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Beatley & Brower, 1999. Intro to Coastal  
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## Regional Planning and Ecosystem Management

### Introduction

Natural resource management does not lend itself to traditional planning and management mechanisms. Indeed, while these fragile resources are often those in need of the greatest protection from the impacts of development, the defined coastal region can be particularly elusive when regulatory regimes attempt to provide the requisite buffer from human encroachment. One reason for this difficulty in managing coastal resources is that all natural resources are included within a system of interacting components, physical and biological, and one action, whether initiated from within or external to the system, will have ramifications far beyond the initial impact. Another major reason for the difficulty in managing coastal resource uses is the fact that natural resources often transcend political boundaries and do not conform to our artificial and arbitrary regulatory and administrative jurisdictions.

One solution that has been posed to address this dilemma is management of natural resources at the *regional* level. Together with a similar approach to natural resource management, the ecosystem approach, regionalism has proven in some cases to have the potential to be the most effective means of ensuring the continued viability of our coastal areas.

### Jurisdictional Problems Addressed by Regional Planning

Environmental statutes and regulations are promulgated at both the federal and state levels. In addition, local governments may also pass

ordinances which address environmental concerns. This combination of authorities and institutions can often lead to confusion when conflicting policies and duplicative or inconsistent permit requirements exist. Furthermore, some regional environmental problems may not be addressed at all. Federal and state programs may be too broad in scope to deal with an area's particular concerns, while local government solutions may only be able to solve a portion of the problem. The following paragraphs describe some of the drawbacks that might become apparent, and which regional management attempts to address, when each of the traditional levels of government attempt to regulate natural resources.

### Federal Policy

The first such drawback involves federal policy, which is often too broad to adequately protect the environmental resources of certain areas. Statutes such as the Clean Water Act and the National Environmental Policy Act must necessarily establish broad goals and standards applicable nationwide. Smaller areas on the regional scale, however, frequently require specific environmental management strategies regulating activities such as land development and pollution discharge in order to preserve their sensitive natural systems. The site-specific environmental necessities of certain areas are often not addressed in federal legislation.

Furthermore, federal environmental policies are not designed to mitigate multi-jurisdictional conflicts or address regional issues. Managing wide areas requires cooperation among all levels of government. Although federal policies can mandate state and local compliance with environmental standards, they often do not establish a basis for intergovernmental cooperation. Most federal policies do not mitigate conflicts between municipal, county, and state governments regarding authority over and responsibility for management planning. Rather, these policies frequently act as enforcement agents by concentrating more on delegating responsibility to the states than on working collectively to address regional issues.

### State Policy

While states are given much authority to carry out federal mandates and programs of their own, there are often problems associated with

natural resource management at the state level. State environmental agencies are usually the parties responsible for environmental quality within the state. State agencies may be subject to broad federal standards; but it is the states, not the federal government, which are responsible for creating implementation plans and drafting regulations.

For a number of reasons, however, state agencies may fail to discern and address the needs of certain environmentally sensitive areas. For instance, existing programs and regulations may be too broad in scope. As with federal environmental statutes and regulations, state standards are intended to address large areas and therefore are not tailored to meet the needs of particularly sensitive areas.

### Local Policy

Although state agencies administer most environmental regulations, local governments play an important role in natural resource protection. Many state regulations are implemented and enforced at the local level. Through the police-power and state-enabling legislation, local governments are responsible for land use planning, zoning, and subdivision regulations. There are, however, several limitations to natural resource protection at the local level.

One such limitation lies in the fact that natural ecosystems transcend local boundaries. Local political borders do not correspond to natural ecosystems, and natural resource management plans are often developed around jurisdictional boundaries without fully incorporating the natural systems that are to be protected. This problem is especially true if land use management is required to protect resources, as the regulation of land use is a local domain. For example, through their land use practices, all localities within a watershed affect the water quality for all users of that watershed. Uncoordinated efforts to improve water quality by individual localities through land use regulations may be hindered as a result of activities in other jurisdictions, whose land use laws may not be as stringent.

