is the San Francisco Bay Program, CA-C is the outer coast program).

States where outcome effectiveness of CZM programs is greater than potential effectiveness (OE>PE); *overall*, these state CMPs are judged to have ***Higher-Than-Expected*** performance levels, given their potential effectiveness.

States where outcome effectiveness of CZM programs is equal to potential effectiveness (OE=PE); *overall*, these state CMPs are judged to have ***Expected*** performance levels, given their potential effectiveness.

States where outcome effectiveness of CZM programs is less than potential effectiveness (OE<PE); *overall*, these state CMPs are judged to have ***Lower-Than-Expected*** performance, given their potential effectiveness.

States where outcome effectiveness of CZM programs is inconclusive due to insufficient data (OE=I); *overall*, these state CMPs are judged to have ***Inconclusive*** performance levels with respect to potential effectiveness.

One of the best examples of CZM innovations is special area management planning (SAMP), an elaborate adaptation of regional planning and dispute resolution methods to address intense conflicts and complex problems in specific geographic areas. SAMP as a CZM process was first elaborated and described in the mid-1970s in the Grays Harbor, Washington estuary plan (Evans and others 1980) and was incorporated into the CZMA as part of the 1980 amendments. Other states have developed and refined the SAMP process as a principal management tool and have shared this experience nationally and internationally (e.g., Rhode Island). Compensatory mitigation for wetland loss is another CZM innovation, first incorporated as explicit state CZM policy in Oregon in 1976 (OLCDC 1976); subsequently, Oregon developed the mitigation banking concept as a tool for collectively addressing the mitigation needs for many small projects (CREST 1979).

Other noteworthy examples of CZM leadership in the design and implementation of management tools to protect estuaries and coastal wetlands include integrated land and water use planning (Oregon, New Hampshire, and others); innovative public-private partnerships and environment-development dispute resolution techniques (California); protection of wetlands from unnecessary loss or degradation through water-dependency tests for locating on the shoreline (San Francisco Bay and many others); exclusion zones for major facilities (Delaware); shoreland buffers to protect tidal and freshwater wetlands (New Hampshire, Maryland, and New Jersey); coastal habitat restoration (Louisiana, Delaware, and Connecticut); GIS-based methods for wetland evaluation and restoration planning (North Carolina and Washington); innovative use of federal consistency standards in lieu of a separate state permit (South Carolina); and many others described in individual state profiles developed as part of this research. Sixteen of these case examples have been expanded to full case studies by Weber (1998).

These and other innovations that took root in state CMPs have seen wide application in coastal zones (and inland areas) throughout the U.S. and the world. Although it is impossible to say what would have occurred in the absence of CZM, coastal states, with impetus provided by the national CZMA and OCRM, can justifiably take a large measure of credit for inventing and advancing the concept and practice of integrated coastal management. Because limited data availability constrains our ability to assess outcome effectiveness across all state programs, case examples of successful, innovative management of estuaries and wetlands are particularly important for understanding the impact of state and national CZM. If used by other states with similar problems or opportunities, significant improvement of individual state programs could result, with national benefits. Specific case examples for each category of processes and tools examined are included in Appendix E.

Conclusions

The principal objective of this study was to determine the on-the-ground effectiveness of state CMPs in protecting estuaries and coastal wetlands. To the extent that outcome data were available (and it was meager in many cases), we found that state CMPs are relatively effective and make significant contributions to this national CZMA objective. Among the various management tools used by states, regulatory programs rated the highest for their contributions to estuary and coastal wetland protection.

But a variety of other strategies and tools, many built around state-local planning partnerships, also contributed significantly to state accomplishments. State CMP weaknesses were also apparent, including a general lack of organized outcome monitoring; relatively limited use of restoration as a management strategy in many states; and relatively weak nontidal, freshwater wetland management in many states. Most of these weaknesses can be traced back to shortcomings in national policy, such as the lack of outcome monitoring requirements and performance standards. The principal study conclusions follow.

1. The importance of estuary and coastal wetland protection is relatively high for most states and for the nation as a whole. Based on the seven indicators used in this study, the importance of estuary and coastal wetland protection as a CZM issue ranges from low to high among states, but is "moderately to highly important" overall. Although there are differences among the states with respect to the importance of estuary and coastal wetland protection, they are mostly subtle gradations within the high and moderate rating categories. This finding and the high importance of the issue nationally means that most states would be expected to have relatively strong, comprehensive CZM policies, processes, and institutions in place and be operating effectively. One caveat to these findings is that the issue importance indicators used here must be considered preliminary. Additional indicators should be evaluated for their relevance in helping define the importance of this and other CZM issues in the states. *See Recommendation 1*.