In addition, local governance is largely fragmented among numerous counties and municipalities. Activities or problems in one jurisdiction, such as nonpoint source pollution, may affect other localities. Traditionally there is a lack of framework for dealing with regional issues or problems and there are generally no incentives for protecting resources of regional significance.

Within localities, authority may be fragmented among various agencies, special districts, or service districts. For example, programs and regulations affecting the environment, planning, housing, and infrastructure may be carried out by independent agencies. As a result, the local permit process is also fragmented, and there is generally no coordination between local and state or federal permit processes.

A final drawback is that local governments may have provincial or parochial outlooks. The regulation of land and natural resources is a political decision, and local decisions tend to reflect local political influences which often do not take into account greater-than-local concerns. All too often there is no reason for localities to consider impacts beyond their border or outside of their extraterritorial jurisdiction. Economic development and the pressure to create jobs and increase the tax base may take precedence over other wider community goals. As a result, some local governments may be prodevelopment at any cost, although competition for economic development among localities can substantially reduce any benefits. An urban and rural dichotomy may be a problem as well, as rural residents may resent conservation efforts that are seen as deterring growth.

### Ecosystem Management

A planning and management concept closely related to regionalism which attempts to reach similar goals in natural resource management is the ecosystem approach. This involves the concept of interaction among environmental factors, living organisms, and human beings in a holistic, sustainable system, usually referred to as an ecosystem. (National Research Council of the U.S., 1985).

The ecosystem approach is based on the premise that land, water, air, and biota interact and are mutually influenced. Existing resource management approaches which partition the environment into separate components of land, water, and air with associated biota are recognized as inadequate from the ecosystem perspective, "since management of a resource component in isolation from adjacent or interacting components would likely produce short-sighted strategies to protect one component of the environment at the expense of another" (Caldwell, 1985).

The ecosystem approach often involves issues of intergenerational equity. As resources are exploited, whether directly or as a depository

for wastes, we also affect the use that future generations will be able to make of that resource. The present generation has the ability in some instances to magnify the benefits of certain resources for future generations, for example, by implementing navigational aids along a waterway. Other actions of the current population, however, will decrease the utility of certain resources, or severely increase the cost of its use for future generations, as in the case of the dumping of toxic wastes. Future generations are generally unrepresented when policy decisions regarding the use of a natural resource are made, and so the present generation, however unwittingly, often lessens the flexibility that the future generation will have in using that resource (National Research Council of U.S., 1985).

The ecosystem approach to natural resource management has the potential to embody the principles of intergenerational equity. One such principle is that there should be a concerted effort toward conservation of quality of the resource, which entails leaving the ecosystem in no worse condition than it was received from previous generations. The second such principle for intergenerational equity involves conserving the diversity of the natural resource base, so that future generations have as many options regarding its use as are present today.

There are many different approaches to implementing regional or ecosystem management. In some areas, management is undertaken by a regulatory agency. This may take the form of a free-standing body spanning state borders, or it may operate within a state government, either as a separate entity or as a division of an existing state department or agency. Such regulatory agencies are usually created by the legislators of the state(s) and may be given both regulatory and enforcement powers. Other regional management bodies are more administrative in nature and may perform coordinating functions or act as advisory boards to state and/or local governments.

Many states have legislation which enables localities to voluntarily form Councils of Government (COGs). For instance, in North Carolina, legislation allows COGs to be created to study and inventory regional roles, resources, and problems, and promote cooperative arrangements and coordinated action among their member governments. Planning districts can also be formed for the basis of COGs, where participating governments pay dues to the COG and each

locality sends a delegate to COG planning meetings. COGs are similar in nature to regional planning commissions, which are often formed to prepare regional plans to address land uses, public works, and economic development strategies.