2. The potential effectiveness of state coastal management programs in protecting estuaries and coastal wetlands looks good "on paper." The *potential effectiveness* of state CMPs collectively, based on an assessment of process indicators, was judged to be "high" for estuaries and tidal wetlands—the saltwater coast—but just "moderate" for nontidal, freshwater wetlands. Despite these generally positive findings, the limited use of available nontidal wetland management tools by some coastal states and too-narrowly drawn coastal zone boundaries in others means that states often lack sufficient jurisdiction to prevent the continued gradual loss of nontidal freshwater wetlands. Further, the fragmentation of wetland management responsibilities in many states and the incomplete networking of relevant authorities into state CMPs result in coordination problems, contribute to monitoring and record-keeping difficulties, and mask some state accomplishments.

Another conclusion based on process indicator data is that a wide variety of processes and tools—inventory and assessment, regulatory, planning, and nonregulatory—are needed for a well-rounded estuary and coastal wetland protection program. However, because five of the ten most important processes and tools were in the regulatory category, it is clear that regulatory programs are considered essential to strong estuary and coastal wetland protection at the state level. States without such regulatory components should consider ways to add or otherwise strengthen their protection efforts to compensate.

The model program and associated evaluation criteria are useful CZM evaluation tools, providing a common, consistent basis for evaluating the potential effectiveness of individual state CMPs—what we have termed the "paper program." The model program also serves as a simple self-evaluation framework for states wanting to improve their programs. The strength of the model program rests on its basis in empirical data (process indicator results) provided by the states. Clearly, however, the model is an ideal—no actual state CMP is likely to have all its features, nor should it necessarily,

because each state's unique context for estuary and wetland management may make one or another strategy or tool inappropriate. *See Recommendation 1.*

3. Outcome effectiveness of state coastal management programs in protecting estuaries and coastal wetlands gets moderate to high ratings for states with sufficient data. Eleven states could be assigned at least probable outcome ratings for tidal wetlands management. Of these, seven (64 percent) rated *high* in outcome effectiveness, with the remainder *moderate.* For nontidal wetlands, only seven states merited at least probable outcome ratings. Of these, effectiveness was *high* for two (29 percent), *moderate* for four (57 percent), and *low* for one. Combining tidal and nontidal, 50 percent rated high in *outcome effectiveness*, 44 percent moderate, and just 6 percent low. If it is assumed that these states are a representative sample of state programs, it is fair to conclude that nationally, outcome effectiveness is relatively high. Improved outcome data from more states are needed to prove or disprove this assertion. *See Recommendation 1.*

4. The overall performance of state coastal management programs in protecting estuaries and coastal wetlands is relatively good for states with sufficient data. When on-the-ground outcome effectiveness in protecting estuaries and coastal wetlands is compared to issue importance-based expectations on one hand, or the "on-paper" potential as derived from process indicator evaluations on the other, 88 percent of state CMPs were judged to be performing at *expected* or *higher-than-expected* levels in the first case and 76 percent in the second case. As with outcome effectiveness, if we assume that the states for which we have sufficient data are representative, the overall performance of state CMPs nationally is fairly high. These findings comport well with the expert opinion-based results of Knecht, Cicin-Sain, and Fisk (1996), who found that state programs are performing "well" or "very well" with respect to the CZM goal of natural resource protection. *See Recommendation 1.*

5. Management of nontidal, freshwater wetlands needs CZM attention. The management of nontidal wetlands in state coastal zones is relatively weak compared to management of tidal areas. Further, there are large areas of nontidal wetlands in many states that probably should be considered "coastal" for CZM purposes, but are located outside present state coastal zone boundaries. Weak management of nontidal, freshwater wetlands in coastal regions in the U.S. poses one of the most significant threats to coastal and estuarine water quality, coastal ecosystem sustainability, and flood hazard mitigation. One of the key issues is the extent to which coastal zone boundaries might need to be expanded to fully encompass nontidal wetlands with clear, unambiguous relationships to coastal waters. A logical starting point for examination of this issue is the coastal assessment framework (CAF) developed by NOAA (1992). This same framework was used to define the boundaries within which wetlands on National Wetlands Inventory maps were defined as "coastal" (NOAA 1991). *See Recommendation 2.*