The following sections discuss several manifestations of the regional or ecosystem approach to natural resource management. To a greater or lesser degree, each of these programs attempts to deal with the problems of multiple jurisdictions and to cross political borders in order to manage natural systems by following natural boundaries.

### The National Estuary Program

The National Estuary Program (NEP) was established in 1987 by the Federal Water Pollution Control Act, and is administered by the U.S. Environmental Protection Agency (EPA) through the Office of Wetlands, Oceans and Watersheds (OWOW). The Act defines the NEP's primary goals to be the protection and improvement of water quality and the enhancement of living resources (33 U.S.C.S. §1330(a)(2)(A)). Before this formal declaration, however, the roots of the NEP had already been established through efforts to manage the coastal environment at both the federal and state levels. In particular, the EPA's involvement in the Great Lakes Program and the Chesapeake Bay Program supported the basic premise of the NEP: that management of hydrologic ecosystems must be approached holistically by recognizing the interconnections of all living resources within the estuarine environment. The NEP also relies on past experience, which demonstrates that a regional, cooperative approach to natural resources protection and management is both feasible and effective.

The National Estuary Program is a voluntary program operated at the state level. Federal technical and financial assistance is available to the states in order to identify an estuary's problems and to develop a management plan of action to address those problems. The management approach used by each program follows federal standards which are flexible enough to allow for considerable local variation in problem selection and managerial design. While federal planning funds are provided through the NEP, state and local governments are responsible for funding implementation of the management plan.

The NEP encompasses estuaries which represent diverse ecosystems, including both heavily urbanized and rural watersheds, each of which has its own attending ecological, social, and economic issues to be addressed. Furthermore, some of the estuaries of the NEP transcend both local and state boundaries, and many differ in their degree of jurisdictional complexity. To deal with these differences among estuaries, the structure of each individual NEP centers around its own Management Conference, comprised of various committees which oversee the various program activities undertaken by that particular NEP. The Conference also acts as the primary decision-making unit. There is considerable variation in the composition and size of the individual Management Conferences, depending upon the specific conditions of each estuary program.

While the EPA allows for flexibility in composition, each Management Conference must contain several committees, headed by a policy committee, made up of EPA representatives, governor(s), and top agency officials. The Conference also includes a management committee, which acts as the consensus builder for the group as a whole and whose members are representatives of state water quality and natural resource agencies, state regulatory offices, and community and environmental groups. The management committee is responsible for developing the five-year Management Conference Agreement between the state and EPA, which identifies program activities, work products, and sets major program milestones and work schedules. Other committees found in a Management Conference include a science and technical advisory committee, a citizens' advisory committee, a local government committee, and a financial planning committee.

The various committees of each NEP Management Conference work together to achieve seven basic federally mandated purposes, with the underlying understanding that the ultimate goal of the NEP is to achieve basinwide planning to control pollution and manage living resources. The seven legislatively determined purposes of a Management Conference are

- assess trends in water quality, natural resources, and estuary uses
- data collection and assessment of toxins, nutrients, and natural resources within the estuarine zone in order to identify the causes of environmental problems

- develop the relationship between the point and nonpoint loadings of pollutants to the estuarine zone and the potential uses of the zone, water quality, and natural resources
- develop a Comprehensive Conservation and Management Plan (CCMP) that includes recommendations for priority corrective actions and compliance schedules addressing sources of pollution and restoration of the biological, chemical, and physical integrity of the estuarine zone
- develop plans for the coordinated implementation of the CCMP by states as well as the federal and local agencies participating in the Conference
- monitor the effectiveness of actions taken pursuant to the plan
- review federal financial assistance programs and federal development programs for consistency with the CCMP (33 U.S.C.S. §1330(b)).