6. Nonregulatory wetland restoration is an underutilized tool in CZM. Historic loss of estuarine and nontidal freshwater wetlands in many states is high. Although historical losses do not necessarily equate to restoration opportunities, especially in densely populated states where much wetland loss can be considered permanent, only a few states—Louisiana, California, Connecticut, Delaware, North Carolina, and Washington—have systematically evaluated wetland restoration opportunities or

developed action programs (see Appendix E for specific case examples). Other states should follow these examples, working toward a goal of achieving a net gain in wetlands in the coastal zone, so as to reclaim some of the ecosystem services sacrificed in the past. *See Recommendation 3.*

7. OCRM and the states need to act quickly to standardize CZM performance evaluation. Outcome data for evaluating state performance in this study were limited, but this situation is changing at the state level. These changes present a "window of opportunity" for establishing a national CZM outcome monitoring and performance evaluation system. Because many states are gearing up for or are in the process of developing improved information management systems, a window of opportunity is open for OCRM and the states to ensure that nationally important state CZM outcome indicators are part of these state systems. The advent of new information-handling and sharing technologies—high-speed desktop computers, easy-to-use off-the-shelf software, GIS, and the Internet and World Wide Web—is another trend that increasingly makes a national monitoring and reporting system feasible. *The key need is for a well-designed set of policy-relevant outcome indicators*—ones that clearly indicate the degree to which decisions are leading toward desired policy goals. *See Recommendation 1.*

8. Although the question of attribution for CZM outcomes may be important in some cases, it should be subsidiary to questions of CZM performance overall. Too much focus on who gets what share of credit for outcomes discounts one of CZM's chief strengths, namely its role in fostering collaboration and integration within and among governmental levels, economic sectors, disciplines, and across the coastal land-water interface. Often, the most effective state CMPs are those able to engage other governmental and nongovernmental partners to achieve collective goals. Where shares of credit for CZM outcomes must be determined, however, case studies are the preferred methodology, rather than the systematic cataloging of relative contributions. In the earlier discussion of methods, we raised the attribution question—*Was the outcome we identified based on CZM or was the credit due more to some other local, state, federal, or private agency or group?* We acknowledged that we could not fully address this question because we were examining only CZM programs and outcomes linked to CZM policy, not the larger array of programs working toward similar goals. We could not make definitive statements about relative credit due each program for each outcome. However, we conclude that the systematic evidence needed to make such definitive statements is not available today and may never be. The massive effort needed to systematically assign credit for coastal management outcomes is not justifiable in the first place. Can you imagine the ensuing arguments? Finally, such a quest contradicts other explicit national objectives of CZM, namely objectives to foster integration, partnerships, and resource leveraging to achieve common objectives. We assert that the "shared credit" nature of CZM outcomes is actually the result of wise investments of limited resources, with CZM resources often used as a catalyst for subsequent non-CZM actions. For example, in this study, we found that several states used CZM funds to collaboratively prepare a plan for acquisition of critical wetland habitat, but depended on other public and private sources to fund acquisition efforts. Clearly, CZM was a catalyst and legitimately gets a share of the credit for the outcome, because without their initiative, the outcome may not have happened at all. This suggests that case studies are a more effective and useful way to learn about relative contributions of coastal management outcomes. *See Recommendation 1.*

Recommendations

Recommendation 1: Establish a National Performance Evaluation System

A national outcome monitoring and performance evaluation system should be developed by OCRM in collaboration with state coastal managers. In designing the estuary and coastal wetland protection component of that system, we recommend using the indicators and the four-step evaluation process used here to determine (1) issue importance, (2) potential effectiveness, (3) outcome effectiveness, and (4) overall performance. In addition, a fifth step is recommended—the comparison of CZM effectiveness results to the "state of the coast" to determine and evaluate gaps between them.

Performance Evaluation Model. The semi-quantitative CZM program performance evaluation model recommended here is built around five questions—the four addressed in this report and the fifth suggested above. In theory, the same five questions could be applied to any of the outcome-oriented objectives of the CZMA, but this needs more exploration. Our CZME study colleagues examining state CMPs relative to other CZMA objectives followed the same general evaluation model, but modified it to suit their aims. The five questions in the evaluation model are listed below, followed by more detailed discussion of elements of the proposed evaluation framework:

1. How important is the objective or the issue in the state?
2. What is the potential effectiveness of the coastal management program "on paper" for this issue, based on assessment of the policies, processes, and tools employed?
3. How effective are management efforts "on the ground" as determined by outcome indicator data associated with state policies, processes, and tools used?
4. What is the overall performance of the state coastal program, considering issue importance in the state and the potential effectiveness of the program?
5. How does state coastal program effectiveness and performance compare with "state of the coast" data and trends? Do gaps exist between program performance and the state of the coast? If so, what are the causes, and can they be addressed through CMP improvements?

Recommended Issue Importance Indicators. For the evaluation of estuary and coastal wetland protection, the issue importance indicators used in this study are recommended as a starting point, but additional indicators should be sought to make the statistic more robust and address the limitations noted in the results and discussion. Greiner (1998) is examining additional issue importance indicators that may account for makeup of state wetland management programs.

Recommended Process Indicators. The process indicators used in this study are also recommended, but the list of thirty-three processes and tools should be narrowed to the most important processes and tools, plus several others that were highly ranked by one or more states (e.g., local regulation, environmental assessments, state 401 certification, wetland setbacks) or otherwise judged important (e.g., less-than fee acquisition, nonregulatory restoration) (Table 5).

Recommended Outcome Indicators. Recommended outcome indicators for evaluating estuary and coastal wetland protection are listed below and are a subset of those in Table 10. All indicator data need to be normalized (for example, percent wetland loss versus absolute loss) so that state-to-state comparisons are more valid. Outcome indicators that can be addressed using a variety of tools should be emphasized (e.g., loss and/or gain of wetland area can be based on data from state permit decisions, local permit decisions, 401 certifications, and federal consistency reviews). These outcome indicators should be applied separately to (1) estuaries and tidal wetlands, and (2) nontidal, freshwater wetlands in coastal zones. Such separation has an ecological basis, but equally important for CZM, it has an institutional basis. Institutional considerations that argue for this separation include differences in the predominance of public versus private ownership, public trust responsibilities, applicable legal precedents, and management policies and laws. Recommended outcome indicators include:

- *Regulatory Outcome Indicators*: the six outcome indicators used for this study are recommended: (1) area of absolute permitted loss, (2) absolute violation loss, (3) absolute mitigation gain, (4) permitted loss trends, (5) violation loss trends, and (6) mitigation gain trends. For nontidal freshwater wetlands especially, these results need to factor in two process indicators—the extent of state CZM jurisdiction over the resource; and the relative strength of the policy or tool, including exemptions.
- *Planning Outcome Indicators*: the first three outcome indicators used for this study are recommended for a national system: (1) area given high protection by local plans, (2) high protection provided by Special Area Management Plans, and (3) high protection provided by other plans and designations, such as Geographic Areas of Particular Concern, or Areas of Environmental Concern, and critical areas.
- *Acquisition and Nonregulatory Restoration Outcome Indicators*: several of the indicators used for this study are recommended: (1) area acquired in fee-simple (with CZM's contribution specified), (2) area acquired using less-than-fee methods (with CZM's contribution specified), (3) area of wetland or other aquatic habitat restored through nonregulatory mechanisms (including CZM's contribution), and (4) area of wetland or other aquatic habitat created through nonregulatory mechanisms (with CZM's contribution). In addition, for nonregulatory restoration, it may be desirable to differentiate between former wetlands and degraded wetlands restored.

"State of the Coast" Baseline and Monitoring. Regularly assessing the "state of the coast" and comparing it to CZM performance is a fifth and very necessary step in the evaluation model. Using national guidelines, states should establish a baseline and monitor change in relevant indicators, such as the change in area of tidal and nontidal wetlands in a state. When CZM outcomes and performance are compared to overall coastal change, gaps in program content or performance can be uncovered and management programs improved to address the gaps. In addition, natural processes (e.g., global change and relative sea level rise) and human activities (e.g., water withdrawal for inland irrigated agriculture) that affect estuaries and coastal wetlands and over which CZM has little influence can be sorted out. With this improved knowledge about the state of the coast and diagnostic methods to identify causal mechanisms, changes in CZM or other programs or activities can be pursued as appropriate.

Use of Case Studies. Case studies are an often-used evaluation method, and although they do not provide a comprehensive picture of effectiveness that an indicator-based program does, they do lend detail and richness to impact evaluation that could otherwise be missed (see, for example, Appendix E). It is recommended that a national CZM performance evaluation system incorporate case studies as a

means to gain more understanding of state accomplishments and effectiveness. Case studies are also valuable when relative contributions to important CZM outcomes need to be attributed.

State Record Keeping on CZM Outcomes. OCRM should initiate a state-level audit of existing data collection methods (e.g., permit and grant application forms), information management systems (e.g., databases and GIS), and reporting methods. Improvements should be implemented that allow more effective identification, tracking, compilation, and reporting of the outcomes that can be attributed to CZM policy implementation.