The Comprehensive Conservation and Management Plans are the heart of each NEP, but their implementability remains questionable. While federal assistance covers preparation and planning, no federal monies are available for implementation. Therefore, responsibility for putting the plans into action rests entirely with state and participating local governments. Furthermore, while the CCMP operates as a vehicle for problem identification, the plans do not automatically become state public policy. Further political action, along with budgetary and public support, is often required before a CCMP gets on the state agenda. Despite the limitations in terms of policy execution and implementation financing, the structure of the National Estuary Program may prove to be flexible and adaptable enough to be successful in managing estuaries of national significance (Imperial et al., 1993).

### Special Area Management Planning

Special Area Management Planning (SAMP) is a coordinated approach which addresses complex and often far-reaching environmental problems through regional management. The Federal Coastal Zone Management Act defines a special area management plan as a "com-

prehensive plan providing for natural resource protection and reasonable coastal-dependent economic growth containing a detailed and comprehensive statement of policies; standards and criteria to guide public and private uses of lands and waters; and mechanisms for timely implementation in specific geographic areas within the coastal zone" (16 U.S.C. §1453(17)).

As a planning mechanism, special area management has been used with varying degrees of success throughout the United States. While specific applications of SAMP vary widely, the basic tenets of the technique are designed to accomplish similar broad goals, including

- address environmental problems that are best solved through a multi-jurisdictional and integrated policy approach
- coordinate existing policies in order to adequately and comprehensively address environmental problems
- establish a balanced management framework for the protection of public or socially important resources, while allowing for appropriate continued use of these resources.

There are several scenarios in which SAMP may be appropriate. First, environmental problems that warrant this approach typically involve natural systems lying within multiple political jurisdictions. Conflicts regarding the multiple use of resources, including numerous human and natural forces which may threaten the vitality of the resource, may make management by a single entity problematic. Second, high resource values (economic, recreational, social, biological) often create conflicting interests regarding preservation or development, and in these cases an integrated special area approach allows for more flexible, tailored management. A publicly or socially important natural resource area (characterized as a "public good") may also be targeted for special area management. Finally, particularly severe environmental problems ranging over a large geographic area may warrant the use of this management technique.

Special area management is founded upon specific management goals and objectives pertaining to an explicit, well-defined problem area. Typically, this area is delineated spatially, according to resource-area boundaries which include the environmental system targeted by management goals and the human systems that impact upon it.



Natural, political, and social systems within this area must also be identified. The planning area must also encompass a broad enough area to include the entire relevant environmental system in addition to the human systems that impact upon it.

In its best form, special area management plan participants typically work together through consensus and negotiation to create an agreed-upon management text. Various interest groups can be involved in the SAMP process, including state and federal agencies, local officials, environmentalists, landowners, developers, citizen groups, and others with a stake in the management of a particular area.

The final outcome of the special area management process can take several forms. Some SAMPs end as a loose nonenforceable coalition of interests who confer with one another concerning policy goals. Other plans operate by means of an advisory committee which counsels relevant governmental units on how to deal with specific problems. Still other SAMPs become a formal part of either state or local government and are often given some degree of regulatory control.

Special areas can range in size from a relatively small tract, such as San Bruno Mountain's 3,400 acres, to a massive area, such as the Adirondack State Park, which encompasses six million acres in rural upstate New York. Although these two areas may initially appear to have nothing in common, both contain valuable natural resources that are subject to a complex web of competing interests, and which the SAMP technique helps to protect and preserve.

A prime example of a SAMP in the United States is the Chesapeake Bay Program. The Chesapeake Bay is the largest estuary in the United States, being 195 miles long and from 4 to 30 miles wide. Approximately 50 major rivers and over 100 smaller tributaries provide freshwater to the bay. The drainage basin includes an area of roughly 64,000 square miles, thus accounting for one-sixth of the Atlantic seaboard.