One of the major difficulties anticipated with state record keeping, especially for mostly networked programs, is that many of the activities that come under the aegis of "CZM" are carried out by other than the lead CZM agency. Persuading other state agencies—or more difficult yet, many local government units—to monitor outcomes of CZM decision making and projects would be a monumental task. This is complicated by coastal zone boundaries that do not necessarily correspond to existing record-keeping units, such as whole states, counties, watersheds, and so on. It is recommended that centralized monitoring and record keeping at the lead CZM agency be considered as the most efficient and simple mechanism. For estuary and coastal wetland protection, expanding or strengthening record keeping for federal consistency decisions might be a partial solution.

At a minimum, states should develop and maintain databases to track CZM outcome indicator results, providing standardized performance reports to state officials and OCRM. Eventually, monitoring systems should be upgraded to include relevant data in a GIS to provide for more meaningful display, analysis, and reporting. A final step should be incorporation of such data into state CMP World Wide Web sites, so that historical and near-real-time current performance could be available on demand to OCRM, researchers, or the public.

Recommendation 2: Improve Nontidal Freshwater Wetland Management

Improve nontidal freshwater wetland management in state coastal zones by expanding coastal zone boundaries as necessary to encompass all coastal wetlands, by strengthening wetland policies, and by applying a more robust set of wetland management tools.

OCRM and individual states should initiate a more intensive study of nontidal wetland protection needs, strategies, processes, and tools, ranging from the more sophisticated statute-based programs of Maryland or New Jersey to techniques that can administratively increase protection of these valuable resources. Section 401 certification, federal consistency standards, executive orders, and similar mechanisms should be examined. In addition, states should reexamine the 6217 coastal boundary review (NOAA 1992) with respect to the need to protect wetlands within estuarine and coastal drainage areas, particularly where land use and other activities, including wetland alterations, may have direct and significant impacts on estuarine and coastal waters (NOAA 1985; NOAA 1991). One way for OCRM to initiate this nontidal wetland management review would be through the next round or a supplemental round of Section 309 assessment and strategy development. Individual states could also undertake independent reviews.

Recommendation 3: Establish a Coastal Wetland Restoration Policy

OCRM should establish explicit national CZM policy goals for wetland restoration, including (1) no net loss of wetland area and function in the short term, implemented through regulatory programs; and (2) a net gain of wetland area and function over the long term, implemented through nonregulatory restoration programs.

This national CZM policy should strongly encourage states to explicitly establish their own policies as part of their federally approved CMPs. Both wetland policy goals recommended here—no net loss in the short term and net gain in the long term—are fully consistent with CZMA objectives, the findings and recommendations of the National Research Council (NRC 1992), present White House policy (WHOEP 1993), and Congressional policy (Water Resources Development Act of 1990, P. L. 101-640).

Implementing No Net Loss. State CMPs should implement a no-net-loss policy by requiring full mitigation of unavoidable losses permitted under state regulatory authorities. No net loss of wetland area is an inherent benchmark that can be assessed using regulatory outcome indicators and rating criteria recommended in this study, particularly RG1 and RG3 in Table 10.

Implementing Net Gain. The net-gain goal of this recommended policy recognizes the substantial historic loss of coastal wetlands and the significant opportunities that exist to restore a portion of the lost or degraded functions, services, and values of these ecosystems. OCRM should encourage and support state nonregulatory initiatives for ecosystem restoration with a long-term goal to increase the quality and quantity of coastal wetlands as measured by acreage and function. Net-gain benchmarks should be established by states based on an assessment of historic loss and actual restoration opportunities. Assessment can be based on the nonregulatory outcome indicators and rating criteria recommended in this study (NR1 to NR3 in Table 10). CZMA Section 309 program enhancement guidance should also be amended to require more explicit assessment of restoration needs and opportunities.

Implementing Function and Quality Assessments. Implementing the wetland "function" part of the recommended coastal wetlands policy will be very challenging for reasons outlined earlier (e.g., standard methods for assessing wetland functions are just being developed, and there is significant time and expense involved in adaptation of national methods to a locale and subsequently validating results). Nevertheless, there are existing CZM examples that serve as models. North Carolina's Coastal Region Evaluation of Wetland Significance (NC-CREWS) is one (Sutter and Wuenscher 1997); Washington State's function-based wetland restoration planning is another (Gersib 1997). Both examples utilize hydrogeomorphic (HGM) classification approaches that focus explicitly on the habitat, water quality, and hydrologic functions of wetlands (Brinson 1993; 1995; 1996; Brinson and others 1996). These and other means of addressing wetland function and quality should be supported by OCRM and explored by states using CZM technical and financial resources.

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