Responding to public concern regarding the declining water quality and the diminishing fish and shellfish landings, in 1975 EPA conducted a comprehensive study of the Chesapeake Bay. The findings of the five-year study prompted the governors of the states of Maryland, Virginia, Pennsylvania, the mayor of the District of Columbia, the chairman of the Chesapeake Bay Commission, and the administrator of the EPA to sign the 1983 Chesapeake Bay Agreement (CBA). Of the states within the watershed, only Delaware, New York, and West

Virginia have not signed the CBA, though the 1992 amendments state that members should "explore cooperative working relationships" with these states.

The Chesapeake Bay Agreement relies entirely upon individual state implementation of the goal and policy statements. Thus each state has approached watershed management differently. This has allowed flexibility in developing a management program that is politically acceptable to each state. In addition, the setting of priorities, goals, and objectives are established by consensus.

### The Great Lakes Program

The Great Lakes are the most important natural resource shared by Canada and the United States. The joint responsibility for this shared resource has produced large-scale cooperative arrangements such as the St. Lawrence Seaway, the Niagara Falls Treaty, the Great Lakes Water Quality Agreements, the Great Lakes Fishery Commission, and three Lake Levels Boards of Control. The institutional setting within which these management activities occur is complex and diverse. The responsibility for governance is diffused among the two federal governments, eight American states, the province of Ontario, as well as among numerous regional, local, and special purpose districts of government.

With relatively few exceptions, the lakes themselves are not directly managed. There are, of course, specific instances of direct management—such as the regulation of water levels or the manipulation of biota (for example, species of fish). But the major task of environmental protection for the lakes involves managing certain activities of people. The greater body of law and policy is directed toward those human activities that affect the lakes and their quality (Caldwell, 1985). This section describes one such management system, the Great Lakes Program (GLP), which began in the early 1970s as a cooperative effort between the United States and Canada to address the environmental problems facing the Great Lakes ecosystem.

The GLP is a true inter-jurisdictional effort which encompasses the entire watershed of the Great Lakes. The United States and Canada base their respective management programs on a series of

international agreements, the Great Lakes Water Quality Agreements (GLWQA) (Imperial et al., 1993). The first GLWQA was signed in Ottawa by President Nixon and Prime Minister Trudeau. Following the first five-year review, the GLWQA of 1978 was signed at Ottawa.

The International Joint Commission (IJC) plays an important role in guiding the efforts of the two countries and monitoring the progress of implementation of the GLP. The IJC has a history pre-dating the GLWQA, and was actually established in 1909 by the Boundary Waters Treaty between the United States and Canada to oversee navigation, water withdrawal, and water levels. Today the IJC is the most prominent public body shaping policy with respect to the Great Lakes, and it is a testament to the Commission's effectiveness in that it continues to oversee management today. The U.S. portion of the GLP is administered by the Great Lakes National Program Office (GLNPO), which is a separate and distinct office within the U.S. Environmental Protection Agency.

With careful study of biannual and five-year progress reports, the Great Lakes Program has been able to evolve over the years to deal with increasingly complex issues involving the integrity of the Great Lakes environment. As scientific data is acquired and interpreted, and as new understandings of the ecosystem have been reached, the GLP has been able to update and adapt its management programs to respond to the lakes' environmental needs.

The first GLWQA, signed in 1972, contained general objectives and addressed conventional pollutants. The early years of the program focused primarily on point sources of pollution in order to address the problems of oxygen depletion and eutrophication. To achieve these goals, major municipal treatment plants within the management area were required to reduce phosphorus in effluents, and phosphate detergents were banned in many states (Imperial et al., 1993).

The 1978 Agreement added more specific and quantitative objectives, including physical, microbiological, and radiological parameters (Imperial et al., 1993). Specific objectives of the Agreement include a nondegradation clause, a policy that flow augmentation is not a substitute for adequate treatment, exclusion of inshore areas where natural phenomena prevent achievement of objectives, and designation of limited-use zones.

The 1978 GLWQA is most notable for being the first major international treaty or agreement to embrace the ecosystem approach to the

management of large regional resources (National Research Council of U.S., 1985). Thus, by formal agreement between Canada and the United States, policies directed toward the restoration and enhancement of water quality in the Great Lakes were to be based upon a basinwide ecosystem view (Caldwell, 1985).

The 1978 GLWQA took a long-term perspective in managing pollutant threats, recognizing the need for both reactive and preventive measures to control the buildup of substances and the transport of materials from the land to the water and from the air to the water. In the Agreement, the water resources of the basin transcend political boundaries within the basin and are treated as a single hydrologic system (National Research Council of the U.S., 1985).

Article I(g) of the 1978 GLWQA defines the Great Lakes ecosystem as "the interacting components of air, land, water and living organisms, including man" (Caldwell, 1985). This ecosystem approach means that actions affecting the lakes, taken or authorized by the governments, must "proceed on the understanding that the field of policy is no less than the basinwide watershed of the Great Lakes and the multifarious relationships interacting within and intruding from without" (Caldwell, 1985).

The Great Lakes Program has evolved substantially since the 1972 GLWQA. The adoption of a basinwide ecosystem approach to management for the lakes is a decision of major international importance (Caldwell, 1985). Aside from this more general achievement, progress in specific areas has also been notable. For instance, phosphorous loadings from point sources have been reduced by an estimated 80-90% through regulation and financial assistance; all major dischargers as a group are currently meeting the 1 mg/liter phosphorous goal; the GLP is now targeting the control of nonpoint sources of nutrients; support is being given to efforts to obtain information about sources, fates, and effects of pollutants to support a mass balance approach in remedial action programs; point-source loadings of almost all toxic substances have decreased in recent years; and the GLP is working to assess and address the problem of contaminated bottom sediments (Imperial et al., 1993).

There are also some lessons to be learned from the Great Lakes Program that can be applied to other ecosystem-based management approaches. For instance, without clearly articulated goals and priorities to drive the decisions and actions of the GLP, its efforts have

frequently lacked focus. This problem is exacerbated in a management system that is highly complex and involves many levels of government. Furthermore, it is clear that it is crucial to set risk-based goals and priorities and let the priorities drive the management decisions and actions. The GLP will never have the authority or the resources to address all of the problems in the Great Lakes, and it is important that these resources be flexibly targeted and integrated in a manner that provides the greatest opportunity from the limited availability of resources (Imperial et al., 1993).

### North Carolina Areas of Environmental Concern

The North Carolina Coastal Area Management Act (CAMA) protects natural resources in the coastal zone through an ecosystem approach by designating certain geographic areas as Areas of Environmental Concern (AECs). The 13 categories of AEC designated as such by the North Carolina Coastal Resources Commission (CRC) include water as well as land, and are identified as areas in which uncontrolled or incompatible development might result in irreversible damage. CAMA further instructs the CRC to determine what types of development activities are appropriate within such areas, and it calls on local government to give special attention to these environmentally fragile and important areas when developing land use plans. Also, CAMA provided that upon establishing the types of development activities appropriate within AECs, the CRC would implement a permit program capable of controlling any inappropriate or damaging development activities within the AECs. The intent of this authority is not to stop development but rather to ensure the compatibility of development with the continued productivity and value of certain critical land and water areas (15A NCAC 7H .0102(e)).

The Act divides the implementation responsibilities of the permit program between local governments and the Coastal Resources Commission. Individuals proposing "minor development" activities within an AEC are required to receive permits from a local permit officer, while individuals undertaking "major development" activities must seek permits directly from the CRC.

As presented in the guidelines accompanying CAMA, the 13 cate-

gories of AECs are separated into four broad groupings. The broad breakdowns include categories of AECs that are either interrelated components of an ecological system or a collection of AECs with similar management objectives. The purpose in presenting the material in this manner is not only to create a logical organization, but also to emphasize the relationship of one AEC category to another and the interactive nature of AECs within the total coastal environment (15A NCAC 7H .0103(b)).

The first AECs discussed collectively in the CAMA regulations are those within the estuarine system, and include the following AEC categories: estuarine waters, coastal wetlands, public trust areas, and estuarine shorelines. The next broad grouping is composed of those AECs that are considered natural hazard areas along the Atlantic shoreline. Ocean hazard areas include beaches, frontal dunes, inlet lands, and other areas with the possibility of erosion or flood damage.

The third broad grouping of AECs includes valuable small surface water supply watersheds and public water supply wellfields. The fourth and final group of AECs is gathered under the heading of fragile coastal natural and cultural resource areas, and is defined as areas containing "environmental, natural or cultural resources of more than local significance in which uncontrolled or incompatible development could result in major or irreversible damage to natural systems or cultural resources, scientific, educational, or associative values, or aesthetic qualities" (15A NCAC 7H .0501). The AECs within this grouping include coastal complex natural areas, coastal areas that sustain remnant species, unique coastal geologic formations, and significant coastal architectural resources.

The state guidelines provide detailed descriptions of each Area of Environmental Concern, explain the significance of the areas, outline management objectives, and set forth use standards for each type of AEC.

The designation of AECs, the development of use standards adopted by the CRC, and the implementation of the permit process in conformance with these standards are an application of ecosystem management within the context of the North Carolina Coastal Management Program. The Coastal Resources Commission has reserved AEC designation for areas of particular importance or vulnerability; not all coastal resource areas become CAMA Areas of Environmental Concern.



## The Watershed Protection Approach

All states and the federal government have water protection programs designed to reverse or prevent water quality degradation. Most of these programs include regulations on industrial and municipal point source discharges. One of the greatest dangers to the nation's water supply, however, emanates from nonpoint sources of pollution, such as runoff into waterways and seepage into groundwaters. Wetland degradation and habitat destruction are also threatened by these nonpoint sources of pollution.

There are now in place some federal programs aimed at nonpoint source pollution. However, absolute uniform regulation of nonpoint sources at the federal level would be prohibitively expensive. Furthermore, such federally imposed control would most likely be politically infeasible in our federalist system, where impingements on traditional state and local prerogatives such as land use regulation and economic development are not frequently tolerated. Because of these limitations on any federal system of regulation, governments at all levels are broadening their outlook on water quality protection and refocusing existing water pollution control programs to operate in a more comprehensive and coordinated manner. There is a growing consensus that the pollution and habitat degradation problems now facing society can best be solved by following a basinwide approach that takes into account the dynamic relationships that sustain natural resources and their beneficial uses. The term "watershed protection approach" is often used to encompass these ideas (U.S. Environmental Protection Agency, 1991).

The term "watershed," as used in the United States, refers to a geographic area in which water, sediments, and dissolved materials drain to a common outlet—a point on a larger stream, a lake, an underlying aquifer, an estuary, or an ocean. This area is also called the "drainage basin" of the receiving water body.

When defining the boundaries of the watershed in a particular locality for purposes of regulation, many factors may be considered. Local decisions on the scale of geographic unit may involve analysis of the hydrologic aspects of underlying groundwaters, economic uses, the type and scope of pollution problems, and the level of resources available for protection and restoration projects (U.S. Environmental Protection Agency, 1991).

The watershed protection approach aims at targeted, cooperative, and integrated action. Three main principles are usually relied upon. First, the target watersheds should be those where pollution poses the greatest risk to human health, ecological resources, desirable uses of the water, or a combination of these. This risk-based geographic targeting may involve several different problems that pose health or ecological risks in the watershed. These problems include industrial wastewater discharges; municipal wastewater, stormwater, and combined sewer overflows; waste dumping and injection; nonpoint source runoff or seepage; accidental leaks and spills of toxic or hazardous substances; atmospheric deposition; habitat alteration, including wetlands loss; and flow variations. Based on evaluation of these and similar problems, the highest-risk watersheds are identified and one or more are selected for cooperative, integrated assessment and protection.

The second principle of the watershed protection approach entails stakeholder involvement; all parties with a stake in the specific local situation should participate in the analysis of problems and the creation of solutions. Potential participants in watershed protection projects include state environmental, public health, agricultural, and natural resources agencies; local/regional boards, commissions, and agencies; EPA water and other programs; other federal agencies; Native American tribes; public representatives; private wildlife and conservation organizations; industry sector representatives; and the academic community. Stakeholders should work as a task force, reaching consensus on goals and approaches for addressing a watershed's problems, the specific actions to be taken, and how they will be coordinated and evaluated.

The third principle in the watershed protection approach is that the actions undertaken should draw on the full range of methods and tools available, integrating them into a coordinated, multi-organization attack on the problems. Coordinated action may be taken in such areas as voluntary source reduction programs (e.g., waste minimization, BMPs); permit issuance and enforcement programs, standard setting and enforcement programs (nonpermitting); direct financing; economic incentives; education and information dissemination; technical assistance; remediation of contaminated soil or water; and emergency response to accidental leaks or spills. The selected tools are then applied to the watershed's problems, according to the plans and roles established through stakeholder consensus. Progress evaluated

periodically via ecological indicators and other measures (U.S. Environmental Protection Agency, 1991).

Numerous projects using the watershed protection approach have been implemented throughout the United States, and many more are in various stages of planning. These activities were not mandated by EPA or any other central agency; they have arisen spontaneously as the most effective way to address pressing local or regional problems (U.S. Environmental Protection Agency, 1991). In general, these project differ from conventional water quality initiatives in that they encompass all or most of the landscape in a well-defined watershed or other ecological, physiographic, or hydrologic unit, such as an embayment, an aquifer, or a mountain valley. Most such projects are more comprehensive than traditional water regulations, and establish goals and objectives dealing with a vast array of watershed issues, such as chemical water quality (conventional pollutants and toxics), physical water quality (e.g., temperature, flow, circulation), habitat quality (e.g., channel morphology, composition, and health of biotic communities), and biodiversity (e.g., species number, range) (U.S. Environmental Protection Agency, 1991).

One watershed project which has had some success to date is the Stillaguamish Watershed Protection Project in Washington State. The Stillaguamish Watershed is a significant source of nonpoint source pollution to Puget Sound. Bacteria from livestock wastes and onsite sewage disposal systems are the main pollutants, as well as runoff of sediment from forests, farms, and development sites. In large part because of these pollutants, shellfish beds in Port Susan have been declared unsafe for commercial harvest.

A Watershed Management Committee (WMC) was formed in 1988 with a grant from the Washington Department of Ecology. The WMC was made up of representatives from the Tulalip and Stillaguamish Tribes, county and city governments, environmental and business interests, and homeowners' and citizens' organizations. State and federal environmental regulators participated via a technical advisory committee.

The Stillaguamish Watershed Action Plan, completed in 1989, consists of five source control programs, a public education program, and a monitoring program. WMC recommendations include developing farm conservation plans, reducing improper disposal of human waste,

preventing urban runoff, and sampling on a regular basis to track water quality trends (U.S. Environmental Protection Agency, 1991).

## Conclusions

This chapter has introduced the regional perspective in coastal management and discussed the primary benefits and advantages of a regional approach. Clearly, many coastal problems, and the coastal ecosystem itself, extend beyond local (and frequently state) jurisdictional boundaries. Regional planning approaches can help to overcome these difficulties. Several key federal and state initiatives have been undertaken and serve to promote regional coastal management. These include the National Estuary Program, Special Area Management Plans (under CZMA), the Great Lakes Program, North Carolina's Areas of Environmental Concern (AECs), and the EPA's Watersheds Protection Program. These and other examples illustrate the potential importance and utility of regional coastal management approaches. Increasingly, regional, ecosystem-oriented strategies will constitute an integral element in effective coastal management in the United States and elsewhere.